TM-8: Watershed Management and Protection

1.0 Introduction

An approved source water assessment and protection plan (SWAP) provides multiple benefits to both the drinking water utility and the community in general. Though changes in water quality in a watershed are typically slow, it may be possible to improve water quality through execution of management and educational strategies. Source water quality directly impacts treatment process requirements, regulatory compliance and treatment costs. Therefore, improvements in source water quality are beneficial to the drinking water system and can also provide aesthetic improvements for communities along lakes and Detroit River.

This technical memorandum discusses the United States Environmental Protection Agency (EPA) and Michigan Department of Environmental Quality (MDEQ) requirements and recommendations regarding source water assessment and protection. The Source Water Assessment Program (SWAP) and Surface Water Intake Protection Program (SWIPP) are described and current DWSD reports assessed. Rules specific to the Great Lakes are presented. Since portions of the source water areas and one of the DWSD intakes are in Canadian waters, the Ontario source water protection program is reviewed. The regulatory section concludes with a look at potential future regulations.

Source water quality is discussed specifically as it may be impacted by climate change, by the introduction of zebra mussels and by spills. Given that the Lake Huron to Lake St. Clair to Detroit River is a major shipping channel and shoreline manufacturing location, details regarding spills are discussed. This technical memorandum discusses the Huron to Erie Water Quality Monitoring System. This is a multi-community network of water quality monitors developed specifically to detect spills and other contamination events. Final recommendations are presented for improvements to the overall source water assessment and protection program.

2.0 Source Water Assessment Program (SWAP) & Surface Water Intake Protection Program (SWIPP)

The Michigan Department of Natural Resources and the Environment (MDNRE, now the MDEQ) completed a Source Water Assessment Program (SWAP) as required by the 1996 reauthorization of the EPA Safe Drinking Water Act (SDWA). These SDWA amendments required the states to:

- Delineate the source water assessment area
- Conduct an inventory of potential sources of contamination, including spill assessment
- Determine the susceptibility of the water supply to contamination
- Provide public information; including specific language that must be included in the Consumer Confidence Report

All DWSD intakes have approved SWAPs by the MDEQ in 2004. DWSD obtains water from three sources:

- Lake Huron which provides water to the Lake Huron Water Treatment Plant (WTP)
- Belle Isle in the Detroit River which provides water to Water Works Park WTP, Springwells WTP and Northeast WTP
- Fighting Island in the Detroit River which provides water to Southwest WTP

The Surface Water Intake Protection Program (SWIPP) is program developed by the MDEQ to provide guidance to communities after the SWAP has been completed. A SWIPP includes the same seven elements as the Wellhead Projection Program:

- Definition of roles and duties of government units and water supply agencies
- Designation of a source water protection area for each water supply source (based on the MDEQ's defined source water area)
- Identification of potential contaminant sources
- Implementation of management approaches for protection of source water, including but not limited to educational and regulatory approaches
- Creation of contingency plans for public water supply sources including the location of alternate drinking water sources (Contingency plans are discussed in TM No. 13 Emergency Response Plan)
- Proper siting of new water sources to minimize potential contamination
- Encouragement of public participation

DWSD has not completed nor obtained an approved SWIPP for any of the intakes.

2.1 Existing SWAPs

The USGS (United States Geological Survey), the MDEQ and DWSD completed the SWAP requirements for the DWSD system in 1999. SWAPs were approved by MDEQ in 2004. The completed SWAPs include the regulatory required information as well as sections on:

- Regulatory Review
- Background on the Detroit water system
- Source water geology and hydrology
- Raw water quality history
- References
- Glossary

Raw sources were rated for sensitivity and susceptibility. Sensitivity is an indication of the natural protection afforded the source water by its natural setting. Susceptibility is based on factors within the source water protection area that may pose a risk to the water supply. The susceptibility rating is based on four factors:

- The presence of potential contaminant sources from the contaminant inventory and the likelihood that contaminants will be released from those contamination sources
- The physical integrity of the intake
- The sensitivity of the natural settings
- The presence of existing or likely contamination of the source water

