

DETROIT RIVER AREA OF CONCERN DELISTING IMPLEMENTATION PLAN FOR BENEFICIAL USE IMPAIRMENTS

Submitted to the Great Lakes Commission and the
Michigan Department of Environmental Quality

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DETROIT RIVER AREA OF CONCERN
LOCALLY-BASED PLAN FOR DELISTING OF BENEFICIAL USE IMPAIRMENTS

Page

- 1** **Introduction**
- 2** Work Plan, Project Outcomes and Deliverables, Regional Support
- 3** Project Team, Project Schedule
- 4** **Workshop I – December 14, 2010**
Work Task, Schedule, and Estimated Budget
- 7** **Workshop II – January 28, 2011**
Work Task, Schedule, and Estimated Budget
- 10** **Workshop III – February 28, 2011**
Work Task, Schedule, and Estimated Budget
- 13** **Workshop IV – March 28, 2011**
Work Task, Schedule, and Estimated Budget
- Exhibits**
- A** Copies of Agendas for Workshops I – IV
- B** Copies of Sign-in sheets
- C** Guidance for Delisting Michigan’s Great Lakes Areas of Concern
Page 14 - 18 - Restrictions on Fish & Wildlife Consumption/Tainting
Page 23 - 27 - Bird or Animal Deformities/Fish Tumors or other Deformities
Page 28 -30 - Degradation of Benthos
Page 37 - 40 - Closings BUI/CSO and SSO in Area of Concern
Page 41 - 42 - Degradation of Aesthetics

Chapter 1:

PROJECT INTRODUCTION

The Detroit River Area of Concern (AOC) Public Advisory Council (PAC) has been addressing the delisting criteria for the Beneficial Use Impairments (BUIs) in the Detroit River since the early 1990's. This project continues the development of a locally based plan for delisting several BUIs in the Detroit River AOC through a public participation process involving various stakeholders, experts, and others with an interest in the renewal of this vital environmental asset.

This project builds upon the Detroit River AOC evaluation conducted in 2009 (***Restoration Criteria Review for the Detroit River Area of Concern, December 2008*** – See Exhibit C) and has focused on four stakeholder meetings designed to move several BUI delisting plans to the next step. The Wayne State University (WSU) Department of Civil and Environmental Engineering has partnered with the Detroit River Public Area of Concern (PAC) Friends of Detroit River (FDR) and took the lead, both technically and financially, on this project.

To this end, WSU staff worked with FDR to facilitate the four stakeholder workshops that deliberated on the BUIs that need to be addressed in the Detroit River AOC. These BUIs included:

- Restrictions on fish and wildlife consumption
- Tainting of fish and wildlife flavor
- Fish tumors or other deformities
- Degradation of benthos

The BUI - Restrictions on Drinking Water Consumption or Taste and Odor Problems – has been assessed and a draft delisting document has been prepared and submitted to the MDEQ. The remaining BUIs are being addressed at a statewide level and would not be included in this work effort. The fish and wildlife habitat and population BUIs have also been addressed already through a statewide effort.

The next step in the BUI delisting planning process, building upon the above-referenced work completed in December 2008, was to conduct several technical workshops addressing the four remaining Detroit River AOC BUIs. These workshops were organized and facilitated by WSU to engage and document stakeholder input to BUI delisting.

1. Work Plan The work completed under this project included the following:

Stakeholder Workshop Schedule – WSU and the Detroit River PAC began meeting in August of 2010 to develop a workshop schedule to address the four relevant AOC BUIs. This activity identified sources of research materials, points of contacts, and a technical expertise membership list.

Develop & Prepare Workshop Materials – The project team developed and maintained a working set of materials for each of the BUI technical workshops. These workshop materials are being posted on the FDR website and the UWERG website as an ongoing document along with periodic status reports.

BUI Workshops – For one or more related BUIs, stakeholder workshops were scheduled and conducted. Technical experts were invited and the facilitated workshop addressed the MDEQ delisting criteria and developed a series of proposed tasks that would, once executed, lead to the BUI delisting.

Prepare a working document - for each of the four Detroit River BUI that outlines the next steps including the accepted restoration criteria and work activities; a projected schedule; and budget (if required) to achieve BUI removal/designation. These BUI Delisting Outlines will be submitted for review to the MDEQ, the EPA, and the Detroit River PAC.

Prioritization of projects - The Detroit River AOC PAC, in consultation with other stakeholders including the regional office of the EPA and the MDEQ, will continue to review the restoration criteria and work activities in order to prioritize projects based on funding and implementation criteria. These activities shall continue after the publication of the final report.

2. Project Outcomes and Deliverables Three basic deliverables were generated by this project:

Stakeholder workshops including workshop attendees, handouts, workshop materials, and workshop outcomes and recommendations.

Proposed BUI Work Plans – For each of the four Detroit River BUIs addressed herein, a short work plan with work tasks, schedule and budget were developed. These work plans outlined the efforts required to remove/re-designate the BUI.

Final Report – A document to be used by the Detroit River PAC, WSU, MDEQ, EPA, and other stakeholders to better understand the various BUI issues in the Detroit River AOC and to evaluate future project implementations.

3. Regional Support The Friends of the Detroit River along with many other interested organizations and persons participated in the stakeholder process and the development of the BUI objectives. The stakeholder workshops brought technical staff from the MDEQ; Canadian government; Sea Grant; MNFI; City of Detroit; Detroit Water & Sewer Department, Macomb County, Wayne County, Detroit Zoological Society; and many private organizations and consultants. (See Exhibit B). These individuals possessed a wide variety of backgrounds on such matters as:

- Aquatic Habitat Assessments
- Fisheries Management
- Animal Management
- Sediment Remediation
- Environmental Engineering
- Shoreline Rehabilitation
- Education
- Water & Sewer Issues

4. Project Team The team for this project consisted of a principal investigator, project manager, student and expert project support, specifically:

Principal Investigator: Carol J. Miller, Ph.D., P.E.; Professor and Chair of WSU Civil and Environmental Engineering Department. Professor Miller is the co-Director of the WSU Urban Watershed Environmental Research Group (UWERG) and has extensive knowledge of the hydrologic/Detroit River AOC's hydraulic/ environmental characteristics of southeastern Michigan. She will be the direct link between the Detroit River AOC and the extensive tools of UWERG.

Project Manager: Kurt L. Heise, JD., LL.M; Adjunct Professor at WSU Civil and Environmental Engineering Department. Mr. Heise has been actively involved in the Areas of Concern in Southeast Michigan since 1989. He is the former Director of the Wayne County Department of Environment and has led the development of the Stage 2 Remedial Action Plan for the Rouge River AOC. He was the principal organizer and facilitator for the four stakeholder workshops mandated by the project.

Project Staff: Nicole Ball, a WSU undergraduate from the Civil and Environmental Engineering Department and UWERG program assisted greatly in the organization of the stakeholder workshops, agenda organization, and information gathering. Mr. Charlie Bristol, PE, from the Friends of the Detroit River also provided invaluable assistance, technical and organizational expertise to the project from initial project development through facilitation assistance and final product review.

5. Project Schedule:

October 2010:	Project Initiation and development of workshop objectives
November 2010:	Stakeholder workshop schedule with invitees and locations
December 2010:	Workshop I: Tumors and Other Deformities in Fish, Birds and Wildlife
January 2011:	Workshop II: Degradation of Benthos and Aesthetics
February 2011:	Workshop III: Restrictions and Tainting on Fish and Wildlife Consumption
March 2011:	Workshop IV: Beach Closing/Full Body Contact BUI, Combined Sewer Overflows and Sanitary Sewer Overflows
April-May 2011:	Rough draft for review and editing
June 2011:	Final draft for publication

Tumors and Other Deformities in Fish, Birds and Wildlife

The first workshop under this project was held on December 14, 2010 at the School of Engineering on the campus of Wayne State University. Presenters included Dr. Donna Kashian and Dr. David Pitts of Wayne State University, and Marcy Sieggreen of the Detroit Zoological Society. Two breakout groups were established after their presentations for stakeholder input on projects and plans that could be employed to delist the BUI of Tumors and Other Deformities in Fish Birds, and Wildlife. The history and definitions of this BUI “Tumors and Other Deformities in Fish, Birds, and Wildlife” can be found in Exhibit C on page 23 of the exhibit.

