

STAGE 2 REMEDIAL ACTION PLAN

Implementation Annex for the Canadian Waters of the St. Marys River Area of Concern



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- Ministry of the Environment, Conservation and Parks (MECP)
- Environment and Climate Change Canada (ECCC)
- City of Sault Ste. Marie, Ontario
- Algoma Public Health
- Sault Ste. Marie Region Conservation Authority
- Ministry of Natural Resources & Forestry
- Fisheries and Oceans Canada
- Algoma University

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In particular, the leadership and effort of local RAP Coordinator Lisa Derickx, and former RAP Coordinator Corrina Barrett, and the federal and provincial RAP co-leads Mark Chambers and Dawn Talarico (previously Curniss McGoldrick and Michelle McChristie), are acknowledged.



EXECUTIVE SUMMARY

The St. Marys River was designated as one of 43 Areas of Concern under the amended Canada-U.S. Great Lakes Water Quality Agreement in 1987. Areas of Concern are sites located in the Great Lakes basin where environmental issues have resulted from a history of pollution and habitat disruption in the area. Each Area of Concern has a Remedial Action Plan (RAP) that defines the nature, extent, and causes of environmental problems and recommends actions to restore and protect the environment. Canada and Ontario work together with conservation authorities, municipalities, First Nation and Métis communities, environmental groups, industry and others to develop and implement the plans.

Past pollution from industrial sources, partially treated municipal and private sewage, discharges from vessels, and untreated stormwater from the surrounding watershed were factors that historically contributed to the degradation of the St. Marys River. Urban development and alterations to the river and its shoreline have also had an impact. The St. Marys River was designated an Area of Concern because of the cumulative negative effects this was having on fish and wildlife populations and habitat, sediment quality, and water quality.

Steady progress has been made in restoring and better protecting the environment of the St. Marys River. The river is much healthier today compared to when it was first designated an Area of Concern. Investments in remedial actions and stricter environmental controls by government, along with considerable improvements in wastewater treatment made by the City of Sault Ste. Marie and local industry, have led to significant improvements in the river's water quality.

In the 1990s, the federal government passed environmental legislation for pulp and paper effluents, and the provincial government

introduced regulations under the *Environmental Protection Act*. Today, all municipal and industrial effluents must meet strict requirements and cannot be lethal to fish or aquatic insects. Wastewater effluents discharged to the river currently meet provincial and federal regulations for suspended solids, biochemical oxygen demand, phosphorus, phenol, toluene, coliform and toxicity.

In 2006, with financial assistance from Canada and Ontario, the City of Sault Ste. Marie upgraded its East End Wastewater Treatment Plant featuring the first biological nutrient removal system in Ontario and ultraviolet disinfection. The result has been improved effluent quality¹ with a reduction in suspended solids by 89%, phosphorus by 91%, and biological oxygen demand (BOD) by 96%. Significant reductions in nitrogen and ammonia have also been achieved.

Since 1987, Algoma Steel (formerly Essar Steel Algoma Inc.) has reduced the amount of oil and grease entering the river via wastewater effluent by 96%. It has also reduced suspended solids by 94%, phenols by 99%, and ammonia by 95%.

As of 2012, the St. Marys Paper plant has been decommissioned and the site dismantled, therefore there is no wastewater discharge to the river. That being said, efforts made in previous years had significantly reduced contaminants in the mill's wastewater. Between 1995 and 2006, the installation of an activated sludge secondary treatment facility reduced suspended solids by 91%, biological oxygen demand (BOD) by 97%, and odour-causing phenols by 95%.

While inputs of pollution into the river are no longer as severe as they used to be, the legacy of harmful activities has left many environmental challenges that still need to be addressed within the AOC. This includes managing contaminated sediment on the river bottom, and restoring fish habitat.

¹From "Wastewater Infrastructure Upgrades: East End Wastewater Treatment Plant". City of Sault Ste. Marie Engineering Services' presentation to Joint Sault Ontario/Michigan Council Meeting, February 27, 2008.

INTRODUCTION

This document complements the Stage 2 Remedial Action Plan report for the St. Marys River Area of Concern, released in December 2002¹. The purpose of this Implementation Annex is three-fold: 1) to take stock of the completed actions and achievements since 2002 within the Canadian portion of the Area of Concern; 2) to describe its current ecological conditions as articulated by the relevant beneficial use impairments and associated delisting criteria; and 3) to outline the remedial actions, monitoring and assessment needs necessary to complete the restoration of the remaining beneficial uses. As recommended by the International Joint Commission², where possible, this document emphasizes the resource needs, roles and responsibilities, and timelines for completing this work.

The St. Marys River is a 112 km waterway that acts as a border between Canada and the United States. The two largest settlements around the river are the twin cities of Sault Ste. Marie, Ontario and Sault Ste. Marie, Michigan with a combined population of approximately 100,000. The river is the outflow of Lake Superior to Lake Huron, and as a

result, is often referred to as the “Hub of the Great Lakes” due to its importance in shipping along the Great Lakes – St. Lawrence Seaway.

The river provides habitat for many types of plants and animals. Since the 1800s, the river has been modified significantly to accommodate urban development, ship navigation, vehicular and rail transportation, and provide hydroelectric power. This has negatively impacted fish and wildlife habitat. For over 100 years, municipal waterworks and a number of industries have operated along the river as well, such as a

former tannery, manufactured gas plant, pulp and paper mill and an active steel mill. Operating under less stringent environmental laws than today, the municipalities and industries have historically contributed to reduced water quality and contaminated sediment on the river bottom.

In 1987, the *Canada-U.S. Great Lakes Water Quality Agreement* identified the St. Marys River as one of 43 Areas of Concern (AOC) in the Great Lakes. This was due to the negative ecological impacts that urban development and industrial and municipal effluents were having on fish and their habitat, sediment composition, and water quality. The binational agreement was amended in 2012³ and reaffirms the commitment to develop and

implement Remedial Action Plans (RAPs). These plans use a systemic and comprehensive ecosystem approach to restore environmental conditions in AOCs.

Since 1987, Canada and the United States have worked together with the Province of Ontario, State of Michigan, Indigenous communities, municipalities,

the Conservation Authority, environmental groups, industry, academia, and others to develop and implement the RAP for the St. Marys River AOC.

The Binational Public Advisory Council (BPAC)⁴ was formed in 1988 to provide informed and continuous public participation in the St. Marys River RAP process. BPAC is made up of residents from both sides of the river, and its role is to inform the agencies involved in implementing the RAP about public views and opinions regarding the clean-up of the AOC, and advocates for projects that achieve the restoration goals of the RAP.

AN AREA OF CONCERN (AOC)

An AOC is a geographic location that has experienced significant environmental degradation and impaired beneficial use. These locations are designated under the *Canada-U.S. Great Lakes Water Quality Agreement* and each have a Remedial Action Plan that guides restoration and protection efforts.

1 Stage 2 RAP report available at: http://bpac.algomau.ca/?page_id=900

2 International Joint Commission St. Marys River Stage 2 Remedial Action Plan Review. October 2003.
www.ijc.org/publications/html/stmarys_rap2-e.htm

3 The updated version of the binational agreement can be viewed at: www.ijc.org/en/Great_Lakes_Water_Quality

4 The BPAC website can be viewed at: <http://bpac.algomau.ca>

The first stage of the St. Marys River RAP identified the environmental problems and sources of pollution within the AOC; the findings of which are outlined in the *St. Marys River Area of Concern Environmental Conditions and Problem Definitions: Stage 1*⁵. The original problems identified included excessive phosphorus, bacteria, oil and grease, heavy metals, trace organics, contaminated sediment, fish consumption advisories, and impacted biota caused by urbanization and the loss of rapids and wetland habitat.

⁵ Stage 1 RAP report available at: http://bpac.algomau.ca/?page_id=900

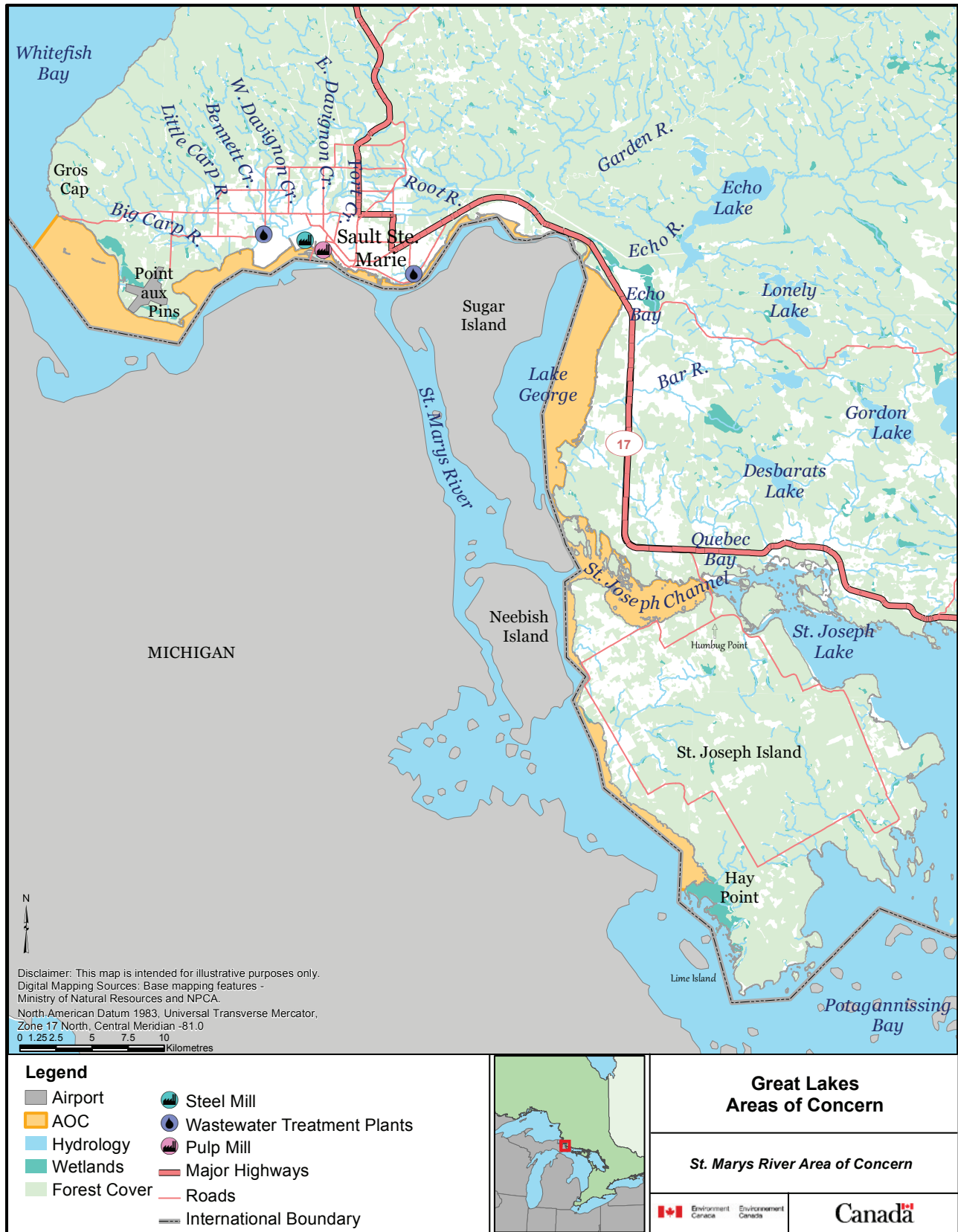
During the second stage of the RAP, a number of remedial actions were identified to help restore the area. The remedial actions are presented in *The St. Marys River Area of Concern Remedial Strategies for Ecosystem Restoration: Stage 2*⁶ and include over 50 remedial action items (many of which have sub-actions) to restore the environment by focusing on the AOC's Beneficial Use Impairments (BUIs). Of the 14 possible BUIs identified under the *Canada-U.S. Great Lakes Water Quality Agreement*, nine were deemed impaired for the St. Marys River, and one required further assessment (see Table 1).

⁶ Stage 2 RAP report available at: http://bpac.algomau.ca/?page_id=900

Table 1. Summary of the BUI status within the St. Marys River AOC.

Beneficial Use Impairment (BUI)		Status
1.	Restrictions on Fish and Wildlife Consumption [specific to fish only; those for wildlife NI]	I
2.	Tainting of Fish and Wildlife Flavour	NI
3.	Degradation of Fish and Wildlife Populations [specific to fish populations only; those for wildlife RFA but change to NI recommended]	I
4.	Fish Tumours and Other Deformities	I
5.	Bird and Animal Deformities or Reproductive Problems	NI
6.	Degradation of Benthos	I
7.	Restrictions on Dredging Activities	I
8.	Eutrophication or Undesirable Algae [*change to NI recommended]	I*
9.	Restrictions on Drinking Water Consumption or Taste and Odour Problems	NI
10.	Beach Closures [*change to NI recommended]	I*
11.	Degradation of Aesthetics [*change to NI recommended]	I*
12.	Added Cost to Agriculture and Industry	NI
13.	Degradation of Phytoplankton and Zooplankton	NI
14.	Loss of Fish and Wildlife Habitat [specific to fish habitat only; those for wildlife RFA but change to NI recommended]	I
I = Impaired; RFA = Requires Further Assessment; NI = Not Impaired		

Figure 1. The St. Marys River Area of Concern



To assess progress in addressing the environmental impairments, the Stage 2 RAP report presented delisting criteria for each BUI. Delisting criteria are local, measurable targets for restoring beneficial uses, and ultimately the AOC, and establish a benchmark for when a beneficial use can be deemed no longer impaired. The initial delisting criteria for the St. Marys River AOC were developed in 2002, and required revision in 2014 to reflect current science to define meaningful targets following the SMART test, meaning they are Specific, Measurable, Achievable, Relevant, and Time-oriented [see Appendix B].

This Implementation Annex complements the Stage 2 RAP report. It summarizes the completed actions and achievements within the Canadian portion of the AOC that have been accomplished

since the Stage 2 RAP report was released in 2002, describes the current ecological conditions and describes the remedial actions necessary to complete the restoration of the remaining beneficial uses. When the remedial actions necessary to restore the area have been implemented, the third and final stage of the RAP will be completed. This will require confirmation—based on scientific data—that the actions have been effective and the beneficial uses are no longer impaired.

To date, there have been a number of significant accomplishments to improve the health of the St. Marys River AOC, and there are also several remedial actions that remain to be completed, particularly those related to contaminated sediment and fish habitat. These achievements and the work ahead are outlined in the following pages.



SUMMARY OF STAGE 2 RECOMMENDED ACTIONS

The Stage 2 RAP report (2002) recommended over 50 remedial actions and monitoring initiatives to address the environmental problems within the St. Marys River (summarized in Table 2) that were identified in the Stage 1 RAP report. Many of these actions and monitoring initiatives have since been completed thanks to cooperative efforts by government agencies at all levels, industry, and the public.

This document matches the naming and formatting used in the Stage 2 RAP report:

- The remedial and monitoring actions have been grouped separately.
- Each remedial and monitoring action has a corresponding number.
- “Action PS” stands for **P**oint **S**ource related actions; “Action NPS” stands for **N**on-**P**oint **S**ource related actions; and “FF” stands for **F**lora and **F**auna related actions.
- When an “M” appears after any of the above acronyms, it stands for the Monitoring actions related to that section.

