Background Report

Assessing the Potential Hazards to the River Associated With Vessel Discharges

St Marys River AOC
St Clair River AOC

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Prepared for

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Executive Summary

Background

Under Annex 2 of the previous Canada United States Great Lakes Water Quality Agreement (amended by Protocol in 1987), 43 Areas of Concern (AOC) were identified in the Great Lakes. For each Area of Concern a Remedial Action Plan (RAP) has been developed that guides restoration and protection efforts and focus on local impairments to beneficial use of the environment (Environment Canada, 2010).

In Stage 2 of the Remedial Action Plan for the St. Marys River AOC, one of the action items included an assessment of 'Potential Hazards to the River Associated with Spills from Shipping Vessels' (Environment Canada et. al). Although the Remedial Action Plan for the St. Clair River AOC did not specify a need to assess potential hazards of spills from shipping vessels, there is local concern about such events and having the spill incidences summarized for past decade, is helpful (Environment Canada, 2012).

The purpose of this report is to summarize vessel discharges within both the St. Marys River AOC and the St. Clair River AOC within the context of the Great Lakes, as well as to provide an overview of vessel discharge regulations and agreements currently in place (Chapter 2). It is important to note that although the Stage 2 action item specifies 'shipping vessels', the data used for this report includes discharges from both personal watercraft and commercial vessels.

Chapter 3 provides a summary of discharges for the St. Marys River AOC and Chapter 4 provides a summary of discharges for the St. Clair AOC between the years of 2001 and 2011 and illustrates suspected causes, pollutant types, discharge severity, season and timing of discharges, in comparison to the Great Lakes. For the purposes of the data analysis, vessel discharges refer to any harmful substance discharged in the Great Lakes, with a focus on the St. Marys River and St. Clair River waterways. As outlined in Chapter 2, agreements and regulations over vessel discharges refer to a wider definition of pollution, including air pollution and invasive species introduction from ballast water. These types of pollution are outside the scope of this report and are therefore not included.

The Results

Many similar patterns can be seen between the St. Marys River AOC, the St. Clair River AOC and the Great Lakes, including pollutant sources, pollutant types and method of determining amounts discharged. The main differences between the locations are seasons, time of day and also in number of litres discharged. Overall, the discharges in both the St Marys River AOC and the St. Clair River AOC are approximately 15% of the total incidents reported in the Great Lakes.

According to our analysis of the Canadian Coast Guard's Marine Pollution Incident Reporting System Excel Database, although vessel discharges account for the largest percentage of pollution sources for discharges recorded in the database, the number of vessel related discharges that have occurred within the St. Marys River AOC (14 incidents) are very low (4%), especially when compared with the rest of the Great Lakes (380 incidents). Vessel discharges in the St. Clair River AOC (39 incidents) are higher than in St. Marys River AOC; however, when compared with the rest of the Great Lakes, incidents are still relatively low 11%).

The key findings of our analysis are:

- Number of Vessel Discharges in St Marys River AOC and St Clair River AOC is relatively low - Both the St. Marys River AOC (14 incidents) and the St. Clair River AOC (39 incidents) have significantly lower numbers of discharges than the Great Lakes (380). The St. Marys River AOC experiences fewer vessel discharges than the St. Clair River AOC.

- Number of Litres Discharged is Low - The total number of litres actually discharged in the St. Marys River AOC between 2001 and 2011 was 1,941.42 litres, and in the St. Clair River AOC it was 5,132.72 litres. In comparison with the Great Lakes, a total of 104,885.15 litres have been discharged within the same time period. It is important to note that for the St. Marys River AOC, the total number of litres discharged can be mainly attributed to one incident involving an 'operational discharge' in 2007, when 1892.71 litres of diesel oil were discharged. This means that only 48.71 litres were discharged between 2001 and 2006 and from 2008 to 2011. Aside from the 'operational discharge' event, the St. Marys River AOC has experienced significantly lower volumes of discharges on an annual basis.
- Vessel Discharges are the Largest Contributor of Discharges - Out of all pollutant sources that were compared from the Marine Pollution Incident Reporting System (MPIRS) Database (land based, mystery, oil handling facilities, other, unknown, vessel and not sourced), vessels account for the largest cause of discharges into both Areas of Concern and in the Great Lakes overall. Although percentages of pollution sources varied between sites, the patterns were similar between the St. Marys River AOC, the St. Clair River AOC and the Great Lakes. It is important to note that land-based incidents reported in Canadian Coast Guard's MPIRS database ***are not reflective of the actual number of land-based discharges within the region***. The CCG mandate focuses on vessel discharges and mystery spills on water. The land-based spills in the MPIRS database are usually recorded because there is a potential for impact on U.S. waters (resulting in obligations for CCG under the Canada-US Joint Contingency Plan) or that a spill on water was traced back to a land-based source (e.g. a sheen in a marina that was traced back to a sewer outfall).
- No Clear Long Term Trend in Vessel Discharges - Between 2001 and 2011, there is no clear trend in vessel discharges in either of the AOCs. From the data, it can be concluded that numbers of vessel discharge incidents within the St. Marys River AOC and St. Clair River AOC vary from year to year. For the Great Lakes overall, there is a more visible trend. Despite certain years with significant reductions in the number of vessel discharges, there has been an increase in incidents since 2008.
- Fewer Suspected Causes of Discharges in St. Marys River AOC and St. Clair River AOC than in the Great Lakes – The St. Marys River AOC had a total of seven suspected causes of vessel discharges (mechanical failure, operational discharge, etc.), the St. Clair River AOC had nine, and the Great Lakes overall had a total of 17. Suspected causes of vessel discharges varied between locations and are likely related to types of industry and activities that occur within the Areas of Concern.
- There are differences in seasonal timing of vessel discharges in St. Marys River AOC, St. Clair River AOC and the Great Lakes - For the St. Marys River AOC, the highest number of incidents occurred in the winter, followed by fall. The lowest number of incidents occurred in the summer and spring, equally. For both the St. Clair River AOC and the Great Lakes, the highest number of incidents occurred in the summer. In both the St. Marys River AOC and the Great Lakes, more incidents occurred in the afternoon/evening (p.m.), whereas in the St. Clair River AOC, the number of incidents recorded in the morning and afternoon/evening were similar.

Contents

1. Introduction

Background and Purpose

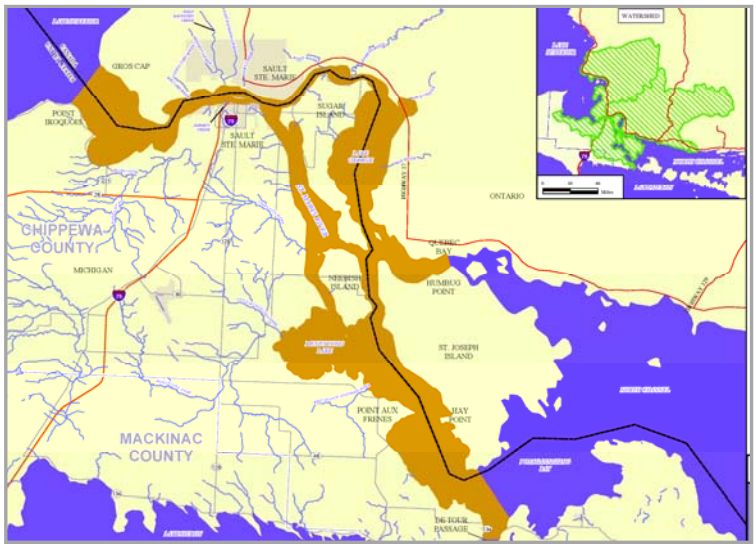
Under Annex 2 of the previous Canada United States Great Lakes Water Quality Agreement (amended by Protocol in 1987), 43 Areas of Concern (areas that have experienced environmental degradation) were identified in the Great Lakes. Currently there remain 9 Areas of Concern in Canada, 25 Areas of Concern in the United States, and 5 additional Areas of Concern shared by both countries (Environment Canada, 2010). The five shared Areas on Concern include both the St. Marys River AOC and the St. Clair River AOC. For each Area of Concern a Remedial Action Plan (RAP) has been developed that guides restoration and protection efforts. Remedial Action Plans focus on local impairments to beneficial use of the environment (Environment Canada, 2010).

For the St. Marys River Area of Concern, a Remedial Action Plan was created to be carried out over three stages. In Stage 2, one of the action items included an assessment of 'Potential Hazards to the River Associated with Spills from Shipping Vessels' (Environment Canada et. al). Although the Remedial Action Plan for the St. Clair River AOC did not specify a need to assess potential hazards of spills from shipping vessels, there is local concern for such events and having the spill incidences summarized for past decade is helpful (Environment Canada, 2012).

The purpose of this report is to summarize vessel discharges within both the St. Marys River and the St. Clair River Areas of Concern, within the context of the Great Lakes. In addition, a summary of vessel discharge regulations and agreements is provided which identifies the responsible agencies within Canada and the United States. It is important to note that although the Stage 2 action item specifies 'shipping vessels', the data used for this report includes discharges from both personal watercraft and commercial vessels. This report provides a summary of discharges for both the St. Marys River (Chapter 3) and the St. Clair River (Chapter 4) Areas of Concern between the years of 2001 and 2011 to identify suspected causes, pollutant types, discharge severity, season and timing of discharges, in comparison to the Great Lakes. Chapter 5 provides a list of the key findings.

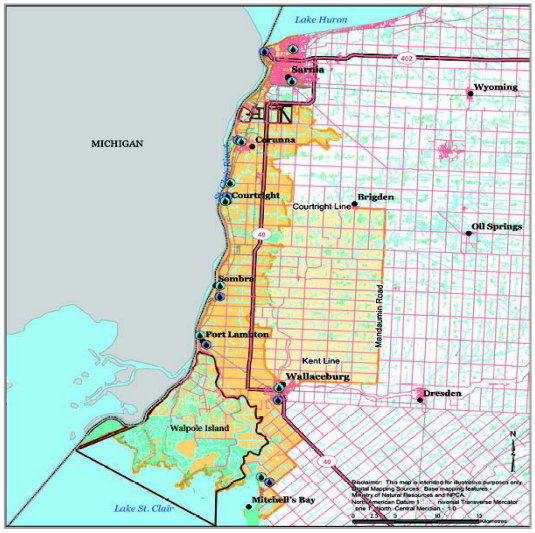
The St. Marys River is the connecting waterway between Lake Superior and Lake Huron (flowing southeast for 100 to 120 kilometres). The St. Marys River is a shared waterway between Canada and the United States. Within the St. Marys River, there is an identified Area of Concern which is also shared by both countries. Beginning at the north end of the river, the AOC extends from Gros Cap and Point Iroquois, around both sides of Sugar Island and through Lake George to St. Joseph Island. At St. Joseph Island it splits, ending at Quebec Bay and Humbug Point on the north side of the island and Hay Point and De Tour Passage on the south end of the island at Potagannissing Bay, Map 1 (USEPA, July 13, 2012).

Map 1 - St. Marys River Area of Concern



The St Clair River is the connecting waterway between Lake Huron and Lake St. Clair, flowing south for 64 kilometres. The St. Clair River is also a shared waterway between Canada and the United States, and the entire river is an Area of Concern shared between the two countries. The St. Clair River begins at Point Edward, just north of Sarnia, and ends at the outlet at Lake St. Clair where the river splits into numerous channels, Map 2 (USEPA, December 10, 2012).

Map 2 - St. Clair River Area of Concern



Both Canada and the United States report on discharges that occur within the Great Lakes every two to three years. The reports are prepared by Transport Canada and the U.S. Coast Guard, and they are then submitted to the International Joint Commission (IJC) and recorded by the Spills Action Centre in their data base.

Approach

To initiate the project, staff from Environment Canada were contacted to confirm the objectives and develop the framework and content for this Background Document. The following reference documents and data were obtained and reviewed:

- Canadian Summary Shipping Discharges Report 2007-2009
- Final Spill Study for St. Clair River AOC March 31, 2010 by James Li
- 2008 and 2009 Binational Report on Protections of Great Lakes Water Quality by the U.S. Coast Guard, Environmental Protection Agency, Transport Canada Marine Safety and Department of Fisheries and Oceans, Coast Guard and Science Divisions.
- 2010-2011 Binational Report on Protection of Great Lakes Water Quality by U.S. Coast Guard, Environmental Protection Agency, Transport Canada Marine Safety and Department of Fisheries and Oceans, Coast Guard and Science Divisions.
- Canadian Coast Guard Central and Arctic Region Regional Response Plan 2008
- Canada-U.S. Joint Marine Pollution Contingency Plan
- Canadian Coast Guard Marine Pollution Incident Reporting System Excel Database 2001-2011

In addition to the documents reviewed above, discussions with the Project Team and internet research were conducted to identify regulations and agreements regarding the prevention of vessel discharges and to identify the various roles and responsibilities of agencies internationally, nationally and regionally.

The main source of data used for analyzing and summarizing vessel discharges within the Great Lakes was obtained from a database of the Canadian Coast Guard Marine Pollution Incident Reporting System (MPIRS), provided by Joanne Munroe at the Canadian Coast Guard (Appendix 1 and 2). Vessel discharge incidents reported directly to both the Ministry of Environment and the Canadian Coast Guard are recorded in the Canadian Coast Guard's MPIRS database. The Project Team decided to utilize this database as it was the most comprehensive digital database that included the data from all other sources, such as the Canadian Summary Shipping Discharges Report 2007-2009. Vessel discharges within the U.S. are reported to their own National Response Centre (USCG et. al, 2012). The MPIRS database only includes U.S. data if there has been a coordinated response that occurred under the Canada-United States Joint Marine Pollution Contingency Plan. Therefore, data used in the analysis for the St. Marys River AOC and St. Clair River AOC may include reports from the U.S., but it is not differentiated between. To determine if the vessel incident occurred in Canada or the U.S., each incident would need to be

looked up individually (CCG, 2012). It is important to emphasize that the MPIRS database is not representative of all the discharges that occur in the Great Lakes; the data analysis used in this report is only representative of that database.

Data was analyzed for the St. Marys River AOC and then compared with the Great Lakes and the St. Clair River AOC (Chapter 3). The same procedure was followed for the St. Clair River AOC, and that data was compared with the Great Lakes, including the St. Marys River AOC (Chapter 4). Based on the information contained in the database, the following information could be summarized:

- Pollutant source
- Suspected cause
- Pollutant type
- Pollutant name
- Severity
- Time and season
- Number of discharges per year
- Total litres discharged (annual and overall)

Once the data was analyzed, charts and graphs were created, and the information was summarized into one final report.

There were some characteristics of the data that made analysis difficult, and limited the interpretation of the data, such as the following:

- There were many blank entries which indicate the responsible officer did not complete their entry. The data is only as reliable as the person that has entered it.
- For some case files, there were multiple entries with different fields. This indicated that it was either a record of a single incident that may have had multiple entries (recorded as one file with the same file number) or that the incident reported had multiple pollutants (reported under the same file). When multiple entries were used to identify more than one substance discharged, both substances were counted in the analysis. However, in order to clarify the details of these entries, additional information would need to be looked up on a case-by-case basis.
- While a location of each discharge was provided, there was no geographic reference to confirm the exact location of the discharge, and the locations had to be checked individually. For example, a few discharge locations in the St. Marys River were listed as ‘Purdy’s’ and ‘steel mill dock’. All locations had to be verified to ensure they occurred within the actual AOC, for both the St. Marys River and the St. Clair River. For the St. Marys River, there was one location that could not be verified, even when the case file was looked up; therefore, that location could not be used in the analysis.
- There was little digital data on vessel discharges available prior to 2001. The MPIRS data and the Spills Action Centre (SAC) data (Ministry of the Environment) are recorded differently. The Coast Guard has many years of data; however, this data is not in digital form and is archived and not easily accessible. The individual files would need to be reviewed manually, providing the Department’s file retention period has not been exceeded. Files may be destroyed after they exceed their retention periods (CCG, 2013).
- While the database provides an indication of the number of vessel discharges, it does not provide any context to the percentage of incidents relative to the total vessel traffic that travels through the AOC. However, this would be difficult to piece together as there is no one source for the information. Service Canada would have the number

of personal watercraft (PWCs) that are licensed in the Great Lakes, and Transport Canada's Commercial Vessel Registry would include the number of operating vessels (tugs, carriers, etc.) , but it would not include the number of voyages each vessel was making or the number of other ships traveling though the AOC. In addition, at the St. Marys Locks, the larger vessels would be recorded but not the total number of vessels (Canada Coast Guard, 2012).

2. Overview of Current Regulations and Agreements

Chapter 2 provides an overview of the current legislation, regulations and agreements that apply to prevent, mitigate, and monitor vessel discharges in the Great Lakes. The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) is the keystone document that provides regulations for shipping discharges that occur internationally and in Canadian waters (including the Great Lakes). Pollution Discharge Reporting Regulations were promulgated in 1995. These regulations were required because of the coming into force of the Canada Shipping Act (CSA), 2001 and amalgamated a couple of regulations into one. The Vessel Pollution and Dangerous Chemicals Regulations, pursuant to the CSA, 2001, is a recent federal regulation that puts in place requirements based on the MARPOL Convention. Other agreements, response plans and reporting mechanisms related to vessel discharges are identified to provide a context of who and how government agencies are involved with responding to, reporting and preventing pollution from vessels.

2.1. International Convention for the Prevention of Pollution from Ships (MARPOL)

The International Maritime Organization (IMO) is a United Nations agency with the responsibility for the safety and security of shipping and the prevention of pollution by ships. The IMO was created in 1948 in response to growing safety and pollution concerns and since then has adopted a series of measures to minimize the consequences of tanker accidents and to address environmental issues caused by regular shipping operations, such as cleaning of oil cargo tanks and the disposal of engine room wastes (IMO, 2011).

An International Convention for the Prevention of Pollution from Ships (MARPOL) was adopted in 1973 and amended in 1978 and is an international convention governing pollution caused by shipping, aiming to prevent and reduce incidences and effects. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes, as noted in Table 1 (IMO, 2011).