The workshop recommendations are as follows:

1. Re-evaluation and modeling project of data to investigate the BUI of fish tumors and other deformities, re-examining the trigger values of fish and new indicators

Work Task: This modeling project would be based on current and new data from both the U.S. and Canadian sides of the AOC concerning the fish population; examining tumors and other deformities and their potential sources. Current data on the U.S. side is limited, outdated, and unreliable. A newer, more modern data set is needed.

Schedule: 1 to 2 years

Estimated Budget: \$100,000

2. Joint U.S./Canadian monitoring project for fish and other animals in the AOC

Work Task: The need for reliable and updated data, on both sides of the river is critical for future delisting of this BUI. This would also include animals other than fish, such as mudpuppies, newts, birds, and other wildlife and would include trend data. Coordination with Canadian researchers is vital for uniformity and evaluation of contamination sources and could be conducted by Wayne State and the University of Windsor.

Schedule: 2 years

Estimated Budget: \$200,000 (combined US and Canadian)

3. Drinking Water monitoring project for the Detroit River AOC and its Environs; preferably from Lakes Huron to Erie

Work Task: A plan for a real-time drinking water monitoring project was commissioned by Macomb County in 2009; up to 13 member communities could collaborate on this project through an intergovernmental agreement or state law. Data would be gathered in real time and used to warn of bacterial and chemical contamination threats and to identify the sources of these threats to the water

ecosystem and public health. Staff or consultants would be hired to monitor the system and develop and distribute data.

Schedule: 1 year startup; otherwise perpetual

Estimated Budget: \$1.75 million annually

4. Joint US/Canadian public education campaign for fish consumption

Work Task: A coordinated public education campaign involving a website, brochures, radio and television public service announcements and informational seminars, each with a consistent message on both the U.S. and Canadian sides of the river, would better serve the public and lead to delisting of the BUI.

Schedule: 1 year startup; otherwise perpetual

Estimated Budget: \$200,000 startup; \$50,000 annually thereafter

5. Coordinated household pharmaceutical waste collection program

Work Task: A coordinated pharmaceutical waste collection program would help remove these contaminants from the Detroit River AOC ecosystem with a positive impact on this BUI. A public education effort would also be required. Wayne, Oakland, and Macomb Counties could participate in a regional effort, possibly using drop-off sites and targeted 'waste days' under the management of a central authority such as the Southeast Michigan Council of Governments (SEMCOG) or Wayne State. Businesses (Target, WalMart, CVS, etc.) could also maintain drop off facilities for their customer base. A similar Canadian effort would be essential for success.

Schedule: 1-2 year startup; otherwise perpetual

Estimated Budget: \$300,000 startup; \$200,000 annually thereafter

6. Targeted removal of sediment in certain "hot spots" in river.

Work Task: A frequently-identified task in several of the workshops was the need to remove contaminated sediment in certain known areas in the river. While this can often cause more harm by re-opening and re-releasing contamination, it was the consensus of the workshops that certain targeted areas would help restore redevelopment and reclamation sites along the river and would reduce the overall impact of contaminated sediments on humans, fish, and other wildlife, ultimately removing this BUI.

Schedule: 5-8 years, depending on project size and scope

Estimated Budget: \$2 – \$5 million, depending on project size and scope

7. Joint US/Canadian review of both U.S. and Canadian studies to create an integrated, updated Detroit River Remedial Action Plan and Detroit River Alliance.

Work Task: For decades, there has been a lack of coordination and cooperation between the U.S. and Canadian AOC's along the Detroit River. The creation of a holistic, fully-integrated and updated RAP for the entire river is needed. A new, sustainable governing structure for the river to carry out RAP projects is also required. Michigan Public Act 517 of 2004, the Watershed Alliance Act, would serve as the basis for the new international alliance governance structure. A similar bi-national plan was also researched and proposed in the 2007 Lake St. Clair Blue Ribbon Commission Final Report.

Schedule: 1-year startup; otherwise perpetual

Estimated Budget: \$100,000 per year

8. Study the impact of UV light on sewage processing at a wastewater treatment facility

Work Task: Ultraviolet light (UV) disinfection is currently used at the Wayne County Wyandotte Facility and could also be studied as a pilot project at DWSD. The workshop recommended that a DWSD project would save money for the system, improve maintenance and reliability, and negate the need for chemical treatment. A successful UV program would also remove contaminants that may not be removed through traditional methods.

Schedule: 1 year

Estimated Budget: \$20,000

Degradation of Benthos and Aesthetics

The second workshop under this project was held on January 24, 2011 at the School of Engineering on the campus of Wayne State University. Presenters included Mike Alexander of the MDEQ concerning contaminated sediments and the Trenton Channel, Rose Ellison of the USEPA on the Great Lakes Legacy Act and Benthos Delisting Objectives, and Detroit Riverkeeper Bob Burns on the broader issues of river aesthetics based on his extensive observations and those of similar stakeholders. Stakeholder input was then sought on projects and plans that could be employed to delist the BUI of Degradation of Benthos and Aesthetics. The history and definitions of the BUI “Degradation of Benthos and Aesthetics” can be found in Exhibit C on page 28 of the exhibit. The workshop recommendations are as follows:

The workshop recommendations are as follows:

- 1. Funding for the development of a consensus on sites for cleanup in the Detroit River AOC; prioritization of sites based on level of contamination, ability to remediate, cost, and other factors.**

Work Task: This project would start with historical, prioritized lists and maps of current sites, and peer review of those sites with the assistance of Detroit River AOC and other stakeholders. A consultant would draft new lists, maps and terminology based on the input received from entities such as the Detroit/Wayne County Port Authority, SEMCOG, Downriver Community Conference, Wayne County, and private businesses along the river corridor.

Schedule: 2 years

Estimated Budget: \$35,000

- 2. Funding for advocacy programs along the Detroit River AOC to educate and promote projects for cleanup; develop consensus and stakeholder support and funding – local governments, federal government, Army Corps, etc.**

Work Task: An integrated advocacy program along the entire Detroit River AOC, including U.S. and Canadian stakeholders, local, county, state, and provincial governments and other non-governmental organizations – possibly under the umbrella of a regional Detroit River Alliance – would strengthen public support and education for PAC objectives and assist in the stormwater permit education objectives of several AOC communities.

Schedule: 1-year startup; otherwise perpetual

Estimated Budget: \$100,000 per year

- 3. Work with MDEQ on the new stormwater regulations for MS4 communities.**

Work Task: Stormwater regulations for MS4 communities were proposed by the US EPA and MDEQ in 2007; litigation was initiated against the MDEQ by several of the impacted communities in Southeast Michigan. Continued litigation up to 2011 has resulted in the Snyder Administration re-opening discussions with MS4 communities on new permit standards. Input from Detroit River AOC communities could potentially assist the State on permit objectives that would lead to delisting of the Benthos and Aesthetics BUI.

Schedule: 1-2 years

Estimated Budget: \$12,000

4. Funding for improvements to stormwater management best practices, local and county initiatives and improved stormwater controls; erosion, IDEP, coal dust, air deposition, nutrient loading, and construction activities.

Work Task: The Detroit River AOC could play a role in assisting municipal and county governments in their federal and state-mandated stormwater permits. Among the activities mandated in these permits are soil erosion, illicit discharge elimination and nutrient loading activities. However, coal dust, air deposition, and construction activities also impact aesthetics in the Detroit River AOC. Finding additional funding for these activities would help lead to the delisting of the Aesthetics BUI.

Schedule: Annually until removal of BUI

Estimated Budget: \$1 million annually

5. Funding for cleanup of Brownfield sites impacting Detroit River AOC.

Work Task: The cleanup of Brownfield sites along the Detroit River and its watershed would improve aesthetics and remove harmful contaminants and sediments from the AOC, ultimately leading to removal of several BUI's. Sites should be fully identified for cleanup and remediation efforts must be coordinated with new development objectives or reasonable re-use of the remediate site.

