

**Public Health Implications of Great Lakes
Areas of Concern (AOC)**

Prepared By

Department of Health and Human Services

**Syracuse Research Corporation
Under Contract Number 205-1999-00024**

Prepared For

**U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry**

ACKNOWLEDGEMENT

A Very Special Thanks to the International Joint Commission

United States Commissioners

Dennis L. Schornack, Chair
Irene B. Brooks, Commissioner
Allen I. Olson, Commissioner

United States Section Staff

Lisa Bourget, Secretary
Dr. H. Kay Austin, Ecomanagement Advisor
Frank Bevacqua, Public Information Officer

Canadian Commissioners

Herb Gray, Chair
Robert Gourd, Commissioner
Jack P. Blaney, Commissioner

Canadian Section Staff

Murray Clamen, Secretary
Jim Houston, Senior Environmental
Advisor

PROJECT MANAGEMENT/CONTRIBUTORS

Annette E. Ashizawa, Ph.D., Project Manager
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Glenn D. (Dan) Todd, Ph.D.
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Janna Brooks, M.A.
CDC, Coordinating Office for Global Health

William Cibulas, Ph.D.
ATSDR, Division of Health Assessment and Consultation, Atlanta, GA

Charlton Coles, Ph.D.
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Joan Colman, Ph.D.
Syracuse Research Corporation, Syracuse, NY

Larry Cseh, M.S.A.
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Olga Dawkins
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Christopher T. De Rosa, Ph.D.
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

D. Anthony Gray, Ph.D.
Syracuse Research Corporation, Syracuse, NY

Charles Green, M.A.
ATSDR, Office of Communications, Atlanta, GA

Heraline E. Hicks, Ph.D.
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Max M. (Monty) Howie, M.S.
CDC, Coordinating Center for Environmental Health and Injury Prevention

Ira Hubert
ATSDR, Division of Health Studies (formerly of ATSDR)

Kim Jenkins
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Kevin Liske, M.A.
ATSDR, Division of Health Studies

Ed Murray, Ph.D.
ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Paula Peters
ATSDR, Division of Health Assessment and Consultation, Atlanta, GA

Cassandra Smith, M.S.

ATSDR, Division of Toxicology and Environmental Medicine, Atlanta, GA

Januett P. Smith-George, M.S.W

ATSDR, Division of Health Assessment and Consultation, Atlanta, GA

Sher're Walton

ATSDR, Office of Communications, Atlanta, GA

REVIEWERS

Peer Reviewers

A peer review panel was assembled for the Great Lakes Areas of Concern (AOC) report. The panel consisted of the following members:

1. David Carpenter, M.D., Professor and Director, Institute for Health and Environment, State University at Albany, Rensselaer, New York
2. Michael Gilbertson, M.S., Ecologist, formerly of the International Joint Commission, Guelph, Ontario, Canada
3. Peter Orris, M.D., M.P.H, Director, Occupational Health Services Institute, University of Illinois School of Public Health, Chicago, Illinois

These experts collectively have knowledge of the environmental conditions within the Great Lakes basin and the potential health effects observed through research from the exposure to these conditions.

Scientists from the Agency for Toxic Substances and Disease Registry (ATSDR) have reviewed the peer reviewers' comments and determined which comments will be included in the profile. A listing of the peer reviewers' comments not incorporated in the report, with a brief explanation of the rationale for their exclusion, exists as part of the administrative record for this report.

The citation of the peer review panel should not be understood to imply its approval of the report's final content. The responsibility for the content of this report lies with the ATSDR.

Other Expert Reviewers

This report was desiminated to a large number of experts. The following individuals provided comments which have been incorporated, as appropriate, in this document:

Kevin Adler
U.S. Environmental Protection Agency
77 W. Jackson Boulevard, SR-6J
Chicago, Illinois 60604

David Barna
U.S. Environmental Protection Agency
25089 Center Ridge Road
Mail Code: ME-W
West Lake, Ohio 44145

Barbara Belasco
U.S. Environmental Protection Agency
290 Broadway
New York, New York 10007-1866

Cherri Blair
U.S. Environmental Protection Agency
347 North Dunbridge Road
Bowling Green, Ohio 43402

Frank Bove
Agency for Toxic Substances and Disease Registry
Division of Health Studies
1600 Clifton Road, N.E.
Atlanta, Georgia 30333

Scott Cieniawski
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard, (G-17J)
Chicago, Illinois 60604

Milt Clark, Ph.D.
Senior Health and Science Advisor
U.S. Environmental Protection Agency
Superfund Division, HR-6J
77. W. Jackson
Chicago, Illinois 60604

Rosanne Ellison
U.S. Environmental Protection Agency
Large Lakes Research Station/ORD
USEPA Region 5 Emergency Response # 1
9311 Groh Road, Mail Code: SE-GI
Grosse Ile, Michigan 48138-1697

Mark Elster
Senior Program Analyst
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard, (G-17J)
Chicago, Illinois 60604

Jacqueline Fisher
Environmental Health Coordinator
U.S. Environmental Protection Agency
Great Lakes National Program Office, G17-J
77. W. Jackson
Chicago, Illinois 60604

Denise Hakowski
U.S. Environmental Protection Agency
1650 Arch Street
Mail Code: 3WP30
Philadelphia, Pennsylvania 19103-2029

Russ Hart
U.S. Environmental Protection Agency
77 W. Jackson Boulevard, SR-6J
Chicago, Illinois 60604

Marc Hershfield
Minnesota Pollution Control Agency
525 Lake Avenue, South
Suite 400
Duluth, Minnesota 55802

Mark Johnson
Agency for Toxic Substances and Disease Registry
Division of Regional Operations, Region 5
77 West Jackson Boulevard
Room. 413, Mailstop ATSD-4J
Chicago, Illinois 60604

Brenda Jones
U.S. Environmental Protection Agency
77 W. Jackson Boulevard, SR-6J
Chicago, Illinois 60604

Mike Joyce
U.S. Environmental Protection Agency
77 W. Jackson Boulevard, P-19J
Chicago, Illinois 60604

Carri Lohse-Hanson
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

Fred Luckey
U.S. Environmental Protection Agency
290 Broadway
New York, New York 10007-1866