Table 2. Stage 2 RAP Report's Recommended Remedial Actions and Monitoring for the Restoration of Beneficial Uses

Stage 2 RAP Remedial Actions and Monitoring Activities	
REMEDIAL ACTIONS	
Point Source:	
Action PS-1:	Virtual elimination of all persistent and bioaccumulative contaminants from industrial and municipal discharge.
Action PS-2:	Reduce stormwater infiltration at East End Wastewater Treatment Plant (EEWWTP).
Action PS-3:	Upgrade EEWWTP to secondary treatment.
Action PS-4:	Relocate discharge pipe at EEWWTP to deeper, faster moving water.
Action PS-5:	Contaminant source control in stormwater discharge systems should be addressed by source control, air quality control, and pollution prevention education.
Action PS-6:	Continue with Canadian and U.S. regulatory programs for industrial dischargers.
Action PS-7:	Encourage major point source dischargers to continue process improvements.
Action PS-8:	Continue work on combined sewer overflows in Sault Ste. Marie, Michigan.
Action PS-9:	Algoma Steel to limit discharges from its de-kish operation.
Non-Point Source:	
Action NPS-1:	Development of a multi-agency sediment management program for the river to address immediate remedial options and implement actions for contaminated sediments. [Broken into 10 subsections, see pages 53-55 of the Stage 2 RAP report].
Action NPS-2:	Further characterize several high priority areas (i.e. adjacent to Algoma Slag Dump, portion of Little Lake George Channel downstream of EEWWTP, and the Algoma Slip).
Action NPS-3:	Completion of the St. Marys River contaminated sediment zones evaluation including chemistry analysis and benthic community assessment (needed for Action NPS-1).
Action NPS-4:	Identification and control of contaminants from the Algoma Slag Dump, including stabilization of shoreline and nearshore sediments. [Broken into 2 subsections, see pages 55-56 of the Stage 2 RAP report].

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Action NPS-5:	Evaluation of Algoma Slip sediment and implementation of cleanup.
Action NPS-6:	Control of agricultural and other non-point sources of pollution. [Broken into 5 subsections, see pages 56-57 of the Stage 2 RAP report].
Action NPS-7:	Remediation for contaminated terrestrial and aquatic disposal sites (if through Action NPSM-9 there are found to be any).
Action NPS-8:	Plan and implement appropriate remediation, protection, and enforcement actions to remove any potential public health risks identified by Action NPSM-10.
Flora and Fauna:	
Action FF-1:	Bar River habitat project including recovery of the walleye habitat and spawning stock.
Action FF-2:	Watershed Development Plan for Bennett and West Davignon Creeks. [Broken into 23 subsections, see pages 68-71 of the Stage 2 RAP report].
Action FF-3:	Watershed Development Plan for the East Davignon and Fort Creeks.
Action FF-4:	Sedimentation reduction in the Munuscong River/Bay.
Action FF-5:	Characterization/Feasibility Study for waste removal in Mission Creek.
Action FF-6:	Remediation of rapids habitat and associated wetlands. [Broken into 8 subsections, see pages 71-73 of the Stage 2 RAP report].
Action FF-7:	Develop a 10 Year Fisheries Assessment Program for the river and develop assessment of mortality rates for walleye, pike, and yellow perch.
Action FF-8:	Continued support for Sea Lamprey control efforts.
Action FF-9:	Stabilize shoreline of the Algoma Slag Dump to provide habitat for plant growth to soften and stabilize the landscape.

MONITORING ACTIONS

Point Source:	
Action PSM-1:	Long-term water monitoring at the Cannelton Industries site.
Action PSM-2:	The Sault Ste. Marie, Michigan air quality monitoring project.
Action PSM-3:	Ambient water monitoring in the St. Marys River.
Action PSM-4:	The Sault Ste. Marie, Ontario air quality monitoring project.
Action PSM-5:	Monitoring for particulate emissions at Algoma's de-kish operation.
Action PSM-6:	Monitoring receiving water at St. Marys Paper.
Action PSM-7:	Monitoring system for urban stormwater.
Action PSM-8:	Examine short-term variability and monthly ranges of contaminant discharges from wastewater treatment plants.
Non-Point Source:	
Action NPSM-1:	Monitor EEWTP and identify upstream sources to determine concentrations and loadings of persistent contaminants exceeding guidelines in Lake George Channel sediments.
Action NPSM-2:	Aerial monitoring of Cannelton Industries site.

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Action NPSM-3:	Biological monitoring at the Cannelton Industries site to ensure protection of the ecological food chain.
Action NPSM-4:	Task team monitoring recommendations. [Broken into 4 subsections, see page 58 of the Stage 2 RAP report].
Action NPSM-5:	Re-sampling of river sediments to obtain trend information.
Action NPSM-6:	Benthic, toxicity, and sediment chemistry studies at Bellevue Marine Park.
Action NPSM-7:	Assess potential health risks resulting from floating contaminated masses.
Action NPSM-8:	Monitor non-point sources of pollution in the AOC. (Incidences of algal blooms were believed caused by excessive nutrients from EEWTP and septic bed leakage in Echo Bay).
Action NPSM-9:	Identify terrestrial and aquatic disposal sites transferring contaminants into waterways.
Action NPSM-10:	Assess health risks to communities and individuals taking their water from the "down-river" regions of the St. Marys River.
Action NPSM-11:	Assess the potential hazards associated with spills from shipping vessels.
Action NPSM-12:	Identify locations within the AOC that are associated with elevated levels of human health disorders.
Flora and Fauna:	
Action FFM-1:	Identify the causes of fish tumours and other deformities that originate within the AOC.
Action FFM-2:	The marsh monitoring program – established to provide baseline information on marsh birds and amphibian populations and their habitat.
Action FFM-3:	The fish harvest survey.
Action FFM-4:	The fish contaminant monitoring programs.
Action FFM-5:	Canadian Wildlife Service surveys of the Common and Black Tern populations.
Action FFM-6:	Analysis of contaminant levels in bird eggs.
Action FFM-7:	Monitoring of population changes due to habitat enhancement.
Action FFM-8:	Reproductive assessment of Gulls and Terns.
Action FFM-9:	Evaluate influence of water levels and flows on spawning and production.
Action FFM-10:	Determine minimum water levels and flow rates necessary for spawning.
Action FFM-11:	Monitoring water quantity.

The following section provides detail on the current status of each remedial action and monitoring activity, and indicates whether it is complete, underway/ongoing, under review, or pending. It also indicates the associated BUI(s), the work completed to date, and future actions to be undertaken, including the agencies involved, and project timelines and costs where applicable.

In a few cases, some actions are addressed through other regulatory programs separate from the AOC program, or are not within the scope of the RAP. These actions are marked as 'already addressed' throughout this document, and no further action is required. Actions that are 'no longer applicable' are also indicated when they are specific to Michigan and the U.S. side of the AOC.

STATUS OF THE STAGE 2 REMEDIAL AND MONITORING ACTIONS

Action PS-1: Virtual elimination of all persistent and bioaccumulative contaminants from industrial and municipal discharge

** Note that this action has been interpreted as virtual elimination of all known persistent and bioaccumulative contaminants.*

Current Status: ONGOING

BUIs Addressed: Restrictions on Fish Consumption, Degradation of Fish Populations, and Fish Tumours and other Deformities.

Work completed to date:

St. Marys Paper

- As of 2012, the St. Marys Paper plant has been decommissioned and the site dismantled, therefore there is no wastewater discharge to the river. Before the closure, contaminants in the mill's wastewater were reduced significantly between 1995 and 2006⁷ due to the installation of an activated sludge secondary treatment facility (reducing suspended solids by over 91%⁸, biological oxygen demand (BOD) by more than 97%, and odour-causing phenols by over 95%).

Algoma Steel (formerly Essar Steel Algoma)

- In 1991, Algoma Steel Inc. installed a main filtration plant for wastewater discharge, which reduced levels suspended solids and phenols. It also decommissioned the Terminal Basin settling ponds, reducing discharges into the river.
- Between 1997 and 1999 Algoma Steel Inc. invested in: a new biological treatment facility to treat Cokemaking wastewater, new direct casting facility, toxicity control system on the Bar and Strip process effluent, and a water recirculation system on Ironmaking Blast Furnace water facilities. These improvements led to reduced phenol, ammonia, cyanide, oil and grease, and suspended solids concentrations in wastewater and optimized water re-use by up to 90%.

- Since 2002, Algoma Steel has made upgrades to the Secondary Emission Control, Composition Adjustment System with oxygen blowing, and hot metal transfer Baghouses at the steelmaking operations to improve the capture efficiency of particulate matter.
- In 2004, the facility established an extensive continuous air quality monitoring program surrounding the entire facility. There are two continuous on-line monitoring stations and four continuous off-line monitoring stations used to measure several different parameters, including suspended particulate matter, dustfall, total reduced sulfur, metals, polycyclic aromatic hydrocarbons and volatile organic compounds.
- In 2005, the company completed its Environmental Management Agreement with the Ontario Ministry of the Environment, Conservation and Parks and Environment Canada for environmental improvements⁹, and addressed surface water run-off from the coal piles by diverting it into a settling area to eliminate coal entering the river.
- Beginning in 2007, the company constructed a wind berm measuring 600 meters long by 10 meters high to deflect wind over Algoma Steel's coal piles to reduce the generation of wind-blown coal and particulates.
- In 2009, the company commissioned a new 70 megawatt co-generation facility that converts previously flared by-product fuels from the coke and iron making processes into electricity and steam for the steelworks. This is the only facility of its kind in Canada and it reduces the facility's reliance on the provincial electricity grid by approximately 50% and off-

⁷ Based on environmental performance reports filed under ECCC's Environmental Effects Monitoring program for the pulp and paper industry.

⁸ Based on company environmental performance reports.

⁹ For more information on the Environmental Management Agreement, please visit www.ec.gc.ca/epe-epa

sets the release of approximately 500,000 tonnes of carbon dioxide per year.

- In 2009, in an effort to address air emissions, the company added baghouses to its No. 7 blast furnace, the de-kish operations (see Action PS-9), and the lime plant baghouse was also upgraded. An extensive monitoring program was also initiated for the material storage and reprocessing site that monitors groundwater and surface water quality on a quarterly basis for the entire 320 hectare site.

City of Sault Ste. Marie's East End Wastewater Treatment Plant

- In 2006, Sault Ste. Marie upgraded the East End Wastewater Treatment Plant to include secondary treatment using the first biological

nutrient removal system in Ontario, including ultraviolet (UV) light for disinfection, meaning no chlorine is discharged to the river (see Action PS-3 for more details).

- The City of Sault Ste. Marie is implementing a stormwater management policy/master plan that identifies ways to improve the management of stormwater runoff and reduce the inputs of contaminants to the river, such as oil, grease, nutrients and bacteria (see Action PS-2 for more details). With financial support from Environment and Climate Change Canada (\$127,000), this is an effort to address stormwater quantity and quality issues within new and existing development around the city.

Action PS-2: Reduce stormwater infiltration at the EEWWTP

** Note that this action has been interpreted as mitigating stormwater infiltration and loading at the East End Wastewater Treatment facility.*

Current Status: ONGOING

BUIs Addressed: Beach Closures

Work completed to date:

- In 2002, the City of Sault Ste. Marie constructed the Bellevue Park Sanitary Sewer Overflow tank, which mitigates the impact of stormwater infiltration and stormwater impacts on the EEWWTP.
- In 2009, the City updated its Sewer Use By-law¹⁰. The 1968 bylaw prohibited storm connections to the sanitary system; however, the 2009 update prohibits the discharge of stormwater and surface water to the sanitary sewer system without prior approval from the City, and prohibits the connection of roof leaders to the sanitary system. Several other updates were also included.
- In March 2014, a Notice of Completion was issued for the City of Sault Ste. Marie Stormwater Management Master Plan, followed by a 30-

day comment period. In November 2014, the Stormwater Management Report was finalized and in February 2015, City Council approved the new *Storm Water Management Master Plan and Guidelines*¹¹.

- The City is continuously enforcing stormwater management to address stormwater quantity and quality issues within new and existing development around the city.
- Pending the City's budgeting process over the coming years, including approval by Council, the City plans to implement its city-wide approach to stormwater management including: improving snow disposal sites, education, implementing a point source monitoring plan, implementing oil grit separators at various locations throughout the city prior to discharge to the natural environment, improving stormwater conveyance at known problem areas and the retrofitting of existing stormwater management facilities for quality control.

¹⁰ Sewer Use By-law 2009-50 available at: www.city.sault-ste-marie.on.ca/contentadmin/UserFiles/File/By-Laws/Sewer.pdf

¹¹ Information on the City's stormwater [plans, policies and guidelines](http://www.saultstemarie.ca/City-Hall/City-Departments/Engineering-and-Planning/Engineering-and-Construction/Stormwater-Management.aspx) available at: www.saultstemarie.ca/City-Hall/City-Departments/Engineering-and-Planning/Engineering-and-Construction/Stormwater-Management.aspx

Current work and actions to be undertaken:

No further action required.

- The Stage 2 RAP identifies three actions needed to address the Beach Closings BUI, including Action PS-2. The other two were: Upgrade East End Wastewater Treatment Plant to secondary treatment (Action PS-3); and Assess potential health risks resulting from floating contaminated masses (Action NPSM-7). In 2017, a BUI assessment report was drafted and circulated for community review and comment. The report accounts for significant improvements in overall water quality and efforts to address sources of *E. coli* in the AOC,

including the development of a stormwater management plan for the City of Sault Ste. Marie. The Beach Closings BUI assessment report also accounts for a multi-year beach quality assessment completed in 2016 that indicates there are no major anthropogenic sources of bacterial contamination on the Canadian side of the St. Marys River, and that the AOC is comparable to non-AOC areas (http://bpac.algomau.ca/?page_id=900). As such, in October 2018 Canada and Ontario officially redesignated the Beach Closings BUI to Not Impaired status. The BUI was removed on the U.S. side of the AOC in July 2016.

Action PS-3: Upgrade EEWWTP to Secondary Treatment

Current Status: COMPLETE

BUIs Addressed: Eutrophication or Undesirable Algae, Beach Closures

Work completed to date:

- In 2006, with financial assistance from Canada and Ontario, the City of Sault Ste. Marie upgraded its East End Wastewater Treatment Plant featuring the first biological nutrient removal system in Ontario and ultraviolet disinfection. This has resulted in improved effluent quality with a reduction in suspended

solids by 89%, phosphorus levels by 91%, and biological oxygen demand (BOD) by 96%. Significant reductions in nitrogen and ammonia have also been achieved¹².

- Combined with other wastewater system upgrades, this \$77 million infrastructure program was supported by \$47 million in federal and provincial grants and \$30 million in municipal funds.

- ***Current work and actions to be undertaken:***
No further action required.

Action PS-4: Relocate discharge pipe at EEWWTP to deeper, faster moving water in the Lake George Channel in order to improve dispersion of discharge plume

Current Status: COMPLETE

BUIs Addressed: Degradation of Aesthetics

Work completed to date:

- In 2006, the City relocated the pipe to deeper water in the Lake George Channel.

Current work and actions to be undertaken: No further action required.

¹² From "Wastewater infrastructure Upgrades: East End Wastewater Treatment Plant". City of Sault Ste. Marie Engineering Services' presentation to Joint Sault Ontario/Michigan Council Meeting, February 27, 2008.

Action PS-5: Contaminant source control in stormwater discharge systems

** To be addressed by source control and pollution prevention education for businesses and the public*

Current Status: ONGOING

BUIs Addressed: No official BUI designated.

Work completed to date:

- As noted above (Action PS-2), in 2009 the City updated its Sewer Use By-law with more stringent requirements.

Source Control

- At an investment of \$133,000 (\$86,000 from the City; \$47,000 from ECCC), the City undertook targeted monitoring between 2012 and 2015 to determine baseline:
 - water quality data for potential installation of oil/grit separators;
 - data at the Bellevue Park pond to quantify the potential impairment and assess potential mitigating actions, and;
 - data at the East End Snow Dump to assess potential impacts and identify mitigating measures.
- Results were presented to the BPAC in 2016.
- With financial support from the MECP (\$20,000) and ECCC (\$25,000), the City also evaluated rainwater inflow and infiltration in the Dell Avenue sanitary sewer system from 2014 to 2016 to identify areas with high flows and thus potentially mitigate wastewater outflows and treatment bypasses to the St. Marys River.
- All potential remedial measures are subject to budget.