Schedule: Annually until removal of BUI

Estimated Budget: \$75 - \$100 million

6. Funding for CSO and SSO control impacting Detroit River AOC, including Detroit River, Rouge River, and Ecorse Creek.

Work Task: Combined Sewer Overflows and Sanitary Sewer Overflows dump millions of gallons of untreated, raw sewage and stormwater into the Detroit River annually. While cleanup efforts have been funded with federal and local dollars since the early 1990's, large CSO areas continue to exist in the City of Detroit, Dearborn, Dearborn Heights, and Redford. Other SSO areas are known to exist along the

Ecorse Creek, Rouge River, and other creeks and streams in Macomb County. New structures, sewer systems, and treatment facilities need to be designed and built in the impacted areas.

Schedule: 15 – 20 years

Estimated Budget: \$1.5 billion

7. Funding for a regional meeting of Detroit River AOC stakeholders and others on how to define the BUI for aesthetics and benthos and prepare a report.

Work Task: The BUI for aesthetics and benthos are difficult to define; therefore there is disagreement on how to address the BUI, or when it is deemed as delisted. A regional meeting, or series of meetings, or AOC stakeholders could develop criteria or a case study on what criteria such as ‘persistent, high’ levels mean in the real world and other standards required to address this BUI.

Schedule: 1 year

Estimated Budget: \$20,000

Restrictions and Tainting on Fish and Wildlife Consumption

The third workshop under this project was held on February 28, 2011 at the School of Engineering on the campus of Wayne State University. Presenters included John Bohr of the MDEQ concerning fish contaminants and the assessment/removal of the BUI; Ted Briggs, Great Lakes Advisor to the Ontario Ministry of the Environment on fish tainting and consumption surveys and data from the Canadian RAP perspective, and Bruce Manny from the USGS Great Lakes Science Center regarding research on the Sturgeon population in the Detroit River AOC. Stakeholder input was then sought on projects and plans that could be employed to delist the BUI of Restrictions and Tainting on Fish and Wildlife Consumption. The history and definitions of the BUI “Restrictions and Tainting on Fish and Wildlife Consumption” can be found in Exhibit C on page 14 of the exhibit.

The workshop recommendations are as follows:

1. Prepare a report to seek delisting of this BUI.

Work Task: This BUI was deemed to be the most likely to be delisted in the coming years. To this end, the AOC should prepare a report and required data to submit to the EPA and DEQ to seek delisting. At least two stakeholder workshops and additional data from Wayne State, USGS, and Canadian counterparts would provide analytical data for the request. Survey work would likely involve a combination of scientific survey and interviews of anglers, consumers and other stakeholders regarding taste and odor findings.

Schedule: 1 year

Estimated Budget: \$25,000

2. Mapping project of Sturgeon habitat areas

Work Task: Sturgeon are a key indicator fish in the Detroit River AOC and a good source for fish tainting and consumption BUI statistical data as they breed in the river and live long lives. Determining and mapping their habitat areas would provide information on potential contaminant sources in the river and their impact on this particular species. Data could be gathered through a combination of scientific studies, citizens, and fishing enthusiasts in the AOC.

Schedule: 1-2 years

Estimated Budget: \$30,000

3. Tracking of migratory fish to determine sources of potential contaminants in areas other than Detroit AOC area, and to determine true fish habitat in the Detroit River.

Work Task: Determining restrictions and tainting on fish can be difficult as certain fish are migratory and may not be exposed to long-term contamination and sediment pollution in the river. Certain fish, such as Carp and Brown Bullhead live continuously in Detroit River and may be better indicators of contaminant exposure than other fish. A project that tracks migratory fish and monitors the health of permanent fish populations would be of assistance in a report to delist this BUI.

Schedule: 1-3 years

Estimated Budget: \$50,000

5. Conduct a survey of contamination areas, including known contaminated sediment areas, abandoned properties along the river, brownfield sites, and known contaminated areas in the river itself.

Work Task: This project would start with historical prioritized lists and maps of current sites, and peer review those sites with the assistance of Detroit River AOC and other stakeholders. This would be used as benchmark data for future cleanup projects. A consultant would draft new lists, maps and terminology based on the input received from entities such as the Detroit/Wayne County Port Authority, Downriver Community Conference, Wayne County, and private businesses along the river corridor.

Schedule: 2 years

Estimated Budget: \$35,000

6. Removal of contaminated sediment areas, including but not limited to PCB areas, Mercury, Dioxins.

Work Task: While a very broad delisting objective, removal of these contaminants would be a long-term goal for the full restoration of the Detroit River AOC. Once sediment areas are fully identified, PCB, Mercury, and Dioxin areas could be fully removed and cleaned by entities such as the EPA or the Army Corps of Engineers.

Schedule: 5 – 8 years from date of project start

Estimated Budget: \$100 - \$500 million

7. Study the potential impact of pharmaceutical waste on fish tainting, taste and odor and the long-term hazards associated with this contaminant.

Work Task: While consensus was that pharmaceutical waste is not currently considered a factor in this BUI, it was also recognized that this new form of contaminant is already a factor in deformities, tainting, and health impacts on fish, wildlife, and birds in the Detroit River AOC. Continuing study of these hazards, while outside of the BUI definition, would be helpful for the long-term public health and wildlife protection in the AOC, and could be conducted by Wayne State in conjunction with federal agencies and non-governmental organizations.

Schedule: 2 – 5 years

Estimated Budget: \$125,000

Beach Closing/Full Body Contact; (Combined Sewer Overflows and Sanitary Sewer Overflows)

The fourth and final workshop under this project was held on March 28, 2011 at the School of Engineering on the campus of Wayne State University. Presenters included research by Shannon Briggs of the MDEQ on the Michigan Beach Monitoring Program and its impact on the Detroit River AOC; Stacey McFarlane and Jeff Tread from the Macomb County Public Health Department on the history of beach closings in Macomb County and proactive measures; Annette DeMaria of ECT Consultants regarding the 2007 EPA study of E. Coli in the Detroit River, Rouge River, and Ecorse Creek; and Mirza Rabbai of the Detroit Water & Sewer Department concerning CSO projects and timelines for CSO control along the Detroit River. Stakeholder input was then sought on projects and plans that could be employed to delist the BUI of Beach Closing/Full Body Contact, Combined Sewer Overflows and Sanitary Sewer Overflows. The history and definitions of this BUI "Beach Closings/Full Body Contact" can be found in Exhibit C on page 37 of the exhibit.

The workshop recommendations are as follows:

1. Creation of a Huron to Erie water quality monitoring project with real-time surface monitoring and monitors at water intakes along the river, Lake St. Clair, and Lakes Huron and Erie.

Work Task: A plan for a real-time drinking water monitoring project was commissioned by Macomb County in 2009; up to 13 member communities could collaborate on this project through an intergovernmental agreement or state law. Data would be gathered in real time and used to warn of contamination threats and to identify threats to the water ecosystem and public health.

Schedule: 1 year startup; otherwise perpetual

Estimated Budget: \$1.75 million annually

2. Use of Rapid Analytical Methods (IMS/ATP) and gPCR testing through the USGS and other agencies for faster analysis of E. Coli levels on public beaches and enhanced, quicker warning for beach closings. This would include E. Coli counts on the beach itself.

Work Task: The IMS/ATP method addresses critical public health needs for the rapid detection of fecal-indicator contamination and has potential for satisfying EPA mandates requiring methods to detect bathing water contamination in 2 hours or less. Moreover, IMS/ATP equipment is considerably less costly and more portable than that for molecular methods, making the method suitable for field applications. Funding for this analysis, whether implemented by the USGS or another governmental entity, would provide more reliable data as well as more immediate warning for beach closings in the Detroit River AOC.

Schedule: 1-year startup; perpetual thereafter

Estimated Budget: \$75,000 per year

3. Renewed emphasis and funding on removal of remaining CSO areas impacting Detroit River AOC, including but not limited to DWSD DRO-2 and Upper Rouge Tunnel projects, Dearborn, Dearborn Heights, and Redford CSO areas.