Jennifer Manville
(231) 922-4769
manville.jennifer@epa.gov

Mark Moloney
U.S. Environmental Protection Agency
25089 Center Ridge Road, Mail Code: ME-W
West Lake, Ohio 44145

Richard Nagle
U.S. Environmental Protection Agency
77 W. Jackson Boulevard, C-14J
Chicago, Illinois 60604

Ken Orloff
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
1600 Clifton Road, N.E.
Atlanta, Georgia 30333

Kyle Rogers
U.S. Environmental Protection Agency
77 W. Jackson Boulevard, SR-6J
Chicago, Illinois 60604

Kelvin Rogers
U.S. Environmental Protection Agency
2110 E. Aurora Road
Twinsburg, Ohio 44087

Mary Beth Ross
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard, (G-17J)
Chicago, Illinois 60604

James Schardt
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard, (G-17J)
Chicago, Illinois 60604

Robert Townsend
New York State Department of Environmental Conservation
Division of Water
625 Broadway
Albany, New York 12233

Marc Tuchman
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard, (G-17J)
Chicago, Illinois 60604

Therese Van Donsel
U.S. Environmental Protection Agency
77 W. Jackson Boulevard, SR-6J
Chicago, Illinois 60604

Anne Marie Vincent
U.S. Environmental Protection Agency
25089 Center Ridge Road, Mail Code: ME-W
West Lake, Ohio 44145

Clem Welsh
Agency for Toxic Substances and Disease Registry
Division of Regional Operations
1600 Clifton Road, N.E.
Atlanta, Georgia 30333

TABLE OF CONTENTS

ACKNOWLEDGEMENT	ii
PROJECT MANAGEMENT/CONTRIBUTORS	iii
REVIEWERS.....	v
TABLE OF CONTENTS.....	x
LIST OF FIGURES	xxi
LIST OF TABLES	xxi
EXECUTIVE SUMMARY	xxvi
1. INTRODUCTION	1
1.1 ATSDR PUBLIC HEALTH ASSESSMENTS FOR THE 26 GREAT LAKES AOCs.....	4
1.2 TRI DATA FOR THE 26 GREAT LAKES AOCs	6
1.3 NPDES DATA FOR THE 26 U.S. GREAT LAKES AOCs.....	6
1.4 COUNTY HEALTH OUTCOME DATA FOR THE 26 GREAT LAKES AOCs	7
1.5 METHODOLOGY OF EXISTING DATA.....	7
1.6 BENEFICIAL USE IMPAIRMENTS (BUI).....	8
1.7 BIOLOGICAL CONTAMINATION AT THE AOC SITES.....	8
1.8 HAZARD CATEGORIES.....	8
1.9 THE COMPLETED EXPOSURE PATHWAY	9
1.10 LIMITATIONS OF THE REPORT.....	9
2. LAKE ONTARIO.....	11
2.1 OSWEGO RIVER AOC, OSWEGO COUNTY, NY	11
2.1.1 Hazardous Wastes Sites Relevant to Oswego River AOC	11
2.1.2 TRI Data for the Oswego River AOC.....	11
2.1.3 NPDES Data for Oswego River AOC	11
2.1.4 County Demographics and Health Status Data for the Oswego River AOC.....	11
2.1.5 Summary and Conclusions for the Oswego River AOC	12
2.1.5.1 TRI Data.....	12
2.1.5.2 NPDES Data	12
2.1.5.3 County Health Data Indicators.....	12
2.1.5.4 Beneficial Use Impairments.....	12
2.2 ROCHESTER EMBAYMENT AOC, MONROE COUNTY, NY	16
2.2.1 Hazardous Waste Sites Relevant to the Rochester Embayment AOC.....	16
2.2.1.1 Rochester City of APCO Site (Former APCO Property Brownfield Site)	16
2.2.2 TRI Data for the Rochester Embayment AOC	17
2.2.3 NPDES Data for the Rochester Embayment AOC	18
2.2.4 County Demographics and Health Status Data for the Rochester Embayment AOC ...	18
2.2.5 Summary and Conclusions for the Rochester Embayment AOC	18
2.2.5.1 Hazardous Waste Sites.....	18
2.2.5.2 TRI Data.....	18
2.2.5.3 NPDES Data	19
2.2.5.4 County Demographics and Health Status Indicators	19
2.2.5.5 Beneficial Use Impairments.....	19

2.3	EIGHTEEN MILE CREEK AOC, NIAGARA COUNTY, NY.....	25
2.3.1	Hazardous Waste Sites Relevant to the Eighteen Mile Creek AOC.....	25
2.3.2	TRI Data for the Eighteen Mile Creek AOC	25
2.3.3	NPDES Data for Eighteen Mile Creek AOC.....	26
2.3.4	County Demographics and Health Status Data for the Eighteen Mile Creek AOC	26
2.3.5	Summary and Conclusions for the Eighteen Mile Creek AOC	27
2.3.5.1	Hazardous Waste Sites.....	27
2.3.5.2	TRI Data.....	27
2.3.5.3	NPDES Data	27
2.3.5.4	County Demographics and Health Status Indicators	27
2.3.5.5	Beneficial Use Impairments.....	27
3.	LAKE ERIE.....	33
3.1	BUFFALO RIVER AOC, ERIE COUNTY, NY.....	33
3.1.1	Hazardous Waste Sites Relevant to the Buffalo River AOC	33
3.1.1.1	Abby Street/Hickory Woods Subdivision.....	34
3.1.1.2	Diarsenol Company (Kingsley Park).....	35
3.1.1.3	Ernst Steel Site.....	36
3.1.1.4	Newstead Site.....	37
3.1.1.5	Pfohl Brothers Landfill	38
3.1.2	TRI Data for the Buffalo River AOC	39
3.1.3	NPDES Data for the Buffalo River AOC	39
3.1.4	County Demographics and Health Status Data for the Buffalo River AOC.....	40
3.1.5	Summary and Conclusions for the Buffalo River AOC, Erie County, NY	40
3.1.5.1	Hazardous Waste Sites.....	40
3.1.5.2	TRI Data.....	41
3.1.5.3	NPDES Data	41
3.1.5.4	County Demographics and Health Status Indicators	42
3.1.5.5	Beneficial Use Impairments.....	42
3.2	PRESQUE ISLE BAY AOC, ERIE COUNTY, PA.....	51
3.2.1	Hazardous Waste Sites Relevant to the Presque Isle Bay AOC	51
3.2.1.1	Foamex Products Site (Corry Area Middle-High School).....	51
3.2.1.2	Hammermill – Scott Run Site	52
3.2.1.3	Lord Shope Landfill.....	53
3.2.1.4	Mill Creek Dump.....	54
3.2.2	TRI Data for the Presque Isle Bay AOC, Erie County, PA	55
3.2.3	NPDES Data for the Presque Isle Bay, Erie County, PA	55
3.2.4	County Demographics and Health Status Data for the Presque Bay AOC.....	55
3.2.5	Summary and Conclusions for the Presque Isle Bay AOC, Erie County, PA	56
3.2.5.1	Hazardous Waste Sites.....	56
3.2.5.2	TRI Data.....	57
3.2.5.3	NPDES Data	57
3.2.5.4	County Demographics and Health Status Indicators	57
3.2.5.5	Beneficial Use Impairments.....	57

