ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

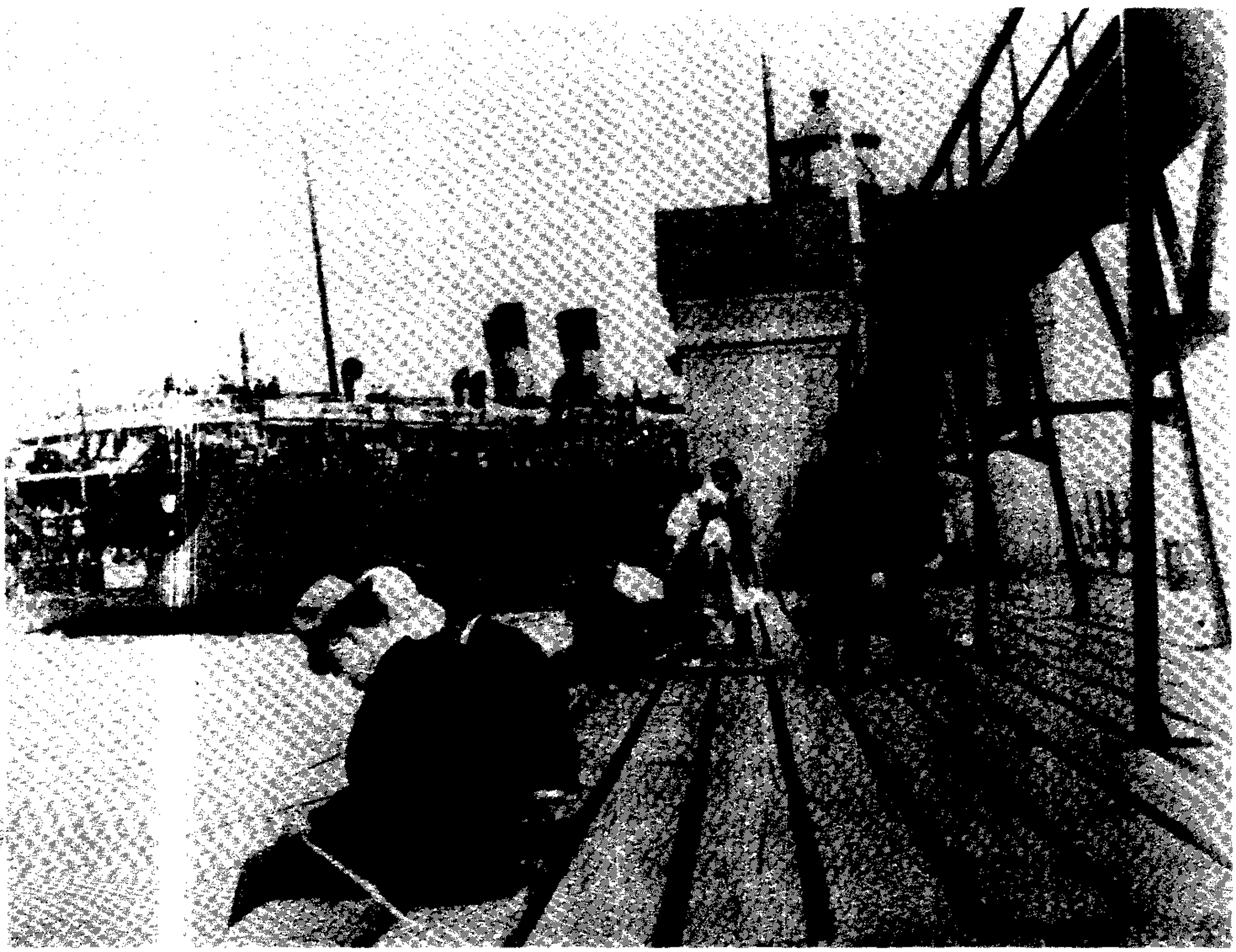
Citizens Advisory Group
Waukegan

FINAL
Stage I & II
REPORT

Waukegan Harbor Remedial Action Plan

Waukegan, Illinois

December, 1994



WAUKEGAN CITIZENS ADVISORY GROUP

P.O. BOX 91
WAUKEGAN, IL 60079

March 1995

TO ALL INTERESTED READERS:

Waukegan Harbor has been designated by the United States and Canadian governments as one of the 43 "AREAS OF CONCERN" along the Great Lakes and the Saint Lawrence Seaway. These "AREAS OF CONCERN" all have one or more impaired water uses. Remedial Action Plans (RAPS) are being prepared to prescribe remedies that will restore impaired water uses within the "AREAS OF CONCERN."

In August 1990 the Waukegan Citizens Advisory Group (CAG) and the Illinois Environmental Protection Agency (IEPA) began working together to prepare the WAUKEGAN HARBOR RAP. The Waukegan CAG includes a variety of interests, with representatives from academic, business, chamber of commerce, civic, conservation, environmental, fishing, health, and recreational groups. The RAP is divided into two stages: Stage I (Chapters 1 thru 4) identifies impaired water uses; Stage II (Chapters 5 thru 10) describes remedies to restore these uses, provides information on why these uses are impaired, and gives background on how the impairment occurred.

THE CAG ENDORSES THIS DOCUMENT but, like the IEPA, is interested in hearing your comments and questions. Any information that could improve this document is welcome. The RAP is a living document that will be updated as additional information becomes available. This includes historical as well as new information about remedial activities.

Restoration of water uses in the harbor and along our lakefront will benefit all of us. We hope that you share an appreciation of this valuable resource and participate in efforts described in this document.

Sincerely,

Charles C Isely III

CHARLES C. ISELY III, COCHAIRMAN

WAUKEGAN
REMEDIAL ACTION PLAN

STAGE I AND II
FINAL REPORT

December 1, 1994

COVER - The Pere Marquette Ferry leaving Waukegan Harbor. The Ferry ran in 1906, 1907 and 1908 providing excursions to Chicago for a cost of 35¢. The Pere Marquette sank in a storm off of Green Bay, Wisconsin in 1908. (Source: Waukegan Historical Society.)

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UPDATES AVAILABLE

Additional information pertinent to the Remedial Action Plan is continually becoming available for the Area of Concern and the Expanded Study Area. Updated information and documents will be made available through the Illinois Environmental Protection Agency, Office of Community Relations, Greg Michaud, 2200 Churchill Road, Springfield, Illinois 62794-9274 as well as the Waukegan Public Library, which has been chosen as the official repository for Remedial Action Plan documents.

DEDICATION

During the preparation of this plan, three children were born to families of Waukegan CAG members. We hope the benefits from this plan will be enjoyed by these children and all present and future generations of the Great Lakes Region.

COVER: The Pere Marquette Ferry leaving Waukegan Harbor. The ferry ran in 1906, 1907, and 1908 providing excursions to Chicago for a cost of 35 cents. The Pere Marquette sank in a storm off of Green Bay, Wisconsin in 1908. (Source: Historical photos for the cover and chapter dividers were provided by the Waukegan Historical Society.)

SANDRA BROWN
JACK BENNY JUNIOR HIGH SCHOOL

1. SUMMARY

The Great Lakes Water Quality Agreement (GLWQA) requires that State and Provincial Governments designate geographic Areas of Concern (AOC) on the Great Lakes where conditions have caused or are likely to cause the impairment of beneficial uses. The GLWQA further requires that a Remedial Action Plan (RAP) must be submitted to the public and the International Joint Commission (IJC) for review and comment at three stages:

I. When a definition of the problem at the AOC has been completed;
II. When remedial and regulatory measures are selected; and
III. When monitoring indicates that identified beneficial uses have been restored.

The International Joint Commission (IJC), the United States Environmental Protection Agency (USEPA), and the Illinois Environmental Protection Agency (IEPA) designated Waukegan Harbor as an Area of Concern (AOC) in 1981. This designation was prompted by the discovery of high levels of PCBs in harbor sediments.

To assist in the RAP development process, a Citizens Advisory Group (CAG) was formed by the IEPA in 1990 to provide recommendation to the IEPA on the development and implementation of the RAP. The CAG is made up of business, civic, education, environment, government, industry, and recreation interests in the area. As part of the overall environmental assessment process, the CAG and the IEPA have worked together to identify potential pollution sources in the Waukegan area beyond PCB contamination in the harbor.

The Waukegan AOC is located in Lake County, Illinois, on the west shore of Lake Michigan. An Expanded Study Area (ESA), which includes the Waukegan AOC, is bounded by the Dead River on the north, the bluff line which parallels Sheridan Road on the west, the south boundary of the Abbott Laboratory property (the former U.S. Steel property) on the south, and the nearshore waters of Lake Michigan on the east. The Waukegan Harbor AOC includes the North Ditch and its watershed, the North Harbor, entrance channel and South Harbor (new harbor) with their associated watersheds and the near-shore Lake Michigan water from the North Ditch south to the mouth of the Waukegan River (Figure 3.1.).

Three Superfund sites are located within the ESA and an additional Superfund site is within the watershed tributary to the ESA. Containment of asbestos-containing materials at one of the ESA Superfund sites is near completion. Cleanup of PCBs in harbor sediment as required for another Superfund remediation began in October 1990 and was completed by August 1993. Remedial investigations are currently underway at the remaining sites. Separate actions not related to the Superfund program were taken to prevent contaminants from an abandoned paint and lacquer manufacture facility, tar pit, and leaking underground storage tanks from causing further degradation of the harbor and near shore area.

Table 1.1. Organizations and Individuals Comprising the Waukegan Harbor Citizens Advisory Group

CLEAR
- Paul Geiselhart
- Christine Geiselhart

Lake County Health Department
- Bob Whyte*
- Colin Thacker
- Mark Pfister

City of Waukegan
- Ronald H. Kroop*, former Co-chair
- Mark Haugen
- Russ Tomlin

Great Lakes Sport Fishing Council
- Dan Thomas

Sierra Club, Illinois Chapter
- Sandy Kubillus

Outboard Marine Corporation
- Dale Vitale*
- John L. Birkinbine, Jr.

League of Women Voters of Illinois
- Marjorie Sennholtz*
- Carolyn R. Sevcik*
- Rosalie Shipkowitz

North Shore Sanitary District
- Brian Dorn*
- William K. Koepsel, Sr.*
- H. William Byers*
- Karen Farrell, Co-Chair
- Jane E. Jones

Salmon Unlimited
- Ed Vanderheyden
- Cass Sliwa*
- John Ohl

Lake County Chamber of Commerce
- Charles C. Isely III, Co-Chair

Waukegan Charter Boat Association
- Arthur Burt Atkinson

Concerned Citizens
- Mary Goodley
- Woody Teegarden

Waukegan Yacht Club
- Stephen C. Lapish, Co-Chair

Waukegan Port District
- Mary S. Walker

Illinois Audubon Society
- Mary Eager*
- Jean "Susie" Schreiber

College of Lake County
- Dr. John Mathwig*
- Dr. Richard Meginniss

Lake Michigan Federation
- Glenda Daniel*
- Cameron Davis*, former Co-Chair
- Ellen Carpenter*
- Margaret Rader*
- James D. Griffith
- Andrew Comai*
- Steve Skavroneck

Integrated Lakes Management
- Jim Bland*

Waukegan Park District/Historical Society
- Sharon A. Laughlin

Lake County Department of Planning
- Warren Wood

Dexter Corporation
- Stephen Morris*
- Randy Vickery*
- Charles E. Davis, Jr.*
- Brian Maher
- Jerry Manley

North Shore Gas
- Marianne Grammer

* Former member

Table 1.1. (continued) Organizations and Individuals Comprising the Waukegan Harbor Citizens Advisory Group.

Commonwealth Edison Company	Larsen Marine
Jeanne M. Johnson*	Jerry Larsen
Ron Crawford	
Thomas B. Platt	Northeastern Illinois Planning Commission
Harry Bernhard	Phillip D. Peters
Brian McCann	Dennis Dreher
Kathy Williamson	Ted Grey*
Joe Trexler	Bob Kirschner
	Tom Price
City of North Chicago	
John A. Patterson, Jr.*	EJ&E Railroad
	Tom Weigel

* Former member

Public participation brings significant benefits to the RAP process. This has been recognized in the GLWQA which calls for public consultation in all aspects of the RAP process, from development through implementation. Currently, the CAG consists of representatives from 25 organizations (Table 1.1.) and meets monthly. The CAG has sponsored several activities aimed at heightening public awareness of the environmental conditions near the harbor and lakeshore areas. Two public bus tours, conducted by the CAG, focused on the history of the Waukegan ESA and past practices which adversely affected the environment. The CAG prepared informational flyers about the Waukegan ESA and the CAG and participate annually in the Great Lakes Beach Sweep and took part in the 1991 Waukegan River Clean-up. In addition, the CAG sponsored a poster competition among local children which resulted in over 50 entries. Several posters from this competition are presented between chapters of this document. Finally, the CAG has developed a group logo featuring the Waukegan lighthouse (Figure 1.1.).

Seven subcommittees have been formed within the CAG to provide assistance with specific RAP topics or CAG activities. These subcommittees and their members are presented in Table 1.2.

The RAP process requires the cooperation of various state agencies, federal agencies, and the International Joint Commission. These organizations provide guidance to facilitate RAP development and gather data and project information on which the problem definition and remediation goals are established. Agencies and personnel which have taken an active part in the RAP process are presented in Table 1.3.

In June, 1991, IEPA assembled an additional group of representatives from various state and federal agencies. This group, known as the Interagency Workgroup, consists of individuals with expertise specifically related to the fourteen uses defined by the IJC (IJC, 1989) and experience with the water resources of the Waukegan ESA. These individuals provide review and comment of the RAP, paying particular attention to the scientific accuracy of the document. Agencies and individuals represented on the Interagency Workgroup are presented in Table 1.4.

This Stage I RAP identifies impaired uses in the Waukegan ESA which include fish consumption restrictions, benthos degradation, dredging restrictions, beach closings, phytoplankton and zooplankton degradation, and loss of fish and wildlife habitat (Table 1.5.). Supportive data and discussion are found throughout this Stage I document. Stage II of the RAP will focus on selecting additional remedial and regulatory measures needed to restore beneficial uses in the ESA. This will require close coordination between the public sector, industry, academia, and government at all levels. Prioritization of remedial and regulatory measures will be of prime importance in view of the limited amount of funding available for anticipated efforts in the ESA. Throughout all stages of the development process, the Remedial Action Plan (RAP) will be updated to reflect the results of ongoing sampling, remedial action, and changes in the ecosystem.

Table 1.2. Subcommittees of the Waukegan Harbor Citizens Advisory Group.

Documentation Subcommittee
- Sharon Laughlin, Chair
- Joan Wilts

Finance Subcommittee
- Joe Trexler, Chair
- Stephen C. Lapish
- Dan Thomas

Habitat Subcommittee
- Ed Vanderheyden, Chair
- Rich Hess
- Christine Pennisi
- Arthur Burt Atkinson
- Dan Thomas
- Paul Geiselhart
- Susie Schreiber

Outreach Subcommittee
- Mary Walker, Chair
- Janet Causey
- Arthur Burt Atkinson
- Charles C. Isely, III
- Nike Horoszewicz

Site Review Subcommittee
- Stephen C. Lapish, Chair
- Karen Farrell

Technical Subcommittee
- Mark Pfister, Chair
- Ronald H. Kroop *
- Jim Bland *
- David Beno *
- Dr. John Mathwig *
- Jane Jones
- Karen Farrell

* Former member

Table 1.3. State and Federal Agencies and Individuals which have Participated in the RAP Process.

Illinois Environmental Protection Agency	
	Mary A. Gade
	Bernard P. Killian
	James B. Park
	Robert Schacht, IEPA Co-Coordinator
	Greg Michaud, IEPA Co-Coordinator
	Bill Hammel
	Scott Moyer*
	Sherry Otto
	Gino Bruni
	Tim Murphy
	Brad Frost
	Bob Wiatrolik
	Craig Boatright
	Joel Cross
	Heather Nifong
	Amy Wilson
	Howard Essig
	Mike Hayes
	Thomas Hornshaw
	John Hurley
	Chris Kallis
	Leonard Lindstrom
	Robert Mosher
	Clark Olson
	Jay Patel
	Hitten Soni
International Joint Commission	
	Dr. John Hartig
	Bruce Kirschner
U.S. Army Corps of Engineers	
	Mike Fisher
	Don Wadleigh*
Illinois-Indiana Sea Grant Program	
	Christine H. Pennisi
U.S. Environmental Protection Agency	
	Barry DeGraff
	Janet Causey, USEPA Region V Coordinator
	Cindy Nolan
	Nike Horoszewicz
	Steve Garbaciak
	John Perrecone
	Paulette Foreste
	Peggy Schwebke
	Brad Bradley
	Wendy Schumacher

Table 1.4. Agencies and Individuals Participating in the Interagency Workgroup.

Illinois Department of Conservation
- Rich Hess
- Glen W. Kruse
- T. Miller*
- Jim Witham*

Illinois Pollution Control Board
- Lou Ann Burnett

Illinois State Geological Survey
- J. Bruno Risatti

The Citadel
- Phil Ross, formerly with the Illinois Natural History Survey

U.S. Fish and Wildlife Service
- Jody Millar*
- Ed Karecki

U.S. Environmental Protection Agency
- Janet Causey

Illinois Environmental Protection Agency
- Greg Michaud
- Robert Schacht

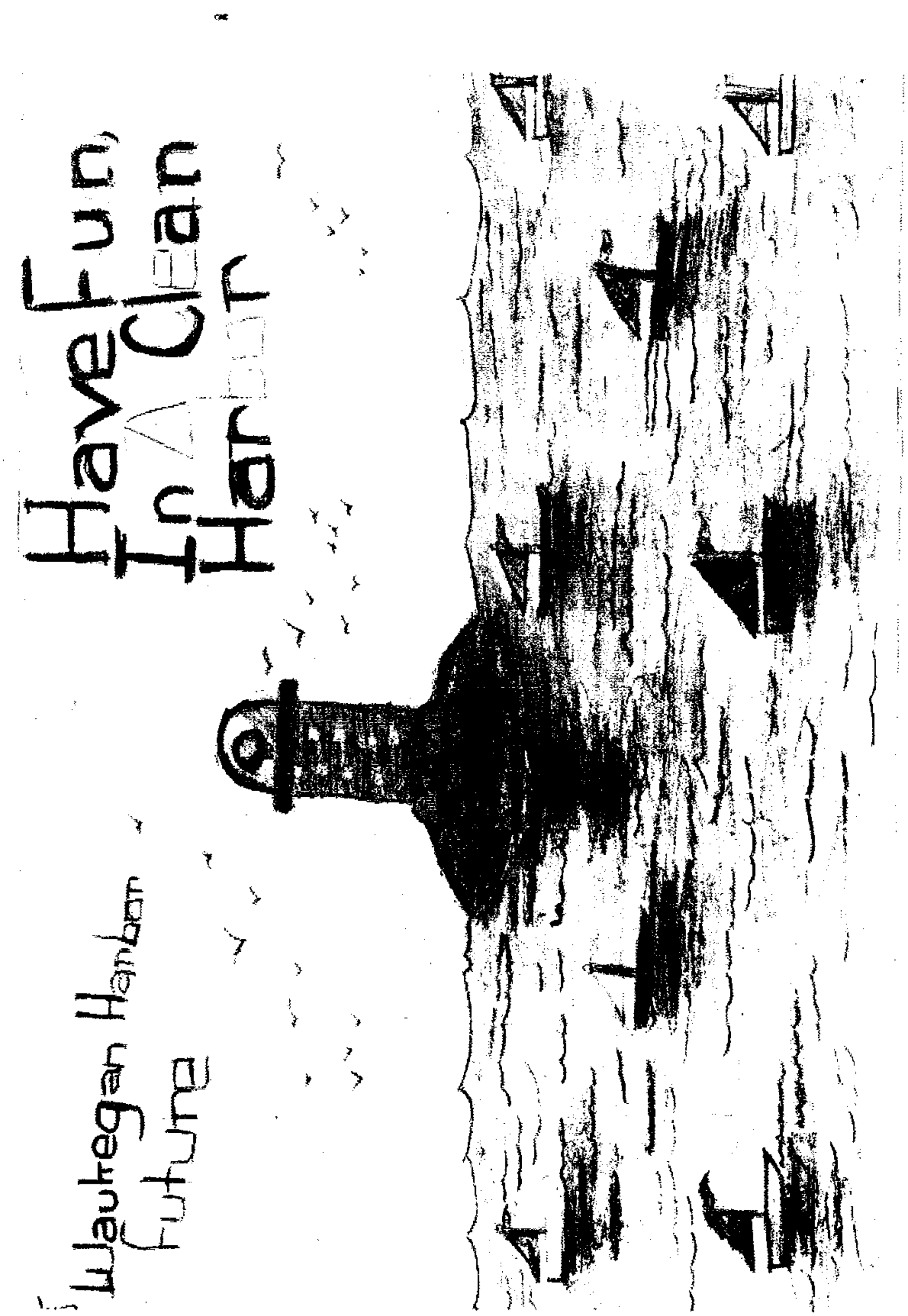
* Former Member

Table 1.5. Use Impairment within the Waukegan Area of Concern.

		Use Is Impaired	Use Is Unimpaired	Unknown[1]
i	Restriction on Fish and Wildlife Consumption			
	Fish	X		
	Wildlife			X
ii	Tainting of Fish and Wildlife Flavor			X
iii	Degradation of Fish and Wildlife Populations (diversity and abundance, including reproduction problems)			
	Fish			X
	Wildlife			X
iv	Fish Tumors and Other Deformities		X	
v	Bird or Animal Deformities or Reproductive Problems			X
vi	Degradation of Benthos	X		
vii	Restrictions on Dredging Activities	X		
viii	Eutrophication or Undesirable Algae		X	
ix	Restrictions on Drinking Water Consumption or Taste and Odor Problems		X	
x	Beach Closings	X		
xi	Degraded Aesthetics		X	
xii	Added Costs to Industry		X	
xiii	Degradation of Phytoplankton and Zooplankton Populations			
	Phytoplankton	X		
	Zooplankton	X		
xiv	Loss of Fish and Wildlife Habitat			
	Fish Habitat	X		
	Wildlife Habitat	X		

[1] Additional data collection is required before a determination can be made.

Figure 1.1. Logo of the Waukegan Harbor Citizens Advisory Group



ROSS GUBE
ST. ANASTASIA GRADE SCHOOL

2. INTRODUCTION

The International Joint Commission (IJC), the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) designated Waukegan Harbor as an Area of Concern (AOC) in 1981. This designation was prompted by the discovery of high levels of polychlorinated biphenyls (PCBs) in harbor sediments. In 1975 and 1976, PCBs were identified in several discharges into the harbor from Outboard Marine Corporation (OMC). The AOC is located on the west shore of Lake Michigan in Waukegan, Illinois, about 37 miles north of Chicago and 10 miles south of the Wisconsin state border (Figure 2.1.).

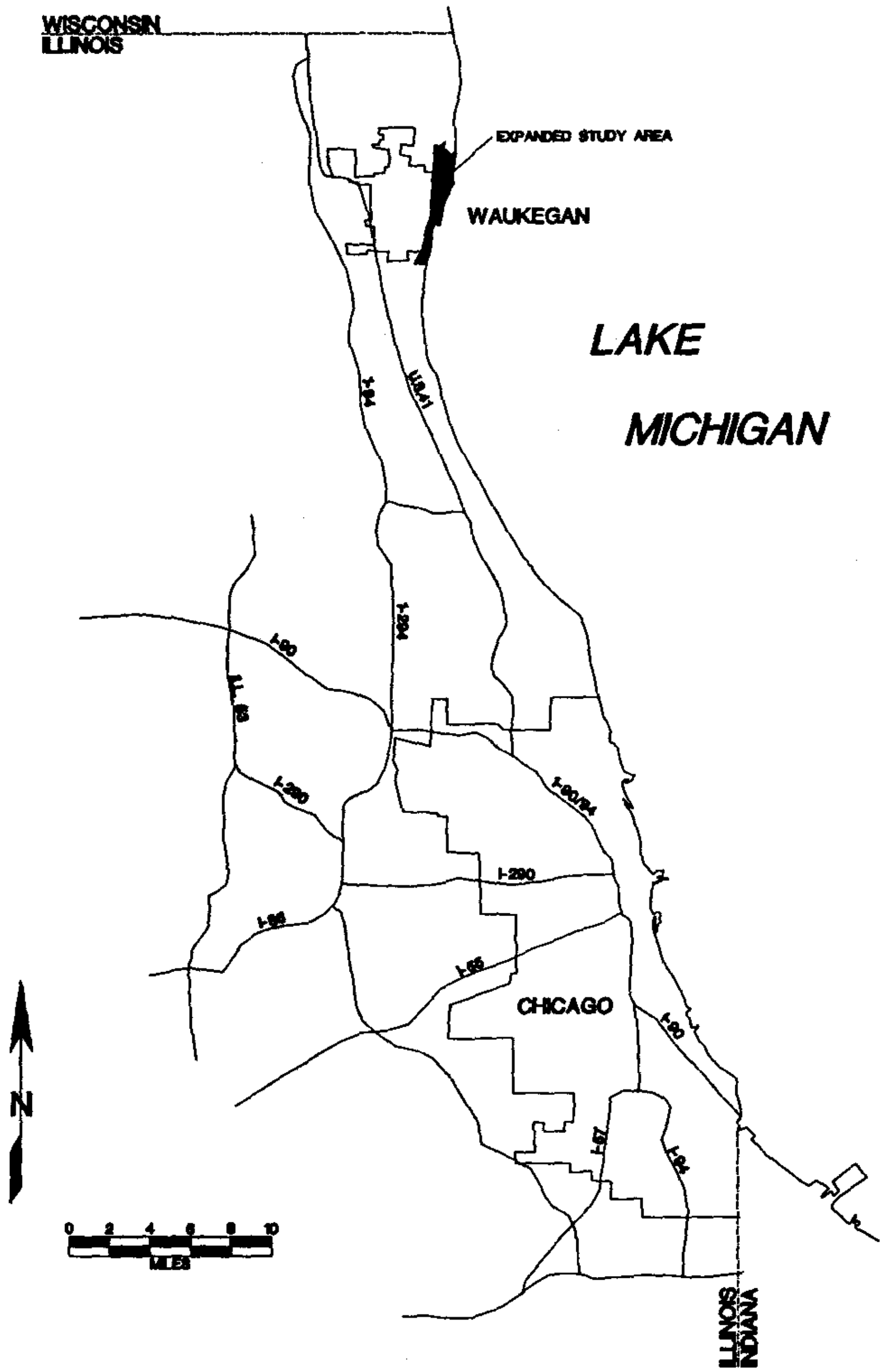
The Great Lakes Water Quality Agreement (GLWQA) and the Great Lakes Critical Program Act require states to prepare a Remedial Action Plan (RAP) for their respective AOCs. The GLWQA also requires public consultation in all RAP development and implementation actions. As part of the process to prepare the RAP for the Waukegan AOC, the Waukegan Citizens Advisory Group (CAG) was formed in the summer of 1990. The CAG has provided useful information to the IEPA and has actively assisted with the preparation of the RAP (refer to Chapter 9 of Stage II for more information about CAG and the RAP development). For example, the CAG raised concerns about a variety of industrial sites in the vicinity of the harbor that may be impairing beneficial uses. Consequently, while the original AOC included only the harbor, the IEPA, with input and advice from the Waukegan CAG, expanded the study area to include potential sources of contamination other than PCBs which may affect both Waukegan Harbor and near-shore Lake Michigan in the area adjacent to the harbor. This combined effort has led to investigation and remediation planning for non-PCB sources of contamination. The results of this expanded review are described elsewhere in this RAP document. For purposes of clarity and brevity throughout the remainder of this document, the expanded area was designated the Waukegan Expanded Study Area (ESA).

2.1. BACKGROUND

The Waukegan ESA has historically been an industrial area. As early as 1885, active industries in the ESA included two tanneries, two breweries, several mills, and a mattress factory (Sanborn, 1885). This industrial background has resulted in contamination of both land and water resources and, consequently, has impaired some of the beneficial uses provided by these resources.

The Waukegan ESA contains three sites, OMC, Schuller International Inc. (formerly Johns-Manville), and the Waukegan Manufactured Gas and Coke Plant, which are currently undergoing investigation or remediation through the federal Superfund program. An additional Superfund site, Yeoman Creek Landfill, is located within the watershed tributary to the ESA. Two other sites - Waukegan Tar Pit and Waukegan Paint and Lacquer - have had waste removed under Superfund's emergency response program. Both of these projects were

Figure 2.1. Regional Location of the Waukegan Expanded Study Area for the Waukegan Remedial Action Plan.



completed by 1992.

From approximately 1961 to 1972, OMC purchased a hydraulic fluid which contained PCBs and was used in the die-casting works. Some of this hydraulic fluid ultimately escaped through floor drains. At OMC, the floor drains discharged to an oil interceptor system which discharged to the North Ditch, a tributary to Lake Michigan. Some of the PCBs escaped from a portion of the oil interceptor, diversion, and pump system and were released to the Waukegan Harbor. The discharge to the harbor was located in the western edge of slip 3, and the discharge on the northern portion of the property drained to the crescent ditch (Figure 2.2.). The discharge pipe to the harbor was sealed in 1976. As a result of OMC discharges, it is estimated that there were over 700,000 pounds of PCBs on OMC property and approximately 300,000 pounds of PCBs in Waukegan Harbor (Figure 2.2.).

Investigation of the sediments in the Waukegan Harbor was made in 1977 and a thorough investigation of both the harbor and the OMC property was completed in 1979 and 1980 by the USEPA. A feasibility study was completed by USEPA in 1984 and the Record of Decision (ROD) selecting on-site containment with off-site disposal of select soils was issued in May 1984. An amended ROD was issued in 1989.

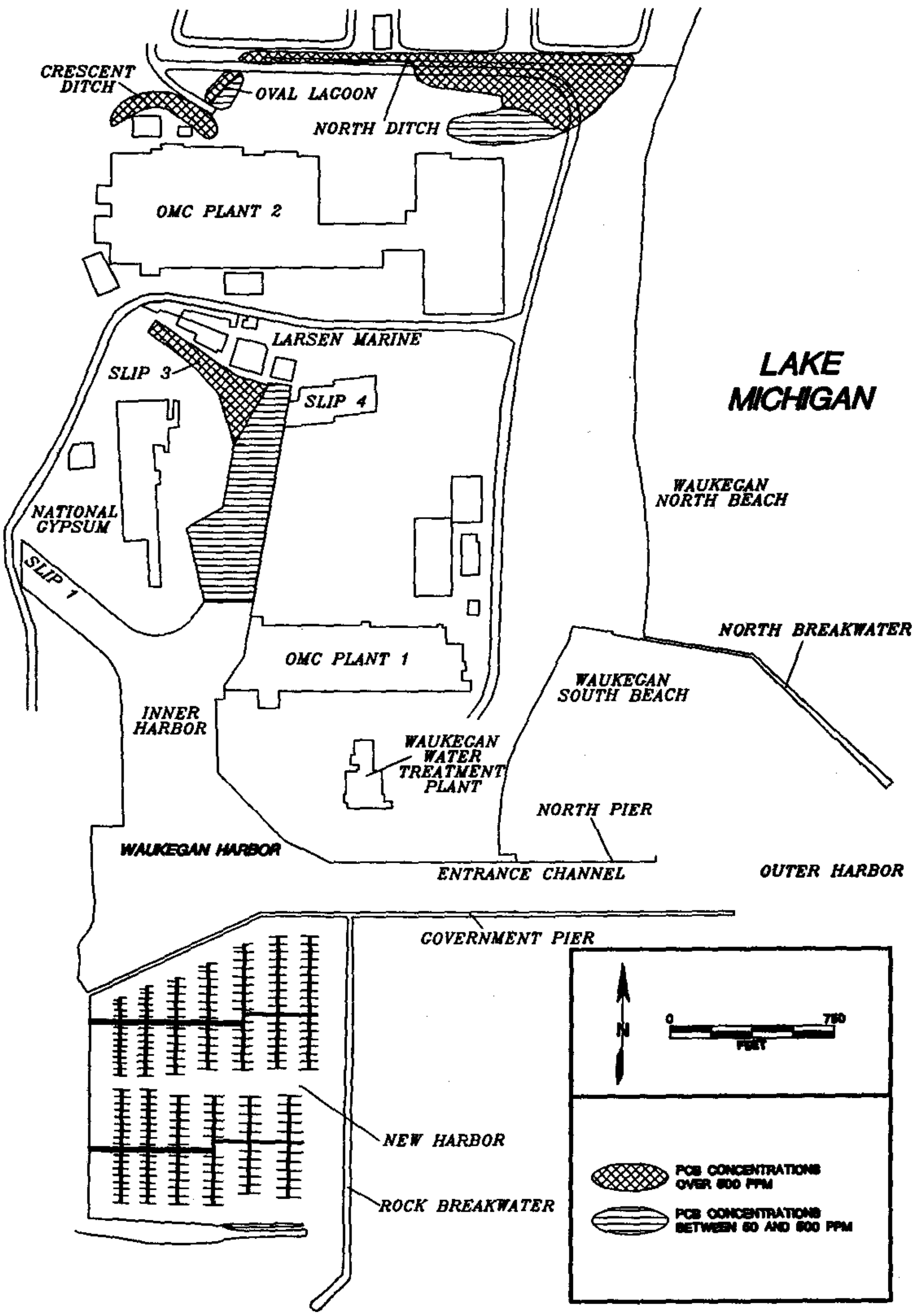
The same year the engineering design work for the selected remedial action was initiated. However, in late 1985, design work on the project was suspended due to litigation between OMC and USEPA regarding access to OMC property. Such access was essential to continue the engineering design process.

While this litigation was pending before the courts, Congress enacted the Superfund Amendments and Reauthorization Act (SARA). The SARA amendments call for the preference for "permanent remedies which reduce the mobility, toxicity, or volume of hazardous substances." Although RODs signed before October 1986 are not required to meet these new requirements, USEPA reevaluated the 1984 ROD to develop a remedy consistent with SARA.

About the time USEPA began reviewing the remedy set forth in the 1984 ROD, USEPA and OMC agreed to end the ongoing access litigation. Shortly thereafter, OMC submitted a proposal to remediate the site. The negotiations between OMC, USEPA, and the IEPA since late 1986 have resulted in a Consent Decree initiated in April 1989 (U.S. District Court, 1988). Construction on the remedy at the Superfund site began in October 1990 according to the 1989 ROD. Remediation was completed in 1993; long term monitoring of the site remains.

The Schuller International facility was first recognized as a potential environmental problem site based on air monitoring conducted by USEPA in 1982, which found elevated levels of airborne asbestos downwind of the disposal area. The site was added to the National Priorities List (NPL) on December 30, 1982.

Figure 2.2. Extent of PCB Contamination In and Around Waukegan Harbor Prior to Cleanup (USEPA, 1984).



Although Schuller International did contest the site listing, a voluntary enforcement agreement was reached with USEPA in 1983 for the company to pay for an investigation. Although IEPA was not a party to that agreement, technical comments were provided in a supporting role to USEPA through the remedial investigation and feasibility study (RI/FS).

The remedial investigation, which was completed in 1985, revealed elevated levels of asbestos in the air and groundwater, and relatively high levels of lead in on-site soils. Traces of other contaminants including chromium, copper, and arsenic were also found at the site. Based on the type and quantity of contaminants found and potential exposure pathways, the remedial response goals focused on preventing direct contact and air releases of asbestos and lead, while monitoring on-site groundwater to ensure acceptable levels remain. Remedial alternatives ranging from on-site grading and seeding to off-site landfilling were evaluated in the feasibility study which was completed in January, 1987. The remedial alternative selected in the June 1987 Record of Decision as proposed by USEPA and concurred with by IEPA consists of a vegetated 24-inch thick site cover designed to prevent freeze-thaw effects on asbestos containing materials. Areas not conducive to soil cover such as the banks around active settling basins are protected with a stone bedding and rip-rap cover. Key aggregate roadways were established to allow routine plant maintenance work to be performed. A groundwater, surface water, and soil cover monitoring program was outlined to evaluate the success of the remedy over the established 30 year operation and maintenance program.

A remedial design/remedial action consent decree was negotiated between USEPA, the State, and Schuller International, Inc. (formerly Johns-Manville). It was entered by the Federal Court in March 1988. Remedial design work on the selected remedy was concluded in September and construction began in October of that same year. As construction progressed throughout 1989, several on-site areas not covered in the original design were identified for remediation. Several supplemental work plans were developed and these phased efforts were completed by the summer of 1991.

Currently, the operation and maintenance program has been initiated by Schuller and the remedial action close out documents are in the final stages of review. The site is on a 30-year operation and maintenance schedule and protectiveness will be evaluated by USEPA and IEPA at the designated five year review intervals.

Remedial investigations are underway at Yeoman Creek Landfill and at the former Waukegan Manufactured Gas and Coke Plant to determine the nature and extent of contamination. Remedial actions for these sites will be selected and implemented following the completion of the remedial investigations and feasibility studies.

Development of the RAP began with the formation by the IEPA of the Waukegan CAG. Recognizing that sources of non-PCB contamination are present near the harbor, a list of these potential sources of contamination was prepared by CAG members and IEPA staff (Table 2.1.). Preliminary sampling of the harbor area and investigations of some of these potential sources of contamination began in the fall of 1990. Subsequently, drafting of the RAP started early the following year.

Identification of beneficial uses that have been impaired in the Waukegan ESA include restrictions on fish consumption, degradation of the benthos, restrictions on dredging activities, beach closings, degradation of phytoplankton and zooplankton populations, and loss of fish and wildlife habitats. It should be noted that a restriction on fish consumption is also in existence for selected species of fish for all of Lake Michigan.

2.2. PURPOSE AND OBJECTIVES

The purpose of the RAP process is to provide a coordinated approach to environmental management that will ultimately contribute to the successful rehabilitation of Lake Michigan and the Waukegan ESA. This approach requires the integration of available data on environmental conditions, socio-economic influences, and political/institutional frameworks. The RAP identifies sources of degradation and resultant use impairments related to sources other than PCBs in Waukegan Harbor. Environmental issues in the Waukegan ESA are identified in Chapter 4. Status of the remediation and recommendations for restoration of impaired uses are based on currently available data and pollution control programs and priorities. The data contained in Chapter 4 will be reviewed and appended periodically to update information and, if appropriate, identify new issues and impacted areas.

2.3. INTENDED USE

Development and implementation of the RAP and determination of whether impaired uses have been restored is an ongoing, recurring process. The RAP brings together information and provides suggestions to focus the activities which aim to restore and maintain beneficial uses. It is intended for concerned citizens, state and local organizations with an involvement in Waukegan Harbor and the lakeshore area, and those individuals and organizations who use the harbor and lakeshore for economic and recreational benefit. The RAP should be used as a technical management document that provides a platform for continuing analysis and decision-making. It contains a review of available data, defines impaired uses and data needs, and prioritizes investigations and remedial actions. Every attempt is being made to identify information pertaining to the critical environmental issues affecting this ESA. Suggestions and additions from the CAG and the general public are welcomed and should be sent to the IEPA in Springfield, Illinois.

Table 2.1. Potential Sources of Contamination within the Waukegan ESA (Lapish, 1991).

Common Name	Current Owner
Outboard Marine Corporation	Outboard Marine Corporation
Johns-Manville	Schuller International, Inc.
Waukegan Manufactured Gas and Coke Plant	Outboard Marine Corporation
U.S. Steel Property	Abbott Laboratories
Greiss-Pfleger Tanning Co.	Commonwealth Edison Company
Diamond Scrap Yard	Bank of Waukegan
Waukegan Paint and Lacquer Site	Waukegan Paint and Lacquer
North Shore Gas Co. Tar Pit	North Shore Sanitary District
E.J.&E. Rail Yards	E.J.&E. Rail Road
Commonwealth Edison Company Waukegan Generating Station	Commonwealth Edison Company
North Shore Sanitary District Waukegan Sewage Treatment Plant	North Shore Sanitary District
Larsen Marine	Larsen Marine
Yeoman Creek Landfill	City of Waukegan
Abbott Laboratories	Abbott Laboratories
Frederick Gumm Chemical Company	Frederick Gumm Chemical Company
Dexter Corporation	Dexter Corporation
Contaminated Harbor Sediments	---
Urban Nonpoint Source Pollution	---
Atmospheric Deposition	---

2.4. REFERENCES

International Joint Commission (IJC). 1978. Great Lakes Water Quality Agreement of 1978. International Joint Commission, United States and Canada, Office Consolidation, September 1989.

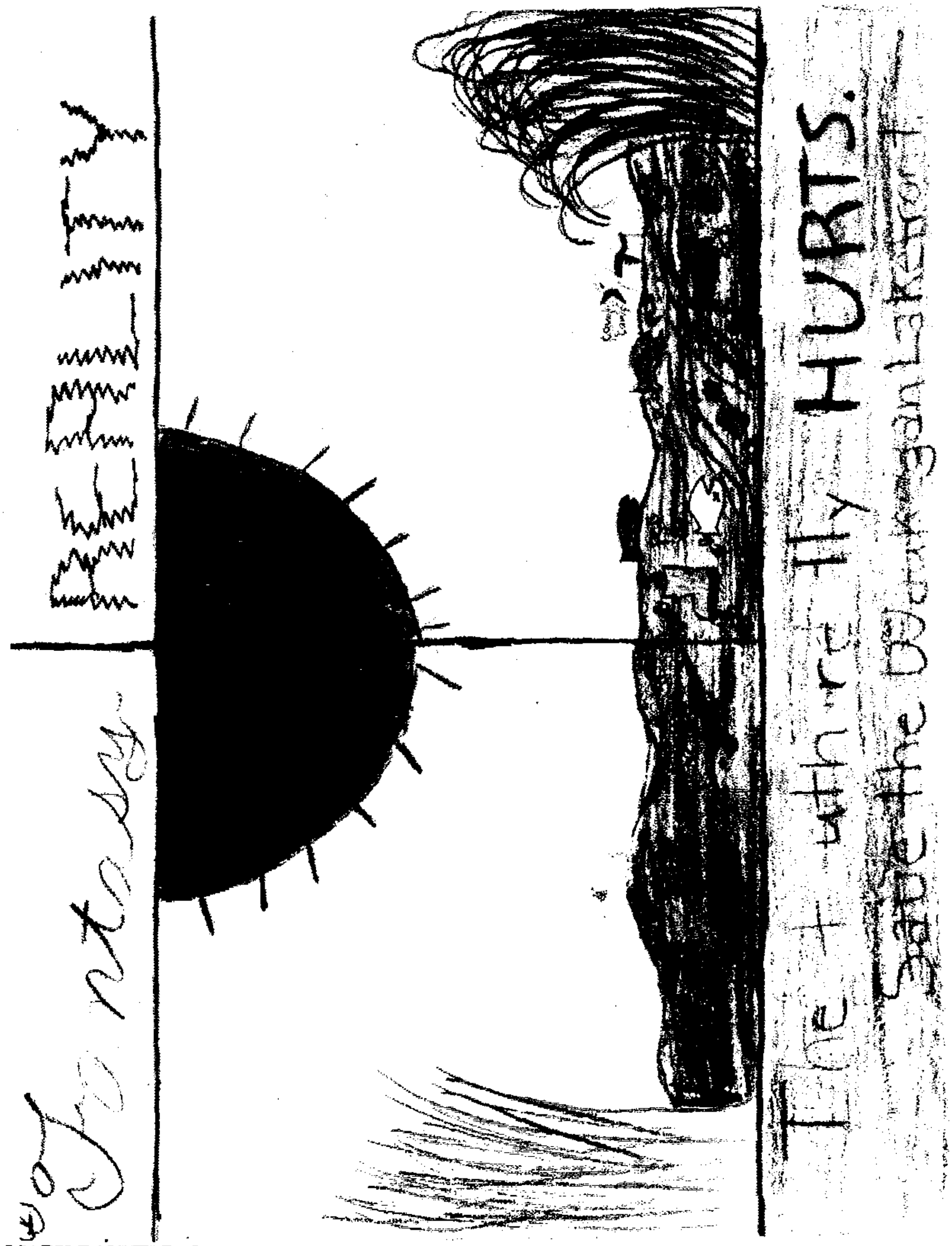
Lapish, S. 1991. Report presented to the Waukegan Citizens Advisory Group, August 5, 1991.

Sanborn. 1885. Waukegan, Illinois (Insurance Maps). Sanborn Map and Publishing Co., Limited, New York, 1885.

U.S. District Court. 1988. Consent Decree: United States of America and People of the State of Illinois v. Outboard Marine Corporation, Inc. Northern District Court of Illinois, Eastern Division, October 1988.

U.S. Environmental Protection Agency (USEPA). 1984. Superfund Record of Decision (EPA Region V), Outboard Marine Corporation Site, Waukegan, Illinois, May 1984. U.S. Environmental Protection Agency, Washington, D.C., May 1984.

U.S. Environmental Protection Agency (USEPA). 1989. Amended Superfund Record of Decision (EPA Region V), Outboard Marine Corporation Site, Waukegan, Illinois, March 1989. U.S. Environmental Protection Agency, Washington, D.C., March 1989.



MARY BANKHEAD
JACK BENNY JUNIOR HIGH SCHOOL

3. ENVIRONMENTAL SETTING

This chapter describes the location, natural features, land uses, and water uses of the Waukegan Expanded Study Area (ESA). This chapter also summarizes the groundwater, surface water and near shore limnology, and includes sections on recreational, commercial, and industrial activities that characterize the area. This information was gathered from state and federal reports, as well as the additional sources presented in the list of references.

3.1. LOCATION

The Waukegan ESA is located in Lake County, Illinois, on the west shore of Lake Michigan. The ESA, as defined by the Illinois Environmental Protection Agency (IEPA) with input and advice from the Waukegan Citizens Advisory Group (CAG), is bounded by the Dead River on the north, the bluff line which parallels Sheridan Road on the west, the south boundary of the former U.S. Steel Property on the south, and the nearshore waters of Lake Michigan on the east (Figure 3.1.). The Waukegan River bisects the study area and is a tributary to Lake Michigan approximately 1/4 mile south of the Waukegan Port District boat launching area. The North Ditch is a smaller tributary to Lake Michigan, located north of the Outboard Marine Corporation (OMC) property, which drains part of the study area north of Waukegan Harbor.

3.2. NATURAL FEATURES

Waukegan Harbor is largely a manmade structure constructed in the late 19th and early 20th centuries. A natural inlet and portions of adjacent wetlands were filled to form the present shape of the harbor area. Waukegan Harbor is about 37 acres and water depths generally vary from 14 to 21 feet. The harbor sediments consist of 1 to 10.5 feet of very soft organic silt (muck) overlying 9 feet of medium dense, fine to coarse sand. A very stiff silt (glacial till) that typically ranges from 50 to more than 100 feet thick underlies the sand. The entire harbor is bordered by 20 to 25 foot long steel sheet piling, except at the Waukegan Port District boat launching areas and at the retaining wall near the harbor mouth. The sheet piles generally extend into the sand layer above the glacial till.

3.3. DRAINAGE BASIN SIZE

The Waukegan Harbor drainage area is bounded by the North Ditch to the north, the Zion moraine bluff to the west and the Government Pier to the south (O'Gata, 1975). The Waukegan Harbor watershed consists of approximately 0.47 square miles of industrial, commercial, municipal, and open/vacant lands (Figure 3.2.).

Figure 3.1. The Waukegan Expanded Study Area for the Waukegan Remedial Action Plan.

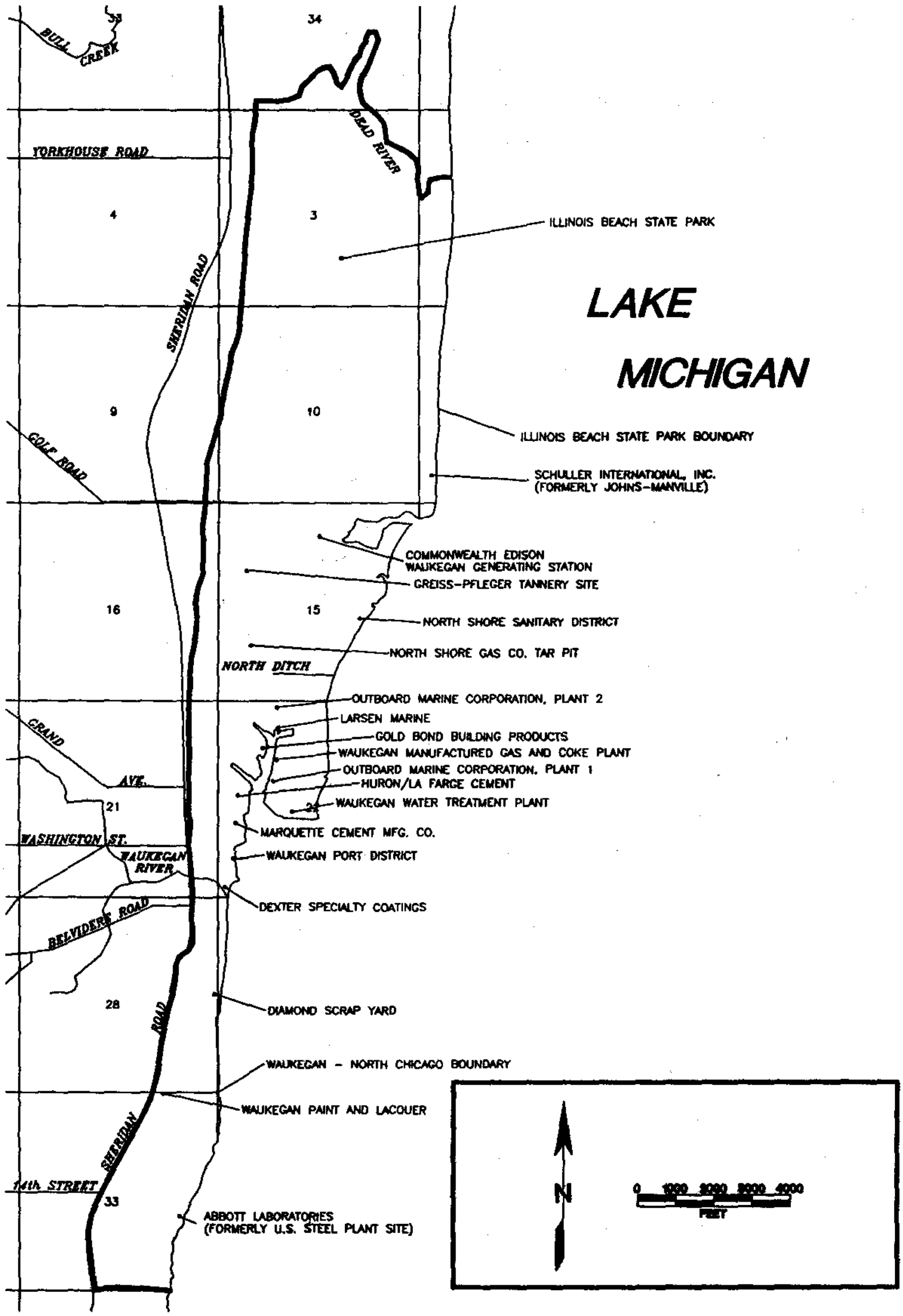
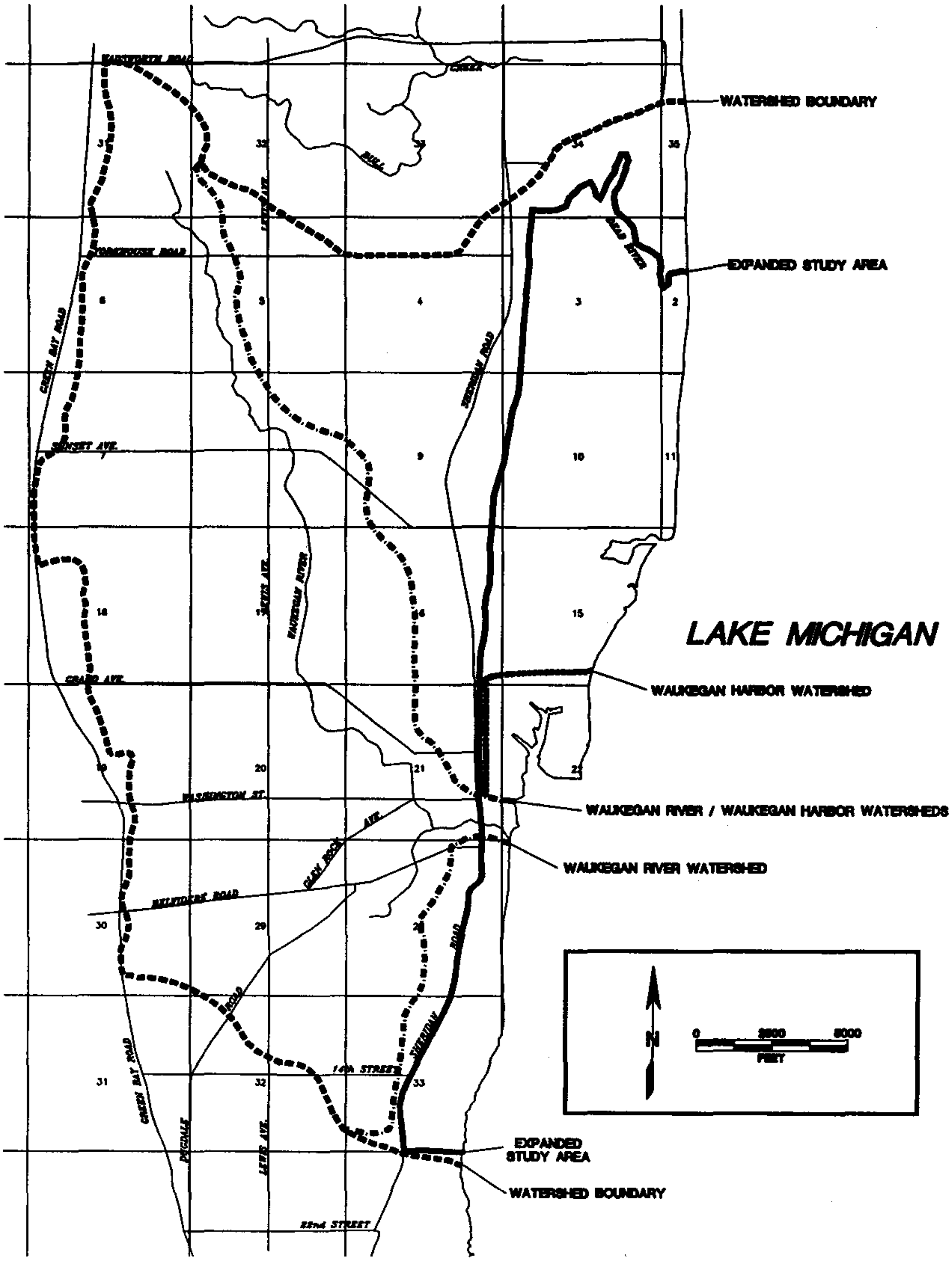


Figure 3.2. The Watershed Tributary to the Waukegan Expanded Study Area for the Waukegan Remedial Action Plan.



The Waukegan River (Figure 3.2.), which passes through the study area and is tributary to Lake Michigan, consists of approximately 5.8 stream miles and carries runoff from 9.68 square miles of land (Healy, 1979). An additional small tributary of Lake Michigan drains surface runoff from about 0.11 square miles of Outboard Marine Corporation (OMC) and North Shore Sanitary District (NSSD) property. This drainage system, which includes the North Ditch, also drains surface runoff from areas west of OMC property, the railroad tracks, and a large portion of the City of Waukegan stormwater runoff via the Gillette Avenue storm sewer which discharges to the west end of the North Ditch. The North Ditch is approximately 2000 feet in length and varies in width from 10 to 20 feet.

The watershed tributary to the Waukegan ESA (Figure 3.2.) contains the Waukegan River watershed, the North Ditch watershed, and other nearshore areas which drain to Lake Michigan.

3.4. TOPOGRAPHY

The general topography throughout the ESA is relatively flat. Some slight variations exist between filled areas and natural ground. One partially filled depression, a tar pit on the NSSD property, is within this area along with some closed depressions on the Schuller International Inc. (formerly Johns-Manville) property (an asbestos disposal pit, sludge disposal pit, and miscellaneous disposal pit), and the filled Greenwood Avenue disposal site. One manmade mound in the area is the Schuller International primary asbestos disposal area which is approximately 40 feet above natural ground. Additional manmade high areas include a gypsum storage pile on the Gold Bond Building Products property adjacent to the harbor, and a coal pile on the Commonwealth Edison company property located approximately 1.3 miles northeast of the harbor area (Vitale, 1991). Manmade low areas include sludge pits at the Commonwealth Edison Company Waukegan generating station and tanning pits at the former Greiss-Pfleger Tannery (Vitale, 1992)

On the west side of the expanded study area bluffs rise approximately 60 feet. The business and residential areas of Waukegan are situated on these bluffs.

3.5. HYDROLOGY

The 100-year, 24-hour precipitation event in Waukegan is 6.40 inches and the 2-year, 24-hour event is 2.80 inches (ISWS, 1989).

The Waukegan Harbor has a tributary area of 0.47 square miles and receives stormwater runoff at seven discharge points as well as from overland flow. The expected annual yield from an urbanized watershed of this type would be about 14 inches (NIPC, 1977). This translates to a mean annual discharge of 0.50 cubic feet per second.

The Waukegan River has a watershed of 9.68 square miles and receives numerous stormwater discharges from its highly urbanized watershed. Assuming a yield of 14 inches, this watershed would yield about 10 cubic feet per second as an annual average.

The North Ditch discharge has been measured at 1.8 cubic feet per second by the U.S. Department of the Interior. This value was calculated from measurements taken between March and September, 1979. The maximum measured discharge was 5.3 cubic feet per second. Based on a watershed of 0.34 square miles (0.11 square miles of OMC and NSSD property and 0.23 square miles discharging through the Gillette Avenue storm sewer) and an annual yield of 14 inches, this watershed would have a mean annual discharge of 0.35 cubic feet per second.

Lake Michigan longshore currents near the ESA are typically north to south (Hess, 1992). In addition, the lake experiences mixing during the winter months but stratifies during the summer (Cole, 1979). Other flow phenomena which occur in Lake Michigan include seiches, free oscillations of water within the lake; Langmuir cells, movement of water in horizontal spirals; thermal bars, cold water zones which develop near shore as shallow water warms in spring; and wave action (Cole, 1979).

3.6. GEOLOGY

The uppermost deposits throughout the ESA alternate between fill material, natural material, and a mix of fill and natural material. The fill material appears to consist of naturally occurring material, probably hauled into the area from other areas farther from the lake, and man-made demolition debris. The naturally occurring material consists of medium-grained sand with gravel and near lake deposits of Glacial Lake Chicago. These materials are of the Equality Formation and reportedly range in thickness from 25 to 40 feet (IEPA, 1991; Malhorta and Assoc., 1985).

Below the Equality Formation is the Wadsworth Till. This unit is relatively thick ranging from 50 to 75 feet and consists of mostly gray clay and sandy clay till with some pebbles and cobbles. Underneath the till resting on top of the bedrock is a sand and gravel deposit that ranges from 3 to 20 feet in thickness.

Silurian age dolomite comprises the uppermost bedrock in this area. This shallow bedrock is fractured which contributes to groundwater movement through this unit. Rainfall seeps through the glacial till and imported fill to replenish groundwater levels in the Silurian dolomite. Underneath the Silurian dolomite are Maquoketa Group shales which act as an aquitard separating the Silurian dolomites from the deeper bedrock units.

There are three major "deep" bedrock units below the Maquoketa Shale that are significant sources of drinking water. These are the Glenwood-St. Peter Sandstone, the Ironton-Galesville Sandstone, and the Mt. Simon Sandstone. The deepest of these units is the Mt. Simon which is approximately 1,600 feet deep in this area.

3.7. HYDROGEOLOGY

Although the City of Waukegan obtains raw water for treatment and distribution from an intake located in Lake Michigan, some businesses located near the harbor reportedly obtain groundwater through one or more private wells on their property. The Remedial Investigation for the Schuller International disposal area identified six private wells on or near the site.

Soil sampling and monitoring well installation near the harbor indicates that the water table is frequently in the range of one to three feet below the ground surface. The presence of cattails and smartweed is further evidence of near surface groundwater. Artesian conditions have been reported near the harbor (Vitale, 1991).

Lake Michigan and Waukegan Harbor appear to serve as discharge areas for shallow groundwater. However, several factors could affect the groundwater levels and flow direction. These factors include: the presence of silt below the sandy near shore lake deposits, the water level in the north ditch (near OMC), the use of water from the industrial canal by Schuller International, and fluctuations of the lake level.

Hydraulic conductivity will vary between compacted, imported fill material and the natural in-place material. In general, relatively fast hydraulic conductivities would be expected where medium grain sand, gravel, and lake sediments are present.

Slug tests (a method of in-situ hydraulic conductivity measurement based on water level fluctuations in piezometers following the addition of a known volume of water) conducted by consulting firms on the Sculler International and OMC properties found conductivities ranging from 1.6×10^{-2} cm/sec (45.4 ft/day) to 2.5×10^{-2} cm/sec (70.9 ft/day) and 2.0×10^{-4} cm/sec (0.6 ft/day) to 9.0×10^{-3} cm/sec (25.5 ft/day), respectively. These hydraulic conductivities are typical of clean and silty sands (Freeze and Cherry, 1979). As previously stated, naturally occurring soils in the ESA likely contain sand and gravel associated with the deposits of Glacial Lake Chicago.

3.8. AIR QUALITY

Waukegan, Illinois, is located in Air Quality Control Region (AQCR) #67 of the Metro Chicago Interstate AQCR. The air quality of this AQCR is determined on the basis of the National Ambient Air Quality Standards

(NAAQS) set forth in the Clean Air Act of 1970 as amended in 1990. Federal and State standards are identical with the exception of standards for ozone (O_3) and lead (Pb).

Air quality is monitored at Waukegan by the IEPA. When the measured concentration of a pollutant in a particular area does not exceed the primary standard or the secondary standard, the area is designated as an attainment area for that pollutant. Waukegan is an attainment area for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), total suspended particulates (TSP), and lead. Lake County is classified as a nonattainment area for the ozone primary standard (no secondary standard has been set). Waukegan is unclassified for carbon monoxide (CO) because no monitoring data is available.

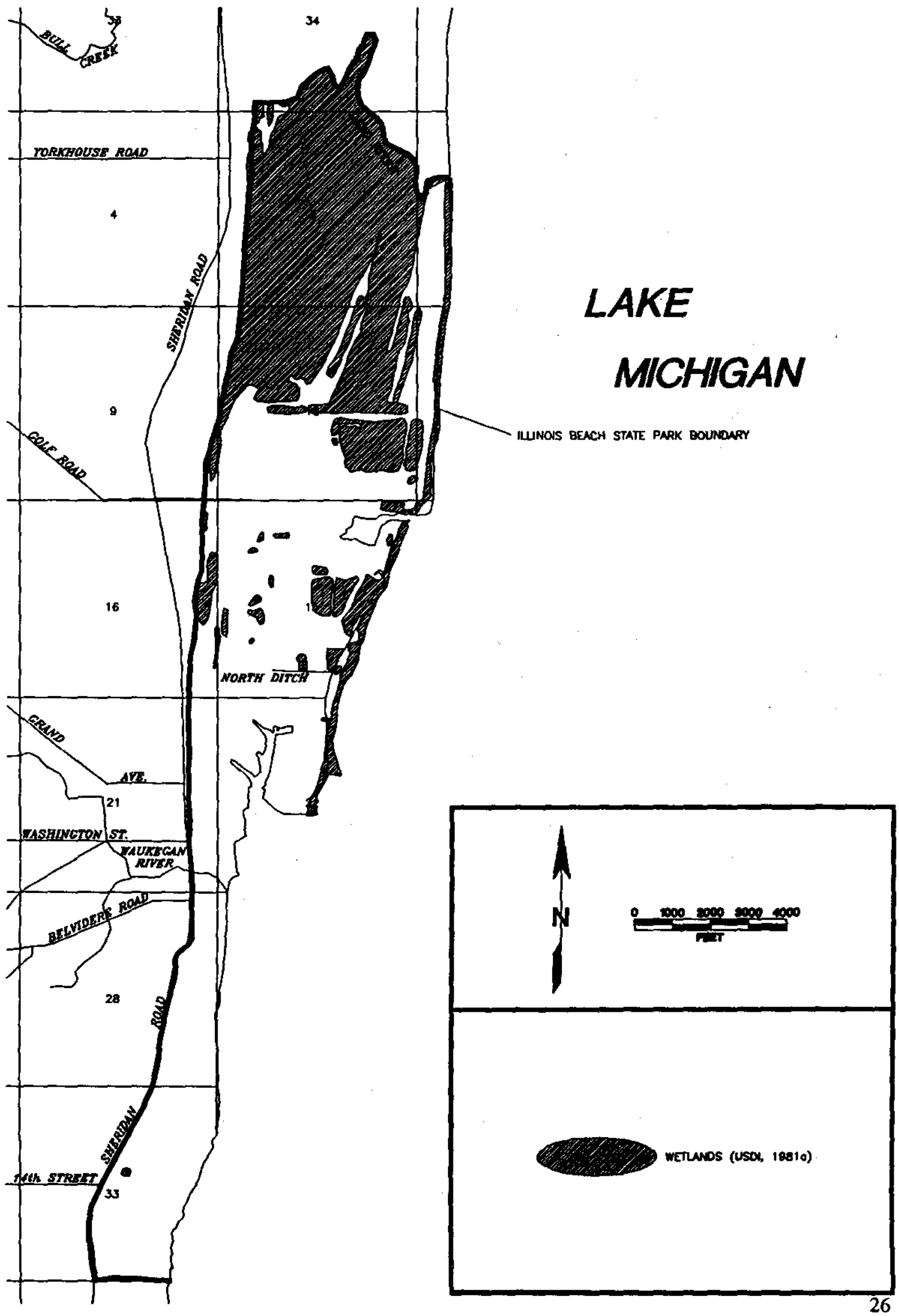
Sources of air-borne constituents originating in the ESA include automobile, rail, and water traffic, the Waukegan generating station, local manufacture industries, and dust from construction sites and open storage areas. Volatilization of PCBs also contributes air-borne constituents. According to the 1984 OMC Record of Decision (ROD), approximately 12 to 40 pounds of PCBs are released from the harbor into the local airshed each year. Air contamination from the North Ditch waters was estimated at 15 pounds per year (USEPA, 1984). The OMC sources will be essentially eliminated by remediation to be completed in 1993.

3.9. WETLANDS

Several types of natural and excavated wetlands are located near the north and west of Waukegan Harbor (Figure 3.3.). Of these 17.5 acres are classified as lake shore community, wetland vegetation communities characterized by creeping juniper and nodding wild rye which develop along large rivers and wave-affected lakes (IDOC, 1988). These wetlands are recognized as Lake Michigan beach area and include the Waukegan North and Central public beaches. The remaining natural wetlands near the harbor are classified as marsh (3.1 acres) or pond (3.1 acres) and are located along the Lake Michigan shoreline immediately north of Waukegan Harbor. Most of these wetlands are located on NSSD property. Excavated wetlands comprise 4.8 acres of ponds and 2.3 acres of wet meadows (USDI, 1981a; USDI, 1981b). The final, most extensive wetlands are located at the extreme north end of the ESA immediately south of the Dead River. These wetland areas are part of the Illinois Beach State Park.

The existing wetlands in the Waukegan ESA provide storage of stormwater runoff and improve the quality of stored water by promoting sediment deposition, microbial degradation, and vegetative uptake. Moreover, wetlands provide habitat to water-loving vegetation and numerous wildlife species. The habitat value of the extensive wetland complex in the Illinois Beach State Park is particularly high since the wetland area is quite large and has not been severely impacted by development.

Figure 3.3. Wetlands Within the Waukegan Expanded Study Area for the Waukegan Remedial Action Plan (USDI, 1981a).



3.10. URBAN, OPEN SPACE, AND SPECIAL USE AREAS

Land use areas in Lake County, Illinois, were classified by the Lake County Board in 1987 and the City of Waukegan in 1987 (Figure 3.4.). Land surrounding the northern portion of Waukegan Harbor has been classified as urban while the beach areas and water filtration plant properties have been classified as open space areas. The remaining land in the immediate harbor area is classified as special use (Lake County) or industrial (City of Waukegan). The Waukegan Port District property is located within this special use area. According to the Lake County Board, urban areas are intended to provide for both residential and non-residential needs including commercial, office, research, light to heavy industrial, institutional, and recreational uses. Urban areas are intended to meet subregional and community needs and provide a metropolitan lifestyle. Open space districts include state, county, and local parks and recreational lands which are presently publicly owned or are included in the acquisition plans of State or local park and Forest Preserve districts. Open space districts are intended to fulfill all needs for community-wide and regional public recreation areas. Special districts were designed to deal with a variety of uses that do not easily fit into any of the other categories (City of Waukegan, 1987; Lake County Board, 1987).

3.11. SEWER SERVICE AREAS

The City of Waukegan provides storm and sanitary sewers while the NSSD provides, operates, and maintains the interceptor sewers and wastewater treatment facilities in the ESA. The system in the vicinity of the North Ditch consists of a 54-inch diameter gravity sanitary sewer and a 48-inch diameter gravity combined sewer which carry influent to the wastewater treatment plant and a 54-inch diameter force main which carries effluent from the plant to the Des Plaines River (Farrell, personal communication, 1991). These sewers are located parallel to each other in an east-west direction just north of the south property line of the NSSD Waukegan treatment plant which parallels the North Ditch. There is a sanitary sewer traversing OMC property. Another sewer runs north from the water filtration facilities near the harbor mouth along the beach to the NSSD treatment plant. This sewer was installed in 1978 to carry filter-backwash solids to the NSSD facility for treatment.

Seven storm sewers discharge to the inner harbor (a 10 inch line discharging into slip 3 was sealed in 1976). There is a 30 inch line to slip 1, a 12 inch line along Clayton Street, and a 24 inch line at Madison Street. These three storm discharges take runoff from portions of the metropolitan Waukegan area. In the new harbor area, there is a 21 inch line draining the north portions of the Waukegan Port Authority's parking lot. An additional 27 inch line discharges to Lake Michigan and drains the southern portion of the parking (Figure 3.5.). Storm sewer lines which drain the Gold Bond property and discharge into slip 3 were rerouted as part of the OMC remediation. A single storm sewer will serve that property and will discharge to the harbor. City of Waukegan storm sewers which discharge to Lake Michigan are depicted in Figure 3.6.

Figure 3.4. Land Use Within the Waukegan Expanded Study Area for the Waukegan Remedial Action Plan (Lake County Board, 1987).

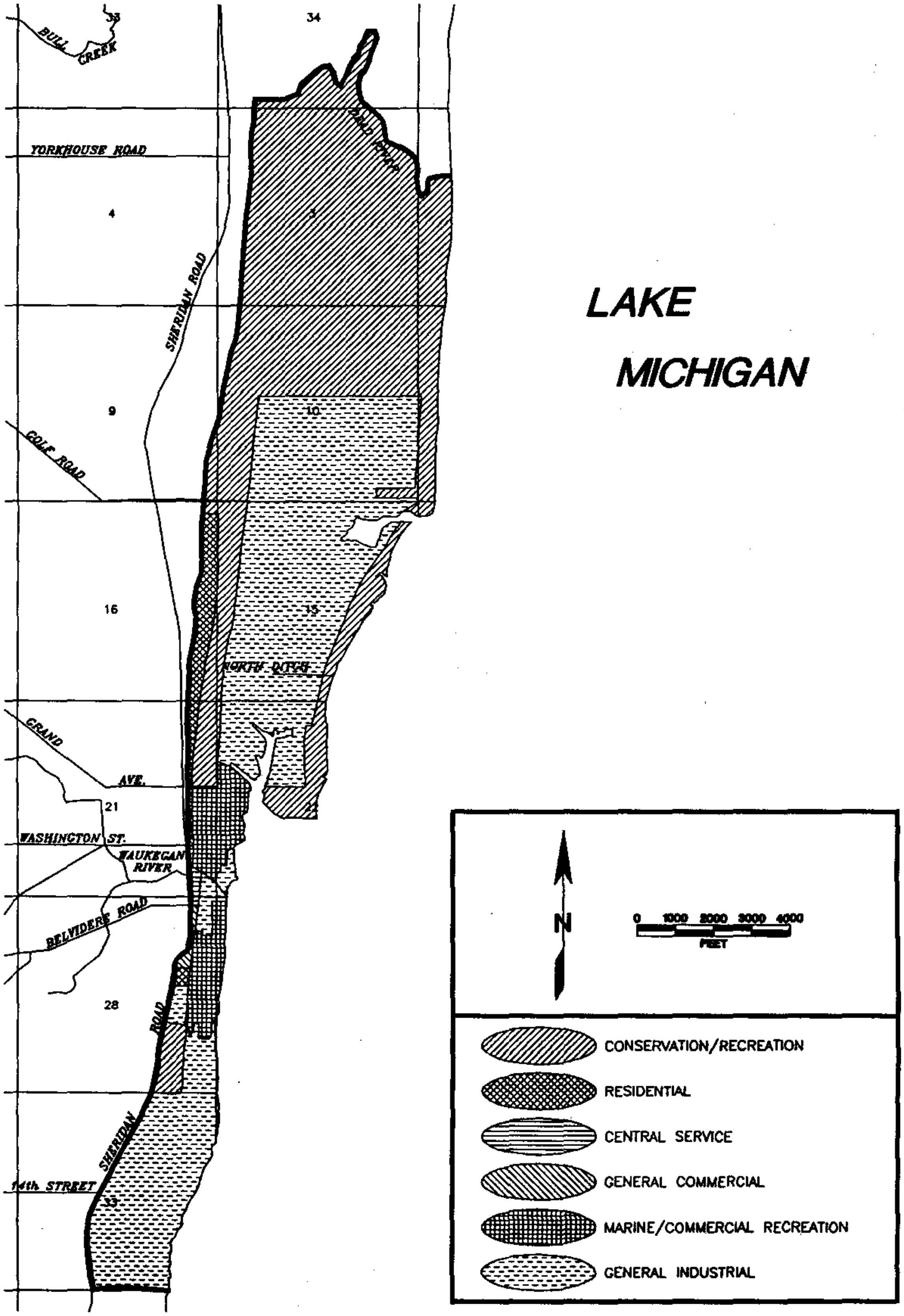


Figure 3.5. City of Waukegan Storm Sewer Discharges in and near Waukegan Harbor (Kallis, 1991).

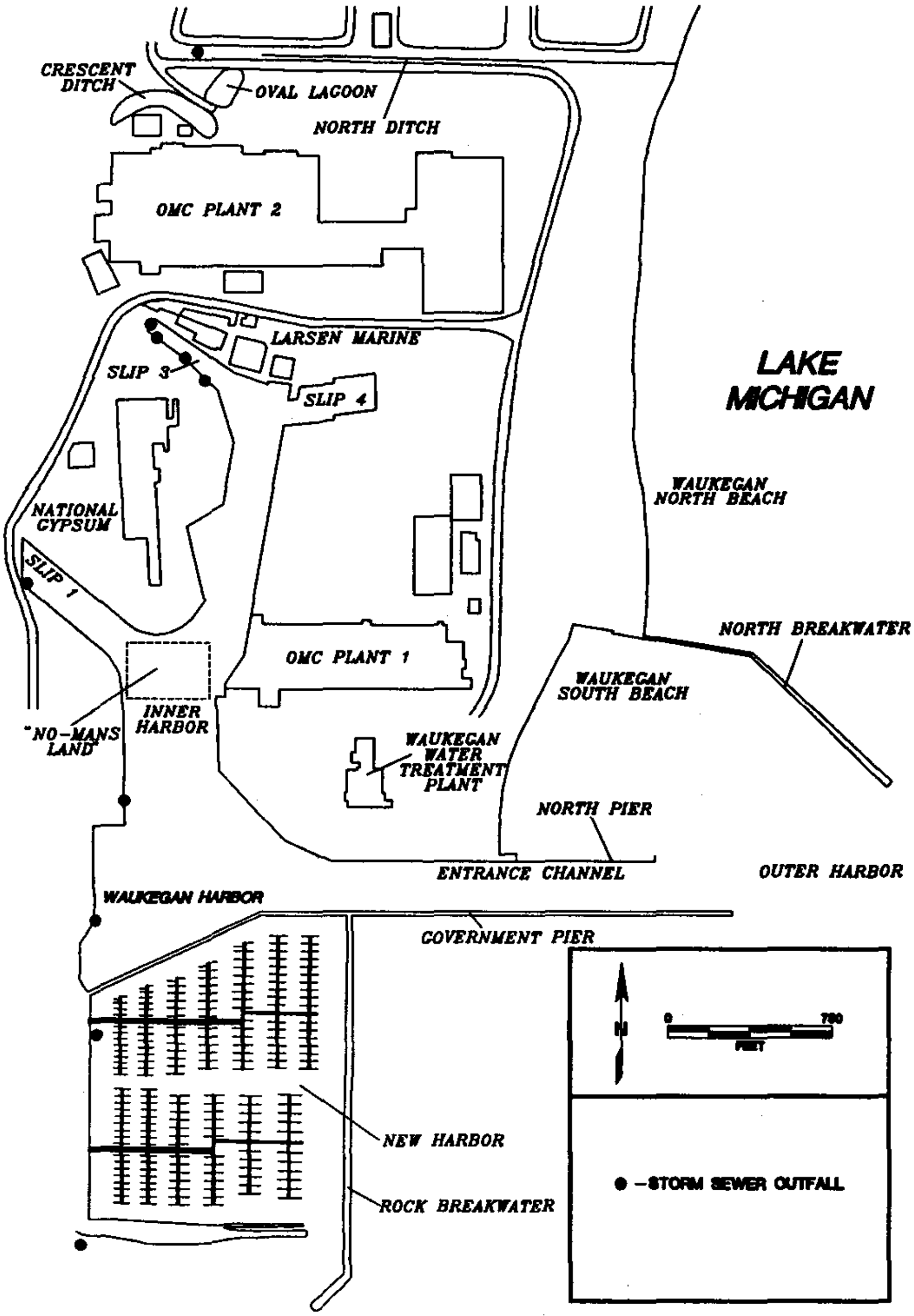
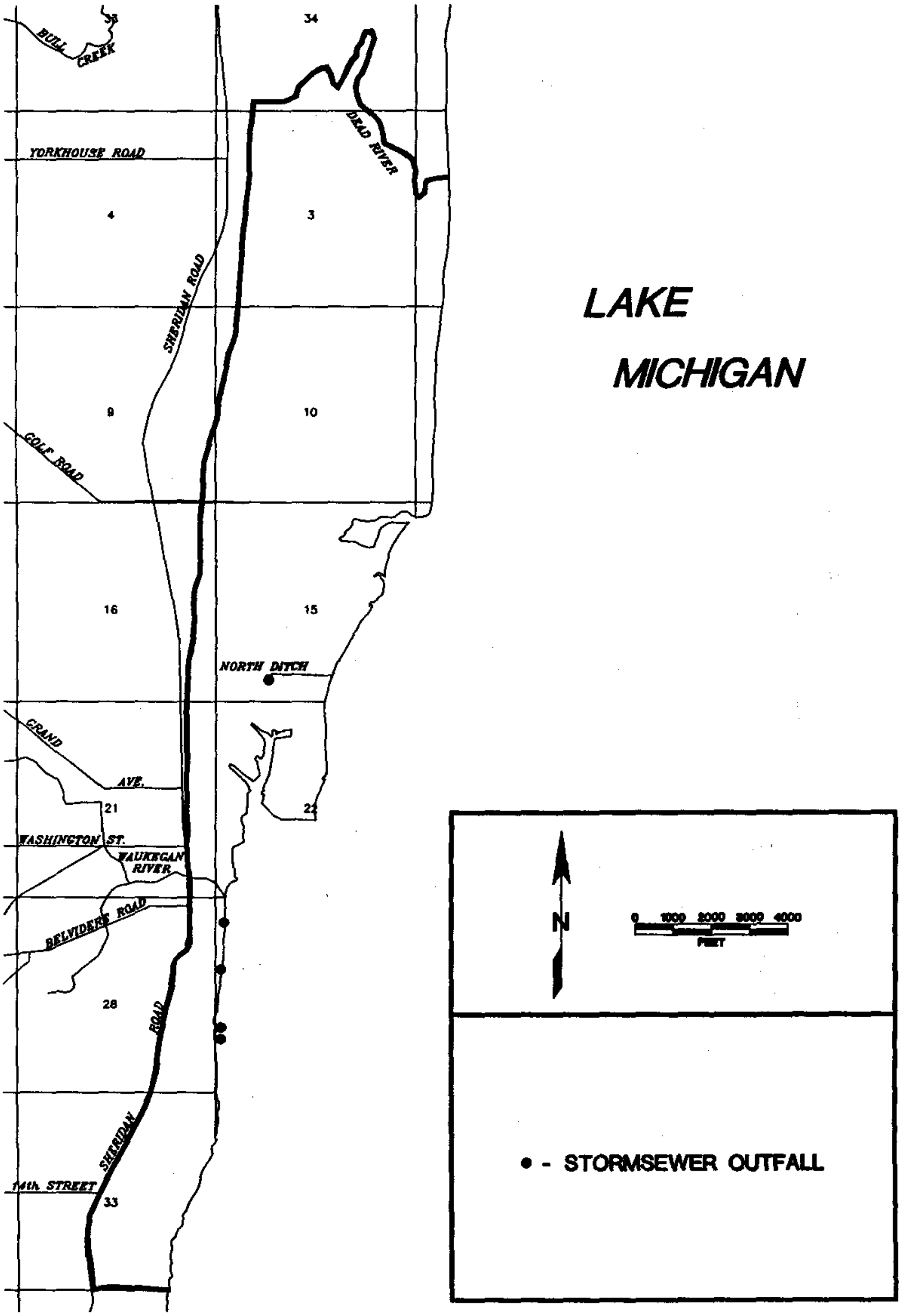


Figure 3.6. City of Waukegan Storm Sewers which Discharge to Lake Michigan.



3.12. UNSEWERED AREAS

No area is unsewered in the ESA.

3.13. INDUSTRIAL USES

The land use throughout the Waukegan ESA is primarily industrial. OMC, Gold Bond Building Products, Huron/LaFarge, Lone Star Industries, Dexter Corporation, and St. Mary's Cement are adjacent to Waukegan Harbor. Schuller International, Lake Shore Foundry, Hansen Manufacturing, and the Diamond Scrap Yard are among the active businesses in the ESA. U.S. Steel, the Waukegan Manufactured Gas and Coke Plant, Waukegan Paint and Lacquer, and the Griess-Pfleger Tannery are closed industrial sites in the study area. The ESA also contains several utilities including the Commonwealth Edison Company Waukegan generating station, the NSSD Waukegan sewage treatment plant, and the Waukegan Water Utility water treatment plant.

Access to water, land, and rail transportation contributed and helped to maintain this area as the industrial hub of Waukegan. Railroad yards and light industrial facilities span virtually the entire length of the Waukegan ESA.

3.14. RECREATIONAL USES

A substantial number of people use the area around Waukegan Harbor for sailing, picnicking, fishing, or sightseeing. The public beaches to the north and east of the harbor are used for swimming, sunbathing, volleyball, and public events. Recreational facilities in the harbor area, in addition to the boat mooring and public launching areas, include the Waukegan Yacht Club, the Warren G. Sivert Park, and the Government Pier. The Yacht Club owns a clubhouse adjacent to the harbor and totaled about 500 members as of 1990. The Yacht Club sponsors several events during the year that bring large numbers of people to the harbor area. The biggest of these is the annual Chicago to Waukegan sailboat race which is held in July. Over 285 boats participated in this race in 1990. The Warren G. Sivert Park is a small park immediately west of the boat mooring area. There are several small concession stands in this area that sell food, beverages, ice, and fishing supplies. Public restrooms and picnic tables are available at the park. The Government Pier is used for sightseeing, walking, sunbathing, birdwatching, and fishing. This pier ends at the lighthouse that marks the entrance to the harbor.

The city also sponsors festivals each year at the beach that include food, music, games, and fireworks. The city estimates between 70,000 and 80,00 people attend these festivals annually.

3.15. AGRICULTURAL USES

No land in the Waukegan ESA is used for agricultural purposes. Cement silos previously used for grain storage stand empty today.

3.16. WATER SUPPLY

Currently, the Waukegan Water Utility water treatment plant has a nominal capacity of 18 million gallons per day. The principal raw water intake is located 6,200 feet southeast of the government pier and is in approximately 25 feet of water (Figure 3.7.). An emergency intake is located 1,275 feet southeast of government pier and is in roughly 20 feet of water. The old emergency intake located in the north seawall of the Waukegan Harbor channel is sealed and is not in use. Plant facilities include five rapid mix basins, alum and powdered carbon storage and feed equipment, five flocculation/sedimentation basins, 14 media filters, and high service pumping facilities (Consoer, Townsend and Associates, Inc., 1991).

Samples of raw and finished drinking water are analyzed annually for constituents listed in the Safe Drinking Water Act (USEPA, 1986). The quality of water at the Waukegan water treatment plant meets Safe Drinking Water Act standards. No PCBs have been found in the raw or finished water at the Waukegan public water supply. Results of annual testing of raw and finished drinking water are presented in Appendix A.

3.17. COMMERCIAL FISHING

The Illinois commercial fishery for Lake Michigan for the period of 1979 through 1991 was summarized by the Illinois Department of Conservation (IDOC) (Hess, 1992). This summary is presented in Table 3.1. Commercial fishing for trout and salmon is not allowed in Illinois.

3.18. SPORT FISHING

The IDOC stocks salmon and trout in the new harbor just south of Waukegan Harbor (Table 3.2.). Prior to construction of the new harbor in 1983, stocked fish were released into the lake south of the original harbor. The last release of fish into the original harbor occurred in 1979. Stocked species include coho and chinook salmon and steelhead, brown, and lake trout.

A survey of sport fishing in the Illinois portion of Lake Michigan is conducted between April and September by the Illinois Natural History Survey (Horns and Brofka, 1990). The survey includes all types of sport fishing except charter boat and smelt fishing. Effort and expenditure estimates for Waukegan sportfishing between 1986 and 1990 are presented in Table 3.3.

Figure 3.7. Raw Water Intakes for the Waukegan Water Utility Water Treatment Plant.

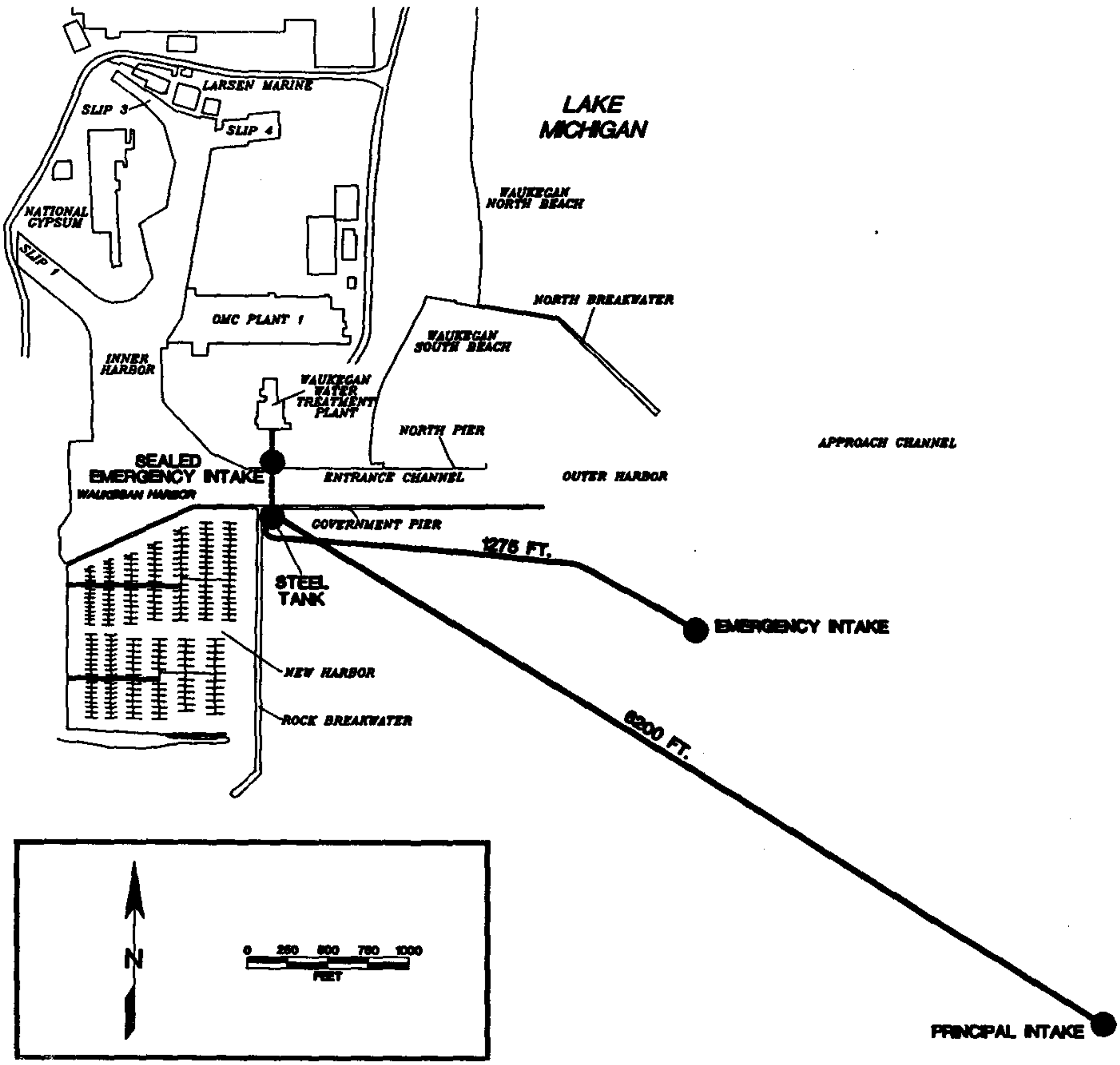


Table 3.1. Reported Commercial Catch from the Illinois Waters of Lake Michigan, 1979-1991 (Hess, 1992).

Year[a]	Number of licensees	Bloaters[b]	Yellow[c] perch
1979-80[d]	5	126,299	46,066
1980-81[d]	5	137,504	49,430
1981-82[d]	5	182,722	56,738
1982-83[e]	5	256,290	88,470
1983-84[e]	5	204,143	74,068
1984-85[e]	5	102,730	193,099
1985-86[f]	5	107,672	130,128
1986-87[f]	5	99,591	156,285
1987-88[f]	5	31,847	203,163
1988-89[f]	4	62,005	188,921
1989-90[f]	4	42,950	206,830
1990-91[f]	3	37,705	159,754

[a] license year is from April 1 through March 31
[b] dressed weight (heads attached) in pounds
[c] round weight (whole fish) in pounds
[d] Total allowable harvest (TAH): 250,000 pounds of bloaters or yellow perch, singly or in combination
[e] TAH: 350,000 pounds of bloaters or yellow perch, singly or in combination
[f] TAH: 70,000 pounds per licensee, consisting of bloaters and not more than 55,000 pounds of yellow perch

Table 3.2. Number of Salmon and Trout Stocked in the Waukegan Harbor-New Harbor Area by the Illinois Department of Conservation, 1975-1991 (Hess, 1992).

	Salmon		Trout			
Year	Coho	Chinook	Steelhead	Brown	Lake	Annual total
1975			122,266	10,499		132,765
1976	39,264	40,185		42,212	160,000	281,661
1977	102,742	40,354	29,000		70,800	242,896
1978	103,497	67,000			116,000	286,497
1979	22,500	51,140	51,976		100,250	225,866
1980		40,075	21,850			61,925
1981	95,814	5,000	32,800			133,614
1982		343,065				343,065
1983	201,200			25,925		227,125
1984	110,100	258,300	22,635	37,493		428,528
1985	83,034	95,000	29,091	22,745		229,870
1986	76,876	107,500	32,227	20,298		236,901
1987	87,923	201,080	24,284	19,266		332,553
1988	101,091	74,553	28,025	23,796		227,465
1989	24,380	240,273	26,475	25,152		316,280
1990	100,300	175,000	30,990	27,443		333,733
1991	106,044	162,500	25,500	29,392		323,436

Table 3.3. Sportfishing Effort and Expenditure Estimates for Waukegan Harbor, 1986-1990 (Hess, 1992).

Year	Angler-hours		Expenditures
	Pedestrians	Launched Boats	
1986	121,330	132,102	$ 989,000
1987	122,676	103,115	1,355,242
1988	135,222	108,974	3,233,464
1989	92,596	67,357	768,370
1990	88,635	43,433	625,519

The Waukegan charter boat fishery contributes a substantial catch for the Illinois portion of Lake Michigan. In 1988, the Waukegan area catch was 1.9 times greater than the Chicago area catch. Angler-hours from charter boats for the period 1986 through 1990 are presented in Table 3.4.

3.19. CONTACT RECREATION

Two public beaches, Waukegan North Beach and Waukegan Central Beach, are located to the north and east of the harbor. They are staffed during the summer by lifeguards and are supervised by a beach director and security director. There are picnic pavilions with grills and a bathhouse with washrooms and showers. There also is a concession stand at the north end of the beach area and a snack bar at the south end. Beach use is free to Waukegan residents while nonresidents must pay a fee.

During July and August of 1990, Waukegan area beaches were closed periodically due to elevated bacteria counts. An intensive reconnaissance of the area by the NSSD for possible sources of contamination concluded that the Waukegan River was the source of fecal contamination. Further sampling of the Waukegan River was recommended to pinpoint illegal discharges to the river (Farrell and Budzinski, 1990).

3.20. COMMERCIAL NAVIGATION AND RECREATIONAL BOATING

The Waukegan Port District operates the Waukegan Harbor. The Port District's gross revenues during 1990 totalled $ 2,161,499. The sources of their revenues are shown below:

Gasoline and oil	$ 54,384
Lease income	90,580
Percentage of gross	3,576
Gift Shop sales	9,433
Vending sales	10,845
Ice sales	12,422
Miscellaneous	15,154
Slip fees	1,669,945
Transient fees	40,743
Launch and park fees	22,956
Key card sales	455
Tenant work orders	10,469
Dock boxes and bumpers	32,910
Ad sales	3,600
Winter dry storage	4,810
Charter permits	13,425
Interest income	165,792
Total	$ 2,161,499

Table 3.4. Charter Boat Fishing Effort From Waukegan Harbor, 1986-1990 (Hess, 1992).

Year	Angler-hours
1986	63,443
1987	60,164
1988	87,430
1989	86,125
1990	69,442

During 1990, there were approximately 75 commercial ship dockings at Waukegan Harbor. The Port District currently serves three commercial clients: Huron/LaFarge Corporation, St. Mary's Cement, and Gold Bond Building Products (National Gypsum). Gold Bond Building Products is located on the northwest side of the harbor between slips 3 and 1. Huron/LaFarge Corporation is located south of slip 1 (Figure 3.1.). During 1990, 515,168 tons of bulk cement and gypsum rock were hauled into the harbor. Since each of the three commercial clients supply building materials for the construction industry in the Chicago metropolitan area, their need for raw materials is directly related to the level of construction activity taking place.

Many types of recreation facilities and opportunities are available in the Waukegan Harbor area; the foremost of these is fishing. The IDOC Division of Fisheries and Wildlife indicates that Waukegan Harbor and the offshore Waukegan area experience the heaviest fishing pressure of any area along the Illinois coastline of Lake Michigan. Although the majority of the recreational uses of the harbor are related to fishing, a substantial amount of pleasure boating, sailing, picnicking, and other water-related activities also take place.

Eight public boat launching ramps at the harbor are open for use on April 1 of each year. Demand for the boat slips has leveled off due to the opening of the North Point Marina in Zion.

A considerable amount of boat-launching activity occurs at the harbor. During the period April 1990 through October 1990, 1500 boat launching tickets were sold (a $9 fee is charged). This does not account, however, for the approximately 97 season-pass holders who have unlimited boat launching privileges.

Larsen Marine Service, Inc. located at the north end of Waukegan Harbor is the largest lakefront yacht dealer in the Chicago metropolitan area. Before Winthrop Harbor Marina opened, Waukegan Harbor was the only protected public harbor along the northern Illinois shoreline. As of 1990, Waukegan Harbor can accommodate 1008 power boats (993 through the Waukegan Port District and 15 at Larsen Marine). Larsen Marine is the only marine sales and services company located directly on Waukegan Harbor. The company provides yacht brokerage for new and used power boats and sailboats and offers complete marine repair services. A crane operated boat hoist is also available for removal and storage of all size classes of boats. These services are of considerable importance to recreational boaters in the region because there are no similar commercial facilities on the northern Illinois coastline. As of 1990, there were 41 registered charter boat captains working out of the Waukegan Harbor.

3.21. WASTE DISPOSAL (MUNICIPAL, INDUSTRIAL, AND UNCONTROLLED)

All Lake County, Illinois, municipal and industrial treated wastewater discharges were diverted away from Lake Michigan to the Des Plaines River Basin during the period 1974 through 1978. The chronology of diversions are summarized below:

1974 Highland Park Sewage Treatment Plant (STP) (all flows); Lake Forest STP (Dry weather flows); Lake Bluff STP (dry weather flows).

1975 Lake Bluff STP (Wet weather flows); United States Steel-South Works (Process wastewater). Lake Bluff STP (dry weather flows).

1976 North Chicago STP (Dry weather flows); Great Lakes Naval Training Center STP (all flows); Abbott Laboratories (Process wastewater)

1977 Fort Sheridan STP (all flows); United States Steel-Waukegan Works (Process wastewater).

1978 Lake Forest STP (wet weather flows); Waukegan STP (Dry weather flows).

Excess wet weather flows continue to be discharged into Lake Michigan from NSSD's North Chicago and Waukegan treatment plants after settling and disinfection. The contribution from the North Chicago plant to these stormwater overflows was further reduced in 1990 by the completion of a transfer line and retention basin at NSSD's Gurnee facility. Excess North Chicago flow is pumped to Gurnee for treatment rather than discharge to Lake Michigan.

Abbott Laboratories and Commonwealth Edison Company's Waukegan station discharges are in compliance with their respective National Pollution Discharge Elimination System (NPDES) permits. The Illinois Pollution Control Board granted a 45 day provisional variance to Commonwealth Edison Company's Zion station on December 20, 1990. However, the Commonwealth Edison Company was able to complete changes at this station, thus removing the need for a variance. The Highwood water filtration plant continues to discharge backwash water directly to the Lake Michigan south of the Waukegan ESA.

3.22. WATER QUALITY STANDARDS, GUIDELINES, AND OBJECTIVES

Subtitle C, Title 35 Ill. Admin. Code 302 provides four use designation categories for Illinois' lakes and streams. Each category has a specific set of water quality standards.

General use water quality standards for Illinois surface water resources were established for protection of aquatic life, primary (e.g. swimming) and secondary (e.g. boating) contact recreation, agricultural and industrial uses. The majority of Illinois' streams and lakes come under the general use designation. A somewhat stricter set of surface water standards applies to Public Food and Processing Water Supplies. These standards apply at any point at which water is withdrawn for use as potable water supply or for food processing. Even more stringent standards were established to protect Lake Michigan. A fourth set of standards applies to streams designated as Secondary Contact and Indigenous Aquatic Life waters. This is the most limited designated use and applies only to certain streams in the Chicago area. Illinois water quality standards are presented in Table 3.5. Revised General Use Standards were established for several metals in February 1990 (Table 3.6.) as well as comprehensive narrative toxics controls to protect human health, aquatic life, and wildlife. All Illinois water quality standards have been fully approved by the USEPA. IJC water quality recommendations are presented in Appendix B.

The Great Lakes Water Quality Agreement (GLWQA) of 1978 (as amended by Protocol signed November 18, 1987) called for the maintenance of the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. It is the intent of this agreement to provide for the protection of the full and unimpaired uses of the Great Lakes System. Use impairment is measured by impacts on any of the fourteen basic uses listed as follows:

(i) restrictions on fish and wildlife consumption;

(ii) tainting of fish and wildlife flavor;

(iii) degradation of fish wildlife populations;

(iv) fish tumors or other deformities;

(v) bird or animal deformities or reproduction problems;

(vi) degradation of benthos;

(vii) restrictions on dredging activities;

(viii) eutrophication or undesirable algae;

(ix) restrictions on drinking water consumption, or taste and odor problems;

(x) beach closings;

(xi) degradation of aesthetics;

(xii) added costs of agriculture or industry;

(xiii) degradation of phytoplankton and zooplankton populations; and

(xiv) loss of fish and wildlife habitats.

Illinois Water Quality Standards, as they apply to Lake Michigan, are consistent with these objectives.

Table 3.5. Illinois Water Quality Standards for Surface Water (Subtitle C, Title 35 Ill. Admin. Code 302).

Parameter	Units	General Use	Public and Food Processing Water Supply	Lake Michigan	Secondary Contact and Indigenous Aquatic Life
pH	SU	6.5 min 9.0 max	6.5 min 9.0 max	7.0 min (d) 9.0 max (d)	6.0 min 9.0 max
Dissolved Oxygen	mg/L	5.0 min	5.0 min	90% saturation (d)	4.0 min
Arsenic	μg/L	(See Table 3.6)	50	50	1000
Barium	μg/L	5000	1000	1000	5000
Boron	μg/L	1000	1000	1000	---
Cadmium	μg/L	(See Table 3.6)	10	10	150
Chloride	mg/L	500	250	12.0 (d)	---
Chromium	μg/L	(See Table 3.6)	50	50	1300
Copper	μg/L	20	20	20	1000
Cyanide	mg/L	0.025	0.025	0.025	0.10
Fluoride	mg/L	1.4	1.4	1.4	15.0
Iron (Total)	μg/L	1000	1000	1000	2000
Iron (Dissolved)	μg/L	---	---	---	500
Lead	μg/L	100	50	50	100
Manganese	μg/L	1000	150	150	1000
Mercury	μg/L	0.5	0.5	0.5	0.5
Nickel	μg/L	1000	1000	1000	1000
Phenols	μg/L	100	1.0	1.0	300
Selenium	μg/L	1000	10	10	1000
Silver	μg/L	5.0	5.0	5.0	100
Sulfate	mg/L	500	250	24.0 (d)	---
Total Dissolved Solids	mg/L	1000	500	180 (d)	1500
Zinc	μg/L	1000	1000	1000	1000
Fecal Coliform					
May-Oct.	#/100mL	200 (f)	2000	20	---
Nov-April	#/100mL	---	2000	20	---
Fecal Coliform (Beach)	#/100mL	---	---	500 (e)	---
Ammonia Nitrogen	mg/L	1.5/15 (b)	1.5/15 (b)	0.02	---
Un-ionized Ammonia	mg/L	0.04 (a)	0.04 (a)	---	.01
Nitrate Nitrogen	mg/L	---	10.0	10.0	---
Oil and Grease	mg/L	---	0.01	0.01	15.0
Total Phosphorus	mg/L	0.05 (c)	0.05(c)	0.007	---

mg/L = milligrams per liter
μg/L = micrograms per liter

(a) Unless total ammonia nitrogen is less than 1.5 mg/L
(b) The allowable concentration varies in accordance with water temperature and pH values. In general, as both temperature and pH decrease, the allowable value of ammonia nitrogen increases. Un-ionized ammonia nitrogen must not exceed 0.04 mg/L within the given range of total ammonia nitrogen values.
(c) Standard applies to lakes and reservoirs and at the point of entry of any stream to lake or reservoir.
(d) Lake Michigan Standard (35 Ill. Admin. Code 302).
(e) Swimming Criterion
(f) Waterbody reaches physically unsuited for primary contact uses and not found in urban areas or parks may be designated as unprotected

Table 3.5. (continued) Illinois Water Quality Standards for Surface Water (Subtitle C, Title 35 Ill. Admin. Code 302).

Parameter	Units	General Use	Public and Food Processing Water Supply (h)	Lake Michigan (g)	Secondary Contact and Indigenous Aquatic Life
Aldrin	µg/L	---	1.0	1.0	---
Dieldrin	µg/L	---	1.0	1.0	---
Endrin	µg/L	---	0.2	0.2	---
Total DDT	µg/L	---	50.0	50.0	---
Total Chlordane	µg/L	---	3.0	3.0	---
Methoxychlor	µg/L	---	100.0	100.0	---
Toxaphene	µg/L	---	5.0	5.0	---
Heptachlor	µg/L	---	0.1	0.1	---
Heptachlor epoxide	µg/L	---	0.1	0.1	---
Lindane	µg/L	---	4.0	4.0	---
Parathion	µg/L	---	100.0	100.0	---
2,4-D	µg/L	---	100.0	100.0	---
Silvex	µg/L	---	10.0	10.0	---
TTHM	µg/L	---	100.0	100.0	---
Benzene	µg/L	---	5.0	5.0	---
Vinyl chloride	µg/L	---	2.0	2.0	---
Carbon tetrachloride	µg/L	---	5.0	5.0	---
1,2-Dichloroethane	µg/L	---	5.0	5.0	---
Trichloroethylene	µg/L	---	5.0	5.0	---
1,1-Dichloroethylene	µg/L	---	7.0	7.0	---
1,1,1-Trichloroethane	µg/L	---	200.0	200.0	---
para-Dichlorobenzene	µg/L	---	75.0	75.0	---

mg/L = milligrams per liter
µg/L = micrograms per liter

(a) Unless total ammonia nitrogen is less than 1.5 mg/L
(b) The allowable concentration varies in accordance with water temperature and pH values. In general, as both temperature and pH decrease, the allowable value of ammonia nitrogen increases. Un-ionized ammonia nitrogen must not exceed 0.04 mg/L within the given range of total ammonia nitrogen values.
(c) Standard applies to lakes and reservoirs and at the point of entry of any stream to lake or reservoir.
(d) Lake Michigan Standard (35 Ill. Admin. Code 302).
(e) Swimming Criterion
(f) Waterbody reaches physically unsuited for primary contact uses and not found in urban areas or parks may be designated as unprotected whereby no fecal coliform standard applies.
(g) Public and Food Processing Water Supply Standards for most organics apply for Lake Michigan waters withdrawn for that purpose.
(h) See Appendix Q for an expanded list of existing and proposed regulated contaminants for drinking water in Illinois.

Table 3.6. Acute and Chronic General Use Water Quality Standards for Surface Water (Subtitle C, Title 35 Ill. Admin. Code 302).

Constituent (μg/L)	Acute Standard[a]	Chronic Standard[b]
Arsenic (total)	360	190
Cadmium (total)	exp(1.128(lnH)-2.918)	exp(0.7852(lnH)-3.490)
Chlorine (total residual)	19	11
Chromium (total hexavalent)	16	11
Chromium (total trivalent)	exp(0.819(lnH)+3.688)	exp(0.819(lnH)+1.561)
Copper (total)	exp(0.9422(lnH)-1.464)	exp(0.8545(lnH)-1.465)
Cyanide (weak acid dissociable)[c]	22	5.2
Lead (total)	exp(1.273(lnH)-1.460) but not to exceed 100 μg/L	—
Mercury (total)	0.5	—

exp = base of natural logarithms raised to parenthetic power

lnH = natural logarithm of hardness of the receiving water in mg/L

(a) not to be exceeded except where a zone of initial dilution is granted

(b) not to be exceeded by the average of at least four consecutive samples collected over any period of at least four days.

(c) Standard Methods 4500-CN I. STORET No. 718.

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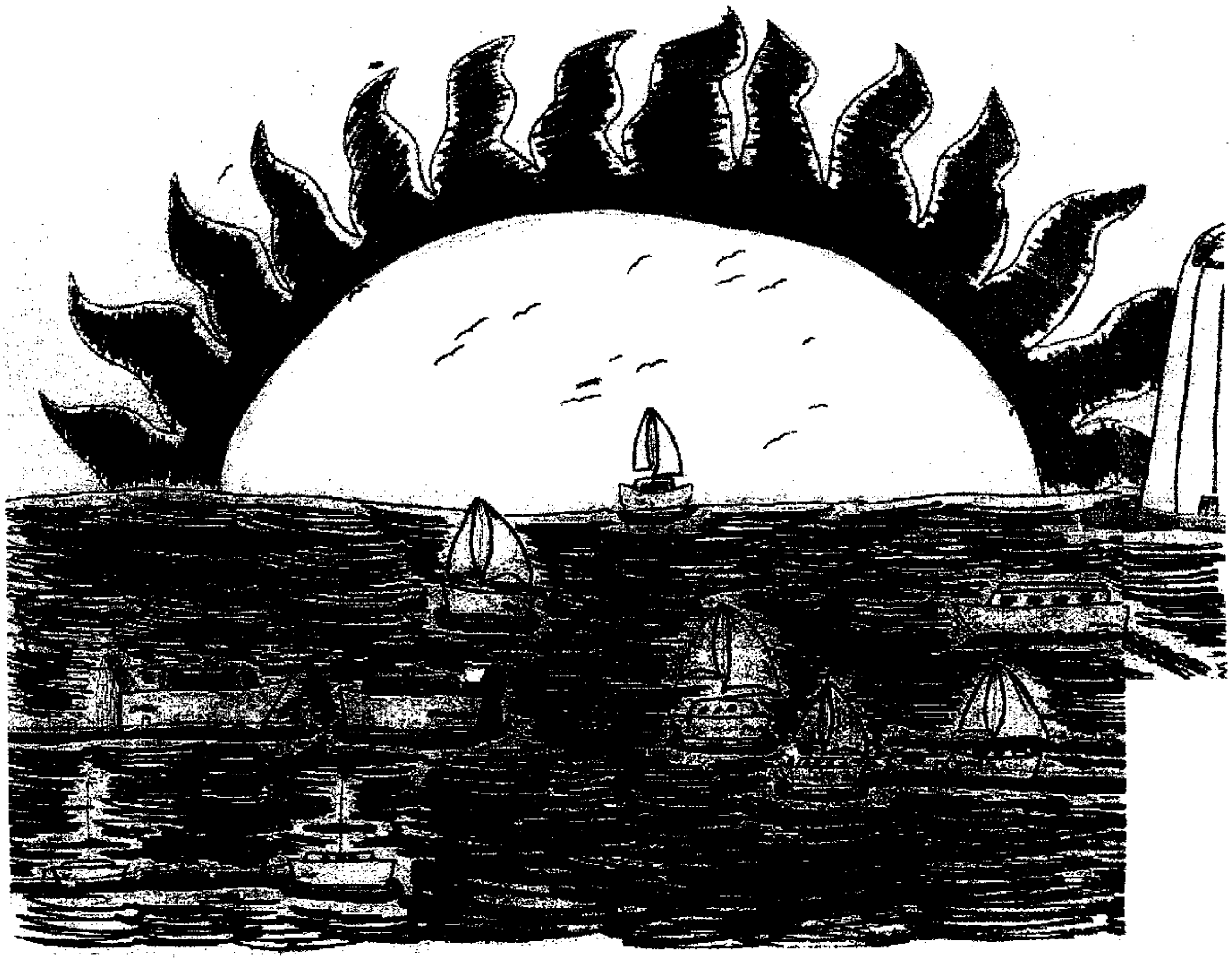

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4. DEFINITION OF THE PROBLEM

This Remedial Action Plan (RAP) relies on an "ecosystem approach" for identifying remediation needs and plans within the Expanded Study Area (ESA). The ecosystem approach considers the impairment of beneficial water resource uses within the ESA as well as contaminant sources and loadings. The International Joint Commission (IJC, 1991) has developed criteria for the identification of use impairments (Table 4.1.). Use impairments identified within the Waukegan ESA were determined through the application of these criteria.

Once the use impairments were defined, the environmental condition of the harbor was identified using existing monitoring data. Data reviewed included water quality, sediment quality, biomonitoring, benthic community assessments, and environmental contaminant monitoring data for sediments and fish.

The organization of this chapter reflects the above described use impairment procedure. Section 4.1., Impaired Uses, describes use impairments identified through documented observations. Sections 4.2. through 4.4., Water Quality, Sediment Quality, and Biota, discuss the nature and extent of contamination associated with the identified use impairments. Additional updated information will be appended to the Remedial Action Plan as it becomes available.

4.1. IMPAIRED USES

Six use impairments have been identified for the Waukegan ESA based on the listing criteria approved by the IJC (1991) and are shown in Table 4.2. Impairments include fish consumption restrictions, benthos degradation, restrictions on dredging, beach closings, degradation of phytoplankton and zooplankton populations, and loss of fish and wildlife habitat.

4.1.1. Restrictions on Fish and Wildlife Consumption

Proper handling and processing of fish taken from Lake Michigan has been shown to reduce fillet concentrations of organic compounds (Hazleton Laboratories America, Inc., 1986). Removal of the skin, belly and back fat, and lateral vein from chinook salmon fillets resulted in average reductions in PCBs, DDT and metabolites, Dieldrin, Chlordane, and benzene hexachloride (BHC) and all isomers of roughly 70 percent. Regardless of handling procedure, the recommendations provided by the Illinois Department of Public Health should be followed. Recommendations for fish caught in Lake Michigan and Waukegan Harbor are presented in Appendix C.

Table 4.1. Guidelines for Recommending the Listing and Delisting of Great Lakes Areas of Concern (IJC, 1991).

USE IMPAIRMENT	LISTING GUIDELINE	DELISTING GUIDELINE	RATIONALE	REFERENCE
RESTRICTIONS ON FISH AND WILDLIFE CONSUMPTION	When contaminant levels in fish or wildlife populations exceed current standards, objectives or guidelines, or public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input from the watershed.	When contaminant levels in fish and wildlife populations do not exceed current standards, objectives or guidelines, and no public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input form the watershed.	Accounts for jurisdictional and federal standards; emphasizes local watershed sources.	Adapted from Mack 1988
TAINTING OF FISH AND WILDLIFE FLAVOR	When ambient water quality standards, objectives, and guidelines, for the anthropogenic substance(s) known to cause tainting, are being exceeded or survey results have identified tainting of fish or wildlife flavor.	When survey results confirm no tainting of fish or wildlife flavor.	Sensitive to ambient water quality standards for tainting substances; emphasizes survey results	See American Public Health Association (1980) for survey methods
DEGRADED FISH AND WILDLIFE POPULATIONS	When fish and wildlife management programs have identified degraded fish or wildlife populations due to a cause within the watershed. In addition, this use will be considered impaired when relevant, field-validated, fish or wild-bioassays with appropriate quality assurance/quality controls confirm significant toxicity from water column or sediment contaminants.	When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present. An effort must be made to ensure that fish and wildlife objectives for Areas of Concern are consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals. Further, in the absence of community structure data, this use will be considered restored when fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.	Emphasizes fish and wildlife management program goals; consistent with Agreement and Great Lakes Fishery Commission goals; accounts for toxicity bioassays.	Adapted from Manny and Pacific, 1988; Wisconsin DENR, 1987; United States and Canada, 1987; Great Lakes Fishery Commission, 1980.
FISH TUMORS OR OTHER DEFORMITIES	When the incidence rates of fish tumors or other deformities exceed rates at unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers.	When the incidence rates of fish tumors or other deformities do not exceed rates at unimpacted control sites and when survey data confirm the absence of neoplastic or preneoplastic tumors in bullheads or suckers.	Consistent with expert opinion on tumors; acknowledges background incidence rates.	Adapted from Mack and Smith, 1988; Black, 1983; Baumann etal.,1982
BIRD OR ANIMAL DEFORMITIES OR REPRODUCTIVE PROBLEMS	When wildlife survey data confirm the presence of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species.	When the incidence rates of deformities (e.g. cross-bill syndrome) or reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species do not exceed background levels in inland control populations.	Emphasizes confirmation through survey data; makes necessary control comparisons.	Adapted from Kubiak, 1988; Miller, 1988; Wiemeyer et al., 1984
DEGRADATION OF BENTHOS	When the benthic macroinvertebrate community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined by relevant, field-validated, bioassays with appropriate quality assurance/quality controls) of sediment-associated contaminants at a site is significantly higher than controls.	When the benthic macroinvertebrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment-associated contaminants is not significantly higher than controls.	Accounts for community structure and composition; recognizes sediment toxicity; uses appropriate control sites.	Adapted from Reynoldson, 1988; Henry, 1988; IJC, 1988

Table 4.1. (continued) Guidelines for Recommending the Listing and Delisting of Great Lakes Areas of Concern (IJC, 1991).

USE IMPAIRMENT	LISTING GUIDELINE	DELISTING GUIDELINE	RATIONALE	REFERENCE
RESTRICTIONS ON DREDGING ACTIVITIES	When contaminants in sediments exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.	When contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.	Accounts for jurisdictional and federal standards; emphasizes dredging and disposal activities.	Adapted from IJC, 1988
EUTROPHICATION OR UNDESIRABLE ALGAE	When there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.	When there are no persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.	Consistent with Annex 3 of the Agreement; accounts for persistence of problems.	United States and Canada, 1987
RESTRICTIONS ON DRINKING WATER CONSUMPTION OR TASTE AND ODOR PROBLEMS	When treated drinking water supplies are impacted to the extent that: 1) densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odor problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e. settling, coagulation, disinfection).	For treated drinking water supplies: 1) when densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances do not exceed human health objectives, standards or guidelines; 2) when taste and odor problems are absent; and 3) when treatment needed to make raw water suitable for drinking does not exceed the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e. settling, coagulation, disinfection).	Consistency with the Agreement; accounts for jurisdictional standards; practical; sensitive to increased cost as a measure of impairment.	Adapted from United States and Canada, 1987
BEACH CLOSINGS	When waters, which are commonly used for total-body contact or partial-body contact recreation, exceed standards, objectives, or guidelines for such use.	When water, which are commonly used for total-body contact of partial-body contact recreation, do not exceed standards, objectives, or guidelines for such use.	Accounts for use of waters; sensitive to jurisdictional standards; addresses water contact recreation; consistent with the Agreement.	Adapted from United States and Canada, 1987; Ontario Ministry of the Environment, 1984
DEGRADATION OF AESTHETICS	When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).	When the waters are devoid of any substance which produces a persistent objectable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).	Emphasizes aesthetics in water; accounts for persistence.	Adapted from the Ontario Ministry of the Environment, 1984
ADDED COSTS TO AGRICULTURE OR INDUSTRY	When there are additional costs required to treat the water prior to use for agricultural purposes (i.e. including, but not limited to, livestock watering, irrigation and crop-spraying) or industrial purposes (i.e. intended for commercial or industrial applications and noncontact food processing).	When there are no additional costs required to treat the water prior to use for agricultural purposes (i.e. including, but not limited to, livestock watering, irrigation and crop-spraying) and industrial purposes (i.e. intended for commercial or industrial applications and noncontact food processing).	Sensitive to increased cost and a measure of impairment.	Adapted from Michigan DNR, 1977
DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS	When phytoplankton or zooplankton community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when relevant, field-validated, phytoplankton or zooplankton bioassays (e.g. Ceriodaphnia; algal fractionation bioassays) with appropriate quality assurance/quality controls confirm toxicity in ambient waters.	When phytoplankton and zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters.	Accounts for community structure and composition; recognizes water column toxicity; uses appropriate control sites.	Adapted from IJC, 1987
LOSS OF FISH AND WILDLIFE HABITAT	When fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a perturbation in the physical, chemical, or biological integrity of the Boundary Waters, including wetlands.	When the amount and quality of physical, chemical, and biological habitat required to meet fish and wildlife management goals have been achieved and protected.	Emphasizes fish and wildlife management program goals; emphasizes water component of Boundary Waters.	Adapted from Manny and Pacific, 1988

Table 4.2. Use Impairment within the Waukegan Expanded Study Area.

		Use Is Impaired	Use Is Unimpaired	Unknown[1]
i	Restriction on Fish and Wildlife Consumption			
	Fish	X		
	Wildlife			X
ii	Tainting of Fish and Wildlife Flavor			X
iii	Degradation of Fish and Wildlife Populations (diversity and abundance, including reproduction problems)			
	Fish			X
	Wildlife			X
iv	Fish Tumors and Other Deformities		X	
v	Bird or Animal Deformities or Reproductive Problems			X
vi	Degradation of Benthos	X		
vii	Restrictions on Dredging Activities	X		
viii	Eutrophication or Undesirable Algae		X	
ix	Restrictions on Drinking Water Consumption or Taste and Odor Problems		X	
x	Beach Closings	X		
xi	Degraded Aesthetics		X	
xii	Added Costs to Industry		X	
xiii	Degradation of Phytoplankton and Zooplankton Populations			
	Phytoplankton	X		
	Zooplankton	X		
xiv	Loss of Fish and Wildlife Habitat			
	Fish Habitat	X		
	Wildlife Habitat	X		

[1] Additional data collection is required before a determination can be made.

In 1981, the U.S. Environmental Protection Agency (USEPA) recommended that fish caught in Waukegan Harbor not be eaten (USEPA, 1981). The Lake County Health Department subsequently posted the harbor area warning that consumption of fish taken from the "North" portion of Waukegan Harbor may be dangerous to human health. When cleanup of high-concentration PCB's in the North Harbor sediments was completed in late 1993 the Lake County Health Department updated the warning signs (Figure 4.4.). The 1993 IDOC Fishing Information regulations (IDOC, 1993) notes that "the Department of Public Health advises that no fish from Waukegan Old North Harbor be consumed." Contamination of fish tissue is discussed in Section 4.4. Hunting is not allowed in the ESA because it is in an urban area. There have been no studies of contaminants in wildlife within the ESA (Millar, 1991).

The Illinois Department of Conservation conducted a fish sampling in the Old North Harbor in August 1993. Six species of fish (carp, gizzard, shad, alewife, sunfish, golden shiner, and white sucker) were analyzed for chlordane, dieldrin, heptachlor epoxide, total DDT, total PCBs, and mirex and compared to USFDA action levels. Thirteen total samples were comprised of six carp fillets, two whole white sucker, one whole gizzard shad, and individual composite whole fish samples of alewife, sunfish, and two golden shiner samples.

Concentration of organochlorine residues in fish tissue exceeded USFDA action limits in three samples for four parameters. All three fish samples over the USFDA limits were in carp. USFDA limits that were exceeded were for PCBs (2.40, 6.39, and 2.66 ppm) and chlordane (0.81 ppm). All other species were below USFDA action limits (Appendix O).

PCB limits were considerably reduced from the 1991 levels of 10.0 ppm in alewife and 19.0 ppm in carp. Sampling for additional species will be conducted to determine if the fish consumption advisory can eventually be lifted.

4.1.2. Tainting of Fish Flavor

There have been no reports of tainted flavor in fish flesh in or near the area of concern. A fish flavor study using American Public Health Association (1980) methods has not been conducted (Hess, personal communication, 1991).

4.1.3. Degradation of Fish and Wildlife Populations

There is no available information on impacts to fish and wildlife populations in the Waukegan ESA. Detailed fish and wildlife population studies have not been conducted in the Waukegan ESA. Detailed population studies in the area have been restricted to the annual collection of salmonids in the fall, including samples for fish contaminant analysis (Hess, personal communication, 1991). Specific studies in the ESA are needed. Additional information may become available from a U.S. Fish and Wildlife Service (USFWS) national damage assessment of fish and wildlife impairments for Areas of Concern (AOCs) in the Great Lakes.

Contaminant concentrations similar to those found within the Waukegan ESA have been correlated with declines in fish and wildlife populations throughout the Great Lakes. These lake-wide impacts are likely associated with bioaccumulation, the uptake and retention of contaminants from food and the environment (Environment Canada, 1991). Organochlorine compounds in the Great Lakes have been linked to reduced populations of double-crested cormorant and bald eagle (Government of Canada, 1991). Double-crested cormorant populations in the Great Lakes declined in the 1970s as a result of eggshell thinning associated with DDT. Recovery of the double-crested cormorant began in the 1980s and, currently, basin-wide cormorant populations are 20 times greater than at any other time this century (Government of Canada, 1991). Bald eagles, as long-lived top predators, are particularly susceptible to bioaccumulation and suffered population declines in the Great Lakes starting in the 1940s (Government of Canada, 1991). Other species which have experienced population declines associated with water and sediment contamination are otter, black-crowned night-heron, and possibly mink (Millar, personal communication, 1992). The Waukegan area is not in the natural range of the otter while it is for the bald eagle. Nesting black-crowned night-herons have been recently observed in Illinois Beach State Park. Both cormorants and mink are resident to the ESA while the bald eagle is not.

Decline of native stocks of lake trout in Lake Michigan have been linked to sea lamprey predation, degradation of spawning habitat, overharvest, and changes in forage. Lake trout are currently stocked in Lake Michigan but the stocked trout do not reproduce successfully. Reasons for lack of successful reproduction by stocked fish are not well understood.

Surveys of charter boat sport catch from the Illinois waters of Lake Michigan show greater total catch in Waukegan area waters than in Chicago area waters (Hess and Trudeau, 1990). In 1987 and 1988, overall charter boat sport catch near Waukegan was approximately 140 and 190 percent greater than near Chicago. Individual species of sport fish which were most commonly caught off Waukegan included coho salmon, chinook salmon, lake trout, rainbow trout, and brown trout.

As with charter boat fishing, pedestrian catch in the Waukegan area is greater than in other areas along the Lake Michigan shoreline in Illinois (Horns and Brofka, 1990). Pedestrian catch of brown trout, rainbow trout, coho salmon, and chinook salmon from both the Commonwealth Edison Waukegan Generating Station and the Waukegan Harbor area were greater than from six other locations along the Illinois shoreline. Catch of yellow perch was greater at the Waukegan locations than from five of the six other locations.

4.1.4. Fish Tumors or Other Deformities

There have been no reports of fish tumors or other abnormalities in Waukegan area fish. Since 1975, annual fall electrofishing surveys have been conducted either in the original harbor basin, off the mouth of the Waukegan River, or in the new boat harbor south of government pier by the Illinois Department of Conservation (IDOC) to assess salmonid returns and collect fish for contaminant analysis. Collected samples do not represent bottom-feeding species. Examinations of subsamples of collected fish have not identified any internal or external tumors or abnormalities. It is not expected that fish tumors or other abnormalities are a problem in the ESA since no reports or observations have been documented (Hess, personal communication, 1991).

4.1.5. Bird or Animal Deformities or Reproduction Problems

There is no available information on bird or animal deformities or reproduction problems in the Waukegan ESA (Millar, 1991). Specific studies in the ESA appear warranted.

Studies have shown that levels of toxicity similar to those levels found in Waukegan Harbor have produced adverse effects, reproductive failure, and gross deformities on wildlife. Ranch raised mink experienced reproductive failure and elevated kit mortality when fed PCB-containing fish (Government of Canada, 1991; Fitchko, 1986). Organochlorine compounds, especially DDT and DDE, are correlated with eggshell thinning and reproductive failure in double-crested cormorant and bald eagle (Government of Canada, 1991). Contaminant-associated reproduction failure in herring gulls was attributed to altered egg incubation behavior in adult gulls. Deformities attributed to contaminant exposure include feminization of male herring gull embryos; bill deformities in common terns; tail, leg, and mouth deformities in snapping turtle; and, most notably, crossed bills in double-crested cormorants (Government of Canada, 1991).

4.1.6. Degradation of Benthos

Polluted conditions which presently exist within Waukegan Harbor have impacted benthos populations. In 1972, the Illinois Environmental Protection Agency (IEPA) conducted a benthic survey of Waukegan Harbor at four stations and, based on this survey, classified each station as polluted (Figure 4.1.). Benthic life (Table 4.3.) consisted of Oligochaete (aquatic worms), Sphaeriidae (fingernail clams), Hirudinea (leeches), Chironimidae (midges), Prosobranchia (gilled snails), and Amphipods (scuds). Pollution tolerant forms, specifically aquatic worms, predominated at each location indicating environmental degradation (IEPA, 1972).

In 1973, additional benthic surveys were accomplished by the IEPA near the mouth of the Dead River, in near-shore areas near the North Shore Sanitary District (NSSD) sewage treatment plant, and the mouth of the

Figure 4.1. Stations Sampled for Benthic Organisms by the IEPA in 1972 (IEPA, 1972).