Table 1 - The Six Annexes of the International Convention for the Prevention of Pollution from Ships (MARPOL)

Annex Number	Title	Regulation/Prevention Measure	Date enforced
1	**Prevention of Pollution by Oil**	Prevent pollution by oil from operational discharges and accidental discharges	2-Oct-83
2	**Control of Pollution by Noxious Liquid Substances in Bulk**	Residues with noxious substances (includes a list of 250 substances) cannot be discharged within 12 miles of the nearest land point.	2-Oct-83
3	**Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form**	Requires standardized transportation systems (labelling, packaging), transported for "harmful substances". "Harmful substances" are listed in the International Maritime Dangerous Goods Code (IMDG Code) or meet criteria set in the Appendix of Annex III	1-Jul-92
4	**Prevention of Pollution by Sewage from Ships**	Prevent sewage pollution by prohibiting sewage disposal at sea or only allowing disposal if it has been treated by an approved method.	27-Sep-03
5	**Prevention of Pollution by Garbage from Ships**	Limits amount and type of garbage disposed of into the sea in relation to distance from land. The most recent amendment will come into effect on January 2013 which prohibits dumping of any garbage, unless under certain circumstances.	31-Dec-88
6	**Prevention of Air Pollution from Ships**	Controls the amount of sulphur oxide and nitrogen oxide emissions from ship exhaust and prohibits intentional emissions of ozone depleting substances. A new amendment coming into effect in January 2013 will greatly reduce greenhouse gas emissions from ships.	19-May-05

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The original MARPOL Convention was adopted by the IMO on November 2, 1973 and the Protocol of 1978 was adopted in response to a number of tanker accidents in 1976 and 1977. The combined instrument entered into force on 2 October 1983. MARPOL has been updated by many amendments since its creation (IMO, 2011). When Canada ratified this agreement, MARPOL conventions only applied to the degree that they were encompassed into Canada's regulations. If countries did not assimilate any of the MARPOL conventions, they could not use MARPOL as a "force of law". In Canada, components of this Convention (Annexes I and II) entered into force in 1992. That is when changes to the Canada Shipping Act incorporated the content of those annexes (CCG, 2013).

2.2. Canada Shipping Act

The Canada Shipping Act, 2001 (CSA) is governed by Transport Canada and is the primary Federal legislation that addresses marine issues, including protecting the marine environment. The CSA is applicable to all vessels that enter Canadian waters (including canoes, kayaks, cruise ships and tankers) and also to Canadian ships that navigate in all waters (Transport Canada, 2010).

The Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69), November 18, 2012, establishes requirements that are additional or complementary to the standards set out in the International Convention for the Prevention of Pollution from Ships (MARPOL) (Government of Canada, 2012). This recently approved regulation establishes new regulations on matters relating to the six MARPOL annexes (Table 1), including the following requirements that are relevant to shipping discharges:

- Limitation of sewage discharges;
- Potential testing of waste substances from marine sanitation devices;
- Ship-board pollution plans must be carried by certain non-oil barges carrying trucks or tanks;
- Non-Canadian ships must possess an International Sewage Prevention Certificate when navigating to a Canadian port;
- Certain vessels must possess a garbage management plan and maintain "Garbage Record Books";
- Sulphur content of fuel oil is limited to 4.5 percent;
- Implement standards for the fuel oil used for combustion;
- By January 1, 2008, any ship coating covered by paint containing tributyl tin must be removed or encapsulated

2.3. 2012 Great Lakes Water Quality Agreement (GLWQA)

Vessel discharges are addressed by Annex 5 of the amended GLWQA (signed September 2012) for the purpose of achieving the overall objectives of the GLWQA. The GLWQA recognizes that vessel discharges could potentially harm water quality and that they need to be addressed through regulations, programs and other measures (Environment Canada, 2012). The agencies involved with carrying out the regulations, programs and measures are:

- Transport Canada
- Fisheries and Oceans Canada
- Canadian Coast Guard
- U.S. Coast Guard
- U.S. Environmental Protection Agency
- Other agencies, as deemed appropriate

The actions to be carried out by the above parties will be based on the standards and guidance of the IMO and follow the six annexes of MARPOL. In addition, they may implement regional regulations for vessel discharges, including the best-available science, and prohibit and penalize any discharges deemed harmful to the water quality in the Great Lakes (Environment Canada, 2012).

In accordance with Annex 5 of the GLWQA, all agencies address discharges into the Great Lakes through the following measures:

Oil and Hazardous Polluting Substances

1. Prohibit discharges of these substances, including any contained in ballast water.
2. When there is notification of a discharge or potential discharge, the agency within the appropriate jurisdiction must be contacted.
3. Prevent discharges of these substances through:
    a. Regulations, as guided by the IMO:
        - Vessel must have the ability to contain these substances during operation and prevent discharges during loading and unloading;
        - Vessels must have the capacity to unload the waste at a designated facility;
        - Each vessel must be able to safely stop discharges during an emergency;
        - Equipment must be inspected regularly to reduce chances of failure; and
        - Unloading/loading areas must be well-lit at night to prevent the potential of a discharge.
    b. Vessels carrying these substances must be identified.
    c. Vessels must document any of these substances (manifest).
    d. Any of these substances in packaged form must follow the guidelines in the International Marine Dangerous Goods Code.
    e. Through programs, guarantee vessel staff are properly trained in the handling and storage of these substances, including the associated risks and how to reduce chances of pollution.

Garbage

1. Prohibit the dumping of garbage, aside from cargo residue.
2. Following the IMO, agencies can form regulations to minimize discharge of cargo residue, within reason.

Wastewater and Sewage

1. Prohibit discharges of wastewater in “Harmful Quantities”.
2. Agencies are required to:
    a. Address discharges of sewage from vessels that could affect water quality in the Great Lakes;
    b. Create and put in effect regulations that each vessel with toilet facilities is required to hold, incinerate or treat sewage to a certain extent; and
    c. Discharge of wastewater or sewage may be controlled or prohibited within certain areas of the Great Lakes, where designated.

Antifouling

1. Following IMO guidelines, implement means to “prevent harm” from antifouling systems within the Great Lakes.

Agencies need to provide appropriate facilities for receiving, treating and disposing of all pollutants listed above. In addition, they must review discharges from vessels (including services, systems, programs, recommendations, standards and regulations) in order to sustain and improve water quality within the Great Lakes. Each party must report their progress on Annex 5 implementation every three

years via a "Progress Report of the Parties" which will be made available to the public (Environment Canada, 2012).

Under Article 6 of the GLWQA (Notification and Response), Canada and the U.S. are required to notify each other in the event of a pollution incident and to follow requirements under the Joint Marine Pollution Contingency Plan (Section 2.5) with continued implementation of the "CANUSLAK Annex" of that Contingency Plan. (Environment Canada, 2012).

2.4. Canadian Coast Guard Central and Arctic Region - Regional Response Plan

The Central and Arctic Regional Response Plan includes the Great Lakes System and outlines the procedures for assessing, responding and documenting actions in response to a discharge situation. It is used as a guide for all parties involved with discharge response. The Canadian Coast Guard is the lead agency for responding to mystery discharges and vessel discharges, although all other parties are required to respond, as mandated (CCG, 2008). Transport Canada is now responsible for policies regarding 'Emergency Preparedness for Oil and Noxious Liquid Substances' instead of the Canadian Coast Guard, although the Coast Guard is still responsible for responding (USCG et. al, 2012). Under the Regional Response Plan, "significant waterways" include the Great Lakes and their connecting waterways, up to the international boundary with the United States. Through a Memorandum of Understanding between Fisheries and Oceans Canada (Canadian Coast Guard) and Transport Canada, roles and responsibilities are designated for prevention of vessel pollution and facilitating pollution clean- up (CCG, 2008). Other partners involved in the Regional Response Plan include:

1. Internal partners
    a. Fisheries and Oceans-different branches, sectors and directorates
    b. Transport Canada
    c. Public Safety Canada
    d. Other government departments (Environment Canada)
2. External Partners
    a. Provincial Ministries and Departments (Ministry of Environment)
3. Clients (divided into three groups)
    a. Oil Handling Facilities
    b. Legislated Ships (ships over 400 gross registered tonnes and oil tankers over 150 GRT)
    c. Ships (less than 400 GRT or any tanker less than 150 GRT)
4. External Resources
    a. Response Organizations certified by Transport Canada under the *Canada Shipping Act*
    b. Other contractors

The plan is also linked to International Joint Plans, including:

- Canada-United States Joint Marine Pollution Contingency Plan (see next Section)
- Canada-Denmark Agreement for Co-operation Relating to the Marine Environment, Annex B (Joint Marine Contingency Plan concerning Incidents resulting from Shipping Activities)

The Regional Response Plan identifies the Great Lakes region as being at highest risk for pollution from vessels. It also identifies that through the Great Lakes basin, the highest risk of pollution is within the connecting channels (including the St. Clair River and the St. Marys River) due to the volume and frequency of vessel operations within the converging areas. It also notes that areas of high pleasure craft traffic and small commercial craft traffic are subject to small but frequent occurrences of pollution (CCG, 2008).

2.5. Canada-United States Joint Marine Pollution Contingency Plan (JCP)

The purpose of the JCP is to address planning, preparing for and responding to pollution incidents within the connected areas by acting as a supplement to the present national response systems. In case of a discharge, the JCP will coordinate the discharge response and consultation between the involved parties.

2.6. Binational Report to International Joint Commission (IJC)

As required by the Great Lakes Water Quality Agreement, Canada and the United States have issued a binational report every two to three years on reported incidences of discharges/pollution from shipping vessels on the Great Lakes system. Transport Canada and the U.S. Coast Guard prepare these reports and submit them to the IJC.

According to the Binational Report on Protection of Great Lakes Water Quality from 2008-2009, prepared by the U.S. Coast Guard, U.S. Environmental Protection Agency, Transport Canada Marine Safety, Department of Fisheries and Oceans Canada (Coast Guard and Science Divisions), there was a low impact on the Great Lakes Basin from vessel discharges during this time period, excluding the issue of ballast water and invasive species. It acknowledges there is still work to be done on each of the discharges; however, existing programs are sufficient in addressing potential and actual vessel discharges.

The 2010-2011 report concluded that discharges of oil and hazardous chemical substances continued to have a low impact on the Great Lakes system, due to the effective regulations in both Canada and the U.S. The report stated there had been no violations to regulations regarding discharges of sewage or garbage. There will be future discussion on sewage discharges at the Canadian Marine Advisory Council on issues regarding current regulations in No Discharge Zones. In addition, the report noted that Canada has synchronized enforcement of discharges for specific, non-polluting substances with those of the U.S. Coast Guard (USCG et. al, 2012).

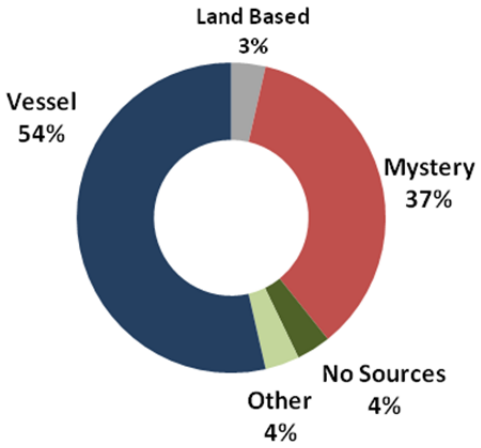
3. Summary of Discharges within the St Marys River AOC

Chapter 3 provides a summary of the discharges that occurred in the St Marys River AOC between 2001 and 2011, based on the MPIRS database. The database provided discharge incidents for the entire St. Marys River, and the locations of each incident had to be confirmed by verifying the location on Google maps or through project contacts and then compared with the St. Marys River AOC map. Once the locations were verified, the applicable data was analyzed and displayed in the following figures. Where the St. Marys River AOC data is compared to the Great Lakes, the Great Lakes data includes the St. Clair River AOC data, aside from Figures 14 and 15, where all locations have been divided.

3.1. Types of Discharges within the St Marys River AOC

Overall, between 2001 and 2011, there have been 28 documented incidents within the St. Marys River AOC. Of these 28, vessel discharges account for 14 occurrences or 54 percent, as illustrated in Figure 1. "Mystery" discharges account for the second largest percentage of discharges in the St. Marys River AOC. 'Mystery' describes an unknown pollution source. 'No sources' indicates that the potential source was either identified or that it did not turn out to be a source of pollution. For example, many discharges reported are actually pollen.

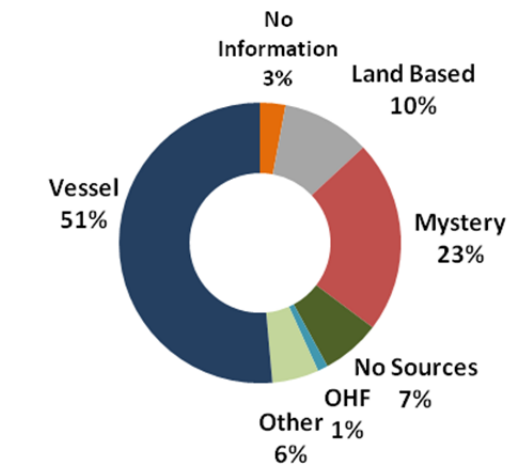
Figure 1 - Types of Discharges within the St. Marys River Area of Concern Between 2001 and 2011



3.2. Types of Discharges on the Great Lakes

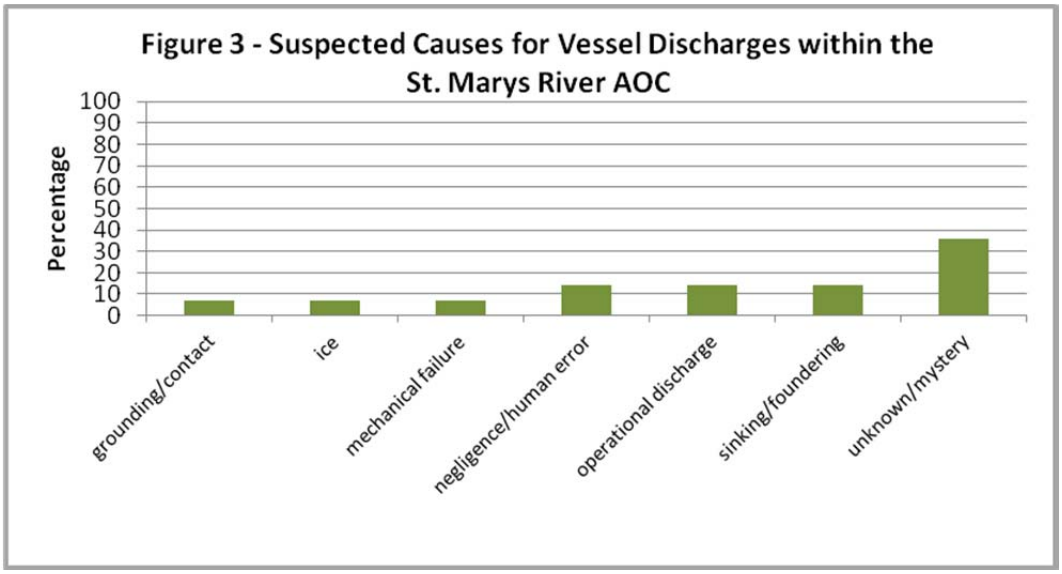
Similar to the St. Marys River AOC, over half of the discharge types in the Great Lakes were due to vessel discharges (see Figure 2). In addition, there are Oil Handling Facilities (OHF) within the Great Lakes, and this is included as a source of discharges. There are no OHFs located in the St. Marys River AOC; therefore it is not listed in Figure 1. 'No information' refers to pollutant sources left blank in the database. It is important to note that land-based incidents reported in the MPIRS database are not reflective of the actual number of land-based discharges within the region. The land-based spills in the MPIRS database are usually recorded because there is a potential for impact on U.S. waters (resulting in obligations for CCG under the Canada-US Joint Contingency Plan) or that a spill on water was traced back to a land-based source (e.g. a sheen in a marina that was traced back to a sewer outfall).

Figure 2 - Types of Discharges within the Great Lakes Between 2001 and 2011



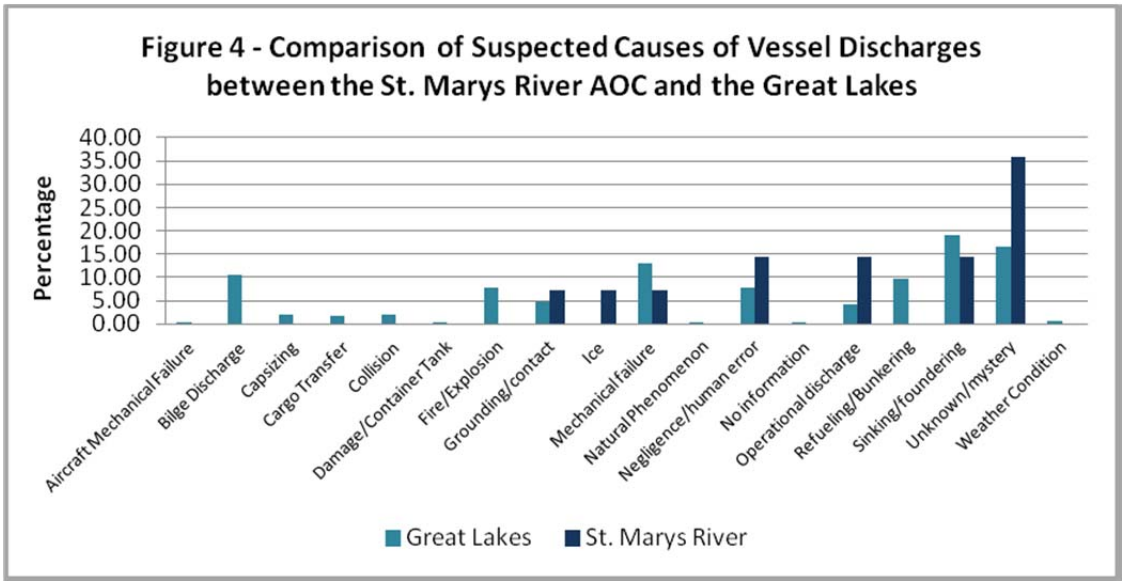
3.3. Suspected Causes for Vessel Discharges within the St Marys River AOC

Of the 14 incidents that occurred in the St. Marys River AOC, 36 percent of the suspected causes are 'unknown/mystery' (see Figure 3). Negligence/human error, operational discharge and sinking/foundering each account for 14 percent of suspected causes. Ice, grounding/ contact and mechanical failure are the least significant suspected causes, each accounting for seven percent of vessel discharges.