3.3	ASHTABULA RIVER AOC, ASHTABULA COUNTY, OH	64
3.3.1	Hazardous Waste Sites Relevant to the Ashtabula River AOC	64
3.3.1.1	Big D Campground	64
3.3.1.2	Fields Brook	65
3.3.1.3	Laskin Poplar Oil	67
3.3.1.4	New Lyme Landfill	68
3.3.2	TRI Data for Ashtabula River AOC, Ashtabula County, OH	68
3.3.3	NPDES Data for Ashtabula River AOC, Ashtabula County, OH	67
3.3.4	County Demographics and Health Status Data for the Ashtabula River AOC	69
3.3.5	Summary and Conclusions for the Ashtabula River AOC	69
3.3.5.1	Hazardous Waste Sites	69
3.3.5.2	TRI Data	70
3.3.5.3	NPDES Data	70
3.3.5.4	County Demographics and Health Status Indicators	70
3.3.5.5	Beneficial Use Impairments	71
3.4	CUYAHOGA RIVER AOC, CUYAHOGA AND SUMMIT COUNTIES, OH	80
3.4.1	Hazardous Waste Sites Relevant to the Cuyahoga River AOC	80
3.4.1.1	Cady Road, Cuyahoga County, OH	80
3.4.2	TRI Data for the Cuyahoga AOC	82
3.4.3	NPDES Data for the Cuyahoga AOC	82
3.4.4	County Demographics and Health Status Data for the Cuyahoga River AOC	82
3.4.5	Summary and Conclusions for the Cuyahoga River	83
3.4.5.1	Hazardous Waste Sites	83
3.4.5.2	TRI Data	83
3.4.5.3	NPDES Data	84
3.4.5.4	County Demographics and Health Status Indicators	84
3.4.5.5	Beneficial Use Impairments	84
3.5	BLACK RIVER AOC, LORAIN COUNTY, OH	93
3.5.1	Hazardous Waste Sites Relevant to the Black River AOC	93
3.5.1.1	Ford Road Industrial Landfill	93
3.5.1.2	Republic Steel Corp. Quarry	95
3.5.2	TRI Data for the Black River AOC	96
3.5.3	NPDES Data for the Black River AOC	96
3.5.4	County Demographic and Health Status Data for the Black River AOC	97
3.5.5	Summary and Conclusions for the Black River AOC	97
3.5.5.1	Hazardous Waste Sites	97
3.5.5.2	TRI Data	98
3.5.5.3	NPDES Data	98
3.5.5.4	County Demographics and Health Status Indicators	99
3.5.5.5	Beneficial Use Impairments	99
3.6	MAUMEE RIVER AOC, LUCAS, OTTAWA, AND WOOD COUNTIES, OH	108
3.6.1	Hazardous Waste Sites Relevant to the Maumee River AOC	108
3.6.2	TRI Data for the Maumee River AOC	108

3.6.3	NPDES Data for the Maumee River AOC	108
3.6.4	County Demographics and Health Status Data for the Maumee River AOC.....	108
3.6.5	Summary and Conclusions for the Maumee River AOC.....	110
3.6.5.1	TRI Data.....	110
3.6.5.2	NPDES Data	110
3.6.5.3	County Demographics and Health Status Indicators	110
3.6.5.4	Beneficial Use Impairments.....	110
3.7	RIVER RAISIN AOC, MONROE COUNTY, MI.....	116
3.7.1	Hazardous Waste Sites Relevant to the River Raisin AOC.....	116
3.7.1.1	Consolidated Packaging Corp.....	116
3.7.2	TRI Data for the River Raisin AOC	117
3.7.3	NPDES Data for the River Raisin AOC	118
3.7.4	County Demographics and Health Status Data for the River Raisin AOC.....	118
3.7.5	Summary and Conclusions for the River Raisin AOC	118
3.7.5.1	Hazardous Waste Sites.....	118
3.7.5.2	TRI Data.....	119
3.7.5.3	NPDES Data	119
3.7.5.4	County Demographics and Health Status Indicators	119
3.7.5.5	Beneficial Use Impairments.....	119
3.8	ROUGE RIVER AOC, WAYNE AND OAKLAND COUNTIES, MI	124
3.8.1	Hazardous Waste Sites Relevant to the Rouge River AOC.....	124
3.8.1.1	Carter Industrials, Inc.....	125
3.8.1.2	Ford Motor Co. Allen Part Clay Mine	126
3.8.1.3	Gratiot Trailer Park	128
3.8.1.4	Joy Road Dump/Holiday Park/Holiday Nature Preserve.....	129
3.8.1.5	Lower Ecorse Creek Dump.....	129
3.8.1.6	Master Metals Inc. #2	130
3.8.1.7	Packard Plant	131
3.8.1.8	Proposed Beard Street School/New Beard Elementary School.....	131
3.8.1.9	Wholesale Russell/Mack.....	132
3.8.1.10	Old World Trade Center	133
3.8.1.11	Cemetery Dump.....	133
3.8.1.12	Continental Aluminum Company	134
3.8.1.13	Hi-Mill Manufacturing Company	135
3.8.1.14	J & L Landfill.....	136
3.8.1.15	Rose Township Dump.....	137
3.8.1.16	Springfield Township Dump.....	138
3.8.2	TRI Data for the Rouge River AOC	139
3.8.3	NPDES Data for the Rouge River AOC.....	139
3.8.4	County Demographics and Health Status Data for the Rouge River AOC	140
3.8.5	Summary and Conclusions for the Rouge River AOC	141
3.8.5.1	Hazardous Waste Sites.....	141
3.8.5.2	TRI Data.....	142
3.8.5.3	NPDES Data	142