Pollution Prevention

- Stormwater pollution prevention material is available to the public and can be viewed from the “Downloadable Materials” page of the BPAC’s website¹³. At future public events and outreach opportunities, the RAP Coordinator will have such materials on hand to help disseminate the message that homeowners and the public play a significant role in affecting stormwater quality, and by extension, the health of the St. Marys River.
- In 2012, the City’s Municipal Environmental Initiatives (Green) Committee partnered with the Sault Ste. Marie Innovation Centre to create an “Environmental Initiatives Map”¹⁴, which showcases various environmental projects within the community. The map also features base maps and a “Green News in Sault Ste. Marie” section.
- In June 2015 and 2016, the City completed the Yellow Fish Road project with the local Girl Guides of Canada. Yellow fish were painted on the road near storm drains and pamphlets delivered to residents to help educate the public about the negative effects of pollution entering the environment by way of catch basins. This project was part of a broader program run by Trout Unlimited Canada.

Current work and actions to be undertaken:

No further action required.

¹³ Visit: http://bpac.algomau.ca/?page_id=900

¹⁴ City’s Environmental Initiatives Map can be viewed at maps.cityssm.on.ca/

Action PS-6: Continue with Canadian and U.S. regulatory programs for industrial dischargers

Current Status: ADDRESSED

BUIs Addressed: No official BUI designated.

This action is already addressed through a comprehensive set of laws and regulations, programs and agreements at the provincial, state, federal and binational level, and this action goes beyond the scope of the RAP program. The regulatory and governance framework that affects the environment of the St. Marys River AOC and overall Great Lakes system includes but is not limited to:

- Canada-United States *Great Lakes Water Quality Agreement*
- Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health
- Federal Laws: *Fisheries Act*; *Canadian Environmental Protection Act*; *Canadian Environmental Assessment Act*
- Provincial Laws: *Ontario Water Resources Act*, *Nutrient Management Act*, and *Environmental Protection Act* including the Effluent Monitoring and Effluent Limits Regulations¹⁵
- Ontario's Municipal/Industrial Strategy for Abatement Program

¹⁵ To reduce regulatory burden for facilities while maintaining oversight over release of industrial wastewater, the Ontario government is planning to transfer applicable requirements from the Effluent Monitoring and Effluent Limits Regulations into the Environmental compliance Approvals for these facilities, and then revoke the applicable regulations.

Action PS-7: Encourage major point source dischargers to continue process improvements

Current Status: COMPLETE

BUIs Addressed: Fish Tumours and other Deformities

A number of acts and regulations apply to industrial activities, including:

- *Environmental Protection Act* and associated regulations, such as the Effluent Monitoring and Effluent Limits Regulations (Ontario)
- *Ontario Water Resources Act* (Ontario)
- Environmental Compliance Approval regime (Ontario)
- Environmental Activity and Sector Registry (Ontario)
- *Canadian Environmental Protection Act* (Canada)
- Wastewater Systems Effluent Regulations (Canada)
- *Fisheries Act* (Canada)

Algoma Steel (formerly Essar Steel Algoma)

- See Action PS-1 for a list of improvements

made by the company. In addition, Algoma Steel has: reduced road dust through road paving and the application of dust suppressants; continually monitored both air and water in accordance with MECP guidelines; and plans to target fugitive emissions.

- In 2012, Essar accepted the RAP Coordinator as a new member of their Community Liaison Committee (formed as a forum for communicating relevant environmental information to the public).

St. Marys Paper

- As of 2012, the St. Marys Paper plant is not operating thus; there is no wastewater discharge to the river (see Action PS-1).

Tenaris Algoma Tubes Inc.

- In 2010, Tenaris Algoma Tubes Inc. (a manufacturer and supplier of steel pipe products and related services for the energy industry) removed one of its wastewater discharge points to the river (now recirculates through plant).

Current work and actions to be

undertaken: No further action required.

Action PS-8: Continue work on combined sewer overflows in Sault Ste. Marie, MI

Current Status: NOT APPLICABLE
– this is a MICHIGAN action



Action PS-9: Algoma Steel to limit discharges from its dekish operation

Current Status: COMPLETE

BUIs Addressed: Degradation of Aesthetics

Work completed to date:

- In 2009, Essar constructed a fume hood collection system with a portable baghouse on its east dekish station. In 2012, additional upgrades were made to this system to improve capture efficiency.
- In early 2014 a similar hood enclosure and an additional baghouse was installed on the west dekish station. Both stations now operate in parallel to capture emissions from this process.

Current work and actions to be undertaken: No further action required.

Action NPS-1: Development of a multi-agency sediment management program

** This action includes short- and long-term activities ranging from the assessment of immediate remedial options to the implementation of management actions. As such, there are ten actions listed in the Stage 2 RAP report (see Appendix C).*

** Linked to Action NPSM-5.*

Current Status: UNDERWAY

BUIs Addressed: Degradation of Fish and Wildlife Populations, Fish Tumours and other Deformities, Degradation of Benthos, Restrictions on Dredging Activities

Work completed to date:

- In 2008, the Canada-Ontario Decision-Making Framework for Assessment of Great Lakes Contaminated Sediment was developed by the Sediment Task Team on behalf of ECCC and the MECP as a consistent and scientifically defensible, and publicly acceptable decision



making framework; the framework has been applied to the St. Marys River.

- In 2009, ECCC and MECP formed a multi-agency sediment management technical team, which included representatives from Algoma University, DFO, MNRF, SSMRCA, and the City of Sault Ste. Marie. BPAC representatives occasionally participated in or observed the meetings.
- In 2010, ECCC completed mapping and characterization of contaminated sediment.
- In 2010, ECCC completed a study that concluded management action is not required for sediment upstream of Bellevue Marine Park and in the Lake George Channel. The same study recommended further assessment for the area east (downstream) of Bellevue Marine Park.
- In 2012, the Sault Ste. Marie Innovation Centre initiated a project to assess the quantity and quality of sediment being deposited in the area east of Bellevue Marine Park. The results are helping to identify suitable management actions for the contaminated sediment in this area. To date, MECP has contributed \$29,000 for the modeling component of this project. ECCC has contributed \$115,000 (excluding salary) for work related to sedimentation study (quantity and quality). ECCC also contributed \$25,000 to initiate the sediment fate and transport model study in 2010.
- ECCC contributed \$135,000 and the MECP contributed \$54,884 toward sediment assessment from 2010 to 2011 (excluding salary).

- In 2012, with funding from ECCC, the Sault Ste. Marie Innovation Centre commissioned a report that describes a Conceptual Site Model (CSM) for sediment in the St. Marys River and includes recommendations for further efforts toward a contaminated Sediment Management Strategy. The CSM represents the site-specific state of understanding of contaminant sources, fate, transport, and potential exposure of receptors.
- A Dredging Administrative Controls document was created in 2016 that provides guidance for dredging proponents and permitting agencies on the regulatory oversights in the planning and undertaking of dredging activities. It was finalized in 2016, and will be linked to the planned Sediment Management Strategy
- In early 2019, the CSM for the river was updated based upon new information available.
- Sub-action (g) is beyond the scope of the AOC and RAP program. Atmospheric inputs are already addressed under a number of other programs (i.e. Lake Superior and Lake Huron Lakewide Management and Action Plans and in particular federal and provincial regulations with respect to domestic sources of atmospheric emissions).

Current work and actions to be undertaken:

- The City has various stormwater management initiatives underway (described in detail under Action PS-2).
- Sub-actions (f), (h), (i), (j) are pending and depend on the management actions taken under the Sediment Management Strategy.
- Continued work on the Sediment Management Strategy is planned for 2019 with the recent completion of sediment quality, stability and biological studies.
- ECCC is commissioning an update to the CSM, which is scheduled for completion by April 2019. It will support the development of the Sediment Management Strategy and community engagement on the strategy.
- Further updates will be incorporated into the CSM based upon the findings of new studies from 2018, updated information on the status of the Algoma boat slip and information on the former federal docks at Purvis Marine. The CSM will be used to determine whether management action is required for the St. Marys River sediments.
- If a requirement for management action is identified a sediment management options assessment will be initiated in 2019.

Action NPS-2: Further characterize sediment quality in several high priority areas

** i.e. Adjacent to Algoma Slag Dump, portion of Little Lake George Channel downstream of EEWWTP, and the Algoma Slip. Refer to Action NPS-4 for a complete explanation of the Slag Dump.*

Current Status: UNDERWAY

BUIs Addressed: Degradation of Benthos

Work completed to date:

- ECCC completed a Benthic Assessment of Sediment (BEAST) study in 2002 and 2008. The results from 2008 for the area upstream of Bellevue Marine Park indicated sediment management is not required at this area, but ECCC and MECP determined a further study was required for the area east of Bellevue Marine Park (i.e., downstream of Topsail Island) and within the Lake George Channel.

- In 2009 and 2010, ECCC completed additional mapping/ characterization of contaminated sediment in the area east of Bellevue Marine Park and within the Lake George Channel.
- The Algoma Steel boat slip was dredged in 1995 (11,500 m³), 2005 (2,630 m³) and 2017 (10,906 m³) (see Action NPS-5)
- In 2015, with financial support from ECCC (\$15,000) Algoma Steel completed a sediment survey that provides current detailed information about contaminant concentrations in the slip. Results show elevated levels of PAHs, and confirm the slip is a depositional area for contaminated sediment within the AOC.

- In 2011, with ECCC and MECP funding, the Sault Ste. Marie Innovation Centre commissioned a sediment flow and transport model to determine whether sediment at depth could be exposed under various conditions. The modelling report concluded that deeper sediments (> 5 cm) were stable under a range of historical flow conditions (i.e. those measured over the last 100 years)¹⁶.
- In 2011, the Innovation Centre also completed a geotechnical assessment of sediment in the area east of Bellevue Marine Park to determine the geotechnical properties of the sediment, the thickness of the sediment, and the vertical extent of contamination. The study found the sediment to be soft and relatively thick (2.5 to 4.5 meters), with the likelihood of hydrocarbon contamination in the uppermost 0.9 meters of sediment (contaminant analysis was not completed due to difficulty retrieving cores from the very soft sediment).
- The above work was undertaken with financial support from ECCC and the MECP. To date, the MECP has contributed \$29,000 for the modelling component of this project and \$55,000 for the geotechnical work done in 2011 and 2012. From 2011 to 2014, ECCC contributed \$135,000 toward sample acquisition for the sediment quantity and quality study.
- For information on the Algoma Steel slag dump, see Actions NPS-4 and FF-9. For information on the Algoma Steel boat slip see Action NPS-5.
- In 2018 a number of new assessment studies occurred related to contaminated sediments in the St. Marys River. A new study "*Fish and Invertebrate Long-term Exposure to St. Marys River Sediments*" was completed which examined the affects of St. Marys River on additional receptors. Data from the previous benthic invertebrate study (BEAST) was re-assessed using a new approach including an updated list of reference sites. Fieldwork was completed which included sampling associated with a new BEAST study, coring work east of topsail island in order to update the vertical characterization of the sediments in this area and the application of tracer compounds in that same area to aid in the future assessment of sediment accumulation.

Current work and actions to be undertaken:

- Complete the ECCC sediment study in the area east of Bellevue Marine Park using a sediment accumulation model to determine the rate and chemical quality of new sediment deposition over time. The project was completed in 2016, and will provide important information for developing the AOC sediment management strategy, beginning in 2017-18.
- Reports will be completed for the 2018 BEAST work and coring work. Additional fish and invertebrate toxicity work will also be completed using sediment collected during the 2018 BEAST work.

¹⁶ Krishnappan, B. 2011. Modelling Flow and Sediment Transport in the St. Marys River.

Action NPS-3: Completion of the St. Marys River contaminated sediment zones evaluation

** Including chemistry analysis and benthic community assessment.*

** Needed for Action NPS-1.*

Current Status: COMPLETE

BUIs Addressed: Degradation of Benthos

Work completed to date:

- Work completed has been previously described

under Action NPS-1 and Action NPS-2.

Current work and actions to be undertaken:

- Additional actions have been previously described under Action NPS-1 and Action NPS-2.

Action NPS-4: Identification and control of contaminants from the Algoma Slag Dump

** Including stabilization of shoreline and nearshore sediments. Broken into 2 subsections (a)-(b) of the Stage 2 Report (see Appendix C)*

Current Status: COMPLETE

BUIs Addressed: Degradation of Fish and Wildlife Populations, Fish Tumours and other Deformities

Work completed to date:

- (a) This three-party Environmental Management Agreement (2001-2005) is complete.
- Related to Action NPS-2: Starting in 2010,

Algoma Steel has implemented an extensive ground and surface water monitoring program as part of the Environmental Compliance Approval for the landfill. Analysis is performed on a quarterly basis and reported annually to the MECP.

- (b) For information on shoreline stabilization, see Action FF-9.

Current work and actions to be undertaken:
No further action required.

Action NPS-5: Evaluation of Algoma Slip sediment and implementation of cleanup

Current Status: UNDERWAY

BUIs Addressed: Degradation of Benthos, Restrictions on Dredging Activities, Fish Tumours

Work completed to date:

- Subsequent to the 1995 dredging of the Algoma Steel boat slip and the removal of 11,500 m³ of sediment, Algoma Steel completed a sediment assessment that recommended the removal of sediment in the north end of the slip.
- In 2006, Algoma Steel dredged the slip and removed an additional 2,630 m³ of sediment. The material was disposed at the licensed facility on the Algoma Steel property.

- Algoma Steel, with financial support from ECCC (\$15,000), hired a professional consultant to survey the slip and provide current detailed information about contaminant concentrations. The work was completed in early 2015. Results showed elevated levels of PAHs, and confirms the presence of an ongoing source of contaminants to the slip.

Current work and actions to be undertaken:

- In 2017, Algoma Steel removed 10,906 m³ of sediment in an attempt to remediate the boat slip of contaminants such as PAHs. Dredging and remediation is planned to be completed in 2019. The company also plans to initiate a hydrogeological investigation into any ongoing sources of contaminants to the slip in 2019.

Action NPS-6: Control of agricultural and other non-point sources of pollution

** Broken into 5 subsections (a)-(e) in the Stage 2 Report (see Appendix C)*

Current Status: COMPLETE [agriculture];
COMPLETE [urban stormwater]

BUIs Addressed: Eutrophication or Undesirable Algae, Degradation of Aesthetics,

Loss of Fish and Wildlife Habitat

Work completed to date:

Agricultural-based pollution

- In 2013-14, ECCC commissioned a study

- (\$15,000) to: 1) determine the current potential for water quality impacts on the AOC from agricultural activities; 2) determine how this compares to other regions along Great Lakes that are not AOCs (as reference site) and to the agricultural sector in the Province of Ontario; and 3) inventory the current regulations and programs now in place that govern agricultural sources of water pollution in Ontario (i.e., which were not in place when Action NPS-6 was recommended, such as Ontario's *Nutrient Management Act, 2002* and *Clean Water Act, 2006*).
- Overall, the study concludes impacts from Ontario-based agriculture in the AOC are low. Specifically, these farms around the AOC:
 - consist of small operations with mixed farming (diversity of livestock and crops) as opposed to larger, more intensive livestock farms in other jurisdictions like South Huron;
 - utilize manure use/management that is much less risky for impacting water quality than other jurisdictions like South Huron (i.e., there are fewer farms occupying smaller acreage that tend to use composted or solid manure, not liquid); and
 - have cut the use of commercial fertilizer – and although very few report using herbicides, insecticides and fungicides – the number that do is significantly lower compared to farms in South Huron and the rest of Ontario.
 - The report's finding is similar to conclusions reached in the Sault Ste. Marie Region Source Protection Plan, which after assessing the impact of agricultural activities on the wellheads and surface water intakes in the Source Protection Area; concluded agriculture is of limited significance.
 - In addition: sub-actions (a), (b) are covered under Ontario's *Nutrient Management Act* (MECP/OMAFRA); (c), (d) are covered under regulations administered by the Conservation Authority; and (e) is covered under the Canada-Ontario Environmental Farm Plan.
- Urban stormwater runoff**
- In February 2015, City Council approved the new *Storm Water Management Master Plan and Guidelines*.
 - The City undertook targeted monitoring between 2012 and 2015 to determine baseline:
 - water quality data for potential installation of oil/grit separators;
 - data at the Bellevue Park pond to quantify the potential impairment and assess potential mitigating actions, and;
 - data at the East End Snow Dump to assess potential impacts and identify mitigating measures. Results were presented to the BPAC in 2016.
 - Continue to monitor and support progress in better managing urban stormwater as a non-point source of pollution to the AOC. This includes evaluating rainwater inflow and infiltration in the Dell Avenue sanitary sewer system for three years ending in 2016 to identify areas with high flows and thus potentially mitigate wastewater outflows and treatment bypasses to the St. Marys River.
 - Pending the City's budgeting process, including approval by council, the City plans to implement a city-wide approach to stormwater management.
 - The City is implementing a stormwater management project that will help reduce the risk of flooding and help mitigate future damage from flooding by improving and upgrading the stormwater system. This infrastructure project is supported by \$2.1 million in federal and \$1 million in provincial grants and \$2.5 million in municipal funds.
 - (see Actions PS-2 and PS-5).
- Current work and actions to be undertaken:**
No further action required.

