

**Ports and Waterways Safety Assessment  
Workshop Report**

**Sault Ste. Marie, Michigan**

**6 – 7 August 2025**



**Providing Navigation Safety Information  
for America's Waterways Users**

**Released By:  
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## Executive Summary

Coast Guard Sector Northern Great Lakes sponsored a Ports and Waterways Safety Assessment (PAWSA) workshop in Sault Ste. Marie, Michigan, from August 6, 2025, to August 7, 2025. Fifteen participants and observers representing a range of waterway users, stakeholders, and federal, state, and local regulatory and public safety authorities met to collaboratively assess navigational safety on the waterways adjoining the port of Sault Ste. Marie. This report provides a visual depiction of the study area and contains the full list of workshop participants and their associated organizations. The first day of the workshop included discussions about port and waterway attributes and vessel traffic in relation to the sixteen Waterway Risk Factors (WRFs) in the PAWSA Waterway Risk Model, which is described in more detail in this report. During this dialogue, participants identified specific port WRF issues to inform mitigations and facilitate the Focused Quantitative Risk Assessment (FQRA) conducted on the second day of the workshop. At the conclusion of WRF discussions, Risk Characterization for each WRF was established based on participants' survey responses. Risk Characterization assesses the potential consequence, risk trend, risk tolerance, and effectiveness of existing mitigation strategies for a specific WRF. The metrics from the Risk Characterization quantitatively prioritized WRFs to inform discussions during the next phase of the workshop. During the second day, participants conducted a FQRA to approximate adverse economic impacts of prioritized WRF issues and engaged in follow-on discussions to identify and develop risk mitigation strategies. The output of the FQRA is called a Risk Index Number (RIN), a numerical value designed to quantify an issue's adverse monetary impact on a port to guide resource prioritization and decision-making. A value of one RIN is equivalent to one million dollars in economic loss to a port. A higher RIN value is indicative of larger projected annual economic loss due to a specific event type or issue. FQRA results for the average annual frequency for each type of event and its associated RIN Value for the workshop study area is provided in the table below.

Event Name	RIN	Avg Frequency
Collision	10.16	2.69
Traffic Restricted	7.72	14.01
Sinking	6.61	1.60
Infrastructure Failure	5.83	5.17
Allision	4.43	3.93
Grounding	1.08	3.60
Oil Spill	0.22	0.43
HAZMAT Release	0.04	0.08
Fire/Explosion	0.01	0.00
<b>Total</b>	<b>36.11</b>	<b>31.52</b>

FQRA results for the five issues with the highest RIN value and the associated numerical value are presented in Chapter 2.C. The RIN results, recommended mitigation strategies, and participant observations documented in this report will meaningfully facilitate continued collaboration between the Coast Guard and waterway stakeholders to improve safe and efficient navigation within the Marine Transportation System (MTS). The Director of Marine Transportation Systems (CG-5PW), the Coast Guard's Navigation Center (CG NAVCEN), and CG Sector Northern Great Lakes extend their sincere appreciation to participants for their contributions to the Northern Great Lakes PAWSA workshop.

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## CHAPTER 1. GENERAL

### A. Background and Purpose

1. The Director of Marine Transportation Systems (CG-5PW) is responsible for developing and implementing policies and procedures that facilitate commerce, improve safety and efficiency, and maximize the commercial viability of the Marine Transportation System (MTS). In the late 1990s, the Coast Guard convened a national dialogue group (NDG) comprised of maritime stakeholders to identify the needs of waterway users with respect to Vessel Traffic Management (VTM) and Vessel Traffic Service (VTS) systems. A major outcome of the NDG was the development of the Ports and Waterways Safety Assessment (PAWSA) process, which the Coast Guard established as the formal model for facilitating stakeholder discussion to identify VTM improvements and determine candidate VTS waterways. The PAWSA methodology has been modernized several times by the CG NAVCEN and Office of Waterways & Ocean Policy (CG-WWM) since its original inception for purposes of creating a more adaptable tool available to Sector Commanders to engage the maritime community to monitor and improve the health of the MTS within their area of responsibility. The most recent PAWSA process update occurred in 2025.
  
2. The current PAWSA process convenes a select group of waterway users and stakeholders to facilitate a structured workshop agenda to meet pre-identified risk assessment objectives. A successful workshop involves the participation of professional waterway users with local expertise in navigation, waterway conditions, and port safety. Stakeholder involvement is central to ensuring that important environmental, public safety, and economic consequences receive appropriate attention as risk interventions are identified and evaluated. The workshop culminates in a written report that includes proposed risk mitigations developed by participants, which is made publicly available on the CG NAVCEN's website (<https://www.navcen.uscg.gov/ports-and-waterways-safety-assessment-final-reports>.)
  
3. The PAWSA process strives to achieve the following objectives:
  - a. Gather stakeholder input to identify major waterway trends, safety hazards, and potential mitigation strategies.
  
  - b. Bolster public-private partnership and enhance cooperation across the MTS.
  
  - c. Generate a stakeholder driven report that captures data gathered from the PAWSA to prioritize future projects impacting the MTS.