3.8.5.4	County Demographics and Health Status Indicators	142
3.8.5.5	Beneficial Use Impairments.....	143
3.9	CLINTON RIVER AOC, OAKLAND AND MACOMB COUNTIES, MI	154
3.9.1	Hazardous Waste Sites Relevant to the Clinton River AOC	154
3.9.1.1	G & H Landfill.....	155
3.9.1.2	Liquid Disposal, Inc.....	156
3.9.1.3	South Macomb Disposal Authority	157
3.9.2	TRI Data for the Clinton River AOC.....	158
3.9.3	NPDES Data for the Clinton River AOC	158
3.9.4	County Demographics and Health Status Data for the Clinton River AOC.....	159
3.9.5	Summary and Conclusions for the Clinton River AOC.....	159
3.9.5.1	Hazardous Waste Sites.....	160
3.9.5.2	TRI Data.....	160
3.9.5.3	NPDES Data	161
3.9.5.4	County Demographics and Health Status Indicators	161
3.9.5.5	Beneficial Use Impairments.....	161
4.	LAKE HURON.....	170
4.1	SAGINAW RIVER AND BAY AOC	170
4.1.1	Hazardous Waste Sites Relevant to the Saginaw River and Bay AOC	170
4.1.1.1	Bay City Middlegrounds.....	170
4.1.1.2	Keit Property	172
4.1.1.3	Clare Water Supply.....	173
4.1.1.4	Berlin and Farrow	174
4.1.1.5	Forest Waste Products.....	175
4.1.1.6	Gratiot County Landfill.....	176
4.1.1.7	Velsicol Chemical.....	177
4.1.1.8	Hedblum Industries.....	178
4.1.1.9	Metamora Landfill	179
4.1.1.10	Spiegelberg and Rasmussen Dump Sites	180
4.1.1.11	Shiawassee River	181
4.1.1.12	Dow Chemical Co., Michigan Division, Midland Location.....	182
4.1.1.13	Tittabawassee River	185
4.1.1.14	Lufkin Rule	186
4.1.1.15	Laingsburg	187
4.1.2	TRI Data for the Saginaw River and Bay AOC.....	188
4.1.3	NPDES Data for the Saginaw River and Bay AOC	188
4.1.4	County Demographics and Health Status Data for the Saginaw River and Bay AOC.....	189
4.1.5	Summary and Conclusions for the Saginaw River and Bay AOC.....	189
4.1.5.1	Hazardous Waste Sites.....	189
4.1.5.2	TRI Data.....	190
4.1.5.3	NPDES Data	190
4.1.5.4	County Demographics and Health Status Indicators	190
4.1.5.5	Beneficial Use Impairments.....	191

5. LAKE MICHIGAN	204
5.1 MUSKEGON LAKE AOC AND WHITE LAKE AOC, MUSKEGON COUNTY, MI..	204
5.1.1 Hazardous Waste Sites Relevant to the Muskegon Lake and White Lake AOCs	204
5.1.1.1 Bofors Nobel Incorporated	205
5.1.1.2 Duell & Gardner Landfill.....	206
5.1.1.3 E.I. Du Pont De Nemours & Col., Inc., Montague Plant.....	208
5.1.1.4 Hooker (Montague Plant)	208
5.1.1.5 Muskegon Chemical Company.....	209
5.1.1.6 Ott/Story/Cordova Chemical Co.....	210
5.1.1.7 Peerless Plating	212
5.1.1.8 Ruddiman Drain Area (Ruddiman Creek Area)	213
5.1.1.9 SCA Independent Landfill	213
5.1.1.10 Thermo-Chem Incorporated.....	214
5.1.1.11 Whitehall Municipal Wells.....	215
5.1.2 TRI Data for the White Lake AOC and Muskegon AOC.....	216
5.1.3 NPDES Data for the White Lake AOC and Muskegon AOC	216
5.1.4 County Demographics and Health Status Data for the Muskegon Lake and White Lake AOCs.....	217
5.1.5 Summary and Conclusions for the Muskegon Lake AOC and White Lake AOC.....	217
5.1.5.1 Hazardous Waste Sites.....	217
5.1.5.2 TRI Data.....	218
5.1.5.3 NPDES Data	219
5.1.5.4 County Demographics and Health Status Indicators	219
5.1.5.5 Beneficial Use Impairments.....	219
5.2 KALAMAZOO RIVER AOC, ALLEGAN AND KALAMAZOO COUNTIES, MI	229
5.2.1 Hazardous Waste Sites Relevant to the Kalamazoo River AOC.....	229
5.2.1.1 Rockwell International Corp.....	230
5.2.1.2 Allied Paper/Portage Creek/Kalamazoo River	231
5.2.1.3 Auto Ion Chemicals, Inc.	232
5.2.1.4 K & L Landfill	233
5.2.1.5 Michigan Disposal Service	234
5.2.1.6 Roto-Finish Company	235
5.2.2 TRI Data for the Kalamazoo River AOC	236
5.2.3 NPDES Data for the Kalamazoo River AOC	236
5.2.4 County Demographics and Health Status Data for the Kalamazoo RiverAOC.....	236
5.2.5 Summary and Conclusions for the Kalamazoo River AOC	237
5.2.5.1 Hazardous Waste Sites.....	237
5.2.5.2 TRI Data.....	238
5.2.5.3 NPDES Data	238
5.2.5.4 County Demographics and Health Status Indicators	238
5.2.5.5 Beneficial Use Impairments.....	239