Action NPS-7: Remediation for contaminated terrestrial and aquatic disposal sites

** If identified through Action NPSM-9 and NPSM-12.*

Current Status: ADDRESSED

BUIs Addressed: Degradation of Fish and Wildlife Populations, Loss of Fish and Wildlife Habitat

- Known contaminated terrestrial and aquatic disposal sites within the AOC are already addressed through other actions.
- Known sites are being addressed and the related monitoring actions are outside of the scope of the RAP.

Action NPS-8: Plan and implement appropriate remediation, protection, and enforcement actions to remove any potential public health risks identified by Action NPSM-10

Current Status: ADDRESSED

BUIs Addressed: No official BUI designated

Action NPSM-10 is outside of the scope of the RAP program. Protection and enforcement actions are undertaken by the MECP through the Incident Response Protocol. The MECP notifies

downstream residents of any incidents or spills as per the Incident Response Protocol. Subsequent follow up with individual residents is completed by Algoma Public Health.

This action is also already addressed through the Conservation Authority's Source Water Protection program and falls outside of the scope of the RAP program.

Action FF-1: Bar River habitat project

** Includes recovery of the walleye habitat and spawning stock.*

Current Status: COMPLETE

BUIs Addressed: Loss of Fish and Wildlife Habitat

Work completed to date:

- With support from ECCC and the local office of the Ministry of Natural Resources and Forestry (MNRF), tree planting was carried out in Spring 1999 by the local chapter of Scouts Canada and teachers and students from Central Algoma Secondary School. Cedar, spruce and some hardwood species cultivated in the Ontario Forest Research Institute's arboretum were planted on three properties in the upper reaches of the Bar River.

Current work and actions to be undertaken:

- In July 2013, ECCC-Canadian Wildlife Service (CWS) conducted a follow-up site reconnaissance (\$2,500) to determine the efficacy of the original restoration project and to provide a qualitative evaluation of the current condition of the Bar River. The team looked to identify any significant impacts from livestock or farming practices, which were the original stressors that prompted the restoration project in 1999.
- The conclusion is that, overall, the positive effects of the 1999 restoration project are still evident, particularly with the improvement of stream bank and riparian zone conditions through plantings and livestock restriction. The stream bank remains well vegetated and

continues to stabilize the riverbank, and fencing appears successful in reducing the instances of livestock access to the river. There were isolated locations with damaged livestock fences, and these have been flagged to the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), as the relevant

authority for appropriate follow-up.

- But for the Bar River overall, observations suggest the project has had a lasting, positive effect on the St. Marys River years after its implementation, and can be seen as a positive step in helping delist the St. Marys River as an AOC.

Action FF-2: Watershed Development Plan for Bennett and West Davignon Creeks

** Broken into 23 subsections (a)-(w) in the Stage 2 Report (see Appendix C)*

Current Status: UNDER REVIEW

BUIs Addressed: Loss of Fish and Wildlife Habitat

Work completed to date:

- Sub-actions (a)-(g), (k)-(o), (q), (s)-(t), (v)-(w) are covered by the Sault Ste. Marie Region Conservation Authority (SSMRCA) mandate/regulations.
- (h) is implemented through the City of Sault Ste. Marie's Official Plan and MNRF regulations.(i) –
- (j) MECP and Algoma Steel will ensure that these sub-actions have been addressed. All but one underground fuel storage tank at Algoma Steel has been removed and the sites remediated. The former Domtar site has been remediated and covered with a clay cap and vegetated. Some hydrocarbon contaminated sites within the bounds of the slag storage area were remediated and covered with clay caps to prevent infiltration of water.
- (n) SSMRCA also allows the Department of Fisheries and Oceans and U.S. Fish & Wildlife

Service to control Sea Lamprey (e.g. using lampricide) via the Great Lakes Fisheries Commission.

- (p) is the responsibility of the Ontario Ministry of Agriculture, Food and Rural Affairs and private property owners.
- (r) is addressed by the City of Sault Ste. Marie under the stormwater management policy and master plan (see Action PS-2).
- (u) is the responsibility of private property owners.

Current work and actions to be undertaken:

- (w) SSMRCA encourages non-governmental organizations to accomplish this sub-action with respect to the Diversion Channel as long as it does not impede flood flows. ECCC will accept project proposals to its *Great Lakes Protection Initiative*.
- Algoma University is in consultation with the SSMRCA and the City to identify where habitat improvements can be made along tributaries connecting to the AOC as a component to developing sub-watershed plans.



Action FF-3: Watershed Development Plan for the East Davignon and Fort Creeks etc.

Current Status: UNDER REVIEW

BUIs Addressed: Loss of Fish and Wildlife Habitat

Similar to Action FF-2, please see above for detailed explanation. Some additional sub-actions are listed below.

Work completed to date:

- In 2005, SSMRCA identified the need for



sediment studies and improvements.

- In 2009, SSMRCA completed improvements South of Second Line, planted trees, established a pond which increased wildlife, and improved flow with sediment and garbage removal.

Current work and actions to be undertaken:

- Many are the same as above.
- Discuss possibilities of assessing Root River, Crystal Creek, Big Carp River, and Little Carp River.

Action FF-4: Sedimentation reduction in the Munuscong River/Bay

Current Status: NOT APPLICABLE
– this is a MICHIGAN action

Action FF-5: Characterization/ Feasibility Study for waste removal in Mission Creek

Current Status: NOT APPLICABLE
– this is a MICHIGAN action

Action FF-6: Remediation of rapids habitat and associated wetlands

** Broken into 8 possible options (a)-(h) in the Stage 2 Report (see Appendix C)*

Current Status: UNDERWAY

BUIs Addressed: Loss of Fish and Wildlife Habitat

Work completed to date:

- In October 2013, following a competitive bid process, ECCC hired a contractor (\$115,000) to collect the necessary data and evaluate the physical, ecological and economic feasibility of undertaking actions FF-6 c and f (creating new or augmenting

existing rapids areas in the St. Marys River) and FF-6 e (creating wetlands in association with the existing Big Rapids).

- ECCC also entered into contracts with Batchewana First Nation and Garden River First Nation to secure their knowledge, data and insights into past and current habitat conditions within specific locations, and for their ideas on future potential options to create and/or augment rapids habitat.
- In March 2015, results of the feasibility study

were presented and discussed with BPAC, and the report was shared with community stakeholders. A total of five conceptual designs were developed, with commentary on the overall benefit to the specific study area and to the AOC. The options identified to be most feasible are: 1) channel modifications/enhancements and wetland creation on Whitefish Island, followed by: 2) wetland creation, channel realignment, and habitat enhancements at the mouth of Fort Creek.

- The latter was discussed with City officials in June 2015, who indicated Fort Creek (currently a brownfield) is not an option because the City-owned area is already slated to be part of the City's proposed "Gateway site" under the long-term Canal District Neighbourhood plan.
- In December 2016, concept drawings for Whitefish Island were shared with BPAC that illustrate options for naturalizing channel bed and bank areas, replacing concrete/rock berms

with natural materials and plants, creating wetland features, improving fish passage and sediment transport to benefit Brook Trout and other fish, and building a series of islands and shoals east of the island to provide nursery habitat for Whitefish and Walleye.

Current work and actions to be undertaken:

- In 2018-19, ECCC, its contractor (Riggs Engineering), and the Batchewana First Nation have been working to advance proposed aquatic habitat restoration on Whitefish Island. Completed fieldwork included hydrology and bathymetry surveys. In early 2019, engineered designs will be produced further detailing the options for naturalizing the channel bed and bank areas of the Whitefish Channel and constructing islands and shoals east of Whitefish Island to benefit native fish populations. A presentation on the work was delivered to BPAC in March 2019.

Action FF-7: Develop a 10 Year Fisheries Assessment Program for the river

** Includes an assessment of mortality rates for walleye, pike, and yellow perch.*

Current Status: COMPLETE

BUIs Addressed: Degradation of Fish and Wildlife Populations, Loss of Fish and Wildlife Habitat

Work completed to date:

- In 2002, the St. Marys River Fisheries Task Group completed the St. Marys River Fisheries Assessment Plan to guide fisheries management for the next ten year period. The plan provides a standardized approach for regular assessment of the river's fishery and aquatic resources

- The plan ensures coordination of management actions for the St. Marys River Fishery through the Great Lakes Fishery Commission's Lake Huron Committee.

Current work and actions to be undertaken:

- As part of the above plan, the Task Group has ongoing Fish Community Surveys.
- This assessment was setup for a ten-year period and will be reviewed periodically to ensure that it reflects the ongoing needs of the St. Marys River fisheries.

Action FF-8: Continued support for Sea Lamprey control efforts

Current Status: ADDRESSED

BUIs Addressed: Degradation of Fish and Wildlife Populations, Loss of Fish and Wildlife Habitat

- There are dedicated programs dealing with Sea

Lamprey that are led by the Sea Lamprey Control Centre (Fisheries and Oceans Canada) in Sault Ste. Marie. It functions independently of the RAP.

- This action is already addressed because aquatic invasive species are a lake- and basin-wide management issue.

Action FF-9: Stabilize shoreline of the Algoma Slag Dump to provide habitat for plant growth (e.g., via soil addition) to soften and stabilize the landscape

Current Status: **COMPLETE**

BUIs Addressed: Degradation of Aesthetics,
Loss of Fish and Wildlife Habitat

Work completed to date:

- In the early 1980s, the slag pile banks along the St. Marys River were sloped and stabilized.



- In 2010, approximately 2.6 km of shoreline was covered with biosolids from St. Mary's Paper and successfully hydro-seeded.
- The entire perimeter of Essar's material storage and re-processing yard (5.3 km) has stabilized slopes and is not subject to any erosion.

Current work and actions to be undertaken:
No further action needed.

Action PSM-1: Long-term water monitoring at the Cannelton Industries site

Current Status: NOT APPLICABLE
– this is a MICHIGAN action

Action PSM-2: The Sault Ste. Marie, Michigan air quality monitoring project

Current Status: NOT APPLICABLE
– this is a MICHIGAN action

Action PSM-3: Ambient water monitoring in the St. Marys River

Current Status: NOT APPLICABLE
– this is a MICHIGAN action

Action PSM-4: The Sault Ste. Marie, Ontario air quality monitoring project

Current Status: ADDRESSED

BUIs Addressed: Degradation of Aesthetics

Air quality monitoring is outside of the scope of the RAP; the Degradation of Aesthetics BUI refers to impairments to water rather than air. The International Joint Commission's listing guideline¹³ for this BUI states it as occurring, "when any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum)."

By 2005, in accordance with the Environmental

Management Agreement, Algoma Steel Inc. had reduced benzene air emissions by 89.5% (from 432.6 g/tonne coke in 1993 to 45.38 g/tonne coke produced in 2005), and polycyclic aromatic hydrocarbon air emissions by 57.9% (from 21.3 g/tonne coke in 1993 to 8.98 g/tonne coke produced in 2005). For more information on the Environmental Management Agreement see Action PS-1.

In 2010 Health Canada / NORDIK Institute conducted the Sault Ste. Marie Air Quality Study in an effort to address concerns by local residents on emissions coming from Essar Steel Algoma Inc. As of 2013, data collection for the \$900,000 study is complete.

¹³ For the IJC's BUI listing and delisting guidelines, visit: www.ijc.org/rel/boards/annex2/buis.htm

Action PSM-5: Monitoring for particulate emissions at Algoma's dekish operation

Current Status: ADDRESSED

BUIs Addressed: Degradation of Aesthetics

Algoma Steel has implemented a plan to reduce air emissions through upgraded fumehood and

baghouse technology on the stations that are running. See Action PS-9 for more information on the dekish. Monitoring is ongoing through Algoma Steel's facility-wide air quality monitoring program (see Action PS-1).

Same rationale as noted above under Action PSM-4.

Action PSM-6: Monitoring receiving water at St. Marys Paper

Current Status: NO LONGER APPLICABLE

BUIs Addressed: Degradation of Fish and Wildlife Populations, Degradation of Benthos

As of 2012, the St. Marys Paper plant is decommissioned and no longer discharging to the river. During its operation, ECCC and the MECP implemented requirements for monitoring the receiving waters of the mill (e.g., Canada's *Environmental Effects Monitoring* program to assess the impacts of effluent on the

receiving environment and Ontario's *Municipal Industrial Strategy for Abatement* that established effluent limits and monitoring requirements).

While in operation between 1995 and 2006, contaminants within the mill's effluents were reduced significantly due to the installation of an activated sludge secondary treatment facility (reducing suspended solids by over 91%, biological oxygen demand (BOD) by more than 97%, and odour-causing phenols by over 95%). This action is no longer applicable given the plants decommissioning.

Action PSM-7: Monitoring system for stormwater

Current Status: **COMPLETE**

BUIs Addressed: Beach Closures

Work completed to date:

- This action is linked to Action PS-1.
- As outlined under Actions PS-1, PS-2 and PS-5, the City of Sault Ste. Marie is implementing a stormwater management master plan and policy to address stormwater quantity and quality issues within new and existing development in the city.
- The City undertook targeted monitoring between 2012 and 2015 to determine baseline:
 - water quality data for potential installation of oil/grit separators;
 - data at the Bellevue Park pond to quantify the potential impairment and assess potential mitigating actions, and;
 - data at the East End Snow Dump to assess potential impacts and identify mitigating measures.
- All potential remedial measures are subject to budget.

Action PSM-8: Monitoring study to examine short-term variability and monthly ranges of contaminant discharges from wastewater treatment plants

** Linked to Action NPSM-1*

Current Status: **COMPLETE**

BUIs Addressed: Degradation of Fish and Wildlife Populations

Work completed to date:

- The East End and West End Wastewater Treatment Plants have monitoring programs in place that are implemented by the municipality as required by Environmental Compliance Approval issued by the MECP.

Current Work and Actions to be

Undertaken: No further action required.



Action NPSM-1: Monitoring EEWWTP and identification of upstream sources

** Note that this action has been interpreted as monitoring the EEWWTP and identification of upstream sources to determine concentrations and loadings of persistent contaminants exceeding guidelines in Lake George Channel and Little Lake George sediments.*

** Linked to Actions PS-3 and PS-4*

Current Status: NO LONGER APPLICABLE

BUIs Addressed: Degradation of Benthos

EEWWTP was upgraded to secondary treatment near the end of 2006, and the discharge pipe was relocated to deeper waters. The plant now uses biological nutrient removal to significantly diminish

phosphorous, nitrogen, biochemical oxygen demand (BOD) and ammonia. It also uses UV light for disinfection.

This action is no longer applicable given the upgrades to the EEWWTP. Moreover, the Lake George Channel area has not been identified for sediment management action.