The EPA (2006) notes that there are multiple methods for developing a source water protection area. The order of increasing accuracy and sophistication is:

- Arbitrary fixed radius
- Calculated fixed radius
- Fixed variable shapes
- Analytical methods (such as the uniform flow equation)
- Hydrogeologic mapping
- Numerical flow or flow-and-transport computer models

Within the source water protection area, a sub category known as the Critical Assessment Zone (CAZ) is determined. The CAZ is the "area from the intake structure to the shoreline and inland". The area includes a triangular water surface and land area encompassed by an arc from the endpoint of the shoreline distance on either site of the on shore intake pie location" (MDEQ, 1999). However, in the analysis of the CAZ for the DWSD intakes, the MDEQ has taken a simplified approach where by the CAZ is based on a combination of the distance from the shore to the intake and the water depth resulting in CAZs of 1,000 or 2,000 or 3,000 feet.

2.1.1 Lake Huron Intake

The Lake Huron Intake provides water to the Lake Huron WTP. The critical assessment zone (CAZ) is shown in **Figure 2-1**. For this intake, the MDEQ calculated the CAZ as 1,000 feet from the intake.

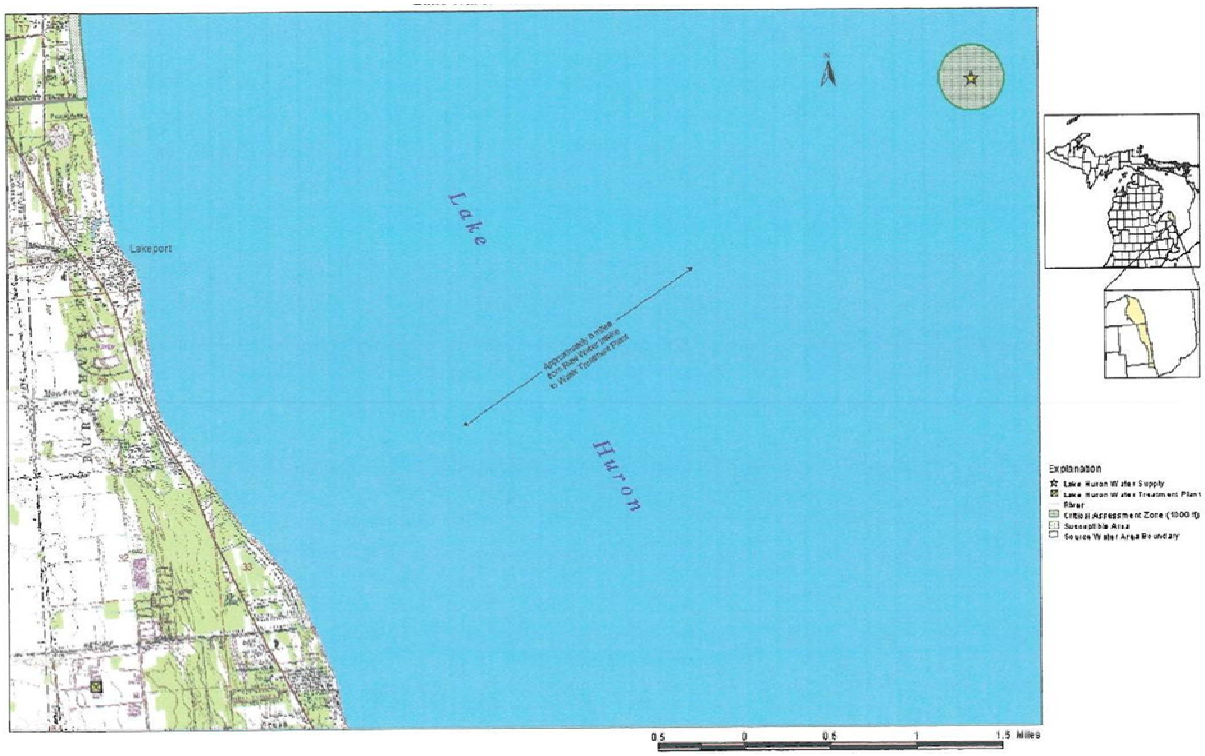

Figure 2-1: Critical Assessment Zone, Lake Huron Water Intake (SWAP, 2004)

The point and non-point contaminant source locations are shown in **Figures 2-2** and **2-3**. A summary of the contaminants is provided in **Table 2-1**. The assessment identifies the following potential contaminants:

- 40 listed sources, including solid waste sites, industrial facilities, toxic release inventory and national priory list sites; 19 of these are in the susceptible area
- Urban and agricultural runoff
- Shipping

The major potential source of contamination was shipping. Note that Canadian land and water uses were not considered an impact on this intake.