5.3	GRAND CALUMET AOC, LAKE COUNTY, IN, AND COOK COUNTY, IL.....	248
5.3.1	Hazardous Waste Sites Relevant to the Grand Calumet AOC	248
5.3.1.1	American Chemical Services, Inc.....	249
5.3.1.2	Sandy Jo Landfill	250
5.3.1.3	Midco I.....	251
5.3.1.4	Midco II	252
5.3.1.5	Ninth Avenue Dump	253
5.3.1.6	U.S. Smelter and Lead Refinery, Inc.	254
5.3.1.7	Celotex Corp.	255
5.3.1.8	Double A Metals	256
5.3.1.9	Electro Finishers	256
5.3.1.10	Elizabeth Street Foundry.....	257
5.3.1.11	Estech General Chemical Co.	258
5.3.1.12	Hartz Construction	258
5.3.1.13	Stauffer Chemical Company.....	259
5.3.1.14	West Pullman Iron & Metal	260
5.3.2	TRI Data for the Grand Calumet AOC	261
5.3.3	NPDES Data for the Grand Calumet AOC.....	261
5.3.4	County Demographics and Health Status Data for the Grand Calumet AOC	262
5.3.5	Summary and Conclusions for the Grand Calumet AOC	263
5.3.5.1	Hazardous Waste Sites.....	263
5.3.5.2	TRI Data.....	264
5.3.5.3	NPDES Data	264
5.3.5.4	County Demographics and Health Status Indicators	265
5.3.5.5	Beneficial Use Impairments.....	265
5.4	WAUKEGAN HARBOR AOC, LAKE COUNTY, IL.....	277
5.4.1	Hazardous Waste Sites Relevant to the Waukegan Harbor AOC.....	277
5.4.1.1	Diamond Scrap Yard.....	278
5.4.1.2	H.O.D. Landfill	278
5.4.1.3	Johns-Manville Disposal Area.....	279
5.4.1.4	Outboard Marine Corp.	280
5.4.1.5	Precision Chrome, Inc.	282
5.4.1.6	Yeoman Creek Landfill.....	283
5.4.2	TRI Data for the Waukegan Harbor AOC	284
5.4.3	NPDES Data for the Waukegan Harbor AOC	284
5.4.4	County Demographics and Health Status Data for the Waukegan Harbor AOC	285
5.4.5	Summary and Conclusions for the Waukegan Harbor AOC	285
5.4.5.1	Hazardous Waste Sites.....	285
5.4.5.2	TRI Data.....	286
5.4.5.3	NPDES Data	286
5.4.5.4	County Demographics and Health Status Indicators	286
5.4.5.5	Beneficial Use Impairments.....	286
5.5	MILWAUKEE ESTUARY AOC, MILWAUKEE COUNTY, WI.....	294
5.5.1	Hazardous Waste Sites Relevant to the Milwaukee Estuary AOC.....	294

5.5.1.1	Boerke Property	295
5.5.1.2	Fadrowski Drum Disposal	296
5.5.1.3	Former Tannery	297
5.5.1.4	Moss-American Co., Inc. (Kerr-McGee Oil Co.)	297
5.5.1.5	Northwestern Barrel (Former), (Marina Cliffs)	299
5.5.1.6	P&G School Bus Service	300
5.5.1.7	Robert Betz Trust Co. (Betz, Robert G. Property).....	301
5.5.1.8	St. Francis Auto Wreckers	302
5.5.1.9	Try Chemical Corp.	302
5.5.2	TRI Data for the Milwaukee Estuary AOC	303
5.5.3	NPDES Data for the Milwaukee Estuary AOC	303
5.5.4	County Demographics and Health Status Data for the Milwaukee Estuary AOC	303
5.5.5	Summary and Conclusions for the Milwaukee Estuary AOC	304
5.5.5.1	Hazardous Waste Sites.....	304
5.5.5.2	TRI Data.....	305
5.5.5.3	NPDES Data	305
5.5.5.4	County Demographics and Health Status Indicators	305
5.5.5.5	Beneficial Use Impairments.....	305
5.6	SHEBOYGAN RIVER AOC, SHEBOYGAN COUNTY, WI.....	313
5.6.1	Hazardous Waste Sites Relevant to the Sheboygan River AOC	313
5.6.1.1	Kohler Company Landfill	313
5.6.1.2	Sheboygan Harbor & River	315
5.6.2	TRI Data for the Sheboygan River AOC.....	316
5.6.3	NPDES Data for the Sheboygan River AOC.....	316
5.6.4	County Demographics and Health Status Data for the Sheboygan River AOC	316
5.6.5	Summary and Conclusions for the Sheboygan River AOC.....	317
5.6.5.1	Hazardous Waste Sites.....	317
5.6.5.2	TRI Data.....	318
5.6.5.3	NPDES Data	318
5.6.5.4	County Demographics and Health Status Indicators	318
5.6.5.5	Beneficial Use Impairments.....	318
5.7	LOWER GREEN BAY AND FOX RIVER AOC (FOX RIVER/SOUTHERN GREEN BAY AOC), BROWN COUNTY, WI.....	326
5.7.1	Hazardous Waste Sites Relevant to the Lower Green Bay AOC	326
5.7.1.1	Better Brite Plating Co.....	326
5.7.1.2	Fox River NRDA/PCB Releases	327
5.7.2	TRI Data for the Lower Green Bay and Fox River AOC	328
5.7.3	NPDES Data for the Lower Green Bay and Fox River AOC.....	329
5.7.4	County Demographics and Health Status Data for the Lower Green Bay and Fox River AOC.....	329
5.7.5	Summary and Conclusions for the Lower Green Bay and Fox River AOC	329
5.7.5.1	Hazardous Waste Sites.....	329
5.7.5.2	TRI Data.....	330
5.7.5.3	NPDES Data	330