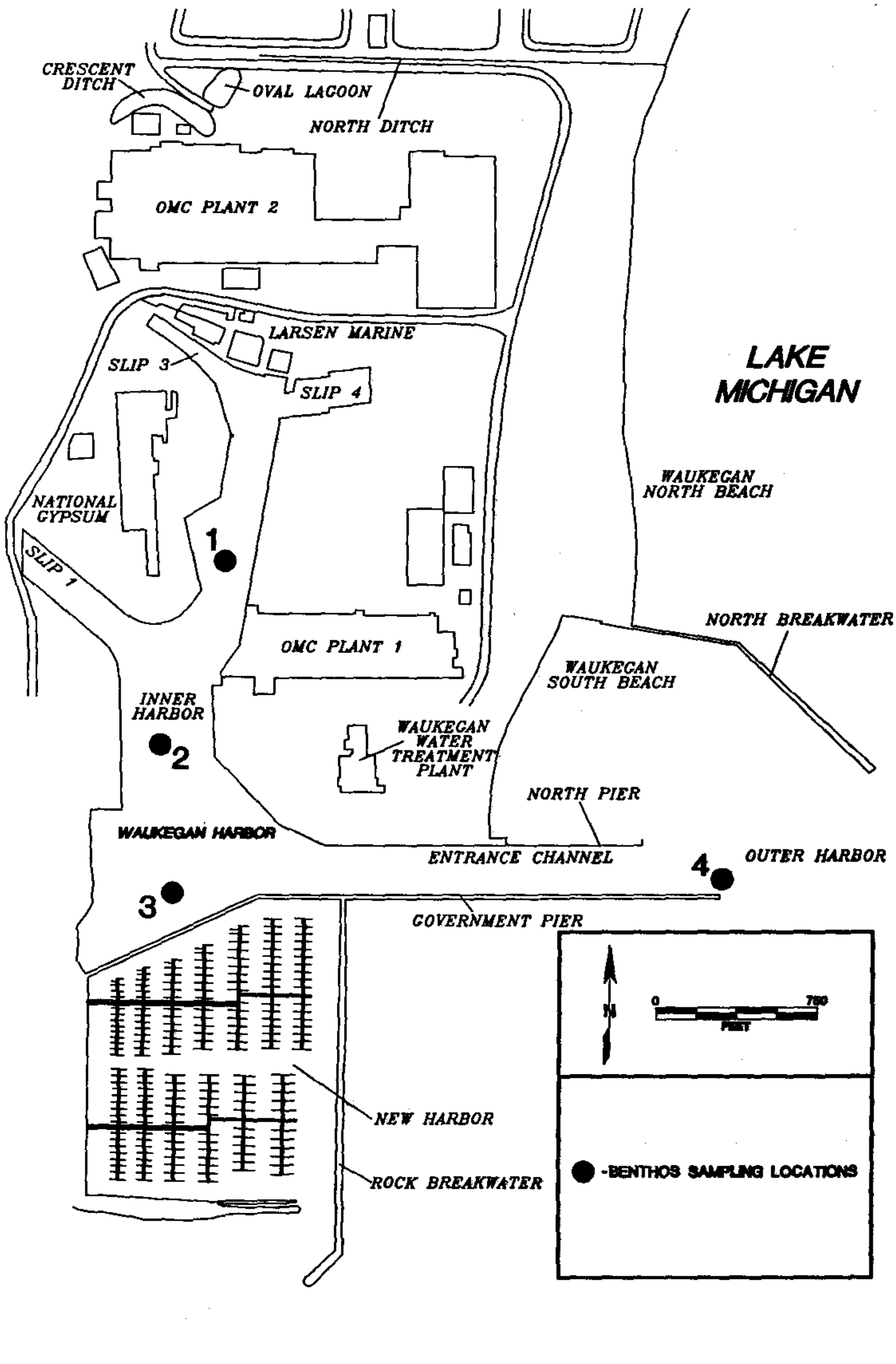


Table 4.3. **Benthic Organisms Collected in Waukegan Harbor by the IEPA (1972).**

	Organisms per Square Foot			
Organism	Station 1	Station 2	Station 3	Station 4
Scuds	7	2	0	0
Fingernail clams	2100	12	1110	150
Gilled snails	14	0	7	0
Midge larvae	7	0	0	85
Leeches	36	7	392	14
Aquatic worms	3900	105	6800	13600

Waukegan River in Lake Michigan (IEPA, 1973). Benthos populations around the Dead River were classified as balanced and were dominated by scuds. Several sampling locations immediately off-shore of the NSSD facility were found to be devoid of benthic life. However, samples within 0.5 miles of the shoreline were found to have balanced benthic populations. It should be noted that since the date of this 1973 study, effluent from the NSSD facility has been routed away from Lake Michigan and to the Des Plaines River. The resulting reduction of nutrient, chloride, and biodegradable loads to the lake should have improved the benthic environment off-shore of the NSSD facility. However, current data concerning benthic populations near the NSSD facility are not available. Eleven of fifteen sampling locations near the mouth of the Waukegan River were classified as either polluted or semipolluted.

Sediment samples for benthic invertebrate analysis were taken from nearshore Lake Michigan near the Commonwealth Edison Waukegan generating station in 1972 and 1973 (CEC, 1972; CEC, 1973). Sampling depths ranged from 10 to 40 feet. Samples were dominated by aquatic worms, scuds, and fingernail clams.

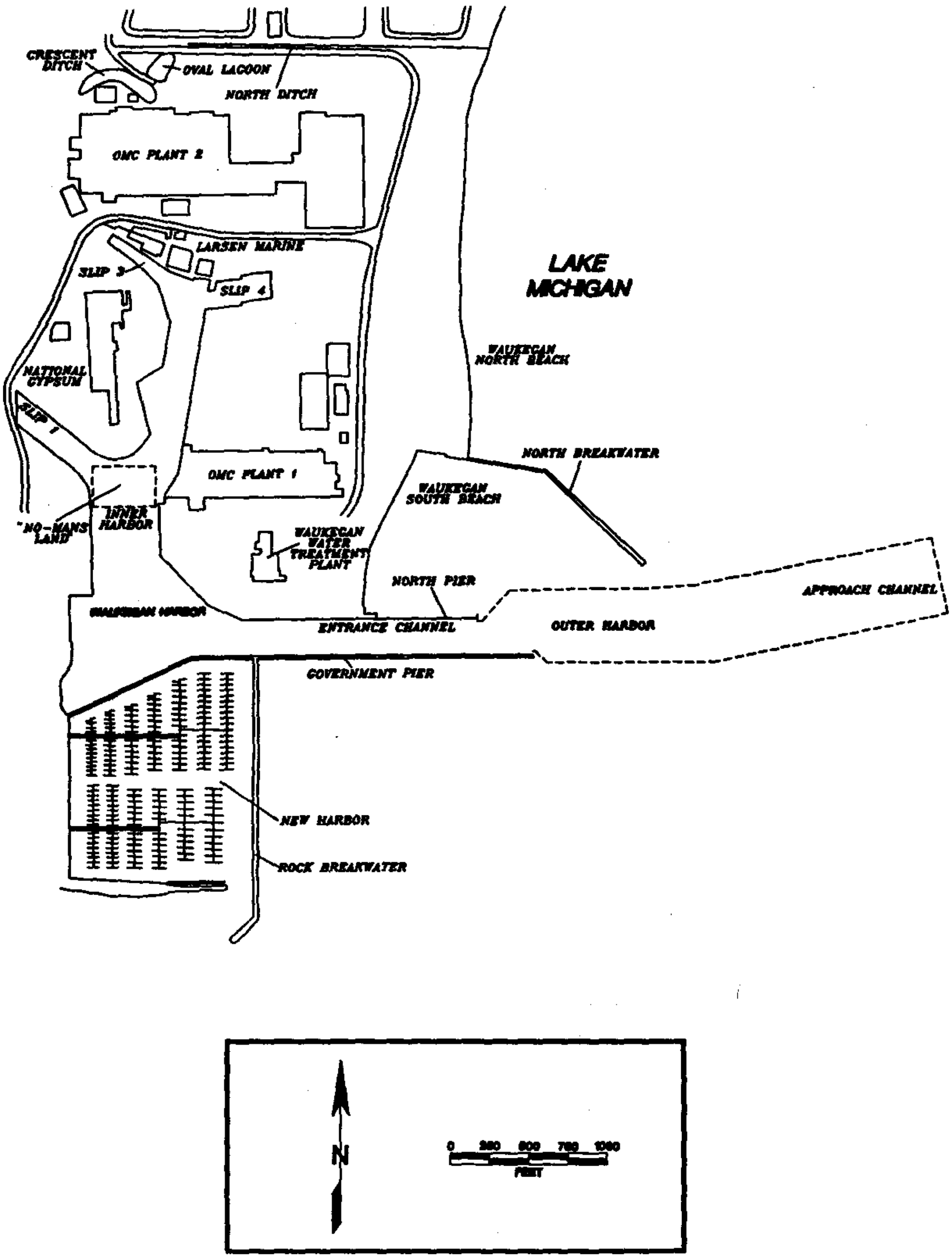
A 1987 benthic survey was conducted by the Illinois Natural History Survey (Ross et al., 1989) within Waukegan Harbor and in Lake Michigan immediately outside the harbor. As with earlier benthic studies, dominant species included aquatic worms and fingernail clams. Biomass, based on the dry weight of collected samples, was lower in areas of marked contamination.

The toxicity of Waukegan Harbor sediments to benthic organisms was evaluated by Marking et al. (1981). Sediment samples were vigorously shaken with water and allowed to settle for one hour. The remaining suspension was decanted and used for the toxicity tests. The suspension was aerated during exposure to prevent further sedimentation. Species mortality was recorded after 96 hours of exposure. Organisms tested included scuds, mayfly nymphs, midge larvae, snails, and fingernail clams. All species except fingernail clam experienced increased mortality attributed to sediment exposure.

4.1.7. Restrictions on Dredging Activities

Both the inner and outer areas of Waukegan Harbor (Figure 4.2.) are affected by sediment accumulation. Accumulated sediment in the inner harbor is estimated to be between 1 and 10 feet thick (Ross et al., 1989). The breakwaters and piers which define and protect the outer harbor trap sandy sediments which are eroded from the beaches at Illinois Beach State Park north of Waukegan and carried by the littoral drift (Norby, 1981). The U.S. Army Corps of Engineers (USACOE) has dredged the outer areas of Waukegan Harbor as recently as 1991 and has instituted a program of annual dredging of the approach channel. Dredged materials removed from the outer harbor areas were clean sandy sediments which were suitable for unconfined lake disposal or use as nourishment materials for beaches. The most recently used disposal site for approach channel material is a near-shore site (water depths from 6 to 12 feet) approximately 2000 feet south of the Waukegan Port Authority

Figure 4.2. Waukegan Harbor Navigation Areas.



South Harbor.

Dredging of the inner portions of Waukegan Harbor, west of North Pier, was discontinued after 1972 because the sediments were classified as polluted (USACOE, 1989). Since that time, the USACOE has investigated alternatives for confined disposal facilities (CDFs) (USACOE, 1986; USACOE, 1989). None of the proposed CDF alternatives have been approved. An alternative that received serious consideration by the Chicago District, USACOE, in an un-circulated 1989 draft report involved construction of an in-lake CDF with sufficient capacity to contain all the polluted, fine-grained soft sediment from the inner harbor (estimated to be 225,000 cubic yards) outside of the Outboard Marine Corporation (OMC) Superfund remediation site. This alternative, in conjunction with OMC's Superfund remediation, would have removed the vast majority of contaminated sediments currently in the harbor. However, after thorough review of existing federal law and USACOE policy on dredging outside of designated channel limits, it was determined that federal funds were available only for dredging and disposal of sediments located within the physical boundaries of the authorized navigation project. The volume of sediment in the navigation project area is estimated to be 50,000 to 70,000 cubic yards.

There has been an increased cost to industry due to a lack of dredging in the harbor. The inner (old) harbor area is authorized to be dredged to 23 feet and was last dredged to 18 feet in 1972. The inner harbor is now about 16 feet deep and is scheduled for only partial dredging as part of the OMC Superfund clean up. Representatives of industries which rely on the harbor for transportation of raw and finished materials reported problems associated with lack of dredging to the Waukegan Citizens Advisory Group (CAG, 1991). Three of the four participating industries must currently alter normal shipping procedures to accommodate shallow water depths in the harbor. Of these three, two local building product manufacturers have indicated that lack of dredging has cost their companies a sum of roughly 0.5 million dollars per year in additional shipping costs. These increased shipping costs are related to the number of deliveries required. Since water depths in the harbor have been reduced by sedimentation, shipping vessels may not safely navigate the harbor when they are fully loaded. Consequently, ships may only be loaded to approximately 70 percent of capacity requiring a greater number of dockages.

In December 1970, the Chief of Engineers, USACOE, under the authority of Section 201 of the Rivers and Harbors Act of 1965, authorized a modification of the Waukegan Harbor channel dimensions to increase the depth to -23.0 feet LWD in the inner harbor and -25.0 feet LWD in the approach channel. However, due to a lack of interest at that time by local concerns and a lack of economic feasibility, this depth increase was declared an inactive project and remains in that status today. Although inactive projects retain formal authorization, they are not implementable without a formal study essentially equivalent to that required for initial authorization. The Chicago District, USACOE, plans to undertake such as study as soon as possible.

4.1.8. Eutrophication or Undesirable Algae

Eutrophication is the accumulation of nutrients in a water body and is commonly associated with increased high biotic productivity (Cole, 1979). Water quality constituents related to eutrophication are those which are required as macronutrients for production of plant material, particularly nitrogen and phosphorus.

The trophic status of the Illinois shore of Lake Michigan is oligotrophic (IEPA, 1990). Water quality samples collected from within Waukegan Harbor in November, 1990 yielded a mean total phosphorus concentration of 0.018 ent levels exceed mg/L and a mean total ammonia concentration of 0.37 mg/L (Table 4.4.). Although these nutrient State of Illinois Standards, no undesirable algae growths have been reported or observed.

4.1.9. Restrictions on Drinking Water Consumption or Taste and Odor Problems

Two city of Waukegan water intakes (including an emergency intake) are located east of the harbor in the lake. The main intake is a 48 inch pre-stressed concrete pipe line that runs in an east southeast direction for 6,200 feet from the steel tank on the south side of government pier (Figure 3.7). The emergency intake is a 24 inch line running approximately 1275 feet out from the tank. The location of the emergency intake is about 125 feet south of the eastern end Government pier and 100 feet east (Lapish, 1990). An additional emergency intake (15 inch line) is located in the entrance channel to the harbor (Consoer, Townsend and Associates, Inc., 1991). Currently, both emergency intakes are valved shut. Since an emergency intake which draws Lake Michigan water is available for use, it is quite unlikely that the City would ever utilize the emergency intake located in the harbor.

There are no restrictions on drinking water for the City of Waukegan. Samples of finished water and raw water from the main intake are collected annually and tested for constituents identified in the Safe Drinking Water Act (USEPA, 1986). Results of this annual sampling are included in Appendix A. In addition, finished water is analyzed daily for bacteria, turbidity, residual chlorine, and fluoride and raw water is analyzed daily for turbidity and temperature (Kroop, personal communication, 1991).

There have been no complaints regarding taste and odor since 1988 when harbor water entered the raw water intake due to drain and sump problems. Following reconstruction of the drain and sump and initiation of activated carbon treatment in 1988, no taste and odor complaints were reported. Use of granular activated carbon for treatment of drinking water is typical of public drinking water supplies in Cook and Lake counties which rely on surface water resources (IEPA, 1991a).

In April 1992 water sampled from the Waukegan water plant showed no organics in both raw and finished water. Sludge filtrate at the water treatment plant also had organics concentrations below detectable levels.

Table 4.4. Comparison of Mean Water Quality Concentrations from the Waukegan Harbor Area and Lake Michigan, 1990. Samples were collected and analysed by the Illinois EPA.

Parameter	Standard	Waukegan Harbor Area (1)	Lake Michigan North Shore (2)
Water Temperature (C)	--	7.1	15
pH (units)	7.0 - 9.0 (a)	7.0	--
Dissolved Oxygen (mg/L)	5.0 (c)	8.3	--
DO Percent Saturation	90 (a)	70.4 *	--
Conductivity (μS/cm) 3	300 (a)	321 *	287
Total Phosphorus (mg/L)	0.007 (a)	0.018 *	0.004
Total Ammonia (mg/L)	0.02 (a)	0.37 *	0.01
Un-ionized Ammonia (mg/L) 4	0.04 (c)	0.000	--
Total Kjeldahl Nitrogen (mg/L)	--	0.6	0.2
Nitrite + Nitrate (mg/L)	--	0.29	0.24
COD (mg/L)	--	15	4
Turbidity (NTU)	--	11.7	2.0
Total Suspended Solids (mg/L)	--	12	2
Volatile Solids (mg/L)	--	4	2
Chloride (mg/L)	12 (a)	15 *	11
Sulfate (mg/L)	24 (a)	30 *	22
Cyanide (mg/L)	0.022 (c)	0.021	0.005 K
Fluoride (mg/L)	1.4 (c)	0.13	0.09
Phenols (μg/L)	1.0 (b)	15 *	3 K
Fecal Coliform (No./100ml)	20 (a)	24 *	8 K

1 Seven stations, November, 1990.
2 Five stations (1N, 3N, 5N, 7N, 9N), May & September, 1990.
3 Conductivity x 0.6 = TDS (mg/L)
4 Calculated
(a) Lake Michigan Standard (35 Ill. Admin. Code 302)
(b) Public Water Supply Standard (35 Ill. Admin. Code 302)
(c) General Use Standard (35 Ill. Admin. Code 302)
K Less than
* Violated Standard

Other parameters were within expected ranges. In the harbor entrance channel, PCB levels in sediments were below 1.5 ppm. Highly elevated levels of arsenic in sediments were detected at 18.1 to 23.0 ppm. No additional parameters were rated as highly elevated (Appendix K).

Based on available information, harbor and open lake sediments do not pose a threat to the public water supply. Drinking water continues to meet standards set forth by the Safe Drinking Water Act after conventional treatment.

4.1.10. Beach Closings

The Illinois Pollution Control Board (IPCB) and the Illinois Department of Public Health have set water quality standards for swimming based on fecal coliform counts. Fecal coliform is present in the feces of humans and other warm-blooded animals. Its presence in water indicates the possible presence of pathogenic organisms. The IPCB standard for full contact recreation is a geometric mean less than or equal to 200 counts per 100 mL and no more than 10 percent of the samples shall exceed 400 counts per 100 mL (35 Ill. Admin. Code 302). The North Shore Sanitary District and the Lake County Health Department conduct a daily (Monday through Friday) sampling program at Lake Michigan beaches in the county during the swimming season (June through August). The criteria used for closing a beach is two consecutive samples with fecal coliform counts greater than 500 per 100 mL water or total coliform counts greater than 5000 per 100 mL water (IDPH, 1987). The Lake Michigan water quality standard of a geometric mean of 20 counts fecal coliform per 100 mL water (Table 4.4.) is applied for environmental evaluations rather than public health concerns related to beach closures.

Two city beaches, Waukegan North and Waukegan South are located immediately north of the harbor entrance. The Waukegan beaches have exceeded bacterial count swimming standards occasionally between 1983 and 1991 (Table 4.5.). Generally, Waukegan North beach has greater levels of fecal coliform than Waukegan South beach. These beaches were closed periodically between July 16 and August 20, 1990 due to elevated coliform bacteria counts. Waukegan North beach experienced thirteen days with coliform counts (total coliform or fecal coliform) above Lake County Health Department limits for full contact use resulting in beach closings on nine occasions. Waukegan South beach experienced nine days with coliform counts above Health Department limits resulting in five beach closings (Farrell and Budzinski, 1990). An intensive reconnaissance of the area conducted in 1990 by the North Shore Sanitary District found that the Waukegan River was the source of fecal contamination; further sampling of the Waukegan River was recommended to locate the source of contamination (Farrell and Budzinski, 1990). In 1991, Waukegan North beach experienced two closings while Waukegan South had no closings (Colwell, personal communication, 1991). At both beaches there was one closure in 1992, six in 1993 and none in 1994. All closures in 1992 and 1993 were at Waukegan South.

Table 4.5. Summary of Beach Closings and Fecal Coliform Bacteria Counts at Lake Michigan Beaches in Waukegan, Illinois, 1983 Through 1993.

	Waukegan North	Waukegan South	Total
Year	Days Closed	Days Closed	Days Closed
1987	2	3	5
1988	0	3	3
1989	3	2	5
1990	10	10	20
1991	2	0	2
1992	0	1	1
1993	0	6	6
1994	0	0	0

	Waukegan North (1)			Waukegan South (1)		
Year	Geo. Mean	% >400	CS >500	Geo. Mean	% >400	CS >500
1983	28	4	0	26	3	0
1984	44	8	1	24	7	0
1985	32	6	0	23	1	0
1986	66	18	4	42	8	0
1987	79	13	1	52	4	1
1988	76	8	0	82	10	3
1989	71	12	1	67	9	1
1990	91	20	5	67	10	4
1991	49	9	1	64	10	0
1992	49	6	1	55	10	1
1993	41	5	0	51	15	5
1994	53	12	5	116	10	4

Standards (35 IL Adm Code 302)

Lake Michigan: geometric mean < = 20/100mL

General Use: geometric mean < = 200/100mL and no more than 10% of samples > 400/100mL

Criterion for closing beaches (IDPH, 1987)

Consecutive Samples (CS) >500/100mL Fecal Coliform

(1) Data Based on Fecal Coliform No./100 ml

An inspection by the IEPA found several stormwater and sanitary sewer cross-connections resulting in pollutional discharges to the Waukegan River (Kallis, 1991). The City of Waukegan was requested to correct any pollutional discharge in a compliance inquiry letter dated April 24, 1991 (Marek, 1991).

Follow-up monitoring by IEPA pinpointed additional problem sewers. The Agency subsequently notified City officials of the problem and the need for repairs pending possible enforcement action (Park, 1993).

Although the Waukegan River has been identified as the primary source of fecal coliform contamination at municipal beaches, there is the potential that additional nearby stormwater discharges and combined sewer overflow during periods of heavy rainfall could contribute fecal coliform.

4.1.11. Degradation of Aesthetics

As defined by the IJC (1991), aesthetics within the ESA may be considered degraded when a "persistent objectionable deposit, unnatural color or turbidity, or unnatural odor" is observed in water. There is no available information on degradation of aesthetics, as defined by the IJC, in the Waukegan ESA.

4.1.12. Added Costs to Agriculture or Industry

According to the IJC (1991), additional costs required to treat waters prior to agricultural or industrial use indicate an impaired use. Information on added costs for treatment of water from the Waukegan ESA for industry is not available. There is no agricultural use of water from the Waukegan ESA.

4.1.13. Degradation of Phytoplankton and Zooplankton Populations

Phytoplankton communities in Lake Michigan near Waukegan were monitored by Commonwealth Edison between 1972 and 1974 (CEC, 1972; CEC, 1973; CEC, 1974). Overall, 349 genera representing six algal divisions were identified in samples taken from Lake Michigan between Zion and Waukegan. Dominant phytoplankton by number were Stephanodiscus binderanus and S. hantzchii vel tenuis and by volume was Rhizosolenia eriensis.

Zooplankton populations also were monitored by Commonwealth Edison (CEC, 1972; CEC, 1973; CEC, 1974). Generally, cladocera dominated zooplankton catch and the dominant species observed was Bosmina longirostris.

McNaught et al. (1980) investigated the effects of PCB concentrations on photosynthesis of phytoplankton. Photosynthesis was found to be inhibited 5.7 percent when phytoplankton was exposed to PCB concentrations of

5 ng/L. Likewise, photosynthesis inhibition was determined to be 8.9 percent and 18.9 percent for PCB concentrations of 100 ng/L and 500 ng/L, respectively. PCB concentrations of 5ng/L are comparable to concentrations in open water areas of Lake Michigan and PCB concentrations of 500 ng/L are comparable to those in slip 3 of Waukegan Harbor.

Protozoan community response to Waukegan Harbor sediments was examined by Ross et al. (1988) in-situ and in laboratory tests. Sediment contamination within slip 3 was found to significantly alter the structure of indigenous protozoan communities. This result was confirmed through laboratory test results. Impacts to protozoan communities were found to be greater within lower portions of the water column where suspension of particles which carry toxic chemicals was probably greater.

The studies of Ross et al. (1988) and Risatti et al. (1990) show that the photosynthesis of the green alga Selenastrum capricornutum was inhibited by sediment elutriates from several sampling sites within the harbor. Burton et al. (1989) reported toxicity to Daphnia magna, Ceriodaphnia dubia, and S. capricornutum when these organisms were exposed to sediments or sediment elutriates from the inner harbor. Also, Marking et al. (1981) observed water flea (probably Daphnia magna) mortalities of 100 percent from some sediment suspension samples taken from the harbor.

4.1.14. Loss of Fish and Wildlife Habitat

The urbanized and industrial nature of the Waukegan lake shore has significantly altered the potential for terrestrial wildlife habitat in the ESA. Development of the ESA is documented as early as 1885 and included two tanneries, two breweries, several mills, and a mattress factory (Sanborn, 1885). Industrial use of the ESA continues presently and provides an important economic base for the Waukegan area. The terrestrial habitat which remains in the Waukegan ESA is predominantly located in the portion of the ESA which intersects Illinois Beach State Park. Since the harbor is a man-made structure which was constructed for industrial purposes, its value for wildlife and fish habitat is limited (Hartig, 1993).

In nearshore Lake Michigan areas, both fish and wildlife habitat are impacted through sediment accumulation and contamination. Fish spawning and rearing habitat and avian foraging habitat have been adversely impacted according to the U.S. Department of the Interior Fish and Wildlife Service (Millar, 1991). Sediment accumulation may bury spawning and shelter areas used by small or immature fish. PCB concentrations of 10 ng/L have been associated with a 20 percent increase in the mortality of lake trout fry (Willford, 1980). In addition, Mac (1988) reported decreased hatching of lake trout eggs after exposure to PCBs.

4.2. LAKE MICHIGAN WATER QUALITY

The water quality of the Illinois shore of Lake Michigan has improved substantially since the 1970's. In the early 70's total phosphate and ammonia concentrations were routinely above Lake Michigan water quality standards. The trophic status of the Illinois shore has improved from mesotrophic/eutrophic to oligotrophic conditions based on total phosphate. In the open lake, fecal coliform counts have generally been low and uniform since 1970, indicating excellent conditions for swimming. Conductivity measurements and chloride and sulfate levels have fluctuated over the past 11 years but have generally been within water quality standards. Toxic substances in the lake, including metals and organic compounds, have generally been below detection levels and well below water quality standards (IEPA, 1990).

Water samples were collected at seven stations in the Waukegan ESA on November 14, 1990 (Figure 4.3.). Results, presented in Tables 4.6. and 4.7., were compared to appropriate Illinois water quality standards including Lake Michigan, Public Water Supply and General Use Standards (35 Ill. Admin. Code 302). Data from this sampling effort are presented in Appendix D.

Water quality conditions were worse in the upper harbor and tended to improve towards the harbor mouth. A total of 48 standards violations involving 10 parameters were found in the Waukegan Harbor area. The most serious problems were with ammonia, cyanide, phenols and dissolved oxygen.

Upper harbor (QZO01), slip 1 (QZP01), and central harbor (QZQ01) each had nine standards violations. Eight violations were found near the boat ramp (QZR01), five each at harbor channel (QZS01) and new harbor (QZT01), and three at North Beach (QZN01). Total phosphorus, total ammonia and sulfate were found to be in violation at all seven stations; dissolved oxygen percent saturation and conductivity at six stations; chloride and phenols at four stations; pH and cyanide at three stations and fecal coliform at one station.

Water samples collected in November 1990 were scanned for thirty-eight VOCs, eighteen organochlorine pesticides, PCBs and pentachlorophenol. A complete list of compounds is presented in Appendix E. Pentachlorophenol and xylenes were the only compounds detected. There are no Illinois water quality standards for these two compounds. The concentrations of pentachlorophenol were at the detection level (0.01 μg/L) and well below USEPA's acute criterion of 55 μg/L (USEPA, 1986). Xylenes were detected in central harbor (39 μg/L), upper harbor (62 μg/L), and slip 1 (64 μg/L). Additional compounds were detected but could not be identified and were reported as aliphatic hydrocarbons (3 μg/L to 64 μg/L) and other organic compounds (4 μg/L to 50 μg/L). Highest levels of these compounds were found in slip 1 and upper harbor.

This recent sampling was compared with results from five Lake Michigan North Shore stations sampled in May and September, 1990 (Tables 4.3. and 4.8.). These stations are located from one to six miles off-shore between

Figure 4.3. Water and Sediment Sampling Locations for Sampling Conducted for the Waukegan RAP on November 14, 1990. Samples were collected and analyzed by the IEPA.

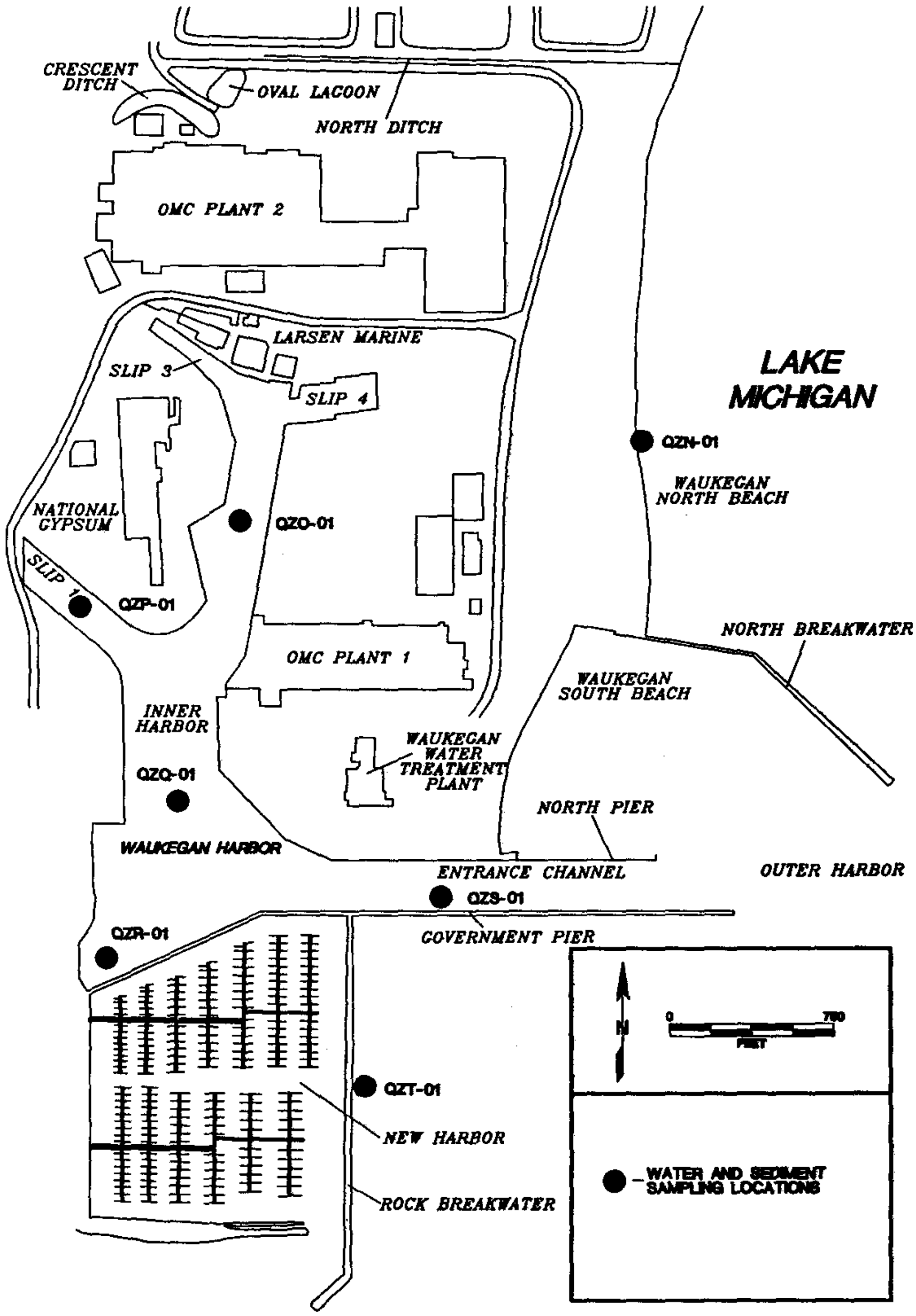


Table 4.6. Water Quality in the Waukegan Harbor Area, November 14, 1990. Concentrations are in Parts Per Million Unless Otherwise Noted. Samples were Collected and Analyzed by the Illinois EPA.

Parameter	Standard	North Beach QZN01	Upper Harbor QZO01	Slip No. 1 QZP01	Central Harbor QZQ01	Boat Ramp QZR01	Harbor Channel QZS01	New Harbor QZT01
Water Temperature (C)	--	7.7	7.4	7.3	7.3	6.4	6.8	6.5
pH (units)	7.0 - 9.0 a	7.8	6.7 *	6.6 *	6.7 *	7.0	7.1	7.4
Dissolved Oxygen (mg/L)	5.0 c	11.2	5.9	6.0	6.6	8.7	9.4	10.0
DO Percent Saturation	90 a	96.6	50.9 *	51.7 *	56.9 *	73.1 *	79.7 *	84.0 *
Conductivity (μS/cm) #	300 a	265	349 *	347 *	339 *	339 *	304 *	306 *
Total Phosphorus (mg/L)	0.007 a	0.023 *	0.020 *	0.020 *	0.019 *	0.017 *	0.019 *	0.011 *
Total Ammonia (mg/L)	0.02 a	0.04 *	0.82 *	0.62 *	0.52 *	0.29 *	0.22 *	0.09 *
Un-ionized Ammonia (mg/L) @	0.04 c	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Total Kjeldahl Nitrogen (mg/L)	--	0.3	1.1	0.9	0.8	0.5	0.4	0.3
Nitrite + Nitrate (mg/L)	--	0.26	0.29	0.30	0.30	0.31	0.29	0.31
COD (mg/L)	--	23	16	14	14	12	13	11
Turbidity (NTU)	--	22	8.4	9.1	9.1	7.3	16.4	9.5
Total Suspended Solids (mg/L)	--	34	5	4	6	8	18	6
Volatile Solids (mg/L)	--	6	2	3	3	3	6	4
Chloride (mg/L)	12 a	11	18 *	18 *	16 *	19 *	11	12
Sulfate (mg/L)	24 a	26 *	32 *	32 *	31 *	32 *	28 *	29 *
Cyanide (mg/L)	0.022 c	0.005 K	0.050 *	0.040 *	0.030 *	0.010	0.010	0.005 K
Fluoride (mg/L)	1.4 c	0.09	0.15	0.15	0.15	0.13	0.11	0.10
Phenols (μg/L)	1.0 b	5 K	43 *	26 *	19 *	5 *	5 K	5 K
Fecal Coliform (No./100mL)	20 a	10	18	20	20	60 *	18	50 K

a Lake Michigan Standard (35 Ill. Admin. Code 302)
b Public Water Supply Standard (35 Ill. Admin. Code 302)
c General Use Standard (35 Ill. Admin. Code 302)
K Less Than
* Violated Standard
# Conductivity x 0.6 = TDS (mg/L)
@ Calculated

Table 4.7. Water Quality in the Waukegan Harbor Area, November 14, 1990. Concentrations are in Parts Per Million Unless Otherwise Noted. Samples were Collected and Analyzed by the Illinois EPA.

Parameter	Standard	North Beach QZN01	Upper Harbor QZO01	Slip No. 1 QZP01	Central Harbor QZQ01	Boat Ramp QZR01	Harbor Channel QZS01	New Harbor QZT01
Calcium (mg/L)	--	42	45	45	44	45	42	42
Magnesium (mg/L)	--	14	14	14	14	14	14	13
Potassium (mg/L)	--	1.3	2.9	2.7	2.1	2.7	1.2	3.0
Sodium (mg/L)	--	10.0	17.0	17.0	16.0	19.0	12.0	13.0
Hardness (mg/L)	--	165	169	168	167	170	162	159
Aluminum (μg/L)	--	675	247	312	290	227	494	272
Arsenic (μg/L)	50 a	1 K	7	5	4	2	2	1
Barium (μg/L)	1000 a	25	27	27	27	27	25	24
Beryllium (μg/L)	--	0.5 K	0.5 K	0.5 K	0.5 K	0.5 K	0.5 K	0.5 K
Boron (μg/L)	1000 b	50 K	60	64	54	51	50 K	50 K
Cadmium (μg/L)	10 a	3 K	3 K	3 K	4	3 K	5	3 K
Chromium (μg/L)	50 a	5 K	5 K	5 K	5 K	5 K	5	5 K
Cobalt (μg/L)	--	5 K	5 K	5 K	7	5 K	5 K	5 K
Copper (μg/L)	** b	6	5 K	5	5 K	5 K	5	6
Iron (μg/L)	--	1015	447	486	446	343	691	347
Lead (μg/L)	50 a	50 K	100 K	50 K	100 K	50 K	100 K	50 K
Manganese (μg/L)	150 a	25	42	42	39	22	23	9
Mercury (μg/L)	0.5 b	0.05 K	0.05 K	0.05 K	0.05 K	0.05 K	0.05 K	0.05 K
Nickel (μg/L)	1000 b	5 K	9	5 K	21	10 K	20	5 K
Silver (μg/L)	5 b	5 K	3 K	5 K	3 K	3 K	3 K	5 K
Strontium (μg/L)	--	129	148	147	145	147	134	134
Vanadium (μg/L)	--	6	5 K	5 K	5 K	5 K	5 K	5 K
Zinc (μg/L)	1000 b	136	50 K	100 K	130	50 K	100 K	50 K

a Public Water Supply Standard (35 Ill. Admin. Code 302)
b General Use Standard (35 Ill. Admin. Code 302)
c Calculated
d Total Metal Concentration
K Less Than
* Violated Standard
** Depends on Hardness; Acute Copper = e[0.9422ln(Hardness)-1.464]

Table 4.8. **Comparison of Mean Metals (total) Concentrations in Water from the Waukegan Harbor Area and Lake Michigan, 1990. Samples were collected and analyzed by the IEPA.**

Parameter	Standard	Waukegan Harbor Area (1)	Lake Michigan North Shore(2)
Calcium (mg/L)	--	44	36
Magnesium (mg/L)	--	14	11
Potassium (mg/L)	--	2.3	1.0
Sodium (mg/L)	--	14.8	5.6
Hardness (mg/L) 3	--	166	134
Aluminum (ug/L)	--	360	53
Arsenic (ug/L)	50 (a)	3	1 K
Barium (ug/L)	1000 (a)	26	20
Beryllium (ug/L)	--	0.5 K	0.5 K
Boron (ug/L)	1000 (b)	54	50 K
Cadmium (ug/L)	10 (a)	3 K	3 K
Chromium (ug/L)	50 (a)	5 K	5 K
Cobalt (ug/L)	--	5 K	5 K
Copper (ug/L)	** (b)	5	6 K
Iron (ug/L)	--	539	50 K
Lead (ug/L)	50 (a)	71 K	50 K
Manganese (ug/L)	150 (a)	29	5 K
Mercury (ug/L)	0.5 (b)	0.05 K	0.08 K
Nickel (ug/L)	1000 (b)	11	8 K
Silver (ug/L)	5 (b)	4 K	3 K
Strontium (ug/L)	--	140	124
Vanadium (ug/L)	--	5 K	5 K
Zinc (ug/L)	1000 (b)	88 K	50 K

1 Seven Stations, November,1990.
2 Five Stations (1N, 3N, 5N, 7N, 9N), May & September, 1990.
3 Calculated
(a) Public Water Supply Standard (35 IL Adm Code 302)
(b) General Use Standard (35 IL Adm Code 302)
K Less Than
* Violated Standard
** Depends on Hardness; Acute Copper = $e[0.9422\ln(\text{hardness})-1.464]$.

Waukegan and Chicago. All of the Lake Michigan mean values were well within standards, while Waukegan Harbor mean values for dissolved oxygen, conductivity, total phosphorus, total ammonia, chloride, sulfate, phenols and fecal coliform were in violation. The most substantial difference was total ammonia which was 37 times higher in Waukegan Harbor than in Lake Michigan. Other parameters which were at least twice as high in Waukegan Harbor than in Lake Michigan were iron, aluminum, total suspended solids (TSS), turbidity, manganese, phenols, phosphorus, cyanide, chemical oxygen demand (COD), total Kjeldahl nitrogen (TKN), fecal coliform, sodium, and potassium. Organic compounds were not detected in offshore Lake Michigan.

4.3. SEDIMENT QUALITY

Sediment samples were collected for chemical analyses on November 14, 1990 at seven stations in the Waukegan ESA (Figure 4.3.). Results for metals, cyanide, nutrients, COD, and volatile solids are presented in Table 4.9. and data is presented in Appendix F. Sediment samples were scanned for seventy semi-volatile organic compounds, nineteen organochlorine pesticides, and PCBs. A complete list of organic compounds and the USEPA methods used for their analysis (USEPA, 1990b) is presented in Appendix G. Organic compounds which were detected are listed in Table 4.10. This table includes compounds which were detected but could not be identified. These compounds were reported as aliphatic hydrocarbons, aliphatic ketones, or other organic compounds. Results in these tables were compared with guidelines for the pollution classification of Great Lakes harbor sediments (USEPA, 1977; Appendix H) and with sediment results from the Illinois/Indiana area of Lake Michigan.

The upper harbor (Station QZ001) had the highest number of parameters signifying "heavy pollution" with 11, followed by central harbor (QZQ01) with 8, slip 1 (QZP01) with 5, new harbor (QZQ01) with 3 and the harbor channel (QZS01) with 1. The area near the boat ramp (QZR01) had no parameters signifying heavily polluted conditions, but it did have 5 parameters showing moderately polluted conditions. North Beach (QZN01) was classified as nonpolluted for all parameters.

Heavily polluted levels of arsenic and lead were found at four stations; cadmium and copper at three stations; chromium, zinc, nickel, COD and volatile solids at two stations; and cyanide, iron, phosphorus and Kjeldahl nitrogen at one station. Moderately polluted levels of barium were found at six stations; and manganese and PCBs at three stations.

Waukegan Harbor sediment results were compared with results from Lake Michigan, Lake Calumet and five harbors in Illinois and Indiana collected between 1981 and 1990 (Table 4.11.). Only seven parameters (Cd, Cr, Cu, Pb, Mn, Zn, PCBs) were analyzed at all six harbors and Lake Michigan. Waukegan Harbor had samples with the most parameters classified as heavily polluted with six (Cd, Cu, Pb, Mn, Zn, PCBs), followed by Indiana Harbor and Great Lakes Naval Training Center Harbor with four (Cu, Pb, Mn, Zn), Lake Calumet with

Table 4.9. Unsieved Sediment Concentrations in the Waukegan Harbor Area, November 14, 1990. Concentrations are in Parts Per Million Unless Otherwise Noted. Samples were Collected and Analyzed by the IEPA.

Parameter	North Beach QZN01	Upper Harbor QZO01	Slip No. 1 QZP01	Central Harbor QZQ01	Boat Ramp QZR01	Harbor Channel QZS01	New Harbor QZT01
Arsenic	1 N	41 H	13 H	23 H	6 M	10 H	4 M
Barium	9 N	52 M	31 M	43 M	27 M	34 M	22 M
Cadmium	1 K	12 H	7 H	12 H	1 K	1 *	1 K
Chromium	4 N	90 H	47 M	88 H	22 N	34 M	15 N
COD	39200 N	117650 H	77648 M	91000 H	24900 N	62600 M	23600 N
Copper	2 N	160 H	53 H	86 H	26 M	50 M	30 M
Cyanide	0.52 K	1.2 K	2.4 K	3.3 K	0.65 K	0.87 K	9.3 H
Iron	3200 N	26000 H	14000 N	20000 M	9000 N	18000 M	12000 N
Kjeldahl Nitrogen	60 K	2500 H	900 N	1700 M	175 N	175 N	450 N
Lead	10 K	140 H	12000 H	120 H	39 N	60 M	10000 H
Manganese	96 N	460 M	91 N	450 M	220 N	480 M	24 N
Mercury	0.1 K	0.40 N	0.19 N	0.34 N	0.1 K	0.13 N	0.1 K
Nickel	5 K	26 M	340 H	21 M	9 N	16 N	400 H
Phosphorus	329 N	826 H	350 N	545 M	202 N	428 M	510 M
Potassium	1000 K	1900	1000	1500	1000 K	1300	1000
Silver	1 K	1 K	13	1 K	1 K	1 K	10
Volatile Solids (%)	2.3 N	9.8 H	7.3 M	8.3 H	4.2 N	4.8 N	2.2 N
Zinc	20 N	280 H	15 N	210 H	100 M	130 M	15 N

Sediment Classifications (USEPA, 1977)
K = Less Than
N = Nonpolluted
M = Moderately Polluted
H = Heavily Polluted
* = Lower Limits Not Established

Table 4.10. Unsieved Sediment Concentrations of Organic Compounds Detected[1] in the Waukegan Harbor Area, November 14, 1990. Concentrations are in Parts Per Million. Samples Were Collected and Analyzed by the IEPA.

Parameter	North Beach QZN01	Upper Harbor QZO01	Slip No. 1 QZP01	Central Harbor QZQ01	Boat Ramp QZR01	Harbor Channel QZS01	New Harbor QZT01
PCBs	0.01 K	9.000 M	4.600 M	1.900 M	0.200 N	0.260 N	0.037 N
4-Methylphenol	0.5 K	0.5 K	0.5 K	0.62	0.5 K	0.5 K	0.5 K
Bis(2-Ethylhexyl)Phthalate	0.5 K	0.69	0.5 K	0.5 K	0.5 K	1.1	0.5 K
Fluoranthene	0.5 K	0.5 K	0.62	0.5 K	0.66	0.5 K	0.5 K
Pyrene	0.5 K	0.58	0.65	0.5 K	0.63	0.5 K	0.5 K
Aliphatic Hydrocarbon **	ND	70 *	24 *	18 *	1.6 *	1.8 *	ND
Aliphatic Ketone **	ND	ND	ND	ND	0.55 *	ND	ND
C3-Substituted Benzene	ND	0.95 *	ND	ND	ND	ND	ND
C4-Substituted Benzene	ND	6.1 *	3.0 *	1.0 *	ND	ND	ND
C5-Substituted Benzene	ND	2.8 *	1.8 *	ND	ND	ND	ND
Dimethyl Naphthalene #	ND	ND	0.78 *	ND	ND	ND	ND
Methyl Naphthalene #	ND	ND	0.71 *	ND	ND	ND	ND
Ethyl-Dimethyl-Pentane #	ND	1.5 *	ND	ND	ND	ND	ND
Methyl Pentane #	ND	0.60 *	0.59 *	ND	ND	ND	ND
Tetramethyl Pentane #	ND	15 *	7.2 *	ND	ND	ND	ND
Other Organics **	2.8	16 *	9.1 *	6.9 *	0.63 *	1.3 *	9.6 *

Approximate Quantitations
** Could Not Be Identified
# Tentatively Identified
K = Less Than
ND = Not Detected

Classification Guidelines (USEPA, 1977)
N = Nonpolluted
M = Moderately Polluted
H = Heavily Polluted

(1) A Priority Pollutant Scan was Done for 90 Organic Compounds, see Appendix G for a Complete List.

Table 4.11. Comparison of Mean Concentrations of Various Parameters in Unsieved Sediments from the Illinois Area of Lake Michigan. Concentrations are in Parts Per Million Unless Otherwise Noted.

Parameter	Waukegan Harbor Area (1)	Waukegan Harbor (2)	Great Lakes Naval Training Center Harbor (3)	Wilmette Harbor (3)	Chicago Harbor (4)	Calumet Harbor (5)	Lake Calumet (6)	Indiana Harbor (7)	Lake Michigan (8)
Volatile Solids (%)	5.6 M	--	4.4 N	4.6 N	4.3 N	8.8 H	--	3.6 N	2.3 N
Kjeldahl Nitrogen	851 N	--	951 N	1060 M	760 N	872 N	--	946 N	592 N
Phosphorus	456 M	--	368 N	229 N	217 N	205 N	20.0 N	478 M	291 N
COD	62371 M	--	46000 M	48850 M	53333 M	72500 M	--	98000 H	47000 M
Arsenic	14 H	--	8 M	6 M	3.6 M	4.7 M	29.8 H	20 H	7.4 M
Barium	31 M	283 H	--	--	--	--	--	--	--
Cadmium	5.0 *	8.0 H	1.2 *	0.4 *	3.0 *	3.0 *	1.8 *	0.5 K	0.5 K
Chromium	43 M	5 N	23 N	13 N	28 M	41 M	76.7 H	58 M	12 N
Copper	58 H	104 H	87 H	30 M	35 M	38 M	57.5 H	110 H	23 N
Lead	3196 H	202 H	134 H	31 N	107 H	132 H	187.0 H	120 H	18 N
Manganese	260 N	531 H	589 H	537 H	490 M	710 H	--	970 H	430 M
Mercury	0.19 N	--	0.32 N	0.18 N	0.34 N	0.38 N	--	0.13 N	0.03 N
Nickel	117 H	18 N	--	--	--	--	23.6 M	--	--
PCBs	2.29 M	2426 H	0.225 N	0.070 N	0.133 N	0.585 N	--	0.400 N	0.017 N

(1) IEPA, 1990, Seven Samples, Includes Samples from Waukegan Harbor (except Slip No. 3), New Harbor and North Beach.
(2) Metals 23 Samples (Risatti et al., 1990); PCBs 18 Samples (Ross et al., 1988), (Includes Samples from Slip 3).
(3) Three Samples (City of Chicago and IEPA, 1985).
(4) Three Samples (Stations 15, 16, 17), (USACOE, 1981).
(5) Four Samples (Stations 1, 2, 3, 4), (USACOE, 1981).
(6) Thirty-seven Samples (Ross et al., 1988)
(7) One Sample (City of Chicago and IEPA, 1981).
(8) Eight Samples (Stations 5A, 5H, 5J, 1N, 7N, 2S, 5S, 7S), (City of Chicago and IEPA, 1981).

Sediment Classification (USEPA, 1977)
N = Nonpolluted
M = Moderately Polluted
H = Heavily Polluted
* Lower Limits Not Established
K = Less Than

four (Cr, Cu, Pb, Zn), Calumet Harbor with three (Pb, Mn, Zn), Chicago and Wilmette Harbors with one (Pb and Mn respectively) and none in Lake Michigan. The highest levels of PCBs, lead, and cadmium were found in Waukegan Harbor sediments.

Work done in 1985 and 1986 by Ross et al. (1988) found that the highest levels of PCBs in Waukegan Harbor are in slip 3 (maximum = 17,251 ppm), and that concentrations generally decreased towards the harbor mouth. Sampling by IEPA in 1990 also showed this decrease in PCB concentrations away from slip 3, although slip 3 was not sampled. A comprehensive discussion of the PCB contamination in Waukegan Harbor can be found in the settlement agreement between the United States of America and the People of the State of Illinois with Outboard Marine Corporation (U.S. District Court, Northern District Eastern Division, Civil Action No. 78-C-1004, April 1989).

A 1987 Waukegan Harbor study by Risatti et al. (1990) found the highest levels of lead (420 ppm) and cadmium (50 ppm) in slip 1. Much higher levels of lead were found in slip 1 (12,200 ppm) and the new harbor (10,000 ppm) by IEPA in 1990. The highest cadmium concentration (12 ppm) in 1990 was found at upper and central harbor stations.

Available information on biological effects of sediments is limited. Present guidelines used for the pollution classification of Great Lakes harbor sediments (USEPA, 1977) are not based on known toxic response but rather on deviations from "normal" concentrations. Sediment classifications in Illinois lakes and streams by Kelly and Hite (1981 and 1984) were developed much the same way. Ross (1991) reviewed a report by Long and Morgan (1990) who compiled data from all available studies that report a minimum sediment concentration of a contaminant required to produce a biological impact. Long and Morgan arranged sediment concentrations in order from lowest to highest and took the 10th percentile and 50th percentile and termed these points the Effects Range - Low (ER-L) and Effects Range-Median (ER-M). The ER-L indicates that adverse biological effects occur approximately one time out of ten at this level and above. The ER-M indicates that adverse biological effects occur over half the time. This procedure was done for zinc, cadmium and lead. Guidelines developed by Long and Morgan for a wide range of chemicals are included in Appendix I.

Ross (1991) compared data from Long and Morgan (1990) with Waukegan Harbor sediment data from Risatti et al. (1990). Results are summarized in Table 4.12. and data are presented in Appendix I. According to Ross (1991) the greatest hazard to aquatic life is from lead. Zinc also presents a clear hazard, while there are possible hazards from cadmium. Ross (1991) also indicated that metals toxicity is additive. In order to approximate the relative additivity of toxic potential at each station, Ross calculated the ratio of zinc, cadmium, and lead concentration to the ER-M value for that metal at each of the 23 stations sampled by Risatti et al. These ratios were then summed to give an additive estimate of the hazard to aquatic life from those three metals. Based on these sums it appears that the most severe metal contamination is in the northern part of

Table 4.12. Comparison of Lead, Zinc and Cadmium Concentrations in Waukegan Harbor Sediments with Effects Range Levels from Long and Morgan (1990).

	Waukegan Harbor 23 Stations (1)	Waukegan Harbor Area 7 Stations (2)
Lead (mg/kg)		
Minimum	36	< 10
Maximum	420	12000
Mean	202	3196
Number >35 (ER-L)	23	6
Number >110 (ER-M)	18	4
Zinc (mg/kg)		
Minimum	81	15
Maximum	370	280
Mean	214	110
Number >120 (ER-L)	12	3
Number >270 (ER-M)	7	1
Cadmium (mg/kg)		
Minimum	< 1.3	< 1.0
Maximum	50.0	12.0
Mean	8.0	5.0
Number >5.0 (ER-L)	7	3
Number >9.0 (ER-M)	4	2

(1) Risatti et al. (1990)
(2) IEPA (1990)

ER-L = Effects Range Low (biological effects 10% of the time).
ER-M = Effects Range Median (biological effects 50% of the time).

Waukegan Harbor and in slip 1. Data collected by IEPA in 1990 also suggests that lead is the greatest problem compared to zinc and cadmium (Table 4.12.), and that slip 1 and the new harbor have severe sediment contamination. A discussion of bioaccumulation of PCBs in fish follows in part 4.4. of this report.

4.4. FISH FLESH CONTAMINATION

On a lakewide basis PCBs and chlordane are the constituents of primary concern. Eighty-nine composite fish samples were collected from the Illinois shore of Lake Michigan from 1986 through 1989. U.S. Food and Drug Administration (USFDA) action levels for PCBs (2.0 ppm) and chlordane (0.3 ppm) were exceeded in 12.4 percent and 11.2 percent of these samples, respectively. Concentrations exceeding action levels were found in lake trout over 23 inches, brown trout over 22 inches, chinook salmon over 36 inches, and carp over 33 inches. PCBs ranged from 0.10 to 18.0 ppm (mean = 1.48) and chlordane ranged from 0.02 to 0.69 ppm (mean = 0.13). Table 4.13. summarizes trout, salmon and perch data for 1986 through 1989 and Tables 4.14., 4.15., 4.16., and 4.17. contain individual sample results for the same period. It should be noted that, while the Waukegan ESA certainly is a source of PCBs in fish flesh, chlordane concentrations are below detection limits throughout the ESA, including Waukegan Harbor.

Advisory information is made available to the public through news releases, pamphlets such as "Guide to Illinois Fishing Regulations" (published by the IDOC and available at the time of purchasing a license) and "Guide to Eating Illinois Sport Fish" (published by the IEPA and available upon request - IEPA, 1991b). As previously stated, Illinois recommendations for Lake Michigan sportfish are listed in Appendix B.

Participating state agencies and departments coordinate Lake Michigan advisories with other states sharing its border as required by the Toxic Substance Control Agreement signed by each of the Great Lake States Governors. Based on data from all the participating states, the Lake Michigan advisory provides uniform recommendations throughout the lake utilizing edible fillet samples.

The GLWQA has set an objective of 0.1 ppm PCBs in whole fish to measure environmental conditions. Present Illinois monitoring programs for fish flesh contaminants continue to emphasize human health evaluations using U.S. Food and Drug Administration criteria.

By mid-1980, USEPA had completed two types of studies to determine the extent of PCB contamination of fish in Waukegan Harbor. In the first, 16 random samples of fish collected from the harbor averaged 18 ppm PCBs. All but three of these samples exceeded the old 5 ppm USFDA guideline and all but one exceeded 2 ppm, the present guideline. Fish taken from the harbor had higher levels than those found in the lake for the same species.

Table 4.13. **Concentrations of Chlordane and PCBs in Trout, Salmon, and Perch Fillets from the Illinois Area of Lake Michigan, 1986 to 1989. Analyses by the IEPA.**

	1986	1987	1988	1989
Lake Trout				
Mean Chlordane (mg/kg)	0.17	0.29	0.49 *	0.19
Mean PCBs (mg/kg)	3.81 *	2.58 *	1.76	1.79
Mean Length (inches)	23.7	22.7	24.0	22.8
Brown Trout				
Mean Chlordane (mg/kg)	0.05	0.12	0.25	0.12
Mean PCBs (mg/kg)	2.22 *	0.94	1.18	1.63
Mean Length (inches)	20.2	18.0	21.1	21.2
Rainbow Trout				
Mean Chlordane (mg/kg)	0.04	0.14	0.14	0.05
Mean PCBs (mg/kg)	0.72	0.96	0.65	0.65
Mean Length (inches)	19.6	19.4	21.0	20.0
Chinook Salmon				
Mean Chlordane (mg/kg)	0.22	0.17	0.20	0.09
Mean PCBs (mg/kg)	4.60 *	1.47	1.04	1.04
Mean Length (inches)	30.0	30.0	31.0	23.6
Coho Salmon				
Mean Chlordane (mg/kg)	0.03	0.06	--	0.08
Mean PCBs (mg/kg)	0.69	0.30	--	0.62
Mean Length (inches)	23.4	23.3	--	24.1
Yellow Perch				
Mean Chlordane (mg/kg)	--	0.02 K	0.02 K	0.02 K
Mean PCBs (mg/kg)	--	0.10 K	0.10 K	0.11 K
Mean Length (inches)	--	8.9	--	9.4

* Exceeds USFDA Action Level (0.30 mg/kg chlordane; 2.00 mg/kg PCBs)

K Less than

Table 4.14. Concentration of Organochlorine Compounds in Lake Michigan Fish Fillet Composite Samples from the Illinois Area of Lake Michigan, 1986.

Samples	Date	No. Fish In Sample	Fish Species	Mean Weight (lbs)	Mean Length (inches)	% Fat	Chlordane (mg/kg)	DDT (mg/kg)	Dieldrin (mg/kg)	Heptachlor Epoxide (mg/kg)	PCBs (mg/kg)
1.	10/1/86	5	LT	4.19	23.36	11.0	0.13	0.70	0.17	0.03	2.60 *
2.	10/1/86	5	LT	8.68	28.52	20.0	0.33 *	3.10	0.29	<0.01	7.90 *
3.	10/1/86	3	LT	2.20	19.13	5.2	0.05	0.23	0.06	<0.01	0.93
4.	10/6/86	1	BT	15.42	29.40	12.0	0.12	1.30	0.19	0.03	6.10 *
5.	10/6/86	5	CHO	4.08	22.24	1.7	<0.02	0.15	0.01	<0.01	0.37
6.	10/8/86	3	BT	2.46	16.87	3.6	<0.02	0.16	<0.01	<0.01	0.94
7	10/8/86	5	CHO	1.94	17.04	1.7	<0.02	0.04	<0.01	<0.01	0.15
8.	10/9/86	2	BT	5.07	22.20	5.0	0.06	0.42	0.07	<0.01	2.70 *
9.	10/9/86	5	CHN	20.35	36.61	13.0	0.48 *	4.70	0.33 *	0.04	11.0 *
10.	10/14/86	5	BT	1.45	14.00	4.5	0.02	0.21	0.03	<0.01	0.65
11.	10/14/86	3	RBT	1.95	17.73	6.5	<0.02	0.05	0.02	<0.01	0.24
12.	10/14/86	7	CHN	12.27	33.37	0.9	0.08	0.66	0.02	<0.01	1.60
13.	10/17/86	5	RBT	6.32	22.39	9.9	0.04	0.10	0.05	<0.01	0.45
14.	10/17/86	5	CHO	6.85	26.40	1.2	0.03	0.28	0.01	<0.01	0.73
15.	10/21/86	1	RBT	12.22	27.20	8.4	0.06	0.24	0.08	<0.01	0.76
16.	10/29/86	3	RBT	0.99	11.00	5.5	0.07	0.58	0.06	<0.01	2.00
17.	10/29/86	1	CHO	6.94	28.00	1.2	0.06	0.38	0.02	<0.01	1.50
18.	10/29/86	2	CHN	3.52	20.20	1.3	0.10	0.50	0.03	<0.01	1.20
19.	10/6/86	3	BT	5.27	22.00	3.6	0.05	0.39	0.06	<0.01	1.30
20.	10/6/86	2	BT	2.04	16.40	4.3	0.02	0.27	0.03	<0.01	1.60
21.	11/24/86	1	RBT	3.85	19.80	4.9	<0.02	0.04	0.02	<0.01	0.14
USFDA Action Level							0.30	5.00	0.30	0.30	2.00

LT -Lake Trout
BT -Brown Trout
CHO -Coho Salmon
CHN -Chinook Salmon
RBT -Rainbow Trout
* Value Exceeds USFDA Action Level

Table 4.15. Concentrations of Chlordane and Polychlorinated Biphenyls (PCBs) in Fish Fillet Composite Samples from the Illinois Area of Lake Michigan, 1987. Analyses by the IEPA.

Date Collected	Fish Species	No. Fish in Sample	Mean Length (inches)	Mean Weight (lbs)	% Fat	Total Chlordane (mg/kg)	Total PCBs (mg/kg)
4/87	Alewife	25	6.9	0.1	4.9	0.05	0.46
10/87	Brown Trout	3	12.1	0.6	3.0	0.07	0.65
9/87	Brown Trout	5	18.9	3.3	7.2	0.14	1.20
9/87	Brown Trout	5	23.0	6.7	6.3	0.14	0.96
9/87	Carp	1	33.8	32.6	28.0	0.58 *	18.00 *
9/87	Chinook Salmon	6	22.5	4.7	2.5	0.14	0.88
9/87	Chinook Salmon	5	28.6	9.1	1.4	0.13	0.69
9/87	Chinook Salmon	5	32.8	12.0	1.2	0.17	1.70
9/87	Chinook Salmon	6	36.3	16.4	1.9	0.23	2.60 *
9/87	Coho Salmon	5	16.3	2.1	1.5	0.06	0.35
9/87	Coho Salmon	5	23.3	4.4	3.7	0.04	0.21
9/87	Coho Salmon	5	25.6	5.6	1.7	0.08	0.25
10/87	Coho Salmon	3	28.0	6.8	1.1	0.07	0.38
8/87	Lake Trout	5	15.8	1.5	5.0	0.09	0.55
8/87	Lake Trout	5	23.7	4.6	12.0	0.19	1.60
8/87	Lake Trout	5	28.7	9.7	19.0	0.58 *	5.60 *
10/87	Rainbow Trout	3	11.9	0.8	5.1	0.15	1.00
10/87	Rainbow Trout	7	17.8	2.6	7.9	0.13	1.10
9/87	Rainbow Trout	5	21.8	5.3	7.3	0.14	1.10
10/87	Rainbow Trout	5	26.0	7.6	6.0	0.13	0.64
6/87	Yellow Perch	10	8.9	0.3	0.4	<0.02	<0.10

* Value Exceeds USFDA Action Level	USFDA Action Level	0.30	2.00
	Number Above Action Level	2	3
	Percent Above Action Level	9.5	14.3

Table 4.16. Concentrations of Organochlorine Compounds in Fish Composite Samples from the Illinois Area of Lake Michigan, 1988. Analyses by the IEPA.

Date Collected	Location	Species	No. Fish in Sample	Mean Length (inches)	Mean Weight (lbs)	% Fat	Total Chlordane (mg/kg)	Dieldrin (mg/kg)	Heptachlor Epoxide (mg/kg)	Total DDT (mg/kg)	Total PCBs (mg/kg)
4/19/88	Waukegan (b)	Alewife (w)	25	--	0.1	5.4	0.05	0.06	0.01 U	0.19	0.46
9/22/88	Multiple (a)	Brown Trout (f)	5	14.1	1.2	5.7	0.13	0.02	0.01 U	0.30	0.80
10/12/88	Multiple (a)	Brown Trout (f)	5	19.3	3.7	8.5	0.25	0.05	0.01 U	0.52	1.30
9/20/88	GLNTC Harbor	Brown Trout (f)	5	24.0	7.2	6.6	0.31 *	0.05	0.01 K	0.50	1.20
9/22/88	Multiple (a)	Brown Trout (f)	5	27.1	9.2	6.9	0.32 *	0.05	0.01 K	0.71	1.40
9/22/88	Multiple (a)	Chinook Salmon (f)	5	23.2	4.5	2.1	0.10	0.02	0.01 U	0.22	0.65
9/20/88	Multiple (a)	Chinook Salmon (f)	5	30.0	8.4	1.0	0.18	0.01 K	0.01 U	0.50	1.00
9/20/88	Multiple (a)	Chinook Salmon (f)	5	34.0	12.0	1.8	0.18	0.02	0.01 U	0.44	0.83
9/27/88	Multiple (a)	Chinook Salmon (f)	5	36.9	16.5	1.7	0.32 *	0.02	0.01 U	0.71	1.70
8/10/88	Waukegan (b)	Lake Trout (f)	5	18.7	2.1	6.1	0.17	0.05	0.01 U	0.20	0.59
8/17/88	Waukegan (b)	Lake Trout (f)	5	24.6	5.4	11.8	0.62 *	0.14	0.04	0.71	1.50
8/13/88	Waukegan (b)	Lake Trout (f)	5	28.7	8.2	15.7	0.69 *	0.14	0.03	1.10	3.20 *
11/16/88	Diversey Harbor	Rainbow Trout (f)	1	12.2	0.8	4.6	0.10	0.02	0.01 K	0.18	0.40
12/06/88	Diversey Harbor	Rainbow Trout (f)	1	21.0	3.9	6.3	0.18	0.04	0.01 K	0.35	0.81
9/22/88	Multiple (a)	Rainbow Trout (f)	5	23.6	6.7	8.5	0.13	0.05	0.01 K	0.28	0.62
9/22/88	Multiple (a)	Rainbow Trout (f)	5	27.0	8.7	8.3	0.14	0.06	0.01 K	0.29	0.76
6/07/88	Foster Ave. (b)	Yellow Perch (f)	10	--	0.3	0.6	0.02 K	0.01 K	0.01 K	0.02	0.10 K
6/10/88	Lake Bluff (b)	Yellow Perch (f)	10	--	0.4	0.5	0.02 K	0.01 K	0.01 U	0.02	0.10 K

	Total Chlordane	Dieldrin	Heptachlor Epoxide	Total DDT	Total PCBs
USFDA Action Level (mg/kg)	0.30	0.30	0.30	5.00	2.00
Number Above Action Level	5	0	0	0	1
Percent Above Action Level	27.8	0.0	0.0	0.0	5.6
Mean Concentration (mg/kg)	0.22	0.05	0.01	0.40	0.97
Standard Deviation	0.18	0.04	0.01	0.28	0.72

(f) = Fillets
(w) = Whole
U = Not Detected
K = Actual Value Known to be Less than Value Reported
* = Value Exceeds USFDA Action Level
(a) = Multiple Harbors
(b) = Offshore

Table 4.17. Concentrations of Organochlorine Compounds in Fish Composite Samples from the Illinois Area of Lake Michigan, 1989. Analyses by the IEPA.

Date Collected	Location	Species	No. Fish in Sample	Mean Length (inches)	Mean Weight (lbs)	% Fat	Total Chlordane (mg/kg)	Dieldrin (mg/kg)	Heptachlor Epoxide (mg/kg)	Total DDT (mg/kg)	Total PCBs (mg/kg)
4/19/89	Chicago (b)	Alewife (w)	25	6.8	0.1	10.1	0.05	0.06	0.01K	0.14	0.52
9/01/89	Multiple (a)	Brown Trout (f)	5	14.5	1.2	3.7	0.06	0.01	0.01K	0.15	0.92
9/01/89	Multiple (a)	Brown Trout (f)	4	19.3	5.3	6.7	0.14	0.05	0.01K	0.30	1.40
9/01/89	Multiple (a)	Brown Trout (f)	5	22.8	5.4	9.3	0.16	0.06	0.01K	0.39	1.70
9/01/89	Multiple (a)	Brown Trout (f)	5	28.0	10.1	7.8	0.14	0.06	0.01K	0.41	2.50*
4/01/89	Multiple (a)	Chinook Salmon (f)	1	-	3.0	5.8	0.09	0.05	0.01K	0.32	0.87
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	20.7	3.1	4.1	0.03	0.02	0.01K	0.17	0.57
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	21.4	3.4	7.6	0.08	0.05	0.01	0.35	1.30
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	21.8	3.4	7.1	0.06	0.04	0.01K	0.25	0.92
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	23.3	5.0	17.7	0.10	0.04	0.01K	0.25	1.10
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	23.8	4.6	9.0	0.18	0.06	0.02	0.70	1.80
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	24.7	4.6	2.8	0.08	0.03	0.01K	0.25	0.74
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	25.1	5.1	4.7	0.04	0.03	0.01K	0.12	0.33
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	25.1	5.0	6.2	0.10	0.05	0.01	0.28	1.10
4/05/89	Michigan City, IN	Chinook Salmon (f)	1	26.3	4.8	7.0	0.12	0.03	0.01K	0.33	1.50
4/06/89	Michigan City, IN	Chinook Salmon (f)	1	-	6.8	13.2	0.13	0.08	0.02	0.48	1.60
9/01/89	Multiple (a)	Coho Salmon (f)	5	18.6	2.9	4.1	0.05	0.01	0.01K	0.13	0.39
9/01/89	Multiple (a)	Coho Salmon (f)	5	23.6	4.9	2.8	0.07	0.01	0.01K	0.19	0.66
9/01/89	Multiple (a)	Coho Salmon (f)	5	26.4	6.8	3.4	0.09	0.02	0.01K	0.21	0.66
9/01/89	Multiple (a)	Coho Salmon (f)	5	27.8	6.5	2.7	0.11	0.02	0.01K	0.24	0.78

(f) = Fillets
(w) = Whole
K = Actual Value Known to be Less Than Value Reported.
* = Value Exceeds USFDA Action Level.
(a) = Multiple Harbors
(b) = Offshore

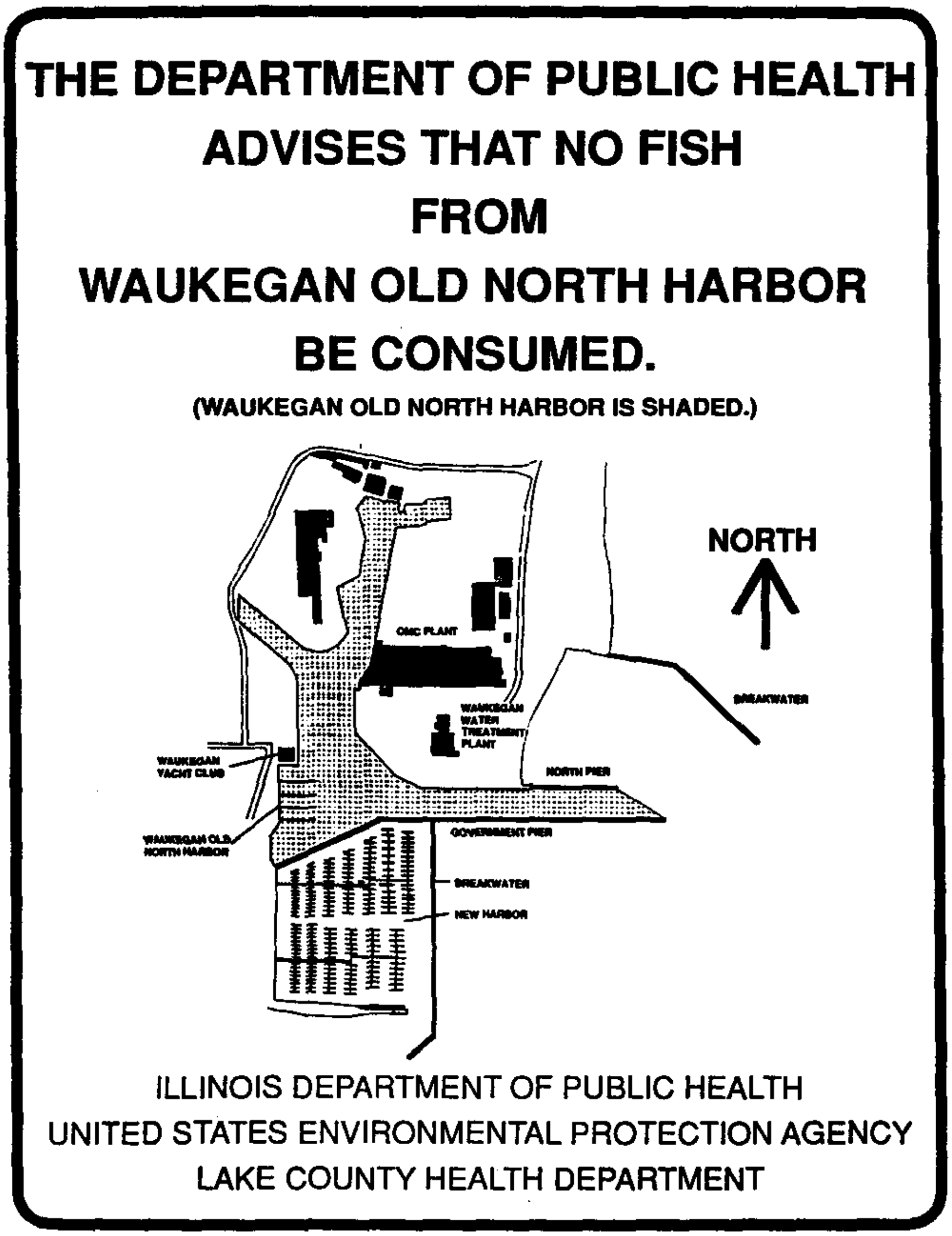
Table 4.17.(continued) Concentrations of Organochlorine Compounds in Fish Composite Samples from the Illinois Area of Lake Michigan, 1989. Analyses by the IEPA.

Date Collected	Location	Species	No. Fish in Sample	Mean Length (inches)	Mean Weight (lbs)	% Fat	Total Chlordane (mg/kg)	Dieldrin (mg/kg)	Heptachlor Epoxide (mg/kg)	Total DDT (mg/kg)	Total PCBs (mg/kg)
8/15/89	Waukegan (b)	Lake Trout (f)	5	19.0	2.3	8.5	0.08	0.04	0.01	0.20	1.30
8/15/89	Waukegan (b)	Lake Trout (f)	5	21.7	3.2	4.2	0.07	0.02	0.01K	0.18	0.66
8/15/89	Waukegan (b)	Lake Trout (f)	5	27.7	7.2	14.4	0.43*	0.18	0.02	0.89	3.40*
9/01/89	Multiple (a)	Rainbow Trout (f)	5	12.8	1.0	5.0	0.04	0.01K	0.01K	0.17	0.44
9/19/89	Multiple (a)	Rainbow Trout (f)	1	17.4	2.1	3.7	0.02K	0.01K	0.01K	0.04	0.13
10/02/89	Multiple (a)	Rainbow Trout (f)	5	23.3	5.8	6.9	0.04	0.02	0.01K	0.20	0.44
9/01/89	Multiple (a)	Rainbow Trout (f)	4	26.4	8.0	6.5	0.11	0.03	0.01K	0.49	1.60
6/07/89	Chicago (b)	Yellow Perch (f)	10	9.4	0.3	0.4	0.02K	0.01K	0.01K	0.01K	0.10K
6/08/89	Lake Bluff (b)	Yellow Perch (f)	10	9.5	0.3	0.5	0.02K	0.01K	0.01K	0.02	0.11

	Total Chlordane	Dieldrin	Heptachlor Epoxide	Total DDT	Total PCBs
USFDA Action Level (mg/kg)	0.30	0.30	0.30	5.00	2.00
Number Above Action Level	1	0	0	0	2
Percent Above Action Level	3.4	0.0	0.0	0.0	6.9
Mean Concentration (mg/kg)	0.09	0.04	0.01	0.27	1.02
Standard Deviation	0.08	0.03	0.00	0.19	0.74

(f) = Fillets
(w) = Whole
K = Actual Value Known to be Less than Value Reported
* = Value Exceeds USFDA Action Level
(a) = Multiple harbors
(b) = Offshore

Figure 4.4. Posted Fish Consumption Advisory at Waukegan Harbor.



In a second study, uncontaminated fish were exposed for 30 days to water from slip 3 in the harbor, and then placed in open lake water for an additional 84 days. The 30-day exposure to the harbor water resulted in 20 ppm PCB levels in bluegills and 12 ppm levels in yellow perch. Even after the 84-day exposure to cleaner open lake water, these levels did not drop below 8 ppm (USEPA, 1981).

Although the determination of these concentrations was based upon analysis of the whole fish, and the USFDA guidelines refer only to the edible portions of the fish, the tests strongly indicate that fish caught in Waukegan Harbor should never be eaten, and that fish spending even short periods of time in the harbor should not be eaten except on an infrequent basis (USEPA, 1981). As a result of these studies the Lake County Health Department has posted signs in the harbor which read "Eating fish caught in the North of Waukegan harbor may be dangerous to your health". The posting was updated in late 1993 with a recommendation that the public consume no fish from Waukegan old North Harbor (Figure 4.4.).

4.5. THREATENED AND ENDANGERED BIOTA

A total of twenty plant and animal species in the Waukegan ESA are presently on the state endangered or threatened species list (Table 4.18.). The list includes six bird and fourteen plant species. All but the Common Tern are found within Illinois State Beach Park, south of the Dead River. Common Terns nest at the Commonwealth Edison Waukegan Plant. This is the only Common Tern nesting colony in Illinois.

There is no indication that contamination of Waukegan Harbor by PCBs or other chemicals has had an effect on these State-listed species, although no specific studies addressing such effects have been done. Within the Waukegan ESA it is likely that industrial and commercial development of the Lake Michigan shore has reduced the abundance of some of these endangered and threatened species by eliminating suitable habitats. Short of removing such developments from the area, it is unlikely that restoration of those habitats to any significant extent is possible.

Two state threatened fish, the longnose sucker and the lake whitefish, have been found near the Waukegan ESA between Waukegan and Zion. Longnose sucker were last collected in 1985, and lake whitefish in 1991 (Hess, personal communication, 1991).

According to the USFWS five species which are known or suspected to be present in the ESA are federally listed and an additional species is a candidate for federal listing (Table 4.18.; Tuggle, 1993). Additional information concerning species which inhabit or use the Waukegan ESA may be found in Appendix J.

Table 4.18. Threatened and Endangered Species Within the Waukegan ESA.

State of Illinois Listing

Scientific Name	Common Name	Last Observed	Status
Euphagus cyanodephalus	Brewer's blackbird	1987	T
Bartramia longicauda	Upland sandpiper	1987	E
Ammodramus henslowii	Henslow's sparrow	1982	T
Podilymbus podiceps	Pied-billed grebe	1982	E
Nycticorax nycticorax	Black-crowned night heron	1983	E
Calopogon tuberosous	Tuberous grass pink	1990	T
Carex garberi	Sedge	1987	E
Carex crawei	Crawe's sedge	1988	T
Eleocharis olivacea	Spikerush	1988	E
Platanthera clavellata	Wood orchid	1977	E
Utricularia cornuta	Horned bladderwort	1990	E
Utricularia minor	Small bladderwort	1970	E
Salix syrticola	Dune willow	1988	E
Ammophila breviligulata	Marram grass	1977	E
Populus balsamifera	Balsam poplar	1990	E
Chamaesyce polygonifolia	Seaside spurge	1977	E
Juncus alpinus	Richardson's rush	1975	E
Carex viridula	Little green sedge	1977	E
Orobanche fasciculata	Clustered broomrape	1988	E
Sterna hirundo	Common tern	1991	E

T = Threatened, E = Endangered

The Illinois Department of Conservation reports collecting two threatened fish species offshore of the Waukegan ESA. These include the longnose sucker, Catostomus catostumus last observed in 1985 and the lake whitefish, Coregonus clupeaformis last observed in 1991.

Federal Listing

Scientific Name	Common Name	Presence in ESA	Status
Cirsium pitcheri	Pitcher's thistle	K	T
Sterna hirundo	Common tern	K	C
Charadrius melodus	Piping plover	P	E
Falco peregrinus	Peregrine falcon	P	E
Myotis soladis	Indiana bat	P	E
Lyaeides melissa samuelis	Karner blue butterfly	P	E

K = Known presence, P = Possible presence
T = Threatened, C = Candidate, E = Endangered

4.6. MAJOR POLLUTANTS OF CONCERN (CAUSING THE IMPAIRED USES)

The USEPA recommends that the following yardsticks be used to designate critical pollutants for Lake Michigan as additional information becomes available:

1. a pollutant bioaccumulates in fish or wildlife tissue, resulting in a lakewide fish or wildlife health advisory;

2. a pollutant exceeds an enforceable water or sediment quality standard;

3. the trend in a pollutant concentration in fish tissue, sediments, or ambient water suggests that safe concentrations, as established by State or Federal water or sediment quality standards, by the parties as specific objectives under the Great Lakes Water Quality Agreement (GLWQA), or by using accepted risk assessment procedures, will be exceeded; and/or

4. a pollutant is present at sufficient locations and at fish tissue, sediment, or water concentrations capable of violating State narrative quality standards prohibiting the presence of substance in toxic amounts.

Pollutants of concern (Table 4.19.) in Waukegan Harbor include those parameters which exceed Illinois water quality standards, are classified as heavily polluted according to USEPA sediment criteria (USEPA, 1977), or exceed USFDA action levels in fish. Those pollutants which have not been directly linked to impaired uses associated with the Waukegan ESA are considered possible potential causes, pending further investigation. For specific information on water, sediment and fish contamination see Sections 4.2., 4.3., and 4.4., respectively. Potential chronic health effects of selected pollutants of concern are presented in Table 4.20.

Table 4.19. **Pollutants of Concern in the Waukegan Expanded Study Area.**

Water	Sediment	Fish
Total Phosphorus	PCBs[1]	PCBs[1]
Total Ammonia	Arsenic[2]	
Chloride	Barium	
Sulfate	Cadmium[2]	
Total Dissolved Solids	Chromium[2]	
Cyanide	Copper[2]	
Phenols	Iron	
Dissolved Oxygen	Lead[2]	
pH	Manganese	
Fecal Coliform	Nickel	
	Phosphorus	
	Kjeldahl Nitrogen	
	Chemical Oxygen Demand	
	Volatile Solids	
	Cyanide[2]	
	Zinc[2]	

[1] Targeted as a lakewide critical pollutant in the Lake Michigan Lakewide Management Plan, Stage I (USEPA, 1993).

[2] Targeted as a lakewide pollutant of concern in the Lake Michigan Lakewide Management Plan, Stage I (USEPA, 1993).

Table 4.20. Potential Chronic Human Health Effects of Selected Pollutants of Concern (Stewart et al., 1988).

Contaminant	Possible Chronic Human Health Effect
Arsenic	skin and lung cancer; liver and kidney damage
Barium	hypertension and heart damage
Cadmium	kidney damage
Chromium	liver, kidney, and lung damage
Copper	anemia; digestive disturbances; liver and kidney damage
Lead	brain and nerve damage, especially in children; kidney damage; digestive disturbances; blood disorders; hypertension
Nitrogen	methemoglobinemia in infants
PCBs	cancer; liver damage; reproductive effects

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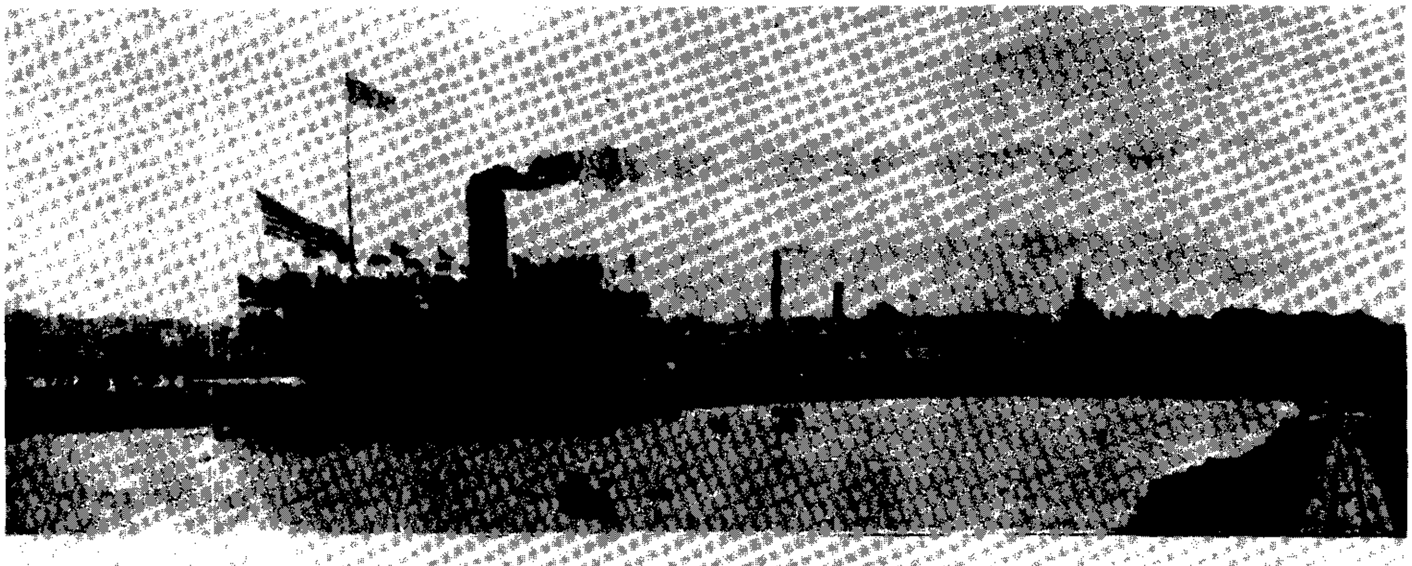
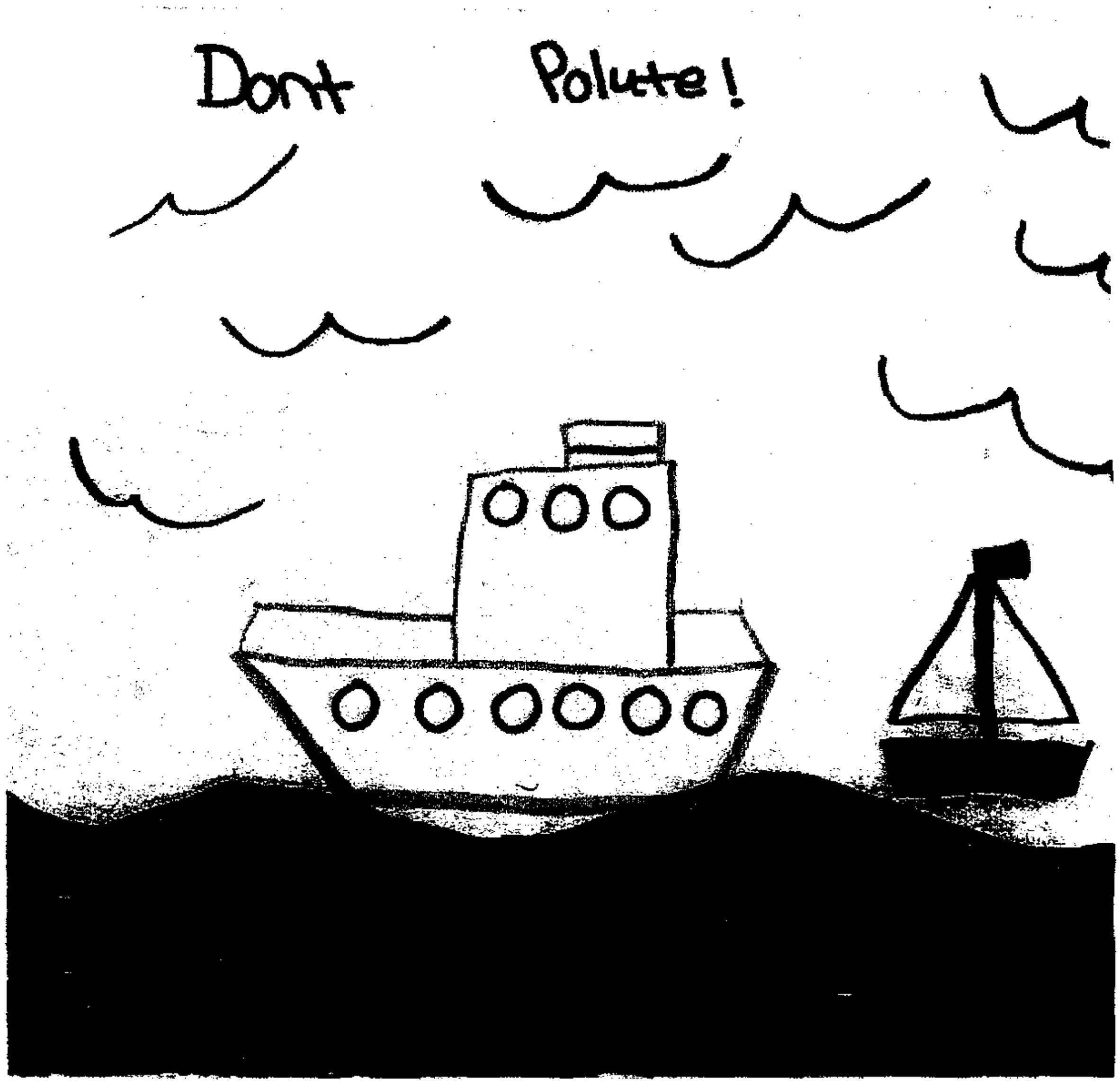


THE WHALEBACK IN THE HARBOR OF WAUKEGAN.

The Whaleback, a famous passenger carrier named for its unique look and design, is pictured here visiting the Harbor of Waukegan.



SABRINA
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5. SOURCES OF POLLUTION AND TRANSPORT MECHANISMS

To control the primary contaminants thought to cause the use impairments identified in Chapter 4, the sources and transport mechanisms responsible for movement of contaminants into, within, and out of the Waukegan Expanded Study Area (ESA) must be identified. Once known, the contaminant sources and transport mechanisms which require immediate remedial actions may be selected and the most applicable remedial activities chosen.

5.1. PRIMARY SOURCES

Primary contaminant sources are associated with the manufacture, or use of materials which become pollutants. Primary sources include: domestic waste treatment effluent, including overflows and bypasses; industrial discharges; and, runoff from urban areas. In addition to these currently active sources, the contaminated sediments and soils in and around Waukegan Harbor are a primary contaminant source in the Waukegan ESA.

5.1.1. Domestic Wastes

The North Shore Sanitary District (NSSD) operates the Waukegan Sewage Treatment Plant (STP) which receives wastes from the cities of Waukegan, Zion, and Winthrop Harbor. Sewage is conveyed from these municipalities to the Waukegan STP through five interceptor sewers designed with sufficient capacity to service the tributary area under fully developed conditions (Greeley and Hansen, 1980).

The Waukegan STP currently has a treatment capacity of 19.9 million gallons per day (mgd). Treatment involves primary and secondary treatment, biological nitrification, filtration, chlorination, and post-aeration. Phosphorus removal by chemical precipitation is added to the treatment process as required (Greeley and Hansen, 1982). Treated effluent is pumped to the Des Plaines River. Sludge is vacuum filtered and disposed of in the Newport Township Sanitary Landfill near Zion, Illinois.

Discharge from the Waukegan STP to Lake Michigan only occurs during periods of peak flow rates. When influent rates exceed the treatment capacity of the plant, excess influent is routed to stormwater treatment facilities. If the stormwater facilities are filled to capacity and influent continues to exceed plant capacity, excess flow from the filters is chlorinated and discharged into Lake Michigan. During overflow events, effluent is monitored for biological oxygen demand (BOD), total suspended solids (TSS), pH, fecal coliform, chlorine residual, and phosphorus (Greeley and Hansen, 1980).

The NSSD is permitted to discharge flow from two outfalls under the National Pollution Discharge Elimination System (NPDES) permit program. Of these, one outfall is tributary to the Des Plaines River and one is tributary to Lake Michigan. The outfall tributary to Lake Michigan is an excess flow outfall and may legally operate only when the maximum practical capacity is carried by the other outfalls and the excess flow treatment facilities on the site are full. At times when the excess flow outfall is discharging, flow from the outfall is to be monitored continuously. Discharge is to be sampled daily and analyzed for carbonaceous biological oxygen demand ($CBOD_5$), suspended solids, fecal coliform, pH, and chlorine residual. Special conditions of the permit require NSSD to sample influent, effluent, and final sludge on an annual basis for priority metals, oils, phenols, and organic priority pollutants. The results of this annual testing and of the discharge monitoring must be reported annually to the IEPA. The NPDES permit for the NSSD went into effect in March, 1991 and will expire in February, 1996 (IEPA, 1991).

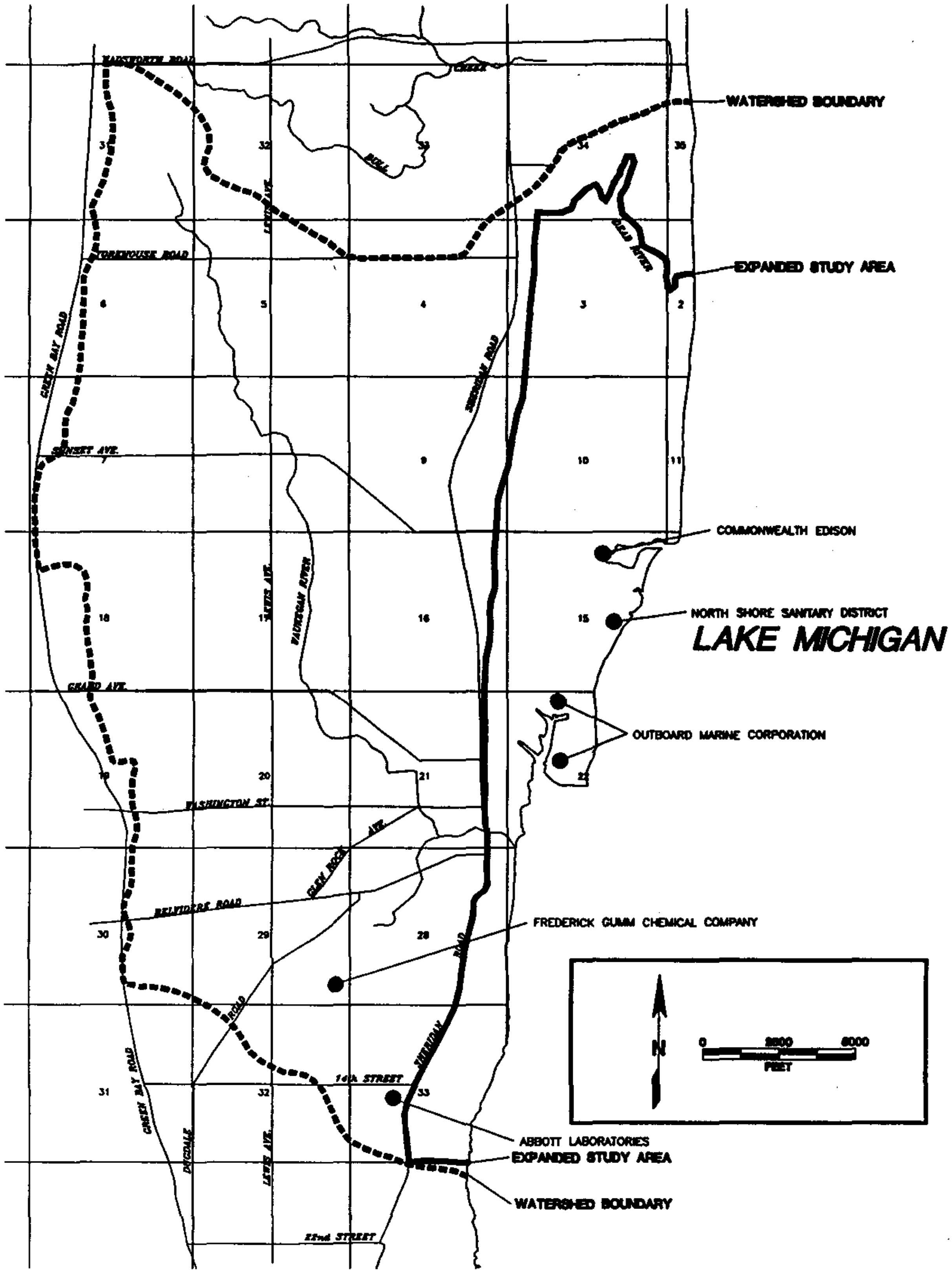
The sewer system that discharges to the Waukegan STP underwent an infiltration and inflow analysis in 1975 and a sewer system evaluation survey in 1977. Total infiltration and inflow averaged 3.3 mgd and peaked at 28.5 mgd (Greeley and Hansen, 1980). Currently, primary sources of inflow include discharge from roof runoff downspouts and perimeter drains directly to sewer lines in older residential neighborhoods (Kroop, 1991). The cross connection of a sanitary sewer with a storm sewer near the intersection of Utica and Washington was identified by the IEPA and was reported to the City of Waukegan in April, 1991 (Marek, 1991). The Utica Street storm sewer discharges into the Waukegan River approximately two blocks downstream of the cross connection. Contributions by the sanitary sewer to the storm sewer's discharge may be associated with high fecal and total coliform counts observed in the Waukegan River during a study conducted by the NSSD (Farrell and Budzinski, 1990). The City of Waukegan is proceeding with plans to correct this problem.

5.1.2. Industries

The National Pollutant Discharge Elimination System (NPDES) requires permits for point source discharges to waters of the United States. Currently, there are three dischargers within the Waukegan ESA for which NPDES permits have been issued: Outboard Marine Corporation (OMC), Commonwealth Edison Company (CEC) Waukegan Generating Station, and Schuller International, Inc. (formerly Johns-Manville Corporation). Two additional permitted dischargers are located in areas tributary to the ESA: Abbott Laboratories, which is located south of the ESA, is permitted to discharge to Lake Michigan via a storm sewer. The Frederick Gumm Chemical Company is permitted to discharge into a storm sewer which is tributary to the Waukegan River. The location of each of these permitted facilities is depicted in Figure 5.1.

Seven outfalls from OMC are permitted through the NPDES program. Outfall (007) enters Lake Michigan directly while a second (017), enters Lake Michigan via the North Ditch. The remaining outfalls enter Lake

Figure 5.1. Location of NPDES Permitted Dischargers.



Michigan via Waukegan Harbor. Outfalls (001) and (007) are non-contact cooling water and stormwater. Outfall (008) is an emergency overflow for (007). Outfalls on the north plant property are now directed to outfall (017). Presently, retention is being used to partially meet requirements at this outfall and further treatment is now under design. Sampling requirements for OMC outfalls are presented in Table 5.1. The current NPDES permit for OMC was first issued September, 1987 and went into effect October, 1987. A permit modification issued November, 1990 became effective December, 1990 (IEPA, 1987). An updated permit is expected to be finalized in 1995.

Thirteen effluent violations were observed at OMC outfalls between May, 1990 and April, 1991. Violations occurred at outfalls 006, 014, 015, and 016 and constituents which exceeded permit limits were oil and grease, total suspended solids, and PCBs (IEPA, 1991).

CEC is permitted to discharge effluent at a single discharge point at the Waukegan facility. The circulating water receives discharges from six points: boiler blowdown, demineralizer regenerant wastes, wastewater treatment system effluent, east yard runoff collection basin discharge, demineralized water, and demineralized water storage tank drain. Effluent at the discharge point (which consists of these six sources plus condenser cooling water and house service water) must be sampled for flow and temperature. This discharge also must be sampled weekly during chlorination of the stations main condensers for total residual chlorine. Sampling requirements for each of the six points are summarized in Table 5.2. The current NPDES permit for CEC is in effect between October, 1990 and June, 1995 (IEPA, 1990).

Abbott Laboratories, located within the ESA (Figure 5.1.), has a NPDES permit to discharge non-contact cooling water and stormwater through a storm sewer which discharges to Lake Michigan (IEPA, 1989). The terms of the permit require that Abbott monitor flow, pH, and temperature of the discharge on a monthly basis. This NPDES permit is effective from January, 1990 to October, 1994 (IEPA, 1989).

Schuller International, Inc., formerly the Johns-Manville Corporation, located in the ESA north of the harbor, has a NPDES permit to discharge from one outfall to Lake Michigan. Effluent from the outfall must be sampled twice a month for flow, pH, BOD, TSS, asbestos, and arsenic. These parameters are listed in Table 5.3. This permit is effective from September 14, 1993, to September 1, 1996.

The Frederick Gumm Chemical Company is located outside the boundaries of the ESA but within its watershed. Gumm Chemical has a NPDES permit to discharge non-contact cooling water into a storm sewer which is tributary to the Waukegan River. The flow, pH, and temperature of the effluent must be monitored monthly (IEPA, 1990).

Table 5.1. NPDES Sampling Requirements for OMC Waste Effluents (as of April 29, 1994).(1)

Discharge	Parameter	Sample Frequency
Non-contact cooling water		
Outfall 001	flow	1/month
	pH	1/month
	temperature	1/month
	PCBs	2/month
	Benzene	2/month
	Phenol	2/month
	Naphthalene	2/month
Stormwater Run-off		
Outfalls 002, 003, 004, 005	flow	(2)
	PCBs	1/quarter

(1) As of April 29, 1994 an updated permit is pending with the IEPA.
(2) Sampling for each precipitation event greater than 0.3 inches in a 24-hour period.

Table 5.1. (continued) NPDES Sampling Requirements for OMC Waste Effluents.

Discharge	Parameter	Sample Frequency
Non-contact cooling water		
Outfall 007 and 008	flow	2/month
	pH	1/month
	PCBs	2/month
	temperature	1/month
	Benzene	2/month
	Phenol	2/month
	Naphthalene	2/month
	Trichloroethylene	2/month
Stormwater Catch Basin Discharge		
Outfall 017A *(3)*	flow	*(1)*
	PCBs	1/quarter
Stormwater runoff diverted from Catch Basin		
Outfall 017 *(3)*	flow	*(2)*
	PCBs	1/quarter

(1) Total flow when discharging.
(2) Sampling for each precipitation event greater than 0.1 inches in a 24-hour period.
(3) Outfall 017/017A is considered one outfall.

Table 5.2. NPDES Sampling Requirements for Commonwealth Edison - Waukegan (as of March 1, 1994).

Discharge	Parameter	Sample Frequency
Boiler Blowdown	flow	bi-monthly
	TSS[1]	bi-monthly
	hydrazine	weekly
	ammonia nitrogen	weekly
Demineralizer Reagent Wastes	flow	weekly
	TSS	weekly
Wastewater Treatment System	flow	continuous
	pH	weekly
	TSS	weekly
	oil and grease	weekly
	total iron	bi-monthly
	total copper	as required
East Yard Runoff Collection Basin	flow	daily
	pH	weekly
	TSS	weekly
	oil and grease	monthly
Demineralized Water	flow	weekly
Demineralized Water Storage Tank	flow	weekly

[1] TSS = total suspended solids

Table 5.3. NPDES Sampling Requirements for Schuller International, Inc (as of March 1, 1994).

Discharge	Parameter	Sample Frequency / Type
001 Recycle System Overflow	Flow	2/month / Total
	pH	2/month / Grab
	BOD_5	2/month / Composite
	TSS	2/month / Composite
	Asbestos	2/month / Composite
	Arsenic	2/month / Composite

5.1.3. Agriculture

The watershed tributary to the Waukegan ESA does not contain agricultural land uses.

5.1.4. Urban Nonpoint Sources

Nonpoint source (NPS) contamination from urban areas has been widely studied to determine the nature and typical concentrations of constituents and to develop and evaluate strategies for controlling NPS contamination. Studies which are applicable to the Waukegan ESA and its tributary watershed include the Nationwide Urban Runoff Program (NURP, USEPA, 1983), a study of Lake Ellyn in Glen Ellyn, Illinois (Hey and Schaefer, 1983), and two sampling programs conducted by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), formerly the Metropolitan Sanitary District, (MSD, 1978a; MSD, 1978b). Event mean concentrations of various water quality constituents determined during the four studies described above are presented in Table 5.4.

The NURP was developed to supplement existing data on urban runoff pollution and best management practice efficiency and to provide additional information for use in planning management strategies. The program included 28 separate projects which were conducted locally throughout the U.S. but were centrally coordinated. All individual projects addressed the characteristics of urban pollution, pollutant loads, effects on receiving waters, and the effectiveness of control measures. The median of the event mean concentration values for all the sites (Table 5.4.) yielded a general description of chemical characteristics of urban runoff.

Constituents expected in runoff generated in urban areas in northeastern Illinois were discussed in a study of the Lake Ellyn watershed (Hey and Schaefer, 1983). The Lake Ellyn study was one of the 28 local projects conducted as part of the NURP program. Based on this study, constituents expected in stormwater runoff from the Waukegan ESA watershed include solids and chloride from winter salting activities; copper, lead, and zinc from traffic and atmospheric deposition; phosphorus and solids from landscaped areas; and zinc from decomposition of construction materials.

The Metropolitan Sanitary District (MSD) investigated typical constituent contents of stormwater from various land uses (MSD, 1978b). Sixteen small watersheds of homogeneous land use located throughout a six county region in northeastern Illinois were examined to characterize the nature of stormwater runoff. Studied land uses which are present in the watershed of the Waukegan ESA are high and low density residential (multifamily and single family residences, respectively) and industrial. The MSD also examined the quality of water in the Waukegan River as part of the Lake Michigan Sampling Program (MSD, 1978a). The results of this study are presented in Table 5.4. The concentrations found in Table 5.4 do not appear to be causing any significant contributions to the impaired uses.

Table 5.4. Concentrations for Urban Stormwater Runoff.

Constituent	NURP[1] (EMC[5])	Lake Ellyn[2] (EMC[5])	Industrial (Mean)	MSD[3] High Density (Mean)	MSD[4] Low Density (Mean)	Waukegan River (Mean)
TS			634	1075	818	811
TSS	100	196	302	797	513	24
VSS			36.3	68.0	54.0	5.6
DO			7.0		8.1	8.9
BOD_5	9	18	14.6	45.7	17.1	2.9
BOD_{20}			35.8	37.3	54.5	6.67
COD	65	91.5				91.8
TOC		15.2				34.1
Cl		34.7				
TKN	1.50		1.42	2.15	1.73	0.64
NH_4-N		0.18	0.42	0.53	0.51	0.18
NO_{2+3}-N	0.68	0.77	1.22	1.14	1.37	0.55
Sol. P	0.12	0.08	0.19	0.23	0.14	0.12
Tot. P	0.33	0.48				
Cu	0.034	0.041				
Sol. Pb		0.004				
Tot. Pb	0.144	0.224				
Zn	0.160	0.171				

[1] USEPA, 1983
[2] Hey and Schaefer, 1983
[3] MSD, 1978b
[4] MSD, 1978a
[5] Event Mean Concentration

5.1.5. In-Place Contaminants

Sediments in Waukegan Harbor, particularly those in the north portion of the harbor, had contained high concentrations of PCBs. These PCBs were released into the harbor from the Outboard Marine Corporation (OMC) manufacturing plant. A hydraulic fluid which contained PCBs was used in the plant between roughly 1961 and 1972. The hydraulic fluid escaped through floor drains and resulted in the contamination of soils on the OMC property and sediments in the upper harbor area, particularly slip 3. PCB concentrations as high as 520,000 mg/kg had been detected in the sediments of slip 3. In all, roughly 700,000 pounds of PCBs were estimated to be in soils on OMC property and an additional 300,000 pounds of PCBs were estimated to be in Waukegan Harbor sediments (USEPA, 1991b). The extent and relative concentration of PCB contamination before remediation at the OMC site and within the harbor is depicted in Figure 2.2.

Part of the remedial action activities to clean up PCB contamination in the harbor and immediate vicinity involved the conversion of slip 3 into a containment cell. To compensate for the loss of the slip, slip 4 was constructed on the east side of the harbor. During the design of the new slip, soil samples were taken from the proposed slip location.

Soil samples indicated contamination of soils in the slip location, likely the result of historical use of the site and adjacent property for a coking plant, a manufactured gas plant, and a railroad tie processing plant (USEPA, 1991a). Contaminants included coal tar derivatives, creosote, and polynuclear aromatic hydrocarbons (PAHs). The new contaminated area has been designated the Waukegan Manufacturing Gas and Coke Plant (Figure 3.1.). A remedial investigation is underway to determine the extent and nature of the contamination.

Cooperation between the CAG and the IEPA resulted in the identification of other sites within the ESA that were possible hazardous concerns. Two of these, the Diamond Salvage Yard and the Griess-Pfleger Tannery, have the focus of remedial investigations to determine the extent of contamination from the sites.

Commonwealth Edison Company currently owns the old Griess-Pfleger Tannery property and is coordinating a voluntary investigation and clean-up of the site with the IEPA. The investigation has been completed and chromium and lead in the soil are considered to be the primary contaminants of concern.

A consultant for the Bank of Waukegan, Roy F. Weston, Inc., conducted soil sampling at the Diamond Salvage Yard site. Shallow soils at this site were found to contain detectable levels of inorganics, volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). The impact to groundwater was not evaluated. Asbestos was found in the buildings but most of it is considered nonfriable. Asbestos in this condition is less likely to pose a health threat.

Of the inorganics, cadmium, lead, cyanide, copper, and zinc appeared in the largest quantities. VOCs include solvents and cleaning materials as well as various chemicals found in petroleum products. Creosote (used in the treatment of wood), diesel fuel, fuel oil, asphalt, and tire burning residues comprised most of the PAHs. Near the bailer and metal shears, PCBs were found.

5.2. SECONDARY SOURCES

5.2.1. Landfills and Dumpsites

A 1987 study conducted by the Northeastern Illinois Planning Commission (NIPC, 1987) identified twenty solid and liquid waste landfills within the Waukegan ESA watershed (Figure 5.2.). Of these, seven are within the boundaries of the Waukegan ESA. The name and location of each of the landfills are provided in Table 5.5. None of the identified landfills are currently active. Inactive landfills and dump sites within the Waukegan ESA subject to remedial actions are Schuller International, Inc. (formerly Johns-Manville), the Waukegan Tar Pit, and Waukegan Paint and Lacquer. Yeoman Creek Landfill is located outside the boundaries of the ESA, but is within the ESA watershed and has been found to impact Yeoman Creek, a tributary of the Waukegan River. Additional dump sites which are currently under investigation include the old Griess-Pfleger Tannery property and Diamond Scrap Yard.

Production at Schuller International began in the 1920s and included the manufacture of ceiling and floor tiles, siding shingles, wallboard, and asbestos-containing products (asbestos is no longer used on the site). Wastes generated since 1922 generally were disposed of on roughly 120 acres of the site. Stored wastes included asbestos, lead, xylene, chromic oxide, and thiram. In the early 1980s, air samples collected downwind of the site contained low concentrations of asbestos. Consequently, the site was placed on the National Priorities List (NPL) in 1982, making the site eligible for long-term investigation and remediation under the Superfund program.

Remediation of Schuller International emphasized containment of the disposed asbestos. Two feet of clean soil were placed over the majority of the on-site disposal areas. In addition, 15 acres of a 53 acre system of wastewater treatment lagoons also were covered. Erosion control measures were applied to the remainder of the wastewater treatment system, and the system was dredged to remove any asbestos containing sediments. Long term monitoring is ongoing for the site and includes testing the new soil cover, groundwater, surface water, and air (USEPA, 1988).

Little is known about the origin of the Waukegan Tar Pit. An Administrative Order by Consent was signed by representatives of the NSSD, the North Shore Gas Company, and the E.J. & E. Railroad in March, 1991 (USEPA, 1991). Remediation was initiated in 1991 and a removal action completed in January 1992. The free

Figure 5.2. Landfill Locations within the Waukegan ESA Watershed.

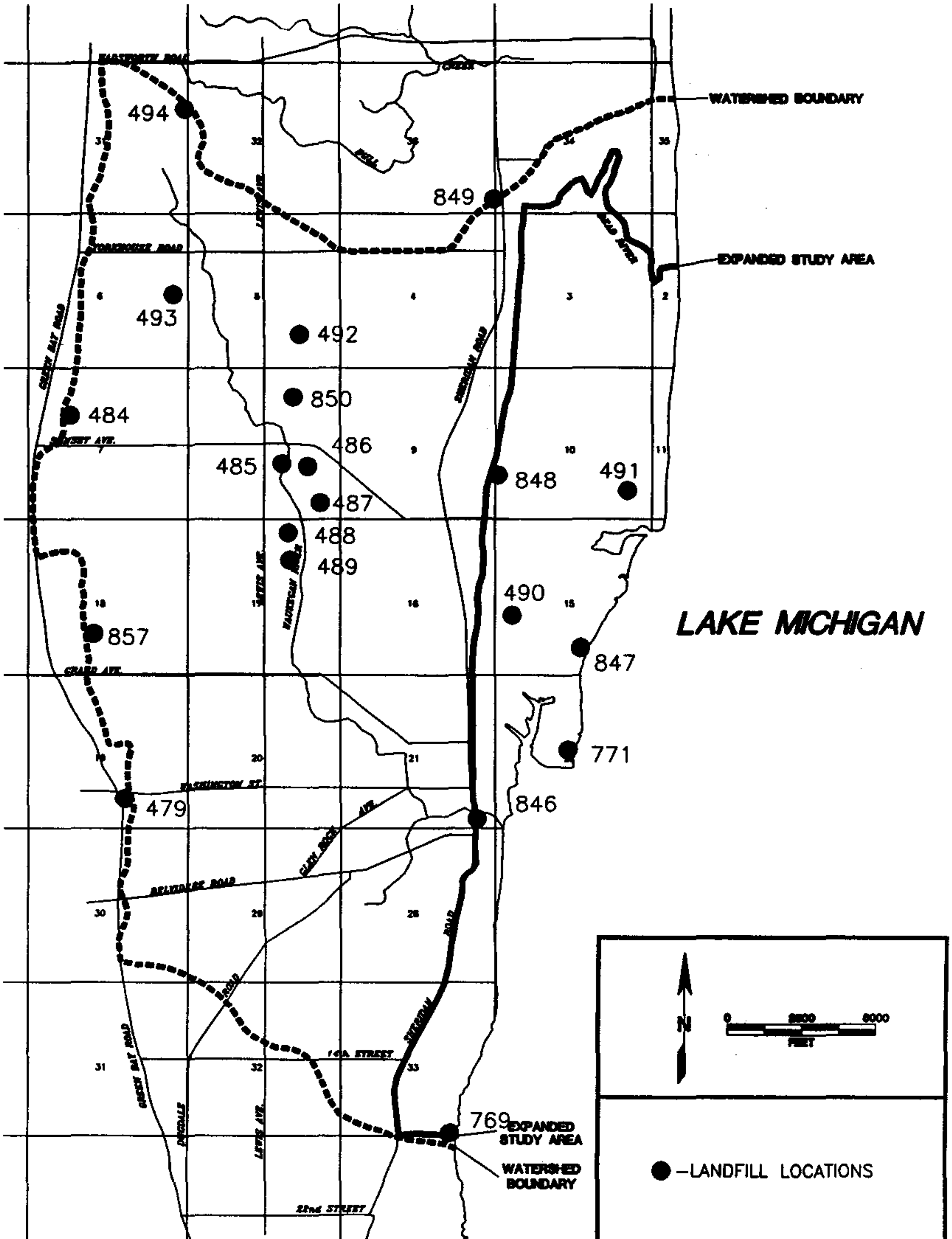


Table 5.5. Landfills/Dumpsites in the Waukegan ESA Watershed (NIPC, 1987).

Map Number	Name	Township	Location
479	Souzopoulos, Athanas	Waukegan	45N, 12E, 19, SW
484	Waukegan Municipal #2 (Adelphi Ave.)	Waukegan	45N, 12E, 07, NW
485	Yeoman Creek	Waukegan	45N, 12E, 08, SE
486	Seegren	Waukegan	45N, 12E, 08, SE
487	Bertha Orgin	Waukegan	45N, 12E, 08, SE
488	Waukegan Park District (Edwards Field)	Waukegan	45N, 12E, 17, NE
489	Rubloff, Arthur	Waukegan	45N, 12E, 17, NE
490[1]	Griess-Pfleger	Waukegan	45N, 12E, 15, SW
491[1]	Schuller International	Waukegan	45N, 12E, 10, SE
492	TK Disposal, Inc. #1	Waukegan	45N, 12E, 05, SE
493	Waukegan Municipal #1 (Yorkhouse)	Waukegan	45N, 12E, 06, SE
494	Waukegan Port District (Engelhard)	Waukegan	46N, 12E, 32, NW
769[1]	U.S. Steel	Waukegan	45N, 12E, 33, SE
771[1]	Waukegan Manufacturing Gas & Coke	Waukegan	45N, 12E, 22, NW
846[1]	Diamond Scrap Yard	Waukegan	45N, 12E, 21, SE
847[1]	Abbott/Lakefront	Waukegan	45N, 12E, 15, SE
848[1]	Greenwood Ave. Dump	Waukegan	45N, 12E, 09, SE
849	Mohr	Benton	46N, 12E, 33, SE
850	Butrick and Wilson Ave.	Waukegan	45N, 12E, 08, NE
851	Interurban Development	Waukegan	45N, 12E, 18, SW

[1] Landfill within Waukegan AOC boundaries

tar present in the former tar pit was removed, and a thick plastic cover has been placed over the excavated area. Thin layers of tar have been found at depths ranging from 3 to 25 feet in areas near the former tar pit. The tar is in the 25 foot thick sand layer overlying a thick bed of clayey hardpan. These areas continue to be investigated. Before remediation, the open surface of the pit was approximately 0.4 acres and was covered with four to six inches of water. Depths of free tar varied down to 6 feet and the total volume of tar in the pit was estimated to be 1,300 cubic yards. Physical properties and constituents found in composite tar samples are presented in Table 5.6. (Barr Engineering Company, 1991).

Waukegan Paint and Lacquer was involved in manufacturing until the plant was destroyed by fire in 1978. Two IEPA investigations of the site conducted in 1989 revealed 201 drums (149 outside the main building and 52 inside), seven vats, and eight tanks. Of the seven vats, six were partially filled and one was empty. Likewise, six of the eight tanks were partially filled and two were empty. In August 1991, representative samples were taken from one drum, one vat, and one tank for analysis. The results of this sampling are presented in Table 5.7. The total waste volume on the site was estimated to be 13,000 gallons of liquid, 1,000 gallons of thick resins, 5 cubic yards of solid wastes, and 50 cubic yards of crushed drums (Ecology and Environment, Inc., (1991). Site remediation was completed in 1992.

The Yeoman Creek Landfill is located southeast of the intersection of Lewis and Sunset Avenues (#485 on Figure 5.2.). The landfill was operated between 1959 and 1969 by T.K. Disposal and National Disposal Companies. Roughly 3.5 million cubic yards of refuse consisting of domestic garbage, landscape waste, demolition debris, and PCB contaminated material is contained within the landfill. Waste varies between 4 and 19 feet thick and fill extends to within 5 feet of Yeoman Creek. In 1969, IEPA determined that landfill leachate was entering Yeoman Creek, probably the result of inadequate landfill cover. Two feet of additional cover was added to the landfill in 1980. The landfill was added to the NPL in March 1989. Later that year, an Administrative Order was signed by the USEPA, the IEPA, and five potentially responsible parties: Browning-Ferris Industries, OMC, T.K. Disposal, the Waukegan School District, and the City of Waukegan. Edwards Field Park was added to the Yeoman Creek Landfill site in 1990 (USEPA, 1991).

Sampling efforts associated with the Yeoman Creek Landfill include groundwater, landfill leachate, Yeoman Creek flow, and Yeoman Creek sediments (IDPH, 1990). Constituents detected in groundwater and landfill leachate are presented in Table 5.8. Sampling activities from one of the seven leachate wells indicate a 3-foot thick oil layer. The oil was sampled and found to contain 470 ppm xylene, 15,000 ppm dichlorobenzene, 2,800 ppm aliphatic hydrocarbons, 90 ppm toluene, and 150 ppm PCBs. Sediments in Yeoman Creek indicate transport of PCBs from the landfill. Upstream of the landfill site, sediment PCB concentrations are 0.4 ppm. On the site, concentrations were 4.3 to 11 ppm and downstream concentrations are 2.2 ppm. Water samples taken from the creek exhibit iron and ammonia concentrations in violation of Illinois' general use water quality standards.

Table 5.6. Properties and Constituents of Tar from the Waukegan Tar Pit (Barr Engineering Company, 1991).

Constituent	Concentration, ppm
Benzene	140
Ethylbenzene	100
Toluene	220
Xylenes (total)	420
Total BETX	880

Constituent	Concentration (ppm) using Standard Method[1] 8100	8270
Naphthalene	18,000	27,000
2-Methylnaphthalene	6,000	14,000
Acenaphthalene	4,200	8,400
Dibenzofuran		700
Fluorene	2,700	5,600
Phenanthrene	7,000	16,000
Anthracene	1,400	4,300
Fluoranthene	2,100	5,300
Pyrene	4,300	8,500
Benzo(a)anthracene	1,200	3,800
Chrysene	1,300	4,300
Benzo(b)fluoranthene	510	1,300
Benzo(k)fluoranthene	930	1,700
Benzo(a)pyrene	1,100	2,900
Indeno(1,2,3-cd)pyrene	300	1,100
Benzo(g,h,i)perylene	630	1,200
Total Carcinogenic PAHs	5,100	15,000
Total PAHs	52,000	110,000

Characteristic	Magnitude
Heat of Combustion, BTU/lb	<150
Density, g/mL	1.6
Flash Point, °F	>200
Percent Ash	60

[1] APHA, 1989

Table 5.7. Chemical Composition of Representative Samples from Waukegan Paint and Lacquer (Ecology and Environment, Inc., 1991).

Parameter	Drum	Vat	Tank
Flash Point, °F	80-85[1]	90-95[1]	80-85[1]
Tetrachloroethene (mg/L)	10	<10	<1
Trichloroethene (mg/L)	140	<10	<1
1,1,1-Trichloroethane (mg/L)	28	<10	<1
Xylenes (mg/L)	10	2,100	1
Acetone (mg/L)	<50	260	<50
Ethyl acetate (mg/L)	13	150	320
Ethylbenzene (mg/L)	2	1,500	<1
Diethyl ether (mg/L)	140	<100	<10
Methyl isobutyl ketone (mg/L)	<50	1,600	<100
2-Butanol (mg/L)	<50	270	63

[1] Capacity to sustain burning after being flames

Table 5.8. Ranges of Groundwater and Landfill Leachate Concentration in and near the Yeoman Creek Landfill (IDPH, 1990).

Constituent	Leachate	Groundwater	Background Groundwater
Ammonia (ppm)	710-7,500	0.06-34	7.7-10.0
Arsenic (ppm)	0.006-0.13	0.002-0.025	0.002-0.005
Barium (ppm)	0.6-5.8	0.2-1.7	0.2-0.3
Boron (ppm)	0.6-5.8	0.3-97.0	0.3-0.4
Chloride (ppm)	59-1,100	30-333	11-61
Iron (ppm)	32-1991	N.D.[1]-29.1	0.1-3.8
Magnesium (ppm)	0.12-12.86	0.10-1.95	1.25-1.40
Sodium (ppm)	30.7-1286	36.3-465	45.8-75.2
PCBs (ppm)	0.087-3.8	0.17-2.3	N.D.-0.0005
Grease (ppm)	7013		
Toluene (ppm)	0.16		
Xylene (ppm)	1.70		
Benzene (ppm)	0.12		

[1] Not detected

5.2.2. Atmospheric Deposition

Lake Michigan has a surface area of 22,400 square miles and receives approximately 53 percent of its water input from precipitation (Elder, 1976). Consequently, deposition of air-borne constituents into the lake through dryfall and precipitation scavenging present a potentially significant source of lakewide pollution. These same deposition processes will impact water quality in the Waukegan ESA as well as the near shore lake areas. In addition, air-borne contaminants which are deposited on land and man-made structures are available for transport to surface water resources by runoff and sediment transport.

Air quality is monitored throughout the state of Illinois by the IEPA Bureau of Air Pollution Control using a system of over 200 monitors. Waukegan has one air monitoring station located at the North Fire Station at Golf and Jackson. Air is sampled for ozone, wind speed, and wind direction. In addition, total solar radiation is monitored. The highest 1-hour ozone observation in Waukegan during 1990 was 0.115 ppm. This observed high is less than the 0.12 ppm standard for "advisory" air quality conditions as defined by the IEPA (IEPA, 1991).

Air monitoring stations within the metropolitan Chicago region may be used to provide a better picture of air quality in the northeastern Illinois region. Average air concentrations for monitored constituents during 1990 are presented in Table 5.9.

The movement of PCBs into the atmosphere was discussed by Andren et al. (1979). Volatilization was identified as the principal route by which PCBs enter the atmosphere. Sources for volatilized PCBs include PCB containing formulations, areas which have experienced environmental contamination with PCBs, and landfill gas vents. In addition, PCBs may volatilize as a result of incomplete combustion such as that which may occur at small domestic or apartment incinerators or in open burning dumps. Volatilization from the PCB contaminated sites within the Waukegan ESA was estimated by the USEPA (1984). Assuming a volatilization rate of 3.8 $mg/m^2/hr$ yielded volatilization loss estimates of roughly 12 to 40 pounds per year from Waukegan Harbor and roughly 15 pounds per year from the North Ditch contamination area.

Andren and Stolzenburg (1979) presented the composition of air emissions from eight sources (Table 5.10.). The total emission load to the atmosphere is dependent on the number and locations of air contaminant sources. For the Chicago metropolitan area, emission loads were estimated by Gatz (1975). These estimates are presented in Table 5.11.

5.2.3. Groundwater

Shallow sand and gravel aquifers along Lake Michigan are hydraulically connected to the lake. Generally, these aquifers discharge into the lake, especially after precipitation events (Wapora, Inc., 1981).

Table 5.9. Monitored Air Quality in the Metropolitan Chicago Area, 1990 (IEPA, 1991).

Constituent, Units	Mean Concentration	Annual Arithmetic Sampling Location
Particulate Matter, $\mu g/m^3$	40	Chicago-Mayfair[1]
Total Suspended Particulates, $\mu g/m^3$	65	Chicago-Mayfair
Sulfur dioxide, ppm	0.007	Chicago-Edgewater[2]
Nitrogen dioxide, ppm	0.021	Chicago-Edgewater
Lead, $\mu g/m^3$	0.04	Chicago-Mayfair
Arsenic, $\mu g/m^3$	0.001	Chicago-Mayfair
Beryllium, $\mu g/m^3$	0.000	Schiller Park[3]
Cadmium, $\mu g/m^3$	0.002	Chicago-Mayfair
Chromium, $\mu g/m^3$	0.009	Chicago-Mayfair
Iron, $\mu g/m^3$	1.26	Chicago-Mayfair
Manganese, $\mu g/m^3$	0.048	Chicago-Mayfair
Nickel, $\mu g/m^3$	0.005	Chicago-Mayfair
Selenium, $\mu g/m^3$	0.010	Schiller Park
Vanadium, $\mu g/m^3$	0.001	Schiller Park
Nitrates, $\mu g/m^3$	5.3	Chicago-Mayfair
Sulfates, $\mu g/m^3$	9.1	Chicago-Mayfair

[1] 4850 Wilson Avenue
[2] 5358 N. Ashland
[3] 4243 N. Mannheim

Table 5.10. Composition of Emissions (percent mass) from Air Constituent Sources (Andren and Stolzenburg, 1979).