3.4. Comparison of Suspected Causes of Vessel Discharges between the St. Marys River AOC and the Great Lakes

The Canadian Coast Guard Response Plan identifies that connecting waterways between the Great Lakes are typically more risky due to a number of factors (2008); however, when comparing suspected causes of vessel discharges within the St. Marys River AOC and the Great Lakes, there are much fewer types of suspected causes. There are seven causes within the St. Marys River AOC, and within the Great Lakes, there are 17. As listed in Figure 4, additional causes of discharges in the Great Lakes include collision, bilge discharge, cargo transfer, natural phenomenon and weather condition. The lower number of causes within the St. Marys River AOC could potentially be attributed to different types of unloading/loading activities, number of vessels, frequency/traffic, number of operations/activities or size of water body.



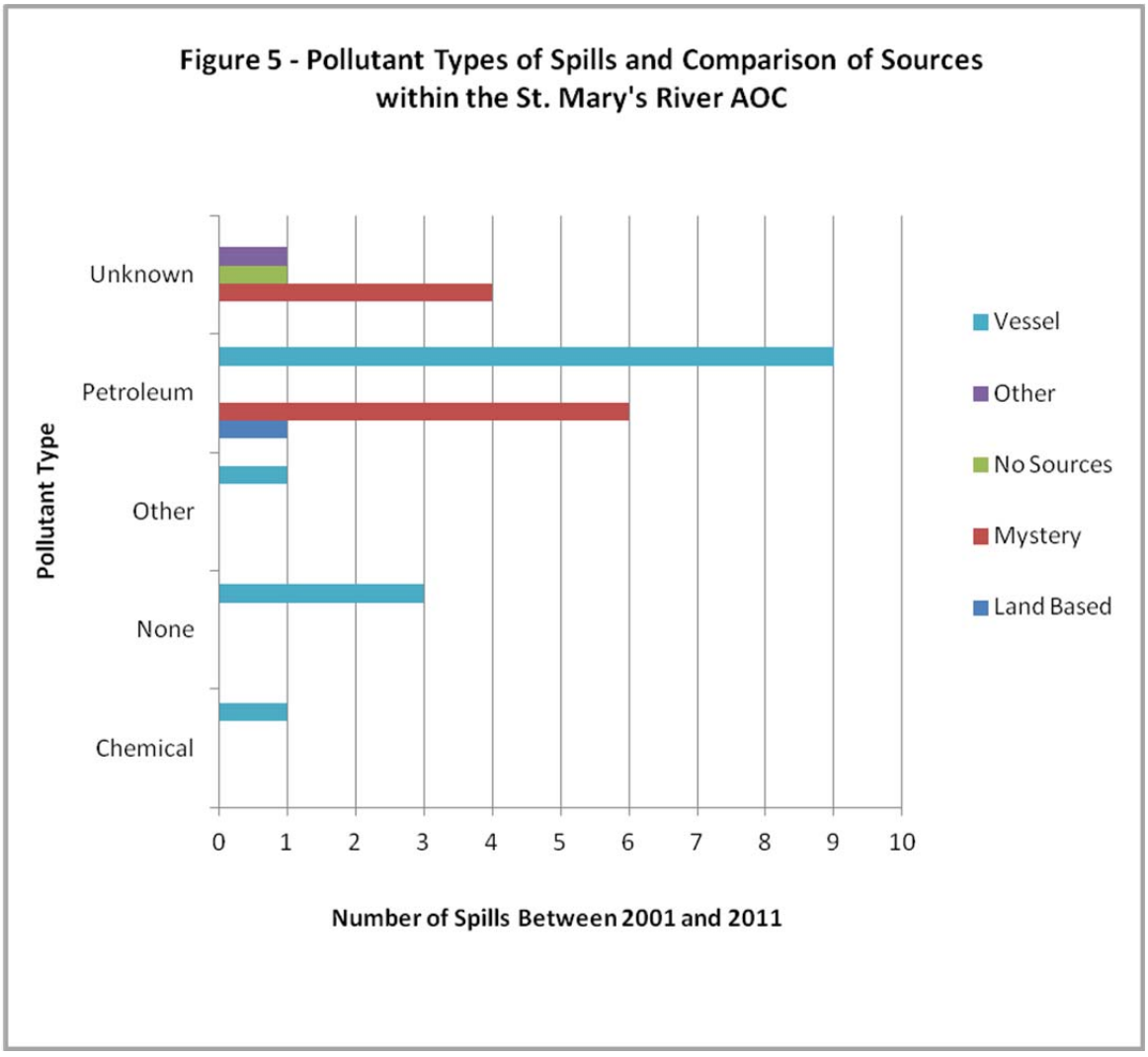
3.5. Comparison of Pollutant Sources and Corresponding Pollutant Types of Discharges

Figure 5 illustrates each of the pollutant sources of discharges within the St. Marys River AOC and the corresponding pollutant types. Within vessel discharges, nine of the fourteen discharges were petroleum based. Three discharges were classified as 'none', one as 'other' and one discharge was chemical based.

The specific pollutants discharged in those incidents include (brackets indicate number of occurrences):

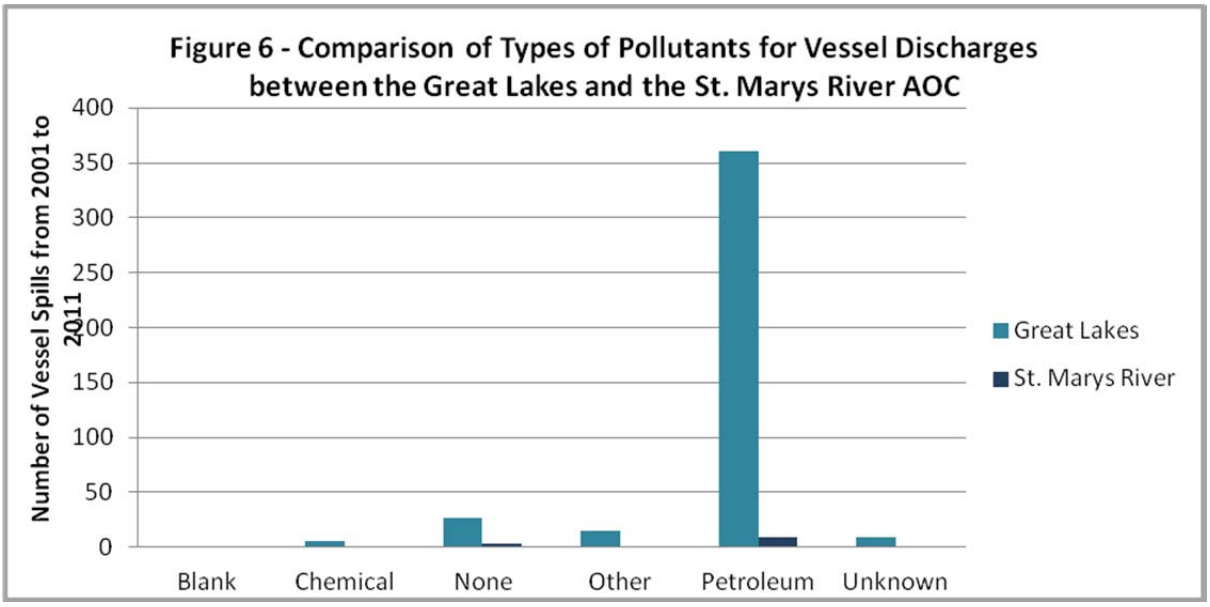
- Diesel Oil (4)
- Flammable Liquid (1)
- Lubricant Oil (2)
- Soot (1)
- Waste Oil-Marine (1)
- Unknown (2)
- No information (3)

The category 'No information' does not indicate a lack of data. It indicates an incomplete entry where categories were left blank.



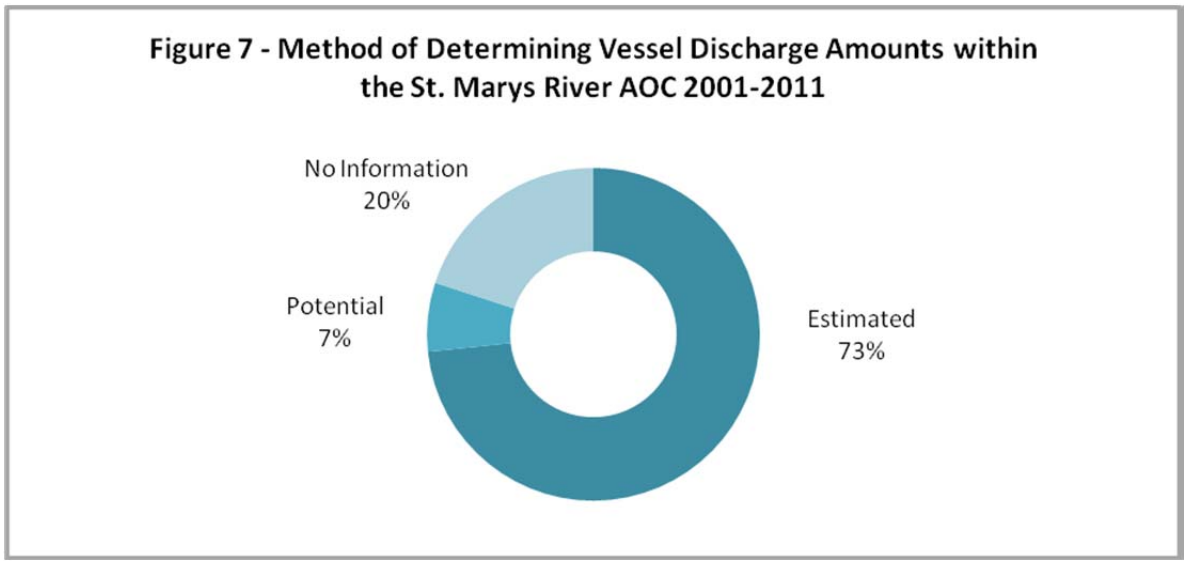
3.6. Comparison of Types of Pollutants for Vessel Discharges between the Great Lakes and the St Marys River AOC

Vessel discharges within the Great Lakes follow a similar pattern in type of pollutant to the St. Marys River AOC. The majority of discharges are petroleum based, with the category 'none' as the second most common, followed by other, unknown, chemical and blank (Figure 6).



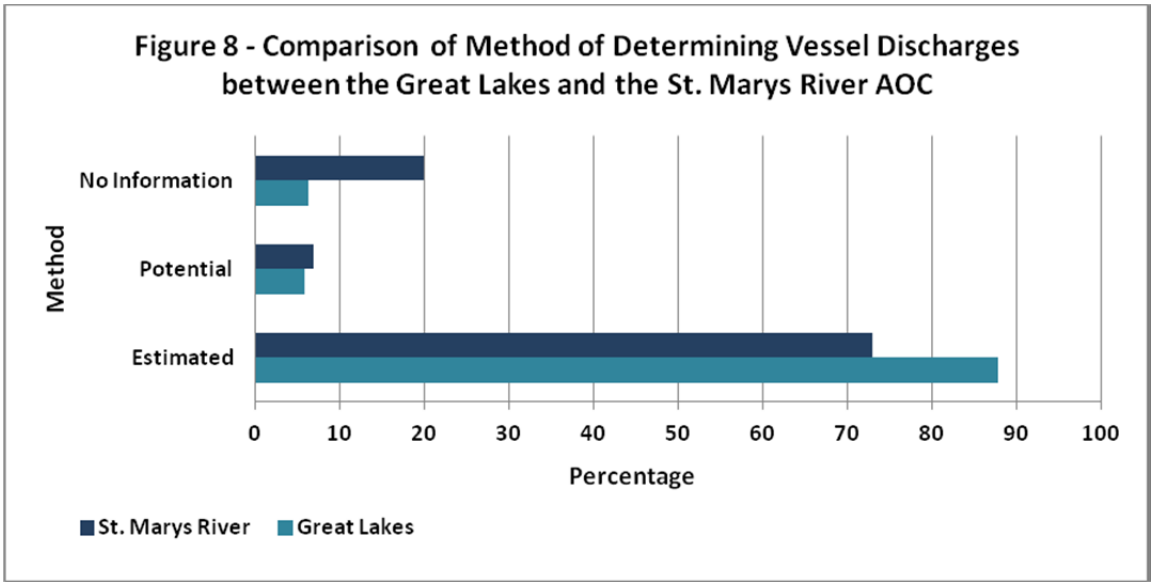
3.7. Method for Determining Vessel Discharge Amounts within the St. Marys River AOC

When a vessel discharge occurs, the amount of discharge must be determined. In the MPIRS database, there are two methods of determining amounts: estimated and potential. Estimated refers to the amount that is estimated to have been discharged into the water. Potential refers to an incident where the pollutant that is still contained within the vessel but could be released and is therefore not an actual discharge. For the St. Marys River AOC, only one incident was listed as potential. It is therefore not included in the rest of the analysis. 'No information' reflects the percentage of entries left blank within the database. As illustrated in Figure 7, 73 percent of vessel discharges were estimated, and the one incident listed as potential accounts for seven percent of the overall total. Twenty percent of entries were left blank.



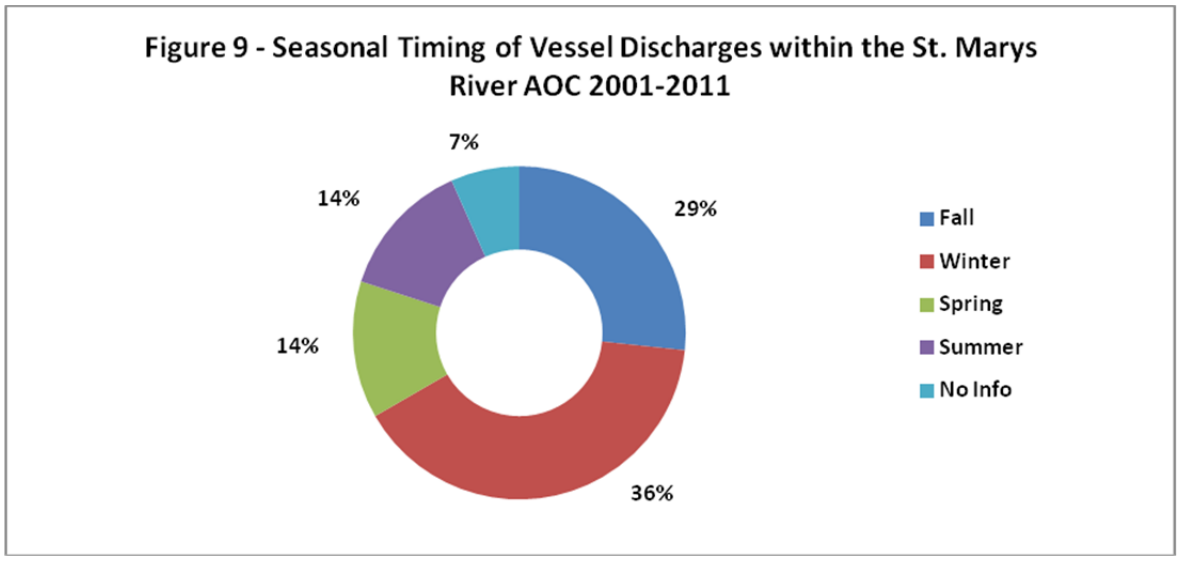
3.8. Comparison of Methods of Determining Vessel Discharges between the Great Lakes and the St. Marys River AOC

The method of determining vessel discharges in the Great Lakes is similar to the St. Marys River AOC, with 89 percent of the discharges estimated (see Figure 8). For the Great Lakes, the number of potential discharges is equal to 26 incidents, which accounts for five percent. This means that 26 of the 419 incidents did not result in an actual substance released. The number of entries that have no information is much less (six percent) in the Great Lakes as opposed to the St. Marys River AOC (twenty percent).



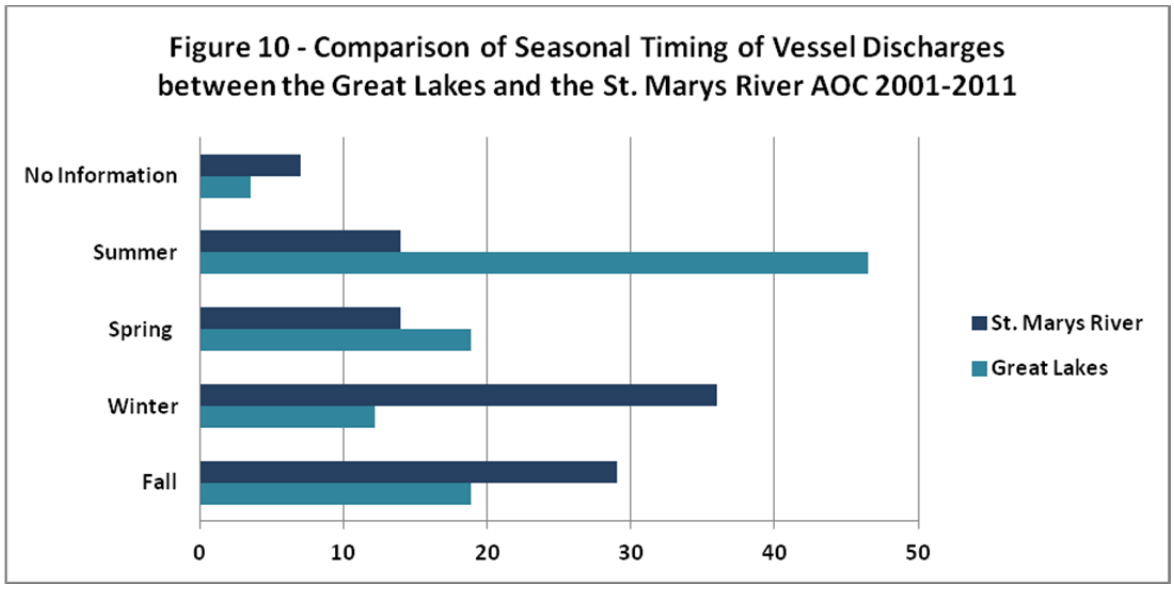
3.9. Seasonal Timing of Vessel Discharges within the St. Marys River AOC

The SAC database includes information on what season discharges occurred in and the time of day. Figure 9 illustrates the seasonal differences for the St. Marys River AOC, and Figure 10 compares seasonal differences between the St. Marys River AOC and the Great Lakes. Overall for the St. Marys River AOC, winter is the season when most vessel discharges occurred between 2001 and 2011. Twenty-nine percent of vessel discharges occurred in the fall, and the lowest number of discharges occurred in spring and summer, with 14 percent each. One entry (seven percent) was left blank for time and season.