Work Task: Combined Sewer Overflows and Sanitary Sewer Overflows dump millions of untreated, raw sewage and stormwater into the Detroit River annually. While cleanup efforts have been funded with federal and local dollars since the early 1990's, large CSO areas continue to exist in the City of Detroit, Dearborn, Dearborn Heights, and Redford. Other SSO areas are known to exist along the Ecorse Creek and other creeks and streams in Macomb County. New structures, sewer systems, and treatment facilities need to be designed and built in the impacted areas.

Schedule: 15 – 20 years

Estimated Budget: \$1.5 billion

4. Renewed emphasis and funding on identification of Sanitary Sewer Overflow sources and Illicit Discharges in the Rouge River and Ecorse Creek, including inspection and monitoring of septic systems that impact the AOC area, especially in Detroit and Downriver Wayne County areas; greater IDEP inspection and remediation.

Work Task: The EPA report explained by Annette DeMaria from ECT underscored the significant pollutant threat posed by Sanitary Sewer Overflows and Illicit Discharges on the Detroit River AOC. E. Coli counts in the Ecorse Creek and Rouge River impact the Detroit River AOC and contribute to the continuing BUI of full body contact in the AOC. Local communities with MS4 Stormwater Permit mandates must also have additional funding to identify and remove illicit discharges (IDEP) especially in the Ecorse Creek and Rouge River.

Schedule: 20 years

Estimated Budget: \$50 - \$75 million

5. Improved cleaning of storm drains in the AOC area.

Work Task: Local communities with MS4 Stormwater Permit mandates must also undertake storm drain cleaning activities. Failure to clean storm drains, or non-periodic cleaning, contributes to stormwater pollution runoff which contributes to this BUI. Additional funding for these communities in the Rouge and Ecorse Creek watersheds, and the City of Detroit, would address, but not remove, the BUI over time.

Schedule: Perpetual

Estimated Budget: \$5 million annually

6. Project for limiting of goose population and plant growth along the river.

Work Task: Reduction of geese in the Detroit River AOC through humane means, and limiting adverse and invasive plant species along and in the river would assist in the removal of the BUI. Ongoing efforts by local and county governments and non-governmental agencies in the AOC could be expanded upon with additional funding and public education efforts.

Schedule: 2-year startup; otherwise perpetual

Estimated Budget: \$250,000 annually

7. Project funding for bacteria-sniffing dogs to determine sewerage pollution in public beaches.

Work Task: The use of specially-trained dogs to detect E. Coli and other signs of sewerage pollution on beaches is increasing in popularity and effectiveness, and may provide more 'real time' warning of beach closings than more conventional and expensive technical analysis. A pilot program for bacteria-sniffing dogs on the Belle Isle beach or comparable areas, maintained by a municipal or county government, would help better understand the frequency and severity of this BUI and its impacts on public health.

Schedule: 1-year startup; otherwise perpetual

Estimated Budget: \$75,000 startup; \$20,000 annually thereafter

Exhibit A



Detroit River AOC Workshop:

Tumors and Other Deformities in Fish, Birds and Wildlife of the Detroit River

December 14, 2010, 1:00-4:00pm

Wayne State University, College of Engineering (EDC Auditorium)

Light Refreshments Provided



Featured Speaker: Dr. Donna Kashian, WSU

Dr. Kashian is an assistant professor at Wayne State University and holds a visiting scientist position at the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory (NOAA/GLERL) in Ann Arbor Michigan. She is the principal investigator of the ***Fish Consumption Advisories Project*** funded by Michigan Sea Grant. She earned her PhD (1998-2002) in Zoology at the University of Wisconsin examining the effects of organic compounds on reproductive and developmental endpoints in *Daphnia*. Her research has covered a diverse array of topics within ecotoxicology including examining the effects of wastewater effluent in the Great Lakes, investigating the response of *Daphnia* to toxaphene, developing a water quality biological monitoring program for Yellowstone and Grand Teton NP, examining the impacts of metals and ultra violet radiation on benthic stream communities, and developing a novel screen for chemicals classified as endocrine disrupters.

Background to Workshop Series: The WSU Department of Civil and Environmental Engineering has established a partnership with the Friends of the Detroit River in order to develop a comprehensive strategy for the long-term betterment of the Detroit River habitat. WSU will host a series of workshops on delisting Beneficial Use Impairments (BUIs), for the Detroit River from December 2010 through March of 2011. The purpose of the workshops is to address current MDNRE delisting criteria for the BUI and to develop a series of proposed tasks that once executed, lead to the delisting of the BUI.

The workshop discussion will be facilitated by WSU Adjunct Professor Kurt Heise. Mr. Heise has been involved in the development of the Action Plans for the Rouge River and Detroit River Areas of Concern, and has previously served as Director of the Wayne County Department of Environment. Representatives of the Friends of the Detroit River and other regional stakeholders have also been invited to attend. Active participation and recommendations will be sought by all participants to the event in an informal, conversational setting.

Location Details: The WSU College of Engineering is located at the corner of Anthony Wayne and Warren Avenue in Detroit, MI. The building address is 5050 Anthony Wayne Drive. A detailed campus map is available at: <http://campusmap.wayne.edu/>

Some street parking is available on Warren Avenue, while a parking structure is available across from the College of Engineering on Anthony Wayne Drive. Further parking information/assistance will be sent to you upon receipt of your registration for this event.

Registration: Please register at
<https://spreadsheets.google.com/viewform?formkey=dGRHQ2xld1JTREt4cjRyUzZLUKJnOHc6MQ>

or email Nicole Ball at: eg8154@wayne.edu



Detroit River AOC Workshop II:

Degradation of Benthos and Aesthetics

January 24, 2011, 1:00-4:00pm

Wayne State University, College of Engineering

Light Refreshments Provided

Featured Speakers:

John Barkach, Great Lakes Environmental Center

Mike Alexander, Michigan Department of Environmental Quality

Rose Ellison, US Environmental Protection Agency

Bob Burns, Friends of the Detroit River

Background on Workshop II: The purpose of this workshop is to determine appropriate methods and actions that will lead to the delisting of these BUI's based on the state of Michigan's established delisting criteria.

Degradation of Benthos: This BUI will be considered restored when:

1. An assessment of benthic community, using either MDEQ's SWAS Procedure #51 for wadeable streams or MDEQ's pending rapid assessment procedure for non-wadeable rivers yields a score for the benthic metrics which meets the standards for aquatic life in any 2 successive monitoring cycles (as defined in the two procedures).

OR, in cases where MDEQ procedures are not applicable and benthic degradation is caused by contaminated sediments, this BUI will considered restored when:

2. All remedial actions for known contaminated sediment sites with degraded benthos are completed (except for minor repairs required during operation and maintenance) and monitored according to the approved plan for the site. Remedial actions and monitoring are conducted under authority of state and federal programs, such as Superfund, Resource Conservation and Recovery Act, Great Lakes Legacy Act, or Part 201 of Michigan's National Resource and Environmental Protection Act (NREPA) of 1994.

Degradation of Aesthetics: This BUI will be considered restored when:

Monitoring data for two successive monitoring cycles indicates that water bodies in the AOC do not exhibit persistent, high levels of the following "unnatural physical properties" (as defined by Rule 323.1050 of the Michigan WQS) in quantities which interfere with the State's designated uses for surface waters: turbidity, foams, color, settleable solids, oil films, suspended solids, floating solids, and deposits.

Location Details: The WSU College of Engineering is located at the corner of Anthony Wayne and Warren Avenue in Detroit, MI. The building address is 5050 Anthony Wayne Drive. A detailed campus map is available at: <http://campusmap.wayne.edu/>

Parking information/assistance will be sent to you upon receipt of your registration for this event.

Registration: Please register at

<https://spreadsheets.google.com/viewform?formkey=dEFCTy14RkRMV1ZiYINMwXN4NjhwN1E6MQ>.

