

**City of Zeeland**  
**MS4 NPDES Application**

**Total Maximum Daily Load Implementation Plan**  
**Lake Macatawa - Phosphorus**

**I. Procedure to identify and prioritize BMPs being implemented or to be implemented during the permit cycle to achieve TMDL load reductions**

BMPs that address the Phosphorus TMDL for Lake Macatawa were identified and prioritized in the Macatawa Watershed Management Plan, approved by the DEQ (now EGLE) in 2012. Identification and prioritization exercises were completed by a Watershed Planning Committee, comprised of representatives from the local MS4 communities and other local stakeholders, with guidance from Macatawa Area Coordinating Council staff. BMPs were categorized into two groups, highly critical and moderately critical. The BMPs were then prioritized based on monitoring data that focused on pollutant sources and their causes within the watershed. Some of the top causes of nutrient loading identified in the management plan include loss of wetlands, lack of riparian buffers, improper use or over application of fertilizers, and poor storm water management. To insure that the BMPs established in the management plan are still prioritized in a way that ensures the greatest amount of progress towards meeting the TMDL, the Macatawa Watershed Project's Watershed Advisory Committee, which meets every other month, has been tasked with conducting periodic reviews of the management plan. The Watershed Advisory Committee includes representatives from the MS4 communities, local Board of Public Works, local townships, Michigan Department of Environment, Great Lakes and Energy (EGLE), Hope College, non-profits, and citizens.

**II. List of prioritized BMPs being implemented or to be implemented during the permit cycle to achieve TMDL load reductions**

The Macatawa Watershed Management Plan includes a list of prioritized BMPs that will reduce nutrient loads into Lake Macatawa (Table 1). Many of these BMPs have been implemented since 2012 when the management plan was approved and the MACC will continue to work with local landowners and other stakeholders to continue to implement these BMPs with the goal of meeting the phosphorus TMDL and restoring water quality in Lake Macatawa.

Multiple initiatives in the watershed have been making progress towards achieving phosphorus load reductions for Lake Macatawa. From 2015-2018, agricultural BMPs were implemented using grant funding from the Great Lakes Commission and Great Lakes Restoration Initiative as well as funding from a private source. In this time period, over 2,900 acres of residue management, 8,400 acres of cover crops and 10,000 acres of gypsum application were implemented. Additional practices including water and sediment control basins, two-stage ditches, grassed waterways, and wetland restorations were also implemented. It is estimated that during this timeframe, annual phosphorus inputs to Lake Macatawa were reduced by over 21,000 pounds.

Many of the BMPs that MS4 communities conduct result in nutrient load reductions, including street sweeping, catch basin cleaning and other pollution prevention and good housekeeping practices. Dry

weather screening is conducted once during the permit cycle, which helps identify and remove nutrient rich illicit discharges.

The City of Zeeland actively seeks ways to incorporate water quality improvements into their storm sewer system projects, such as the use of proprietary devices or green infrastructure.

**Table 1. BMP recommendations to reduce nutrient loading to Lake Macatawa. Red indicates high priority and orange indicates moderate priority actions.**

Source	Cause	Recommendations	
		Structural	Non-Structural
Agricultural Runoff	Loss of Wetlands	Wetland restoration	Wetland protection ordinances
	Lack of riparian buffers	Increase and improve buffers	Riparian Overlays/ Zoning
	Lack of BMPs	Cover crops, reduced tillage, gypsum amendments, grassed waterways, grade stabilization structures, drainage water management, two stage ditch design	Verification in MAEAP program
	Improper use of over application of manure		Nutrient management plans, manure management plans, refraining from winter applications
Urban Residential Runoff	Loss of wetlands		Wetland protection ordinances
	Improper use or over application of fertilizers		Homeowners use Lawn Care Seal of Approval Companies
	Lack of riparian buffers	Increase and improve buffers	Riparian Overlays/ Zoning
	Poor Storm Water Management	Rain gardens, native vegetation, rain barrels, porous pavement, buffer strips, storm water retrofits	Storm water ordinances, improved site plan review
	Erosion (loss of vegetation and logjams)	Streambank stabilization, buffer zones, native vegetation, removal of log jams	Revised maintenance procedures at county drain offices