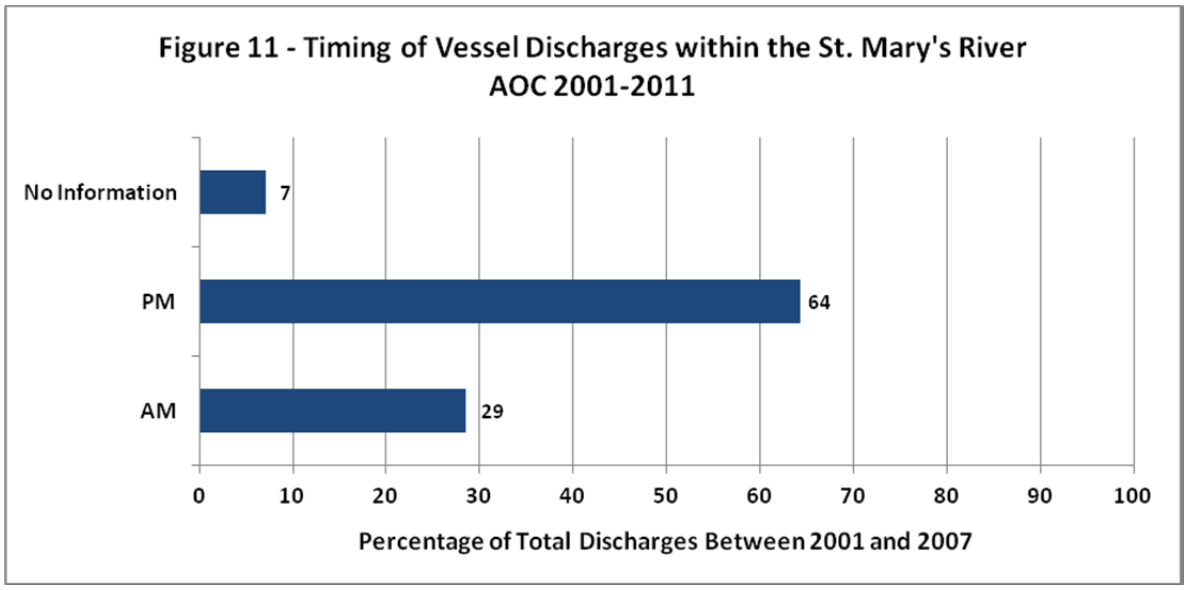
3.10. Comparison of Seasonal Timing of Vessel Discharges between the Great Lakes and the St. Marys River AOC 2001 to 2011

The seasonal timing of vessel discharges varies greatly between the St. Marys River AOC and the Great Lakes. For the Great Lakes, summer is the season with the highest number of incidents, and winter is the season with the least amount. According to the statistics, many discharges are caused by personal watercraft (PWCs). In 2010, 44 percent of vessel discharges were attributed to PWCs, which is consistent with other recent years (CCG, 2012). The high number of incidents in the Great Lakes in the summer may reflect an increase of PWC use.



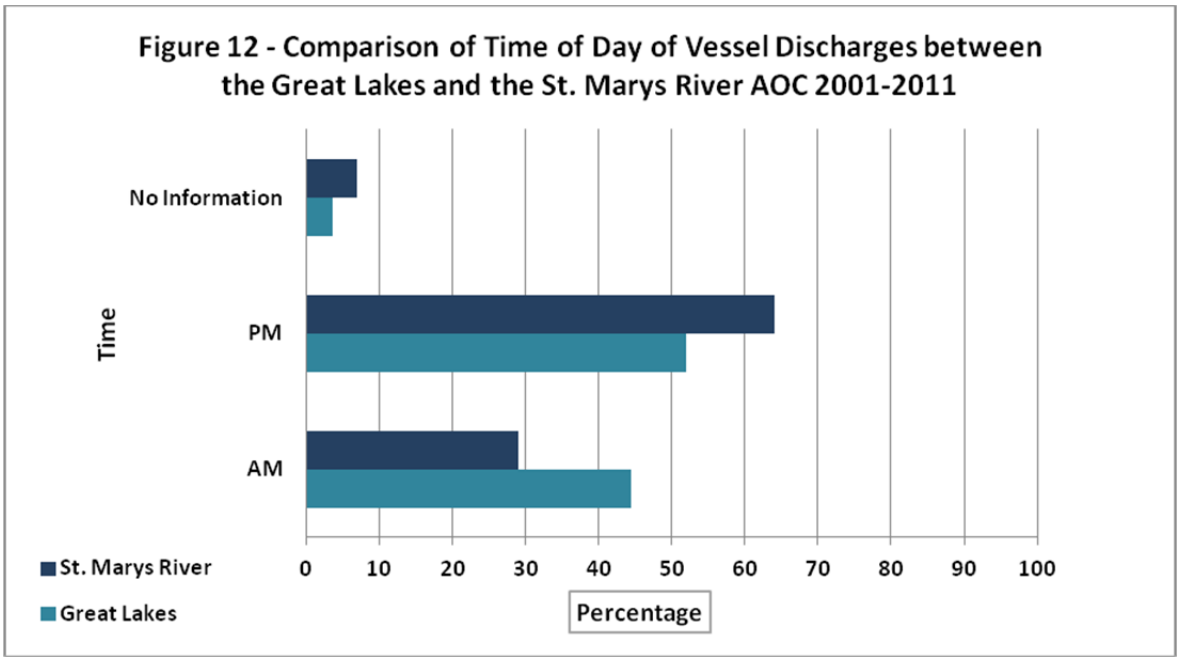
3.11. Timing of Vessel Discharges within the St. Marys River AOC

In the St. Marys River AOC, the majority of discharges (64 percent) occurred in the afternoon/evening. Twenty-nine percent occurred in early or late morning (Figure 11). Seven percent had no information listed for time of day.



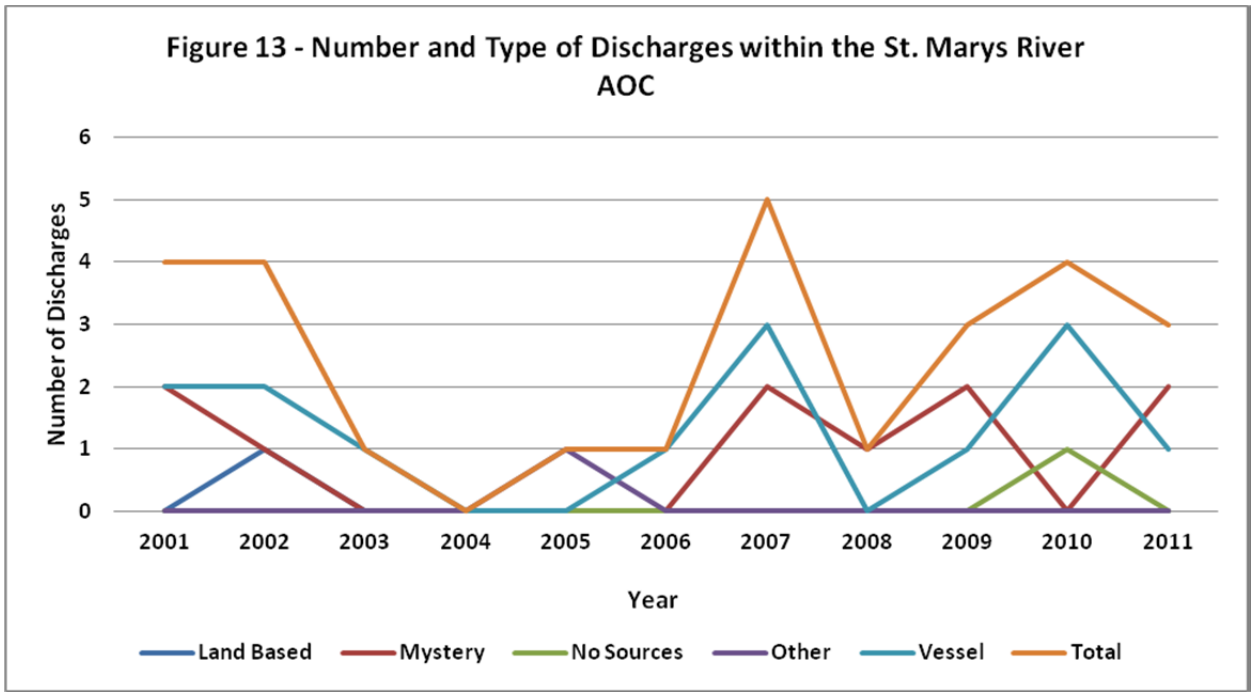
3.12. Comparison of Time of Day of Vessel Discharges between the Great Lakes and the St. Marys River AOC 2001 to 2011

The 'time of day' for vessel discharges for the Great Lakes was quite similar to the St. Marys River AOC. Fifty-two percent of discharges occurred in the afternoon/evening, and 44 percent occurred in the early or late morning (see Figure 12). Four percent of entries were left blank in the Great Lakes data.



3.13. Number and Type of Discharges within the St. Marys River AOC

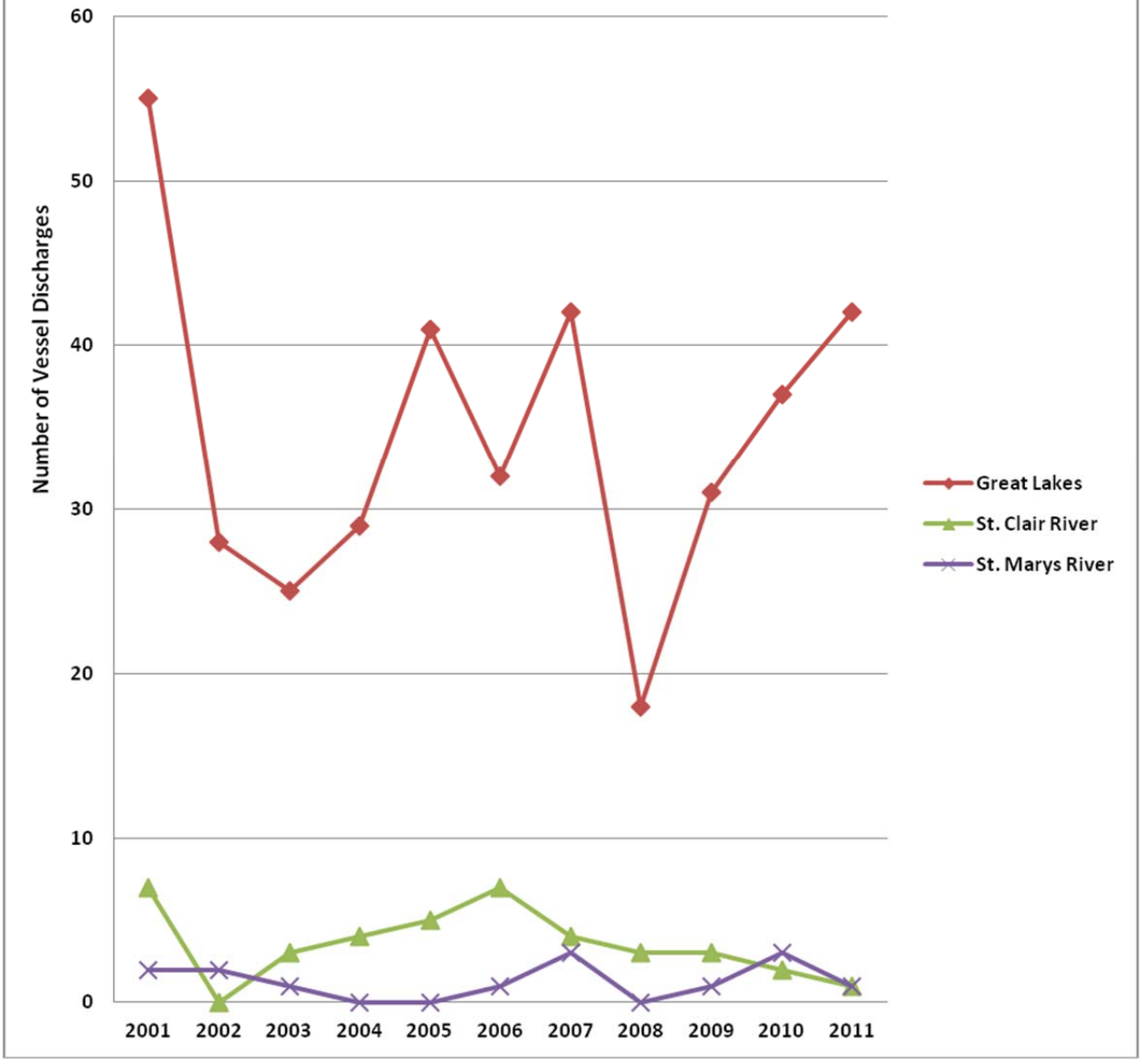
Figure 13 displays the number of all types of discharges within the St. Marys River AOC for each year recorded in the MPIRS database between 2001 and 2011. Vessel discharges account for the highest number of discharges within the database. The highest number of incidents occurred in 2007 and 2010. In 2004, 2005 and 2008 there were no vessel discharges reported to the MPIRS database. The remaining years averaged one to two discharges annually.



3.14. Comparison of Number of Vessel Discharges between the Great Lakes, the St. Marys River AOC and the St. Clair River AOC from 2001 to 2011

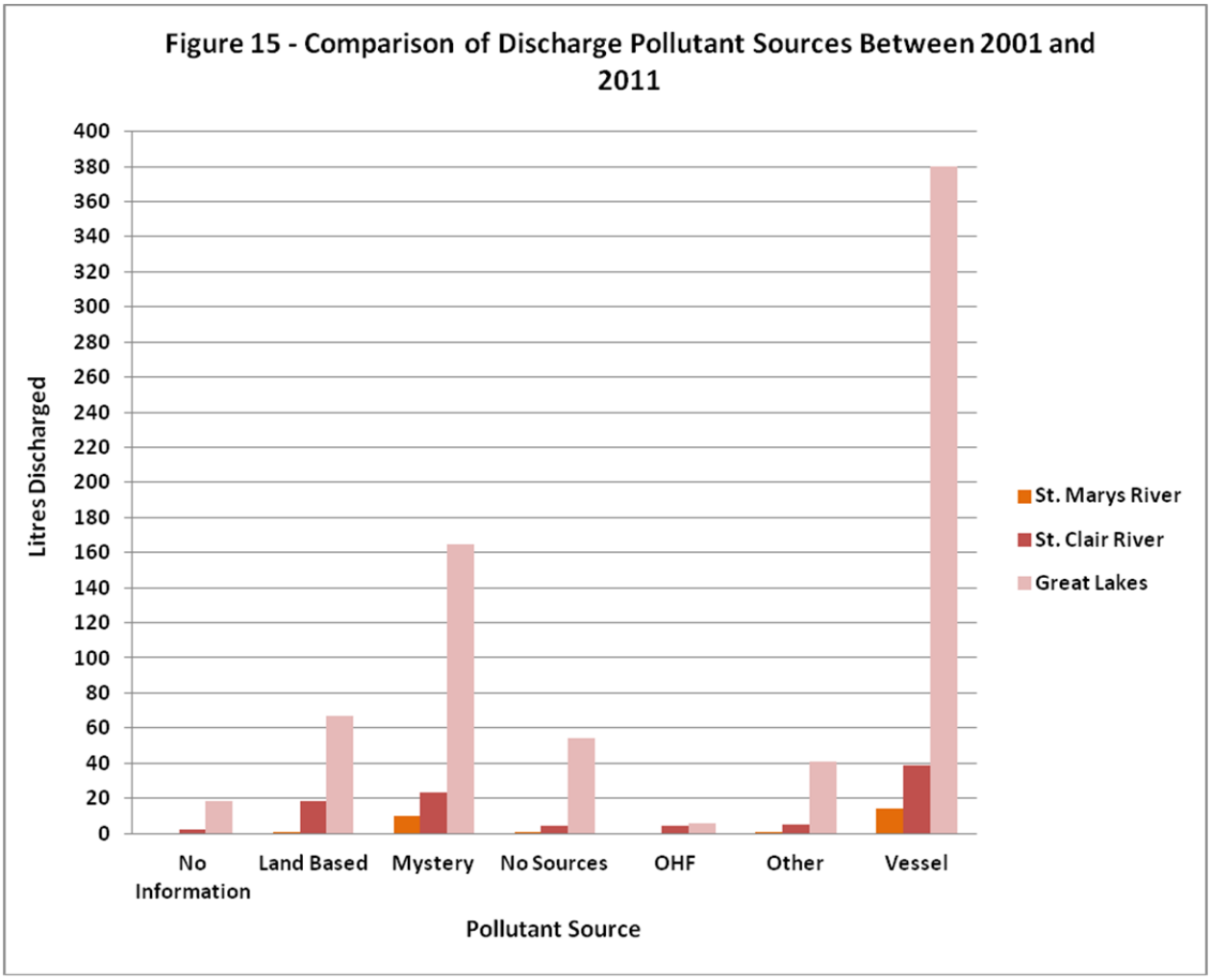
In comparison with the St. Clair River AOC and the Great Lakes, there are significantly fewer vessel discharges within the St. Marys River AOC, which is demonstrated in Figure 14. Between 2001 and 2011, there were 14 incidents within the St. Marys River AOC, 39 within the St. Clair River AOC and 380 in the Great Lakes.