Element	Coal fly ash	Automotive emissions	Fuel oil ash	Cement manufacture	Iron and steel manufacture	Agricultural soil dust	Construction soil dust	Incineration emissions
Al	8.11	--	0.8	2.4	2.4	6.3	5.2	1.4
Ca	2.7	--	1.3	46.0	5.4	2.4	16.5	--
Cu	0.054	--	0.2	--	1.6	0.014	0.01	0.17
Fe	10.5	0.4	6.0	1.09	38.7	4.8	4.2	0.65
K	2.43	--	0.2	0.53	--	0.90	1.0	--
Mg	13.5	--	0.06	0.48	1.6	2.2	12.8	1.3
Mn	0.054	--	0.06	--	2.4	0.16	0.13	0.073
Na	1.08	--	5.0	0.4	--	0.80	0.47	8.2
Pb	0.054	40.0[1]	0.07	--	--	0.003	0.003	8.1
Zn	0.54	0.14	0.02	--	1.8	0.012	0.007	12.0

[1] Value determined before the phase-out of leaded gasoline, current values are likely less.

Table 5.11. Estimates of Emission Loads in the Chicago Metropolitan Area (Gatz, 1975).

Element	Estimated Emission (metric tons per year)
Al	7,800
As	69
Cd	65
Cr	130
Cu	750
Fe	22,000
Mn	800
Ni	200
Pb	6,100
Ti	930
V	370
Zn	1,560

PCB contamination of shallow groundwater beneath OMC's Crescent Ditch and Oval Lagoon and the North Ditch was reported by Wapora, Inc. (1981). Contamination under the Crescent Ditch and Oval Lagoon was found to be stationary. Near the east end of North Ditch, contaminants were found to be travelling towards Lake Michigan. Before remediation, the contaminate plume was estimated to reach the lake around the year 2010; PCB loading to the lake by groundwater was estimated to be 10 g/day in the year 2040. Shallow groundwater also contributed PCBs to surface water in the North Ditch during periods of wet weather. Pulsing of the water table after precipitation events caused the upward movement of PCBs into the North Ditch where they were transported towards Lake Michigan (Wapora, Inc., 1981). These loading were virtually eliminated with the remedial steps completed in 1993.

5.3. TRANSPORT PROCESSES

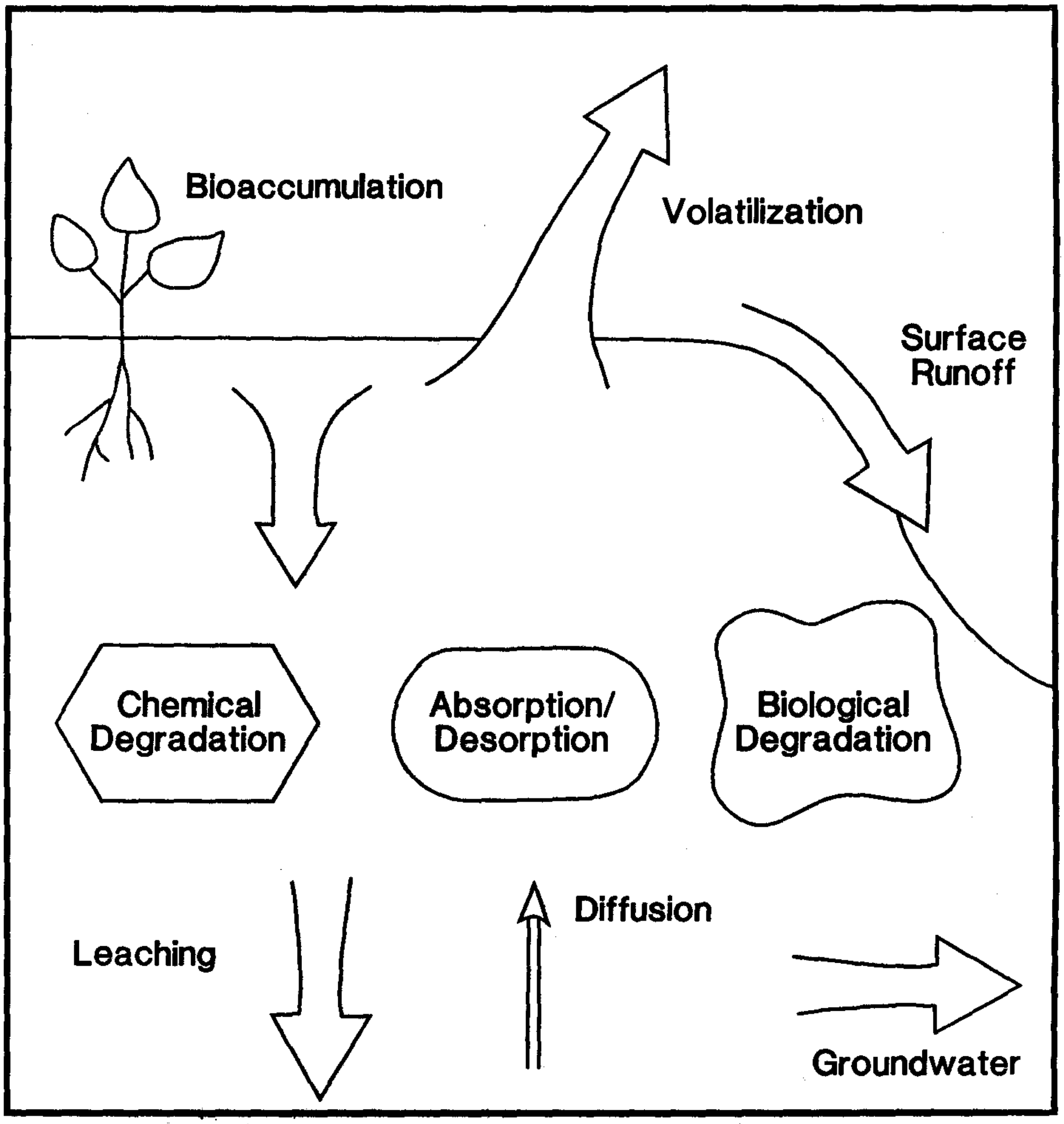
Once in the environment, contaminants are subjected to biological, chemical, and physical processes. If contaminant source information is known, identification and quantification of these processes allows estimation of the contaminant movement in the environment. Control of contaminant movement in combination with control of contaminant sources is the key to the restoration of beneficial uses in the Waukegan ESA.

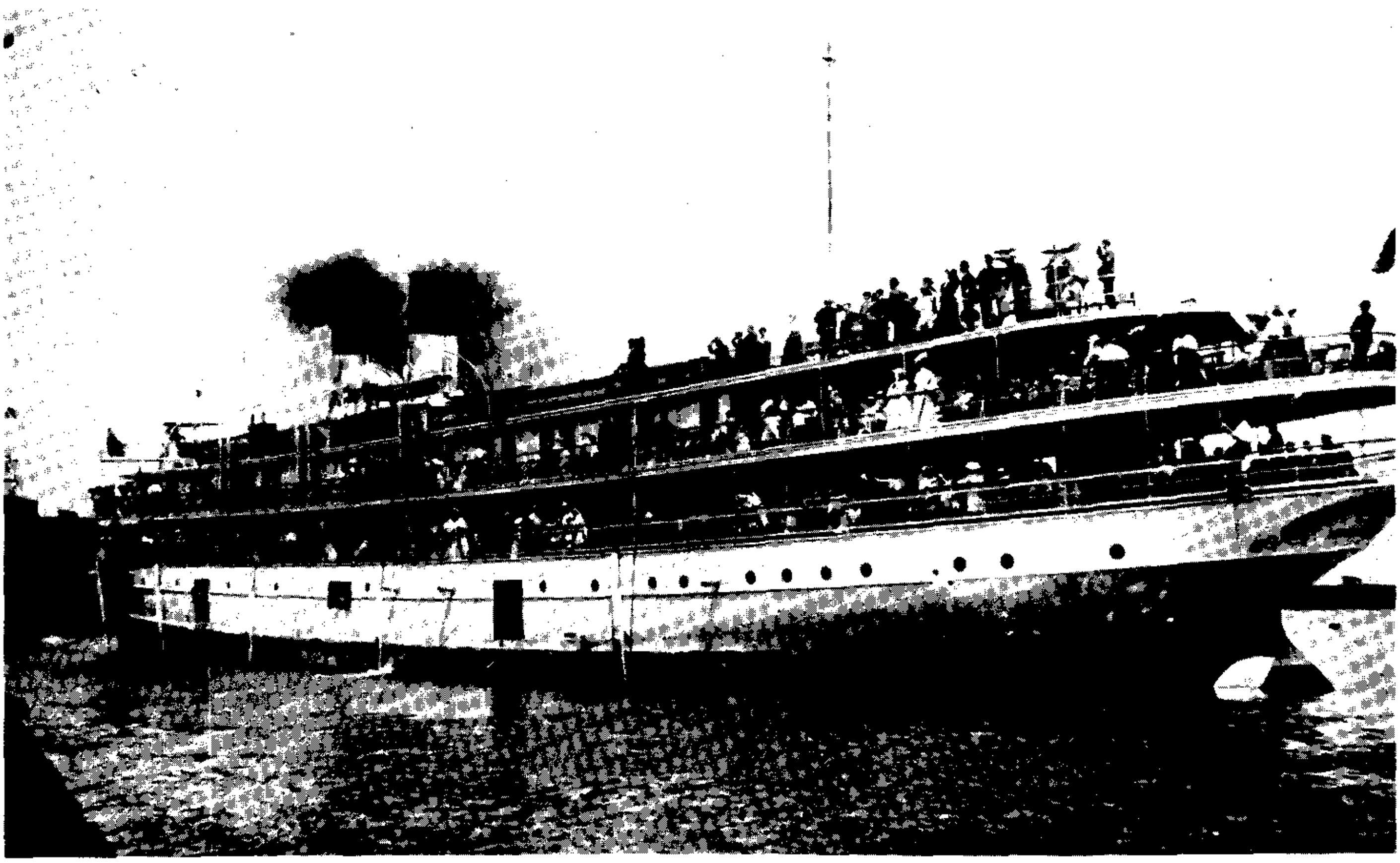
5.3.1. Environmental Chemodynamics

Processes which affect the behavior of contaminants in the environment include degradation, volatilization, adsorption and desorption, and bioaccumulation. These processes are depicted in Figure 5.3. Degradation, the break-down of complex compounds into simpler components, occurs in three forms: photochemical, chemical, and biological. Photochemical degradation, the break-down of compounds under the influence of ultraviolet light, is common for organic compounds. Chemical decomposition may occur through the presence of excess acidity or alkalinity, which is measured by pH. Biological degradation is the result of microbial metabolism of contaminants and is often the main cause of degradation in soils and sediments (Haque and Freed, 1974). Volatilization, the diffusion of contaminants from a solid or liquid surface to the atmosphere, is dependent on the vapor pressure and heat of chemical vaporization, the partition coefficient between the atmosphere and any other phase, and the air flow mass which will transport the airborne chemical (Haque and Freed, 1974). In addition to these factors, volatilization is affected by the contaminant location. Obviously, a contaminant located at the soil surface is more likely to volatilize than a substance located within the soil profile or in submerged sediments.

Contaminants released into the environment will eventually come into contact with soils and sediments. Adsorption is the bonding of a compound onto the surface of a solid particle. The breaking of the bond and subsequent release of the compound is known as desorption. The tendency for a compound to adsorb to solids determines whether that compound will be transported primarily by water or moving sediment. PCBs, metals,

Figure 5.3. Processes Which Impact the Fate of Contaminants in the Environment.





The waterways of Waukegan Harbor offered individuals a mode of transportation as passengers on large vessels. The ships were used for excursions between Chicago, Waukegan, and Milwaukee.

phosphorus, and some organic compounds (particularly those which are not highly soluble in water) tend to adsorb to soils. Adsorption is dependent on the characteristics of the contaminant as well as soil or sediment characteristics such as organic matter content, particle size distribution, temperature, and moisture content (Freed and Haque, 1973).

Bioaccumulation is the absorption of chemicals into living organisms and the concentration of these chemicals within the food chain. Possible pathways for the concentration of contaminants in the ecosystem include ingestion of material from surrounding water and sediments, ingestion of precontaminated food, and uptake of compounds through physiological systems (e.g. transdermal or respiratory). The ability to concentrate contaminants and the relative importance of contamination processes depends on the species (Mason, 1981). Bioaccumulation also occurs at different rates for different substances. Fishing restrictions have been posted around the harbor. A picture of one of those signs is presented in Table 4.4. Restriction on fish flesh consumption are presented in Appendix C.

5.3.2. Transport of Contaminants to the Expanded Study Area

Contaminants may enter the Waukegan ESA via four pathways: direct discharge, surface runoff, groundwater discharge, and atmospheric deposition. Direct discharges generally involve point sources which empty directly into the harbor or one of the streams which drain the ESA. Examples of direct discharges include storm sewer outfalls, sanitary sewer overflows, industrial discharges, and treatment plant effluents.

Surface runoff may occur as either sheet flow (very, shallow uniform flow across a broad surface) or channelized flow. Both types of runoff contribute to nonpoint source pollution. Sheet flow picks up and transports constituents which are available on the soil surface or on impervious surfaces such as roadways, parking areas, and rooftops. In addition, sheet flow contributes to soil erosion and sediment transport. Channelized flow also contributes to soil erosion through channel scouring and bank cutting. Constituents which are carried by surface runoff may be transported in either dissolved in water or adsorbed onto eroded soil particles.

Constituents which dissolve in water may be transported via groundwater. The initial location of the contaminants may be either at the soil surface or underground. Groundwater frequently moves very slowly and, therefore, remains in contact with subsurface media for long periods of time. This protracted contact may allow the groundwater to pick up soluble components from the solids which constitute the media. Subsequently, groundwater may have "background" concentrations of some constituents, such as calcium, iron, and magnesium, which are greater than those commonly found in surface waters.

Airborne contaminants may be deposited onto land and water surfaces during both wet and dry weather conditions. Rates of air contaminant deposition depend on air quality characteristics and regional weather conditions. Deposition during dry periods (dry fall) includes gravitational settling of particulate matter and turbulent deposition of particulates and gases (NIPC, 1977). Generally, particles with mean diameters greater than 100 micrometers are subject to gravitational settling (IEPA, 1991). Wet deposition involves the transport of constituents in precipitation, also known as precipitation scavenging. Once deposited on soil or impervious surfaces, contaminants are available for further transport by surface runoff or downward movement into shallow groundwater.

5.3.3. Transport of Contaminants to Lake Michigan

As with contaminant transport into the Waukegan ESA, compounds transported out of the ESA and into Lake Michigan may be either dissolved in water or adsorbed onto sediments. Two transport processes affect dissolved constituents: advection and dispersion. Advection is the movement of dissolved material with the bulk flow of water. Lake phenomena which cause nearshore water flow include waves, longshore currents, seiches, and surges (Wapora, Inc., 1981). Dispersion is movement caused by the turbulence of fluid flow and molecular diffusion. Sediment movement in and near the ESA includes sediments transported in flows which discharge into the harbor (e.g. North Ditch and Waukegan River) and littoral drift of sediments from north to south along the coastline.

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The Waukegan beach offered a refreshing place to cool off during the hot summer months. The bathers pictured here were typical of the visitors seen at the beach during the early 1900s.

6. POLLUTANT LOADINGS

Contaminant sources considered in this evaluation include point, non-point, and in-place sources. Point sources generally refer to discharges emitted from structures specifically designed to carry wastewater and other effluent. Non-point sources, by contrast, are spatially distributed and usually involve the movement of contaminants with the hydrologic cycle. In-place sources are contaminated soils or sediments.

6.1. POINT SOURCES

Point source contaminants are those which are discharged from discrete locations. Point sources which are tributary to the Waukegan ESA may be divided into three categories: 1) sources related to domestic wastes including overflows from the Waukegan Sewage Treatment Plant (STP), discharges from cross connections, and exfiltration from exposed sewer lines; 2) industrial point sources including cooling and treated wastewater released from industries within the ESA and its tributary watershed; and 3) stormwater runoff generated in the ESA watershed which is transported via storm sewer.

Analysis of contaminant loads from point sources were conducted for the entire ESA watershed. However, it should be noted that only a portion of contaminants released into the upper portions of the watershed are delivered to Waukegan Harbor or Lake Michigan. Contaminants discharged at upstream locations, such as the North Branch of the Waukegan River (Yeoman Creek) are subjected to physical, chemical, and biological forces which may impact transport or the chemical characteristics of the constituent. Forces which are likely to impact constituent transport in the ESA watershed include settling, degradation, chemical transformation, and bioaccumulation.

6.1.1. Domestic Wastes

Transmission and treatment of domestic and industrial wastewater is under the jurisdiction of both the City of Waukegan and the North Shore Sanitary District (NSSD). The City of Waukegan oversees the collection and transmission of wastewater from individual locations to the Waukegan STP. The NSSD treats domestic and industrial wastewater at the Waukegan STP and discharges the treated effluent to the Des Plaines River.

Since 1978, treated effluent from the NSSD Waukegan STP has been diverted away from Lake Michigan and pumped to the Des Plaines River. The Waukegan STP discharges to Lake Michigan only under extreme wet weather flow conditions. All NSSD discharges are permitted under the NPDES program.

Influent to the Waukegan STP contains not only domestic and industrial wastewater, but also water generated by infiltration and inflow, which is non-sewage water that seeps into sewer pipes or is inadvertently discharged into the sewage collection system. Infiltration and inflow contributions to the Waukegan STP average 3.3 million gallons per day and peak at roughly 28.5 mgd (Greely and Hansen, 1980). During periods of extreme wet weather, infiltration and inflow may cause influent to exceed the capacity of the Waukegan STP. Excess flows are diverted to stormwater treatment facilities which have a combined maximum capacity of 38 million gallons. Discharge to Lake Michigan occurs only when the stormwater facilities are filled and influent to the STP continues to exceed the plant capacity. These discharges to Lake Michigan are settled and disinfected.

Excess flow from the Waukegan STP was discharged to Lake Michigan on three occasions during 1991 (IEPA, 1992). In total, excess discharge occurred over eight days. Observed flow rates and constituent concentrations as well as estimates of total flow volumes and constituent loads for each of the three discharge periods are presented in Table 6.1. Using observed phosphorus and chlorine concentrations from 1978 and 1979 and observed flows from 1991, NIPC estimated annual loadings of phosphorus at 1,300 pounds and chlorine at 1,160 pounds (NIPC, 1983).

An investigation conducted in 1991 by the IEPA uncovered a cross-connection, in which a storm sewer is connected to a sanitary sewer manhole, near the intersection of Utica and Washington Streets (Marek, 1991). The storm sewer discharges into the Waukegan River. A detailed evaluation of the sewer system to determine if other such cross-sections exist is needed to quantify the pollutant load from this potential source. The City of Waukegan has indicated its policy to improve its sewer systems to prevent the inflow of sewage into the Waukegan River and Lake Michigan (Durkin, 1994). The city is removing inflows of stormwater into the sanitary sewer as they are identified when city streets are reconstructed. A previously identified cross connection between sanitary and storm sewers at Utica and Washington Streets is in the final planning stage with construction anticipated shortly after funding is made available.

Several short sections of sanitary sewer which were originally installed below the Waukegan River have become exposed due to channel erosion in the river (Kroop, personal communications, 1991). Currently, these sewer sections are located within the flow of the river. This direct contact between the sewer pipe and river flow likely contributes to infiltration of river water into the sewer flow during periods with high water levels and exfiltration of sewage from the pipe into the river during periods with low water levels. To date, the impact of exfiltration from these sewer sections on river water quality has not been quantified. An extensive survey of the Waukegan River was completed in 1994.

Table 6.1. **Estimates of Flow Volumes and Contaminant Loads Released to Lake Michigan During Excess Flow Events at the Waukegan Sewage Treatment Plant (IEPA, 1992).**

Month	Duration of Flow days	Flow Rate mgd	Flow Vol[4] million gal.	BOD[1] Conc[5] mg/L	BOD[1] Load lb	TSS[2] Conc mg/L	TSS[2] Load lb	Fecal coliform[3] Conc counts/L
March	3	9.95	29.9	20	5000	37	9200	5100
April	4	12.12	48.5	17	6900	17	6900	2000
November	1	8.33	8.3	21	1500	40	2800	___

[1] Biological Oxygen Demand
[2] Total Suspended Solids
[3] Since fecal coliform and other organisms constitute dynamic living populations, loads cannot be estimated based on flow volumes and concentrations
[4] Volume
[5] Concentration

6.1.2. Permitted Industrial Discharges

Industrial discharges in and tributary to the Waukegan ESA must be permitted through the National Pollution Discharge Elimination System (NPDES). As discussed in Chapter 5, five industries within the ESA or its tributary watershed have been permitted under the NPDES program: Commonwealth Edison Company (CEC), Outboard Marine Corporation (OMC), Abbott Laboratories, the Frederick Gumm Chemical Company and Schuller International, Inc. (formerly, the Johns-Manville Corporation). In general, the permitted discharges are composed of contact and non-contact cooling water, wastewater, and/or stormwater runoff.

During 1991, CEC discharged an average of 689 million gallons per day into Lake Michigan (IEPA, 1992). This flow consisted of circulating water which receives discharges from six points as described in Chapter 5. The quality of discharged circulating water and the six individual discharges is reported monthly to the IEPA. Constituent concentrations (IEPA, 1992) and estimated annual loads from discharged circulating water at four of the six points are presented in Table 6.2.

OMC has eight outfalls. One outfall (007) enters Lake Michigan directly while a second (017/017A), enters Lake Michigan via the North Ditch. The remaining outfalls enter Lake Michigan via Waukegan Harbor. Outfalls 001 and 007 are non-contact cooling water and stormwater. Outfall 008 is an emergency overflow for 007. Outfalls 002 through 005 are rooftop runoff at the south plant. All runoff on the north plant property is now directed to outfall 017/017A. Presently, retention is being used to partially meet requirements at this outfall and further treatment is now under design.

Abbott Laboratories and the Frederick Gumm Chemical Company discharge only non-contact cooling water into Lake Michigan. Since this non-contact cooling water is not exposed to compounds which may be used within the facilities, it likely does not transport contaminants. NPDES permit requirements for both of these facilities require monitoring of flow, pH, and temperature only.

Polyfoam Packers Corporation discharged contact cooling water and condensate to a storm sewer tributary to Waukegan Harbor. These discharges were not permitted under the NPDES program. Polyfoam is no longer located within the ESA. Consequently, the discharge rates and chemical characteristics are not known. Polyfoam moved in 1992.

Table 6.2. Estimated Annual Loads Discharged from the Commonwealth Edison Waukegan Generating Station (IEPA, 1992).

Outfall Constituent	Flow Rate mgd	Constituent Concentration mg/L	Estimated Annual Load lb/yr
001[1]	172		
TRC[2]		0.2	104,780
001a	0.0592		
Hydrazine		0.033	5.9
NH_4-N		0.265	47.8
001b	0.0696		
TSS[3]		2.9	615
001c	3.591		
TSS		1.7	18,600
FOG[4]		<1	<10,900
Total Fe		0.08	875
001d	0.651		
TSS		2.8	5,550
FOG		<1	<1,980

[1] Circulating water discharge which includes discharges from outfalls 001a through 001f
[2] Total residual chlorine
[3] Total suspended solids
[4] Fats, oil, and grease

Table 6.3. Estimated Annual Loads Discharged from Outboard Marine Corporation Facilities (IEPA, 1992).

Outfall Constituent	Flow Rate mgd	Constituent Concentration mg/L	Estimated Annual Load lb/yr
001	0.047		
PCB		0.0004	0.06
007 and 008	0.376		
PCB		0.0003	0.35
014	0.021		
PCB		0.0008	0.05
TCE[2]		0.064	4.09
015	0.033		
PCB		0.0008	0.05
TSS[3]		19.6	1,970
Chloride		36.3	3,649
016	0.136		
PCB		0.0006	0.25
TSS		20.5	7,913
Chloride		86.5	35,836

[1] Fats, oil, and grease
[2] Tetrachloroethene
[3] Total suspended solids

6.1.3. Stormwater

The vast majority of the land area within the Waukegan ESA and its tributary watershed is serviced by storm sewers, especially residential, industrial, and commercial areas.

The distribution of park, industrial, commercial, and residential land use areas within the ESA watershed is depicted in Figure 6.1. Annual runoff volumes generated from each of these land uses were estimated using observed runoff rates in northeastern Illinois as presented by NIPC (1977b). The storm sewered area and estimated annual runoff volume for each of the four listed land uses are presented in Table 6.4.

Observed constituent concentrations in runoff as presented in the Land Use Runoff Sampling Program (MSD, 1978b) were used with the annual runoff volume estimates to obtain annual stormwater load estimates. Estimates for each of the four land uses and total estimated annual loads are presented in Table 6.5.

Stormwater runoff from current and former industrial sites may contain compounds relating to on-site industrial processes. For example, gypsum may be present in runoff from building product manufacturing sites and metals may be present in runoff from Abbott Labs, the former U.S. Steel site. Information concerning these industrial stormwater discharges is not currently available.

6.2. NONPOINT SOURCES

Contaminants released from nonpoint sources within the Waukegan ESA may be transported by overland flow (water flow across the land surface), flow in ditches and stream channels, eroded sediments, groundwater, and air. Nonpoint sources within the ESA watershed include urban, rural, industrial and suburban areas without storm sewers; streambank erosion; contaminated groundwater; atmospheric deposition; and discharges from watercraft. As with point sources, nonpoint sources which are generated in upstream areas of the ESA watershed are subjected to forces which impact transport and chemical properties. Consequently, some contaminants released from upstream areas will not be delivered to the lake.

6.2.1. Rural and Suburban Runoff

Generally, runoff generated in the watershed tributary to the ESA is transported by storm sewers. However, runoff from the section of Illinois Beach State Park which intersects the ESA boundaries (between the Dead River and the north boundary of Schuller International) is not sewered. Consequently, runoff and water quality constituents from this area may be considered a nonpoint source.

Figure 6.1. Land Use Areas within the Waukegan ESA and Tributary Watershed.

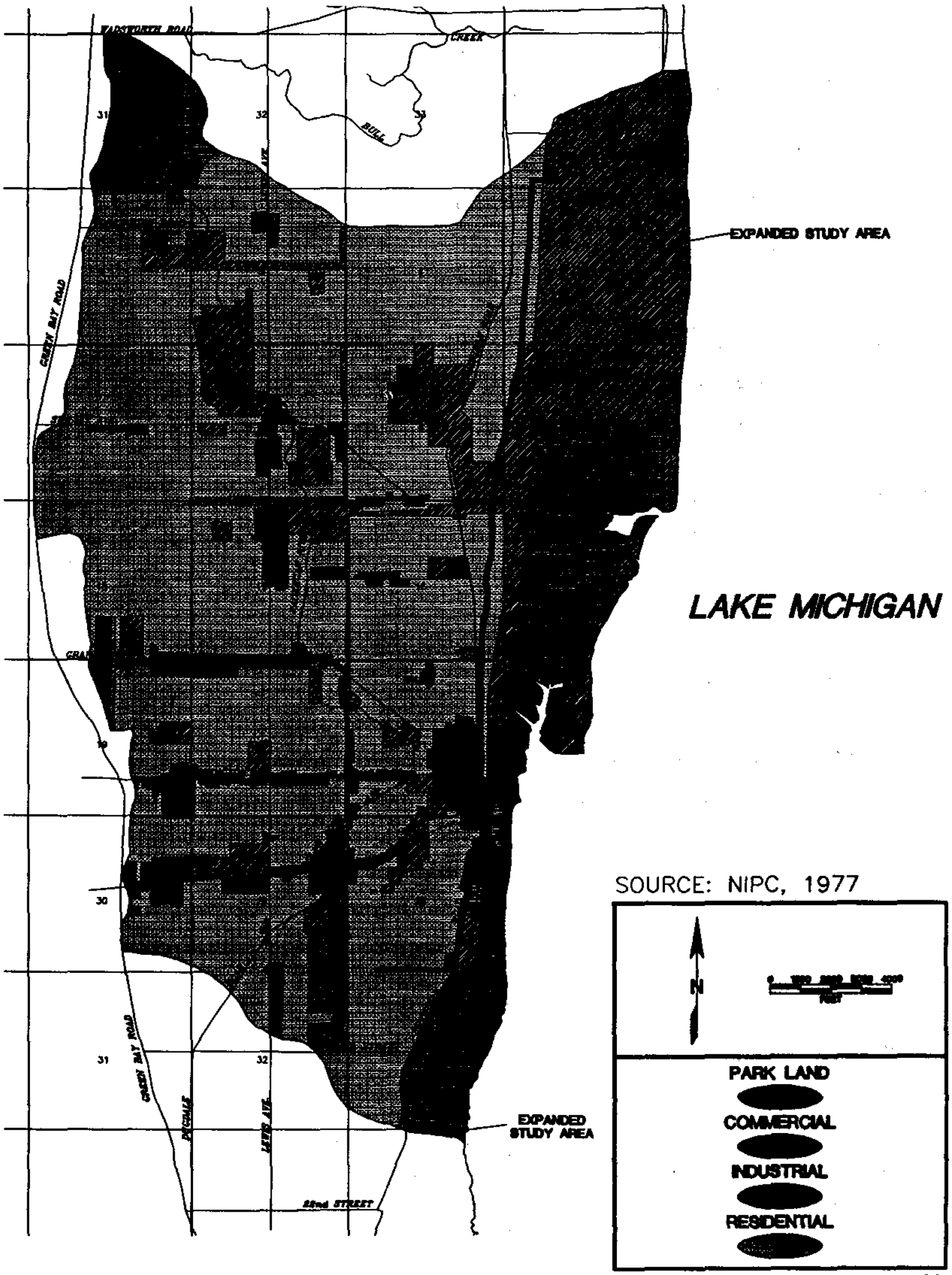


Table 6.4. Runoff Depths and Volumes for Land Use Areas Within the Waukegan ESA Watershed (NIPC, 1977b).

Land Use	Area acres	Runoff Depth inches	Runoff Volume million gallons
Park Land[1]	1,640	11	490
Residential	6,980	14	2,650
Commercial	860	26	610
Industrial	1,470	27	1,080

[1] Area does not include a 830 acre section of the Illinois Beach State Park

Table 6.5. Estimated Annual Stormwater Runoff Loads Generated in the Waukegan ESA Watershed (Based on estimated runoff volumes (Table 6.4) and constituent concentrations (MSD, 1978b).

	Land Use				
Constituent	Park Land lb	Residential lb	Commercial lb	Industrial lb	Total lb
TSS	139,700	11,370,700	1,957,300	2,716,000	16,184,000
VSS	30,000	1,197,300	221,600	326,600	1,775,000
TS	4,277,700	18,121,500	6,296,400	5,703,500	34,399,000
BOD_5	10,200	377,700	110,200	131,100	629,000
BOD_{20}	102,200	1,206,800	278,800	322,000	1,910,000
Kjeldahl-N	1,900	38,400	10,000	12,800	63,000
NH_4-N	400	11,300	2,600	3,700	18,000
NO_2,NO_3-N	800	30,400	8,100	11,000	50,000
Sol. P	200	3,000	1,200	1,700	6,000

The portion of the park south of the Dead River encompasses approximately 830 acres. The annual runoff volume generated on the park property was estimated using typical runoff quantities for northeastern Illinois as presented by NIPC (1977b). For forested and wetland areas, annual runoff is roughly 9 inches and the total annual yield from the 830 acre parcel is 200 million gallons.

The characteristics of runoff from wooded areas were examined by the MSD (1978b). These constituent concentrations were used in combination with the estimated annual runoff volume to calculate annual load estimates. Analyzed constituents and concentrations, and estimated annual loads are presented in Table 6.6.

6.2.2. Unsewered Urban and Industrial Site Runoff

All urban and industrial areas within the Waukegan ESA and its tributary area are serviced by storm sewers.

6.2.3. Streambank Erosion

Much of the sediment carried by the Waukegan River to Lake Michigan is contributed by stormwater runoff which is discharged to the river. However, erosion of the river banks also contributes to the sediment load. Streambank erosion and instability was a problem along the Waukegan River. The streambanks were stabilized by a program conducted in Powell and Washington Parks. The Waukegan River, its watershed, and the locations of Powell and Washington Park are depicted in Figure 6.2. The goals and activities of the streambank stabilization program are discussed in greater detail in Chapter 7. Streambank erosion also is likely to contribute to loads of other contaminants such as nutrients and BOD. However, the proportion of loads which may be attributed to streambank erosion as opposed to stormwater flow is not known.

6.2.4. Groundwater Discharges

Soil and groundwater quality has been studied at several locations within the ESA and the watershed tributary to the ESA. These locations include Schuller International, Inc. (formerly, Johns-Manville) Superfund site, the Waukegan Tar Pit, the OMC property, the Waukegan Manufacturing Gas and Coke, and Yeoman Creek landfill.

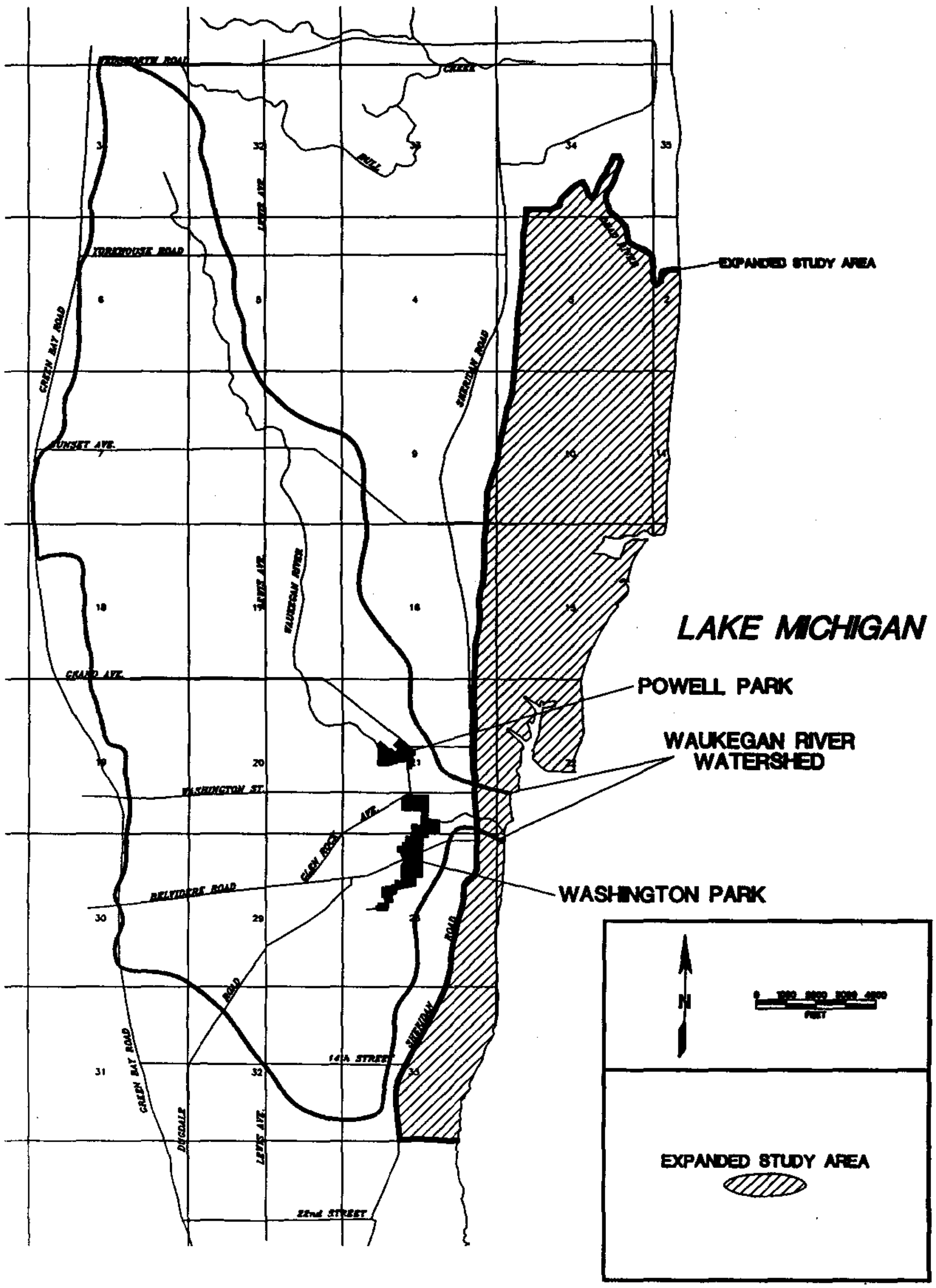
The general direction of groundwater flow at Schuller International is toward Lake Michigan (Malhotra and Associates, 1985). Since asbestos is a particulate contaminant, it is not highly mobile in groundwater. Consequently, loads of asbestos delivered to the lake from Schuller International in groundwater are expected to be negligible. The extent and movement of other groundwater contaminants from the site have not been quantified.

Table 6.6. **Estimated Annual Nonpoint Source Loads from the Southern Portion of Illinois Beach State Park.**

Constituent	Concentration[1] mg/L	Load lb
TSS	34.17	57,860
VSS	7.33	12,410
TS	1046.0	1,771,170
BOD_5	2.5	4,230
BOD_{20}	25.0	42,330
Kjeldahl-N	0.467	790
NH_4-N	0.100	169
NO_2,NO_3-N	0.200	339
Sol. P	0.042	71

[1] MSD, 1978b

Figure 6.2. The Waukegan River Watershed.



Free tar present in the Waukegan Tar Pit was excavated during a removal action completed in January 1992. In areas near the excavated tar pit, thin layers of tar have been identified in the sand overlying the clayey hardpan. Tar layers have been identified in certain areas located within roughly 300 feet east and 250 feet west of the excavated pit. The water table in the vicinity of the excavated pit is 1 to 3 feet below the ground surface. Groundwater flow directions are variable and appear to be affected by the nearby stormwater retention basins. Tar, tar mixed with soil, and oil coated soil from the Waukegan Tar Pit have been detected as deep as 25 feet below the soil surface (Barr Engineering, 1991). Lateral movement of these substances extends roughly 300 feet east and 250 feet west of the pit. The water table in the vicinity of the tar pit is 1 to 3 feet below the ground surface, but the direction of groundwater flow has not been established (Barr Engineering, 1991a).

In the vicinity of the North Ditch, groundwater is within 3 feet of the soil surface and is influenced by precipitation and the resulting flow in the ditch. Groundwater concentrations of PCBs up to 35,000 μg/L (parts per billion) had been detected. Subsurface flow near the west end of the ditch discharged PCBs into the North Ditch. These PCBs were then transported toward Lake Michigan. Subsurface flow near the east end of the ditch tends to move toward Lake Michigan. Before remediation, the contaminant plume was expected to reach the lake around the year 2010 and groundwater loads to the lake were estimated to be as great as 10 g/day by 2040 (USEPA, 1984).

A preliminary investigation of groundwater quality and flow was conducted on the Waukegan Manufacturing Gas and Coke Plant site before the construction of slip 4. Based on preliminary computer simulations performed for the Waukegan Harbor Trust in support of new slip construction (Geraghty and Miller, 1990), groundwater in the area was believed to flow toward Lake Michigan and Waukegan Harbor. The simulations indicate that a groundwater divide is located approximately down the center of the peninsula on the east side of the harbor. Groundwater elevation data were unavailable at that time to confirm the simulated flow patterns. Concentrations of phenols in 23 to 28 foot deep monitoring wells were detected at 130 and 296 mg/L (parts per million). The total PAHs concentration in a shallow well (12.5 to 17.5 feet deep) was 1.3 mg/L (Barr Engineering, 1991b). The ongoing remedial investigation will provide more detailed information on groundwater flow, direction, flow rates and quality. The additional information will be used to refine computer simulations and to assess potential contaminant loadings to the harbor or lake.

Leachate from the Yeoman Creek Landfill is suspected to have contributed PCBs and other pollutants to shallow groundwater below the site and to Yeoman Creek. Preliminary analysis of site geology indicates that two shallow aquifers may be impacted by the site. The first aquifer is composed of sand and gravel and is located roughly 30 to 40 feet below the land surface. The second aquifer also is sand and gravel but is deeper, located roughly 100 to 150 feet below the land surface. Throughout most of the site, the two aquifers are separated by a thick layer of silty clay. However, the aquifers appear to be hydraulically connected at the southwest corner of the site.

Groundwater flow is expected to be towards the south in the upper aquifer and towards the northeast in the lower aquifer (IDPH, 1990). Further remedial investigation of the site, including groundwater sampling and flow monitoring, is currently underway (USEPA, 1991).

Due to the historical and current industrial nature of the Waukegan Harbor and surrounding areas, other sites may influence groundwater contaminant loads delivered to the water resources of the Waukegan ESA. Further investigation into groundwater contamination and regional groundwater flow are needed to fully assess the impact on water quality in Waukegan Harbor and nearshore Lake Michigan. In December 1992, the IEPA completed installation of eight groundwater monitoring wells. Two rounds of sampling were conducted at each of the wells, the first on August 17 and the second on November 19, 1993. The three month interval between sampling rounds was designed to provide a view of groundwater during different precipitation conditions and to detect contamination that may be moving intermittently.

Water level readings were taken monthly including the days these samples were taken. Typically, one evening reading was taken between two daytime readings within a 24 hour period. Copies of water level readings and sample results are included in Appendices M and N. Metals were detected in all monitoring wells including the upgradient well. Iron and manganese were detected in concentrations significantly higher than levels allowable in public drinking water supplies. There are no wells providing drinking water in the Area of Concern. During the second round of sampling, cadmium and chromium were detected at levels that violate drinking water standards in one well, G-101S. Volatile and semi-volatile compounds were virtually non-existent in these samples. 1,1,1-trichloroethane was detected at approximately the same concentration in one monitoring well, G-104S. The concentration was at a level that violated drinking water standards. Bis (2-ethyl-hexyl) phthalate also appeared in some well results from both rounds of sampling. This semi-volatile is a laboratory contaminant. These monitoring well results do not indicate movement of significant quantities of contaminants through shallow groundwater. Consequently, there appears to be no significant loading of analyzed chemicals into Lake Michigan from shallow groundwater in this area immediately south of Waukegan Harbor.

6.2.5. Atmospheric Deposition

Contaminant deposition from the atmosphere occurs through dryfall, the result of particle settling and turbulent deposition, and wetfall, the transport of airborne contaminants with rainfall. Atmospheric deposition occurs throughout the ESA watershed, and contaminant loads which are deposited onto land surfaces may be transported to surface water sources by runoff. As a result, these contaminants are considered part of the stormwater runoff load. The atmospheric deposition load consists only of those contaminants which are deposited onto water surfaces.

For this analysis, the water surface used for estimation of atmospheric deposition loads included Waukegan Harbor and the nearshore area of Lake Michigan along the ESA. Waukegan Harbor has a surface area of approximately 37 acres. The nearshore area of Lake Michigan is arbitrarily defined as a 2 mile wide strip running the length (north to south) of the ESA. As defined, this nearshore zone has a surface area of roughly 7,680 acres.

Estimates of annual air deposition loads to the water area described above were made using deposition rates observed in the northeastern Illinois region (Gatz and Peden, 1980; NIPC, 1977a; Mason and Hanger, 1981). These deposition rates and corresponding annual load estimates are presented in Table 6.7.

6.2.6. Shipping Vessel Discharges

Commercial and recreational watercraft which use Waukegan Harbor and the waters adjacent to the Waukegan lakefront may contribute to contaminant loadings. Contaminants associated with watercraft include sanitary wastes, petroleum products and combustion byproducts, and garbage (USDI, 1968). Although watercraft discharges are now regulated (Subtitle C, Title 35, Ill. Admin. Code 308), illegal and inadvertent discharges within the harbor and nearshore areas are possible. There is no quantitative information available for discharges of this type.

6.3. IN-PLACE CONTAMINANTS

In-place contaminants are those which are already located within the water resources of the ESA, particularly contaminated sediments. The sediments of Waukegan Harbor, which have elevated concentrations of PCBs and metals, and contaminated soils directly adjacent to the harbor and Lake Michigan are considered in-place contaminants for this analysis.

Wastes generated and stored at Schuller International, Inc. (formerly Johns-Manville) included asbestos, lead, xylene, chromic oxide, and thiram. A containment facility was constructed on-site for the immobilization of these materials as part of the Superfund cleanup (USEPA, 1988). Groundwater, as well as containment facility soil cover, surface water, and air, will be monitored at the site for thirty years to ascertain the effectiveness of containment for limiting contaminant loadings (USEPA, 1988).

In 1990, asbestos-containing debris were found along the Lake Michigan shoreline between the CEC Waukegan Generating Station and the Waukegan beaches. A cleanup of the area was initiated by Schuller International and approximately 38 cubic yards of material were collected. An inspection of the nearshore lake areas, conducted with the direction of Schuller International, did not uncover additional asbestos debris (Neibergall, 1991).

Table 6.7. Air Deposition Rates and Estimated Annual Loads to Waukegan Harbor and Nearshore Lake Michigan.

Constituent	Deposition Rate: Dryfall lb/ac/yr	Wetfall lb/ac/yr	Annual Load[1] lb/yr	Source[2]
TSP	375	72	3,450,000	b
VSP	98	18	895,000	b
TOC	68	20	679,000	b
Inorganic C	12	5.0	131,000	b
Total P	0.37	0.11	3,700	b
NH_4-N	35	12	363,000	b
NO_3-N	18	4.3	172,000	b
Organic N	2.6	0.72	25,600	b
Total S	22	15	286,000	a
Soluble Ca	3.5	1.5	38,600	a
Soluble Mg	1.5	0.27	13,700	a
Soluble K	0.14	0.10	1,900	a
Soluble Na	3.0	1.2	32,400	a
Soluble Cl	4.7	0.43	39,600	a
Soluble SO	9.5	12	166,000	a
Total Zn	0.10	0.070	1,300	a
Insoluble Fe	2.5	0.72	24,800	a
Total Cu	0.016	0.016	250	a
Total Cd	0.0005	0.0005	8	a
Total Pb	0.10	0.046	1,100	a
PCBs	0.004	0.0007	36	c

[1] Assuming a water surface area of 7,717 acres

[2] a: Gatz and Peden, 1980
b: NIPC, 1977a
c: Mason and Hanger, 1981

The north portion of the OMC property, including the North Ditch, Crescent Ditch, and Oval Lagoon, was estimated to be contaminated with over 700,000 pounds of PCBs. Discharges of PCBs from the North Ditch to Lake Michigan in water and sediments were estimated to be roughly 7 to 20 pounds per year (USEPA, 1984). Contributions of PCBs from the North Ditch area to the atmosphere were estimated to be 15 pounds per year (USEPA, 1984). These areas have been remediated as part of the Superfund action at the OMC site.

Contaminated sediments in Waukegan Harbor were also a significant in-place source of PCBs. Harbor sediments were estimated to contain roughly 300,000 pounds of PCBs of which approximately 98 percent were in slip 3. Movement of dissolved and adsorbed PCBs from the harbor to Lake Michigan was estimated at 22 pounds per year, considering both steady and episodic transport. Depending on atmospheric conditions, volatilization of PCBs from the harbor ranged between 12 and 40 pounds per year (USEPA, 1984). Dredging contaminated sediments from the North harbor and slip 3 was the primary part of the Superfund action taken in 1992.

Contaminants of concern at the Waukegan Manufacturing Gas and Coke site include creosote, which contains polynuclear aromatic hydrocarbons (PAHs), phenols, volatile aromatics, metals, PCBs, and cyanide. A remedial investigation is ongoing to gather more detailed information on the nature and extent of contamination and to assess potential transport of chemical constituents to the Harbor and Lake Michigan (Barr Engineering, 1991b).

6.4. SUMMARY

The current analysis of contaminant load to Waukegan Harbor and nearshore Lake Michigan suggests the need for additional information concerning the nature and extent of contamination and contaminant transport. Future data collection should focus on those constituents which are directly related to impaired uses. To illustrate the relative impacts of contaminant sources, the estimated annual loads of three constituents, TSS, phosphorus, and PCBs, are presented in Table 6.8. Major contributing sources and additional data needs for selected contaminant groups are discussed below.

Suspended Solids

High concentration of suspended solids interferes with the recreational use and aesthetic enjoyment of these waters. Of the known sources, stormwater contributes the greatest load of suspended solids to the harbor and lake followed by atmospheric deposition. Resuspension of sediments in the harbor and nearshore lake area by watercraft traffic, water turbulence, and biological activity may exacerbate suspended solids concentrations but data is lacking. Streambank erosion in the Waukegan River also is likely to be a significant source of suspended solids. Collection of additional data on streambank erosion rates may be warranted.

Table 6.8. **Estimated Annual Loads to Lake Michigan from Sources Throughout the Waukegan ESA and Tributary Watershed.**

Source	TSS lb/yr	Phosphorus lb/yr	PCBs lb/yr
Point Sources			
Domestic Wastes			
NSSD Excess Flow	18,900	1,300	----[1]
Cross Connections	ID[2]	ID	ID
Exfiltration	ID	ID	ID
Industrial			
CEC	24,800	ID	----
OMC	9,800	ID	2.4
Abbott	----	----	----
Frederick Gumm	----	----	----
Stormwater	16,184,000	6,000	ID
Nonpoint Sources			
Unsewered Areas	57,860	71	ID
Streambank Erosion	ID	ID	----
Groundwater			
Schuller International	----	ID	ID
Greiss-Pfleger	----	ID	ID
Tar Pit	----	ID	ID
OMC	----	ID	0.0[3]
Wauk. Manuf. Gas & Coke Site	----	ID	ID
Yeoman Creek	----	ID	ID
Atmospheric			
Deposition	3,450,000	3,700	36
Shipping Vessels	ID	ID	ID
In-Situ Contaminants			
Schuller International	ID	ID	ID
OMC	ID	ID	29-42
Wauk. Manuf. Gas & Coke Site	ID	ID	ID

[1] Significant load contributions not expected
[2] Insufficient Data
[3] Discharge estimated to be 10 g/day by the year 2040

Nutrients

As with suspended solids, stormwater and atmospheric deposition are the principal phosphorus sources within the ESA watershed. Excess flow from the NSSD Waukegan STP also contributes phosphorus loads. Potentially significant phosphorus sources which are not quantified include cross connections and sanitary sewer exfiltration into the Waukegan River.

Nitrogen loads are primarily attributable to atmospheric deposition, although urban stormwater runoff also supplies significant loads. Since most forms of nitrogen are highly soluble in water, groundwater contamination by nitrogen and transport of nitrogen in groundwater flows is possible.

Biological Oxygen Demand (BOD)

Urban stormwater discharges are the main contributor of BOD to the Waukegan ESA. Additional significant sources may include discharges from cross connections and exfiltration from sanitary sewer lines.

Fecal Coliform

The only impaired use associated with fecal coliform is the closing of Waukegan beaches. These beach closings have been linked with fecal coliform discharges into the Waukegan River (Farrell and Budzinski, 1990). Principal sources of fecal coliform to the Waukegan River are likely to be discharges from cross connections, stormwater runoff, and water which exfiltrates from sanitary sewer lines. These contributions must be assessed to effectively and economically control fecal coliform discharges to the river. Fecal coliform discharges in excess flow from the NSSD Waukegan STP have not been shown to impact beneficial uses within the Waukegan ESA.

Metals

The primary identified source of metals are sediments within Waukegan Harbor and atmospheric deposition. Stormwater runoff may contribute copper, lead, and zinc. Further, surface, sediment, and groundwater discharges from the former U.S. Steel Site (now owned by Abbott Labs) and from the Diamond Scrap Yard may have elevated metals concentrations. Additional sampling is required to evaluate these potential sources.

Polychlorinated Biphenol (PCB)

PCB loading to the Waukegan ESA is well documented. Principal sources are atmospheric deposition and releases from contaminated harbor sediments and the North Ditch area.

PAHs.

PAHs have been identified at the Waukegan Manufacturing Gas and Coke plant and the Waukegan Tar Pit. Additional investigations will provide information for evaluating the transport of PAHs from the Waukegan Manufacturing Gas and Coke Plant site. PAHs also may be present in oils and fuels associated with other commercial/industrial activities in and around the harbor.

Phenols

The Waukegan Manufacturing Gas and Coke Plant site may be a significant source of phenols in the harbor area. Additional characterization of the extent of soil and groundwater contamination at the site will allow an evaluation of potential contaminant transport from the site. Phenols also are present at the Waukegan Tar Pit.

Chloride

Chloride in this environment usually results from the use of road salt. Chloride discharges in urban stormwater runoff are likely to be relatively high during the winter months when salt is used for snow control (Hey and Schafer, 1983).

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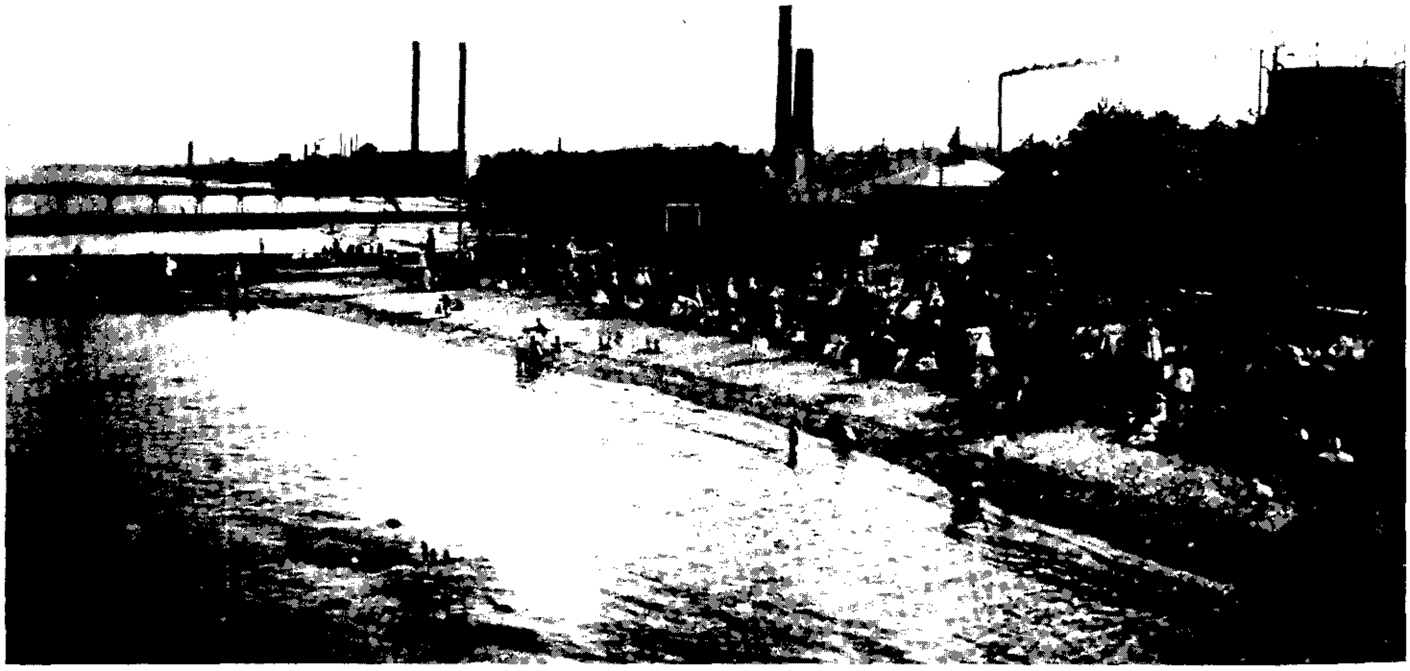


Waukeganites converged on the city's small beach in the 1920s in efforts to beat the heat. The right portion of the photo, which captures the tree-lined area, is now Siver Park, while the background gives a view of the still-standing Teece Pavilion, built in 1894.

7. HISTORICAL RECORD OF REMEDIAL ACTION

Many remedial actions have been completed or are currently in progress which will help to preserve and improve the quality of water resources in the Waukegan Expanded Study Area (ESA). Current and previous remedial activities include regulatory actions, remedial activities conducted by both the public and private sector, and sampling programs. Identification of these remedial actions and evaluation of their impact on impaired uses within the ESA will aid the identification and prioritization of remedial actions to be conducted in the future.

7.1. REGULATORY ACTIONS

Two general types of regulatory actions impact the Waukegan ESA. The first type limits harmful activities to provide protection to environmental conditions and public health. The second type of action regulates activities aimed at improving or preserving beneficial physical, chemical, and biological characteristics of the ESA water resources. In addition to these regulatory actions, several major guidance documents have been prepared to limit pollution potential.

7.1.1. Harbor Dredging Ban

Before 1969, Waukegan Harbor was dredged annually by the Chicago District Corps of Engineers. Spoils from pre-1969 dredging activities were disposed of at a deep water site approximately 3 miles east of the harbor. After harbor sediments were found to contain non-PCB contaminants in 1969, dredging was suspended while a diked disposal facility was developed and constructed as an alternative to deep water disposal. Preliminary designs for a diked disposal facility south of the harbor were completed in 1972. Dredging of the inner and outer harbor was halted after the discovery of PCB contamination in 1976 because of the lack of an approved confined disposal facility (USACOE, 1986; USACOE, 1989). Slip 3 was developed into an approved confined disposal facility in 1993. The North Waukegan Harbor was then dredged in 1993 to remove PCB concentrations greater than 50 ppm as part of remedial activities by the OMC Corporation. The Army Corps of Engineers dredged the mouth of the harbor in the summer of 1993 and it is scheduled to be dredged again in 1994.

Clean sands accumulate in the approach channel and necessitate the removal of 50,000 to 100,000 cubic yards of material every 2 to 3 years. Consequently, maintenance dredging of unpolluted sediments from the approach channel has been conducted routinely since 1974. Since this material is nonpolluted sand, it is suitable for deep-water disposal or use on upland areas. The total sediment accumulation in the outer harbor, entrance channel, and inner harbor is estimated to be roughly 50,000 cubic yards, 19,000 cubic yards, and 86,000 cubic yards, respectively (USACOE, 1989).

Restrictions on dredging activities is one of the listed impaired uses in the Waukegan ESA. Elimination of this impaired use is dependent on the further remediation of sediment contamination in Waukegan Harbor and the subsequent lifting of this dredging ban.

7.1.2. PCB Production Ban

PCBs were manufactured primarily by the Monsanto Chemical Company under the trade name Arachlor between 1929 and 1977 (USEPA, 1981). In total, 209 different types of PCBs, or congeners, are possible depending on the number and location of chlorine atoms on the biphenyl molecule. Mixtures of these congeners were used to formulate various Arachlors (WDNR, 1989). PCBs possess the characteristics of chemical and thermal stability, fire resistance, low conductivity, and low water solubility, which made them particularly suitable for many industrial applications.

The toxicity of PCBs became apparent in the 1960's. In the early 1960's, ranch-raised mink were fed Lake Michigan salmon contaminated with PCBs. Mortality and reproductive problems were documented. These problems were later linked to the PCB concentrations in the fish flesh. PCB toxicity to humans was demonstrated in Yusho, Japan, in 1968 after the contamination of rice oil with PCBs. Contamination victims suffered skin lesions, blindness, hearing loss, jaundice, and abdominal pain (USEPA, 1981).

In 1971, Monsanto voluntarily restricted its sales of PCBs to only closed system applications which would not release the compounds to the environment (Table 7.1.). The U.S. Food and Drug Administration (USFDA) originally established tolerance limits for PCBs of 5 parts per million in selected food products in 1973. The Toxic Substances Control Act of 1976 included a provision which banned the manufacture of PCBs for use other than in closed systems (USEPA, 1981). In 1977 the USFDA PCB tolerance limit was restricted to 2 parts per million (WDNR, 1989). Other agencies which have published guidelines for PCB exposure include the USEPA, the National Institute for Occupational Safety and Health (NIOSH), and the Occupational Health and Safety Administration (OSHA) of the U.S. Department of Labor.

Restrictions on PCB production will help to limit further environmental contamination. However, because PCBs are highly persistent, much of the PCB mass produced before manufacture was restricted is expected to still be in existence (USEPA, 1981).

7.1.3. Fish Consumption Advisories

Advisories for consumption of fish from the inner portions of Waukegan Harbor were first issued by the USEPA in 1981. The Lake County Health Department currently maintains fish consumption advisory postings throughout the harbor area advising that no fish taken in the old north harbor be consumed (Appendix C). Fish taken from Lake Michigan are subjected to lakewide consumption advisories. These advisories are published annually by the IEPA for all waters of the state in the Guide To Eating Illinois Sport Fish (IEPA, 1994).

Like dredging restrictions, fish consumption restrictions are among the listed impaired uses. Lifting of fish consumption restrictions relies on the reduction of fish flesh contamination. Reducing fish flesh contamination will likely require the reduction of ambient contaminant concentrations resulting in the reduction of contaminant concentrations in lower levels of the food web on a lakewide basis.

7.1.4. Water Quality Management Plans

The Illinois Water Quality Management Plan (IWQMP) is the official water quality management policy plan for the State of Illinois. In 1982, the IEPA consolidated an Areawide Water Quality Management Plan (AWQMP) for northeastern Illinois (NIPC, 1979) with three other plans covering the rest of the state to form the IWQMP (IEPA, 1982). The IWQMP places authority and responsibility for all of the state, including the northeastern Illinois planning area, with the IEPA and stipulates that the northeastern Illinois AWQMP be maintained by NIPC. Further, the IWQMP indicates that implementation of the northeastern Illinois WQM Plan be monitored by NIPC with oversight by the IEPA (IEPA, 1982).

These documents were developed to plan for the comprehensive control of water pollution in northeastern Illinois. The plans were mandated by the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500), which aim to establish and maintain good physical, chemical, and biological (fishable, swimmable) conditions in all U.S. water resources. Sections 101 (a) 5 and 208 of Public Law 92-500 require the preparation of water quality management plans for urbanized areas. In addition, Section 208 requires the identification of the governmental, political, and financial processes by which water quality management strategies will be implemented.

The AWQMP for northeastern Illinois consists of two parts. Part I (NIPC, 1979a) considers water quality management throughout the six county area which constitutes northeastern Illinois: Cook, DuPage, Kane, Lake, McHenry, and Will Counties. Part II (NIPC, 1979b) consists of water quality management plans for each of the thirteen major stream basins which exist in the northeastern Illinois planning area. The Lake Michigan North Basin, which contains the ESA and its tributary watershed, is defined as the portion of Lake County which drains into Lake

Michigan. The basin extends from the northern boundary of Cook County north to the Wisconsin state line and contains 34,100 acres.

Specific recommendations made in the Lake Michigan North Basin WQM Plan (NIPC, 1979b) which are applicable to the Waukegan ESA and its tributary watershed are described below. All recommendations have been completed except those indicated with an asterisk:

Point Source Discharges

- o Implement the North Shore Sanitary District's (NSSD) facilities plan (details of this plan are summarized in Section 7.2.),
- o Implement pretreatment of industrial wastes which are received by the NSSD,
- o Eliminate discharge of backwash wastes and residual wastes from the Waukegan water treatment plant to Lake Michigan,
- o Monitor discharges from the Commonwealth Edison Company's (CEC) Waukegan Generating Station,
- o Monitor other point sources through the National Pollution Discharge Elimination System (NPDES) program,

Nonpoint Sources

- * Reduce pollutants in stormwater runoff from urbanized areas by 50 percent,(ongoing)
- o Adopt measures to regulate stormwater detention, control soil erosion and sedimentation, control surface runoff from open storage yards, and control application of de-icing materials,
- * Evaluate the impact of air pollution on water quality and devise strategies for correcting existing negative impacts,(ongoing)
- o Evaluate sanitary landfills to assess compliance with siting, design, construction, and operation regulations,

Waterways

- o Prepare and implement a plan for removal of PCB contaminated sediments from Waukegan Harbor,
- o Assess dredging proposals and evaluate potential negative water quality impacts,
- * Identify and make available suitable dredge disposal areas,(ongoing)
- o Develop recommendations and plans for the coordination of channel maintenance and improvement operations,
- o Provide adequate disposal facilities at marinas and docks for wastes generated on watercraft,

Groundwater

* Monitor groundwater quality in areas where the potential for groundwater contamination currently exists or may exist in the future.(ongoing)

The IWQMP generally retained and updated policy recommendations contained in the AWQMP. The specific recommendations on point source discharges were incorporated into local facilities planning actions or actual NPDES permits for the facilities listed. The nonpoint source recommendations were retained with the exception of air quality impacts. Air programs are being implemented by the IEPA to control air discharges. The evaluation of landfills was delegated to IEPA's Solid Waste program. Recommendations for waterways regarding in-place contaminants were dropped from the IWQMP pending decisions on the then ongoing harbor cleanup discussion and litigation. A new section was added to the IWQMP to cover hydrologic modification of streams which incorporated NIPC's recommendations. Finally, the groundwater section of the IWQMP incorporates the AWQMP recommendations.

7.1.5. Lake County Watershed Development Ordinance

The Lake County Watershed Development Ordinance (LCWDO) contains specific provisions for the control of urban stormwater runoff pollution. This ordinance applies to both unincorporated and incorporated Lake County. The ordinance contains specific provisions which will increase stormwater pollutant removal by increasing stormwater infiltration and stormwater detention times. The requirements of the ordinance meets the IWQMP water quality management guidelines for pollutant removal. The ordinance also contains provisions to protect wetlands and to require soil erosion and sediment control measures for all new development near water resources (LCSMC, 1992).

7.1.6. Waukegan Remedial Action Plan

The Great Lakes Water Quality Agreement (GLWQA) of 1978 as amended in 1987 (IJC, 1989) lists specific objectives for the restoration and maintenance of "the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem." These specific objectives include the identification and remediation of Areas of Concern (AOC). Programs and measures called for in the Agreement include the development of a RAP for each AOC. Guidelines recommended that each RAP is to include the following information:

- A description of environmental problems in the AOC detailing impaired beneficial uses, the degree of impairment, and the geographic extent of impairment;
- Identification of the causes of the impairments including known and possible pollutant sources;
- An evaluation of previous remedial actions;

- Identification and evaluation of additional remedial actions;
- Identification of parties responsible for the implementation of remedial actions;
- Criteria for evaluating the effectiveness of implemented remedial actions;
- Development of monitoring procedures to document the impact of remedial actions and to indicate the restoration of beneficial uses.

As recommended by the Water Quality Board of the International Joint Commission (IJC) and as detailed in the Agreement, the eight Great Lakes states and the Province of Ontario agreed to prepare and implement RAPs. The state or province which has political jurisdiction of the AOC is responsible for preparation of the associated RAP. Currently there are 43 AOCs throughout the Great Lakes Basin. Of these, Waukegan Harbor is the only AOC within Illinois (IJC, 1991).

RAPs employ an ecosystem approach, considering land, water, air, and biota, for identification of impaired beneficial uses and proposed remedial actions. In addition, RAP development must include and facilitate public involvement. Development of the Waukegan RAP will aid the definition of environmental quality problems within the ESA; identification of gaps in existing data sources; definition of goals, objectives, and milestones for restoration of impaired uses; and prioritization of necessary remedial actions.

7.2. PUBLIC FACILITIES REMEDIAL ACTIONS

7.2.1. North Shore Sanitary District

As discussed in Chapters 5 and 6, effluent from the North Shore Sanitary District's (NSSD) Waukegan Sewage Treatment Plant (STP) was diverted from Lake Michigan to the Des Plaines River in 1978. Discharge from the Waukegan STP to Lake Michigan occurs only under excess flow conditions, when inflow exceeds the 19.8 mgd capacity of the plant and the 38 million gallon stormwater treatment facilities are filled.

In 1982, a facilities plan was developed for the NSSD, including the Waukegan STP and its tributary service area (Greeley and Hansen, 1982). The general purpose of the plan was to develop a "sound, cost-effective, energy-efficient wastewater management plan for the NSSD." Specific objectives of the facilities plan included:

- Evaluate existing facilities based on projected population in the service area,
- Investigate alternatives to landfilling sludge,
- Investigate reduction of excess flow discharges to Lake Michigan from the Waukegan and North Chicago STPs, and

- Investigate the feasibility of recovering methane from sludge digestion which could be implemented at Waukegan and Gurnee STPs.

Evaluation of the Waukegan STP indicated that the plant required expansion of the primary treatment clarifiers, first stage aeration, nitrification stage aeration, and recycle stream treatment to accommodate projected loads for the year 2000 (Greeley and Hansen, 1982). In addition, the 38 million gallon stormwater treatment facilities were found to be adequate. Landfilling of dewatered sludge was the recommended method of sludge disposal, but pilot scale investigation of land application and composting was suggested. In 1993 the Waukegan STP underwent expansion increasing capacity to 44 mgd (Chapter 10.1.). The stormwater treatment facilities and the sludge landfilling operations remain intact.

Investigations of the sanitary sewer system tributary to the Waukegan STP included an infiltration and inflow analysis conducted in 1975 and a sewer system evaluation survey conducted in 1977. Average annual infiltration and inflow was found to be 3.3 mgd and peak infiltration and inflow was found to be 28.5 mgd. Further activities concerning cross connections are discussed in section 7.2.5.

7.2.2. Waukegan Water Treatment Plant

Before 1988, the IEPA and the City of Waukegan occasionally received complaints about offensive taste and odor in the Waukegan public drinking water. A 1988 letter from the IEPA to the City suggested that the activated carbon, which had previously been used periodically, be used continually (IEPA, 1988). Modifications to the activated carbon feed rate were made in 1988 and no taste or odor problems have been reported since. To date, the City of Waukegan maintains a high quality of drinking water.

Other improvements which have been made to the Waukegan public drinking water supply include the use of polymer for water clarification to reduce the volume of sludge sent to the NSSD Waukegan Sewage Treatment Plant, rehabilitation of the harbor emergency intake to prevent the movement of harbor water into the raw water intake well, and conversion of the old Lake Michigan intake located roughly 1,000 feet into Lake Michigan to an emergency intake. In April, 1992, the IEPA sampled the Waukegan Water Treatment Plant for raw water, finished water, and sludge filtrate and found no organics, including PCBs (Appendix K).

7.2.3. Waukegan Port District

Since 1988, the marina located in the new harbor area has experienced nuisance growths of macrophytic vegetation, particularly in slip areas. The Waukegan Port District contracted for the harvesting of this vegetation and later purchased used harvesting equipment. Such vegetation growths are fairly common in shallow, quiescent lake waters and also have occurred at the North Point Marina located approximately 10 miles north of Waukegan in Zion, Illinois (Walker, personal communications, 1992).

The Waukegan Port District provides waste disposal facilities at the marina and boat launch within the Waukegan ESA. Three pump-out facilities, two in the new harbor and one in the Waukegan Harbor, are provided. Wastes from these facilities are discharged to the sanitary sewer system. In addition, the Port District provides approximately 90 garbage barrels throughout the harbor area. A fish cleaning facility is maintained at the new harbor. Fish scrap is being disposed of with other solid wastes; however, the Port District is considering using fish scrap as compost substrate (Walker, personal communications, 1992).

The Waukegan Port District has co-sponsored beachsweeps and a tire recycling project. The beachsweeps were held in 1992, 1993, and 1994. The tire recycling was held in 1993 and more than 3,000 tires were collected.

7.2.4. Waukegan River

The City of Waukegan has developed a program to reduce bank erosion along the Waukegan River (IEPA, 1991). Program objectives are to stabilize river banks in Washington and Powell Parks and to train local employees and private contractors in streambank stabilization methodologies. Specifically, the City of Waukegan implemented vegetative streambank stabilization practices (utilizing grasses, willows, and structures), and developed a plan for the management of the restored stream areas.

Implementation of vegetative streambank stabilization practices in the two parks and development of the management plan was completed in 1993. The project was sponsored in part through Section 319 of the Clean Water Act. The City of Waukegan supplied 40 percent of the project costs. IEPA provided the remaining 60 percent up to 200,000 dollars (IEPA, 1991). Stabilization of these streambanks has reduced erosion and, consequently, sediment loads to Lake Michigan. Reduction of streambank erosion has helped to prevent future exposure and destruction of sanitary sewer lines which are located along the stream channel thereby reducing exfiltration of sewage into the Waukegan River.

7.2.5. Cross Connections

In April 1991, the IEPA notified the City of Waukegan of a cross connection, in which a storm sewer is connected to a sanitary sewer manhole, near Utica and Washington Streets. The following month, the City acknowledged the cross connection and indicated that it would be corrected.

The City of Waukegan has indicated that it has a policy to improve its sewer systems to prevent the inflow of sewage into the Waukegan River and Lake Michigan (Durkin, 1994). The city is removing inflows of stormwater into the sanitary sewer as they are identified when city streets are reconstructed. A previously identified cross connection between sanitary and storm sewers at Utica and Washington Streets is in the final planning stage with construction anticipated shortly after funding is made available.

Elimination of cross connections which are tributary to the Waukegan River should reduce counts of fecal coliform in river water. It is this fecal coliform source which has been connected with recent closings of Waukegan North and Central beaches (Farrell and Budzinski, 1990). Elimination of cross connections should, therefore, reduce the number of beach closings.

7.3. PRIVATE FACILITIES REMEDIAL ACTIONS

Many of the private facilities within the Waukegan ESA and its tributary watershed are the subject of intensive remedial actions. Activities include site investigations, regulatory actions defining remediation needs, sampling programs, contaminant containment, and clean-up operations.

7.3.1. Schuller International, Inc.

Sampling for airborne asbestos at Schuller International, Inc. (formerly Johns-Manville) and at off-site locations conducted in 1982 by the USEPA indicated that concentrations of 2.5 to 15 μm (microns) and less than 2.5 μm (microns) asbestos fibers were in excess of safe concentrations. As a result of these findings, the site was placed on the National Priorities List (NPL) in December 1982, making the site eligible for the Superfund program.

An Administrative Order by Consent between Schuller International and the USEPA was issued in July 1985. Subsequently, a Remedial Investigation/Feasibility Study (RI/FS) and Risk Assessment were conducted. Findings of the RI/FS and the Risk Assessment indicated that levels of asbestos were high and Total Suspended Particulate (TSP) concentrations were greater than National Ambient Air Quality Standards (NAAQS). In addition, asbestos and lead concentrations were elevated in soil. Surface and groundwater were sampled; however, conclusions drawn from this sampling are suspect because the number of sampling locations and sampling rounds were limited. Preliminary results of surface sampling indicated that Lake Michigan contaminant concentrations were within the applicable standards. Preliminary results of groundwater sampling indicated contamination by asbestos and arsenic.

In June 1987, a Record of Decision (ROD) was signed by the USEPA with concurrence of the IEPA (USEPA, 1987). The ROD outlined actions to be taken to prevent release of asbestos and TSP to the atmosphere and to better quantify contamination of water resources. A Consent Decree for Remedial Design and Remedial Action (USEPA, 1988a), indicating that Schuller International would implement remedial actions outlined in the ROD, was issued in March 1988.

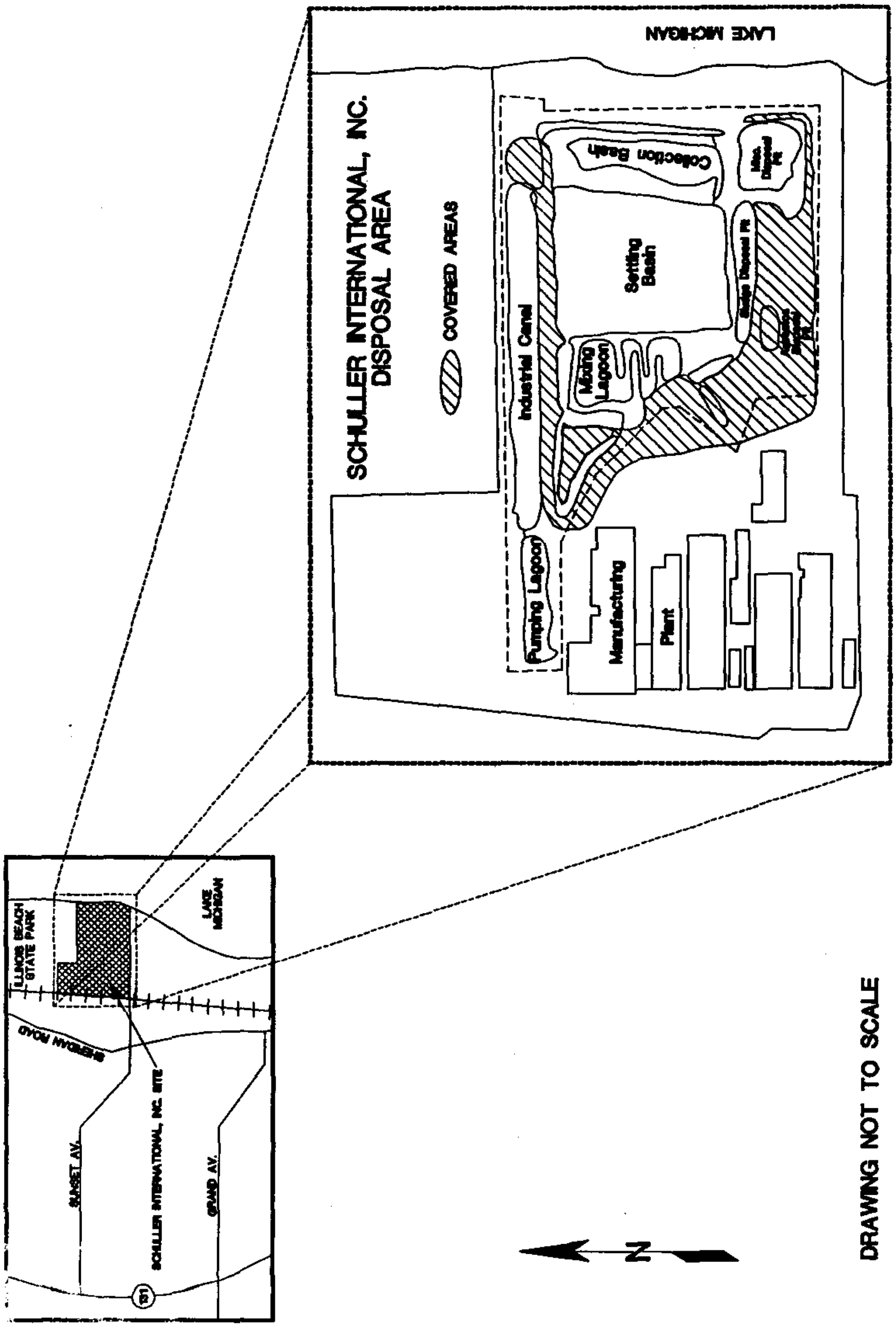
On-site remedial construction activities began in November 1988. Activities included placement of clean soil cover consisting of six inches of sand overlain by 12 inches of clay and six inches of topsoil on inactive waste disposal areas (Figure 7.1.). Vegetation was established and will be maintained on all soil cover. Sideslopes of the wastewater settling basins were treated with either a single layer of 12-inch riprap or the 24 inch soil cover described above. Asbestos-containing debris which had washed onto the lakeshore south of Schuller International was collected and placed in on-site containment areas. A 30-year groundwater monitoring program and a 15-year air quality monitoring program were developed. In addition, a program aimed at monitoring all soil cover was developed to limit erosion and ensure that asbestos does not reach the cover surface (Manville, 1988; 1989; 1990a; 1990b; 1991a). Construction activities were completed in August 1991. Remedial construction activities were concluded to be successfully completed during a final site inspection which was conducted by the USEPA in September 1991. Successful completion of construction activities was documented in a December 1991 Remedial Action Report prepared by Schuller International (Manville, 1991c). The total cost of remedial actions was estimated to be approximately 15 million dollars.

Operation and maintenance activities associated with remediation at Schuller International include soil cover inspection and maintenance and air, surface water, and groundwater monitoring (Manville, 1991b). As previously mentioned, surface and groundwater quality monitoring, as well as soil cover inspection and maintenance, will be conducted over a 30-year period. Air quality will be monitored for 15 years. Contingency plans provide for further remedial actions should contaminants at the site pose any future threat to public health.

Beneficial water resource uses within the ESA will be protected by containment of contaminated soils within disposal areas on Schuller International's property. Containment will limit transport of contaminants to the atmosphere and water resources. The effectiveness of containment to improve impaired uses will be documented through the long-term sampling program.

An NPDES permit was issued to Schuller International in September of 1993 for the recycle water overflow that discharges to Lake Michigan. Parameters for the permit are presented in Table 5.3.

Figure 7.1. Remediation Activities at the Schuller International, Inc. Facility (adapted from Manville, 1988; USEPA, 1988).



7.3.2. Griess-Pfleger Tannery

The site of the former Griess-Pfleger tannery is presently owned by the Commonwealth Edison Company (CEC). CEC would like to use the site for the installation of peakers, which are special generators that are used during periods of extremely high electricity demand such as during hot summer afternoons. CEC is coordinating a voluntary investigation and clean-up of the site with the IEPA. The IEPA approved the work plan in February of 1993 for an investigation which determined the nature and extent of the contamination at this site. Field work began in April and the results of this investigation are available for review at the Waukegan Public Library. Chromium and lead are considered to be the main contaminants of concern at the site.

7.3.3. Waukegan Tar Pit

The results of an assessment of the Waukegan Tar Pit site (Figure 7.2.), which involved the collection and analysis of two tar samples, were reported to the USEPA in October 1990 (Weston, 1990). Recommendations made in the site assessment report included development and execution of an extent of contamination study (EOC).

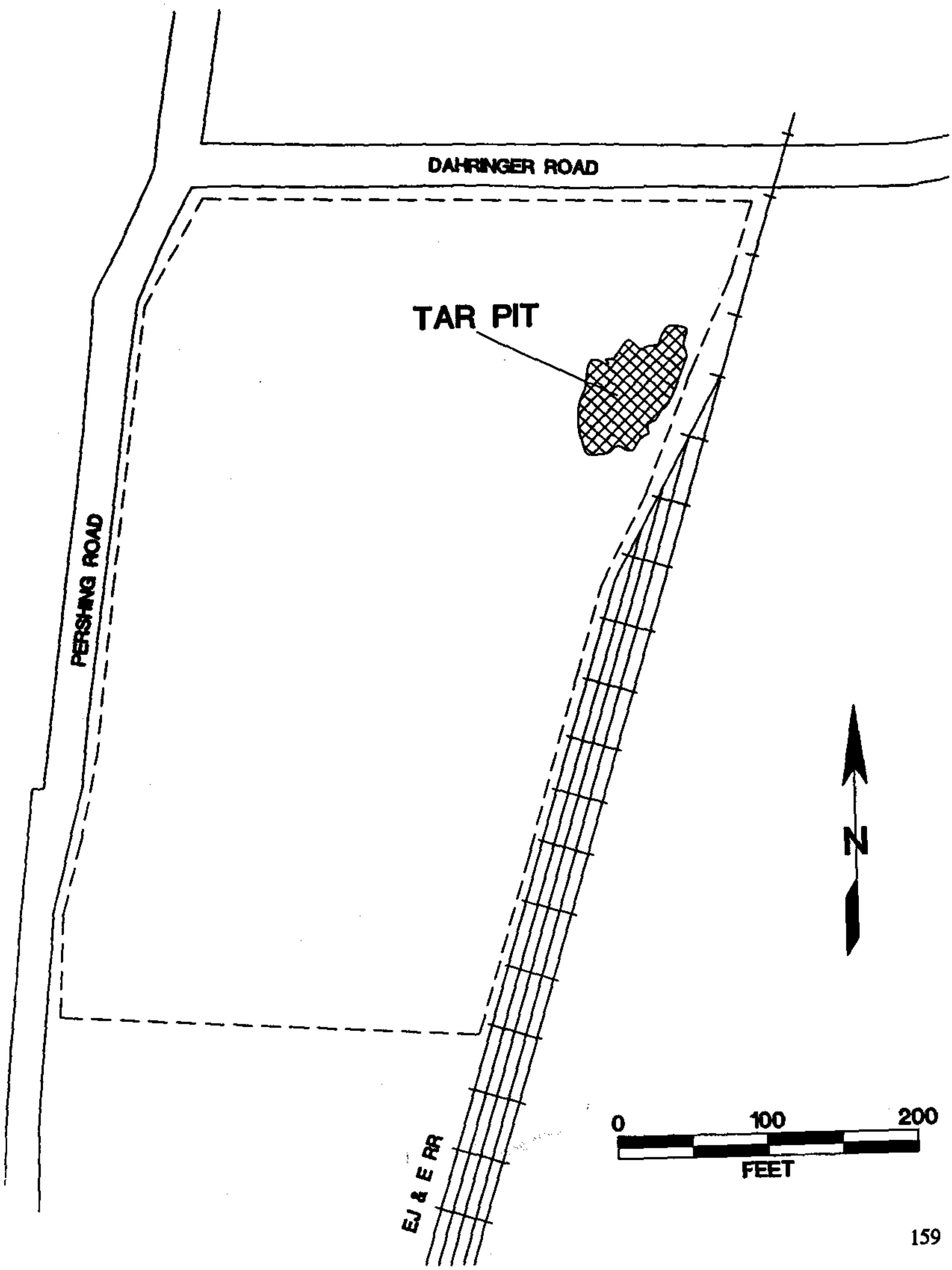
In November 1990, a request was made to the Emergency and Enforcement Branch of the USEPA for 42,800 dollars for the execution of the EOC (O'Mara, 1990). An Administrative Order by Consent was issued in early 1991 between the USEPA and three respondents: North Shore Gas Company; Elgin, Joliet, and Eastern Railway Company; and the NSSD (USEPA, 1991a). Directives included in the Order by Consent concerned the submission of a work plan for the EOC and its implementation. The EOC was conducted and results were reported in May 1991 (Barr Engineering, 1991b).

Free tar was excavated from the Waukegan Tar Pit in a removal action completed in January 1992 in accordance with the Consent Order. Removal of this material has reduced the potential for fire; for contamination of groundwater resources by tar and associated constituents; and eliminated the possibility of wildlife becoming trapped in the tar.

7.3.4. Outboard Marine Corporation

Elevated concentrations of PCBs in soils and harbor sediments near Outboard Marine Corporation's (OMC) Plant Number 2 were discovered in 1976 (USEPA, 1984). As discussed earlier in this document, roughly 300,000 pounds of PCBs were estimated to be in the sediments of slip 3 and the upper portions of Waukegan Harbor, and an additional 700,000 pounds of PCBs were estimated to be in the soils on OMC property near the North Ditch.

Figure 7.2. Plan View of the Waukegan Tar Pit Site (adapted from Barr Engineering, 1991).



Waukegan Harbor and the North Ditch area were placed on the first NPL in 1982. In 1984, the USEPA entered a ROD detailing remedial actions to be taken at the OMC site (USEPA, 1984). Litigation between the USEPA and OMC between 1985 and 1988 resulted in the postponement of remedial activities. An agreement between the USEPA and OMC was reached in October 1988 and a Consent Decree was filed with the U.S. District Court for the Northern District of Illinois. In March 1989, an amended ROD, which contained the final plan for remedial activities, was signed by the USEPA (USEPA, 1989). The Consent Decree was entered into the U.S. District Court in April 1989.

Remediation outlined in the 1984 ROD and the 1989 amendment encompasses four major activities: 1) construction of slip 4, 2) conversion of slip 3 into a containment cell and construction of two additional containment cells, 3) dredging and soil removal, and 4) thermal extraction (by the Taciuk Process) of PCBs from highly contaminated soils. Each of these four activities has been completed and is described below. A plan view of the OMC property depicting components of the remediation is presented in Figure 7.3. A flow diagram of remediation activities, including the Taciuk process is presented in Figure 7.4.

The Larsen Marine Company has historically used slip 3 for operations. Since slip 3 is to be filled as part of the OMC remediation, the amended ROD requires the construction of a new slip to accommodate the relocation of Larsen Marine. Construction of this new slip, slip 4, began in November 1990 and the slip was officially opened to the public in July 1991. Originally, construction of slip 4 was to have been initiated in the fall of 1989, however, contaminated soils were discovered in the area. This discovery led to an adjustment of the slip 4 location and the initiation of contamination studies at the Waukegan Manufacturing Gas and Coke Plant site. Investigations and other remedial activities at the Gas and Coke Plant site are described in Section 7.3.5.

For conversion to a containment cell, slip 3 has been isolated from the remainder of Waukegan Harbor by a cutoff wall. The cutoff wall consists of two steel sheets located 20 feet apart and extending 7 feet into natural clay beneath the slip. Each of the steel sheets is supported by steel braces which are set 12 feet into the natural clay under the slip. Bentonite, a clay material which is nearly impermeable to water, was used to fill the 20 foot space between the steel sheets. A rock berm was established on the harbor side of the cutoff wall to provide extra support and protection from wave action. The remaining three sides of the slip 3 containment cell consist of 3-foot thick vertical bentonite cutoff walls that extend 3 feet into the natural clay underlying the slip.

Additional containment cells have been constructed on the north portion of OMC property. The west containment cell encompasses the Oval Lagoon and the Crescent Ditch. As with the slip 3 containment cell, the west containment cell consists of 3-foot thick vertical bentonite cutoff walls that extend 3 feet into the natural clay underlying the site. The east containment cell incorporates the same design and is located in the parking lot area.

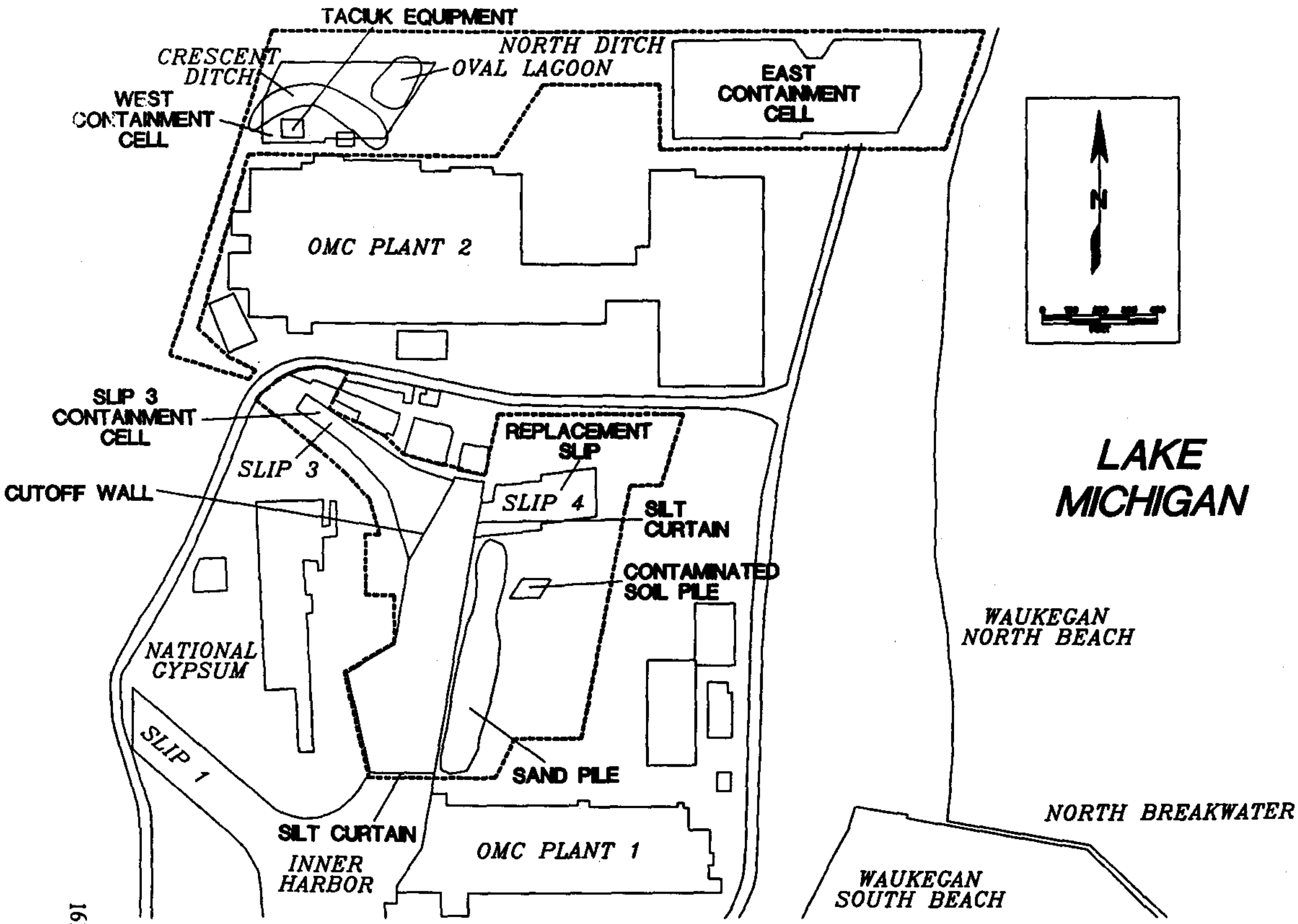
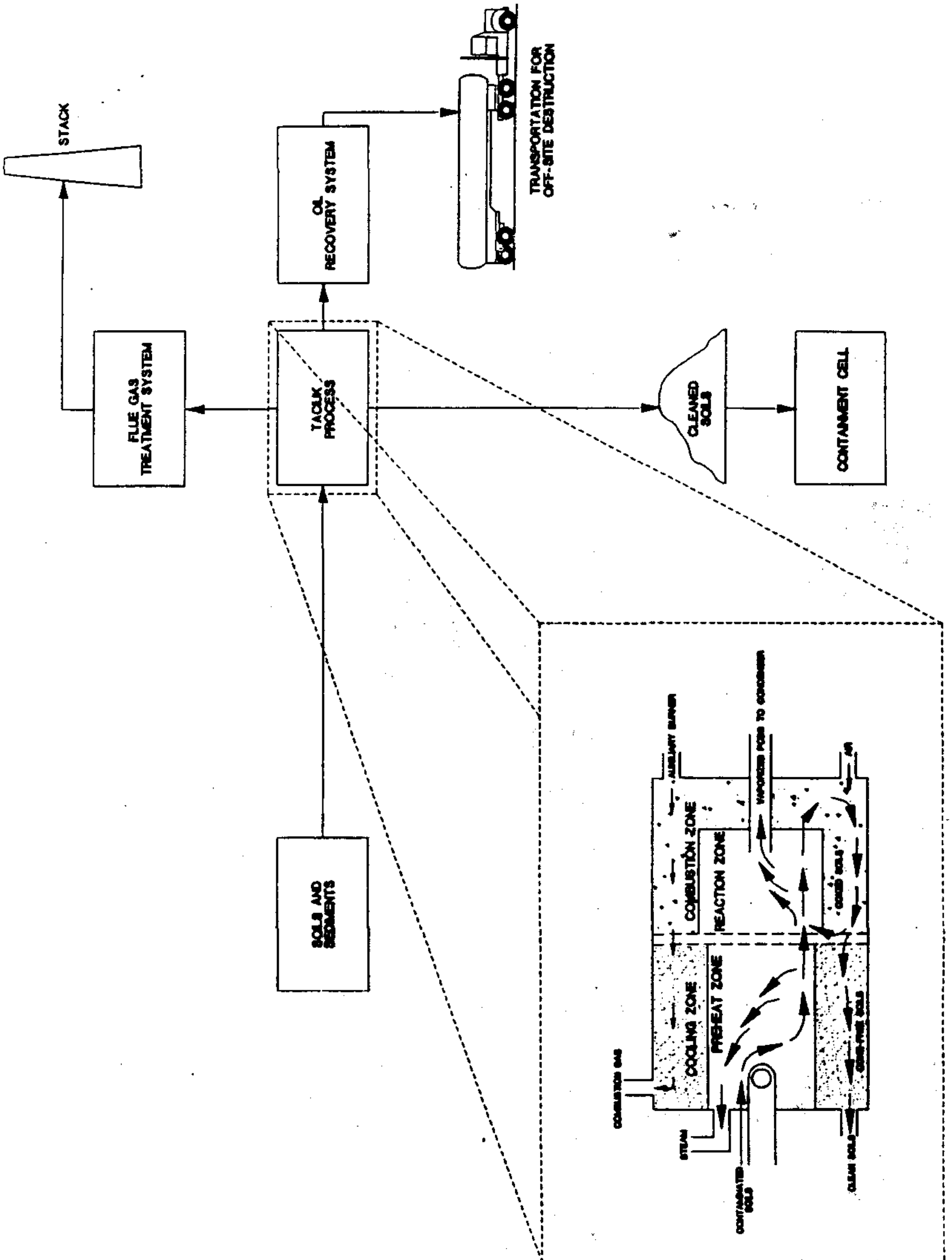


Figure 7.3. Remedial Activities at Outboard Marine Corporation (adapted from USEPA, 1991).

Figure 7.4. Flow Diagram of Remedial Activities at Outboard Marine Corporation (adapted from USEPA, 1991).



Dredging of highly contaminated harbor sediments began following the completion of the three containment cells. Contaminated material from slip 3 was moved to the west containment cell so that the slip 3 containment cell could be used to discharge contaminated dredge spoils. Dredging was accomplished with a hydraulic dredge which pumped loosened sediment from the harbor floor through pipes to the discharge area. To reduce transport of resuspended sediment, silt curtains were installed across the harbor and the entrance to slip 4 (USEPA, 1991b). Water quality was monitored to assure the effectiveness of the silt curtains.

Soils and sediments having PCB concentrations in excess of 500 mg/kg (ppm) were treated before final placement in one of the three containment facilities. The treatment utilized the Taciuk process and removed over 97 percent of PCBs in the treated material. The Taciuk process was conducted in a single enclosed unit referred to as an anaerobic thermal processor (ATP). Contaminated sediments and soils were transported to the ATP via a completely enclosed conveyor system. Once inside the ATP the contaminated materials were heated to approximately 1,100 °F in an environment which contains no oxygen. Under these conditions, the PCBs vaporize and separate from the solid material. PCB-containing vapors were collected and condensed to form an oily liquid. This liquid was transported off-site to be destroyed. Treated solids were placed in the west containment cell. Air quality was monitored near the ATP and at OMC site boundaries.

After all soils and sediments were removed, treated, and placed in containment cells, the cells were covered with clay and soil. In addition, the containment covers are being vegetated for stabilization and erosion control. Groundwater extraction wells located within the boundaries of each of the containment cells are used to keep the groundwater level inside the cells lower than that outside the cells. In this way, any groundwater which passes through the highly impermeable bentonite cutoff walls will move into the containment cells. All water removed from these extraction wells will be treated on-site and released.

In June 1992, the soil treatment phase of the Waukegan Harbor Superfund Project was completed. A total of 12,700 tons of PCB contaminated sediments were treated. Approximately 30,000 gallons of PCB oil, desorbed from the contaminated sediments, were returned to the potentially responsible party (PRP) trust for subsequent off-site disposal.

Remedial operations were completed in June 1993 at an approximate cost of 21 million dollars (USEPA, 1993). Removal of contaminated sediments from Waukegan Harbor should have a profound impact on many of the listed impaired uses identified in Chapter 4. Ambient concentrations of many constituents should be much lower in the harbor following sediment removal. Removal of PCBs in the harbor area is estimated at 96%. Any remaining sediments will not exceed 50 parts per million of PCB. These lower concentrations could lead to lower contaminants in fish flesh, making fish safer for human consumption. Dredging operations included in the clean-up will make the harbor more accessible to commercial traffic. In addition, new sediments which accumulate in the harbor should have substantially lower constituent concentrations and may make dredging restrictions unnecessary. Removal of contaminated sediments also should promote the development of a healthier benthos community and better fish habitat. Finally, treatment and containment of contaminated soils from upland areas of the site will reduce the potential of further PCB contamination in Waukegan Harbor and nearshore Lake Michigan.

7.3.5. Waukegan Manufacturing Gas and Coke Plant

Several soil investigations were conducted on the former Waukegan Manufacturing Gas and Coke Plant site between 1989 and 1991 in preparation for the construction of slip 4. In all, four sampling programs were completed, two by Canonie Environmental (Canonie, 1990a; 1990b), one by the IEPA, and one by OMC. Sampling results indicated the presence of elevated concentrations of polynuclear aromatic hydrocarbons (PAHs) and phenols (Barr, 1991b).

The USEPA, who has oversight of the investigation, identified OMC, North Shore Gas Company, and General Motors as "potentially responsible parties" (PRPs) for the Waukegan Manufacturing Gas and Coke Plant site. An Administrative Order by Consent was signed between the USEPA and the North Shore Gas Company in September 1990. Pursuant to that Administrative Order, a RI/FS work plan to evaluate soil and groundwater contamination on the site was prepared and submitted to the USEPA in 1991 (Barr, 1991b). The RI/FS, which includes detailed site surveys, groundwater and soil sampling, risk assessment, and remedial alternatives analysis, is expected to be completed in late 1995.

7.3.6. Diamond Scrap Yard

Roy F. Weston, Inc., a consultant for the Bank of Waukegan, conducted soil sampling at the Diamond Scrap Yard in 1991. Shallow soils at this site were found to contain detectable levels of inorganics, volatile organic compounds (VOC), polynuclear aromatic hydrocarbons (PAH), and polychlorinated biphenyls (PCB). The impact to groundwater was not evaluated. Asbestos was found in the buildings but most of it is considered nonfriable. Asbestos in this condition is less likely to pose a health threat.

Of the inorganics, cadmium, lead, cyanide, copper, and zinc appeared in the largest amounts. VOCs include solvents and cleaning materials as well as various chemicals found in petroleum products. Creosote (used for treating wood), diesel fuel, fuel oil, asphalt, and tire burning residues comprised most of the PAHs. Near the boiler and metal shears, PCBs were found.

Diamond Salvage ceased operations by the close of 1993. Much of the scrap and other debris was removed from the site by April, 1994. The Bank of Waukegan holds the property title.

7.3.7. Waukegan Paint and Lacquer

The site of the Waukegan Paint and Lacquer facility was inspected by the IEPA in September 1989 and was found to contain barrels, vats, and tanks both inside and outside the main building. An IEPA Record of Decision - Immediate Removal Action Required was issued in December 1989 and called for a two phase remedial action. Phase I entailed the staging, overpacking, and sampling of on-site substances. Phase II involved disposal of waste materials.

The IEPA conducted the Phase I portion of the Record of Decision in August 1991. The study revealed 201 drums, eight vats, and seven tanks on the property. Representative samples from one drum, one vat, and one tank were collected for analysis. Analytical results are summarized in Chapter 5, Table 5.6.

The Waukegan Citizens Advisory Group (CAG) contacted the USEPA Emergency and Enforcement Branch about potential hazards presented by solvents and other substances stored on the abandoned Waukegan Paint and Lacquer Company site (Farrell, 1991). The Waukegan CAG listed potential hazards through direct exposure; contaminant transport from the site, especially through volatilization; and fire or explosion potential.

A title search on the property was conducted for the USEPA in September 1991. The search revealed that the property was under the ownership of Waukegan Paint Company and that the owner was in the Waukegan area.

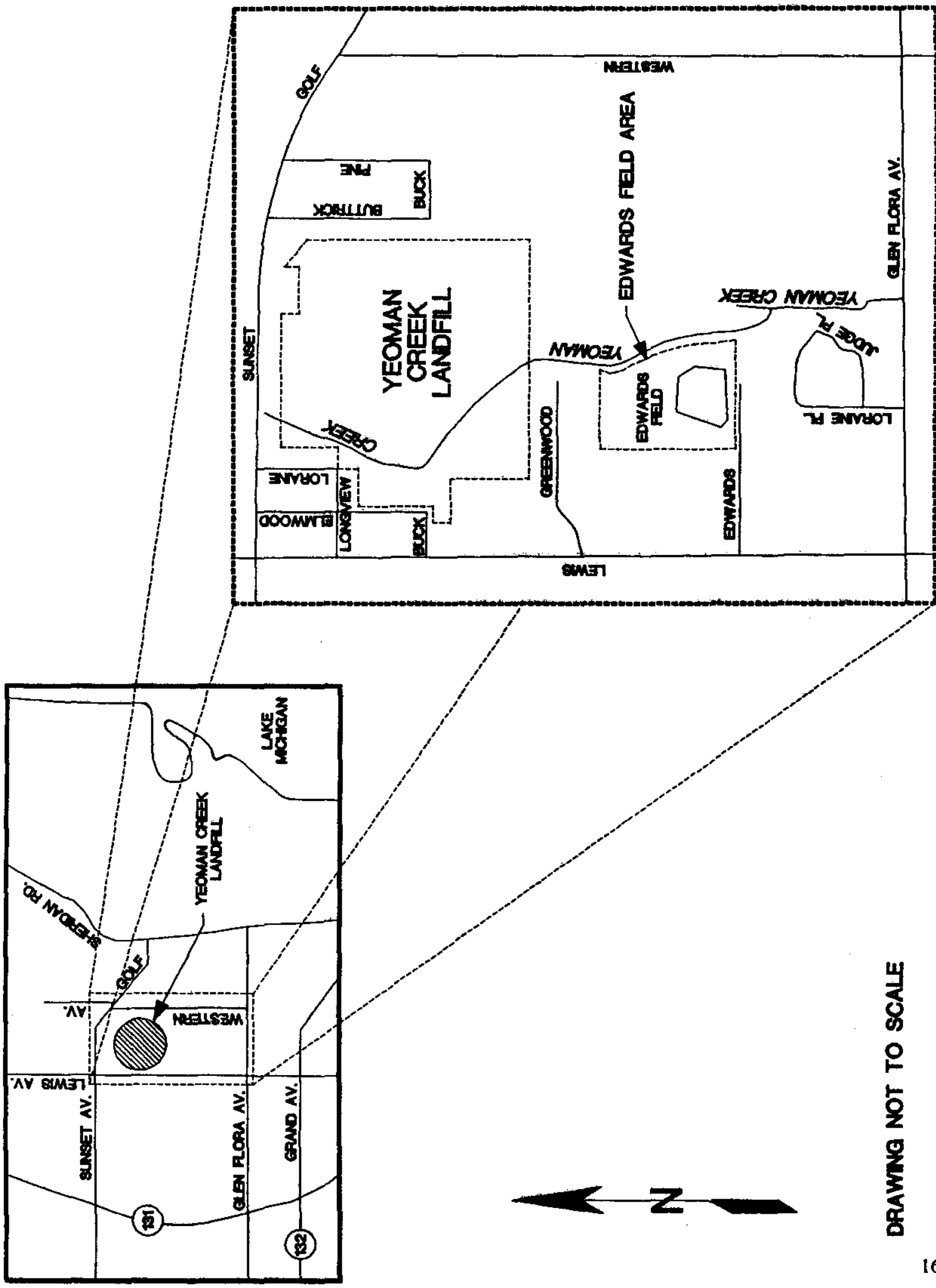
Development of a removal action plan was completed and submitted to the USEPA in October 1991 (Ecology and Environment, 1991). Actions included the removal of 13,000 gallons of liquid, 1,000 gallons of thick resins, 5 cubic yards of solid wastes, and 50 cubic yards of crushed drums. The estimated cost of removal was $ 206,000.

Removal actions at the Waukegan Paint and Lacquer site were completed in 1992. All highly explosive nitrocellulose materials have been transported off-site. Approximately 50 drums have been removed. Fire and explosion hazards have been eliminated and the potential for direct exposure and environmental contamination has been reduced.

7.3.8. Yeoman Creek Landfill

In 1969, sampling conducted by the IEPA indicated that leachate from the Yeoman Creek landfill (Figure 7.5.) was entering Yeoman Creek. Leachate movement was attributed to inadequate landfill closure (USEPA, 1991c).

Figure 7.5. Plan View of Yeoman Creek Landfill and Edwards Field (adapted from USEPA, 1991).



additional two feet of soil cover was applied to the landfill in 1980.

Between 1980 and 1984, the IEPA installed 22 monitoring wells throughout the site and conducted four rounds of sampling, including 7 leachate wells (IDPH, 1990). Sampling results indicated the movement of PCBs and other contaminants from the landfill into shallow groundwater and Yeoman Creek (see Chapter 5).

The USEPA conducted additional sampling of the site in 1985. The results of this sampling effort were used to place the Yeoman Creek landfill on the NPL in March 1989. An Administrative Order to develop and conduct a RI/FS for the site was signed in December 1989 by the USEPA and the IEPA with five potentially responsible parties: Browning-Ferris Industries, OMC, T.K. City Disposal Inc., the Waukegan School District, and the City of Waukegan. Additional measures dictated by the Administrative Order include the installation of a fence around the site and implementation of erosion and sediment control measures (USEPA, 1991). The Administrative Order was amended in March 1991 to add the Edwards Field area to the RI/FS. Fences surrounding the Yeoman Creek Landfill and the Edwards Field area have been installed to limit access to the site and public contact with contaminants. The RI/FS mandated by the Administrative Order is presently in progress as of early 1994.

7.4. SAMPLING PROGRAMS

7.4.1. PCB Monitoring

Throughout the duration of dredging activities for the OMC harbor clean-up, the Lake County Health Department (LCHD) collected raw water samples from the intakes of the Waukegan and North Chicago water treatment plants. Samples were collected from each location daily and were analyzed for PCBs. The two-year record of PCB sampling at these intakes indicated no movement of PCBs into the raw water supplies for Waukegan and North Chicago.

7.4.2. Groundwater Monitoring

The IEPA is developing a groundwater sampling program intended to characterize the quality and flow patterns of shallow groundwater sources in the portion of the Waukegan ESA south of the harbor. Eight wells were installed in 1992 at locations which will most likely reflect the impact of potential sources on groundwater quality. Two rounds of sampling were conducted at each of the wells, and a summary of the results appears in Chapter 6.2.4. Copies of water level readings and sample results are included in Appendices M and N (Michaud, Schacht, et al.).

7.4.3. Raw Water and Sediment Sampling

To capture worst case conditions which likely occur during turnover in Lake Michigan, the IEPA conducted sampling near the principal raw water intake for the Waukegan Water Treatment Plant in 1992 (reference: 7.2.2 and 4.1.9).

7.5. SUMMARY

A summary of important events and remedial actions effecting the Waukegan ESA is presented in Table 7.1. Identification of these actions will aid the development and prioritization of goals and objectives for future remediation.

Table 7.1. Important Events and Remedial Actions Affecting the Waukegan Expanded Study Area.

Year	Remedial Action	Impact
1968	Rice oil contaminated with PCBs in Yusho, Japan	Toxicity demonstrated
1969	Harbor sediments classified as polluted	Dredging restrictions
	Movement of landfill leachate from Yeoman Creek Landfill into Yeoman Creek discovered	Contamination identified
1971	Monsanto Chemical Company voluntarily restricts sales of PCBs	---
1973	USFDA establishes temporary tolerance limits of 5 ppm for PCBs	Fish consumption restrictions
1976	Manufacture of PCBs for other than closed systems banned in the United States	---
	PCB contamination of Waukegan Harbor sediments and soils on OMC property discovered	Contamination identified
1977	USFDA lowers tolerance limits for fish consumption for PCBs to 2 ppm	Fish consumption restrictions
1978	Effluent from the Waukegan Sewage Treatment Plant is diverted away from Lake Michigan	Improved water quality
1979	Areawide Water Quality Management Plan developed for northeast Illinois	Improved water quality
1981	Fish consumption advisories established for inner portions of Waukegan Harbor	Consumption restrictions
1982	Illinois Water Quality Management Plan developed	Improved water quality
	Schuller International, Inc. (formerly Johns-Manville) added to the National Priorities List	---
	OMC and Waukegan Harbor added to the National Priorities List	---
1984	Record of Decision (ROD) for OMC signed	---
1985	Administrative Order by Consent for Schuller International issued	---
	Litigation between the USEPA and OMC begins	---

Table 7.1. (continued) Important Events and Remedial Actions Affecting the Waukegan Expanded Study Area.

Year	Remedial Action	Impact
1987	RAPs are required for all AOCs	---
	Record of Decision for Schuller International, Inc. (formerly Johns-Manville) signed	---
1988	Constant feed of activated carbon initiated at Waukegan Water Treatment Plant	Improved drinking water
	Nuisance growth of macrophytic vegetation experienced at marina in the Waukegan new harbor	Recreational boating
	Consent Decree for Remedial Design and Remedial Action for Schuller International signed	---
	Remedial construction activities at Schuller International initiated	Improved air quality Improved water quality
	Consent Decree for OMC signed	---
1989	Amended Record of Decision for OMC signed	---
	Contaminated soils discovered at Wauk. Manuf. Gas & Coke Plant	Contamination identified
	Waukegan Paint and Lacquer site inspected	Contamination identified
	IEPA Record of Decision - Immediate Removal Action Required for Waukegan Paint and Lacquer issued	---
	Yeoman Creek Landfill added to the National Priorities List	---
	Administrative Order for Yeoman Creek Landfill issued	---
1990	Waukegan River found to be the source of the fecal coliform causing closures at Waukegan beaches	Beach closings Contamination identified
	Initial investigation of the Waukegan Tar Pit conducted	Contamination identified
	Remedial activities at OMC initiated	---
	Citizens Advisory Group formed and preparation of Remedial Action Plan begins.	---

Table 7.1. (continued) Important Events and Remedial Actions Affecting the Waukegan Expanded Study Area.

Year	Remedial Action	Impact
1991	Lake County Watershed Development Ordinance drafted	Improved water quality
	Waukegan River streambank stabilization program established	Improved water quality
	City of Waukegan notified of cross connection at Utica and Washington Streets	Beach closings Improved water quality
	Remedial construction activities at Schuller International completed	Improved air/water quality
	Administrative Order by Consent for the Waukegan Tar Pit issued	---
	Extent of Contamination Study for the Waukegan Tar Pit conducted	---
	Soil and groundwater tested at Diamond Scrap Yard	---
	Removal Action Plan for Waukegan Paint and Lacquer submitted	---
	Interagency Workgroup formed, June	---
1992	Removal of underground fuel storage tanks from Waukegan Port District	---
	Removal of drums containing hazardous waste and explosive nitrocellulose from Waukegan Paint and Lacquer.	---
1993	Waukegan Harbor dredging under OMC Consent Decree completed	Improved habitat, benthos, water quality, and sediment quality
	Remedial Investigation at Griess-Pfleger commenced	---
	Waukegan Gas and Coke is investigated by North Shore Gas	---
	Waukegan Tar Pit is excavated	Wildlife protected
	Stage I RAP submitted to IJC and USEPA (July 29, 1993)	---
1994	IJC review of Stage I RAP in January	---
	Stage II RAP public comment period March 1 to May 1	---
	Commonwealth Edison completes Phase I investigation of Griess-Pfleger Tannery in April.	---
	Stage II RAP revised and prepared for submission to IJC and USEPA	---

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8. GOALS AND OBJECTIVES FOR RESTORATION OF BENEFICIAL USES

The Waukegan Expanded Study Area (ESA) is vital to the economic and environmental well-being of Waukegan and Lake County, Illinois. The commercial and industrial activities along the lakeshore provide jobs. Recreational opportunities are diverse and include two public beaches on Lake Michigan, the Illinois Beach State Park, parks along the Waukegan River, marinas, and access to charter boat and pedestrian fishing. Restoration of impaired uses and enhancement of unimpaired uses in the ESA will support the further utilization of these amenities and may enhance the development potential of nearby urban areas.

8.1. PROCESS FOR ESTABLISHING GOALS AND OBJECTIVES

The goals and objectives presented in this chapter are the result of a cooperative process involving both technical experts and the public. After initial development, the goals and objectives were sent to members of the IEPA's Interagency Workgroup, a consortium of representatives from U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the Illinois Department of Conservation, the Citadel, the Illinois Pollution Control Board, and the Illinois State Geological Survey, for review and comment. The goals and objectives were revised, then submitted to the Waukegan Citizens Advisory Group (CAG) and its Technical, Habitat, and Site Review Subcommittees. The goals and objectives were revised and are being presented to the public as part of the Stage II RAP material. Final updates to the goals and objectives where completed following a 60-day public comment period.

8.2. GOALS

Goals for each of the 14 beneficial uses identified by the IJC (IJC, 1989) are presented in Table 8.1. Generally, goals for the Waukegan RAP aim to restore, maintain, or enhance beneficial uses. In situations where the status of the beneficial use is currently unknown, additional study of the use is specified as the goal. Objectives for each goal are presented in section 8.3. Accomplishment of goals will require the determination of a responsible party for follow-up together with adequate funding to accomplish goals according to priority.

8.3. OBJECTIVES

8.3.1. Restrictions on Fish and Wildlife Consumption

- Eliminate fish consumption advisories specific to Waukegan Harbor.

Table 8.1. Goals for the Waukegan Remedial Action Plan.

		Maintain/Enhance Current Quality	Provide Further Study	Provide Remedial Action
i	Restriction on Fish and Wildlife Consumption			
	Fish		X	X
	Wildlife		X	
ii	Tainting of Fish and Wildlife Flavor		X	
iii	Degradation of Fish and Wildlife Populations (diversity and abundance, including reproduction problems)			
	Fish		X	
	Wildlife		X	
iv	Fish Tumors and Other Deformities	X		
v	Bird or Animal Deformities or Reproductive Problems		X	
vi	Degradation of Benthos			X
vii	Restrictions on Dredging Activities			X
viii	Eutrophication or Undesirable Algae	X		
ix	Restrictions on Drinking Water Consumption or Taste and Odor Problems	X		
x	Beach Closings			X
xi	Degraded Aesthetics	X		
xii	Added Industrial Water Treatment Costs	X		
xiii	Degradation of Phytoplankton and Zooplankton Populations			
	Phytoplankton			X
	Zooplankton			X
xiv	Loss of Fish and Wildlife Habitat			
	Fish Habitat		X	X
	Wildlife Habitat		X	X

- Reduce contaminant concentrations in the Waukegan ESA which may influence lakewide fish flesh contamination.

- Evaluate flesh contamination in fish and wildlife which inhabit or use the Waukegan ESA.

8.3.2. Tainting of Fish and Wildlife Flavor

- Evaluate the impact of water and sediment contamination in the Waukegan ESA on the flavor of fish and wildlife.

- Evaluate ambient water and sediment concentrations of contaminants, such as phenols, which are associated with fish and wildlife tainting.

8.3.3. Degradation of Fish and Wildlife Populations

- Protect threatened and endangered species which inhabit or use the ESA.

- Protect the diversity of plant and animal life in the southern portions of Illinois Beach State Park.

- Evaluate and quantify use of the Waukegan ESA by fish and wildlife.

8.3.4. Fish Tumors and Other Deformities

- Maintain ambient water and sediment quality such that occurrence of tumors and deformities in fish do not appear.

8.3.5. Bird or Animal Deformities or Reproductive Problems

- Evaluate the impact of water and sediment contamination in the Waukegan ESA on deformities and reproductive problems in birds and animals.

- If bird and animal deformities and reproductive problems are discovered in the Waukegan ESA, studies would be needed to determine the cause associated with these problems.

8.3.6. Degradation of Benthos

- Maintain conditions which promote the development of healthy and diverse benthic populations in the nearshore waters of Lake Michigan adjacent to Waukegan.

- Remove contaminated sediments with PCB concentrations greater than 50 mg/kg (ppm) from Waukegan Harbor to prevent the spread of contamination to the nearshore waters of Lake Michigan.

- Promote improved water and sediment quality conditions in Waukegan Harbor. Allow the development of diverse benthic communities consistent with industrial and commercial use of the harbor.

8.3.7. Restrictions on Dredging Activities

- Remove, treat, and dispose of highly contaminated sediments (PCB concentrations greater than 50 mg/kg) from Waukegan Harbor which currently prevent dredging activities.

- Promote the development of a responsible dredging and disposal plan for moderately polluted sediments which may collect in the harbor in the future.

- Maintain quality of sediment in outer harbor.

- Maintain channel depths throughout the harbor which allow passage of fully loaded commercial vessels.

8.3.8. Eutrophication or Undesirable Algae

- Maintain water quality conditions, through appropriate management practices such as monitoring of stormwater and industrial discharges and installation of urban best management practices.

- Reduce discharges of nutrient rich effluent, such as those from sewer exfiltration.

8.3.9. Restrictions on Drinking Water Consumption or Taste and Odor Problems

- Protect the current quality of raw water as a municipal public water supply.

8.3.10. Beach Closings

- Identify and quantify sources of fecal coliform, such as cross connections or exfiltration from sewer lines, which impact the quality of the Waukegan River.

- Reduce fecal coliform contamination from the Waukegan River.

8.3.11. Degraded Aesthetics

- Maintain and protect the color and clarity of water in the harbor and in nearshore Lake Michigan.

- Promote activities which will improve the ambiance of the immediate harbor vicinity and the lakefront such as landscaping and maintenance of buildings and grounds of industrial facilities.

8.3.12. Added Cost to Industry

- Protect water quality so that additional treatment is not required before industrial use.

8.3.13. Degradation of Phytoplankton and Zooplankton Populations

- Provide water and sediment quality throughout the harbor and nearshore lake area which is not detrimental to the development and growth of phytoplankton and zooplankton populations.

8.3.14. Loss of Fish and Wildlife Habitat

- Protect the high quality habitat provided by the southern portion of Illinois Beach State Park.

- Maximize, to the greatest extent practicable in an industrial use situation, the habitat value of the Waukegan Harbor.

- Protect and enhance the habitat provided in the nearshore waters of Lake Michigan, especially through reduction of water and sediment contamination in the ESA.

8.4. APPLICABLE STANDARDS AND GUIDELINES

Goals and objectives for the Waukegan ESA were developed using the guidance of the Clean Water Act, the Great Lakes Water Quality Agreement, and state and federal water quality standards. In addition, these goals and objectives reflect the concerns of the public through input from the Waukegan CAG and its Technical, Habitat, and Site Review Subcommittees. Specific standards and guidelines which are especially applicable to the goals and objectives for the Waukegan ESA are discussed below.

8.4.1. Water Quality Standards and Guidelines

The Federal Clean Water Act establishes goals for water quality that support fishing and swimming. Attainment of the fishable goal requires water quality conditions which provide protection and propagation of balanced populations of shellfish, fish, and wildlife. Likewise, attainment of the swimmable goal requires water quality conditions which allow recreation activities in or on the water.

Four use designation categories for Illinois' lakes and streams are defined in Subtitle C of Title 35 of the State of Illinois Administrative Code: General Use, Public and Food Processing Water Supplies, Lake Michigan, and Secondary Contact and Indigenous Aquatic Life. General Use standards apply to the majority of streams and lakes in Illinois and are intended to provide a water quality which supports aquatic life, primary and secondary contact (e.g. swimming and boating, respectively), and agricultural and industrial applications. Public and Food Processing Water Supply criteria are more strict than General Use criteria and apply at the point at which water is drawn for potable water supply or for food processing. Lake Michigan standards, which were developed to protect the quality of water in Lake Michigan, are the most stringent among the four designated uses. Finally, Secondary Contact and Indigenous Aquatic Life standards, which apply to some streams in the Chicago area, support limited water uses (IEPA, 1990). Water quality criteria for General Use waters and Lake Michigan are presented in Chapter 4.

The Great Lakes Water Quality Agreement (Agreement) was developed with the purpose of restoring and maintaining "the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem" (IJC, 1989). The general objectives of the Agreement aim to protect the Great Lakes System from adverse impacts which may result from human activity. Adverse impacts include contamination of bottom sediments, concentration of floating materials at the water surface, degradation of the physical characteristics of water, and introduction of toxic contaminants and nutrients. IJC standards for specific constituents are presented in Appendix B.

8.4.2. Sediment Quality Standards and Guidelines

The USEPA has developed guidelines for pollution classification of Great Lakes harbor sediments (USEPA, 1977). These guidelines were developed to facilitate the identification of appropriate disposal locations for dredge spoils. Under these guidelines, sediments are classified as either nonpolluted, moderately polluted, or heavily polluted based on the concentration of the most prevalent sediment contaminants. Contaminant concentration ranges used to classify harbor sediments are presented in Appendix H.

The IEPA has published pollution classifications of inland lake sediments based on observed concentrations of samples collected in lakes throughout the State of Illinois (Kelly and Hite, 1981). The database used to develop these classifications included sediment samples from 63 lakes. Mean background contaminant concentrations were identified and the classifications were developed based on deviation from these background means. The IEPA four tier classification for inland lake sediments is presented in Appendix H.

8.4.3. Fish Consumption Guidelines

The U.S. Food and Drug Administration (USFDA) and the IJC have published recommended maximum contaminant concentrations in fish flesh. The USFDA guidelines were developed to protect the health of human consumers. The IJC guidelines were developed to protect human consumers as well as to protect birds and animals which may consume contaminated fish flesh. The IEPA has developed fish consumption guidelines based on the recommendations of the USFDA (IEPA, 1991).

8.4.4. Beneficial Use Guidelines

In defining the Remedial Action Plan process, the IJC identified 14 beneficial uses which could potentially be impaired as a result of contamination. These use impairments and the criteria used for their evaluation are listed in Table 4.1.

8.5. SUMMARY

The goals and objectives presented in this chapter aim to maintain, enhance, and remediate beneficial uses in the Waukegan ESA and were based on water, sediment, and fish and wildlife contamination standards and guidelines. After development, the goals and objectives were reviewed by representatives of federal and state agencies, the Waukegan CAG, and the general public. These goals and objectives are to be used to identify and prioritize future remedial actions to be conducted in the Waukegan ESA.

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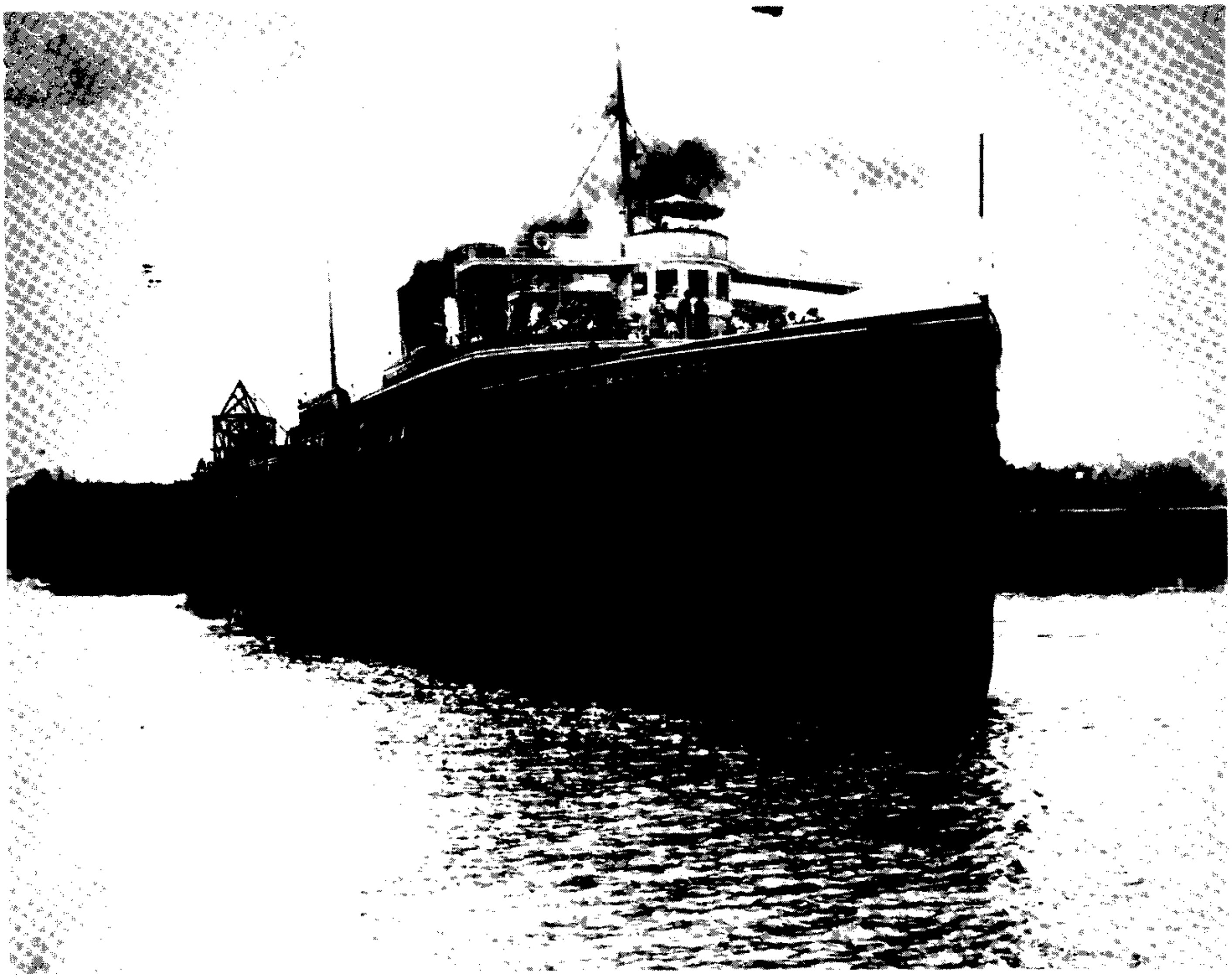

This photograph captured the Pere Marquette as it disembarks at the Waukegan Harbor. The ship was used for both excursions and freight. The vessel sank in Green Bay, Wisconsin on September 9, 1910 as the back gates took on water because it was overloaded. Twenty-eight people lost their lives.