Excerpt from Table 23, Section 4.3, Macatawa Watershed Management Plan. Available online at [www.the-macc.org/watershed/overview](http://www.the-macc.org/watershed/overview)

### III. Monitoring plan to assess the effectiveness of BMPs being implemented or to be implemented during the permit cycle to achieve TMDL load reductions

Multiple ongoing efforts help monitor the effectiveness of BMPs in the Macatawa Watershed. They include:

#### *Secchi Disk Monitoring*

- A small group of local volunteers has been taking secchi disk readings at several locations in Lake Macatawa, including the channel to Lake Michigan and the main branch of the Macatawa River, weekly during the growing season since 2002
- Summary of Secchi data through 2018: [www.the-macc.org/watershed/water-quality/](http://www.the-macc.org/watershed/water-quality/)

#### *Aquatic Macroinvertebrate Monitoring*

- The MACC, in partnership with the Outdoor Discovery Center Network (ODCN), started a macroinvertebrate monitoring program in the fall of 2012 following MiCorps protocol. Twice a year in the fall and spring, staff and volunteers collect and count the insects from seven different stream locations in the Macatawa Watershed.
- Data is available through the MiCorps data exchange: <https://micorps.net/data/view/stream/>

#### *Water Quality Monitoring - Michigan Department of Environment, Great Lakes and Energy (EGLE)*

- Annual monitoring of phosphorus in Lake Macatawa (five locations) and its tributaries occurred from 1999 through 2006. Since then, monitoring has been conducted biennially.
- The most recent results available are from 2012: [http://www.the-macc.org/wp-content/uploads/2012\\_DEQ\\_monitoring\\_report.pdf](http://www.the-macc.org/wp-content/uploads/2012_DEQ_monitoring_report.pdf)
- Monitoring was conducted in 2014 and 2016, but final reports have not yet been provided by MDEQ
- Biological and bacterial monitoring was conducted in 2015. These reports are available on the MACC's website: <http://www.the-macc.org/watershed/water-quality/>

#### *Water Quality Monitoring - Project Clarity Monitoring by the Grand Valley State University (GVSU) Annis Water Resources Institute (AWRI)*

- AWRI samples the same locations in the lake that are sampled by EGLE. Additional sites in tributaries are sampled to monitor specific restoration projects, including up and down stream of wetland restorations completed as part of Project Clarity. GVSU-AWRI students are also conducting research related to phosphorus movement and algae growth in the watershed.
- 2018 AWRI Report: <http://www.the-macc.org/wp-content/uploads/Project-Clarity-final-report-2018.pdf>

#### *Dry weather monitoring - MS4 Permit Holders*

- Dry weather screening of outfalls have been occurring as part of the Illicit Discharge Elimination Program (IDEP).
- The City of Zeeland completes screening at least once every 5 years as required by the MS4 permit.

#### *Sediment Monitoring*

- Sediment monitoring was initially conducted in 2009 and funded by an EGLE grant with private funding support from the local community
- The monitoring is conducted in partnership between the ODCN and Hope College
- Sediment is collected in PVC tubes placed in the stream designed to capture sediment during high flow events. Tubes are deployed from spring through fall.
- Monitoring has continued annually at key locations to monitor long term trends and effectiveness of BMPs
- Sediment contribution to Lake Macatawa is primarily an agricultural/rural concern
- All data collected is maintained by the ODCN

#### *Urban Monitoring*

- At least twice within the 5 year permit cycle, the MACC will coordinate with the City of Zeeland and the five (5) other permittees in the Macatawa Watershed to conduct urban water quality monitoring.
- Monitoring will include samples collected in key urban waterways and/or storm sewer systems up and down stream of urban areas
- Water samples will be tested at a minimum for total suspended solids and total phosphorus
- Processing of samples will be completed in partnership with a local university or at a private lab
- Additional field analyses may be completed using field test kits (pH, ammonia, temperature, etc.)