Figure 14 - Comparison of Number of Vessel Discharges between the Great Lakes, the St. Marys River AOC and the St. Clair River AOC from 2001 to 2011



3.15. Comparison of Discharge Pollutant Sources Between 2001 and 2011

From the MPIRS database, it is possible to compare all three locations and pollutant sources. The St. Marys River AOC has the lowest percentage of discharges within all types of pollutant sources; however, all locations follow a similar pattern, with vessel discharges as the highest source of pollution, followed by mystery, land based, other, no sources or OHF (only for the Great Lakes and the St. Clair River AOC) and the least was no information. It is important to note that land based incidents reported in CCG's MPIRS database are not reflective of the actual number of land-based discharges within the region. The land-based spills in the MPIRS database are usually recorded because there is a potential for impact on U.S. waters (resulting in obligations for CCG under the Canada-US Joint Contingency Plan) or that a spill on water was traced back to a land-based source.



Between 2001 and 2011, the total number of litres discharged within the St. Marys River AOC was 1941.42 litres. The total number of litres discharged can be mainly attributed to one incident in 2007, when 1892.71 litres of Diesel oil were discharged. This means that only 48.71 litres were discharged between 2001 and 2006 and from 2008 to 2011. Aside from the 'operational discharge' event, the St. Marys River AOC has experienced significantly lower volumes of discharges on an annual basis.

In comparison with the Great Lakes, there have been significantly fewer litres discharged in the St. Marys River AOC. In the Great Lakes, a total of 104,885.15 litres have been discharged within the same time period. 2004 had the highest amount of vessel discharges, totaling 83,358.1 litres which was mainly attributable to two discharges, one discharge of 31,000 litres of Fuel Oil IFO 180 in Lake Superior and one discharge of 50,000 litres of calcium chlorite in the St. Lawrence River/Lake St. Francis. In the St. Marys River AOC, aside from 2007, annual vessel discharges are quite low, ranging from 1 litre to 25 litres. For the Great Lakes, aside from 2003, 2004, 2006 and 2007, annual totals range from 598 litres to

2000 litres. However, it must also be considered that the St. Marys River AOC is a much smaller area than the Great Lakes in total.

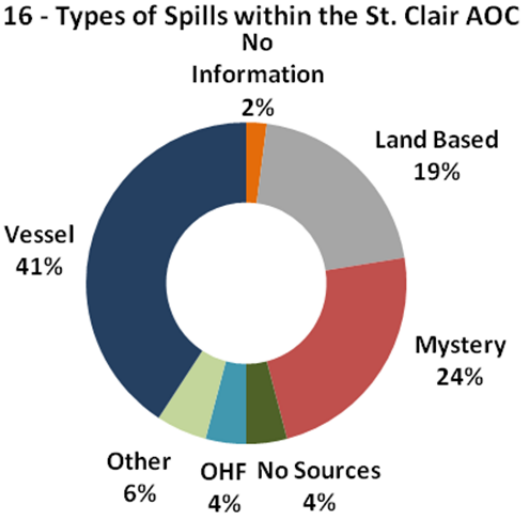
4. Summary of Discharges in the St Clair River AOC

Chapter 4 provides a summary of discharges in the St. Clair River AOC between 2001 and 2011, based on the Spills Action Centre database. Within the MPIRS database, the St. Clair River, Lake St. Clair and Detroit River are considered to be one area. The locations of the each incident had to be confirmed by verifying the location on Google maps or through project contacts and then compared with the St. Clair River AOC map. Once the locations were verified, the applicable data was analyzed and is displayed in the following figures. Where the St. Clair River AOC data is compared to the Great Lakes, the Great Lakes data includes the St. Marys River AOC data, aside from Figures 14 and 15, where all locations were separated.

4.1. Types of Discharges within the St. Clair River AOC

Within the St. Clair River AOC between 2001 and 2011, there have been 95 documented incidents. Of these 95 incidents, vessel discharges account for 39 occurrences (41 percent), as illustrated in Figure 16. Mystery discharges account for the second largest percentage of discharges in the St. Clair River AOC, followed by Land Based discharges. Discharges from OHF, Other, No sources and No Information each account for a small percentage of the overall occurrences

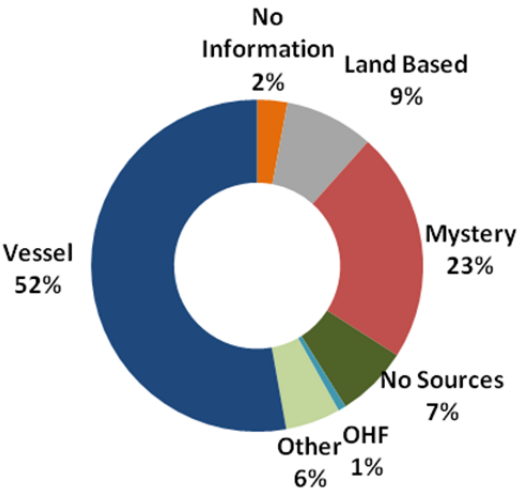
Figure 16 - Types of Spills within the St. Clair AOC



4.2. Types of Discharges within the Great Lakes

In comparison, although there is a greater percentage of vessel discharges in the Great Lakes (52 percent), the pattern is similar, in that the largest percentage of discharges are due to vessel discharges, followed by Mystery and Land Based discharges. The other categories make up a smaller portion of discharges for both the St. Clair River AOC and the Great Lakes. For the Great Lakes, only one percent of discharges can be attributed to Oil Handling Facilities (OHF), whereas in the St. Clair River, it is four percent. This could be due to the higher concentration of OHFs

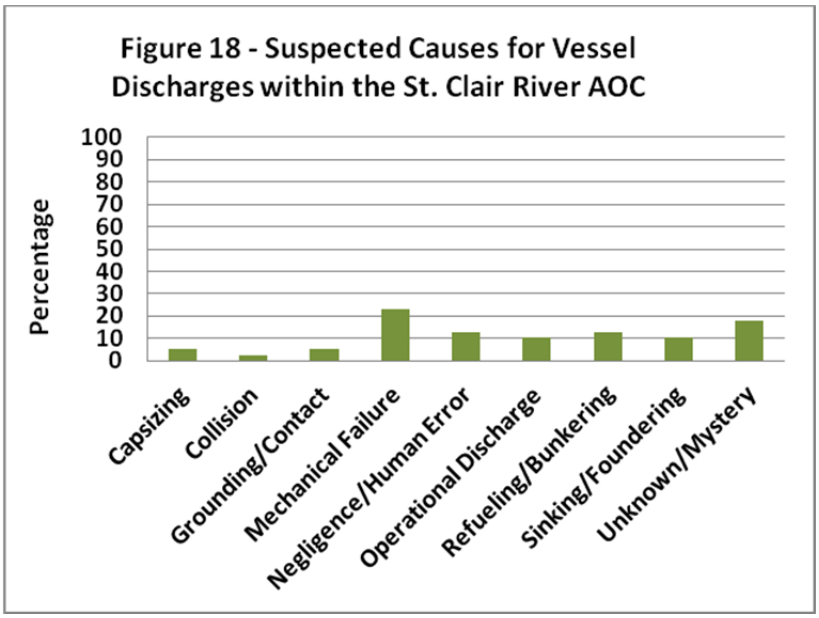
Figure 17 - Types of Spills within the Great Lakes



located in the St. Clair River AOC than in any other area of the Great Lakes system. It is important to note that land based incidents reported in CCG's MPIRS database are not reflective of the actual number of land-based discharges within the region. The land-based spills in the MPIRS database are usually recorded because there is a potential for impact on U.S. waters (resulting in obligations for CCG under the Canada-US Joint Contingency Plan) or that a spill on water was traced back to a land-based source.

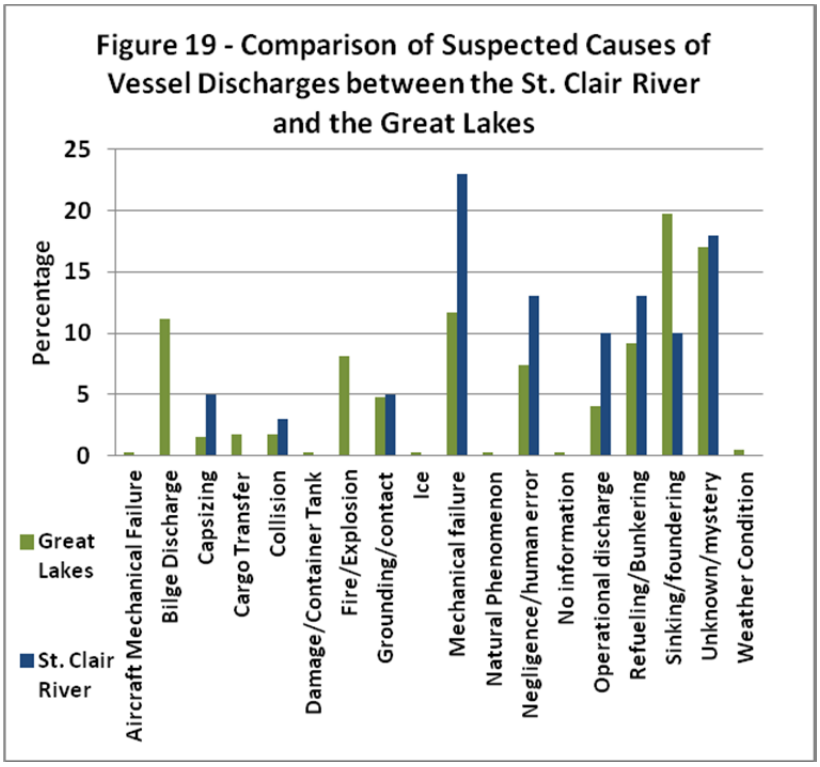
4.3. Suspected Causes for Vessel Discharges within the St. Clair River AOC 2001-2011

There are nine suspected causes of vessel discharges within the St. Clair River AOC. Of the 39 vessel discharges, 23 percent is attributed to mechanical failures. Unknown/mystery accounts for 18 percent of discharges, followed by negligence/human error and refueling/bunkering, each accounting for 13 percent of suspected causes (see Figure 18). Sinking/foundering and operational discharges account for 10 percent of suspected causes, and capsizing and grounding/contact are the least significant, each accounting for five percent of vessel incidents. Three percent of discharges are attributed to collisions.



4.4. Comparison of Suspected Causes of Vessel Discharges between the St. Clair River AOC and the Great Lakes

The Canadian Coast Guard Response Plan identifies that connecting waterways between the Great Lakes are typically more risky due to a number of factors (2008); however, when comparing suspected causes of vessel discharges within the St. Clair River AOC and the Great Lakes, the AOC has half as many of the suspected causes. As in Figure 19, additional causes of discharges in the Great Lakes include aircraft mechanical failure, bilge discharge, cargo transfer, damage container/tank, fire/explosion, natural phenomenon and weather condition. Blank entries in the database are listed as 'No information'. The lower number of causes within the AOC could potentially be due to different types of unloading/loading activities, number of vessels, frequency/traffic, number of operations/activities and/or differences in size of the watercourses.



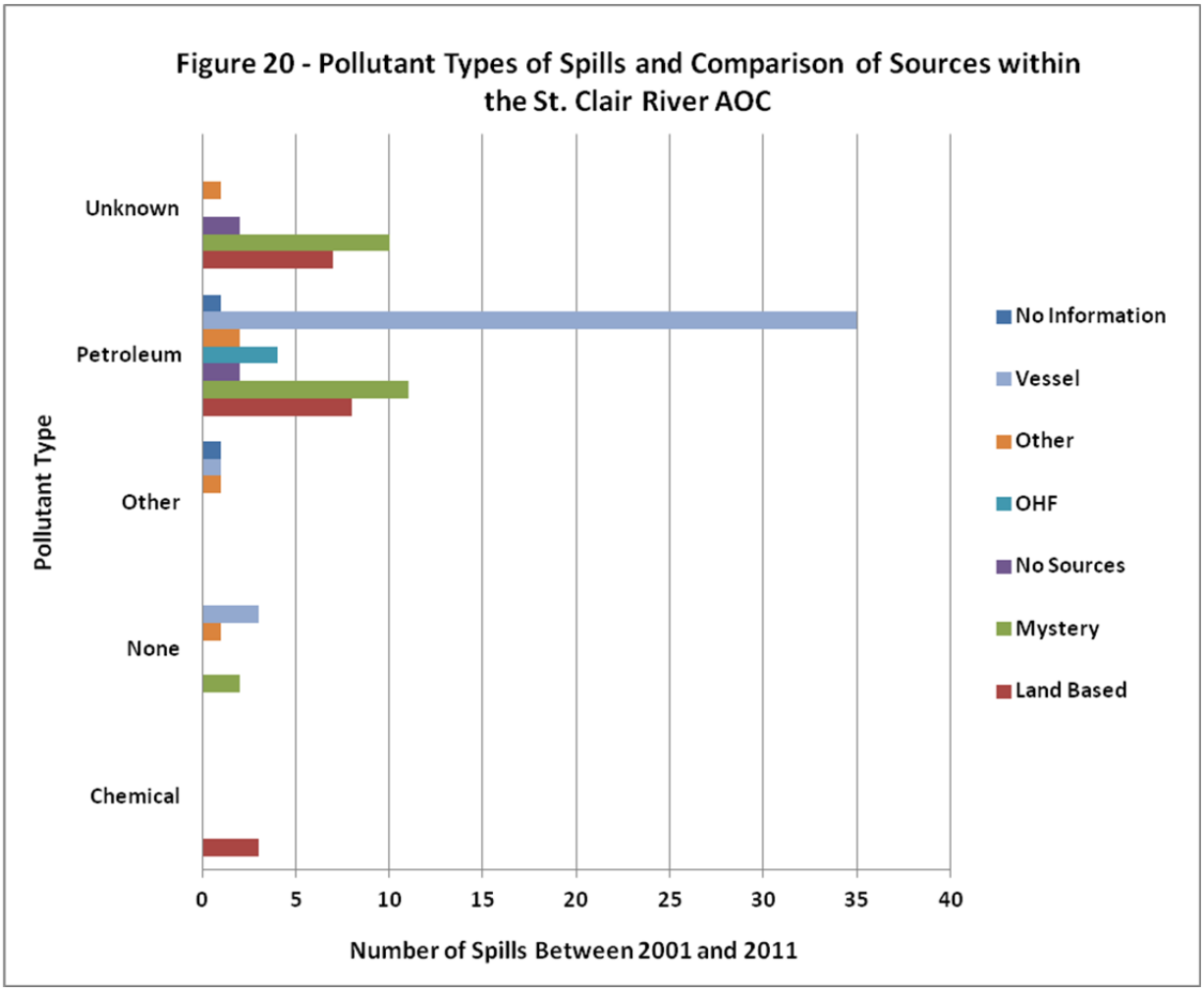
4.5. Pollutant Types of Discharges and Comparison of Sources within the St. Clair River AOC

Figure 20 illustrates each of the pollutant sources of discharges within the St. Clair River AOC and the corresponding pollutant types. Within vessel discharges, 36 of the 40 discharges were petroleum based, one of which was the 'potential' discharge with no actual substance released. Three discharges were classified as 'none' and one as 'other'. Within all pollutant sources of discharges, a total of 18 specific pollutants were released. Ten of the 18 pollutants were included for vessels discharges.

The specific pollutants discharged in those incidents include:

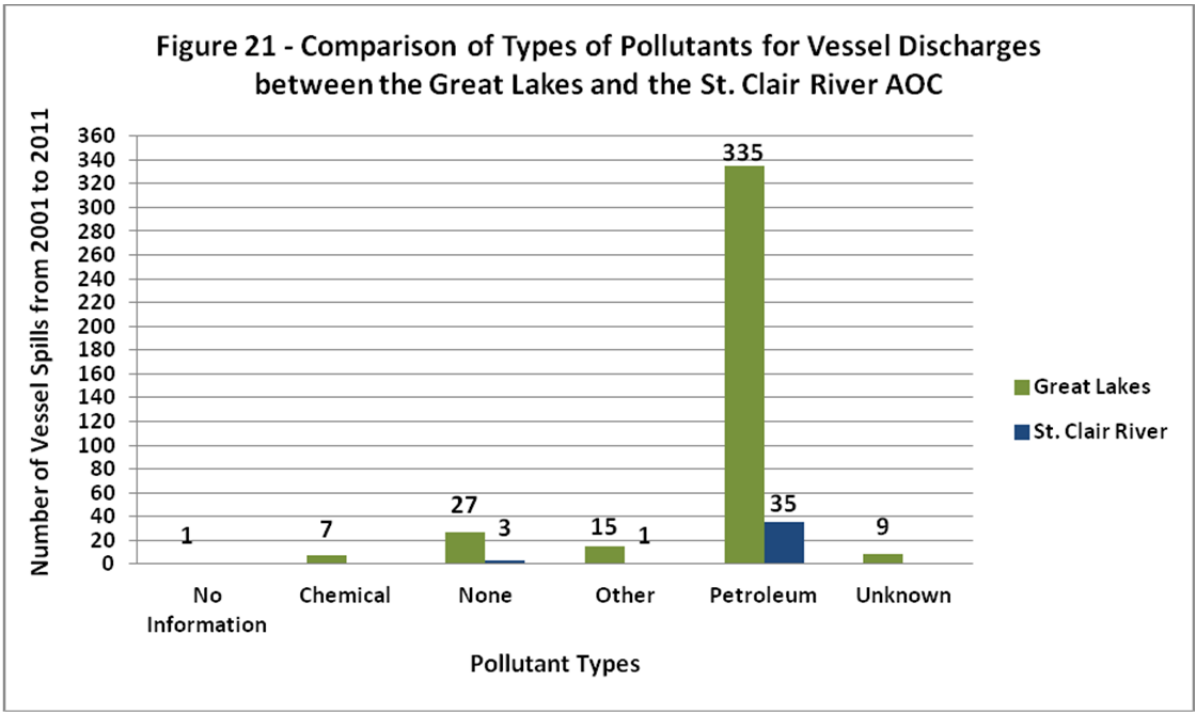
- Asphalt (1)
- Diesel Oil (13)
- Fuel Oil IFO 80 (1)
- Gasoline (2)
- Hydraulic Oil (5)
- Lubricant Oil (5)
- Sewage (1)
- Waste Oil-Marine (4)
- Unknown (4)
- No information (3)

The category 'No information' does not indicate a lack of data. It indicates an incomplete entry where blanks were categories were left blank.



