2013 REMEDIAL ACTION PLAN UPDATE

for the

LOWER MENOMINEE RIVER AREA OF CONCERN

DRAFT December, 2013

Wisconsin Department of Natural Resources
Office of the Great Lakes

Michigan Department of Environmental Quality
Office of the Great Lakes

Cover Photo:
A family enjoys the beach at Red Arrow Park, courtesy WDNR.

Disclaimer

The Great Lakes Water Quality Agreement (GLWQA) is a non-regulatory agreement between the United States and Canada which describes the commitment of each country to restore and maintain the chemical, physical, and biological integrity of the Waters of the Great Lakes and their intention to prevent further pollution and degradation of the Great Lakes Basin Ecosystem (GLWQA Protocol, 2012). The actions identified in this document are needed to meet beneficial use impairment (BUI) removal targets leading to the delisting of the Lower Menominee Area of Concern. These actions are not subject to enforcement or regulatory actions. Implementation of the recommendations described within should result in water quality and habitat benefits.

The actions identified in this 2013 Remedial Action Plan (RAP) Update do not constitute a list of preapproved projects, nor is it a list of projects simply related to BUIs or generally to improve the environment. Actions identified in this document are directly related to removing a BUI and are needed to delist the AOC.

Acknowledgments

We, the Wisconsin Department of Natural Resources and the Michigan Department of Environmental Quality, would like to acknowledge the many contributions of members of the Lower Menominee River Area of Concern (AOC) Citizen's Advisory Committee (CAC) and Technical Advisory Committee (TAC) in the development of this 2013 RAP Update, development of the Fish and Wildlife Population and Habitat Management Plan, previous RAPs, and development of public outreach materials and activities. CAC and TAC collaboration with state and federal agencies has resulted in materials and activities which reflect local issues and concerns.

2013 Remedial Action Plan Update
for the
Lower Menominee River Area of Concern

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EXECUTIVE SUMMARY

The Wisconsin Department of Natural Resources (WDNR) and the Michigan Department of Environmental Quality (MDEQ) share oversight of the Lower Menominee River Area of Concern (AOC). The *1990 Lower Menominee River Remedial Action Plan* (RAP) and the *1996 Lower Menominee River RAP Update* describe the historical activities that led to AOC designation, identify the beneficial use impairments (BUIs) for the AOC, summarize the status of those impairments, and offer recommendations for meeting environmental cleanup goals. The *2011 Lower Menominee River Stage 2 RAP* outlines a strategic plan for the removal of remaining beneficial use impairments (BUI), and is the primary tool needed to delist the AOC. The purpose of subsequent RAP updates, including this update, is to document progress made for the remaining BUIs since the 2011 Stage 2 RAP and their current status. Please review the 1990, 1996, RAP documents and 2011 Stage 2 RAP for more information.

Six of the potential fourteen BUIs were identified in the Lower Menominee River when it was designated an AOC. Significant upgrades to the City of Marinette's and City of Menominee's wastewater treatment plants have resulted in removal of the "restrictions on recreational contact" impairment, leaving only five impairments to be addressed (WDNR and MDEQ, 2011). Remaining impairments include: restrictions on dredging, degradation of benthos, restrictions on fish consumption, degradation of fish and wildlife populations, and loss of fish and wildlife habitat. Most of the impairments are influenced by the presence of contaminated sediment (Table 1). Arsenic, paint sludge, and coal tar, have been identified as the three most significant contaminants, although other more minor sediment contaminants exist. Log driving, urbanization, invasive species, habitat fragmentation, and stormwater discharges also contribute to the impairments. The cause(s) of the restrictions on fish consumption BUI is unknown and currently under investigation.

Significant progress has been made toward restoring the Lower Menominee River AOC relating to contaminated sediment:

- Paint sludge remediation was completed in 1995 by the Lloyd Flanders Furniture Company through Michigan Act 307 authority (WDNR, 1996).
- Wisconsin Public Service Corporation (WPS) completed remediation efforts at the coal tar site in early 2013.
- Tyco International is currently in the process of implementing the approved work plan to remediate arsenic contaminated sediment at the Ansul arsenic site.
- The City of Marinette and WDNR are developing plans to restore Menekaunee Harbor (Figure B, segment 6b and Figure D) including the removal of contaminated sediment and habitat improvements.
- Sediment characterization was conducted in the Lower Scott Flowage (Figure B, segment 1) through the Great Lakes Legacy Act, results are expected in 2014.

To remove all impairments, activities beyond the remediation of contaminated sediment sites are also required. Staff from the WDNR and the MDEQ completed an update to the existing fish and wildlife plan, titled the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013). This plan is the principal document needed to guide the removal of the "degradation of fish and wildlife populations" and "loss of fish and wildlife habitat" impairments. At this time, none of the five restoration goals contained in the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* have

been achieved. However, many activities contributing towards their achievement have either been completed or are in progress.

Significant milestones likely to be reached in 2014 include:

- Start of construction on the Menekaunee Harbor restoration project
- Results from the Lower Scott Flowage sediment characterization work
- Start of construction on the Park Mill Dam downstream fish passage and Menominee Dam upstream sturgeon passage facilities
- Additional progress on many projects including the fish consumption advisory assessment, island rookery habitat restoration, and fisheries data roundup

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List of Acronyms

[As]	Arsenic concentration
AOC	Area of Concern
BLM	Bureau of Land Management of the United States Department of the Interior
BUI	Beneficial Use Impairment
CAC	Citizen's Advisory Committee
CSO	Combined Sewer Overflow
FERC	Federal Energy Regulatory Commission
GLNPO	Great Lakes National Program Office
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Agreement
LAMP	Lakewide Management Plan
MDCH	Michigan Department of Community Health
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
NAH	North American Hydro Holdings
NAPL	non-aqueous phase liquid
NOAA	National Oceanic and Atmospheric Administration
NTCRA	Non-Time Critical Removal Action
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
ppm	parts per million
RAP	Remedial Action Plan
SPMD	Semi-permeable membrane device
TAC	Technical Advisory Committee
USACE	U.S. Army Corps of Engineers
USEPA	U. S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDHS	Wisconsin Department of Health Services
WDNR	Wisconsin Department of Natural Resources
WPS	Wisconsin Public Service Corporation

DEFINITIONS

Activity- A specific action or project that's completion will contribute towards the achievement of one or more objectives. Details regarding who will do the work, how it will be done, costs, location, and timeframe should also be included. Activities are listed in Table 2.

Area of Concern (AOC) - Defined by Annex 2 of the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement (GLWQA) as "geographic areas that fail to meet the general or specific objectives of the Agreement where such failure has caused or is likely to cause impairment of beneficial use or of the area's ability to support aquatic life." These areas are, or were, the "most contaminated" areas of the Great Lakes, and the purpose of the AOC program is to bring these areas to a point at which they are not environmentally degraded more than other comparable areas of the Great Lakes. When that point has been reached, the AOC can be removed from the list of AOCs in the Annex, or "delisted." The GLWQA can be found at: http://www.ijc.org/rel/agree/quality.html

AOC In Recovery - Annex 1 of the 2012 QLWQA states that, "A Party may elect to identify an AOC as an AOC in Recovery when all remedial actions identified in the RAP have been implemented and monitoring confirms that recovery is progressing in accordance with the RAP. A Party shall monitor and take further action, if required, to restore beneficial uses within an AOC in Recovery. A Party shall remove the designation of an AOC or AOC in Recovery when environmental monitoring confirms that beneficial uses have been restored in accordance with the criteria established in the RAP."

Beneficial Use Impairment (BUI)- Defined by the Great Lakes Water Quality Agreement (QLWQA) as a reduction in the chemical, physical, or biological integrity of the waters of the Great Lakes sufficient to cause impairment to a designated use (GLWQA, 2012). The Lower Menominee River AOC has five BUIs remaining including: restrictions on fish and wildlife consumption; restrictions on dredging activities; degradation of benthos; degradation of fish and wildlife populations; and loss of fish and wildlife habitat.

Beneficial use(s) are ways that a water body can improve the quality of life for people or for fish and wildlife. For example, providing habitat for fish and wildlife is a beneficial use of a water body. If a beneficial use is suppressed or unavailable due to environmental problems, like loss of habitat, then that beneficial use is considered impaired. The International Joint Commission provided a list of 14 possible beneficial use impairments in the 1987 amendments to the GLWQA.

Colonial Waterbirds- A term referring to a large variety of birds that gather in large assemblies called colonies or rookeries during the nesting season and are dependent on the water for food (fish or aquatic invertebrates). Examples include terns, gulls, pelicans, herons and egrets.

Restoration Target- Specific goals and objectives established to track restoration progress of beneficial use impairments. Once targets have been met, the beneficial use is no longer considered impaired. Targets should be locally derived. Working with the Lower Menominee AOC Citizens Advisory Committee, delisting targets were developed in partnership with the WDNR and the MDEQ. Wisconsin and Michigan use different criteria when assessing BUIs. The agencies and CAC agreed to implement the most restrictive criteria from either state when developing the Menominee AOC specific delisting targets.

Fish Consumption Advisory- Some fish from certain waterbodies contain harmful chemicals. These chemicals build up in the fish over time, and can build up in people when they eat the fish. WDNR and MDEQ routinely test fish and issue recommendations typically to "eat no more than" or "eat up to", on how much fish a person could eat based on protecting human health from contaminants which may be found in fish. Current Wisconsin and Michigan fish consumption advisories are available online at http://dnr.wi.gov/topic/fishing/consumption/ and www.michigan.gov/eatsafefish.

Great Lakes Restoration Initiative (GLRI)- A federal program that provides unprecedented funding for protection and restoration efforts on the five Great Lakes. State and local governments and non–profit organizations are eligible to receive grants from the U.S. Environmental Protection Agency (USEPA) for projects addressing toxic substances, invasive species, non–point source pollution, habitat protection and restoration or accountability, monitoring, evaluation, communication and partnership building.

Goal- Goals are broad ideas that may take a long time to achieve. They usually don't change significantly over the life of a project. An example goal statement is, "*Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC."* The delisting targets for the impairments may also be considered the goal statements (in some cases they may be objectives).

Lakewide Management Plan (LAMP)- A Lakewide Management Plan, or "LAMP", is a plan of action to assess, restore, protect and monitor the ecosystem health of a Great Lake. It is used to coordinate the work of all the government, tribal, and non-government partners working to improve the Lake's ecosystem. A public consultation process is used to ensure that the LAMP is addressing the public's concerns.

Natural Areas- A "natural area" is an area that currently has value as fish and wildlife habitat or has the potential to be restored so that it has value as fish and wildlife habitat. Natural areas can be publically or privately held, and can include wetlands or riparian lands within the AOC. Natural areas are not necessarily formally designated State Natural Areas.

Objective- Objectives are the detailed and quantitative components of a goal. They are important because they provide a means of measuring progress toward achieving a goal. Objectives should be SMART: Specific, Measurable, Achievable, Realistic, Time-Constrained. An example objective is, "Invasive, non-native species comprise no more than 33% of the vegetation community in protected natural areas of the AOC." Objectives are listed in Table 1.

Polychlorinated Biphenyls (PCBs)- A group of more than 200 compounds, PCBs have been manufactured since 1929 for uses including electrical insulation, hydraulics, fluorescent lights, and carbonless paper to name a few. In 1979, PCBs were banned because of their persistence in the environment and tendency to magnify up the food chain. They have been linked to reproductive problems in wildlife and are suspected of causing developmental problems in human infants.

Polycyclic Aromatic Hydrocarbons (PAHs)- Chemicals commonly associated with oils, greases, and other components derived from petroleum. Some PAH compounds have been identified as cancer or mutation causing.

Potamodromous- Truly migratory fish whose migrations occur wholly in freshwater.

Protected- A parcel may be considered "protected" by any agreement, ordinance, easement, or management plan which significantly limits the degradation of that parcel's value as fish or wildlife habitat for an approved length of time.

Remedial Action Plan (RAP)- A RAP is developed for each AOC to: identify the status of BUIs and their sources, document restoration targets, and list actions needed to reach those targets. RAPs are updated periodically to report progress towards achieving the restoration targets. This Plan along with the most current RAP Update for the Lower Menominee River AOC constitutes a complete strategy for removing all BUIs in the Lower Menominee River AOC.

Semi-Permeable Membrane Device (SPMD)- A passive sampling device used to measure concentrations of lipophilic (mixing more easily with oils than water) environmental pollutants like PCBs. SPMDs consist of "lay-flat" low-density polyethylene tubing containing a thin film of a pure, high molecular weight lipid. The tubing allows for the selective diffusion of the target compounds through the membrane which are then sequestered in the lipid. The compounds are extracted from the membrane and analyzed for components.

Figure A. The Lower Menominee River AOC as delineated by USEPA. Green Island, which was included in the AOC in the 1996 RAP, is not visible on this map, and is located approximately 5 miles east from Seagull Bar. The watershed inset includes the drainage area of major Menominee River tributaries including the Paint, Brule Michigamme, Pine and Sturgeon Rivers.