Or email Nicole Ball at: eg8154@wayne.edu



Detroit River AOC Workshop III:

Tainting of Fish and Wildlife Flavor & Restrictions on Fish and Wildlife Consumption

February 28, 2011, 1:00-4:00pm

Wayne State University, College of Engineering

Light Refreshments Provided

Featured Speakers:

Ted Briggs, Great Lakes Advisor, Ministry of the Environment

John Bohr, Michigan Department of Environmental Quality

Dr. Bruce Manny, US Geological Survey, Great Lakes Science Center

Dr. Donna Kashian, Assistant Professor, Wayne State University Department of Biological Sciences

Dr. John Hartig, The Detroit River Conservancy

Background on Workshop III: The purpose of this workshop is to determine appropriate methods and actions that will lead to the delisting of these BUI's based on the state of Michigan's established delisting criteria.

Tainting of Fish and Wildlife Flavors- This BUI will be considered restored when:

No more than three reports of fish tainting have been made to the MDNR or MDEQ for a period of three years. OR, if there have been reports of tainting:

A one-time analysis of representative fish species in an AOC in accordance with MDEQ Surface Water Assessment Section (SWAS) Procedure #55 for conducting taste and odor studies indicates that there is no tainting of fish flavor. Conservation and Recovery Act, Great Lakes Legacy Act, or Part 201 of Michigan's National Resource and Environmental Protection Act (NREPA) of 1994.

Restrictions of Fish and Wildlife Consumption- This BUI will be considered restored when:

1. The fish consumption advisories in the AOC are the same or less restrictive than the associated Great Lake or appropriate control site.

OR, if the advisory in the AOC is more stringent than the associated Great Lake or control site:

2. A comparison study of fish tissue contaminant levels demonstrates that there is no statistically significant difference in fish tissue concentrations of contaminants causing fish consumption advisories in the AOC compared to a control site.

Location Details: The WSU College of Engineering is located at the corner of Anthony Wayne and Warren Avenue in Detroit, MI. The building address is 5050 Anthony Wayne Drive. A detailed campus map is available at: www.campusmap.wayne.edu

Parking information/assistance will be sent to you upon receipt of your registration for this event.

Registration: Please register at

<https://spreadsheets.google.com/viewform?formkey=dEFCTy14RkRMV1ZIYINMWXN4NjhwN1E6MQ>.

Or email Nicole Ball at: eg8154@wayne.edu



Detroit River AOC Workshop IV:

Beach Closing/Full Body Contact, Combined Sewer Overflows and Sanitary Sewer Overflows in the Detroit River Area of Concern

March 28, 2011, 1:00-4:00pm

Wayne State University, College of Engineering

Light Refreshments Provided

Featured Speakers:

Annette DeMaria, Environmental Consulting & Technology, Inc.

Mirza Rabbaig, Detroit Water and Sewerage Department

Representative from the Macomb County Health Department

Background on Workshop IV: The purpose of this workshop is to determine appropriate methods and actions that will lead to the delisting of these BUI's based on the state of Michigan's established delisting criteria.

This BUI will be considered restored when:

no waterbodies within the AOC are included on the list of impaired waters due to contamination with pathogens in the most recent Clean Water Act *Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report* (Integrated Report), which is submitted to U.S. EPA every two years.

MDEQ Rationale (MDEQ 2006a)

Practical Application in Michigan

This restoration criteria is based on Michigan's WQS for bacterial contamination. Rule 323.1062 of Michigan's WQS sets the maximum concentrations of *E. coli* that are acceptable for waters of the state to meet total- and partial-body contact recreation uses. The AOCs with a Beach Closing BUI have historically dealt with persistent elevation of bacteria levels in their recreation waters.

Location Details: The WSU College of Engineering is located at the corner of Anthony Wayne and Warren Avenue in Detroit, MI. The building address is 5050 Anthony Wayne Drive. A detailed campus map is available at: www.campusmap.wayne.edu

Parking information/assistance will be sent to you upon receipt of your registration for this event.

Registration: Please register at

<https://spreadsheets.google.com/viewform?formkey=dEFCTy14RkRMV1ZiYINMWXN4NjhwN1E6MQ>.

Or email Nicole Ball at: eg8154@wayne.edu

Exhibit B

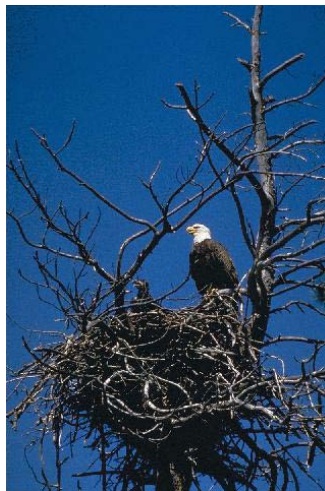
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Mackey, Jane		

Exhibit C

*Note: Pages in this section are restricted to the relevant sections for this report.
i.e. page numbers are not all contiguous.

Guidance for Delisting Michigan's Great Lakes Areas of Concern



Michigan Department of Environmental Quality
Water Bureau
P.O. Box 30273
Lansing, Michigan 48909

Restrictions on Fish and Wildlife Consumption

Significance in Michigan's Areas of Concern

Fish and wildlife consumption advisories in Michigan are determined by the Michigan Department of Community Health (MDCH), based on levels of contaminant concentrations in fish or wildlife tissue. Currently, all of Michigan's 14 AOCs have consumption advisories for specific contaminants in certain species of fish. No AOCs have advisories for wildlife consumption. Fish consumption advisories range from no human consumption to restrictions on consumption for specific amounts of fish for certain human populations.

Almost all fish consumption advisories are based on levels of polychlorinated biphenyls (PCBs) or mercury which exceed MDCH guidelines. Excessive levels of dioxin result in fish consumption advisories in the Saginaw River/Bay/River AOC and in the Detroit River AOC. Excessive chlordane is causing fish consumption advisories in the White Lake AOC. Other non-AOC locations in Michigan also have various consumption advisories for these contaminants. There is a statewide consumption advisory for certain fish in all inland lakes due to mercury contamination.

Michigan Restoration Criteria and Assessment

The restoration criteria for this BUI uses a tiered approach for evaluating restoration success. This BUI will be considered restored when:

1. The fish consumption advisories in the AOC are the same or less restrictive than the associated Great Lake or appropriate control site.

OR, if the advisory in the AOC is more stringent than the associate Great Lake or control site:

2. A comparison study of fish tissue contaminant levels demonstrates that there is no statistically significant difference in fish tissue concentrations of contaminants causing fish consumption advisories in the AOC compared to a control site.

OR, if a comparison study is not feasible because of the lack of a suitable control site:

3. Analysis of trend data (if available) for fish with consumption advisories shows similar trends to other appropriate Great Lakes trend sites.

When comparison studies (per #2 above) are used to demonstrate restoration of a BUI, the studies will:

- Be designed to control variables known to influence contaminant concentrations such as species, size, age, sample type, lipids and other relevant variables from the examples in the MDEQ's Fish Contaminant Monitoring Program (FCMP).
- Include a control site which is agreed to by the MDEQ, in consultation with the PAC. It will be chosen based on physical, chemical, and biological similarity to the AOC and the 2 sites must be within the same U.S. EPA Level III Ecoregions for the Conterminous U.S. (see references). When a single control site cannot be found, sites may be pooled for comparisons. Where mercury concentrations in fish tissue cause waterbody specific advisories in lakes, the comparison may be made to the concentrations causing the general inland lake advisory.
- Use fish samples collected from the AOC and control site within the same time frame (ideally 1 year).
- Evaluate contaminant levels in the same species of fish from the AOC and the control site to avoid problems with cross-species comparisons. In addition, fish used for comparison studies should be the same species as the consumption advisory.

If there is no statistically significant difference ($\alpha = 0.05$) in fish tissue concentrations of contaminants causing advisories in the AOC compared to a control site, then the BUI has been restored. If there is a significant difference between the AOC and the control site in the comparison study, then an impairment still exists.

If a comparison study is not practical for the AOC due to the lack of an appropriate control site, then trend monitoring data (if available) can be used to determine restoration success (as per approach #3 above). This is likely to be the approach used to evaluate this BUI in the connecting channel AOCs, where there are not appropriate control sites for a comparison study, and where MDEQ has substantial trend monitoring data. If MDEQ trend analysis of fish with consumption advisories shows similar trends to other appropriate, MDEQ-approved Great Lakes trend sites, this BUI will be considered restored. If trend analysis does not show similarity to other appropriate Great Lakes trends sites, then an impairment exists.