9. PROGRAMS AND PARTICIPANTS

Numerous state, local, and federal agencies sponsor programs and activities which are applicable to the Waukegan ESA. Necessary remedial actions identified in Chapter 10 of the RAP may be supported by many of these agency programs. In addition, data describing the status of contamination in the ESA and its impacts on water resource uses (as defined by IJC) gathered by ongoing monitoring activities may help to better define use impairment status and needed remedial actions. Certainly, coordination of future remedial activities with established programs will facilitate a timely and cost effective restoration of the water resources in the Waukegan ESA.

Remediation of the Waukegan ESA will reflect the needs and concerns of the public. Consequently, public response to the ESA and RAP process must be obtained. Public participation measures and agency programs applicable to the Waukegan ESA are discussed in this chapter.

9.1. STATE AGENCIES AND PROGRAMS

9.1.1. Illinois Environmental Protection Agency (IEPA)

Water Quality Standards

General use and Lake Michigan water quality standards apply to the water resources of the Waukegan ESA as described in Chapter 8. Illinois general use and Lake Michigan water quality standards will be updated to reflect the recommendations of the Great Lakes Water Quality Initiative when federal criteria and guidance is final.

Illinois Water Quality Management Plan

In accordance with the Great Lakes Critical Programs Act of 1990, the Illinois Water Quality Management Plan (IWQMP; IEPA, 1982) will be updated to include the goals and objectives of the Waukegan RAP. Modifications to the IWQMP are in accordance with the terms of the Critical Programs Act of 1990 (P.L. 101-596).

Monitoring Programs

In cooperation with the city of Chicago, the IEPA provides ambient water quality monitoring in nearshore Lake Michigan. Sampling locations for the North Shore Lake Survey extend northward to waters near Waukegan. The northern sampling point is located approximately one mile east of the entrance to Waukegan Harbor (IEPA, 1990a).

The IEPA also monitors raw and finished drinking water at the Waukegan Water Utility water treatment plant in accordance with the Safe Drinking Water Act. The IEPA has sampled sediments near the intakes of the primary and emergency raw water intakes. Finally, a groundwater monitoring program was initiated in 1993 utilizing eight monitoring wells located south of the Waukegan River (Appendix L).

Point Source Control Programs

Within the state of Illinois, the IEPA administers the National Pollutant Discharge Elimination System (NPDES) program and is, therefore, responsible for permitting and monitoring discharges. As described in Chapter 5, the Waukegan ESA contains three permitted discharges: from the Commonwealth Edison Company Waukegan generating station, the Waukegan sewage treatment plant, and the Outboard Marine Corporation (IEPA, 1991b; IEPA, 1990b; IEPA, 1987). Two additional dischargers, Abbott Laboratories and the Frederick Gumm Chemical Company, are tributary to Lake Michigan (IEPA, 1989; IEPA, 1990c).

401 Water Quality Certification

The IEPA requires Water Quality Certification for all discharges into waters of the state and wetlands and dredging activities. Certifications are issued under Section 401 of the Clean Water Act and require that the applicant not cause violations of applicable Illinois Water Quality Standards, water pollution, or interference with water use practices.

Nonpoint Source Control Programs

Section 319 of the Clean Water Act requires a comprehensive assessment of nonpoint source problems in the state. This section also requires the development of a nonpoint source management plan that identifies programs to control these problems. The IEPA is the lead agency coordinating statewide nonpoint source pollution control efforts. This coordination eliminates duplication of efforts and provides a comprehensive statewide program. Section 319 provides federal grants to assist the state in implementing the management plan for nonpoint source pollution control. The IEPA uses these federal grants to provide up to 60 percent of the cost of demonstration projects for controlling nonpoint source pollution.

Water Pollution Control Revolving Fund

The IEPA manages a financial assistance program which provides low interest loans to municipalities for improvements to their wastewater facilities. The IEPA also manages a federal and state grant assistance program for wastewater facilities. However, only those communities currently scheduled for funding will receive grant assistance as no new appropriations are currently anticipated for either of these two grant programs.

Solid Waste Management

The IEPA oversees three solid waste management programs, the Solid Waste Permit Program, the Industrial Materials Exchange Service, and the Used Tire Program. The Solid Waste Permit Program administers the permitting of all landfills and other solid waste treatment facilities. The Industrial Materials Exchange Service allows waste generators to anonymously list waste products which may be useful as resources in other industries. This waste reuse service is one of the largest in the United States. Finally, the Used Tire Program aims to keep discarded vehicle tires out of landfills and to prevent tire burning. Within Waukegan the CAG has sponsored and supported the IEPA's Used Tire Program. At a collection event in 1993 approximately 3000 tires were collected for recycling.

Hazardous Waste Management

Illinois' hazardous waste management programs fall into three categories: those dealing with hazardous wastes which have been discarded improperly, those hazardous wastes which are currently being generated, and hazardous household wastes. The Pre-Remedial program conducts preliminary assessments of sites where improper hazardous waste disposal is suspected of posing a threat to human health and the environment. Approximately 1,300 Illinois sites are listed on an inventory of suspected sites. Four sites within the ESA are on this inventory. Improperly discarded hazardous wastes may also be handled through the federal Superfund program or through the Clean Illinois Program. Two remedial pathways are available through the Clean Illinois Program. The Immediate Removal Program applies to sites which present a hazard which requires immediate remediation. The other program, a pre-notice site program allows private parties to cooperate with the IEPA for the design and implementation of hazardous waste remediation.

Current generation of hazardous wastes in Illinois requires permitting through Resource Conservation and Recovery Act (RCRA). Waste generators must explain the process resulting in waste generation, estimate the quantity of waste generated, and describe the method of waste disposal. Within Lake County there are four facilities with RCRA permits: Abbott Laboratories, Browning-Ferris Industries, Fansteel Inc., and Outboard Marine Corporation, which has two RCRA permits. Within Illinois, RCRA permitting is supervised by the IEPA.

Pollution Prevention

Partners in Pollution Prevention is a voluntary program conducted by the IEPA Pollution Prevention Office. This program was launched at a meeting of Great Lakes governors and USEPA in 1991. Companies that join develop a strategy to prevent or reduce pollution at the source. Of the 186 Partners in Pollution Prevention in Illinois, three are within the ESA. These three are Abbott Laboratories, Commonwealth Edison and Schuller International. In addition, the North Shore Sanitary District has met with the IEPA Pollution Prevention Office to discuss pre-treatment and other waste minimization options that may be practiced both within and adjacent to the Area of Concern.

As part of an initiative aimed at small business, the Pollution Prevention Office is working with the chamber of Commerce, trade associations, and local groups such as the League of Women Voters, to promote pollution prevention activities. Waste minimization, recycling, raw material substitution, and production changes are the main topics being discussed with small business.

Household Hazardous Waste Collection

In cooperation with local sponsors, the IEPA holds "Household Hazardous Waste" programs at various locations across the state. During these programs, local citizens may bring in hazardous household substances such as pesticides, painting supplies, and cleaning supplies, for proper final disposal. The Waukegan CAG is working with IEPA to have a household hazardous waste collection day in Waukegan.

Air Quality Management

Air quality management and monitoring is provided throughout Illinois by the IEPA. Air quality management activities include the evaluation of air pollution trends, attainment of air quality standards, and development of emissions criteria. Air monitoring is conducted statewide for a variety of pollutants including particulate matter, sulfur dioxide, ozone, carbon monoxide, lead, and nitrogen dioxide. The IEPA also issues operating permits and construction permits which may result in new emission sources and the installation of air pollution control equipment. The IEPA maintains an air quality monitoring station in Waukegan at the North Fire Station at the corner of Golf and Jackson (IEPA, 1991a).

9.1.2. Illinois Department of Conservation (IDOC)

Fish Stocking

The IDOC stocks fish in the waters of the Waukegan ESA. Fish stocking originally occurred in Waukegan Harbor, but was relocated to the open waters of Lake Michigan to the south of the harbor in 1980 following the discovery of sediment contamination. In 1983, fish stocking was relocated to the new boat harbor. A typical fish stocking consists of 150,000 chinook salmon and 100,000 coho salmon in the spring, and 25,000 each of brown trout and rainbow trout from early summer to early fall (R. Hess, IDOC, personal communications, 1992).

Fisheries Monitoring

An open lake survey is conducted by the IDOC in mid-April every other year. Gill nets are fished at depths ranging from 15 to 270 feet along a transect starting approximately one mile south of the entrance to Waukegan Harbor and running due east. Captured fish are examined for age, sex, growth rate, reproductive state, food habits and sea lamprey wounding. In addition, representative samples of alewife, smelt, and chub are analyzed for flesh contaminant concentrations (R. Hess, IDOC, personal communications, 1992).

Lake trout, coho salmon, chinook salmon, brown trout, and rainbow trout are monitored annually by the IDOC. Lake trout are collected from approximately 50 to 100 foot depths in Lake Michigan; the remaining four species are collected in the new boat harbor. Collected fish are grouped by size (three size classes for lake trout and four size classes for coho salmon, chinook salmon, brown trout, and rainbow trout) and are examined for age, sex, reproductive state, lamprey wounding, and fin clips (markings) indicating stocking locations. Representative samples from each size class of each fish species are analyzed for tissue contamination (R. Hess, IDOC, personal communications, 1992).

Illinois Beach State Park

The IDOC also manages the Illinois Beach State Park which overlaps the northern portions of the Waukegan ESA. As many as 75 research programs have been conducted concurrently at the park and approximately 80 percent of the research activities are conducted in the portion of the park located within the ESA (south of the Dead River). Research covering such topics such as botany, ecology, hydrogeology, and entomology, among others, is directed by state agencies, not-for-profit organizations, and regional universities (R. Grosso, Illinois Beach State Park, personal communications, 1992).

Threatened and Endangered Species

Information on recent sightings of threatened and endangered species is maintained in a database system developed by the IDOC. Specific information available through the database includes sighting location, date, and population density. The database is updated continuously (D. Glosser, IDOC, personal communications, 1992).

9.1.3. Illinois Department of Transportation (IDOT)

The IDOT has statutory authority to regulate water resources in several areas in Illinois through its Division of Water Resources (DWR). The DWR provides permitting for fills, deposits, and encroachments in streams having tributary areas greater than one square mile in urban areas. DWR guidelines for review of proposed projects are based on Illinois code regulations and include preservation of existing flood storage, preservation of existing conveyance, and no increase in flood velocity. Illinois statutes and regulations also require that in northeast Illinois counties only appropriate uses may be sited in floodway areas.

9.1.4. Illinois Department of Public Health (IDPH)

The IDPH has conducted health assessments on specific sites within the Waukegan ESA and its tributary watershed as part of the Superfund program. Two health assessments have been performed, one on the Yeoman Creek Landfill and another on both the OMC and Waukegan Manufactured Gas and Coke Plant site. Final reports on both assessments are pending (T. Baughman, IDPH, personal communications, 1992).

9.1.5. Illinois Natural History Survey (INHS)

Since 1985, the INHS has been conducting sportfishing creel surveys of anglers utilizing Waukegan Harbor. The creel surveys include both pedestrian and boat catch (excluding charter boats), and represent the effort expended by anglers in terms of catch per angler hour (R. Hess, IDOC, personal communications, 1992).

9.2. LOCAL AGENCIES AND PROGRAMS

9.2.1. Northeastern Illinois Planning Commission (NIPC)

The NIPC is working with the IEPA to produce Illinois' contribution to the Lake Michigan Lakewide Management Plan. NIPC is responsible for providing information concerning the watershed boundaries for Lake

Michigan in Illinois; sewer systems in the watershed including combined sewer overflows, stormwater discharge points tributary to Lake Michigan; and, RCRA/CERCLA facilities.

9.2.2. Lake County Stormwater Management Commission (LCSMC)

Illinois Revised Statutes Chapter 34, Section 5-1062 (Chapter 55 of the Illinois Compiled Statutes section 5/5-1062) empowers Lake County to administer and enforce "management and mitigation of the effects of urbanization on stormwater drainage." The Lake County Watershed Development Ordinance (LCSMC, 1992) was developed by the Lake County Stormwater Management Commission and was accepted by the Lake County Board in February 1992. The ordinance became effective in June 1992. A Technical Reference Manual, was released in June 1992, and provides specific information on the application of the ordinance (J. Brown, LCSMC, personal communications, 1992).

9.2.3. Lake County Health Department (LCHD)

The LCHD oversees daily water sampling for fecal coliform and total coliform analysis at the two Waukegan public beaches. The LCHD also is cooperating with Abbott Laboratories to monitor daily PCB concentrations in raw and finished water at the Waukegan and North Chicago water treatment plants. Daily PCB monitoring will be conducted concurrent with harbor dredging activities associated with the OMC Superfund cleanup. Finally, the LCHD maintains the posting of consumption advisories for fish taken from the north portions of Waukegan Harbor (M. Pfister, LCHD, personal communications, 1992).

9.2.4. City of Waukegan

The City of Waukegan is conducting cleanup operations along the Lake Michigan shoreline south of Waukegan Harbor. The project area includes 57 acres bound on the north by Belvedere Road, west by Market Street, south by 10th Street, and east by Lake Michigan. Cleanup activities include removal of discarded tires, construction debris, and garbage.

City of Waukegan funding for 1992 includes 2 million dollars for sewer work. City officials plan to repair sewers and provide upgraded sewer service prior to planned road improvements. An additional 1 million dollars may be available for stormwater retention work (City of Waukegan, 1992; J. Bleck, City of Waukegan, personal communications, 1992).

9.2.5. North Shore Sanitary District (NSSD)

The NSSD is in the process of expanding the Waukegan Sewage Treatment Plant. This full-plant expansion will increase the average daily plant capacity to 22 mgd from 19.8 mgd and the peak capacity to 44 mgd from 39.6 mgd. Additional stormwater retention capacity also will be provided. Construction was completed in late 1992 (K. Farrell, NSSD, personal communications, 1992).

9.3. FEDERAL AGENCIES AND PROGRAMS

9.3.1. U.S. Environmental Protection Agency (USEPA)

Superfund

Actions taken to date at each of the Superfund sites within the Waukegan ESA and its tributary watershed are discussed in Chapter 7. The current status of each site is briefly described below.

Construction of disposal facilities at Schuller International, Inc. (formerly Johns-Manville) have been completed (Manville, 1991b). The 30-year surface and groundwater quality monitoring and surface cover maintenance program and the 15-year air quality monitoring program (Manville, 1991a) have been initiated.

Dredging of Waukegan Harbor, as part of OMC Superfund remedial activities, has been completed. All dredge spoils have been placed in the slip 3 containment cell for dewatering and holding prior to PCB extraction treatment. The silt curtain installed across the harbor was removed before the start of the 1993 boating season in April.

The remedial investigations for the two additional Waukegan Superfund sites, the Waukegan Manufactured Gas and Coke Plant site and Yeoman Creek Landfill, are currently in progress. Feasibility studies investigating possible remedial activities for each of these sites will be initiated following the completion of the remedial investigations.

Two former industrial sites within the Waukegan ESA have been the subjects of actions by the USEPA's Emergency and Enforcement Branch. Remedial actions at these sites, the Waukegan Tar Pit and the Waukegan Paint and Lacquer, are currently in progress. All tar has been removed from the Waukegan Tar Pit and has been transported off-site. Volatile materials at the Waukegan Paint and

Lacquer have been stabilized and all nitrocellulose materials have been transported off-site (J. Perrecone, USEPA, personal communications, 1992).

Great Lakes Water Quality Initiative

A USEPA initiative, the Great Lakes Water Quality Initiative (GLWQI), aims to develop uniform water quality criteria and implementation procedures across the Great Lakes. The GLWQI will provide a mechanism through which the Great Lakes states may comply with objectives of the Great Lakes Water Quality Agreement (IJC, 1989). In addition, the GLWQI will provide a basis from which the Great Lakes states can negotiate specific terms of the Great Lakes Water Quality Agreement with Canada. Once implemented, the GLWQI will require revisions to the Illinois Water Quality Standards within two years of final publication.

9.3.2. U.S. Army Corps of Engineers (USACE)

Dredging Operations

USACE has provided dredging of clean sands from the approach channel to Waukegan Harbor every 2 to 3 years since 1974. The mouth of the harbor was dredged in the spring of 1993, following analysis of sediment samples for contamination. A feasibility study investigating deeper channels in the harbor is underway.

Confined Disposal Facilities

The USACE has proposed two possible sites for a confined disposal facility (CDF) which would accept contaminated dredge spoils from Waukegan Harbor. The first site is located in Lake Michigan immediately south of the new harbor. The CDF proposed for this in-lake site would hold 200,000 cubic yards of dredged material. The second site is an upland location which could accommodate a CDF capable of holding 50,000 cubic yards of dredge material. Environmental impact statements for each of the sites are currently in preparation. Deepening of harbor channels would require reconfiguration of either of the CDF designs to provide sufficient space for extra dredge spoils.

Pier Resurfacing

Final plans and specifications are currently being prepared by the USACE for the rebuilding and resurfacing of Government Pier. All renovation activities will occur east of the pier steps. Construction activities were completed in 1994. In addition, the USACE plans to replace public safety and information signs throughout the harbor area.

9.3.3. U.S. Fish and Wildlife Service (USFWS)

Under CERCLA and the Oil Pollution Control Act, trustees of natural resources, including the USFWS, may file claims for damages against individuals and organizations which have caused degradation to natural resources. Claims are based on the estimated value of the lost resource. Currently, the USFWS has not identified any such actions specific to the Waukegan ESA.

9.3.4. International Joint Commission (IJC)

The Great Lakes Water Quality Agreement of 1978 requires that RAPs shall be submitted to the IJC for review and comment. To facilitate RAP development, the IJC has sponsored workshops with the USEPA and Environment Canada to better define necessary RAP content. In addition, the IJC shall work with the Great Lakes states and provinces and the governments of the U.S. and Canada to identify new Areas of Concern.

9.3.5. U.S. Coast Guard

The U.S. Coast Guard provides response to pollution discharges from watercraft in federal navigable waters.

9.4. PUBLIC INVOLVEMENT

Public participation and the cooperation of state, federal, and local agencies are an integral part of the RAP development process. The development of the Waukegan Area of Concern RAP is a cooperative effort which includes input from representatives from business, government, industry, environmental groups, education, recreation, and local citizens. In addition, information concerning the RAP has been provided to the general public. Public information and participation in the development of the Waukegan RAP is described below. Public involvement activities and strategies are described in two separate public involvement plans prepared in 1990 and 1993 for the Stage I and II Remedial Action processes (Appendix P).

9.4.1. Citizens Advisory Group

In August 1990, the Waukegan Harbor Citizens Advisory Group (CAG) was formed. Twenty-six organizations have been represented on the Citizens Advisory Group (Table 1.1.) which meets monthly. The CAG has sponsored several activities aimed at heightening public awareness of the environmental conditions near the harbor and lakeshore areas. Two public bus tours, conducted by the CAG, focused on the history of the Waukegan ESA and past practices which adversely affected the environment. The CAG prepared informational flyers about the Waukegan ESA and the CAG, and participated in the 1991 Waukegan River Clean-up. The CAG cosponsored a tire cleanup in the Waukegan Harbor area. The CAG annually participates in the Great Lakes Beach Sweep. In addition, the CAG sponsored a poster competition among local children which resulted in over 50 entries. Several posters from this competition are presented between chapters of this document. The CAG has developed a group logo featuring the Waukegan Lighthouse (Figure 1.1.) used on t-shirts, factsheets and other informational tools.

Seven subcommittees have been formed within the CAG to provide assistance with specific RAP topics or CAG activities. These subcommittees and their members are presented in Table 1.2.

9.4.2. Steering Committees

The RAP process requires the cooperation of various state agencies, federal agencies, and the International Joint Commission. These organizations provide guidance to facilitate RAP development and gather data and project information on which the problem definition and remediation goals are established. Agencies and personnel which have taken an active part in the RAP process are presented in Table 1.3.

The IEPA assembled an additional group of representatives from various state and federal agencies in June of 1991. This group, known as the Interagency Workgroup, consists of individuals with expertise specifically related to the fourteen uses defined by the IJC and experience with the water resources of the Waukegan ESA. These individuals provide review of and comment on the RAP document, paying particular attention to the scientific accuracy of the document. Agencies and individuals represented on the Interagency Workgroup are presented in Table 1.4.

9.4.3. Public Information Media

Information concerning the Waukegan ESA and the RAP process has been made available to the public by the IEPA, CAG, USEPA, and general media. Minutes from the CAG meetings, selected reports and project summaries are available at the Waukegan Public Library and the Waukegan Port District office. Public information materials developed by the CAG also are available at the repositories.

An exhibit illustrating the environmental conditions in the Waukegan ESA and the RAP process was developed by the IEPA and was displayed at the 1991 annual meeting of the IJC in Traverse City, Michigan, and at Waukegan Harbor during a visit of the USEPA's research vessel, Lake Guardian. The IEPA also has developed a traveling exhibit featuring a video tape about the Waukegan ESA, the RAP, and the CAG for use with community and school groups. Articles about the ESA have appeared in the Waukegan News Sun; Happenings and Educational Activities around Lake Michigan (HELM); the IEPA's publication, Progress; the IJC's publication Focus; the Chicago Tribune; and the Great Lakes Basin Report of the Great Lakes Sport Fishing Council. Greg Michaud, an IEPA RAP co-coordinator, was interviewed about the Waukegan ESA and the RAP by the Earth Network in October 1991, and local broadcast and print media at various times during the development of the RAP. The IEPA also produced a one hour television program about the Waukegan ESA and the RAP development. This program was broadcast repeatedly by local cable stations and at least 20 other stations statewide.

9.4.4. Public Meetings/Hearings

All RAP text was presented to the public for review and comment. The text was submitted for public review in two portions. The first consisted of "Stage I" material and included a site description and background and a problem definition based on the 14 uses listed by the IJC. The second portion consisted of "Stage II" material and included information about pollutant sources, past remedial actions, remedial goals and objectives, ongoing programs, public participation, and specific remedial actions to be conducted in the future. The public review periods for the Stage I material was October 1 through December 1, 1992. The public review period for Stage II was March 1 through May 1, 1994.

Each public review period was initiated by an afternoon and evening availability session sponsored by the IEPA at which IEPA and CAG representatives were available to the public to answer questions and describe the RAP process. In addition, each public review period was concluded by a public meeting on the presented text. The Stage I and II availability sessions were held at the Ramada Inn - Waukegan on Thursday, October 22, 1992, from 1pm to 8pm and March 24, 1994, from 1pm to 8pm respectively. The Stage I public meeting was held on Thursday, November 5, 1992 from 7pm to 9pm at the same location. The Stage II public meeting was held on April 20, 1994 at the Waukegan Port District from 7pm to 10pm. Public Service Announcements, interviews on local public affairs shows, and news releases were used to announce the public comment periods, availability sessions and public meetings. The IEPA also produced a five minute videotape about public input into the RAP process. Copies of this videotape were distributed to CAG members for use during speaking engagements.

9.5. POLITICAL IMPLEMENTABILITY

A tremendous amount of information is available concerning the Waukegan ESA, particularly Waukegan Harbor. However, the available information base is certain to expand, and the nature and extent of contamination and use impairment is likely to change as current remedial actions progress. To accommodate these changes in the ESA, the Waukegan RAP exists as a "living document" and will be updated to reflect current conditions. The IEPA will maintain close coordination with agencies and organizations involved with ongoing monitoring and remedial action activities in the ESA.

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10. REMEDIAL ACTION STEPS

Attainment of the goals and objectives defined in Chapter 8 requires the completion of plans and remedial actions. Remedial actions recommended for the Waukegan ESA include: studies which will better define the status and extent of use impairments; specific remedial actions which will promote better environmental conditions in the ESA; and, maintenance and protective activities which will conserve natural resources and guard against future environmental degradation.

10.1. PLANS AND STUDIES

Although Waukegan Harbor has been the subject of numerous studies, additional investigations throughout the ESA may be required. These studies are needed to determine whether there may be other use impairments that have not been previously defined. Studies also are needed to identify additional contaminated sites. Further, transport processes and exposure pathways which affect contaminant movement and bioaccumulation require greater definition. The plans and studies outlined in this chapter resulted from input provided by the Citizens Advisory Group (CAG), Inter-Agency Workgroup, the International Joint Commission (IJC), and the USEPA among others.

Examine Water and Sediment Quality at the Intake of the Waukegan (Drinking) Water Treatment Plant

Responsible Parties: IEPA
Estimated Cost: $ 25,000
Completion Date: 1993
Funding Source: IEPA, USEPA

Raw and finished water samples were collected from the Waukegan Water Treatment Plant. Water samples were analyzed for constituents presented in Appendix A. Samples of sediment collected near each of the inlets to the plant and samples of water treatment sludge also were analyzed. Sediment and water treatment sludge samples were analyzed for constituents presented in Appendix A.

Sample data collected during the sampling allowed evaluation of the potential for drinking water restrictions or taste and odor problems. Evaluation of sediment samples provided information on sediment quality and the potential for intake into the water treatment plant (Results of this study are described in Chapter 4.1.9.).

In April, 1992, water sampled from the Waukegan Water Treatment Plant showed no organics in either raw or finished water. Sludge filtrate at the water treatment plant also had organic concentrations below detectable levels. Other parameters were within expected ranges. In the harbor entrance channel, PCB levels in sediments were below 1.5 ppm. Highly elevated levels of arsenic in sediments were detected at 18.1 to 23.0 ppm in this vicinity, while no additional parameters were rated as highly elevated at all locations (Appendix K). Based on presently available information, harbor and open lake sediments do not pose a threat to the public water supply. Drinking water continues to meet standards set forth by the Safe Drinking Water Act after conventional treatment.

<u>**Waukegan Harbor Commercial Navigation Study 1970 Modification - Reconnaissance Phase**</u>

Responsible Parties: USACE
Estimated Cost: $ 70,000
Completion Date: 1995
Funding Source: USACE

The Corps of Engineers is undertaking a study to determine whether additional depth in the Federal navigation project at Waukegan Harbor will be feasible. Shippers utilizing the harbor all have ships with deeper drafts than the presently available depths, and could reduce shipping costs considerably if the harbor channels were deeper. Additional depth had been authorized in 1970, but because of an apparent lack of economic feasibility at that time, the deepening project was not constructed. The current reconnaissance study will seek to determine, based on readily available data, whether the proposed deepening project appears feasible. If so, analyses will be conducted to confirm the feasibility of the proposed project, to more precisely define specific project features, and to continue to coordinate the project with local interests and with other concerned agencies and groups.

<u>**Public Health Site Review and Update of Schuller International, Inc.**</u>

Responsible Parties: ATSDR, IDPH
Estimated Cost: Indeterminant
Completion Date: 1994
Funding Source: USEPA

The Agency for Toxic Substances and Disease Registry (ATSDR) has completed a Site Review and Update (SRU). The purpose of a SRU is to discuss the current status of a hazardous waste site and to identify future ATSDR activities planned for the site. The Illinois Department of Public Health has concluded the Schuller International site had levels of contamination in on-site soil samples that exceed background levels for asbestos, lead, and chromium. There is no evidence that contaminants are migrating off-site. Future contamination of Lake Michigan, air, groundwater, or soils is not likely. Site access is restricted, and there are no residential dwellings located within 0.5 miles of the site. Since the site has been capped to reduce contaminant migration. Future exposures are not likely. The data and information used in developing the Site Review and Update has been evaluated to determine that no further public health actions are needed.

<u>Lake Michigan Ozone Study (LMOS)/Lake Michigan Ozone Project (LMOP)</u>

Responsible Parties: IEPA, MDNR, IDEM, WDNR, USEPA
Estimated Cost: $ 12,000,000
Completion Date: 1994
Funding Source: IEPA, MDNR, IDEM, WDNR, USEPA

The Lake Michigan Ozone Study is a comprehensive investigation of the formation and transport of smog in the Lake Michigan airshed. The study is a joint effort involving the states of Illinois, Michigan, Wisconsin, and Indiana, along with the USEPA. The project has been the subject of discussion and planning since 1987. The study represents a coordinated approach to a regional problem - ozone formation and transport in the Lake Michigan region. State-of-the-art computer "modeling" will help planners organize and interpret data. The purpose of the study is to gather the information needed to develop improved ozone control strategies for each of the four participating states.

<u>Sport Fishing Creel Survey on the Illinois Portion of Lake Michigan</u>

Responsible Parties: INHS, IDOC, USFWS
Estimated Cost: $ 324,000
Completion Date: 1996
Funding Source: USFWS, IDOC

This Study will estimate total summer (April 1 to September 30) sport harvest of yellow perch, brown trout, rainbow trout, lake trout, coho salmon and chinook salmon for the years 1993, 1994, and 1995. Estimates will cover harvests by pedestrian anglers, anglers using launched boats, anglers using boats kept at moorings, and excluding harvest by charter fishing boats, winter fishing, and smelt fishing. Snagging from October 1 through November 15 will be included. Estimates of the number of man hours fished and the number of angler trips will be made. Records will be made of fish lengths, weights, and markings (especially fin clips) for fish in the possession of anglers.

Public Health Assessment of Outboard Marine Corporation

Responsible Parties: ATSDR, IDPH

Estimated Cost: Indeterminant

Completion Date: 1994

Funding Source: USEPA

The Agency for Toxic Substances and Disease Registry (ATSDR) has collected relevant health data, environmental data, and community health concerns for a public health assessment at the Outboard Marine Corporation. The aim of this evaluation is to find out if people are being exposed to hazardous substances, and if so, whether that exposure is harmful and should be stopped or reduced. The Illinois Department of Public Health (IDPH) has concluded that this site posed a public health hazard because humans have probably been exposed to PCBs, via consumption of contaminated fish, which could result in adverse health effects. As a means to protect the public health, fish consumption advisories have been issued and signs have been posted warning that no fish should be consumed if caught in the Old North Waukegan Harbor. If additional information suggests a change in risk due to cleanup activities, IDPH and ATSDR will reevaluate this site for any necessary follow up.

Characterize Groundwater Quality and Flow in the Waukegan ESA

Responsible Parties: IEPA

Estimated Cost: $ 105,000

Completion Date: 1994

Funding Source: IEPA, USEPA

Eight groundwater monitoring wells were installed south of Waukegan Harbor along the lake front (Appendix L). Water level readings from the wells were taken between October, 1992 and December, 1993 (Appendix N). Water samples from each well were drawn twice and analyzed for various constituents including volatile organic compounds (VOC), semi-volatile compounds, metals, pesticides, and PCBs.

Results from the groundwater study show lead and VOCs to be the contaminants of concern south of the harbor (Appendix M). The data shows that shallow groundwater flows to Lake Michigan. Information concerning groundwater contamination and flow could indicate the potential for future use impairment due to discharge of contaminated groundwater to Lake Michigan.

Waukegan River National Monitoring Strategy

Responsible Parties: ISWS, Waukegan Park District, IEPA
Estimated Cost: $ 50,000
Completion Date: 1996
Funding Source: IEPA, USEPA

A monitoring program plan for the Waukegan River is being developed to be a part of a national non-point pollution monitoring strategy. The study will include data collection for macroinvertebrate sampling, physical habitat, fisheries, and stream flow during Spring, Summer and Fall. The monitoring plan is being prepared to describe the effectiveness of biotechnical stream stabilization techniques. The study area includes Washington and Powell Parks in the city of Waukegan. A final report including a video and brochure will be available in 1996.

Bird Census at Illinois Beach State Park - Zion

Responsible Parties: Chicago Ornithological Society
Estimated Cost: Indeterminant
Completion Date: Ongoing
Funding Source: Volunteer

The Chicago Ornithological Society will initiate volunteer bird census activities at Illinois Beach State Park in 1995 to provide bird population information. Census information will provide data on bird migrations and use of habitats in Illinois Beach State Park.

Reproductive Success of Stocked Lake Trout in Southwestern Lake Michigan

Responsible Parties: INHS, IDOC, USFWS
Estimated Cost: $ 56,000
Completion Date: 1995
Funding Source: USFWS, IDOC

This study will provide information on the spawning success of stocked lake trout by looking at the relationship between gillnet assessment data of adult lake trout and their actual reproductive output. Spawning activity will be evaluated with remote methods such as underwater video and sonar as well as gillnetting data as indicators of local spawning activity (presence of eggs). Data will be obtained on the amount and type of egg loss due to predation by exotic species, and egg mortality due to intrinsic factors (such as contaminants) between egg fertilization and fry emergence. The study will also examine the extent to which man-made structures such as breakwalls positively or negatively affect lake trout reproduction. Ultimately this information can be used to design or modify artificial structures to enhance reproductive success of lake trout.

Waukegan River Intensive Survey

Responsible Parties: IEPA
Estimated Cost: $ 50,000
Completion Date: 1995
Funding Source: USEPA, IEPA

A Waukegan River Intensive Survey will evaluate the environmental conditions of the Waukegan River based on water chemistry, sediment chemistry and macroinvertebrate community. Both point and non-point pollution sources will be investigated. Special areas of interest will be abandoned landfill sites, sanitary-storm sewer cross connections and areas of exfiltration from exposed sanitary sewer lines.

Examine Waukegan's Sewer System and Identify Sanitary Sewer Problems and Illegal Connections to Storm Sewers

Responsible Parties: City of Waukegan
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Funding Source: IEPA, USEPA, City of Waukegan

The City of Waukegan is planning an investigation aimed at the identification of sanitary sewer problems. Identification of primary sources of sewer infiltration could aid in reducing the frequency and magnitude of excess flow discharges from the North Shore Sanitary District's Waukegan Sewage Treatment Plant. Identification of sanitary sewer problems and illegal connections to storm sewers will help to target remedial actions necessary to reduce the fecal coliform concentrations in the Waukegan River associated with the periodic closing of Waukegan North and South beaches (Farrell and Budzinski, 1990).

Yellow Perch Population Assessment in Southwestern Lake Michigan

Responsible Parties: INHS, IDOC, USFWS

Estimated Cost: $ 93,100

Completion Date: 1995

Funding Source: USFWS, IDOC

This study conducted by the INHS will expand and improve annual assessments of the yellow perch spawning population in southwestern Lake Michigan by supplementing IDOC index stations, calibrating data from gill nets and fyke nets, and assessing the validity of current index stations relative to yellow perch spawning concentrations. Diel and vertical movements of yellow perch larvae and their prey will be used to improve sampling methods and collect data on early recruitment patterns. Genetic studies will determine whether geneticly distinct stocks of yellow perch populations occur in Lake Michigan.

Investigate Contamination of Fish Flesh

Responsible Parties: IDOC, IEPA

Estimated Cost: $ 53,400/year

Completion Date: Ongoing

Funding Source: IDOC, IEPA, Great Lakes Protection Fund

Fish tissue sampling will be conducted annually within the Old North harbor to determine present contaminant levels for fish taken by electrofishing gear. Both sport and bottom feeding species will be targeted for whole fish or fillet samples as appropriate.

Examine Lake Waters Near Schuller International for Asbestos-Containing Materials

Responsible Parties: IEPA, Schuller International, USEPA

Estimated Cost: Indeterminate

Completion Date: Indeterminate

Funding Source: IEPA, Schuller International, USEPA

Discovery of asbestos-containing materials (ACM) along the Lake Michigan beach (Neibergall, 1991) south of the Schuller International, Inc. (formerly Johns-Manville) facility indicates the possible presence of ACM in the nearshore waters of Lake Michigan. The nearshore waters near Schuller International were examined for deposits of ACM. If material is detected it will be removed and disposed.

Removal of ACM deposits from Lake Michigan will reduce the chance for future washup of the material onto beaches along the Waukegan lakeshore. In addition, removal of ACM which may be present will reduce the threat of water contamination.

Pilot Waukegan Harbor Water and Sediment Survey

Responsible Parties: IEPA
Estimated Cost: $ 50,000
Completion Date: 1995
Funding Source: USEPA, IEPA

The water and sediment survey is a repeat of a 1990 sampling by the Illinois EPA to determine the present environmental condition and the need for additional more detailed studies.

Evaluate Use of the Waukegan ESA by Fish and Wildlife

Responsible Parties: IDOC, USFWS
Estimated Cost: $ 100,000
Completion Date: Indeterminate
Potential Funding Source: IEPA, USEPA

While use of the Waukegan ESA water resources by several species of fish has been fairly well documented, use by bird and animal species, especially outside the boundaries of Illinois Beach State Park, is not well defined. Use of the ESA by bird and animal species for habitat and foraging will be observed and recorded. If possible, observed usage will be compared to available records to assess historical changes in bird and animal populations. Fish and wildlife will be monitored to aid the evaluation of remediation success and to document re-establishment of impaired uses.

Monitoring of fish and wildlife in the ESA will provide an opportunity to further document the lack of tumors and deformities in fish and to investigate the occurrence of tumors and deformities in birds and animals. Population monitoring over an extended period also could indicate the existence or nonexistence of any fish and wildlife reproductive problems.

The USEPA has sponsored a study of the use of the Lake Michigan shoreline wetlands by birds. The study began in Spring, 1992. Study locations within the ESA are all located in the Illinois Beach State Park and include one transect along the lakeshore and two sites on the Dead River. As much as possible, new studies of bird populations in the ESA should build upon the results of this study.

<u>Investigate Possible Contamination at the Diamond Scrap Yard</u>

Responsible Parties: Bank of Waukegan
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: Diamond Scrap Yard, IEPA, USEPA

The nature and extent of contamination at the Diamond Scrap Yard should be investigated through site inspection, soil borings, and groundwater sampling. The Bank of Waukegan funded a preliminary site survey, conducted by Roy F. Weston, Inc., that involved soil and asbestos sampling from buildings on-site. The results of the preliminary site survey indicated the presence of metals, VOCs, and PCBs. Further investigation is needed to determine the extent of contamination. Study results would be used to determine potential threats posed by contamination to human health and the possibility for transport of contaminants to Lake Michigan. Study results also will be used to identify any required remedial actions.

<u>Waukegan River Wetland Demonstration</u>

Responsible Parties: Wetlands Research Inc.
Estimated Cost: $ 166,000
Completion Date: 1995
Funding Source: Great Lakes Protection Fund

The Illinois Environmental Protection Agency and the Lake County (Illinois) Stormwater Management Commission have both identified the Waukegan River watershed for intensive study and development of controls for urban stormwater runoff. The Waukegan River is a direct tributary to Lake Michigan near Waukegan Harbor, an Area of Concern in Lake Michigan. A large area of degraded wetlands exists in the upper part of the watershed. Wetlands

Research Inc. will study the feasibility of restoring the wetlands in the watershed to manage stormwater, reduce stream bank erosion, and to improve water quality, and work with the local Citizens Advisory Group for the Waukegan Harbor Remedial Action Plan to evaluate the plan. The study will determine the potential water quality improvements from three different types of wetland restoration projects (one each in Illinois, Wisconsin, and Michigan). Results of these pilot projects will be promoted at a series of regional workshops for government agencies and citizens groups so that similar efforts can be created around the basin.

Investigate Potential Tainting of Fish and Wildlife Flavor

Responsible Parties: USFWS, IDOC
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: USFWS, IDOC

Anglers fishing in the waters of the ESA should be surveyed about any past experiences with tainted fish taken from the Waukegan area. Results of this study and survey should provide a better indication of the status of possible use impairment. Water samples collected throughout Waukegan Harbor and the Waukegan nearshore areas of Lake Michigan should be analyzed for substances such as volatile organic carbons and phenols which are associated with tainting of fish and wildlife flavor.

Great Lakes Charterboat Captain Fish Consumption Health Study

Responsible Parties: IDPH
Estimated Cost: Indeterminate
Completion Date: 1995
Funding Source: IL, MI, IN, WS, OH

The Health Departments from the states of Ohio, Michigan, Indiana, Illinois and Wisconsin are working together to study the possible health effects of Great Lakes fish consumption. The focus of the study is on charter boat captains and their families from the Lakes Michigan, Huron and Erie. Past studies have suggested that charter captains may eat more Great Lakes fish than the general public and it is hoped that they can provide an accurate assessment of human exposure to fish contaminants.

Phase One of the study, which began in the fall of 1993, used a telephone survey to gather information on the consumption of Great Lakes fish among charter captain families and to determine the health status of children born to charter captains since 1970. Early in 1994 Phase Two of the study began, which involves checking the chemical contaminants in the blood of approximately 600 individuals. A final report, analyzing the results of the information gathered from the study, should be available by mid to late 1995.

Investigate Possible Contamination at Abbott Laboratory (formerly U.S. Steel)

Responsible Parties: Abbott Laboratories, MCL Development, IEPA, USEPA
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: Abbott Laboratories, MCL Development, IEPA, USEPA

The Abbott Laboratory property (formerly U.S. Steel) adjacent to Waukegan Paint and Lacquer along the southern boundary of the ESA, should be investigated for the presence of soil and groundwater contamination. The site should be examined to determine the presence of underground storage tanks and to better define the location of the stormwater drainage system and its outfalls to the lake. Abbott Laboratory study results should be used to determine any potential health threats from contamination and potential contaminant transport. If necessary, appropriate remedial activities will be identified based on study results.

Investigate Contamination of Wildlife Flesh

Responsible Parties: IDOC, IEPA, USFWS
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: IDOC, USFWS

Tissue from resident wildlife will be collected and analyzed for concentrations of constituents commonly found within the Waukegan ESA, such as PCBs and PAHs. Concentrations of these constituents in wildlife flesh will provide an indication of the exposure of wildlife to hazardous substances in the ESA. Constituent concentrations also may indicate a need for wildlife consumption restrictions; however, since hunting is not allowed in the ESA due to its urban location, the need for wildlife consumption restrictions is questionable.

Investigate the Nature and Extent of Sediment Contamination in "No-Man's-Land"

Responsible Parties: USACE
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: USACE

Sediments collected from Waukegan Harbor between slip 1 and the area dredged as part of OMC Superfund remediation will be analyzed for various contaminants, including PCBs. Contaminant analysis will help to determine actions necessary to allow dredging of sediments from this portion of the harbor.

10.2. SPECIFIC REMEDIAL ACTIONS

Specific remedial actions are aimed at removing, destroying, and/or containing constituents which are associated with impairment of uses within the Waukegan ESA or are considered a health or environmental threat. In addition to alleviating listed use impairments, these specific remedial actions will promote the reestablishment of any impaired uses which are not currently identified and will reduce the potential for further use impairments.

Complete OMC Superfund Remedial Activities

Responsible Parties: OMC, USEPA
Estimated Cost: $ 20,000,000
Completion Date: 1994
Funding Source: OMC

Remedial activities for the OMC property and the northernmost portions of Waukegan Harbor were initiated in October 1990. Since that time, the construction of the containment cell in slip 3 and the two additional containment cells on the north side of OMC property has been completed. Dredging of the North Ditch and the northern portion of the harbor (sediments containing greater than 50 ppm PCBs) has been completed. Dredged sediment containing greater than 500 ppm PCB has been treated with the Taciuk Process and all dredged sediment has been placed in the three containment cells. A detailed description of activities which have been completed at the OMC Superfund site can be found in Chapter 7.

All three containment cells have been capped. Extraction wells have been installed into each of the containment cells to ensure that groundwater flows into the cells. Extracted water is analyzed and treated prior to being discharged.

Five of the six known use impairments in the Waukegan ESA (restrictions on fish consumption, degradation of benthos, restrictions on dredging activities, degradation of phytoplankton and zooplankton populations, and loss of fish and wildlife habitat) are associated with contaminated sediments. Therefore, removal of contaminated sediments should provide a positive first step toward reestablishment of these currently impaired uses. Removal of highly contaminated sediments will provide cleaner bottom conditions for benthic organisms and bottom dwelling fish. Transport of contaminants from sediment into the water column through sediment suspension, desorption, and solution also should be reduced once contaminated sediments are removed. Lower constituent concentrations in the water column will promote reestablishment of phytoplankton and zooplankton populations and reduce assimilation of constituents by aquatic organisms.

The indirect benefits resulting from removal of highly contaminated sediments are many. Increased populations of plankton and benthic organisms will improve fish forage in the ESA and, thus will improve fish and wildlife habitat. Since the concentration of contaminants in the tissues of aquatic organisms is likely to be reduced, bioaccumulation of contaminants through the food web should decrease. Lower tissue contaminant concentrations in Waukegan Harbor and Lake Michigan fish will reduce the need for fish consumption advisories. Lower tissue concentrations in high trophic level organisms will alleviate possible wildlife deformity or reproductive problems and fish and wildlife population declines. Finally, removal of the most contaminated sediments will prevent further spread of constituents to less contaminated areas of the harbor and lake. Slowing transport of highly contaminated sediment will protect down-gradient sediment and water quality and will facilitate future dredging activities.

Waukegan River Rock Riffle Restoration Project

Responsible Parties: IL State Water Survey, Waukegan Park District
Estimated Cost: $ 80,000
Completion Date: 1996
Funding Source: IEPA, USEPA

A series of pools and riffles will be created in the Waukegan River to create aeration and improve habitat for aquatic life. The proposed techniques for recreating riffles should prevent further streambank erosion and will act as protection for the sewer stream crossings. When combined with vegetative bank stabilization, this process will reverse the instability created by runoff and early channel modifications.

In addition, the creation of riffles will improve water aeration during normal stream flows when urban streams typically have very low oxygen levels. The stream habitat improvements resulting from the creation of deep pools, rock riffles, and increased water aeration will provide strong positive benefits for aquatic life.

A proposal for this project was submitted to the IEPA in 1994. Restoration activities are projected to take two years to complete following project approval.

<u>Select and Implement Remedial Actions at Waukegan Manufactured Gas and Coke Plant</u>

Responsible Parties: North Shore Gas Company, OMC, General Motors, USEPA, IEPA
Estimated Cost: $ 1,500,000
Completion Date: 1994
Funding Source: North Shore Gas Company, OMC, General Motors

A Remedial Investigation/Feasibility Study (RI/FS) has been initiated at the Waukegan Manufactured Gas and Coke Plant Site. North Shore Gas has retained Barr Engineering to perform the Remedial Investigation/Feasibility Study. This work is being conducted under a work plan approved by USEPA in November, 1991.

The Feasibility Study will identify site-specific remedial goals and objectives and will evaluate alternatives for the remediation of contaminated soils and groundwater. Completion of the RI/FS will determine the areas of the site which require remediation and will allow selection of an effective remedial action. The specific remedial activities required at the site have not been determined. Once selected and implemented, the required remedial activities should provide significant reductions in the contaminant mass at the site; consequently, the potential for transport of the contaminants to nearby water resources and the risks to humans and the environment will be reduced. In addition, since some of the contaminants found at the coke plant site are associated with tainting of fish flavor, removal of these contaminants should reduce the risk of fish flesh tainting.

A phase I field inspection was conducted in 1992 to define the areal extent of contamination. Soil samples indicated the presence of PAHs at the site. A phase II field investigation to determine the vertical extent of contamination and groundwater flow pattern was finished in 1993. USEPA will conduct a risk assessment of the site in 1994.

Waukegan Harbor Confined Dredge Disposal Facility Draft Letter Report and Environmental Impact Statement

Responsible Parties: USACE
Estimated Cost: $ 400,000
Completion Date: 1994
Funding Source: USACE

The Corps of Engineers has responsibility for maintenance dredging of the authorized navigation project at Waukegan Harbor. However, due to pollutants in the bottom sediment of the inner portions of the harbor (primarily PCB's) and the inability of all concerned parties (Corps of Engineers, State of Illinois, local interests, environmental agencies and groups) to reach an agreement on an environmentally acceptable manner to dispose of the contaminated dredged material, no maintenance dredging has been carried out in the inner portions of the harbor since 1969. This poses a hardship on shippers. The Letter Report and EIS summarize study work done to arrive at an environmentally responsible way to dispose of the dredge material. The report identifies disposal in a Confined Disposal Facility (CDF) as the most feasible, environmentally responsible disposal method for Waukegan Harbor dredging. CDF's are engineered, diked structures designed to contain large volumes of moderately contaminated dredge material and to keep the confined pollutants from reentering the open environment. CDF's can be constructed either in-lake or upland. The report and EIS consider both types.

Shoreline Stabilization at Illinois Beach State Park

Responsible Parties: IDOC, ISWS, IEPA
Estimated Cost: $ 100,000
Completion Date: 1994
Funding Source: IEPA, USEPA

In 1994, a beach restoration project for the Illinois Beach State Park in Zion, Illinois is being implemented by the Illinois Department of Conservation and the Illinois State Geological Survey. Approximately 26,000 - 30,000 cubic yards of washed pea gravel will be used to slow downstream shoreline erosion. Monitoring of transport rates will provide sound baseline data on how and where future beach nourishment activities will achieve the best results.

Waukegan Harbor South Pier Resurfacing

Responsible Parties: USACE
Estimated Cost: $ 1,300,000
Completion Date: 1994
Funding Source: USACE

The entire concrete surface of the outermost 1600 feet of the existing south pier at Waukegan Harbor is being replaced. The old concrete is being removed and replaced with new reenforced concrete, approximately 6 inches thick along both sides of the pier. Old concrete is being removed extending from the surface to a point below the waterline and is being replaced with new concrete which butts up against the remaining old concrete. The concrete surface will have a slight slope for improved drainage. When completed, this project will protect the harbor entrance channel for navigational purposes as well as to provide for pedestrian use.

Remove Contaminated Sediments from Waukegan Harbor

Responsible Parties: USACE, Harbor Area Industries
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: USACE, Harbor Area Industries

The area to be dredged should include maintenance dredging between slip 1 and the outer harbor, as currently proposed by the USACE, as well as the "no-man's-land" area between the OMC Superfund site and slip 1.

These sediments must be removed from Waukegan Harbor to prevent contamination of areas for which dredging has already occurred. Dredging of this portion of the harbor should allow passage of fully loaded commercial vessels into slip 1. As discussed earlier, removal of contaminated sediments from Waukegan Harbor will greatly reduce aquatic organism contact with hazardous substances. This will reduce the impacts of environmental degradation on these populations, such as degradation of plankton and benthos and contamination of fish flesh. Once contained, migration of contaminants from the harbor to Lake Michigan will be curtailed.

Expansion of the North Shore Sanitary District's Waukegan Sewage Treatment Plant

Responsible Parties: North Shore Sanitary District

Estimated Cost: $ 21,135,000

Completion Date: 1993

Funding Source: IEPA (WPC Revolving Loan Fund)

The North Shore Sanitary District (NSSD) has expanded the Waukegan Sewage Treatment Plant (STP) with construction of additional treatment facilities increasing the average daily plant capacity from 19.8 million gallons per day to 22 million gallons per day. Peak plant capacity was increased from 39.6 mgd to 44 mgd.

Expansion of the Waukegan STP resulting in increased treatment capacity will reduce the frequency and magnitude of overflows to Lake Michigan. Reduced overflows will result in the reduction of nutrients, residual chlorine loadings, and releases of fecal coliform and other pathogens.

Waukegan River Bank Stabilization and Management

Responsible Parties: City of Waukegan, IEPA, Illinois State Water Survey

Estimated Cost: $ 416,667

Completion Date: 1995

Funding Source: IEPA, USEPA, City of Waukegan

The banks of the Waukegan River within Powell and Washington Parks were stabilized through the application of vegetative stream stabilization techniques. Stabilization techniques involved the establishment of protective vegetation along highly eroded stream reaches. Above ground, vegetation has slowed water velocities in the treated stream reach, and below ground, roots bind and strengthen the soil. Concurrent with establishment of streambank vegetation, local government employees and private contractors received vegetative management training.

Stabilization of steambanks in the study area has provided a reduction in erosion rates along the river and, consequently, a decrease in sediment loads delivered to Lake Michigan. Since erosion along the river has been reduced, further exposure of sanitary sewer lines and the associated damage has diminished. Flow velocities in the river have been sufficiently decreased by the establishment of vegetation to allow sediment to be deposited within the channel.

Finally, with exposure of sanitary sewer lines curtailed, exposed lines may be repaired resulting in a possible reduction in exfiltration of sewage (which contains fecal coliform, BOD, and nutrients) from the lines into the Waukegan River. Additional erosion controls utilizing vegetative stabilization, structural stabilization, and habitat structures with vegetation will be applied to the Waukegan River in Washington Park.

Complete an Extent of Contamination Study at the Waukegan Tar Pit Site

Responsible Parties: EJ&E Rail Road, North Shore Gas Company, North Shore Sanitary District, USEPA
Estimated Cost: Indeterminate
Completion Date: 1993
Funding Source: EJ&E Rail Road, North Shore Gas Company, North Shore Sanitary District, USEPA

All tar-like substances have been removed from the Waukegan Tar Pit. Investigations are currently underway to assess the nature and extent of tar in soils in areas adjacent to the excavated pit, and of associated chemical constituents in the groundwater. Location and identification of contamination at the Tar Pit site away from the actual pit will indicate the remedial actions necessary to complete cleanup at the site. Threats posed at the site associated with exposure to tar substances, particularly wildlife entrapment, have been substantially reduced through removal of free tar in the pit. Further treatment of contaminated soils and groundwater will virtually eliminate remaining contact hazards and will prevent future transport of contaminants from the site.

Select and Implement Remedial Actions at the Griess-Pfleger Tannery Site

Responsible Parties: Commonwealth Edison Company, IEPA
Estimated Cost: $ 230,000
Completion Date: 1994
Funding Source: Commonwealth Edison Company

The Commonwealth Edison Company (CEC) plans to use the site of the former Griess-Pfleger Tannery site for construction of "peakers", which are generators used to supply electricity during periods of extremely high demand. Before construction can commence, hazardous materials must be located, identified, and removed from the site. CEC is currently conducting an investigation of contamination at the tannery site. The work plan was approved by IEPA in 1993. When the site investigation is complete, alternative remedial activities, if necessary, will be evaluated and the most effective remedial actions identified.

As with other remediations throughout the Waukegan ESA, cleanup activities at the Griess-Pfleger Tannery site will reduce the potential for contaminant transport to the water resources of the ESA and also will reduce the potential for contact between contaminants and the environment.

Complete Removal Actions at the Waukegan Paint and Lacquer

Responsible Parties: USEPA, Waukegan Paint and Lacquer
Estimated Cost: $ 150,000
Completion Date: 1992
Funding Source: USEPA, Waukegan Paint and Lacquer

Remedial activities for the removal and destruction of hazardous materials at the Waukegan Paint and Lacquer site were completed in 1992. Removal of these substances from the site will decrease or eliminate the potential for transport of contaminants from the site to groundwater, Lake Michigan, or the harbor. Risks to human, wildlife, or environmental health also will be substantially reduced or eliminated.

Select and Implement Remedial Actions at Yeoman Creek Landfill

Responsible Parties: Browning-Ferris Industries, OMC, T.K. Disposal Inc., USEPA, City of Waukegan, Waukegan School District
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: Browning-Ferris Industries, OMC, T.K. Disposal Inc., USEPA, City of Waukegan, Waukegan School District

A remedial investigation of the Yeoman Creek Landfill and Edwards Field Superfund site is underway. The results of this investigation will be used during the feasibility study to determine the most appropriate set of remedial activities to control hazardous substances at the site. Some remedial activities have already been completed: a two-foot cover was installed over Yeoman Creek Landfill in 1980, a fence was installed around the site in 1990, and erosion control measures have been initiated. Leachate movement from the landfill into the North Branch of the Waukegan River (Yeoman Creek) has been reduced as a result of these activities, but has not been completely controlled. Additional remedial actions will further reduce leachate movement from the landfilled areas to surface water and groundwater. As transport of contaminants to nearby water resources is reduced, contact risks in the

North Branch of the Waukegan River will be reduced, as will the possibility of eventual transport of contaminants to Lake Michigan.

Complete Preliminary Assessment of Alloy Casting and Engineering

Responsible Parties: IEPA
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Funding Source: IEPA, USEPA

Preliminary assessment of property within the ESA referred to as Alloy Casting and Engineering is currently being conducted by the IEPA. Alloy Casting and Engineering has not operated on the segment of property where the preliminary assessment will be conducted. As of this publication, the current owner has not been identified. When completed, this assessment will indicate the most appropriate program through which remediation, if needed, may be accomplished.

Lake Michigan Watershed Inventory/Identify and Control Sources of Nonpoint Source Pollution

Responsible Parties: IEPA, Lake County Stormwater Management Commission
Estimated Cost: $ 140,000
Completion Date: 1994
Funding Source: IEPA, USEPA, Lake County Stormwater Management Commission

The Lake County Stormwater Management Commission (LCSMC) is planning an investigation of the quality of stormwater generated in a portion of the Lake Michigan basin which is within Lake County. The proposed investigation will involve the evaluation of data collected during previous studies, an assessment of surface water uses and impairments, water quality monitoring in select homogeneous watersheds, and the development of urban nonpoint source pollution management programs specific to the studied basin. The NPS management programs will be incorporated into the LCSMC's Stormwater Management Technical Reference Manual.

Promote Participation in Pollution Prevention Programs

Responsible Parties: IEPA, Harbor Area Industries within the ESA
Estimated Cost: Indeterminate
Completion Date: Ongoing
Funding Source: Participating Industries

The IEPA administers the "Partners in Pollution Prevention", a program aimed at assisting industries to target methods for reducing waste production and encouraging waste recycling. The program focuses on identifying ways to modify processes or raw materials which result in an overall decrease in waste production. Abbot Laboratories is one of the leading industries involved in this program. In addition, the IEPA is involved in the Industrial Material Exchange Service through which industries may market their waste materials for reuse elsewhere.

Initiate Preliminary Assessment of Greenwood Avenue Dump

Responsible Parties: IEPA
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Funding Source: IEPA, USEPA

In 1994, this inactive dump site was added to the list of sites that need a preliminary assessment. When completed, this assessment will indicate the most appropriate program through which remediation, if needed, may be accomplished.

Removal of Contaminated Soils from the North Ditch

Responsible Parties: OMC, USEPA, IEPA
Estimated Cost: $ 3,600,000
Completion Date: 1993
Funding Source: OMC

Soils from the North Ditch have been removed and placed in confined disposal facilities as part of the OMC Superfund remediation. Removal of the soils has reduced the risk of human exposure to PCBs and of PCBs impacting Lake Michigan.

Promote the Development of Fish Habitat

Responsible Parties: IDOC, USFWS
Estimated Cost: Indeterminate
Completion Date: Indeterminate
Potential Funding Source: IDOC, Illinois-Indiana Sea Grant Program, USFWS

A management plan for the development and enhancement of fish habitat in the water resources of the Waukegan ESA will be prepared according to the guidelines of the Great Lakes Fishery Commission (GLFC, 1987). The plan will allow for protection, rehabilitation, and enhancement of the physical, chemical, and biological features required for the development and maintenance of a stable fishery.

10.3. MAINTENANCE AND PROTECTIVE ACTIVITIES

Maintenance and protective activities recommended for the Waukegan ESA are geared towards protecting natural resources, limiting the spread of existing contamination, and preventing future contamination. These activities include regulatory functions, monitoring efforts, and public awareness and education.

Nonpoint Source Pollution Awareness through Advertisements

Responsible Parties: Lake County Stormwater Commission, IEPA
Estimated Cost: $ 100,000
Completion Date: 1996
Funding Source: USEPA, IEPA

This project will heighten the awareness of urban nonpoint source pollution (specifically stormwater runoff) in Lake County through pollution prevention advertisements (messages, graphics, and photographs) on billboards, buses and bus stops. The advertisements will address such aspects of the stormwater runoff issue as gasoline on pavement, stormdrains clogged with debris, runoff from construction sites, and erosion of urban streambanks. Preventative actions will be displayed such as storm drain stenciling and recycling motor oil.

Protect Wetlands and Other Natural Areas in the Waukegan ESA

Responsible Parties: IEPA, USACE, IDOC
Estimated Cost: Indeterminate
Completion Date: Ongoing
Funding Source: IEPA, USACE, IDOC

Wetlands provide several functions beneficial to the Waukegan ESA. First, wetlands provide flood storage for runoff waters generated in upland areas. Second, wetlands enhance water quality through detention, filtering, microbial degradation, and biological uptake. Finally, wetlands provide unique habitats suited to diverse vegetation and wildlife communities.

Wetland resources in the ESA are federally protected through Section 404 of the Clean Water Act. In addition, wetlands are included in the Lake County Watershed Development Ordinance. Any modifications to wetlands through fill, excavation, and/or flooding requires a permit, and modifications totaling more than one acre require creation of mitigation wetlands.

Initiate Monitoring of Stormwater Runoff Discharges

Responsible Parties: IEPA, Lake County Stormwater Commission, Municipalities, Industry
Estimated Cost: Indeterminate
Completion Date: Ongoing
Funding Source: IEPA, Lake County Stormwater Commission, Municipalities, Industry

The NPDES permit program which is currently in place for municipal and industrial discharges will be expanded to include additional stormwater discharges. Some additional industrial discharges may be monitored for constituents expected to be present in significant concentrations. New stormwater discharges will require NPDES permits.

Monitoring of these discharges should help to identify constituent loads which may be controlled through application of urban NPS pollution controls and may indicate which of these NPS controls would most likely be effective. Implementation of applicable NPS pollution controls, such as best management practices, may provide improvements in water and sediment quality in Waukegan Harbor and nearshore Lake Michigan.

Continue Public Participation

Responsible Parties: Waukegan CAG, IEPA, USEPA, USACE
Estimated Cost: Indeterminate
Completion Date: Ongoing
Funding Sources: Corporate Sponsors, Illinois-Indiana Sea Grant Program, USEPA

Public participation has played a key role in many of the remedial activities which have been conducted or are currently underway in the Waukegan ESA. Public involvement is an integral part of both the Superfund and the RAP programs. Superfund activities in the ESA have included placement of relevant documents in repositories and USEPA sponsored availability sessions during which concerned citizens may question USEPA representatives about current projects. Past public participation efforts associated with RAP development are discussed in detail in Chapter 9. Additional public efforts include participation in the Lake Michigan Beach Sweep and a cleanup of reaches of the Waukegan River sponsored by Friends of the Waukegan River.

Efforts to promote public participation and action must continue throughout the duration of remedial activities in the Waukegan ESA. Certainly, public involvement should continue through implementation of the RAP and ongoing Superfund remediations. Public comment also must be solicited before the selection of the location for the CDF which eventually will receive dredge spoils from Waukegan Harbor. Other public activities which may occur in the near future include an Amnesty Day for pick-up of hazardous household materials and participation in future Lake Michigan Beach Sweeps.

Protect Threatened and Endangered Species Which Use the Waukegan ESA

Responsible Parties: IDOC, USFWS
Estimated Cost: Indeterminate
Completion Date: Ongoing
Funding Source: IDOC, USFWS

The threatened and endangered species database managed by the IDOC should be maintained. If possible, information contained within the database and added to it in the future should be examined for indications of population trends. Information collected through inventories and research studies conducted at the Illinois Beach State Park should be included in the IDOC's database.

Maintain Adequate Public Access to the Water Resources of the Waukegan ESA

Responsible Parties: City of Waukegan, Waukegan Port District

Estimated Cost: Indeterminate

Completion Date: Ongoing

Funding Source: Corporate Sponsors, City of Waukegan, Waukegan Port District

Currently, many opportunities exist for public access to the water resources of the Waukegan ESA. Access within the ESA include two beaches, marinas, boat launches, public parks, and the Government Pier. At least two city parks, Washington Park and Powell Park, are situated along the Waukegan River upstream of the ESA. Public access to the harbor area also is facilitated through special events held during the recreation season, April through September. Events planned for the 1992 season include the Mayors' Cup invitational race, the Salmon Classic Jackpot, the Chicago to Waukegan Race, a fish boil, the Waukegan Harbor Special Boat Show featuring hydroplane racing, a triathlon, and holiday events on Independence Day and Labor Day.

Public access to Waukegan Harbor and the nearshore areas of Lake Michigan promotes awareness of the amenities provided by the Waukegan area. In addition, as the environmental quality of the ESA improves through the implementation of remedial actions, demand for access to Waukegan Harbor and Lake Michigan may increase thereby enhancing economic growth. Greater public access to the harbor and Lake Michigan may potentially be accomplished through development of some of the old industrial sites, especially those located in the southern portion of the ESA. Expansion of existing marina facilities may be possible to increase boat mooring and launching capacity.

Habitat Protection at Illinois Beach State Park

Responsible Parties: IDOC, IEPA

Estimated Cost: Indeterminate

Completion Date: Ongoing

Funding Source: IDOC, IEPA

The Illinois Beach State Park provides unique and high quality habitats for vegetative communities and wildlife as well as a valuable public beach. These valuable resources should be protected. In addition, resource management activities currently conducted by park staff should be continued to control establishment of invasive plant species and to promote vegetative and habitat diversity and protection of all park lands.

Continue Monitoring of Industrial Discharges

Responsible Parties: IEPA, USEPA
Estimated Cost: Indeterminate
Completion Date: Ongoing
Funding Source: IEPA, USEPA

The IEPA currently has NPDES program authority within the State of Illinois. Consequently, the IEPA is responsible for issuance, modification, and enforcement of NPDES permits. The permit requires that discharges be monitored for chemical and biological parameters to assure compliance with permit limits. Results of monitoring efforts must be reported to the IEPA. This monitoring will identify excursions above permit limits for all discharges in and tributary to the Waukegan ESA. Necessary enforcement actions are taken by IEPA to correct violations of permit limits for these discharges. Continued control of new and existing point source discharges will help assure improved water and sediment quality in the ESA.

Continue Monitoring at Schuller International Superfund Site

Responsible Parties: Schuller International, USEPA, IEPA
Estimated Cost: Indeterminate
Completion Date: Ongoing
Funding Source: Schuller International

Although Superfund construction at Schuller International, Inc. (formerly Johns-Manville) has been completed, monitoring of air quality, surface water and groundwater quality, and containment cell soil cover at the site will continue. Air quality will be monitored for a duration of 15 years. Surface water and groundwater quality will be monitored for 30 years. The soil cover of on-site containment cells will be observed for 30 years to ensure that erosive processes do not cause ACMs to reach the soil surface. Contingency plans have been developed should monitoring results indicate that further remedial activities are necessary. Additional monitoring will be accomplished under the applicable NPDES permit with oversight by IEPA.

10.4. REFERENCES

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GLOSSARY

ABBREVIATIONS

ACM - Asbestos-Containing Materials

AET - Apparent Effects Threshold

AOC - Area Of Concern

AQCR - Air Quality Control Region

ATSDR - Agency for Toxic Substance and Disease Registrary

BDL - Below Detection Limit

BETX - Benzene, Ethylbenzene, Toluene, and Xylene

BHC - Benzene hexachloride

BOD - Biological Oxygen Demand

CAG - Citizen's Advisory Group

CBOD - Carbonaceous Biological Oxygen Demand

Cd - Cadmium

CDF - Confined Disposal Facility

CEC - Commonwealth Edison Company

CERCLA - Comprehensive Environmental Response Compensation and Liability Act (Superfund)

cfs - cubic feet per second; a measure of velocity

Cl - Chlorine

cm/sec - centimeters per second

COA - bioeffects/contaminant Co-Occurrence Analysis

COD - Chemical Oxygen Demand

Cr - Chromium

CSO - Combined Sewer Overflow

Cu - Copper

CWA - Clean Water Act/Public Law 92-500

DDE - Dichloro-diphenyl-dichloro-ethylene

DDT - Dichloro-diphenyl-trichloro-ethane; a colorless and odorless insecticide. This insecticide has been banned because of its' persistence in the environment.

DMR - Discharge Monitoring Report

DO - Dissolved Oxygen

EMC - Ethylmercury chloride

EP - Sediment-water equilibrium approach

ER-L - Effects Range-Low; effects observed one time out of ten

ER-M - Effects Range-Median; effects observed over half of the time

ESA - Expanded Study Area

FDA - Food and Drug Administration

FWPCA - Federal Water Pollution Control Administration

g - gram

GLFC - Great Lakes Fishery Commission

GLWQA - Great Lakes Water Quality Agreement

IDEM - Indiana Department of Environmental Management

IDOC - Illinois Department of Conservation

IDPH - Illinois Department of Public Health

IEPA - Illinois Environmental Protection Agency

IJC - International Joint Commission

INHS - Illinois Natural History Survey

ISWS - Illinois State Water Survey

MCL - Maximum Contaminant Levels

MDNR - Michigan Department of Natural Resources

mgd - million gallons per day; a term commonly used to express rate of flow of a liquid.

mg/kg - milligram per kilogram; the concentration at which one thousandth of a gram (one milligram) is contained in a mass of one kilogram. A gram contains 1000 milligrams.

mg/L - milligrams per liter; the concentration at which one milligram (10^{-3} g) is contained in a volume of one liter; generally equivalent to parts per million.

ml - milliliter; a volume equal to one thousandth of a liter.

Mn - Manganese

MWRDGC - Metropolitan Water Reclamation District of Greater Chicago

NAAQS - National Ambient Air Quality Standards

ng/L - nanogram/liter; the concentration at which one billionth of a gram (10^{-8} g) is contained in a volume of one liter; generally equivalent to parts per trillion.

NH_3 - ammonia

NH_4 - ammonium

NIPC - Northeastern Illinois Planning Commission

NO_2 - Nitrate; a form of nitrogen used by algae. Excessive concentrations result in eutrophication and algal blooms.

NO_3 - Nitrite; a form of nitrogen toxic to aquatic life which rapidly oxidizes to nitrates.

NPDES - National Pollutant Discharge Elimination System

NPL - National Priorities List

NPS - Non-Point Source

NSSD - North Shore Sanitary District

NTU - Nephelometric Turbidity Unit

NURP - National Urban Runoff Program

O_3 - Ozone

OMC - Outboard Marine Corporation

PAH - Polynuclear Aromatic Hydrocarbons

Pb - lead

PCB - Polychlorinated biphenyl

ppb - part per billion

ppm - part per million; a concentration at which one unit is contained in a total of a million units. Any units may be used (e.g. weight, volume) but in any given application identical units should be used (e.g. grams per million grams or liters per million liters).

RAP - Remedial Action Plan

RCRA - Resource Conservation and Recovery Act of 1976

RI/FS - Remedial Investigation/Feasibility Study

ROD - Record of Decision

SARA - Superfund Amendments and Reauthorization Act

SLC - Screening Level Concentration

SO_2 - Sulfur dioxide

SOD - Sediment Oxygen Demand

SRAPL - State Remedial Action Priorities List

SSB - Spiked Sediment Bioassay

STORET - The USEPA data management system for storage and retrieval of water quality information

STP - Sewage Treatment Plant

SRU - Site Review Update

TKN - Total Kjeldahl Nitrogen

TMDL - Total Maximum Daily Load; the maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOC - Total Organic Carbon

TRE - Toxicity Reduction Evaluation

TSCA - Toxic Substance Control Act

TSP - Total Suspended Particulates

TVS - Total Volatile Solids

ug/kg - microgram per kilogram; the concentration at which one thousandth of a gram (one microgram) is contained in a mass of one kilogram. A kilogram is 2.046 pounds.

ug/L - microgram per liter; a unit of measure for concentration generally equivalent to parts per billion (ppb).

USACE - United States Army Corps of Engineers

USEPA - United States Environmental Protection Agency

USFDA - United States Food and Drug Administration

VOC - Volatile Organic Compound

VSS - Volatile Suspended Solids

WDNR - Wisconsin Department of Natural Resources

Zn - Zinc; a bluish-white element used to form a wide variety of alloys including brass, bronze, solders, and nickel silver.

DEFINITIONS

A

action levels - a value that if exceeded requires action, such as an investigation or warning, to be taken.

activated carbon treatment - treatment where undesirable colors or odors are removed, gases absorbed, and solvents are recovered.

acutely toxic - causing death or severe damage to an organism by poisoning during a brief exposure, normally ninety-six hours or less, although there is no clear line of demarcation between acute and chronic toxicity.

additive - a substance added in small amounts to something else to improve, strengthen, or otherwise alter it.

adsorption - Adhesion of molecules of gas, liquid, or dissolved solids to a surface.

advection - The transportation of an atmospheric property solely by the mass motion of the atmosphere.

aerated - to supply or impregnate with air.

aesthetics - Science of the beautiful, philosophy of taste. Pertaining to the attraction of a subject.

airshed - The geographic area covered by an air supply.

alachlor - A herbicide, marketed under the trade name Lasso, used mainly to control weeds in corn and soybean fields.

aliphatic compounds - a large class of organic compounds characterized by an open chain structure.

ambient - An encompassing atmosphere: environment.

ammonia - NH_3; an unionized form of nitrogen found in human and animal wastes. Ammonia is toxic to aquatic life depending upon pH, temperature and ionic strength of the water. NH_4; an ionized ammonia found in human and animal waste.

angler - one that fishes with hook.

anthropogenic - induced or altered by the presence and activities of man.

aquifer - an underground formation composed of materials such as sand, soil, or gravel that can store and supply groundwater to wells and springs.

aquitard - Geologic beds within a stratigraphic sequence which are less permeable than those of an aquifer.

Area of Concern (AOC) - An area of the Great Lakes identified by the International Joint Commission (IJC) as having serious water pollution problems.

artesian wells - a well in which the water is capable of rising to the surface by internal hydrostatic pressure.

asbestos - either of two incombustible, chemical resistant, fibrous mineral forms of impure magnesium silicate, used for fire proofing, electrical insulation, building materials, and chemical filters.

atmospheric deposition - Materials deposited onto land and water from the atmosphere.

attainment area - an area that meets environmental regulations concerning air.

avian foraging - process of birds or fowl look for food or provisions.

B

bacteria - singe-cell, microscopic organisms. Some can cause disease, and some are important in the stabilization of organic wastes.

beneficial uses - uses that maintain the chemical, physical and biological integrity of an ecosystem.

below detection limits - at a level that is not detectable by a specific piece of equipment.

benthos degradation - decrease in the number and diversity of organisms at the bottom of a lake.

beneficial water resource - water resource which contributes to well-being or personal health.

benthic life (benthos) - organisms living on the bottom of the sea or lake.

berm - Man-made, above ground, earth wall

bioaccumulation - the uptake and retention of substance by an organism from its surrounding medium and from its food. Chemicals move through the food chain and tend to end up at higher concentration in organisms at the upper end of the food chain such as predator, fish, or in people or birds that eat fish.

bioassay - see biomonitoring

biodegradable - waste which can be broken down by bacteria into basic elements. Most organic wastes such as food remains and paper are biodegradable.

biological nitrification - Oxidation into nitric acid, nitrous acid, or any nitrite by the action of bacteria.

biological oxygen demand (BOD) - The amount of dissolved oxygen needed by biological processes breaking down organic matter.

biomass - the amount of living matter (as in a unit area or volume of habitat).

biomonitoring (bioassay) - A test for pollutant toxicity. Tanks of fish or other organisms are exposed to varying doses of wastewater effluents, lethal doses of pollutants are thus determined.

biota - the animal or plant life of a particular region considered as a total ecological entity.

biotic - having the qualities of an animal or plant life of a particular region considered as a total ecological entity.

bloaters - a small but common cisco (whitefish) of the Great Lakes region.

blowdown - Hydrocarbons purged during refinery shutdown and startup.

C

chemical oxygen demand (COD) - a measure of the amount of oxygen required to oxidize compounds in water.

chlordane - A colorless, odorless, viscous (highly resistant to flow) liquid. Chlordane is used as an insecticide.

chronically toxic - causing death or damage to an organism by poisoning during prolonged exposure, which depending on the organism testing and the test conditions and purposes, may range from several days, to weeks, months, or years.

Citizens Advisory Group (CAG) - group of concerned individuals that work with and advise the IEPA.

Clean Water Act/Public Law 92-500 - The federal law that set national policy for improving and protecting the quality of the nation's waters. The law set a timetable for the cleanup of the nation's waters and stated that they are to be fishable and swimmable. This also required all pollutant dischargers to obtain a permit and meet the conditions of the permit. To accomplish this pollution cleanup billions of dollars have been made available to help communities pay the cost of building sewage treatment facilities. Amendments to the Clean Water Act were made in 1977, 1981 and 1989.

coagulation - A clumping of particles.

Common Tern (Sterna hirunda) - a sea bird similar to a gull which frequents bodies of water.

compost substrate - The humus like product of the process of composting waste.

comprehensive narrative toxic controls - effluent concentrations based on the narrative water quality standard that are required of all discharges.

condensate - a liquid obtained by the condensation of a gas or vapor (e.g. steam).

confined disposal facility - a structure built for the containment and disposal of contaminated dredged material.

congeners - a chemical substance related to another. ie. a derivative.

Consent Decree - a formal agreement binding consenting parties to a specific course of action under the sanctions of the court.

contact recreation - referring to recreation which requires direct contact with water.

contaminant - an element or chemical compound which by its introduction, results in one or more components of the ecosystem being detrimentally affected.

creosote - coal tar used as a wood preservative.

cross connection - a physical connection (pipes or hose) that allows contaminated water to mix with clean water.

D

decant - to pour from one vessel to another without disturbing the sediment or lower liquid layers.

degradation - The process by which a chemical is reduced to a less complex form

deposits - mineral or sandy material settled out of water.

desorption - to be removed from. the opposite of absorption.

Dieldrin - a white crystalline insecticide consisting chiefly or entirely of the epoxide C(12) H(8) Cl(6) O(1) obtained by the oxidation of aldrin. (SAC 60-57-1)

disinfection - neutralizing or the cleansing of microorganisms in water by chemical oxidants or equivalent agents.

dispersion - A separation or suspension of particles in a liquid, solid, or gaseous medium. Smog is an example of a dispersion of particulate matter in the atmosphere.

dissolved oxygen - Oxygen dissolved in water. Low levels of dissolved oxygen threaten fish survival and are often due to inadequate wastewater treatment.

downspouts - a pipe to carry off rainwater

dredge - To deepen a waterway with a machine used for removing earth.

dressed weight - the weight of an animal after being prepared for market.

dry fall - Precipitation of particles from the air due to gravitational forces.

E

ecosystem - an ecological community together with its physical environment, considered as a unit.

effluent - solid, liquid or gas wastes (by-products) which are disposed on land, in water or in air. As used in the RAP generally means wastewater discharges.

electrofishing - the taking of fish by a system based on their tendency to respond positively to a source of direct electric current.

emergency water intake - an access pipe to lake that is not normally used because of its proximity to the shore.

Equality Formation - a sediment formation in Gallitan County which consists of laustrine silt, clay and sand underlying a lake plane or beach complex of the present under most of Lake Michigan.

eutrophic - designating a body of water in which the increase of mineral and organic nutrients has reduced the oxygen, producing an environment that favors plant over animal life.

eutrophication - the accumulation of nutrients in a water body. Eutrophication can be accelerated by human activity such as agriculture and improper waste disposal.

event mean concentration - the total constituent mass discharge divided by the total runoff volume (U.S. EPA, 1983).

event sampling - the collection of water samples in rivers and streams for biological, physical and chemical analyses, in response to the occurrence of snowmelt or storm events.

F

feasibility study - investigative and analytical studies usually performed at the same time in an interactive and iterative process, and together referred to as the "RI/FS". They are intended to:
- Gather the data necessary to determine the type and extent of contamination at a Superfund site;
- Establish criteria for cleaning up a site;
- Identify and screen cleanup alternatives for Remedial Action;
- Analyze in detail the technology and costs of the alternatives.

fecal coliform - a group of organisms (bacteria) common to the intestinal tracts of man and other warm-blooded animals.

fecal contamination - excrement or sewage contamination.

filter-backwash solids - material that has been trapped in a filter and is subsequently released by reversing the flow of liquid.

finished drinking water - see raw water

foraging - wandering in search of food.

fracture - a crack, joint, or fault in a rock due to mechanical failure by stress.

furan - 2,3,7,8-Tetra-chloro-dibenzofuran; a chlorinated organic compound which is highly toxic.

G

geometric mean - the nth root of the product of n numbers (ex. The geometric mean of 3, 8, and 9 n=3, 3*8*9 = 216, the cubed root of 216 is 6. The geometric mean of 3 and 27 n=2, 3*27 = 81, the square root of 81 is 9).

Glacial Lake Chicago - predecessor of Lake Michigan that existed during the past periods of glaciation.

glacial till - unsorted and unstratified drift consisting of a heterogeneous mixture of clay, sand, gravel, and boulders which is deposited by and underneath a glacier.

granular activated carbon - a highly adsorbent powdered or granular carbon or charcoal made usually by carbonization of materials such as wood or coconut shells and chemical activation (by oxidizing gases).

Great Lakes Water Quality Agreement - This regional agreement was originally signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It provides guidance for the management of water quality, specifically phosphorus and toxics in the Great Lakes.

groundwater - Water beneath the Earth's surface in saturated soil and rock that supplies wells and springs.

groundwater levels - the depth or elevation above or below sea level at which the surface of the groundwater stands.

gypsum - a white mineral used in the manufacturing of plaster of Paris, gypsum plaster, and plasterboard, wallboards and fertilizers.

H

habitat - the place or type of site where a plant or animal naturally lives and grows.

harbor sediment - material settled in the harbor or suspended in the water of the harbor.

heavy metals - a group of metals which may be present in municipal and industrial wastes that pose long-term environmental hazards if not properly disposed. Heavy metals can contaminate ground and surface waters, fish and food. The metals of most concern are: arsenic, cadmium, chromium, copper, lead, mercury, selenium and zinc.

herbicide - a type of pesticide that is specifically designed to kill plants and can also be toxic to other organisms.

hydraulic conductivity - the rate of water flow in gallons per day through a cross-section of 1 square foot under a unit hydraulic gradient at the prevailing temperature or 60 F.

hydrocarbons - any of a large class of chemicals containing carbon and hydrogen in a virtually infinite number of combinations.

hydrologic budget - a systematic summary of the terms (inflow, outflow, storage) of the storage equation as applied to the computation of soil-moisture changes; an evaluation of the hydrologic balance of an area.

hydrologic cycle - The manner in which rain and snow circulates between the earth and the atmosphere.

hydrology - the scientific study of the properties distribution and effects of water on the earth's surface, in the soil, underlying rocks, and in the atmosphere.

I

International Joint Commission (IJC) - A binational commission formed by the United States and Canada to guide management of the Great Lakes and resolve border issues, particularly water quality issues.

imported fill - material used for fill that is brought in from outside of the immediate area.

indigenous - having originated in and being produced, growing, or living naturally in a particular region or environment.

infiltration and inflow analysis - Detailed description of the characteristics of a liquid, whether it be untreated water or sewage, before it is treated at a drinking water or sewage treatment facility.

influent - a tributary stream or other body of water flowing into another water body.

in-situ - in the original place.

in-situ hydraulic conductivity measurement - slug test

interceptor sewers - a sewer which prevents the entrance of solid matter, grease, or other material into the main sewer line.

isomers - a compound, ion or nuclide having the same number of atoms of the same element, but differing in structural arrangement and properties.

iterative - involving replication; relating to or being a computational procedure in which replication of a cycle of operation produces results which approximate the desired result more and more closely.

L

leachate - liquid that has come into contact with solid waste.

lead (Pb) - soft bluish-gray metal. Lead is used in batteries, ammunition, brass, solder, pipes, power and communication cable coverings.

limnology - The scientific study of the life and phenomenon of lakes, ponds, and streams.

liter (L) - the volume occupied by one kilogram of water at a pressure of 760 mm of mercury and a temperature of 4 C. A liter is 0.9463 quart.

litigation - a legal contest according to the judicial process.

load - the total amount of materials or pollutants reaching a given water body.

littoral drift - the materials moved by waves and currents of the littoral zone or area along the shore.

load - The total amount of materials or pollutants reaching a given body of water.

M

macroinvertebrates - Animals without a vertebral column and which are visible to the unaided eye.

macronutrients - an element such as carbon, hydrogen, oxygen, or nitrogen, required in large proportion for the growth and development of plants.

macrophylic vegetation - vegetation with highly specialized cell groups.

marsh - wetland community dominated by emergent vegetation which has water at or above the surface for most of the year. Soils may be organic or mineral.

mesotrophic - refers to a moderately fertile nutrient level of a lake between the oligotrophic and eutrophic levels.

metabolites - any of the various organic compounds produced by metabolism. This substance is essential to the metabolism of a particular organism or a particular metabolic process.

microbial degradation - degradation of compounds by microbes in the soil.

mitigation - the effort to lessen damages caused by modifying a project, providing alternatives, compensating for losses, or replacing lost values.

mitigation wetlands - Wetlands used to reduce adverse impacts to the environment.

monitoring well - A special well drilled at specific locations on or off a site where groundwater can be sampled at selected depths and studied to determine such things as direction in which groundwater flows and the types and amounts of contaminants present.

N

narrative water quality standards - (as defined in Title 35, Subtitle C, Chapter I, Subpart B of the State of Illinois Rules and Regulations) Waters of the State shall be free from any substances in concentrations toxic or harmful to human health, or to animal, plant or aquatic life. Complemented through use of Subpart F.

National Pollutant Discharge Elimination System (NPDES) - a federal permit system to monitor and control the point source dischargers of wastewater. Dischargers are required to have a discharge permit and meet the conditions it specifies.

neoplastic - of, relating to, or constituting a new growth of tissue serving no physiologic function (tumor).

New Harbor - the harbor south of Government Pier.

nonattainment area - an area that is not meeting specific environmental standards.

nonpoint source (NPS) - Pollution sources which are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet.

nonpoint source pollution - pollution whose sources cannot be traced to a single point such as municipal or industrial wastewater treatment plant discharge pipe. Nonpoint sources include eroding farmland and construction sites, urban streets and barnyards. Pollutants from these sources reach water bodies in runoff, which can best be controlled by proper land management.

O

oligotrophic - lacking in plant nutrients and having an abundance of dissolved oxygen throughout the water.

organic silt - accumulation of the organic and inorganic fragmental products of the weathering and erosion of land; very soft silt.

organochlorine pesticides - pesticides containing carbon and chlorine, such as DDT

outfall - the mouth of a sewer, drain or pipe where wastewater effluent is discharged.

ozone - a triatomic form of oxygen that is a bluish irritating gas of pungent odor, is formed naturally in the upper atmosphere by a photochemical reaction with solar ultraviolet radiation or generated commercially by a silent electric discharge in ordinary oxygen or air, is major agent in the formation of smogs.

P

parts per thousand - a concentration at which one unit is contained in a total of a thousand units. The rules for using this term are the same as those for parts per million. Normally, this term is used to specify the salinity of estuarine or sea waters.

parameters - characteristic elements of an area or the specified boundaries of the area.

pathogenic organisms - organisms capable of causing disease.

pH - a measure of the acidity or alkalinity of a solution.

phenols - caustic and poisonous crystalline in resins, plastics, disinfectants, and pharmaceuticals.

phosphorus - a nutrient that in excess amounts in lakes and streams can lead to overfertile (eutrophic) conditions and algae glooms.

photosynthesis - the process by which chlorophyll-containing cells in green plants convert incident light to chemical energy and synthesize organic compounds from inorganic compounds.

phreatophyte - a deep rooted plant that obtains its water from the water table or the layer of soil just above it.

phytoplankton - microscopic, photosynthetic floating aquatic plants.

piezometers - a basic device for measurement of hydraulic head consisting of a tube or pipe, open to water flow at the bottom and open to atmosphere at the top, through which the elevation of water level can be determined.

plankton - tiny plants (phytoplankton or algae) and animals (Zooplankton) that live in water.

plume - visible emissions in air; visible discharge in water.

point sources - sources of pollution that have discrete discharges, usually from a pipe or outfall.

pollutant - any material introduced into the environment that makes a resource unfit for a specific purpose.

pollution tolerant - the ability to survive in polluted areas.

polychlorinated biphenyls (PCB) - A group of 209 compounds. PCB's have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment because they resist wear and chemical breakdown. Although banned in 1979 because of their persistence in the environment, they have been detected in air, soil and water, and recent surveys have found PCB's in every section of the country, even those remote from PCB manufacturers.

post-aeration - Any activity occurring after water had been aerated.

potable water supply - drinkable water supply.

precipitation scavenging - The process by which particles are taken from the air and deposited on the surface by rainfall.

primary standard - Sewage treatment standard that every municipal and industrial sewage treatment facility in Illinois must meet.

priority pollutant - toxic chemicals identified by the federal government because of their potential impact on the environment and/or human health. Major discharges are required to monitor all or some of these chemical when their permits are reissued.

productivity - a measure of the amount of living matter which is supported by an environment over a specific period of time. Often described in terms of algae production for a lake.

protozoan - minute protoplasmic single-celled animals which have varied physiologies and are often complex life cycles and are represented in almost every kind of habitat. Some are parasites of man and domestic animals.

R

raw water - undiluted water.

remedial action - a long-term action that stops or substantially reduces a release or threat of a release of hazardous substances that is serious, but does not pose an immediate threat to public health or the environment.

Remedial Action Plan (RAP) - Document outlining a long-term action that stops or substantially reduces a release or threat of a release of hazardous substances that is serious, but does not pose an immediate threat to public health or the environment.

Remedial Investigation/Feasibility Study - an investigation of problems and assessment of management options conducted as part of a superfund project.

Resource Conservation and Recovery Act of 1976 (RCRA) - this federal law amends the Solid Waste disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program which regulates hazardous wastes to eliminate open dumping and to promote solid waste management programs.

risk assessment - a measure of the possible danger for undertaking a specific course of action.

round weight - Adjusted weight to express a whole number.

runoff - water from rain, snow melt or irrigation that flows over the ground surface and return to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

S

sanitary sewers - a sewer that carries wastewater together with incidental land runoff.

sanitary district - a special-purpose unit of government providing sanitary service in its jurisdictional area.

scuds - the matter worked out of a hide or skin during scrapping.

sediment - soil particles suspended in and carried by water as a result of erosion. Particles are deposited in areas where the water flow is slow (e.g. harbors, wetlands, lakes).

sediment oxygen demand (SOD) - a measure of the amount of dissolved oxygen demand by sediment reactions. The SOD can have a significant influence on the amount of dissolved oxygen available in the water column.

sedimentation - act or process of depositing sediment.

seiche - An oscillation of the surface of a lake or landlocked sea that varies in period from a few minutes to several hours and is thought to be initiated chiefly by local variations in atmospheric pressure aided in some instances by winds and tidal currents and that continues for a time after the inequalities of atmospheric pressure have disappeared.

settling - an area or container used for holding liquids so that suspended matter may settle or matter that settles at the bottom of a liquid.

shallow bedrock - solid rock that underlies all soil, sand, clay, gravel, and loose material on the earth's surface.

silt curtain - A wall of earth used to reduce contaminated sediment from moving to uncontaminated areas.

Silurian age dolomite - a mineral which is presently used as a furnace refractory, construction or ceramic material, and fertilizers. A magnesium rich sedimentary rock resembling limestone that was deposited under water 400,000,000 years ago.

sludge - any solid, semi-solid, or liquid waste generated from a municipal or industrial wastewater treatment plant.

slug tests - a test used to determine the in-situ hydraulic conductivity by causing an instantaneous change in the water level in a piezometer through sudden introduction of an unknown water level.

solid waste - unwanted or discharge material with insufficient liquid to be free flowing.

storm sewers - sewer intended to only receive land runoff.

stormwater runoff - rainwater that drains over land from any part of the facility.

streambank - The margin of a stream; the rising ground bordering a stream.

Superfund - Comprehensive Environmental Response and Liability Act (CERCLA); a federal program administered by the EPA which provides for cleanup of major hazardous waste landfills and land disposal areas.

surface water - natural water which has not penetrated much below the surface of the ground.

surficial groundwater - groundwater very near the surface of the earth.

surges - A series of large waves or billows.

suspended solids - small particles of solid matter suspended in water. Cloudy or turbid water is due to the presence of suspended solids in the form of silt or clay particles. These particles may carry pollutants adsorbed to the particle surfaces.

synergism - the characteristic property of a mixture of toxic substance that exhibits a greater-than-additive cumulative toxic effect.

T

Taciuk process - Thermal treatment process used to separate PCBs from soil.

tannery - a place where the conversion of hide into leather takes place.

tar derivatives - Breakdown products resulting from the biological or chemical degradation of tar.

taxa - groups of classified organisms.

terrestrial - land dwelling inhabitants.

total coliform counts - number of colon bacteria present.

total organic carbon - one of several chemical parameters used to measure the enrichment of sediment with organic materials. TOC levels can effect the bioavailablity of organic contaminants.

toxicity - the degree of danger posed by at toxic substance to animal or plant life.

toxicity reduction evaluation - for a discharger, it is required that causes of toxicity in an effluent be determined and that measures be taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions achieving the desired result.

Toxic Substance Control Act (TSCA) - act that regulates certain toxic wastes (PCB's, and some pesticides).

trophic status - the types of food or nutrients which can be found in the water.

turbidity - lack of water clarity due to sediment or foreign particles being stirred up or suspended.

U

urban - of, relating to, or constituting a city.

V

variance - government permission for a delay or exception in the application of a given law, ordinance or regulation.

volatile - any substance that evaporates at a low temperature.

volatile organic compound - an organic (carbon-containing) compound that evaporates (volatilizes) readily at room temperature.

volatilization - the act of evaporating readily at relatively low temperatures.

W

Wadsworth Till - a glacial formation made of an unconsolidated mixture of clay, sand, gavel, and boulders found in Lake County and present under most of Lake Michigan.

wastewater treatment facilities - a facility for purifying wastewater. Modern wastewater treatment facilities may be capable of removing 95% of organic pollutants.

wasteload allocation - division of the amount of waste a stream can assimilate among the various dischargers to the stream. This results in a limit on the amount (in pounds) of a chemical or biological constituent discharged from a wastewater treatment plant to a water body. A water quality model may be used to calculate allowable loadings, which vary seasonally due to flow.

wastewater: Water that has become contaminated as a byproduct of some human activity. Wastewater includes sewage, washwater and the waterborne wastes of industrial processes.

water filtration facilities - facility that treats water by filtration to remove impurities.

watershed - a ridge of high land dividing two areas that are drained by different river systems.

wetlands - a lowland area, such as a marsh or a swamp, that is saturated with moisture.

wet meadow - Wetland community dominated by emergent vegetation which has water at or above the surface for most of the year. Soils may be organic or mineral.

Z

zooplankton - minute, free-floating microscopic aquatic animals. They form an important food supply for larger aquatic animals.

APPENDICES

APPENDIX A

Raw and Finished Drinking Water Quality
Analyses by the
Illinois Environmental Protection Agency Laboratories

APR 30 1991

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

DIVISION OF PUBLIC WATER SUPPLIES

SAMPLING PROGRAM:
COMPLETE CHEMICAL ANALYSIS

JUL 26 '91
I.E.P.A.
DIV. OF
PUBLIC WATER SUPPLIES

FACILITY: 0971900 Waukegan

SAMPLES SCHEDULED DURING APRIL 1991

SAMPLE LOCATION: COLLECT FROM RAW SURFACE LAKE MICHIGAN INTAKE

MAIL REPORT TO:

NAME: Frank Shess, Supt

ADDR: 106 N. Utica St

CITY: Waukegan STATE: ILL ZIP: 60085

DATE COLLECTED: May 14, 1991

TIME COLLECTED: 3:05P

SAMPLE COLLECTOR: Ken Sheets

PHONE NUMBER: 360-9000, xt 451

FUNDING CODE: PW30
AGENCY ROUTING:
SAMPLE TYPE: RPWS
PURPOSE: 3-REPLACEMENT
NDICATOR: B
MIT SRCE: 0971900
L PROGRAM: CH - CHEMICAL
PARM GROUP: 21001

SAMPLE TYPE: RAW

FACILITY: Waukegan 0971900

SAMPLE LOCATION:

99901-00

RECEIVED
REGION 2
AUG 2 1991
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

---LAB USE ONLY---

RECEIVED
JUL 1 2 1991
Environmental Protection Agency
State of Illinois

SAMPLE NUMBER P106755

DATE RECEIVED MAY 16 1991

TIME RECEIVED 11A

RECEIVED BY pd

DATE FORWARDED JUL 11 1991 SPWSR

IL 532-0761 PWS 21 (REV. 7-87)-cmpchem

A - 1

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : B106755
AMPLING POINT DESC. : WAUKEGAN 99901-00

UBMITTING SOURCE # : 0971900 SITE # :
ATE COLLECTED : 910514 TIME COLLECTED : 1505 SAMPLING PROGRAM : CH

OLLECTED BY : K SHEETS DELIVERED BY : UPS
OMMENTS :
UNDING CODE : PW30 AGENCY ROUTING : 00 UNIT CODE :
AM TYPE CODE : RPWS SAMPLE PURPOSE CODE : 3 REPORTING INDICATOR : B

ATE RECEIVED : 910516 TIME RECEIVED : 1100 RECEIVED BY : PMD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE 7-31-91
MW

00403	PH-LABORATORY	UNITS :	8.0	P00095	CONDUCTIVITY	UM/CM :	307
70300	(ROE) TDS @ 180C	MG/L :	181	P00410	ALKALINITY/TOTAL	MG/L :	107
00900	HARDNESS/EDTATOTAL	MG/L :	130	P00951	FLUORIDE/TOTAL	MG/L :	0.10
00940	CHLORIDE/TOTAL	MG/L :	12	P00945	SULFATE/TOTAL	MG/L :	15
00630	NITRATE&NO2-NTOTAL	MG/L :	0.28	P00610	AMMONIA-N/TOTAL	MG/L :	0.05
00956	SILICA/TOTAL	MG/L :	1.0K	P00720	CYANIDE/TOTAL	MG/L :	0.005K
01002	ARSENIC/TOTAL	UG/L :	1	P01051	LEAD/TOT.FURNACE	UG/L :	5K
71900	MERCURY/TOTAL	UG/L :	0.05K	P01147	SELENIUM/TOTAL	UG/L :	1K
00916	CALCIUM/TOTAL	MG/L :	37	P00927	MAGNESIUM/TOTAL	MG/L :	12
00929	SODIUM/TOTAL	MG/L :	6	P00937	POTASSIUM/TOTAL	MG/L :	1.4
01105	ALUMINUM/TOTAL	UG/L :	50K	P01007	BARIUM/TOTAL	UG/L :	17
	BORON/TOTAL	UG/L :	50K	P01012	BERYLLIUM/TOTAL	UG/L :	0.5K
	CADMIUM/TOTAL	UG/L :	5K	P01034	CHROMIUM/TOTAL	UG/L :	5K
	COPPER/TOTAL	UG/L :	5K	P01037	COBALT/TOTAL	UG/L :	5K
01045	IRON/TOTAL	UG/L :	50K	P01055	MANGANESE/TOTAL	UG/L :	5K
01067	NICKEL/TOTAL	UG/L :	7	P01077	SILVER/TOTAL	UG/L :	5K
01082	STRONTIUM/TOTAL	UG/L :	125	P01087	VANADIUM/TOTAL	UG/L :	5K
01092	ZINC/TOTAL	UG/L :	50K	P82394	HARDNESS CALC.	MG/L :	141C
17700	ANION/CATION BAL	Y/N :	Y				

DI76121 DI76121

Illinois Environmental Protection Agency • 2200 Churchill Road, Springfield, IL 62706

VISION OF PUBLIC WATER SUPPLIES

TRIHALOMETHANE ANALYSIS

RECEIVED
REGION 2
SEP 11 1991
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

CILITY: 0971900 WAUKEGAN

MPLES SCHEDULED DURING: AUGUST, 1991

IL REPORT TO:

ME: Frank Chess Jr., Supt

DATE COLLECTED Aug 20 1991

DR: 106 N. Utica St

SMPL COLLECTOR Ken Sheets

TY: Waukegan STATE IL ZIP 60085

PHONE NUMBER 708-360-9000 xt 451

UTING CODE: P.30
ROUTING:
TYPE: DPWS - DISTRIBUTION
RPOSE: 1 - ROUTINE
LOCATION: 3
DBMIT PACE: 0971900001
PL PROGRAM: TH - TRIHALOMETHANE
PARM GROUP:

N BLANK SAMPLE USE PURPOSE: 8)

COLLECT SAMPLE FROM THE
DISTRIBUTION SYSTEM SERVED BY
WTP E OF SHERIDAN N OF MADISON

WAUKEGAN

BOTTLE 1 ° 1A

LOCATION 926 Poplar St

TIME COLLECTED 3:50 P PH 7.60

CL RESIDUE .90 TEMP 24 °C

PUBLIC WATER SUPPLIES
DIV. OF
I.E.P.A.
SEP 3 '91

--- LAB USE ONLY ---

SAMPLE NUMBER DI76121

DATE RECEIVED AUG 21 1991

TIME RECEIVED 10:30 am

RECEIVED BY ZH

DATE FORWARDED 9-3-91 SPVS D Hurley

532-2176 PWS-91(REV.7-90) A-3

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

PLE NUMBER : D196121
PLING POINT DESC. : WAUKEGAN/926 POPLAR ST

MITTING SOURCE # : 0971900C01 SITE # :
E COLLECTED : 910820 TIME COLLECTED : 1550 SAMPLING PROGRAM : TH

LECTED BY : KEN SHEETS DELIVERED BY : UPS
MENTS : THMS
DING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
TYPE CODE : DPWS SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

E RECEIVED : 910821 TIME RECEIVED : 1030 RECEIVED BY : L H
OBSERVATIONS : 2 THM TRIP BL SAM# : D196122
ERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

106 CHLOROFORM	UG/L :	12
101 DICHLOROBROMOMETHANE	UG/L :	7
105 CHLORODIBROMOMETHANE	UG/L :	3
104 BROMOFORM	UG/L :	1.0K
423 METHYLENE CHLORIDE	UG/L :	1.0K
501 1,1-DICHLOROETHYLENE	UG/L :	1.0K
496 1,1-DICHLOROETHANE	UG/L :	1.0K
546 TRANS-1,2-DICHLOROETHYLENE	UG/L :	1.0K
531 1,2-DICHLOROETHANE	UG/L :	1.0K
506 1,1,1-TRICHLOROETHANE	UG/L :	1.0K
102 CARBON TETRACHLORIDE	UG/L :	1.0K
TRICHLOROETHYLENE	UG/L :	1.0K
TETRACHLOROETHYLENE	UG/L :	1.0K
CHLOROBENZENE	UG/L :	1.0K
716 DICHLOROBENZENE(TOTAL)	UG/L :	1.0K
093 CIS-1,2-DICHLOROETHYLENE	UG/L :	1.0K

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : 0196122
ING POINT DESC. : BLANK W/96121 WAUKEGAN

BMITTING SOURCE # : 097190C01 SITE # :
TE COLLECTED : 910620 TIME COLLECTED : 1550 SAMPLING PROGRAM : TH

LLECTED BY : KEN SHEETS DELIVERED BY : UPS
MMENTS : THMS
NDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
M TYPE CODE : DPWS SAMPLE PURPOSE CODE : 8 REPORTING INDICATOR : B

TE RECEIVED : 910821 TIME RECEIVED : 1030 RECEIVED BY : L H
B OBSERVATIONS : 2 BLANKS TRIP BL SAM# :
PERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

32106	CHLOROFORM	UG/L : 1.0K
32101	DICHLOROBROMOMETHANE	UG/L : 1.0K
32105	CHLORODIBROMOMETHANE	UG/L : 1.0K
32104	BROMOFORM	UG/L : 1.0K
34423	METHYLENE CHLORIDE	UG/L : 1.0K
34501	1,1-DICHLOROETHYLENE	UG/L : 1.0K
34496	1,1-DICHLOROETHANE	UG/L : 1.0K
34546	TRANS-1,2-DICHLOROETHYLENE	UG/L : 1.0K
34531	1,2-DICHLOROETHANE	UG/L : 1.0K
34506	1,1,1-TRICHLOROETHANE	UG/L : 1.0K
32	CARBON TETRACHLORIDE	UG/L : 1.0K
180	TRICHLOROETHYLENE	UG/L : 1.0K
34475	TETRACHLOROETHYLENE	UG/L : 1.0K
34301	CHLOROBENZENE	UG/L : 1.0K
34716	DICHLOROBENZENE(TOTAL)	UG/L : 1.0K
77093	CIS-1,2-DICHLOROETHYLENE	UG/L : 1.0K

D194543

Illinois Environmental Protection Agency • 2200 Churchill Road, Springfield, IL 62706

VISION OF PUBLIC WATER SUPPLIES

PESTICIDE ANALYSIS

CILITY: 0971900 WAUKEGAN

MPLES SCHEDULED DURING: JUNE, 1991

Rcvd bottles 7-3-91

IL REPORT TO:

ME: Frank Chess, Jr. Supt

DR: 106 N. Utica St

TY: Waukegan STATE IL ZIP 60085

DATE COLLECTED July 11, 1991

TIME COLLECTED 8:35A

SMPL COLLECTOR Ken Sheets

PHONE NUMBER 708-360-9000 xt 451

UTING CODE: P430
CY ROUTING:
AMPLE TYPE: DPWS - DISTRIBUTION
PURPOSE: 1 - ROUTINE
INDICATOR: B
UBMIT SRCE: 0971900
PL PROGRAM: PH - PESTICIDE
GROUP:

SAMPLE TYPE: DISTRIBUTION

WAUKEGAN

SAMPLE LOCATION: Victory Hospital

RECEIVED
REGION 2
SEP 20 1991
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

I.E.P.A.
DIV. OF
PUBLIC WATER SUPPLIES
SEP 17 '91

--- LAB USE ONLY ---

SAMPLE NUMBER D194543

DATE RECEIVED JUL 12 1991

TIME RECEIVED 11:00 AM

EPA

RECEIVED BY FT

A - 6

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : D194543
M[illegible]NG POINT DESC. : WAUKEGAN/VICTORY HOSPITAL

BMITTING SOURCE # : 0971900 SITE # :
TE COLLECTED : 910711 TIME COLLECTED : 0835 SAMPLING PROGRAM : PH

LLECTED BY : KEN SHEETS DELIVERED BY : EPA
MMENTS : PESTICIDE ANALYSIS
NDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
M TYPE CODE : DPWS SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

TE RECEIVED : 910712 TIME RECEIVED : 1100 RECEIVED BY : F T
B OBSERVATIONS : 2 QTS WATER TRIP BL SAM# :
PERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

9-18-91
MRL

9340	GAMMA-BHC (LINDANE)	UG/L : .01K
9410	HEPTACHLOR	UG/L : .01K
9330	ALDRIN	UG/L : .01K
9420	HEPTACHLOR EPOXIDE	UG/L : .01K
9350	TOTAL CHLORDANE	UG/L : .01K
9380	DIELDRIN	UG/L : .01K
[illegible]	ENDRIN	UG/L : .01K
	[illegible]THOXYCHLOR	UG/L : .05K
[illegible]	[illegible]P'-DDE	UG/L : .01K
93[illegible]	P,P'-DDE	UG/L : .01K
93[illegible]	O,P'-DDD	UG/L : .01K
9310	P,P'-DDD	UG/L : .01K
9305	O,P'-DDT	UG/L : .01K
9300	P,P'-DDT	UG/L : .01K
	[illegible]OXAPHENE	UG/L : 1.0K
[illegible]	2,4-D	UG/L : 0.1K
[illegible]760	SILVEX	UG/L : .05K

D194530

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

DIVISION OF PUBLIC WATER SUPPLIES

SAMPLING PROGRAM:
PESTICIDE ANALYSIS

FACILITY: 0971900 Waukegan

Rcvd bottles 7-3-91

SAMPLES SCHEDULED DURING JUNE 1991

MAIL REPORT TO:

NAME: Frank Chess, Jr. Supt

ADDR: 106 N. Utica St

CITY: Waukegan STATE: IL ZIP: 60045

DATE COLLECTED: July 11, 1991

TIME COLLECTED: 905A

SAMPLE COLLECTOR: Ken Sheets

PHONE NUMBER: 708-360-9000, xt 4

FUNDING CODE: PW30
NCY ROUTING:
SAMPLE TYPE: DPWS
PURPOSE: 1-ROUTINE
RPT INDICATOR: B
SUBMIT SRCE: 0971900
SMPL PROGRAM: PH - PESTICIDE
PARM GROUP:

SAMPLE TYPE: DPWS

FACILITY: Waukegan

SAMPLE LOCATION: Raw water

RECEIVED
REGION 2
SEP 30 1991
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

PUBLIC WATER SUPPLIES
DIV. OF
I.E.P.A.
SEP 17 '91

---LAB USE ONLY---

SAMPLE NUMBER D194530

DATE RECEIVED JUL 12 1991

TIME RECEIVED 9:40am

RECEIVED BY FT

A - 8

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MP' E NUMBER : D194530
M ING POINT DESC. : WAUKEGAN/RAW WATER

BMITTING SOURCE # : 0971900 SITE # :
TE COLLECTED : 910711 TIME COLLECTED : 0905 SAMPLING PROGRAM : PH

LLECTED BY : KEN SHEETS DELIVERED BY : UPS
MMENTS : PESTICIDE ANALYSIS
NDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
M TYPE CODE : DPWS SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

TE RECEIVED : 910712 TIME RECEIVED : 0940 RECEIVED BY : F T
B OBSERVATIONS : 2 QTS WATER TRIP BL SAM# :
PERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

9340 GAMMA-BHC (LINDANE)	UG/L : .01K		9-17-91
9410 HEPTACHLOR	UG/L : .01K		mm
9330 ALDRIN	UG/L : .01K		
9420 HEPTACHLOR EPOXIDE	UG/L : .01K		
9350 TOTAL CHLORDANE	UG/L : .01K		
9380 DIELDRIN	UG/L : .01K		
9390 ENDRIN	UG/L : .01K		
9480 METHOXYCHLOR	UG/L : .05K		
9327 O,P'-DDE	UG/L : .01K		
9[illegible] P,P'-DDE	UG/L : .01K		
P'-DDD	UG/L : .01K		
[illegible]'-DDD	UG/L : .01K		
[illegible] O,P'-DDT	UG/L : .01K		
9300 P,P'-DDT	UG/L : .01K		
9400 TOXAPHENE	UG/L : 1.0K		
9730 2,4-D	UG/L : 0.1K		
9760 SILVEX	UG/L : .05K		

ATRAZINE .15 UG/L.

D196138 D196138

Illinois Environmental Protection Agency • 2200 Churchill Road, Springfield, IL 62706

VISION OF PUBLIC WATER SUPPLIES VOLATILE ORGANIC CHEMICALS

CILITY: 0971900 WAUKEGAN

MPLE AND DEMAND SCHEDULE: AUG 1, 1991 - AUG 31, 1991

IL REPORT TO:

ME: Frank Chess Jr., Supt DATE COLLECTED Aug 20, 1991

DR: 106 N Utica St SMPL. COLLECTOR Ken Sheets

TY: Waukegan STATE IL ZIP 60085 PHONE NUMBER 708-360-9000 x445

NDING CODE: PW32
AMPLE TYPE: FPWS - FINISHED
PURPOSE: 1 - ROUTINE
UBMIT SRCE: 097190001
PL PROGRAM: VO - VOC
FREQUENCY: QUARTERLY

BLANK SAMPLE USE PURPOSE: 8)

COLLECT WATER FROM THE FINISHED WATER/ENTRY POINT INTO THE DISTRIBUTION SYSTEM SERVED BY 01 WTP E OF SHERIDAN N OF MADISON

BOTTLE: 1 + 1 A

LOCATION: Lab tap

TIME COLLECTED: 3:20P

RECEIVED
REGION 2
SEP 3 1991

Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

I.E.P.A.
DIV. OF
PUBLIC WATER SUPPLIES
SEP 3 1991

--- LAB USE ONLY ---

SAMPLE NUMBER D196138

DATE RECEIVED AUG 21 1991

TIME RECEIVED 10:30 AM

RECEIVED BY

DATE FORWARDED 9-3-91

A - 10

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D196138
SAMPLING POINT DESC. : WAUKEGAN/LAB TAP

SUBMITTING SOURCE # : 0971900C01 SITE # :
DATE COLLECTED : 910820 TIME COLLECTED : 1520 SAMPLING PROGRAM : VO

COLLECTED BY : KEN SHEETS DELIVERED BY : UPS
COMMENTS : VOCS
FUNDING CODE : PW32 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : FPWS SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 910821 TIME RECEIVED : 1030 RECEIVED BY : L H
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D196139
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

9-19-91
MB

: .
: .
: .
: .
: TRIHALOMETHANES .

P32106 CHLOROFORM	UG/L :	13
P32101 BROMODICHLOROMETHANE	UG/L :	6.9
P32105 CHLORODIBROMOMETHANE	UG/L :	2.4
P32104 BROMOFORM	UG/L :	0.5K

: .
: .
: .
: REGULATED VOLATILE ORGANIC COMPOUNDS

P34506 1,1,1-TRICHLOROETHANE	UG/L :	0.5K
P34511 1,1,2-TRICHLOROETHANE	UG/L :	0.5K
P34501 1,1-DICHLOROETHYLENE	UG/L :	0.5K
P34551 1,2,4-TRICHLOROBENZENE	UG/L :	0.5K
P34536 1,2-DICHLOROBENZENE	UG/L :	0.5K
P32103 1,2-DICHLOROETHANE	UG/L :	0.5K
P34541 1,2-DICHLOROPROPANE	UG/L :	0.5K
P34571 1,4-DICHLOROBENZENE	UG/L :	0.5K
P34030 BENZENE	UG/L :	0.5K
P32102 CARBON TETRACHLORIDE	UG/L :	0.5K
P34301 CHLOROBENZENE	UG/L :	0.5K
P77093 CIS-1,2-DICHLOROETHYLENE	UG/L :	0.5K
P34371 ETHYLBENZENE	UG/L :	0.5K
P34423 METHYLENE CHLORIDE	UG/L :	0.5K
P77128 STYRENE	UG/L :	0.5K
P34475 TETRACHLOROETHYLENE	UG/L :	0.5K

UMBER : 0196138

34010	TOLUENE	UG/L :	0.5K
81551	TOTAL XYLENES	UG/L :	0.5K
34546	TRANS-1,2-DICHLOROETHYLENE	UG/L :	0.5K
39180	TRICHLOROETHYLENE	UG/L :	0.5K
39175	VINYL CHLORIDE	UG/L :	0.5K

UNREGULATED VOLATILE ORGANIC COMPOUNDS

7562	1,1,1,2-TETRACHLOROETHANE	UG/L :	0.5K
4516	1,1,2,2-TETRACHLOROETHANE	UG/L :	0.5K
4496	1,1-DICHLOROETHANE	UG/L :	0.5K
7168	1,1-DICHLOROPROPENE	UG/L :	0.5K
7443	1,2,3-TRICHLOROPROPANE	UG/L :	0.5K
4566	1,3-DICHLOROBENZENE	UG/L :	0.5K
7173	1,3-DICHLOROPROPANE	UG/L :	0.5K
7170	2,2-DICHLOROPROPANE	UG/L :	0.5K
1555	BROMOBENZENE	UG/L :	0.5K
4413	BROMOMETHANE	UG/L :	0.5K
4311	CHLOROETHANE	UG/L :	0.5K
4418	CHLOROMETHANE	UG/L :	0.5K
4704	CIS-1,3-DICHLOROPROPENE	UG/L :	0.5K
1522	DIBROMOMETHANE	UG/L :	0.5K
7970	TOTAL CHLOROTOLUENES	UG/L :	0.5K
4699	TRANS-1,3-DICHLOROPROPENE	UG/L :	0.5K

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

.LE NUMBER : 0196139
SAMPLING POINT DESC. : BLANK W/96138 WAUKEGAN

SUBMITTING SOURCE # : 097190C01 SITE # :
DATE COLLECTED : 910820 TIME COLLECTED : 1520 SAMPLING PROGRAM : VO

COLLECTED BY : KEN SHEETS DELIVERED BY : UPS
COMMENTS : VOCS
FUNDING CODE : PW32 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : FPWS SAMPLE PURPOSE CODE : 8 REPORTING INDICATOR : 8

DATE RECEIVED : 910821 TIME RECEIVED : 1030 RECEIVED BY : L H
LAB OBSERVATIONS : 2 BLANKS TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

: .
: .
: .
: .
: TRIHALOMETHANES

P32106 CHLOROFORM	UG/L	: 0.5K
P32101 BROMODICHLOROMETHANE	UG/L	: 0.5K
P32105 CHLORODIBROMOMETHANE	UG/L	: 0.5K
P32104 BROMOFORM	UG/L	: 0.5K

.EGULATED VOLATILE ORGANIC COMPOUNDS

P34506 1,1,1-TRICHLOROETHANE	UG/L	: 0.5K
P34511 1,1,2-TRICHLOROETHANE	UG/L	: 0.5K
P34501 1,1-DICHLOROETHYLENE	UG/L	: 0.5K
P34551 1,2,4-TRICHLOROBENZENE	UG/L	: 0.5K
P34536 1,2-DICHLOROBENZENE	UG/L	: 0.5K
P32103 1,2-DICHLOROETHANE	UG/L	: 0.5K
P34541 1,2-DICHLOROPROPANE	UG/L	: 0.5K
P34571 1,4-DICHLOROBENZENE	UG/L	: 0.5K
P34030 BENZENE	UG/L	: 0.5K
P32102 CARBON TETRACHLORIDE	UG/L	: 0.5K
P34301 CHLOROBENZENE	UG/L	: 0.5K
P77093 CIS-1,2-DICHLOROETHYLENE	UG/L	: 0.5K
P34371 ETHYLBENZENE	UG/L	: 0.5K
P34423 METHYLENE CHLORIDE	UG/L	: 0.5K
P77128 STYRENE	UG/L	: 0.5K
P34475 TETRACHLOROETHYLENE	UG/L	: 0.5K

NUMBER : 0196139

4010	TOLUENE	UG/L	: 0.5K
1551	TOTAL XYLENES	UG/L	: 0.5K
4546	TRANS-1,2-DICHLOROETHYLENE	UG/L	: 0.5K
9180	TRICHLOROETHYLENE	UG/L	: 0.5K
9175	VINYL CHLORIDE	UG/L	: 0.5K

UNREGULATED VOLATILE ORGANIC COMPOUNDS

7562	1,1,1,2-TETRACHLOROETHANE	UG/L	: 0.5K
4516	1,1,2,2-TETRACHLOROETHANE	UG/L	: 0.5K
4496	1,1-DICHLOROETHANE	UG/L	: 0.5K
7168	1,1-DICHLOROPROPENE	UG/L	: 0.5K
7443	1,2,3-TRICHLOROPROPANE	UG/L	: 0.5K
4566	1,3-DICHLOROBENZENE	UG/L	: 0.5K
7173	1,3-DICHLOROPROPANE	UG/L	: 0.5K
7170	2,2-DICHLOROPROPANE	UG/L	: 0.5K
1555	BROMOBENZENE	UG/L	: 0.5K
413	BROMOMETHANE	UG/L	: 0.5K
311	CHLOROETHANE	UG/L	: 0.5K
418	CHLOROMETHANE	UG/L	: 0.5K
704	CIS-1,3-DICHLOROPROPENE	UG/L	: 0.5K
1522	DIBROMOMETHANE	UG/L	: 0.5K
7970	TOTAL CHLOROTOLUENES	UG/L	: 0.5K
[illegible]	TRANS-1,3-DICHLOROPROPENE	UG/L	: 0.5K

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY **PESTICIDE ANALYSIS REPORT FORM**

DIVISION OF PUBLIC WATER SUPPLIES

D054236

R.C. 6-18-87

FAC # 0971900
Waukegan
Howard Peskator
Water Plant
106 North Utica
Waukegan, Illinois 60085

Samples scheduled during: 3/87

Date and time in Laboratory: MAR 12 1987

Received by: [signature]

1. Mail Report to: Name: Howard Peskator, Director
Address: 106 N. Utica St.
Post Office: Waukegan State: ILL Zip Code: 60085

2. Date Collected: MARCH 11, 1987
3. Sample Collector: Ken Sheets
4. Sampling Point: 926 Poplar St.
5. Telephone Number: 312-360-9000 ext 451

COLLECTOR: Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.

All results reported in micrograms per liter (PPB)

Parameter	MCL µg/l	Concentration µg/l
Lindane	4	< 0.01
Heptachlor	0.1	< 0.01
Aldrin	1	< 0.01
Heptachlor Epoxide	0.1	< 0.01
Alpha Chlordane	Total 3	< 0.01
Gamma Chlordane		< 0.01
Dieldrin	1	< 0.01
Endrin	0.2	< 0.01
Methoxychlor	100	< 0.05
PCB		< 0.1
Herbicide *		

Parameter	MCL µg/l	Concentration µg/l
o,p' - DDE		< 0.01
p,p' - DDE		< 0.01
o,p' - DDD		< 0.01
p,p' - DDD		< 0.01
o,p' - DDT	Total 50	< 0.01
p,p' - DDT		< 0.01
Toxaphene	5	< 1.0
Silvex *	10	< 0.05
2,4-D *	100	< 0.1

APR 14 1987
Environmental Protection Agency
State of Illinois

– Laboratory Use Only –

Laboratory Number: D054236

Date Forwarded: 4-10-87 By: [signature]

– DPWS Use Only –

RECEIVED
REGION 2
JUN 25 1987
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

D054236

This Agency is authorized to require this information under Ill. Rev. Stat., 1979, Chapter 111-1/2, Section 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the forms Management Center.

A - 15

IL 532-0142

APPENDIX B

Great Lakes Water Quality Agreement
Specific Objectives for
Water and Fish
(IJC, 1987)

APPENDIX B.1.

Great Lakes Water Quality Agreement Specific Objectives for Water and Fish (IJC, 1987).

Substance	Water $\mu g/L$	Fish mg/kg	Edible Fillet (F) or Whole Fish (W)
Aldrin/Dieldrin	0.001	0.3	F
Chlordane	0.06		
DDT and Metabolites	.003	1.0	W
Endrin	0.002	0.3	F
Heptachlor/Heptachlor Epoxide	0.001	0.3	F
Lindane	0.01	0.3	F
Methoxychlor	0.04		
Mirex	0		
Toxaphene	.008		
Phthalic Acid Esters			
dibutyl phthalate	4.0		
di(2-ethylhexyl) phthalate	0.6		
others	0.2		
PCB's		0.1	W
Arsenic	50		
Cadmium	0.2		
Chromium	50		
Copper	5		
Iron	300		
Lead	25		
Mercury	0.2	0.5	W
Nickel	25		
Selenium	10		
Zinc	30		
Fluoride	1200		
Diazinon	0.08		
Guthion	0.005		
Parathion	0.008		
Ammonia (NH_3)	20		
Total Ammonia	500		
Hydrogen Sulfide	2.0		
Dissolved Oxygen	6.0		
pH	6.5 - 9.0		

APPENDIX C

Fish Consumption Guidelines
for Lake Michigan and
Waukegan Harbor, 1994
(IDOC, 1994)

APPENDIX C.1.

Sport Fish Guidelines for Illinois Waters Organochlorine Contamination in Fish taken from Lake Michigan, 1994.

Group 1 (Low) Unlimited Consumption	Group 2 (Moderate) Limited Consumption	Group 3 (High) No Consumption
Brook Trout	Brown Trout up to 23"	Brown Trout over 23"
Perch	Chinook Salmon 21"-32"	Catfish
Pink Salmon	Coho Salmon over 26"	Chinook Salmon over 32"
Rainbow Trout	Lake Trout 20-23"	Lake Trout over 23"
Chinook Salmon up to 21"		Carp
Coho Salmon up to 26"		
Lake Trout up to 20"		
Smelt		

APPENDIX C.2.

Sport Fish Guidelines for Illinois Waters Organochlorine Contamination in Fish taken from Old North Harbor, Waukegan, 1994.

Group 1 (Low) Unlimited Consumption	Group 2 (Moderate) Limited Consumption	Group 3 (High) No Consumption
none	none	Alewife Carp

Note: The Department of Public Health advises that no fish from Waukegan Old North Harbor be consumed.

Group 1: Lowest levels of contaminants; fish pose little or no health risks.

Group 2: Moderate levels of contaminants; children, pregnant women, women who may become pregnant and nursing mother should not eat Group 2 fish. All other should limit their consumption of these fish to one meal per week.

Group 3: High levels of contaminants; no one should eat Group 3 fish.