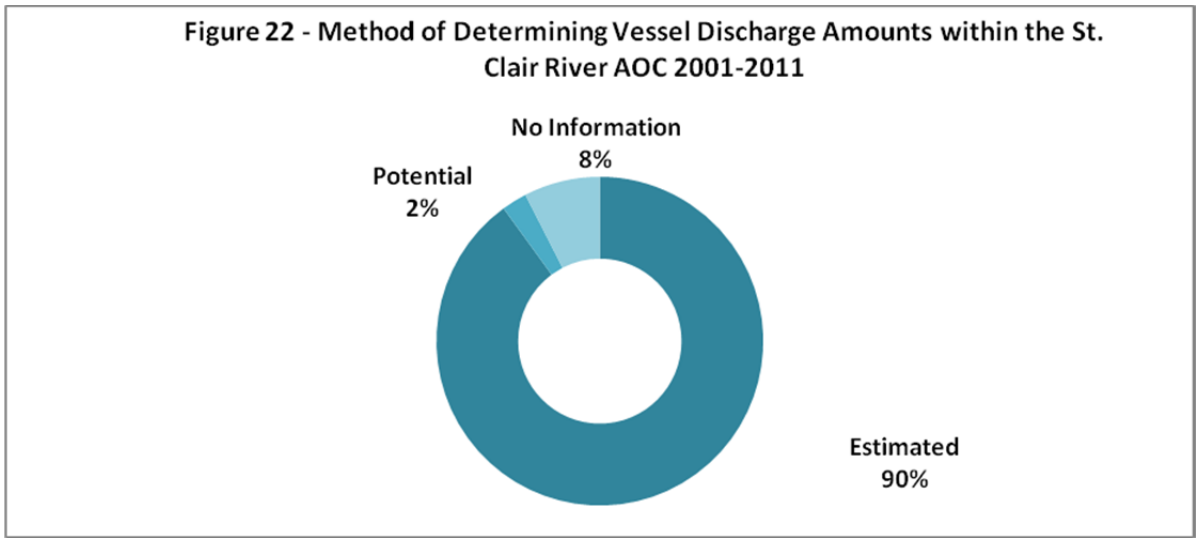
4.6. Comparison of Types of Pollutants for Vessel Discharges between the Great Lakes and the St. Clair River AOC

Vessel discharges within the Great Lakes follow a similar pattern in type of pollutant to the St. Clair River AOC. The majority of discharges are petroleum based, with the category 'none' the second most common, followed by other, unknown, chemical and no information. The one difference is that there were no vessel discharges in the St. Clair River AOC classified as chemical or as no information.



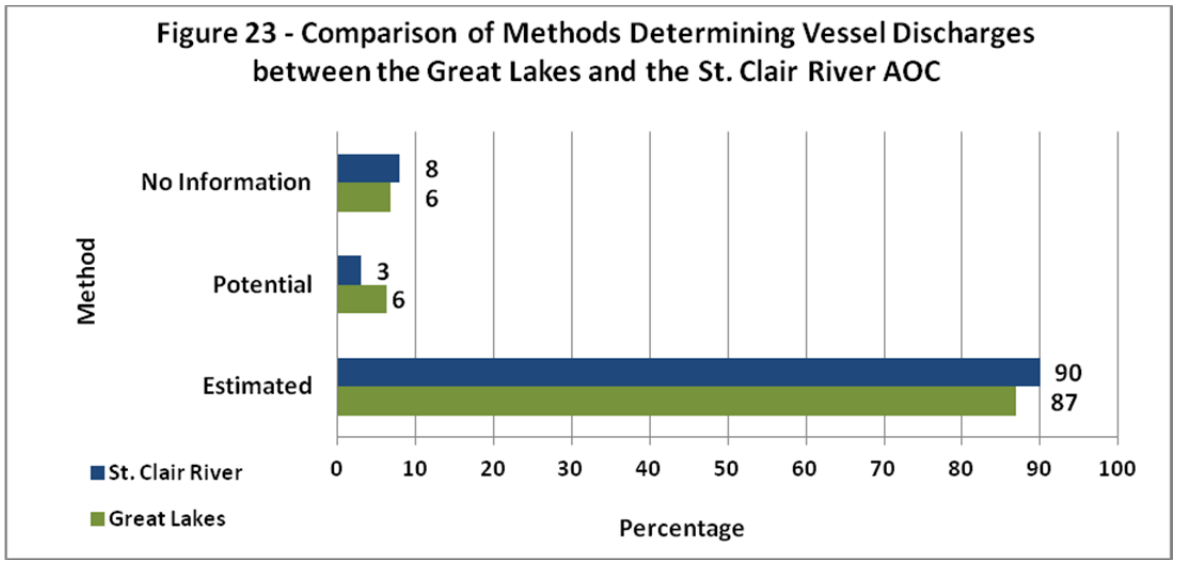
4.7. Method of Determining Vessel Discharge Amounts within the St. Clair River AOC 2001 to 2011

When vessel discharge occurs, the amount of discharge must be determined. In the SAC database, there are two methods of determining amounts: estimated and potential. Estimated refers to the amount discharged into the water. Potential refers to a pollutant that is still contained within the vessel that could be released and is therefore not an actual discharge. For the St. Clair River AOC, only one incident was listed as potential; therefore 39 of the 40 vessel discharges actually had a substance released, and the one potential incident is not included in the analysis. 'No information' reflects the percentage of entries left blank within the database. As illustrated in Figure 22, 90 percent of vessel discharges are estimated and only two percent is classified as potential. Eight percent of entries were left blank.



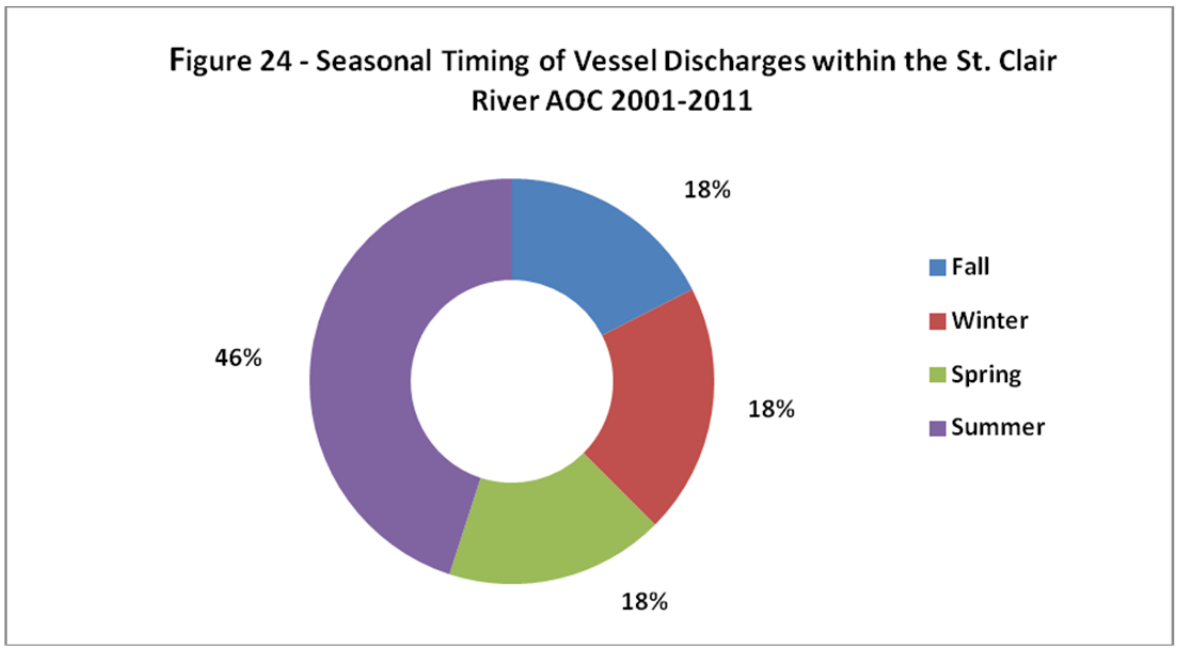
4.8. Comparison of Methods Determining Vessel Discharges between the Great Lakes and the St. Clair River AOC

The method of determining vessel discharges in the Great Lakes is similar to the St. Clair River AOC, and 87 percent of the discharges are estimated. The percentage of potential discharges is higher, at six percent (26 incidents). The number of entries that have no information is very similar for both (six percent in the Great Lakes).



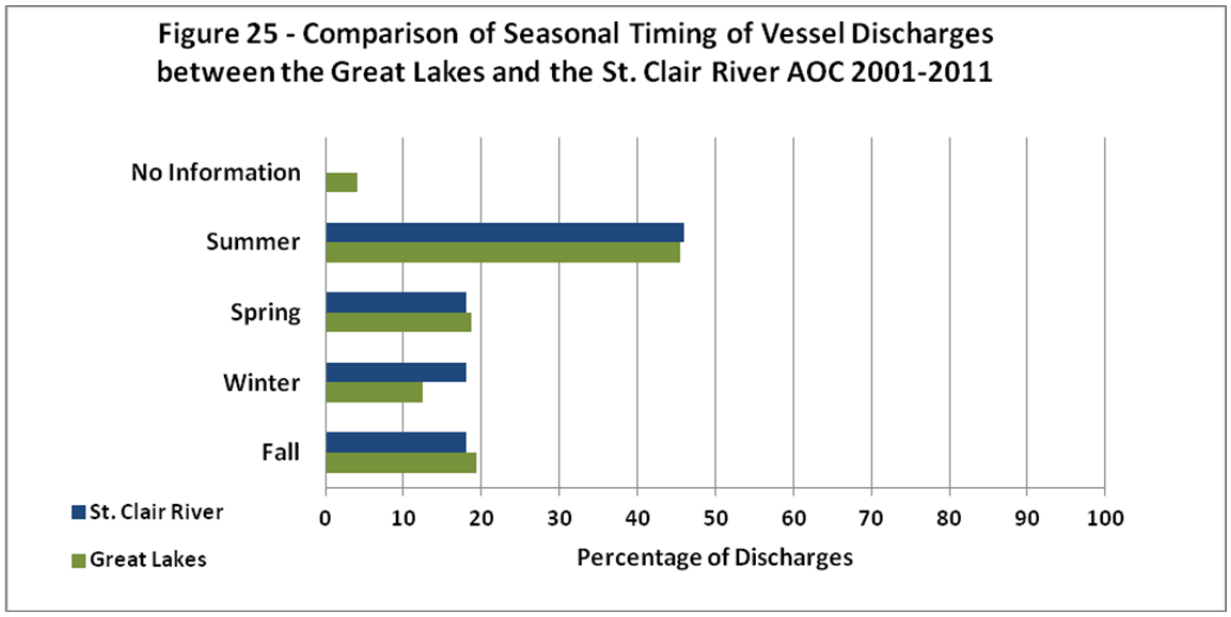
4.9. Seasonal Timing of Vessel Discharges within the St. Clair River AOC 2001 to 2011

The SAC database includes information on what season discharges occurred in and the time of day. Figure 24 illustrates the seasonal differences for the St. Clair River AOC, and Figure 25 compares seasonal differences between the St. Clair River AOC and the Great Lakes. Overall for the St. Clair River AOC, summer is the season with the highest percentage of vessel discharges between 2001 and 2011. Eighteen percent of vessel discharges occurred in the winter, spring and fall, equally at 18 percent.



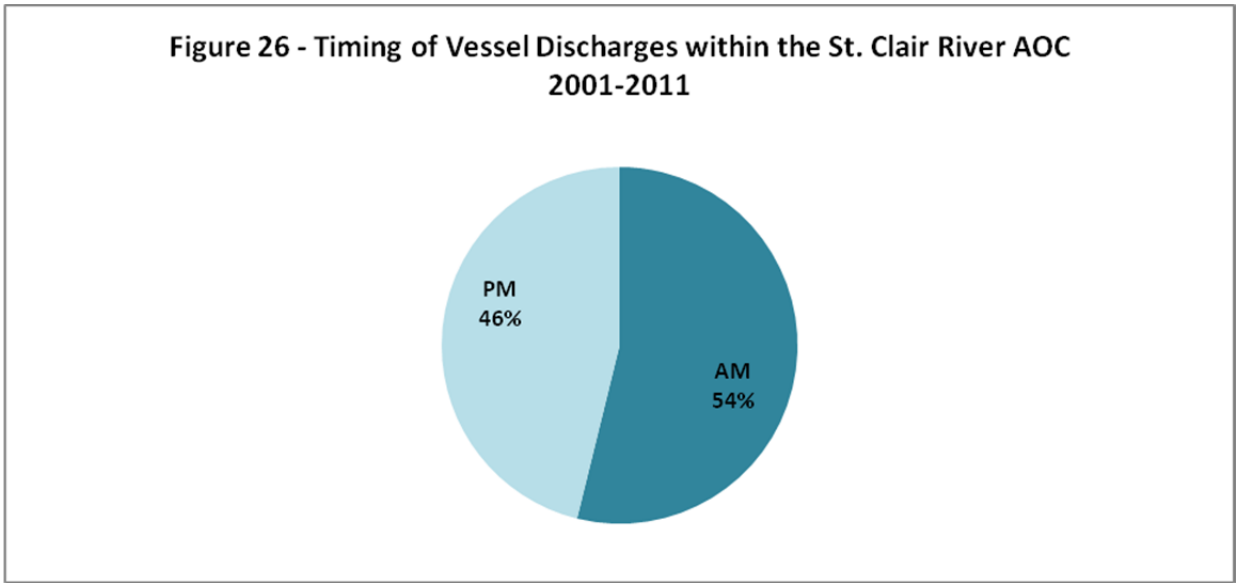
4.10. Comparison of Seasonal Timing of Vessel Discharges between the Great Lakes and the St. Clair River AOC 2001 to 2011

The seasonal timing of vessel discharges varies slightly between the St. Clair River AOC and the Great Lakes. For the Great Lakes, percentage of summer occurrences is nearly the same as the St. Clair River AOC, at 45 percent; however, for the Great Lakes, the least number of incidents occurred in winter (12 percent). For the Great Lakes, 19 percent occurred in the fall and spring. Four percent of the incidents were left blank for season and time, whereas for the St. Clair River AOC, all entries were completed (see Figure 25).



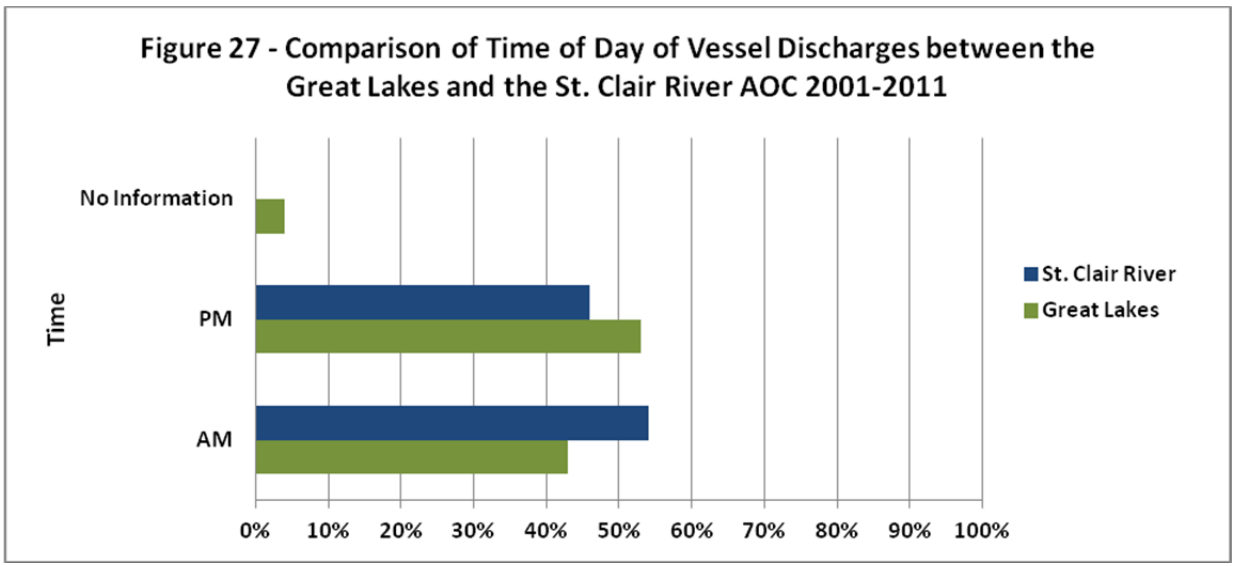
4.11. Timing of Vessel Discharges within the St. Clair River AOC 2001 to 2011

In the St. Clair River AOC, time of day was fairly even. Fifty-four percent occurred in the early to late morning (am), and 46 percent occurred in the afternoon/evening (pm) (see Figure 26).