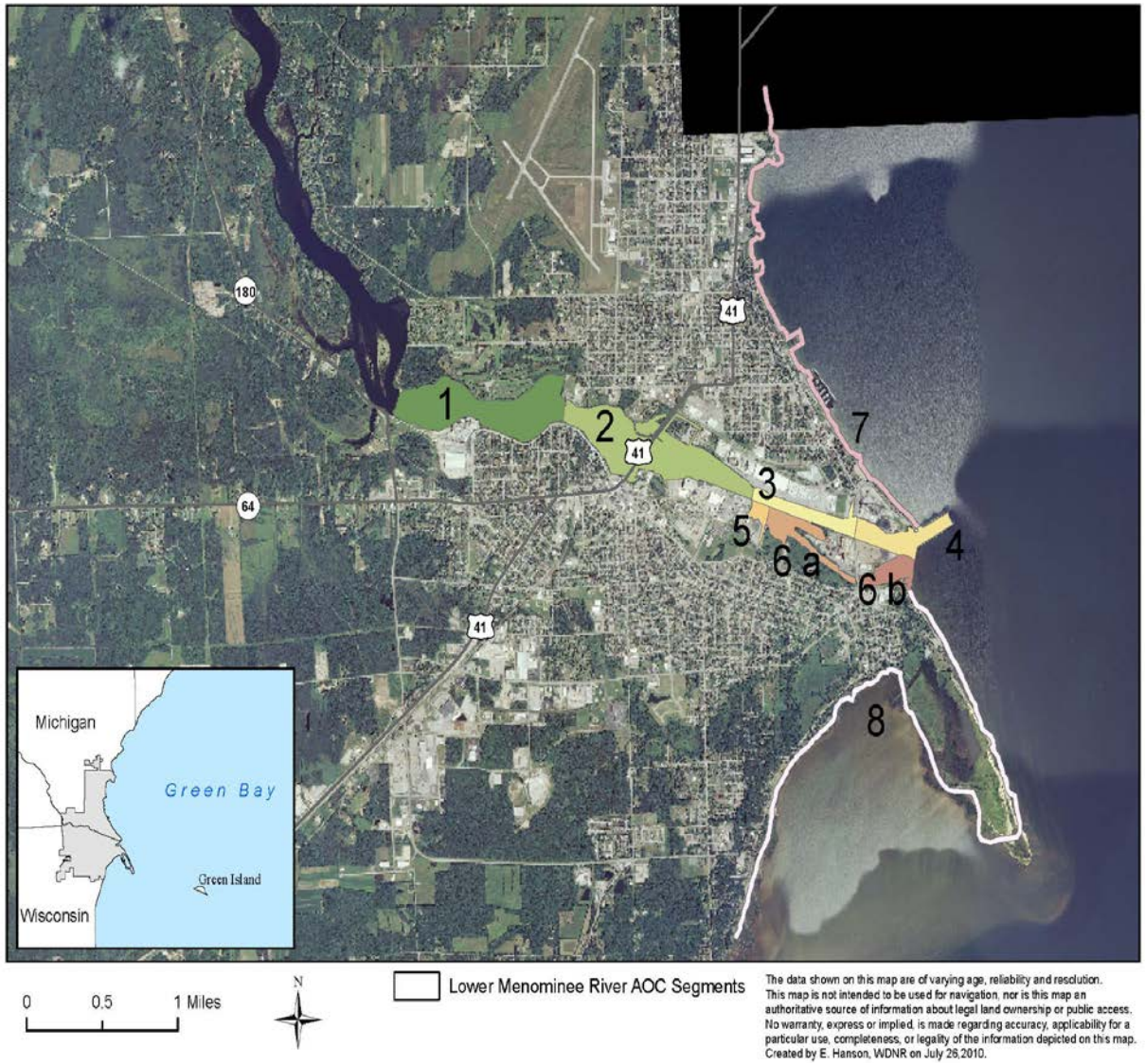

Figure B. Segments of the Lower Menominee River AOC. Used throughout this Plan, segment numbers are used to describe the general location of a place within the AOC. Green Island, seen in the map inlay, has not been assigned a segment number.

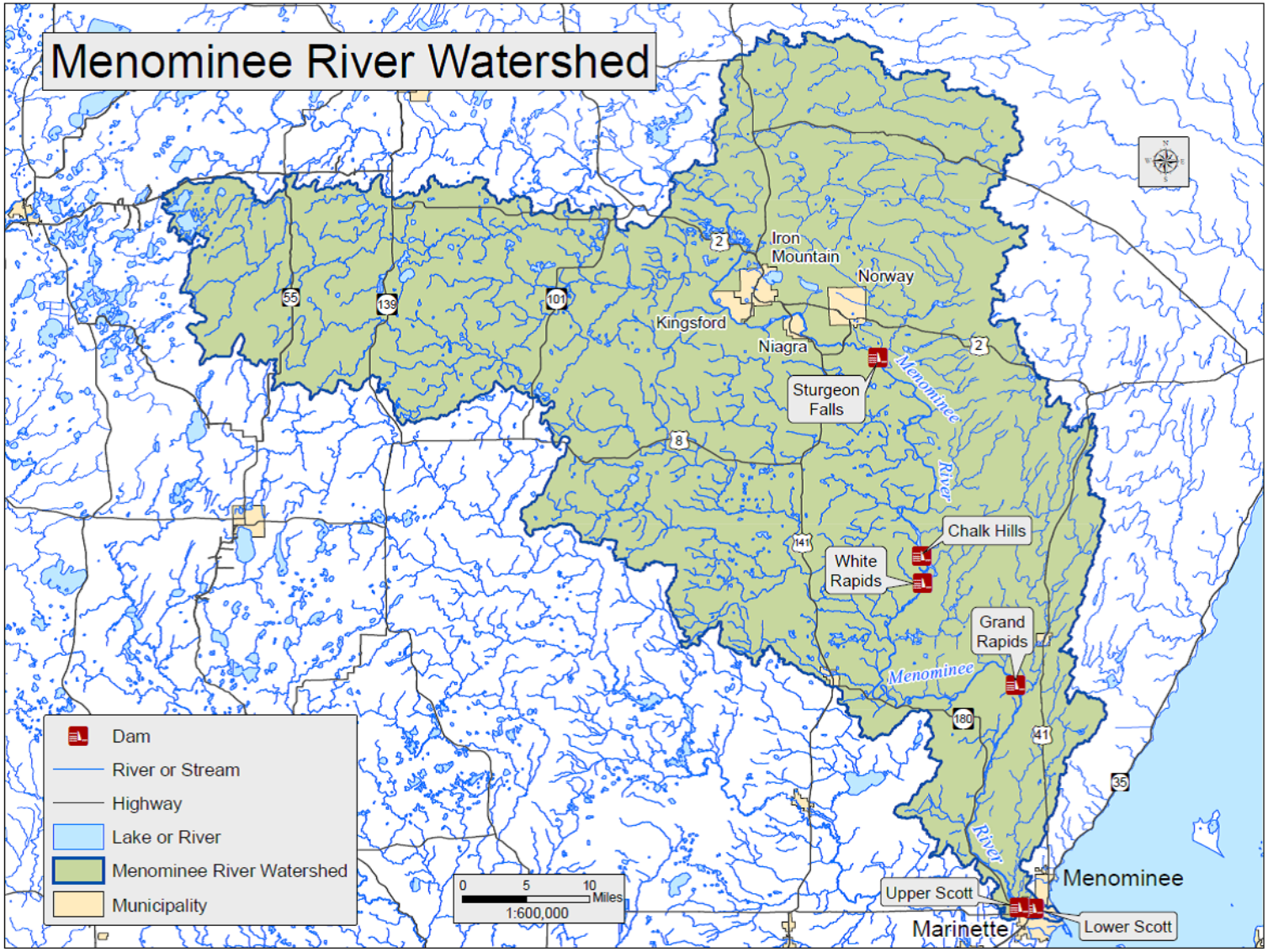

Figure C. Menominee River Watershed including tributaries and dams as they pertain to the Fish Passage Project. The Upper and Lower Scott Dams are commonly referred to as the Park Mill Dam and Menominee or Bridge Street Dams respectively.

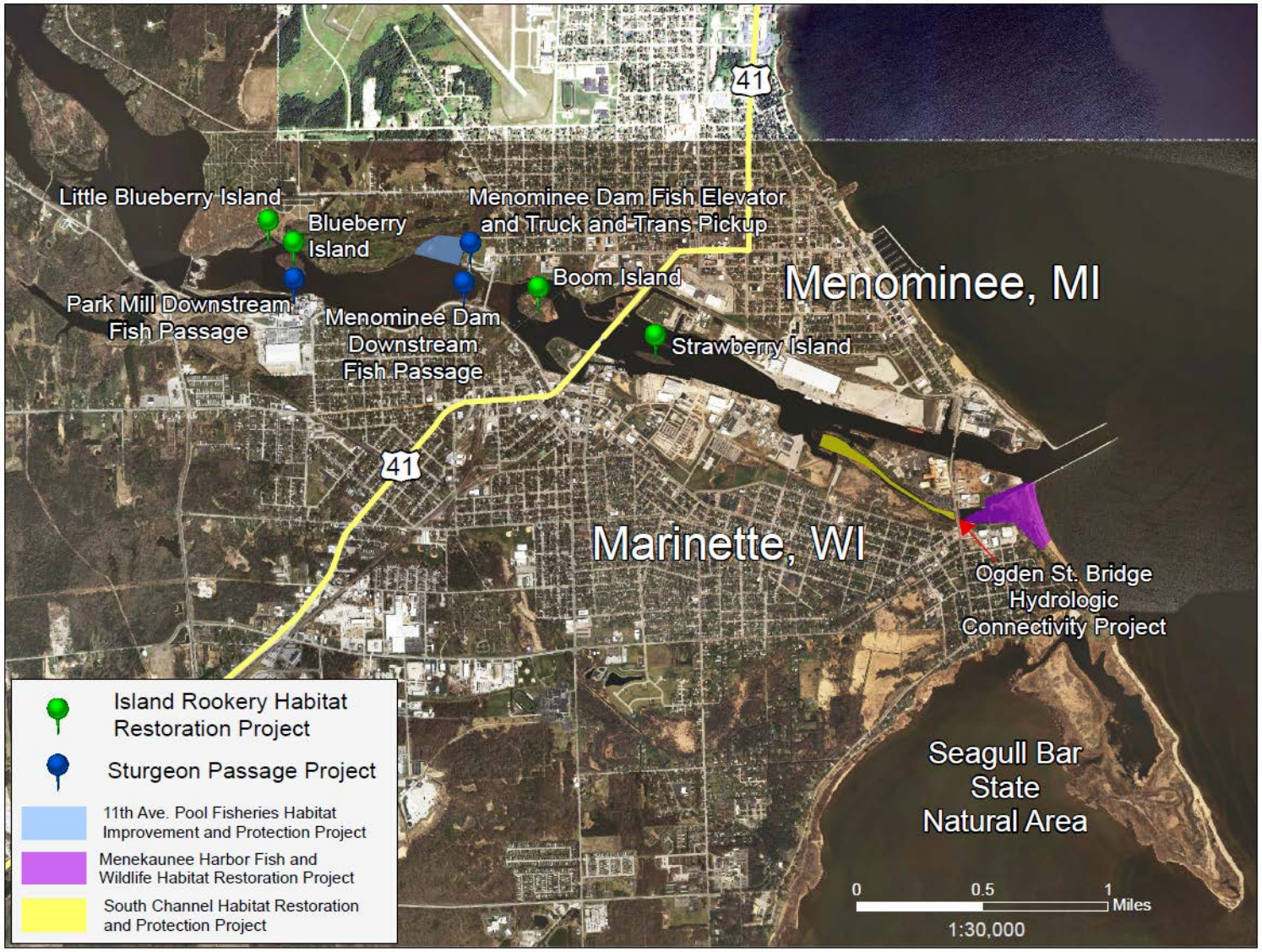

Figure D. Map of the habitat restoration and protection projects listed in Appendix C.