Action NPSM-2: Aerial monitoring of Cannelton Industries site

Current Status: NOT APPLICABLE

– this is a MICHIGAN action

Action NPSM-3: Biological monitoring at the Cannelton Industries site to ensure protection of the ecological food chain

Current Status: NOT APPLICABLE

– this is a MICHIGAN action

Action NPSM-4: Task team monitoring recommendations

** Broken into 4 subsections (a)-(d) in the Stage 2 Report (see Appendix C)*

Current Status: UNDERWAY

BUIs Addressed: Degradation of Benthos, Restrictions on Dredging Activities

Work completed to date:

- (b) This sub-action has been completed. Given

the complexity of sediment management in the St. Marys River a multi-agency approach is needed to oversee dredging. The Conservation Authority is the local permitting agency for dredging operations on the Ontario side of the river; and the MECP reviews and approves disposal options for dredged materials. As mentioned under NPS-1, a multi-agency

Dredging Administrative Controls document was developed that provides guidance for dredging proponents and permitting agencies on the regulatory oversights in the planning and undertaking of dredging activities. The document was completed in 2016, and will be linked to the planned multi-agency Sediment Management Strategy. Since its creation, the Dredging Administrative Controls document has been shared and used for a proposed dredging project in 2018.

Current work and actions to be undertaken:

- (a) This sub-action is ongoing.
- (c) This sub-action is pending until sediment management actions have been determined in the Sediment Management Strategy.
- (d) Guidance will be developed by the Sediment Task Team as part of the Sediment Management Strategy to provide information to those considering any type of activity that may disturb contaminated sediment within the AOC.

Action NPSM-5: Re-sampling of river sediments to obtain trend information

** Linked to Actions NPS-1, NPS-2 and NPS-3*

Current Status: UNDERWAY

BUIs Addressed: Degradation of Benthos

Work completed to date:

- A number of ECCC and MECP studies have been carried out within the St. Marys River in order to assess the contaminated sediment in accordance with the *Canada-Ontario Decision-Making Framework for Assessment of Great Lakes Contaminated Sediment*.
- Sampling for these studies has included areas within Lake George Channel (including the area around the EEWWTP), Little Lake George, Bellevue Marine Park, the area east/downstream of Bellevue Marine Park.
- Given this significant investment and the numerous study reports that have been produced over the past decade, ECCC hired the MMM Group (\$10,000) to develop GIS-based maps that compile and synthesize existing sediment data in an illustrative manner. The maps were shared with BPAC in July 2015, and an interactive version is available online¹⁴. The maps summarize and illustrate the results of over 10 years of study on contaminated sediment on the Canadian side of the AOC, presenting data collected from over 100 sites sampled by ECCC and the MECP since 2012.

- As noted under Action NPS-1 and NPS-2, the Sault Ste. Marie Innovation Centre completed a number of projects to assess the quantity and quality of sediment being deposited in the area east of Bellevue Marine Park. The results indicate:
 - the deeper sediments (> 5 cm) are stable under a range of historical flow conditions (i.e. those measured over the last 100 years); and
 - the sediment is soft and relatively thick (2.5 to 4.5 meters), with the likelihood of hydrocarbon contamination in the uppermost 0.9 meters of sediment.
- As noted under NPS-1, in 2018 fieldwork was completed which included sampling associated with a new BEAST study, coring work east of Topsail Island in order to update the vertical characterization of the sediments in this area and the application of tracer compounds in that same area to aid in the future assessment of sediment accumulation.

Current work and actions to be undertaken:

- Results compiled to date indicate that contaminated sediment is low risk within the AOC, however, data is being reviewed in conjunction with other biological studies. The information will be factored in during the development of the multi-agency sediment management plan (see Action NPS-1).
- Reports will be completed for the 2018 BEAST and coring work. Additional fish and invertebrate toxicity work will also be completed using sediment collected during the 2018 BEAST work.

¹⁴ For the online interactive maps, visit: <http://geo.mmm.ca/flxviewers/StMarys/>

Action NPSM-6: Benthic, toxicity, and sediment chemistry studies at BMP

Current Status: **COMPLETE**

BUIs Addressed: Degradation of Benthos

Work completed to date:

- The Canada-Ontario Decision-Making Framework for Assessment of Great Lakes Contaminated Sediment was applied to St. Marys River from 2002-2010. Although contaminants were elevated in Bellevue Marine Park, this area was the least biologically impacted and does not require sediment management action.

- Sediments from some areas east of Bellevue Marine Park and lower parts of Lake George Channel elicited some toxic responses from tested organisms and/or showed impaired benthic communities. Management actions are required for some of these sites east of Bellevue Marine Park and two sites in Lake George Channel¹⁵.

Current work and actions to be undertaken:

No further action required in the BMP area.

¹⁵ Milani. 2012. Benthic Conditions in the St. Marys River from 2009 to 2010 and an Overview from 2002 to 2010. Environment Canada.

Action NPSM-7: Assess potential health risks resulting from floating contaminated masses

Current Status: **COMPLETE**

BUIs Addressed: Beach Closures

Work completed to date:

- From 2007-2010, the binational Sugar Island Monitoring Workgroup¹⁶ undertook intensive monitoring in the St. Marys River and concluded that the EEWWTP is not a source of ongoing elevated *E. coli* bacteria levels or debris/garbage to the St. Marys River. Laboratory analysis confirmed that floating material was predominantly comprised of algae, detritus and pollen, and a significant source of *E. coli* bacteria is believed to be stormwater runoff on both sides of the river.
- Since 2010, there have been no reported occurrences of floating masses in the Bellevue Marine Park area (previously thought to be from the sediment). Contaminated sediment in the vicinity of the park and downstream has been/is being assessed by the Sediment Task Team (see Action NPS-1 and Action NPS-2).

Current work and actions to be undertaken:

No further action required. The Stage 2 RAP identifies three actions needed to address the Beach Closings BUI, including Action NPSM-7. The other two were: Reduce stormwater infiltration at the East End Wastewater Treatment Plant (Action PS-2); and Upgrade East End Wastewater Treatment Plant to secondary treatment (Action PS-3). A BUI redesignation report was completed in 2017 that recommended the Beach Closings BUI be changed to not impaired status. It accounts for the significant improvements in overall water quality and efforts to address sources of *E. coli* to the AOC, including the confirmation that the floating masses are predominantly comprised of algae, detritus and pollen, and not a significant source of *E. coli* bacteria. The Beach Closings BUI redesignation report also accounts for a multi-year beach quality assessment completed in 2016 that indicates no major anthropogenic sources of bacterial contamination on the Canadian side of the St. Marys River, and that the AOC is comparable to non-AOC areas. The BUI was removed on the US side of the AOC in July 2016 and on the Canadian side in October 2018.

¹⁶ The Sugar Island Monitoring Workgroup's St. Marys River Water Quality Reports from 2007 – 2010 can be viewed at www.lssu.edu/bpac/sugar-island-materials

Action NPSM-8: Monitor non-point sources of pollution in the AOC

** Incidences of algal blooms were believed to have been caused by excessive nutrients coming from the EEWTP (a point source, see Action NPSM-7) and septic bed leakage in Echo Bay (non-point source)*

Current Status: COMPLETE

BUIs Addressed: Eutrophication or Undesirable Algae, Beach Closings; Degradation of Aesthetics

Work completed to date:

- In 1998, the Town of Echo Bay installed a communal sewage treatment system, which addressed the historical nutrient-loading issues related to individual septic beds.
- Algoma Public Health approves septic systems within the Algoma region, and has assessed the performance of these systems. In 2009, Algoma Public Health completed a survey of private septic systems on Pine Island. Although many of these systems are aging (installed in the 1940s-50s), the study did not find any major concerns.
- In 2016, based on information provided by Algoma Public Health, Algoma University completed a summary report on beach closings within the AOC from 2012 and 2016, and compared these to beaches outside the AOC. Exceedances of *E. coli* levels above the Provincial Water Quality Objective (PWQO) do not appear to be any more prevalent at beaches within the AOC versus outside the AOC. This multi-year beach closings assessment was part of a Beach Closings BUI redesignation report recommending that the Beach Closings BUI be changed to a not impaired status. It indicates no major anthropogenic sources of bacterial contamination on the Canadian side of the St. Marys River, and that the AOC is comparable to non-AOC areas. The Beach Closings BUI was redesignated to "not impaired" in October 2018.
- ECCC and the MECP provided financial support (\$140,000) to Algoma University to undertake a comprehensive water quality monitoring study of the St. Marys River. For three years (2013-15), Algoma University collected water samples at five sites throughout the Canadian side of the river on 23 occasions between November 2013 and October 2015. The samples underwent

analysis by a third party (Testmark Laboratories - Sudbury), evaluating the water for a number of aesthetic, physical and chemical parameters. The results were compared to relevant water quality and recreational standards and guidelines, and tested against the delisting criteria established for the Eutrophication/Undesirable Algae and Degradation of Aesthetics beneficial use impairments.

- Results from the water quality study indicate that, at the sites investigated from 2013-2015, there was no evidence of objectionable deposits, unnatural colour, unnatural turbidity, and/or unnatural odour, and therefore, no problems associated with degraded aesthetics as defined. And, oxygen stress is non-existent, large algal blooms and high concentrations of chlorophyll-a are absent, and the vast majority of nutrient measurements (phosphorus, carbon, nitrogen) are below the recommended guidelines and within the levels typically found on either oligotrophic or mesotrophic waters, but not eutrophic waters.
- The final report was shared with BPAC in September 2016, and BPAC agrees with the conclusion that the delisting criteria have been met, and both the aesthetics and eutrophication/algae BUIs should be deemed "not impaired". These two BUIs were redesignated to "not impaired" in October 2018.

Current work and actions to be undertaken:

No further action required. The BUIs associated with this action (Eutrophication or Undesirable Algae, Beach Closings, Degradation of Aesthetics) have been redesignated to a "not impaired" status on the Canadian side of the AOC in October 2018. Redesignation reports have been drafted accounting for the significant improvements in overall water quality and efforts to address sources of *E. coli* to the AOC. On the US side of the AOC: the Beach Closings BUI was removed in July 2016; Degradation of Aesthetics in March 2014; and Eutrophication/Algae in December 2016 by the U.S. Environmental Protection Agency stemming from separate assessments by the Michigan Department of Environmental Quality.



Action NPSM-9: Identify terrestrial and aquatic disposal sites transferring contaminants into waterways

** Linked to Action NPS-7*

Current Status: ADDRESSED

BUIs Addressed: Degradation of Fish and Wildlife Populations, Fish Tumours and Other Deformities. Loss of Fish and Wildlife Habitat

This action is already addressed through the MECP's regulatory programs and falls outside of the scope of the RAP program.

Action NPSM-10: Assess health risks to communities and individuals taking their water from the "down-river" regions of the St. Marys River

Current Status: ADDRESSED

BUIs Addressed: No official BUI designated

This action is already addressed through the Conservation Authority's Source Water Protection program and falls outside of the scope of the RAP program.



Action NPSM-11: Assess the potential hazards associated with spills from shipping vessels

Current Status: **COMPLETE**

BUIs Addressed: Degradation of Fish and Wildlife Populations, Loss of Fish and Wildlife Habitat

Work completed to date:

- In 2012-2013, ECCC commissioned an assessment and report on vessel-based discharges to the St. Marys River¹⁷. The cost was \$10,000. Even though Action NPSM-11 calls for an assessment on shipping vessels, the report looks at all vessels from large freighters to small personal watercraft.
- Covering a decade of reported cases [from 2001 to 2011], the report summarizes the suspected causes, pollutant types, discharge severity, season and timing of the spill/discharge as captured by the Canadian Coast Guard's "Marine Pollution Incident Reporting System" database.
- The St. Clair River AOC is also assessed in the report, and to provide context, it compares the AOC-specific incidents with those that have happened around the Great Lakes system as recorded by Canadian authorities.

- Based on the decade's worth of data, it is concluded that, "the number of vessel discharge incidents within the St. Marys River AOC vary from year to year, but remains fairly low." Key facts include:
 - the prevalence of vessel discharges in the St. Marys is very low (3%), with 14 reported incidents compared to 39 within the St. Clair River AOC and 380 in the Great Lakes [433 in total].
 - the proportion of pollution (i.e., number of litres discharged) in the St. Marys River is very low (<2%), with 1,941 litres entering the river compared to over 104,885 litres discharged to the Great Lakes; and of that total number of litres discharged to the St. Marys River, almost 98% of it is attributed to a single incident involving an 'operational discharge' in 2007 (1892.71 litres of diesel oil was discharged).
 - there exists a number of domestic, binational and international regulations/standards, agreements and programs that oversee vessel operations; and prevent, mitigate, and monitor vessel discharges in the Great Lakes system.

¹⁷ French Planning Services Inc. 2013. Background Report: Assessing the Potential Hazards to the River Associated With Vessel Discharges: St. Marys River AOC and St. Clair River AOC. Commissioned by Environment Canada.

Current work and actions to be undertaken: No further action required.

Action NPSM-12: Identify locations within the AOC which are associated with elevated levels of human health disorders

Current Status: ADDRESSED

BUIs Addressed: No official BUI designated

The issue of human health is addressed through the

Conservation Authority's Source Water Protection program and actions relating to the beach closings and fish consumption advisories BUIs. This particular action falls outside of the scope of the RAP program.

Action FFM-1: Identify the causes of fish tumours and other deformities which originate within the AOC

** Particular emphasis is given to those contaminants suspected of contributing to the problem (e.g. PAHs in sediments) and to the causes of deformities*

Current Status: UNDERWAY

BUIs Addressed: Fish Tumours and Other Deformities

Work completed to date:

- In 2009, ECCC collected AOC-resident fish consisting of 141 white suckers (an indicator species) across a diverse age range. Fisheries & Oceans Canada performed the liver tumour diagnoses and released its findings in 2012, suggesting a tumour prevalence rate of 10.6% (i.e., 15 fish collected from the St. Marys River exhibited tumours). The sampling and diagnosis costs were \$46,000 (not including salary).
- In 2013, with financial support from the MECP, ECCC hired Dr. Paul Baumann and a research team from the University of Toronto to run a full analysis of the data, determine the cause of the fish tumours, and recommend next steps. Completed in mid-2013, this work recommended:
 1. Comparing the age distribution of liver tumours in St. Marys River white sucker from the original 1985-1990 surveys to those from the 2009 survey;
 2. Collecting a targeted series of sediment samples near the Essar Steel Algoma location (including the Algoma Slip) and analyze them for PAHs; and
 3. Repeating the 100 fish survey within the

AOC in 2015 to obtain more information on changes in tumour prevalence and exposure after remediation events, including a subset to be sampled for bile to ascertain the presence of PAH bile metabolites, or for blood to quantify genotoxic damage to red blood cell nuclei using the comet assay.

- In March 2014, the results were presented to BPAC, and the implications and proposed next steps were discussed.

Current work and actions to be undertaken:

- ECCC is pursuing Dr. Baumann's recommendations listed above:
 - a) The original data from the 1985-1990 surveys could not be found; therefore, a comparison of the age distribution of liver tumours detected then versus 2009 cannot be completed.
 - b) As mentioned under NPS-5, with ECCC's financial support (\$15,000), Algoma Steel completed a sediment survey within the boat slip to provide current detailed information about contaminant concentrations, including PAHs. Results show elevated levels of PAHs.
 - c) In August 2015, ECCC completed fieldwork for the follow-up fish tumour survey, which collected 100 White Suckers from the AOC. The fish were analyzed for liver tumours by the B.C. Ministry of Agriculture in January 2017, and upon review by a third party it was confirmed six had tumours. This is down from 10.6% in 2009 and 9.2% in a 1985-90 survey. A report was finalized in July 2018. The total cost was \$65,000.