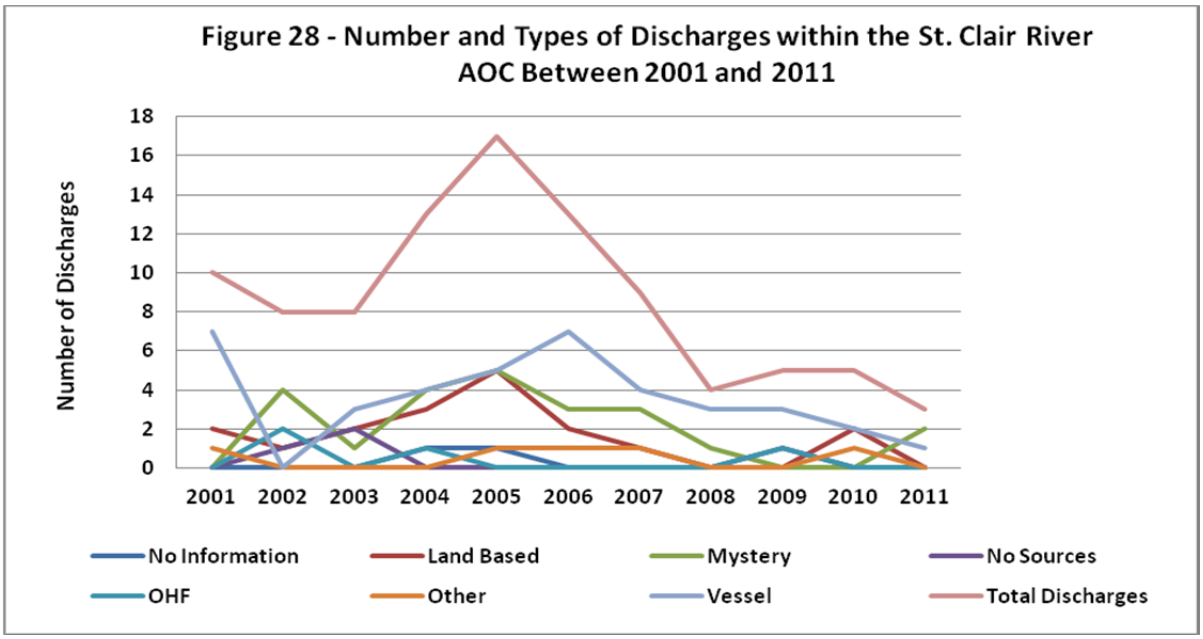
4.12. Comparison of Time of Day of Vessel Discharges between the Great Lakes and the St. Clair River AOC 2001 to 2011

Time of day did not appear to be as significant in the St. Clair River AOC as in the Great Lakes overall. The Great Lakes differed from the St. Clair River AOC in that a higher percentage of vessel discharges occurred in the afternoon/evening. Fifty-three percent of discharges occurred in the afternoon/evening, and 43 percent occurred in the early or late morning. As mentioned previously, four percent of entries for the Great Lakes were left blank.



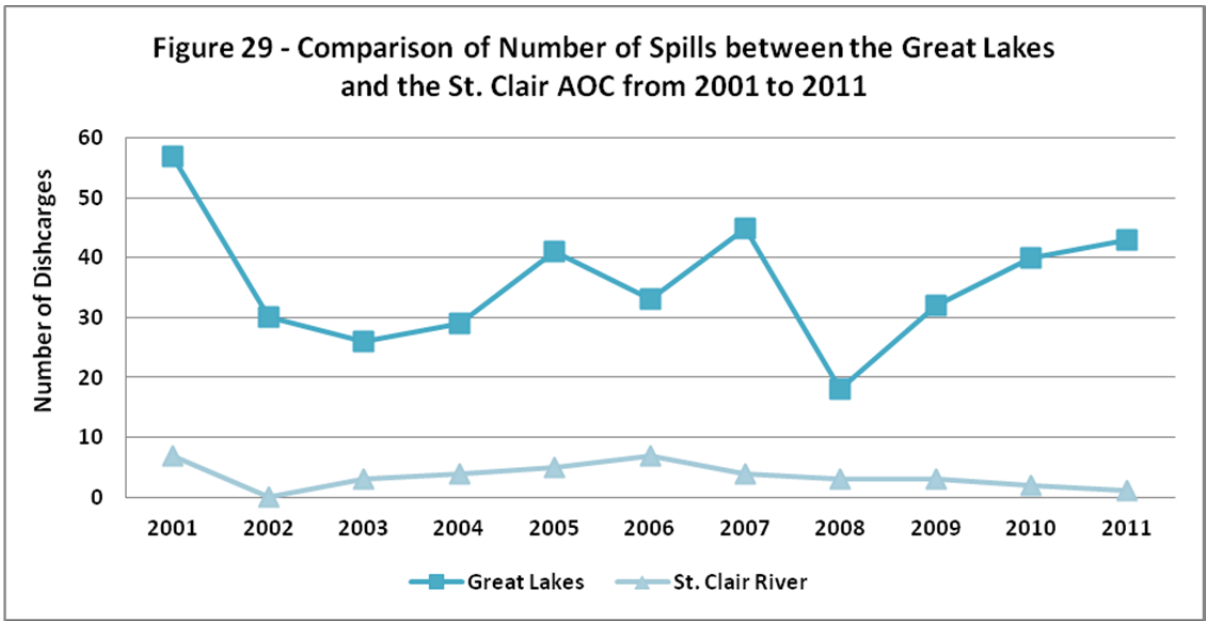
4.13. Number and Type of Discharges within the St. Clair River AOC between 2001 and 2011

Figure 28 displays the number of all types of discharges recorded in the MPIRS database within the St. Clair River AOC for each year between 2001 and 2011. In 2001 and from 2006 to 2011, vessel discharges account for the highest number of discharges. The highest number of vessel discharges occurred in 2001 and 2006, with seven discharges occurring in each of those years. 2002 was the only year when there were no vessel discharges reported to the CCG. The remaining years averaged one to five discharges each year.



4.14. Comparison of Discharges between the Great Lakes and the St. Clair River AOC from 2001 to 2011

Between 2001 and 2011, 39 vessel discharges occurred within the St. Clair River AOC. Fifteen vessel discharges occurred in the St. Marys River AOC and 380 in the Great Lakes. In comparison with the St. Marys River AOC, the St. Clair River experienced a greater number of discharges between 2001 and 2011. However, when compared to the Great Lakes overall, there are significantly fewer vessel discharges, as demonstrated in Figure 29.



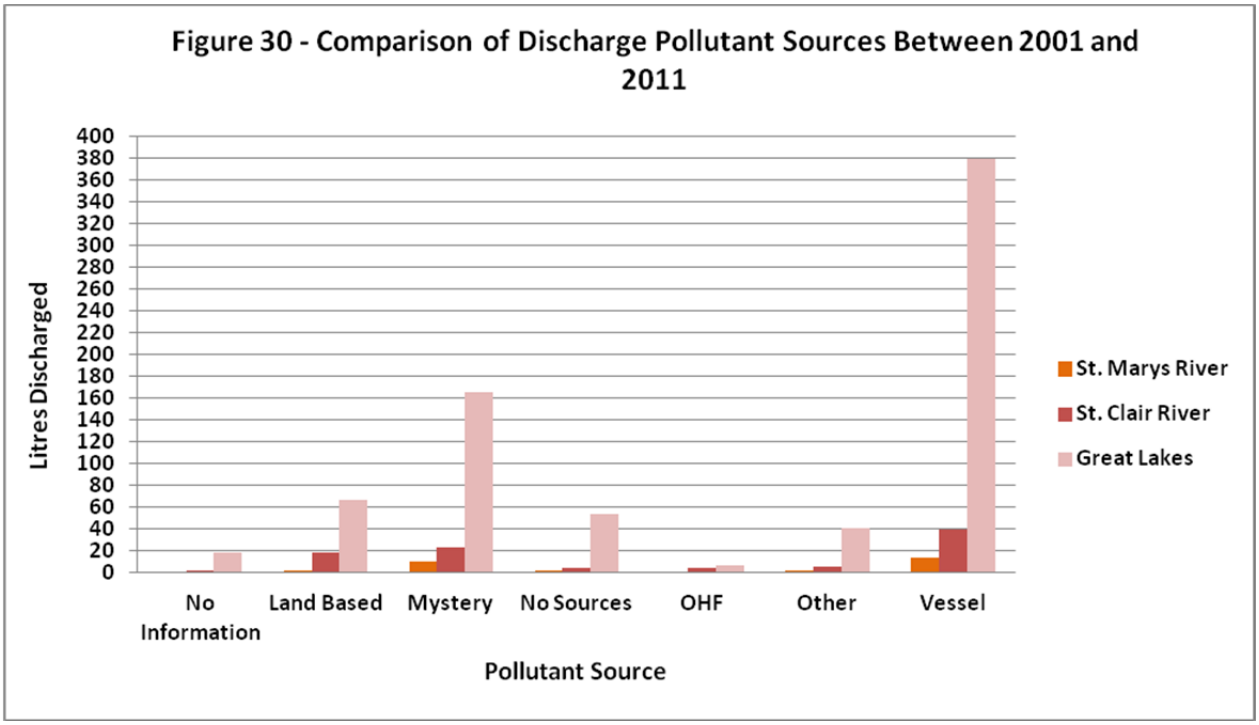
From the MPIRS database, it is possible to compare all three locations and pollutant sources. The St. Clair River AOC has a higher percentage of discharges within all types of pollutant sources than the St. Marys River AOC. However, when compared with the Great Lakes, it has a significantly lower percentage. Despite quantitative differences, they all follow a similar pattern, with vessel discharges as the highest source of pollution, followed by mystery, land based, other, no sources, OHF (only for the Great Lakes and the St. Clair River AOC) and no information.

Between 2001 and 2011, the total number of litres discharged within the St. Clair River AOC was 5518.4 litres. Of that amount, 5132.72 litres were from vessel discharges. The most significant discharges occurred in 2003 and 2005, when over 1000 litres were discharged in each year. In 2003, close to 3000 litres were discharged. Aside from those years and from 2002 when no discharges occurred, 12 to 500 litres were discharged annually within the St. Clair River AOC. Although there are significantly less discharges in the St. Clair River AOC than in the Great Lakes, the majority of litres discharged are caused by vessel discharges.

4.15. Comparison of Discharge Pollutant Sources Between 2001 and 2011

From the MPIRS database, it is possible to compare all three locations and the pollutant sources (see Figure 30). A higher number discharges have occurred in the St. Clair River AOC than in the St. Marys River AOC within all types of pollutant sources. There has been a significantly lower number of discharges in the St. Clair River AOC than in the Great Lakes overall, again within all types of pollutant sources. Despite differences in discharge frequency, all locations follow a similar pattern, with vessel discharges as the highest source of pollution, followed by mystery, land based, other, no sources, OHF (only for the Great Lakes and the St. Clair River AOC) and no information. It is important to note that land based incidents reported in CCG's MPIRS database are not reflective of the actual number of land-based discharges within the region. The land-based spills in the MPIRS database are usually recorded

because there is a potential for impact on U.S. waters (resulting in obligations for CCG under the Canada-US Joint Contingency Plan) or that a spill on water was traced back to a land-based source.



Between 2001 and 2011, the total number of litres discharged within the St. Clair River AOC was 5518.4 litres. Of that amount, 5132.72 litres were from vessel discharges. Close to half of that amount (2,754.06 litres) was discharged in one single incident that occurred in 2003. In comparison with the Great Lakes, there have been significantly fewer litres discharged in the St. Clair River AOC. In the Great Lakes, a total of 104,885.15 litres have been discharged within the same time period. 2004 had the highest amount of vessel discharges, totaling 82,806.13 litres, which was mainly attributable to two discharges, one discharge of 31,000 litres of Fuel Oil IFO 180 in Lake Superior and one discharge of 50,000 litres of calcium chlorite in the St. Lawrence River/Lake St. Francis. In the St. Clair River AOC, aside from 2003, 2005 and 2009, annual vessel discharges are fairly low, ranging from 12.25 litres to 552 litres. For the Great Lakes, aside from 2003, 2004, 2006 and 2007, annual totals range from 598 litres to 2000 litres. However, it must also be considered that the St. Clair River AOC is a much smaller area than the Great Lakes in total.

4.16. Highlight of Two Spill Incidents within the St. Clair River AOC in 2012

Although this report summarizes vessel discharges from the MPIRS database between 2001 and 2011, it is important to note that in the summer of 2012, there were two spills involving vessels that led to the precautionary shut down of water intakes in Point Edward, Wallaceburg and Walpole Island, both within the St. Clair River AOC. The first incident involved the sinking of a barge and tug boat 15 kilometers north of Sarnia in U.S. waters, releasing an estimated 5600 liters (1500 gallons) of diesel fuel. The second incident occurred while a vessel was being loaded with ethyl benzene. The amount of ethyl benzene could not be estimated. As a result, the water intakes for Wallaceburg and Walpole Island were shut down for approximately two days.

5. Summary of Key Findings

Many similar patterns can be seen between the St. Marys River AOC, the St. Clair River AOC and the Great Lakes, including pollutant sources, pollutant types and method of determining amounts discharged. The main differences are between seasons, time of day and also in number of litres discharged. Overall, the discharges in both the St Marys River AOC and the St. Clair River AOC are approximately 15 percent of the total incidents reported in the Great Lakes.

According to a report done by James Li, which was based on SAC data from 1988 to 2007, Sarnia Lambton Environmental Association (SLEA) data (included chemical discharge data) and Environment Canada, the report concluded that for land based discharges, levels of toxic pollutants in the St. Clair River are generally declining, although there have still been major discharges over the years.

According to the Canadian Coast Guard Central and Arctic Regional Response Plan, the Great Lakes are identified as being at highest risk for pollution from vessels. The Response Plan also identifies that throughout the Great Lakes basin, the highest risk of pollution is within the connecting channels (including the St. Clair River and St. Marys River) because of volume and frequency of vessel operations within the converging areas. The Response Plan also notes that areas of high pleasure craft traffic and small commercial craft traffic are subject to small but frequent occurrences of pollution.

According to the Binational Report on Protection of Great Lakes Water Quality from 2008-2009 and from 2010-2011, there is low impact on the Great Lakes Basin from vessel discharges, excluding the issue ballast water and invasive species (USCG et. al, 2010 & 2012). The 2008-2009 Report acknowledges there is still work to be done on each of the discharges; however, existing programs are sufficient in addressing potential and actual vessel discharges (USCG et. al, 2010). The 2010-2011 report concluded that low impacts from oil and hazardous chemical substances discharges were due to effective regulations from both countries (USCG et. al, 2012).

According to our analysis of CCG's MPIRS data, although vessel discharges account for the largest percentage of pollution sources for discharges reported in the database, the number of vessel related discharges that have occurred within the St. Marys River AOC (14 incidents) are very low (4%), especially when compared with the rest of the Great Lakes (380 incidents). Vessel discharges in the St. Clair River AOC (39 incidents) are higher than in the St. Marys River AOC; however, when compared with the rest of the Great Lakes, incidents are still relatively low (11%).

The following provides a summary of the key findings of the analysis of the MPIRS database:

1. **Number of Vessel Discharges** - In comparing the data from 2001 to 2011 between the St. Marys River AOC, the St. Clair River AOC and the Great Lakes, there were significant differences in the number of vessel discharges. The St. Marys River AOC had the least, with only 14 discharges, the St. Clair River AOC had almost three times that amount, with 39 discharges, and the Great Lakes (excluding the St. Marys and St. Clair Rivers), had 380 discharges.
2. **Number of Litres Discharged** - The total number of litres actually discharged in the St. Marys River AOC between 2001 and 2011 was 1,941.42 litres and in the St. Clair River AOC was 5,132.72 litres. In comparison with the Great Lakes, a total of 104,885.15 litres have been discharged within the same time period. It is important to note that for the St. Marys River AOC, the total number of litres discharged can be mainly attributed to one incident involving an 'operational discharge' in 2007, when 1892.71 litres of diesel oil were discharged. This means that only 48.71 litres were discharged between 2001 and 2006 and from 2008 to 2011. Aside from the 'operational discharge' event, the St. Marys River AOC has experienced

significantly lower volumes of discharges on an annual basis. For the Great Lakes, in 2004 there were 83,358.1 litres discharged which were mainly attributable to two discharges, one discharge of 31,000 litres of Fuel Oil IFO 180 in Lake Superior and one discharge of 50,000 litres of calcium chlorite in St. Lawrence River/Lake St. Francis.

3. **Trends of Vessel Discharges** - Between 2001 and 2011, there is no clear trend towards a reduction in vessel discharges in either of the AOCs. For the St. Marys River AOC, the number of vessel discharges declined between 2002 and 2005 and then increased in 2006 and 2007. There was a decrease in incidents for 2008, followed by an increase in 2009 and 2010. In 2011, incidents decreased. From the data, it can be concluded that numbers of vessel discharge incidents within the St. Marys River AOC vary from year to year but remain fairly low. In the St. Clair River AOC, vessel discharges dropped in 2002 but increased between 2003 and 2006. Incidents have decreased since 2006, aside from an increase in 2009. For the Great Lakes overall, there is a more visible trend. Between 2001 and 2003, there was a significant reduction in the number of vessel discharges, followed by increased incidents to 2007, aside from a slight decline in 2005. A significant reduction occurred again in 2008, but since that time there has been an increase in incidents.