Figure 2-2: Potential Point-Source Contaminant Sources, Lake Huron Intake Source Water Protection Area (SWAP, 2004)

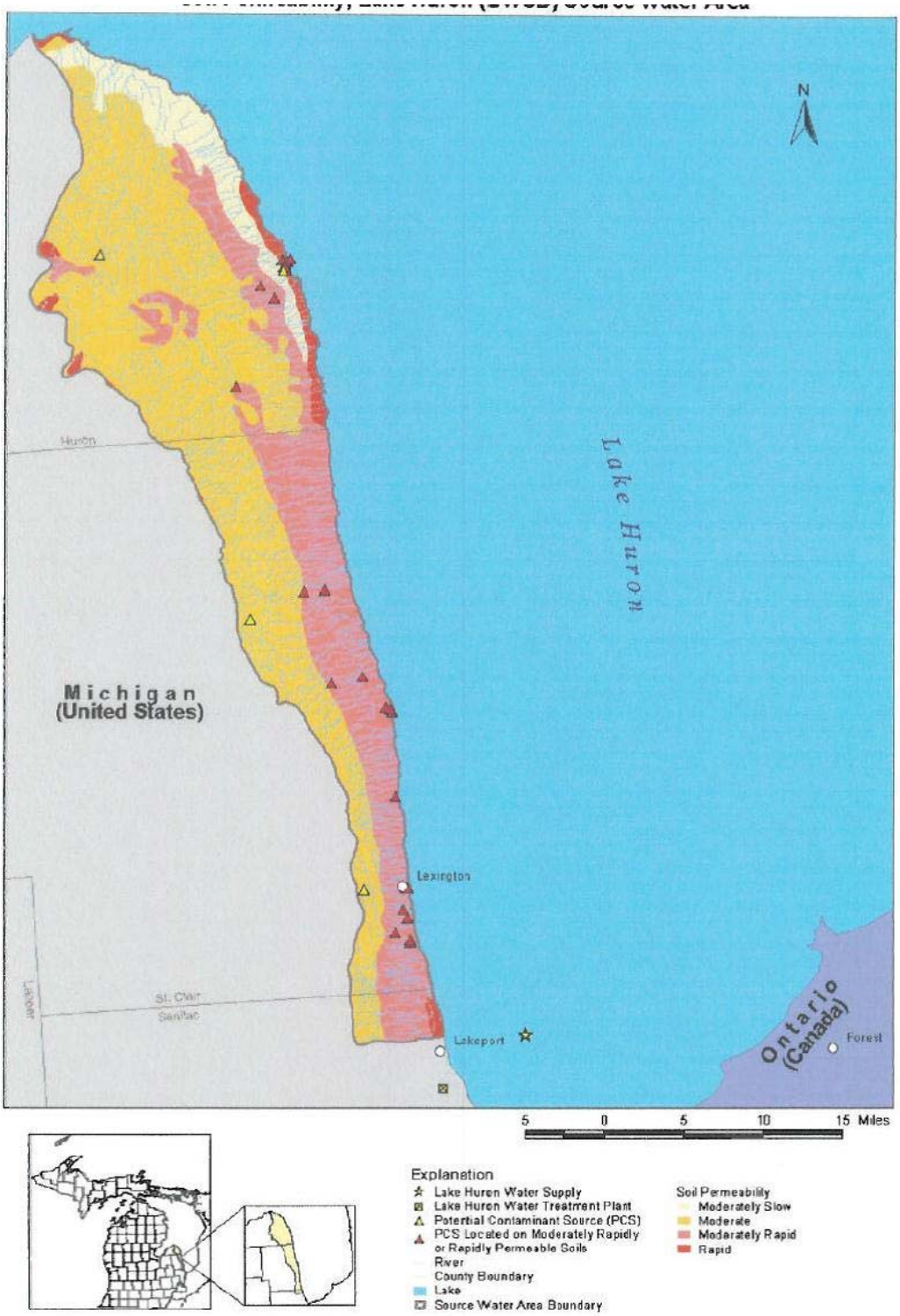

Figure 2-3: Potential Non-Point-Source Contaminant Sources & Soil Permeability, Lake Huron Intake Source Water Protection Area (SWAP, 2004)

Table 2-1: Summary of Contaminant Sources for Lake Huron Intake (SWAP, 2004)

Type of Potential Contaminant Source	Number of Potential Contaminant Sources	PCS within the Susceptible Area and the CAZ
Hazardous or Solid Waste Site	22	10
Industrial Facilities Discharge Site	10	6
National Priority List Sites	0	0
Permit Compliance System	5	2