APPENDIX D

Water Quality Analyses,
Sampling of Waukegan Harbor Area,
November 1990.
Sampling and Analyses by the
Illinois Environmental Protection Agency

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : C004641
SAMPLING POINT DESC. : NORTH BEACH WAUKEGAN

SUBMITTING SOURCE # : CZN C1 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1520 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : CB
COMMENTS : NEW STATION
FUNDING CODE : WP2C AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 8

DATE RECEIVED : 901115 TIME RECEIVED : 1000 RECEIVED BY : LJP
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : JWG NOTE : K = LESS THAN VALUE

~~P00403 PH-LABORATORY~~	~~UNITS~~	~~: 7.3~~	~~P00095 CONDUCTIVITY~~	~~UM/CM~~	~~: 286~~
P00951 FLUORIDE,TOTAL	MG/L	: 0.09	P00940 CHLORIDE,TOTAL	MG/L	: 11
P00945 SULFATE,TOTAL	MG/L	: 26	P00630 NITRATE&NO2-NTOTAL	MG/L	: 0.26
P00610 AMMONIA-N,TOTAL	MG/L	: 0.04	P32730 PHENOLS,TOTAL	UG/L	: 5K
P00665 PHOSPHORUS-P,TOTAL	MG/L	: 0.023	P00720 CYANIDE,TOTAL	MG/L	: 0.005K
P00335 COD,TOTAL	MG/L	: 23	P00530 SOLIDS,TOT.SUS.	MG/L	: 34
P00535 SOLIDS,VOLATILE	MG/L	: 5	P00625 KJELDAHL-N,TOTAL	MG/L	: 0.3
P00556 OIL,GRAVIMETRIC	MG/L	: 12	P00076 TURBIDITY	NTU	: 22
1616 FECAL COLI/100ML	-	: 108	P01002 ARSENIC,TOTAL	UG/L	: 1K
900 MERCURY,TOTAL	UG/L	: 0.05K	P00916 CALCIUM,TOTAL	MG/L	: 42
27 MAGNESIUM,TOTAL	MG/L	: 14	P00929 SODIUM,TOTAL	MG/L	: 10
37 POTASSIUM,TOTAL	MG/L	: 1.3	P01105 ALUMINUM,TOTAL	UG/L	: 675
P01007 BARIUM,TOTAL	UG/L	: 25	P01022 BORON,TOTAL	UG/L	: 50K
P01012 BERYLLIUM,TOTAL	UG/L	: 0.5K	P01027 CADMIUM,TOTAL	UG/L	: 3K
P01034 CHROMIUM,TOTAL	UG/L	: 5K	P01042 COPPER,TOTAL	UG/L	: 4
P01037 COBALT,TOTAL	UG/L	: 5K	P01045 IRON,TOTAL	UG/L	: 1015
P01051 LEAD,TOTAL	UG/L	: 50K	P01055 MANGANESE,TOTAL	UG/L	: 25
P01067 NICKEL,TOTAL	UG/L	: 5K	P01077 SILVER,TOTAL	UG/L	: 5K
P01082 STRONTIUM,TOTAL	UG/L	: 129	P01087 VANADIUM,TOTAL	UG/L	: 5
P01092 ZINC,TOTAL	UG/L	: 136	P00900 HARDNESS CALC.	MG/L	: 165C
P00020 TEMPERATURE,AIR	DEG.C	: NAC	P00010 TEMPERATURE,WATER	DEG.C	: 7.7
P00299 OXYGEN,DISS.-FIELD	MG/L	: 11.2	P00094 COND.(SC)FIELD	UM/CM	: 265
P00400 PH,FIELD	UNITS	: 7.5			

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : C004843
SAMPLING POINT DESC. : WAUKEGAN HARBOR SLIP NO. 1

SUBMITTING SOURCE # : CZP 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1145 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : CB
COMMENTS : NEW STATION
FUNDING CODE : WP20 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : R

DATE RECEIVED : 901115 TIME RECEIVED : 1000 RECEIVED BY : LJP
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : JWO NOTE : K = LESS THAN VALUE

~~P00403~~	~~PH-LABORATORY~~	~~UNITS~~	~~7.2~~	~~P00095~~	~~CONDUCTIVITY~~	~~UM/CM~~	~~350~~
P00951	FLUORIDE,TOTAL	MG/L	0.15	P00940	CHLORIDE,TOTAL	MG/L	18
P00945	SULFATE,TOTAL	MG/L	32	P00630	NITRATE&NO2-NTOTAL	MG/L	0.30
P00610	AMMONIA-N,TOTAL	MG/L	0.52	P32730	PHENOLS,TOTAL	UG/L	26
P00665	PHOSPHORUS-P,TOTAL	MG/L	0.020	P00720	CYANIDE,TOTAL	MG/L	0.04
P00335	COD,TOTAL	MG/L	14	P00530	SOLIDS,TOT.SUS.	MG/L	4
P00535	SOLIDS,VOLATILE	MG/L	5	P00625	KJELDAHL-N,TOTAL	MG/L	0.9
P00556	OIL,GRAVIMETRIC	MG/L	2	P00076	TURBIDITY	NTU	9.1
P31616	FECAL COLI/100ML	#	203	P01002	ARSENIC,TOTAL	UG/L	5
P71900	MERCURY,TOTAL	UG/L	0.05K	P00916	CALCIUM,TOTAL	MG/L	45
P00927	MAGNESIUM,TOTAL	MG/L	14	P00929	SODIUM,TOTAL	MG/L	17
P00937	POTASSIUM,TOTAL	MG/L	1.7	P01105	ALUMINUM,TOTAL	UG/L	312
P01007	BARIUM,TOTAL	UG/L	37	P01022	BORON,TOTAL	UG/L	54
P01012	BERYLLIUM,TOTAL	UG/L	0.5K	P01027	CADMIUM,TOTAL	UG/L	3K
P01034	CHROMIUM,TOTAL	UG/L	5K	P01042	COPPER,TOTAL	UG/L	5
P01037	COBALT,TOTAL	UG/L	5K	P01045	IRON,TOTAL	UG/L	485
P01051	LEAD,TOTAL	UG/L	50K	P01055	MANGANESE,TOTAL	UG/L	42
P01067	NICKEL,TOTAL	UG/L	5K	P01077	SILVER,TOTAL	UG/L	5K
P01082	STRONTIUM,TOTAL	UG/L	147	P01087	VANADIUM,TOTAL	UG/L	5K
P01092	ZINC,TOTAL	UG/L	100K	P00900	HARDNESS CALC.	MG/L	168
P00020	TEMPERATURE,AIR	DEG.C	12	P00010	TEMPERATURE,WATER	DEG.C	7.3
P00299	OXYGEN,DISS.-FIELD	MG/L	6.0	P00094	COND.(EC)FIELD	UM/CM	747
P00400	PH,FIELD	UNITS	8.5				

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : C004842
SAMPLING POINT DESC. : WAUKEGAN HARBOR UPPER HARBOR

SUBMITTING SOURCE # : QZO 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1310 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : CB
COMMENTS : NEW STATION
FUNDING CODE : WP20 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 3

DATE RECEIVED : 901115 TIME RECEIVED : 1000 RECEIVED BY : LJP
LAB OBSERVATIONS : TRIP BL SAMP :
SUPERVISORS INITIALS : JWP NOTE : K = LESS THAN VALUE

~~P00403~~	~~PH-LABORATORY~~	~~UNITS~~	~~:~~	~~7.~~	~~P00095~~	~~CONDUCTIVITY~~	~~UM/CM~~	~~:~~	~~349~~
P00951	FLUORIDE,TOTAL	MG/L	:	0.15	P00940	CHLORIDE,TOTAL	MG/L	:	18
P00945	SULFATE,TOTAL	MG/L	:	32	P00630	NITRATE&NO2-NTOTAL	MG/L	:	0.29
P00610	AMMONIA-N,TOTAL	MG/L	:	0.32	P32730	PHENOLS,TOTAL	UG/L	:	43
P00665	PHOSPHORUS-P,TOTAL	MG/L	:	0.020	P00720	CYANIDE,TOTAL	MG/L	:	0.05
P00335	COD,TOTAL	MG/L	:	16	P00530	SOLIDS,TOT.SUS.	MG/L	:	5
P00535	SOLIDS,VOLATILE	MG/L	:	2	P00625	KJELDAHL-N,TOTAL	MG/L	:	1.1
P00556	OIL,GRAVIMETRIC	MG/L	:	1K	P00076	TURBIDITY	NTU	:	8.4
P31616	FECAL COLI/100ML	?	:	135	P01002	ARSENIC,TOTAL	UG/L	:	7
P71900	MERCURY,TOTAL	UG/L	:	0.05K	P00916	CALCIUM,TOTAL	MG/L	:	45
P00927	MAGNESIUM,TOTAL	MG/L	:	14	P00929	SODIUM,TOTAL	MG/L	:	17
P00937	POTASSIUM,TOTAL	MG/L	:	2.9	P01105	ALUMINUM,TOTAL	UG/L	:	247
P01007	BARIUM,TOTAL	UG/L	:	27	P01022	BORON,TOTAL	UG/L	:	60
P01012	BERYLLIUM,TOTAL	UG/L	:	0.5K	P01027	CADMIUM,TOTAL	UG/L	:	3K
P01034	CHROMIUM,TOTAL	UG/L	:	5K	P01042	COPPER,TOTAL	UG/L	:	5K
P01037	COBALT,TOTAL	UG/L	:	5K	P01045	IRON,TOTAL	UG/L	:	447
P01051	LEAD,TOTAL	UG/L	:	100K	P01055	MANGANESE,TOTAL	UG/L	:	42
P01067	NICKEL,TOTAL	UG/L	:	[illegible]	P01077	SILVER,TOTAL	UG/L	:	3K
P01082	STRONTIUM,TOTAL	UG/L	:	143	P01087	VANADIUM,TOTAL	UG/L	:	5K
P01092	ZINC,TOTAL	UG/L	:	50K	P00900	HARDNESS CALC.	MG/L	:	169C
P00020	TEMPERATURE,AIR	DEG.C	:	12	P00010	TEMPERATURE,WATER	DEG.C	:	7.4
P00299	OXYGEN,DISS.-FIELD	MG/L	:	5.9	P00094	COND.(EC)FIELD	UM/CM	:	349
P00400	PH,FIELD	UNITS	:	5.7					

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : C004844
MPLING POINT DESC. : WAUKEGAN HARBOR CENTRAL

EMITTING SOURCE # : QZQ 01 SITE # :
TE COLLECTED : 901114 TIME COLLECTED : 1115 SAMPLING PROGRAM : 28

LLECTED BY : HE/CB DELIVERED BY : CB
MMENTS : NEW STATION
NDING CODE : WP20 AGENCY ROUTING : 01 UNIT CODE :
M TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

TE RECEIVED : 901115 TIME RECEIVED : 1000 RECEIVED BY : LJP
B OBSERVATIONS : TRIP BL SAMP# :
PERVISORS INITIALS : JWD NOTE : K = LESS THAN VALUE

~~0403~~	~~PH-LABORATORY~~	~~UNITS~~	~~:~~	~~7.2~~	~~P00095~~	~~CONDUCTIVITY~~	~~UM/CM~~	~~:~~	~~341~~
0951	FLUORIDE,TOTAL	MG/L	:	0.15	P00940	CHLORIDE,TOTAL	MG/L	:	16
0945	SULFATE,TOTAL	MG/L	:	31	P00630	NITRATE&NO2-NTOTAL	MG/L	:	0.30
0610	AMMONIA-N,TOTAL	MG/L	:	0.52	P32730	PHENOLS,TOTAL	UG/L	:	19
0665	PHOSPHORUS-P,TOTAL	MG/L	:	0.019	P00720	CYANIDE,TOTAL	MG/L	:	0.03
0335	COD,TOTAL	MG/L	:	14	P00530	SOLIDS,TOT.SUS.	MG/L	:	5
0535	SOLIDS,VOLATILE	MG/L	:	5	P00625	KJELDAHL-N,TOTAL	MG/L	:	0.8
0556	OIL,GRAVIMETRIC	MG/L	:	1K	P00076	TURBIDITY	NTU	:	9.1
1616	FECAL COLI/100ML	#	:	208	P01002	ARSENIC,TOTAL	UG/L	:	4
1900	MERCURY,TOTAL	UG/L	:	0.05K	P00916	CALCIUM,TOTAL	MG/L	:	44
7	MAGNESIUM,TOTAL	MG/L	:	14	P00929	SODIUM,TOTAL	MG/L	:	16
	POTASSIUM,TOTAL	MG/L	:	2.1	P01105	ALUMINUM,TOTAL	UG/L	:	290
007	BARIUM,TOTAL	UG/L	:	27	P01022	BORON,TOTAL	UG/L	:	54
1012	BERYLLIUM,TOTAL	UG/L	:	0.5K	P01027	CADMIUM,TOTAL	UG/L	:	4
1034	CHROMIUM,TOTAL	UG/L	:	5K	P01042	COPPER,TOTAL	UG/L	:	5K
1037	COBALT,TOTAL	UG/L	:	7	P01045	IRON,TOTAL	UG/L	:	446
1051	LEAD,TOTAL	UG/L	:	100K	P01055	MANGANESE,TOTAL	UG/L	:	39
1067	NICKEL,TOTAL	UG/L	:	21	P01077	SILVER,TOTAL	UG/L	:	3K
1082	STRONTIUM,TOTAL	UG/L	:	145	P01087	VANADIUM,TOTAL	UG/L	:	5K
1092	ZINC,TOTAL	UG/L	:	130	P00900	HARDNESS CALC.	MG/L	:	167C
0020	TEMPERATURE,AIR	DEG.C	:	12	P00010	TEMPERATURE,WATER	DEG.C	:	7.3
0299	OXYGEN,DISS.-FIELD	MG/L	:	5.5	P00094	COND.(EC)FIELD	UM/CM	:	339
0400	PH,FIELD	UNITS	:	6.7					

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

LE NUMBER : C004845
MPLING POINT DESC. : WAUKEGAN HARBOR

EMITTING SOURCE # : CZR 01 SITE # :
TE COLLECTED : 901114 TIME COLLECTED : 1050 SAMPLING PROGRAM : 28

LECTED BY : HE/CB DELIVERED BY : CB
MMENTS : NEW STATION
NDING CODE : WP20 AGENCY ROUTING : 01 UNIT CODE :
M TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 9

TE RECEIVED : 901115 TIME RECEIVED : 1000 RECEIVED BY : LJP
B OBSERVATIONS : TRIP BL SAM# :
PERVISORS INITIALS : JWD NOTE : K = LESS THAN VALUE

~~0403~~	~~PH-LABORATORY~~	~~UNITS~~	~~7.6~~	~~P00095~~	~~CONDUCTIVITY~~	~~UM/CM~~	~~353~~
0951	FLUORIDE,TOTAL	MG/L	0.13	P00940	CHLORIDE,TOTAL	MG/L	19
0945	SULFATE,TOTAL	MG/L	32	P00630	NITRATE&NO2-NTOTAL	MG/L	0.31
0610	AMMONIA-N,TOTAL	MG/L	0.29	P32730	PHENOLS,TOTAL	UG/L	5
0665	PHOSPHORUS-P,TOTAL	MG/L	0.017	P00720	CYANIDE,TOTAL	MG/L	0.01
0335	COD,TOTAL	MG/L	12	P00530	SOLIDS,TOT.SUS.	MG/L	8
0535	SOLIDS,VOLATILE	MG/L	2	P00625	KJELDAHL-N,TOTAL	MG/L	0.5
0556	OIL,GRAVIMETRIC	MG/L	3	P00076	TURBIDITY	NTU	7.3
16	FECAL COLI/100ML	#	30A	P01002	ARSENIC,TOTAL	UG/L	2
00	MERCURY,TOTAL	UG/L	0.05K	P00916	CALCIUM,TOTAL	MG/L	45
	MAGNESIUM,TOTAL	MG/L	14	P00929	SODIUM,TOTAL	MG/L	19
	POTASSIUM,TOTAL	MG/L	2.7	P01105	ALUMINUM,TOTAL	UG/L	227
1007	BARIUM,TOTAL	UG/L	27	P01022	BORON,TOTAL	UG/L	51
1012	BERYLLIUM,TOTAL	UG/L	0.5K	P01027	CADMIUM,TOTAL	UG/L	3K
1034	CHROMIUM,TOTAL	UG/L	5K	P01042	COPPER,TOTAL	UG/L	5K
1037	COBALT,TOTAL	UG/L	5K	P01045	IRON,TOTAL	UG/L	343
1051	LEAD,TOTAL	UG/L	50K	P01055	MANGANESE,TOTAL	UG/L	22
1067	NICKEL,TOTAL	UG/L	10K	P01077	SILVER,TOTAL	UG/L	3K
1082	STRONTIUM,TOTAL	UG/L	147	P01087	VANADIUM,TOTAL	UG/L	5K
1092	ZINC,TOTAL	UG/L	50K	P00900	HARDNESS CALC.	MG/L	170C
0020	TEMPERATURE,AIR	DEG.C	12	P00010	TEMPERATURE,WATER	DEG.C	5.4
0299	OXYGEN,DISS.-FIELD	MG/L	8.7	P00094	COND.(EC)FIELD	UM/CM	339
0400	PH,FIELD	UNITS	7.0				

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : C004846
MPLING POINT DESC. : WAUKEGAN HARBOR CHANNEL

BMITTING SOURCE # : GZS 01 SITE # :
TE COLLECTED : 901114 TIME COLLECTED : 1010 SAMPLING PROGRAM : 28

LECTED BY : ME/CB DELIVERED BY : CT
MMENTS : NEW STATION
NDING CODE : WP2C AGENCY ROUTING : 01 UNIT CODE :
M TYPE CODE : ILWW SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

TE RECEIVED : 901115 TIME RECEIVED : 1000 RECEIVED BY : LJP
S OBSERVATIONS : TRIP BL SAMP :
PERVISORS INITIALS : JWG NOTE : K = LESS THAN VALUE

~~0403~~	~~PH-LABORATORY~~	~~UNITS~~	~~7.7~~	~~P00095~~	~~CONDUCTIVITY~~	~~UM/CM~~	~~312~~
0951	FLUORIDE,TOTAL	MG/L	0.11	P00940	CHLORIDE,TOTAL	MG/L	11
0945	SULFATE,TOTAL	MG/L	28	P00630	NITRATE&NO2-NTOTAL	MG/L	0.29
0610	AMMONIA-N,TOTAL	MG/L	0.22	P32730	PHENOLS,TOTAL	UG/L	5K
0665	PHOSPHORUS-P,TOTAL	MG/L	0.019	P00720	CYANIDE,TOTAL	MG/L	0.01
0335	COD,TOTAL	MG/L	13	P00530	SOLIDS,TOT.SUS.	MG/L	18
0535	SOLIDS,VOLATILE	MG/L	5	P00625	KJELDAHL-N,TOTAL	MG/L	0.4
[illegible]	OIL,GRAVIMETRIC	MG/L	2	P00076	TURBIDITY	NTU	16.4
[illegible]	FECAL COLI/100ML	#	183	P01002	ARSENIC,TOTAL	UG/L	2
[illegible]	MERCURY,TOTAL	UG/L	0.05K	P00916	CALCIUM,TOTAL	MG/L	42
0927	MAGNESIUM,TOTAL	MG/L	14	P00929	SODIUM,TOTAL	MG/L	12
0937	POTASSIUM,TOTAL	MG/L	1.2	P01105	ALUMINUM,TOTAL	UG/L	494
1007	BARIUM,TOTAL	UG/L	25	P01022	BORON,TOTAL	UG/L	50K
1012	BERYLLIUM,TOTAL	UG/L	0.5K	P01027	CADMIUM,TOTAL	UG/L	5
1034	CHROMIUM,TOTAL	UG/L	5	P01042	COPPER,TOTAL	UG/L	5
1037	COBALT,TOTAL	UG/L	5K	P01045	IRON,TOTAL	UG/L	591
1051	LEAD,TOTAL	UG/L	100K	P01055	MANGANESE,TOTAL	UG/L	23
1067	NICKEL,TOTAL	UG/L	20	P01077	SILVER,TOTAL	UG/L	3K
1082	STRONTIUM,TOTAL	UG/L	134	P01087	VANADIUM,TOTAL	UG/L	5K
1092	ZINC,TOTAL	UG/L	100K	P00900	HARDNESS CALC.	MG/L	162C
0020	TEMPERATURE,AIR	DEG.C	12	P00010	TEMPERATURE,WATER	DEG.C	8.3
0299	OXYGEN,DISS.-FIELD	MG/L	9.4	P00094	COND.(EC)FIELD	UM/CM	304
0400	PH,FIELD	UNITS	7.1				

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

LE NUMBER : C004847
MPLING POINT DESC. : NEW HARBOR

SMITTING SOURCE # : GZT 01 SITE # :
TE COLLECTED : 901114 TIME COLLECTED : 1320 SAMPLING PROGRAM : 28

LLECTED BY : HE/CB DELIVERED BY : CB
MMENTS : NEW STATION
NDING CODE : WP20 AGENCY ROUTING : 01 UNIT CODE :
M TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 8

TE RECEIVED : 901115 TIME RECEIVED : 1000 RECEIVED BY : LJP
B OBSERVATIONS : TRIP BL SAM# :
PERVISORS INITIALS : JWD NOTE : K = LESS THAN VALUE

~~0403 PH-LABORATORY UNITS : [illegible] P00095 CONDUCTIVITY UM/CM : 311~~

0951	FLUORIDE/TOTAL	MG/L	0.10	P00940	CHLORIDE/TOTAL	MG/L	12
0945	SULFATE/TOTAL	MG/L	29	P00630	NITRATE&NO2-NTOTAL	MG/L	0.31
0610	AMMONIA-N/TOTAL	MG/L	0.09	P32730	PHENOLS/TOTAL	UG/L	5K
0665	PHOSPHORUS-P/TOTAL	MG/L	0.011	P00720	CYANIDE/TOTAL	MG/L	0.005K
0335	COD/TOTAL	MG/L	11	P00530	SOLIDS/TOT.SUS.	MG/L	6
0535	SOLIDS/VOLATILE	MG/L	4	P00625	KJELDAHL-N/TOTAL	MG/L	0.3
0556	OIL/GRAVIMETRIC	MG/L	1K	P00076	TURBIDITY	NTU	9.5
1416	FECAL COLI/100ML	#	50K	P01002	ARSENIC/TOTAL	UG/L	1
	MERCURY/TOTAL	UG/L	0.05K	P00916	CALCIUM/TOTAL	MG/L	42
	GNESIUM/TOTAL	MG/L	13	P00929	SODIUM/TOTAL	MG/L	13
[illegible]	POTASSIUM/TOTAL	MG/L	3.0	P01105	ALUMINUM/TOTAL	UG/L	272
1007	BARIUM/TOTAL	UG/L	24	P01022	BORON/TOTAL	UG/L	50K
1012	BERYLLIUM/TOTAL	UG/L	0.5K	P01027	CADMIUM/TOTAL	UG/L	3K
1034	CHROMIUM/TOTAL	UG/L	5K	P01042	COPPER/TOTAL	UG/L	[illegible]
1037	COBALT/TOTAL	UG/L	[illegible]K	P01045	IRON/TOTAL	UG/L	347
1051	LEAD/TOTAL	UG/L	50K	P01055	MANGANESE/TOTAL	UG/L	9
1067	NICKEL/TOTAL	UG/L	3K	P01077	SILVER/TOTAL	UG/L	5K
1082	STRONTIUM/TOTAL	UG/L	134	P01087	VANADIUM/TOTAL	UG/L	5K
1092	ZINC/TOTAL	UG/L	50K	P00900	HARDNESS CALC.	MG/L	159C
0020	TEMPERATURE/AIR	DEG.C	12	P00010	TEMPERATURE/WATER	DEG.C	6.5
0299	OXYGEN/DISS.-FIELD	MG/L	10.0	P00094	COND.(EC)FIELD	UM/CM	306
0400	PH/FIELD	UNITS	7.4				

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086894
SAMPLING POINT DESC. : WAUKEGAN RAP/NORTH BEACH

SUBMITTING SOURCE # : QZN 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1520 SAMPLING PROGRAM : 28

COLLECTED BY : ME/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 8

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 GAL TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

39330	ALDRIN	UG/L : .01K
39380	DIELDRIN	UG/L : .01K
39370	TOTAL DDT	UG/L : .01K
39327	O,P'-DDE	UG/L : .01K
39320	P,P'-DDE	UG/L : .01K
39315	O,P'-DDD	UG/L : .01K
39310	P,P'-DDD	UG/L : .01K
39305	O,P'-DDT	UG/L : .01K
39300	P,P'-DDT	UG/L : .01K
39350	TOTAL CHLORDANE	UG/L : .02K
39062	CHLORDANE,CIS ISOMER	UG/L : .01K
45	CHLORDANE,TRANS ISOMER	UG/L : .01K
0	ENDRIN	UG/L : .01K
[illegible]	METHOXYCHLOR	UG/L : .05K
39337	ALPHA-BHC	UG/L : .01K
39340	GAMMA-BHC (LINDANE)	UG/L : .01K
39700	HEXACHLOROBENZENE	UG/L : .01K
39516	TOTAL PCBS	UG/L : 0.1K
39400	TOXAPHENE	UG/L : 1.0K
39032	PENTACHLOROPHENOL	UG/L : .01K

a GC/Mass spectrometry Analysis was performed on this sample. No organic compounds were detected.

J Henley

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086895
S PLING POINT DESC. : WAUKEGAN RAP/UPPER HARBOR 3

SUBMITTING SOURCE # : CZC 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1210 SAMPLING PROGRAM : 28

COLLECTED BY : ME/Cc DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP/TOXOPHENE
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 8

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 GAL TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39330	ALDRIN	UG/L : .01K
P39380	DIELDRIN	UG/L : .01K
P39370	TOTAL DDT	UG/L : .01K
P39327	O,P'-DDE	UG/L : .01K
P39320	P,P'-DDE	UG/L : .01K
P39315	O,P'-DDD	UG/L : .01K
P39310	P,P'-DDD	UG/L : .01K
P39305	O,P'-DDT	UG/L : .01K
P39300	P,P'-DDT	UG/L : .01K
P39350	TOTAL CHLORDANE	UG/L : .02K
	CHLORDANE,CIS ISOMER	UG/L : .01K
	CHLORDANE,TRANS ISOMER	UG/L : .01K
	ENDRIN	UG/L : .01K
P39480	METHOXYCHLOR	UG/L : .05K
P39337	ALPHA-BHC	UG/L : .01K
P39340	GAMMA-BHC (LINDANE)	UG/L : .01K
P39700	HEXACHLOROBENZENE	UG/L : .01K
P39516	TOTAL PCBS	UG/L : 0.1K
P39400	TOXAPHENE	UG/L : 1.0K
P39032	PENTACHLOROPHENOL	UG/L : .01K

a GC/Mass spectrometry analysis was performed on this sample. No organic compounds were detected.

J Hurley

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086896
SAMPLING POINT DESC. : WAUKEGAN HARBOR SLIP 1

SUBMITTING SOURCE # : QZP 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1145 SAMPLING PROGRAM : 26

COLLECTED BY : ME/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP/TOXOPHENE
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 8

DATE RECEIVED : 901115 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 GAL TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39330	ALDRIN	UG/L : .01K
P39380	DIELDRIN	UG/L : .01K
P39370	TOTAL DDT	UG/L : .01K
P39327	O,P'-DDE	UG/L : .01K
P39320	P,P'-DDE	UG/L : .01K
P39315	O,P'-DDD	UG/L : .01K
P39310	P,P'-DDD	UG/L : .01K
P39305	O,P'-DDT	UG/L : .01K
P39300	P,P'-DDT	UG/L : .01K
P39350	TOTAL CHLORDANE	UG/L : .02K
	CHLORDANE,CIS ISOMER	UG/L : .01K
	CHLORDANE,TRANS ISOMER	UG/L : .01K
P39390	ENDRIN	UG/L : .01K
P39480	METHOXYCHLOR	UG/L : .05K
P39337	ALPHA-BHC	UG/L : .01K
P39340	GAMMA-BHC (LINDANE)	UG/L : .01K
P39700	HEXACHLOROBENZENE	UG/L : .01K
P39516	TOTAL PCBS	UG/L : 0.1K
P39400	TOXAPHENE	UG/L : 1.0K
P39032	PENTACHLOROPHENOL	UG/L : .01K

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0086897
SAMPLING POINT DESC. : WAUKEGAN HARBOR CENTRAL 5

SUBMITTING SOURCE # : GZQ 01 SITE # :
DATE COLLECTED : 901115 TIME COLLECTED : 1115 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP/TOXOPHENE
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 3

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 GAL TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39330	ALDRIN	UG/L :	.01K
P39380	DIELDRIN	UG/L :	.01K
P39370	TOTAL DDT	UG/L :	.01K
P39327	O,P'-DDE	UG/L :	.01K
P39320	P,P'-DDE	UG/L :	.01K
P39315	O,P'-DDD	UG/L :	.01K
P39310	P,P'-DDD	UG/L :	.01K
P39305	O,P'-DDT	UG/L :	.01K
P39300	P,P'-DDT	UG/L :	.01K
P[illegible]350	TOTAL CHLORDANE	UG/L :	.02K
[illegible]	CHLORDANE,CIS ISOMER	UG/L :	.01K
[illegible]	CHLORDANE,TRANS ISOMER	UG/L :	.01K
[illegible]0	ENDRIN	UG/L :	.01K
P39480	METHOXYCHLOR	UG/L :	.05K
P39337	ALPHA-BHC	UG/L :	.01K
P39340	GAMMA-BHC (LINDANE)	UG/L :	.01K
P39700	HEXACHLOROBENZENE	UG/L :	.01K
P39516	TOTAL PCBS	UG/L :	0.1K
P39400	TOXAPHENE	UG/L :	1.0K
P39032	PENTACHLOROPHENOL	UG/L :	.01

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0086898
SAMPLING POINT DESC. : WAUKEGAN HARBOR 6

SUBMITTING SOURCE # : GZR 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1050 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP/TOXOPHENE
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 GAL TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39330	ALDRIN	UG/L :	.01K
P39380	DIELDRIN	UG/L :	.01K
P39370	TOTAL DDT	UG/L :	.01K
P39327	O,P'-DDE	UG/L :	.01K
P39320	P,P'-DDE	UG/L :	.01K
P39315	O,P'-DDD	UG/L :	.01K
[illegible]10	P,P'-DDD	UG/L :	.01K
	O,P'-DDT	UG/L :	.01K
	P,P'-DDT	UG/L :	.01K
P39350	TOTAL CHLORDANE	UG/L :	.02K
P39062	CHLORDANE/CIS ISOMER	UG/L :	.01K
P39065	CHLORDANE/TRANS ISOMER	UG/L :	.01K
P39390	ENDRIN	UG/L :	.01K
P39480	METHOXYCHLOR	UG/L :	.05K
P39337	ALPHA-BHC	UG/L :	.01K
P39340	GAMMA-BHC (LINDANE)	UG/L :	.01K
P39700	HEXACHLOROBENZENE	UG/L :	.01K
P39516	TOTAL PCBS	UG/L :	0.1K
P39400	TOXAPHENE	UG/L :	1.0K
P39032	PENTACHLOROPHENOL	UG/L :	.01

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086899
SAMPLING POINT DESC. : WAUKEGAN HARBOR CHANNEL 7

SUBMITTING SOURCE # : GZS 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1010 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP/TOXOPHENE
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 GAL TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39330	ALDRIN	UG/L : .01K
P39380	DIELDRIN	UG/L : .01K
P39370	TOTAL DDT	UG/L : .01K
P39327	O,P'-DDE	UG/L : .01K
P39320	P,P'-DDE	UG/L : .01K
P39315	O,P'-DDD	UG/L : .01K
[illegible]	P,P'-DDD	UG/L : .01K
	O,P'-DDT	UG/L : .01K
P39300	P,P'-DDT	UG/L : .01K
P3[illegible]50	TOTAL CHLORDANE	UG/L : .02K
P39062	CHLORDANE,CIS ISOMER	UG/L : .01K
P39065	CHLORDANE,TRANS ISOMER	UG/L : .01K
P39390	ENDRIN	UG/L : .01K
P39480	METHOXYCHLOR	UG/L : .05K
P39337	ALPHA-BHC	UG/L : .01K
P39340	GAMMA-BHC (LINDANE)	UG/L : .01K
P39700	HEXACHLOROBENZENE	UG/L : .01K
P39516	TOTAL PCBS	UG/L : 0.1K
P39400	TOXAPHENE	UG/L : 1.0K
P39032	PENTACHLOROPHENOL	UG/L : .01K

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : C086900
SAMPLING POINT DESC. : NEW HARBOR 8

SUBMITTING SOURCE # : QZT 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1320 SAMPLING PROGRAM : 28

COLLECTED BY : ME/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP/TOXOPHENE
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 8

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 GAL TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39330	ALDRIN	UG/L : .01K
P39380	DIELDRIN	UG/L : .01K
P39370	TOTAL DDT	UG/L : .01K
P39327	O,P'-DDE	UG/L : .01K
P39320	P,P'-DDE	UG/L : .01K
P39315	O,P'-DDD	UG/L : .01K
P39310	P,P'-DDD	UG/L : .01K
P39305	O,P'-DDT	UG/L : .01K
P39300	P,P'-DDT	UG/L : .01K
P39350	TOTAL CHLORDANE	UG/L : .02K
[illegible]9062	CHLORDANE,CIS ISOMER	UG/L : .01K
[illegible]65	CHLORDANE,TRANS ISOMER	UG/L : .01K
[illegible]390	ENDRIN	UG/L : .01K
P39480	METHOXYCHLOR	UG/L : .05K
P39337	ALPHA-BHC	UG/L : .01K
P39340	GAMMA-BHC (LINDANE)	UG/L : .01K
P39700	HEXACHLOROBENZENE	UG/L : .01K
P39516	TOTAL PCBS	UG/L : 0.1K
P39400	TOXAPHENE	UG/L : 1.0K
P39032	PENTACHLOROPHENOL	UG/L : .01

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0086901
SAMPLING POINT DESC. : WAUKEGAN NORTH BEACH 2

SUBMITTING SOURCE # : QZN 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1520 SAMPLING PROGRAM : 28

COLLECTED BY : ME/CB DELIVERED BY : EPA
COMMENTS : VOLS
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 1 VOC TRIP BL SAM# : 0086908
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P32106	CHLOROFORM	UG/L :	1.0K
P32101	DICHLOROBROMOMETHANE	UG/L :	1.0K
P32105	CHLORODIBROMOMETHANE	UG/L :	1.0K
P32104	BROMOFORM	UG/L :	1.0K
P34423	METHYLENE CHLORIDE	UG/L :	1.0K
P34501	1,1-DICHLOROETHYLENE	UG/L :	1.0K
P34496	1,1-DICHLOROETHANE	UG/L :	1.0K
P34546	TRANS-1,2-DICHLOROETHYLENE	UG/L :	1.0K
P34531	1,2-DICHLOROETHANE	UG/L :	1.0K
P34506	1,1,1-TRICHLOROETHANE	UG/L :	1.0K
[illegible]02	CARBON TETRACHLORIDE	UG/L :	1.0K
P39180	TRICHLOROETHYLENE	UG/L :	1.0K
P34475	TETRACHLOROETHYLENE	UG/L :	1.0K
P34301	CHLOROBENZENE	UG/L :	1.0K
P34716	DICHLOROBENZENE(TOTAL)	UG/L :	1.0K
P78124	BENZENE	UG/L :	1.0K
P78131	TOLUENE	UG/L :	1.0K
P78113	ETHYLBENZENE	UG/L :	1.0K
P81551	XYLENES	UG/L :	1.0K
P77093	CIS-1,2-DICHLOROETHYLENE	UG/L :	1.0K

Gas chromatography

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0086902
SAMPLING POINT DESC. : WAUKEGAN HARBOR UPPER HARBOR 3

SUBMITTING SOURCE # : GZC 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1210 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : VOLS
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : C V
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : 0086908
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P34418 CHLOROMETHANE	UG/L :	10K
P34413 BROMOMETHANE	UG/L :	10K
P39175 VINYL CHLORIDE	UG/L :	10K
P34311 CHLOROETHANE	UG/L :	10K
P34423 METHYLENE CHLORIDE	UG/L :	5.0K
P81552 ACETONE	UG/L :	10K
P34488 TRICHLOROFLUOROMETHANE	UG/L :	5.0K
P77277 BROMOCHLOROMETHANE	UG/L :	5.0K
P77041 CARBON DISULFIDE	UG/L :	5.0K
P34501 1,1-DICHLOROETHYLENE	UG/L :	5.0K
P34496 1,1-DICHLOROETHANE	UG/L :	5.0K
34546 TRANS-1,2-DICHLOROETHYLENE	UG/L :	5.0K
7093 CIS-1,2-DICHLOROETHYLENE	UG/L :	5.0K
P32106 CHLOROFORM	UG/L :	5.0K
P34531 1,2-DICHLOROETHANE	UG/L :	5.0K
P81595 2-BUTANONE(MEK)	UG/L :	10K
P34506 1,1,1-TRICHLOROETHANE	UG/L :	5.0K
P32102 CARBON TETRACHLORIDE	UG/L :	5.0K
P77057 VINYL ACETATE	UG/L :	10K
P32101 DICHLOROBROMOMETHANE	UG/L :	5.0K
P34541 1,2-DICHLOROPROPANE	UG/L :	5.0K
P34704 CIS-1,3-DICHLOROPROPENE	UG/L :	5.0K
P39180 TRICHLOROETHYLENE	UG/L :	5.0K
P32105 CHLORODIBROMOMETHANE	UG/L :	5.0K
P34511 1,1,2-TRICHLOROETHANE	UG/L :	5.0K
P78124 BENZENE	UG/L :	5.0K
P34699 TRANS-1,3-DICHLOROPROFENE	UG/L :	5.0K
P34576 2-CHLOROETHYLVINYL ETHER	UG/L :	5.0K
P32104 BROMOFORM	UG/L :	5.0K

SAMPLE NUMBER : D086902

F 133	4-METHYL-2-PENTANONE(MIBK)	UG/L : 10K
P77103	2-HEXANONE(MBK)	UG/L : 10K
P34475	TETRACHLOROETHYLENE	UG/L : 5.0K
P34516	1,1,2,2-TETRACHLOROETHANE	UG/L : 5.0K
P78131	TOLUENE	UG/L : 5.0K
P34301	CHLOROBENZENE	UG/L : 5.0K
P78113	ETHYLBENZENE	UG/L : 5.0K
P77128	STYRENE	UG/L : 5.0K
P81551	XYLENE	UG/L : 62

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: ALIPHATIC HYDROCARBONS UG/L : 47 ~oil

: OTHER ORGANIC COMPOUNDS UG/L : 50 cannot identify

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0086903
SAMPLING POINT DESC. : WAUKEGAN HARBOR SLIP 1 4

SUBMITTING SOURCE # : GZP 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1145 SAMPLING PROGRAM : 28

COLLECTED BY : ME/CB DELIVERED BY : EPA
COMMENTS : VOLS
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : 0086908
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P34418	CHLOROMETHANE	UG/L :	10K
P34413	BROMOMETHANE	UG/L :	10K
P39175	VINYL CHLORIDE	UG/L :	10K
P34311	CHLOROETHANE	UG/L :	10K
P34423	METHYLENE CHLORIDE	UG/L :	5.0K
P81552	ACETONE	UG/L :	10K
P34488	TRICHLOROFLUOROMETHANE	UG/L :	5.0K
P77277	BROMOCHLOROMETHANE	UG/L :	5.0K
P77041	CARBON DISULFIDE	UG/L :	5.0K
P34501	1,1-DICHLOROETHYLENE	UG/L :	5.0K
P34496	1,1-DICHLOROETHANE	UG/L :	5.0K
546	TRANS-1,2-DICHLOROETHYLENE	UG/L :	5.0K
93	CIS-1,2-DICHLOROETHYLENE	UG/L :	5.0K
06	CHLOROFORM	UG/L :	5.0K
P34531	1,2-DICHLOROETHANE	UG/L :	5.0K
P81595	2-BUTANONE(MEK)	UG/L :	10K
P34506	1,1,1-TRICHLOROETHANE	UG/L :	5.0K
P32102	CARBON TETRACHLORIDE	UG/L :	5.0K
P77057	VINYL ACETATE	UG/L :	10K
P32101	DICHLOROBROMOMETHANE	UG/L :	5.0K
P34541	1,2-DICHLOROPROPANE	UG/L :	5.0K
P34704	CIS-1,3-DICHLOROPROPENE	UG/L :	5.0K
P39180	TRICHLOROETHYLENE	UG/L :	5.0K
P32105	CHLORODIBROMOMETHANE	UG/L :	5.0K
P34511	1,1,2-TRICHLOROETHANE	UG/L :	5.0K
P78124	BENZENE	UG/L :	5.0K
P34699	TRANS-1,3-DICHLOROPROPENE	UG/L :	5.0K
P34576	2-CHLOROETHYLVINYL ETHER	UG/L :	5.0K
P32104	BROMOFORM	UG/L :	5.0K

GC Mass spec Method

SAMPLE NUMBER : D086903

8133	4-METHYL-2-PENTANONE(MIBK)	UG/L	:	10K
P77103	2-HEXANONE(MBK)	UG/L	:	10K
P34475	TETRACHLOROETHYLENE	UG/L	:	5.0K
P34516	1,1,2,2-TETRACHLOROETHANE	UG/L	:	5.0K
P78131	TOLUENE	UG/L	:	5.0K
P34301	CHLOROBENZENE	UG/L	:	5.0K
P78113	ETHYLBENZENE	UG/L	:	5.0K
P77128	STYRENE	UG/L	:	5.0K
P81551	XYLENE	UG/L	:	64

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE
: ALIPHATIC HYDROCARBONS UG/L ; 64
: OTHER ORGANIC COMPOUNDS UG/L ; 44

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086904
SAMPLING POINT DESC. : WAUKEGAN HARBOR CENTRAL 5

SUBMITTING SOURCE # : GZG 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1115 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : VOLS
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D086908
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P34418 CHLOROMETHANE	UG/L	10K
P34413 BROMOMETHANE	UG/L	10K
P39175 VINYL CHLORIDE	UG/L	10K
P34311 CHLOROETHANE	UG/L	10K
P34423 METHYLENE CHLORIDE	UG/L	5.0K
P81552 ACETONE	UG/L	10K
P34488 TRICHLOROFLUOROMETHANE	UG/L	5.0K
P77277 BROMOCHLOROMETHANE	UG/L	5.0K
P77041 CARBON DISULFIDE	UG/L	5.0K
P34501 1,1-DICHLOROETHYLENE	UG/L	5.0K
[illegible]496 1,1-DICHLOROETHANE	UG/L	5.0K
[illegible]6 TRANS-1,2-DICHLOROETHYLENE	UG/L	5.0K
[illegible]3 CIS-1,2-DICHLOROETHYLENE	UG/L	5.0K
P32106 CHLOROFORM	UG/L	5.0K
P34531 1,2-DICHLOROETHANE	UG/L	5.0K
P81595 2-BUTANONE(MEK)	UG/L	10K
P34506 1,1,1-TRICHLOROETHANE	UG/L	5.0K
P32102 CARBON TETRACHLORIDE	UG/L	5.0K
P77057 VINYL ACETATE	UG/L	10K
P32101 DICHLOROBROMOMETHANE	UG/L	5.0K
P34541 1,2-DICHLOROPROPANE	UG/L	5.0K
P34704 CIS-1,3-DICHLOROPROPENE	UG/L	5.0K
P39180 TRICHLOROETHYLENE	UG/L	5.0K
P32105 CHLORODIBROMOMETHANE	UG/L	5.0K
P34511 1,1,2-TRICHLOROETHANE	UG/L	5.0K
P78124 BENZENE	UG/L	5.0K
P34699 TRANS-1,3-DICHLOROPROPENE	UG/L	5.0K
P34576 2-CHLOROETHYLVINYL ETHER	UG/L	5.0K
P32104 BROMOFORM	UG/L	5.0K

SAMPLE NUMBER : D086904

P78133	4-METHYL-2-PENTANONE(MIBK)	UG/L :	10K
P77103	2-HEXANONE(MBK)	UG/L :	10K
P34475	TETRACHLOROETHYLENE	UG/L :	5.0K
P34516	1,1,2,2-TETRACHLOROETHANE	UG/L :	5.0K
P78131	TOLUENE	UG/L :	5.0K
P34301	CHLOROBENZENE	UG/L :	5.0K
P78113	ETHYLBENZENE	UG/L :	5.0K
P77128	STYRENE	UG/L :	5.0K
P81551	XYLENE	UG/L :	39

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: ALIPHATIC HYDROCARBONS UG/L ; 19

: OTHER ORGANIC COMPOUNDS UG/L ; 42

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086905
SAMPLING POINT DESC. : WAUKEGAN HARBOR 6

SUBMITTING SOURCE # : GZR 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1050 SAMPLING PROGRAM : B

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : VOLS
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : B

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D086908
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P34418	CHLOROMETHANE	UG/L : 10K
P34413	BROMOMETHANE	UG/L : 10K
P39175	VINYL CHLORIDE	UG/L : 10K
P34311	CHLOROETHANE	UG/L : 10K
P34423	METHYLENE CHLORIDE	UG/L : 5.0K
P81552	ACETONE	UG/L : 10K
P34488	TRICHLOROFLUOROMETHANE	UG/L : 5.0K
P77277	BROMOCHLOROMETHANE	UG/L : 5.0K
P77041	CARBON DISULFIDE	UG/L : 5.0K
P34501	1,1-DICHLOROETHYLENE	UG/L : 5.0K
P34496	1,1-DICHLOROETHANE	UG/L : 5.0K
6	TRANS-1,2-DICHLOROETHYLENE	UG/L : 5.0K
3	CIS-1,2-DICHLOROETHYLENE	UG/L : 5.0K
[illegible]	CHLOROFORM	UG/L : 5.0K
P34531	1,2-DICHLOROETHANE	UG/L : 5.0K
P81595	2-BUTANONE(MEK)	UG/L : 10K
P34506	1,1,1-TRICHLOROETHANE	UG/L : 5.0K
P32102	CARBON TETRACHLORIDE	UG/L : 5.0K
P77057	VINYL ACETATE	UG/L : 10K
P32101	DICHLOROBROMOMETHANE	UG/L : 5.0K
P34541	1,2-DICHLOROPROPANE	UG/L : 5.0K
P34704	CIS-1,3-DICHLOROPROPENE	UG/L : 5.0K
P39180	TRICHLOROETHYLENE	UG/L : 5.0K
P32105	CHLORODIBROMOMETHANE	UG/L : 5.0K
P34511	1,1,2-TRICHLOROETHANE	UG/L : 5.0K
P78124	BENZENE	UG/L : 5.0K
P34699	TRANS-1,3-DICHLOROPROPENE	UG/L : 5.0K
P34576	2-CHLOROETHYLVINYL ETHER	UG/L : 5.0K
P32104	BROMOFORM	UG/L : 5.0K

SAMPLE NUMBER : D086905

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P78133 4-METHYL-2-PENTANONE(MIBK)         UG/L : 10K
P77103 2-HEXANONE(MBK)                    UG/L : 10K
P34475 TETRACHLOROETHYLENE                UG/L : 5.0K
P34516 1,1,2,2-TETRACHLOROETHANE          UG/L : 5.0K

P78131 TOLUENE                            UG/L : 5.0K
P34301 CHLOROBENZENE                      UG/L : 5.0K
P78113 ETHYLBENZENE                       UG/L : 5.0K
P77128 STYRENE                            UG/L : 5.0K

P81551 XYLENE                             UG/L : 5.0K
 : THE FOLLOWING QUANTITATIONS ARE APPROXIMATE
 : ALIPHATIC HYDROCARBONS       UG/L ; 3
 : OTHER ORGANIC COMPOUNDS      UG/L ; 14
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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086906
SAMPLING POINT DESC. : WAUKEGAN HARBOR CHANNEL 7

SUBMITTING SOURCE # : QZS 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1010 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : VOLS
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 3

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : D V
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : 0086903
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P34418	CHLOROMETHANE	UG/L :	10K
P34413	BROMOMETHANE	UG/L :	10K
P39175	VINYL CHLORIDE	UG/L :	10K
P34311	CHLOROETHANE	UG/L :	10K
P34423	METHYLENE CHLORIDE	UG/L :	5.0K
P81552	ACETONE	UG/L :	10K
P34488	TRICHLOROFLUOROMETHANE	UG/L :	5.0K
P77277	BROMOCHLOROMETHANE	UG/L :	5.0K
P77041	CARBON DISULFIDE	UG/L :	5.0K
P34501	1,1-DICHLOROETHYLENE	UG/L :	5.0K
P34496	1,1-DICHLOROETHANE	UG/L :	5.0K
4546	TRANS-1,2-DICHLOROETHYLENE	UG/L :	5.0K
7093	CIS-1,2-DICHLOROETHYLENE	UG/L :	5.0K
P32106	CHLOROFORM	UG/L :	5.0K
P34531	1,2-DICHLOROETHANE	UG/L :	5.0K
P81595	2-BUTANONE(MEK)	UG/L :	10K
P34506	1,1,1-TRICHLOROETHANE	UG/L :	5.0K
P32102	CARBON TETRACHLORIDE	UG/L :	5.0K
P77057	VINYL ACETATE	UG/L :	10K
P32101	DICHLOROBROMOMETHANE	UG/L :	5.0K
P34541	1,2-DICHLOROPROPANE	UG/L :	5.0K
P34704	CIS-1,3-DICHLOROPROPENE	UG/L :	5.0K
P39180	TRICHLOROETHYLENE	UG/L :	5.0K
P32105	CHLORODIBROMOMETHANE	UG/L :	5.0K
P34511	1,1,2-TRICHLOROETHANE	UG/L :	5.0K
P78124	BENZENE	UG/L :	5.0K
P34699	TRANS-1,3-DICHLOROPROPENE	UG/L :	5.0K
P34576	2-CHLOROETHYLVINYL ETHER	UG/L :	5.0K
P32104	BROMOFORM	UG/L :	5.0K

,AMPLE NUMBER : D086906

78133	4-METHYL-2-PENTANONE(MIBK)	UG/L :	10K
P77103	2-HEXANONE(MBK)	UG/L :	10K
P34475	TETRACHLOROETHYLENE	UG/L :	5.0K
P34516	1,1,2,2-TETRACHLOROETHANE	UG/L :	5.0K
P78131	TOLUENE	UG/L :	5.0K
P34301	CHLOROBENZENE	UG/L :	5.0K
P78113	ETHYLBENZENE	UG/L :	5.0K
P77128	STYRENE	UG/L :	5.0K
P81551	XYLENE	UG/L :	5.0K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: OHTER ORGANIC COMPOUNDS UG/L ; 4

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D086907
SAMPLING POINT DESC. : NEW HARBOR 8

SUBMITTING SOURCE # : QZT 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1320 SAMPLING PROGRAM : 28

COLLECTED BY : ME/CS DELIVERED BY : EPA
COMMENTS : VOLS
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ILWQ SAMPLE PURPOSE CODE : 1 REPORTING INDICATOR : 8

DATE RECEIVED : 901116 TIME RECEIVED : 1045 RECEIVED BY : C V
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D086908
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P32106	CHLOROFORM	UG/L :	1.0K
P32101	DICHLOROBROMOMETHANE	UG/L :	1.0K
P32105	CHLORODIBROMOMETHANE	UG/L :	1.0K
P32104	BROMOFORM	UG/L :	1.0K
P34423	METHYLENE CHLORIDE	UG/L :	1.0K
P34501	1,1-DICHLOROETHYLENE	UG/L :	1.0K
P34496	1,1-DICHLOROETHANE	UG/L :	1.0K
P34546	TRANS-1,2-DICHLOROETHYLENE	UG/L :	1.0K
P34531	1,2-DICHLOROETHANE	UG/L :	1.0K
P34506	1,1,1-TRICHLOROETHANE	UG/L :	1.0K
[illegible]102	CARBON TETRACHLORIDE	UG/L :	1.0K
[illegible]80	TRICHLOROETHYLENE	UG/L :	1.0K
[illegible]75	TETRACHLOROETHYLENE	UG/L :	1.0K
P34301	CHLOROBENZENE	UG/L :	1.0K
P34716	DICHLOROBENZENE(TOTAL)	UG/L :	1.0K
P78124	BENZENE	UG/L :	1.0K
P78131	TOLUENE	UG/L :	1.0K
P78113	ETHYLBENZENE	UG/L :	1.0K
P81551	XYLENES	UG/L :	1.0K
P77093	CIS-1,2-DICHLOROETHYLENE	UG/L :	1.0K

APPENDIX E

Organics Scanned in Water Samples
by the
Illinois Environmental Protection Agency Laboratories

APPENDIX E.1.

Organics Scanned in Water Samples by the Illinois Environmental Protection Agency Laboratories. Analytical Methods are Listed According to USEPA, 1990a.

608

ALDRIN
DIELDRIN
TOTAL DDT
O,P'-DDE
P,P'-DDE
O,P'-DDD
P,P'-DDD
O,P'-DDT
P,P'-DDT
TOTAL CHLORDANE
CHLORDANE, CIS ISOMER
CHLORDANE, TRANS ISOMER
ENDRIN
METHOXYCHLOR
ALPHA-BHC
GAMMA-BHC(LINDANE)
HEXACHLOROBENZENE
TOTAL PCBS
TOXAPHENE

8279/608*

PENTACHLOROPHENOL

8260/624/601/602

CHLOROMETHANE
BROMOMETHANE
VINYL CHLORIDE
CHLOROETHANE
METHYLENE CHLORIDE

8260/624/601/602

ACETONE
TRICHLOROFLUOROMETHANE
BROMOCHLOROMETHANE
CARBON DISULFIDE
1,1-DICHLOROETHYLENE
1,1-DICHLOROETHANE
TRANS-1,2-DICHLOROETHYLENE
CIS-1,2 DICHLOROETHYLENE
CHLOROFORM
1,2 DICHLORETHANE
2 BUTANONE (MEK)
1,1,1-TRICHLOROETHANE
CARBON TETRACHLORIDE
VINYL ACETATE
DICHLOROBROMOMETHANE
1,2-DICHLOROPROPANE
CIS-1,3-DICHLOROPROPENE
TRICHLOROETHYLENE
CHLORODIBROMOMETHANE
1,1,2-TRICHLOROETHANE
BENZENE
TRANS-1,3-DICHLOROPROPENE
2-CHLOROETHYLVINYL ETHER
BROMOFORM
4-METHYL-2 PENTANONE
2-HEXANONE (MBK)
TETRACHLOROETHYLENE
1,2,2,2-TETRACHLOROETHANE
TOLUENE
CHLOROBENZENE
ETHYLBENZENE
STYRENE
XYLENE

* Gas chromatographic analysis preceded by acid extraction and esterification

APPENDIX F

Sediment Quality Analyses,
Sampling of Waukegan Harbor Area, November 1990
Sampling and Analyses by the
Illinois Environmental Protection Agency

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : 0087614
APLING POINT DESC. : NORTH BEACH WAUKEGAN/2

BMITTING SOURCE # : GZN 01 SITE # :
TE COLLECTED : 901114 TIME COLLECTED : 1520 SAMPLING PROGRAM : 28

LLECTED BY : HE/CB DELIVERED BY : EPA
MMENTS : WAUKEGAN RAP
NDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
M TYPE CODE : ISED SAMPLE PURPOSE CODE : - REPORTING INDICATOR : 8

TE RECEIVED : 901205 TIME RECEIVED : 1050 RECEIVED BY : C G
B OBSERVATIONS : 1-6OZ SEDIMENT TRIP BL SAM# :
PERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

9519	TOTAL PCBS	UG/KG	: 10K
9333	ALDRIN	UG/KG	: 1.0K
9383	DIELDRIN	UG/KG	: 1.0K
9359	TOTAL DDT	UG/KG	: 10K
9328	O,P'-DDE	UG/KG	: 1.0K
9321	P,P'-DDE	UG/KG	: 1.0K
9316	O,P'-DDD	UG/KG	: 1.0K
9311	P,P'-DDD	UG/KG	: 1.0K
9306	O,P'-DDT	UG/KG	: 1.0K
301	P,P'-DDT	UG/KG	: 1.0K
,351	TOTAL CHLORDANE	UG/KG	: 5.0K
9064	CHLORDANE,CIS ISOMER	UG/KG	: 2.0K
7	CHLORDANE,TRANS ISOMER	UG/KG	: 2.0K
9393	ENDRIN	UG/KG	: 1.0K
9481	METHOXYCHLOR	UG/KG	: 5.0K
9076	ALPHA-BHC	UG/KG	: 1.0K
9343	GAMMA-BHC (LINDANE)	UG/KG	: 1.0K
9701	HEXACHLOROBENZENE	UG/KG	: 1.0K
9413	HEPTACHLOR	UG/KG	: 1.0K
9423	HEPTACHLOR EPOXIDE	UG/KG	: 1.0K
~~4694~~	PHENOL P79408	MG/KG ~~UG/G~~	: 0.5K
~~4273~~	BIS(2-CHLOROETHYL)ETHER P78314	~~UG/G~~	: 0.5K
~~4500~~	2-CHLOROPHENOL P78400	~~UG/G~~	: 0.5K
~~4566~~	1,3-DICHLOROBENZENE P78317	~~UG/G~~	: 0.5K
~~4571~~	1,4-DICHLOROBENZENE P78318	~~UG/G~~	: 0.5K
~~7147~~	BENZYL ALCOHOL P78302	~~UG/G~~	: 0.5K
~~4536~~	1,2-DICHLOROBENZENE P78316	~~UG/G~~	: 0.5K
~~0060~~	2-METHYLPHENOL P78395	~~UG/G~~	: 0.5K
~~4283~~	BIS(2-CHLOROISOPROPYL)ETHER P78326	~~UG/G~~	: 0.5K

SAMPLE NUMBER : 0087614

			MG/KG	
~~A00000~~	4-METHYLPHENOL	P78396	~~UG/G~~	: 0.5K
~~A34428~~	N-NITROSO-DI-N-PROPYLAMINE	P78335	~~UG/G~~	: 0.5K
~~A34396~~	HEXACHLOROETHANE	P78313	~~UG/G~~	: 0.5K
~~A34447~~	NITROBENZENE	P78332	~~UG/G~~	: 0.5K
~~A34408~~	ISOPHORONE	P78330	~~UG/G~~	: 0.5K
~~A34591~~	2-NITROPHENOL	P79403	~~UG/G~~	: 0.5K
~~A34606~~	2,4-DIMETHYLPHENOL	P79402	~~UG/G~~	: 0.5K
~~A77247~~	BENZOIC ACID	P78394	~~UG/G~~	: 5.0K
~~A34278~~	BIS(2-CHLOROETHOXY)METHANE	P78327	~~UG/G~~	: 0.5K
~~A34601~~	2,4-DICHLOROPHENOL	P79401	~~UG/G~~	: 0.5K
~~A34551~~	1,2,4-TRICHLOROBENZENE	P78311	~~UG/G~~	: 0.5K
~~A34696~~	NAPHTHALENE	P78331	~~UG/G~~	: 0.5K
~~A00000~~	4-CHLOROANILINE	P78303	~~UG/G~~	: 0.5K
~~A34391~~	HEXACHLOROBUTADIENE	P78328	~~UG/G~~	: 0.5K
~~A34452~~	4-CHLORO-3-METHYLPHENOL	P78399	~~UG/G~~	: 0.5K
~~A77416~~	2-METHYLNAPHTHALENE	P78305	~~UG/G~~	: 0.5K
~~A34386~~	HEXACHLOROCYCLOPENTADIENE	78329	~~UG/G~~	: 0.5K
~~A34621~~	2,4,6-TRICHLOROPHENOL	P78398	~~UG/G~~	: 0.5K
~~A77687~~	2,4,5-TRICHLOROPHENOL	P78397	~~UG/G~~	: 0.5K
~~A34581~~	2-CHLORONAPHTHALENE	P78315	~~UG/G~~	: 0.5K
~~A00000~~	2-NITROANILINE	P78306	~~UG/G~~	: 1.0K
~~A34341~~	DIMETHYLPHTHALATE	P78341	~~UG/G~~	: 0.5K
~~A34200~~	ACENAPHTHYLENE	P78347	~~UG/G~~	: 0.5K
~~A34626~~	2,6-DINITROTOLUENE	P78321	UG/G	: 0.5K
~~A78300~~	3-NITROANILINE	P78307	~~UG/G~~	: 1.0K
~~A34205~~	ACENAPHTHENE	P78309	~~UG/G~~	: 0.5K
~~A34616~~	2,4-DINITROPHENOL	P79405	~~UG/G~~	: 1.0K
~~A34646~~	4-NITROPHENOL	P79404	~~UG/G~~	: 1.0K
~~A81302~~	DIBENZOFURAN	P78304	~~UG/G~~	: 0.5K
~~A34611~~	2,4-DINITROTOLUENE	P78320	~~UG/G~~	: 0.5K
~~A34336~~	DIETHYLPHTHALATE	P78340	~~UG/G~~	: 0.5K
~~A34641~~	4-CHLOROPHENYL PHENYL ETHER	P78324	~~UG/G~~	: 0.5K
~~A34381~~	FLUORENE	P78350	~~UG/G~~	: 0.5K
A00000	4-NITROANILINE	P78308	~~UG/G~~	: 1.0K
~~A00000~~	4,6-DINITRO-2-METHYLPHENOL	P79406	UG/G	: 1.0K
~~A34636~~	4-BROMOPHENYL PHENYL ETHER	P78325	UG/G	: 0.5K
~~A39700~~	HEXACHLOROBENZENE	P78312	~~UG/G~~	: 0.5K
~~A39032~~	PENTACHLOROPHENOL	P79407	UG/G	: 1.0K
~~A34461~~	PHENANTHRENE	P78351	~~UG/G~~	: 0.5K
~~A34220~~	ANTHRACENE	P78348	~~UG/G~~	: 0.5K
~~A39110~~	DI-N-BUTYLPHTHALATE	P78338	~~UG/G~~	: 0.5K
~~A34376~~	FLUORANTHENE	P78323	~~UG/G~~	: 0.5K
~~A34469~~	PYRENE	P78354	~~UG/G~~	: 0.5K

AMPLE NUMBER : 0087614

~~A34292~~	BUTYL BENZYL PHTHALATE P78337	MG/KG ~~UG/G~~	: 0.5K
A~~34011~~	3,3'-DICHLOROBENZIDINE P78319	~~UG/G~~	: 1.0K
A34526	BENZO(A)ANTHRACENE P78342	~~UG/G~~	: 0.5K
~~A34320~~	CHRYSENE P78346	~~UG/G~~	: 0.5K
~~A39100~~	BIS(2-ETHYLHEXYL)PHTHALATE P78336	~~UG/G~~	: 0.5K
~~A34596~~	DI-N-OCTYLPHTHALATE P78339	~~UG/G~~	: 0.5K
~~A34230~~	BENZO(B)FLUORANTHENE P78344	~~UG/G~~	: 0.5K
~~A34242~~	BENZO(K)FLUORANTHENE P78345	~~UG/G~~	: 0.5K
~~A34247~~	BENZO(A)PYRENE P78343	~~UG/G~~	: 0.5K
A34403	INDENO(1,2,3-CD)PYRENE P78353	~~UG/G~~	: 0.5K
A34556	DIBENZO(AH)ANTHRACENE P78352	UG/G	: 0.5K
~~A34521~~	BENZO(GHI)PERYLENE P78349	UG/G	: 0.5K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: OTHER ORGANIC COMPOUNDS UG/G; 2.8

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D087615
SAMPLING POINT DESC. : UPPER HARBOR WAUKEGAN HARBOR/3

SUBMITTING SOURCE # : GZC C1 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1210 SAMPLING PROGRAM : 26

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

DATE RECEIVED : 901205 TIME RECEIVED : 1050 RECEIVED BY : C G
LAB OBSERVATIONS : 1-6OZ SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG	: 9000
P39333	ALDRIN	UG/KG	: 10K
P39383	DIELDRIN	UG/KG	: 1.5K
P39359	TOTAL DDT	UG/KG	: 100K
P39323	O,P'-DDE	UG/KG	: 10K
P39321	P,P'-DDE	UG/KG	: 10K
P39316	O,P'-DDD	UG/KG	: 10K
P39311	P,P'-DDD	UG/KG	: 10K
P39306	O,P'-DDT	UG/KG	: 10K
P39301	P,P'-DDT	UG/KG	: 10K
P39351	TOTAL CHLORDANE	UG/KG	: 20K
P39064	CHLORDANE,CIS ISOMER	UG/KG	: 10K
P39067	CHLORDANE,TRANS ISOMER	UG/KG	: 10K
P39393	ENDRIN	UG/KG	: 10K
P39481	METHOXYCHLOR	UG/KG	: 50K
P39076	ALPHA-BHC	UG/KG	: 10K
P39343	GAMMA-BHC (LINDANE)	UG/KG	: 10K
P39701	HEXACHLOROBENZENE	UG/KG	: 10K
P39413	HEPTACHLOR	UG/KG	: 10K
P39423	HEPTACHLOR EPOXIDE	UG/KG	: 10K
~~A34694~~	PHENOL P79408	~~UG/G~~ MG/KG	: 0.5K
A~~34273~~	BIS(2-CHLOROETHYL)ETHER P78314	~~UG/G~~	: 0.5K
~~A34586~~	2-CHLOROPHENOL P78400	~~UG/G~~	: 0.5K
A~~34566~~	1,3-DICHLOROBENZENE P 78317	~~UG/G~~	: 0.5K
~~A34571~~	1,4-DICHLOROBENZENE P 78318	~~UG/G~~	: 0.5K
A~~77147~~	BENZYL ALCOHOL P 78302	~~UG/G~~	: 0.5K
~~A34536~~	1,2-DICHLOROBENZENE P 78316	~~UG/G~~	: 0.5K
~~A00000~~	2-METHYLPHENOL P 78395	~~UG/G~~	: 0.5K
~~A34283~~	BIS(2-CHLOROISOPROPYL)ETHER P78326	~~UG/G~~	: 0.5K

AMPLE NUMBER : 0087615

		MG/KG	
~~A00000~~	4-METHYLPHENOL P78396	~~UG/G~~	: 0.5K
~~A34428~~	N-NITROSO-DI-N-PROPYLAMINE P78335	~~UG/G~~	: 0.5K
~~A34396~~	HEXACHLOROETHANE P78313	~~UG/G~~	: 0.5K
~~A34447~~	NITROBENZENE P78332	~~UG/G~~	: 0.5K
~~A34408~~	ISOPHORONE P78330	~~UG/G~~	: 0.5K
~~A34591~~	2-NITROPHENOL P79403	~~UG/G~~	: 0.5K
~~A34606~~	2,4-DIMETHYLPHENOL P79402	~~UG/G~~	: 0.5K
~~A77247~~	BENZOIC ACID P78394	~~UG/G~~	: 5.0K
~~A34278~~	BIS(2-CHLOROETHOXY)METHANE P78327	~~UG/G~~	: 0.5K
~~A34601~~	2,4-DICHLOROPHENOL P79401	~~UG/G~~	: 0.5K
~~A34551~~	1,2,4-TRICHLOROBENZENE P78311	~~UG/G~~	: 0.5K
~~A34696~~	NAPHTHALENE P78331	~~UG/G~~	: 0.5K
~~A00360~~	4-CHLOROANILINE P78303	~~UG/G~~	: 0.5K
~~A34391~~	HEXACHLOROBUTADIENE P78328	~~UG/G~~	: 0.5K
~~A34452~~	4-CHLORO-3-METHYLPHENOL P78399	~~UG/G~~	: 0.5K
~~A77416~~	2-METHYLNAPHTHALENE P78305	~~UG/G~~	: 0.5K
~~A34386~~	HEXACHLOROCYCLOPENTADIENE P78329	~~UG/G~~	: 0.5K
~~A34621~~	2,4,6-TRICHLOROPHENOL P78398	~~UG/G~~	: 0.5K
~~A77687~~	2,4,5-TRICHLOROPHENOL P78397	~~UG/G~~	: 0.5K
~~A34581~~	2-CHLORONAPHTHALENE P78315	~~UG/G~~	: 0.5K
~~A00000~~	2-NITROANILINE P78306	~~UG/G~~	: 1.0K
~~A34341~~	DIMETHYLPHTHALATE P78341	~~UG/G~~	: 0.5K
~~A34200~~	ACENAPHTHYLENE P78347	~~UG/G~~	: 0.5K
~~A34626~~	2,6-DINITROTOLUENE P78321	~~UG/G~~	: 0.5K
~~A78300~~	3-NITROANILINE P78307	~~UG/G~~	: 1.0K
~~A34205~~	ACENAPHTHENE P78309	~~UG/G~~	: 0.5K
~~A34616~~	2,4-DINITROPHENOL P79405	~~UG/G~~	: 1.0K
~~A34646~~	4-NITROPHENOL P79404	~~UG/G~~	: 1.0K
~~A81302~~	DIBENZOFURAN P78304	~~UG/G~~	: 0.5K
~~A34611~~	2,4-DINITROTOLUENE P78320	~~UG/G~~	: 0.5K
~~A34336~~	DIETHYLPHTHALATE P78340	~~UG/G~~	: 0.5K
~~A34641~~	4-CHLOROPHENYL PHENYL ETHER P78324	~~UG/G~~	: 0.5K
~~A34381~~	FLUORENE P78350	~~UG/G~~	: 0.5K
~~A00000~~	4-NITROANILINE P78308	~~UG/G~~	: 1.0K
~~A00000~~	4,6-DINITRO-2-METHYLPHENOL P79406	~~UG/G~~	: 1.0K
~~A34636~~	4-BROMOPHENYL PHENYL ETHER P78325	~~UG/G~~	: 0.5K
~~A39700~~	HEXACHLOROBENZENE P78312	~~UG/G~~	: 0.5K
~~A39032~~	PENTACHLOROPHENOL P79407	~~UG/G~~	: 1.0K
~~A34461~~	PHENANTHRENE P78351	~~UG/G~~	: 0.5K
~~A34220~~	ANTHRACENE P78348	~~UG/G~~	: 0.5K
~~A39110~~	DI-N-BUTYLPHTHALATE P78338	~~UG/G~~	: 0.5K
~~A34376~~	FLUORANTHENE P78323	~~UG/G~~	: 0.5K
~~A34469~~	PYRENE P78354	~~UG/G~~	: 0.5K

SAMPLE NUMBER : 0087615

			MG/KG	
~~A34292~~	BUTYL BENZYL PHTHALATE	P78337	~~UG/G~~	: 0.5K
~~A34631~~	3,3'-DICHLOROBENZIDINE	P78319	~~UG/G~~	: 1.0K
~~A34526~~	BENZO(A)ANTHRACENE	P78342	~~UG/G~~	: 0.5K
~~A34320~~	CHRYSENE	P78346	~~UG/G~~	: 0.5K
~~A39100~~	BIS(2-ETHYLHEXYL)PHTHALATE	P78336	~~UG/G~~	: 0.69
~~A34596~~	DI-N-OCTYLPHTHALATE	P78339	~~UG/G~~	: 0.5K
~~A34230~~	BENZO(B)FLUORANTHENE	P78344	~~UG/G~~	: 0.5K
~~A34242~~	BENZO(K)FLUORANTHENE	P78345	~~UG/G~~	: 0.5K
~~A34247~~	BENZO(A)PYRENE	P78343	~~UG/G~~	: 0.5K
~~A34403~~	INDENO(1,2,3-CD)PYRENE	P78353	~~UG/G~~	: 0.5K
~~A34556~~	DIBENZO(AH)ANTHRACENE	P78352	~~UG/G~~	: 0.5K
~~A34521~~	BENZO(GHI)PERYLENE	P78349	~~UG/G~~	: 0.5K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: ETHYL-DIMETHYL-PENTANE#	UG/G;	1.5
: METHYL PENTANE#	UG/G;	0.60
: TETRAMETHYL PENTANE#	UG/G;	15
: C3-SUBSTITUTED BENZENE	UG/G;	0.95
: C4-SUBSTITUTED BENZENE	UG/G;	5.1
: C5-SUBSTITUTED BENZENE	UG/G;	2.8
: ALIPHATIC HYDROCARBON	UG/G;	70
: OTHER ORGANIC COMPOUNDS	UG/G;	16

: # TENTATIVELY IDENTIFIED

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D067616
SAMPLING POINT DESC. : SLIP NO 1 CENTRAL/WAUKEGAN HARBOR /4

SUBMITTING SOURCE # : CZP 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1145 SAMPLING PROGRAM : 28

COLLECTED BY : ME/CS DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : - REPORTING INDICATOR : 8

DATE RECEIVED : 901205 TIME RECEIVED : 1050 RECEIVED BY : C G
LAB OBSERVATIONS : 1-60Z SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG	: 4600
P39333	ALDRIN	UG/KG	: 10K
P39383	DIELDRIN	UG/KG	: 1.0K
P39359	TOTAL DDT	UG/KG	: 100K
P39328	O,P'-DDE	UG/KG	: 10K
P39321	P,P'-DDE	UG/KG	: 10K
P39316	O,P'-DDD	UG/KG	: 10K
P39311	P,P'-DDD	UG/KG	: 10K
P39306	O,P'-DDT	UG/KG	: 10K
P39301	P,P'-DDT	UG/KG	: 10K
P39351	TOTAL CHLORDANE	UG/KG	: 20K
P39064	CHLORDANE,CIS ISOMER	UG/KG	: 10K
P39067	CHLORDANE,TRANS ISOMER	UG/KG	: 10K
P39393	ENDRIN	UG/KG	: 10K
P39481	METHOXYCHLOR	UG/KG	: 50K
P39076	ALPHA-BHC	UG/KG	: 10K
P39343	GAMMA-BHC (LINDANE)	UG/KG	: 10K
P39701	HEXACHLOROBENZENE	UG/KG	: 10K
P39413	HEPTACHLOR	UG/KG	: 10K
P39423	HEPTACHLOR EPOXIDE	UG/KG	: 10K
~~434694~~	PHENOL P79408	~~UG/G~~ MG/KG	: 0.5K
~~434273~~	BIS(2-CHLOROETHYL)ETHER P78314	~~UG/G~~	: 0.5K
~~434586~~	2-CHLOROPHENOL P78400	~~UG/G~~	: 0.5K
~~434566~~	1,3-DICHLOROBENZENE P78317	~~UG/G~~	: 0.5K
~~434571~~	1,4-DICHLOROBENZENE P78318	~~UG/G~~	: 0.5K
~~477147~~	BENZYL ALCOHOL P78302	~~UG/G~~	: 0.5K
~~434536~~	1,2-DICHLOROBENZENE P78316	~~UG/G~~	: 0.5K
~~400000~~	2-METHYLPHENOL P 78395	~~UG/G~~	: 0.5K
~~434263~~	BIS(2-CHLOROISOPROPYL)ETHER P78326	~~UG/G~~	: 0.5K

AMPLE NUMBER : 0087616

		MG/KG	
~~A00000~~	4-METHYLPHENOL P78396	~~UG/G~~	: 0.5K
~~A34428~~	N-NITROSO-DI-N-PROPYLAMINE P78335	~~UG/G~~	: 0.5K
~~A34396~~	HEXACHLOROETHANE P78313	~~UG/G~~	: 0.5K
~~A34447~~	NITROBENZENE P78332	~~UG/G~~	: 0.5K
~~A34408~~	ISOPHORONE P78330	~~UG/G~~	: 0.5K
~~A34591~~	2-NITROPHENOL P79403	~~UG/G~~	: 0.5K
~~A34606~~	2,4-DIMETHYLPHENOL P79402	~~UG/G~~	: 0.5K
~~A77247~~	BENZOIC ACID P78394	~~UG/G~~	: 5.0K
~~A34278~~	BIS(2-CHLOROETHOXY)METHANE P78327	~~UG/G~~	: 0.5K
~~A34601~~	2,4-DICHLOROPHENOL P79401	~~UG/G~~	: 0.5K
~~A34551~~	1,2,4-TRICHLOROBENZENE P78311	~~UG/G~~	: 0.5K
~~A34696~~	NAPHTHALENE P78331	~~UG/G~~	: 0.5K
~~A00000~~	4-CHLOROANILINE P78303	~~UG/G~~	: 0.5K
~~A34391~~	HEXACHLOROBUTADIENE P78328	~~UG/G~~	: 0.5K
~~A34452~~	4-CHLORO-3-METHYLPHENOL P78399	~~UG/G~~	: 0.5K
~~A77416~~	2-METHYLNAPHTHALENE P78305	~~UG/G~~	: 0.5K
~~A34386~~	HEXACHLOROCYCLOPENTADIENE P78329	~~UG/G~~	: 0.5K
~~A34621~~	2,4,6-TRICHLOROPHENOL P78398	~~UG/G~~	: 0.5K
~~A77687~~	2,4,5-TRICHLOROPHENOL P78397	~~UG/G~~	: 0.5K
~~A34581~~	2-CHLORONAPHTHALENE P78315	~~UG/G~~	: 0.5K
~~A00000~~	2-NITROANILINE P78306	~~UG/G~~	: 1.0K
~~A34341~~	DIMETHYLPHTHALATE P78341	~~UG/G~~	: 0.5K
~~A34200~~	ACENAPHTHYLENE P78347	~~UG/G~~	: 0.5K
~~A34626~~	2,6-DINITROTOLUENE P78321	~~UG/G~~	: 0.5K
~~A78300~~	3-NITROANILINE P78307	~~UG/G~~	: 1.0K
~~A34205~~	ACENAPHTHENE P78309	~~UG/G~~	: 0.5K
~~A34616~~	2,4-DINITROPHENOL P79405	~~UG/G~~	: 1.0K
~~A34646~~	4-NITROPHENOL P79404	~~UG/G~~	: 1.0K
~~A81302~~	DIBENZOFURAN P78304	~~UG/G~~	: 0.5K
~~A34611~~	2,4-DINITROTOLUENE P78320	~~UG/G~~	: 0.5K
~~A34336~~	DIETHYLPHTHALATE P78340	~~UG/G~~	: 0.5K
~~A34641~~	4-CHLOROPHENYL PHENYL ETHER P78324	~~UG/G~~	: 0.5K
~~A34381~~	FLUORENE P78350	~~UG/G~~	: 0.5K
~~A00000~~	4-NITROANILINE P78308	~~UG/G~~	: 1.0K
~~A00000~~	4,6-DINITRO-2-METHYLPHENOL P79406	~~UG/G~~	: 1.0K
~~A34636~~	4-BROMOPHENYL PHENYL ETHER P78325	~~UG/G~~	: 0.5K
~~A39700~~	HEXACHLOROBENZENE P78312	~~UG/G~~	: 0.5K
~~A39032~~	PENTACHLOROPHENOL P79407	~~UG/G~~	: 1.0K
~~A34461~~	PHENANTHRENE P78351	~~UG/G~~	: 0.5K
~~A34220~~	ANTHRACENE P78348	~~UG/G~~	: 0.5K
~~A39110~~	DI-N-BUTYLPHTHALATE P78338	~~UG/G~~	: 0.5K
~~A34376~~	FLUORANTHENE P78323	~~UG/G~~	: 0.62
~~A34469~~	PYRENE P78354	~~UG/G~~	: 0.65

SAMPLE NUMBER : 0027616

~~A34292~~	BUTYL BENZYL PHTHALATE P78337	MG/KG ~~UG/G~~	: 0.5K
~~A34631~~	3,3'-DICHLOROBENZIDINE P78319	~~UG/G~~	: 1.0K
~~A34526~~	BENZO(A)ANTHRACENE P78342	~~UG/G~~	: 0.5K
~~A34320~~	CHRYSENE P78346	~~UG/G~~	: 0.5K
~~A39100~~	BIS(2-ETHYLHEXYL)PHTHALATE P78336	~~UG/G~~	: 0.5K
~~A34596~~	DI-N-OCTYLPHTHALATE P78339	~~UG/G~~	: 0.5K
~~A34230~~	BENZO(B)FLUORANTHENE P78344	~~UG/G~~	: 0.5K
~~A34242~~	BENZO(K)FLUORANTHENE P78345	~~UG/G~~	: 0.5K
~~A34247~~	BENZO(A)PYRENE P78343	~~UG/G~~	: 0.5K
~~A34403~~	INDENO(1,2,3-CD)PYRENE P78353	~~UG/G~~	: 0.5K
~~A34556~~	DIBENZO(AH)ANTHRACENE P78352	~~UG/G~~	: 0.5K
~~A34521~~	BENZO(GHI)PERYLENE P78349	~~UG/G~~	: 0.5K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: METHYL NAPHTHALENE#	UG/G;	0.71
: DIMETHYL NAPHTHALENE#	UG/G;	0.78
: METHYL PENTANE#	UG/G;	0.59
: TETRAMETHYL PENTANE#	UG/G;	7.2
: C4-SUBSTITUTED BENZENE	UG/G;	3.0
: C5-SUBSTITUTED BENZENE	UG/G;	1.8
: ALIPHATIC HYDROCARBON	UG/G;	24
: OTHER ORGANIC COMPOUNDS	UG/G;	9.1

: # TENTATIVELY IDENTIFIED

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D067617
SAMPLING POINT DESC. : WAUKEGAN HARBOR CENTRAL/5

SUBMITTING SOURCE # : CZC 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1115 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : - REPORTING INDICATOR : 8

DATE RECEIVED : 901205 TIME RECEIVED : 1050 RECEIVED BY : C G
LAB OBSERVATIONS : 1-6OZ SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG	1900
P39333	ALDRIN	UG/KG	10K
P39383	DIELDRIN	UG/KG	1.0K
P39359	TOTAL DDT	UG/KG	100K
P39328	O,P'-DDE	UG/KG	10K
P39321	P,P'-DDE	UG/KG	10K
P39316	O,P'-DDD	UG/KG	10K
P39311	P,P'-DDD	UG/KG	10K
P39306	O,P'-DDT	UG/KG	10K
P39301	P,P'-DDT	UG/KG	10K
P39351	TOTAL CHLORDANE	UG/KG	20K
P39064	CHLORDANE,CIS ISOMER	UG/KG	10K
P39067	CHLORDANE,TRANS ISOMER	UG/KG	10K
P39393	ENDRIN	UG/KG	10K
P39481	METHOXYCHLOR	UG/KG	50K
P39076	ALPHA-BHC	UG/KG	10K
P39343	GAMMA-BHC (LINDANE)	UG/KG	10K
P39701	HEXACHLOROBENZENE	UG/KG	10K
P39413	HEPTACHLOR	UG/KG	10K
P39423	HEPTACHLOR EPOXIDE	UG/KG	10K
~~A34694~~	PHENOL P79408	~~UG/G~~ MG/KG	0.5K
~~A34273~~	BIS(2-CHLOROETHYL)ETHER P78314	~~UG/G~~	0.5K
~~A34586~~	2-CHLOROPHENOL P78400	~~UG/G~~	0.5K
~~A34566~~	1,3-DICHLOROBENZENE P78317	~~UG/G~~	0.5K
~~A34571~~	1,4-DICHLOROBENZENE P78318	~~UG/G~~	0.5K
~~A77147~~	BENZYL ALCOHOL P78302	~~UG/G~~	0.5K
~~A34536~~	1,2-DICHLOROBENZENE P78316	~~UG/G~~	0.5K
~~A00000~~	2-METHYLPHENOL P78395	~~UG/G~~	0.5K
~~A34283~~	BIS(2-CHLOROISOPROPYL)ETHER P78326	~~UG/G~~	0.5K

SAMPLE NUMBER : 0087617

~~A00000~~	4-METHYLPHENOL	P78396	MG/KG ~~UG/G~~	: 0.62
~~A34428~~	N-NITROSO-DI-N-PROPYLAMINE	P78335	~~UG/G~~	: 0.5K
~~A34396~~	HEXACHLOROETHANE	P78313	~~UG/G~~	: 0.5K
~~A34447~~	NITROBENZENE	P78332	~~UG/G~~	: 0.5K
~~A34408~~	ISOPHORONE	P78330	~~UG/G~~	: 0.5K
~~A34591~~	2-NITROPHENOL	P79403	~~UG/G~~	: 0.5K
~~A34606~~	2,4-DIMETHYLPHENOL	P79402	~~UG/G~~	: 0.5K
~~A77247~~	BENZOIC ACID	P78394	~~UG/G~~	: 5.0K
~~A34278~~	BIS(2-CHLOROETHOXY)METHANE	P78327	~~UG/G~~	: 0.5K
~~A34601~~	2,4-DICHLOROPHENOL	P79401	~~UG/G~~	: 0.5K
~~A34551~~	1,2,4-TRICHLOROBENZENE	P78311	~~UG/G~~	: 0.5K
~~A34696~~	NAPHTHALENE	P78331	~~UG/G~~	: 0.5K
~~A00000~~	4-CHLOROANILINE	P78303	~~UG/G~~	: 0.5K
~~A34391~~	HEXACHLOROBUTADIENE	P78328	~~UG/G~~	: 0.5K
~~A34452~~	4-CHLORO-3-METHYLPHENOL	P78399	~~UG/G~~	: 0.5K
~~A77416~~	2-METHYLNAPHTHALENE	P78305	~~UG/G~~	: 0.5K
~~A34386~~	HEXACHLOROCYCLOPENTADIENE	P78329	~~UG/G~~	: 0.5K
~~A34621~~	2,4,6-TRICHLOROPHENOL	P78398	~~UG/G~~	: 0.5K
~~A77687~~	2,4,5-TRICHLOROPHENOL	P78397	~~UG/G~~	: 0.5K
~~A34581~~	2-CHLORONAPHTHALENE	P78315	~~UG/G~~	: 0.5K
~~A00000~~	2-NITROANILINE	P78306	~~UG/G~~	: 1.0K
~~A34341~~	DIMETHYLPHTHALATE	P78341	~~UG/G~~	: 0.5K
~~A34200~~	ACENAPHTHYLENE	P78347	~~UG/G~~	: 0.5K
~~A34626~~	2,6-DINITROTOLUENE	P78321	~~UG/G~~	: 0.5K
~~A78300~~	3-NITROANILINE	P78307	~~UG/G~~	: 1.0K
~~A34205~~	ACENAPHTHENE	P78309	~~UG/G~~	: 0.5K
~~A34616~~	2,4-DINITROPHENOL	P79405	~~UG/G~~	: 1.0K
~~A34646~~	4-NITROPHENOL	P79404	~~UG/G~~	: 1.0K
~~A81302~~	DIBENZOFURAN	P78304	~~UG/G~~	: 0.5K
~~A34611~~	2,4-DINITROTOLUENE	P78320	~~UG/G~~	: 0.5K
~~A34336~~	DIETHYLPHTHALATE	P78340	~~UG/G~~	: 0.5K
~~A34641~~	4-CHLOROPHENYL PHENYL ETHER	P78324	~~UG/G~~	: 0.5K
~~A34381~~	FLUORENE	P78350	~~UG/G~~	: 0.5K
~~A00000~~	4-NITROANILINE	P78308	~~UG/G~~	: 1.0K
~~A00000~~	4,6-DINITRO-2-METHYLPHENOL	P79406	~~UG/G~~	: 1.0K
~~A34636~~	4-BROMOPHENYL PHENYL ETHER	P78325	~~UG/G~~	: 0.5K
~~A39700~~	HEXACHLOROBENZENE	P78312	~~UG/G~~	: 0.5K
~~A39032~~	PENTACHLOROPHENOL	P79407	~~UG/G~~	: 1.0K
~~A34461~~	PHENANTHRENE	P78351	~~UG/G~~	: 0.5K
~~A34220~~	ANTHRACENE	P78348	~~UG/G~~	: 0.5K
~~A39110~~	DI-N-BUTYLPHTHALATE	P78338	~~UG/G~~	: 0.5K
~~A34376~~	FLUORANTHENE	P78323	~~UG/G~~	: 0.5K
~~A34469~~	PYRENE	P78354	~~UG/G~~	: 0.5K

SAMPLE NUMBER : 0087617

~~A34292~~	BUTYL BENZYL PHTHALATE P78337	MG/KG ~~UG/G~~	: 0.5K
~~A34631~~	3,3'-DICHLOROBENZIDINE P78319	~~UG/G~~	: 1.0K
~~A34526~~	BENZO(A)ANTHRACENE P78342	~~UG/G~~	: 0.5K
~~A34320~~	CHRYSENE P78346	~~UG/G~~	: 0.5K
~~A39100~~	BIS(2-ETHYLHEXYL)PHTHALATE P78336	~~UG/G~~	: 0.5K
~~A34596~~	DI-N-OCTYLPHTHALATE P78339	~~UG/G~~	: 0.5K
~~A34230~~	BENZO(B)FLUORANTHENE P78344	~~UG/G~~	: 0.5K
~~A34242~~	BENZO(K)FLUORANTHENE P78345	~~UG/G~~	: 0.5K
~~A34247~~	BENZO(A)PYRENE P78343	~~UG/G~~	: 0.5K
~~A34403~~	INDENO(1,2,3-CD)PYRENE P78353	~~UG/G~~	: 0.5K
~~A34556~~	DIBENZO(AH)ANTHRACENE P78352	~~UG/G~~	: 0.5K
~~A34521~~	BENZO(GHI)PERYLENE P78349	~~UG/G~~	: 0.5K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: C4-SUBSTITUTED BENZENE	UG/G;	1.0
: ALIPHATIC HYDROCARBON	UG/G;	18
: OTHER ORGANIC COMPOUNDS	UG/G;	6.9

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0087618
SAMPLING POINT DESC. : WAUKEGAN HARBOR/6

SUBMITTING SOURCE # : GZR 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1050 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : - REPORTING INDICATOR : 8

DATE RECEIVED : 901205 TIME RECEIVED : 1050 RECEIVED BY : C G
LAB OBSERVATIONS : 1-6OZ SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG	: 200
P39333	ALDRIN	UG/KG	: 1.0K
P39383	DIELDRIN	UG/KG	: 1.0K
P39359	TOTAL DDT	UG/KG	: 10K
P39328	O,P'-DDE	UG/KG	: 1.0K
P39321	P,P'-DDE	UG/KG	: 1.0K
P39316	O,P'-DDD	UG/KG	: 1.0K
P39311	P,P'-DDD	UG/KG	: 1.0K
P39306	O,P'-DDT	UG/KG	: 1.0K
P39301	P,P'-DDT	UG/KG	: 1.0K
P39351	TOTAL CHLORDANE	UG/KG	: 5.0K
P39064	CHLORDANE,CIS ISOMER	UG/KG	: 2.0K
P39067	CHLORDANE,TRANS ISOMER	UG/KG	: 2.0K
P39393	ENDRIN	UG/KG	: 1.0K
P39461	METHOXYCHLOR	UG/KG	: 5.0K
P39076	ALPHA-BHC	UG/KG	: 1.0K
P39343	GAMMA-BHC (LINDANE)	UG/KG	: 1.0K
P39701	HEXACHLOROBENZENE	UG/KG	: 1.0K
P39413	HEPTACHLOR	UG/KG	: 1.0K
P39423	HEPTACHLOR EPOXIDE	UG/KG	: 1.0K
~~A34694~~	PHENOL P79408	~~UG/KG~~ MG/KG	: 0.5K
~~A34273~~	BIS(2-CHLOROETHYL)ETHER P78314	~~UG/KG~~	: 0.5K
~~A34586~~	2-CHLOROPHENOL P78400	~~UG/KG~~	: 0.5K
~~A34566~~	1,3-DICHLOROBENZENE P78317	~~UG/KG~~	: 0.5K
~~A34571~~	1,4-DICHLOROBENZENE P78318	~~UG/KG~~	: 0.5K
~~A77147~~	BENZYL ALCOHOL P78302	~~UG/KG~~	: 0.5K
~~A34536~~	1,2-DICHLOROBENZENE P78316	~~UG/KG~~	: 0.5K
~~A00000~~	2-METHYLPHENOL P78395	~~UG/KG~~	: 0.5K
~~A34283~~	BIS(2-CHLOROISOPROPYL)ETHER P78326	~~UG/KG~~	: 0.5K

AMPLE NUMBER : 0087618

			MG/KG	
~~A06000~~	4-METHYLPHENOL	P78396	~~UG/G~~	: 0.5K
~~A34428~~	N-NITROSO-DI-N-PROPYLAMINE	P78335	~~UG/G~~	: 0.5K
~~A34396~~	HEXACHLOROETHANE	P78313	~~UG/G~~	: 0.5K
~~A34447~~	NITROBENZENE	P78332	~~UG/G~~	: 0.5K
~~A34408~~	ISOPHORONE	P78330	~~UG/G~~	: 0.5K
~~A34591~~	2-NITROPHENOL	P79403	~~UG/G~~	: 0.5K
~~A34606~~	2,4-DIMETHYLPHENOL	P79402	~~UG/G~~	: 0.5K
~~A77247~~	BENZOIC ACID	P78394	~~UG/G~~	: 5.0K
~~A34278~~	BIS(2-CHLOROETHOXY)METHANE	P78327	~~UG/G~~	: 0.5K
~~A34601~~	2,4-DICHLOROPHENOL	P79401	~~UG/G~~	: 0.5K
~~A34551~~	1,2,4-TRICHLOROBENZENE	P78311	~~UG/G~~	: 0.5K
~~A34696~~	NAPHTHALENE	P78331	~~UG/G~~	: 0.5K
~~A00000~~	4-CHLOROANILINE	P78303	~~UG/G~~	: 0.5K
~~A34391~~	HEXACHLOROBUTADIENE	P78328	~~UG/G~~	: 0.5K
~~A34452~~	4-CHLORO-3-METHYLPHENOL	P78399	~~UG/G~~	: 0.5K
~~A77416~~	2-METHYLNAPHTHALENE	P78305	~~UG/G~~	: 0.5K
~~A34386~~	HEXACHLOROCYCLOPENTADIENE	P78329	~~UG/G~~	: 0.5K
~~A34621~~	2,4,6-TRICHLOROPHENOL	~~P78399~~ P78398	~~UG/G~~	: 0.5K
~~A77687~~	2,4,5-TRICHLOROPHENOL	P78397	~~UG/G~~	: 0.5K
~~A34581~~	2-CHLORONAPHTHALENE	P78315	~~UG/G~~	: 0.5K
~~A00000~~	2-NITROANILINE	P78306	~~UG/G~~	: 1.0K
~~A34341~~	DIMETHYLPHTHALATE	P78341	~~UG/G~~	: 0.5K
~~A34200~~	ACENAPHTHYLENE	P78347	~~UG/G~~	: 0.5K
~~A34626~~	2,6-DINITROTOLUENE	P78321	~~UG/G~~	: 0.5K
~~A78300~~	3-NITROANILINE	P78307	~~UG/G~~	: 1.0K
~~A34205~~	ACENAPHTHENE	P78309	~~UG/G~~	: 0.5K
~~A34616~~	2,4-DINITROPHENOL	P79405	~~UG/G~~	: 1.0K
~~A34646~~	4-NITROPHENOL	P79404	~~UG/G~~	: 1.0K
~~A81302~~	DIBENZOFURAN	P78304	~~UG/G~~	: 0.5K
~~A34611~~	2,4-DINITROTOLUENE	P78320	~~UG/G~~	: 0.5K
~~A34336~~	DIETHYLPHTHALATE	P78340	~~UG/G~~	: 0.5K
~~A34641~~	4-CHLOROPHENYL PHENYL ETHER	P78324	~~UG/G~~	: 0.5K
~~A34381~~	FLUORENE	P78350	~~UG/G~~	: 0.5K
~~A00000~~	4-NITROANILINE	P78308	~~UG/G~~	: 1.0K
~~A00000~~	4,6-DINITRO-2-METHYLPHENOL	P79406	~~UG/G~~	: 1.0K
~~A34636~~	4-BROMOPHENYL PHENYL ETHER	P78325	~~UG/G~~	: 0.5K
~~A39700~~	HEXACHLOROBENZENE	P78312	~~UG/G~~	: 0.5K
~~A39032~~	PENTACHLOROPHENOL	P79407	~~UG/G~~	: 1.0K
~~A34461~~	PHENANTHRENE	P78351	~~UG/G~~	: 0.5K
~~A34220~~	ANTHRACENE	P78348	~~UG/G~~	: 0.5K
~~A39110~~	DI-N-BUTYLPHTHALATE	P78338	~~UG/G~~	: 0.5K
~~A34376~~	FLUORANTHENE	P78323	~~UG/G~~	: 0.66
~~A34469~~	PYRENE	P78354	~~UG/G~~	: 0.63

AMPLE NUMBER : 0037518

		MG/KG		
~~A34292~~	BUTYL BENZYL PHTHALATE P78337	~~UG/G~~	:	0.5K
~~A34631~~	3,3'-DICHLOROBENZIDINE P78319	~~UG/G~~	:	1.0K
~~A34526~~	BENZO(A)ANTHRACENE P78342	~~UG/G~~	:	0.5K
~~A34320~~	CHRYSENE P78346	~~UG/G~~	:	0.5K
~~A39100~~	BIS(2-ETHYLHEXYL)PHTHALATE P78336	~~UG/G~~	:	0.5K
~~A34596~~	DI-N-OCTYLPHTHALATE P78339	~~UG/G~~	:	0.5K
~~A34230~~	BENZO(B)FLUORANTHENE P78344	~~UG/G~~	:	0.5K
~~A34242~~	BENZO(K)FLUORANTHENE P78345	~~UG/G~~	:	0.5K
~~A34247~~	BENZO(A)PYRENE P78343	~~UG/G~~	:	0.5K
~~A34403~~	INDENO(1,2,3-CD)PYRENE P78353	~~UG/G~~	:	0.5K
~~A34556~~	DIBENZO(AH)ANTHRACENE P78352	~~UG/G~~	:	0.5K
~~A34521~~	BENZO(GHI)PERYLENE P78349	~~UG/G~~	:	0.5K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: ALIPHATIC KETONE	UG/G;	0.55
: ALIPHATIC HYDROCARBON	UG/G;	1.6
: OTHER ORGANIC COMPOUNDS	UG/G;	0.63

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0087619
SAMPLING POINT DESC. : WAUKEGAN HARBOR CHANNEL/7

SUBMITTING SOURCE # : CZS 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1010 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : - REPORTING INDICATOR : 8

DATE RECEIVED : 901205 TIME RECEIVED : 1050 RECEIVED BY : C G
LAB OBSERVATIONS : 1-60Z SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG	260
P39333	ALDRIN	UG/KG	1.0K
P39383	DIELDRIN	UG/KG	1.0K
P39359	TOTAL DDT	UG/KG	10K
P39328	O,P'-DDE	UG/KG	1.0K
P39321	P,P'-DDE	UG/KG	1.0K
P39316	O,P'-DDD	UG/KG	1.0K
P39311	P,P'-DDD	UG/KG	1.0K
P39306	O,P'-DDT	UG/KG	1.0K
P39301	P,P'-DDT	UG/KG	1.0K
P39351	TOTAL CHLORDANE	UG/KG	5.0K
P39064	CHLORDANE,CIS ISOMER	UG/KG	2.0K
P39067	CHLORDANE,TRANS ISOMER	UG/KG	2.0K
P39393	ENDRIN	UG/KG	1.0K
P39481	METHOXYCHLOR	UG/KG	5.0K
P39076	ALPHA-BHC	UG/KG	1.0K
P39343	GAMMA-BHC (LINDANE)	UG/KG	1.0K
P39701	HEXACHLOROBENZENE	UG/KG	1.0K
P39413	HEPTACHLOR	UG/KG	1.0K
P39423	HEPTACHLOR EPOXIDE	UG/KG	1.0K
~~A34694~~	PHENOL P79408	~~UG/G~~ MG/KG	0.5K
~~A34273~~	BIS(2-CHLOROETHYL)ETHER P78314	~~UG/G~~	0.5K
~~A34586~~	2-CHLOROPHENOL P78400	~~UG/G~~	0.5K
~~A34566~~	1,3-DICHLOROBENZENE P78317	~~UG/G~~	0.5K
~~A34571~~	1,4-DICHLOROBENZENE P78318	~~UG/G~~	0.5K
~~A77147~~	BENZYL ALCOHOL P78302	~~UG/G~~	0.5K
~~A34536~~	1,2-DICHLOROBENZENE P78316	~~UG/G~~	0.5K
~~A00000~~	2-METHYLPHENOL P78395	~~UG/G~~	0.5K
~~A34283~~	BIS(2-CHLOROISOPROPYL)ETHER P78326	~~UG/G~~	0.5K

SAMPLE NUMBER : DU07019

~~A00000~~	4-METHYLPHENOL	P78396	MG/KG ~~UG/G~~	0.5K
~~A34428~~	N-NITROSO-DI-N-PROPYLAMINE	P78335	~~UG/G~~	0.5K
~~A34396~~	HEXACHLOROETHANE	P78313	~~UG/G~~	0.5K
~~A34447~~	NITROBENZENE	P78332	~~UG/G~~	0.5K
~~A34403~~	ISOPHORONE	P78330	~~UG/G~~	0.5K
~~A34591~~	2-NITROPHENOL	P79463	~~UG/G~~	0.5K
~~A34606~~	2,4-DIMETHYLPHENOL	P79462	~~UG/G~~	0.5K
~~A77247~~	BENZOIC ACID	P78394	~~UG/G~~	5.0K
~~A34276~~	BIS(2-CHLOROETHOXY)METHANE	P78327	~~UG/G~~	0.5K
~~A34601~~	2,4-DICHLOROPHENOL	P79401	~~UG/G~~	0.5K
~~A34551~~	1,2,4-TRICHLOROBENZENE	P78311	~~UG/G~~	0.5K
~~A34696~~	NAPHTHALENE	P78331	~~UG/G~~	0.5K
~~A00000~~	4-CHLOROANILINE	P78303	~~UG/G~~	0.5K
~~A34391~~	HEXACHLOROBUTADIENE	P78328	~~UG/G~~	0.5K
~~A34452~~	4-CHLORO-3-METHYLPHENOL	P78399	~~UG/G~~	0.5K
~~A77416~~	2-METHYLNAPHTHALENE	P78305	~~UG/G~~	0.5K
~~A34386~~	HEXACHLOROCYCLOPENTADIENE	P78329	~~UG/G~~	0.5K
~~A34621~~	2,4,6-TRICHLOROPHENOL	P78398	~~UG/G~~	0.5K
~~A77687~~	2,4,5-TRICHLOROPHENOL	P78397	~~UG/G~~	0.5K
~~A34581~~	2-CHLORONAPHTHALENE	P78315	~~UG/G~~	0.5K
~~A00000~~	2-NITROANILINE	P78306	~~UG/G~~	1.0K
~~A34341~~	DIMETHYLPHTHALATE	P78341	~~UG/G~~	0.5K
A34200	ACENAPHTHYLENE	P78347	~~UG/G~~	0.5K
~~A34626~~	2,6-DINITROTOLUENE	P78321	~~UG/G~~	0.5K
~~A78300~~	3-NITROANILINE	P78307	~~UG/G~~	1.0K
~~A34205~~	ACENAPHTHENE	P78309	~~UG/G~~	0.5K
A34616	2,4-DINITROPHENOL	P79405	~~UG/G~~	1.0K
~~A34646~~	4-NITROPHENOL	P79464	~~UG/G~~	1.0K
~~A81302~~	DIBENZOFURAN	P78304	~~UG/G~~	0.5K
~~A34611~~	2,4-DINITROTOLUENE	P78320	~~UG/G~~	0.5K
~~A34336~~	DIETHYLPHTHALATE	P78340	~~UG/G~~	0.5K
~~A34641~~	4-CHLOROPHENYL PHENYL ETHER	P78324	~~UG/G~~	0.5K
~~A34381~~	FLUORENE	P78350	~~UG/G~~	0.5K
~~A00000~~	4-NITROANILINE	P78308	~~UG/G~~	1.0K
~~A00000~~	4,6-DINITRO-2-METHYLPHENOL	P79406	~~UG/G~~	1.0K
~~A34636~~	4-BROMOPHENYL PHENYL ETHER	P78325	~~UG/G~~	0.5K
~~A39700~~	HEXACHLOROBENZENE	P78313	~~UG/G~~	0.5K
~~A39032~~	PENTACHLOROPHENOL	P79407	~~UG/G~~	1.0K
~~A34461~~	PHENANTHRENE	P78351	~~UG/G~~	0.5K
~~A34220~~	ANTHRACENE	P78348	~~UG/G~~	0.5K
~~A39110~~	DI-N-BUTYLPHTHALATE	P78338	~~UG/G~~	0.5K
~~A34376~~	FLUORANTHENE	P78323	~~UG/G~~	0.5K
~~A34469~~	PYRENE	P78354	~~UG/G~~	0.5K

SAMPLE NUMBER : 0087619

~~A34292~~	BUTYL BENZYL PHTHALATE P78337	MG/KG ~~UG/G~~	:	0.5K
~~A34631~~	3,3'-DICHLOROBENZIDINE P78319	~~UG/G~~	:	1.0K
~~A34526~~	BENZO(A)ANTHRACENE P78342	~~UG/G~~	:	0.5K
~~A34320~~	CHRYSENE P78346	~~UG/G~~	:	0.5K
~~A39100~~	BIS(2-ETHYLHEXYL)PHTHALATE P78336	~~UG/G~~	:	1.1
~~A34596~~	DI-N-OCTYLPHTHALATE P78339	~~UG/G~~	:	0.5K
~~A34230~~	BENZO(B)FLUORANTHENE P78344	~~UG/G~~	:	0.5K
~~A34242~~	BENZO(K)FLUORANTHENE P78345	~~UG/G~~	:	0.5K
~~A34247~~	BENZO(A)PYRENE P78343	~~UG/G~~	:	0.5K
~~A34403~~	INDENO(1,2,3-CD)PYRENE P78353	~~UG/G~~	:	0.5K
~~A34556~~	DIBENZO(AH)ANTHRACENE P78352	~~UG/G~~	:	0.5K
~~A34521~~	BENZO(GHI)PERYLENE P78349	~~UG/G~~	:	0.5K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: ALIPHATIC HYDROCARBON UG/G; 1.8
: OTHER ORGANIC COMPOUNDS UG/G; 1.3

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0087620
SAMPLING POINT DESC. : PIER S-7/SLIP 27 NEW HARBOR/8

SUBMITTING SOURCE # : QZT 01 SITE # :
DATE COLLECTED : 901114 TIME COLLECTED : 1320 SAMPLING PROGRAM : 28

COLLECTED BY : HE/CB DELIVERED BY : EPA
COMMENTS : WAUKEGAN RAP
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

DATE RECEIVED : 901205 TIME RECEIVED : 1050 RECEIVED BY : C G
LAB OBSERVATIONS : 1-60Z SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG	: 37
P39333	ALDRIN	UG/KG	: 1.0K
P39383	DIELDRIN	UG/KG	: 1.0K
P39359	TOTAL DDT	UG/KG	: 10K
P39328	O,P'-DDE	UG/KG	: 1.0K
P39321	P,P'-DDE	UG/KG	: 1.0K
P39316	O,P'-DDD	UG/KG	: 1.0K
P39311	P,P'-DDD	UG/KG	: 1.0K
P39306	O,P'-DDT	UG/KG	: 1.0K
P39301	P,P'-DDT	UG/KG	: 1.0K
P39351	TOTAL CHLORDANE	UG/KG	: 5.0K
P39064	CHLORDANE,CIS ISOMER	UG/KG	: 2.0K
P39067	CHLORDANE,TRANS ISOMER	UG/KG	: 2.0K
P39393	ENDRIN	UG/KG	: 1.0K
P39481	METHOXYCHLOR	UG/KG	: 5.0K
P39076	ALPHA-BHC	UG/KG	: 1.0K
P39343	GAMMA-BHC (LINDANE)	UG/KG	: 1.0K
P39701	HEXACHLOROBENZENE	UG/KG	: 1.0K
P39413	HEPTACHLOR	UG/KG	: 1.0K
P39423	HEPTACHLOR EPOXIDE	UG/KG	: 1.0K
~~A34694~~	PHENOL P79408	~~UG/G~~ MG/KG	: 0.5K
~~A34273~~	BIS(2-CHLOROETHYL)ETHER P78314	~~UG/G~~	: 0.5K
~~A34586~~	2-CHLOROPHENOL P78400	~~UG/G~~	: 0.5K
~~A34566~~	1,3-DICHLOROBENZENE P78317	~~UG/G~~	: 0.5K
~~A34571~~	1,4-DICHLOROBENZENE P78318	~~UG/G~~	: 0.5K
~~A77147~~	BENZYL ALCOHOL P78302	~~UG/G~~	: 0.5K
~~A34536~~	1,2-DICHLOROBENZENE P78316	~~UG/G~~	: 0.5K
~~A00000~~	2-METHYLPHENOL P78395	~~UG/G~~	: 0.5K
~~A34283~~	BIS(2-CHLOROISOPROPYL)ETHER P78326	~~UG/G~~	: 0.5K

SAMPLE NUMBER : 0087620

~~A00000~~	4-METHYLPHENOL	P78396	MG/KG ~~UG/G~~	: 0.5K
~~A34428~~	N-NITROSO-DI-N-PROPYLAMINE	P78335	~~UG/G~~	: 0.5K
~~A34396~~	HEXACHLOROETHANE	P78313	~~UG/G~~	: 0.5K
~~A34447~~	NITROBENZENE	P78332	~~UG/G~~	: 0.5K
~~A34408~~	ISOPHORONE	P78330	~~UG/G~~	: 0.5K
~~A34591~~	2-NITROPHENOL	P79403	~~UG/G~~	: 0.5K
~~A34606~~	2,4-DIMETHYLPHENOL	P79402	~~UG/G~~	: 0.5K
~~A77247~~	BENZOIC ACID	P78394	~~UG/G~~	: 5.0K
~~A34278~~	BIS(2-CHLOROETHOXY)METHANE	P78327	~~UG/G~~	: 0.5K
~~A34601~~	2,4-DICHLOROPHENOL	P79401	~~UG/G~~	: 0.5K
~~A34551~~	1,2,4-TRICHLOROBENZENE	P78311	~~UG/G~~	: 0.5K
~~A34696~~	NAPHTHALENE	P78331	~~UG/G~~	: 0.5K
~~A00000~~	4-CHLOROANILINE	P78303	~~UG/G~~	: 0.5K
~~A34391~~	HEXACHLOROBUTADIENE	P78328	~~UG/G~~	: 0.5K
~~A34452~~	4-CHLORO-3-METHYLPHENOL	P78399	~~UG/G~~	: 0.5K
~~A77416~~	2-METHYLNAPHTHALENE	P78305	~~UG/G~~	: 0.5K
~~A34386~~	HEXACHLOROCYCLOPENTADIENE	P78329	~~UG/G~~	: 0.5K
~~A34621~~	2,4,6-TRICHLOROPHENOL	P78398	~~UG/G~~	: 0.5K
~~A77687~~	2,4,5-TRICHLOROPHENOL	P78397	~~UG/G~~	: 0.5K
~~A34581~~	2-CHLORONAPHTHALENE	P78315	~~UG/G~~	: 0.5K
~~A00000~~	2-NITROANILINE	P78306	~~UG/G~~	: 1.0K
~~A34341~~	DIMETHYLPHTHALATE	P78341	~~UG/G~~	: 0.5K
~~A34200~~	ACENAPHTHYLENE	P78347	~~UG/G~~	: 0.5K
~~A34626~~	2,6-DINITROTOLUENE	P78321	~~UG/G~~	: 0.5K
~~A78300~~	3-NITROANILINE	P78307	~~UG/G~~	: 1.0K
~~A34205~~	ACENAPHTHENE	P78309	~~UG/G~~	: 0.5K
~~A34616~~	2,4-DINITROPHENOL	P79405	~~UG/G~~	: 1.0K
~~A34646~~	4-NITROPHENOL	P79404	~~UG/G~~	: 1.0K
~~A81302~~	DIBENZOFURAN	P78304	~~UG/G~~	: 0.5K
~~A34611~~	2,4-DINITROTOLUENE	P78320	~~UG/G~~	: 0.5K
~~A34336~~	DIETHYLPHTHALATE	P78340	~~UG/G~~	: 0.5K
~~A34641~~	4-CHLOROPHENYL PHENYL ETHER	P78324	~~UG/G~~	: 0.5K
~~A34381~~	FLUORENE	P78350	~~UG/G~~	: 0.5K
~~A00000~~	4-NITROANILINE	P78308	~~UG/G~~	: 1.0K
~~A00000~~	4,6-DINITRO-2-METHYLPHENOL	P79406	~~UG/G~~	: 1.0K
~~A34636~~	4-BROMOPHENYL PHENYL ETHER	P78325	~~UG/G~~	: 0.5K
~~A39700~~	HEXACHLOROBENZENE	P78313	~~UG/G~~	: 0.5K
~~A39032~~	PENTACHLOROPHENOL	P79407	~~UG/G~~	: 1.0K
~~A34461~~	PHENANTHRENE	P78351	~~UG/G~~	: 0.5K
~~A34220~~	ANTHRACENE	P78348	~~UG/G~~	: 0.5K
~~A39110~~	DI-N-BUTYLPHTHALATE	P78338	~~UG/G~~	: 0.5K
~~A34376~~	FLUORANTHENE	P78323	~~UG/G~~	: 0.5K
~~A34469~~	PYRENE	P78354	~~UG/G~~	: 0.5K

AMPLE NUMBER : D087620

		MG/KG	
~~A34292~~	BUTYL BENZYL PHTHALATE P78337	~~UG/G~~	: 0.5K
~~A34631~~	3,3'-DICHLOROBENZIDINE P78319	~~UG/G~~	: 1.0K
~~A34526~~	BENZO(A)ANTHRACENE P78342	~~UG/G~~	: 0.5K
~~A34320~~	CHRYSENE P78346	~~UG/G~~	: 0.5K
~~A39100~~	BIS(2-ETHYLHEXYL)PHTHALATE P78336	~~UG/G~~	: 0.5K
~~A34596~~	DI-N-OCTYLPHTHALATE P78339	~~UG/G~~	: 0.5K
~~A34230~~	BENZO(B)FLUORANTHENE P78344	~~UG/G~~	: 0.5K
~~A34242~~	BENZO(K)FLUORANTHENE P78345	~~UG/G~~	: 0.5K
~~A34247~~	BENZO(A)PYRENE P78343	~~UG/G~~	: 0.5K
~~A34403~~	INDENO(1,2,3-CD)PYRENE P78353	~~UG/G~~	: 0.5K
~~A34556~~	DIBENZO(AH)ANTHRACENE P78352	~~UG/G~~	: 0.5K
~~A34521~~	BENZO(GHI)PERYLENE P78349	~~UG/G~~	: 0.5K

: THE FOLLOWING QUANTITATIONS ARE APPROXIMATE

: OTHER ORGANIC COMPOUNDS UG/G: 9.6

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : B017754
AMPLING POINT DESC. : NORTH BEACH WAUKEGAN

UBMITTING SOURCE # : QZN 01 SITE # :
ATE COLLECTED : 901114 TIME COLLECTED : 1520 SAMPLING PROGRAM : 28

OLLECTED BY : CB DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
AM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

ATE RECEIVED : 901204 TIME RECEIVED : 1100 RECEIVED BY : MAD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

00668	PHOSPHORUS-P,SED.	MG/KG :	329	P00721	CYANIDE.SEDIMENT	MG/KG :	0.52K
00339	COD,SEDIMENT	MG/KG :	39200	P00627	KJELDAHL-N, SED.	MG/KG :	60K
70322	SOLIDS,VOL SED.	% :	2.3	P01003	ARSENIC,SEDIMENT	MG/KG :	1
71921	MERCURY,SEDIMENT	MG/KG :	0.1K	P00938	POTASSIUM,SED.	MG/KG :	1000K
01008	BARIUM,SEDIMENT	MG/KG :	9	P01028	CADMIUM,SEDIMENT	MG/KG :	1K
01029	CHROMIUM,SEDIMENT	MG/KG :	4	P01043	COPPER,SEDIMENT	MG/KG :	2
01170	IRON,SEDIMENT	MG/KG :	3200	P01052	LEAD,SEDIMENT	MG/KG :	10K
01053	MANGANESE,SEDMT.	MG/KG :	96	P01068	NICKEL,SEDIMENT	MG/KG :	5K
01078	SILVER,SEDIMENT	MG/KG :	1K	P01093	ZINC,SEDIMENT	MG/KG :	20

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : B017755
AMPLING POINT DESC. : WAUKEGAN HARBOR UPPER HARBOR

JBMITTING SOURCE # : QZO 01 SITE # :
ATE COLLECTED : 901114 TIME COLLECTED : 1210 SAMPLING PROGRAM : 28

LLECTED BY : CB DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
AM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

ATE RECEIVED : 901204 TIME RECEIVED : 1100 RECEIVED BY : MAD
AB OBSERVATIONS : TRIP BL SAM# :
JPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

00668	PHOSPHORUS-P,SED.	MG/KG :	826	P00721	CYANIDE,SEDIMENT	MG/KG :	1.2K
00339	COD,SEDIMENT	MG/KG :	117650	P00627	KJELDAHL-N, SED.	MG/KG :	2500
00322	SOLIDS,VOL SED.	% :	9.8	P01003	ARSENIC,SEDIMENT	MG/KG :	41
71921	MERCURY,SEDIMENT	MG/KG :	0.40	P00938	POTASSIUM,SED.	MG/KG :	1900
01008	BARIUM,SEDIMENT	MG/KG :	52	P01028	CADMIUM,SEDIMENT	MG/KG :	12
1029	CHROMIUM,SEDIMENT	MG/KG :	90	P01043	COPPER,SEDIMENT	MG/KG :	160
01170	IRON,SEDIMENT	MG/KG :	26000	P01052	LEAD,SEDIMENT	MG/KG :	140
1053	MANGANESE,SEDMT.	MG/KG :	460	P01068	NICKEL,SEDIMENT	MG/KG :	26
01078	SILVER,SEDIMENT	MG/KG :	1K	P01093	ZINC,SEDIMENT	MG/KG :	280

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : 8017756
MPLING POINT DESC. : WAUKEGAN HARBOR SLIP NO 1

JBMITTING SOURCE # : QZP 01 SITE # :
TE COLLECTED : 901114 TIME COLLECTED : 1145 SAMPLING PROGRAM : 28

LLECTED BY : CB DELIVERED BY : UPS
MMENTS :
NDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
AM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

ATE RECEIVED : 901204 TIME RECEIVED : 1100 RECEIVED BY : MAD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

C0668	PHOSPHORUS-P.SED.	MG/KG : 350	P00721	CYANIDE,SEDIMENT	MG/KG : 2.4K
00339	COD,SEDIMENT	MG/KG : 77648	P00627	KJELDAHL-N. SED.	MG/KG : 900
70322	SOLIDS,VOL SED.	% : 7.3	P01003	ARSENIC,SEDIMENT	MG/KG : 13
71921	MERCURY,SEDIMENT	MG/KG : 0.19	P00938	POTASSIUM,SED.	MG/KG : 1000
01008	BARIUM,SEDIMENT	MG/KG : 31	P01028	CADMIUM,SEDIMENT	MG/KG : 7
01029	CHROMIUM,SEDIMENT	MG/KG : 47	P01043	COPPER,SEDIMENT	MG/KG : 51
01170	IRON,SEDIMENT	MG/KG : 14000	P01052	LEAD,SEDIMENT	MG/KG : 12000
01053	MANGANESE,SEDMT.	MG/KG : 91	P01068	NICKEL,SEDIMENT	MG/KG : 340
01078	SILVER,SEDIMENT	MG/KG : 13	P01093	ZINC,SEDIMENT	MG/KG : 15

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : 8017757
AMPLING POINT DESC. : WAUKEGAN HARBOR CENTRAL

JBMITTING SOURCE # : GZQ 01 SITE # :
ATE COLLECTED : 901114 TIME COLLECTED : 1115 SAMPLING PROGRAM : 23

OLLECTED BY : CB DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
AM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

ATE RECEIVED : 901204 TIME RECEIVED : 1100 RECEIVED BY : MAD
AB OBSERVATIONS : TRIP BL SAM# :
JPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

)0668	PHOSPHORUS-P.SED.	MG/KG :	545	P00721	CYANIDE.SEDIMENT	MG/KG :	3.3K
)0339	COD,SEDIMENT	MG/KG :	31000	P00627	KJELDAHL-N, SED.	MG/KG :	1700
70322	SOLIDS.VOL SED.	% :	8.3	P01003	ARSENIC.SEDIMENT	MG/KG :	23
71921	MERCURY,SEDIMENT	MG/KG :	0.34	P00938	POTASSIUM,SED.	MG/KG :	1500
)1008	BARIUM,SEDIMENT	MG/KG :	43	P01028	CADMIUM,SEDIMENT	MG/KG :	12
)1029	CHROMIUM.SEDIMENT	MG/KG :	88	P01043	COPPER,SEDIMENT	MG/KG :	86
)1170	IRON,SEDIMENT	MG/KG :	20000	P01052	LEAD,SEDIMENT	MG/KG :	120
)1053	MANGANESE,SEDMT.	MG/KG :	450	P01068	NICKEL,SEDIMENT	MG/KG :	21
)1078	SILVER,SEDIMENT	MG/KG :	1K	P01093	ZINC,SEDIMENT	MG/KG :	210

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

;AMPLE NUMBER : B017758
:AMPLING POINT DESC. : WAUKEGAN HARBOR

UBMITTING SOURCE # : QZR 01 SITE # :
ATE COLLECTED : 901114 TIME COLLECTED : 1050 SAMPLING PROGRAM : 28

OLLECTED BY : CB DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
AM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

ATE RECEIVED : 901204 TIME RECEIVED : 1100 RECEIVED BY : MAD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

00668	PHOSPHORUS-P,SED.	MG/KG	202	P00721	CYANIDE,SEDIMENT	MG/KG	0.65K
00339	COD,SEDIMENT	MG/KG	24900	P00627	KJELDAHL-N, SED.	MG/KG	175
70322	SOLIDS,VOL SED.	%	4.2	P01003	ARSENIC,SEDIMENT	MG/KG	6
71921	MERCURY,SEDIMENT	MG/KG	0.1K	P00938	POTASSIUM,SED.	MG/KG	1000K
01008	BARIUM,SEDIMENT	MG/KG	27	P01028	CADMIUM,SEDIMENT	MG/KG	1K
01029	CHROMIUM,SEDIMENT	MG/KG	22	P01043	COPPER,SEDIMENT	MG/KG	26
01170	IRON,SEDIMENT	MG/KG	9000	P01052	LEAD,SEDIMENT	MG/KG	39
01053	MANGANESE,SEDMT.	MG/KG	220	P01068	NICKEL,SEDIMENT	MG/KG	9
01078	SILVER,SEDIMENT	MG/KG	1K	P01093	ZINC,SEDIMENT	MG/KG	100

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : B017759
AMPLING POINT DESC. : WAUKEGAN HARBOR CHANNEL

JBMITTING SOURCE # : OZS 01 SITE # :
ATE COLLECTED : 901114 TIME COLLECTED : 1010 SAMPLING PROGRAM : 23

OLLECTED BY : CB DELIVERED BY : UPS
OMMENTS :
JNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
AM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

ATE RECEIVED : 901204 TIME RECEIVED : 1100 RECEIVED BY : MAD
AB OBSERVATIONS : TRIP BL SAM# :
JPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

)0668	PHOSPHORUS-P,SED.	MG/KG :	428	P00721	CYANIDE,SEDIMENT	MG/KG :	0.67K
)0339	COD,SEDIMENT	MG/KG :	62600	P00627	KJELDAHL-N, SED.	MG/KG :	175
70322	SOLIDS,VOL SED.	% :	4.8	P01003	ARSENIC,SEDIMENT	MG/KG :	10
71921	MERCURY,SEDIMENT	MG/KG :	0.13	P00938	POTASSIUM,SED.	MG/KG :	1300
)1008	BARIUM,SEDIMENT	MG/KG :	34	P01028	CADMIUM,SEDIMENT	MG/KG :	1
)1029	CHROMIUM,SEDIMENT	MG/KG :	34	P01043	COPPER,SEDIMENT	MG/KG :	50
)1170	IRON,SEDIMENT	MG/KG :	18000	P01052	LEAD,SEDIMENT	MG/KG :	60
)1053	MANGANESE,SEDMT.	MG/KG :	480	P01068	NICKEL,SEDIMENT	MG/KG :	16
)1078	SILVER,SEDIMENT	MG/KG :	1K	P01093	ZINC,SEDIMENT	MG/KG :	130

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : B017760
AMPLING POINT DESC. : NEW HARBOR

UBMITTING SOURCE # : QZT 01 SITE # :
ATE COLLECTED : 901114 TIME COLLECTED : 1320 SAMPLING PROGRAM : 26

OLLECTED BY : CB DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
AM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

ATE RECEIVED : 901204 TIME RECEIVED : 1100 RECEIVED BY : MAD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

00668	PHOSPHORUS-P,SED.	MG/KG	510	P00721	CYANIDE,SEDIMENT	MG/KG	9.3
00339	COD,SEDIMENT	MG/KG	23600	P00627	KJELDAHL-N, SED.	MG/KG	450
70322	SOLIDS,VOL SED.	%	2.2	P01003	ARSENIC,SEDIMENT	MG/KG	4
71921	MERCURY,SEDIMENT	MG/KG	0.1K	P00938	POTASSIUM,SED.	MG/KG	1000
01008	BARIUM,SEDIMENT	MG/KG	22	P01028	CADMIUM,SEDIMENT	MG/KG	1K
01029	CHROMIUM,SEDIMENT	MG/KG	15	P01043	COPPER,SEDIMENT	MG/KG	30
01170	IRON,SEDIMENT	MG/KG	12000	P01052	LEAD,SEDIMENT	MG/KG	10000
01053	MANGANESE,SEDMT.	MG/KG	24	P01068	NICKEL,SEDIMENT	MG/KG	400
01078	SILVER,SEDIMENT	MG/KG	10	P01093	ZINC,SEDIMENT	MG/KG	15

APPENDIX G

Organics Scanned in Sediment Samples
by the
Illinois Environmental Protection Agency Laboratories

APPENDIX G.1.

Organics Tested in Sediment Samples by the Illinois Environmental Protection Agency Laboratories. Analytical Methods are Listed According to USEPA, 1990b.

8080

TOTAL PCBS
ALDRIN
DIELDRIN
TOTAL DDT
O,P'-DDE
P,P'-DDE
O,P'-DDD
P,P'-DDD
O,P'-DDT
P,P'-DDT
TOTAL CHLORDANE
CHLORDANE,CIS ISOMER
CHLORDANE, TRANS ISOMER
ENDRIN
METHOXYCHLOR
ALPHA-BHC
GAMMA-BHC (LINDANE)
HEXACHLOROBENZENE
HEPTACHLOR
HEPTACHLOR EPOXIDE

8270

PHENOL
BIS(2-CHLOROETHYL)ETHER
2-CHLOROPHENOL
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
BENZYL ALCOHOL
1,2-DICHLOROBENZENE
2-METHYLPHENOL
BIS(2-CHLOROISOPROPYL) ETHER
BUTYL BENZYL PHTHALATE
3,3-DICHLORBENZIDINE
BENZO(A)ANTHRACENE
CHRYSENE
BIS(2ETHYHEXYL)PHTHALATE
DI-N-OCTYLPHTHALATE
BENZO(8)FLOUROANTHENE
BENZO(K)FLOUROANTHENE
BENZO(A)PYRENE
INDENO(1,2,3-CO) PYRENE
DIBENZO(A)ANTHRACENE
DIBENZO(AH)ANTHRACENE
BENZO(GHI)PERYLENE
:ETHYL-DIMETHYL-PENTANE
:METHYL PENTANE

8270

:TETRAMETHYL PENTANE
:C3-SUBSTITUTED BENZENE
:C4-SUBSTITUTED BENZENE
:C5-SUBSTITUTED BENZENE
4-METHYLPHENOL
N-NITROSO-DI-N-PROPYLAMINE
HEXACHLOROETHANE
ISOPHORONE
2-NITROPHENOL
2,4-DIMETHYLPHENOL
BENZOIC ACID
BIS(2-CHLOROETHYOXY)METHANE
2,4-DICHLOROPHENOL
1,2,4-TRICHLOROBENZENE
NAPHTHALENE
4-CHLOROANILINE
HEXACHLOROPHENOL
4 CHLORO-3-METHYLPHENOL
2-METHYLNAPHTHALENE
2-CHLORONAPTHALENE
HEXACHLOROCYCLOPENTADIENE
2,4,6-TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOL
2 CHLORONAPTHALENE
2-NITROANILINE
DIMETHYLPHTHALATE
ACENAPHTHYLENE
2,6-DINITROTOLUENE
3-NITROANILINE
2,4 DINITROPHENOL
4-NITROPHENOL
DIBENZOFURAN
2,4-DINITROTOLUENE
DIETHYLPHTHALATE
4-CHLOROPHENYL'PHENYL ETHER
FLUORENE
4-NITROANILINE
4,6 DINITRO-2-METHYLPHENOL
4-BROMOPHENYL ETHER
HEXACHLOROBENZENE
PENTACHLOROPHENOL
PHENANTHRENE
ANTHRACENE
DI-N-BUTYLPHTHALATE
FLOUROANTHENE
PYRENE

APPENDIX G.1. (CONTINUED)

Organics Tested in Sediment Samples by the Illinois Environmental Protection Agency Laboratories. Analytical Methods are Listed According to USEPA, 1990b.

<u>8270</u>

DIBENZO(AH)ANTHRACENE
BENZO(GHI)PERYLENE
    :ETHYL-DIMETHYL-PENTANE
    :METHYL PENTANE
    :TETRAMEHTHYL PENTANE
    :C3-SUBSTITUTED BENZENE
    :C4-SUBSTITUTED BENZENE
    :C5-SUBSTITUTED BENZENE
ANTHRACENE
DI-N-BUTYLPHTHALATE
FLOUR0ANTHENE
PYRENE

APPENDIX H

SEDIMENT GUIDELINES

Guidelines for the Pollutional Classification of
Great Lakes Harbor Sediments
(USEPA, 1977)

IEPA Classifications of
Illinois Inland Lake Sediments
(Kelly, M. and Hite, R., 1981)

APPENDIX H.1.

Guidelines for Pollutional Classification of Great Lakes Harbor Sediments (USEPA, 1977).

Constituent[1]	Non-Polluted	Moderately Polluted	Heavily Polluted
PCB's	<1	1-10	>10
Volatile Solids (%)	<5	5-8	>8
COD	<40,000	40,000-80,000	>80,000
TKN	<1,000	1,000-2,000	>2,000
Oil & Grease (hexane solubles)	<1,000	1,000-2,000	>2,000
Lead	<40	40-60	>60
Zinc	<90	90-200	>200
Mercury	<1.0	N.A.	>1.0
Ammonia	<75	75-200	>200
Cyanide	<0.10	0.10-0.25	>0.25
Phosphorus	<420	420-650	>650
Iron	<17,000	17,000-25,000	>25,000
Nickel	<20	20-50	>50
Manganese	<300	300-500	>500
Arsenic	<3	3-8	>8
Cadmium	*	*	>6
Chromium	<25	25-75	>75
Barium	<20	20-60	>60
Copper	<25	25-50	>50

(1) values in mg/kg dry weight unless otherwise noted
* Lower limits not established

APPENDIX H.2.

Classifications of Illinois Inland Lake Sediments (Kelly, M. and Hite, R., 1981).[1]

Constituent	Below Normal	Normal	Elevated	Highly Elevated
Volatile Solids (%)	< 5	5 - 13	13 - 17	> 17
Total Kjeldahl Nitrogen (mg/kg)	< 1650	1650 - 5775	5775 - 7850	> 7850
Total Phosphorus (mg/kg)	< 225	225 - 1175	1175 - 1650	> 1650
COD (mg/kg)	< 32,500	32,500 - 162,000	162,000 - 226,500	> 226,500
N:P Ratio	< 2.2	2.2 - 9.7	9.7 - 13.5	> 13.5
Organic Carbon (mg/kg)	< 26,500	26,500 - 65,550	65,550 - 85,100	> 85,100
C:N Ratio[2]	< 11	11 - 17	17 - 20	> 20
Arsenic (mg/kg)		< 27	27 - 41	> 41
Cadmium (mg/kg)		< 1.8	1.8 - 2.6	> 2.6
Chromium (mg/kg)	< 14	14 - 30	30 - 38	> 38
Copper (mg/kg)		< 100	100 - 150	> 150
Iron (mg/kg)	< 18,000	18,000 - 36,000	36,000 - 45,000	> 45,000
Lead (mg/kg)	< 15	15 - 100	100 - 150	> 150
Manganese (mg/kg)		< 3000	3000 - 3900	> 3900
Mercury (mg/kg)		< 0.25	0.25 - 0.40	> 0.40
Zinc (mg/kg)	< 50	50 - 175	175 - 250	> 250

(1) Groupings for each constituent shown are based upon 273 individual sediment samples collected from 63 lakes in summer 1979. Ranges of concentrations displayed and resultant groupings are based on one or two standard deviations from mean.