4. **Vessel Discharges Are The Largest Cause of Discharges** - Out of all pollutant sources that were recorded in the MPIRS database (land based, mystery, oil handling facilities, other, unknown, vessel and not sourced), vessels account for the largest cause of discharges into both Areas of Concern and in the Great Lakes overall, and the majority of litres discharged can be attributed to vessel discharges. Although percentages of pollution sources varied between sites, the patterns were relatively the same between the St. Marys River AOC, the St. Clair River AOC and the Great Lakes; vessel discharges were the highest contributor, followed by mystery. No sources, no information and other categories accounted for much lower percentages. Land based discharges accounted for a higher percentage in the St. Clair River AOC and the Great Lakes, whereas in the St. Marys River AOC, land based discharges only accounted for three percent. A possible reason is that there is a higher concentration of industry along the St. Clair River, including oil handling facilities, and therefore, more land based discharges. It is important to note that land based incidents reported in CCG's MPIRS database are not reflective of the actual number of land-based discharges within the region. The land-based spills in the MPIRS database are usually recorded because there is a potential for impact on U.S. waters (resulting in obligations for CCG under the Canada-US Joint Contingency Plan) or that a spill on water was traced back to a land-based source. The St. Marys River AOC did not have an OHF pollutant source listed. Some of the OHF sites in the St. Clair River AOC and Great Lakes would also account for vessel discharges. Within vessel discharges for the St. Clair River AOC, discharge locations include Shell Dock, IOL Dock, Sun Oil Dock and Imperial Oil. The reasons for these discharges range from operational discharge to unknown/mystery and human negligence.

5. **Suspected Causes of Vessel Discharges** - Suspected causes of vessel discharges differ between the St. Marys River AOC, the St. Clair River AOC and the Great Lakes, in that there are fewer causes from the St. Marys River AOC (7) and the St. Clair River AOC (9) than from the Great Lakes overall (17). This could potentially be linked to the number of discharges. There were 380 vessel discharges in the Great Lakes. An interesting difference is that collision was a suspected cause of discharges in both the St. Clair River AOC and the Great Lakes, but not in the St. Marys River AOC. Also, weather played a role in vessel discharges in the Great Lakes but did not in the St. Clair River AOC or the St. Marys River AOC. St. Marys River AOC was the only location with an incident due to ice. Causes for vessel discharges within the St. Marys River AOC are listed below, from highest to lowest frequency:

    - unknown/mystery
    - negligence/human error, operational discharge, sinking/foundering

- grounding/contact, mechanical failure, ice

The following is a list of suspected causes for vessel discharges within the St. Clair River AOC from highest to lowest frequency:

- mechanical failure
- unknown/mystery
- negligence/human error, refueling/bunkering
- operational discharge, sinking/foundering
- capsizing, grounding/contact
- collisions

6. **Amount and Type of Pollution -** Although the St. Clair River AOC had a higher percentage of estimated discharges and a lower percentage of potential discharges, each AOC had only once incident listed as potential. For the St. Marys River AOC, there were entries left blank, whereas all of the entries were completed for St. Clair River AOC.

7. **Seasonal Differences** - In comparing seasonal differences between vessel discharges, there are differences between all locations. For the St. Marys River AOC, winter was the season when most incidents occurred; however, for both the Great Lakes and the St. Clair River AOC, summer was the season with the highest number of incidents. There were no documented discharges in the St. Marys River AOC caused by natural phenomenon or weather, and only one incident was caused by ice. Perhaps the difference is due to the amount and type of vessel traffic. According to the Canadian Coast Guard, many discharges are actually caused by personal watercraft (PWCs). In 2010, 44 percent of vessel discharges were attributed to PWCs, and this number is consistent over recent years. The high number of incidents in the St. Clair River AOC and the Great Lakes in the summer may reflect an increase of PWC use. In regards to time of day, number of discharges in the morning (am) and afternoon/evening (pm) were much more even for the St. Clair River AOC than for St. Marys River AOC, where discharges occurred dominantly in the afternoon/evening.

8. **Data Characteristics** – There were some data characteristics that complicated the analysis. For some case files, there were information fields left blank, indicating the responsible officer did not complete their entry. Another issue was that although each discharge had a location listed, there was no geographic reference listed to confirm the exact location of the discharge and the locations had to be checked individually. For example, a few discharge locations in the St. Marys River were listed as 'Purdy's' and 'steel mill dock'. All locations had to be checked to ensure they occurred within the actual AOC, for both St. Marys River and the St. Clair River. For the St. Marys River, there was one location that could not be verified, even when the case file was checked, and that location was not used in the analysis. In summary, there are data characteristics that make analysis difficult.

9. **Lack of Past Data** - Prior to 2001, there is no information (in a database) that is available on vessel discharges. SAC data and Coast Guard data are recorded differently. The Coast Guard has many years of data; however, this data is archived and not easily accessible. The files would need to be reviewed individually.

10. **US Data** - Vessel discharges within the U.S. are reported to their own National Response Centre. The Canadian Coast Guard database does include U.S. data, but only if there has been a coordinated response that occurred under the Canada-United States Joint Marine Pollution Contingency Plan. In that instance, to determine if the vessel incident occurred in Canada or the U.S., each incident would need to be looked up individually.

11. **Context of Findings to Estimated Number of Incidents** - In order to provide context to the number of incidents that have occurred in the St. Marys River AOC and the St. Clair River AOC, it may be beneficial to determine how much traffic travels through each area. However, this would be difficult to piece together. Service Canada may have the number of PWCs that are licensed in the Great Lakes, and Transport Canada's Commercial Vessel Registry would include the number of operating vessels (tugs, carriers, etc.) , but it would not include the number of voyages each vessel was making or the number of other ships coming in. In addition, at the St. Marys River Locks, the larger vessels would be recorded but not the total number of smaller or recreational vessels.

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Appendix 1 - St Marys Database

Incident #	Sitrep #	HQ Status #	Discharge Location	Area Name	Occurred DTG	Suspected Cause	Pollutant Type	Pollutant Name	Severity	Litre	Unknown Quantity	Pollutant Sources
C2001-0001			St. Mary's River	St. Mary's River	2001/01/07 12:15	Grounding/Contact	None					Vessel
C2001-0129			St. Mary's river	St. Mary's River	2001/12/06 03:34	Grounding/Contact	Petroleum	Bunker C Fuel Oil 6	Potential	150,000.00	No	Vessel
C2002-0003			Sault Ste. Marie	St. Mary's River	2002/02/06 21:50	Unknown/Mystery	None					Vessel
C2002-0037			Purvis Dock	St. Mary's River	2002/07/17 09:00	Oper. Discharge	Petroleum	Waste - Oil (Marine)	Estimated	13.64	No	Vessel
C2003-0006			St Mary's River	Lake Superior	2003/04/02 08:50	Ice	None					Vessel
C2006-0088			Sault Ste. Marie	St. Mary's River	2006/10/06 09:10	Unknown/Mystery	Other	Soot	Estimated		Yes	Vessel
C2007-0025			Sault Ste. Marie area	St. Mary's River	2007/05/24 06:55	Oper. Discharge	Petroleum	Diesel - Oil	Estimated	1,892.71	No	Vessel
C2007-0080			Sault Ste. Marie	St. Mary's River	2007/09/28 15:45	Negligence/Human Error	Petroleum	Diesel - Oil	Estimated		Yes	Vessel
C2007-0099			south West Sault Ste. Marie	Lake Huron, Georgian Bay & North Channel	2007/11/02 15:00	Unknown/Mystery	Petroleum	Unknown	Estimated		Yes	Vessel
C2009-0023			Sault Ste. Marie	St. Mary's River	2009/06/19 22:00	Negligence/Human Error	Chemical	Flammable Liquid	Estimated	4.55	No	Vessel
C2010-0003	1		Steel mill dock	St. Mary's River	2010/02/16 13:00	Sinking/Foundering	Petroleum	Diesel - Oil	Estimated	1.00	No	Vessel
C2010-0003	2		Steel mill dock	St. Mary's River	2010/02/16 13:00	Sinking/Foundering	Petroleum	Lubricant - Oil	Estimated		Yes	Vessel
C2010-0085			Purdy's	St. Mary's River	2010/12/04 15:25	Unknown/Mystery	Petroleum	Unknown	Estimated	25.00	No	Vessel
C2011-0096			Sault Ste. Marie	St. Mary's River	2011/11/09 15:20	Mechanical Failure	Petroleum	Lubricant - Oil	Estimated	0.02	No	Vessel
C2001-0036			Sault Ste. Marie	Lake Superior		Unknown/Mystery	Petroleum	Diesel - Oil	Estimated	5.00	No	Vessel

NOTE - St. Marys is incorrectly recorded as St. Mary's

Appendix 2 - St Clair Data Base

Incident #	Sitrep #	HQ Status #	Discharge Location	Area Name	Occurred DTG	Suspected Cause	Pollutant Type	Pollutant Name	Severity	Litre	Unknown Quantity	Pollutant Sources
C2001-0006			St. Clair River	St. Clair River & Lake & Detroit River	2001/02/22 16:10	Grounding/Contact	None					Vessel
C2001-0023			Gov. Dock, Sarnia Harbour	St. Clair River & Lake & Detroit River	2001/04/23 15:25	Oper. Discharge	Petroleum	Diesel - Oil	Estimated	45.46	No	Vessel
C2001-0049			Sarnia Bay	St. Clair River & Lake & Detroit River	2001/06/14 13:50	Unknown/ Mystery	Petroleum	Unknown	Estimated		Yes	Vessel
C2001-0094			Wallaceberg (Ontario)	St. Clair River & Lake & Detroit River	2001/08/08 10:00	Oper. Discharge	Other	Sewage	Estimated		Yes	Vessel
C2001-0102*			North Canal Fawn Island	St. Clair River & Lake & Detroit River	2001/08/14 14:10	Capsizing	Petroleum	Diesel - Oil	Estimated		Yes	Vessel
C2001-0102*			North Canal Fawn Island	St. Clair River & Lake & Detroit River	2001/08/14 14:10	Capsizing	Petroleum	Lubricant - Oil	Estimated		Yes	Vessel
C2001-0124			Sarnia	St. Clair River & Lake & Detroit River	2001/11/03 09:00	Grounding/Contact	None					Vessel
C2003-0002			St. Clair River	St. Clair River & Lake & Detroit River	2003/02/10 10:30	Mechanical Failure	Petroleum	Hydraulic Oil	Estimated	164.25	No	Vessel
C2003-0027	1		Sun Oil dock	St. Clair River & Lake & Detroit River	2003/06/20 01:05	Negligence/Human Error	Petroleum	Asphalt Solution	Estimated	2,384.81	No	Vessel
C2003-0040			St Clair River	St. Clair River & Lake & Detroit River	2003/08/05 17:30	Negligence/Human Error	Petroleum	Hydraulic Oil	Estimated	205.00	No	Vessel
C2004-0001			Sarnia	St. Clair River & Lake & Detroit River	2004/01/06 15:45	Mechanical Failure	Petroleum	Diesel - Oil	Estimated	500.00	No	Vessel
C2004-0048			Mitchells Bay area	St. Clair River & Lake & Detroit River	2004/07/23 23:05	Sinking/Foundering	Petroleum	Gasoline	Estimated	40.00	No	Vessel
C2004-0060			SHELL Dock	St. Clair River & Lake & Detroit River	2004/08/07 10:45	Mechanical Failure	Petroleum	Diesel - Oil	Estimated	2.00	No	Vessel
C2004-0083	1		Sarnia Bay marina	St. Clair River & Lake & Detroit River	2004/09/28 20:00	Unknown/Mystery	Petroleum	Lubricant - Oil	Estimated	10.00	No	Vessel

Incident #	Sitrep #	HQ Status #	Discharge Location	Area Name	Occurred DTG	Suspected Cause	Pollutant Type	Pollutant Name	Severity	Litre	Unknown Quantity	Pollutant Sources
C2005-0002			Shell Dock Corunna, St. Clair river	St. Clair River & Lake & Detroit River	2005/03/08 11:40	Oper. Discharge	Petroleum	Hydraulic Oil	Estimated	3.00	No	Vessel
C2005-0041	1		St. Clair River	St. Clair River & Lake & Detroit River	2005/06/21 06:25	Mechanical Failure	Petroleum	Diesel - Oil	Estimated	100.00	No	Vessel
C2005-0090	1		St. Clair River, Corunna, Ontario	St. Clair River & Lake & Detroit River	2005/10/31 16:30	Refueling/Bunkering	Petroleum	Waste - Oil (Marine)	Estimated	965.28	No	Vessel
C2005-0094			IOL Dock	St. Clair River & Lake & Detroit River	2005/11/20 22:40	Unknown/Mystery	Petroleum	Diesel - Oil	Estimated	2.50	No	Vessel
C2005-0096			St Clair River	St. Clair River & Lake & Detroit River	2005/12/20 09:45	Mechanical Failure	Petroleum	Hydraulic Oil	Estimated	2.00	No	Vessel
C2006-0022			Sarnia, Ontario	St. Clair River & Lake & Detroit River	2006/06/07 07:50	Oper. Discharge	Petroleum	Waste - Oil (Marine)	Estimated	0.25	No	Vessel
C2006-0035			St. Clair River	St. Clair River & Lake & Detroit River	2006/06/26 19:00	Unknown/ Mystery	Petroleum	Unknown	Estimated		Yes	Vessel
C2006-0050			outside breakwall at Sarnia Bay marina	St. Clair River & Lake & Detroit River	2006/07/29 04:20	Collision	Petroleum	Gasoline	Estimated	5.00	No	Vessel
C2006-0052			Corunna	St. Clair River & Lake & Detroit River	2006/07/31 09:45	Sinking/ Foundering	Petroleum	Lubricant - Oil	Estimated	1.00	No	Vessel
C2006-0075			Shell Dock, Sarnia	St. Clair River & Lake & Detroit River	2006/09/12 05:25	Refueling/ Bunkering	Petroleum	Unknown	Estimated		Yes	Vessel
C2006-0076			Sarnia waterfront dock, St. Clair River	St. Clair River & Lake & Detroit River	2006/09/13 11:05	Refueling/ Bunkering	Petroleum	Diesel - Oil	Estimated	1.00	No	Vessel
C2006-0102			Sun Oil Dock Sarnia	St. Clair River & Lake & Detroit River	2006/11/26 10:05	Mechanical Failure	Petroleum	Lubricant - Oil	Estimated	5.00	No	Vessel

Incident #	Sitrep #	HQ Status #	Discharge Location	Area Name	Occurred DTG	Suspected Cause	Pollutant Type	Pollutant Name	Severity	Litre	Unknown Quantity	Pollutant Sources
C2007-0012			north slip, Sarnia	St. Clair River & Lake & Detroit River	2007/04/18 22:43	Negligence/Human Error	Petroleum	Waste - Oil (Marine)	Estimated	454.61	No	Vessel
C2007-0078			Shell dock Corruna	St. Clair River & Lake & Detroit River	2007/09/27 09:00	Negligence/Human Error	Petroleum	Diesel - Oil	Estimated	1.00	No	Vessel
C2007-0081			gov't dock, Sarnia	St. Clair River & Lake & Detroit River	2007/10/05 09:05	Mechanical Failure	Petroleum	Diesel - Oil	Estimated	2.00	No	Vessel
C2007-0100			St. Clair River, Lambton Generating Station	St. Clair River & Lake & Detroit River	2007/11/05 08:30	Mechanical Failure	Petroleum	Hydraulic Oil	Estimated	10.00	No	Vessel
C2008-0001	1		St Clair - upper	St. Clair River & Lake & Detroit River	2008/03/13 14:55	Unknown/ Mystery	Petroleum	Unknown	Estimated	5.00	No	Vessel
C2008-0009			Imperial Oil, St. Clair River	St. Clair River & Lake & Detroit River	2008/05/01 21:10	Mechanical Failure	Petroleum	Diesel - Oil	Estimated	0.50	No	Vessel
C2008-0044			Sarnia Yacht Club	Lake Huron, Georgian Bay & North Channel	2008/07/09 10:18	Refueling/ Bunkering	Petroleum	Diesel - Oil	Estimated	90.92	No	Vessel
C2009-0001*			Black River	St. Clair River & Lake & Detroit River	2009/03/09 19:45	Sinking/ Foundering	Petroleum	Diesel - Oil	Potential	1,892.71	No	Vessel
C2009-0001*			Black River	St. Clair River & Lake & Detroit River	2009/03/09 19:45	Sinking/ Foundering	Petroleum	Lubricant - Oil	Estimated		Yes	Vessel
C2009-0059			Sarnia Gov't wharf	St. Clair River & Lake & Detroit River	2009/08/08 17:25	Sinking/ Foundering	Petroleum	Diesel - Oil	Estimated	2.00	No	Vessel
C2009-0067			Sarnia Bay Gov't dock	St. Clair River & Lake & Detroit River	2009/08/26 09:35	Unknown/ Mystery	Petroleum	Waste - Oil (Marine)	Estimated	15.00	No	Vessel
C2010-0012			St Clair River	St. Clair River & Lake & Detroit River	2010/05/06 03:30	Unknown/ Mystery	None					Vessel
C2010-0023			St Clair River	St. Clair River & Lake & Detroit River	2010/05/28 02:15	Negligence/Human Error	Petroleum	Fuel Oil IFO 180	Estimated	15.14	No	Vessel
C2011-0009			St. Clair River	St. Clair River & Lake & Detroit River	2011/05/06 15:40	Refueling/ Bunkering	Petroleum	Diesel - Oil	Estimated	100.00	No	Vessel

Note * - The incidents highlighted in green are the same incident with multiple pollutant types. (C2001-0102 - C2009-0001)

Appendix 3 - Glossary of Terms

Area name	Watercourse where the discharge occurred (some are grouped together)
Blank	Means that the officer on duty did not complete their database entry.
Estimated	Amount of pollutant that is estimated to be in the water
HQ Status #	Headquarters Status Number
Incident #	Incident Number
Litre	Number of litres discharged
Mystery	Unknown pollution source
No Source	Indicates that no potential source was identified or that it wasn't pollution.
Occurred DTG	Occurred Date Time Group
OHF	Oil Handling Facility (oil companies that have bigger terminals)
Pollutant Name	Specific name of pollutant discharged
Pollutant Type	Classification of pollutants, i.e. chemical, petroleum, etc.
Potential	Amount that could be released but is still inside the vessel.
Sitrep #	Site Repetition Number
Discharge Location	Name of the area where the discharge occurred
Suspected Cause	Potential cause of incident
Unknown Quantity	Number of litres discharged