5.7.5.4	County Demographics and Health Status Indicators	330
5.7.5.5	Beneficial Use Impairments.....	331
5.8	MENOMINEE RIVER AOC, MENOMINEE COUNTY, MI AND MARINETTE COUNTY, WI.....	337
5.8.1	Hazardous Waste Sites Relevant to the Menominee River AOC	337
5.8.2	TRI Data for the Menominee River AOC.....	337
5.8.3	NPDES Data for the Menominee River AOC	337
5.8.4	County Demographics and Health Status Data for the Menominee River AOC.....	337
5.8.5	Summary and Conclusions for the Menominee River AOC	338
5.8.5.1	Hazardous Waste Sites.....	338
5.8.5.2	TRI Data.....	338
5.8.5.3	NPDES Data	338
5.8.5.4	County Demographics and Health Status Indicators	339
5.8.5.5	Beneficial Use Impairments.....	339
5.9	MANISTIQUE RIVER AOC, SCHOOLCRAFT COUNTY, MI.....	345
5.9.1	Hazardous Waste Sites Relevant to the Manistique River AOC	345
5.9.2	TRI Data for the Manistique River AOC.....	345
5.9.3	NPDES Data for the Manistique River AOC	345
5.9.4	County Demographics and Health Status Data for the Manistique River AOC.....	345
5.9.5	Summary and Conclusions for the Manistique River AOC.....	346
5.9.5.1	Hazardous Waste Sites.....	346
5.9.5.2	TRI Data.....	346
5.9.5.3	NPDES Data	346
5.9.5.4	County Demographics and Health Status Indicators	346
5.9.5.5	Beneficial Use Impairments.....	346
6.	LAKE SUPERIOR.....	348
6.1	DEER LAKE AOC, MARQUETTE COUNTY, MI.....	348
6.1.1	Hazardous Waste Sites Relevant to the Deer Lake AOC	348
6.1.1.1	Cliff/Dow Dump	348
6.1.2	TRI Data for the Deer Lake AOC.....	349
6.1.3	NPDES Data for the Deer Lake AOC.....	349
6.1.4	County Demographics and Health Status Data for the Deer Lake AOC.....	350
6.1.5	Summary and Conclusions for the Deer Lake AOC.....	350
6.1.5.1	Hazardous Waste Sites.....	350
6.1.5.2	TRI Data.....	350
6.1.5.3	NPDES Data	351
6.1.5.4	County Demographics and Health Status Indicators	351
6.1.5.5	Beneficial Use Impairments.....	351
6.2	TORCH LAKE AOC, HOUGHTON COUNTY, MI.....	357
6.2.1	Hazardous Waste Sites Relevant to the Torch Lake AOC	357
6.2.1.1	Torch Lake.....	357
6.2.2	TRI Data for the Torch Lake AOC	359

6.2.3	NPDES Data for the Torch Lake AOC.....	359
6.2.4	County Demographics and Health Status Data for the Torch Lake AOC	359
6.2.5	Summary and Conclusions for the Torch Lake AOC	360
6.2.5.1	Hazardous Waste Sites.....	360
6.2.5.2	TRI Data.....	360
6.2.5.3	NPDES Data	360
6.2.5.4	County Demographics and Health Status Indicators	360
6.2.5.5	Beneficial Use Impairments.....	361
6.3	ST. LOUIS RIVER AND BAY AOC, ST. LOUIS AND CARLTON COUNTIES, MN AND DOUGLAS COUNTY, WI.....	367
6.3.1	Hazardous Waste Sites Relevant to the St. Louis River and Bay AOC	367
6.3.1.1	Arrowhead Refinery Company	367
6.3.1.2	St. Louis River Site	368
6.3.1.3	Koppers Company Superior Plant	369
6.3.2	TRI Data for the St. Louis River and Bay AOC	370
6.3.3	NPDES Data for the St. Louis River and Bay AOC.....	370
6.3.4	County Demographics and Health Status Data for the St. Louis River and Bay AOC	371
6.3.5	Summary and Conclusions for the St. Louis River and Bay AOC.....	372
6.3.5.1	Hazardous Waste Sites.....	372
6.3.5.2	TRI Data.....	372
6.3.5.3	NPDES Data	372
6.3.5.4	County Demographics and Health Status Indicators	373
6.3.5.5	Beneficial Use Impairments.....	373
7.	CONCLUSIONS.....	381
7.1	ATSDR PUBLIC HEALTH ASSESSMENTS FOR THE 26 GREAT LAKES AOCs....	381
7.2	TRI DATA FOR THE 26 U.S. GREAT LAKES AOCs	386
7.3	ANALYSIS OF THE GIS MAPS AND TRI AND NPDES DATA	386
7.4	HEALTH OUTCOME DATA.....	389
7.5	LIMITATIONS OF THE REPORT.....	390
7.6	SUMMARY	390
8.	REFERENCES	394

APPENDICES

Appendix A: Selected References on Human Health Effects

Appendix B: GIS Maps of the Twenty-Six U.S. Great Lakes Areas of Concern

Appendix C: EPA Boundary Maps

LIST OF FIGURES

1.1	U.S. and Binational Great Lakes Areas of Concern.....	3
-----	---	---

LIST OF TABLES

1-1	International Joint Commission (IJC) Great Lakes 11 Critical Pollutants	1
1-2	Public Health Hazard Conclusion Categories.....	4
2.1-A	TRI Releases (in pounds, 2001) for the Oswego River AOC.....	13
2.1-B	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Oswego River AOC	14
2.1-C	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Oswego River AOC	15
2.2-A	Hazardous Waste Sites in Monroe County, NY	16
2.2-B	Waste site Contaminants that Exceeded Health-Based Screening Values Rochester Embayment AOC	20
2.2-C	TRI Releases (in pounds, 2001) for the Rochester Embayment AOC.....	21
2.2-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Rochester Embayment AOC.....	23
2.2-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Rochester Embayment AOC.....	24
2.3-A	TRI Releases (in pounds, 2001) for the Eighteen Mile Creek AOC.....	28
2.3-B	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Eighteen Mile Creek AOC.....	30
2.3-C	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Eighteen Mile Creek AOC.....	31
2.3-D	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Eighteen Mile Creek AOC	32
3.1-A	Hazardous Waste Sites in Erie County, NY	33
3.1-B	Waste Sites Contaminants that Exceeded Health-Based Screening Values, Buffalo River AOC ..	43
3.1-C	TRI Releases (in pounds, 2001) for the Buffalo River AOC.....	46
3.1-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Buffalo River AOC.....	48
3.1-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Buffalo River AOC	49
3.1-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Buffalo River AOC	50
3.2-A	Hazardous Waste Sites in Erie County, PA.....	51
3.2-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Presque Isle Bay AOC	58
3.2-C	TRI Releases (in pounds, 2001) for Presque Isle Bay AOC	60
3.2-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Presque Isle Bay AOC	62
3.2-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Presque Isle Bay AOC.....	63
3.3-A	Hazardous Waste Sites in Ashtabula County, OH.....	64
3.3-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Ashtabula River AOC	72
3.3-C	TRI Releases (in pounds, 2001) for the Ashtabula River AOC	75
3.3-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Ashtabula River AOC.....	76
3.3-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Ashtabula River AOC	77
3.3-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Ashtabula River AOC	79
3.4-A	Hazardous Waste Sites in Cuyahoga and Summit Counties, OH.....	80