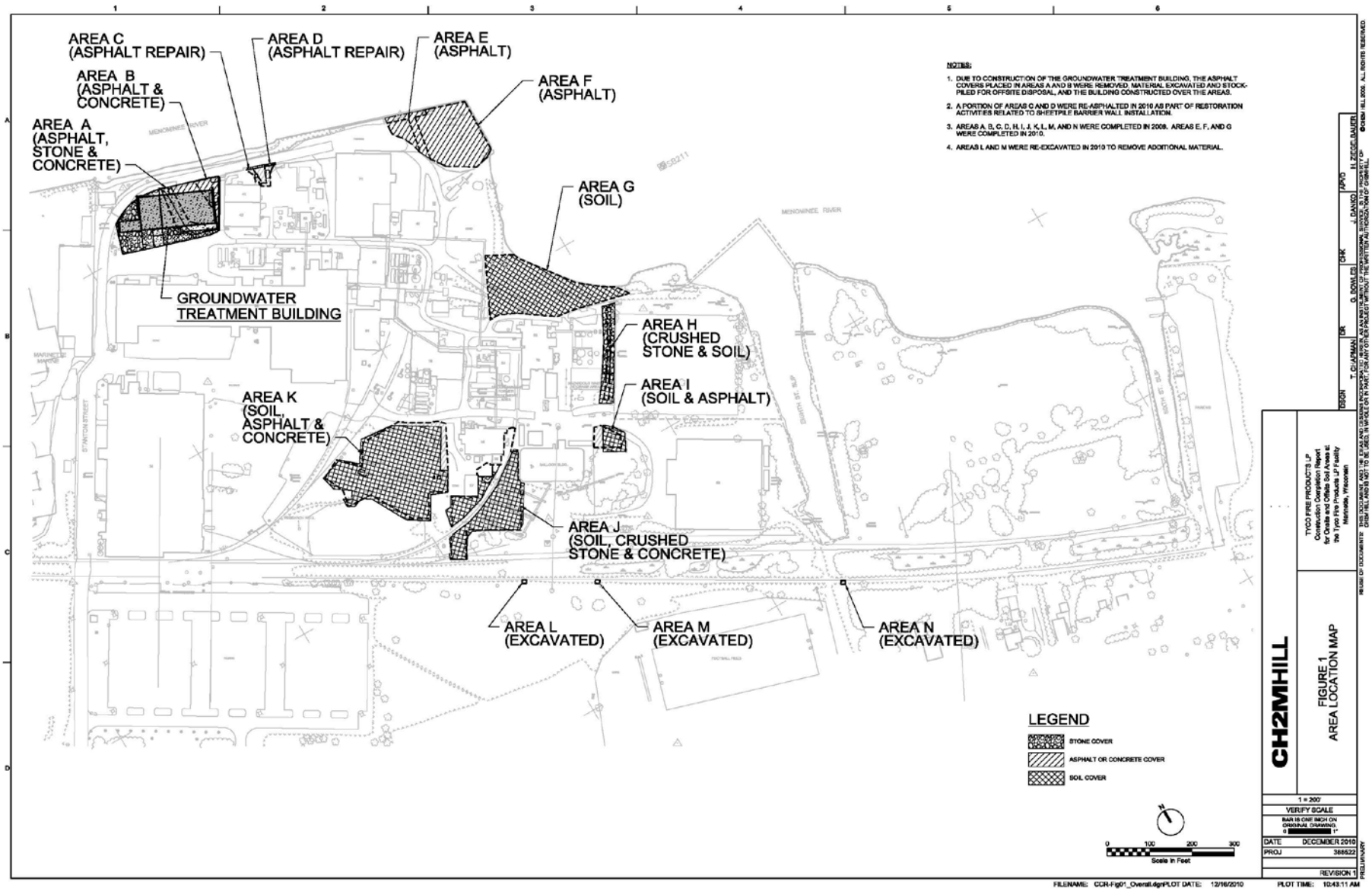

Figure E. Ansul arsenic site, locations of upland soil remedies.

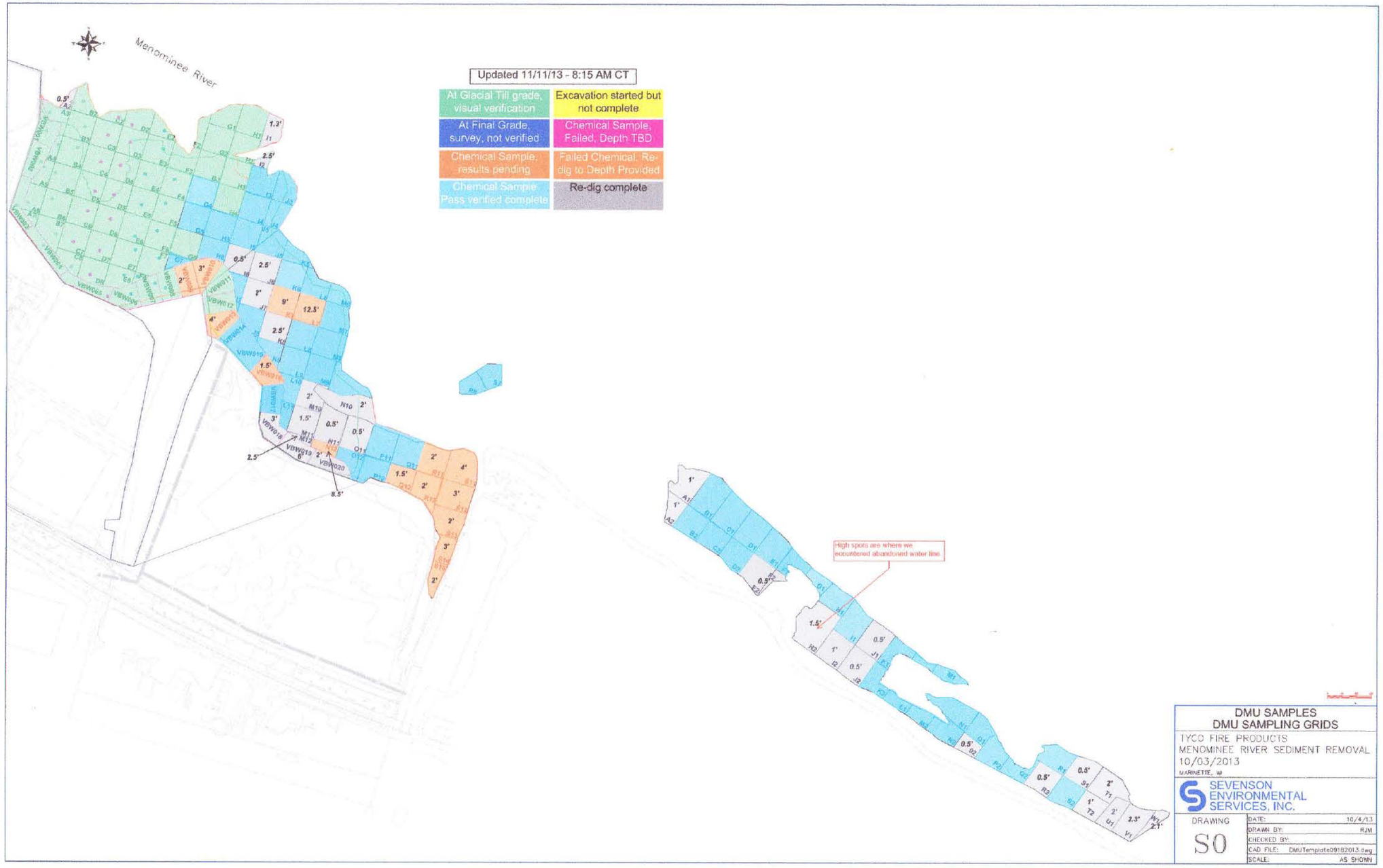

Figure F. Ansul arsenic site, current status of the removal of Menominee River arsenic contaminated sediment delineated by dredge management unit (DMU).

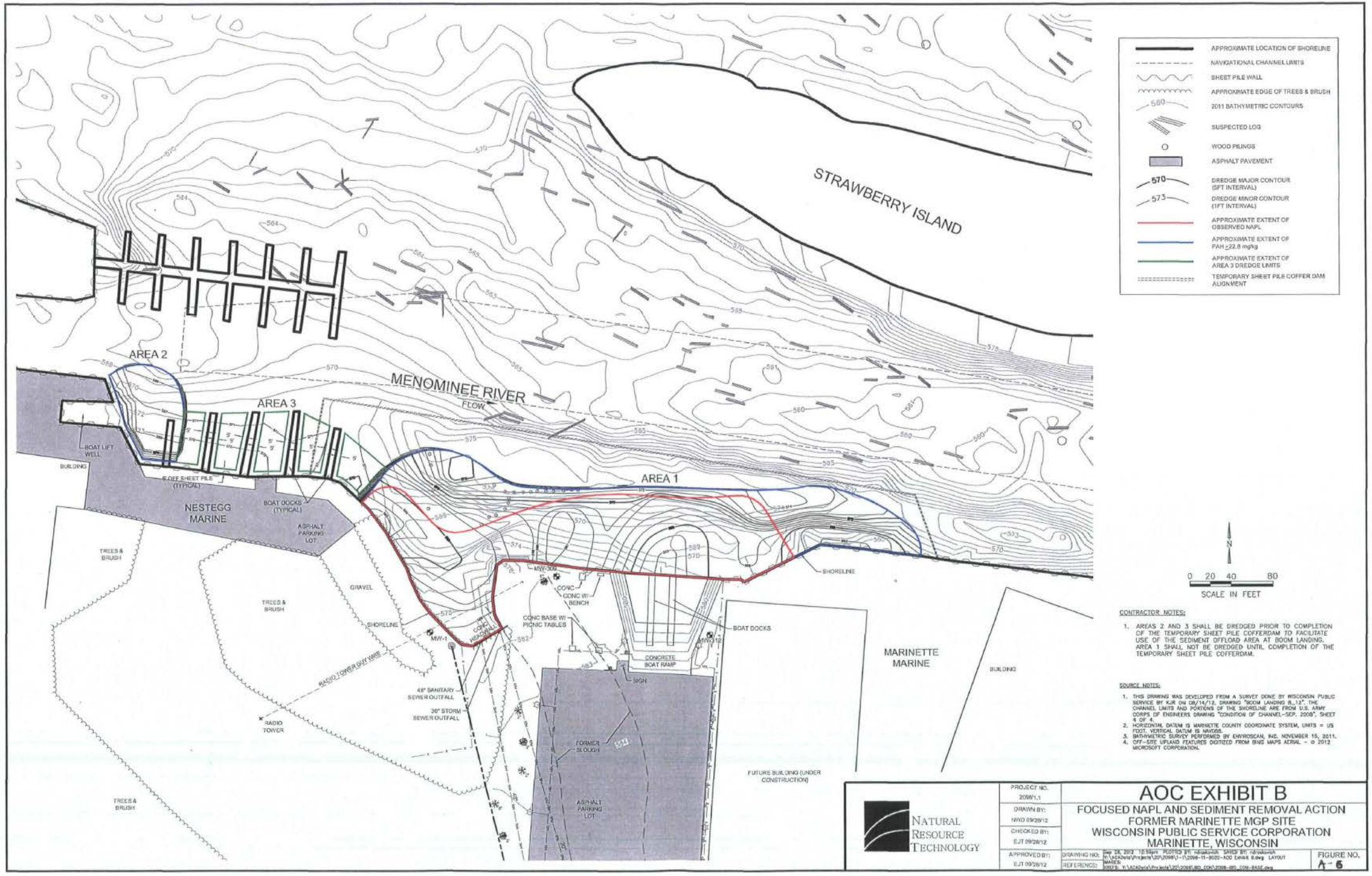

Figure G. WPS coal tar site, location of the NAPL (area 1) and PAH (areas 2 & 3) coal tar contamination. Note the steel sheet pile cofferdam was that was installed prior to the start of dredging.

INTRODUCTION

The Wisconsin Department of Natural Resources (WDNR) and the Michigan Department of Environmental Quality (MDEQ) share oversight of the Lower Menominee River Area of Concern (AOC). The *1990 Lower Menominee River Remedial Action Plan* (RAP) and the *1996 Lower Menominee River RAP Update* describe the historical activities that led to AOC designation, identify the beneficial use impairments (BUIs) for the AOC, summarize the status of those impairments, and offer recommendations for meeting environmental cleanup goals. The *2011 Lower Menominee River Stage 2 RAP* outlines a strategic plan for the removal of remaining BUI, and is the primary tool needed to delist the AOC. The purpose of subsequent RAP updates, including this update, is to document progress made for the remaining BUIs since the 2011 Stage 2 RAP and their current status.

Six of the potential fourteen BUIs were identified in the Lower Menominee River when it was designated an AOC. Significant upgrades to the City of Marinette's and City of Menominee's wastewater treatment plants have resulted in removal of the "restrictions on recreational contact" impairment, leaving only five impairments to be addressed (WDNR and MDEQ, 2011). Remaining impairments include: restrictions on dredging, degradation of benthos, restrictions on fish consumption, degradation of fish and wildlife populations, and loss of fish and wildlife habitat. Most of the impairments are influenced by the presence of contaminated sediment (Table 1). Arsenic, paint sludge, and coal tar, have been identified as the three most significant contaminants, although other more minor sediment contaminants exist. Log driving, urbanization, invasive species, habitat fragmentation, and stormwater discharges also contribute to the impairments. The cause(s) of the restrictions on fish consumption BUI is unknown and currently under investigation.

AOCs are severely degraded geographic areas within the Great Lakes. These areas, 43 within the Great Lakes region, were designated as AOCs primarily due to contamination of river and harbor sediments by toxic pollutants (sometimes referred to as "legacy" pollutants due to the historical industrial development that often was the source of the pollution). Cleaning up these severely degraded areas is a first step toward restoring the chemical, physical, and biological integrity of the lakes as required by the Great Lakes Water Quality Agreement (GLWQA). When AOCs have been cleaned up to the point where they are not more degraded than other comparable non-AOC areas, they are "delisted" or considered restored from the perspective of the AOC program. Former AOCs are then considered to be part of the Lakewide Management and Action Plan (LAMP) program, a "whole lake" program that is also set forth in the GLWQA. The Agreement provides the framework for the U.S. and Canada to work together to restore the chemical, physical, and biological integrity of the Great Lakes.

The Lower Menominee River AOC includes the lower three miles of the river from the Upper Scott Dam (Park Mill Dam) to the river's mouth (Figure A). The AOC Boundary extends north of the river mouth to John Henes Park and south of the river mouth past Seagull Bar along Green Bay. Green Island in Green Bay is part of the AOC because of its strong habitat value and biological link to Seagull Bar State Natural Area. There are six islands in the river within the AOC boundary. The AOC includes portions of Marinette County in Wisconsin and Menominee County in Michigan. Figure A shows the AOC boundaries and Figure C shows the entire Menominee River watershed.