No AOCs have advisories for wildlife consumption. However, if a wildlife restriction is issued at a later time within an AOC with the Fish and Wildlife Consumption BUI, the process for assessing restoration of the wildlife restriction will be similar to the process outlined above for fish consumption.

Rationale

Practical Application in Michigan

Restoration of the fish consumption advisory BUI is based on comparison of fish consumption advisories and tissue concentrations in the AOC with the associated Great Lake or other appropriate control site, not whether or not fish advisories exist in the AOCs or control site.

Comparison of advisories or tissue concentrations to a control site is used because some fish consumption advisories are issued statewide or are due to sources outside an AOC. Because the existence of an advisory may not be due to contaminant sources in an AOC, it should not preclude removal of this BUI. A more stringent advisory in the AOC than the associated Great Lake is an indication that there may be an ongoing contaminant issue within the AOC. In this case, additional source assessment may be conducted to determine whether there are sources of contamination within the AOC (e.g., caged fish studies).

The MDEQ will consider restoration of this BUI on a case by case basis for AOCs with circumstances that do not fit exactly into the evaluation steps outlined above.

1991 IJC General Delisting Guideline

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 not be due to contaminant input from the watershed.

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above takes the general guideline and applies specific criteria for restoration based on existing Michigan programs and authorities.

State of Michigan Programs/Authorities for Evaluating Restoration

Michigan assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and the "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites defined by the National Pollutant Discharge Elimination System (NPDES) permitting program for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for basin rotation maps). One element of the State's monitoring strategy is the enhanced and improved FCMP.

The specific objectives of the FCMP are to:

1. Determine whether fish from the waters of the state are safe for human consumption.
2. Measure whole fish contaminant concentrations in the waters of the state.
3. Assess whether contaminant levels in fish are changing with time.
4. Assist in the identification of waters that may exceed standards and target additional monitoring activities.
5. Evaluate the overall effectiveness of MDEQ programs in reducing contaminant levels in fish.
6. Identify waters of the state that are high quality.
7. Determine if new chemicals are bio-accumulating in fish from Michigan waters.

The FCMP element consists of several components that, in combination, provide data necessary to achieve these objectives. These include:

- Edible fish portion monitoring to support the establishment or delisting of fish consumption advisories;
- Native whole fish trend monitoring;
- Periodic evaluations to expand and improve the State's fish trend monitoring network; and
- Caged fish monitoring for source/problem identification.

Fish contaminant data are used to determine whether fish from waters of the state are safe for human and wildlife consumption, and as a surrogate measure of bioaccumulative contaminants in surface water. Fish tissues are analyzed for bioaccumulative contaminants of concern. These include mercury, PCBs, chlorinated pesticides (e.g., DDT/DDE/DDD), dioxins, and furans. More recently, some fish tissues have been analyzed for polybrominated biphenyl ethers (PBDEs) and perfluorooctane sulfonate (PFOS). Data are reviewed each year to determine whether there are additional new parameters of concern for which the fish should be analyzed.

Fish contaminant studies needed for the assessment of this BUI restoration will be arranged by MDEQ as part of the Michigan FCMP. Timing and study design will be determined by the MDEQ based on available resources.

Some local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC chooses

to use local monitoring data for the assessment of BUI restoration, the data can be submitted to the MDEQ for review. If the MDEQ determines that the data appropriately address the restoration criteria and meet quality assurance and control requirements, they may be used to demonstrate restoration success.

Bird or Animal Deformities or Reproductive Problems

Significance in Michigan's Areas of Concern

Seven of Michigan's AOCs are listed as either impaired or unknown status for bird and animal deformities (e.g., crossed bills) or reproductive problems (e.g., egg shell thinning), including: River Raisin, St. Clair River, Detroit River, Saginaw River/Bay, St. Marys River, Deer Lake, and Kalamazoo River.

In Saginaw River/Bay, Deer Lake, and Kalamazoo River, past studies have indicated elevated toxic chemical concentrations (e.g., mercury or PCBs) and/or some deformities in birds and other animals. In the other AOCs which list this BUI, the status is either unknown or inconclusive. In most cases, studies on bird and animal deformities have not been done. The species historically impacted are fish eating birds or animals such as bald eagles, herring gulls, common terns, mink, or otter. The contaminants associated with these impacts are primarily the persistent bioaccumulative toxics: PCBs, dioxins, DDT, and mercury.

Michigan Restoration Criteria and Assessment

Restoration of this BUI will be demonstrated using two approaches, depending on availability of data in a particular AOC. The first approach evaluates restoration based on field assessment of birds and/or other wildlife in those AOCs where MDEQ or other State-approved bird and wildlife data are available.

The second approach will be applied in those AOCs where bird and other wildlife data are not available, and uses levels of contaminants in fish tissue known to cause reproductive or developmental problems as an indicator of the likelihood that deformities or reproductive problems may exist in the AOC.

Approach 1 – Observational Data and Direct Measurements of Birds and Other Wildlife

- Evaluate observational data of bird and other animal deformities for a minimum of 2 successive monitoring cycles in species identified in the RAP as exhibiting these problems. If deformity or reproductive problem rates are not statistically different than inland background levels (at a 95% confidence interval), or no reproductive or deformity problems are identified during the two successive monitoring cycles, then the BUI is restored. If the rates are statistically different, it may indicate a source from either within or from outside the AOC. Therefore, if the rates are statistically different or the amount of data is insufficient for analysis, then:
- Evaluate tissue contaminant levels in egg, young, and/or adult wildlife. If contaminant levels are lower than the Lowest Observable Effect Level (LOEL) for that species or are not statistically different than inland control populations (at a 95% confidence interval), then the BUI is restored.

Data for a comparison study must come from a control site which is agreed to by the MDEQ, in consultation with MDNR. It will be chosen based on physical, chemical, and biological similarity to the AOC and the 2 sites must be within the same U.S. EPA Level III Ecoregions for the Conterminous U.S. (see references).

Where direct observation of wildlife and wildlife tissue data is not available, the following approach will be used:

Approach 2: Fish Tissue Contaminant Levels as an Indicator of Deformities or Reproductive Problems

- If fish tissue concentrations of PCBs, dioxins, DDT, or mercury (as determined in the RAP) contaminants of concern in the AOC are at or lower than the LOEL known to cause reproductive or developmental problems in fish-eating birds and mammals the use impairment is restored.

OR

- If fish tissue concentrations of PCBs, dioxins, DDT, or mercury in the AOC are not statistically different than the associated Great Lake (at 95% confidence interval), then the BUI is restored. In the connecting channel AOCs, either the upstream or downstream Great Lake may be used for comparison.

Fish of a size and species to be prey for the wildlife species under consideration must be used for the tissue data.

Rationale

Practical Application in Michigan

Bird and other animal deformities and reproductive problems have a particular challenge related to criteria for restoration:

- Most of the species involved are only part year residents in an AOC, or have a home range that may include locations outside an AOC. This makes it difficult to attribute deformities or reproductive problems to a specific location. The 2 approaches of the criteria address this.
- There is also a wide variation in how this use impairment was originally determined in Michigan's AOCs. Some AOCs had empirical data and some had anecdotal information.

- Many fish-eating birds and animals such as eagles are long-lived birds. Long after remedial actions have occurred and a site is restored, it is possible for reproductive effects to remain apparent.
- It is very difficult to determine actual prevalence of deformities and reproductive problems. Fox and Bowerman (in press), provide examples of this last point and detail issues with assessments of this BUI.
- In some AOCs with this BUI, the species monitored under MDEQ's wildlife monitoring program do not reside there, so no direct wildlife data are available.

Given the above practical considerations, the statewide criteria for this BUI uses two approaches – one for AOCs where wildlife data are available, and a second approach where direct wildlife information is not available. In the latter case, contaminant levels in fish tissues are used as an indicator of potential deformities or reproductive problems in the fish-eating species which have historically been impacted by contaminants (e.g., eagles, herring gulls, mink, and otter). Even in the absence of direct wildlife data, if contaminant levels in fish tissue are high, it indicates that the possibility for deformities or reproductive problems in fish-eating wildlife may be higher.