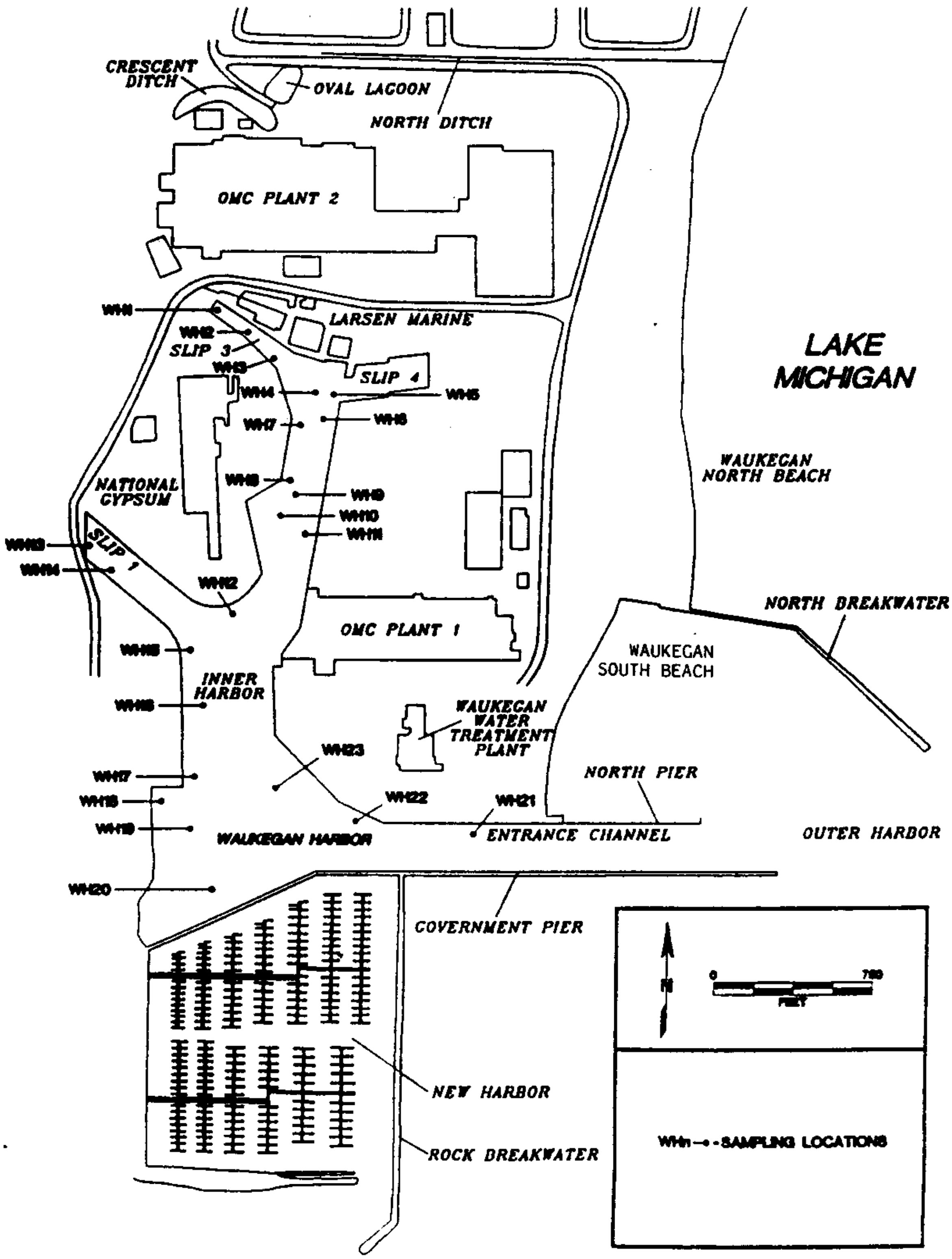
(2) Organic carbon values were calculated from % volatile solids data.

APPENDIX I

Observed Biological Impacts of Sediment Contamination (Long and Morgan, 1990)

APPENDIX I.1.

Sampling Locations (Long and Morgan, 1990).



APPENDIX I.2.

Effects Range-Low (ER-L) and Effects Range-Median (ER-M) Values for Zinc and 46 Concentrations Used to Determine These Values, in Ascending Order (Long and Morgan, 1990). Waukegan Harbor Concentrations Added (underlined).

Concentration (mg/kg)	Method/Source
51	Sublethal SSB with *R. abronius*
59	Sublethal SSB with *P. affinis*
98	Massachusetts Bay, MA; benthos
117	Massachusetts Bay, MA; benthos
120	**(ER-L) Effects Range-Low**
121	Trinity River, TX; bioassay
127	Waukegan Harbor, IL; bioassay
130	San Francisco Bay, CA; AET
154	Keweenaw Waterway, MI; bioassay
168	Keweenaw Waterway, MI; bioassay
169	Feral Fraser River, BC; *M. balthica* absence
172	San Francisco Bay, CA, bioassay
172	M. balthica avoidance bioassay
182	Southern California, arthropod abundance
185	Commencement Bay, WA; bioassays
188	Sublethal SSB with *R. abronius*
195	Puget Sound, WA; bioassays
197	Southern California; species richness
205	San Francisco Bay, CA, bioassay
211	Commencement Bay, WA; bioassays
•214	Waukegan Harbor average of 23 stations
223	Los Angeles Harbor, CA; bioassays
230	San Francisco Bay, CA; AET
230	Southern California; echinoderm abundance
260	Puget Sound, WA; AET-benthic
267	Little Grizzly Creek, CA; bioassays
270	**(ER-M) Effects Range-Median**
•270	WH-5, WH-9
276	SSB with *R. abronius*; LC-50
•280	WH-8
290	Sheboygan River, WI; bioassays
•290	WH-14
•300	WH-3
310	Torch Lake, MI; bioassays
320	Lake Union, WA; bioassays
327	DuPage River, IL; species richness
•330	WH-7
334	Black Rock Harbor, CT; bioassays
348	Southern California; bioassays
•370	WH-13
387	Commencement Bay, WA; bioassays
410	Puget Sound, WA; AET-benthic
449	Hudson-Raritan Bay, NY; bioassays

APPENDIX I.2. (CONTINUED)

Effects Range-Low (ER-L) and Effects Range-Median (ER-M) Values for Zinc and 46 Concentrations Used to Determine These Values, in Ascending Order (Long and Morgan, 1990). Waukegan Harbor Concentrations Added (underlined).

Concentration (mg/kg)	Method/Source
570	Phillips Chain of Lakes, WI; bioassays
613	SSB with *R. abronius*
707	Puget Sound, WA; bioassays
739	Palos Verdes, CA; major degradation
760	EP marine chronic threshold @ 4% TOC
870	Puget Sound, WA; AET-amphipod
941	Commencement Bay, WA; bioassays
960	Puget Sound, WA; AET-amphipod
1600	Puget Sound, WA; AET-oyster
1600	Puget Sound, WA; AET-Microtox^{tm}
1804	Baltimore Harbor, MD; bioassays
2240	EP marine acute threshold @4% TOC

APPENDIX I.3.

Effects Range-Low (ER-L) and Effects Range-Median (ER-M) Values for Cadmium and 36 Concentrations used to Determine These Values, in Ascending Order (Long and Morgan, 1990). Waukegan Harbor Concentrations Added (underlined).

Concentration (mg/kg)	Method/Source
4.3	Southern California arthropods COA
4.7	Southern California species richness COA
5.0	**(ER-L) Effects Range-Low**
5.1	Puget Sound, Washington, AET-benthic
5.3	Southern California bioassay COA
5.6	SSB with *R. abronius*
5.8	Puget Sound, Washington, AET-benthic
5.8	SSB with *R. abronius*
6.2	Southern California echinoderms COA
6.5	SSB with *R. abronius*
6.7	Puget Sound, Washington AET - amphipod
6.9	SSB with *R. abronius*
•<u>8.0</u>	<u>Waukegan Harbor average of 23 stations</u>
8.2	SSB with *E. sencillus*
8.4	SSB with *R. abronius*
8.5	SSB with *R. abronius*
8.7	SSB with *R. abronius*
8.8	SSB with *R. abronius*
8.9	SSB with *R. abronius*
9.0	**(ER-M) Effects Range-Median**
9.1	SSB with *R. abronius*
9.6	Puget Sound, Washington AET - oyster
9.6	Puget Sound, Washington AET - Microtox
9.7	SSB with *R. abronius*
9.8	SSB with *R. abronius*
10.0	SSB with *R. abronius*
10.6	Trinity River, Texas bioassay COA
11.0	SSB with *P. affinis*
11.5	SSB with *R. abronius*
•<u>14.0</u>	<u>WH-17</u>
15.3	Commencement Bay, Washington bioassay COA
18.6	Hudson-Raritan Bay, New York bioassay COA
20.8	SSB with *R. abronius*
22.8	Baltimore Harbor, Maryland bioassay COA
•<u>23.0</u>	<u>WH-12</u>
25.9	SSB with *R. abronius*
28.7	Palos Verdes Shelf, California bioassay COA
28.7	Palos Verdes Shelf, California benthos COA
31.0	EP chronic marine @4% TOC
•<u>38.0</u>	<u>WH-14</u>
41.6	Commencement Bay, Washington bioassay COA
•<u>50.0</u>	<u>WH-13</u>
96.0	EP acute marine @4% TOC

APPENDIX I.4.

Effects Range-Low (ER-L) and Effects Range-Median (ER-M) Values for Lead and 47 Concentrations used to Determine These Values, in Ascending Order (Long and Morgan, 1990). Waukegan Harbor Concentrations Added (underlined).

Concentration (mg/kg)	Method/Source
26.6	Keweenaw Waterway, Michigan bioassay COA
29.0	Keweenaw Waterway, Michigan bioassay COA
30.6	Kishwaukee River, Illinois benthos COA
32.0	*M. balthica* burrowing ET50 COA
35.0	Norway benthos COA
35.0	**(ER-L) Effects Range-Low**
41.3	Los Angeles Harbor, California bioassay COA
42.1	San Francisco Bay, California bioassay COA
42.4	Massachusetts Bay, Massachusetts benthos COA
46.7	Massachusetts Bay, Massachusetts benthos COA
47.8	Southern California arthropods COA
≤50.0	San Francisco, California triad minimum effects
51.0	Southern California species richness COA
53.7	Trinity River, Texas bioassay COA
58.9	San Francisco Bay, California bioassay COA
>60.0	FWPCA Classification: benthos absent COA
63.4	San Francisco Bay, California bioassay COA
64.4	Southern California echinoderms COA
73.1	Southern California bioassay COA
74.0	*M. Balthica* bioassay avoidance COA
81.7	Fraser River, B.C., Canada benthos COA
89.6	Black Rock Harbor, Connecticut bioassay COA
95.7	San Francisco Bay, California bioassay COA
104.5	San Francisco Bay, California bioassay COA
110.0	**(ER-M) Effects Range-Median**
110.0	Torch Lake, Michigan bioassay COA
•110.0	WH-22
113.1	Commencement Bay, Washington bioassay COA
120.0	San Francisco Bay, California AET
•130.0	WH-22
≥130.0	San Francisco Bay, California triad significant effects COA
132.0	EP chronic maine @4% TOC
136.6	Puget Sound, Washington bioassay COA
•140.0	WH-18
140.0	San Francisco Bay, California AET
143.7	DuPage River, Illinois benthos COA
•150.0	WH-3; WH-23
160.0	Phillips Chain of Lakes, Wisconsin bioassay COA
170.8	Commencement Bay, Washington bioassay COA
•190.0	WH-15
•200.0	WH-16
•202.0	Waukegan Harbor average of 23 stations
•210.0	WH-10

APPENDIX I.4. (CONTINUED)

Effects Range-Low (ER-L) and Effects Range-Median (ER-M) Values for Lead and 47 Concentrations used to Determine These Values, in Ascending Order (Long and Morgan, 1990). Waukegan Harbor Concentrations Added (underlined).

Concentration (mg/kg)	Method/Source
•240.0	WH-6
253.0	Sheboygan River, Wisconsin bioassay COA
•260.0	WH-5
•270.0	WH-11
•280.0	WH-9; WH-12; WH-17
•290.0	WH-8
300.0	Puget Sound, Washington AET - benthic
300.0	Lake Union, Washington bioassay COA
312.3	Palos Verdes Shelf, California benthos COA
320.9	Hudson-Raritan Bay, New York bioassay COA
•330.0	WH-7
•370.0	WH-14
•420.0	WH-13
450.0	Puget Sound, Washington AET - benthic
512.0	Baltimore Harbor, Maryland bioassay COA
530.0	Puget Sound, Washington AET - Microtox
570.1	Commencement Bay, Washington AET - amphipod
660.0	Puget Sound, Washington AET - oyster
750.2	Puget Sound, Washington bioassay COA
1613.0	Commencement Bay, Washington bioassay COA
3360.0	EP acute marine @4% TOC

APPENDIX I.5.

The Ratio of Metal Concentration in Bulk Sediment Samples (Risatti et al., 1990) to the Effects Range-Median (ER-M) value (Long and Morgan, 1990) at 23 stations in Waukegan Harbor. The Sum of These Ratios is Provided in the Right-most Column (Σ x/ER-M).

Station	($Zn/ER\text{-}M_{Zn}$)	($Cd/ER\text{-}M_{Cd}$)	($Pb/ER\text{-}M_{Pb}$)	Σ X/ER-M
WH-1	0.78	BDL	0.49	1.27
WH-2	0.48	BDL	0.33	0.81
WH-3	1.11	BDL	1.36	2.47
WH-4	0.30	BDL	0.90	1.20
WH-5	1.00	0.42	2.36	3.78
WH-6	0.96	0.44	2.18	3.58
WH-7	1.22	0.54	3.00	4.76
WH-8	1.04	0.54	2.64	4.22
WH-9	1.00	0.61	2.55	4.16
WH-10	0.78	0.44	1.91	3.13
WH-11	0.78	0.72	2.45	3.95
WH-12	0.74	2.56	2.55	5.85
WH-13	1.37	5.56	3.82	10.8
WH-14	1.07	4.22	3.36	8.65
WH-15	0.74	0.49	1.73	2.96
WH-16	0.74	0.23	1.82	2.79
WH-17	0.89	1.56	2.55	5.00
WH-18	0.41	BDL	1.27	1.68
WH-19	0.74	0.24	1.18	2.16
WH-20	0.59	0.19	0.91	1.69
WH-21	0.33	BDL	.55	.88
WH-22	0.36	BDL	1.00	1.36
WH-23	0.81	0.63	1.36	3.80

BDL	Below Detection Limit (1.3 mg/kg) for Cadmium.
AET	Apparent Effects Threshold
COA	Bioeffects/Contaminant Co-Occurrence Analysis
SSB	Spiked-Sediment Bioassay
SLC	Screening Level Concentration
EP	Sediment-Water Equilibrium Approach
FWPCA	Federal Water Pollution Control Administration
TOC	Total Organic Carbon
ER-L	Effects Range - Low
ER-M	Effects Range - Median

Appendix I.6. Summary of ER-L, ER-M, and Overall Apparent Effects Threshold Concentrations for Selected Chemicals in Sediment (dry weight) (Long and Morgan, 1990).

Chemical Analyte	ER-L Concentration	ER-M Concentration	ER-L:ER-M Ratio	Overall Effects Apparent Threshold	Subjective Degree off Confidence in ER-L/ER-M Values
Trace Elements (ppm)					
Antimony	2	25	12.5	25	Moderate/Moderate
Arsenic	33	85	2.6	50	Low/Moderate
Cadmium	5	9	1.8	5	High/High
Chromium	80	145	1.8	No	Moderate/Moderate
Copper	70	390	5.6	300	High/High
Lead	35	110	3.1	300	Moderate/High
Mercury	0.15	1.3	8.7	1	Moderate/High
Nickel	30	50	1.7	NSD*	Moderate/Moderate
Silver	1	2.2	2.2	1.7	Moderate/Moderate
Tin	NA	NA	NA	NA	NA
Zinc	120	270	2.2	260	High/High
Polychlorinated Biphenyls (ppb)					
Total PCBs	50	400	7.6	370	Moderate/Moderate
DDT and Metabolities (ppb)					
DDT	1	7	7	6	Low/Low
DDD	2	20	10	NSD	Moderate/Low
DDE	2	15	7.5	NSD	Low/Low
Total DDT	3	350	117	No	Moderate/Moderate
Other Pesticides (ppb)					
Lindane	NA	NA	NA	NSD	NA**
Chlordane	0.5	6	12	2	Low/Low
Hepatachlor	NA	NA	NA	NSD	NA
Dieldrin	0.02	8	400	No	Low/Low
Aldrin	NA	NA	NA	NSD	NA
Endrin	0.02	45	2250	NSD	Low/Low
Mirex	NA	NA	NA	NSD	NA
Polynuclear Aromatic Hydrocarbons (ppb)					
Acenaphthene	150	650	4.3	150	Low/Low
Anthracene	85	960	11.3	300	Low/Moderate
Benzo(a)anthracene	230	1600	7	550	Low/Moderate
Benzo(a)pyrene	400	2500	6.2	700	Moderate/Moderate
Benzo(e)pyrene	NA	NA	NA	NSD	NA
Biphenyl	NA	NA	NA	NSD	NA
Chrysene	400	2800	7	900	Moderate/Moderate
Dibenz(a,h)anthracene	60	260	4.3	100	Moderate/Moderate
2,6-dimethylnaphthylene	NA	NA	NA	NSD	NA
Fluoranthene	600	3600	6	1000	High/High
Fluorene	35	640	18.3	350	Low/Low
1-methylnaphthalene	NA	NA	NA	NSD	NA
2-methylnaphthalene	65	670	10.3	300	Low/Moderate
1-methylphenanthrene	NA	NA	NA	NSD	NA
Naphthalene	340	2100	6.2	500	Moderate/High
Perylene	NA	NA	NA	NSD	NA
Phenanthrene	225	1380	6.1	260	Moderate/Moderate
Pyrene	350	2200	6.3	1000	Moderate/Moderate
2,3,5-trimethylnaphthalene	NA	NA	NA	NSD	NA
Total PAH	4000	35000	8.8	22000	Low/Low

* NSD = Not Sufficient Data / ** NA = Not Available
ER-L = Effects Range Low / ER-M = Effects Range Median

APPENDIX J

Plants and Animals which Occur at
Illinois Beach State Park
(Kruse, 1992)

CHECK LIST OF ANIMALS OBSERVED
AT ILLINOIS BEACH NATURE PRESERVE

By R.D. Gustafson
Park Naturalist

MAMMALS

Deer;
- Virginia White Tail

Opossum;
- Virginia

Moles;
- Eastern

Shrews;
- Least
- Short-tailed

Bats;
- Little Brown Myotis
- Big Brown
- Red

Carnivore;
- Raccoon
- Mink
- Longtail Weasel
- Striped Skunk
- Badger (tracks)
- Red Fox

Rodents;
- Woodchuck
- Thirteen-lined Ground Squirrel
- Franklin Ground Squirrel
- Eastern Chipmunk
- Eastern Fox Squirrel
- Eastern Gray Squirrel
- Deer Mouse
- White Footed Mouse
- House Mouse
- Meadow Vole
- Prairie Vole
- Muskrat
- Norway Rat

Rabbits;
- Eastern Cottontail

REPTILES

Turtles;
- Snapping
- Painted
- Blandings
- Eastern Mud
- Musk

Lizards;
- None

Snakes;
- Fox
- Eastern Milk
- Smooth Green
- Eastern Hognose
- Northern Water
- Northern Brown (DeKay's)
- Plains Garter
- Eastern Garter
- Chicago Garter (Eastern subspc...)

AMPHIBIANS

Salamanders;
- Eastern Tiger

Toads;
- American
- Fowler's

Frogs;
- Western Chorus
- Northern Cricket
- Spring Peeper
- Northern Leopard
- Green
- Pickerel

PLANTS APT TO BE SEEN ON SUMMER AND FALL FIELD TRIPS TO ILLINOIS BEACH STATE PARK

Common Name	Scientific Name
FERNS AND FERN ALLIES	
fern, bracken	Pteridium aquilinum latiusculum
fern, marsh shield	Dryopteris thelypteris pubescens
fern, royal	Osmunda regalis spectabilis
fern, sensitive	Onoclea sensibilis
horsetail	Equisetum arvense
rush, scouring	Equisetum hyemale intermedium
TREES	
aspen, quaking	Populus tremuloides
basswood (linden)	Tilia americana
birch, paper	Betula papyrifera
box elder	Acer negundo
cherry, wild black	Prunus serotina
cottonwood (poplar)	Populus deltoides
Juneberry (shadbush)	Amelanchier arborea
oak, black	Quercus velutina
oak, bur	Quercus macrocarpa
oak, white	Quercus alba
pine, Austrian	Pinus nigra
pine, jack	Pinus banksiana
pine, pitch	Pinus rigida
pine, Scotch	Pinus sylvestris
pine, white	Pinus strobus
poplar, gray	Populus canescens
poplar, white	Populus alba
tamarack	Larix ~~laricina~~ decidua
SHRUBS	
alder, speckled	Alnus rugosa americana
bearberry	Arctostaphylos uva-ursi coactillis
birch, dwarf	Betula pumila
blackberry	Rubus allegheniensis
blueberry, early low	Vaccinium angustifolium laevifolium
cedar, red	Juniperus virginiana crebra
cherry, choke	Prunus virginiana
cherry, sand	Prunus pumila
chokeberry	Pyrus melanocarpa
cinquefoil, shrubby	Potentilla fruticosa
crab, Iowa	Pyrus ioensis
currant, wild black	Ribes americanum
dewberry	Rubus flagellaris
dogwood, gray	Cornus racemosa
dogwood, red-osier	Cornus stolonifera
dogwood, silky	Cornus obliqua
elderberry	Sambucus canadensis
hazelnut, American	Corylus americana
hop tree (wafer ash)	Ptelea trifoliata
juniper, common	Juniperus communis depressa
juniper, trailing	Juniperus horizontalis
lead plant	Amorpha canescens
meadowsweet	Spiraea alba
nannyberry	Viburnum lentago

SHRUBS (continued)

raspberry, black	Rubus occidentalis
rose, early wild	Rosa blanda
rose, pasture	Rosa carolina
rose, swamp	Rosa palustris
St. John's wort, shrubby	Hypericum kalmianum
sumac, fragrant	Rhus aromatica
tea, New Jersey	Ceanothus americanus
tea, New Jersey	Ceanothus ovatus
willow, blue-leaved	Salix glaucophylloides glaucophylla
willow, sandbar	Salix interior
willow, sand-dune	Salix syrticola

VINES

bindweed, hedge	Convolvulus sepium
bittersweet, climbing	Celastrus scandens
bittersweet nightshade	Solanum dulcamara
carrion flower	Smilax lasioneura
creeper, Virginia	Parthenocissus quinquefolia
grape, river	Vitis riparia
ivy, poison	Rhus radicans
pea, veiny	Lathyrus venosus
vetch, American	Vicia americana
vetchling, marsh	Lathyrus palustris

GRASSES, SEDGES, AND RUSHES

bulrush, great	Scirpus validus creber
bulrush, red	Scirpus lineatus
bulrush, river	Scirpus fluviatilis
dropseed, prairie	Sporobolus heterolepis
dropseed, sand	Sporobolus cryptandrus
grass, big bluestem	Andropogon gerardi
grass, blue joint	Calamagrostis canadensis
grass, Canada blue	Poa compressa
grass, cotton	Eriophorum angustifolium
grass, downy brome	Bromus tectorum
grass, fowl meadow	Glyceria striata
grass, Indian	Sorghastrum nutans
grass, June	Koeleria cristata
grass, Kentucky blue	Poa pratensis
grass, little bluestem	Andropogon gerardi
grass, marram	Ammophila breviligulata
grass, needle	Stipa spartea
grass, panic	Panicum lanuginosum fasciculatum
grass, panic	Panicum oligosanthes scribnerianum
grass, panic	Panicum villosissimum pseudopubescens
grass, prairie brome	Bromus kalmii
grass, prairie cord	Spartina pectinata
grass, quack	Agropyron repens
grass, reed canary	Phalaris arundinacea
grass, rice cut	Leersia oryzoides
grass, sand reed	Calamovilfa longifolia
grass, slender fescue	Vulpia octoflora tenella
grass, squirrel-tail	Hordeum jubatum
grass, switch	Panicum virgatum
grass, vanilla	Hierochloe odorata
redtop	Agrostis alba
reed, common	Phragmites communis berlandieri

GRASSES, SEDGES, AND RUSHES (continued)

rush, beak	Rhynchospora capillacea
rush, Canadian	Juncus canadensis
rush, candle	Juncus effusus solutus
rush, chairmaker's	Scirpus americanus
rush, dark green	Scirpus atrovirens
rush, Dudley's	Juncus dudleyi
rush, Greene's	Juncus greenei
rush, lake shore	Juncus balticus littoralis
rush, needle spike	Eleocharis acicularis
rush, nut	Scleria triglomerata
rush, nut	Scleria verticillata
rush, roadside	Juncus tenuis
rush, spike	Eleocharis compressa
rush, Torrey's	Juncus torreyi
rush, twig	Cladium mariscoides
rye, beach wild	Elymus arenarius
rye, Canadian wild	Elymus canadensis
sandbur	Cenchrus longispinus
sedge	Carex muhlenbergii
sedge	Carex stipata
sedge	Carex vulpinoidea
sedge	Cyperus filiculmis
sedge	Cyperus rivularis
sedge	Cyperus schweinitzii
sedge	Fimbristylis drummondii
sedge, pond	Dulichium arundinaceum
timothy	Phleum pratense

OTHER MONOCOTYLEDONS

arrowhead	Sagittaria latifolia
asparagus	Asparagus officinalis
asphodel, false	Tofieldia glutinosa
bur-reed	Sparganium eurycarpum
cat-tail, broad-leaved	Typha latifolia
cat-tail, narrow-leaved	Typha angustifolia
colic root	Aletris farinosa
flag, blue	Iris virginica shrevei
flag, sweet	Acorus calamus
grass, blue-eyed	Sisyrinchium albidum
grass, bog arrow	Triglochin maritima
grass, yellow star	Hypoxis hirsuta
lily, Turk's cap	Lilium michiganense
lily, wood	Lilium philadelphicum andinum
Mayflower, Canada	Maianthemum canadense interius
onion, nodding wild	Allium cernuum
onion, wild	Allium canadense
orchid, grass pink	Calopogon pulchellus
orchid, pale green	Habenaria flava herbiola
plantain, water	Alisma triviale
Solomon's seal	Polygonatum canaliculatum
Solomon's seal, false	Smilacina stellata
spiderwort	Tradescantia ohiensis
tresses, ladies'	Spiranthes cernua
tresses, ladies'	Spiranthes lacera
waterweed	Elodea canadensis

COMPOSITES

aster, flat-top	Aster umbellatus
aster, heath	Aster ericoides
aster, heath	Aster pilosus
aster, New England	Aster novae-angliae
aster, silky	Aster sericeus
aster, sky-blue	Aster azureus
aster, stiff	Aster ptarmicoides
balsam, old-field	Gnaphalium obtusifolium
boneset, common	Eupatorium perfoliatum
coneflower, prairie	Ratibida pinnata
coreopsis, prairie	Coreopsis palmata
coreopsis, sand	Coreopsis lanceolata
coreopsis, tall	Coreopsis tripteris
dandelion, false	Krigia biflora
dock, prairie	Silphium terebinthinaceum
fireweed	Erechtites hieracifolia
fleabane, daisy	Erigeron annuus
fleabane, daisy	Erigeron strigosus
goldenrod, grass-leaved	Solidago graminifolia nuttallii
goldenrod, Ohio	Solidago ohioensis
goldenrod, old-field	Solidago nemoralis
goldenrod, prairie	Solidago riddellii
goldenrod, showy	Solidago speciosa
goldenrod, stiff	Solidago rigida
goldenrod, tall	Solidago altissima
hawkweed, Canada	Hieracium canadense fasciculatum
hawkweed, hairy	Hieracium scabrum
ironweed	Vernonia fasciculata
Joe Pye weed	Eupatorium maculatum
lettuce, white	Prenanthes racemosa
lettuce, wild	Lactuca canadensis
marigold, swamp	Bidens coronata tenuiloba
plantain, Indian	Cacalia tuberosa
ragweed, giant	Ambrosia trifida
ragweed, short	Ambrosia artemisiifolia elatior
rosin weed	Silphium integrifolium
sneezeweed	Helenium autumnale
star, blazing	Liatris aspera
star, cylindrical blazing	Liatris cylindracea
star, marsh blazing	Liatris spicata
sunflower, prairie	Helianthus grosseserratus
sunflower, Western	Helianthus occidentalis
sunflower, woodland	Helianthus divaricatus
Susan, black-eyed	Rudbeckia serotina
thistle, pasture	Cirsium discolor
thistle, swamp	Cirsium muticum
yarrow	Achillea millefolium
wormwood, beach	Artemisia caudata

OTHER DICOTYLEDONS

alum root	Heuchera richardsonii grayana
anemone, prairie	Anemone canadensis
bedstraw, Northern	Galium boreale
bedstraw, marsh	Galium obtusum
bellflower, marsh	Campanula aparinoides
bergamot, wild	Monarda fistulosa mollis
betony, marsh	Pedicularis lanceolata
betony, wood	Pedicularis canadensis
bladderwort, horned	Utricularia cornuta

OTHER DICOTYLEDONS (continued)

buckbean	Menyanthes trifoliata minor
bugseed	Corispermum hyssopifolium
butterfly weed	Asclepias tuberosa
cactus, prickly pear	Opuntia humifusa
calamint, low	Satureja arkansana
campion, white	Lychnis alba
candles, swamp	Lysimachia terrestris
carpenter's weed	Prunella vulgaris lanceolata
carpet weed	Mollugo verticillata
catchfly, sleepy	Silene antirrhina
cherry, ground	Physalis heterophylla
cherry, ground	Physalis subglabrata
cinquefoil, common	Potentilla simplex
cinquefoil, marsh	Potentilla palustris
cinquefoil, Norway	Potentilla norvegica
cinquefoil, prairie	Potentilla arguta
cinquefoil, upright	Potentilla recta
clover, bush	Lespedeza capitata vulgaris
clover, purple prairie	Petalostemum purpureum
clover, white prairie	Petalostemum candidum
clover, tick	Desmodium canadense
columbine, wild	Aquilegia canadensis
cowbane	Oxypolis rigidior
cress, sand	Arabis lyrata
dock, great water	Rumex orbiculatus
dogbane, spreading	Apocynum androsaemifolium
dragonhead, false	Physostegia virginiana
flax, yellow	Linum medium texanum
four o'clock, wild	Mirabilis nyctaginea
foxglove, clammy false	Gerardia pedicularia ambigens
foxglove, purple false	Gerardia purpurea
foxglove, purple false	Gerardia tenuifolia
foxglove, yellow false	Gerardia grandiflora pulchra
gentian, bottle	Gentiana andrewsii
gentian, fringed	Gentiana crinita
gentian, fringed	Gentiana procera
geranium, wild	Geranium maculatum
grass, whitlow	Draba reptans
grass of Parnassus	Parnassia glauca
ground nut	Apios americana
hemlock, water	Cicuta maculata
hemp, Indian	Apocynum cannabinum
horehound, water	Lycopus americanus
indigo, white false	Baptisia leucantha
jointweed	Polygonella articulata
knotweed, slender	Polygonum tenue
lily, water	Nymphaea tuberosa
lily, yellow pond	Nuphar advena
lobelia, bog	Lobelia kalmii
lobelia, great blue	Lobelia siphilitica
lobelia, pale	Lobelia spicata hirtella
loosestrife, marsh	Lysimachia quadriflora
loosestrife, tufted	Lysimachia thyrsiflora
loosestrife, water	Ludwigia palustris americana
loosestrife, winged	Lythrum alatum
lupine, wild	Lupinus perennis occidentalis
master, rattlesnake	Eryngium yuccifolium
May apple	Podophyllum peltatum
mermaid weed	Proserpinaca palustris crebra

OTHER DICOTYLEDONS (continued)

milkweed, common	Asclepias syriaca kansana
milkweed, green	Asclepias hirtella
milkweed, green	Asclepias viridiflora
milkweed, sand	Asclepias amplexicaulis
milkweed, swamp	Asclepias incarnata
milkweed, whorled	Asclepias verticillata
milkwort, field	Polygala sanguinea
milkwort, purple	Polygala polygama obtusata
milkwort, small	Polygala verticillata isocycla
mint, horse	Monarda punctata villicaulis
monkey flower	Mimulus ringens
mustard, tumble	Sisymbrium altissimum
nettle, hedge	Stachys tenuifolia hispida
nettle, horse	Solanum carolinense
paintbrush, Indian	Castilleja coccinea
painted cup, downy yellow	Castilleja sessiliflora
parsnip, meadow	Zizia aurea
parsnip, water	Sium suave
pepper, mild water	Polygonum hydropiperoides
phlox, marsh	Phlox glaberrima interior
phlox, prairie	Phlox pilosa
pigweed, winged	Cycloloma atriplicifolium
pinweed, hairy	Lechea villosa
primrose, evening	Oenothera biennis
primrose, sand	Oenothera rhombipetala
puccoon, fringed	Lithospermum incisum
puccoon, hairy	Lithospermum croceum
puccoon, hoary	Lithospermum canescens
rocket, sea	Cakile edentula lacustris
rockrose .	Helianthemum canadense
rue, meadow	Thalictrum dasycarpum
sage, wood	Teucrium canadense
St. John's wort, marsh	Hypericum virginicum
sandwort, stiff	Arenaria stricta
sandwort, thyme-leaved	Arenaria serpyllifolia
sandwort, wood	Arenaria lateriflora
sarsaparilla, wild	Aralia nudicaulis
shield, water	Brasenia schreberi
shooting star	Dodecatheon meadia
silverweed	Potentilla anserina
skullcap, mad-dog	Scutellaria lateriflora
skullcap, marsh	Scutellaria parvula leonardi
snakeroot, black	Sanicula marilandica
sorrel, field	Rumex acetosella
sorrel, yellow wood	Oxalis europaea
sorrel, yellow wood	Oxalis stricta
spurge, flowering	Euphorbia corollata
spurge, seaside	Euphorbia polygonifolia
stonecrop, ditch	Penthorum sedoides
strawberry, wild	Fragaria virginiana
thimbleweed	Anemone cylindrica
toadflax, false	Comandra richardsiana
turtlehead	Chelone glabra linifolia
valerian	Valeriana ciliata
vervain, blue	Verbena hastata
violet, arrow-leaved	Viola sagittata
violet, bird's foot	Viola pedata lineariloba
violet, common blue	Viola papilionacea
woundwort	Stachys palustris homotricha

ILLINOIS BEACH STATE PARK

AVIAN ECOLOGICAL INVESTIGATION

FINAL REPORT

Scott Hickman - James Neal

August 31, 1981

INTRODUCTION

This final report will follow the outline suggested by the I.D.O.C. proposal request for an Illinois Beach State Park (I.B.S.P.) avian ecological investigation. This report will:

A. Tabulate Results

1. Bird species presence and breeding abundance
2. Vegetation record of census stops

B. Summarize Results

1. Species summaries - population number, habitat association and distribution within I.B.S.P.
2. Habitat summaries - habitat distribution, bird species utilization and dependency

C. Management Recommendations

1. Conservation of single species
2. Conservation of species groups
3. Conservation of habitats

D. Analysis of I.D.O.C. Avian Investigation Procedures

TABULATION OF RESULTS

1. Bird species presence and breeding abundance

Four major transect routes (A,B,C,&D, Map 1) and 7 additional qualitative study areas (1,2,3,•••7, Map 1) were censused for breeding birds between May 25, 1981 and June 30, 1981. Only 1 census was onducted during May. This was a night census for rails. All other censuses were conducted during June. Censuses were run between 05:00 and 10:00 hrs. except for those censuses designed to sample rails. These rail censuses were conducted on May 25, June 3, and June 17 between 21:00 and 05:00 hrs. Recorded tapes of King Rail, Virginia Rail, Yellow Rail, Black Rail, and Sora were played in order to stimulate calling. An additional attempt was made to sample rails by flushing them on the afternoon of June 5, 1981.

The results of all censuses are shown in Avian Ecological Investigations Tabulation Sheets 1,2, and 3. A total of 116 species were recorded during the census period. We concluded that 91 species were probably nesting within the boundaries of I.B.S.P. Fourteen of the species encountered were considered to be late migrants. Seven species were using the park for foraging and/or resting while 4 species were classified as wanderers. Wanderers probably nested elsewhere in Lake County. They seemed to be simply passing through I.B.S.P. and may have been unsuccessful in establishing a territory within the park.

Foraging and nesting habitat preferences are indicated for the bird species which nested in the park in Avian Ecological Investigations Tabulation Sheets 1,2, and 3. Savanna, marsh, sand prairie, sedge meadow, sand forest, stream, water impoundment, and Lake Michigan are represented by S, M, SP, SM, SF, St, I, and LM, respectively.

The most unusual findings of nesting birds are as follows:

Endangered Species- Black-crowned Night Heron and Upland Sandpiper.

Threatened Species- Veery, Brewer's Blackbird, and Henslow's Sparrow.

Rare Species (sensu Bohlen, 1978)- Chestnut-sided Warbler.

Uncommon Species (sensu Bohlen, 1978)- Least Bittern, King Rail, Black-billed Cuckoo, Belted Kingfisher, Sedge Wren, Eastern Bluebird, Ovenbird, Yellow-breasted Chat and Scarlet Tanager.

It should be noted that the American Woodcock is also considered to be uncommon by Bohlen (1978). It is not listed as uncommon in our report since it is currently quite common in Lake County. We do, however, consider the Vesper Sparrow to be uncommon in Lake County and therefore worthy of noting as a nesting species in I.B.S.P. even though Bohlen (1978) lists it as a common summer resident in our area.

2. Vegetation record of census stops

The locations of all census stops are shown in Map 1. A description of the vegetation of each census stop is provided by the 52 completed I.D.O.C. Stratum Ranking Forms which are attached to this report.

SUMMARY OF RESULTS

1. Species summaries

A summary of the bird species encountered will be provided by listing each species and giving its estimated population, habitat association, and distribution within I.B.S.P.

Common Loon: The Common Loon was seen only once. It was swimming in Lake Michigan off of the mouth of the Dead River on June 1st and was classified as a late migrant.

Pied-billed Grebe: Four to five pairs were estimated to be breeding in the park. They nest and forage in marshes, ponds and impoundments. Grebes were only observed along the Dead River but we believe that they probably breed in appropriate habitat throughout the park.

Double-crested Cormorant: Two cormorants were observed to be flying over the south end of the park on June 7th. These were classified as late migrants.

Great Blue Heron: We do not feel that any Great Blue Herons were nesting within the park. However, these birds were frequently flying into or over the park. They often were seen to be using the edge of any body of water or marsh within I.B.S.P. as a feeding area.

Green Heron: Sixteen to fifty pairs of Green Herons were estimated to be nesting within the park. They nested in thickets along marsh areas throughout the park and foraged along the edge of any marsh or waterway.

Black-crowned Night Heron: One to 5 pairs of these birds are estimated to nest within the park. We do not know the exact location of the nests. However, we feel justified in classifing this species as nesting since 3 immature birds were observed to be foraging in the south end of the park on July 25th and we have located nests during previous summers in willow thickets south of the Dead River (Map 3). This species typically uses willow or cottonwood thickets within the marsh for nesting and forages along the water's edge.

Yellow-crowned Night Heron: We estimate that 1 to 5 pairs nest within I.B.S.P. No nests were found. However, in previous years this species has nested in the sand forest bordering Wadsworth road (Map 3) along that road's entrance to the park. This species typically nests within taller trees within deciduous woods and forages along the water's edge.

Least Bittern: Six to 15 pairs of Least Bitterns probably nested within the park. This species typically nests within cattail marshes and forages within the marsh as well. They are probably nesting in marshes throughout the park. Three nests were located in the marsh between the second and third transect stop of transect A (Map 1). A more precise indication of the location of these nests is shown in Map 2 by the initials L.B.

Canada Goose: One to 5 pairs are estimated to nest within the park. This species would nest on raised areas such as a muskrat hutch or grassy area within or beside a marsh or other body of water. On the 9th of May 2 adults with 4 young were observed feeding on the prairie in the south end of the park. On June 15th 2 adults with 2 young were observed feeding in the same area. This species probably nests in appropriate areas throughout the park.

Mallard: We estimate that 16 to 50 pairs of Mallards nest within the park. One nested in a window box on the Holiday Inn Lodge. They more typically nest within a short distance of open water and are distributed throughout the park.

Blue-winged Teal: One to 5 pairs probably nest in the park. They typically nest in higher open areas not too far from water and forage in marshes, impoundments and streams. They are scattered throughout the park in appropriate habitat.

Wood Duck: Six to 15 pairs are estimated to nest in I.B.S.P. They typically nest in deciduous woods or savanna close to water. They forage in streams, impoundments, ponds and marshes and are distributed throughout the park in appropriate habitats.

Red-tailed Hawk: One to 5 pairs are estimated to breed within the park. No nests were found this year. However, nests have been located in previous years. Red-tailed Hawks were frequenly observed soaring over the park and hunting in the park. This species would nest in savanna or sand forest and forage in prairie or open savanna. This species can be observed throughout the park and may nest almost anywhere in the park in appropriate habitat where human disturbance is not too high.

American Kestrel: One to 5 pairs likely nest in the park in savanna. They forage throughout the park in prairie habitat. A nesting pair was located at Camp Logan and in the pines south of the Dead River.

Ring-necked Pheasant: Sixteen to 50 pairs nest in the park in prairie and savanna. They forage throughout the park in prairie, savanna and marsh edge. They may be heard or seen anywhere within the park.

Sandhill Crane: This species was observed flying into the park, presumably to forage. Two birds were heard calling from the ground in Winthrop Harbor around census stop 2 of transect D (Map 1). We believe that there is a possibility that this species may nest in the park in the future since they seem to be increasing their use of Lake County as a nesting area. These birds did not consistently use any one habitat or area within the park.

King Rail: One to 5 pairs of this species are estimated to nest within the park. This species nests and forages within the marsh and will also forage along the marsh edge. We were unable to locate specific nesting pairs but previous years experience indicates that this species should be thinly distributed throughout the park.

Virginia Rail: Six to 15 pairs probably nest within the park. This species nests and forages within the marsh. Individuals of this species may be found in any marsh habitat throughout I.B.S.P.

Sora: Six to 15 pairs nest in the park in marsh habitat. They also forage in the marsh and may be found throughout the park in any marsh.

American Coot: One to 5 pairs probably nest in the park. They nest in marsh and forage in marsh, stream, pond and impoundments. They are thinly distributed in appropriate habitat throughout the park.

Killdeer: Six to 15 pairs most likely nest within I.B.S.P. They nest in open areas such as prairie, often close to water. They forage in open areas and along the edge of impoundments, streams and Lake Michigan. They are distributed throughout the park in appropriate habitats.

American Woodcock: Sixteen to 50 pairs nest within the park in sand prairie along wet swales, along the marsh and in deciduous woods. They forage in these same areas and are distributed throughout the park in these habitats.

Common Snipe: No individuals are known to nest within the park. They were observed as late migrants utilizing wet areas for foraging throughout the park.

Ruddy Turnstone: This species was observed as a late migrant along the shore of Lake Michigan and does nest within the park.

Upland Sandpiper: Six to 15 pairs of this species nest within the park. All individuals nest and forage within the sand prairie of the park. These birds were concentrated within the south end of the park (4 or more pairs in qualitative area 1), Camp Logan (4 or more pairs in qualitative area 5) and just north of Hosah Prairie (2 or more pairs in qualitative area 4). The approximate nesting locations of these individuals as determined by flushing and observing territorial behavior (no nests were actually found) is shown on Map 2 with each pair indicated by the initials U.S.

Spotted Sandpiper: One to 5 pairs are likely to nest within the park. This species nests along streams, impoundments and ponds. Individuals nested along the Dead River this year and in previous years nested along the artificial ponds in Camp Logan.

Herring Gull: This species did not nest within the park but did fly in to forage and rest along the Lake Michigan shore line.

Ring-billed Gull: This species did not nest within the park but flew in to forage and rest along the Lake Michigan shore line.

Franklin's Gull: This species did not nest within park. It was simply observed as a late migrant.

Common Tern: This bird did not nest within the park but flew in to forage and rest along the Lake Michigan shore line.

Black Tern: This species did not nest within the park but flew in to forage along the Dead River and marsh habitats on rare occasions.

Mourning Dove: Sixteen to 50 pairs are estimated to nest within the park. This species nests and forages in the savanna and sand prairie and may be found in these habitats throughout the park.

Rock Dove: Six to 15 paris probably nest in the park and may be found wherever there are buildings.

Yellow-billed Cuckoo: Sixteen to 50 pairs are estimated to breed within the park. These birds nested and foraged in savanna habitat and are distributed throughout the park within this habitat.

Black-billed Cuckoo: Approximately 6 to 15 pairs nested in the park. They nested and foraged within savanna and sand forest. This species was distributed throughout the park within this habitat.

Screech Owl. Six to 15 paris are believed to nest within the park. They are found in savanna and sand forest which they use as nesting and foraging habitat. We did not encounter any individuals of this species during our censuses but one young was found by a camper in the park's campground. We are estimating their population number by the results of our christmas and spring bird counts during which we use tapes to elicit calling. This species can be found throughout the park in appropriate habitats.

Great-horned Owl: One to 5 pairs are estimated to be nesting and foraging within the sand forest and savanna of the park. This species was encountered while we were setting up our transects and during scouting trips. Nests have been located in previous years within the park south of the Dead River in the pines. We are using the results of our spring and christmas bird counts as an aid in estimating population number. This species is thinly distributed throughout the park in appropriate habitat.

Whip-poor Will: Six to 15 pairs nest in the savanna and sand forest of the park. Since they are aerial feeders they forage above all habitats throughout the park. They nest in appropriate habitat throughout the park.

Common Nighthawk: One to 5 pairs nest in the savanna and sand prairie of the park. Since they are aerial feeders they forage above all habitats throughout the park. They are thinly distributed in appropriate habitat through the park.

Chimney Swift: We know of no nesting pairs within the park. However, this species does fly in to forage in the air above any habitat throughout the park.

Belted Kingfisher: One to 5 pairs nest in the park. This species nests along streams, ponds and impoundments and forages in these bodies of water. Kingfishers are thinly distributed throughout the park in appropriate habitats.

Common Flicker: Sixteen to 50 pairs are estimated to nest within the park. They nest and forage in the savanna and sand forest habitats throughout the park.

Red-headed Woodpecker: Six to 15 pairs probably nest within the park. They nest and forage in savanna and sand forest. They primarily utilize Black Oak sand forest and may be found wherever this habitat occurs within the park.

Hairy Woodpecker: Six to 15 pairs are estimated to nest within the park. They nest in savanna and sand forest and may be found within this habitat throughout the park.

Downy Woodpecker: Six to 15 pairs are estimated within the park. They also nest in savanna and sand forest and may be found within this habitat throughout the park.

Eastern Kingbird: We estimate that 16 to 50 pairs nest within the park. They nest and forage within savanna and sand prairie throughout the park.

Great-crested Flycatcher: Sixteen to 50 pairs nest within the park. They nest and forage in savanna and sand forest throughout the park.

Willow Flycatcher: Sixteen to 50 pairs nested in the park. They nest and forage in thickets in savanna, sand prairie and marsh. They were found throughout the park within these habitats.

Least Flycatcher: No individuals of this species nested within the park. This species was encountered as a late migrant in savanna and sand forest habitats.

Eastern Wood Pewee: Six to 15 pairs are estimated to nest and forage in savanna and sand forest habitats. They can be found throughout the park within these habitats.

Olive-sided Flycatcher: This species did not nest within the park but was observed as a late migrant which primarily utilized savanna habitat.

Tree Swallow: Six to 15 pairs nested in the park. This species nested in savanna and in dead trees along the water's edge. Tree Swallows foraged over open areas such as marshes, streams and impoundments. They were encountered in appropriate habitats throughout the park.

Bank Swallow: Over 50 pairs are known in the park. A colony was found in a bank along Lake Michigan at Camp Logan. This area was abandoned and the birds set up a new colony at the point where highway 173 would intersect Lake Michigan if the highway were extended. The positions of these two colonys are indicated by the initials B.S. on Map 2. There were 71 cavities in the first colony and 111 in the second.

Rough-winged Swallow: One to 5 pairs are estimated to nest within the park. They nest in banks along bodies of water such as streams, impoundments, ponds, and Lake Michigan. We were unable to locate specific nesting areas. This species can be observed foraging in open areas throughout the park.

Barn Swallow: Sixteen to 50 pairs are estimated to nest in the park. Nests were found within culverts and buildings in Camp Logan. This species was observed foraging above streams, Lake Michigan, sand prairie and marsh and was seen in these habitats throughout the park.

Purple Martin: We estimate that 6 to 5 pairs of this species nest within the park. The known nesting sites were in the Purple Martin houses by the Holiday Inn lodge and by the park's head-quarters. This species was observed foraging primarily above marshes and sand prairie but was seen above all other habitats as well. This species ranged throughout the park.

Blue Jay: Sixteen to 50 pairs of this species nested in sand forest and savanna throughout the park.

Common Crow: Sixteen to 50 pairs are estimated to nest in sand forest and savanna throughout the park. This species foraged in sand forest, savanna, sand prairie and the Lake Michigan shore line. Crows were distributed throughout the park.

Black-capped Chickadee: Sixteen to 50 pairs are believed to nest within the park. They nested in cavities in sand forest and savanna. They foraged in these habitats as well as within thickets located within the marsh. They are found in approp-riate habitats throughout the park.

Tufted Titmouse: This species was known to summer in other regions of Lake County. It was observed once in the park and is classified as a wanderer which entered the park but did not nest there.

House Wren: Six to 15 pairs are estimated to nest and forage within the park in savanna and sand forest habitats. This species is found throughout the park within these habitats.

Marsh Wren: Sixteen to 50 pairs probably nested within the park in cattail marsh habitat. They are found throughout the park within this habitat which they use for both nesting and foraging.

Sedge Wren: Sixteen to 50 pairs are believed to breed within the sedge meadows and more grassy regions of the marshes within the park. These habitats were used for both nesting and foraging by this species. Sedge Wrens were found within appropriate habitat throughout the park.

Mockingbird: Mockingbirds did not breed in the park but one was seen moving through the park on the 17th of June.

Gray Catbird: We estimate that 16 to 50 pairs nested in the park. This species utilized thickets in savanna, sand forest and marshes as nesting habitat. Catbirds foraged in these habitats throughout the park.

Brown Thrasher: Sixteen to 50 pairs are estimated to have nested in the park. Thickets in savanna, sand forest and marshes were utilized as nesting sites. This species was found throughout the park in savanna, sand forest and marshes.

American Robin: We estimate that 16 to 50 pairs nested in the park. They nested and foraged in savanna and sand forest wherever these habitats occured.

Wood Thrush: One to 5 pairs of Wood Thrushes nested in the park. They utilized sand forest as nesting habitat and were found thinly distributed within this habitat throughout the park.

Veery. Six to 15 pairs of Veeries nested in the park. They nested and foraged in savanna and sand forest habitat throughout the park.

Eastern Bluebird: We estimate that 1 to 5 pairs of Eastern Bluebirds nested and foraged in savanna habitat. They nested in the pines south of the Dead River this year and last year but have nested in various locations within oak savanna throughout the park in previous years.

Blue-gray Gnatcatcher: One to 5 pairs of this species nest in I.B.S.P. They nest and forage in savanna and sand forest. They are thinly distributed throughout the park within this habitat.

Cedar Waxwing: Sixteen to 50 pairs nested within the park. They nested and foraged in savanna and sand forest and are found throughout the park within this habitat.

Starling: Sixteen to 50 pairs are estimated to nest within the park. Starlings nested in savanna and sand forest habitats but would forage in virtually any habitat. They were found throughout the park.

Red-eyed Vireo: We estimate that 6 to 15 pairs nested throughout the park within sand forest habitat.

Warbling Vireo: Six to fifteen pairs of this species nested and foraged in savanna habitat in I.B.S.P. All individuals encountered were utilizing the savanna habitat created by abandoned residential areas in the Winthrop Harbor and Camp Logan areas of the park.

Black-and-white Warbler: We encountered this warbler as a late migrant which did not nest in the park.

Golden-winged Warbler: We estimate that one to 5 pairs nest in the park. A territorial male was encountered on June 8 near census stop 5 of qualitative area 7 (Map 1). This species nested in Lake County last year in similar savanna habitat. Since an abundance of suitable savanna habitat exists within I.B.S.P. we feel safe in assuming that nesting did occur within the park. This species uses savanna habitat for nesting and foraging and may have been confined to the area around stop 5 of qualitative area 7 (Map 1). This location is indicated on Map 2 by the initials G.W.

Blue-winged Warbler: One to 5 pairs nested within the park. This species uses savanna or openings in the sand forest for foraging and nesting. A territorial male was encountered June 9th by census stop 1 of transect C (Map 1). Blue-winged Warblers nest in several areas in Lake County so we feel safe in estimating a low number of them to be nesting within I.B.S.P. The location of the censused male is indicated on Map 3 by the initials B.W.

Yellow Warbler: More than 50 pairs nested within the park. They nested and foraged in savanna and thickets in the marshes. Yellow Warblers were found throughout the park in suitable habitat.

Black-throated Green Warbler: This warbler did not nest in the park. It was encountered as a migrant on the 31st of May.

Chestnut-sided Warbler: We estimate that 1 to 5 pairs nested in the park. A singing male was encountered close to census stop 1 of transect D on June 9th and June 20th (Map 1). The location of this male is indicated on Map 2 by the initials C.W. This species was using savanna habitat in an abandoned residential area and may have been confined to this one site within the park.

Bay-breasted Warbler: This warbler did not nest within the park. One individual was encountered as a late migrant.

Ovenbird: One to 5 pairs probably nested in the park in sand forest habitat which was also used for foraging. This species is thinly distributed throughout the park within this habitat.

Mourning Warbler: One to 5 pairs nest in the park. This species nests and forages in sand forest. The locations of consistent sightings are indicated on Map 2 by the initials M.W. This species was thinly scattered through the park and was encountered with surprising frequency. This species was seen on 4 different transect legs, 3 different census stops and in 3 qualitative habitats.

Common Yellowthroat: Over 50 pairs nested throughout I.B.S.P. in savanna and marsh habitats. These habitats were used for foraging as well as nesting.

Yellow-breasted Chat: One to 5 pairs are estimated to nest within the park. Savanna habitat was used for foraging and nesting. One nest was located in a blackberry thicket along transect leg 5 of transect C (Map 1) and contained 1 egg on the 30th of June. The location of this nest, the location of a male which sang consistently in an adjacent territory and the location of a consistently encountered singing male found in the center of transect leg 1 of transect D (Map 1) are indicated on Map 2 by the initials Y.C.

Wilson's Warbler: This warbler did not nest in the park but was encountered as a late migrant.

Canada Warbler: This warbler did not nest in the park but was encountered as a late migrant.

American Redstart: This warbler did not nest in the park but was encountered as a late migrant.

House Sparrow: We estimate that 16 to 50 pairs nest and forage around buildings throughout the park.

Bobolink: We estimate that 16 to 50 pairs nested in sand prairie in the park. These birds did not use sparsely vegetated grasslands. Instead, they inhabited the prairie areas with thicker, taller grasses found along the western 1/4 of the prairie in the south end of the park and Camp Logan.

Eastern Meadowlark: Sixteen to 50 pairs nest in the park. They nested and foraged in sand prairie throughout the park.

Western Meadowlark: One to 5 pairs nested in the park. They nested in sand prairie in the south end of the park. The location of their nesting area has been the same for the last 5 years and is shown on Map 2 by the initials W.M.

Yellow-headed Blackbird: This species did not nest in the park. This species nests elsewhere in the county and passed through the park as a wanderer.

Red-winged Blackbird: More than 50 pairs nested and foraged in marsh and sedge meadow habitat throughout the park. This was our most abundant species.

Orchard Oriole: This species did not nest within the park. A singing second year male passed through the park as a wanderer.

Northern Oriole: Six to 15 pairs nested in the park. They nested and foraged in savanna. They were more concentrated in the savanna formed by the abandoned residential areas around Camp Logan and Winthrop Harbor than in native savanna that was less disturbed.

Brewer's Blackbird: One to 5 pairs nested in the park. They foraged and nested in the sand prairie in the south end of the park. Their nesting locations are indicated on Map 2 by the initials B.B.

Common Grackle: More than 50 pairs nested in the park. They nested and foraged in savanna and sand forest. They also foraged in the marsh. They were distributed throughout the park in appropriate habitat.

Brown-headed Cowbird: More than 50 pairs nested in the park. This brood parasite utilized savanna, sand forest, sand prairie, marsh and sedge meadow habitats. It was found throughout the park.

Scarlet Tanager: One to five pairs nested in the park. This species nested and foraged in sand forest. It was thinly distributed throughout the park in this habitat.

Cardinal: Sixteen to 50 pairs nested in the park. They used savanna and sand forest for nesting and foraging. They were distributed throughout the park within suitable habitat.

Rose-breasted Grosbeak: One to 5 pairs nested in the park. This species nested and foraged in sand forest. They were thinly distributed throughout the park in this habitat.

Indigo Bunting: We estimate that 16 to 50 pairs nested in I.B.S.P. They nested and foraged in savanna and sand forest and were distributed throughout the park within this habitat.

American Goldfinch: We estimate that 16 to 50 pairs nested in the park. They nested and foraged in savanna and sand prairie. They were found throughout the park within these habitats.

Rufous-sided Towhee: Sixteen to 50 pairs nested in the park. They foraged and nested in savanna and sand forest and were distributed throughout the park within these habitats.

Savannah Sparrow: Six to 15 pairs nested in I.B.S.P. They nested and foraged in sand prairie. They were primarily found in the eastern portion of the prairie in the south end of the park and Camp Logan.

Grasshopper Sparrow: Sixteen to 50 pairs nested in the park. They nested and foraged in sand prairie in the eastern portion of the prairie in the south end of the park and the eastern portion of the grassland at Camp Logan.

Henslow's Sparrow: Six to 15 pairs nested in the park and were found to be using sand prairie habitat for nesting and foraging. Three pairs nested in the prairie at Camp Logan and 3 pairs nested in the prairie at the south end of the park. The approximate location of the nesting sites was determined by flushing the birds and by observing territorial behavior. These locations are indicated on Map 2 by the initials H.S. No attempt was made to determine the exact location of the nests.

Vesper Sparrow: We estimate that 6 to 15 pairs nest within the park. They forage and nest within sand prairie. They were primarily located in the eastern portion of the sand prairie at the south end of the park.

Chipping Sparrow: One to 5 pairs of this species nested in I.B.S.P. They nested and foraged in the pines south of the Dead River.

Clay-colored Sparrow: This species did not nest in the park. It was observed as a late migrant.

Field Sparrow: Sixteen to 50 pairs nested in the park. They nested and foraged in savanna and sand prairie habitats. They were distributed throughout the park within these habitats.

Lincoln's Sparrow: This species did not nest within the park. It was encountered as a late migrant.

Swamp Sparrow: We estimate that 16 to 50 pairs nest within the park. They use marshes and sedge meadows for nesting and foraging. They were found throughout the park within these habitats. Three newly fledged young were flushed from the nest site on the 20th of June in Camp Logan by census stop 5 (Map 1).

Song Sparrow: Sixteen to 50 pairs nest within the park. They nested and foraged in savanna. They also nested in small shrubs and thickets located in marsh and sand prairie habitats. They were found throughout the park in appropriate habitats.

2. Habitat Summaries

The major habitats of I.B.S.P. are marsh, savanna (both pine and oak) sand prairie, sedge meadow, sand forest (Black Oaks usually dominate) and successional developed land (razed residential areas). The distribution of these habitats within I.B.S.P. is shown in Map 3.

The bird species habitat utilizations and dependencies are as follows:

Marsh: Pied-billed Grebe, Green Heron, Black-crowned Night Heron, Yellow-crowned Night Heron, Least Bittern, Canada Goose, Mallard, Blue-winged Teal, Wood Duck, King Rail, Virginia Rail, Sora, American Coot, American Woodcock, Willow Flycatcher, Tree Swallow, Barn Swallow, Purple Martin, Black-capped Chickadee, Marsh Wren, Gray Catbird, Brown Thrasher, Yellow Warbler, Common Yellowthroat, Red-winged Blackbird, Common Grackle, Brown-headed Cowbird, Swamp Sparrow, and Song Sparrow. The birds which were dependent upon and restricted to the marsh were the Pied-billed Grebe, Green Heron, Least Bittern, King Rail, Virginia Rail, Sora, American Coot, Marsh Wren and Swamp Sparrow.

Savanna: Black-crowned Night Heron, Red-tailed Hawk, American Kestrel, Ring-necked Pheasant, Mourning Dove, Yellow-billed Cuckoo, Black-billed Cuckoo, Screech Owl, Great-horned Owl, Whip-poor-will, Common Nighthawk, Common Flicker, Red-headed Woodpecker, Hairy Woodpecker, Downy Woodpecker, Eastern Kingbird, Great-crested Flycatcher, Willow Flycatcher, Eastern Wood Pewee, Tree Swallow, Blue Jay, Common Crow, Black-capped Chickadee, House Wren, Gray Catbird, Brown Thrasher, American Robin, Veery, Eastern Bluebird, Blue-gray Gnatcatcher, Cedar Waxwing, Starling, Warbling Vireo, Golden-winged Warbler, Blue-winged Warbler, Yellow Warbler, Chestnut-sided Warbler, Common Yellowthroat, Yellow-breasted Chat, Northern Oriole, Common Grackle, Brown-headed Cowbird, Cardinal, Indigo Bunting, American Goldfinch, Rufous-sided Towhee, Chipping Sparrow, Field Sparrow and Song Sparrow. The birds which were dependent upon and restricted to savanna were the Yellow-billed Cuckoo, Eastern Bluebird, Warbling Vireo, Golden-winged Warbler, Blue-winged Warbler, Chestnut-sided Warbler, Yellow-breasted Chat, Northern Oriole and Chipping Sparrow.

Sand Prairie: Red-tailed Hawk, American Kestrel, Ring-necked Pheasant, Killdeer, American Woodcock, Upland Sandpiper, Mourning Dove, Common Nighthawk, Eastern Kingbird, Willow Flycatcher, Rough-winged Swallow, Barn Swallow, Purple Martin, Common Crow, Bobolink, Eastern Meadowlark, Western Meadowlark, Brewer's Blackbird, Brown-headed Cowbird, American Goldfinch, Savanna Sparrow, Grasshopper Sparrow, Henslow's Sparrow, Vesper Sparrow, Field Sparrow and Song Sparrow.

Sedge Meadow: Sedge Wren, Red-winged Blackbird and Swamp Sparrow. The Sedge Wren was restricted to and dependent upon this habitat.

Sand Forest: Yellow-crowned Night Heron, Wood Duck, Red-tailed Hawk, American Woodcock, Black-billed Cuckoo, Screech Owl, Great-horned Owl, Whip-poor-will, Common Flicker, Red-headed Woodpecker, Hairy Woodpecker, Downy Woodpecker, Great-crested Flycatcher, Eastern Wood Pewee, Blue Jay, Common Crow, Black-capped Chickadee, House Wren, Gray Catbird, Brown Thrasher, American Robin, Wood Thrush, Veery, Blue-gray Gnatcher, Cedar Waxwing, Starling, Red-eyed Vireo, Ovenbird, Mourning Warbler, Common Grackle, Brown-headed Cowbird, Scarlet Tanager, Cardinal, Rose-breasted Grosbeak, Indigo Bunting and Rufous-sided Towhee. The birds which were dependent upon and restricted to sand forest were the Wood Thrush, Red-eyed Vireo, Ovenbird, Mourning Warbler, Scarlet Tanager and Rose-breasted Grosbeak.

Successional Developed Land: The physical structure of this habitat was savanna. The birds found within savanna would therefore also be found in successional developed land. However, the Warbling Vireo and Yellow-breasted Chat were primarily found in the savanna of successional developed land rather than "natural" savanna.

Streams: Green Heron, Canada Goose, Mallard, Blue-winged Teal, Wood Duck, American Coot, Killdeer, Spotted Sandpiper, Belted Kingfisher, Tree Swallow and Barn Swallow. None of these species were completely dependent upon and restricted entirely to streams.

Impoundments: Canada Goose, Mallard, Blue-winged Teal, Killdeer, Spotted Sandpiper, Belted Kingfisher, Tree Swallow, Bank Swallow and Rough-winged Swallow. None of these species were completely dependent upon and restricted entirely to impoundments.

Lake Michigan: Bank Swallow, Rough-winged Swallow, Barn Swallow and Common Crow. None of these species were completely dependent upon and restricted entirely to Lake Michigan.

MANAGEMENT RECOMMENDATIONS

1. Conservation of single species

The species for which we have management recommendations are:

Black-crowned Night Heron: This endangered species nests in the tall, large Eastern Cotton - Black Willow Thickets which are scattered throughout the marshes of I.B.S.P. The primary management consideration should be to not initiate any action that would cause the destruction of these rather widely scatterd thickets.

Upland Sandpiper: It is essential to maintain the short to medium grass prairie habitat inhabited by these birds. The prairie in the south end of the park (Map 3) is used by the Upland Sandpiper for nesting (Map 2) and is already protected. However, the grasslands in Camp Logan (Map 3) are not protected and are also used by nesting Upland Sandpipers (Map 2). These endangered birds are currently being disturbed during the nesting season by hunters running and training their dogs and by groups of people walking through the grasslands of Camp Logan. Camp Logan's prairies should be fully protected from human use during the nesting season (April 1 through August 31). Nondestructive use of Camp Logan's grasslands could be permitted throughout the rest of the year without damaging this species. Upland Sandpipers also nest in grasslands just north of Hosah Prairie (Maps 2 & 3). This area should therefore also receive protection during the nesting season. If possible, action should also be taken to aid in the protection of Zion Park District's Hosah Prairie. This area probably also contains nesting Upland Sandpipers and is continuous with their known nesting area in the I.D.O.C. property just mentioned. Zion officials have previously expressed an interest in protecting the Hosah Prairie area during public meetings.

Common Tern: This species does not currently nest within I.B.S.P. However, these birds have consistently attempted to nest within 1/4 of a mile of the park's southern border. They have also exhibited territorial behavior at several locations within the park during the early nesting season. We believe that they would attempt to nest within the park if suitable habitat was available. The I.D.O.C. Illinois Beach Master Management Plan Public Participation Workbook mentioned the possibility of the construction of armored headlands to retard the erosion of sand from the beach. If these headlands are constructed, they could be designed with a tall gravel top so as to accommodate nesting terns. These headlands would also have to be constructed so as to restrict human and terrestrial predator entrance. If several headlands are constructed some could be designated as tern nesting structures while others could be designated and designed for use by fishermen.

Veery: This species deserves mention since it is a threatened species. However, it was frequently encountered within the park and should continue to thrive within I.B.S.P. as long as savanna containing scattered thickets remains available. This habitat should persist without special management efforts.

Brewer's Blackbird: Approximately 3 pairs of this threatened species nested in the prairie in the south end of the park (Maps 2 & 3). This prairie should be managed so as to remain in its present grassland condition for these birds to persist.

Henslow's Sparrow: This threatened species nested in the prairie of Camp Logan and the south end of the park (Maps 2 & 3). As with the Upland Sandpiper, it will be essential to maintain the medium grass prairie habitat inhabited by these birds. The prairie in the south end of the park is protected and should continue to be managed so as to remain in its present grassy state. The prairie at Camp Logan must be made off limits to humans during the nesting season (April 1 to August 31). Also, a section of land at the northern edge of the prairie was plowed under this year. The plowed area was the site of a nesting Henslow's Sparrow last summer. This plowed area should be allowed to return to its previous grassy condition and no further plowing should be allowed.

2. Conservation of species groups

The species groups for which we have management recommendations are:

Uncommon Marsh and Marsh Ridge Nesting Species: Least Bittern, King Rail, Virginia Rail, Marsh Wren and Sedge Wren are included in this category. The extensive cattail marshes of I.B.S.P. are essential to these uncommon birds and should remain a permanent component of the park.

Unusual Warblers: Golden-winged Warbler, Chestnut-sided Warbler, Mourning Warbler and Yellow-breasted Chat are all members of this category. Our nesting records indicate that this years nesting by these species was an unpredictable, chance occurence. It would not be feasible to consider a management plan unless stable populations of these species would become established in the future.

3. Conservation of habitats

The habitats for which we have management recommendations are:

Marsh: As mentioned above, the extensive cattail marshes of I.B.S.P. are essential to several species of uncommon nesting birds and should remain a permanent feature of the park.

Sand Prairie: We classified all prairies of I.B.S.P. as sand prairie since the soils of the park are sandy. Prairie in Lake County and throughout the state is an unusual and disappearing habitat. It is essential that all prairie habitat within I.B.S.P. remain prairie. The prairie in the south of the park (Map 3) is already protected and should be managed so as to remain in its grassy state. The prairie just to the north of Hosah Prairie (Map 3) should be similarly managed. The prairie at Camp Logan (Map 3) is very important. It contains a large and diverse nesting avifauna. It is also the nesting site of at least 4 pairs of an endangered species, the Upland Sandpiper (Map 2) and of at least 3 pairs of a threatened species, the Henslow's Sparrow (Map 2). This site is currently disturbed during the nesting season. Hunters run and train their dogs and groups of people walk through the grasslands of Camp Logan. Camp Logan's prairies should be fully protected from human use during the nesting season(April 1 through August 31). Nondestructive use of Camp Logan's grasslands could be permitted throughout the rest of the year without damaging these birds. Baseball diamonds should not be allowed to develop since these would produce large grassless zones. The prairie at Camp Logan is also being threatened by the non-native trees that have been planted in the area. The White Poplar and Austrian Pines should be removed immediately before they spread throughout the prairie. Also, the section of land at the northern edge of the prairie which was plowed this year should be allowed to return to its previous grassy condition and no further plowing should be allowed. Camp Logan's grasslands are critically important as the nesting site of Upland Sandpipers and Henslow's Sparrows. These grasslands must be protected.

Savanna: The extensive savanna of I.B.S.P. was nesting habitat for at least 48 species of birds. It was also the nesting habitat of the uncommon and troubled Eastern Bluebird. The extensive savannas of I.B.S.P. should remain a permanent feature of the park so as to help maintain the diversity of habitats and wildlife.

Successional Developed Land: The successional developed land north of main street in the Winthrop Harbor area (Map 3) is of low natural quality. It already contains roads and would be appropriate for development into a "heavy use area". Much of the vegetation is not native and there are no endangered or threatened birds which use the area as a nesting site. Picnic areas, baseball diamonds, playgrounds, camping facilities, boating access, or virtually any heavy use activity could occur here with a minimum of significant environmental damage.

ANALYSIS OF I.D.O.C. AVIAN INVESTIGATION PROCEDURES

We were very well pleased with the I.D.O.C. investigation procedures. Since we have both studied birds in I.B.S.P. for several years we have a basis for assessing the accuracy of the methods used. We felt that these methods accurately and completely censused the avifauna of the park. The only changes we would suggest would be for the I.D.O.C. to have its Northern Illinois breeding bird censuses delay starting until June 1. There are still too many migrants present in May for the suggested May starting date. We also feel that the accuracy and completeness of the vegetation analysis could be improved by having the vegetation field work done in July rather than June. This would be particularly be helpful in grasslands since there are few native grasses sufficiently mature in June for easy identification. Overall, we were pleased with the methodology, enjoyed the fieldwork and would like to thank the I.D.O.C. for this chance to work with birds.

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LITERATURE CITED

Bohlen, David H. 1978. An annotated check-list of the birds of Illinois. Illinois State Museum Popular Science Series Vol. IX, Illinois State Museum, Springfield, Illinois.

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AVIAN ECOLOGICAL
INVESTIGATIONS

TABULATION SHEET

Site: Il. Beach State Park

Year: 1981

Page 1 of 3 (for this year)

Species (in A.O.U.* order)	Total Number of Different** TRANSECT LEGS Species	CENSUS STOPS Recorded	Species Present in Additional Habitats@	Estimated# Population	Habitat Preferences
Common Loon	1			0	late migrant
Pied-billed Grebe	1			1-5 prs	M.
Double-crested Cormorant		1		0	late migrant
Great Blue Heron	2	1	2	0	fly in to forage
Green Heron	4	6	10	16-50 pr	M,St,
Blk-crowned Night Heron			1	1-5 prs	S,M,
Ylw-crowned Night Heron	1			1-5 prs	SF,M,
Least Bittern	3	1	1	6-15 prs	M,
Canada Goose	3	2	4	1-5 prs	M,I,St,
Mallard	6	4	13	16-50 pr	M,I,St,
Blue-winged Teal	1		3	1-5 prs	M,I,St,
Wood Duck	3	3	3	6-15 prs	SF,M,St,
Red-tailed Hawk	2	1	3	1-5 prs	S,SF(edge),SP,
American Kestrel	3	2	1	1-5 prs	S,SP,
Ring-necked Pheasant	11	20	15	16-50 pr	SP,S,
Sandhill Crane		1	1	0	fly in to forage
King Rail			1	1-5 prs	M,
Virginia Rail	1	2	2	6-15 prs	M,
Sora			3	6-15 prs	M,
American Coot			1	1-5 prs	M,St,
Killdeer	5	3	9	6-15 prs	SP,I,St,
American Woodcock	8	1	1	16-50 pr	SP,M,SF,
Common Snipe			1	0	late migrant
Ruddy Turnstone			1	0	late migrant
Upland Sandpiper	4	2	9	6-15 prs	SP,
Spotted Sandpiper	1	1	1	1-5 prs	St,I,
Herring Gull	1		4	0	fly in to forage&re[illegible]
Ring-billed Gull	3	2	8	0	fly in to forage&re[illegible]
Franklin's Gull	1			0	late migrant
Common Tern	1		2	0	fly in to forage&re[illegible]
Black Tern			2	0	fly in to forage
Mourning Dove	10	16	10	16-50 pr	S,SP,
Rock Dove	2	3	2	6-15 prs	around buildings
Yellow-billed Cuckoo	4	5	5	16-50 pr	S,
Black-billed Cuckoo	4	7	2	6-15 prs	S,SF,
Screech Owl				6-15 prs	S,SF,
Great Horned Owl				1-5 prs	SF,S,
Whip-poor-will			3	6-15 prs	S,SF,
Common Nighthawk			1	1-5 prs	S,SP,
Chimney Swift	8	8	6	0	fly in to forage
Belted Kingfisher	2	2	2	1-5 prs	St,I,
Common Flicker	18	17	11	16-50 pr	S,SF,

* A.O.U. = American Ornithologists' Union

** Indicate the total number of different Transect Legs and Census Stops the species was recorded; five Transect Sets would have about 50 Census Stops and 55 Transect Legs.

@ If the species occurred in 6 of the "Additional" Census Stops established by the observer for qualitative sampling, enter the number 6 in this column.

\# Use one of the following categories for this column: 1-5 prs; 6-15 prs; 16-50 prs; or > 50 prs.

Observer: Scott Hickman
Jim Neal

Address: Biol. Department
College of Lake Co.
Grayslake, Il. 60030

AVIAN ECOLOGICAL INVESTIGATIONS

TABULATION SHEET

Site: Il. Beach State Park

Year: 1981

Species (in A.O.U.* order)	Total Number of Different** TRANSECT LEGS Species	CENSUS STOPS Recorded	Species Present in Additional Habitats@	Estimated# Population	Habitat Preferences
Red-headed Woodpecker	4	1	2	6-15 prs	S,SF,
Hairy Woodpecker	4	2	1	6-15 prs	S,SF,
Downy Woodpecker	2	4	0	6-15 prs	S,SF,
Eastern Kingbird	7	7	15	16-50 pr	S,SP,
Great Crested Flycatcher	13	15	5	16-50 pr	S,SF,
Willow Flycatcher	14	13	16	16-50 pr	S,SP,M,
Least Flycatcher	1	1	1	0	late migrant
Eastern Wood Pewee	6	7	11	6-15 pr	S,SF,
Olive-sided Flycatcher		1		0	late migrant
Tree Swallow	3	3	4	6-15 prs	S,M,I,St,
Bank Swallow	1	3	2	>50 prs	LM,I,
Rough-winged Swallow		3	4	1-5 prs	LM,SP,I,
Barn Swallow	9	7	11	16-50 pr	St,LM,SP,Buildings,
Purple Martin	5	7	4	6-15 prs	M,SP,Martin house,
Blue Jay	14	17	17	16-50 pr	SF,S,
Common Crow	17	19	15	16-50 pr	SF,S,SP,LM,
Black-capped Chickadee	14	9	10	16-50 pr	SF,S,M,
Tufted Titmouse		1		0	wanderer
House Wren	8	3	9	6-15 prs	SF,S
Marsh Wren	9	7	8	16-50 pr	M,
Sedge Wren	11	9	8	16-50 pr	SM,F,
Mockingbird	1			0	wanderer
Gray Catbird	11	14	11	16-50 pr	S,SF,M,
Brown Thrasher	11	9	11	16-50 pr	S,SF,M,
American Robin	17	21	18	16-50 pr	S,SF,
Wood Thrush		1		1-5 prs	SF,
Veery	4	7	5	6-15 prs	S,SF,
Eastern Bluebird			6	1-5 prs	S,
Blue-gray Gnatcatcher	1	4	3	1-5 prs	S,SF,
Cedar Waxwing	14	17	12	16-50 pr	S,SF,
Starling	13	18	18	16-50 pr	S,SF,
Red-eyed Vireo	7	9	6	6-15 pr	SF,
Warbling Vireo	5	5	1	6-15 pr	S,
Black-and-white Warbler	1		2	0	late migrant
Golden-winged Warbler			1	1-5 pr	S,
Blue-winged Warbler	1			1-5 pr	S,
Yellow Warbler	17	18	16	>50 pr	S,M,
Black-throated Green W			1	0	late migrant
Chestnut-sided Warbler	1	1		1-5 prs	S,
Bay-breasted Warbler		1		0	late migrant
Ovenbird	3		1	1-5 prs	SF,
Mourning Warbler	4	3	3	1-5 prs	SF,

* A.O.U. = American Ornithologists' Union

** Indicate the total number of different Transect Legs and Census Stops the species was recorded; five Transect Sets would have about 50 Census Stops and 55 Transect Legs.

@ If the species occurred in 6 of the "Additional" Census Stops established by the observer for qualitative sampling, enter the number 6 in this column.

\# Use one of the following categories for this column: 1-5 prs; 6-15 prs; 16-50 prs; or > 50 prs.

Observer: Scott Hickman
Jim Neal

Address: Biol. Department
College of Lake Co.
Grayslake, Il. 60030

AVIAN ECOLOGICAL INVESTIGATIONS

TABULATION SHEET

Site: Il. Beach State Park

Year: 1981

Page 3 of 3 (for this year)

Species (in A.O.U.* order)	Total Number of Different** TRANSECT LEGS Species	CENSUS STOPS Recorded	Species Present in Additional Habitats@	Estimated# Population	Habitat Preferences
Common Yellowthroat	20	20	17	>50 prs	S.M.
Yellow-breasted Chat	5	3		1-5 prs	S.
Wilson's Warbler			1	0	late migrant
Canada Warbler	2		1	0	late migrant
American Redstart	1		1	0	late migrant
House Sparrow	1			16-50 pr	around buildings
Bobolink	6	7	13	16-50 pr	SP.
Eastern Meadowlark	10	11	15	15-50 pr	SP.
Western Meadowlark	4	3	3	1-5 prs	SP.
Yellow-headed Blackbird	1	1	1	0	wanderer
Red-winged Blackbird	17	24	24	>50 prs	M.SM.
Orchard Oriole	1			0	wanderer
Northern Oriole	5	5	3	6-15 prs	S.
Brewer's Blackbird	2	2	2	1-5 prs	SP.
Common Grackle	20	22	22	>50 prs	S.SF.M.
Brown-headed Cowbird	12	13	13	>50 prs	S.SF.M.SP.SM.
Scarlet Tanager		1	2	1-5 prs	SF.
Cardinal	10	14	5	16-50 pr	S.SF.
Rose-breasted Grosbeak	4	4	2	1-5 prs	SF.
Indigo Bunting	11	11	9	16-50 pr	S.SF.
American Goldfinch	18	21	16	16-50 pr	S.SP.
Rufous-sided Towhee	8	9	13	16-50 pr	S.SF.
Savannah Sparrow	1	2	9	6-15 prs	SP.
Grasshopper Sparrow	3	3	11	16-50 pr	SP.
Henslow's Sparrow	2	3	5	6-15 prs	SP.
Vesper Sparrow	2	3	6	6-15 prs	SP.
Chipping Sparrow	1	1	5	1-5 prs	S.
Clay-colored Sparrow	1		1	0	late migrant
Field Sparrow	7	12	20	16-50 pr	S.SP.
Lincoln's Sparrow			2	0	late migrant
Swamp Sparrow	15	13	11	16-50 pr	M.SM.
Song Sparrow	10	13	12	16-50 pr	S.M.SP.

* A.O.U. = American Ornithologists' Union

** Indicate the total number of different Transect Legs and Census Stops the species was recorded; five Transect Sets would have about 50 Census Stops and 55 Transect Legs.

@ If the species occurred in 6 of the "Additional" Census Stops established by the observer for qualitative sampling, enter the number 6 in this column.

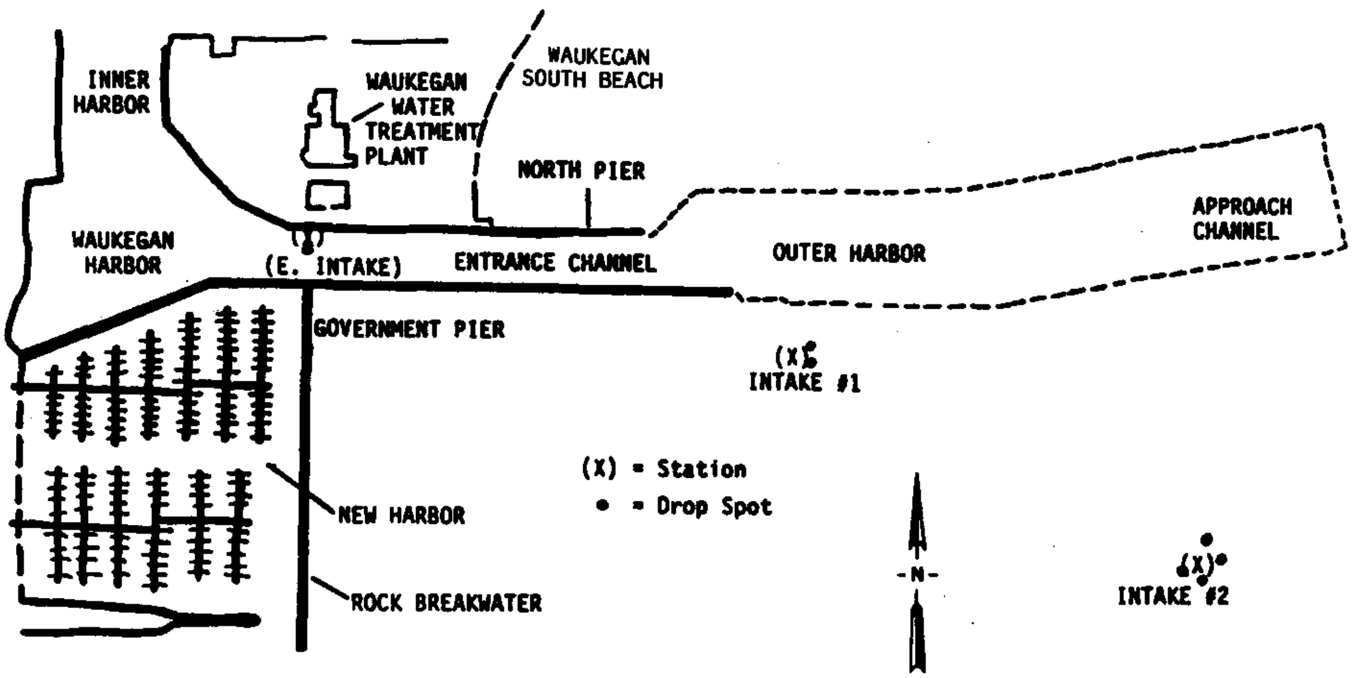
\# Use one of the following categories for this column: 1-5 prs; 6-15 prs; 16-50 prs; or > 50 prs.

APPENDIX K

Water and Sediment Quality Analyses,
Sampling at the Intakes of the
Waukegan Water Treatment Plant, April 1992
Sampling and Analyses by the
Illinois Environmental Protection Agency

APPENDIX K.1.

Location of sediment samples taken near the Waukegan Water Treatment Plant intakes April 24, 1992. Samples were collected and analyzed by the IEPA.



D216731

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

DIVISION OF PUBLIC WATER SUPPLIES

WATER QUALITY SAMPLING PROGRAM

DATE: 4/29/92

VOC ANALYSIS

Both 1A + 1B

COLLECT SAMPLE AT

FACILITY: Waukegan Fac. No. 0971900

MAIL REPORT TO:

NAME: Frank Chess

ADDR: City Hall, 106 North Utica St.

CITY: Waukegan STATE: IL ZIP: 60085

DATE COLLECTED: 4/29/92

TIME COLLECTED: 11:30 AM

SAMPLE COLLECTOR: EARAP/AL

PHONE NUMBER: (708) 781-2221

FUNDING CODE: PW30
AGENCY ROUTING:
SAMPLE TYPE:
PURPOSE: 5-Special
RPT INDICATOR: B
SUBMIT SRCE:
SMPL PROGRAM: VO-WQVOC
PARM GROUP:

FACILITY:

SAMPLE LOCATION Finished

RECEIVED
REGION 2
JUN 03 1992
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

FROM: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

TO:

, IL

FROM:

, IL

TO: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

RECEIVED
MAY 19 1992
Environmental Protection Agency
State of Illinois

---LAB USE ONLY---

SAMPLE NUMBER D216731

DATE RECEIVED MAY 1 1992

TIME RECEIVED EPA 11:00

RECEIVED BY

DATE FORWARDED 5-13-92

IL 532-0761 PWS-31 (REV.7-87)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216731
SAMPLING POINT DESC. : WAUKEGAN/FINISHED/BOTTLE A & B

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1130 SAMPLING PROGRAM : VO

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : VOCS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

DATE RECEIVED : 920411 TIME RECEIVED : 1100 RECEIVED BY : S P
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D216733
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

mbc 5/29/92

: .
: .
: .
: .
: TRIHALOMETHANES

P32106	CHLOROFORM	UG/L : 11
P32101	BROMODICHLOROMETHANE	UG/L : 6.0
P32105	CHLORODIBROMOMETHANE	UG/L : 1.9
P32104	BROMOFORM	UG/L : 0.5K

: .
.
.
: REGULATED VOLATILE ORGANIC COMPOUNDS

P34506	1,1,1-TRICHLOROETHANE	UG/L : 0.5K
P34511	1,1,2-TRICHLOROETHANE	UG/L : 0.5K
P34501	1,1-DICHLOROETHYLENE	UG/L : 0.5K
P34551	1,2,4-TRICHLOROBENZENE	UG/L : 0.5K
[illegible]4536	1,2-DICHLOROBENZENE	UG/L : 0.5K
[illegible]103	1,2-DICHLOROETHANE	UG/L : 0.5K
[illegible]34541	1,2-DICHLOROPROPANE	UG/L : 0.5K
P34571	1,4-DICHLOROBENZENE	UG/L : 0.5K
P34030	BENZENE	UG/L : 0.5K
P32102	CARBON TETRACHLORIDE	UG/L : 0.5K
P34301	CHLOROBENZENE	UG/L : 0.5K
P77093	CIS-1,2-DICHLOROETHYLENE	UG/L : 0.5K
P34371	ETHYLBENZENE	UG/L : 0.5K
P34423	METHYLENE CHLORIDE	UG/L : 0.5K
P77128	STYRENE	UG/L : 0.5K
P34475	TETRACHLOROETHYLENE	UG/L : 0.5K

SAMPLE NUMBER : D216731

P34010	TOLUENE	UG/L : 0.5K
P81551	TOTAL XYLENES	UG/L : 0.5K
P34546	TRANS-1,2-DICHLOROETHYLENE	UG/L : 0.5K
P39180	TRICHLOROETHYLENE	UG/L : 0.5K
P39175	VINYL CHLORIDE	UG/L : 0.5K

: UNREGULATED VOLATILE ORGANIC COMPOUNDS

: .

P77562	1,1,1,2-TETRACHLOROETHANE	UG/L : 0.5K
P34516	1,1,2,2-TETRACHLOROETHANE	UG/L : 0.5K
P34496	1,1-DICHLOROETHANE	UG/L : 0.5K
P77168	1,1-DICHLOROPROPENE	UG/L : 0.5K
P77443	1,2,3-TRICHLOROPROPANE	UG/L : 0.5K
P34566	1,3-DICHLOROBENZENE	UG/L : 0.5K
P77173	1,3-DICHLOROPROPANE	UG/L : 0.5K
P77170	2,2-DICHLOROPROPANE	UG/L : 0.5K
P81555	BROMOBENZENE	UG/L : 0.5K
P34413	BROMOMETHANE	UG/L : 0.5K
P34311	CHLOROETHANE	UG/L : 0.5K
P34418	CHLOROMETHANE	UG/L : 0.5K
P34704	CIS-1,3-DICHLOROPROPENE	UG/L : 0.5K
P81522	DIBROMOMETHANE	UG/L : 0.5K
P77970	TOTAL CHLOROTOLUENES	UG/L : 0.5K
P34699	TRANS-1,3-DICHLOROPROPENE	UG/L : 0.5K

: .

D216732

Illinois Environmental Protection Agency • P.O. Box 19276, Springfield, IL 62794-9276

DIVISION OF PUBLIC WATER SUPPLIES

WATER QUALITY SAMPLING PROGRAM:

VOC ANALYSIS

Bottle 7A + 2B

DATE: 4/29/92

COLLECT SAMPLE AT

FACILITY: Waukegan Fac. No. 0971900

MAIL REPORT TO:

NAME: Frank Chess

ADDR: City Hall, 106 North Utica St.

CITY: Waukegan STATE: IL ZIP: 60085

DATE COLLECTED: 4/29/92

TIME COLLECTED: 11:30 AM

SAMPLE COLLECTOR: E. ABBAS/AL

PHONE NUMBER: (708) 781-2271

FUNDING CODE: PW30

AGENCY ROUTING:

SAMPLE TYPE:

PURPOSE: 5-Special

RPT INDICATOR: B

SUBMIT SRCE:

SMPL PROGRAM: VO-WQVOC

PARM GROUP:

FACILITY:

SAMPLE LOCATION Finished

RECEIVED
REGION 2
JUN 03 1992
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

FROM: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

TO:

, IL

FROM:

, IL

TO: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

---LAB USE ONLY---

SAMPLE NUMBER D216732

DATE RECEIVED MAY 1 992

TIME RECEIVED ~~MAY 1 992~~ EPE

RECEIVED BY SD

DATE FORWARDED 5-18-92 K-5

RECEIVED
MAY 19 1992
Environmental Protection Agency
State of Illinois

IL 532-0761 PWS-31 (REV.7-87)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216732
SAMPLING POINT DESC. : WAUKEGAN/FINISHED/BOTTLES 2A & 2B

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1130 SAMPLING PROGRAM : VO

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : VOCS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : 8

DATE RECEIVED : 920501 TIME RECEIVED : 1100 RECEIVED BY : S P
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D216733
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

mbc 5/29/92

: .
: .
: .
: .
: TRIHALOMETHANES

P32106	CHLOROFORM	UG/L : 12
P32101	BROMODICHLOROMETHANE	UG/L : 7.2
P32105	CHLORODIBROMOMETHANE	UG/L : 2.3
P32104	BROMOFORM	UG/L : 0.5K

: .
: .
: .
: REGULATED VOLATILE ORGANIC COMPOUNDS

P34506	1,1,1-TRICHLOROETHANE	UG/L : 0.5K
P34511	1,1,2-TRICHLOROETHANE	UG/L : 0.5K
P34501	1,1-DICHLOROETHYLENE	UG/L : 0.5K
P34551	1,2,4-TRICHLOROBENZENE	UG/L : 0.5K
P34536	1,2-DICHLOROBENZENE	UG/L : 0.5K
P32103	1,2-DICHLOROETHANE	UG/L : 0.5K
P34541	1,2-DICHLOROPROPANE	UG/L : 0.5K
P34571	1,4-DICHLOROBENZENE	UG/L : 0.5K
P34030	BENZENE	UG/L : 0.5K
P32102	CARBON TETRACHLORIDE	UG/L : 0.5K
P34301	CHLOROBENZENE	UG/L : 0.5K
P77093	CIS-1,2-DICHLOROETHYLENE	UG/L : 0.5K
P34371	ETHYLBENZENE	UG/L : 0.5K
P34423	METHYLENE CHLORIDE	UG/L : 0.5K
P77128	STYRENE	UG/L : 0.5K
P34475	TETRACHLOROETHYLENE	UG/L : 0.5K

AMPLE NUMBER : D216732

34010 TOLUENE	UG/L :	0.5K
551 TOTAL XYLENES	UG/L :	0.5K
P34546 TRANS-1,2-DICHLOROETHYLENE	UG/L :	0.5K
P39180 TRICHLOROETHYLENE	UG/L :	0.5K
P39175 VINYL CHLORIDE	UG/L :	0.5K

: UNREGULATED VOLATILE ORGANIC COMPOUNDS

:

P77562 1,1,1,2-TETRACHLOROETHANE	UG/L :	0.5K
P34516 1,1,2,2-TETRACHLOROETHANE	UG/L :	0.5K
P34496 1,1-DICHLOROETHANE	UG/L :	0.5K
P77168 1,1-DICHLOROPROPENE	UG/L :	0.5K
P77443 1,2,3-TRICHLOROPROPANE	UG/L :	0.5K
P34566 1,3-DICHLOROBENZENE	UG/L :	0.5K
P77173 1,3-DICHLOROPROPANE	UG/L :	0.5K
P77170 2,2-DICHLOROPROPANE	UG/L :	0.5K
P81555 BROMOBENZENE	UG/L :	0.5K
P34413 BROMOMETHANE	UG/L :	0.5K
P34311 CHLOROETHANE	UG/L :	0.5K
P34418 CHLOROMETHANE	UG/L :	0.5K
P34704 CIS-1,3-DICHLOROPROPENE	UG/L :	0.5K
P81522 DIBROMOMETHANE	UG/L :	0.5K
P77970 TOTAL CHLOROTOLUENES	UG/L :	0.5K
P34699 TRANS-1,3-DICHLOROPROPENE	UG/L :	0.5K

D216734

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

DIVISION OF PUBLIC WATER SUPPLIES

WATER QUALITY SAMPLING PROGRAM:

VOC ANALYSIS

Both 2A + 2B

DATE: 4/29/92

COLLECT SAMPLE AT

FACILITY: Waukegan Fac No 0971900

MAIL REPORT TO:

NAME: Frank Chess

ADDR: City Hall, 106 North Utica St

CITY: Waukegan STATE: IL ZIP: 60085

DATE COLLECTED: 4/29/92

TIME COLLECTED: 11:50 AM

SAMPLE COLLECTOR: EABAP/AL

PHONE NUMBER: (708) 781-2221

FUNDING CODE: PW30

AGENCY ROUTING:

SAMPLE TYPE:

PURPOSE: 5-Special

RPT INDICATOR: B

SUBMIT SRCE:

SMPL PROGRAM: VO-WQVOC

PARM GROUP:

FACILITY:

SAMPLE LOCATION Raw (Plant)

RECEIVED
REGION 2
JUN 0 3 1992
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

FROM: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

TO:

, IL

FROM:

, IL

TO: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

RECEIVED
MAY 1 9 1992
Environmental Protection Agency
State of Illinois

---LAB USE ONLY---

SAMPLE NUMBER D216734

DATE RECEIVED MAY 1 1992

TIME RECEIVED 11 EPA

RECEIVED BY SP K-8

DATE FORWARDED 5-18-92 SPVSR

IL 532-0761 PWS-31 (REV.7-87)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216734
SAMPLING POINT DESC. : WAUKEGAN/RAW (PLANT) BOTTLES 2A & 2B

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1150 SAMPLING PROGRAM : VO

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : VOCS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : 8

DATE RECEIVED : 920501 TIME RECEIVED : 1100 RECEIVED BY : S P
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D216736
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

mbc 5/29/9

: TRIHALOMETHANES

P32106	CHLOROFORM	UG/L : 0.5K
P32101	BROMODICHLOROMETHANE	UG/L : 0.5K
P32105	CHLORODIBROMOMETHANE	UG/L : 0.5K
P32104	BROMOFORM	UG/L : 0.5K

: REGULATED VOLATILE ORGANIC COMPOUNDS

P34506	1,1,1-TRICHLOROETHANE	UG/L : 0.5K
P34511	1,1,2-TRICHLOROETHANE	UG/L : 0.5K
P34501	1,1-DICHLOROETHYLENE	UG/L : 0.5K
P34551	1,2,4-TRICHLOROBENZENE	UG/L : 0.5K
P34536	1,2-DICHLOROBENZENE	UG/L : 0.5K
P32103	1,2-DICHLOROETHANE	UG/L : 0.5K
P34541	1,2-DICHLOROPROPANE	UG/L : 0.5K
P34571	1,4-DICHLOROBENZENE	UG/L : 0.5K
P34030	BENZENE	UG/L : 0.5K
P32102	CARBON TETRACHLORIDE	UG/L : 0.5K
P34301	CHLOROBENZENE	UG/L : 0.5K
P77093	CIS-1,2-DICHLOROETHYLENE	UG/L : 0.5K
P34371	ETHYLBENZENE	UG/L : 0.5K
P34423	METHYLENE CHLORIDE	UG/L : 0.5K
P77128	STYRENE	UG/L : 0.5K
P34475	TETRACHLOROETHYLENE	UG/L : 0.5K

SAMPLE NUMBER : 0216734

P34010	TOLUENE	UG/L : 0.5K
P81551	TOTAL XYLENES	UG/L : 0.5K
P34546	TRANS-1,2-DICHLOROETHYLENE	UG/L : 0.5K
P39180	TRICHLOROETHYLENE	UG/L : 0.5K
P39175	VINYL CHLORIDE	UG/L : 0.5K

: UNREGULATED VOLATILE ORGANIC COMPOUNDS

: .

P77562	1,1,1,2-TETRACHLOROETHANE	UG/L : 0.5K
P34516	1,1,2,2-TETRACHLOROETHANE	UG/L : 0.5K
P34496	1,1-DICHLOROETHANE	UG/L : 0.5K
P77168	1,1-DICHLOROPROPENE	UG/L : 0.5K
P77443	1,2,3-TRICHLOROPROPANE	UG/L : 0.5K
P34566	1,3-DICHLOROBENZENE	UG/L : 0.5K
P77173	1,3-DICHLOROPROPANE	UG/L : 0.5K
P77170	2,2-DICHLOROPROPANE	UG/L : 0.5K
P81555	BROMOBENZENE	UG/L : 0.5K
P34413	BROMOMETHANE	UG/L : 0.5K
P34311	CHLOROETHANE	UG/L : 0.5K
P34418	CHLOROMETHANE	UG/L : 0.5K
P34704	CIS-1,3-DICHLOROPROPENE	UG/L : 0.5K
P81522	DIBROMOMETHANE	UG/L : 0.5K
P77970	TOTAL CHLOROTOLUENES	UG/L : 0.5K
P34699	TRANS-1,3-DICHLOROPROPENE	UG/L : 0.5K

: .

D216735

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

DIVISION OF PUBLIC WATER SUPPLIES

WATER QUALITY SAMPLING PROGRAM:

VOC ANALYSIS

Bottle 1A + 1B

DATE: 4/29/92

0971900

COLLECT SAMPLE AT

FACILITY: Waukegan Fac. No. 0971900

MAIL REPORT TO:

NAME: Frank Chess

ADDR: City Hall, 106 North Utica St.

CITY: Waukegan STATE: IL ZIP: 60085

DATE COLLECTED: 4/29/92

TIME COLLECTED: 11:30AM

SAMPLE COLLECTOR: E.ABBAP/AL

PHONE NUMBER: (708) 721-2221

FUNDING CODE: PW30
AGENCY ROUTING:
SAMPLE TYPE:
PURPOSE: 5-Special
RPT INDICATOR: B
SUBMIT SRCE:
SMPL PROGRAM: VO-WQVOC
PARM GROUP:

FACILITY:

SAMPLE LOCATION Raw (Plant)

RECEIVED
REGION 2
JUN 03 1992
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

FROM: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

TO:

, IL

FROM:

, IL

TO: IL EPA LABORATORY SERVICES
4th FLOOR
825 N. RUTLEDGE
SPRINGFIELD, IL 62702

---LAB USE ONLY---

RECEIVED
MAY 19 1992
Environmental Protection Agency
State of Illinois

SAMPLE NUMBER D216735

DATE RECEIVED MAY 1 1992

TIME RECEIVED 11- EPA

RECEIVED BY SD K-11

DATE FORWARDED 5-18-92 SPVSR

IL 532-0761 PWS-31 (REV.7-87)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216735
SAMPLING POINT DESC. : WAUKEGAN/RAW (PLANT) BOTTLES 1A & 1B

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1150 SAMPLING PROGRAM : VO

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : VOCS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

DATE RECEIVED : 920501 TIME RECEIVED : 1100 RECEIVED BY : S P
LAB OBSERVATIONS : 2 VOC TRIP BL SAM# : D216736
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

MBC 5/29/9

: .
: .
: .
: .
: TRIHALOMETHANES

P32106	CHLOROFORM	UG/L : 0.5K
P32101	BROMODICHLOROMETHANE	UG/L : 0.5K
P32105	CHLORODIBROMOMETHANE	UG/L : 0.5K
P32104	BROMOFORM	UG/L : 0.5K

: .
: .
: .
: REGULATED VOLATILE ORGANIC COMPOUNDS

P34506	1,1,1-TRICHLOROETHANE	UG/L : 0.5K
P34511	1,1,2-TRICHLOROETHANE	UG/L : 0.5K
P34501	1,1-DICHLOROETHYLENE	UG/L : 0.5K
P34551	1,2,4-TRICHLOROBENZENE	UG/L : 0.5K
P34536	1,2-DICHLOROBENZENE	UG/L : 0.5K
P32103	1,2-DICHLOROETHANE	UG/L : 0.5K
P34541	1,2-DICHLOROPROPANE	UG/L : 0.5K
P34571	1,4-DICHLOROBENZENE	UG/L : 0.5K
P34030	BENZENE	UG/L : 0.5K
P32102	CARBON TETRACHLORIDE	UG/L : 0.5K
P34301	CHLOROBENZENE	UG/L : 0.5K
P77093	CIS-1,2-DICHLOROETHYLENE	UG/L : 0.5K
P34371	ETHYLBENZENE	UG/L : 0.5K
P34423	METHYLENE CHLORIDE	UG/L : 0.5K
P77128	STYRENE	UG/L : 0.5K
P34475	TETRACHLOROETHYLENE	UG/L : 0.5K

AMPLE NUMBER . 0216735

P34010 TOLUENE	UG/L	: 0.5K
1551 TOTAL XYLENES	UG/L	: 0.5K
546 TRANS-1,2-DICHLOROETHYLENE	UG/L	: 0.5K
P39180 TRICHLOROETHYLENE	UG/L	: 0.5K
P39175 VINYL CHLORIDE	UG/L	: 0.5K

: UNREGULATED VOLATILE ORGANIC COMPOUNDS

P77562 1,1,1,2-TETRACHLOROETHANE	UG/L	: 0.5K
P34516 1,1,2,2-TETRACHLOROETHANE	UG/L	: 0.5K
P34496 1,1-DICHLOROETHANE	UG/L	: 0.5K
P77168 1,1-DICHLOROPROPENE	UG/L	: 0.5K
P77443 1,2,3-TRICHLOROPROPANE	UG/L	: 0.5K
P34566 1,3-DICHLOROBENZENE	UG/L	: 0.5K
P77173 1,3-DICHLOROPROPANE	UG/L	: 0.5K
P77170 2,2-DICHLOROPROPANE	UG/L	: 0.5K
P81555 BROMOBENZENE	UG/L	: 0.5K
P34413 BROMOMETHANE	UG/L	: 0.5K
P34311 CHLOROETHANE	UG/L	: 0.5K
P34418 CHLOROMETHANE	UG/L	: 0.5K
P34704 CIS-1,3-DICHLOROPROPENE	UG/L	: 0.5K
P81522 DIBROMOMETHANE	UG/L	: 0.5K
P77970 TOTAL CHLOROTOLUENES	UG/L	: 0.5K
P34699 TRANS-1,3-DICHLOROPROPENE	UG/L	: 0.5K

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216736
SAMPLING POINT DESC. : BLANK W/16733-34 WAUKEGAN

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1150 SAMPLING PROGRAM : VO

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : VOCS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : 8 REPORTING INDICATOR : 8

DATE RECEIVED : 920501 TIME RECEIVED : 1100 RECEIVED BY : S P
LAB OBSERVATIONS : 2 BLANKS TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

: .
: .
: .
: .
: TRIHALOMETHANES

P32106	CHLOROFORM	UG/L	0.5K
P32101	BROMODICHLOROMETHANE	UG/L	0.5K
P32105	CHLORODIBROMOMETHANE	UG/L	0.5K
P32104	BROMOFORM	UG/L	0.5K

: .
: .
: .
: REGULATED VOLATILE ORGANIC COMPOUNDS

P34506	1,1,1-TRICHLOROETHANE	UG/L	0.5K
P34511	1,1,2-TRICHLOROETHANE	UG/L	0.5K
P34501	1,1-DICHLOROETHYLENE	UG/L	0.5K
P34551	1,2,4-TRICHLOROBENZENE	UG/L	0.5K
P34536	1,2-DICHLOROBENZENE	UG/L	0.5K
P32103	1,2-DICHLOROETHANE	UG/L	0.5K
P34541	1,2-DICHLOROPROPANE	UG/L	0.5K
P34571	1,4-DICHLOROBENZENE	UG/L	0.5K
P34030	BENZENE	UG/L	0.5K
P32102	CARBON TETRACHLORIDE	UG/L	0.5K
P34301	CHLOROBENZENE	UG/L	0.5K
P77093	CIS-1,2-DICHLOROETHYLENE	UG/L	0.5K
P34371	ETHYLBENZENE	UG/L	0.5K
P34423	METHYLENE CHLORIDE	UG/L	0.5K
P77128	STYRENE	UG/L	0.5K
P34475	TETRACHLOROETHYLENE	UG/L	0.5K

AMPLE NUMBER : 0216736

P34010 TOLUENE	UG/L	: 0.5K
P81551 TOTAL XYLENES	UG/L	: 0.5K
34546 TRANS-1,2-DICHLOROETHYLENE	UG/L	: 0.5K
P39180 TRICHLOROETHYLENE	UG/L	: 0.5K
P39175 VINYL CHLORIDE	UG/L	: 0.5K

: UNREGULATED VOLATILE ORGANIC COMPOUNDS
: .

P77562 1,1,1,2-TETRACHLOROETHANE	UG/L	: 0.5K
P34516 1,1,2,2-TETRACHLOROETHANE	UG/L	: 0.5K
P34496 1,1-DICHLOROETHANE	UG/L	: 0.5K
P77168 1,1-DICHLOROPROPENE	UG/L	: 0.5K
P77443 1,2,3-TRICHLOROPROPANE	UG/L	: 0.5K
P34566 1,3-DICHLOROBENZENE	UG/L	: 0.5K
P77173 1,3-DICHLOROPROPANE	UG/L	: 0.5K
P77170 2,2-DICHLOROPROPANE	UG/L	: 0.5K
P81555 BROMOBENZENE	UG/L	: 0.5K
P34413 BROMOMETHANE	UG/L	: 0.5K
P34311 CHLOROETHANE	UG/L	: 0.5K
P34418 CHLOROMETHANE	UG/L	: 0.5K
P34704 CIS-1,3-DICHLOROPROPENE	UG/L	: 0.5K
P81522 DIBROMOMETHANE	UG/L	: 0.5K
P77970 TOTAL CHLOROTOLUENES	UG/L	: 0.5K
P34699 TRANS-1,3-DICHLOROPROPENE	UG/L	: 0.5K

: .

D216750 (4)

Illinois Environmental Protection Agency

[redacted]

PESTICIDES, PCB, ORGANICS
HERBICIDES

Waukegan
Fac. No. 0971900

Samples Scheduled During:

Date and Time in Laboratory: MAY 1 1992

Received By: AP

1. Mail Report To: Name: Frank Chess	2. Date Collected: 4/27/92 — 3. Time Collected: 11:50 AM
Address: City Hall, 106 North Utica St.	4. Sample Collector: E-Asad/Ali
Post Office: Waukegan State: IL Zip Code: 60085	5. Sampling Point: Raw at Plant
	6. Temperature: ☐ Celcius ☐ Fahrenheit
COLLECTOR: *Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.*	7. pH: — 8. Chlorine Residual:

PARAMETER	Concentration µg/l	PARAMETER	Concentration µg/l
methylene chloride			
1,1-dichloroethane			
dichloroethylene		RECEIVED	
chloroform		REGION 2	
1,2-dichloroethane			
1,1,1-trichloroethane		JUN 05 1992	
carbon tetrachloride		Div. Public Water Supplies	
dichlorobromomethane		State of Illinois Environmental Protection Agency	
trichloroethylene			
dibromochloromethane			
bromoform			
tetrachloroethylene			
benzene			
toluene			
chlorobenzene			
ethylbenzene			
xylenes (total)			
dichlorobenzene			

-Laboratory Use Only-

Laboratory Number: D216750

Date Forwarded: 5-28-92 By: J. Hurley

-DPWS Use Only-

RECEIVED

JUN 01 1992

Environmental Protection Agency
State of Illinois

This Agency is authorized to require this information under ILLINOIS REVISED STATUTES, 1979, Chapter 111½, Sec. 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

K-16

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216750
SAMPLING POINT DESC. : WAUKEGAN/RAT AT PLANT/A

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1150 SAMPLING PROGRAM :

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : PESTS/PCB/ORGANICS/HERBS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

RECEIVED : 920501 TIME RECEIVED : 1110 RECEIVED BY : A P
[illegible] OBSERVATIONS : 1 GAL WATER TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

6/3/92
mz

P39340	GAMMA-BHC (LINDANE)	UG/L	.01K
P39410	HEPTACHLOR	UG/L	.01K
P39330	ALDRIN	UG/L	.01K
P39420	HEPTACHLOR EPOXIDE	UG/L	.01K
P39348	ALPHA-CHLORDANE	UG/L	.01K
P39810	GAMMA-CHLORDANE	UG/L	.01K
P39380	DIELDRIN	UG/L	.01K
P39390	ENDRIN	UG/L	.01K
P39480	METHOXYCHLOR	UG/L	.05K
P39327	O,P'-DDE	UG/L	.01K
P39320	P,P'-DDE	UG/L	.01K
P39315	O,P'-DDD	UG/L	.01K
P39310	P,P'-DDD	UG/L	.01K
[illegible]305	O,P'-DDT	UG/L	.01K
[illegible]	P,P'-DDT	UG/L	.01K
[illegible]	TOTAL PCBS	UG/L	0.1K
P34694	PHENOL	UG/L	5.0K
P34273	BIS(2-CHLOROETHYL)ETHER	UG/L	5.0K
P34586	2-CHLOROPHENOL	UG/L	5.0K
P34566	1,3-DICHLOROBENZENE	UG/L	5.0K
P34571	1,4-DICHLOROBENZENE	UG/L	5.0K
P77147	BENZYL ALCOHOL	UG/L	5.0K
P34536	1,2-DICHLOROBENZENE	UG/L	5.0K
A00000	2-METHYLPHENOL	UG/L	5.0K
P34283	BIS(2-CHLOROISOPROPYL)ETHER	UG/L	5.0K
A00000	4-METHYLPHENOL	UG/L	5.0K
P34428	N-NITROSO-DI-N-PROPYLAMINE	UG/L	5.0K
P34396	HEXACHLOROETHANE	UG/L	5.0K
P34447	NITROBENZENE	UG/L	5.0K

P34408	ISOPHORONE	UG/L : 5.0K
P34591	2-NITROPHENOL	UG/L : 5.0K
P34606	2,4-DIMETHYLPHENOL	UG/L : 5.0K
P77247	BENZOIC ACID	UG/L : 50K
P34278	BIS(2-CHLOROETHOXY)METHANE	UG/L : 5.0K
P34601	2,4-DICHLOROPHENOL	UG/L : 5.0K
P34551	1,2,4-TRICHLOROBENZENE	UG/L : 5.0K
P34696	NAPHTHALENE	UG/L : 5.0K
A00000	4-CHLOROANILINE	UG/L : 5.0K
P34391	HEXACHLOROBUTADIENE	UG/L : 5.0K
P34452	4-CHLORO-3-METHYLPHENOL	UG/L : 5.0K
P77416	2-METHYLNAPHTHALENE	UG/L : 5.0K
P34386	HEXACHLOROCYCLOPENTADIENE	UG/L : 5.0K
P34621	2,4,6-TRICHLOROPHENOL	UG/L : 5.0K
P77687	2,4,5-TRICHLOROPHENOL	UG/L : 5.0K
P34581	2-CHLORONAPHTHALENE	UG/L : 5.0K
A00000	2-NITROANILINE	UG/L : 10K
P34341	DIMETHYLPHTHALATE	UG/L : 5.0K
P34200	ACENAPHTHYLENE	UG/L : 5.0K
P34626	2,6-DINITROTOLUENE	UG/L : 5.0K
P78300	3-NITROANILINE	UG/L : 10K
P34205	ACENAPHTHENE	UG/L : 5.0K
P34616	2,4-DINITROPHENOL	UG/L : 10K
P34646	4-NITROPHENOL	UG/L : 10K
P81302	DIBENZOFURAN	UG/L : 5.0K
P34611	2,4-DINITROTOLUENE	UG/L : 5.0K
P34336	DIETHYLPHTHALATE	UG/L : 5.0K
P34641	4-CHLOROPHENYL PHENYL ETHER	UG/L : 5.0K
P34381	FLUORENE	UG/L : 5.0K
A00000	4-NITROANILINE	UG/L : 10K
A00000	4,6-DINITRO-2-METHYLPHENOL	UG/L : 10K
P34636	4-BROMOPHENYL PHENYL ETHER	UG/L : 5.0K
P39700	HEXACHLOROBENZENE	UG/L : 5.0K
P39032	PENTACHLOROPHENOL	UG/L : 10K
P34461	PHENANTHRENE	UG/L : 5.0K
P34220	ANTHRACENE	UG/L : 5.0K
P39110	DI-N-BUTYLPHTHLATE	UG/L : 5.0K
P34376	FLUORANTHENE	UG/L : 5.0K
P34469	PYRENE	UG/L : 5.0K
P34292	BUTYL BENZYL PHTHALATE	UG/L : 5.0K
P34631	3,3'-DICHLOROBENZIDINE	UG/L : 10K
P34526	BENZO(A)ANTHRACENE	UG/L : 5.0K
P34320	CHRYSENE	UG/L : 5.0K

AMPLE NUMBER : D216750

P39100	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	:	5.0K
P34596	DI-N-OCTYLPHTHALATE	UG/L	:	5.0K
P34230	BENZO(B)FLUORANTHENE	UG/L	:	5.0K
P34242	BENZO(K)FLUORANTHENE	UG/L	:	5.0K
P34247	BENZO(A)PYRENE	UG/L	:	5.0K
P34403	INDENO(1,2,3-CD)PYRENE	UG/L	:	5.0K
P34556	DIBENZO(AH)ANTHRACENE	UG/L	:	5.0K
P34521	BENZO(GHI)PERYLENE	UG/L	:	5.0K

D216751 (+)

[redacted]

Illinois Environmental Protection Agency

Waukegan
Fac. No. 0971900

PESTICIDES, PCB, ORGANICS
HERBICIDES

Samples Scheduled During:

Date and Time in Laboratory: MAY 1 1992

Received By:

. Mail Report To:
ame: Frank Chess
ddress: City Hall, 106 North Utica St.
ost Office: Waukegan State: IL Zip Code: 60085

OLLECTOR: Fill in shaded area only. Type or use black ball point pen. See everse side for explanations and instructions.