Prior to combined sewer separation and wastewater treatment plant upgrades, the Menominee River received high loads of bacteria during combined sewer overflow (CSO) events (WDNR and MDNR, 1990). These CSO related bacteria loads led to the "restrictions on recreational contact" (beach closings) BUI. An extensive wetland complex near the mouth of the river was destroyed by log driving activities in the 1800s. Afterwards, wetlands and nearshore areas

surrounding the mouth of the River were filled for industrial expansion, and the shorelines hardened to prevent erosion or providing cargo vessel docking facilities. Remaining quality habitat and wetlands are threatened by encroaching invasive plants and access to spawning and juvenile habitat for potamodromous fish like lake sturgeon has been severely limited due to the lack of a safe passage beyond several dams (Figure C). The loss of historic wetlands has contributed to the “degradation of fish and wildlife populations” and the “loss of fish and wildlife habitat” impairment. There are additional unidentified toxic sources within or upstream of the AOC, as elevated levels of polychlorinated biphenyls (PCBs) and mercury can be detected in fish with no access to Lake Michigan (MDCH, 2011 and WDNR, 2013a). Unidentified toxic sources within the AOC result in the “restrictions on fish consumption” impairment.

Significant progress was made toward restoring the Lower Menominee River AOC in 2013. The “RECENT PROGRESS” section provides an overview of ongoing or recently completed projects.

Table 1: **Sources of Beneficial Use Impairments for the Lower Menominee River AOC.**

Beneficial Use Impairments	**Contaminated Sediments**	**Combined Sewer Overflow**	**Loss of Historic Wetlands**	**Loss of Historic Submerged Aquatic Vegetation**	**Loss of Historic Emergent Aquatic Vegetation**	**Unidentified Toxic Sources**	**Loss of Shoreline Habitat**
Restrictions on Dredging Activities	X						
Restrictions on Fish Consumption						X	
Degradation of Benthos	X						
Degradation of Fish and Wildlife Populations	X		X	X	X		X
Loss of Fish and Wildlife Habitat	X		X	X	X		X
Restrictions on Recreational Contact		X					

There may be additional unidentified toxic sources within or upstream of the AOC, as elevated levels of PCBs and mercury can be detected in fish upstream of the Lower Scott Dam. These sources are probably contaminated sediment. Lost historic wetlands include emergent, submergent, and riparian varieties. Also note that the “restrictions on recreational contact” BUI was removed in 2011 (WDNR and MDEQ, 2011).

RECENT PROGRESS

The current status of the AOC is strongly influenced by progress made since last RAP update. In particular, the progress made removing contaminated sediment was noteworthy. The status of each impairment is briefly summarized in Table 2, and Table 3 contains a summary of studies relevant to BUI status. For a more thorough status of each impairment see Appendix A and Appendix C. Progress on specific areas of interest is described below.

Ansul Arsenic Site

Tyco International, owners of Ansul Incorporated, is currently in the process of implementing an USEPA approved work plan to remediate arsenic contaminated sediment. Arsenic salts were produced as a byproduct of herbicide manufacturing between 1957 and 1977 and stored next to or discharged directly to the river (WDNR, 1996). The site includes segments 5 and 6a from Figure B. In 2009, Tyco signed an Administrative Order on Consent with the USEPA to remediate the site (USEPA, 2009). The administrative order requires Tyco to implement the remedy selected in USEPA's 2008 Statement of Basis and Final Decision Document for Ansul Inc. (USEPA, 2009). Many remedial activities were conducted before the Administrative Order on Consent was signed, see previous RAPs or the USEPA web page http://www.epa.gov/region5/cleanup/rcra/ansul/index.html for additional information.

Components of the selected remedy are summarized and listed below (USEPA, 2008), and include an informal status.

- Construct and maintain an impermeable below-ground barrier wall to control the flow of groundwater to the maximum extent practicable (Figure E).
  - Status: Complete with ongoing maintenance and monitoring as needed.
- Cap surface soils on-site with arsenic concentrations equal to or above 32 ppm (Figure E).
  - Status: Complete with ongoing maintenance and monitoring as needed.
- Remove surface soils near the railroads tracks with arsenic concentrations equal to or above 16 ppm (Figure E).
  - Status: Complete.
- Collect and treat shallow groundwater on-site. Utilize trees cultivated for high rates of evapotranspiration to further suppress the water table. Conduct a technical review of the latest science for treating groundwater containing large quantities of arsenic every five years.
  - Status: Complete with ongoing activities as prescribed. The first five year review is due in December 2013.
- Remove and properly dispose of all Menominee River soft sediments with arsenic concentrations equal to or greater than 50 ppm (Figure F).
  - Status: In progress, additional details below.
- Remove and properly dispose of all Menominee River semi-consolidated silts and clays with arsenic concentrations equal to or greater than 50 ppm (Figure F) or, if removal is technically or economically impractical, provide an alternative to removal that protects human health and the environment, is legally implementable, and achieves arsenic concentrations of 20 ppm or less by November 1, 2023.
  - Status: In progress
  - Removal began in July, 2012. Soft and semi-consolidated sediment containing total arsenic concentrations greater than or equal to 50 ppm were mechanically dredged using an environmental clamshell bucket and stabilized onsite (CH2MHILL, 2012). Stabilization was accomplished through the addition of a drying agent and chemical reagent (ferric sulfate and Portland cement). The stabilized soft sediment was then transported for disposal at an offsite nonhazardous landfill. Wastewater produced as

part of this process was treated by a series of filters and reverse osmosis to reduce arsenic concentrations, and then discharged to the river in accordance with the limits set forth in their WDNR wastewater discharge permit. If arsenic concentrations in wastewater could not be reduced to acceptable levels, reject wastewater was properly disposed of at an offsite hazardous waste facility. Tyco hoped to remove approximately 100,000 cubic yards of contaminated sediment in 2012, but when dredging ceased for the season, only 26,913 cubic yards of material had been removed from the River (Foth, 2012). Greater than expected amounts of large woody debris were encountered during dredging, which slowed progress and required additional screening/grinding steps during sediment processing. Dredging was halted for approximately 30 days while sediment stabilization protocols were modified to comply with the leachable arsenic (less than 5 ppm), free water, and shear strength requirements (CH2MHILL, 2012). The turning basin is also used by local shipping and ship building industries. Anytime it needed to be used dredging had to cease while turbidity control measures were moved.

- Mechanical dredging resumed in May, 2013. The quantity and size of equipment used has increased significantly since 2012. Larger pug mills were utilized to increase sediment treatment capacity and processing rates. An on-site shredder mitigated problems with wood debris. Dry ferric sulfate was substituted as the stabilizing reagent when treating soft sediment, reducing the amount of sediment that needed to be retreated in order to meet the leachable arsenic requirement. A mobile lab was brought in to increase sediment stabilization efficiency and reduce wait times for treatment results. Dredging ceased on November 15th. A total of, 216,250 cubic yards of contaminated sediment were removed from the river in 2013 (Foth, 2013). Confirmation sampling determined that the remedial action goals have been reached (Foth, 2013).

- Monitor remaining sediments natural recovery to a concentration of 20 ppm arsenic or less by November 1, 2023.
  - Status: Undetermined
  - Tyco, USEPA, and WDNR are discussing a Great Lakes Legacy Act betterment project to provide federal cost sharing to remove sediment contaminated with 50-20 ppm arsenic, but a decision has not been made. If a betterment project is pursued, natural recovery goals and monitoring requirements may be altered.

WPS Coal Tar Site

The site was first identified when the Marinette Waste Water Treatment Plant was expanded in 1989, and during this expansion surveyors discovered soils contaminated with coal tar and polycyclic aromatic hydrocarbons (PAHs) (WDNR and MDNR, 1990). Site investigations from 1994 to 2002 discovered approximately 4 acres of contaminated soil, and 1.3 acres of contaminated sediment in the nearby Menominee River. The source was determined to be a manufactured gas plant which operated up to 1960. WPS was found to be responsible for the remediation of contaminated soils and sediments. In August of 2012 WPS signed an Administrative Settlement Agreement and Order on Consent with the USEPA to complete non-time critical removal action (NTCRA) for this site (USEPA, 2012).

WPS has completed the federally approved NTCRA for this site. The cleanup goal for this site was to remove oil-coated sediment (non-aqueous phase liquid, NAPL) and sediment with concentration of PAHs greater than 22.8 ppm (Figure G). A total of 15,028 cubic yards of contaminated sediment was removed from the Menominee River, processed and delivered to Waste Management Landfill in Menominee, Michigan for disposal (NRT, 2013). Confirmation sampling found some residual contamination to be irretrievably intermingled with the uneven bedrock surface. To protect benthic organisms, ten inches of clean sand cover was placed over these areas (NRT, 2013). Reactive core matting was installed around the outfall structure and former slough to the river. The matting was installed to keep upland contamination that was unable to be removed from migrating into the river (NRT, 2013). Upland source contamination

will be further investigated and potentially remediated in the future. A long term monitoring and maintenance plan for the sand cover is being developed. More information on the WPS coal tar site remediation is found in the 1990, 1996, and 2011, RAPs and the USEPA webpage http://www.epa.gov/region5/cleanup/marinette/.

North American Hydro Dam Relicensing & Sturgeon Passage

North American Hydro Holdings (NAH) is the owner/operator of two hydroelectric dams within the AOC. Both dams, Park Mill (Upper Scott) and Menominee (Lower Scott or Bridge Street), are scheduled for relicensing by the Federal Energy Regulatory Commission (FERC) in 2015. As part of a relicensing agreement, NAH has funded assessments of the fisheries community, fish tissue contaminant burden, sediment contamination, native mussel community, riparian and aquatic vegetation, wetlands, archeological resources, endangered resources, erosion, and water quality within their areas of responsibility. The results of these studies are included as appendices in the *Final License Application for the Menominee – Park Mill Hydro Project* (NAH, 2013). Through the relicensing process, NAH is working with State and Federal Agencies to facilitate lake sturgeon passage above the Upper and Lower Scott Dams (Figure C and Figure D). Downstream passage for all fish species will also be accomplished through this effort. The Fish Passage Project was originally to be implemented in four phases, but phase language has been dropped.

Park Mill Dam downstream fish passage will be accomplished by installing an angled bar rack in front of the turbine intake to redirect fish moving downstream from the Upper Scott Flowage into a chute leading to the tailrace below (USFWS, 2012). Upstream sturgeon passage will be accomplished by building a fish elevator into one of the existing empty turbine bays of the Menominee Dam to lift and sort adult lake sturgeon (USFWS, 2012). As sturgeon are sorted, biologists will check for fish health or disease and remove any invasive species including sea lamprey. Sturgeon to be passed upstream will be loaded into a tanker truck and transported to a release point above the Park Mill Dam. Menominee Dam downstream fish passage will use technology similar to the Park Mill Dam to redirect fish into a chute carrying them downstream of the Lower Scott Dam (USFWS, 2012).

Over four million dollars in funding from the Great Lakes Restoration Initiative (GLRI) and NAH contributions have been dedicated to the project. Funding is still required to complete Menominee Dam downstream fish passage and the upstream truck and transfer activities. Design work was completed by the USACE for downstream fish passage at the Menominee Dam in 2013. Construction was scheduled to begin during the summer of 2013, but was postponed while liability and long term maintenance issues were resolved. Construction is now planned for 2014 and 2015. A temporary downstream passage gate will be installed in the Menominee Dam if permanent passage is lagging behind other project aspects.

Green Island

Green Island is an approximately 80 acre privately owned island located 5 miles east of Seagull Bar State Natural Area (Figure B). Green Island was identified as critical wildlife habitat in the 1990 RAP, and included within the boundaries of the AOC to facilitate bird population recoveries. The CAC and TAC support public acquisition of the island for conservation purposes. Public acquisition of Green Island, or other conservation easements, is not required to achieve the removal of any impairment to the AOC. In 2011, a plan to fully develop the Island as vacation housing and a resort was proposed by the island's owner. No development has begun to date. Environmental and archeological considerations remain an issue (Schiefelbein, C. L. 2013). In August 2013, the *Peshtigo Times* reported that the Island's owner had requested permission from the City of Marinette to have an archeological investigation take

place at Red Arrow Park ("Marinette Board Oks", 2013). Red Arrow Park is the proposed location for an underground power supply cable to the Island from Marinette.

Menekaunee Harbor Restoration

Sediment quality and fish and wildlife habitat in the Harbor is degraded as a result of many years of industrial and urban activities. Contamination is not as high as other segments of the AOC, but elevated concentrations of metals, PAHs, and nutrients have been reported (Weston Solutions, 2008). Menekaunee Harbor is an important component of the environmental corridor, as a midpoint between the South Channel and Seagull Bar State Natural Area (Figure B, segment 6b and Figure D). Habitat improvements here would improve the connectivity between all three sites and the overall habitat value to fish and wildlife.

The WDNR and the City of Marinette began work with the City's engineering consultant to develop plans to remove contaminated sediment, improve navigational and recreational opportunities, and restore fish and wildlife habitat in Menekaunee Harbor in 2013. This effort formally started in 2011 when the partners entered into an intergovernmental agreement for this work (WDNR, 2011). WDNR and the City are fully funding plan development, estimated to cost $422,000, and have requested GLRI funding from the USEPA to implement the plans in 2014. The WDNR and City of Marinette will also contribute approximately $860,000 and $460,000 respectively towards construction. Plans are still under development, but are expected to be ready by January, 2014. If funding from the USEPA is available, construction could begin as early as April, 2014.