Action FFM-2: The marsh monitoring program

** The Marsh Monitoring program was established to provide baseline information on marsh birds and amphibian populations and their habitat.*

Current Status: COMPLETE

BUIs Addressed: Degradation of Fish and Wildlife Populations, Loss of Fish and Wildlife Habitat

Work completed to date:

- In August 2016, ECCC-CWS completed its 5-year monitoring effort (2011-2016) to assess baseline wildlife habitat conditions and evaluate the degree of impairment (if any) of coastal wetland water quality, and breeding marsh bird, amphibian, aquatic macroinvertebrate and submerged aquatic vegetation communities within the AOC. Non-AOC reference sites were also evaluated for comparison, and an index of biotic integrity (IBI) was used to factor in several metrics in the overall assessment. Total project cost was \$150,000 (not including salary). Stages of the study involved: in 2011, ECCC-
- CWS (with help from the local MNRF office) initiated the acquisition and review of existing data, imagery and documentation on baseline conditions and habitat availability within the AOC. In 2012, a reconnaissance survey was carried out for site selection based on geophysical parameters. In 2013, 2014 and 2015 breeding bird and amphibian (key indicator species) surveys were undertaken at selected sites. In June 2015, the project lead presented preliminary results to BPAC. The final report was shared with BPAC in October 2016, and the project lead presented and discussed the results at BPAC's meeting in December 2016. The main conclusions detailed in the final report include:
 - Water quality within the AOC;s coastal wetlands is comparable to non-AOC reference sites; suggesting overall water quality can be considered not impaired. Algoma University's water quality survey (2013-15) corroborates this.

- Breeding marsh birds in the AOC are in relatively undisturbed condition; thus this can be considered not impaired.
- There is no clear response to disturbance within the amphibian and aquatic macroinvertebrate communities, suggesting they can be considered not impaired.
- There are some differences between submerged aquatic vegetation communities in the AOC versus non-AOC reference sites, but the overall area is not impaired for this community type.
- The wildlife habitat component of the Loss of Fish and Wildlife BUI had been designated as "Requires Further Assessment" since the Stage 2 report in 2002. After this 5-year monitoring effort, the AOC's coastal wetland habitat and biotic communities were found "Not Impaired", thus satisfying the wildlife component of the BUI delisting criteria (i.e., coastal wetland wildlife habitat conditions within the AOC are comparable to those of suitable reference sites, as assessed using an index of biotic integrity).

Current work and actions to be undertaken:

- Although the wildlife component of the Loss of Fish and Wildlife Habitat BUI has been found to be "Not Impaired", the entire BUI will not be redesignated until all elements of the delisting criteria have been met. The delisting criteria states the BUI will no longer be impaired when: i) coastal wetland wildlife habitat conditions within the AOC are comparable to those of suitable reference sites, as assessed using an index of biotic integrity (ACHIEVED); ii) rapids habitat conditions are enhanced through feasible conservation and restoration measures identified in the Stage 2 Remedial Action Plan (see Action FF-6); and iii) the closely linked "Degradation of Fish Populations" BUI is no longer deemed impaired (see Action FFM-3).

Action FFM-3: The fish harvest survey

Current Status: UNDERWAY

BUIs Addressed: Degradation of Fish Populations

Work completed to date:

- MNRF and the Michigan Department of Natural Resources (MDNR) have been conducting joint creel surveys examining the fish harvest in the river. The most recent survey synopsis from 2000-09 (by the St. Marys River Fisheries Task Group) is posted on the Great Lakes Fisheries Commission website¹⁸. A short summary was reported to the public in March 2011 and covered a summary of all the creel surveys since 1998.
- In 2009, Fisheries & Oceans Canada¹⁹ compared the status of fish communities from four distinct areas of the river (the upper river above the compensating works, the main river, Lake George, and the lower river) and provided an overall assessment of the fish community using an *index of biotic integrity* (IBI) approach. The study concluded, “The overall health of the St. Marys River fish community compared favourably with healthy reference sites from Lake Huron.” An IBI combines several metrics to provide an overall assessment of fish community health (not just population levels), including: mortality rates, age-class structure, survival to spawning age, reproductive success, total biomass, productivity, richness, assemblage, and abundance.
- In 2014, DFO initiated a follow-up 2-year survey that used the IBI approach again, and relied on the Mississagi River near the North Channel as the reference site. The total cost was \$57,000. Sampling was carried out in 2014, and the preliminary results discussed with BPAC in February 2015. The early findings rank the AOC’s IBI score lower than the reference site’s

(56.6 vs. 65.9, where 60-80 = very good and 40-60 = average). IBI scoring relies on biomass more than richness and diversity, so the number for the AOC is lower than the reference site because of relatively less biomass, despite the St. Marys River having high biodiversity. And the AOC’s fish community is dominated by native species, which is very positive. With a score just 3.4 points below the “very good” level, the AOC is considered to have good biotic integrity.

Current work and actions to be undertaken:

- DFO conducted the second year of fieldwork in summer 2015, and is currently reviewing the data. A final report is anticipated in 2019 which will be shared with BPAC as part of the discussion on the current status of the Degradation of Fish Populations BUI as it relates to the delisting criteria.
- In summer 2017, MNRF and MDNR partnered to complete a river-wide creel survey of the St. Marys River. This has not occurred since 1998 as funding was the principle impediment. A report is expected in 2019.



¹⁸ The survey can be viewed at: www.gllfc.org/lakecom/lhc/SMRFTG.php

¹⁹ Fisheries and Oceans Canada. 2009. The Nearshore Fish Community of the St. Marys River. T. Pratt and L. O'Connor.

Action FFM-4: The fish contaminant monitoring programs

Current Status: UNDERWAY

BUIs Addressed: Restrictions on
Fish and Wildlife Consumption

Work completed to date:

- The MECP monitors fish contaminants through the Fish Contaminant Monitoring Program.

Current work and actions to be undertaken:

- In 2013, the MECP reviewed the availability of fish

contaminant data for the AOC and identified priorities for monitoring. Limited collections were completed in 2014 and 2015; additional fish were collected in 2016 in order to provide an update on contaminant levels in comparison to reference sites. The preliminary results suggest that the levels of contaminants in fish at St. Marys River AOC have declined such that beneficial use of fish consumption can be considered "Not Impaired". Final results will be available by the end of 2019-2020 fiscal year. A fish eating survey, however, will also need to be conducted to confirm the status of this BUI.

Action FFM-5: The CWS surveys of the Common and Black Tern populations

Current Status: COMPLETE

BUIs Addressed: Degradation of
Fish and Wildlife Populations

Work completed to date:

- In December 2014, ECCC completed a population assessment for the terns based on nest count surveys it conducted between 2010 and 2013, supplemented with historical breeding data from 1978-80, 1989, 1999-00, and 2007-08. Population trends for other colonial waterbirds were included to provide a broader context of trends in diversity and abundance within the AOC. Key facts include:
 - overall, the total number of colonial waterbird nests on the Ontario side of the river increased by almost 23% between 1999 and 2008; largely driven by dramatic increases in Ring-billed Gulls.
 - despite natural fluctuations, Common Tern populations have had no significant change

over the past 30+ years, with 70 nests found in 1978-80 versus 78 in 2007-08;

- evidence from nest count surveys between 1980 and 2013 suggest trends in populations of nesting Common Terns in the AOC are likely related to factors consistent with the life history strategies of the species, and are not specific to influences in the AOC;
- Black Terns seem to be limited on the Ontario side of the river, with a breeding colony found only at Echo Bay. It is not possible to report on temporal trends in abundance of Black Terns in the AOC due to limited data, but there is no evidence to suggest that breeding status within the AOC differs from those nesting at sites downstream in the North Channel.
- the relative low population of nesting Black Terns is likely reflective of low densities reported throughout the region, Ontario and the Great Lakes basin; not due to AOC-specific conditions.

Current work and actions to be undertaken:

No further action required.

Action FFM-6: Analysis of contaminant levels in eggs

* *Linked to Action FFM-8*

Current Status: COMPLETE

BUIs Addressed: Degradation of Fish and Wildlife
Populations, Bird and Animal Deformities
or Reproductive Problems

Work completed to date:

- In February 2014, ECCC completed a report on its 3-year common tern and herring gull study, which was based on fieldwork and

laboratory analysis in 2011, 2012 and 2013 to assess deformities, reproductive health, and chemical contamination (in eggs) of these indicator species. The report was shared with BPAC in March 2014, which followed a presentation of the preliminary findings the previous June. An addendum was circulated in December 2014 with added detail on embryonic deformities. The total project cost was \$157,000 (not including salary).

- The study's conclusion is, "there is little evidence of impaired reproduction or deformities in colonial waterbirds [herring gulls and common terns] attributable to local contamination effects within the St. Marys River AOC". Key findings include:
 - Contaminant levels are low overall and not sufficiently elevated to have an adverse impact on reproductive success and development [this is the case for polychlorinated biphenyls (PCBs) and other organochlorines, dioxins/furans, heavy metals like mercury, and polybrominated diphenyl ethers (PBDEs)];

- No physical deformities have been detected within gull or tern chicks [the original issue identified by the RAP]. There is a low incidence of embryonic deformities that cannot be linked to contaminant burdens or to geographical area (i.e., there is no significant difference between AOC and non-AOC bird colonies); and the reproductive success for herring gulls within the AOC is high, and that of the common tern is similar to the rest of the region.

Current work and actions to be undertaken:

- In January 2016, the Bird and Animal Deformities or Reproductive Problems BUI was officially re-designated to "Not Impaired," consistent with the decision by the United States and State of Michigan in February 2015. The previous designation of "Requires Further Assessment" had been in place since 2002.

Action FFM-7: Monitoring of population changes due to habitat enhancement

Current Status: COMPLETE [Wildlife Habitat]
PENDING [Fish Habitat]

BUIs Addressed: Degradation of Fish and Wildlife Populations, Loss of Fish and Wildlife Habitat

This action is to be addressed only after fish and wildlife "habitat enhancement efforts" are implemented.

Work completed to date:

Wildlife: see Action FFM-2, FFM-6, and FFM-8.

Fish: In 2009, the DFO produced a Nearshore Fish Community Survey that concluded the overall health of the St. Marys River fish community compares favourably with healthy reference sites from Lake Huron. DFO undertook a follow-up survey in 2014-2015, with a second survey expected in 2017.

Current work and actions to be undertaken:

Wildlife: No further action required. As outlined under Action FFM-2, Action FFM-6, and Action FFM-8; through a number of comprehensive studies the wildlife component for both the Degradation of Fish and Wildlife Populations BUI and Loss of Fish and Wildlife Habitat BUI have been determined to be Not Impaired.

Fish: DFO completed its second Nearshore Fish Community Survey to evaluate the overall health of the St. Marys River fish community, and the results will be reviewed in parallel with the latest fish creel survey results from the St. Marys River Fisheries Task Group. The survey results were presented to BPAC in 2017. The 2017 survey results will be presented to BPAC in 2019. In addition, it is anticipated there will be a post-construction monitoring component of the proposed aquatic habitat restoration project on Whitefish Island being planned in partnership with Batchewana First Nation (see Action FFM-6).

Action FFM-8: Reproductive assessment of Gulls and Terns

* Including the assessment of deformities in Common Terns.

* Linked to Action FFM-6

Current Status: COMPLETE

BUIs Addressed: Degradation of Fish and Wildlife Populations, Bird and Animal Deformities or Reproductive Problems

Work completed to date:

- Refer to Action FFM-6. The reproductive success for Gulls within the AOC has been found to be at

healthy levels, and that of Terns has been found to be similar to that found within the region (i.e., non-AOC areas).

Current work and actions to be undertaken:

- The Bird and Animal Deformities or Reproductive Problems BUI will be designated Not Impaired in 2015; consistent with the decision by the United States and State of Michigan in February 2014.

Action FFM-9: Evaluate influence of water levels and flows on spawning and production

Current Status: ADDRESSED

BUIs Addressed: Loss of Fish and Wildlife Habitat

This and other actions related to St. Marys River water levels/flows are beyond the scope of the RAP program. The associated policies and controlling measures are the purview of the International Lake Superior Board of Control and regulations set by the International Joint Commission (IJC).

In November 2014, the Board of Control announced it was adopting *Regulation Plan 2012* (effective January 2015) as the means for regulating Lake Superior outflows in a manner that will allow for more natural flows in the St. Marys River, with

smaller month-to-month changes in flows compared to the previous plan in place since 1977. The Board cites that as an important factor in the sustainability of the river's ecosystem and for protecting Lake Sturgeon habitat from rare but serious impacts²⁰.

The Regulation Plan 2012 is the outcome of the IJC's *International Upper Great Lakes Study*²¹ (2007-12). The study – a 5-year, \$17.6 million binational effort – examined alternative water-level regulation scenarios (including potential ecological impacts) on Lakes Superior, Michigan-Huron, and Erie. The Ecosystem Technical Working Group of that study provided information on the potential ecological impacts on the St. Marys River rapids should the water level/flow regulations change. In March 2012, upon completion of the study, the Study Board recommended “Lake Superior Regulation Plan 2012” as the improved regulation plan governing outflows from Lake Superior. The Study Board – made up of a panel of experts from Canada and the U.S. – believe the proposed plan offers important environmental benefits over the status quo, including benefits to the St. Marys River.



²⁰ Fact sheet on Regulation Plan 2012 found at: www.ijc.org/files/tinymce/uploaded/ILSBC/Plan2012_FactSheet.pdf

²¹ For information on the *International Upper Great Lakes Study*, visit: www.iugls.org

Action FFM-10: Determine minimum water levels and flow rates necessary for spawning

Current Status: **ADDRESSED**

BUIs Addressed: Loss of Fish and Wildlife Habitat

Refer to Action FFM-9, as the same argument applies for removing this action from the list.

Action FFM-11: Monitoring water quantity

Current Status: **ADDRESSED**

BUIs Addressed: Loss of Fish and Wildlife Habitat

Refer to Action FFM-9, as the same argument applies for removing this action from the list.

ECCC and the U.S. Army Corp. of Engineers monitor St. Marys River water quantity as part of the International Joint Commission's Lake Superior Board of Control and its program for monitoring the water level of Lake Superior and ordering adjustments to the Compensating Works at the St. Marys Rapids as per the water level/flow regulations of the day.

As mentioned under Action FFM-9, effective January 2015, the Board of Control is adopting *Regulation Plan 2012* as the means for regulating Lake Superior outflows in a manner that will allow for more natural flows in the St. Marys River.

CONCLUSIONS: CHARTING A COURSE TO DELISTING THE AOC

Since the Stage 2 RAP document was released in 2002, substantial progress has been made on many of the recommended actions. There are still many actions that remain unfinished though, as well as actions that no longer apply to the AOC due to process improvements from local dischargers, or because they fall outside of the scope of what the AOC and RAP program entails.

Future AOC efforts will focus on sediment management concerns, fish health, and habitat restoration. It has been determined that Lake George Channel and the Bellevue Marine Park do not require sediment management action, but the area downstream or east of Bellevue Marine Park do have sites that need to be addressed. A dedicated task team is reviewing the results from recent studies that should put the group in a better situation to decide the most appropriate action under a contaminated Sediment Management Strategy, which will be a standalone document from this Implementation Annex.

As progress is made on the remaining outstanding actions, the Implementation Annex will be updated, so that it is displaying the current status of each action at all times.

Once the recommended actions are completed, the criteria for restoring beneficial uses are met, and long-term monitoring plans are in place to ensure that environmental recovery is maintained, the St. Marys River will reach the point where it will be able to be delisted as an AOC. At such a time, the rationale for doing so will be articulated in a final RAP report with appropriate scientific evidence. Delisting will also depend on public and stakeholder consensus that the time has come to remove the St. Marys River from the list of one of the most degraded areas in the Great Lakes.