2. Date Collected: 4/29/92
3. Time Collected: 11:30 Am
4. Sample Collector: E. ABAD/AL
5. Sampling Point: Finished
6. Temperature: ☐ Celcius ☐ Fahrenheit
7. pH:
8. Chlorine Residual:

ARAMETER	Concentration µg/l
ethylene chloride	
,1-dichloroethane	
ichloroethylene	
hloroform	
,2-dichloroethane	
,1,1-trichloroethane	
arbon tetrachloride	
ichlorobromomethane	
richloroethylene	
ibromochloromethane	
romoform	
etrachloroethylene	
enzene	
oluene	
hlorobenzene	
thylbenzene	
ylenes (total)	
ichlorobenzene	

PARAMETER	Concentration µg/l

RECEIVED
REGION 2
JUN 05 1992
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

-Laboratory Use Only-

Laboratory Number: D216751

Date Forwarded: 5-28-92 By: J Hurley

-DPWS Use Only-

RECEIVED
JUN 01 1992
Environmental Protection Agency
State of Illinois

This Agency is authorized to require this information under ILLINOIS REVISED STATUTES, 1979, Chapter 111½, Sec. 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

K-20

AMPLE NUMBER : DL16751

P34408	ISOPHORONE	UG/L :	5.0K
P34591	2-NITROPHENOL	UG/L :	5.0K
P34606	2,4-DIMETHYLPHENOL	UG/L :	5.0K
P77247	BENZOIC ACID	UG/L :	50K
P34278	BIS(2-CHLOROETHOXY)METHANE	UG/L :	5.0K
P34601	2,4-DICHLOROPHENOL	UG/L :	5.0K
P34551	1,2,4-TRICHLOROBENZENE	UG/L :	5.0K
P34696	NAPHTHALENE	UG/L :	5.0K
A00000	4-CHLOROANILINE	UG/L :	5.0K
P34391	HEXACHLOROBUTADIENE	UG/L :	5.0K
P34452	4-CHLORO-3-METHYLPHENOL	UG/L :	5.0K
P77416	2-METHYLNAPHTHALENE	UG/L :	5.0K
P34386	HEXACHLOROCYCLOPENTADIENE	UG/L :	5.0K
P34621	2,4,6-TRICHLOROPHENOL	UG/L :	5.0K
P77687	2,4,5-TRICHLOROPHENOL	UG/L :	5.0K
P34581	2-CHLORONAPHTHALENE	UG/L :	5.0K
A00000	2-NITROANILINE	UG/L :	10K
P34341	DIMETHYLPHTHALATE	UG/L :	5.0K
P34200	ACENAPHTHYLENE	UG/L :	5.0K
P34626	2,6-DINITROTOLUENE	UG/L :	5.0K
P78300	3-NITROANILINE	UG/L :	10K
P34205	ACENAPHTHENE	UG/L :	5.0K
P34616	2,4-DINITROPHENOL	UG/L :	10K
34646	4-NITROPHENOL	UG/L :	10K
P81302	DIBENZOFURAN	UG/L :	5.0K
P34611	2,4-DINITROTOLUENE	UG/L :	5.0K
P34336	DIETHYLPHTHALATE	UG/L :	5.0K
P34641	4-CHLOROPHENYL PHENYL ETHER	UG/L :	5.0K
P34381	FLUORENE	UG/L :	5.0K
A00000	4-NITROANILINE	UG/L :	10K
A00000	4,6-DINITRO-2-METHYLPHENOL	UG/L :	10K
P34636	4-BROMOPHENYL PHENYL ETHER	UG/L :	5.0K
P39700	HEXACHLOROBENZENE	UG/L :	5.0K
P39032	PENTACHLOROPHENOL	UG/L :	10K
P34461	PHENANTHRENE	UG/L :	5.0K
P34220	ANTHRACENE	UG/L :	5.0K
P39110	DI-N-BUTYLPHTHLATE	UG/L :	5.0K
P34376	FLUORANTHENE	UG/L :	5.0K
P34469	PYRENE	UG/L :	5.0K
P34292	BUTYL BENZYL PHTHALATE	UG/L :	5.0K
P34631	3,3'-DICHLOROBENZIDINE	UG/L :	10K
P34526	BENZO(A)ANTHRACENE	UG/L :	5.0K
P34320	CHRYSENE	UG/L :	5.0K

SAMPLE NUMBER : D216751

P39100	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	: 5.0K
P34596	DI-N-OCTYLPHTHALATE	UG/L	: 5.0K
P34230	BENZO(B)FLUORANTHENE	UG/L	: 5.0K
P34242	BENZO(K)FLUORANTHENE	UG/L	: 5.0K
P34247	BENZO(A)PYRENE	UG/L	: 5.0K
03	INDENO(1,2,3-CD)PYRENE	UG/L	: 5.0K
55c	DIBENZO(AH)ANTHRACENE	UG/L	: 5.0K
P34521	BENZO(GHI)PERYLENE	UG/L	: 5.0K

U216751 (+)

Illinois Environmental Protection Agency

[redacted]

Waukegan

Fac. No. 0971900

PESTICIDES, PCB, ORGANICS
HERBICIDES

Samples Scheduled During:

Date and Time in Laboratory: MAY 1 1992

Received By:

1. Mail Report To: Name: Frank Chess	2. Date Collected: 4/29/92 — 3. Time Collected: 11:30 Am
Address: City Hall, 106 North Office St.	4. Sample Collector: E. ABAD / Al.
Post Office: Waukegan — State: Il — Zip Code: 60085	5. Sampling Point: Finished
COLLECTOR: *Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.*	6. Temperature: ☐ Celcius ☐ Fahrenheit
	7. pH: — 8. Chlorine Residual:

PARAMETER	Concentration µg/l	PARAMETER	Concentration µg/l
methylene chloride			
1,1-dichloroethane			
dichloroethylene			
chloroform			
1,2-dichloroethane			
1,1,1-trichloroethane			
carbon tetrachloride			
dichlorobromomethane			
trichloroethylene			
dibromochloromethane			
bromoform			
tetrachloroethylene			
benzene			
toluene			
chlorobenzene			
ethylbenzene			
xylenes (total)			
dichlorobenzene			

RECEIVED
REGION 2
JUN 05 1992
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

-Laboratory Use Only-

Laboratory Number: D216751

Date Forwarded: 5-28-92 By: J. Hurley

-DPWS Use Only-

RECEIVED
JUN 01 1992
Environmental Protection Agency K-23
State of Illinois

This Agency is authorized to require this information under ILLINOIS REVISED STATUTES, 1979, Chapter 111½, Sec. 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

IL 532-1710

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216751
SAMPLING POINT DESC. : WAUKEGAN/FINISHED/A

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1130 SAMPLING PROGRAM :

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : PESTS/PCB/ORGS/HERBICIDES
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

DATE RECEIVED : 920501 TIME RECEIVED : 1110 RECEIVED BY : A P
LAB OBSERVATIONS : 1 GAL WATER TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

6-3-92
mre

P39340	GAMMA-BHC (LINDANE)	UG/L	.01K
P39410	HEPTACHLOR	UG/L	.01K
P39330	ALDRIN	UG/L	.01K
P39420	HEPTACHLOR EPOXIDE	UG/L	.01K
P39348	ALPHA-CHLORDANE	UG/L	.01K
P39810	GAMMA-CHLORDANE	UG/L	.01K
P39380	DIELDRIN	UG/L	.01K
P39390	ENDRIN	UG/L	.01K
P39480	METHOXYCHLOR	UG/L	.05K
P39327	O,P'-DDE	UG/L	.01K
P39320	P,P'-DDE	UG/L	.01K
P39315	O,P'-DDD	UG/L	.01K
P39310	P,P'-DDD	UG/L	.01K
P39305	O,P'-DDT	UG/L	.01K
P39300	P,P'-DDT	UG/L	.01K
P39516	TOTAL PCBS	UG/L	0.1K
P34694	PHENOL	UG/L	5.0K
P34273	BIS(2-CHLOROETHYL)ETHER	UG/L	5.0K
P34586	2-CHLOROPHENOL	UG/L	5.0K
P34566	1,3-DICHLOROBENZENE	UG/L	5.0K
P34571	1,4-DICHLOROBENZENE	UG/L	5.0K
P77147	BENZYL ALCOHOL	UG/L	5.0K
P34536	1,2-DICHLOROBENZENE	UG/L	5.0K
A00000	2-METHYLPHENOL	UG/L	5.0K
P34283	BIS(2-CHLOROISOPROPYL)ETHER	UG/L	5.0K
A00000	4-METHYLPHENOL	UG/L	5.0K
P34428	N-NITROSO-DI-N-PROPYLAMINE	UG/L	5.0K
P34396	HEXACHLOROETHANE	UG/L	5.0K
P34447	NITROBENZENE	UG/L	5.0K

D216752 (B)

Illinois Environmental Protection Agency

[redacted]

PESTICIDES, PCB, ORGANICS
HERBICIDES

Waukegan
Fac No. 0971900

Samples Scheduled During:

Date and Time in Laboratory:

Received By: AP MAY 1 1992

1. Mail Report To: Name: Frank Chess	2. Date Collected: 4/29/92	3. Time Collected: 11:38 AM
Address: City Hall, 106 North Utica St.	4. Sample Collector: E. ABAD/AL	
Post Office: Waukegan State: IL Zip Code: 60085	5. Sampling Point: Raw	
COLLECTOR: *Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.*	6. Temperature: ☐ Celcius ☐ Fahrenheit	
	7. pH:	8. Chlorine Residual:

PARAMETER	Concentration µg/l	PARAMETER	Concentration µg/l
methylene chloride			
1,1-dichloroethane			
dichloroethylene			
chloroform			
1,2-dichloroethane		RECEIVED	
1,1,1-trichloroethane		REGION 2	
carbon tetrachloride		JUN 05 1992	
dichlorobromomethane			
trichloroethylene		Div. Public Water Supplies	
dibromochloromethane		State of Illinois Environmental Protection Agency	
bromoform			
tetrachloroethylene			
benzene			
toluene			
chlorobenzene			
ethylbenzene			
xylenes (total)			
dichlorobenzene			

-Laboratory Use Only-

Laboratory Number: D216752

Date Forwarded: 5-28-92 By: J. Hurley

-DPWS Use Only-

RECEIVED

JUN 01 1992

Environmental Protection Agency
State of Illinois

This Agency is authorized to require this information under ILLINOIS REVISED STATUTES, 1979, Chapter 111½, Sec. 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

K-25

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D216752
SAMPLING POINT DESC. : WAUKEGAN/RAW/B

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1150 SAMPLING PROGRAM :

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : PESTS/PCB/ORGS/HERBICIDES
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

DATE RECEIVED : 920501 TIME RECEIVED : 1110 RECEIVED BY : A P
LAB OBSERVATIONS : 1 GAL WATER TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

6-3-92
mr

P39340	GAMMA-BHC (LINDANE)	UG/L	: .01K
P39410	HEPTACHLOR	UG/L	: .01K
P39330	ALDRIN	UG/L	: .01K
P39420	HEPTACHLOR EPOXIDE	UG/L	: .01K
P39348	ALPHA-CHLORDANE	UG/L	: .01K
[illegible]	GAMMA-CHLORDANE	UG/L	: .01K
[illegible]380	DIELDRIN	UG/L	: .01K
P39390	ENDRIN	UG/L	: .01K
P39480	METHOXYCHLOR	UG/L	: .05K
P39327	O,P'-DDE	UG/L	: .01K
P39320	P,P'-DDE	UG/L	: .01K
P39315	O,P'-DDD	UG/L	: .01K
P39310	P,P'-DDD	UG/L	: .01K
P39305	O,P'-DDT	UG/L	: .01K
P39300	P,P'-DDT	UG/L	: .01K
P39516	TOTAL PCBS	UG/L	: 0.1K
P34694	PHENOL	UG/L	: 5.0K
P34273	BIS(2-CHLOROETHYL)ETHER	UG/L	: 5.0K
P34586	2-CHLOROPHENOL	UG/L	: 5.0K
[illegible]66	1,3-DICHLOROBENZENE	UG/L	: 5.0K
[illegible]71	1,4-DICHLOROBENZENE	UG/L	: 5.0K
P77147	BENZYL ALCOHOL	UG/L	: 5.0K
P34536	1,2-DICHLOROBENZENE	UG/L	: 5.0K
A00000	2-METHYLPHENOL	UG/L	: 5.0K
P34283	BIS(2-CHLOROISOPROPYL)ETHER	UG/L	: 5.0K
A00000	4-METHYLPHENOL	UG/L	: 5.0K
P34428	N-NITROSO-DI-N-PROPYLAMINE	UG/L	: 5.0K
P34396	HEXACHLOROETHANE	UG/L	: 5.0K
P34447	NITROBENZENE	UG/L	: 5.0K

SAMPLE NUMBER : U216752

P34408	ISOPHORONE	UG/L : 5.0K
P34591	2-NITROPHENOL	UG/L : 5.0K
34606	2,4-DIMETHYLPHENOL	UG/L : 5.0K
P77247	BENZOIC ACID	UG/L : 50K
P34278	BIS(2-CHLOROETHOXY)METHANE	UG/L : 5.0K
P34601	2,4-DICHLOROPHENOL	UG/L : 5.0K
P34551	1,2,4-TRICHLOROBENZENE	UG/L : 5.0K
P34696	NAPHTHALENE	UG/L : 5.0K
A00000	4-CHLOROANILINE	UG/L : 5.0K
P34391	HEXACHLOROBUTADIENE	UG/L : 5.0K
P34452	4-CHLORO-3-METHYLPHENOL	UG/L : 5.0K
P77416	2-METHYLNAPHTHALENE	UG/L : 5.0K
P34386	HEXACHLOROCYCLOPENTADIENE	UG/L : 5.0K
P34621	2,4,6-TRICHLOROPHENOL	UG/L : 5.0K
P77687	2,4,5-TRICHLOROPHENOL	UG/L : 5.0K
P34581	2-CHLORONAPHTHALENE	UG/L : 5.0K
A00000	2-NITROANILINE	UG/L : 10K
P34341	DIMETHYLPHTHALATE	UG/L : 5.0K
P34200	ACENAPHTHYLENE	UG/L : 5.0K
P34626	2,6-DINITROTOLUENE	UG/L : 5.0K
P78300	3-NITROANILINE	UG/L : 10K
P34205	ACENAPHTHENE	UG/L : 5.0K
P34616	2,4-DINITROPHENOL	UG/L : 10K
34646	4-NITROPHENOL	UG/L : 10K
P81302	DIBENZOFURAN	UG/L : 5.0K
P34611	2,4-DINITROTOLUENE	UG/L : 5.0K
P34336	DIETHYLPHTHALATE	UG/L : 5.0K
P34641	4-CHLOROPHENYL PHENYL ETHER	UG/L : 5.0K
P34381	FLUORENE	UG/L : 5.0K
A00000	4-NITROANILINE	UG/L : 10K
A00000	4,6-DINITRO-2-METHYLPHENOL	UG/L : 10K
P34636	4-BROMOPHENYL PHENYL ETHER	UG/L : 5.0K
P39700	HEXACHLOROBENZENE	UG/L : 5.0K
P39032	PENTACHLOROPHENOL	UG/L : 10K
P34461	PHENANTHRENE	UG/L : 5.0K
P34220	ANTHRACENE	UG/L : 5.0K
P39110	DI-N-BUTYLPHTHLATE	UG/L : 5.0K
P34376	FLUORANTHENE	UG/L : 5.0K
P34469	PYRENE	UG/L : 5.0K
P34292	BUTYL BENZYL PHTHALATE	UG/L : 5.0K
P34631	3,3'-DICHLOROBENZIDINE	UG/L : 10K
P34526	BENZO(A)ANTHRACENE	UG/L : 5.0K
P34320	CHRYSENE	UG/L : 5.0K

AMPLE NUMBER : D216752

P39100	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L : 5.0K
P34596	DI-N-OCTYLPHTHALATE	UG/L : 5.0K
P34230	BENZO(B)FLUORANTHENE	UG/L : 5.0K
P34242	BENZO(K)FLUORANTHENE	UG/L : 5.0K
P34247	BENZO(A)PYRENE	UG/L : 5.0K
P34403	INDENO(1,2,3-CD)PYRENE	UG/L : 5.0K
P34556	DIBENZO(AH)ANTHRACENE	UG/L : 5.0K
P34521	BENZO(GHI)PERYLENE	UG/L : 5.0K

D216753 (B)

Illinois Environmental Protection Agency

[redacted]

PESTICIDES, PCB, ORGANICS
HERBICIDES

Waukegan
Fac. No. 097 1900

Samples Scheduled During:

Date and Time in Laboratory: MAY 1 1992

Received By: AP

1. Mail Report To: Name: Frank Chess	2. Date Collected: 4/29/92 — 3. Time Collected: 11:20 AM
Address: City Hall, 106 North Utica St	4. Sample Collector: E. Abad / Ali
Post Office: Waukegan — State: IL — Zip Code: 60085	5. Sampling Point: Finished
	6. Temperature: ☐ Celcius ☐ Fahrenheit
COLLECTOR: Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.	7. pH: — 8. Chlorine Residual:

PARAMETER	Concentration µg/l	PARAMETER	Concentration µg/l
methylene chloride			
1,1-dichloroethane			
dichloroethylene		RECEIVED	
chloroform		REGION 2	
1,2-dichloroethane		JUN 05 1992	
1,1,1-trichloroethane			
carbon tetrachloride		Div. Public Water Supplies	
dichlorobromomethane		State of Illinois Environmental Protection Agency	
trichloroethylene			
dibromochloromethane			
bromoform			
tetrachloroethylene			
benzene			
toluene			
chlorobenzene			
ethylbenzene			
xylenes (total)			
dichlorobenzene			

-Laboratory Use Only-

Laboratory Number: D216753

Date Forwarded: 5-28-92 By: J Hurley

-DPWS Use Only-

RECEIVED

JUN 01 1992

Environmental Protection Agency
State of Illinois

K-29

This Agency is authorized to require this information under ILLINOIS REVISED STATUTES, 1979, Chapter 111½, Sec. 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

IL 532-1310

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0216753
SAMPLING POINT DESC. : WAUKEGAN/FINISHED/B

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 1130 SAMPLING PROGRAM :

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : PESTS/PCBS/ORGS/HERBICIDES
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

DATE RECEIVED : 920501 TIME RECEIVED : 1110 RECEIVED BY : A P
LAB OBSERVATIONS : 1 GAL WATER TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

6-3-92
mr

P39340	GAMMA-BHC (LINDANE)	UG/L :	.01K
P39410	HEPTACHLOR	UG/L :	.01K
P39330	ALDRIN	UG/L :	.01K
P39420	HEPTACHLOR EPOXIDE	UG/L :	.01K
P39348	ALPHA-CHLORDANE	UG/L :	.01K
[illegible]10	GAMMA-CHLORDANE	UG/L :	.01K
[illegible]	DIELDRIN	UG/L :	.01K
[illegible]390	ENDRIN	UG/L :	.01K
P39480	METHOXYCHLOR	UG/L :	.05K
P39327	O,P'-DDE	UG/L :	.01K
P39320	P,P'-DDE	UG/L :	.01K
P39315	O,P'-DDD	UG/L :	.01K
P39310	P,P'-DDD	UG/L :	.01K
P39305	O,P'-DDT	UG/L :	.01K
P39300	P,P'-DDT	UG/L :	.01K
P39516	TOTAL PCBS	UG/L :	0.1K
P34694	PHENOL	UG/L :	5.0K
P34273	BIS(2-CHLOROETHYL)ETHER	UG/L :	5.0K
P34586	2-CHLOROPHENOL	UG/L :	5.0K
[illegible]	1,3-DICHLOROBENZENE	UG/L :	5.0K
[illegible]	1,4-DICHLOROBENZENE	UG/L :	5.0K
P77147	BENZYL ALCOHOL	UG/L :	5.0K
P34536	1,2-DICHLOROBENZENE	UG/L :	5.0K
A00000	2-METHYLPHENOL	UG/L :	5.0K
P34283	BIS(2-CHLOROISOPROPYL)ETHER	UG/L :	5.0K
A00000	4-METHYLPHENOL	UG/L :	5.0K
P34428	N-NITROSO-DI-N-PROPYLAMINE	UG/L :	5.0K
P34396	HEXACHLOROETHANE	UG/L :	5.0K
P34447	NITROBENZENE	UG/L :	5.0K

P34408	ISOPHORONE	UG/L : 5.0K
34591	2-NITROPHENOL	UG/L : 5.0K
P34606	2,4-DIMETHYLPHENOL	UG/L : 5.0K
P77247	BENZOIC ACID	UG/L : 50K
P34278	BIS(2-CHLOROETHOXY)METHANE	UG/L : 5.0K
P34601	2,4-DICHLOROPHENOL	UG/L : 5.0K
P34551	1,2,4-TRICHLOROBENZENE	UG/L : 5.0K
P34696	NAPHTHALENE	UG/L : 5.0K
A00000	4-CHLOROANILINE	UG/L : 5.0K
P34391	HEXACHLOROBUTADIENE	UG/L : 5.0K
P34452	4-CHLORO-3-METHYLPHENOL	UG/L : 5.0K
P77416	2-METHYLNAPHTHALENE	UG/L : 5.0K
P34386	HEXACHLOROCYCLOPENTADIENE	UG/L : 5.0K
P34621	2,4,6-TRICHLOROPHENOL	UG/L : 5.0K
P77687	2,4,5-TRICHLOROPHENOL	UG/L : 5.0K
P34581	2-CHLORONAPHTHALENE	UG/L : 5.0K
A00000	2-NITROANILINE	UG/L : 10K
P34341	DIMETHYLPHTHALATE	UG/L : 5.0K
P34200	ACENAPHTHYLENE	UG/L : 5.0K
P34626	2,6-DINITROTOLUENE	UG/L : 5.0K
P78300	3-NITROANILINE	UG/L : 10K
P34205	ACENAPHTHENE	UG/L : 5.0K
P34616	2,4-DINITROPHENOL	UG/L : 10K
P34646	4-NITROPHENOL	UG/L : 10K
P81302	DIBENZOFURAN	UG/L : 5.0K
P34611	2,4-DINITROTOLUENE	UG/L : 5.0K
P34336	DIETHYLPHTHALATE	UG/L : 5.0K
P34641	4-CHLOROPHENYL PHENYL ETHER	UG/L : 5.0K
P34381	FLUORENE	UG/L : 5.0K
A00000	4-NITROANILINE	UG/L : 10K
A00000	4,6-DINITRO-2-METHYLPHENOL	UG/L : 10K
P34636	4-BROMOPHENYL PHENYL ETHER	UG/L : 5.0K
P39700	HEXACHLOROBENZENE	UG/L : 5.0K
P39032	PENTACHLOROPHENOL	UG/L : 10K
P34461	PHENANTHRENE	UG/L : 5.0K
P34220	ANTHRACENE	UG/L : 5.0K
P39110	DI-N-BUTYLPHTHLATE	UG/L : 5.0K
P34376	FLUORANTHENE	UG/L : 5.0K
P34469	PYRENE	UG/L : 5.0K
P34292	BUTYL BENZYL PHTHALATE	UG/L : 5.0K
P34631	3,3'-DICHLOROBENZIDINE	UG/L : 10K
P34526	BENZO(A)ANTHRACENE	UG/L : 5.0K
P34320	CHRYSENE	UG/L : 5.0K

SAMPLE NUMBER : D210753

P39100	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L :	5.0K
P34596	DI-N-OCTYLPHTHALATE	UG/L :	5.0K
P34230	BENZO(B)FLUORANTHENE	UG/L :	5.0K
P34242	BENZO(K)FLUORANTHENE	UG/L :	5.0K
P34247	BENZO(A)PYRENE	UG/L :	5.0K
P34403	INDENO(1,2,3-CD)PYRENE	UG/L :	5.0K
P34556	DIBENZO(AH)ANTHRACENE	UG/L :	5.0K
P34521	BENZO(GHI)PERYLENE	UG/L :	5.0K

ILLINOIS ENVIRONME' AL PROTECTION AGENCY — CHEMICAL ANALYSIS REPORT FORM

DIVISION OF PUBLIC WATER SUPPLIES

Public Water Supply Name: Waukegan

County: Lake

Facility Number: 0971900

Mail Report to:

Name: Frank Chess

Address: City Hall, 106 North Utica St

Post Office: Waukegan State: IL Zip Code: 60085

COLLECTOR: Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.

This Agency is authorized to require this information under Ill. Rev. Stat., 1979, Chapter 111-1/2, Section 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the forms Management Center.

Samples scheduled during:

Received by:

Date and time in Laboratory: MAY 11 1992

5. Date and time collected: 4/29/92 4/30/92

6. Sample Collector: E. ABAD/ Al.

7. Telephone Number:

8. Sample Type:

☐ Distribution: Sampling point address or building: Raw (Plant)

☐ Raw-Well # ___ Depth: ___ Year Drilled: ___

Pumping rate: ___ gpm Hours pumped: ___

☐ Raw-Surface: Inlet depth ___ ft.

Source:

Parameter	Reported As	MAC mg/l*	Concentration mg/l*
Ammonium	N		
Potassium	K		
Iron	Fe	1.0	
Manganese	Mn	0.15	
Calcium	Ca		
Magnesium	Mg		
Sodium	Na		
Barium	Ba	1.	
Beryllium	Be		
Boron	B		
Cadmium	Cd	0.010	
Chromium (Total)	Cr	0.05	
Cobalt	Co		
Copper	Cu	5.	
Nickel	Ni		
Silver	Ag	0.05	
Strontium	Sr		
Vanadium	V		
Zinc	Zn	5.	

Parameter	Reported As	MAC mg/l*	Concentration mg/l*
Fluoride	F	1.8**	
Chloride	Cl		
Nitrate + Nitrite	N	10	
Sulfate	SO_4		
Alkalinity (pH 4.5)	$CaCO_3$		
Specific Conductance @ 25°C	mmhos/cm		
Total Dissolved Solids/EC	TDS		
Filterable Residue @ 180°C	TDS		
pH	pH units		
Hardness	$CaCO_3$		
Cyanide	CN	0.2	
Soluble Silicates	SiO_2		
Arsenic	As	0.05	
Lead	Pb	0.05	
Mercury	Hg	2. µg/l	µg/l
Selenium	Se	0.01	

TOTAL METALS

WET WEIGHT

PLANT SLUDGE

RECEIVED
REGION 2
JUN 22 1992
Div. Public Water Supplies
State of Illinois
Environmental Protection Agency

-Laboratory Use Only-

Laboratory Number: B206803

K-33

If Forwarded: By:

JUN 18 1992

* Unless Otherwise Indicated

** For those counties of the State North of and including Henderson, McDonough, Fulton, Tazewell, McLean, Ford and Iroquois the MAC ... mg/l.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : L205293
SAMPLING POINT DESC. : WAUKEGAN

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920430 TIME COLLECTED : 0000 SAMPLING PROGRAM : CH

COLLECTED BY : E ABAD DELIVERED BY : UPS
COMMENTS :
FUNDING CODE : PWIC AGENCY ROUTING : 00 UNIT CODE :
SAM TYPE CODE : CPWS SAMPLE PURPOSE CODE : C REPORTING INDICATOR : R

DATE RECEIVED : 920511 TIME RECEIVED : 0900 RECEIVED BY : MAD
LAB OBSERVATIONS : TRIP BL SAME :
SUPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

P00530 SOLIDS,TOT.SUS.	MG/L	:	6980	P00916 CALCIUM,TOTAL	MG/L	:	3000
P00927 MAGNESIUM,TOTAL	MG/L	:	1330	P00929 SODIUM,TOTAL	MG/L	:	11.
P00937 POTASSIUM,TOTAL	MG/L	:	11.	P01105 ALUMINUM,TOTAL	UG/L	:	578000
P01007 BARIUM,TOTAL	UG/L	:	3920	P01022 BORON,TOTAL	UG/L	:	380
P01012 BERYLLIUM,TOTAL	UG/L	:	50K	P01027 CADMIUM,TOTAL	UG/L	:	50K
P01034 CHROMIUM,TOTAL	UG/L	:	200	P01042 COPPER,TOTAL	UG/L	:	200
P01037 COBALT,TOTAL	UG/L	:	508	P01045 IRON,TOTAL	UG/L	:	161000
P01051 LEAD,TOTAL	UG/L	:	830	P01055 MANGANESE,TOTAL	UG/L	:	118000
P01067 NICKEL,TOTAL	UG/L	:	285	P01077 SILVER,TOTAL	UG/L	:	72
P01082 STRONTIUM,TOTAL	UG/L	:	3120	P01087 VANADIUM,TOTAL	UG/L	:	212
P01092 ZINC,TOTAL	UG/L	:	1990				

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY — CHEMICAL ANALYSIS REPORT FORM

DIVISION OF PUBLIC WATER SUPPLIES

D216743

Organics

RECEIVED REGION 2 OCT 1 4 1992 Division of Public Water Supplies

State of Illinois Environmental Protection Agency

Water Supply Name: Waukegan

County: Lake

Facility Number: 0971900

Mail Report to:

Name: Frank Chess

Address: City Hall, 106 North Utica St.

Post Office: Waukegan State: IL Zip Code: 60085

COLLECTOR: *Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.*

This Agency is authorized to require this information under Ill. Rev. Stat., 1979, Chapter 111-1/2, Section 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the forms Management Center.

Samples scheduled during:

Received by: AP

Date and time in Laboratory: MAY 1 1992

5. Date and time collected: 4/29/92

6. Sample Collector: E. ABAD/ AL.

7. Telephone Number:

8. Sample Type:

☐ Distribution: Sampling point address or building: Reclaim Sludge Basin

☐ Raw-Well # : Depth: Year Drilled:

Pumping rate: gpm Hours pumped:

☐ Raw-Surface: Inlet depth ft.

Source:

Parameter	Reported As	MAC mg/l*	Concentration mg/l*	Parameter	Reported As	MAC mg/l*	Concentration mg/l*
Ammonium	N			Fluoride	F	1.8**	
Potassium	K			Chloride	Cl		
Iron	Fe	1.0		Nitrate + Nitrite	N	10	
Manganese	Mn	0.15		Sulfate	SO_4		
Calcium	Ca			Alkalinity (pH 4.5)	$CaCO_3$		
Magnesium	Mg			Specific Conductance @ 25°C	mmhos/cm		
Sodium	Na			Total Dissolved Solids/EC	TDS		
Barium	Ba	1.		Filterable Residue @ 180°C	TDS		
Beryllium	Be			pH	pH units		
Boron	B			Hardness	$CaCO_3$		
Cadmium	Cd	0.010		Cyanide	CN	0.2	
Chromium (Total)	Cr	0.05		Soluble Silicates	SiO_2		
Cobalt	Co			Arsenic	As	0.05	
Copper	Cu	5.		Lead	Pb	0.05	
Nickel	Ni			Mercury	Hg	2. µg/l	µg/l
Silver	Ag	0.05		Selenium	Se	0.01	
Strontium	Sr						
Vanadium	V						
Zinc	Zn	5.					

RECEIVED SEP 2 1992 Environmental Protection Agency State of Illinois

-Laboratory Use Only-

Laboratory Number: D216743

*Unless Otherwise Indicated

**For those counties of the State North of and including Henderson, McDonough, Fulton, Tazewell, McLean, Ford and Iroquois the MAC is 1.6 mg/l.

K-35

Forwarded: 9-25-92 By: J Hinley

* Please treat as Draft

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0216743
SAMPLING POINT DESC. : WAUKEGAN/LAKE CO/A

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 0000 SAMPLING PROGRAM :

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : ORGANICS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

DATE RECEIVED : 920501 TIME RECEIVED : 1100 RECEIVED BY : A P
LAB OBSERVATIONS : 1-8OZ LIQ/SOLID TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P34694	PHENOL	UG/L	1000K
P34273	BIS(2-CHLOROETHYL)ETHER	UG/L	1000K
P34586	2-CHLOROPHENOL	UG/L	1000K
P34566	1,3-DICHLOROBENZENE	UG/L	1000K
P34571	1,4-DICHLOROBENZENE	UG/L	1000K
P77147	BENZYL ALCOHOL	UG/L	1000K
P34536	1,2-DICHLOROBENZENE	UG/L	1000K
A00000	2-METHYLPHENOL	UG/L	1000K
P34283	BIS(2-CHLOROISOPROPYL)ETHER	UG/L	1000K
A00000	4-METHYLPHENOL	UG/L	1000K
P34428	N-NITROSO-DI-N-PROPYLAMINE	UG/L	1000K
P34396	HEXACHLOROETHANE	UG/L	1000K
P34447	NITROBENZENE	UG/L	1000K
P34408	ISOPHORONE	UG/L	1000K
P34591	2-NITROPHENOL	UG/L	1000K
P34606	2,4-DIMETHYLPHENOL	UG/L	1000K
P77247	BENZOIC ACID	UG/L	10000K
P34278	BIS(2-CHLOROETHOXY)METHANE	UG/L	1000K
P34601	2,4-DICHLOROPHENOL	UG/L	1000K
P34551	1,2,4-TRICHLOROBENZENE	UG/L	1000K
P34696	NAPHTHALENE	UG/L	1000K
A00000	4-CHLOROANILINE	UG/L	1000K
P34391	HEXACHLOROBUTADIENE	UG/L	1000K
P34452	4-CHLORO-3-METHYLPHENOL	UG/L	1000K
P77416	2-METHYLNAPHTHALENE	UG/L	1000K
P34386	HEXACHLOROCYCLOPENTADIENE	UG/L	1000K
P34621	2,4,6-TRICHLOROPHENOL	UG/L	1000K
P77687	2,4,5-TRICHLOROPHENOL	UG/L	1000K
P34581	2-CHLORONAPHTHALENE	UG/L	1000K

SAMPLE NUMBER : 0216743

A00000	2-NITROANILINE	UG/L :	2000K
P34341	DIMETHYLPHTHALATE	UG/L :	1000K
P34200	ACENAPHTHYLENE	UG/L :	1000K
P34626	2,6-DINITROTOLUENE	UG/L :	1000K
P78300	3-NITROANILINE	UG/L :	2000K
P34205	ACENAPHTHENE	UG/L :	1000K
P34616	2,4-DINITROPHENOL	UG/L :	2000K
P34646	4-NITROPHENOL	UG/L :	2000K
P81302	DIBENZOFURAN	UG/L :	1000K
P34611	2,4-DINITROTOLUENE	UG/L :	1000K
P34336	DIETHYLPHTHALATE	UG/L :	1000K
P34641	4-CHLOROPHENYL PHENYL ETHER	UG/L :	1000K
P34381	FLUORENE	UG/L :	1000K
A00000	4-NITROANILINE	UG/L :	2000K
A00000	4,6-DINITRO-2-METHYLPHENOL	UG/L :	2000K
P34636	4-BROMOPHENYL PHENYL ETHER	UG/L :	1000K
P39700	HEXACHLOROBENZENE	UG/L :	1000K
P39032	PENTACHLOROPHENOL	UG/L :	2000K
P34461	PHENANTHRENE	UG/L :	1000K
P34220	ANTHRACENE	UG/L :	1000K
P39110	DI-N-BUTYLPHTHLATE	UG/L :	1000K
P34376	FLUORANTHENE	UG/L :	1000K
P34469	PYRENE	UG/L :	1000K
P34292	BUTYL BENZYL PHTHALATE	UG/L :	1000K
P34631	3,3'-DICHLOROBENZIDINE	UG/L :	2000K
P34526	BENZO(A)ANTHRACENE	UG/L :	1000K
P34320	CHRYSENE	UG/L :	1000K
P39100	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L :	1000K
P34596	DI-N-OCTYLPHTHALATE	UG/L :	1000K
P34230	BENZO(B)FLUORANTHENE	UG/L :	1000K
P34242	BENZO(K)FLUORANTHENE	UG/L :	1000K
P34247	BENZO(A)PYRENE	UG/L :	1000K
P34403	INDENO(1,2,3-CD)PYRENE	UG/L :	1000K
P34556	DIBENZO(AH)ANTHRACENE	UG/L :	1000K
P34521	BENZO(GHI)PERYLENE	UG/L :	1000K

: 8 OZ. AQUEOUS SAMPLE.

: INSUFFICIENT SAMPLE FOR FURTHER ANALYSIS.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

DIVISION OF PUBLIC WATER SUPPLIES

CHEMICAL ANALYSIS REPORT FORM

D216744

Public Water Supply Name: Waukegan

County: Lake

Facility Number: 0971900

Mail Report to:

Name: Frank Chess

Address: City Hall, 106 North Utica St.

Post Office: Waukegan State: IL Zip Code: 60085

COLLECTOR: Fill in shaded area only. Type or use black ball point pen. See reverse side for explanations and instructions.

This Agency is authorized to require this information under Ill. Rev. Stat., 1979, Chapter 111-1/2, Section 1019. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the forms Management Center.

Samples scheduled during: Organics

Received by: AP

Date and time in Laboratory: MAY 1 1992

5. Date and time collected: 4/29/92

6. Sample Collector: E. ABAD/AL

7. Telephone Number:

8. Sample Type:

☐ Distribution: Sampling point address or building: ~~Raw (Plant)~~ Kedron Basin (sludge)

☐ Raw-Well #: Depth: Year Drilled:

Pumping rate: Hours pumped:

☐ Raw-Surface: Inlet depth ____ ft.

Source:

RECEIVED
REGION 2
OCT 14 1992
Division of Public Water Supplies
State of Illinois
Environmental Protection Agency

Parameter	Reported As	MAC mg/l*	Concentration mg/l*
Ammonium	N		
Potassium	K		
Iron	Fe	1.0	
Manganese	Mn	0.15	
Calcium	Ca		
Magnesium	Mg		
Sodium	Na		
Barium	Ba	1.	
Beryllium	Be		
Boron	B		
Cadmium	Cd	0.010	
Chromium (Total)	Cr	0.05	
Cobalt	Co		
Copper	Cu	5.	
Nickel	Ni		
Silver	Ag	0.05	
Strontium	Sr		
Vanadium	V		
Zinc	Zn	5.	

Parameter	Reported As	MAC mg/l*	Concentration mg/l*
Fluoride	F	1.8**	
Chloride	Cl		
Nitrate + Nitrite	N	10	
Sulfate	SO_4		
Alkalinity (pH 4.5)	$CaCO_3$		
Specific Conductance @ 25°C	mmhos/cm		
Total Dissolved Solids/EC	TDS		
Filterable Residue @ 180°C	TDS		
pH	pH units		
Hardness	$CaCO_3$		
Cyanide	CN	0.2	
Soluble Silicates	SiO_2		
Arsenic	As	0.05	
Lead	Pb	0.05	
Mercury	Hg	2. µg/l	µg/l
Selenium	Se	0.01	

RECEIVED
SEP 28 1992
Environmental Protection Agency
State of Illinois

-Laboratory Use Only-

Laboratory Number: D216744

K-38

Forwarded: By:

* Unless Otherwise Indicated

** For those counties of the State North of and including Henderson, McDonough, Fulton, Tazewell, McLean, Ford and Iroquois the MAC is ...

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0216744
SAMPLING POINT DESC. : WAUKEGAN/LAKE CO/B

SUBMITTING SOURCE # : 0971900 SITE # :
DATE COLLECTED : 920429 TIME COLLECTED : 0000 SAMPLING PROGRAM :

COLLECTED BY : E ABAD DELIVERED BY : EPA
COMMENTS : ORGANICS
FUNDING CODE : PW30 AGENCY ROUTING : -- UNIT CODE :
SAM TYPE CODE : SAMPLE PURPOSE CODE : - REPORTING INDICATOR : B

DATE RECEIVED : 920501 TIME RECEIVED : 1100 RECEIVED BY : A P
LAB OBSERVATIONS : 1-8OZ LIQ/SOLID TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P34694	PHENOL	UG/L :	1000K
P34273	BIS(2-CHLOROETHYL)ETHER	UG/L :	1000K
P34586	2-CHLOROPHENOL	UG/L :	1000K
P34566	1,3-DICHLOROBENZENE	UG/L :	1000K
P34571	1,4-DICHLOROBENZENE	UG/L :	1000K
P77147	BENZYL ALCOHOL	UG/L :	1000K
P34536	1,2-DICHLOROBENZENE	UG/L :	1000K
A00000	2-METHYLPHENOL	UG/L :	1000K
P34283	BIS(2-CHLOROISOPROPYL)ETHER	UG/L :	1000K
A00000	4-METHYLPHENOL	UG/L :	1000K
P34428	N-NITROSO-DI-N-PROPYLAMINE	UG/L :	1000K
P34396	HEXACHLOROETHANE	UG/L :	1000K
P34447	NITROBENZENE	UG/L :	1000K
P34403	ISOPHORONE	UG/L :	1000K
P34591	2-NITROPHENOL	UG/L :	1000K
P34606	2,4-DIMETHYLPHENOL	UG/L :	1000K
P77247	BENZOIC ACID	UG/L :	10000K
P34278	BIS(2-CHLOROETHOXY)METHANE	UG/L :	1000K
P34601	2,4-DICHLOROPHENOL	UG/L :	1000K
P34551	1,2,4-TRICHLOROBENZENE	UG/L :	1000K
P34696	NAPHTHALENE	UG/L :	1000K
A00000	4-CHLOROANILINE	UG/L :	1000K
P34391	HEXACHLOROBUTADIENE	UG/L :	1000K
P34452	4-CHLORO-3-METHYLPHENOL	UG/L :	1000K
P77416	2-METHYLNAPHTHALENE	UG/L :	1000K
P34386	HEXACHLOROCYCLOPENTADIENE	UG/L :	1000K
P34621	2,4,6-TRICHLOROPHENOL	UG/L :	1000K
P77687	2,4,5-TRICHLOROPHENOL	UG/L :	1000K
P34581	2-CHLORONAPHTHALENE	UG/L :	1000K

SAMPLE NUMBER : D216744

A00000	2-NITROANILINE	UG/L :	2000K
P34341	DIMETHYLPHTHALATE	UG/L :	1000K
P34200	ACENAPHTHYLENE	UG/L :	1000K
P34626	2,6-DINITROTOLUENE	UG/L :	1000K
P78300	3-NITROANILINE	UG/L :	2000K
P34205	ACENAPHTHENE	UG/L :	1000K
P34616	2,4-DINITROPHENOL	UG/L :	2000K
P34646	4-NITROPHENOL	UG/L :	2000K
P81302	DIBENZOFURAN	UG/L :	1000K
P34611	2,4-DINITROTOLUENE	UG/L :	1000K
P34336	DIETHYLPHTHALATE	UG/L :	1000K
P34641	4-CHLOROPHENYL PHENYL ETHER	UG/L :	1000K
P34381	FLUORENE	UG/L :	1000K
A00000	4-NITROANILINE	UG/L :	2000K
A00000	4,6-DINITRO-2-METHYLPHENOL	UG/L :	2000K
P34636	4-BROMOPHENYL PHENYL ETHER	UG/L :	1000K
P39700	HEXACHLOROBENZENE	UG/L :	1000K
P39032	PENTACHLOROPHENOL	UG/L :	2000K
P34461	PHENANTHRENE	UG/L :	1000K
P34220	ANTHRACENE	UG/L :	1000K
P39110	DI-N-BUTYLPHTHLATE	UG/L :	1000K
P34376	FLUORANTHENE	UG/L :	1000K
P34469	PYRENE	UG/L :	1000K
P34292	BUTYL BENZYL PHTHALATE	UG/L :	1000K
P34631	3,3'-DICHLOROBENZIDINE	UG/L :	2000K
P34526	BENZO(A)ANTHRACENE	UG/L :	1000K
P34320	CHRYSENE	UG/L :	1000K
P39100	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L :	1000K
P34596	DI-N-OCTYLPHTHALATE	UG/L :	1000K
P34230	BENZO(B)FLUORANTHENE	UG/L :	1000K
P34242	BENZO(K)FLUORANTHENE	UG/L :	1000K
P34247	BENZO(A)PYRENE	UG/L :	1000K
P34403	INDENO(1,2,3-CD)PYRENE	UG/L :	1000K
P34556	DIBENZO(AH)ANTHRACENE	UG/L :	1000K
P34521	BENZO(GHI)PERYLENE	UG/L :	1000K

: 8 OZ. AQUEOUS SAMPLE.

: INSUFFICIENT SAMPLE FOR FURTHER ANALYSIS.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D218728
SAMPLING POINT DESC. : WAUKEGAN HARBR CHNL/EMER INTK WWTP

SUBMITTING SOURCE # : GZS 02   SITE # :
DATE COLLECTED : 920624   TIME COLLECTED : 1410   SAMPLING PROGRAM : 2C

COLLECTED BY : CLS   DELIVERED BY : CMS
COMMENTS : CORE-SEDIMENT ORGANICS
FUNDING CODE : WPOC   AGENCY ROUTING : 01   UNIT CODE :
SAM TYPE CODE : ISED   SAMPLE PURPOSE CODE : 5   REPORTING INDICATOR : 2

DATE RECEIVED : 920617   TIME RECEIVED : 0935   RECEIVED BY : H E
LAB OBSERVATIONS : 1-5CZ SEDIMENT   TRIP BL SAM# :
SUPERVISORS INITIALS : JTH   NOTE : K = LESS THAN VALUE

P39519 TOTAL PCBS	UG/KG	1090
P39333 ALDRIN	UG/KG	10K
P39383 DIELDRIN	UG/KG	1.0K
P39359 TOTAL DDT	UG/KG	50K
P39328 O,P'-DDE	UG/KG	5K
P39321 P,P'-DDE	UG/KG	5K
P39316 O,P'-DDD	UG/KG	5K
P39311 P,P'-DDD	UG/KG	5K
P39306 O,P'-DDT	UG/KG	5K
P39301 P,P'-DDT	UG/KG	15
P39351 TOTAL CHLORDANE	UG/KG	25K
P39064 CHLORDANE,CIS ISOMER	UG/KG	10K
P39067 CHLORDANE,TRANS ISOMER	UG/KG	10K
P39393 ENDRIN	UG/KG	5K
P39481 METHOXYCHLOR	UG/KG	25K
P39076 ALPHA-BHC	UG/KG	10K
P39343 GAMMA-BHC (LINDANE)	UG/KG	10K
P39701 HEXACHLOROBENZENE	UG/KG	10K
P39413 HEPTACHLOR	UG/KG	10K
P39423 HEPTACHLOR EPOXIDE	UG/KG	10K

CMC 10/30/92

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0218729
SAMPLING POINT DESC. : WAUKEGAN HARBOR CHANL/EMER INTK WWTP

SUBMITTING SOURCE # : CZS 02 SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1416 SAMPLING PROGRAM : 26

COLLECTED BY : CLB DELIVERED BY : CMS
COMMENTS : CORE-SEDIMENT ORGANICS
FUNDING CODE : WPC6 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

DATE RECEIVED : 920617 TIME RECEIVED : 0935 RECEIVED BY : H E
LAB OBSERVATIONS : 1-502 SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519 TOTAL PCBS	UG/KG : 1360
P39333 ALDRIN	UG/KG : 5K
P39383 DIELDRIN	UG/KG : 5K
P39359 TOTAL DDT	UG/KG : 50K
P39326 O,P'-DDE	UG/KG : 5K
P39321 P,P'-DDE	UG/KG : 5K
P39316 O,P'-DDD	UG/KG : 5K
P39311 P,P'-DDD	UG/KG : 5
P39306 O,P'-DDT	UG/KG : 5K
P39301 P,P'-DDT	UG/KG : 5K
P39351 TOTAL CHLORDANE	UG/KG : 25K
P39064 CHLORDANE,CIS ISOMER	UG/KG : 10K
P39067 CHLORDANE,TRANS ISOMER	UG/KG : 10K
P39393 ENDRIN	UG/KG : 5K
P39481 METHOXYCHLOR	UG/KG : 25K
P39076 ALPHA-BHC	UG/KG : 5K
P39343 GAMMA-BHC (LINDANE)	UG/KG : 5K
P39701 HEXACHLOROBENZENE	UG/KG : 5K
P39413 HEPTACHLOR	UG/KG : 5K
P39423 HEPTACHLOR EPOXIDE	UG/KG : 5K

cmc 10/30/92

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D218730
SAMPLING POINT DESC. : LAKE MICHIGAN/INTK #1 E OF PIER

SUBMITTING SOURCE # : C 05 SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1301 SAMPLING PROGRAM : 28

COLLECTED BY : CLS DELIVERED BY : CMS
COMMENTS : CORE-SEDIMENT ORGANICS
FUNDING CODE : WPUG AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : 1SED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : E

DATE RECEIVED : 920617 TIME RECEIVED : 0935 RECEIVED BY : M E
LAB OBSERVATIONS : 1-602 SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTM NOTE : K = LESS THAN VALUE

P39519 TOTAL PCBS	UG/KG :	13
P39333 ALDRIN	UG/KG :	1.0K
P39383 DIELDRIN	UG/KG :	1.0K
P39359 TOTAL DDT	UG/KG :	10K
P39323 O,P'-DDE	UG/KG :	1.0K
P39321 P,P'-DDE	UG/KG :	1.0K
P39315 O,P'-DDD	UG/KG :	1.0K
P39311 P,P'-DDD	UG/KG :	1.0K
P39306 O,P'-DDT	UG/KG :	1.0K
P39301 P,P'-DDT	UG/KG :	1.0K
P39351 TOTAL CHLORDANE	UG/KG :	5.0K
P39064 CHLORDANE,CIS ISOMER	UG/KG :	2.0K
P39067 CHLORDANE,TRANS ISOMER	UG/KG :	2.0K
P39393 ENDRIN	UG/KG :	1.0K
P39481 METHOXYCHLOR	UG/KG :	5.0K
P39076 ALPHA-BHC	UG/KG :	1.0K
P39343 GAMMA-BHC (LINDANE)	UG/KG :	1.0K
P39701 HEXACHLOROBENZENE	UG/KG :	1.0K
P39413 HEPTACHLOR	UG/KG :	1.0K
P39423 HEPTACHLOR EPOXIDE	UG/KG :	1.0K

CMC 10/30/92

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D218731
SAMPLING POINT DESC. : LAKE MICHIGAN/INTK #1 E OF PIER

SUBMITTING SOURCE # : L US SITE # :
DATE COLLECTED : 920422 TIME COLLECTED : 1306 SAMPLING PROGRAM : 28

COLLECTED BY : CLS DELIVERED BY : CMS
COMMENTS : CORE-SEDIMENT ORGANICS
FUNDING CODE : WPUC AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

DATE RECEIVED : 920617 TIME RECEIVED : 0935 RECEIVED BY : M E
LAB OBSERVATIONS : 1-602 SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTM NOTE : K = LESS THAN VALUE

P39519 TOTAL PCBS	UG/KG :	13
P39333 ALDRIN	UG/KG :	1.0K
P39383 DIELDRIN	UG/KG :	1.0K
P39359 TOTAL DDT	UG/KG :	10K
P39323 O,P'-DDE	UG/KG :	1.0K
P39321 P,P'-DDE	UG/KG :	1.0K
P39316 O,P'-DDD	UG/KG :	1.0K
P39311 P,P'-DDD	UG/KG :	1.0K
P39306 O,P'-DDT	UG/KG :	1.0K
P39301 P,P'-DDT	UG/KG :	1.0K
P39351 TOTAL CHLORDANE	UG/KG :	5.0K
P39064 CHLORDANE,CIS ISOMER	UG/KG :	2.0K
P39067 CHLORDANE,TRANS ISOMER	UG/KG :	2.0K
P39393 ENDRIN	UG/KG :	1.0K
P39481 METHOXYCHLOR	UG/KG :	5.0K
P39075 ALPHA-BHC	UG/KG :	1.0K
P39343 GAMMA-BHC (LINDANE)	UG/KG :	1.0K
P39701 HEXACHLOROBENZENE	UG/KG :	1.0K
P39413 HEPTACHLOR	UG/KG :	1.0K
P39423 HEPTACHLOR EPOXIDE	UG/KG :	1.0K

MC 10/30/92

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 0218732
SAMPLING POINT DESC. : LAKE MICHIGAN/INTK #2 SE WTR TNK S PIER

SUBMITTING SOURCE # : 6 C4 SITE # :
DATE COLLECTED : 920624 TIME COLLECTED : 1335 SAMPLING PROGRAM : 26

COLLECTED BY : CLS DELIVERED BY : CMS
COMMENTS : CORE-SEDIMENT ORGANICS
FUNDING CODE : WPUE AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : E

DATE RECEIVED : 920617 TIME RECEIVED : 0935 RECEIVED BY : M E
LAB OBSERVATIONS : 1-6OZ SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTM NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG : 10K
P39333	ALDRIN	UG/KG : 1.0K
P39383	DIELDRIN	UG/KG : 1.0K
P39359	TOTAL DDT	UG/KG : 10K
P39326	O,P'-DDE	UG/KG : 1.0K
P39321	P,P'-DDE	UG/KG : 1.0K
P39316	O,P'-DDD	UG/KG : 1.0K
P39311	P,P'-DDD	UG/KG : 1.0K
P39306	O,P'-DDT	UG/KG : 1.0K
P39301	P,P'-DDT	UG/KG : 1.0K
P39351	TOTAL CHLORDANE	UG/KG : 5.0K
P39064	CHLORDANE,CIS ISOMER	UG/KG : 2.0K
P39067	CHLORDANE,TRANS ISOMER	UG/KG : 2.0K
P39393	ENDRIN	UG/KG : 1.0K
P39481	METHOXYCHLOR	UG/KG : 5.0K
P39076	ALPHA-BHC	UG/KG : 1.0K
P39343	GAMMA-BHC (LINDANE)	UG/KG : 1.0K
P39701	HEXACHLOROBENZENE	UG/KG : 1.0K
P39413	HEPTACHLOR	UG/KG : 1.0K
P39423	HEPTACHLOR EPOXIDE	UG/KG : 1.0K

CMC 10/30/92

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : D218733
SAMPLING POINT DESC. : LAKE MICHIGAN/INTK #2 SE WTR TNK S PIER

SUBMITTING SOURCE # : SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1343 SAMPLING PROGRAM : 28

COLLECTED BY : CL? DELIVERED BY : CMS
COMMENTS : CORE-SEDIMENT ORGANICS
FUNDING CODE : WPOC AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : 6

DATE RECEIVED : 920517 TIME RECEIVED : 0935 RECEIVED BY : H E
LAB OBSERVATIONS : 1-8OZ SEDIMENT TRIP BL SAM# :
SUPERVISORS INITIALS : JTH NOTE : K = LESS THAN VALUE

P39519	TOTAL PCBS	UG/KG : 26
P39330	ALDRIN	UG/KG : 1.0K
P39380	DIELDRIN	UG/KG : 1.0K
P39359	TOTAL DDT	UG/KG : 10K
P39328	O,P'-DDE	UG/KG : 1.0K
P39321	P,P'-DDE	UG/KG : 1.0K
P39316	O,P'-DDD	UG/KG : 1.0K
P39311	P,P'-DDD	UG/KG : 1.0K
P39306	O,P'-DDT	UG/KG : 1.0K
P39301	P,P'-DDT	UG/KG : 1.0K
P39351	TOTAL CHLORDANE	UG/KG : 5.0K
P39064	CHLORDANE,CIS ISOMER	UG/KG : 2.0K
P39067	CHLORDANE,TRANS ISOMER	UG/KG : 2.0K
P39393	ENDRIN	UG/KG : 1.0K
P39481	METHOXYCHLOR	UG/KG : 5.0K
P39076	ALPHA-BHC	UG/KG : 1.0K
P39343	GAMMA-BHC (LINDANE)	UG/KG : 1.0K
P39701	HEXACHLOROBENZENE	UG/KG : 1.0K
P39410	HEPTACHLOR	UG/KG : 1.0K
P39420	HEPTACHLOR EPOXIDE	UG/KG : 1.0K

CMC 10/30/92

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 3208978
SAMPLING POINT DESC. : EMER TANK 15' FROM CHANNEL WALL ? WWTP

SUBMITTING SOURCE # : 02S 02 SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1410 SAMPLING PROGRAM : 28

COLLECTED BY : CL3 DELIVERED BY : UPS
COMMENTS :
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : B

DATE RECEIVED : 920616 TIME RECEIVED : 0900 RECEIVED BY : MAD
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

P00668	PHOSPHORUS-P,SED.	MG/KG :	359
P00339	COD,SEDIMENT	MG/KG :	59950
P00627	KJELDAHL-N, SED.	MG/KG :	1140
P70322	SOLIDS,VOL SED.	% :	4.2
P01003	ARSENIC,SEDIMENT	MG/KG :	20.0
P71921	MERCURY,SEDIMENT	MG/KG :	0.24
P00938	POTASSIUM,SED.	MG/KG :	1200
P01008	BARIUM,SEDIMENT	MG/KG :	28
P01028	CADMIUM,SEDIMENT	MG/KG :	4
P01029	CHROMIUM,SEDIMENT	MG/KG :	35
P01043	COPPER,SEDIMENT	MG/KG :	43
P01170	IRON,SEDIMENT	MG/KG :	12000
P01052	LEAD,SEDIMENT	MG/KG :	58
P01053	MANGANESE,SEDMT.	MG/KG :	392
P01068	NICKEL,SEDIMENT	MG/KG :	18
P01078	SILVER,SEDIMENT	MG/KG :	1K
P01093	ZINC,SEDIMENT	MG/KG :	135

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 8208979
SAMPLING POINT DESC. : EMER INTAKE 15' FROM CHAN WALL @ WWTP

SUBMITTING SOURCE # : 22S 02 SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1416 SAMPLING PROGRAM : 28

COLLECTED BY : CLB DELIVERED BY : UPS
COMMENTS :
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : 9

DATE RECEIVED : 920616 TIME RECEIVED : 0900 RECEIVED BY : MAD
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

P00668	PHOSPHORUS-P,SED.	MG/KG	330
P00339	COD,SEDIMENT	MG/KG	56200
P00627	KJELDAHL-N, SED.	MG/KG	1470
P70322	SOLIDS,VOL SED.	%	4.3
P01003	ARSENIC,SEDIMENT	MG/KG	18.1
P71921	MERCURY,SEDIMENT	MG/KG	0.23
P00938	POTASSIUM,SED.	MG/KG	1100
P01008	BARIUM,SEDIMENT	MG/KG	28
P01028	CADMIUM,SEDIMENT	MG/KG	3
P01029	CHROMIUM,SEDIMENT	MG/KG	31
P01043	COPPER,SEDIMENT	MG/KG	41
P01170	IRON,SEDIMENT	MG/KG	12000
P01052	LEAD,SEDIMENT	MG/KG	52
P01053	MANGANESE,SEDMT.	MG/KG	407
P01068	NICKEL,SEDIMENT	MG/KG	19
P01078	SILVER,SEDIMENT	MG/KG	1K
P01093	ZINC,SEDIMENT	MG/KG	131

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 8208990
SAMPLING POINT DESC. : INTAKE 1 125' S ' 100' E OF PIER

SUBMITTING SOURCE # : 0 05 SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1301 SAMPLING PROGRAM : 28

COLLECTED BY : CLB DELIVERED BY : UPS
COMMENTS :
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : 8

DATE RECEIVED : 920616 TIME RECEIVED : 0900 RECEIVED BY : MAD
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

P00668	PHOSPHORUS-P,SED.	MG/KG :	187
P00339	COD,SEDIMENT	MG/KG :	2900
P00627	KJELDAHL-N, SED.	MG/KG :	99
P70322	SOLIDS,VOL SED.	% :	1.3
P01003	ARSENIC,SEDIMENT	MG/KG :	2.1
P71921	MERCURY,SEDIMENT	MG/KG :	0.1K
P00938	POTASSIUM,SED.	MG/KG :	1000K
P01008	BARIUM,SEDIMENT	MG/KG :	9
P01028	CADMIUM,SEDIMENT	MG/KG :	1K
P01029	CHROMIUM,SEDIMENT	MG/KG :	5
P01043	COPPER,SEDIMENT	MG/KG :	3
P01170	IRON,SEDIMENT	MG/KG :	4500
P01052	LEAD,SEDIMENT	MG/KG :	10K
P01053	MANGANESE,SEDMT.	MG/KG :	183
P01068	NICKEL,SEDIMENT	MG/KG :	9
P01078	SILVER,SEDIMENT	MG/KG :	1K
P01093	ZINC,SEDIMENT	MG/KG :	45

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 8208931
SAMPLING POINT DESC. : INTAKE 1 125' S & 100' E OF PIER

SUBMITTING SOURCE # : C 05 SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1306 SAMPLING PROGRAM : 28

COLLECTED BY : CLB DELIVERED BY : UPS
COMMENTS :
FUNDING CODE : WP06 AGENCY ROUTING : C1 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : 8

DATE RECEIVED : 920616 TIME RECEIVED : 09CC RECEIVED BY : MAD
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

P00668	PHOSPHORUS-P,SED.	MG/KG :	281
P00339	COD,SEDIMENT	MG/KG :	4800
P00627	KJELDAHL-N, SED.	MG/KG :	105
P70322	SOLIDS,VOL SED.	% :	1.6
P01003	ARSENIC,SEDIMENT	MG/KG :	2.2
P71921	MERCURY,SEDIMENT	MG/KG :	0.1K
P00938	POTASSIUM,SED.	MG/KG :	1000K
P01008	BARIUM,SEDIMENT	MG/KG :	9
P01028	CADMIUM,SEDIMENT	MG/KG :	1K
P01029	CHROMIUM,SEDIMENT	MG/KG :	5
P01043	COPPER,SEDIMENT	MG/KG :	3
P01170	IRON,SEDIMENT	MG/KG :	4700
P01052	LEAD,SEDIMENT	MG/KG :	10K
P01053	MANGANESE,SEDMT.	MG/KG :	136
P01068	NICKEL,SEDIMENT	MG/KG :	9
P01078	SILVER,SEDIMENT	MG/KG :	1K
P01093	ZINC,SEDIMENT	MG/KG :	51

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : 8209592
SAMPLING POINT DESC. : INTAKE 2 6244' SE FROM H2O TANK S PIER

SUBMITTING SOURCE # : C 04 SITE # :
DATE COLLECTED : 920424 TIME COLLECTED : 1335 SAMPLING PROGRAM : 28

COLLECTED BY : CLB DELIVERED BY : UPS
COMMENTS :
FUNDING CODE : WP06 AGENCY ROUTING : 01 UNIT CODE :
SAM TYPE CODE : ISED SAMPLE PURPOSE CODE : 5 REPORTING INDICATOR : 8

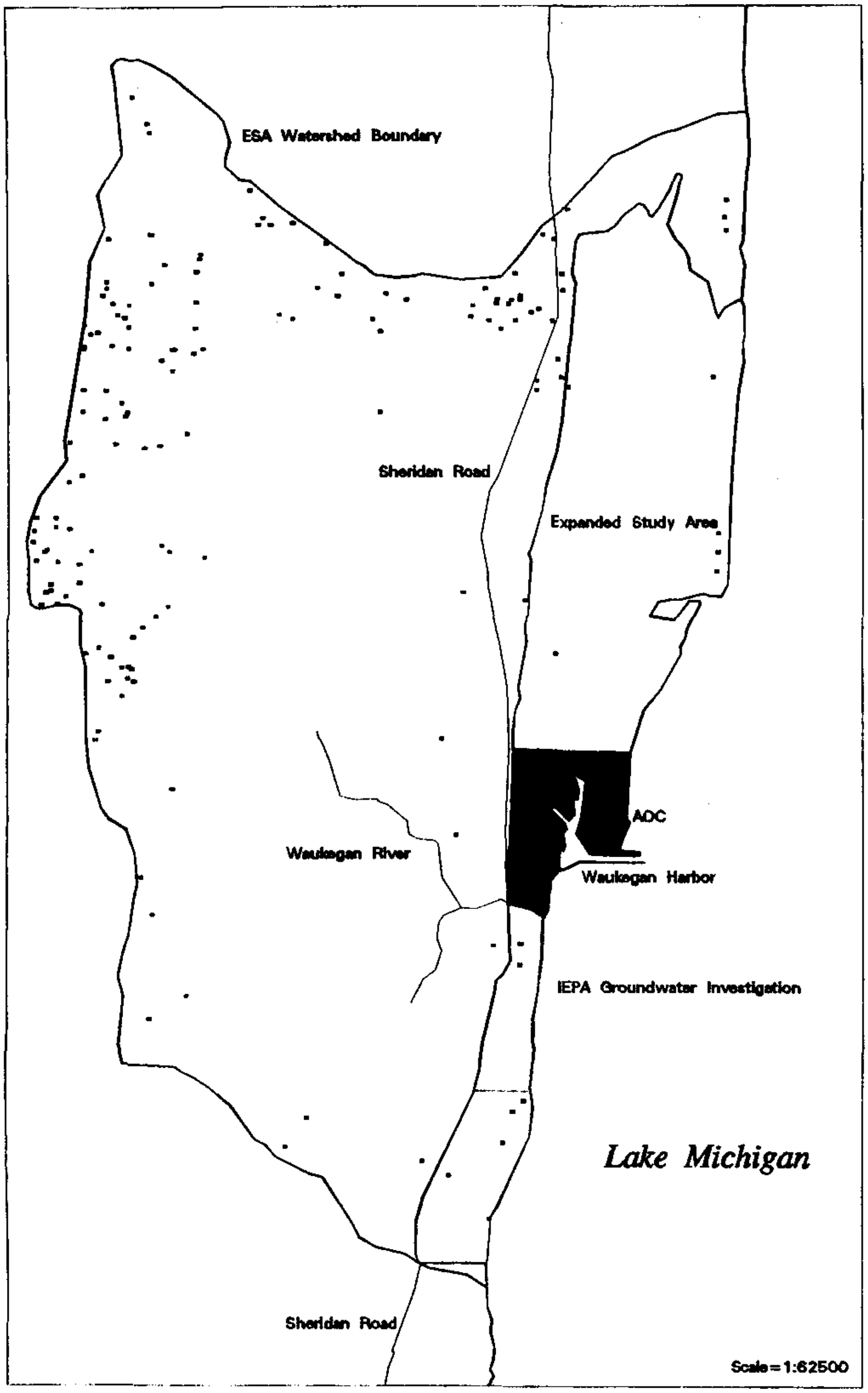
DATE RECEIVED : 920616 TIME RECEIVED : 09CC RECEIVED BY : MAD
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

P00668	PHOSPHORUS-P, SED.	MG/KG :	143
P00339	COD/SEDIMENT	MG/KG :	5800
P00627	KJELDAHL-N, SED.	MG/KG :	319
P70322	SOLIDS, VOL SED.	% :	2.0
P01003	ARSENIC, SEDIMENT	MG/KG :	6.1
P71921	MERCURY/SEDIMENT	MG/KG :	0.1K
P00938	POTASSIUM, SED.	MG/KG :	1000K
P01008	BARIUM/SEDIMENT	MG/KG :	10
P01028	CADMIUM/SEDIMENT	MG/KG :	1K
P01029	CHROMIUM/SEDIMENT	MG/KG :	6
P01043	COPPER/SEDIMENT	MG/KG :	7
P01170	IRON/SEDIMENT	MG/KG :	6800
P01052	LEAD/SEDIMENT	MG/KG :	10K
P01053	MANGANESE/SEDMT.	MG/KG :	240
P01068	NICKEL/SEDIMENT	MG/KG :	7
P01078	SILVER/SEDIMENT	MG/KG :	1K
P01093	ZINC/SEDIMENT	MG/KG :	38

APPENDIX L

Monitoring Well Locations in the Waukegan ESA Watershed, the Harbor Area, and the IEPA Groundwater Investigation Area

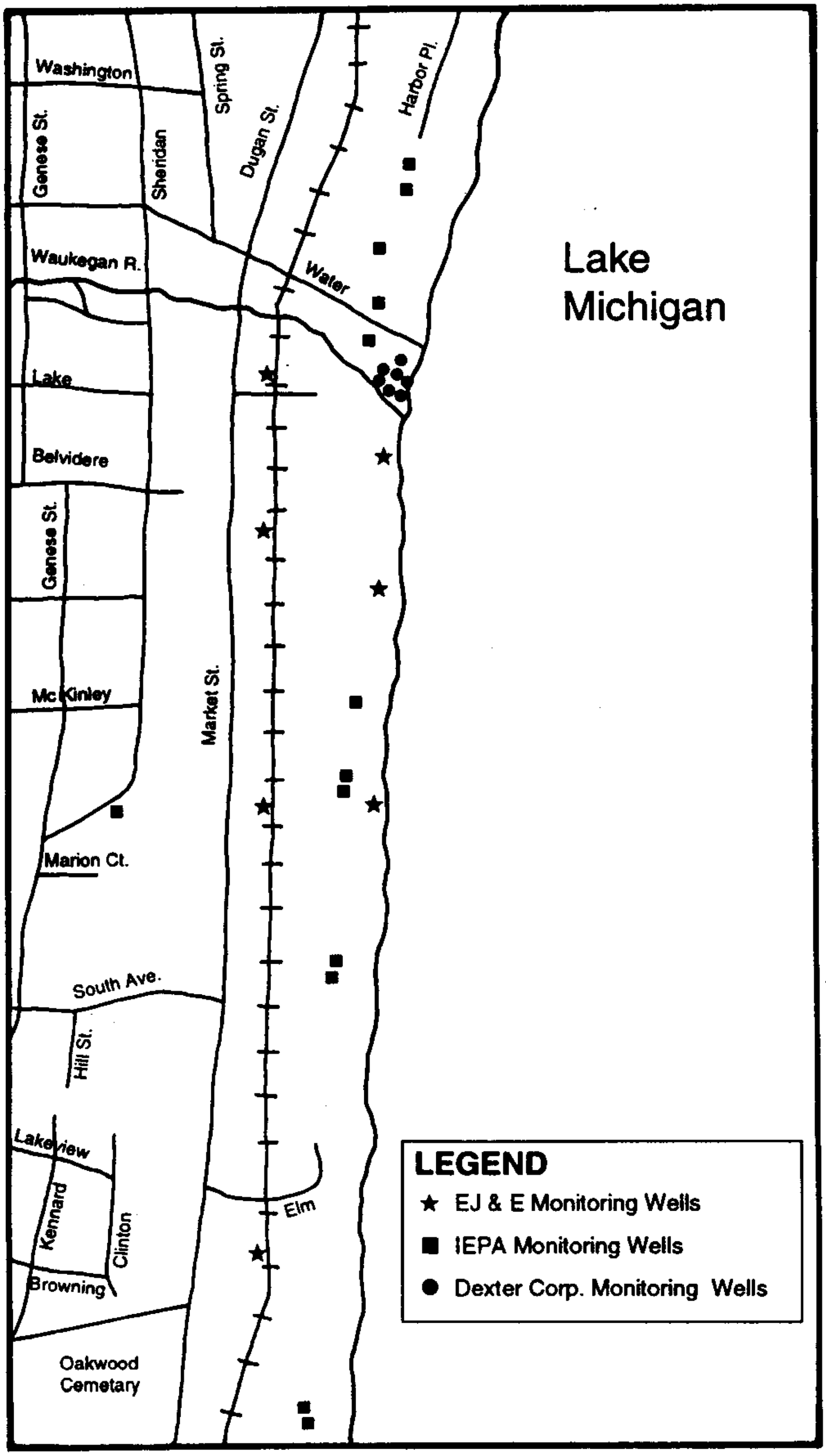
Drinking and Monitoring Well Locations in the Expanded Study Area Watershed



Well locations plotted from database developed by ISGS
all wells within this area may not be represented

Monitoring Wells South of Waukegan Harbor

(Within IEPA Groundwater Investigation Area)



APPENDIX M

IEPA Groundwater Monitoring Results

L1790000000 -- Lake Co.
Waukegan/Waukegan Area Study
SF/Tech LP52-914
SMO:TJM QPRO\WAKGN1.WQ1

Summary of Monitor Well Sample Results -- August 17, 1993

Parameter	G101S mid south	G101D mid south	G102S mid north	G102D mid north	G103 north	G104S south	G104D south	G105 bluff	MCL 620 Regs
VOLATILES (ppb)									
Acetone	18		11		12		15	21	
Benzene				13				11	5
1,1-Dichloroethane						11			
cis-1,2-Dichloroethene						49			70
1,1,1-Trichloroethane						9 J			200
Trichloroethene						18			5
Tetrachloroethene						4 J			5
SEMI-VOLATILES (ppb)									
diethyl Phthalate	2 B								
bis(2-ethyl-hexyl)Phthalate		2 J	2200	710		2000	650		
PESTICIDES/PCB's (ppb)									
Methoxychlor		1.6							40
INORGANICS (ppb)									
Aluminum	40400	3470	17200	155 B	6740	554	4140	708	
Arsenic	15	7.2 B	14.2	2.4 B	8.0 B	5.5 B	5.2 B	4.2 B	50
Barium	299	45.9 B	241	11.6 B	52.0 B	62.3 B	37.0 B	43.8 B	2000
Beryllium	2.0 B								
Calcium	456000	56100	260000	11800	107000	123000	53400	44500	
Chromium	68.2	12.6	61.3	25.6	19.6	6.0 B	32.6	141	100
Cobalt	45.2 B	4.1 B	25.6 B		8.4 B	6.9 B	5.0 B	3.6 B	1000
Copper	107	13.7 B	61.9	18.2	25.0	57.0	19.1 B	61.7	650
Cyanide							10.0		200
Iron	69700	5400	35500	1040	14200	8240	6940	3290	5000
Lead	49.2	10.5	24.6		17.8	72.1	10.4	4.6	7.5
Magnesium	217000	30200	155000	4550 B	57600	51300	25500	20100	
Manganese	2430	291	1420	64.0	858	436	379	124	150
Nickel	97.4	14.5 B	64.8	32.3 B	23.1 B	8.1 B	25.6 B	113	100
Potassium	19000	6030	24100	1130 B	4020 B	7500	3070 B	4290 B	
Selenium			2.2 B			2.6 B		2.2 B	50
Sulfate	124000	20000	59000	17000		145000	42000	92000	400000
Sulfide	640			480					
Sodium	127000	49100	91000	57900	43400	17000	60100	60900	
Vandium	90.2	10.5 B	38.8 B		19.0 B	5.4 B	6.5 B	3.8 B	
Zinc	295	95.7	140	45.3	112	279	79.7	103	5000

Data Qualifiers: Organics; B - found in blank; J - estimated value below CRQL; Inorganics; B - reported concentration is > IDL but < CRQL

L1790000000 -- Lake Co. Waukegan/Waukegan Area Stud SF/Tech LP52-914	Summary of Monitor Well Sample Results -- November 19, 1993									
SMO:TJM QPRO\WAKGN2.WQ1	G101S	G101D	G102S	G102D	G103	G104S	G104SPP	G104D	G105	MCL
Parameter	mid south	mid south	mid north	mid north	north	south	south	south	bluff	620 Regs
VOLATILES (ppb)										
Acetone									110 B	
Benzene										5
2-Butanone (MEK)									75	
1,1-Dichloroethane						8 J	12			
cis/trans-1,2-Dichloroethene						19	53			170
2-Hexanone									17	
4-Methyl-2-pentanone (MIBK)									7 J	
1,1,1-Trichloroethane						9 J	8 J			200
Trichloroethene						19	19			5
Tetrachloroethene						4 J	4 J			5
SEMI-VOLATILES (ppb)										
diethyl Phthalate	2 J B		2 J	3 J B			2 J B		1 J B	
bis(2-ethyl-hexyl)Phthalate	3 J B	47 B	3 J	36	250 D		2 J	21	2 J B	
PESTICIDES/PCB's (ppb)										
Methoxychlor										40
INORGANICS (ppb)										
Aluminum	115000	5810	4260	187 B	1290	2460	999	12200		
Arsenic	3.8 B	5.9 B	6.0 B	2.0 B		10.3	8.8 B	6.9 B	1.7 B	50
Barium	587	52.3 B	156 B	15.4 B	30.3 B	112 B	371	79.2 B	58.2 B	2000
Beryllium	7.0							1.0 B		
Cadmium	7.6						8.3			5
Calcium	1290000	69100	147000	13700	25300	124000	127000	114000	56100	
Chromium	212	38.8	46.0	21.8	6.1 B	92	13.8	44.6	32.9	100
Cobalt	128	5.9 B	7.1 B			12.5 B	14.2 B	13.7 B		1000
Copper	356	16.0 B	21.4 B	21.1	6.6 B	161	90.9	[illegible]	18.0 B	650
Cyanide					5.6 B	21.2	45.6	14.9		200
Iron	218000	9220	10800	801	2110	50600	214000	21100	4110	5000
Lead		4.1	4.2	1.9 B	2.2 B	217	59.1	26.7	1.5 B	7.5
Magnesium	689000	35300	69600	4760 B	11800	51600	61300	56900	24200	
Manganese	8540	410	529	66.9	150	599	460	855	302	150
Mercury	0.65					0.62	[illegible]	0.20		2
Nickel	304	25.5 B	38.2 B	26.2 B				34.8 B	25.5 B	100
Potassium	33400	6550	14900	2320 B		8000	7930	5960	3170 B	
Selenium										50
Sulfate	122000	13300	57700	18000		114000	106000	47600	124000	400000
Sulfide				1100		1100		1100		
Sodium	68700	40700	76200	56200	41100	18700	18000	53700	52600	
Vandium	247		10.0 B			17.1 B		21.4 B		
Zinc	975	97.2	41.6	97.2	25.5	499	861	106	22.2	5000

Data Qualifiers: Organics; B - found in blank; J - estimated value below CRQL; Inorganics; B - reported concentration is > IDL but < CRQL

IEPA TOXICITY TESTING UNIT
TOXICITY TEST SUMMARY

Date: June 14, 1993

To: Sherry Otto

From: Mike Henebry, EL *M. Henebry*

Subject: Biomonitoring Data

Site : Waukegan Expanded Study Area

County: Lake

Site Inventory #: 0970000000
Program Code : LP52 914
Project Manager : Sherry Otto
Collected by : Tim Murphy

Sample Number: G102D, G102S, G103D, G105, G104D, G104S, G101S, G101D

Sample I.D. : All G- Samples were from monitoring wells in the Waukegan Expanded Study Area. D = deep well sample; S = shallow well sample.
Samples Collected: 6/10/93

Tests Initiated : 6/11/93 1400 hrs

Test(s) Conducted: ( ) 96-hr static fathead minnow
(x) 48-hr static Ceriodaphnia dubia
(x) MICROTOX bacterial bioassay

0 - 19% mortality = nontoxic, 20 - 49% mortality = marginally toxic, 50 - 100% mortality = toxic.

Comments: Only one sample, G102S, could be considered toxic to Ceriodaphnia dubia. Samples G104S, G101S and G101D were in the mortality range (20-49%) that we consider marginally toxic. The other four samples were nontoxic to C. dubia. No samples were toxic in Microtox screenig tests. It is interesting that in all cases where there were samples from both shallow and deep wells, (e.g., G102D and G102S) the sample from the shallow well was more toxic to C. dubia. C. dubia showed some toxic response to all samples from shallow wells. The results for our internal positive and negative controls were in the acceptable range.

cc: Bill Busch, BOW

Completed by: Mike Henebry *MH* Date: 06/14/93

IEPA ECOTOXICOLOGY LABORATORY
TOXICITY TEST RESULTS

SAMPLE NUMBER DATE/TIME COLLECTED	SITE DESCRIPTION	% MORTALITY IN SAMPLE		MICROTOX RESULTS
		FATHEAD MINNOW	CERIODAPHNIA	
G102D 06/10/93 1535 hrs	Deep well	N/A	10 at 48hrs	Nontoxic
G102S 06/10/93 1535 hrs	Shallow well	N/A	55 at 48hrs	Nontoxic
G103D 06/10/93 1535 hrs	Deep well	N/A	10 at 48hrs	Nontoxic
G105 06/10/93 1535 hrs		N/A	0 at 48hrs	Nontoxic
G104D 06/10/93 1345 hrs	Deep well	N/A	15 at 48hrs	Nontoxic
G104S 06/10/93 1345 hrs	Shallow well	N/A	45 at 48hrs	Nontoxic
G101S 06/10/93 1345 hrs	Shallow well	N/A	40 at 48hrs	Nontoxic
G101D 06/10/93 1345 hrs	Deep well	N/A	35 at 48hrs	Nontoxic
	Negative Control	N/A	0 at 48hrs	Nontoxic
	Positive Control (2400 ppm NaCl)	N/A	85 at 48hrs	Toxic

Completed by: Mike Henebry M.H.   Date: 06/14/93

APPENDIX N

Water Level Readings
from IEPA Groundwater Monitoring Wells
and Lake Michigan Water Levels

IEPA Groundwater Monitoring Well Readings

All Measurements are in Feet

WELL #	DAY	OCT8@5P	OCT8@9P	OCT9@8:3A	OCT22@5:3P	OCT22@9P	NOV12@4P	NOV12@9P	NOV13@10p	JAN14 @4:00p
g103	ELEVATION	591.39	591.39	591.39	591.39	591.39	591.39	591.39	591.39	591.39
	WELL READING	8.4	8.4	8.4	8.62	8.63	8.44	8.44	8.58	8.42
	WATERLEVEL	582.99	582.99	582.99	582.77	582.76	582.95	582.95	582.81	582.97
g102d	ELEVATION	590.18	590.18	590.18	590.18	590.18	590.18	590.18	590.18	590.18
	WELL READING	6.8	6.8	6.8	6.87	6.86	6.6	6.6	6.64	6.94
	WATERLEVEL	583.38	583.38	583.38	583.31	583.32	583.58	583.58	583.54	583.24
g102s	ELEVATION	589.99	589.99	589.99	589.99	589.99	589.99	589.99	589.99	589.99
	WELL READING	7.4	7.4	7.4	7.58	7.58	6.68	6.68	6.68	6.04
	WATERLEVEL	582.59	582.59	582.59	582.41	582.41	583.31	583.31	583.31	583.95
MW1d	ELEVATION	591.81	591.81	591.81	591.81	591.81	591.81	591.81	591.81	591.81
	WELL READING	9.3	9.3	9.3	9.58	9.58	9.62	9.62	9.64	10.24
	WATERLEVEL	582.51	582.51	582.51	582.23	582.23	582.19	582.19	582.17	581.57
MW1s	ELEVATION	591.67	591.67	591.67	591.67	591.67	591.67	591.67	591.67	591.67
	WELL READING	6	6	6	9.13	9.13	7.74	7.64	7.88	7.62
	WATERLEVEL	585.67	585.67	585.67	582.54	582.54	583.93	584.03	583.79	584.05
G104s	ELEVATION									594.84
	WELL READING									13.28
	WATERLEVEL									581.56
G104d	ELEVATION									594.78
	WELL READING									12.9
	WATERLEVEL									581.88
G105	ELEVATION									631.66
	WELL READING									37.66
	WATERLEVEL									594

WELL #	All Measurements are in Feet									0	0
										0	0
	DAY	JAN14 @10	JAN15 @10	FEB11 @ 5:40	FEB11 @11:20	FEB12 @12:	MAR11 @4:0	MAR11 @10:	MAR12 @10:3	APR8 @4:30p	APR8 @8:40p
g103	ELEVATION	591.39	591.39	591.39	591.39	591.39	591.39	591.39	591.39	591.39	591.39
	WELL READING	8.48	8.48	8.64	8.61	8.56	8.81	8.83	8.85	8.56	8.56
	WATERLEVEL	582.91	582.91	582.75	582.78	582.83	582.58	582.56	582.54	582.83	582.83
g102d	ELEVATION	590.18	590.18	590.18	590.18	590.18	590.18	590.18	590.18	590.18	590.18
	WELL READING	6.92	6.94	7.38	7.38	7.36	7.795	7.79	7.79	7.82	7.8
	WATERLEVEL	583.26	583.24	582.8	582.8	582.82	582.385	582.39	582.39	582.36	582.38
g102s	ELEVATION	589.99	589.99	589.99	589.99	589.99	589.99	589.99	589.99	589.99	589.99
	WELL READING	6.03	6.06	6.38	6.38	6.36	6.51	6.5	6.51	4.92	4.9
	WATERLEVEL	583.96	583.93	583.61	583.61	583.63	583.48	583.49	583.48	585.07	585.09
MW1d	ELEVATION	591.81	591.81	591.81	591.81	591.81	591.81	591.81	591.81	591.81	591.81
	WELL READING	10.26	10.25	10.76	10.76	10.72	10.92	10.94	10.93	10.3	10.29
	WATERLEVEL	581.55	581.56	581.05	581.05	581.09	580.89	580.87	580.88	581.51	581.52
MW1s	ELEVATION	591.67	591.67	591.67	591.67	591.67	591.67	591.67	591.67	591.67	591.67
	WELL READING	7.64	7.64	7.94	7.96	7.9	7.99	8	7.99	5.9	5.78
	WATERLEVEL	584.03	584.03	583.73	583.71	583.77	583.68	583.67	583.68	585.77	585.89
G104s	ELEVATION	594.84	594.84	594.84	594.84	594.84	594.84	594.84	594.84	594.84	594.84
	WELL READING	13.3	13.38	12.66	12.6	12.6	13.12	13.105	13.13	12.8	12.84
	WATERLEVEL	581.54	581.46	582.18	582.24	582.24	581.72	581.735	581.71	582.04	582
G104d	ELEVATION	594.78	594.78	594.78	594.78	594.78	594.78	594.78	594.78	594.78	594.78
	WELL READING	12.96	13.02	12.36	12.3	12.28	12.805	12.705	12.77	12.42	12.44
	WATERLEVEL	581.82	581.76	582.42	582.48	582.5	581.975	582.075	582.01	582.36	582.34
G105	ELEVATION	631.66	631.66		631.66	631.66	631.66	631.66	631.66	631.66	631.66
	WELL READING	37.62	32		34.6	34.52	33.905	33.91	33.89	33.17	32
	WATERLEVEL	594.04	599.66		597.06	597.14	597.755	597.75	597.77	598.49	599.66

WELL #	All Measurements are in Feet								
	DAY	APR9 @ 8:	APR28 @2:	MAY13 @2:35	MAY13 @10:00	MAY14 @9:1	JUN3 @2:30	JUN10@10P	JUN11@9A
g103	ELEVATION	591.39	591.39	591.39	591.39	591.39	591.39	591.39	591.39
	WELL READING	8.55	8.28	8.08	8.08	8.1	7.9	7.89	7.82
	WATERLEVEL	582.84	583.11	583.31	583.31	583.29	583.49	583.5	583.57
g102d	ELEVATION	590.18	590.18	590.18	590.18	590.18	590.18	590.18	590.18
	WELL READING	7.82	7.73	7.68	7.66	7.68	7.67	32.76	29.05
	WATERLEVEL	582.36	582.45	582.5	582.52	582.5	582.51	557.42	561.13
g102s	ELEVATION	589.99	589.99	589.99	589.99	589.99	589.99	589.99	589.99
	WELL READING	4.82	4.87	5.52	5.52	5.56	6.27	5.89	5.92
	WATERLEVEL	585.17	585.12	584.47	584.47	584.43	583.72	584.1	584.07
MW1d	ELEVATION	591.81	591.81	591.81	591.81	591.81	591.81	591.81	591.81
	WELL READING	10.26	9.66	9.54	9.54	9.56	9.37	24.1	18.94
	WATERLEVEL	581.55	582.15	582.27	582.27	582.25	582.44	567.71	572.87
MW1s	ELEVATION	591.67	591.67	591.67	591.67	591.67	591.67	591.67	591.67
	WELL READING	5.4	6.2	6.9	6.9	6.94	7.69	6.95	6.96
	WATERLEVEL	586.27	585.47	584.77	584.77	584.73	583.98	584.72	584.71
G104s	ELEVATION	594.84	594.84	594.84	594.84	594.84	594.84	594.84	594.84
	WELL READING	12.88	12.67	12.38	12.56	12.76	12.86	12.9	12.88
	WATERLEVEL	581.96	582.17	582.46	582.28	582.08	581.98	581.94	581.96
G104d	ELEVATION	594.78	594.78	594.78	594.78	594.78	594.78	594.78	594.78
	WELL READING	12.48	12.24	11.94	12.1	12.3	12.4	12.59	12.57
	WATERLEVEL	582.3	582.54	582.84	582.68	582.48	582.38	582.19	582.21
G105	ELEVATION	631.66	631.66	631.66	631.66	631.66	631.66	631.66	631.66
	WELL READING	33.16	32.9	32.74	32	32.68	32.75	43	43
	WATERLEVEL	598.5	598.76	598.92	599.66	598.98	598.91	588.66	588.66

Lake Michigan Water Level Readings

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

October 1992
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.49	176.43	176.42	176.62	176.51	176.51	176.45	176.51
0200	176.44	176.46	176.43	176.58	176.55	176.49	176.48	176.49
0300	176.50	176.43	176.46	176.60	176.54	176.48	176.44	176.50
0400	176.53	176.44	176.46	176.63	176.54	176.46	176.46	176.51
0500	176.50	176.41	176.48	176.65	176.53	176.47	176.44	176.50
0600	176.50	176.44	176.50	176.64	176.53	176.50	176.45	176.50
0700	176.49	176.43	176.47	176.61	176.55	176.48	176.47	176.50
0800	176.47	176.43	176.51	176.59	176.59	176.49	176.45	176.52
0900	176.52	176.44	176.49	176.61	176.57	176.50	176.47	176.54
1000	176.44	176.40	176.52	176.62	176.55	176.50	176.50	176.48
1100	176.52	176.45	176.54	176.61	176.51	176.54	176.52	176.54
1200	176.46	176.42	176.50	176.60	176.52	176.50	176.49	176.51
1300	176.50	176.42	176.61	176.55	176.53	176.46	176.52	176.52
1400	176.48	176.44	176.55	176.59	176.54	176.47	176.50	176.54
1500	176.52	176.44	176.58	176.56	176.56	176.45	176.46	176.46
1600	176.48	176.41	176.56	176.59	176.52	176.46	176.46	176.52
1700	176.50	176.48	176.61	176.62	176.55	176.44	176.48	176.49
1800	176.46	176.44	176.58	176.57	176.57	176.51	176.50	176.44
1900	176.46	176.43	176.58	176.61	176.54	176.50	176.51	176.46
2000	176.44	176.45	176.62	176.57	176.54	176.46	176.54	176.52
2100	176.45	176.42	176.61	176.63	176.52	176.52	176.53	176.55
2200	176.42	176.42	176.55	176.57	176.55	176.51	176.57	176.52
2300	176.48	176.44	176.56	176.57	176.59	176.48	176.56	176.49
2400	176.42	176.45	176.59	176.51	176.50	176.50	176.55	176.28
Mean	176.48	176.43	176.53	176.60	176.54	176.49	176.49	176.50

CST	9	10	11	12	13	14	15	16
0100	176.38	176.37	176.54	176.44	176.40	176.48	176.61	176.46
0200	176.37	176.44	176.48	176.44	176.36	176.45	176.50	176.48
0300	176.34	176.46	176.53	176.38	176.36	176.46	176.47	176.52
0400	176.46	176.43	176.51	176.33	176.34	176.52	176.56	176.55
0500	176.50	176.46	176.47	176.26	176.36	176.42	176.60	176.55
0600	176.36	176.46	176.47	176.31	176.36	176.54	176.49	176.56
0700	176.48	176.40	176.48	176.27	176.36	176.48	176.59	176.58
0800	176.41	176.43	176.50	176.29	176.36	176.37	176.62	176.65
0900	176.62	176.38	176.51	176.45	176.33	176.36	176.61	176.58
1000	176.50	176.42	176.54	176.54	176.32	176.50	176.47	176.47
1100	176.43	176.43	176.54	176.59	176.33	176.49	176.62	176.51
1200	176.42	176.48	176.54	176.61	176.40	176.48	176.63	176.61
1300	176.45	176.51	176.54	176.56	176.41	176.56	176.63	176.54
1400	176.50	176.47	176.50	176.46	176.43	176.50	176.63	176.50
1500	176.37	176.46	176.50	176.50	176.40	176.55	176.59	176.66
1600	176.44	176.46	176.48	176.37	176.37	176.43	176.62	176.54
1700	176.45	176.43	176.47	176.37	176.40	176.64	176.52	176.59
1800	176.35	176.48	176.42	176.31	176.38	176.63	176.66	176.61
1900	176.47	176.44	176.46	176.37	176.36	176.53	176.69	176.54
2000	176.40	176.42	176.48	176.39	176.36	176.67	176.62	176.54
2100	176.36	176.42	176.45	176.41	176.39	176.71	176.49	176.44
2200	176.38	176.51	176.41	176.46	176.52	176.52	176.72	176.49
2300	176.46	176.52	176.46	176.42	176.52	176.48	176.58	176.41
2400	176.46	176.53	176.45	176.40	176.44	176.63	176.51	176.47
Mean	176.43	176.45	176.49	176.42	176.39	176.52	176.58	176.54

CST	17	18	19	20	21	22	23	24
0100	176.46	176.37	176.48	176.37	176.50	176.45	176.44	176.50
0200	176.47	176.42	176.50	176.31	176.50	176.45	176.42	176.54
0300	176.42	176.45	176.45	176.38	176.50	176.49	176.40	176.51
0400	176.46	176.48	176.45	176.28	176.46	176.42	176.43	176.35
0500	176.43	176.50	176.51	176.30	176.46	176.43	176.39	176.54
0600	176.39	176.53	176.50	176.30	176.46	176.40	176.40	176.41
0700	176.36	176.57	176.51	176.32	176.53	176.43	176.40	176.50
0800	176.40	176.54	176.50	176.33	176.52	176.46	176.40	176.48
0900	176.40	176.54	176.50	176.29	176.53	176.45	176.43	176.50
1000	176.36	176.55	176.48	176.21	176.51	176.47	176.42	176.53
1100	176.36	176.51	176.50	176.42	176.45	176.46	176.53	176.54
1200	176.35	176.52	176.48	176.43	176.51	176.48	176.43	176.59
1300	176.40	176.52	176.48	176.44	176.52	176.46	176.43	176.51
1400	176.42	176.54	176.46	176.49	176.55	176.41	176.48	176.40
1500	176.41	176.49	176.46	176.56	176.47	176.45	176.43	176.54
1600	176.46	176.55	176.49	176.50	176.50	176.42	176.36	176.44
1700	176.41	176.57	176.48	176.49	176.52	176.44	176.39	176.43
1800	176.40	176.52	176.49	176.54	176.48	176.44	176.48	176.42
1900	176.32	176.53	176.50	176.48	176.46	176.39	176.46	176.52
2000	176.48	176.54	176.47	176.49	176.51	176.49	176.37	176.51
2100	176.39	176.49	176.38	176.64	176.44	176.46	176.52	176.44
2200	176.40	176.52	176.43	176.58	176.55	176.50	176.50	176.54
2300	176.36	176.50	176.43	176.55	176.53	176.48	176.48	176.50
2400	176.41	176.48	176.42	176.57	176.55	176.48	176.50	176.58
Mean	176.40	176.51	176.47	176.43	176.50	176.45	176.44	176.49

CST	25	26	27	28	29	30	31	
0100	176.49	176.44	176.53	176.50	176.58	176.57	176.53	Monthly
0200	176.46	176.39	176.49	176.49	176.58	176.57	176.52	Maximum
0300	176.48	176.46	176.41	176.46	176.61	176.56	176.51	176.72
0400	176.55	176.42	176.43	176.49	176.63	176.53	176.53	2200/15
0500	176.55	176.50	176.40	176.46	176.63	176.51	176.54	
0600	176.48	176.65	176.42	176.36	176.65	176.55	176.52	
0700	176.44	176.58	176.45	176.35	176.56	176.50	176.47	Monthly
0800	176.50	176.57	176.43	176.44	176.59	176.53	176.51	Minimum
0900	176.48	176.51	176.51	176.40	176.57	176.51	176.48	176.21
1000	176.51	176.48	176.46	176.45	176.58	176.50	176.54	1000/20
1100	176.51	176.52	176.44	176.46	176.59	176.53	176.55	
1200	176.49	176.44	176.44	176.51	176.62	176.52	176.46	
1300	176.59	176.50	176.43	176.53	176.64	176.53	176.53	Monthly
1400	176.54	176.50	176.47	176.48	176.62	176.52	176.46	Mean
1500	176.54	176.54	176.48	176.51	176.64	176.55	176.58	176.49
1600	176.42	176.51	176.52	176.48	176.64	176.57	176.49	
1700	176.43	176.44	176.51	176.50	176.59	176.55	176.57	
1800	176.39	176.44	176.44	176.50	176.57	176.57	176.56	
1900	176.37	176.39	176.49	176.52	176.56	176.54	176.57	
2000	176.42	176.40	176.39	176.52	176.55	176.49	176.56	
2100	176.43	176.49	176.34	176.53	176.55	176.48	176.58	
2200	176.44	176.47	176.40	176.56	176.56	176.48	176.57	
2300	176.37	176.47	176.45	176.55	176.59	176.52	176.52	
2400	176.38	176.48	176.44	176.56	176.58	176.55	176.55	
Mean	176.47	176.46	176.45	176.48	176.60	176.53	176.53	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

November 1992
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.59	176.62	176.51	176.54	176.43	176.53	176.55	176.49
0200	176.58	176.57	176.54	176.47	176.45	176.54	176.54	176.48
0300	176.61	176.62	176.54	176.49	176.41	176.54	176.52	176.46
0400	176.62	176.72	176.46	176.43	176.43	176.54	176.53	176.48
0500	176.65	176.67	176.53	176.44	176.40	176.53	176.56	176.47
0600	176.66	176.75	176.54	176.51	176.40	176.58	176.51	176.50
0700	176.62	176.73	176.51	176.59	176.51	176.57	176.53	176.46
0800	176.65	176.70	176.60	176.45	176.46	176.58	176.58	176.50
0900	176.61	176.72	176.55	176.40	176.46	176.58	176.55	176.50
1000	176.60	176.72	176.59	176.43	176.53	176.59	176.56	176.50
1100	176.69	176.68	176.48	176.45	176.46	176.60	176.55	176.48
1200	176.68	176.55	176.54	176.44	176.50	176.56	176.58	176.47
1300	176.69	176.48	176.53	176.44	176.48	176.51	176.56	176.48
1400	176.65	176.65	176.53	176.37	176.46	176.53	176.49	176.45
1500	176.68	176.56	176.52	176.40	176.44	176.51	176.56	176.44
1600	176.74	176.58	176.59	176.47	176.44	176.50	176.52	176.44
1700	176.69	176.59	176.54	176.44	176.46	176.51	176.54	176.43
1800	176.72	176.61	176.56	176.46	176.48	176.54	176.52	176.41
1900	176.64	176.60	176.57	176.47	176.49	176.53	176.53	176.38
2000	176.71	176.62	176.61	176.44	176.57	176.57	176.54	176.40
2100	176.64	176.60	176.66	176.48	176.56	176.56	176.54	176.40
2200	176.62	176.54	176.59	176.51	176.57	176.59	176.54	176.43
2300	176.64	176.37	176.53	176.46	176.59	176.58	176.56	176.37
2400	176.62	176.48	176.54	176.46	176.57	176.54	176.53	176.40
Mean	176.65	176.61	176.55	176.46	176.48	176.55	176.54	176.45

CST	9	10	11	12	13	14	15	16
0100	176.46	176.42	176.54	176.50	176.44	176.34	N/A	N/A
0200	176.44	176.44	176.55	176.54	176.39	176.40	N/A	N/A
0300	176.43	176.44	176.52	176.53	176.32	176.40	N/A	N/A
0400	176.38	176.34	176.50	176.50	176.41	176.40	N/A	N/A
0500	176.35	176.38	176.47	176.52	176.43	176.39	N/A	N/A
0600	176.36	176.44	176.46	176.52	176.43	176.37	N/A	N/A
0700	176.40	176.48	176.46	176.56	176.40	176.36	N/A	N/A
0800	176.39	176.43	176.42	176.61	176.43	176.39	N/A	N/A
0900	176.37	176.36	176.48	176.49	176.40	176.44	N/A	N/A
1000	176.40	176.41	176.45	176.56	176.35	176.43	N/A	N/A
1100	176.45	176.39	176.53	176.62	176.38	176.46	N/A	N/A
1200	176.50	176.46	176.56	176.72	176.33	176.44	N/A	N/A
1300	176.50	176.46	176.48	176.74	176.34	176.44	N/A	N/A
1400	176.49	176.48	176.46	176.70	176.33	176.44	N/A	N/A
1500	176.47	176.42	176.49	176.68	176.33	176.47	N/A	N/A
1600	176.44	176.45	176.50	176.56	176.33	176.41	N/A	N/A
1700	176.44	176.40	176.50	176.56	176.34	176.46	N/A	N/A
1800	176.46	176.41	176.40	176.55	176.32	176.44	N/A	N/A
1900	176.45	176.39	176.39	176.53	176.28	176.49	N/A	N/A
2000	176.38	176.39	176.46	176.52	176.30	176.50	N/A	N/A
2100	176.42	176.41	176.46	176.43	176.33	176.47	N/A	N/A
2200	176.42	176.51	176.48	176.46	176.34	176.47	N/A	N/A
2300	176.41	176.47	176.44	176.48	176.35	176.48	N/A	N/A
2400	176.44	176.53	176.51	176.43	176.35	176.62	N/A	N/A
Mean	176.43	176.43	176.48	176.56	176.36	176.44	N/A	N/A

CST	17	18	19	20	21	22	23	24
0100	N/A	N/A	176.58	176.62	176.69	176.64	176.73	176.71
0200	N/A	N/A	176.59	176.61	176.67	176.66	176.76	176.68
0300	N/A	N/A	176.60	176.68	176.58	176.65	176.68	176.65
0400	N/A	N/A	176.64	176.59	176.58	176.56	176.73	176.65
0500	N/A	N/A	176.64	176.62	176.53	176.59	176.72	176.67
0600	N/A	N/A	176.66	176.57	176.54	176.57	176.65	176.65
0700	N/A	N/A	176.64	176.68	176.46	176.64	176.75	176.57
0800	N/A	N/A	176.64	176.61	176.50	176.76	176.75	176.59
0900	N/A	N/A	176.61	176.69	176.54	176.68	176.79	176.64
1000	N/A	N/A	176.62	176.62	176.56	176.86	176.75	176.72
1100	N/A	N/A	176.65	176.66	176.59	176.76	176.75	176.69
1200	N/A	N/A	176.60	176.64	176.56	176.78	176.73	176.73
1300	N/A	176.57	176.64	176.66	176.66	176.75	176.64	176.68
1400	N/A	176.57	176.58	176.64	176.63	176.72	176.64	176.67
1500	N/A	176.59	176.64	176.68	176.56	176.76	176.74	176.63
1600	N/A	176.58	176.61	176.65	176.64	176.74	176.68	176.70
1700	N/A	176.56	176.64	176.71	176.59	176.68	176.61	176.72
1800	N/A	176.62	176.62	176.69	176.58	176.72	176.69	176.60
1900	N/A	176.63	176.62	176.74	176.57	176.81	176.69	176.75
2000	N/A	176.63	176.62	176.68	176.61	176.73	176.62	176.66
2100	N/A	176.59	176.64	176.67	176.67	176.75	176.64	176.64
2200	N/A	176.63	176.64	176.70	176.64	176.70	176.68	176.63
2300	N/A	176.60	176.65	176.74	176.64	176.75	176.63	176.68
2400	N/A	176.57	176.61	176.67	176.63	176.77	176.69	176.71
Mean	N/A	176.59	176.62	176.66	176.59	176.71	176.70	176.67

CST	25	26	27	28	29	30	
0100	176.68	176.68	176.67	176.59	176.55	176.53	Monthly
0200	176.73	176.70	176.69	176.63	176.55	176.55	Maximum
0300	176.72	176.70	176.65	176.67	176.57	176.51	176.86
0400	176.67	176.64	176.67	176.62	176.59	176.51	1000/22
0500	176.70	176.68	176.64	176.57	176.59	176.50	
0600	176.59	176.65	176.65	176.56	176.54	176.50	
0700	176.71	176.74	176.59	176.60	176.50	176.49	Monthly
0800	176.69	176.74	176.59	176.59	176.55	176.48	Minimum
0900	176.65	176.73	176.62	176.55	176.54	176.53	176.28
1000	176.69	176.76	176.67	176.52	176.51	176.53	1900/13
1100	176.75	176.70	176.59	176.56	176.49	176.53	
1200	176.72	176.80	176.64	176.62	176.55	176.49	
1300	176.85	176.72	176.62	176.63	176.54	176.55	Monthly
1400	176.81	176.70	176.68	176.59	176.49	176.57	Mean
1500	176.74	176.71	176.62	176.59	176.55	176.60	176.56
1600	176.64	176.71	176.62	176.58	176.50	176.61	
1700	176.79	176.70	176.64	176.62	176.46	176.61	
1800	176.77	176.68	176.62	176.61	176.48	176.64	
1900	176.61	176.67	176.60	176.57	176.49	176.62	
2000	176.69	176.68	176.58	176.53	176.49	176.61	
2100	176.62	176.64	176.62	176.53	176.46	176.60	
2200	176.58	176.65	176.56	176.56	176.53	176.62	
2300	176.56	176.66	176.60	176.53	176.54	176.59	
2400	176.65	176.71	176.61	176.50	176.52	176.61	
Mean	176.69	176.70	176.63	176.58	176.52	176.56	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

November 1992
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7057 :
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.54	176.77	176.67	176.50	176.43	176.51	176.48	176.53
0200	176.61	176.81	176.62	176.52	176.47	176.49	176.53	176.55
0300	176.60	176.74	176.65	176.47	176.41	176.47	176.50	176.52
0400	176.63	176.86	176.61	176.50	176.48	176.50	176.52	176.54
0500	176.61	176.86	176.64	176.53	176.42	176.50	176.51	176.53
0600	176.67	176.77	176.63	176.56	176.47	176.50	176.53	176.54
0700	176.64	176.86	176.62	176.52	176.44	176.50	176.51	176.54
0800	176.74	176.77	176.61	176.50	176.46	176.53	176.53	176.54
0900	176.64	176.75	176.61	176.49	176.43	176.54	176.55	176.53
1000	176.69	176.74	176.66	176.49	176.45	176.52	176.56	176.52
1100	176.70	176.72	176.67	176.47	176.43	176.52	176.56	176.54
1200	176.69	176.77	176.55	176.46	176.47	176.48	176.53	176.53
1300	176.71	176.76	176.56	176.40	176.47	176.50	176.55	176.55
1400	176.75	176.69	176.54	176.48	176.45	176.49	176.51	176.53
1500	176.70	176.73	176.57	176.44	176.46	176.49	176.54	176.49
1600	176.81	176.74	176.62	176.45	176.44	176.50	176.52	176.50
1700	176.79	176.76	176.60	176.46	176.47	176.49	176.53	176.50
1800	176.85	176.76	176.56	176.45	176.47	176.50	176.53	176.53
1900	176.78	176.84	176.54	176.47	176.50	176.49	176.54	176.51
2000	176.90	176.78	176.56	176.46	176.51	176.52	176.54	176.50
2100	176.82	176.72	176.56	176.46	176.54	176.49	176.55	176.47
2200	176.86	176.65	176.56	176.53	176.52	176.52	176.55	176.53
2300	176.77	176.65	176.60	176.45	176.51	176.51	176.54	176.52
2400	176.79	176.68	176.58	176.42	176.52	176.52	176.53	176.56
Mean	176.72	176.76	176.60	176.48	176.47	176.50	176.53	176.52

CST	9	10	11	12	13	14	15	16
0100	176.52	176.53	176.50	176.49	176.35	176.38	176.51	176.49
0200	176.51	176.54	176.56	176.54	176.38	176.38	176.49	176.51
0300	176.49	176.55	176.50	176.54	176.47	176.40	176.51	176.51
0400	176.46	176.51	176.52	176.52	176.42	176.37	176.53	176.47
0500	176.51	176.51	176.46	176.52	176.43	176.42	176.51	176.50
0600	176.45	176.50	176.44	176.50	176.40	176.38	176.51	176.53
0700	176.47	176.50	176.45	176.52	176.42	176.41	176.54	176.53
0800	176.46	176.49	176.46	176.48	176.39	176.40	176.51	176.50
0900	176.50	176.54	176.46	176.51	176.42	176.43	176.52	176.50
1000	176.51	176.48	176.47	176.53	176.36	176.44	176.51	176.54
1100	176.56	176.52	176.53	176.52	176.36	176.46	176.51	176.50
1200	176.54	176.48	176.44	176.60	176.33	176.46	176.51	176.57
1300	176.55	176.51	176.46	176.58	176.37	176.45	176.53	176.55
1400	176.57	176.53	176.45	176.54	176.36	176.46	176.52	176.53
1500	176.55	176.55	176.47	176.56	176.38	176.46	176.53	176.53
1600	176.54	176.51	176.44	176.50	176.38	176.48	176.54	176.52
1700	176.52	176.48	176.45	176.46	176.30	176.48	176.51	176.51
1800	176.51	176.47	176.42	176.48	176.35	176.49	176.52	176.57
1900	176.52	176.43	176.40	176.40	176.32	176.46	176.50	176.56
2000	176.52	176.48	176.44	176.47	176.36	176.49	176.52	176.51
2100	176.56	176.52	176.49	176.52	176.33	176.47	176.50	176.50
2200	176.51	176.45	176.45	176.48	176.34	176.49	176.48	176.54
2300	176.54	176.44	176.46	176.47	176.36	176.47	176.47	176.53
2400	176.53	176.48	176.50	176.43	176.38	176.49	176.48	176.53
Mean	176.52	176.50	176.47	176.51	176.37	176.44	176.51	176.52

CST	17	18	19	20	21	22	23	24
0100	176.61	176.61	176.58	176.62	176.72	176.54	176.73	176.67
0200	176.59	176.57	176.56	176.63	176.70	176.56	176.72	176.64
0300	176.59	176.60	176.60	176.59	176.72	176.55	176.72	176.63
0400	176.57	176.59	176.56	176.63	176.68	176.55	176.70	176.60
0500	176.57	176.59	176.59	176.64	176.59	176.56	176.68	176.61
0600	176.59	176.60	176.59	176.64	176.57	176.50	176.67	176.61
0700	176.63	176.58	176.58	176.61	176.58	176.53	176.68	176.59
0800	176.65	176.57	176.63	176.62	176.54	176.47	176.66	176.58
0900	176.61	176.57	176.58	176.64	176.61	176.60	176.73	176.61
1000	176.65	176.56	176.57	176.66	176.56	176.64	176.70	176.64
1100	176.63	176.57	176.57	176.64	176.60	176.63	176.71	176.68
1200	176.58	176.53	176.55	176.64	176.62	176.68	176.70	176.61
1300	176.62	176.53	176.59	176.63	176.65	176.64	176.68	176.61
1400	176.60	176.58	176.60	176.61	176.65	176.65	176.68	176.63
1500	176.61	176.56	176.58	176.56	176.59	176.69	176.62	176.66
1600	176.64	176.56	176.56	176.71	176.57	176.67	176.65	176.61
1700	176.61	176.56	176.61	176.66	176.56	176.78	176.68	176.60
1800	176.63	176.57	176.58	176.69	176.55	176.70	176.64	176.58
1900	176.64	176.56	176.59	176.65	176.54	176.72	176.65	176.61
2000	176.65	176.58	176.62	176.68	176.56	176.71	176.62	176.61
2100	176.59	176.58	176.57	176.68	176.54	176.77	176.63	176.61
2200	176.58	176.59	176.62	176.68	176.57	176.77	176.62	176.64
2300	176.59	176.58	176.66	176.68	176.58	176.71	176.64	176.58
2400	176.59	176.55	176.65	176.68	176.56	176.67	176.68	176.63
Mean	176.61	176.57	176.59	176.64	176.60	176.64	176.68	176.62

CST	25	26	27	28	29	30
0100	176.63	176.73	176.63	176.53	176.54	176.49
0200	176.58	176.72	176.60	176.57	176.55	176.47
0300	176.63	176.70	176.61	176.56	176.56	176.50
0400	176.61	176.60	176.60	176.58	176.54	176.51
0500	176.63	176.64	176.59	176.59	176.52	176.52
0600	176.62	176.65	176.57	176.56	176.54	176.50
0700	176.61	176.70	176.58	176.53	176.53	176.52
0800	176.60	176.64	176.56	176.55	176.52	176.51
0900	176.62	176.62	176.56	176.56	176.50	176.55
1000	176.60	176.66	176.54	176.56	176.50	176.50
1100	176.68	176.67	176.56	176.56	176.52	176.51
1200	176.64	176.64	176.60	176.55	176.50	176.54
1300	176.65	176.67	176.57	176.59	176.53	176.55
1400	176.64	176.64	176.58	176.54	176.53	176.54
1500	176.66	176.61	176.55	176.59	176.52	176.55
1600	176.72	176.62	176.56	176.55	176.50	176.55
1700	176.75	176.66	176.56	176.58	176.52	176.54
1800	176.72	176.59	176.56	176.52	176.50	176.56
1900	176.72	176.62	176.56	176.56	176.50	176.57
2000	176.69	176.57	176.54	176.52	176.49	176.55
2100	176.72	176.59	176.51	176.54	176.48	176.56
2200	176.61	176.57	176.57	176.52	176.49	176.55
2300	176.65	176.58	176.53	176.53	176.52	176.55
2400	176.68	176.59	176.56	176.53	176.52	176.56
Mean	176.65	176.64	176.57	176.55	176.52	176.53

Monthly Maximum
176.90
2000/01

Monthly Minimum
176.30
1700/13

Monthly Mean
176.56

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

December 1992
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.58	176.48	176.61	176.54	176.72	176.52	176.46	176.49
0200	176.61	176.55	176.57	176.59	176.67	176.48	176.44	176.50
0300	176.57	176.54	176.56	176.56	176.65	176.51	176.39	176.53
0400	176.59	176.55	176.64	176.62	176.61	176.47	176.41	176.48
0500	176.60	176.55	176.58	176.60	176.59	176.39	176.38	176.50
0600	176.59	176.53	176.59	176.62	176.64	176.46	176.41	176.48
0700	176.60	176.49	176.60	176.64	176.62	176.44	176.46	176.51
0800	176.60	176.52	176.58	176.63	176.59	176.45	176.45	176.52
0900	176.57	176.55	176.57	176.66	176.61	176.52	176.43	176.52
1000	176.61	176.50	176.59	176.65	176.68	176.43	176.54	176.52
1100	176.60	176.52	176.57	176.67	176.62	176.41	176.48	176.56
1200	176.55	176.59	176.50	176.65	176.60	176.44	176.49	176.61
1300	176.44	176.65	176.54	176.63	176.61	176.43	176.46	176.60
1400	176.46	176.68	176.54	176.59	176.56	176.39	176.45	176.62
1500	176.49	176.65	176.53	176.61	176.51	176.32	176.46	176.61
1600	176.45	176.62	176.54	176.64	176.50	176.37	176.45	176.57
1700	176.43	176.62	176.48	176.67	176.52	176.35	176.45	176.58
1800	176.46	176.62	176.53	176.60	176.48	176.38	176.48	176.61
1900	176.52	176.59	176.51	176.69	176.48	176.36	176.51	176.67
2000	176.55	176.60	176.47	176.68	176.57	176.36	176.52	176.62
2100	176.48	176.63	176.46	176.70	176.62	176.42	176.50	176.59
2200	176.47	176.59	176.50	176.75	176.55	176.43	176.51	176.64
2300	176.48	176.56	176.57	176.69	176.51	176.34	176.54	176.66
2400	176.45	176.62	176.54	176.69	176.55	176.43	176.45	176.64
Mean	176.53	176.58	176.55	176.64	176.59	176.42	176.46	176.57

CST	9	10	11	12	13	14	15	16
0100	176.58	176.59	176.69	176.70	176.64	176.58	176.46	176.20
0200	176.61	176.68	176.71	176.64	176.67	176.55	176.45	176.34
0300	176.65	176.55	176.76	176.58	176.70	176.59	176.48	176.28
0400	176.64	176.56	176.76	176.70	176.64	176.68	176.53	176.44
0500	176.62	176.61	176.64	176.66	176.68	176.69	176.58	176.40
0600	176.55	176.59	176.73	176.66	176.67	176.60	176.52	176.51
0700	176.50	176.57	176.68	176.60	176.63	176.58	176.50	176.42
0800	176.47	176.54	176.64	176.60	176.61	176.52	176.42	176.59
0900	176.47	176.60	176.62	176.62	176.60	176.50	176.46	176.49
1000	176.54	176.62	176.63	176.62	176.60	176.46	176.37	176.58
1100	176.53	176.59	176.69	176.62	176.66	176.48	176.39	176.49
1200	176.46	176.64	176.72	176.60	176.60	176.52	176.44	176.40
1300	176.44	176.64	176.66	176.73	176.66	176.50	176.48	176.48
1400	176.59	176.64	176.63	176.66	176.62	176.53	176.50	176.54
1500	176.54	176.70	176.63	176.70	176.64	176.61	176.50	176.47
1600	176.52	176.65	176.67	176.63	176.67	176.60	176.56	176.51
1700	176.37	176.69	176.64	176.68	176.67	176.56	176.60	176.46
1800	176.55	176.67	176.60	176.61	176.69	176.56	176.60	176.58
1900	176.46	176.61	176.62	176.63	176.63	176.56	176.61	176.59
2000	176.46	176.67	176.56	176.57	176.60	176.55	176.56	176.60
2100	176.50	176.69	176.71	176.58	176.61	176.52	176.55	176.56
2200	176.45	176.64	176.65	176.62	176.58	176.50	176.42	176.55
2300	176.48	176.65	176.57	176.64	176.60	176.44	176.31	176.55
2400	176.56	176.66	176.63	176.64	176.60	176.38	176.25	176.53
Mean	176.52	176.63	176.66	176.64	176.64	176.54	176.48	176.48

CST	17	18	19	20	21	22	23	24
0100	176.52	176.50	176.37	176.49	176.34	176.46	176.37	176.52
0200	176.50	176.52	176.41	176.45	176.38	176.49	176.49	176.49
0300	176.45	176.53	176.40	176.46	176.33	176.45	176.49	176.47
0400	176.58	176.54	176.49	176.47	176.36	176.42	176.51	176.45
0500	176.61	176.56	176.49	176.44	176.32	176.45	176.51	176.36
0600	176.63	176.62	176.57	176.46	176.36	176.45	176.53	176.40
0700	176.62	176.65	176.59	176.45	176.26	176.41	176.52	176.38
0800	176.65	176.55	176.61	176.48	176.28	176.50	176.39	176.44
0900	176.62	176.55	176.64	176.44	176.25	176.47	176.39	176.40
1000	176.59	176.46	176.64	176.44	176.27	176.47	176.46	176.38
1100	176.64	176.46	176.53	176.46	176.34	176.51	176.58	176.40
1200	176.59	176.42	176.52	176.41	176.32	176.48	176.48	176.45
1300	176.62	176.44	176.52	176.41	176.30	176.41	176.61	176.33
1400	176.55	176.44	176.51	176.35	176.39	176.36	176.61	176.40
1500	176.52	176.44	176.58	176.40	176.31	176.40	176.55	176.42
1600	176.56	176.46	176.54	176.40	176.31	176.44	176.55	176.29
1700	176.55	176.44	176.59	176.40	176.35	176.37	176.57	176.31
1800	176.64	176.41	176.59	176.33	176.45	176.35	176.59	176.12
1900	176.62	176.43	176.62	176.35	176.39	176.40	176.53	176.14
2000	176.65	176.36	176.55	176.34	176.45	176.41	176.56	176.02
2100	176.62	176.37	176.42	176.37	176.40	176.39	176.62	175.92
2200	176.61	176.43	176.48	176.34	176.49	176.33	176.63	175.89
2300	176.67	176.48	176.48	176.37	176.37	176.40	176.61	176.08
2400	176.55	176.43	176.48	176.35	176.42	176.35	176.57	176.08
Mean	176.59	176.48	176.53	176.41	176.35	176.42	176.53	176.30

CST	25	26	27	28	29	30	31	
0100	176.20	176.26	176.25	176.49	176.45	176.64	176.54	Monthly
0200	176.23	176.28	176.11	176.48	176.50	176.62	176.74	Maximum
0300	176.21	176.33	176.17	176.46	176.66	176.73	176.58	176.85
0400	176.14	176.25	176.12	176.48	176.58	176.71	176.69	1600/30
0500	176.13	176.26	176.14	176.48	176.60	176.64	176.67	
0600	176.01	176.26	176.19	176.45	176.53	176.72	176.51	
0700	176.02	176.33	176.17	176.52	176.59	176.68	176.53	Monthly
0800	176.13	176.22	176.30	176.43	176.49	176.70	176.62	Minimum
0900	176.31	176.25	176.32	176.49	176.53	176.71	176.69	175.89
1000	176.34	176.25	176.25	176.50	176.53	176.60	176.65	2200/24
1100	176.51	176.25	176.32	176.49	176.56	176.65	176.55	
1200	176.54	176.29	176.31	176.50	176.62	176.56	176.60	
1300	176.42	176.32	176.36	176.41	176.72	176.62	176.55	Monthly
1400	176.34	176.34	176.43	176.48	176.51	176.79	176.56	Mean
1500	176.28	176.35	176.41	176.51	176.47	176.73	176.70	176.51
1600	176.23	176.34	176.40	176.55	176.55	176.85	176.56	
1700	176.19	176.32	176.46	176.51	176.61	176.62	176.64	
1800	176.10	176.30	176.38	176.54	176.68	176.50	176.58	
1900	176.26	176.28	176.42	176.62	176.58	176.61	176.57	
2000	176.26	176.23	176.38	176.60	176.57	176.48	176.69	
2100	176.37	176.26	176.43	176.53	176.62	176.59	176.56	
2200	176.29	176.31	176.40	176.51	176.57	176.42	176.55	
2300	176.28	176.28	176.43	176.38	176.69	176.46	176.61	
2400	176.28	176.17	176.51	176.45	176.59	176.54	176.57	
Mean	176.25	176.28	176.32	176.49	176.58	176.63	176.60	

U.S. Department of Commerce — December 1992
NOAA/NOS - Silver Spring, Maryland — | Water Levels in Meters |
Great Lakes Water Levels, N/OES211 — | IGLD (1985) |

Station 908-7057 :
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.55	176.53	176.53	176.58	176.53	176.43	176.40	176.49
0200	176.57	176.47	176.54	176.54	176.50	176.45	176.40	176.49
0300	176.56	176.55	176.54	176.55	176.50	176.42	176.38	176.49
0400	176.53	176.53	176.54	176.56	176.48	176.41	176.37	176.50
0500	176.54	176.54	176.54	176.52	176.50	176.42	176.40	176.50
0600	176.54	176.50	176.56	176.52	176.49	176.48	176.40	176.50
0700	176.52	176.54	176.52	176.56	176.47	176.41	176.44	176.52
0800	176.55	176.52	176.49	176.55	176.51	176.41	176.42	176.49
0900	176.51	176.52	176.51	176.58	176.48	176.40	176.46	176.55
1000	176.53	176.53	176.50	176.55	176.52	176.41	176.42	176.50
1100	176.50	176.54	176.49	176.56	176.53	176.45	176.46	176.56
1200	176.50	176.55	176.49	176.57	176.53	176.39	176.45	176.53
1300	176.49	176.53	176.47	176.57	176.46	176.34	176.47	176.52
1400	176.52	176.59	176.52	176.56	176.48	176.34	176.44	176.56
1500	176.46	176.57	176.49	176.56	176.46	176.33	176.43	176.54
1600	176.48	176.59	176.54	176.54	176.47	176.38	176.46	176.52
1700	176.47	176.54	176.48	176.53	176.48	176.38	176.45	176.50
1800	176.49	176.56	176.51	176.54	176.45	176.38	176.47	176.54
1900	176.49	176.54	176.48	176.51	176.48	176.37	176.45	176.50
2000	176.51	176.54	176.52	176.56	176.49	176.37	176.47	176.57
2100	176.53	176.58	176.51	176.53	176.49	176.37	176.49	176.54
2200	176.48	176.57	176.49	176.59	176.46	176.38	176.47	176.58
2300	176.45	176.58	176.54	176.56	176.52	176.42	176.48	176.57
2400	176.45	176.54	176.53	176.57	176.42	176.43	176.51	176.58
Mean	176.51	176.54	176.51	176.55	176.49	176.40	176.44	176.53

CST	9	10	11	12	13	14	15	16
0100	176.56	176.60	176.62	176.51	176.61	176.62	176.50	176.48
0200	176.57	176.61	176.63	176.52	176.58	176.61	176.54	176.43
0300	176.56	176.64	176.64	176.62	176.61	176.59	176.52	176.56
0400	176.58	176.63	176.63	176.56	176.62	176.56	176.57	176.46
0500	176.64	176.60	176.67	176.60	176.62	176.58	176.53	176.49
0600	176.53	176.58	176.59	176.56	176.60	176.57	176.64	176.57
0700	176.57	176.61	176.61	176.60	176.57	176.59	176.56	176.63
0800	176.53	176.61	176.59	176.54	176.59	176.55	176.53	176.59
0900	176.55	176.62	176.62	176.56	176.56	176.52	176.57	176.55
1000	176.52	176.63	176.57	176.55	176.57	176.54	176.55	176.61
1100	176.57	176.63	176.60	176.56	176.57	176.57	176.52	176.53
1200	176.55	176.64	176.59	176.56	176.64	176.56	176.59	176.53
1300	176.59	176.61	176.63	176.60	176.61	176.58	176.52	176.47
1400	176.55	176.62	176.60	176.59	176.63	176.58	176.54	176.48
1500	176.56	176.61	176.56	176.54	176.61	176.57	176.67	176.54
1600	176.56	176.66	176.60	176.58	176.63	176.58	176.68	176.61
1700	176.60	176.62	176.56	176.56	176.58	176.54	176.52	176.59
1800	176.54	176.64	176.57	176.58	176.61	176.57	176.65	176.58
1900	176.51	176.61	176.54	176.56	176.62	176.56	176.61	176.55
2000	176.52	176.63	176.55	176.56	176.59	176.58	176.68	176.54
2100	176.53	176.60	176.53	176.54	176.56	176.49	176.65	176.54
2200	176.58	176.64	176.54	176.55	176.56	176.51	176.52	176.59
2300	176.58	176.60	176.54	176.59	176.58	176.50	176.56	176.56
2400	176.64	176.60	176.53	176.58	176.58	176.54	176.52	176.52
Mean	176.56	176.62	176.59	176.57	176.60	176.56	176.57	176.54

CST	17	18	19	20	21	22	23	24
0100	176.48	176.55	176.49	176.50	176.38	176.48	176.52	176.46
0200	176.55	176.49	176.50	176.47	176.46	176.48	176.51	176.43
0300	176.55	176.53	176.55	176.50	176.39	176.45	176.51	176.44
0400	176.55	176.55	176.56	176.45	176.39	176.48	176.53	176.39
0500	176.50	176.54	176.59	176.49	176.42	176.52	176.49	176.44
0600	176.53	176.55	176.57	176.46	176.40	176.46	176.48	176.40
0700	176.55	176.54	176.55	176.46	176.40	176.47	176.50	176.42
0800	176.55	176.52	176.58	176.45	176.42	176.45	176.50	176.40
0900	176.60	176.57	176.56	176.45	176.44	176.49	176.49	176.48
1000	176.56	176.49	176.54	176.41	176.40	176.49	176.44	176.39
1100	176.56	176.54	176.51	176.44	176.42	176.55	176.47	176.47
1200	176.56	176.53	176.56	176.38	176.44	176.51	176.50	176.43
1300	176.54	176.50	176.53	176.41	176.42	176.49	176.52	176.46
1400	176.48	176.54	176.53	176.43	176.42	176.49	176.48	176.37
1500	176.50	176.53	176.53	176.36	176.44	176.45	176.49	176.47
1600	176.54	176.51	176.52	176.40	176.45	176.48	176.42	176.47
1700	176.59	176.54	176.52	176.35	176.46	176.50	176.43	176.40
1800	176.59	176.57	176.58	176.42	176.45	176.47	176.45	176.32
1900	176.58	176.55	176.47	176.38	176.47	176.47	176.45	176.32
2000	176.55	176.59	176.52	176.39	176.53	176.43	176.42	176.28
2100	176.55	176.57	176.47	176.40	176.46	176.45	176.42	176.24
2200	176.53	176.52	176.52	176.39	176.47	176.47	176.45	176.34
2300	176.55	176.53	176.47	176.43	176.51	176.49	176.44	176.34
2400	176.50	176.53	176.52	176.43	176.48	176.50	176.42	176.38
Mean	176.54	176.54	176.53	176.43	176.44	176.48	176.47	176.40

CST	25	26	27	28	29	30	31	
0100	176.35	176.28	176.36	176.54	176.52	176.64	176.53	Monthly
0200	176.44	176.30	176.38	176.54	176.57	176.66	176.64	Maximum
0300	176.40	176.25	176.33	176.51	176.58	176.56	176.57	176.70
0400	176.36	176.21	176.33	176.50	176.52	176.57	176.58	2400/29
0500	176.26	176.23	176.35	176.51	176.56	176.64	176.64	
0600	176.24	176.26	176.35	176.53	176.49	176.64	176.53	
0700	176.27	176.30	176.37	176.55	176.50	176.58	176.54	Monthly
0800	176.25	176.24	176.40	176.51	176.60	176.59	176.54	Minimum
0900	176.30	176.28	176.43	176.58	176.68	176.58	176.50	176.19
1000	176.37	176.24	176.38	176.54	176.65	176.52	176.60	1900/25
1100	176.41	176.26	176.42	176.49	176.52	176.56	176.66	
1200	176.39	176.29	176.43	176.56	176.41	176.59	176.54	
1300	176.39	176.36	176.46	176.54	176.51	176.66	176.59	Monthly
1400	176.37	176.33	176.49	176.53	176.54	176.60	176.60	Mean
1500	176.35	176.36	176.47	176.54	176.60	176.60	176.52	176.51
1600	176.33	176.36	176.49	176.52	176.66	176.58	176.50	
1700	176.30	176.33	176.48	176.55	176.62	176.70	176.58	
1800	176.24	176.38	176.49	176.58	176.65	176.62	176.51	
1900	176.19	176.35	176.47	176.59	176.53	176.49	176.52	
2000	176.28	176.36	176.50	176.58	176.56	176.54	176.54	
2100	176.28	176.35	176.45	176.51	176.57	176.53	176.52	
2200	176.34	176.35	176.50	176.54	176.58	176.50	176.56	
2300	176.27	176.32	176.50	176.51	176.58	176.51	176.46	
2400	176.27	176.36	176.53	176.55	176.70	176.59	176.48	
Mean	176.32	176.31	176.43	176.54	176.57	176.59	176.55	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

January 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.58	176.43	176.37	176.59	176.72	176.64	176.58	176.63
0200	176.47	176.43	176.36	176.53	176.77	176.56	176.54	176.64
0300	176.52	176.41	176.38	176.48	176.63	176.69	176.57	176.62
0400	176.44	176.38	176.38	176.53	176.57	176.60	176.52	176.64
0500	176.48	176.47	176.46	176.53	176.64	176.52	176.50	176.62
0600	176.51	176.41	176.59	176.56	176.66	176.56	176.45	176.62
0700	176.49	176.38	176.55	176.58	176.72	176.56	176.49	176.59
0800	176.44	176.46	176.60	176.62	176.66	176.64	176.45	176.67
0900	176.56	176.43	176.55	176.67	176.60	176.61	176.46	176.64
1000	176.58	176.40	176.50	176.57	176.71	176.62	176.54	176.74
1100	176.60	176.44	176.53	176.59	176.60	176.56	176.61	176.68
1200	176.48	176.45	176.46	176.65	176.67	176.58	176.59	176.74
1300	176.51	176.40	176.50	176.63	176.57	176.61	176.58	176.74
1400	176.45	176.40	176.53	176.51	176.64	176.58	176.57	176.71
1500	176.40	176.42	176.54	176.56	176.57	176.56	176.55	176.70
1600	176.46	176.45	176.49	176.76	176.54	176.59	176.48	176.70
1700	176.51	176.44	176.51	176.77	176.61	176.53	176.48	176.68
1800	176.50	176.39	176.50	176.65	176.50	176.48	176.56	176.65
1900	176.46	176.32	176.42	176.71	176.56	176.54	176.53	176.72
2000	176.41	176.48	176.43	176.66	176.48	176.51	176.60	176.71
2100	176.42	176.45	176.48	176.71	176.68	176.52	176.59	176.70
2200	176.40	176.36	176.46	176.74	176.67	176.45	176.58	176.75
2300	176.45	176.37	176.50	176.73	176.67	176.58	176.62	176.77
2400	176.39	176.36	176.59	176.68	176.65	176.51	176.64	176.73
Mean	176.48	176.41	176.49	176.62	176.63	176.57	176.55	176.68

CST	9	10	11	12	13	14	15	16
0100	176.77	176.80	176.64	176.63	176.69	176.67	176.63	176.59
0200	176.77	176.78	176.66	176.63	176.76	176.73	176.62	176.59
0300	176.73	176.76	176.68	176.65	176.69	176.69	176.64	176.54
0400	176.76	176.76	176.64	176.63	176.72	176.69	176.64	176.62
0500	176.79	176.70	176.65	176.69	176.66	176.74	176.65	176.53
0600	176.74	176.77	176.64	176.65	176.75	176.68	176.65	176.60
0700	176.70	176.76	176.63	176.58	176.63	176.71	176.66	176.56
0800	176.81	176.66	176.62	176.64	176.69	176.67	176.66	176.53
0900	176.75	176.69	176.56	176.63	176.66	176.64	176.62	176.53
1000	176.76	176.72	176.59	176.67	176.68	176.67	176.61	176.52
1100	176.79	176.73	176.62	176.64	176.69	176.59	176.67	176.45
1200	176.76	176.76	176.63	176.64	176.74	176.64	176.67	176.47
1300	176.76	176.75	176.69	176.67	176.72	176.64	176.61	176.44
1400	176.82	176.73	176.65	176.67	176.83	176.61	176.58	176.41
1500	176.81	176.73	176.68	176.74	176.78	176.64	176.56	176.37
1600	176.78	176.78	176.63	176.68	176.84	176.58	176.62	176.47
1700	176.78	176.72	176.65	176.64	176.80	176.60	176.60	176.46
1800	176.78	176.65	176.65	176.69	176.82	176.62	176.64	176.43
1900	176.73	176.67	176.63	176.71	176.83	176.60	176.64	176.47
2000	176.77	176.68	176.61	176.71	176.82	176.65	176.68	176.50
2100	176.80	176.64	176.58	176.67	176.76	176.59	176.60	176.47
2200	176.72	176.64	176.63	176.68	176.73	176.62	176.55	176.48
2300	176.78	176.60	176.59	176.63	176.69	176.58	176.58	176.49
2400	176.80	176.62	176.61	176.67	176.75	176.57	176.60	176.51
Mean	176.77	176.71	176.63	176.66	176.74	176.64	176.62	176.50

CST	17	18	19	20	21	22	23	24
0100	176.49	176.56	176.46	176.50	176.58	176.60	176.57	176.64
0200	176.50	176.57	176.46	176.43	176.64	176.65	176.56	176.64
0300	176.55	176.58	176.48	176.50	176.60	176.64	176.58	176.72
0400	176.53	176.54	176.47	176.43	176.60	176.68	176.57	176.78
0500	176.55	176.52	176.44	176.45	176.57	176.59	176.54	176.70
0600	176.55	176.58	176.44	176.44	176.63	176.58	176.49	176.72
0700	176.56	176.58	176.52	176.46	176.60	176.57	176.51	176.70
0800	176.56	176.56	176.45	176.46	176.59	176.55	176.59	176.58
0900	176.56	176.57	176.54	176.40	176.60	176.54	176.48	176.61
1000	176.60	176.57	176.44	176.48	176.63	176.55	176.48	176.58
1100	176.58	176.61	176.51	176.46	176.66	176.64	176.51	176.68
1200	176.57	176.58	176.48	176.46	176.70	176.67	176.52	176.67
1300	176.52	176.59	176.48	176.52	176.63	176.62	176.58	176.69
1400	176.53	176.61	176.46	176.47	176.73	176.64	176.48	176.67
1500	176.52	176.55	176.50	176.53	176.67	176.66	176.54	176.61
1600	176.52	176.54	176.45	176.49	176.63	176.60	176.46	176.62
1700	176.52	176.54	176.47	176.51	176.59	176.61	176.53	176.58
1800	176.54	176.56	176.43	176.52	176.66	176.52	176.62	176.52
1900	176.55	176.55	176.49	176.50	176.55	176.57	176.57	176.56
2000	176.61	176.55	176.48	176.53	176.50	176.51	176.53	176.59
2100	176.63	176.55	176.48	176.50	176.58	176.60	176.56	176.61
2200	176.62	176.48	176.49	176.53	176.63	176.59	176.54	176.58
2300	176.58	176.56	176.49	176.57	176.63	176.58	176.57	176.53
2400	176.60	176.51	176.48	176.58	176.70	176.62	176.58	176.54
Mean	176.56	176.56	176.48	176.49	176.62	176.60	176.54	176.63

CST	25	26	27	28	29	30	31	
0100	176.53	176.45	176.66	176.57	176.64	176.43	176.24	Monthly
0200	176.51	176.40	176.66	176.61	176.63	176.37	176.40	Maximum
0300	176.49	176.49	176.66	176.59	176.59	176.38	176.43	176.84
0400	176.54	176.40	176.70	176.62	176.55	176.48	176.40	1600/13
0500	176.58	176.35	176.57	176.64	176.62	176.32	176.39	
0600	176.55	176.36	176.52	176.61	176.66	176.37	176.45	
0700	176.55	176.24	176.54	176.48	176.66	176.41	176.47	Monthly
0800	176.55	176.32	176.54	176.56	176.63	176.40	176.32	Minimum
0900	176.54	176.23	176.52	176.54	176.55	176.43	176.42	176.08
1000	176.54	176.27	176.57	176.44	176.54	176.38	176.50	1200/26
1100	176.53	176.10	176.59	176.58	176.55	176.49	176.45	
1200	176.58	176.08	176.57	176.60	176.50	176.39	176.56	
1300	176.57	176.27	176.57	176.61	176.50	176.30	176.46	Monthly
1400	176.54	176.37	176.56	176.64	176.53	176.44	176.40	Mean
1500	176.61	176.41	176.51	176.71	176.48	176.37	176.46	176.57
1600	176.58	176.49	176.51	176.69	176.53	176.26	176.46	
1700	176.54	176.54	176.62	176.59	176.46	176.35	176.48	
1800	176.52	176.63	176.61	176.68	176.49	176.51	176.45	
1900	176.51	176.55	176.60	176.64	176.44	176.38	176.63	
2000	176.50	176.57	176.63	176.71	176.32	176.24	176.59	
2100	176.45	176.52	176.52	176.72	176.36	176.26	176.62	
2200	176.53	176.49	176.54	176.81	176.41	176.26	176.64	
2300	176.53	176.55	176.49	176.76	176.36	176.17	176.66	
2400	176.50	176.67	176.57	176.64	176.41	176.26	176.63	
Mean	176.54	176.41	176.58	176.63	176.52	176.36	176.48	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