3.4-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Cuyahoga River AOC	85
3.4-C	TRI Releases (in pounds, 2001) for the Cuyahoga River AOC	87
3.4-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Cuyahoga River AOC	89
3.4-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Cuyahoga River AOC	91
3.4-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Cuyahoga River AOC	92
3.4-G	County Demographic Profiles for the Cuyahoga River AOC	82
3.5-A	Hazardous Waste Sites in Lorain County, OH	93
3.5-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Black River AOC ..	100
3.5-C	TRI Releases (in pounds, 2001) for the Black River AOC	102
3.5-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Black River AOC	105
3.5-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Black River AOC	106
3.5-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Black River AOC	107
3.6-A	TRI Releases (in pounds, 2001) for the Maumee River AOC	111
3.6-B	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Maumee River AOC	113
3.6-C	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Maumee River AOC	114
3.6-D	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Maumee River AOC	115
3.6-E	County Demographic Profiles for the Maumee River AOC	109
3.7-A	Hazardous Waste Sites in Monroe County, MI	116
3.7-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, River Raisin AOC ..	120
3.7-C	TRI Releases (in pounds, 2001) for the River Raisin AOC	121
3.7-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the River Raisin AOC	122
3.7-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, River Raisin AOC	123
3.8-A	Hazardous Waste Sites in Wayne County, MI	124
3.8-B	Hazardous Waste Sites in Oakland County, MI	125
3.8-C	Waste Site Contaminants that Exceeded Health-Based Screening Values, Rouge River AOC ..	144
3.8-D	TRI Releases (in pounds, 2001) for the Rouge River AOC	147
3.8-E	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Rouge River AOC	150
3.8-F	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Rouge River AOC	152
3.8-G	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Rouge River AOC	153
3.8-H	County Demographic Profiles for the Rouge River AOC	140
3.9-A	Hazardous Waste Sites in Oakland County, MI	154
3.9-B	Hazardous Waste Sites in Macomb County, MI	154
3.9-C	Waste Site Contaminants that Exceeded Health-Based Screening Values, Clinton River AOC ..	162
3.9-D	TRI Releases (in pounds, 2001) for the Clinton River AOC	165
3.9-E	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Clinton River AOC	167
3.9-F	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Clinton River AOC	168
3.9-G	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Clinton River AOC	169
3.9-H	County Demographic Profiles for the Clinton River AOC	159

4.1-A	Hazardous Waste Sites in Counties Relevant to the Saginaw River and Bay AOC	171
4.1-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Saginaw River and Bay AOC	192
4.1-C	TRI Releases (in pounds, 2001) for the Saginaw River and Bay AOC	196
4.1-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Saginaw River and Bay AOC ...	199
4.1-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Saginaw River and Bay AOC	200
4.1-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Saginaw River and Bay AOC	201
4.1-G	County Health Status Indicators that Compared Unfavorably with U.S. Indicators and with the Median of the Peer Counties, Saginaw River and Bay AOC.....	202
5.1-A	Hazardous Waste Sites in Muskegon County, MI	205
5.1-B	Waste Site Contaminants that Exceeded Health-Based Screening Value, Muskegon Lake and White Lake AOCs.....	220
5.1-C	TRI Releases (in pounds, 2001) for Muskegon Lake and White Lake AOCs	224
5.1-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Muskegon Lake and White Lake AOCs.....	226
5.1-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Muskegon Lake and White Lake AOCs	227
5.1-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Muskegon Lake and White Lake AOCs.....	228
5.2-A	Hazardous Waste Sites in Allegan and Kalamazoo Counties, MI	229
5.2-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Kalamazoo River AOC	240
5.2-C	TRI Releases (in pounds, 2001) for the Kalamazoo River AOC	243
5.2-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Kalamazoo River AOC.....	245
5.2-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Kalamazoo River AOC	246
5.2-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Kalamazoo River AOC	247
5.2-G	County Demographic Profiles for the Kalamazoo River AOC.....	236
5.3-A	Hazardous Waste Sites in Lake County, IN, and Cook County, IL.....	248
5.3-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Grand Calumet AOC	266
5.3-C	TRI Releases (in pounds, 2001) for the Grand Calumet AOC.....	269
5.3-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Grand Calumet AOC	272
5.3-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Grand Calumet AOC.....	275
5.3-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Grand Calumet AOC.....	276
5.3-G	County Demographic Profiles for the Grand Calumet AOC	262
5.4-A	Hazardous Waste Sites in Lake County, IL	277
5.4-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Waukegan Harbor AOC.....	287
5.4-C	TRI Releases (in pounds, 2001) for the Waukegan Harbor AOC.....	290
5.4-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Waukegan Harbor AOC	292
5.4-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Waukegan Harbor AOC.....	293

5.5-A	Hazardous Waste Sites in Milwaukee County, WI.....	294
5.5-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Milwaukee Estuary AOC	306
5.5-C	TRI Releases (in pounds, 2001) for the Milwaukee Estuary AOC.....	310
5.5-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Milwaukee Estuary AOC.....	312
5.6-A	Hazardous Waste Sites in Sheboygan County, WI.....	313
5.6-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Sheboygan River AOC	319
5.6-C	TRI Releases (in pounds, 2001) for the Sheboygan River AOC	321
5.6-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Sheboygan River AOC	323
5.6-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Sheboygan River AOC	324
5.6-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Sheboygan River AOC.....	325
5.7-A	Hazardous Waste Sites in Brown County, MI.....	326
5.7-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Lower Green Bay and Fox River AOC	332
5.7-C	TRI Releases (in pounds, 2001) for the Lower Green Bay and Fox River AOC.....	333
5.7-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Lower Green Bay and Fox River AOC	335
5.7-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Lower Green Bay and Fox River AOC.....	336
5.8-A	TRI Releases (in pounds, 2001) for the Menominee River AOC.....	340
5.8-B	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Menominee River AOC	342
5.8-C	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Menominee River AOC	343
5.8-D	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Menominee River AOC.....	344
5.8-E	County Demographic Profiles for the Menominee River AOC	337
5.9-A	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Manistique River AOC	347
6.1-A	Hazardous Waste Sites in Marquette County, MI	348
6.1-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Deer Lake AOC.....	352
6.1-C	TRI Releases (in pounds, 2001) for the Deer Lake AOC	353
6.1-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Deer Lake AOC	354
6.1-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Deer Lake AOC	355
6.1-F	NPDES Facilities Permitted to Discharge IJC Critical Pollutants, Deer Lake AOC	356
6.2-A	Hazardous Waste Sites in Houghton County, MI.....	357
6.2-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, Torch Lake AOC	362
6.2-C	TRI Releases (in pounds, 2001) for the Torch Lake AOC	364
6.2-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the Torch Lake AOC	365
6.2-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, Torch Lake AOC	366