Toxic Release Inventory	3	1
Canadian Wastewater Treatment Facilities	0	0
National Pollutant Release Inventory	0	0

This Lake Huron source water was rated as moderate sensitivity and moderately low susceptibility based on the limited number of potential contaminant sources.

2.1.2 Fighting Island Intake

The Fighting Island Intake provides water to the Southwest WTP. The CAZ is shown in **Figure 2-4**. The CAZ for this intake extends 2,000 feet. The point and non-point contaminant source locations are shown in **Figures 2-5** and **2-6**.

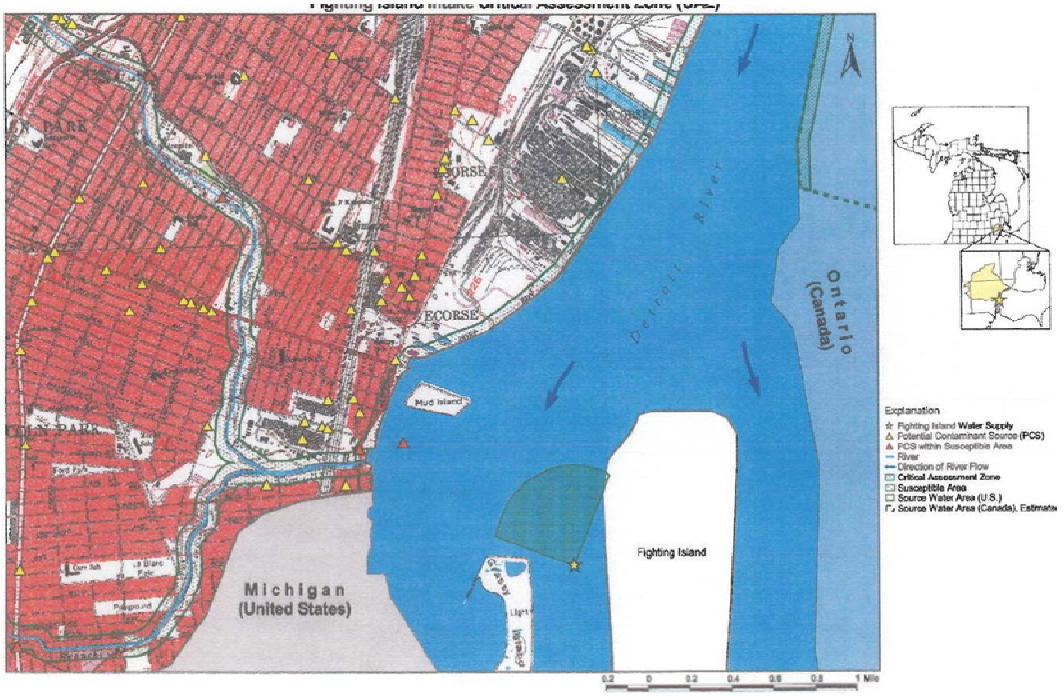

Figure 2-4: Critical Assessment Zone, Fighting Island Water Intake (SWAP, 2004)