January 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7057 ;
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.43	176.42	176.42	176.63	176.54	176.53	176.46	176.52
0200	176.49	176.46	176.50	176.60	176.63	176.49	176.54	176.54
0300	176.50	176.41	176.48	176.59	176.56	176.53	176.44	176.51
0400	176.52	176.44	176.55	176.56	176.52	176.51	176.48	176.54
0500	176.47	176.46	176.59	176.61	176.57	176.56	176.44	176.54
0600	176.50	176.45	176.59	176.56	176.53	176.55	176.46	176.51
0700	176.50	176.49	176.56	176.58	176.61	176.62	176.46	176.57
0800	176.45	176.46	176.56	176.57	176.51	176.50	176.48	176.56
0900	176.53	176.47	176.58	176.68	176.52	176.59	176.47	176.56
1000	176.47	176.46	176.58	176.58	176.49	176.48	176.45	176.56
1100	176.51	176.55	176.61	176.59	176.63	176.58	176.55	176.60
1200	176.42	176.47	176.57	176.49	176.57	176.51	176.50	176.60
1300	176.46	176.52	176.57	176.63	176.56	176.58	176.56	176.68
1400	176.47	176.45	176.54	176.60	176.52	176.50	176.47	176.63
1500	176.48	176.48	176.56	176.67	176.52	176.55	176.50	176.65
1600	176.50	176.49	176.55	176.53	176.49	176.48	176.44	176.57
1700	176.46	176.46	176.54	176.58	176.49	176.50	176.50	176.58
1800	176.41	176.59	176.57	176.58	176.55	176.47	176.49	176.59
1900	176.47	176.54	176.53	176.56	176.45	176.43	176.49	176.61
2000	176.48	176.55	176.55	176.68	176.53	176.46	176.54	176.68
2100	176.42	176.55	176.54	176.53	176.45	176.44	176.46	176.64
2200	176.49	176.56	176.54	176.68	176.60	176.51	176.54	176.66
2300	176.42	176.50	176.52	176.56	176.55	176.46	176.48	176.61
2400	176.40	176.51	176.60	176.57	176.59	176.54	176.56	176.70
Mean	176.47	176.49	176.55	176.59	176.54	176.52	176.49	176.59

CST	9	10	11	12	13	14	15	16
0100	176.61	176.67	176.63	176.64	176.75	176.70	176.57	176.54
0200	176.67	176.71	176.67	176.59	176.72	176.68	176.58	176.54
0300	176.64	176.73	176.68	176.64	176.72	176.70	176.57	176.52
0400	176.63	176.70	176.64	176.64	176.80	176.68	176.58	176.54
0500	176.65	176.68	176.62	176.62	176.74	176.69	176.56	176.54
0600	176.65	176.66	176.64	176.61	176.78	176.71	176.61	176.51
0700	176.68	176.70	176.58	176.61	176.73	176.66	176.58	176.53
0800	176.64	176.65	176.64	176.61	176.73	176.68	176.57	176.50
0900	176.69	176.68	176.62	176.61	176.76	176.64	176.59	176.52
1000	176.65	176.65	176.63	176.60	176.78	176.67	176.56	176.48
1100	176.69	176.67	176.62	176.62	176.82	176.66	176.58	176.50
1200	176.63	176.68	176.59	176.60	176.74	176.66	176.53	176.44
1300	176.70	176.70	176.64	176.67	176.75	176.65	176.55	176.47
1400	176.67	176.68	176.60	176.69	176.76	176.63	176.54	176.45
1500	176.73	176.68	176.69	176.70	176.76	176.64	176.56	176.48
1600	176.69	176.70	176.61	176.70	176.77	176.64	176.56	176.47
1700	176.69	176.67	176.63	176.65	176.79	176.61	176.57	176.46
1800	176.69	176.67	176.59	176.63	176.72	176.62	176.55	176.44
1900	176.69	176.65	176.62	176.70	176.78	176.61	176.57	176.47
2000	176.66	176.68	176.60	176.70	176.72	176.61	176.56	176.43
2100	176.72	176.68	176.57	176.68	176.72	176.59	176.54	176.48
2200	176.67	176.63	176.58	176.66	176.70	176.62	176.54	176.53
2300	176.68	176.61	176.58	176.66	176.72	176.60	176.52	176.49
2400	176.72	176.64	176.62	176.69	176.68	176.59	176.52	176.51
Mean	176.67	176.67	176.62	176.65	176.75	176.65	176.56	176.49

CST	17	18	19	20	21	22	23	24
0100	176.48	176.49	176.52	176.50	176.56	176.70	176.58	176.64
0200	176.50	176.50	176.49	176.46	176.59	176.64	176.57	176.64
0300	176.48	176.50	176.50	176.51	176.60	176.59	176.48	176.64
0400	176.50	176.52	176.49	176.48	176.63	176.56	176.52	176.64
0500	176.50	176.50	176.50	176.50	176.61	176.58	176.52	176.62
0600	176.51	176.50	176.50	176.51	176.60	176.53	176.51	176.59
0700	176.54	176.50	176.49	176.51	176.62	176.61	176.58	176.58
0800	176.51	176.50	176.49	176.50	176.56	176.52	176.61	176.61
0900	176.50	176.52	176.50	176.50	176.63	176.57	176.59	176.52
1000	176.47	176.53	176.50	176.50	176.58	176.58	176.57	176.55
1100	176.46	176.55	176.51	176.55	176.69	176.54	176.58	176.55
1200	176.46	176.52	176.50	176.54	176.63	176.53	176.49	176.58
1300	176.49	176.54	176.48	176.55	176.63	176.53	176.55	176.57
1400	176.48	176.50	176.48	176.56	176.65	176.60	176.54	176.60
1500	176.45	176.53	176.49	176.53	176.68	176.56	176.54	176.54
1600	176.49	176.53	176.46	176.55	176.60	176.55	176.56	176.52
1700	176.46	176.52	176.48	176.56	176.59	176.50	176.55	176.50
1800	176.49	176.48	176.49	176.53	176.67	176.55	176.50	176.50
1900	176.51	176.50	176.47	176.52	176.55	176.46	176.52	176.50
2000	176.53	176.50	176.50	176.58	176.59	176.52	176.52	176.49
2100	176.52	176.54	176.48	176.58	176.56	176.49	176.55	176.49
2200	176.54	176.53	176.53	176.59	176.61	176.55	176.53	176.48
2300	176.52	176.52	176.52	176.58	176.59	176.54	176.58	176.50
2400	176.50	176.51	176.52	176.58	176.65	176.56	176.52	176.46
Mean	176.50	176.51	176.50	176.53	176.61	176.56	176.54	176.56

CST	25	26	27	28	29	30	31	
0100	176.46	176.56	176.57	176.56	176.50	176.41	176.45	Monthly
0200	176.47	176.48	176.54	176.59	176.42	176.40	176.46	Maximum
0300	176.48	176.45	176.53	176.61	176.45	176.35	176.45	176.82
0400	176.46	176.39	176.56	176.56	176.48	176.35	176.45	1100/13
0500	176.45	176.45	176.50	176.57	176.50	176.33	176.42	
0600	176.47	176.47	176.52	176.55	176.50	176.42	176.36	
0700	176.46	176.47	176.47	176.52	176.51	176.34	176.45	Monthly
0800	176.47	176.43	176.52	176.54	176.48	176.40	176.37	Minimum
0900	176.48	176.38	176.53	176.54	176.47	176.44	176.38	176.33
1000	176.48	176.38	176.55	176.51	176.45	176.43	176.45	0500/30
1100	176.44	176.34	176.50	176.58	176.44	176.44	176.37	
1200	176.50	176.37	176.5[illegible]	176.50	176.44	176.45	176.44	
1300	176.50	176.42	176.54	176.56	176.42	176.45	176.42	Monthly
1400	176.51	176.49	176.51	176.56	176.45	176.41	176.39	Mean
1500	176.54	176.57	176.48	176.59	176.46	176.38	176.48	176.55
1600	176.51	176.58	176.50	176.55	176.44	176.41	176.41	
1700	176.49	176.64	176.51	176.62	176.37	176.46	176.50	
1800	176.49	176.58	176.53	176.57	176.40	176.36	176.47	
1900	176.49	176.56	176.56	176.57	176.35	176.37	176.49	
2000	176.48	176.50	176.52	176.52	176.34	176.40	176.54	
2100	176.49	176.53	176.56	176.57	176.36	176.38	176.56	
2200	176.48	176.52	176.50	176.60	176.36	176.38	176.54	
2300	176.52	176.55	176.50	176.59	176.38	176.36	176.55	
2400	176.50	176.54	176.51	176.54	176.36	176.38	176.53	
Mean	176.48	176.49	176.52	176.56	176.43	176.40	176.46	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

February 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.69	176.50	176.48	176.51	176.41	176.67	176.58	176.67
0200	176.67	176.54	176.44	176.54	176.48	176.76	176.61	176.69
0300	176.69	176.57	176.42	176.49	176.44	176.71	176.57	176.68
0400	176.70	176.54	176.44	176.54	176.44	176.69	176.60	176.60
0500	176.67	176.57	176.44	176.52	176.39	176.67	176.56	176.63
0600	176.69	176.59	176.44	176.51	176.43	176.67	176.49	176.61
0700	176.65	176.55	176.46	176.48	176.44	176.66	176.50	176.62
0800	176.68	176.56	176.44	176.53	176.45	176.65	176.50	176.62
0900	176.66	176.54	176.51	176.56	176.46	176.64	176.45	176.59
1000	176.62	176.56	176.50	176.54	176.49	176.74	176.54	176.62
1100	176.63	176.50	176.49	176.51	176.50	176.54	176.50	176.63
1200	176.64	176.52	176.49	176.56	176.58	176.71	176.59	176.62
1300	176.62	176.53	176.46	176.54	176.53	176.68	176.56	176.63
1400	176.62	176.51	176.51	176.54	176.57	176.71	176.64	176.64
1500	176.60	176.50	176.48	176.40	176.58	176.62	176.60	176.65
1600	176.58	176.50	176.44	176.46	176.56	176.70	176.57	176.58
1700	176.61	176.50	176.42	176.48	176.57	176.65	176.60	176.62
1800	176.59	176.48	176.48	176.46	176.58	176.61	176.53	176.60
1900	176.63	176.45	176.48	176.41	176.62	176.61	176.50	176.60
2000	176.64	176.47	176.55	176.45	176.60	176.61	176.51	176.58
2100	176.60	176.46	176.51	176.48	176.60	176.62	176.62	176.57
2200	176.62	176.45	176.57	176.49	176.69	176.64	176.62	176.56
2300	176.65	176.46	176.52	176.51	176.68	176.56	176.62	176.59
2400	176.62	176.49	176.50	176.46	176.73	176.63	176.66	176.64
Mean	176.64	176.51	176.48	176.50	176.53	176.66	176.56	176.62

CST	9	10	11	12	13	14	15	16
0100	176.59	176.62	176.69	176.78	176.67	176.57	176.56	176.62
0200	176.62	176.64	176.68	176.79	176.65	176.56	176.54	176.62
0300	176.62	176.58	176.70	176.80	176.66	176.52	176.51	176.66
0400	176.64	176.55	176.73	176.78	176.67	176.51	176.51	176.67
0500	176.59	176.64	176.72	176.81	176.64	176.54	176.50	176.73
0600	176.59	176.60	176.74	176.80	176.65	176.54	176.52	176.67
0700	176.59	176.55	176.75	176.81	176.65	176.52	176.50	176.68
0800	176.58	176.49	176.74	176.76	176.60	176.52	176.48	176.74
0900	176.65	176.50	176.69	176.76	176.58	176.53	176.51	176.68
1000	176.55	176.57	176.74	176.77	176.57	176.48	176.57	176.65
1100	176.60	176.59	176.75	176.73	176.58	176.50	176.52	176.64
1200	176.53	176.61	176.74	176.72	176.57	176.49	176.54	176.65
1300	176.57	176.61	176.72	176.72	176.56	176.49	176.52	176.60
1400	176.62	176.64	176.72	176.72	176.56	176.47	176.53	176.64
1500	176.61	176.63	176.83	176.72	176.57	176.50	176.51	176.59
1600	176.64	176.62	176.82	176.72	176.55	176.49	176.50	176.57
1700	176.54	176.65	176.77	176.75	176.56	176.47	176.49	176.56
1800	176.57	176.67	176.81	176.74	176.52	176.50	176.54	176.58
1900	176.59	176.62	176.82	176.75	176.56	176.49	176.55	176.59
2000	176.54	176.62	176.79	176.70	176.53	176.49	176.57	176.59
2100	176.56	176.66	176.70	176.69	176.54	176.49	176.54	176.58
2200	176.62	176.65	176.74	176.66	176.56	176.48	176.63	176.58
2300	176.51	176.68	176.72	176.68	176.52	176.53	176.58	176.60
2400	176.59	176.76	176.76	176.66	176.54	176.52	176.58	176.57
Mean	176.58	176.62	176.74	176.74	176.59	176.51	176.53	176.63

CST	17	18	19	20	21	22	23	24
0100	176.51	176.48	176.53	176.54	176.61	176.66	176.61	176.54
0200	176.56	176.50	176.44	176.56	176.59	176.71	176.61	176.54
0300	176.54	176.47	176.41	176.56	176.57	176.62	176.62	176.54
0400	176.54	176.46	176.40	176.52	176.60	176.66	176.64	176.55
0500	176.50	176.45	176.41	176.49	176.65	176.65	176.60	176.51
0600	176.54	176.47	176.41	176.50	176.62	176.64	176.60	176.52
0700	176.54	176.44	176.44	176.51	176.62	176.62	176.58	176.53
0800	176.52	176.46	176.44	176.50	176.66	176.66	176.58	176.52
0900	176.52	176.45	176.42	176.55	176.66	176.66	176.56	176.51
1000	176.59	176.48	176.48	176.55	176.67	176.71	176.57	176.50
1100	176.52	176.50	176.48	176.55	176.60	176.66	176.56	176.49
1200	176.57	176.51	176.48	176.55	176.68	176.69	176.61	176.53
1300	176.54	176.54	176.47	176.59	176.69	176.61	176.56	176.53
1400	176.54	176.50	176.41	176.55	176.66	176.66	176.57	176.53
1500	176.50	176.49	176.44	176.54	176.69	176.65	176.56	176.54
1600	176.46	176.43	176.44	176.55	176.69	176.63	176.56	176.55
1700	176.46	176.40	176.48	176.53	176.61	176.64	176.50	176.54
1800	176.45	176.41	176.46	176.48	176.68	176.63	176.47	176.49
1900	176.46	176.41	176.44	176.57	176.68	176.62	176.45	176.49
2000	176.50	176.41	176.48	176.52	176.62	176.61	176.46	176.48
2100	176.46	176.41	176.49	176.57	176.57	176.62	176.50	176.48
2200	176.48	176.46	176.51	176.58	176.67	176.61	176.49	176.49
2300	176.50	176.54	176.54	176.52	176.64	176.58	176.53	176.50
2400	176.47	176.52	176.55	176.55	176.68	176.60	176.53	176.50
Mean	176.51	176.47	176.46	176.54	176.64	176.64	176.56	176.52

CST	25	26	27	28
0100	176.53	176.56	176.54	176.44
0200	176.53	176.62	176.54	176.48
0300	176.53	176.58	176.54	176.51
0400	176.53	176.61	176.54	176.48
0500	176.52	176.61	176.54	176.44
0600	176.50	176.62	176.50	176.45
0700	176.44	176.60	176.53	176.43
0800	176.49	176.58	176.51	176.48
0900	176.49	176.58	176.48	176.43
1000	176.52	176.54	176.46	176.43
1100	176.49	176.54	176.47	176.42
1200	176.48	176.57	176.53	176.36
1300	176.50	176.59	176.50	176.42
1400	176.57	176.58	176.52	176.36
1500	176.55	176.58	176.54	176.32
1600	176.55	176.60	176.51	176.37
1700	176.54	176.58	176.51	176.32
1800	176.55	176.57	176.52	176.40
1900	176.53	176.55	176.52	176.31
2000	176.55	176.56	176.46	176.34
2100	176.46	176.53	176.44	176.35
2200	176.56	176.53	176.45	176.40
2300	176.54	176.52	176.46	176.26
2400	176.53	176.51	176.48	176.37
Mean	176.52	176.57	176.50	176.40

Monthly
Maximum
176.83
1500/11

Monthly
Minimum
176.26
2300/28

Monthly
Mean
176.56

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

February 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7057 :
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.55	176.54	176.45	176.50	176.46	176.63	176.60	176.61
0200	176.55	176.51	176.45	176.50	176.48	176.60	176.60	176.55
0300	176.58	176.53	176.42	176.52	176.48	176.62	176.58	176.60
0400	176.57	176.54	176.40	176.48	176.42	176.59	176.56	176.54
0500	176.54	176.53	176.43	176.45	176.46	176.63	176.52	176.56
0600	176.56	176.52	176.42	176.45	176.46	176.66	176.51	176.53
0700	176.53	176.65	176.45	176.52	176.45	176.58	176.54	176.56
0800	176.58	176.54	176.41	176.46	176.47	176.63	176.57	176.50
0900	176.58	176.54	176.47	176.52	176.52	176.59	176.50	176.55
1000	176.55	176.49	176.44	176.52	176.52	176.60	176.52	176.54
1100	176.58	176.46	176.47	176.56	176.56	176.64	176.50	176.59
1200	176.56	176.50	176.46	176.48	176.54	176.63	176.57	176.58
1300	176.54	176.50	176.46	176.50	176.49	176.61	176.55	176.60
1400	176.54	176.49	176.47	176.47	176.52	176.62	176.61	176.57
1500	176.54	176.48	176.44	176.48	176.50	176.57	176.48	176.60
1600	176.54	176.47	176.44	176.46	176.50	176.61	176.61	176.57
1700	176.54	176.45	176.44	176.43	176.52	176.58	176.50	176.57
1800	176.58	176.47	176.51	176.46	176.53	176.59	176.51	176.57
1900	176.52	176.48	176.46	176.49	176.53	176.56	176.48	176.54
2000	176.58	176.46	176.54	176.49	176.56	176.56	176.51	176.55
2100	176.52	176.41	176.51	176.48	176.53	176.58	176.51	176.55
2200	176.57	176.42	176.48	176.47	176.62	176.57	176.55	176.56
2300	176.54	176.44	176.48	176.48	176.60	176.59	176.55	176.56
2400	176.54	176.46	176.50	176.47	176.60	176.59	176.59	176.59
Mean	176.55	176.49	176.46	176.48	176.51	176.60	176.54	176.56

CST	9	10	11	12	13	14	15	16
0100	176.60	176.57	176.67	176.72	176.61	176.52	176.52	176.56
0200	176.56	176.52	176.62	176.74	176.61	176.50	176.52	176.53
0300	176.60	176.62	176.65	176.72	176.59	176.52	176.53	176.55
0400	176.59	176.57	176.67	176.74	176.62	176.51	176.51	176.54
0500	176.60	176.55	176.66	176.73	176.60	176.52	176.53	176.58
0600	176.56	176.54	176.68	176.72	176.60	176.51	176.48	176.57
0700	176.56	176.50	176.70	176.73	176.59	176.51	176.50	176.60
0800	176.53	176.46	176.71	176.71	176.57	176.52	176.53	176.56
0900	176.57	176.52	176.64	176.72	176.57	176.49	176.53	176.63
1000	176.54	176.53	176.72	176.68	176.54	176.49	176.54	176.62
1100	176.50	176.55	176.69	176.68	176.55	176.51	176.54	176.60
1200	176.64	176.57	176.72	176.68	176.55	176.50	176.51	176.57
1300	176.60	176.54	176.67	176.66	176.57	176.50	176.54	176.58
1400	176.59	176.58	176.73	176.70	176.55	176.50	176.50	176.56
1500	176.54	176.52	176.71	176.67	176.54	176.51	176.50	176.59
1600	176.55	176.59	176.72	176.69	176.54	176.50	176.49	176.53
1700	176.54	176.58	176.73	176.69	176.56	176.48	176.50	176.56
1800	176.56	176.59	176.76	176.67	176.51	176.48	176.56	176.54
1900	176.59	176.63	176.72	176.68	176.55	176.50	176.51	176.55
2000	176.56	176.64	176.74	176.67	176.53	176.52	176.56	176.52
2100	176.50	176.62	176.72	176.66	176.52	176.50	176.53	176.54
2200	176.50	176.62	176.72	176.64	176.53	176.54	176.52	176.54
2300	176.51	176.63	176.69	176.63	176.53	176.53	176.56	176.53
2400	176.55	176.61	176.70	176.62	176.53	176.53	176.57	176.53
Mean	176.56	176.57	176.70	176.69	176.56	176.51	176.52	176.56

CST	17	18	19	20	21	22	23	24
0100	176.49	176.46	176.51	176.58	176.61	176.62	176.54	176.49
0200	176.53	176.46	176.47	176.57	176.60	176.67	176.57	176.51
0300	176.50	176.45	176.50	176.55	176.61	176.62	176.55	176.53
0400	176.50	176.46	176.44	176.53	176.62	176.65	176.53	176.48
0500	176.51	176.44	176.47	176.54	176.70	176.64	176.59	176.50
0600	176.48	176.43	176.46	176.54	176.57	176.62	176.56	176.47
0700	176.50	176.42	176.50	176.54	176.64	176.64	176.58	176.52
0800	176.49	176.43	176.49	176.54	176.56	176.61	176.52	176.48
0900	176.52	176.45	176.50	176.57	176.73	176.66	176.54	176.51
1000	176.51	176.44	176.51	176.58	176.61	176.63	176.52	176.49
1100	176.50	176.49	176.54	176.63	176.78	176.64	176.55	176.51
1200	176.52	176.48	176.55	176.64	176.67	176.61	176.51	176.50
1300	176.49	176.50	176.56	176.57	176.71	176.64	176.55	176.53
1400	176.49	176.47	176.54	176.59	176.68	176.63	176.53	176.53
1500	176.51	176.47	176.52	176.54	176.71	176.61	176.56	176.53
1600	176.46	176.46	176.50	176.54	176.66	176.60	176.54	176.56
1700	176.43	176.42	176.50	176.56	176.65	176.59	176.54	176.53
1800	176.45	176.47	176.51	176.53	176.66	176.61	176.52	176.56
1900	176.44	176.44	176.53	176.57	176.68	176.55	176.50	176.49
2000	176.47	176.47	176.55	176.56	176.67	176.61	176.51	176.52
2100	176.45	176.47	176.50	176.60	176.68	176.57	176.49	176.50
2200	176.48	176.48	176.54	176.56	176.72	176.59	176.49	176.50
2300	176.47	176.50	176.52	176.62	176.66	176.54	176.47	176.49
2400	176.50	176.51	176.55	176.54	176.67	176.58	176.49	176.53
Mean	176.49	176.46	176.51	176.57	176.66	176.61	176.53	176.51

CST	25	26	27	28
0100	176.56	176.57	176.53	176.54
0200	176.55	176.59	176.55	176.48
0300	176.56	176.59	176.64	176.50
0400	176.53	176.57	176.53	176.51
0500	176.55	176.59	176.64	176.48
0600	176.52	176.59	176.51	176.51
0700	176.52	176.57	176.52	176.48
0800	176.53	176.56	176.50	176.50
0900	176.52	176.54	176.48	176.49
1000	176.54	176.55	176.52	176.45
1100	176.55	176.55	176.50	176.47
1200	176.54	176.56	176.51	176.51
1300	176.54	176.55	176.52	176.45
1400	176.54	176.56	176.52	176.46
1500	176.57	176.56	176.52	176.44
1600	176.54	176.57	176.51	176.49
1700	176.56	176.56	176.50	176.42
1800	176.56	176.56	176.52	176.48
1900	176.54	176.54	176.50	176.47
2000	176.57	176.53	176.47	176.45
2100	176.54	176.53	176.48	176.44
2200	176.55	176.52	176.50	176.49
2300	176.53	176.51	176.47	176.43
2400	176.56	176.52	176.47	176.42
Mean	176.54	176.56	176.51	176.47

Monthly
Maximum
176.78
1100/21

Monthly
Minimum
176.40
0400/03

Monthly
Mean
176.55

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

March 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.28	176.40	176.51	176.70	176.73	176.55	176.52	176.53
0200	176.44	176.41	176.53	176.67	176.71	176.55	176.45	176.54
0300	176.43	176.44	176.52	176.70	176.65	176.51	176.47	176.50
0400	176.41	176.51	176.58	176.67	176.65	176.49	176.47	176.48
0500	176.42	176.48	176.52	176.68	176.63	176.50	176.43	176.51
0600	176.40	176.49	176.55	176.76	176.67	176.51	176.38	176.47
0700	176.37	176.49	176.57	176.68	176.62	176.51	176.42	176.44
0800	176.38	176.52	176.59	176.76	176.60	176.53	176.45	176.48
0900	176.46	176.48	176.62	176.74	176.60	176.53	176.50	176.50
1000	176.46	176.51	176.60	176.76	176.66	176.55	176.48	176.53
1100	176.31	176.52	176.57	176.78	176.67	176.55	176.49	176.56
1200	176.49	176.46	176.63	176.77	176.66	176.53	176.52	176.58
1300	176.44	176.50	176.59	176.76	176.62	176.55	176.49	176.60
1400	176.40	176.51	176.63	176.75	176.60	176.54	176.52	176.57
1500	176.42	176.42	176.66	176.74	176.63	176.53	176.47	176.58
1600	176.44	176.49	176.63	176.76	176.56	176.50	176.45	176.55
1700	176.39	176.47	176.60	176.74	176.55	176.48	176.44	176.50
1800	176.45	176.51	176.62	176.79	176.52	176.46	176.40	176.49
1900	176.45	176.41	176.64	176.76	176.55	176.47	176.46	176.47
2000	176.49	176.54	176.65	176.72	176.55	176.44	176.46	176.50
2100	176.42	176.56	176.64	176.77	176.52	176.46	176.46	176.54
2200	176.49	176.54	176.71	176.76	176.57	176.48	176.53	176.57
2300	176.43	176.50	176.63	176.73	176.58	176.53	176.52	176.60
2400	176.41	176.53	176.67	176.73	176.56	176.51	176.55	176.59
Mean	176.42	176.49	176.60	176.74	176.61	176.51	176.47	176.53

CST	9	10	11	12	13	14	15	16
0100	176.57	176.56	176.60	176.57	176.59	176.70	176.50	176.37
0200	176.55	176.58	176.58	176.59	176.64	176.68	176.54	176.31
0300	176.55	176.54	176.63	176.59	176.64	176.63	176.51	176.29
0400	176.54	176.50	176.58	176.60	176.69	176.62	176.51	176.37
0500	176.50	176.53	176.58	176.54	176.71	176.62	176.50	176.37
0600	176.50	176.52	176.58	176.51	176.65	176.59	176.46	176.40
0700	176.53	176.53	176.55	176.53	176.67	176.60	176.44	176.34
0800	176.53	176.50	176.58	176.50	176.75	176.58	176.41	176.34
0900	176.50	176.51	176.61	176.51	176.77	176.59	176.40	176.32
1000	176.52	176.56	176.58	176.51	176.76	176.56	176.45	176.26
1100	176.50	176.58	176.62	176.51	176.73	176.59	176.43	176.26
1200	176.50	176.61	176.61	176.53	176.77	176.58	176.37	176.33
1300	176.51	176.62	176.60	176.56	176.80	176.57	176.41	176.26
1400	176.53	176.62	176.62	176.57	176.82	176.59	176.42	176.32
1500	176.54	176.65	176.63	176.55	176.85	176.56	176.40	176.37
1600	176.54	176.65	176.64	176.54	176.85	176.60	176.37	176.41
1700	176.52	176.65	176.63	176.54	176.79	176.56	176.38	176.55
1800	176.49	176.59	176.63	176.51	176.78	176.57	176.59	176.63
1900	176.49	176.54	176.61	176.52	176.76	176.51	176.48	176.66
2000	176.43	176.58	176.57	176.53	176.70	176.56	176.50	176.57
2100	176.45	176.58	176.56	176.52	176.67	176.53	176.37	176.50
2200	176.50	176.60	176.58	176.52	176.66	176.50	176.33	176.53
2300	176.48	176.59	176.56	176.58	176.70	176.52	176.32	176.56
2400	176.51	176.60	176.57	176.61	176.69	176.49	176.38	176.62
Mean	176.51	176.57	176.60	176.54	176.73	176.58	176.44	176.42

CST	17	18	19	20	21	22	23	24
0100	176.67	176.55	176.48	176.55	176.49	176.53	176.69	176.68
0200	176.64	176.55	176.51	176.54	176.49	176.55	176.63	176.67
0300	176.68	176.52	176.49	176.55	176.50	176.53	176.64	176.67
0400	176.69	176.55	176.42	176.49	176.49	176.50	176.62	176.60
0500	176.65	176.57	176.44	176.48	176.49	176.55	176.63	176.60
0600	176.61	176.56	176.48	176.48	176.46	176.50	176.60	176.52
0700	176.56	176.55	176.51	176.46	176.45	176.53	176.60	176.56
0800	176.57	176.52	176.50	176.52	176.46	176.50	176.63	176.59
0900	176.57	176.53	176.51	176.48	176.47	176.60	176.62	176.57
1000	176.64	176.52	176.52	176.52	176.46	176.59	176.59	176.59
1100	176.59	176.54	176.46	176.52	176.53	176.51	176.64	176.62
1200	176.62	176.54	176.55	176.54	176.50	176.61	176.63	176.58
1300	176.58	176.57	176.50	176.51	176.50	176.58	176.65	176.61
1400	176.58	176.54	176.50	176.49	176.57	176.58	176.64	176.57
1500	176.55	176.52	176.50	176.52	176.47	176.62	176.68	176.59
1600	176.57	176.55	176.47	176.51	176.51	176.57	176.67	176.59
1700	176.50	176.50	176.51	176.45	176.46	176.58	176.58	176.56
1800	176.56	176.49	176.47	176.50	176.46	176.63	176.56	176.51
1900	176.58	176.50	176.51	176.54	176.47	176.60	176.64	176.54
2000	176.59	176.49	176.50	176.46	176.52	176.56	176.58	176.54
2100	176.59	176.50	176.51	176.45	176.51	176.59	176.58	176.57
2200	176.58	176.49	176.51	176.51	176.49	176.61	176.61	176.55
2300	176.54	176.53	176.50	176.54	176.56	176.61	176.62	176.55
2400	176.53	176.52	176.50	176.50	176.57	176.64	176.69	176.61
Mean	176.59	176.53	176.49	176.50	176.50	176.57	176.63	176.59

CST	25	26	27	28	29	30	31	
0100	176.59	176.60	176.58	176.63	176.57	176.55	176.62	Monthly
0200	176.59	176.60	176.59	176.63	176.56	176.55	176.62	Maximum
0300	176.57	176.59	176.60	176.63	176.58	176.58	176.65	176.92
0400	176.56	176.58	176.62	176.61	176.61	176.53	176.61	2300/31
0500	176.55	176.58	176.60	176.58	176.59	176.55	176.67	
0600	176.53	176.55	176.55	176.60	176.54	176.62	176.68	
0700	176.48	176.51	176.57	176.57	176.57	176.56	176.75	Monthly
0800	176.52	176.52	176.53	176.56	176.51	176.53	176.68	Minimum
0900	176.53	176.54	176.52	176.58	176.50	176.56	176.66	176.26
1000	176.57	176.53	176.52	176.59	176.52	176.54	176.68	1300/16
1100	176.56	176.55	176.59	176.56	176.57	176.53	176.73	
1200	176.58	176.59	176.58	176.58	176.55	176.51	176.71	
1300	176.58	176.60	176.56	176.59	176.58	176.59	176.82	Monthly
1400	176.57	176.58	176.59	176.58	176.62	176.58	176.76	Mean
1500	176.56	176.58	176.59	176.57	176.58	176.59	176.84	176.56
1600	176.55	176.58	176.59	176.59	176.58	176.61	176.79	
1700	176.56	176.54	176.61	176.58	176.54	176.60	176.82	
1800	176.56	176.54	176.58	176.58	176.54	176.57	176.78	
1900	176.50	176.53	176.56	176.54	176.54	176.60	176.84	
2000	176.54	176.52	176.57	176.55	176.56	176.61	176.82	
2100	176.54	176.50	176.54	176.54	176.54	176.60	176.87	
2200	176.57	176.58	176.58	176.56	176.55	176.64	176.89	
2300	176.55	176.54	176.58	176.51	176.57	176.57	176.92	
2400	176.52	176.56	176.61	176.54	176.56	176.59	176.90	
Mean	176.55	176.56	176.58	176.58	176.56	176.57	176.75	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

March 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7057 :
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.48	176.47	176.52	176.61	176.65	176.56	176.50	176.56
0200	176.47	176.49	176.51	176.56	176.65	176.52	176.50	176.53
0300	176.51	176.49	176.52	176.58	176.64	176.51	176.50	176.52
0400	176.48	176.53	176.53	176.61	176.60	176.50	176.50	176.51
0500	176.50	176.52	176.55	176.59	176.60	176.50	176.51	176.50
0600	176.44	176.51	176.58	176.61	176.59	176.52	176.49	176.48
0700	176.49	176.50	176.57	176.62	176.60	176.50	176.49	176.49
0800	176.48	176.52	176.56	176.63	176.61	176.52	176.47	176.51
0900	176.47	176.53	176.55	176.63	176.61	176.55	176.50	176.51
1000	176.48	176.52	176.57	176.70	176.60	176.53	176.50	176.53
1100	176.51	176.51	176.56	176.68	176.59	176.54	176.54	176.56
1200	176.52	176.55	176.56	176.67	176.58	176.54	176.51	176.55
1300	176.47	176.54	176.57	176.65	176.57	176.54	176.53	176.56
1400	176.46	176.50	176.58	176.67	176.57	176.54	176.51	176.55
1500	176.50	176.52	176.62	176.70	176.53	176.52	176.50	176.53
1600	176.48	176.53	176.61	176.64	176.54	176.52	176.52	176.50
1700	176.49	176.49	176.59	176.71	176.52	176.49	176.52	176.51
1800	176.50	176.52	176.59	176.66	176.52	176.48	176.51	176.50
1900	176.50	176.53	176.56	176.72	176.51	176.50	176.51	176.49
2000	176.48	176.52	176.59	176.69	176.55	176.49	176.51	176.51
2100	176.53	176.50	176.58	176.68	176.54	176.50	176.52	176.50
2200	176.50	176.55	176.56	176.66	176.54	176.50	176.53	176.54
2300	176.50	176.57	176.62	176.69	176.55	176.53	176.54	176.53
2400	176.45	176.54	176.64	176.67	176.56	176.52	176.54	176.54
Mean	176.49	176.52	176.57	176.65	176.58	176.52	176.51	176.52

CST	9	10	11	12	13	14	15	16
0100	176.53	176.53	176.57	176.52	176.54	176.59	176.47	176.47
0200	176.51	176.58	176.56	176.52	176.57	176.56	176.46	176.46
0300	176.50	176.51	176.55	176.54	176.61	176.55	176.46	176.46
0400	176.49	176.54	176.55	176.52	176.60	176.56	176.47	176.44
0500	176.50	176.55	176.54	176.51	176.60	176.52	176.46	176.45
0600	176.49	176.55	176.57	176.50	176.62	176.54	176.46	176.47
0700	176.49	176.57	176.57	176.50	176.60	176.53	176.45	176.48
0800	176.49	176.58	176.59	176.50	176.59	176.53	176.47	176.45
0900	176.51	176.54	176.58	176.48	176.59	176.52	176.43	176.44
1000	176.48	176.56	176.58	176.48	176.59	176.53	176.51	176.47
1100	176.48	176.57	176.56	176.50	176.60	176.50	176.43	176.41
1200	176.51	176.60	176.59	176.51	176.61	176.49	176.47	176.44
1300	176.49	176.59	176.57	176.50	176.64	176.47	176.45	176.43
1400	176.51	176.60	176.55	176.51	176.63	176.50	176.44	176.46
1500	176.49	176.60	176.56	176.49	176.64	176.48	176.47	176.50
1600	176.50	176.57	176.58	176.51	176.66	176.49	176.48	176.50
1700	176.49	176.56	176.56	176.51	176.61	176.47	176.48	176.52
1800	176.49	176.53	176.56	176.50	176.62	176.46	176.47	176.50
1900	176.46	176.54	176.53	176.49	176.58	176.48	176.51	176.54
2000	176.45	176.52	176.53	176.48	176.55	176.47	176.53	176.56
2100	176.46	176.53	176.50	176.50	176.58	176.44	176.51	176.50
2200	176.49	176.54	176.52	176.50	176.59	176.42	176.48	176.46
2300	176.49	176.55	176.50	176.54	176.60	176.45	176.48	176.43
2400	176.51	176.54	176.51	176.52	176.57	176.46	176.41	176.50
Mean	176.49	176.56	176.55	176.50	176.60	176.50	176.47	176.47

CST	17	18	19	20	21	22	23	24
0100	176.50	176.47	176.50	176.55	176.50	176.50	176.61	176.60
0200	176.55	176.49	176.50	176.54	176.50	176.51	176.61	176.61
0300	176.50	176.51	176.48	176.54	176.48	176.51	176.64	176.58
0400	176.51	176.50	176.47	176.51	176.49	176.50	176.62	176.56
0500	176.46	176.49	176.48	176.50	176.45	176.50	176.60	176.56
0600	176.48	176.49	176.47	176.50	176.47	176.52	176.59	176.56
0700	176.48	176.50	176.51	176.49	176.44	176.51	176.58	176.52
0800	176.47	176.51	176.54	176.53	176.46	176.52	176.59	176.52
0900	176.46	176.49	176.50	176.51	176.49	176.55	176.61	176.53
1000	176.50	176.49	176.49	176.51	176.48	176.55	176.62	176.56
1100	176.50	176.51	176.50	176.52	176.51	176.56	176.61	176.54
1200	176.51	176.49	176.54	176.53	176.50	176.58	176.59	176.59
1300	176.49	176.51	176.53	176.51	176.52	176.51	176.62	176.54
1400	176.46	176.51	176.50	176.50	176.50	176.56	176.67	176.56
1500	176.45	176.51	176.48	176.50	176.50	176.54	176.60	176.54
1600	176.47	176.49	176.49	176.50	176.48	176.54	176.61	176.54
1700	176.47	176.50	176.51	176.49	176.46	176.53	176.62	176.51
1800	176.50	176.47	176.49	176.47	176.46	176.54	176.60	176.50
1900	176.48	176.47	176.49	176.47	176.45	176.56	176.57	176.52
2000	176.49	176.48	176.52	176.47	176.47	176.56	176.60	176.49
2100	176.50	176.52	176.49	176.48	176.50	176.53	176.59	176.53
2200	176.49	176.54	176.53	176.49	176.48	176.56	176.57	176.54
2300	176.46	176.53	176.54	176.49	176.54	176.61	176.59	176.54
2400	176.48	176.52	176.53	176.51	176.47	176.59	176.61	176.49
Mean	176.49	176.50	176.50	176.50	176.48	176.54	176.61	176.54

CST	25	26	27	28	29	30	31	
0100	176.59	176.53	176.55	176.57	176.53	176.54	176.53	Monthly
0200	176.53	176.52	176.54	176.53	176.53	176.50	176.56	Maximum
0300	176.55	176.53	176.56	176.51	176.53	176.54	176.62	176.91
0400	176.53	176.53	176.53	176.50	176.50	176.51	176.63	2300/31
0500	176.53	176.51	176.54	176.52	176.51	176.55	176.59	
0600	176.50	176.50	176.49	176.50	176.52	176.49	176.67	
0700	176.52	176.49	176.51	176.54	176.51	176.54	176.61	Monthly
0800	176.48	176.49	176.51	176.52	176.50	176.52	176.66	Minimum
0900	176.50	176.46	176.51	176.51	176.50	176.53	176.61	176.41
1000	176.52	176.50	176.52	176.52	176.50	176.49	176.64	1100/16
1100	176.53	176.49	176.51	176.50	176.48	176.50	176.64	
1200	176.54	176.54	176.52	176.50	176.56	176.53	176.68	
1300	176.53	176.52	176.55	176.50	176.52	176.48	176.68	Monthly
1400	176.52	176.52	176.53	176.52	176.54	176.51	176.68	Mean
1500	176.52	176.54	176.54	176.54	176.51	176.54	176.75	176.53
1600	176.52	176.54	176.54	176.54	176.51	176.55	176.74	
1700	176.51	176.49	176.53	176.51	176.49	176.51	176.81	
1800	176.53	176.52	176.55	176.50	176.51	176.52	176.83	
1900	176.50	176.49	176.51	176.48	176.50	176.47	176.80	
2000	176.49	176.50	176.50	176.50	176.50	176.55	176.82	
2100	176.52	176.53	176.51	176.50	176.50	176.52	176.88	
2200	176.50	176.50	176.48	176.50	176.51	176.60	176.86	
2300	176.52	176.52	176.53	176.50	176.52	176.58	176.91	
2400	176.51	176.52	176.53	176.50	176.52	176.55	176.90	
Mean	176.52	176.51	176.52	176.51	176.51	176.52	176.71	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

April 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.88	176.78	176.56	176.61	176.66	176.66	176.66	176.62
0200	176.90	176.76	176.59	176.59	176.62	176.66	176.66	176.64
0300	176.93	176.73	176.56	176.57	176.62	176.62	176.65	176.62
0400	176.94	176.72	176.58	176.56	176.63	176.63	176.58	176.65
0500	176.96	176.72	176.59	176.55	176.60	176.59	176.58	176.62
0600	176.95	176.71	176.62	176.56	176.62	176.60	176.56	176.65
0700	176.99	176.69	176.60	176.60	176.62	176.62	176.54	176.56
0800	177.02	176.67	176.62	176.61	176.59	176.62	176.60	176.55
0900	177.01	176.69	176.61	176.62	176.66	176.61	176.60	176.66
1000	176.99	176.70	176.65	176.62	176.63	176.62	176.62	176.63
1100	176.97	176.68	176.65	176.61	176.68	176.64	176.60	176.58
1200	176.93	176.64	176.60	176.67	176.70	176.65	176.61	176.63
1300	176.91	176.64	176.60	176.59	176.72	176.66	176.68	176.61
1400	176.92	176.62	176.62	176.65	176.72	176.66	176.65	176.63
1500	176.85	176.60	176.60	176.59	176.64	176.64	176.61	176.66
1600	176.89	176.59	176.57	176.63	176.60	176.59	176.58	176.67
1700	176.89	176.59	176.57	176.62	176.59	176.64	176.55	176.66
1800	176.92	176.57	176.58	176.64	176.58	176.57	176.61	176.61
1900	176.89	176.57	176.58	176.61	176.63	176.59	176.61	176.64
2000	176.88	176.59	176.60	176.67	176.63	176.58	176.53	176.61
2100	176.85	176.62	176.60	176.61	176.67	176.60	176.58	176.59
2200	176.86	176.60	176.63	176.62	176.66	176.63	176.63	176.64
2300	176.80	176.58	176.62	176.69	176.65	176.63	176.68	176.56
2400	176.84	176.58	176.64	176.63	176.66	176.62	176.65	176.64
Mean	176.92	176.65	176.60	176.61	176.64	176.62	176.61	176.62

CST	9	10	11	12	13	14	15	16
0100	176.58	176.64	176.64	176.62	176.62	176.66	176.78	176.69
0200	176.56	176.61	176.71	176.76	176.68	176.63	176.70	176.70
0300	176.65	176.54	176.64	176.74	176.64	176.70	176.78	176.72
0400	176.67	176.61	176.69	176.71	176.64	176.67	176.75	176.75
0500	176.62	176.58	176.65	176.75	176.65	176.66	176.75	176.66
0600	176.59	176.59	176.69	176.70	176.68	176.66	176.67	176.71
0700	176.60	176.55	176.64	176.70	176.64	176.76	176.69	176.69
0800	176.62	176.57	176.66	176.71	176.61	176.62	176.85	176.60
0900	176.54	176.56	176.71	176.69	176.66	176.81	176.80	176.68
1000	176.62	176.56	176.73	176.69	176.64	176.69	176.74	176.75
1100	176.61	176.60	176.62	176.67	176.62	176.70	176.80	176.73
1200	176.57	176.55	176.64	176.69	176.68	176.70	176.81	176.72
1300	176.68	176.54	176.62	176.71	176.60	176.66	176.73	176.80
1400	176.68	176.55	176.66	176.60	176.67	176.76	176.74	176.74
1500	176.69	176.61	176.76	176.70	176.65	176.72	176.79	176.69
1600	176.64	176.63	176.72	176.62	176.70	176.77	176.78	176.73
1700	176.58	176.62	176.78	176.65	176.67	176.72	176.82	176.72
1800	176.60	176.61	176.70	176.65	176.65	176.77	176.87	176.72
1900	176.56	176.63	176.76	176.64	176.66	176.76	176.88	176.78
2000	176.57	176.57	176.68	176.68	176.65	176.72	176.89	176.79
2100	176.54	176.58	176.62	176.59	176.70	176.80	176.84	176.80
2200	176.59	176.51	176.72	176.58	176.70	176.78	176.81	176.80
2300	176.65	176.58	176.69	176.64	176.64	176.73	176.80	176.81
2400	176.62	176.68	176.76	176.62	176.61	176.83	176.77	176.67
Mean	176.61	176.59	176.69	176.68	176.65	176.72	176.78	176.73

CST	17	18	19	20	21	22	23	24
0100	176.65	176.61	176.71	176.86	176.90	176.70	176.72	176.70
0200	176.69	176.60	176.72	176.82	176.86	176.72	176.70	176.70
0300	176.66	176.64	176.73	176.80	176.83	176.68	176.68	176.72
0400	176.70	176.56	176.70	176.75	176.76	176.64	176.67	176.66
0500	176.70	176.62	176.65	176.80	176.77	176.64	176.65	176.66
0600	176.70	176.64	176.67	176.86	176.76	176.66	176.64	176.62
0700	176.69	176.57	176.71	176.86	176.73	176.70	176.63	176.70
0800	176.66	176.60	176.76	176.84	176.80	176.63	176.64	176.62
0900	176.67	176.64	176.78	176.87	176.78	176.67	176.66	176.57
1000	176.61	176.62	176.73	177.04	176.74	176.68	176.65	176.58
1100	176.69	176.65	176.72	177.01	176.78	176.68	176.70	176.64
1200	176.60	176.65	176.75	176.92	176.75	176.74	176.70	176.69
1300	176.62	176.68	176.86	177.00	176.76	176.74	176.71	176.64
1400	176.61	176.58	176.78	177.04	176.71	176.69	176.70	176.56
1500	176.64	176.61	176.77	177.06	176.72	176.70	176.73	176.71
1600	176.58	176.64	176.74	177.01	176.71	176.69	176.68	176.67
1700	176.66	176.61	176.81	176.97	176.63	176.70	176.68	176.69
1800	176.60	176.61	176.73	176.94	176.69	176.64	176.69	176.66
1900	176.65	176.66	176.80	176.87	176.67	176.65	176.71	176.72
2000	176.67	176.62	176.83	176.91	176.68	176.64	176.64	176.74
2100	176.68	176.69	176.86	176.86	176.69	176.67	176.67	176.77
2200	176.68	176.70	176.85	176.84	176.67	176.70	176.69	176.80
2300	176.66	176.71	176.86	176.86	176.67	176.69	176.69	176.78
2400	176.58	176.66	176.90	176.92	176.72	176.68	176.67	176.71
Mean	176.65	176.63	176.77	176.90	176.74	176.68	176.68	176.68

CST	25	26	27	28	29	30	
0100	176.72	176.69	176.82	176.66	176.68	176.72	Monthly
0200	176.74	176.78	176.82	176.67	176.69	176.69	Maximum
0300	176.83	176.73	176.81	176.64	176.74	176.74	177.06
0400	176.75	176.83	176.76	176.65	176.71	176.70	1500/20
0500	176.71	176.82	176.76	176.65	176.72	176.70	
0600	176.80	176.76	176.68	176.76	176.69	176.76	
0700	176.69	176.75	176.68	176.73	176.78	176.75	Monthly
0800	176.74	176.77	176.73	176.60	176.79	176.71	Minimum
0900	176.59	176.74	176.78	176.61	176.73	176.72	176.51
1000	176.61	176.71	176.76	176.75	176.68	176.68	2200/10
1100	176.67	176.72	176.71	176.75	176.74	176.74	
1200	176.70	176.76	176.68	176.72	176.78	176.72	
1300	176.69	176.70	176.65	176.74	176.70	176.73	Monthly
1400	176.78	176.75	176.66	176.68	176.75	176.72	Mean
1500	176.72	176.78	176.77	176.73	176.76	176.70	176.62
1600	176.76	176.80	176.73	176.76	176.80	176.73	
1700	176.61	176.86	176.69	176.72	176.73	176.68	
1800	176.70	176.81	176.69	176.64	176.75	176.78	
1900	176.74	176.76	176.75	176.70	176.80	176.78	
2000	176.71	176.79	176.70	176.64	176.76	176.73	
2100	176.68	176.73	176.72	176.71	176.78	176.80	
2200	176.73	176.71	176.61	176.68	176.82	176.73	
2300	176.80	176.73	176.63	176.71	176.74	176.78	
2400	176.79	176.82	176.62	176.66	176.67	176.76	
Mean	176.72	176.76	176.72	176.69	176.74	176.73	

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Great Lakes Water Levels, N/OES211 | | IGLD (1985) |

Station 908-7057 :
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.87	176.70	176.55	176.54	176.58	176.58	176.59	176.58
0200	176.91	176.70	176.54	176.54	176.61	176.58	176.58	176.57
0300	176.90	176.66	176.55	176.53	176.55	176.57	176.60	176.65
0400	176.94	176.66	176.54	176.53	176.58	176.55	176.55	176.62
0500	176.92	176.65	176.53	176.55	176.56	176.57	176.55	176.56
0600	176.96	176.64	176.53	176.53	176.57	176.52	176.55	176.58
0700	177.00	176.64	176.53	176.53	176.59	176.56	176.54	176.66
0800	176.99	176.64	176.52	176.53	176.55	176.54	176.55	176.55
0900	176.98	176.64	176.54	176.55	176.56	176.57	176.56	176.64
1000	176.91	176.62	176.55	176.55	176.58	176.57	176.57	176.60
1100	176.92	176.62	176.55	176.56	176.60	176.57	176.59	176.66
1200	176.89	176.62	176.54	176.57	176.63	176.57	176.59	176.60
1300	176.91	176.60	176.56	176.55	176.62	176.59	176.60	176.68
1400	176.90	176.58	176.52	176.53	176.60	176.56	176.59	176.64
1500	176.87	176.58	176.54	176.58	176.57	176.58	176.59	176.64
1600	176.85	176.57	176.52	176.56	176.58	176.56	176.58	176.58
1700	176.87	176.56	176.52	176.53	176.55	176.54	176.55	176.64
1800	176.87	176.56	176.53	176.55	176.56	176.54	176.64	176.64
1900	176.81	176.56	176.53	176.54	176.54	176.51	176.57	176.63
2000	176.79	176.58	176.52	176.54	176.56	176.54	176.59	176.62
2100	176.78	176.57	176.56	176.57	176.58	176.54	176.56	176.57
2200	176.75	176.57	176.55	176.57	176.59	176.58	176.63	176.58
2300	176.75	176.56	176.56	176.59	176.60	176.57	176.63	176.63
2400	176.72	176.56	176.56	176.57	176.59	176.59	176.57	176.59
Mean	176.88	176.61	176.54	176.55	176.58	176.56	176.58	176.61

CST	9	10	11	12	13	14	15	16
0100	176.67	176.53	176.61	176.68	176.58	176.62	176.76	176.89
0200	176.64	176.51	176.62	176.67	176.58	176.66	176.75	176.85
0300	176.60	176.56	176.68	176.71	176.64	176.56	176.74	176.86
0400	176.56	176.54	176.59	176.66	176.64	176.70	176.77	176.83
0500	176.62	176.53	176.64	176.67	176.62	176.68	176.77	176.81
0600	176.57	176.49	176.61	176.65	176.62	176.75	176.75	176.82
0700	176.59	176.53	176.60	176.60	176.56	176.73	176.77	176.82
0800	176.53	176.50	176.70	176.65	176.60	176.66	176.75	176.77
0900	176.56	176.52	176.65	176.61	176.58	176.61	176.77	176.80
1000	176.52	176.52	176.68	176.65	176.63	176.66	176.91	176.77
1100	176.56	176.55	176.63	176.59	176.58	176.65	176.77	176.81
1200	176.59	176.52	176.74	176.67	176.62	176.65	176.82	176.83
1300	176.57	176.48	176.68	176.60	176.57	176.62	176.81	176.75
1400	176.59	176.56	176.74	176.64	176.60	176.61	176.79	176.75
1500	176.60	176.52	176.70	176.56	176.59	176.63	176.78	176.72
1600	176.56	176.53	176.73	176.60	176.60	176.65	176.85	176.74
1700	176.53	176.52	176.73	176.62	176.60	176.67	176.89	176.71
1800	176.54	176.54	176.71	176.61	176.62	176.66	176.88	176.74
1900	176.51	176.51	176.70	176.64	176.61	176.70	176.91	176.73
2000	176.54	176.52	176.68	176.58	176.61	176.72	176.92	176.73
2100	176.55	176.50	176.67	176.64	176.60	176.73	176.95	176.74
2200	176.50	176.51	176.67	176.56	176.62	176.75	176.87	176.71
2300	176.54	176.54	176.69	176.61	176.67	176.77	176.93	176.70
2400	176.52	176.57	176.65	176.58	176.63	176.71	176.81	176.70
Mean	176.56	176.52	176.67	176.63	176.61	176.67	176.82	176.77

CST	17	18	19	20	21	22	23	24
0100	176.68	176.62	176.68	176.88	176.78	176.67	176.69	176.72
0200	176.68	176.58	176.68	176.83	176.74	176.66	176.69	176.75
0300	176.61	176.58	176.66	176.86	176.73	176.64	176.67	176.73
0400	176.67	176.56	176.65	176.82	176.71	176.65	176.65	176.75
0500	176.67	176.59	176.64	176.76	176.71	176.65	176.64	176.70
0600	176.69	176.57	176.68	176.81	176.71	176.61	176.66	176.68
0700	176.65	176.60	176.73	176.91	176.67	176.64	176.67	176.72
0800	176.66	176.58	176.65	176.93	176.67	176.64	176.66	176.73
0900	176.64	176.59	176.68	176.92	176.71	176.66	176.65	176.73
1000	176.64	176.61	176.69	176.92	176.70	176.67	176.65	176.74
1100	176.63	176.60	176.79	176.93	176.68	176.69	176.66	176.68
1200	176.66	176.63	176.75	176.90	176.67	176.69	176.69	176.70
1300	176.59	176.60	176.78	176.92	176.67	176.68	176.67	176.72
1400	176.65	176.62	176.76	176.92	176.68	176.69	176.69	176.72
1500	176.63	176.61	176.74	176.94	176.65	176.69	176.69	176.67
1600	176.62	176.61	176.73	176.87	176.66	176.67	176.71	176.70
1700	176.61	176.64	176.80	176.88	176.64	176.65	176.65	176.68
1800	176.61	176.65	176.80	176.78	176.66	176.65	176.67	176.72
1900	176.61	176.64	176.79	176.79	176.64	176.66	176.66	176.71
2000	176.62	176.65	176.84	176.75	176.63	176.68	176.69	176.74
2100	176.60	176.67	176.81	176.80	176.63	176.68	176.69	176.74
2200	176.62	176.65	176.81	176.77	176.65	176.67	176.70	176.74
2300	176.61	176.67	176.82	176.83	176.65	176.67	176.66	176.71
2400	176.61	176.68	176.81	176.78	176.67	176.68	176.71	176.68
Mean	176.64	176.62	176.74	176.85	176.68	176.66	176.67	176.71

CST	25	26	27	28	29	30	
0100	176.67	176.73	176.72	176.68	176.70	176.68	Monthly
0200	176.73	176.70	176.73	176.68	176.74	176.75	Maximum
0300	176.70	176.72	176.73	176.70	176.63	176.70	177.00
0400	176.74	176.70	176.69	176.68	176.67	176.71	0700/01
0500	176.74	176.72	176.73	176.72	176.72	176.67	
0600	176.78	176.71	176.71	176.70	176.68	176.71	
0700	176.68	176.72	176.72	176.65	176.75	176.72	Monthly
0800	176.56	176.68	176.66	176.68	176.76	176.71	Minimum
0900	176.68	176.65	176.72	176.72	176.72	176.73	176.48
1000	176.61	176.71	176.72	176.65	176.70	176.69	1300/10
1100	176.69	176.63	176.68	176.71	176.68	176.70	
1200	176.62	176.67	176.69	176.71	176.71	176.72	
1300	176.72	176.68	176.66	176.70	176.75	176.70	Monthly
1400	176.66	176.73	176.68	176.63	176.73	176.67	Mean
1500	176.67	176.71	176.73	176.69	176.71	176.66	176.66
1600	176.71	176.73	176.71	176.63	176.67	176.67	
1700	176.67	176.69	176.72	176.71	176.76	176.70	
1800	176.72	176.74	176.73	176.65	176.70	176.68	
1900	176.72	176.67	176.73	176.68	176.74	176.71	
2000	176.65	176.70	176.74	176.63	176.72	176.70	
2100	176.67	176.64	176.69	176.68	176.75	176.70	
2200	176.70	176.71	176.67	176.70	176.70	176.73	
2300	176.68	176.67	176.65	176.66	176.75	176.68	
2400	176.72	176.73	176.64	176.72	176.73	176.72	
Mean	176.69	176.70	176.70	176.68	176.72	176.70	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

May 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.76*	176.77*	176.76*	176.77*	176.78*	176.64*	176.81*	176.78*
0200	176.74*	176.72*	176.76*	176.73*	176.73*	176.72*	176.79*	176.81*
0300	176.71*	176.75*	176.75*	176.75*	176.72*	176.66*	176.71*	176.77*
0400	176.76*	176.73*	176.74*	176.68*	176.72*	176.64*	176.71*	176.75*
0500	176.77*	176.77*	176.71*	176.69*	176.70*	176.68*	176.72*	176.73*
0600	176.72*	176.79*	176.76*	176.68*	176.75*	176.60*	176.74*	176.78*
0700	176.78*	176.76*	176.71*	176.69*	176.72*	176.65*	176.76*	176.76*
0800	176.78*	176.82*	176.70*	176.71*	176.69*	176.61*	176.78*	176.69*
0900	176.78*	176.81*	176.74*	176.72*	176.72*	176.63*	176.73*	176.78*
1000	176.78*	176.78*	176.76*	176.76*	176.72*	176.69*	176.72*	176.74*
1100	176.73*	176.76*	176.83*	176.77*	176.74*	176.65*	176.77*	176.78*
1200	176.80*	176.73*	176.75*	176.79*	176.74*	176.68*	176.70*	176.80*
1300	176.80*	176.73*	176.70*	176.80*	176.75*	176.70*	176.77*	176.79*
1400	176.81*	176.79*	176.72*	176.73*	176.75*	176.68*	176.74*	176.82*
1500	176.77*	176.75*	176.68*	176.74*	176.71*	176.76*	176.83*	176.71*
1600	176.75*	176.73*	176.66*	176.69*	176.69*	176.68*	176.78*	176.80*
1700	176.81*	176.74*	176.64*	176.75*	176.62*	176.68*	176.76*	176.78*
1800	176.74*	176.75*	176.68*	176.64*	176.65*	176.66*	176.73*	176.76*
1900	176.79*	176.75*	176.70*	176.71*	176.67*	176.62*	176.68*	176.74*
2000	176.83*	176.75*	176.72*	176.77*	176.56*	176.70*	176.76*	176.66*
2100	176.78*	176.78*	176.74*	176.77*	176.70*	176.70*	176.76*	176.76*
2200	176.81*	176.73*	176.77*	176.77*	176.65*	176.71*	176.73*	176.73*
2300	176.80*	176.78*	176.74*	176.79*	176.74*	176.73*	176.76*	176.77*
2400	176.76*	176.78*	176.78*	176.76*	176.76*	176.74*	176.76*	176.73*
Mean	176.77*	176.76*	176.73*	176.74*	176.71*	176.68*	176.75*	176.76*

CST	9	10	11	12	13	14	15	16
0100	176.69*	176.75*	176.77*	176.71*	176.88*	176.77*	176.70*	176.62*
0200	176.76*	176.73*	176.79*	176.68*	176.84*	176.83*	176.76*	176.61*
0300	176.80*	176.76*	176.76*	176.69*	176.83*	176.66*	176.78*	176.68*
0400	176.73*	176.77*	176.73*	176.65*	176.85*	176.59*	176.74*	176.66*
0500	176.77*	176.73*	176.77*	176.64*	176.78*	176.72*	176.68*	176.73*
0600	176.70*	176.77*	176.78*	176.66*	176.85*	176.71*	176.74*	176.72*
0700	176.70*	176.73*	176.76*	176.64*	176.86*	176.65*	176.77*	176.64*
0800	176.74*	176.75*	176.75*	176.64*	176.80*	176.75*	176.69*	176.75*
0900	176.72*	176.75*	176.76*	176.73*	176.82*	176.72*	176.74*	176.62*
1000	176.75*	176.71*	176.77*	176.69*	176.81*	176.70*	176.78*	176.68*
1100	176.68*	176.71*	176.70*	176.76*	176.79*	176.72*	176.77*	176.65*
1200	176.79*	176.74*	176.73*	176.82*	176.76*	176.70*	176.72*	176.70*
1300	176.78*	176.81*	176.78*	176.86*	176.76*	176.72*	176.73*	176.73*
1400	176.77*	176.75*	176.75*	176.90*	176.76*	176.62*	176.66*	176.68*
1500	176.78*	176.74*	176.74*	176.82*	176.76*	176.77*	176.59*	176.69*
1600	176.73*	176.80*	176.76*	176.93*	176.75*	176.80*	176.64*	176.66*
1700	176.68*	176.76*	176.73*	176.96*	176.76*	176.73*	176.72*	176.57*
1800	176.77*	176.76*	176.72*	176.87*	176.77*	176.80*	176.74*	176.72*
1900	176.77*	176.66*	176.71*	176.97*	176.73*	176.83*	176.73*	176.64*
2000	176.72*	176.75*	176.69*	177.00*	176.70*	176.72*	176.85*	176.68*
2100	176.72*	176.76*	176.63*	177.06*	176.77*	176.80*	176.72*	176.73*
2200	176.72*	176.74*	176.68*	177.00*	176.70*	176.76*	176.74*	176.69*
2300	176.76*	176.75*	176.69*	176.96*	176.66*	176.78*	176.66*	176.72*
2400	176.72*	176.76*	176.65*	176.90*	176.69*	176.72*	176.63*	176.69*
Mean	176.74*	176.75*	176.73*	176.81*	176.78*	176.73*	176.72*	176.68*

CST	17	18	19	20	21	22	23	24
0100	176.73*	176.76*	176.80*	176.73*	176.71*	176.72*	176.75*	176.68*
0200	176.67*	176.76*	176.80*	176.68*	176.66*	176.70*	176.65*	176.69*
0300	176.69*	176.72*	176.72*	176.68*	176.70*	176.71*	176.72*	176.68*
0400	176.69*	176.69*	176.72*	176.66*	176.65*	176.66*	176.67*	176.78*
0500	176.68*	176.72*	176.68*	176.67*	176.68*	176.65*	176.68*	176.64*
0600	176.76*	176.74*	176.69*	176.61*	176.65*	176.64*	176.64*	176.69*
0700	176.74*	176.73*	176.71*	176.64*	176.69*	176.66*	176.63*	176.65*
0800	176.73*	176.73*	176.69*	176.65*	176.70*	176.67*	176.66*	176.62*
0900	176.80*	176.75*	176.72*	176.68*	176.69*	176.67*	176.68*	176.61*
1000	176.77*	176.76*	176.72*	176.70*	176.71*	176.69*	176.70*	176.60*
1100	176.73*	176.73*	176.75*	176.73*	176.74*	176.78*	176.68*	176.68*
1200	176.74*	176.80*	176.69*	176.71*	176.72*	176.72*	176.76*	176.61*
1300	176.75*	176.86*	176.69*	176.73*	176.77*	176.75*	176.74*	176.61*
1400	176.74*	176.77*	176.74*	176.69*	176.73*	176.73*	176.72*	176.67*
1500	176.77*	176.84*	176.68*	176.68*	176.70*	176.80*	176.72*	176.60*
1600	176.74*	176.80*	176.69*	176.63*	176.71*	176.72*	176.69*	176.62*
1700	176.68*	176.77*	176.67*	176.65*	176.75*	176.66*	176.65*	176.66*
1800	176.73*	176.72*	176.66*	176.66*	176.65*	176.67*	176.67*	176.66*
1900	176.76*	176.76*	176.65*	176.67*	176.66*	176.67*	176.60*	176.59*
2000	176.73*	176.76*	176.64*	176.64*	176.68*	176.64*	176.72*	176.62*
2100	176.68*	176.80*	176.68*	176.67*	176.68*	176.74*	176.62*	176.75*
2200	176.78*	176.78*	176.66*	176.72*	176.69*	176.72*	176.63*	176.67*
2300	176.70*	176.76*	176.68*	176.70*	176.74*	176.74*	176.66*	176.69*
2400	176.77*	176.76*	176.74*	176.72*	176.74*	176.69*	176.67*	176.68*
Mean	176.73*	176.76*	176.70*	176.68*	176.70*	176.70*	176.68*	176.66*

CST	25	26	27	28	29	30	31	
0100	176.70*	176.61*	176.72*	176.73*	176.83*	176.75*	176.92*	Monthly
0200	176.69*	176.66*	176.79*	176.69*	176.68*	176.82*	176.86*	Maximum
0300	176.68*	176.68*	176.75*	176.74*	176.75*	176.80*	176.94*	177.08*
0400	176.66*	176.67*	176.75*	176.83*	176.78*	176.80*	177.08*	0400/31
0500	176.69*	176.65*	176.75*	176.86*	176.86*	176.73*	176.91*	
0600	176.72*	176.68*	176.76*	176.85*	176.84*	176.68*	176.96*	
0700	176.67*	176.66*	176.72*	176.84*	176.72*	176.81*	176.90*	Monthly
0800	176.67*	176.68*	176.76*	176.89*	176.67*	176.81*	176.96*	Minimum
0900	176.64*	176.65*	176.67*	176.87*	176.74*	176.72*	176.84*	176.56*
1000	176.65*	176.67*	176.64*	176.80*	176.70*	176.81*	176.82*	2000/05
1100	176.63*	176.64*	176.69*	176.75*	176.80*	176.77*	176.86*	
1200	176.64*	176.68*	176.69*	176.80*	176.75*	176.83*	176.70*	
1300	176.63*	176.72*	176.66*	176.80*	176.59*	176.78*	176.81*	Monthly
1400	176.67*	176.67*	176.70*	176.82*	176.73*	176.76*	176.86*	Mean
1500	176.70*	176.74*	176.75*	176.79*	176.66*	176.72*	176.87*	176.73*
1600	176.67*	176.76*	176.68*	176.72*	176.86*	176.66*	176.84*	
1700	176.68*	176.76*	176.69*	176.83*	176.84*	176.80*	176.69*	
1800	176.67*	176.75*	176.74*	176.83*	176.73*	176.84*	176.85*	
1900	176.66*	176.74*	176.72*	176.81*	176.78*	176.85*	176.97*	
2000	176.64*	176.73*	176.82*	176.82*	176.68*	176.86*	176.80*	* = Pro-
2100	176.62*	176.70*	176.59*	176.79*	176.81*	176.80*	176.92*	visional
2200	176.65*	176.68*	176.72*	176.65*	176.72*	176.91*	176.80*	Data
2300	176.65*	176.72*	176.65*	176.89*	176.70*	176.99*	176.76*	
2400	176.65*	176.68*	176.62*	176.65*	176.75*	176.85*	176.81*	
Mean	176.66*	176.69*	176.71*	176.79*	176.75*	176.80*	176.86*	

U.S. Department of Commerce
NOAA/NOS - Silver Spring, Maryland
Great Lakes Water Levels, N/OES211

May 1993
| Water Levels in Meters |
| IGLD (1985) |

Station 908-7057 :
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.68	176.76	176.76	176.80	176.77	176.72	176.74	176.79
0200	176.70	176.76	176.78	176.78	176.76	176.70	176.69	176.81
0300	176.69	176.76	176.74	176.76	176.76	176.69	176.77	176.80
0400	176.72	176.78	176.78	176.73	176.74	176.70	176.72	176.79
0500	176.72	176.77	176.75	176.72	176.73	176.66	176.73	176.80
0600	176.70	176.81	176.74	176.74	176.73	176.73	176.77	176.76
0700	176.74	176.76	176.73	176.74	176.74	176.68	176.74	176.80
0800	176.71	176.79	176.75	176.74	176.76	176.73	176.75	176.78
0900	176.74	176.81	176.73	176.76	176.76	176.70	176.76	176.76
1000	176.72	176.76	176.78	176.78	176.74	176.70	176.78	176.77
1100	176.75	176.80	176.77	176.77	176.74	176.68	176.74	176.79
1200	176.73	176.76	176.76	176.81	176.76	176.71	176.78	176.82
1300	176.76	176.78	176.75	176.80	176.73	176.75	176.78	176.80
1400	176.71	176.79	176.76	176.77	176.73	176.72	176.78	176.73
1500	176.78	176.82	176.73	176.75	176.66	176.75	176.80	176.75
1600	176.72	176.78	176.76	176.75	176.72	176.72	176.81	176.80
1700	176.74	176.78	176.75	176.74	176.69	176.72	176.80	176.77
1800	176.76	176.76	176.72	176.75	176.68	176.68	176.81	176.75
1900	176.80	176.74	176.73	176.77	176.69	176.68	176.78	176.80
2000	176.78	176.77	176.77	176.76	176.66	176.70	176.80	176.77
2100	176.76	176.82	176.73	176.78	176.69	176.73	176.78	176.73
2200	176.79	176.82	176.79	176.78	176.74	176.73	176.81	176.80
2300	176.78	176.80	176.77	176.78	176.73	176.76	176.80	176.74
2400	176.79	176.81	176.78	176.78	176.74	176.74	176.82	176.77
Mean	176.74	176.78	176.76	176.76	176.73	176.71	176.77	176.78

CST	9	10	11	12	13	14	15	16
0100	176.80	176.80	176.75	176.72	176.72	176.67	176.72	176.70
0200	176.81	176.78	176.78	176.68	176.75	176.66	176.70	176.68
0300	176.77	176.78	176.75	176.66	176.75	176.68	176.71	176.64
0400	176.80	176.76	176.78	176.68	176.77	176.67	176.71	176.68
0500	176.78	176.77	176.77	176.66	176.74	176.66	176.72	176.67
0600	176.78	176.76	176.76	176.67	176.77	176.71	176.73	176.68
0700	176.78	176.76	176.73	176.69	176.77	176.67	176.72	176.65
0800	176.78	176.75	176.73	176.69	176.81	176.74	176.74	176.68
0900	176.75	176.76	176.74	176.73	176.76	176.75	176.70	176.68
1000	176.77	176.75	176.75	176.73	176.75	176.74	176.72	176.69
1100	176.79	176.78	176.74	176.79	176.73	176.70	176.72	176.65
1200	176.79	176.75	176.76	176.77	176.73	176.72	176.75	176.68
1300	176.79	176.78	176.72	176.74	176.73	176.70	176.70	176.71
1400	176.77	176.78	176.72	176.77	176.76	176.68	176.68	176.65
1500	176.77	176.78	176.75	176.78	176.75	176.74	176.68	176.70
1600	176.78	176.74	176.73	176.77	176.74	176.67	176.72	176.68
1700	176.77	176.74	176.72	176.78	176.74	176.76	176.71	176.64
1800	176.79	176.75	176.71	176.78	176.69	176.80	176.74	176.67
1900	176.75	176.74	176.71	176.79	176.73	176.76	176.77	176.65
2000	176.75	176.77	176.70	176.81	176.75	176.74	176.78	176.74
2100	176.76	176.74	176.69	176.81	176.69	176.79	176.72	176.72
2200	176.76	176.75	176.67	176.80	176.69	176.71	176.75	176.72
2300	176.79	176.74	176.68	176.75	176.70	176.73	176.73	176.71
2400	176.77	176.74	176.70	176.74	176.74	176.70	176.71	176.71
Mean	176.78	176.76	176.73	176.74	176.74	176.71	176.72	176.68

CST	17	18	19	20	21	22	23	24
0100	176.73	176.74	176.76	176.72	176.73	176.74	176.77	176.75
0200	176.70	176.70	176.74	176.73	176.74	176.74	176.78	176.77
0300	176.71	176.76	176.72	176.71	176.72	176.73	176.75	176.79
0400	176.71	176.73	176.72	176.68	176.71	176.74	176.76	176.73
0500	176.73	176.73	176.71	176.66	176.71	176.71	176.73	176.75
0600	176.74	176.75	176.70	176.70	176.70	176.71	176.77	176.73
0700	176.72	176.74	176.72	176.69	176.71	176.68	176.75	176.73
0800	176.76	176.77	176.71	176.72	176.73	176.74	176.76	176.69
0900	176.73	176.74	176.71	176.70	176.74	176.74	176.74	176.75
1000	176.77	176.79	176.70	176.73	176.73	176.74	176.76	176.69
1100	176.75	176.77	176.76	176.71	176.75	176.75	176.79	176.68
1200	176.74	176.78	176.74	176.73	176.75	176.76	176.79	176.68
1300	176.73	176.75	176.72	176.74	176.76	176.77	176.80	176.70
1400	176.72	176.75	176.71	176.73	176.74	176.74	176.79	176.72*
1500	176.72	176.72	176.70	176.70	176.73	176.75	176.76	176.71*
1600	176.77	176.79	176.69	176.69	176.72	176.75	176.74	176.74*
1700	176.78	176.74	176.66	176.70	176.72	176.74	176.74	176.65*
1800	176.73	176.75	176.68	176.70	176.71	176.74	176.83	176.72*
1900	176.68	176.76	176.70	176.70	176.72	176.76	176.82	176.70*
2000	176.69	176.76	176.67	176.71	176.71	176.75	176.80	176.73*
2100	176.78	176.75	176.68	176.72	176.74	176.74	176.77	176.69*
2200	176.72	176.74	176.69	176.74	176.75	176.76	176.76	176.70*
2300	176.79	176.76	176.72	176.75	176.75	176.77	176.73	176.69*
2400	176.72	176.78	176.72	176.73	176.74	176.77	176.74	176.73*
Mean	176.73	176.75	176.71	176.71	176.73	176.74	176.77	176.72*

CST	25	26	27	28	29	30	31	
0100	176.71*	176.71*	176.75*	176.78*	176.66*	176.72*	176.85*	Monthly
0200	176.69*	176.70*	176.80*	176.79*	176.73*	176.80*	176.87*	Maximum
0300	176.70*	176.72*	176.76*	176.80*	176.71*	176.80*	176.88*	176.90*
0400	176.66*	176.71*	176.78*	176.87*	176.85*	176.71*	176.87*	2200/30
0500	176.72*	176.71*	176.77*	176.86*	176.75*	176.73*	176.86*	
0600	176.69*	176.69*	176.72*	176.81*	176.77*	176.75*	176.84*	
0700	176.69*	176.72*	176.75*	176.83*	176.72*	176.78*	176.83*	Monthly
0800	176.66*	176.72*	176.82*	176.81*	176.69*	176.75*	176.82*	Minimum
0900	176.68*	176.74*	176.72*	176.76*	176.72*	176.83*	176.86*	176.64*
1000	176.69*	176.73*	176.72*	176.77*	176.73*	176.81*	176.77*	2300/28
1100	176.67*	176.74*	176.77*	176.78*	176.72*	176.76*	176.85*	
1200	176.66*	176.73*	176.70*	176.77*	176.76*	176.76*	176.78*	
1300	176.67*	176.75*	176.74*	176.77*	176.78*	176.82*	176.85*	Monthly
1400	176.69*	176.76*	176.79*	176.76*	176.69*	176.79*	176.77*	Mean
1500	176.69*	176.75*	176.83*	176.79*	176.66*	176.80*	176.83*	176.74*
1600	176.71*	176.78*	176.78*	176.77*	176.73*	176.85*	176.88*	
1700	176.69*	176.77*	176.75*	176.75*	176.72*	176.80*	176.79*	
1800	176.68*	176.74*	176.76*	176.69*	176.78*	176.86*	176.73*	
1900	176.66*	176.74*	176.78*	176.75*	176.78*	176.82*	176.77*	
2000	176.69*	176.73*	176.80*	176.75*	176.75*	176.89*	176.77*	* = Pro-
2100	176.66*	176.71*	176.80*	176.72*	176.77*	176.88*	176.76*	visional
2200	176.67*	176.73*	176.79*	176.78*	176.77*	176.90*	176.77*	Data
2300	176.67*	176.74*	176.76*	176.64*	176.73*	176.86*	176.74*	
2400	176.70*	176.74*	176.78*	176.74*	176.76*	176.89*	176.78*	
Mean	176.68*	176.73*	176.77*	176.77*	176.74*	176.81*	176.81*	

U.S. Department of Commerce — June 1993
NOAA/NOS - Silver Spring, Maryland — | Water Levels in Meters |
Great Lakes Water Levels, N/OES211 — | IGLD (1985) |

Station 908-7057 :
Milwaukee, Wisconsin on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.66*	176.73*	176.77*	176.78*	176.80*	176.76*	176.80*	N/A
0200	176.75*	176.75*	176.85*	176.77*	176.80*	176.79*	176.86*	N/A
0300	176.72*	176.73*	176.78*	176.80*	176.74*	176.77*	176.81*	N/A
0400	176.72*	176.71*	176.77*	176.78*	176.81*	176.75*	176.73*	N/A
0500	176.71*	176.72*	176.74*	176.79*	176.80*	176.74*	176.76*	N/A
0600	176.69*	176.70*	176.76*	176.76*	176.80*	176.72*	176.75*	N/A
0700	176.71*	176.75*	176.71*	176.78*	176.70*	176.76*	176.76*	N/A
0800	176.71*	176.76*	176.75*	176.77*	176.71*	176.72*	176.86*	N/A
0900	176.72*	176.79*	176.78*	176.75*	176.76*	176.74*	N/A	N/A
1000	176.74*	176.77*	176.77*	176.72*	176.83*	176.78*	N/A	N/A
1100	176.74*	176.81*	176.81*	176.78*	176.80*	176.78*	N/A	N/A
1200	176.72*	176.74*	176.74*	176.86*	176.76*	176.84*	N/A	N/A
1300	176.74*	176.80*	176.85*	176.79*	176.80*	176.79*	N/A	N/A
1400	176.71*	176.77*	176.76*	176.80*	176.82*	176.76*	N/A	N/A
1500	176.75*	176.78*	176.78*	176.82*	176.80*	176.76*	N/A	N/A
1600	176.71*	176.75*	176.72*	176.86*	176.75*	176.75*	N/A	N/A
1700	176.74*	176.76*	176.78*	176.78*	176.75*	176.79*	N/A	N/A
1800	176.74*	176.79*	176.74*	176.72*	176.76*	176.79*	N/A	N/A
1900	176.68*	176.79*	176.75*	176.68*	176.75*	176.80*	N/A	N/A
2000	176.72*	176.79*	176.78*	176.78*	176.74*	176.79*	N/A	N/A
2100	176.71*	176.75*	176.78*	176.75*	176.73*	176.77*	N/A	N/A
2200	176.72*	176.80*	176.77*	176.81*	176.77*	176.77*	N/A	N/A
2300	176.71*	176.78*	176.77*	176.74*	176.77*	176.74*	N/A	N/A
2400	176.76*	176.82*	176.77*	176.88*	176.78*	176.80*	N/A	N/A
Mean	176.72*	176.76*	176.77*	176.78*	176.77*	176.77*	176.79*	N/A

U.S. Department of Commerce — June 1993
NOAA/NOS - Silver Spring, Maryland — | Water Levels in Meters |
Great Lakes Water Levels, N/OES211 — | IGLD (1985) |

Station 908-7044 :
Calumet Harbor, Illinois on Lake Michigan

CST	1	2	3	4	5	6	7	8
0100	176.84*	176.76*	176.82*	176.86*	176.86*	176.77*	176.73*	N/
0200	176.72*	176.77*	176.80*	176.82*	176.89*	176.77*	176.72*	N/
0300	176.64*	176.72*	176.79*	176.82*	176.86*	176.67*	176.79*	N/
0400	176.78*	176.72*	176.77*	176.80*	176.82*	176.70*	176.80*	N/
0500	176.70*	176.67*	176.74*	176.83*	176.76*	176.68*	176.80*	N/
0600	176.82*	176.79*	176.73*	176.79*	176.80*	176.71*	176.80*	N/
0700	176.67*	176.80*	176.73*	176.81*	176.80*	176.66*	176.80*	N/
0800	176.74*	176.78*	176.81*	176.82*	176.70*	176.71*	N/A	N/A
0900	176.69*	176.76*	176.73*	176.80*	176.69*	176.73*	N/A	N/A
1000	176.68*	176.82*	176.78*	176.86*	176.77*	176.77*	N/A	N/A
1100	176.70*	176.78*	176.83*	176.98*	176.78*	176.75*	N/A	N/A
1200	176.68*	176.79*	176.84*	176.95*	176.83*	176.72*	N/A	N/A
1300	176.71*	176.75*	176.81*	176.92*	176.80*	176.75*	N/A	N/A
1400	176.76*	176.80*	176.78*	176.96*	176.83*	176.77*	N/A	N/A
1500	176.72*	176.75*	176.81*	176.97*	176.69*	176.70*	N/A	N/A
1600	176.69*	176.77*	176.80*	176.92*	176.72*	176.75*	N/A	N/A
1700	176.57*	176.81*	176.75*	176.92*	176.72*	176.69*	N/A	N/A
1800	176.76*	176.78*	176.77*	176.96*	176.68*	176.73*	N/A	N/A
1900	176.73*	176.71*	176.79*	176.97*	176.67*	176.67*	N/A	N/A
2000	176.68*	176.76*	176.78*	176.87*	176.75*	176.85*	N/A	N/A
2100	176.77*	176.81*	176.75*	176.97*	176.70*	176.77*	N/A	N/A
2200	176.74*	176.75*	176.78*	176.89*	176.68*	176.72*	N/A	N/A
2300	176.83*	176.76*	176.82*	176.98*	176.78*	176.74*	N/A	N/A
2400	176.80*	176.80*	176.81*	176.87*	176.78*	176.80*	N/A	N/A
Mean	176.73*	176.77*	176.78*	176.89*	176.76*	176.73*	176.78*	N/

APPENDIX O

Concentrations of Organochlorine
Compounds in Fish Samples from
the Waukegan Old North Harbor Area, 1993

APPENDIX O.1

Concentrations of organochlorine compounds in fish samples from the Waukegan Old North Harbor area, 1993.

Date Collected	Station Code	Location	Species	No. Fish in Sample	Mean Length (mm)	Mean Weight (g)	Percent Lipid	Total Chlordane (mg/kg)	Dieldrin (mg/kg)	Heptachlor Epoxide (mg/kg)	Total DDT (mg/kg)	Total PCBs (mg/kg)	Mirex (mg/kg)
8/16/93	QZO01	Waukegan Hbr.	Carp (f)	1	685	3950	5.1	0.12	0.06	0.01K	0.27	2.40 *	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Carp (f)	1	670	4800	5.5	0.05	0.04	0.02	0.24	6.39 *	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Carp (f)	1	795	10550	40.1	0.81 *	0.25	0.06	0.66	2.66 *	0.25 K
8/16/93	QZO01	Waukegan Hbr.	Carp (f)	1	700	5700	20.3	0.10	0.01K	0.02	0.49	1.84	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Carp (f)	1	655	4600	16.2	0.26	0.06	0.01K	0.62	1.66	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Carp (f)	1	625	3900	5.3	0.12	0.02	0.01K	0.47	0.60	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Gizzard Shad (w)	1	415	800	3.6	0.01	0.01K	0.01K	0.06	0.41	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Alewife (w)	8	--	--	3.8	0.06	0.01K	0.01K	0.08	0.17	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Lepomis sp. (w)	6	--	--	2.6	0.02	0.03	0.01K	0.09	1.07	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Golden Shiner (w)	5	--	--	2.0	0.02	0.01K	0.01K	0.06	0.46	0.05 K
8/16/93	QZO01	Waukegan Hbr.	Golden Shiner (w)	15	--	--	3.0	0.03	0.01K	0.01K	0.03	0.52	0.05 K
8/16/93	QZO01	Waukegan Hbr.	W.Sucker (w)	1	365	600	4.1	0.04	0.01	0.01K	0.13	1.06	0.05 K
8/16/93	QZO01	Waukegan Hbr.	W.Sucker (w)	1	275	300	3.0	0.04	0.01	0.01K	0.05	0.62	0.05 K
					USFDA Action Level (mg/kg)			0.30	0.30	0.30	5.00	2.00	0.10
					Number above action level			1	0	0	0	3	0
					Percent above action level			7.7	0.0	0	0.0	23.1	0.0

(f) = Fillets
(w) = Whole
K = Actual value known to be less than value reported.
* = Value exceeds USFDA Action Level.

APPENDIX P

Public Participation Plan for
the Waukegan Area of Concern

Illinois Environmental Protection Agency
Public Participation Plan
for the
Waukegan Area of Concern

The Great Lakes Water Quality Agreement requires the eight Great Lakes states and the Province of Ontario to prepare and implement Remedial Action Plans (RAP) for each site designated as an Area of Concern (AOC). The state or province which has political jurisdiction of the AOC is responsible for preparing the RAP. The International Joint Commission (IJC), the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) designated Waukegan Harbor as an Area of Concern. There are 43 AOCs throughout the Great Lakes Basin, and Waukegan Harbor is the only AOC within Illinois.

This public participation plan describes the objectives and activities for developing the Stage I RAP. The contents of this plan are:

INTRODUCTION

The International Joint Commission (IJC), the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) designated Waukegan Harbor as an Area of Concern (AOC) in 1981 due to the discovery of significantly high levels of polychlorinated biphenols (PCB) in harbor sediment. Discharges of PCBs to the harbor had been detected in 1975 and 1976 as coming from Outboard Marine Corporation (OMC). The AOC, located on the west shore of Lake Michigan in Waukegan, Illinois, is about 37 miles north of Chicago and 10 miles south of the Wisconsin state border. The Great Lakes Water Quality Agreement (GLWQA) and the Great Lakes Critical Program Act require that a Remedial Action Plan (RAP) be prepared for the AOC.

Public consultation and involvement in all RAP implementation and development is also required by the GLQWA. As part of public consultation the Waukegan Citizens Advisory Group (CAG) was formed in August 1990. The Waukegan CAG included, in an effort to keep all interested individuals and groups informed, spokespeople from a variety of concerned parties in the area. The CAG has actively assisted with the preparation of the RAP by providing useful background information and voicing concerns that focus the IEPA's attention on what should be addressed in the RAP. For example, the CAG raised concerns about a variety of industrial sites in the vicinity of Waukegan Harbor that may impair beneficial uses. Consequently, while the original AOC included only the harbor, the IEPA expanded the study area to include both the Harbor and adjacent Lake Michigan shore for PCBs and other contaminants. The combined effort has led to investigation and remediation planning for non-PCB sources of contamination. The expanded area, including the AOC, is designated as the Waukegan Expanded Study Area (ESA).

I. BACKGROUND OF WAUKEGAN HARBOR

A. Site Description

Waukegan is approximately 37 miles north of Chicago and 10 miles south of Wisconsin. The ESA is a larger area encompassing approximately 15 industrial sites including the harbor area. The ESA is bounded by the Dead River to the north, the former U.S. Steel property to the south, the Lake Michigan shoreline to the east and the bluff line to the west. A map showing the location of the industrial sites within the ESA is provided. The Waukegan Harbor AOC includes the North Ditch and its watershed, the North Harbor, entrance channel and South Harbor (new harbor) with their associated watersheds and the near Shore Lake Michigan water from the North Ditch south of the mouth of the Waukegan River.

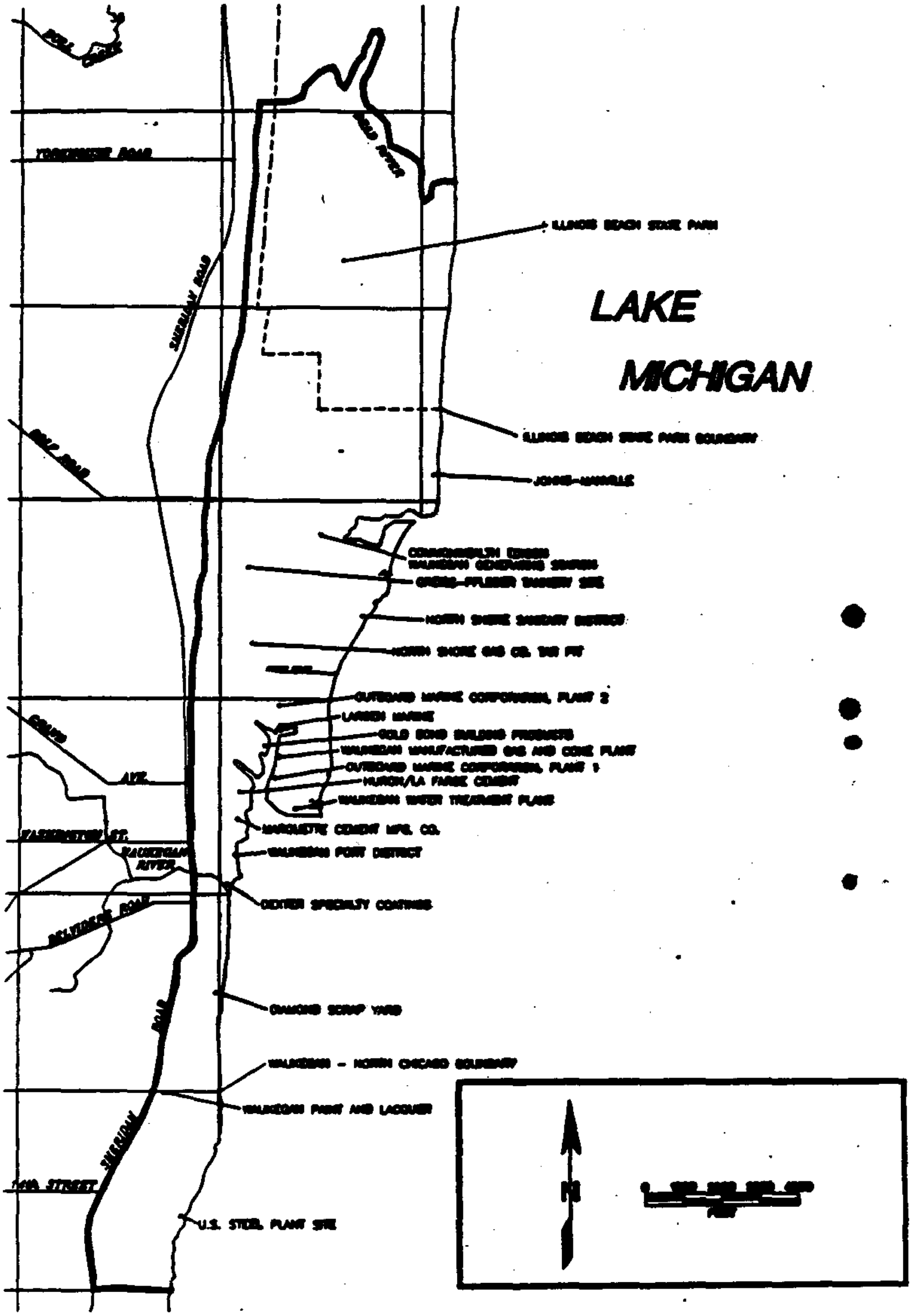
B. Site History

Between 1961 and 1972, Outboard Marine Corporation (OMC) purchased hydraulic fluid used in its die-casing works that contained PCBS. Some of this fluid escaped through floor drains and discharged to an oil interceptor system that emptied into the North Ditch. Some of the PCBs escaped from a portion of the oil interceptor and were released to the Waukegan Harbor. As a result of OMC discharges, an estimated 700,000 pounds or more of PCBs are contaminating OMC property and approximately 300,000 pounds of PCBs are in Waukegan Harbor.

An investigation of the sediments in Waukegan Harbor was made in 1977 and thorough investigations of both the OMC property and the harbor were completed in 1979 and 1980 by the USEPA. A feasibility study was completed by the USEPA in 1984 and the Record of Decision (ROD), selecting on-site containment with off-site disposal of some soils, was issued in May 1984.

Also in 1984, the engineering design work for the selected remedial action was initiated. However, in late 1985 design work was suspended due to litigation between OMC and USEPA regarding access to OMC property. Access was essential to continue the engineering design work.

The Waukegan Expanded Study Area for the Waukegan Remedial Action Plan.



While litigation was pending in courts, Congress enacted the Superfund Amendments and Reauthorization Act (SARA). The SARA amendments encourage "permanent remedies which reduce the mobility, toxicity, or volume of hazardous substances." Although RODs signed before October 1986 are not required to meet these new requirements, the USEPA re-evaluated the 1984 ROD to develop a remedy consistent with SARA.

About the time the USEPA began reviewing the remedy set forth in the 1984 ROD, the USEPA and OMC agreed to end litigation. OMC proposed to clean up the site and negotiations led to a Consent Decree in April 1989 (U.S. District Court, 1988) between OMC, the USEPA and the IEPA. Remediation at the OMC Superfund site began November 15, 1990.

Development of the RAP started with the formation of the Waukegan CAG by the IEPA. Recognizing that sources of non-PCB contamination are present near the harbor, CAG members and the IEPA staff prepared a list of these potential sources of contamination. Preliminary sampling of the harbor area and limited investigations of these potential sources of contamination began in the fall of 1990. Drafting of the RAP started early the following year.

II. PUBLIC PARTICIPATION GOALS

A. Establish and maintain a dialogue with interested and affected citizens and organizations in the Waukegan vicinity.

B. Obtain input to develop the Remedial Action Plan and review of draft chapters by federal, state, and local governmental agencies involved with relevant issues.

C. Provide information about the RAP which is easily accessible in the Waukegan area.

D. Respond to all questions and information requests in a timely manner.

E. Develop a process for review of each draft chapter at the local level.

III. PUBLIC PARTICIPATION ACTIVITIES & SCHEDULE

GOAL

Establish and maintain a dialogue with interested and affected citizens and organizations in the Waukegan vicinity:

ACTIVITIES

Assemble a Citizens Advisory Group to meet monthly or on an as-needed basis to obtain input into the RAP process.

Provide speakers to explain the RAP process and the importance of a RAP to Lake County.

Contact news media about milestone events and provide background information.

Participate in functions which would elevate awareness of the RAP.

Conduct a poster contest among local schools in the fall.

Assist USEPA with the Lake Guardian visit in October, 1991.

GOAL

Obtain input to develop the Remedial Action Plan and review of draft chapters by federal, state, and local governmental agencies involved with relevant issues.

ACTIVITIES

Assemble an Inter-Agency Work Group of representatives from U.S. Department of Fish & Wildlife; Illinois Department of Conservation; Illinois Geological Survey; Illinois Water Survey, Illinois Natural History Survey, and the Illinois Pollution Control Board.

GOAL

Provide information about the RAP which is easily accessible in the Waukegan area.

ACTIVITIES

Establish a repository at the Waukegan Public Library. Index all material in an easily retrievable format.

Develop and distribute copies of a videotape about the RAP process and how citizens can comment.

Build and distribute 2 information kiosks. Establish a kiosk at the Waukegan Port District and the Waukegan Public Library.

GOAL

Respond to all questions and information requests in a timely manner.

ACTIVITIES

Designate RAP Coordinators in the Springfield (Greg Michaud) and Maywood (Bob Schacht) Field Office.

Assign two public participation staff to respond to inquiries, prepare meeting minutes, and coordinate printing and distribution of informational materials.

GOAL

Develop a process for review of each draft chapter at the local level.

ACTIVITIES

Formal presentation and review of each Chapter by the CAG.

Initial review by Co-Chairs with major revisions made before distribution to CAG members;

CAG members submit comments in writing to CAG Co-Chairs;

Discussion of major issues and concerns at monthly CAG meetings;

Meet, when necessary, with appropriate subcommittees to discuss specific concerns.

Design a 60 day public comment period on the Stage I RAP with the following components:

Public Notice of Comment Period in a display ad to appear at least 3 times in the Waukegan News Sun;

Chapter Repositories at the Waukegan Port District and the Lake County Health Department;

One Public Availability Session;

One Public Meeting;

Postage paid, self-addressed envelopes;

Public information video-tape on the Waukegan RAP.

V. MAILING LIST

Updated April 12, 1993
190 Addresses

Waukegan Harbor Remedial Action Plan
Expanded Contact List

Citizens Advisory Group
P.O. Box 91
Waukegan, Illinois 60079

April, 1993

A. CITIZENS ADVISORY GROUP
(25 Voting Members)

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Clerk, Shirley Reitz
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Illinois Environmental Protection Agency
Public Participation Plan
for the
Waukegan Area of Concern

The Great Lakes Water Quality Agreement requires the eight Great Lakes states and the Province of Ontario to prepare and implement Remedial Action Plans (RAP) for each site designated as an Area of Concern (AOC). The state or province which has political jurisdiction of the AOC is responsible for preparing the RAP. The International Joint Commission (IJC), the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) designated Waukegan Harbor as an Area of Concern. There are 43 AOCs throughout the Great Lakes Basin, and Waukegan Harbor is the only AOC within Illinois.

This public participation plan describes the objectives and activities for developing the Stage II RAP. The Stage I RAP was originally drafted October, 1990. The contents of this plan for the Stage II RAP are:

I. Introduction
II. Background of Waukegan Harbor
III. Public Participation Goals
IV. Public Participation Activities & Schedule
V. Mailing List

INTRODUCTION

The International Joint Commission (IJC), the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) designated Waukegan Harbor as an Area of Concern (AOC) in 1981 due to the discovery of significantly high levels of polychlorinated biphenols (PCB) in harbor sediment. Discharges of PCBs to the harbor had been detected in 1975 and 1976 as coming from Outboard Marine Corporation (OMC). The AOC, located on the west shore of Lake Michigan in Waukegan, Illinois, is about 37 miles north of Chicago and 10 miles south of the Wisconsin state border. The Great Lakes Water Quality Agreement (GLWQA) and the Great Lakes Critical Program Act require that a Remedial Action Plan (RAP) be prepared for the AOC.

Public consultation and involvement in all RAP implementation and development is also required by the GLQWA. As part of public consultation the Waukegan Citizens Advisory Group (CAG) was formed in August 1990. The Waukegan CAG included, in an effort to keep all interested individuals and groups informed, spokespeople from a variety of concerned parties in the area. The CAG has actively assisted with the preparation of the RAP by providing useful background information and voicing concerns that focus the IEPA's attention on what should be addressed in the RAP. For example, the CAG raised concerns about a variety of industrial sites in the vicinity of Waukegan Harbor that may impair beneficial uses. Consequently, while the original AOC included only the harbor, the IEPA expanded the study area to include both the Harbor and adjacent Lake Michigan shore for PCBs and other contaminants. The combined effort has led to investigation and remediation planning for non-PCB sources of contamination. The expanded area, including the AOC, is designated as the Waukegan Expanded Study Area (ESA).

The Stage I RAP went through formal public review in the Fall of 1992. During this period the general public, CAG, and interagency workgroup made approximately 110 revisions. Currently the Stage I RAP is being reviewed by the USEPA. The IJC formal review of the Stage I RAP, with the IEPA, is planned for January 1994.

I. BACKGROUND OF WAUKEGAN HARBOR

A. Site Description

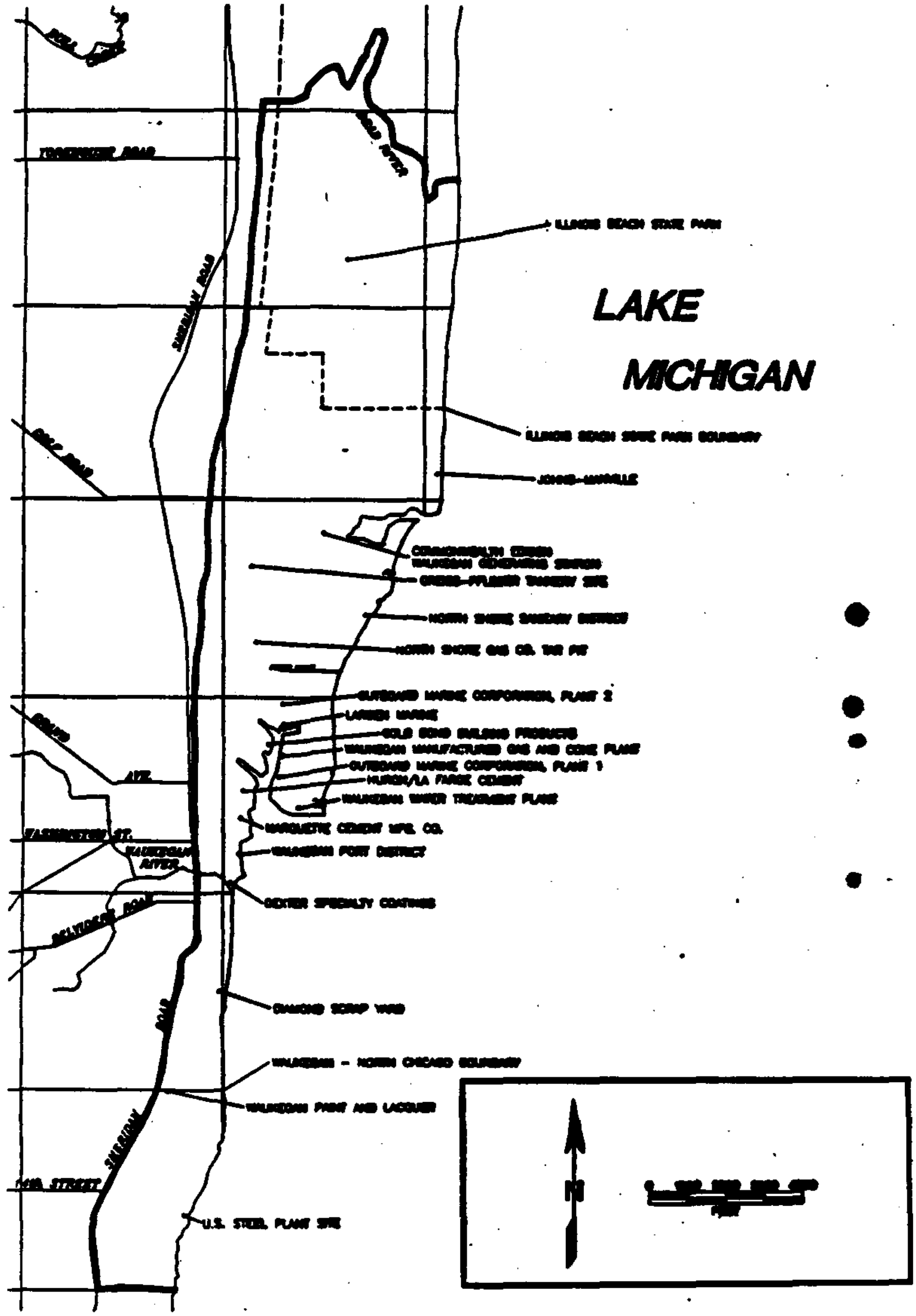
Waukegan is approximately 37 miles north of Chicago and 10 miles south of Wisconsin. The ESA is a larger area encompassing approximately 15 industrial sites including the harbor area. The ESA is bounded by the Dead River to the north, the former U.S. Steel property to the south, the Lake Michigan shoreline to the east and the bluff line to the west. A map showing the location of the industrial sites within the ESA is provided. The Waukegan Harbor AOC includes the North Ditch and its watershed, the North Harbor, entrance channel and South Harbor (new harbor) with their associated watersheds and the near Shore Lake Michigan water from the North Ditch south of the mouth of the Waukegan River.

B. Site History

Between 1961 and 1972, Outboard Marine Corporation (OMC) purchased hydraulic fluid used in its die-casing works that contained PCBS. Some of this fluid escaped through floor drains and discharged to an oil interceptor system that emptied into the North Ditch. Some of the PCBs escaped from a portion of the oil interceptor and were released to the Waukegan Harbor. As a result of OMC discharges, an estimated 700,000 pounds or more of PCBs are contaminating OMC property and approximately 300,000 pounds of PCBs are in Waukegan Harbor.

An investigation of the sediments in Waukegan Harbor was made in 1977 and thorough investigations of both the OMC property and the harbor were completed in 1979 and 1980 by the USEPA. A feasibility study was completed by the USEPA in 1984 and the Record of Decision (ROD), selecting on-site containment with off-site disposal of some soils, was issued in May 1984.

The Waukegan Expanded Study Area for the Waukegan Remedial Action Plan.



Also in 1984, the engineering design work for the selected remedial action was initiated. However, in late 1985 design work was suspended due to litigation between OMC and USEPA regarding access to OMC property. Access was essential to continue the engineering design work.

While litigation was pending in courts, Congress enacted the Superfund Amendments and Reauthorization Act (SARA). The SARA amendments encourage "permanent remedies which reduce the mobility, toxicity, or volume of hazardous substances." Although RODs signed before October 1986 are not required to meet these new requirements, the USEPA re-evaluated the 1984 ROD to develop a remedy consistent with SARA.

About the time the USEPA began reviewing the remedy set forth in the 1984 ROD, the USEPA and OMC agreed to end litigation. OMC proposed to clean up the site and negotiations led to a Consent Decree in April 1989 (U.S. District Court, 1988) between OMC, the USEPA and the IEPA. Remediation at the OMC Superfund site began November 15, 1990. Under Superfund, the harbor dredging was completed in November 1992.

Development of the RAP started with the formation of the Waukegan CAG by the IEPA. Recognizing that sources of non-PCB contamination are present near the harbor, CAG members and the IEPA staff prepared a list of these potential sources of contamination. Preliminary sampling of the harbor area and limited investigations of these potential sources of contamination began in the fall of 1990. Drafting of the RAP started early the following year. Interagency and CAG review took during the summer of 1991 and went through September 1992. The public comment period went from October 1992 through December 1992. CAG review of the draft chapters of the Stage II RAP took place in May 1993.

The following are other cleanup activities relative to the Waukegan ESA. Commonwealth Edison is taking the initiative to remediate the Greiss-Pfleger Tannery site under the voluntary program. The IEPA's LUST unit was responsible for removing two USTs at OMC and two USTs at the Waukegan Park District. The IEPA and USEPA worked together to conduct immediate removal of hazardous wastes at Waukegan Paint and Lacquer and at the tarpit site located north of the harbor.

II. PUBLIC PARTICIPATION GOALS

A. Establish and maintain a dialogue with interested and affected citizens and organizations in the Waukegan vicinity.

B. Obtain input to develop the Remedial Action Plan and review of draft chapters by federal, state, and local governmental agencies involved with relevant issues.

C. Provide information about the RAP which is easily accessible in the Waukegan area.

D. Respond to all questions and information requests in a timely manner.

E. Develop a process for review of each draft chapter at the local level.

III. PUBLIC PARTICIPATION ACTIVITIES & SCHEDULE

GOAL

Establish and maintain a dialogue with interested and affected citizens and organizations in the Waukegan vicinity:

ACTIVITIES

Assemble a Citizens Advisory Group to meet monthly or on an as-needed basis to obtain input into the RAP process.

Provide speakers to explain the RAP process and the importance of a RAP to Lake County.

Contact news media about milestone events and provide background information.

Participate in functions which would elevate awareness of the RAP.

Held a commemoration event to mark the completion of the OMC Superfund site August 2, 1993.

IEPA cooperated with the University of Illinois Department of Urban Regional Planning in their report - "Citizen Advisory Groups and Remedial Action Planning: Observations on the Waukegan, Illinois Area of Concern."

GOAL

Obtain input to develop the Remedial Action Plan and review of draft chapters by federal, state, and local governmental agencies involved with relevant issues.

ACTIVITIES

Assemble an Inter-Agency Work Group of representatives from U.S. Department of Fish & Wildlife; Illinois Department of Conservation; Illinois Geological Survey; Illinois Water Survey, Illinois Natural History Survey, and the Illinois Pollution Control Board.

GOAL

Provide information about the RAP which is easily accessible in the Waukegan area.

ACTIVITIES

Establish a repository at the Waukegan Public Library. Index all material in an easily retrievable format.

Develop and distribute copies of a videotape about the RAP process and how citizens can comment.

Maintain a kiosk at the Waukegan Port District and the Waukegan Public Library.

Prepared a cable television show on Waukegan Harbor RAP process which aired locally for 1 month.

Contacted area grade schools and secondary schools and offered information and tours of AOC.

GOAL

Respond to all questions and information requests in a timely manner.

ACTIVITIES

Designate RAP Coordinators in the Springfield (Greg Michaud) and Maywood (Bob Schacht) Field Office.

Assign two public participation staff to respond to inquiries, prepare meeting minutes, and coordinate printing and distribution of informational materials.

GOAL

Develop a process for review of each draft chapter at the local level.

ACTIVITIES

Formal presentation and review of each Chapter by the CAG.

Initial review by Co-Chairs with major revisions made before distribution to CAG members;

CAG members submit comments in writing to CAG Co-Chairs;

Discussion of major issues and concerns at monthly CAG meetings;

Meet, when necessary, with appropriate subcommittees to discuss specific concerns.

Design a 60 day public comment period on the Stage I RAP with the following components:

Public Notice of Comment Period in a display ad to appear at least 3 times in the Waukegan News Sun;

Chapter Repositories at the Waukegan Port District and the Lake County Health Department;

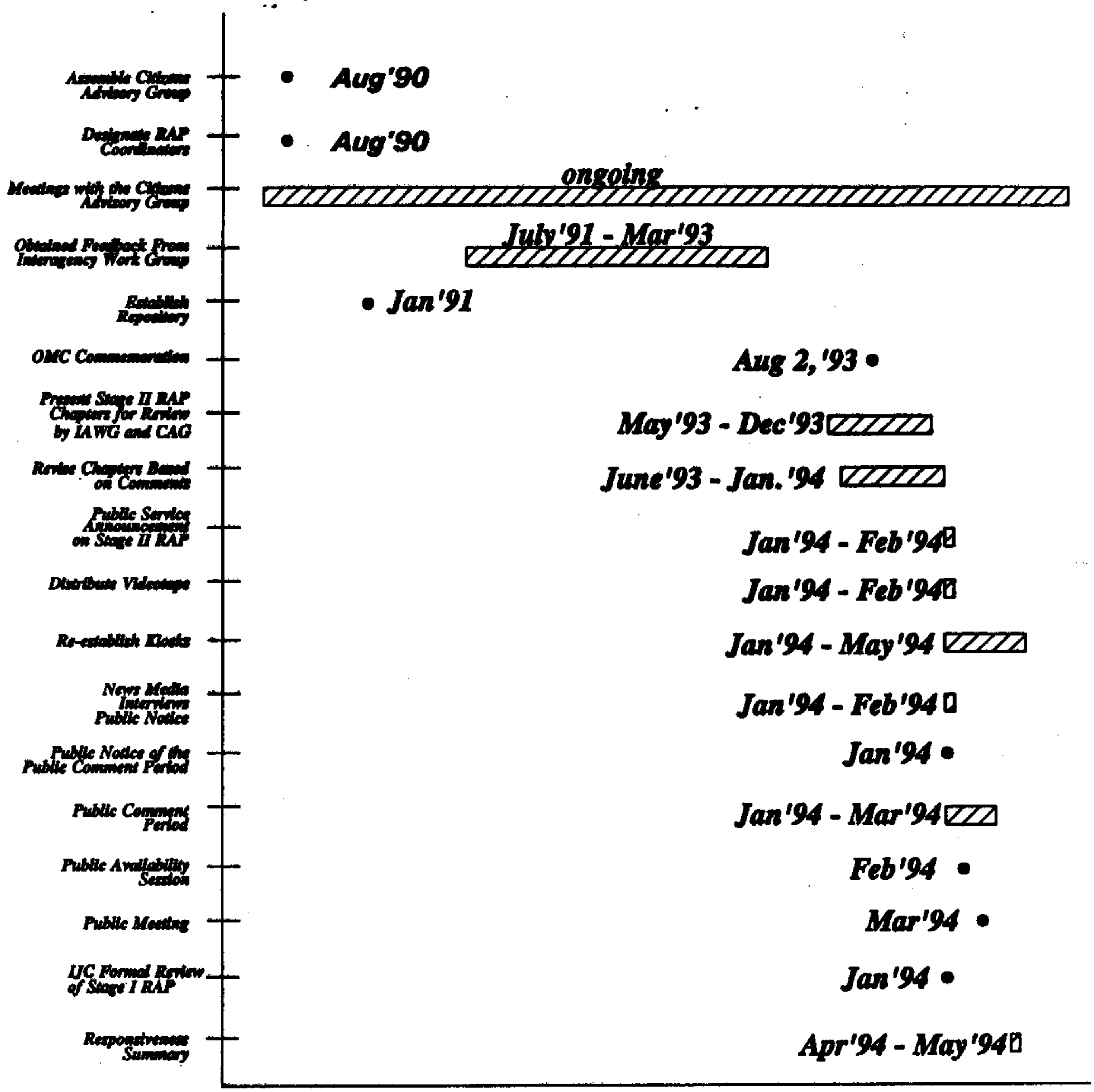
One Public Availability Session;

One Public Meeting;

Postage paid, self-addressed envelopes;

Public information video-tape on the Waukegan RAP.

Schedule of Public Participation Activities



• *A single point in time.*

V. MAILING LIST

Updated April 12, 1993
190 Addresses

Waukegan Harbor Remedial Action Plan
Expanded Contact List

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April, 1993

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Local Municipalities

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Clerk Tim Miller
1850 Lewis Avenue
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Evelyn Alexander
Administrative Assistant to the Mayor
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Keith Humphres
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Clerk William F. Durkin
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Clerk, Shirley Reitz
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Clerk Jane Curtis
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Clerk Barbara S. Douglas
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Lake Forest, Illinois 60045-1983

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United States Senator
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Honorable John E. Porter
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HOUSE DISTRICT 59
Honorable Virginia E. Frederick
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HOUSE DISTRICT 60
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!312/750-7381!

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!Fax: !

WSNS/Ch. 44 (Spanish)
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!312/929-1200! !Fax:

WGN/Ch. 9
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Kenosha, Wisconsin 53142

WMAQ/AM
Merchandise Mart Plaza
Chicago, Illinois 60654

WBBM/FM
630 North McClurg Court
Chicago, Illinois 60611

WGN/AM
435 North Michigan
Chicago, Illinois 60618

WLS/AM, WYTZ/FM
360 North Michigan
Chicago, Illinois 60601

City News Bureau
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Chicago, Illinois 60601

Newspapers:

Chicago Sun-Times
401 North Wabash
Chicago, Illinois 60611
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Lake County Market/Journal
101 Center, Suite 300
Grayslake, Illinois 60030
!708/223-3200!
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Lake Forester
2201 Waukegan Road
Banochburn, Illinois 60015
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Vernon Hills, Illinois 60030
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Room 110 Post Headquarters
Fort Sheridan, Illinois 60037-5000
708/926-6617
FAX: 708/926-7670

Waukegan News-Sun*
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Waukegan, Illinois 60085
708/336-7000
FAX: 708/249-7202
!Devon Nelson!

Zion Benton News
2719 Elisha Ave.
Zion, Illinois 60099
708/746-9000
FAX: 708/746-9150

Chicago Sun-Times
401 North Wabash
Chicago, Illinois 60611
312/321-3000
312/321-2522 (City Desk)
FAX: 312/321-3084

Chicago Tribune
435 North Michigan
Chicago, Illinois 60611
312/222-3232
312/222-3540 (City Desk)
FAX: 312/222-3143

LeAnn Spencer
700 North Milwaukee, Suite 135
Vernon Hills, Illinois 60061-1523
708/918-2804

Libertyville News
North Chicago Tribune
Gurnee Press
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Grayslake, Illinois 60030
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APPENDIX Q

Existing and Proposed Regulated Contaminant Listing for Drinking Water in Illinois

EXISTING AND PROPOSED REGULATED CONTAMINANT LISTING

MICROBIOLOGICAL AND SURFACE WATER TREATMENT

CONTAMINANT	MCL	HEALTH EFFECTS
FECAL COLIFORM	ZERO	GASTROINTESTINAL PROBLEMS
GIARDIA LAMBLIA	99.9% REMOVAL ✓	GIARDIASIS
HETEROTROPHIC BACTERIA	<500/ML IN 95% OF SAMPLES ✓	COULD INDICATE OTHER DISEASE CAUSING ORGANISMS
LEGIONELLA	DETECTABLE DISINFECTANT IN DISTRIBUTION SYSTEM ✓	LEGIONNAIRE'S DISEASE
TOTAL COLIFORM	> 5% POS FOR SUPPLIES COLLECTING 40 OR MORE DIST SAMPLES, > 1 FOR SUPPLIES COLLECTING LESS THAN 40 DIST SAMPLES	BACTERIA INDICATES OTHER DISEASE CAUSING ORGANISMS
VIRUSES	99.99% REMOVAL ✓	GASTROINTESTINAL PROBLEMS
TURBIDITY	0.5 NTU IN 95% OF SAMPLES ✓ 5.0 NTU IN SINGLE SAMPLES ✓	INTERFERES WITH DISINFECTION
ENTRY POINT DISINFECTANT	0.2 mg/l ✓	
DISTRIBUTION DISINFECTANT	DETECTABLE IN 95% OF SAMPLES ✓	

RADIOLOGICAL PARAMETERS

CONTAMINANT	MCL	HEALTH EFFECTS
GROSS ALPHA	15 pCi/l	CANCER RISK
ADJUSTED GROSS ALPHA ♦	15 pCi/l	CANCER RISK
BETA PARTICLE & PHOTON EMITTERS ♦	4 mrem	CANCER RISK
RADON 222	300 pCi/l	CANCER RISK
COMBINED RADIUM 226 & 228	5 pCi/l	BONE CANCER RISK
RADIUM 226 ♦	20 pCi/l	CANCER RISK
RADIUM 228 ♦	20 pCi/l	CANCER RISK
URANIUM ♦	20 ug/l	KIDNEY, CANCER

♦ = INDICATES PROPOSED MCL, MCL SUBJECT TO CHANGE; PROPOSED OR DEFERRED

✓ = THIS IS A TREATMENT TECHNIQUE, NOT AN MCL

CONTAMINANT INORGANIC CHEMICALS		MCL	HEALTH EFFECTS
ANTIMONY	#	6 ug/l	DECREASE LONGEVITY, ALTERS CHOLESTEROL & GLUCOSE LEVELS
ARSENIC	★	50 ug/l 2-10 ug/l ♦	DERMAL AND NERVOUS SYSTEM TOXICITY EFFECTS
ASBESTOS		7 MFL	BENIGN TUMORS
BARIUM		2000 ug/l	CIRCULATORY SYSTEM EFFECTS & INCREASE BLOOD PRESSURE
BERYLLIUM	#	4 ug/l	CANCER RISK AND DAMAGE TO BONES AND LUNGS
CADMIUM		5 ug/l	CONC IN THE LIVER, KIDNEY, PANCREASE & THYROID
CHROMIUM		100 ug/l	SKIN SENSITIZATION, LIVER & KIDNEY EFFECTS
CYANIDE	#	200 ug/l	SPLEEN, LIVER & BRAIN EFFECTS
FLUORIDE		4.0 mg/l	SKELETAL DAMAGE
IRON	★	1000 ug/l	
MANGANESE	★	150 ug/l	
MERCURY		2 ug/l	CENTRAL NERVOUS SYSTEM DISORDERS; KIDNEY EFFECTS
NICKEL	#	100 ug/l	NERVOUS SYSTEM AND SKIN SENSITIZATION
NITRATE (as N)		10 mg/l	METHEMOGLOBINEMIA (BLUE BABY SYN-OXYGEN DEPRIVATION)
NITRITE (as N)		1.0 mg/l	METHEMOGLOBINEMIA (BLUE BABY SYN-OXYGEN DEPRIVATION)
NITRATE + NITRITE (as N)		10 mg/l	METHEMOGLOBINEMIA (BLUE BABY SYN-OXYGEN DEPRIVATION)
SELENIUM		50 ug/l	NERVOUS SYSTEM
SULFATE	♦	500 mg/l	GASTROINTESTINAL EFFECTS
THALLIUM	#	2 ug/l	LIVER, KIDNEY, INTESTINES, & BRAIN EFFECTS
ZINC	★	5000 ug/l	

= EFFECTIVE DATE 01/17/94

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★ = STATE ONLY

CONTAMINANT VOLATILE ORGANIC CHEMICALS	MCL	HEALTH EFFECTS
BENZENE	5 ug/l	CANCER RISK
CARBON TETRACHLORIDE	5 ug/l	CANCER RISK
ORTHO-DICHLOROBENZENE (1,2-DCB)	600 ug/l	KIDNEY AND LIVER EFFECTS
PARA-DICHLOROBENZENE (1,4-DCB)	75 ug/l	CANCER RISK
1,2-DICHLOROETHANE	5 ug/l	CANCER RISK
1,1-DICHLOROETHYLENE	7 ug/l	KIDNEY AND LIVER EFFECTS
CIS 1,2-DICHLOROETHYLENE	70 ug/l	NERVOUS SYSTEM AND LIVER EFFECTS
TRANS 1,2-DICHLOROETHYLENE	100 ug/l	LIVER AND KIDNEY EFFECTS
DICHLOROMETHANE (METHYLENE CHLORIDE) #	5 ug/l	CANCER RISK
1,2-DICHLOROPROPANE	5 ug/l	CANCER RISK
ETHYLBENZENE	700 ug/l	KIDNEY AND LIVER EFFECTS
MONOCHLOROBENZENE (CHLOROBENZENE)	100 ug/l	KIDNEY AND LIVER EFFECTS
STYRENE	100 ug/l	NERVOUS SYSTEM AND LIVER EFFECTS
TETRACHLOROETHYLENE (TCE)	5 ug/l	CANCER RISK
TOLUENE	1000 ug/l	NERVOUS SYSTEM AND KIDNEY EFFECTS
1,2,4-TRICHLOROBENZENE #	70 ug/l	LIVER AND KIDNEY EFFECTS
1,1,1-TRICHLOROETHANE	200 ug/l	NERVOUS SYSTEM
1,1,2-TRICHLOROETHANE #	5 ug/l	LIVER AND KIDNEY EFFECTS
TRICHLOROETHYLENE	5 ug/l	CANCER RISK
VINYL CHLORIDE	2 ug/l	CANCER RISK
XYLENE (TOTAL)	10000 ug/l	LIVER AND KIDNEY EFFECTS

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CONTAMINANT	MCL	HEALTH EFFECTS
LEAD/COPPER REGULATIONS		
COPPER	90% SAMPLE 15 ug/l ✓	GASTROINTESTINAL, LIVER, KIDNEY DAMAGE, ESP. WILSON'S DISEASE
LEAD	90% SAMPLE 1300 ug/l ✓	NERV SYS DAMAGE, KIDNEY EFFECTS, HIGHLY TOXIC-INFANTS
TREATMENT TECHNIQUE		
ACRYLAMIDE	TREATMENT TECHNIQUE	CANCER RISK, NERVOUS SYSTEM
EPICHLOROHYDRIN	TREATMENT TECHNIQUE	CANCER RISK
SYNTHETIC ORGANIC CHEMICALS		
ALACHLOR	2 ug/l	CANCER RISK
ALDICARB ♦	3 ug/l	NERVOUS SYSTEM
ALDICARB SULFONE ♦	2 ug/l	NERVOUS SYSTEM
ALDICARB SULFOXIDE ♦	4 ug/l	NERVOUS SYSTEM
ALDRIN ★	1 ug/l	
ATRAZINE	3 ug/l	REPRODUCTIVE AND CARDIAC EFFECTS
BENZO(A)PYRENE #	0.2 ug/l	CANCER RISK
CARBOFURAN	40 ug/l	NERVOUS SYSTEM AND REPRODUCTIVE SYSTEM
CHLORDANE	2 ug/l	CANCER RISK
2,4-D (2,4-DICHLOROPHENOXYACTIC ACIDS)	70 ug/l	NERVOUS SYSTEM, KIDNEY & LIVER EFFECTS
DALAPON #	200 ug/l	LIVER AND KIDNEY EFFECTS
DDT ★	50 ug/l	
1,2-DIBROMO-3-CHLOROPROPANE-(DBCP)	0.2 ug/l	CANCER RISK
DIELDRIN ★	1 ug/l	

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CONTAMINANT	MCL	HEALTH EFFECTS
DI(2-ETHYLHEXYL)ADIPATE #	400 ug/l	LIVER AND REPRODUCTIVE EFFECTS
DI(2-ETHYLHEXYL)PHTHALATE#	6 ug/l	CANCER RISK
DINOSEB #	7 ug/l	THYROID AND REPRODUCTIVE EFFECTS
DIQUAT #	20 ug/l	KIDNEY & GASTRO EFFECTS & CATARACT RISK
ENDOTHALL #	100 ug/l	LIVER, KIDNEY, GASTRO & REPRODUCTIVE EFFECTS
ENDRIN #	2 ug/l	KIDNEY AND NERVOUS SYSTEM
ETHYLENE DIBROMIDE (EDB)	0.05 ug/l	CANCER RISK
GLYPHOSPHATE #	700 ug/l	LIVER AND KIDNEY EFFECTS
HEPTACHLOR	0.4 ug/l 0.1 ug/l ★	CANCER RISK
HEPTACHLOR EPOXIDE	0.2 ug/l 0.1 ug/l ★	CANCER RISK
HEXACHLOROBENZENE #	1 ug/l	CANCER RISK
HEXACHLOROCYCLOPENTADIENE#	50 ug/l	KIDNEY AND STOMACH EFFECTS
LINDANE	0.2 ug/l	NERVOUS SYSTEM, KIDNEY & LIVER EFFECTS
METHOXYCHLOR	40 ug/l	NERVOUS SYSTEM, KIDNEY & LIVER EFFECTS
OXAMYL (VYDATE) #	200 ug/l	KIDNEY EFFECTS
PENTACHLOROPHENOL (PCP)	1 ug/l	CANCER RISK
PICLORAM #	500 ug/l	LIVER & KIDNEY EFFECTS
POLYCHLORINATED BIPHENYLS (PCBs)	0.5 ug/l	CANCER RISK
SIMAZINE #	4 ug/l	CANCER RISK
2,3,7,8-TCDD (DIOXIN) #	0.03 ng/l	CANCER RISK
TOXAPHENE	3 ug/l	CANCER RISK
2,4,5-TP (SILVEX)	50 ug/l	NERVOUS SYSTEM, KIDNEY AND LIVER EFFECTS

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CONTAMINANT | **MCL** | **HEALTH EFFECTS**

TOTAL TRIHALOMETHANES
Current MCL for TTHMs applies to all supplies serving greater than 10,000 person and regardless of population. This rule will be replaced by the Disinfectant By-Products Rule explained below.

TOTAL TRIHALOMETHANE (TTHMs)	100 ug/l	CANCER RISK

DISINFECTANT BY-PRODUCTS (DBPs)
The proposed disinfectant by-products (DBPs) rule will be implemented in three stages. First results of information monitoring for DBPs, *Giardia*, *Cryptosporidium* and Enteroviruses will be collected from October 1994 to March 1996, then the first stage (1) MCL are proposed to become effective in June 1998 and the second stage (2) MCl are proposed to become effective in January 2002.

BROMATE	0.010 mg/l (1)	CANCER RISK
CHLORITE	TO BE PROPOSED (1)	CANCER RISK
TOTAL HALOACTIC ACIDS (THAs) DIBROMOACETIC ACID DICHLOROACETIC ACID MONOBROMOACETIC ACID MONOCHLOROACETIC ACID TRICHLOROACETIC ACID	60 ug/l(1), 30 ug/l(2)	CANCER RISK
TOTAL ORGANIC CARBON (TOC)	TO BE PROPOSED (1)	CANCER RISK
TOTAL TRIHALOMETHANES (THMs) BROMODICHLOROMETHANE BROMOFORM DIBROMOCHLORMETHANE CHLOROFORM	80 ug/l(1), 40 ug/l(2)	CANCER RISK
MAXIMUM RESIDUAL DISINFECTANTS CHLOROMINES CHLORITE CHLORINE DIOXIDE	 4.0 mg/l (1) 4.0 mg/l (1) 0.8 mg/l (1)	CANCER RISK

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