APPENDIX A: REMAINING ST. MARYS RIVER AREA OF CONCERN REMEDIAL ACTIONS TRACKING MATRIX

Action	Status	BUI Addressed	Implementing Organisation(s)	Targeted Completion date	Comments
Remaining Point Source Actions:					
Action PS – 1	ONGOING	Restrictions on Fish Consumption Degradation of Fish and Wildlife Populations Fish Tumours and Other Deformities	Lead: Industry, City of Sault Ste. Marie Support: ECCC, MECP, DFO		
Action PS - 2	ONGOING	Beach Closures	Lead: City of Sault Ste. Marie		
Action PS – 5	ONGOING	N/A	Lead: City of Sault Ste. Marie, SSMRCA, MNRF, DFO, MECP, ECCC, Industry		
Action PS – 9	COMPLETE	Degradation of Aesthetics	Algoma Steel, MECP		
Remaining Non-Point Source Actions:					
Action NPS-1	UNDERWAY	Degradation of Fish and Wildlife Populations Fish Tumours and other Deformities Degradation of Benthos Restrictions on Dredging Activities	ECCC, MECP, SSMRCA, City of Sault Ste. Marie, TC, Industry	Multi-agency Sediment Management Strategy to be completed by December 2019	
Action NPS-2	UNDERWAY	Degradation of Benthos	ECCC, MECP, Industry		
Action NPS-5	UNDERWAY	Degradation of Benthos Restrictions on Dredging Activities	Algoma Steel, MECP, ECCC	Algoma boat slip dredging to be completed in 2019	This action will need review
Action NPS-6	COMPLETE	Eutrophication or Undesirable Algae Loss of Fish and Wildlife Habitat	Lead: AAFC, OMAFRA, SSMRCA Support: ECCC, MECP		
Remaining Flora and Fauna Actions:					
Action FF-2	UNDER REVIEW	Loss of Fish and Wildlife Habitat	Lead: SSMRCA, City of Sault Ste. Marie, OMAFRA, Algoma Steel Support: MNRF, ECCC, DFO, MECP, Local Groups	Unknown / Pending	This action will need review

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Action	Status	BUI Addressed	Implementing Organisation(s)	Targeted Completion date	Comments
Action FF-3	UNDER REVIEW	Loss of Fish and Wildlife Habitat	Lead: SSMRCA, City of Sault Ste. Marie, OMAFRA Support: MNRF, ECCC, DFO, MECP, Local Groups	Unknown / Pending	This action will need review
Action FF-6	UNDERWAY	Loss of Fish and Wildlife Habitat	Lead: MNRF, DFO Support: ECCC, MECP	Unknown / Pending	
Remaining Point Source Monitoring Actions:					
Action PSM-7	COMPLETE	Beach Closures	Lead: City of Sault Ste. Marie, SSMRCA Support: ECCC, MECP		
Remaining Non-Point Source Monitoring Actions:					
Action NPSM-4	UNDERWAY	Degradation of Benthos Restrictions on Dredging Activities	ECCC, MECP, TC	Sediment Management Strategy to be completed in 2019	
Action NPSM-5	UNDERWAY	Degradation of Benthos	ECCC, MECP		
Action NPSM-8	COMPLETE	Eutrophication or Undesirable Algae Beach Closings	Lead: City of Sault Ste. Marie, ECCC, MECP Support: AAFC, StatsCan, OMAFRA, SSMRCA		
Remaining Flora and Fauna Monitoring Actions:					
Action FFM-1	UNDERWAY	Fish Tumours and Other Deformities	Lead: ECCC, DFO Support: SMRFTG (DFO, MNRF)		
Action FFM-2	COMPLETE	Degradation of Fish and Wildlife Populations Loss of Fish and Wildlife Habitat	Lead: ECCC-CWS Support: MNRF		
Action FFM-3	UNDERWAY	Restrictions on Fish and Wildlife Consumption	SMRFTG (DFO, MNRF)	River-wide creel survey report expected in 2019	This action relies on an entire river survey which involves both sides of the river
Action FFM-4	UNDER REVIEW	Restrictions on Fish and Wildlife Consumption	Lead: MECP Support: MNRF, ECCC	Summary report expected by the end of 2019-2020 fiscal year	
Action FFM-7	PENDING (Fish Habitat) COMPLETE (Wildlife Habitat)	Degradation of Fish and Wildlife Populations Loss of Fish and Wildlife Habitat	ECCC, MNRF, DFO		This action relies on results from many other actions (FFM-1, -2, -6, -8)

APPENDIX B: BENEFICIAL USE IMPAIRMENT (BUI) DELISTING CRITERIA FOR THE ST. MARYS RIVER AREA OF CONCERN

CANADIAN SECTION (AS VOTED/ENDORSED BY BPAC ON FEBRUARY 25, 2015)

1) Restrictions on Fish Consumption

Description

This BUI is assessed through the Ministry of the Environment & Climate Change's Sport Fish Contaminant Monitoring Program. Local species that are of interest to anglers, and other large-bodied fishes representative of different trophic levels, are assessed and the results published in the *Guide to Eating Ontario Sport Fish*²². For the St. Marys River, consumption advisories have generally been based on mercury, polychlorinated biphenyls (PCBs), dioxins/furans, and dioxin-like PCBs. While polycyclic aromatic hydrocarbons (PAHs) have been linked to tumours within fish, they do not accumulate in fish at levels that result in restrictions for human consumption.

Delisting Criteria

This beneficial use will no longer be impaired when the fish consumption advisories in the Area of Concern are no more restrictive than

²² Visit: www.ene.gov.on.ca/environment/en/resources/collection/guide_to_eating_ontario_sport_fish/index.htm

the advisories for the same contaminants in suitable reference sites. Comparisons shall be based on samples collected in the same timeframe for a minimum of two consecutive sampling events.

Assessment Approach/Rationale

- Suitable reference sites: upstream: Goulais Bay (Block LS11); and downstream: Lake Huron's North Channel (Block NC1 and/or NC2).
- Same timeframe: The criterion states that samples for comparison should be caught in the same timeframe (i.e. ≤ 6 years which is consistent with the Lake Superior/Lake Huron lakewide monitoring efforts). An examination of records for historical fish consumption advisories in the St. Marys River will also be included to compare changes over time.
- Assessment shall target resident river species, such as: Northern Pike, Yellow Perch, 'river' Walleye, White Sucker, and potentially Smallmouth Bass. Although Pacific Salmon, Atlantic Salmon, and trout species are caught in the St. Marys River, these species are not considered resident river species for most of their life cycle.

2) Degradation of Fish Populations

Description

Fish population dynamics is the foundation of this BUI. It assesses whether local environmental conditions support healthy, self-sustaining communities of fish. This is not limited to population levels, but overall fish community health. For the St. Marys River AOC, the concern raised in the Remedial Action Plan has been native fish populations being stressed by habitat alteration, over-fishing, pollution, and invasive species. There had been a body burden component of this BUI, but the issues raised in the RAP were specific to PAHs, PCBs, and resin acids. These are addressed in other BUIs, so this BUI is only focused on fish population dynamics.

Delisting Criteria

This beneficial use will no longer be impaired when the overall fish community health within the Area of Concern is comparable to that of a suitable reference site, as assessed using an index of biotic integrity through a minimum of two consecutive studies.

Assessment Approach/Rationale

- Suitable reference sites: Lake Huron, such as the North Channel.
- Fish community: The St. Marys River contains a diversity of habitats that has resulted in a widely diverse fish community containing some 46 fishes from 16 families²³. An "index of biotic

²³ Fisheries and Oceans Canada. 2009. The Nearshore Fish Community of the St. Marys River. Thomas C. Pratt and Lisa M. O'Connor, pg. 3

integrity (IBI)” approach combines several metrics to provide an overall assessment of fish community health, and does not ‘target’ specific fish species. Instead, based on all fish collected, an IBI-based study examines: fish production, habitat-productivity, community structure, species richness, and biomass; and uses four factors that determine the condition of nearshore fish assemblages: non-native species, water quality, physical habitat, and piscivore abundance.

In 2009, Fisheries & Oceans Canada completed an overall assessment of the fish community using the IBI approach, with

²⁴ Ibid.

fieldwork starting in 2006. Comparing the status of fish communities from four distinct areas of the river (upper river above the Compensating Works; main river, Lake George, and the lower river), the study concluded, “The overall health of the St. Marys River fish community compared favourably with healthy reference sites from Lake Huron.”²⁴ DFO is conducting a follow-up survey using the IBI approach, with sampling in 2014 and 2015, with a final report anticipated in 2016. Other information/data sources will be used to supplement the IBI approach. Specifically, results from the binational St. Marys River Fisheries Task Group’s fish surveys (produced every 3 years) will be used to confirm the status of “managed” fish populations.

3) Fish Tumours and Other Deformities

Description

This BUI was designated *impaired* for the St. Marys River AOC after 185 White suckers sampled from 1985-90 exhibited a tumour prevalence rate of 9.2%²⁵. In 2012, Fisheries & Oceans Canada completed tumour diagnoses for White suckers collected in 2009, and found the tumour rate remained elevated with 15 of the 141 fish exhibiting liver tumours, or 10.6%. In both cases, the likely cause was deemed to be exposure to polycyclic aromatic hydrocarbons (PAHs) within the river sediment. Experts believe there is a state of impairment when the prevalence of liver tumours (hepatic neoplasms) is greater than 5%^{26, 27}. Equally valid is the comparison of tumour rates from AOC-based fish against those sampled from not-impacted reference sites²⁸.

Delisting Criteria

This beneficial use will no longer be impaired when a survey from within the Area of Concern

of a locally abundant member of the sucker family, encompassing a diverse age range, indicates a liver tumour prevalence rate of less than 5%.

Assessment Approach/Rationale

- Environment and Climate Canada is undertaking a repeat fish tumour survey in 2015, with results anticipated by mid-2016.
- Possible reference sites could include: bays, channels or other rivers within the upper Great Lakes (Superior and Huron).
- Targeted indicator species will be the White sucker considering its range is fairly limited; it is abundant in the St. Marys River and upper Great Lakes (to use as reference); and has been used in previous AOC studies. Benthic feeders like White sucker are used in all Canadian AOCs to assess fish tumours since they are a good – albeit sensitive – indicator species for ecological conditions.
- Sample size goal will be 100 or more individuals encompassing diverse ages. This is considered a robust sample set needed for defensible statistics to compare against the expert-recommended 5% tumour rate threshold, and to contrast the tumour rates from AOC-based fish against those from a suitable reference site(s).

²⁵ Environment Canada et al. 2002. St. Marys River Remedial Action Plan – Stage 2. Page 37.

²⁶ Ibid

²⁷ Great Lakes Commission. 2002. An Overview of U.S. Great Lakes Areas of Concern. Under cooperative agreement with the U.S. EPA. Page 101.

²⁸ International Joint Commission. 1991. Commission Approves List/Delist Criteria for Great Lakes Areas of Concern. www.ijc.org/rel/focus/listdelist/

4) Degradation of Benthos:

- a) Dynamics of benthic populations and**
- b) Body burdens of benthic organisms**

Description

The original impetus for this BUI being deemed impaired was the exceedence of the Severe Effect Level for polycyclic aromatic hydrocarbons (PAHs) in several locations in the St. Marys River; for iron at several sites; and for arsenic, nickel and manganese at the Algoma Steel slag yard. Environment and Climate Change Canada and the Ministry of the Environment, Conservation and Parks have been carrying out studies on the chemical, biological and physical conditions of the river sediment and the organisms living within it (benthos), which will contribute to an informed decision on appropriate sediment management for the AOC.

Delisting Criteria

To be developed.

Assessment Approach/Rationale

The Canada-Ontario Decision Making Framework for Assessment of Great Lakes Contaminated Sediment was developed in 2008 on behalf of ECCC and the MECP as a consistent, scientifically defensible, and publically accepted framework for assessing and managing contaminated sediment within AOCs. It is being applied in the St. Marys River AOC.

Since 2009, ECCC and the MECP have co-led a multi-agency Sediment Management Technical Team, which also includes representatives from the Department of Fisheries Oceans, Ministry of Natural Resources and Forestry, Sault Ste. Marie Regional Conservation Authority, City of Sault Ste. Marie, and Algoma University. The team will begin working on a sediment management plan after the completion of sediment quality, stability and biological studies (including the fish tumour work, pending completion in mid-2016).

Future meetings will be held with BPAC to discuss the approach going forward, starting with the process for evaluation potential sediment management options.

5) Restrictions of Dredging Activities

Description

Similar to Degradation of Benthos, this BUI is focused on contaminated sediment. It applies to specific cases where commercial-navigational dredging is routinely required but is considered “impaired” when contaminants are above concentrations that permit open water disposal (i.e., it cannot exceed limits under the Provincial Sediment Quality Guidelines²⁹). It is the additional *financial cost* associated with disposing the contaminated dredgate on land (instead of freely in the open waters) that is considered the impaired beneficial use. Regardless, open water disposal does not happen on the Canadian side of the St. Marys River. Doing so can affect aquatic communities and habitat by smothering the area and introducing

different sediment types³⁰. Instead, it is disposed of within a landfill, confining structure of a lakefill, or confined disposal facility.

Delisting Criteria

This beneficial use will no longer be impaired when administrative controls and other regulatory procedures are in place within the Area of Concern that provide guidance and oversight for dredging proponents and permitting agencies in the planning and undertaking of dredging activities, including mitigating measures to reduce negative impacts. Such guidance will be made clear in a multi-agency Dredging Administrative Controls document that will be part of a broader sediment management plan for the Area of Concern.

²⁹ Ministry of the Environment. 1992. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario.

³⁰ Golder Associates. 2012. Review of Sediment-Related BUIs in the Toronto & Region AOC and the Bay of Quinte AOC. Submitted to Environment Canada.

Assessment Approach/Rationale

This is to not only reflect the current regulatory process and oversights in place today, but to hold each proponent and dredging activity to account.

A multi-agency Dredging Administrative Controls document will articulate the current system of checks and balances that oversee dredging on the Ontario side of the St. Marys River.

6) Eutrophication and Undesirable Algae

Description

The Stage 1 and 2 RAP reports recognized that eutrophication and excessive algal growth were issues in the vicinity of Sault Ste. Marie Ontario's East End Water Pollution Control Plant. This led to the recommendation that the plant be upgraded to secondary treatment, which was successfully completed in 2006. In fact, the plant now features a biological nutrient removal system and UV light disinfection. The upgrade resulted in an 89% reduction in suspended solids, phosphorus levels reduced by more than 91%, and biological oxygen demand (BOD) lowered by over 96%. Significant reductions in nitrogen and ammonia have also been achieved.

Delisting Criteria

This beneficial use will no longer be impaired when comprehensive tests of the Area of Concern's water quality demonstrate the river is free from persistent or reoccurring problems associated with oxygen stress (eutrophication) and large algal blooms, as determined through a comparison to established guidelines for the relevant physical and chemical parameters.

Assessment Approach/Rationale

Environment Canada and the Ministry of the Environment are providing financial support to Algoma University to undertake a comprehensive, 3-year water quality monitoring study of the St. Marys River (2013-15). The study will include a control site (Gros Cap) and will factor in high-rain events. Along with documenting field observations and taking photographs, the study will involve the collection and analysis of surface water samples at five locations along the river. Physical and chemical parameters to be tested include:

- Total Suspended Solids
- Turbidity/light penetration depth
- Dissolved Organic Carbon
- Temperature
- Dissolved Oxygen
- Visual Water Clarity and Colour
- Total Phosphorus
- Visible sheens, algae mats
- Total Nitrogen
- Odour
- Major Anions (NO₂, NO₃)
- pH
- Chlorophyll A Content
- Unionized Ammonia
- Ammonia/Ammonium

7) Beach Closings

Description

The Beach Closings BUI was first deemed "impaired" in the Stage 1 RAP (released 1992) due to elevated *E.coli* bacteria within the St. Marys River. At that time, there were no official public beaches on the Ontario side of the river; so no specific beaches were identified or studied for designation (today, potential human health risks associated with using public beaches are assessed and managed under the Algoma Public Health Agency's Beach Warnings program, which is separate from the RAP/AOC program).