Lower Scott Flowage Sediment Characterization

The Lower Scott Flowage (Figure B, segment 1) has not been comprehensively sampled for environmental contaminants in the sediment. In 2012, the MDEQ conducted a semi-permeable membrane device study on the Menominee River Watershed, some net uptake of PCBs was observed just downstream of the Menominee Dam, indicating that sediments in either the Lower or Upper Scott Flowage, or both, are a relatively small source of PCBs (MDEQ, 2012b). A sediment study completed for NAH as part of the FERC relicensing process, indicated some metal contamination exists within the flowage (NAH, 2012). The WDNR and MDEQ publish a fish consumption advisory for the Lower Scott Flowage for PCBs and mercury based on fish tissue analysis (MDCH, 2011 and WDNR, 2013a).

The WDNR formally requested that USEPA GLNPO characterize flowage sediment through the Great Lakes Legacy Act. The request was accepted and sampling was conducted in November 2013. Thirty-one surface grab samples and eight depth core samples were collected, including samples taken from the Upper Scott Flowage for comparison. Parameters being analyzed for include PCBs, PAHs, pesticides, metals, and sediment physical properties. Results are expected in 2014.

Fish Consumption Advisory Assessment

In 2011 the Michigan Department of Community Health (MDCH) received grant funding from the USEPA through the GLRI to assess the status of the "restriction on fish consumption" BUI in several Michigan AOCs. The assessment will compare the concentrations of key contaminants in common carp (*Cyprinus carpio*) and smallmouth bass (*Micropterus dolomieu*) collected from two areas within the AOC and from Little Bay de Noc, the selected reference site. All tissue samples will be analyzed for mercury, total PCBs, and the standard suite of contaminants normally measured for the MDEQ fish contaminant monitoring program. Samples of one species of fish from the Lower Scott Flowage and from below the Menominee Dam will be analyzed for dioxin, furan, and dioxin-like PCB congeners. A sampling plan for the Lower

Menominee River AOC was developed with feedback from WDNR and other stakeholders, which contains the rational for selecting target fish species and reference sites (MDEQ, 2012a).

Fish tissue collections were conducted in 2012 and 2013 in the AOC in conjunction with other planned WDNR activities. Inadequate numbers of common carp, which are critically import as they represent a “worst case scenario” in regards to PCB contamination (MDEQ, 2012a), were available for collection in the Lower Scott Flowage. WDNR fisheries staff believe adequate carp are found in the flowage, but are less available during cold spring and fall months when sampling was conducted. A targeted collection is planned for the summer of 2014 when carp are more vulnerable to electrofishing.

Island Rookery Habitat Restoration

The Great Lakes Commission and MDEQ hired NES Ecological Services to mechanically and chemically control invasive, non-native buckthorn (*Rhamnus* spp.), honeysuckle (*Lonicera* spp.), and wild grape vine (*Vitis* spp.) on islands within the AOC. Strawberry Island, Blueberry Island, Little Blueberry Island and Boom Island were included in the effort (Figure D). Work was completed during October and November, 2013. Property owners, and other stakeholders, assisted with project scoping and development. Work under this contract will cover the first year of a three year effort to enhance colonial bird nesting habitat in the AOC.

Fisheries Data Roundup

In 2012, a team of fisheries experts from MDNR, WDNR, and the USFWS were assembled to review existing fisheries data for the AOC. The project team selected metrics to assess recruitment, and then set recruitment goals based on the evaluation metrics (WDNR, 2013b). When existing data was not available, inadequate, or not comparable, the team recommended the collection of additional fisheries data. In 2013, additional data was collected for the Lower Scott Flowage lower river section (Figure B segments 2-8), and two reference sites. Additional data will be collected for the selected reference sites and lower river in 2014 and 2015. Project results will help steer habitat restoration efforts and will assess the status of two objectives of the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update (WDNR and MDEQ, 2013).*

Table 2: Lower Menominee River Beneficial Use Impairment Status Summary (refer to Appendix A and Appendix C for more detail).

Beneficial Use Impairment	Impaired?	Summary of Status and Next Steps
Restrictions on Dredging	Yes	Two of four known contaminated sediment sites (Lloyd Flanders paint sludge and WPS coal tar sites) have been remediated. Cleanup is underway at a third site (Ansul arsenic site). The remaining site (Menekaunee Harbor) is expected to begin remediation in 2014, pending adequate funding. Sediment samples from the Lower Scott Flowage were collected and are being analyzed. A sediment investigation is being planned for Rio Vista Slough. A dredge management delineating restrictions that must remain in place is also required to remove this BUI.
Restrictions on Fish Consumption	Yes	MDCH and MDEQ are conducting a statewide fish consumption advisory assessment that will compare fish tissue contaminant levels in Michigan AOCs, including the Menominee River, to non-AOC reference sites. MDCH, MDEQ, and WDNR will review fish tissue assessment results to determine impairment status when the study is complete, 2014 or 2015.
Degradation of Benthos	Yes	Two of four known contaminated sediment sites (Lloyd Flanders paint sludge and WPS coal tar sites) have been remediated. Cleanup is underway at a third site (Ansul arsenic site). The remaining site (Menekaunee Harbor) is expected to begin remediation in 2014, pending adequate funding. Sediment samples from the Lower Scott Flowage were collected and are being analyzed. A sediment investigation is being planned for Rio Vista Slough.
Degradation of Fish and Wildlife Populations & Loss of Fish and Wildlife Habitat	Yes	Final restoration goals, objectives, and activities are contained in the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update*. Many field studies have been completed and habitat restoration and protection projects are in progress *(WDNR and MDEQ, 2013)*.
Restrictions on Recreational Contact	No	Source control was achieved. Recommendation to remove impaired status approved by GLNPO in March, 2011 (WDNR and MDEQ, 2011).

Table 3: A summary of environmental studies relevant to the Lower Menominee River AOC.

Study	Data Gathering	Data Review	Potential Data Uses	BUI Removal Effort Benefited	Results Available
aquatic vegetation survey	WDNR, MDEQ	WDNR MDEQ,	determine the extent and diversity of aquatic flora in the AOC	degradation of fish and wildlife habitat	(Onterra, 2010)
FERC required sediment sampling	NAH	WDNR MDEQ NAH	detect metals, mercury, PCBs, and PAHs	restrictions on dredging activities, restrictions on fish consumption, degradation of benthos	(NAH, 2013)
fish consumption advisory assessment	MDCH MDNR WDNR	MDCH MDEQ WDNR	compare mercury, metals, pesticides, and PCBs in AOC caught fish tissue to those at a reference site	restrictions on fish consumption	2015
fisheries data roundup	WDNR	WDNR MDEQ	evaluate evidence of recruitment for appropriate fish species	loss of fish and wildlife populations	2015
Lower Scott Flowage sediment characterization	USEPA	USEPA WDNR	detect metals, mercury, PCBs, and PAHs	restrictions on dredging activities, restrictions on fish consumption, degradation of benthos	2014
mussel survey	NAH	WDNR MDEQ	qualitatively determine the extent and diversity of native mussels in the AOC	loss of fish and wildlife populations	(WDNR, 2012)
NOAA mussel watch program	NOAA	NOAA WDNR MDEQ	detect contaminants in mussel tissue and sediment	restrictions on fish consumption	unpublished
riparian vegetation survey	WDNR	WDNR MDEQ	determine the extent and diversity of terrestrial flora in the AOC	degradation of fish and wildlife habitat	(NES, 2012)
semi-permeable membrane device study	MDEQ	MDEQ WDNR	detect PCBs, pesticides,	restrictions on dredging activities, restrictions on fish consumption, degradation of benthos	(MDEQ, 2012b)
USGS benthos and plankton assessment	USGS	USGS WDNR	assess benthic conditions	degradation of benthos	unpublished
USGS swallow study	USGS	USGS WDNR MDEQ	evaluate reproductive success rates and tissue contaminant concentrations	loss of fish & wildlife populations	unpublished

STAKEHOLDER ENGAGEMENT AND OUTREACH

The Citizens Advisory Committee (CAC) was formed as a means of incorporating stakeholder feedback into the RAP documents and to serve as ambassadors on AOC issues to the Marinette and Menominee communities. CAC members help the agencies by: identifying local issues, developing local targets and goals, serving as a resource for historical information, and assisting in project implementation when possible. The CAC developed governing bylaws in June of 2011 to ensure the committee's long term viability and balanced representation of the community. As of December 2013, there are eleven membership positions filled of a possible twenty-six. Dozens more individuals have attended monthly meetings and currently receive meeting minutes and AOC updates through e-mail. The WDNR and MDEQ strongly prefer that requests to remove the impaired designation of a BUI be agreed to by the CAC. The CAC has included a letter of support for this document as Appendix B.

The CAC holds regular meetings on the UW-Marinette campus open to all interested parties. Meetings are advertised through the WDNR Open Meeting Calendar, CAC/TAC list serve, and other means. Nine meetings of the CAC were held in 2013. Meetings are the primary way members of the CAC stay informed and provide input on AOC activities. In addition to meetings, the CAC has: participated in on-site tours for the sturgeon passage project, the Ansul arsenic, and WPS coal tar remediation sites; reviewed documents and provided letters of support for AOC related projects; provided local representation or feedback at various state and federal AOC workshops, trainings, and meetings; and participated in state and federal AOC related conference calls.

The informed CAC plays a critical role in conducting community outreach. Table 4 lists community outreach activities ongoing or completed in 2013. Members of the CAC actively manage and present the AOC foldout educational display at community events including the Menominee Waterfront Festival and Audubon Society's International Migratory Bird Day. Print copies of the display travel between UW-Marinette, local public libraries, and governmental buildings. Four Members of the CAC provided interviews for a short video on the Menominee River AOC. Short videos on AOC related topics are seen as a way to efficiently reach a large, broad audience. Videos can easily be distributed online through agency websites, and shared through social media outlets. New videos will be pursued to cover additional topics in the AOC as needed. Existing videos pertaining to the Lower Menominee River AOC are available below as examples:

- Lower Menominee River AOC Video
- Menominee River Sturgeon Passage
- USGS Swallow Contaminant Study
- Controlling Phragmites along the Lake Michigan Shoreline

Table 4: Community outreach activities ongoing or completed in 2013 to help keep the local community, businesses, and tourists updated and supportive of projects, and aware of needed actions on their part.

MEDIA	TARGET AUDIENCE	MESSAGES	ACTIVITY LEAD	COLLABORATORS	FUNDED BY
Traveling Educational Display & Materials	General public, tourists, people attending Marinette/Menominee community events	The Lower Menominee River is an AOC. Details on major restoration and cleanup projects. The CAC and how they can be involved.	CAC	WDNR, UW-Extension, MDEQ, Marinette County Land Water Conservation Division	2011 MDEQ capacity grant, display and accessories 2012 WDNR CAC capacity grant, design printing of updated panels
Lower Menominee River AOC Video	General public, internet users	Many partners have put a lot of effort into restoring the Lower Menominee River, restoration is nearly complete.	WDNR	CAC, Nest Egg Marine, WPS, UW-Extension	2013 WDNR CAC capacity grant
***2013 Northwoods Journal* Article**	Readers of the *Northwoods Journal,* environmentally interested tourists and general public	Many partners have put a lot of effort into restoring the Lower Menominee River, restoration is nearly complete.	Marinette County Land Water Conservation Division	WDNR	Marinette County Land Water Conservation Division

Next action(s) needed

CAC capacity grant funding should be sought from either MDEQ or WDNR to continue presenting and updating the interpretive kiosks, boat launch signs, and traveling educational display on an as needed basis. Expected funding need ranges between $2,000 and $10,000 annually. Funding should also be sought to produce short films on the AOC for web based distribution, costing approximately $1,000 per finished minute of video. Agencies and the CAC should continue to invite members of the press to CAC meetings, and encourage local media coverage of progress in the AOC.

BENEFICIAL USE IMPAIRMENT UPDATES

The following pages summarize the current status of each Beneficial Use Impairment using the format below. An explanation of each section is provided after the heading.

Restoration Target and Status

Beneficial Use Impairment Name	Status
The 2008 Lower Menominee River AOC Beneficial Use Impairment Restoration Targets (WDNR and MDEQ, 2008) are listed here as separate target components on each row to clearly show the status of each part of the target.	May be: • "Complete" • "Assessment in progress" • "Incomplete" • "Incomplete, in progress"

Target Concerns

This section may discuss one or more of the following:

- potential concerns about the target, particularly if the target is not specific enough to define a measurable endpoint for the BUI
- if revisions are anticipated and how such changes might be approached including responsible party and timeline
- if the 2008 target was modified and details of any changes

PLEASE NOTE: The MDEQ and WDNR have established that when a disagreement regarding restoration targets arose, the more restrictive target would be used.

Rationale for Listing

The section briefly summarizes the reason the BUI was known or suspected at the time of listing. If sources contributing to the impairment have been identified since listing, those are included in this section as well.

Summary of key remedial actions since the 2011 Stage 2 RAP and current status

"Key remedial actions" are those that directly contributed to the current status of the BUI. A table may be included as an appendix, or reference made to the "RECENT PROGRESS" section to capture a detailed list of past projects. The narrative here explains and leads to the "Next action needed."

Next action(s) needed

This section is a narrative listing of assessments, on-the-ground projects, and stakeholder engagement processes that are clearly delineated and directly address the specific BUI. Plans for verifying achievement of delisting targets are listed here if known.