The contaminants of concern are PCBs, dioxins, DDT, and mercury and each AOC with this BUI may have one or more contaminants present. Assessment in each AOC will be based on the relevant contaminant(s).

The State will consider restoration of this BUI on a case-by-case basis for AOCs with circumstances that may not fit exactly into the process outlined above.

1991 IJC General Delisting Guideline

When the incidence rates of deformities or reproductive problems in sentinel wildlife species do not exceed background levels in inland control populations.

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above describes application of specific criteria for restoration based on existing Michigan programs and authorities.

State of Michigan Programs/Authorities for Evaluating Restoration

Michigan assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds is sampled at selected sites defined by the NPDES permitting program for conventional and toxic pollutants, and biological and physical

habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations). One element of the strategy is wildlife contaminant monitoring.

Wildlife play an important role in monitoring water quality and ecosystem health and can be used to monitor for spatial and temporal trends in contaminant concentrations. Specific life stages may be sampled to provide discrete time units for determination of temporal trends. Specific geographic regions or watersheds may be targeted for the determination of spatial trends.

The specific objectives of the wildlife contaminant monitoring are to:

1. Determine contaminant levels in wildlife that may be exposed to contaminants from surface waters of the state.
2. Assess whether contaminant levels in fish are changing with time.
3. Evaluate the overall effectiveness of MDEQ programs in protecting wildlife from toxic contaminants.
4. Determine whether new chemicals are bioaccumulating in wildlife.

The wildlife contaminant monitoring element currently consists of two components that, in combination, provide data necessary to achieve these objectives. These components include bald eagle and herring gull egg monitoring. The bald eagle project began in 1999 and has continued each year since then. Sample collection and analysis of herring gull eggs began in 2002. Wildlife are analyzed for bioaccumulative contaminants of concern, including mercury, PCBs, and chlorinated pesticides (e.g., DDT/DDE/DDD). Data are reviewed each year to determine whether there are additional new parameters of concern for which wildlife should be analyzed.

Another element of the State's monitoring strategy applicable to this BUI is enhanced and improved FCMP. Fish contaminant data are used to determine whether fish from waters of the state are safe for human and wildlife consumption, and as a surrogate measure of bioaccumulative contaminants in surface water. Fish tissues are analyzed for bioaccumulative contaminants of concern. These include mercury, PCBs, chlorinated pesticides (e.g., DDT/DDE/DDD), dioxins, and furans. More recently, some fish tissues have been analyzed for polybrominated biphenyl ethers (PBDEs) and perfluorooctane sulfonate (PFOS).

Fish contaminant studies needed for the assessment of this BUI restoration will be arranged by MDEQ as part of the Michigan FCMP. Timing and study design will be determined by the MDEQ based on available resources.

Some local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC chooses to use local monitoring data for the assessment of BUI restoration, the data can be submitted to the MDEQ for review. If the MDEQ determines that the data appropriately address the restoration criteria and meet quality assurance and control requirements, they may be used to demonstrate restoration success.

Degradation of Benthos

Significance in Michigan's Areas of Concern

Thirteen AOCs in Michigan have identified Degradation of Benthos as a BUI (all except Deer Lake). This impairment usually results from the biologically-based effects of sediment contamination and is closely related to the restrictions on dredging impairment. This impairment deals with only the surficial layer of sediments where organisms live.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when:

- An assessment of benthic community, using either MDEQ's SWAS Procedure #51 for wadeable streams or MDEQ's pending rapid assessment procedure for non-wadeable rivers yields a score for the benthic metrics which meets the standards for aquatic life in any 2 successive monitoring cycles (as defined in the two procedures).

OR, in cases where MDEQ procedures are not applicable and benthic degradation is caused by contaminated sediments, this BUI will be considered restored when:

- All remedial actions for known contaminated sediment sites with degraded benthos are completed (except for minor repairs required during operation and maintenance) and monitored according to the approved plan for the site. Remedial actions and monitoring are conducted under authority of state and federal programs, such as the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund), Resource Conservation and Recovery Act, Great Lakes Legacy Act, or Part 201 of Michigan's National Resource and Environmental Protection Act (NREPA) of 1994.

Rationale

Practical Application in Michigan

The AOC program addresses the worst contaminated sites in the Great Lakes. Those AOCs that have degradation of benthos from sediment contamination have specific sites that are being remediated with regulatory programs. Once these specific sites have been remediated, the benthos in the AOC will no longer be among the worst in the Great Lakes so the use impairment can be considered restored. The reasons for identifying degradation of benthos varies across Michigan's AOCs. Benthos in some AOCs are degraded due to non-

contaminated sediment deposition, or hydrologic changes in the waterbody. In other AOCs, benthos are degraded due to the effects of contaminated sediments.

The restoration criteria for Degradation of Benthos allows for two different approaches for evaluating restoration success. The first approach employs MDEQ procedures for evaluating benthic community structure in wadeable and non-wadeable streams. Rapid, qualitative biological assessments of wadeable streams and rivers are conducted using SWAS Procedure #51, which compares fish and benthic invertebrate communities at a site to the communities that are expected at an unimpacted, or reference site. This is a key tool used by MDEQ to determine whether waterbodies are attaining Michigan WQS. However, this procedure can not be used on non-wadeable rivers. The MDEQ has been partnering with Michigan State University to develop and validate a procedure for assessing aquatic communities in non-wadable rivers that the State implemented beginning in 2006. If these procedures are applicable to an AOC, data collected under the monitoring program will be used to evaluate whether benthos has been restored according to the criteria. Where biological assessments are not applicable, the second approach will be used to determine removal of this BUI.

The second approach focuses on benthic degradation from chemical contamination. Contaminated sediments are the primary cause for benthic impairments in AOCs. Sediment remediation and assessment will be accomplished through established programs such as federal Superfund, Resource Conservation and Recovery Act, Great Lakes Legacy Act, and Michigan's NREPA Part 201. Criteria are site specific and are usually based on sediment chemistry or sediment toxicity. In addition to dredging contaminated sediments for remediation, regulatory programs sometimes adopt natural attenuation as the method for addressing contaminated sediments. In both cases, when the final remedial measures are completed, and monitored according to site plans, the BUI will be considered restored. Removal of the BUI will not be contingent on full recovery of the benthic community, which may take many years or even decades.

1991 IJC General Delisting Guideline

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.

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above describes application of specific criteria for restoration based on existing Michigan programs and authorities.

State of Michigan Programs/Authorities for Evaluating Restoration

Michigan conducts remedial actions on contaminated sediments under NREPA Part 201 and other state regulatory authority. The State also cooperates with federal programs that remediate contaminated sediments and restore benthos, such as the U.S. Superfund, the Resource Conservation and Recovery Act, and the Great Lakes Legacy Act programs. In addition, the State has a permit program for dredging and filling of lakes, streams, and wetlands. Through these programs, biologically based effects of contamination could be determined as part of any assessment. Remediation which addresses biological effects occurs on a site-specific basis.

The MDEQ has benthic data from wadeable stream surveys (SWAS Procedure #51) gathered as part of the 5-year rotating basin monitoring in the state. In addition, the State will be starting a monitoring program for benthos in non-wadeable streams as part of the 5-year basin monitoring program beginning in 2006. Data from these surveys, as well as other relevant state monitoring data (e.g. MDNR surveys or special studies by DEQ for lake systems) will be used as applicable for monitoring and assessing restoration of this impairment.

In addition, U.S. EPA GLNPO and the U.S. Geological Survey are working together to identify procedures for developing delisting criteria for BUIs associated with contaminated sediments. The MDEQ will incorporate this guidance, as available and applicable, into the assessment of whether the State's restoration criteria for Degradation of Benthos BUI have been met in Michigan AOCs.

Some local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC chooses to use local monitoring data for the assessment of BUI restoration, the data can be submitted to the MDEQ for review. If the MDEQ determines that the data appropriately address the restoration criteria and meet quality assurance and control requirements, they may be used to demonstrate restoration success.