Instead, the original BUI was based on levels of *E. coli* in the river exceeding both the *Provincial Water Quality Objectives* and the *Michigan Water Quality Standards*. This occurred within Ontario and Michigan waters downstream of storm sewers, combined sewer overflows (specific to Michigan), industrial outfalls, and the East End Water Pollution Control Plant. [see page iii, 18 and 87 in the Stage 2 RAP for details]

Therefore, with the original focus of the Beach Closings BUI being specific to *E.coli* in the river itself (and the need to manage the bacterium in the river, not on particular beaches), the delisting

criteria is specific to the actions outlined in the Stage 2 Remedial Action Plan to address the original scope of the problem.

Delisting Criteria

This beneficial use will no longer be impaired when:

- i) stormwater infiltration is reduced to help prevent sewage treatment bypasses, and a Stormwater Management Master Plan completed and being implemented by the City of Sault Ste. Marie that outlines the preferred solution for managing stormwater quantity and quality;*
- ii) the East End Water Pollution Control Plant is upgraded to secondary treatment; and*
- iii) potential human health risks resulting from floating material near and downstream of Bellevue Marine Park are assessed and managed, as required.*

Assessment Approach/Rationale

Meeting these three elements of the delisting criteria will be the measure of success for the Beach Closings BUI, because the original concern identified in the Stage 2 RAP was *E. coli* in the river itself and sources of the pollution: storm sewers, combined sewer overflows (specific to Michigan), industrial outfalls, and the East End Water Pollution Control Plant (EEWPCP).

The Stage 2 RAP (pg. x) identifies three corresponding actions specific to the Beach Closures BUI, and hence they are explicit in the

delisting criteria:

i) Reduce stormwater infiltration to prevent sewage bypasses (RAP Action “Point Source 2”)

** Note: this action is interpreted as mitigating stormwater infiltration and loading at the East End Water Pollution Control Plant.*

Status: **COMPLETE** – see RAP Implementation Annex, pg. 13

The City has already invested in the construction of the Bellevue Park Sanitary Sewer Overflow tank in 2002 that mitigates the impact of stormwater infiltration and impacts on the EEWPCP. The City also updated its Sewer Use By-law in 2009, with more stringent discharge requirements. The bylaw continues to include clauses restricting the discharge of stormwater and surface water to the sanitary sewer system, and prohibiting the connection of roof leaders to the sanitary system. Upon approval, the Stormwater Management Master Plan is the long-term strategy the City will follow for managing stormwater runoff around the community.

ii) Upgrade East End Water Pollution Control Plant to secondary treatment (RAP Action “Point Source 3”)

Status: **COMPLETE** – see RAP Implementation Annex, pg. 14

iii) Assess potential human health risks resulting from floating contaminated masses near, and downstream from, Bellevue Marine Park (RAP Action “Non-Point Source Monitoring 7”)

Status: **COMPLETE** – see RAP Implementation Annex, pg. 31

8) Degradation of Aesthetics

Description

The Stage 1 and 2 RAP reports speak to years past when oil slicks occurred downstream of the Algoma Slip and Terminal Basin. Historically, oily fibrous material mixed with woody debris were spotted along the Ontario shoreline. The East End Water Pollution Control Plant in Sault Ste. Marie, Ontario was also identified as impacting the river's aesthetics, before it was upgraded in 2006. For these past conditions, the BUI was designated as impaired. Conditions along the river are much improved, and

many now believe the river's aesthetics are fine (i.e., Michigan DEQ and U.S. EPA's redesignation of BUI to “Not Impaired” in March 2014).

Delisting Criteria

This beneficial use will no longer be impaired when comprehensive tests of the Area of Concern's water quality demonstrate the river is devoid of any substances that produce a persistent objectionable deposit, unnatural colour or turbidity, or unnatural odour, and is free from persistent or reoccurring problems associated with degraded aesthetics.

Assessment Approach/Rationale

As part of the same 3-year study (2013-15) to re-assess the Eutrophication and Undesirable Algae BUI, several physical and chemical parameters relevant to aesthetics (below) will be tested from surface water samples taken at five locations along the river. In addition, field observations will provide a qualitative assessment, which will be backed up with photographs. The study will include a control site (Gros Cap) and will factor in high-rain events.

- Total Suspended Solids
- Turbidity/light penetration depth
- Dissolved Organic Carbon

- Temperature
- Dissolved Oxygen
- Visual Water Clarity and Colour
- Total Phosphorus
- Visible sheens, algae, mats
- Total Nitrogen
- Odour
- Major Anions (NO₂, NO₃)
- Chlorophyll A Content
- Unionized Ammonia
- Ammonia/Ammonium
- pH

9) Loss of Fish and Wildlife Habitat

Description

The Stage 1 and 2 RAP reports identify shoreline alteration, industrialization and urbanization, shipping activities, and shoreline cottage development as having caused a significant loss in fish and wildlife habitat along the river; particularly around the twin cities of Sault Ste. Marie. The flow control structure at the head of the rapids (the Compensating Works) is also cited as changing the biological integrity and productive potential of the river's rapids habitat. However, there has never been a comprehensive assessment for this BUI, which was a gap identified in the Stage 2 RAP report when it still deemed the BUI as impaired.

Delisting Criteria

This beneficial use will no longer be impaired when:

- i) coastal wetland wildlife habitat conditions within the Area of Concern are comparable to those of suitable reference sites, as assessed using an index of biotic integrity;*
- ii) rapids habitat conditions are enhanced through feasible conservation and restoration measures identified in the Stage 2 Remedial Action Plan; and*
- iii) the closely linked "Degradation of Fish Populations" BUI is no longer deemed impaired.*

Assessment Approach/Rationale

- Wildlife Habitat: EC is conducting a comprehensive, 4-year study (2012-15) to assess current conditions and evaluate the degree of impairment (if any) in coastal wetland water quality, and breeding marsh bird, amphibian, aquatic macroinvertebrate and submerged aquatic vegetation communities within the AOC, as well as non-AOC reference sites. Using a wetland disturbance gradient, an index of biotic integrity (IBI) specific to the St. Marys River is being developed for these factors. Each IBI uses several metrics to provide an overall assessment. Assessment of water quality uses a water quality index developed for the Great Lakes. Together, this will enable a comparison of conditions found within the AOC to non-impacted reference sites. EC is also using this approach in other river-based AOCs (i.e., Detroit River and St. Clair River).
- Fish Habitat: Several proposed conservation and restoration measures are outlined in the Remedial Action Plan specific to rapids habitat (pg. 70-72, Action FF-6: *Remediation of Rapids Habitat*). These will be fully assessed, and if deemed feasible, implemented.
- Degradation of Fish Populations BUI: DFO's evaluation of the St. Marys River nearshore fish community using an IBI approach that examines several metrics will provide an overall assessment of fish community health, and by extension, the condition of fish habitat within the AOC. The SMRFTG's fish surveys will evaluate the status of "managed" fish populations.

APPENDIX C: ACTIONS LISTED IN THE STAGE 2 REMEDIAL ACTION PLAN REPORT FOR THE ST. MARYS RIVER AREA OF CONCERN

Action NPS-1: Development of a multi-agency sediment management program

* This action includes short- and long-term activities ranging from the assessment of immediate remedial options to the implementation of management actions. As such, there are ten actions listed in the Stage 2 RAP Report:

- a) The sediment mapping in the St. Marys River system should be continued until all significant zones of contaminated sediment, including those in the "down river regions", have been included in the survey. Once these zones have all been located and identified, they should each be characterized, if they haven't already, by determining their spatial distribution and by identifying and quantifying the contaminants within them. The identification would be done using the most current benthic, toxicity, and sediment chemistry studies (see Actions NPS-2 and NPS-3). The zones should also be ranked on the basis of toxicity and/or degradation of benthos.
- b) Using the monitoring data described above, develop a consistent, scientifically defensible, and publicly acceptable decision-making framework that will identify remediation options and provide a logical basis to guide community-based management decisions on sediment remediation within the AOC. This framework would contain, for example, the decision criteria used in identifying which zones require remediation and which remediation options are most appropriate for each zone. It would also provide the logical justification for these criteria and identify all of the data requirements needed for their application, thereby guiding decision making and providing the public with the means to understand and participate in the management process. Using available data, the framework would identify the range of remediation and disposal options for each site and would identify what additional information is needed to choose between them. Then, once this information has been obtained, it would guide the final selection of the most appropriate option (e.g., dredging, in situ treatment, capping, etc.).
- c) Once the final options have been selected in consultation with the public, implementation would be carried out with agency support and would be guided by precisely defined, numerically quantified objectives developed by the sediment management teams and incorporated into the delisting criteria. These objectives would define the completion-point for both implementation and ultimate remediation, and would be the focus of appropriate monitoring activities, as described under (h) below.
- d) To prevent additional accumulation of contaminants, and also their re-accumulation following remediation, it would be necessary to implement, prior to sediment remediation, a strategy to identify and control all major point and non-point sources of contaminant loadings to sediments within the St. Marys River system.
- e) The identification of contaminant sources, as described in item (d), would require a monitoring program that would track water and sediment quality at stations above, at, and below major dischargers, with the downstream limit for stations extending to the point of near-background conditions. It would also require the monitoring of any non-point sources (and tributaries) which may be contributing contaminants to the waterways within the AOC. The control measures, referred to in item (d), for point and non-point sources would include process upgrades at industrial and municipal facilities, cooperative environmental management agreements between industry and government, enforcement of government

regulations, and the measures described below under Action NPS-6.

f) There would also be a requirement to monitor and control any resuspension of contaminants that may occur during sediment remediation activities (see Action NPSM-4c) or during the dredging of navigation channels (see Action NPSM-4d).

g) Atmospheric inputs of persistent toxic substances to the waters and basin of the River would also need to be tracked (see also Action NPSM-4a).

h) Appropriate monitoring of remediation, both short-term and long-term, would be a vital component of the sediment management program. The short term monitoring would track progress towards the immediate implementation objectives, whereas the long term monitoring would track ecosystem response to the remediation and control measures and the ultimate effectiveness (or ineffectiveness) of these measures in meeting the delisting criteria. These monitoring activities, therefore, would provide the necessary information for adaptive management decisions or any changes or additions which may be required in the remediation strategy in order that it meet its designated goals.

i) The management program should also incorporate the benefits afforded by advancing technology. Thus, for example, remedial actions previously considered necessary but unrealistic, should be initiated once new technology makes them feasible, provided the necessity of these actions is still supported by current monitoring data and decision criteria.

j) All the above monitoring and remediation activities, furthermore, should be fully coordinated with those of the Lake Superior LAMP and those of the various RAP task teams. Furthermore, since Lake Huron is downstream from the St. Marys River, they should also be coordinated with those of the Lake Huron Binational Initiative.

Action NPS-4: Identification and control of contaminants from the Algoma Slag Dump

* Including stabilization of shoreline and nearshore sediments. Broken into 2 subsections (a)-(b), of the Stage 2 Report:

a) In an effort to identify and quantify the impacts resulting from groundwater seepage, ASI has made a commitment in the three party EMA to continue a program of monitoring the landfill site to assess trends in groundwater quality. The groundwater monitoring will be conducted on a four-year cycle commencing in 2001 and again in 2005. The results of the monitoring will be included in the first semi-annual report following completion of the studies as required in section 7.1 of the EMA. ASI has also committed to continue its efforts to reduce the overall load of material sent to the landfill for disposal and to develop and implement a suitable long-term plan for the waste disposal site describing its site operations and closure. The plan will be submitted to the OMOE and EC as part of the February 1, 2002 semi-annual report. The executive summary of this, and other semi-annual reports, may be found on the Internet at the URL provided in section 1.4.

b) It is also necessary to minimize the impact of contaminated sediments adjacent to the landfill site. Although actions were taken in 1993 to stabilize the shoreline along the slag dump, there is relatively little shoreline stability in some areas. It is therefore recommended that action be taken, wherever necessary, to stabilize the shoreline and nearshore sediments of the slag dump.

Action NPS-6: Control of agricultural and other non-point sources of pollution

* Broken into 5 subsections (a)-(e) of the Stage 2 Report:

- a) limiting livestock access to surface waters,
- b) proper management of manure piles and milkhouse waste disposal systems,
- c) restoring and stabilizing stream banks to reduce erosion,
- d) extending buffer strips along drainage ditches and streams, and
- e) providing education and financial support to farmers to facilitate the implementation of these and other proper farm management practices.

Action FF-2: Watershed Development Plan for Bennett and West

Davignon Creeks

* Broken into 23 subsections (a)-(w) in the Stage 2 Report:

- a) maintenance of headwater reaches in a natural state is encouraged
- b) restrict new development within 30m of shoreline
- c) tree planting in riparian zone
- d) restricting livestock access to stream
 - requires funding source to defray costs to landowners
- e) assist passage of migratory salmonids (eg. jumping pools below weirs, boulder placement, refuge creation)
- f) create spawning and nursery habitat for non-jumping fish between estuary and furthest downstream weir in the Diversion Channel
- g) naturalization of Diversion Channel
 - stream survey to assess migratory pathways, weir design, jumping pools, and resting areas
 - habitat and fish community usage study in the Diversion Channel from furthest downstream weir to the estuary
- h) prevent seepage of petroleum products from aggregate extraction operations into the aquifer to protect groundwater quality
- i) cooperation between Algoma Steel and the OMOE in designing and implementing soil remediation projects for inactive parcels of land
- j) Algoma Steel to continue to work with OMOE in addressing specific contamination issues as required (eg. phenolic seepage into downstream portion of the combined channel)
 - requires assessment of soil and groundwater contaminant levels on Algoma Steel property
- k) increase habitat quality and migration pathways in Diversion Channel with instream modifications
- l) review of weir and culvert design with respect to flow volumes between Diversion Channel and Bennett and West Davignon Creeks to optimize use of allocated flows
- m) maintain migratory pathways
- n) exclude passage of sea lamprey
 - definition of seasonal distribution of flow volumes prior to water reallocation and redesign of water management structures
- o) protection of natural water quality by adhering to buffer strip guidelines and continued restrictions on development
- p) provide alternative water sources for livestock
- q) streambank stabilization
 - identify current land use practices, livestock access points, streambank erosion, and parcels of inactive agricultural land

- r) reduce elevated bacteria and phosphorus levels between storm sewer pipe and the receiving water course through construction of retention ponds or man-made wetlands
- s) continued wetland development to improve salmonid staging habitat and provide for waterfowl and other wildlife
- options assume that water quality impairments upstream from Algoma Steel are the result of elevated iron, phosphorus, and bacteria levels; therefore, water quality sampling is required in the Diversion Channel and Mid and Upland sections of the Bennett and West Davignon Creeks.
- t) maintenance of riparian buffer zone contiguous with a forested area of no less than 1,000ha
- u) reforestation of inactive agricultural lands
- a guide outlining existing reforestation programs and strategies for owners of inactive agricultural land
- v) tree planting along top of Diversion Channel to improve aesthetic values and augment songbird habitat
- w)enhancement of wetland forming off of mouth of the Diversion Channel including contouring the shoreline of the estuary and planting semi-aquatic vegetation.
- x) list of appropriate species for planting
 - x) identify areas of shoreline in need of contouring

Action FF-6: Remediation of rapids habitat and associated wetlands

- * Broken into 8 possible options (a)-(h) in the Stage 2 Report:
 - a) Protection of remnant rapids habitat
 - b) Physical enhancement of remnant rapids habitat
 - c) Creation of new rapids areas in the St. Marys River
 - d) Creation of alternatives to rapids habitat
 - e) Creation of wetlands in association with existing rapids
 - f) Creation of new wetlands/rapids complexes
 - g) Enhance habitat and water quality in tributary watersheds
 - h) Do nothing

Action NPSM-4: Task team monitoring recommendations

- * Broken into 4 subsections (a)-(d) in the Stage 2 Report:
 - a) Continue with data collection at air quality monitoring network [see Action PSM-2, 4, 5]
 - b) Determine disposal options for dredged material following Provincial Sediment Quality Guidelines for Open Water Disposal of Dredged Spoils [see Action NPS-1]
 - c) Monitor change and impacts of remedial activities [see Action NPS-1]
 - d) Establish monitoring program for potential dredging and sediment dispersal within navigation channels [see Action NPS-1]