Issues (challenges, risks) affecting progress on this BUI

This section lists project contingencies (i.e., one thing has to happen before another can occur), funding obstacles and any other considerations that could affect the timeline for delisting.

RESTRICTIONS ON DREDGING ACTIVITIES

Restoration Target and Status

Restrictions on Dredging Activities	Status
All remediation actions for known contaminated sediment sources are completed and monitored according to the approved remediation plans and the remedial action goals have been achieved; and	Incomplete, in progress
An AOC dredge management plan is developed by the communities and agencies that includes an evaluation of: o Restrictions that must remain in place to protect human health and the environment o Restrictions that must remain in place due to RCRA requirements that are based upon state and federal law o Priority areas for navigational use o Priority areas for utility dredging, e.g. utility crossings o Identify costs and funding options for removing dredging restrictions in priority areas	Incomplete

Target Concerns

The MDEQ and WDNR have established that when a disagreement regarding restoration targets arose, the more restrictive target would be used. In this case, MDEQ normally considers only federally designated navigational channels when assessing this impairment (WDNR and MDEQ 2008), while WDNR considers dredging impairments throughout the AOC. The entire AOC will be considered per interstate agreement above.

Rationale for Listing

Any location within the AOC where the presence of contaminated sediment increases dredging costs and limits dredge spoil disposal options contributes to the listing of this impairment. The Lower Menominee River is classified as a federal navigable harbor and is used as a diversified cargo port and shipyard. Dredging activities are restricted due to the presence of toxic contaminants in the river's sediments. Their presence increases dredging costs and limits dredge spoil disposal options. The shipping channel in the Lower Menominee River and Harbor has been regularly dredged since 1982. Dredged spoils have been deposited into the open waters of Lake Michigan in Michigan's waters. However, the turning basin was not dredged at that time because of increased costs and limited dredge spoil disposal options from the arsenic contamination. The contamination was so severe that sediments from this portion of the river could have been classified as a hazardous waste if an attempt were made to remove them via dredging (WDNR, 1996). Sites that at one time contributed towards the listing of this impairment include the Ansul arsenic site, WPS coal tar site, Lloyd Flanders paint sludge site, and Menekaunee Harbor. The Lower Scott Flowage and Rio Vista Slough will be investigated to determine if they are also contributing to this impairment.

Summary of key remedial actions since the last RAP and current status

The Lloyd Flanders paint sludge site was successfully remediated in 1995, see the *1996 Lower Menominee River Remedial Action Plan* for more information. Remediation of the WPS coal tar site was completed in early 2013 (NRT, 2013). Remediation of the Ansul arsenic site is currently underway and planning efforts are in progress related to Menekaunee Harbor.

Efforts are underway to identify any unknown sources of contamination to the AOC. In November, sediments samples were collected by GLNPO's contractor in the Lower Scott Flowage, results are expected in 2014.

See the "RECENT PROGRESS" section for a detailed account of the status of these activities.

Next action(s) needed

- Compete the removal of arsenic impacted sediment (50-20ppm arsenic) through the proposed Great Lakes Legacy Act betterment project, or monitor the remaining sediments natural recovery to a concentration of 20ppm arsenic or less
- Remove contaminated sediment from Menekaunee Harbor
- Review results of USEPA GLNPO Great Lakes Legacy Act sediment characterization work in the Lower Scott Flowage and determine if further action is needed
- Plan and conduct sediment characterization work in Rio Vista Slough, and determine if further action is needed
- Develop an AOC dredge management plan focusing on priority areas for future dredging and dredging restriction that must remain in place

Issues (challenges, risks) affecting progress on this BUI

If all partners do not come to an agreement and a betterment action is not pursued, Tyco has until November 1, 2023 to monitor the natural recovery of arsenic contaminated sediments to 20 ppm or less (USEPA, 2008). The WDNR and MDEQ will not consider BUI removal until all components of the selected remedy have been met. Additional funding is needed to complete the Menekaunee Harbor restoration project, but has been pledged by the USEPA through GLRI. If sediment investigations in the Lower Scott Flowage or Rio Vista Slough indicate significant contamination, it would need to be remediated prior to removal of this impairment.

RESTRICTIONS ON FISH CONSUMPTION

Restoration Target and Status

Restrictions on Fish Consumption	Status
Sources of PCBs, mercury, and dioxins within the AOC have been controlled or eliminated; and	Incomplete, in progress
Waters within the Lower Menominee River AOC are no longer listed as impaired due to PCB or dioxin fish consumption advisories in the most recent Impaired Waters (303(d)) list for either state; or	Incomplete
Fish tissue contaminants causing advisories in the AOC are the same or lower than those in the associated Great Lake or appropriate control site.	Assessment in progress

Target Concerns

Fish from the waters of Green Bay and the Lower Fox River have access to all segments of the AOC except segment 1 (Figure B). These fish are known to have elevated levels of PCBs in their tissue. To be protective of human health, the fish consumption advisories from both states for these segments are the same as advisories for Green Bay. It's unlikely that all fish consumption advisories in AOC waters will be lifted due to the presence of Green Bay and Lake Michigan fish. BUI removal could occur if studies indicate that fish are not impacted by contamination within the AOC, even though fish consumption advisories will likely remain.

Rationale for Listing

This beneficial use is considered impaired, because of elevated levels of mercury and PCBs in fish tissue that do not meet Wisconsin Department of Health Services (WDHS), U.S. Food and Drug Association, and/or MDCH's health advisory limits (WDNR and MDNR, 1990). Fish from Green Bay have access to all segments of the AOC except segment 1 (Figure B) and may carry contamination in their tissues originating outside of the AOC. These fish are known to have elevated levels of PCBs and mercury in their tissue. There is potential for unidentified toxic sources within or upstream of the AOC, as elevated levels of PCBs and mercury can be detected in fish upstream of the Lower Scott Dam (MDCH, 2011 and WDNR, 2013a).

Michigan issues fish consumption advisories for Green Bay south of the Cedar River including the Menominee River below the Lower Scott Dam for PCBs, dioxins, and mercury (MDCH, 2011). Michigan also issues advisories for the Menominee River below Quinnesec to the Lower Scott Dam for mercury and PCBs (MDCH, 2011). Wisconsin issues fish consumption advisories for Green Bay and its tributaries, including the Menominee River, up to the first dam for PCBs and mercury (WDNR, 2013a). Wisconsin also issues advisories on the Menominee River from Pier's Gorge, near Quinnesec, downstream to the Lower Scott Dam also for PCBs and mercury (WDNR, 2013a).

Summary of key remedial actions since the last RAP and current status

See the "Fish Consumption Advisory Assessment" topic in the "RECENT PROGRESS" section.

Both states update fish consumption guidance based on the most current fish tissue monitoring data and state and federal guidance. Current Michigan and Wisconsin fish consumption advice may be found online at www.michigan.gov/eatsafefish,
and http://dnr.wi.gov/topic/fishing/consumption/index.html respectively.

Next action(s) needed

- Collect additional common carp tissue samples from the Lower Scott Flowage and conduct tissue analysis
- Review results of tissue analysis for the AOC and Little Bay de Noc to determine if further action is needed or if the BUI can be removed

Issues (challenges, risks) affecting progress on this BUI
It is important to note that current contaminated sediment remediation efforts do not significantly affect the removal of this beneficial use impairment. There is no advisory at this time for consuming fish contaminated with arsenic or PAHs in the AOC.

A second attempt was made to collect additional common carp tissue samples for the fish consumption advisory assessment in 2013, but only one common carp was captured. The WDNR has committed to collecting remaining tissue samples from the Lower Scott Flowage in 2014 through targeted electrofishing. If tissue analysis records contaminant levels higher than background in Little Bay de Noc, BUI removal would be delayed until a source is identified and remediated.

If sediment investigations detect significant sources of mercury, PCBs, or dioxins in the AOC, additional sediment remediation would be required prior to the removal of this BUI.

DEGRADATION OF BENTHOS

Restoration Target and Status

Degradation of Benthos	Status
All remediation actions for known contaminated sediment sources are completed and monitored according to the approved plan and have met their remedial action goal.	Incomplete, in progress

Target Concerns

Some concerns have arisen because restoration targets for this BUI do not include monitoring efforts to document the recovery of the benthic community. Sites not impacted by contaminated sediments in the AOC show a relatively healthy benthic community. It's assumed that these communities will re-colonize former degraded areas once contaminated sediment sites have met their remedial goals.

The Lower Menominee River AOC was included in a GLRI-funded study, initiated by WDNR and carried out by the U.S. Geological Survey (USGS), to characterize benthic invertebrate and planktonic communities in Wisconsin's Lake Michigan AOCs and six reference sites (Table 3). The Lower Menominee AOC site was included to increase the statistical power of the study. Although the BUI removal target does not require such data, it may be useful for gaining a better understanding of benthic conditions in the AOC.

Rationale for Listing

The 1990 RAP attributes degradation of the benthos in otherwise suitable habitat to toxic conditions caused by contaminated sediment (WDNR and MDNR, 1990). A WDNR Menominee River Survey conducted in August 1957 sampled just below the Ansul Chemical Company, found few bottom-dwelling organisms at this point and populations were composed of known of pollution tolerant varieties [Letter, Committee on Water Pollution, Theodore F. Wisniewski, Director, Division of Water Pollution Control]. Studies conducted in the area over a period between 1974 and 1989 found degraded benthic communities in and around the turning basin (Figure B, segment 5) and some studies determined there was an absence of benthic organisms. Elevated levels of arsenic, cadmium and mercury were detected in subsequent benthic organism tissue analyses. Benthic impairments were due to a variety of causes but heavy arsenic pollution was interpreted by USEPA as the likely cause since there were substrate and nutrients available to support a diverse benthic population (WDNR and MDNR, 1990).

Summary of key remedial actions since the last RAP and current status

The Lloyd Flanders paint sludge site was successfully remediated in 1995, see the 1996 Lower Menominee River Remedial Action Plan for more information. Remediation of the WPS coal tar site was completed in early 2013 (NRT, 2013). Remediation of the Ansul arsenic site is currently underway and planning efforts are in progress related to Menekaunee Harbor.

Efforts are underway to identify any unknown sources of contamination to the AOC. In November, sediments samples were collected by GLNPO's contractor in the Lower Scott Flowage, results are expected in 2014.

See the "RECENT PROGRESS" section for a detailed account of the status of these activities.

Next action(s) needed

- Compete the removal of arsenic impacted sediment (50-20ppm arsenic) through the proposed Great Lakes Legacy Act betterment project, or monitor the remaining sediments natural recovery to a concentration of 20ppm arsenic or less
- Remove contaminated sediment from Menekaunee Harbor
- Review results of USEPA GLNPO Great Lakes Legacy Act sediment characterization work in the Lower Scott Flowage and determine if further action is needed
- Plan and conduct sediment characterization work in Rio Vista Slough, and determine if further action is needed

Issues (challenges, risks) affecting progress on this BUI

If all partners do not come to an agreement and a betterment action is not pursued, Tyco has until November 1, 2023 to monitor the natural recovery of arsenic contaminated sediments to 20 ppm or less (USEPA, 2008). The WDNR and MDEQ will not consider BUI removal until all components of the selected remedy have been met. Additional funding is needed to complete the Menekaunee Harbor restoration project, but has been pledged by the USEPA through GLRI. If sediment investigations in the Lower Scott Flowage or Rio Vista Slough indicate significant contamination, it would need to be remediated prior to removal of this impairment.

DEGRADATION OF FISH AND WILDLIFE POPULATIONS & LOSS OF FISH AND WILDLIFE HABITAT

Restoration Target and Status

Degradation of Fish and Wildlife Populations & Loss of Fish and Wildlife Habitat	Status
A local fish and wildlife habitat management and restoration plan has been developed and implemented for the Lower Menominee River AOC that: o Defines the causes of fish and wildlife population and habitat impairments within the AOC o Establishes site specific habitat and population objectives for fish and wildlife species within the AOC o Identifies fish and wildlife population restoration programs and activities within the AOC and establishes a mechanism to assure coordination among states and programs for assessment monitoring, implementation activities and associated monitoring; and	Development complete, implementation in progress
o The programs and actions necessary to accomplish the recommendations are identified in the fish and wildlife management and restoration plan are implemented; and	Incomplete, in progress
o Monitoring conducted according to the Fish and Wildlife Plan shows consistent improvement in the quality and quantity of habitat or populations identified in the plan	Incomplete
Please note o Removal of this BUI will be based on achievement of implementation of actions in the steps above, including monitoring conducted according to site plans and showing consistent improvement in quantity or quality of habitat or populations addressed in the criteria. Habitat values and populations need not be fully restored prior to delisting, as some may take many years to recover after actions are complete. o Actions already implemented in AOCs may be reported and evaluated as long as the reports contain all the elements above.	

Target Concerns

These BUIs are interdependent and are discussed and addressed together. Removal of these BUIs will take place concurrently through implementation of the 2011 *Fish and Wildlife Population and Habitat Management and Restoration Plan*.

Rationale for Listing

The “degradation of fish and wildlife populations” and “loss of fish and wildlife habitat” BUIs were listed because of the loss of historic wetlands and localized toxicity caused by contaminated sediment. An extensive wetland complex near the mouth of the river was destroyed by log driving activities in the 1800s. Afterwards, land near the mouth of the river was filled for industrial and municipal expansion and the shorelines hardened to prevent erosion. Remaining quality habitat and wetlands are threatened by encroaching invasive plants and access to spawning and juvenile habitat for potamodromous fish like lake sturgeon has been severely limited due to the lack of a safe passage beyond several dams (Figure C).