Beach Closings

Significance in Michigan's Areas of Concern

Eleven of Michigan's AOCs are listed as impaired due to beach closings from bacterial contaminants, including: Raisin River, Detroit River, Rouge River, Clinton River, St. Clair River, Saginaw River/Bay, St. Marys River, Kalamazoo River, Menominee River, Muskegon Lake, and Manistique River.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when:

1. No waterbodies within the AOC are included on the list of non-attaining waters due to contamination with pathogens in the most recent Clean Water Act *Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report* (Integrated Report), which is submitted to U.S. EPA every two years.

2. OR, in cases where the waterbodies within the AOC are on the list of non-attaining waters due to the presence of Combined Sewer Overflows (CSOs) or are impacted by upstream CSOs, this BUI will be considered restored when:
 - Updated information reveals that the CSOs have been eliminated or are being treated.

3. OR, in cases where CSOs still exist and significant progress has been made towards their elimination or treatment, this BUI will be considered restored when:

Monitoring in the AOC during the recreation period, using the sampling protocol outlined in Rule 62 of the Michigan WQS, meets the following criteria:

- The sampling plan and Quality Assurance Project Plan are approved by the MDEQ;

- *E. coli* concentrations are below a 30-day geometric mean of 130 counts per 100 milliliters (ml);

- At least 90% of sample results are below the daily geometric mean limits of 300 counts *E. coli* per 100 ml;

- No more than 1 of the sample results exceed the partial-body contact water quality standard of 1,000 counts *E. coli* per 100 ml based on a daily geometric mean; and
- DEQ-approved plans in a National Pollutant Discharge Elimination System (NPDES) permit are in place for addressing any remaining CSOs that are causing BUIs and the implementation plan is on schedule.

Sampling under approach 3 is done systematically throughout the recreation season, and does not specifically monitor wet weather discharges from CSOs. Meeting the above criteria does not negate regulatory requirements for separating CSOs in order to meet water quality standards.

Rationale

Practical Application in Michigan

These restoration criteria are based on Michigan's WQS for bacterial contamination. Rule 323.1062 of Michigan's WQS sets the maximum concentrations of *E. coli* that are acceptable for waters of the state to meet total- and partial-body contact recreation uses. The AOCs with a Beach Closing BUI have historically found persistent elevation of bacteria levels in their recreation waters, often due to the existence of sanitary sewer overflows and CSOs.

In accordance with Public Health Code (Act 368 of 1978), county health departments have the authority to monitor and evaluate public beaches to determine if the water is safe for bathing, swimming, or partial body contact recreation. While beach monitoring is a voluntary program, those county health departments that participate must monitor in accordance with Michigan's WQS.

County health departments which monitor public beaches must submit their sampling data to the MDEQ, which tracks monitoring results and uses the data to determine whether water bodies are identified as impaired in the *Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report* to the U.S. EPA on Clean Water Act compliance.

Many water bodies are placed on the non-attaining lists in the Integrated Report due to the presence of CSOs, rather than monitoring data that indicate waters were contaminated with pathogens. Although it is understood that the presence of a CSO and the chance of overflow is a serious issue and needs to be addressed, the criteria provides for BUI removal based on monitoring data, not just listing in the Report. The proposed monitoring is done systematically throughout the recreation season to determine whether or not there is normally a localized bacterial contamination issue. It does not specifically monitor wet weather discharges from CSOs. Meeting the proposed monitoring criteria does

not negate regulatory requirements for separating CSOs in order to meet water quality standards, but does allow for removal of the BUI if the site meets the criteria.

1991 IJC General Delisting Guideline

When waters, commonly used for total-body contact or partial body-contact recreation, do not exceed standards, objectives, or guidelines for such use.

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above describes application of specific criteria for restoration based on existing Michigan programs and authorities.

State of Michigan Programs/Authorities for Evaluating Restoration

Michigan assesses water bodies throughout the state on a 5-year basin rotation cycle according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations). One element of the strategy is improved support for public beach monitoring.

The specific objectives of the beach monitoring element are to:

1. Support county health departments in determining whether waters of the state are safe for total body contact recreation.
2. Evaluate the effectiveness of MDEQ programs in protecting waters of the state from bacteria/*E. coli* contamination.
3. Develop and maintain a database into which counties can enter their beach monitoring data, and which the public can access for the latest information.

The beach monitoring element consists of two components that, in combination, provide data necessary to achieve these objectives. These include annual grants awarded to local governments/county health departments each year to monitor public beaches through a grant application package, and development and maintenance of a statewide beach database, which is available on the MDEQ web site (www.michigan.gov/deq - click on "Water," then "Water Quality Monitoring," and then "Beach Monitoring"). Counties enter data directly into the database.

Some local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC chooses to use local monitoring data for the assessment of BUI restoration, the data can be submitted to the MDEQ for review. If the MDEQ determines that the data appropriately address the restoration criteria and meet quality assurance and control requirements, they may be used to demonstrate restoration success.

Degradation of Aesthetics

Significance in Michigan’s Areas of Concern

Ten of Michigan’s AOCs are listed as impaired due to aesthetics, including: River Raisin, Detroit River, Rouge River, Clinton River, St. Clair River, Saginaw River/Bay, St. Marys River, Kalamazoo River, Muskegon Lake, and White Lake.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when monitoring data for two successive monitoring cycles indicates that water bodies in the AOC do not exhibit persistent, high levels of the following “unnatural physical properties” (as defined by Rule 323.1050 of the Michigan WQS) in quantities which interfere with the State’s designated uses for surface waters:

• turbidity	• foams
• color	• settleable solids
• oil films	• suspended solids
• floating solids	• deposits

For the purposes of this criteria, these 8 properties impair aesthetic values if they are unnatural – meaning those that are manmade (e.g., garbage, sewage), or natural properties which are exacerbated by human-induced activities (e.g., excessive algae growth from high nutrient loading). Persistent, high levels are those defined as long enough in duration, or elevated to the point of being injurious, to any designated use listed under Rule 323.1100 of the Michigan WQS.

Natural physical features which occur in normal ecological cycles (e.g., logjams/woody debris, rooted aquatic plants) are not considered impairments, and in fact serve a valuable role in providing fish and wildlife habitat.

Rationale

Practical Application in Michigan

Evaluation of aesthetic impairments can be subjective, with individuals having different perceptions about what constitutes a nuisance or impairment. The above criteria are focused solely on aesthetic impairments as they relate to water quality, and are consistent with Rule 323.1050 of the Michigan WQS.

In evaluating whether any of the 8 “unnatural physical properties” identified in the restoration criteria are causing an aesthetic impairment, the focus should be on whether it interferes with a waterbody’s designated use (as identified in Rule 323.1100 of the Michigan WQS). The persistence, frequency, and magnitude of the occurrence of these properties are a key part of the consideration regarding whether these problems are significant enough to warrant continued designation as an AOC.

323.1100 of the Michigan WQS). The persistence, frequency, and magnitude of the occurrence of these properties are a key part of the consideration regarding whether these problems are significant enough to warrant continued designation as an AOC.

1991 IJC General Delisting Guideline

When the waters are devoid of any substance which produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g., oil slick, surface scum).

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above describes application of specific criteria for restoration based on existing Michigan programs and authorities.

State of Michigan Programs/Authorities for Evaluating Restoration

Michigan assesses water bodies throughout the state on a 5-year basin rotation cycle according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations).

Selected water bodies are monitored for chemical and biological parameters including, nutrients, conventional parameters (i.e., temperature, conductivity, suspended solids, pH, dissolved oxygen), total mercury, and trace metals (i.e., cadmium, chromium, copper, lead, nickel, zinc), fish and benthic invertebrate communities. Other parameters may be included as appropriate at specific locations, including observations of "unnatural physical properties" in AOCs with this impairment. Data are reviewed each year to determine whether additional parameters should be added, removed, or analyzed at a greater or lesser frequency.

Some local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC chooses to use local monitoring data for the assessment of BUI restoration, the data can be submitted to the MDEQ for review. If the MDEQ determines that the data appropriately addresses the restoration criteria and meets quality assurance/quality control requirements, they may be used to demonstrate restoration success.