6.3-A	Hazardous Waste Sites in St. Louis and Carlton Counties, MN, and Douglas County, WI.....	367
6.3-B	Waste Site Contaminants that Exceeded Health-Based Screening Values, St. Louis River and Bay AOC.....	374
6.3-C	TRI Releases (in pounds, 2001) for the St. Louis River and Bay AOC.....	377
6.3-D	TRI Facilities Releasing IJC Critical Pollutants Onsite for the St. Louis River and Bay AOC ..	379
6.3-E	NPDES Permitted Average Annual Discharges (in pounds, 2004) to Surface Water, St. Louis River and Bay AOC.....	380
6.3-F	County Demographic Profiles for the St. Louis River and Bay AOC.....	371
7.1	TRI Releases of IJC Critical Pollutants in the 26 U.S. AOCs	392
7.2	Elevated Rates of Morbidity and Mortality within 26 U.S. Great Lakes AOCs.....	393

Executive Summary (Draft)

Public Health Implications of Hazardous Substances in the Twenty-Six U.S. Great Lakes Areas of Concern

This report was developed by the Agency for Toxic Substances and Disease Registry (ATSDR) in response to a request by the International Joint Commission (IJC) regarding the public health implications of hazardous substances found at the U.S. Areas of Concern (AOCs). This report should not be construed as a traditional analytic epidemiologic evaluation. Instead, it should be viewed as an assessment to identify the co-occurrence of elevated patterns of morbidity and mortality and environmental contamination that may merit further hypothesis-based epidemiologic study.

Despite limitations, this report provides a comprehensive evaluation of patterns of environmental contamination and the demographics of vulnerable populations in the 26 AOCs.

ATSDR identified waste sites, their hazard categories, relevant demographic information on populations at risk, and IJC critical pollutants with completed exposure pathways in the 26 U.S. AOCs. Data from over 100 hazardous waste sites where ATSDR has been involved were reviewed for 54 counties. County-wide health outcome data and U.S. Environmental Protection Agency Toxic Release Inventory (TRI) and National Pollutant Discharge Elimination System (NPDES) data were retrieved and reviewed for all 26 AOCs. Geographic Information System (GIS) maps were developed showing the hazardous waste site locations, TRI and NPDES reporting facilities, and vulnerable populations. These data were subsequently compiled into this report.

With the exception of the Manistique River AOC (Lake Michigan), all AOCs continue to be impacted by the release of IJC pollutants as determined from both the TRI and NPDES data. Lake Michigan AOCs (Grand Calumet, Kalamazoo River, Lower Green Bay and Fox River, Menominee River, Milwaukee Estuary, Muskegon Lake/White Lake, Sheboygan River, and Waukegan Harbor) continue to have contaminant problems. Lake Erie's AOCs (Ashtabula River, Black River, Buffalo River, Clinton River, Cuyahoga River, Maumee River, Presque Isle, River Raisin, and Rouge River) also have discharges of IJC critical pollutants. Lake Superior's AOCs (Deer Lake, St. Louis River and Bay, and Torch Lake) have heavy soil and sediment contamination with polycyclic aromatic hydrocarbons (PAHs). Lake Ontario AOCs (Eighteen Mile Creek, Oswego River, and Rochester Embayment) continue to have releases of IJC pollutants. Lake Huron AOC (Saginaw River and Bay AOC) also continues to be affected by the release of IJC critical pollutants.

Data presented in this report demonstrate that many of the hazardous waste sites that, in the past, contributed to human exposure or the environmental burden of the IJC critical pollutants and other contaminants were found to be remediated.

Of the over 100 hazardous waste sites assessed in the U.S. AOCs, 86 sites were identified as having a potential human health impact. Of this number, 2 were classified as *urgent public health hazards*, 47 identified as *public health hazards*, and 37 listed as *indeterminant public health hazards* as defined by the ATSDR Public Health Assessment Manual. Vulnerable

populations (i.e., children less than 6 years of age, reproductive age women, and older adults) living within a one-mile radius from the AOC hazardous waste sites included approximately 5,000 residents for the Lake Superior AOCs, over 200,000 persons for Lake Michigan AOCs, approximately 9,000 persons in the Lake Ontario AOCs, and over 7,000 residents for the Lakes Erie and Huron AOCs, respectively. These figures indicate that the total number of individuals within vulnerable populations residing within one mile of AOC hazardous waste sites totals an estimated 230,000. According to analysis of ATSDR's HazDat database for 2003, there were over 15,000 instances where contaminants of concern were found at levels above health-based screening values in a variety of media (i.e., water, air, and soil).

This report indicates that there are 25 AOCs which have not been remediated and that over 9 million residents are living within these AOC counties. The AOC county health measures (health status indicators) that compare unfavorably with the median of the peer counties and also with the U.S. population data merit further attention. Differences between the peer counties, the U.S. population data, and the U.S. AOC counties indicate elevated rates of disease beyond the norm (norm being the peer counties and the U.S. population data). While no causal inferences or associations are made in this report, of the 26 AOCs, elevated rates were observed for infant mortality in 21 AOCs, low birth weight in 6 AOCs, and premature births in 4 AOCs. Elevated cancer mortality was also seen for breast cancer in 17 AOCs, colon cancer in 16 AOCs, and lung cancer in 12 AOCs.

Future studies investigating the associations between potential exposures to contaminants found within the AOCs and health outcomes should consider examination of smaller, targeted areas near waste sites and/or other sources of contamination. These prospective analytic epidemiologic studies should address sensitive health outcomes (e.g., functional deficits in cognition, immune function, and fertility); confounding factors; critical exposure periods and disease latency; and the effect of mixtures of chemicals. Ecological studies are not being proposed. The proposed studies would use actual exposure data. Current insights derived from this study regarding the potential for such health effects are summarized in peer reviewed literature and the Expert Panel Report (Appendix).