Sediment contaminated with arsenic, PAHs, and other heavy metals including cadmium, chromium, copper, lead, mercury, nickel, and zinc have impacted fish populations throughout the AOC (WDNR and MDNR, 1990). Sediment was contaminated through industrial activities and stormwater discharges that took place throughout the 1900s.

Summary of remedial actions since the last RAP and current status

Staff from the WDNR and the MDEQ completed an update to the existing fish and wildlife plan, titled the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013). Using the same stakeholder input process used to developed RAP updates, agencies gathered feedback and developed final goals, objectives, and activities to achieve them. This is the principle document used to remove these BUIs. Progress towards that end will be reported in annual RAP updates.

At this time, none of the five restoration goals contained in the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* have been achieved. However, many activities contributing towards their achievement have either been completed or are in progress. See the "NAH Dam Relicensing & Sturgeon Passage", "Menekaunee Harbor Restoration", "Island Rookery Habitat Restoration", and "Fisheries Data Roundup" topics in the "RECENT PROGRESS" section for details on specific ongoing activities.

Next action(s) needed

In general, implementation of the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* is needed to continue making progress in removing these BUIs. Appendix C, an excerpt from the aforementioned plan, lists the activities required to achieve restoration targets. It also includes details on project status, management, cost estimates, and other necessary information. The WDNR, MDEQ, CAC, and TAC agree that only activities listed in this table are required to achieve restoration targets. Many activities have been completed, and many more are currently in progress.

Issues (challenges, risks) affecting progress on these BUIs

Some activities listed in Appendix C have prerequisites to their implementation. The remediation of contaminated sediment sites and acquisition of adequate funding are common themes in this area.

Several habitat restoration and protection activities require the Ansul arsenic site remediation to be completed first. However, the timeframe for completing the final steps of the remediation is uncertain. To record how and when these activities should proceed, the Ansul Arsenic Site Remediation and South Channel Habitat Restoration Decision Tree was developed and is located in Appendix D. If Lower Scott Flowage sediment characterization work finds contamination in the area of the 11th Avenue Pool (Figure D), habitat there will need to be restored after sediment remediation is complete. Characterization results will not be available until 2014. If no contamination requiring cleanup is discovered by GLNPO, no additional habitat work is required there.

The GLRI has been identified as the sole or a contributing funding source for nearly all activities requiring federal funding. Future GLRI funding is considered critical to remove these BUIs and delisting the Lower Menominee River AOC.

RESTRICTIONS ON RECREATIONAL CONTACT (BEACH CLOSINGS)

Restoration Target and Status

Restrictions on Recreational Contact	Status
No waterbodies within the AOC are included on the list of non-attaining waters due to contamination with pathogens *from combined sewer overflows* in the most recent Clean Water Act Water Quality and Pollution Control in either states: Section 303(d) and 305(b) Integrated Report (Integrated Report), which are submitted to USEPA every two years; or	Complete
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 CSOs have been eliminated or are being treated; 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: o All known sources of bacterial contamination to the AOC originating in the AOC and tributary watersheds have been controlled or treated to reduce exposures; and o No unpermitted sanitary sewer overflows have occurred within the AOC during the previous five year period as a result of a less than 25-year precipitation event or snow/ice melt conditions; and o Marinette, WI and Menominee, MI have adopted and are implementing storm water reduction programs including an illicit discharge elimination program	

Target Concerns

The restoration target set in 2008 was modified to identify combined sewer overflows as the primary reason for this impairment, (WDNR and MDEQ, 2011).

Rationale for Listing

Elevated levels of bacteria exceeding water quality standards had been documented in the Menominee River (WDNR and MDNR, 1990). These exceedances were associated with wet weather events causing combined sewer overflows.

Summary of remedial actions since the last RAP and current status

Significant upgrades to the City of Menominee and City of Marinette wastewater treatment plants have resulted in no combined sewer overflows. Both municipalities are operating within their respective state wastewater discharge permits. The impairment was officially removed in 2011, see the 2011 Stage 2 RAP for more information.

SUMMARY AND CONCLUSIONS

Five of the six BUIs identified in the Lower Menominee River AOC still remain. The "restrictions on recreational contact" BUI was removed from the AOC after its cause, combined sewer overflows, was remedied. Significant progress has been made toward restoring the Lower Menominee River AOC relating to contaminated sediment:

- Paint sludge remediation was completed in 1995 by the Lloyd Flanders Furniture Company through Michigan Act 307 authority (WDNR, 1996).
- WPS completed remediation efforts at the coal tar site in early 2013.
- Tyco International is currently in the process of implementing the approved work plan to remediate arsenic contaminated sediment at the Ansul arsenic site.
- The City of Marinette and the WDNR are developing plans to restore Menekaunee Harbor, including the removal of contaminated sediment and habitat improvements.
- Sediment characterization was conducted in the Lower Scott Flowage through the Great Lakes Legacy Act, results are expected in 2014.

To remove all impairments, activities beyond the remediation of contaminated sediment sites are also required. Staff from the WDNR and the MDEQ completed an update to the existing fish and wildlife plan, titled the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013). This plan is the principal document needed to guide the removal of the "degradation of fish and wildlife populations" and "loss of fish and wildlife habitat" impairments. At this time, none of the five restoration goals contained in the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* have been achieved. However, many activities contributing towards their achievement have either been completed or are in progress.

Significant milestones likely to be reached in 2014 include:

- Start of construction on the Menekaunee Harbor restoration project
- Results from the Lower Scott Flowage sediment characterization work
- Start of construction on the Park Mill Dam downstream fish passage and Menominee Dam upstream sturgeon passage facilities
- Additional progress on many projects including the fish consumption advisory assessment, island rookery habitat restoration, and fisheries data roundup

Some potential hurdles exist that could delay or complicate reaching restoration targets. If a Great Lakes Legacy Act betterment action at the Ansul arsenic site is not pursued, Tyco has until November 1, 2023 to monitor the natural recovery of arsenic contaminated sediments to 20 ppm or less (USEPA, 2008). The WDNR and MDEQ will not consider BUI removal until all components of the selected remedy have been met. In addition, several habitat restoration and protection activities require the Ansul arsenic site remediation to be completed before they can begin. Adequate federal funding support through the GLRI is required for the Menekaunee Harbor and other fish and wildlife habitat restoration projects to be successful.

If sediment investigations in the Lower Scott Flowage or Rio Vista Slough indicate significant contamination, it would need to be remediated prior to removal of the "restrictions on dredging activity" or "degradation of benthos" BUIs could be removed. If significant sources of mercury, PCBs, or dioxins are detected in the AOC, additional sediment remediation would be required prior to the removal of the "restrictions on fish consumption" BUI. If Lower Scott Flowage sediment characterization work finds contamination in the area of the 11th Avenue Pool (Figure

D), habitat there will need to be restored to remove the “loss of fish and wildlife habitat” and “degradation of fish and wildlife populations” BUIs.

Updates of the Stage 2 RAP will continue to be produced on an as needed basis to effectively communicate progress to the public as well as local, state, and federal agencies.

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APPENDICES

Appendix A	Lower Menominee River AOC Beneficial Use Impairment Tracking Matrix
Appendix B	Letter of Support for the 2012 Stage 2 RAP Update from the Citizen's Advisory Committee
Appendix C	Updated Goals, Objectives, and Activities Table from the Fish and Wildlife Population and Habitat Management and Restoration Plan
Appendix D	Ansul Arsenic Site Remediation and South Channel Habitat Restoration Decision Tree

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Appendix A

Lower Menominee River AOC Beneficial Use Impairment Tracking Matrix

Beneficial Use Impairment Name	Project Lead	*Project Type	Actions/Tasks Needed	Funding Source	Start Date	Targeted Completion Date	Status and Comments
Restrictions on Dredging Activities	WDNR and MDEQ	4, 5	Dredge management planning	none required	2014		**INCOMPLETE.** Start and completion dates are contingent on completion sediment cleanups.
Restrictions on Dredging Activities		3, 5	Completion "degradation of benthos" actions				**IN PROGRESS.** See items under "Degradation of Benthos".
Restrictions on Fish Consumption	MDCH	1, 2, 4, 5	Fish consumption advisory assessment	GLRI	2011	2015	**IN PROGRESS.** Fish tissue collections were conducted in 2012 and 2013, additional samples needed for analysis.
Degradation of Benthos	Lloyd Flanders, MDEQ	3	Remediation of the Lloyd Flanders paint sludge site	Lloyd Flanders	1995	1996	**COMPLETE.**
Degradation of Benthos	MDEQ	1	SPMD study	MI GLRI State Capacity	2010	2012	**COMPLETE.** The Lower Scott Flowage was identified as a potential source of PCBs by this study.
Degradation of Benthos	WPS, USEPA, and WDNR	3	Remediation of the WPS coal tar site	WPS	2012	2013	**COMPLETE.** Upland source contamination will be further investigated and potentially remediated in the future.
Degradation of Benthos	Tyco, USEPA, and WDNR	3	Remediation of the Ansul arsenic site	Tyco	2012	2023 or earlier	**IN PROGRESS.** Dredging began in 2012 and continued in 2013. A Great Lakes Legacy Act betterment project is being discussed.
Degradation of Benthos	GLNPO	1	Lower Scott Flowage sediment characterization	Great Lakes Legacy Act	2013	2014	**IN PROGRESS.** Samples collected in 2013, parameters being analyzed for include PCBs, PAHs, pesticides, metals, and sediment physical properties.
Degradation of Benthos	City of Marinette and WDNR	3	Completion of Menekaunee Harbor restoration	GLRI, WDNR, and City of Marinette	2013	2015	**IN PROGRESS.** Plans are still under development, but are expected to be ready by January, 2014. If funding from the USEPA is available, construction could begin as early as April, 2014.
Degradation of Benthos	MDEQ	1	Rio Vista Slough sediment characterization	MI GLRI State Capacity	2014	2015	**INCOMPLETE.** Previous investigations indicated PAH and metal contamination was present, but limited. Rigor of previous investigations uncertain.
Degradation of Fish and Wildlife Populations		1,2,3,4,5	See Appendix C for a list of activities				**IN PROGRESS.** These BUIs are interdependent and are discussed and addressed together.
Loss of Fish and Wildlife Habitat		1,2,3,4,5	See Appendix C for a list of activities				**IN PROGRESS.** These BUIs are interdependent and are discussed and addressed together.

***Project types**
1:Baseline assessment through data gathering
2:Compile & analyze existing data
3:On-the-ground remediation or restoration project
4:Stakeholder engagement and/or community education & outreach
5:Verification of target achievement through monitoring or other documentation
6:BUI removal process.

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Appendix B

Letter of Support for the 2013 RAP Update from the Lower Menominee River Citizen's Advisory Committee

Lower Menominee River Remedial Action Plan Citizens Advisory Committee

The Lower Menominee River: A Great Lakes Area of Concern

November 21, 2013

Michigan Department of Environmental Quality
Office of the Great Lakes
Richard Hobrla, AOC Program Manager
Constitution Hall 6 Floor, South Tower
525 West Allegan Street
Lansing, Michigan 48909-7973

Wisconsin Department of Natural Resources
Office of the Great Lakes
Kendra Axness, LAMP and AOC Coordinator
PO Box 7921
101 S Webster Street
Madison, WI 53703-7921

Dear Mr. Hobrla and Mrs. Axness,

The members of the Citizens Advisory Committee for the Lower Menominee River Area of Concern are writing to express our support for the *2013 Remedial Action Plan Update for the Lower Menominee River Area Of Concern*. The Lower Menominee River Citizens Advisory Committee has been involved in development and review of the document and we consent to its findings and statements. We request your review and concurrence of this document.

The CAC is composed of local concerned citizens, industry leaders, and governmental representatives representing a balanced viewpoint of Marinette, WI & Menominee, MI. We are tasked with assisting resource agencies with removing designated BUIs in the Lower Menominee River AOC. The CAC has provided local perspective and feedback into the development of this plan. We understand that the RAP is the primary document that will be used to track progress on BUI restoration, assessment, and removal, as well as describing the path for delisting the AOC.

If you have any questions please contact Mark Erickson Michigan CAC Co-Chair at 906-863-1954, or Keith West Wisconsin CAC Co-Chair at 715-735-4300 x4352.

Sincerely,

Mark Erickson, Michigan Co-chair

Keith West, Wisconsin Co-chair

C.C. Stephen Galarneau, WDNR
Victor Pappas, WDNR

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Appendix C

Updated Goals, Objectives, and Activities Table from the Fish and Wildlife Population and Habitat Management and Restoration Plan

<table>
<tr><th colspan="5">GOALS</th></tr>
<tr><td>Long-term protection is in place for natural areas and wetlands within the AOC, including Seagull Bar and riverine islands.</td><td>Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.</td><td>The lake sturgeon population is enhanced.</td><td>Diverse & functional native fish and mussel assemblages are present in the AOC that sustain natural recruitment.</td><td>A healthy and diverse native vegetation community has been restored.</td></tr>
<tr><th colspan="5">OBJECTIVES</th></tr>
<tr><td rowspan="4">Long term protections deemed acceptable by the WDNR, MDEQ, TAC, and CAC have been established for all natural areas where habitat improvement work has taken place and contributes to achieving one or more BUI removal objectives.</td><td rowspan="2">Maintain or enhance habitat conducive to colonial waterbird rookery activity on known or prospective rookeries.</td><td rowspan="2">Provide additional spawning and juvenile rearing habitat for lake sturgeon by providing passage upstream of both Menominee and Park Mill Dams (USFWS, 2012).</td><td>There is evidence of recruitment within segments 2-8 for the following fish species: lake sturgeon walleye, yellow perch, muskellunge, smallmouth bass, largemouth bass, and northern pike.</td><td rowspan="4">Invasive, non-native species comprise no more than 33% of the vegetation community in protected natural areas of the AOC.</td></tr>
<tr><td>There is evidence of recruitment in segment 1 for the following fish species: walleye, rock bass, bluegill smallmouth bass, largemouth bass, and northern pike.</td></tr>
<tr><td rowspan="2">Monitor the rookery activity of known or prospective rookeries.</td><td rowspan="2">Provide a means for fish to pass safely downstream of both Menominee and Park Mill Dams (USFWS, 2012).</td><td>There is evidence of recruitment within the AOC for native mussel species.</td></tr>
<tr><td>Monitor for larval lake whitefish to determine necessity of future habitat improvements.</td></tr>
</table>

Type	Activity	Funding Status	Funded By	Cost or Cost Estimate	Management	Status/Date Completed	Prerequisites	Additional Comments
Review of Existing Data and Restoration Plans	Compile historical monitoring data to establish trends and assess fishery status. Also, assess the potential for existing fisheries programs to provide the needed data regarding fish assemblage and recruitment within the AOC.	Funded	WDNR Capacity Grant	$5,000	WDNR	Complete, 2013		Project titled "Fisheries Data Roundup"
	Analyze the results of the 2010 aquatic vegetation survey and 2011 riparian vegetation survey. Identify aquatic and riparian natural areas.	None Required			TAC	Complete, 2011		Completed through TAC discussions
	Identify existing mechanisms in place for wetland, aquatic, and riparian protection. Identify possible gaps, and ways to fill protection gaps.	None Required			TAC	In Progress		Needs additional discussion
	Review results of the 2011 semi-permeable membrane device (SPMD) study and assess implications for habitat restoration.	None Required			TAC	Complete, 2012		Indicated Lower Scott Flowage as a potential source of PCBs, GLNPO pursuing sediment characterization in segment 1 and upstream of the AOC
	Review Ansul arsenic site remediation plans and assess the implications for habitat restoration.	None Required			TAC	Complete, 2013		Habitat work in segment 6a is not possible until arsenic concentrations are less than 20 ppm
	Review segment 1 GLNPO sediment characterization and assess the implications for habitat restoration.	None Required			TAC	In Progress	Completion of GLNPO sediment characterization	Sediment requiring remediation may result in additional habitat work
	Review the Menekaunee Harbor (segment 6b) sediment remediation plan for habitat restoration implications.	None Required			TAC	Complete, 2013		Habitat work moving forward as part of sediment remediation
	Determine whether or not carp exclusion should be pursued in the Seagull Bar State Natural Area (segment 8) pocket	None Required			TAC	Complete, 2013		Access considered largely dependent on water levels, carp exclusion also outside AOC goals
	Review WPS coal tar site remediation plans and assess the implications for habitat restoration.	None Required			TAC	Complete, 2013		Remediation complete, no habitat implications

Type	Activity	Funding Status	Funded By	Cost or Cost Estimate	Management	Status/Date Completed	Prerequisites	Additional Comments
Field Studies	Conduct an aquatic vegetation survey.	Funded	WDNR and MDEQ Capacity Grants	$15,690	WDNR	Complete, 2010		Rio Vista Slough and lakeshore excluded from survey
	Conduct a riparian vegetation survey. Inventory, map, and ground-truth lands within the AOC, include information about ownership and protection status for these lands.	Funded	WDNR Capacity Grant	$16,500	WDNR	Complete, 2012		Survey area dependent on landowner agreements
	Conduct an SPMD study including segment 1 and below the Menominee Dam and assess the implications for habitat restoration.	Funded	MDEQ Capacity Grant	$70,000	MDEQ	Complete, 2012		Lower Scott Flowage suspected as a source of PCBs, further sediment characterization through GLNPO pending.
	Conduct a mussel survey upstream of the AOC and segments 1, 2, 3, 4, and 6a. Surveys will assess hydro dam impacts as well as serve as a baseline for evaluating subsequent sediment remediation & habitat enhancement efforts.	Funded	NAH and WDNR Capacity Grant	$6,093	WDNR	Complete, 2012		Provided evidence of recruitment within the AOC for native mussel species
	Conduct additional fish population surveys in the AOC and select reference sites to determine target species recruitment status.	Needs Funding	WDNR and MDEQ Capacity Grants	$30,000	WDNR, MDNR	In Progress	Approximately $20,000 is needed for 2014 and 2015	Project titled "Fisheries Data Roundup Reference Site Monitoring" funded ($10,000) in 2013

Type	Activity	Funding Status	Funded By	Cost or Cost Estimate	Management	Status/Date Completed	Prerequisites	Additional Comments
Habitat Restoration and Protection Projects (For a map of proposed habitat restoration and protection projects, see Figure D)	Complete downstream fish passage around the Park Mill Dam.	Funded	NAH and GLRI	$2,162,000	NAH, USFWS, River Alliance of Wisconsin	In Progress		Construction planned for 2014-2015
	Complete fish lift and research facility construction at the Menominee Dam for upstream fish passage	Funded	NAH and GLRI	$2,224,250	NAH, USFWS, River Alliance of Wisconsin	In Progress		Construction planned for 2014-2015
	Acquire means and materials to conduct the truck and transfer of lake sturgeon above the Menominee Dam.	Needs Funding	NAH and GLRI	unknown	NAH, USFWS, River Alliance of Wisconsin	Incomplete	Completion of the Menominee Dam fish lift and research facility	
	Complete downstream fish passage around the Menominee Dam.	Needs Funding	NAH, USACE, and GLRI	$6,300,000	NAH, USFWS, USACE, River Alliance of Wisconsin	In Progress	Funding required for construction	Design work completed by USACE, installation of temporary downstream passage gate insert planned for 2014-2015
	Improve the vegetation communities of Strawberry, Blueberry, and Boom Islands to maintain habitat conducive to rookery activity.	Needs Funding	MDEQ Capacity Grant	$52,500	MDEQ, Great Lakes Commission	In Progress	Approximately $35,000 is needed for 2014 and 2015	Project titled "Island Rookery Habitat Restoration" funded ($17,500) in 2013
	Protect rookery habitat of Strawberry, Blueberry, and Boom Islands from human development.	None Required		unknown	TAC	In Progress		Blueberry and Strawberry Islands protected through respective ownership, further discussion is needed regarding Boom Island
	Increase the hydrologic connection between South Channel and Menekaunee Harbor by removing debris and excess riprap under the Ogden St. Bridge.	None Required	City of Marinette	$1,000	City of Marinette	Incomplete	Completion of Ansul arsenic site and Menekaunee Harbor sediment remediations	See "Ansul Arsenic Site Remediation and South Channel Habitat Restoration Decision Tree" for more information on timing
	Complete a habitat restoration and protection project in the South Channel for increased fish and wildlife habitat.	unknown	GLRI	unknown	WDNR	Incomplete	Completion of Ansul arsenic site sediment remediation	See "Ansul Arsenic Site Remediation and South Channel Habitat Restoration Decision Tree" for more information on timing
	Complete a habitat restoration and protection project in Menekaunee Harbor for increased fish and wildlife habitat.	Needs Funding	City of Marinette, WDNR, GLRI	$600,000	WDNR, City of Marinette	In Progress	Completion of Menekaunee Harbor sediment remediation	Design being developed in 2013 through larger "Menekaunee Harbor Restoration" Project
	Complete a fisheries habitat improvement and protection project in the 11th Avenue Pool.	Needs Funding	GLRI	unknown	MDEQ	Incomplete	Completion of GLNPO sediment characterization	TENATIVE, this project will only occur if sediment remediation is required in this area

Type	Activity	Funding Status	Funded By	Cost or Cost Estimate	Management	Status/Date Completed	Prerequisites	Additional Comments
Monitoring	Monitor rookery activity on all riverine islands.	unknown		unknown	TAC	Incomplete	TAC must determine if existing datasets are adequate or if new data must be collected	Data will be used primarily for public education
	Conduct biological monitoring of the South Channel (segment 6a) to document ecological recovery.	Funded	USFWS capacity grant	$116,000	USFWS	In Progress	Completion of Ansul arsenic site sediment remediation	See "Ansul Arsenic Site Remediation and South Channel Habitat Restoration Decision Tree" for more information on timing
	Conduct monitoring for larval lake whitefish.	Needs Funding	Great Lakes Protection Fund	$36,000	WDNR	incomplete	Receipt of funding	Characterize larval whitefish outmigration from Menominee River, results will inform the design and operation of other habitat restoration activities.
	Repeat fish recruitment studies, mussel survey, bird survey, and aquatic vegetation survey after the restoration & protection projects have been completed to confirm targets have been achieved.	Needs Funding		unknown	Various	Incomplete	To be completed after sediment remediation and habitat restoration activities are complete, 2016	Studies will be repeated only as needed to confirm the objectives have been met

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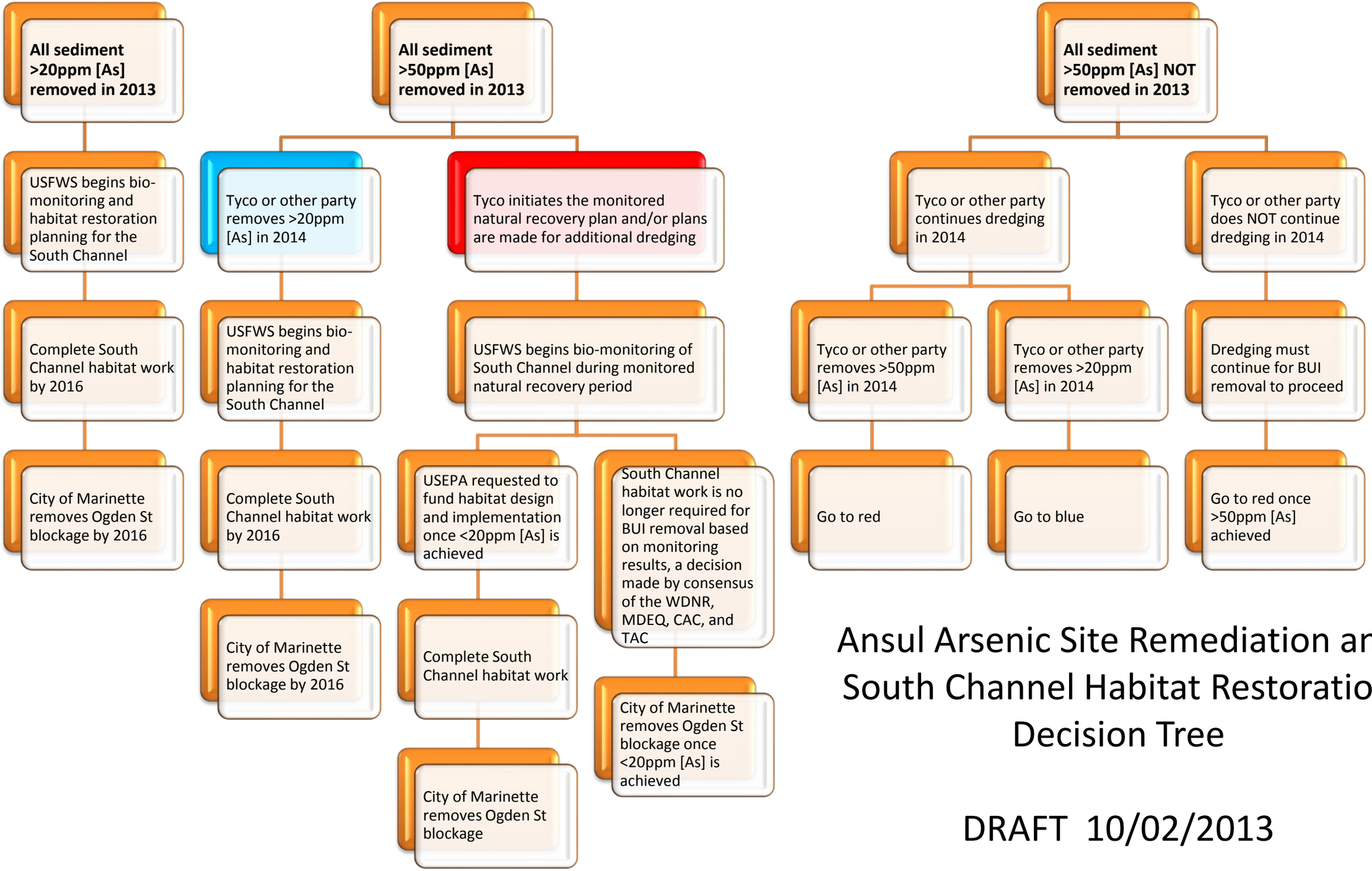
Appendix D

Ansul Arsenic Site Remediation and South Channel Habitat Restoration Decision Tree



Ansul Arsenic Site Remediation and South Channel Habitat Restoration Decision Tree

DRAFT 10/02/2013