## B. Methodology

1. Waterway Risk Conditions and Waterway Risk Factors. The PAWSA process is designed to convert qualitative experience, observations, and opinions of participants into quantitative assessments. This method uses numerical comparison among sixteen WRFs to build consensus among participants to better inform conversations regarding risk mitigation strategies within an identified study area. The Waterway Risk Condition categories and associated WRFs are listed in Table 1 and further defined in Appendix B.

Navigation	Vessel Quality & Operation	Traffic	Waterway
Winds	Large Commercial Vessels	Volume of Commercial Traffic	Dimensions
Currents and Tides	Small Commercial Vessels	Volume of Recreational Traffic	Obstructions
Visibility Restrictions	Commercial Fishing Vessels	Waterway Use	Visibility Impediments
Bottom Type	Recreational Vessels	Congestion	Configuration

*Table 1 – The four Waterway Risk Condition categories and sixteen WRFs*

2. PAWSA Workshop Structure. Each PAWSA workshop is a two-day facilitated process. The following sections detail the structure and goals for each day of a workshop. A maximum of 30 stakeholders divided into 15 two-person teams may participate.

- a. PAWSA Workshop - Day 1.

- (1) WRF Discussion. During the first day of a PAWSA, participants gain a comprehensive understanding of the workshop study area and are led through individual discussions for each WRF identified in Table 1. The purpose of these discussions is to provide a collaborative forum for stakeholders to generate a list of specific challenges unique to their respective port as related to each WRF. Participants identify and prioritize the top three issues for each WRF to facilitate

the Focused Quantitative Risk Assessment (FQRA) process and inform mitigation discussions during Day 2. These issues are documented in Appendix E.

(2) Risk Characterization Survey. Risk Characterization is a combined qualitative measure of the risk tolerance, risk trend, and effectiveness of existing mitigation strategies for a specific WRF. Surveys are completed at the end of Day 1 by the established two-person teams. The survey asks teams to evaluate the Current Risk Level, Current Risk Trend, and Current Risk Mitigations to characterize the risk associated with each WRF. Participants select from a set of qualitative descriptors that have weighted numeric values assigned to each answer to calculate Risk Characterization. Table 2 provides the available selections for each Risk Characterization question.

	<b>Available Selections</b>
<b>Current Risk Level</b>	We could accept more risk
	Balanced
	Unacceptable
<b>Current Risk Trend</b>	Decreasing
	Steady
	Increasing
<b>Current Risk Mitigations</b>	Acceptable
	Acceptable, but tenuous
	Unacceptable
	<i>*(If unacceptable select all that apply)</i>
	<i>Not Effective</i>
	<i>Too costly</i>
	<i>Slow operations</i>
<i>Causes other issues</i>	

Table 2 – WRF Survey, Risk Characterization categories.

After each team completes the Risk Characterization survey, their assessment of the Waterway Risk Factors is compiled into a Characterization Count. The Characterization Count is crucial because it reflects how each team perceives risk for each WRF. The selected values from the survey generate a color-coded classification that informs the overall WRF Risk Characterization for each team. The results from each team survey are then aggregated together to determine the Characterization Rating for each WRF that represents the average of the stakeholder group. The Characterization Rating informs the prioritization of

WRFs to guide mitigation development discussions and evaluation of WRF issues through the FQRA during Day 2 of the workshop.

(3) Characterization Count Color Designations. Individual team Characterization Count for a WRF is designated as red, orange, or green. For this scale, red represents high risk, orange represents intermediate risk, and green represents low risk. The following subsections outline the thresholds for each color-coded Risk Characterization designation for team Characterization Count.

(a) A WRF is designated with a red Risk Characterization when an individual team determines the WRF Current Risk Level is “unacceptable,” or the Current Risk Mitigations are “unacceptable.”

(b) A WRF is designated with an orange Risk Characterization when an individual team determines the Current Risk Trend is “increasing” and the Current Risk Mitigations are “weak.”

(c) A WRF is designated with a green Risk Characterization when an individual team’s combinations of answers do not meet the threshold for red or orange.

(4) Characterization Rating Color Designations. When the teams complete the Risk Characterization survey, their assessments are combined to calculate and assign the overall Characterization Rating for each WRF, as shown as an example in Table 3.

Category	RF Small	Characterization	Red	Orange	Yellow	Green
Traffic	Rec	Red	10	3		1
Vessel	Rec	Red	11	1		2
Vessel	Small	Red	9	3		2
Traffic	Congestion	Orange	6	6		2
Traffic	Usage	Orange	4	8		2
Navigational	Bottom	Green	1	1		12
Navigational	Tides	Green	2	4		8
Navigational	Vis	Green	1			13
Navigational	Winds	Green		1		13
Traffic	Commercial	Green		5		9
Vessel	Fishing	Green	1			13
Vessel	Large	Green	2	4		8
Waterway	Config	Green	4	2		8
Waterway	Dims	Green	4	2		8
Waterway	Obstr	Green	2	1		11
Waterway	Vis	Green	4	2		8

**Characterization Count - Individual Team**  
**Red.** The Risk Level is Unacceptable OR the Mitigations are Unacceptable.  
**Orange.** The Risk Trend is Increasing AND the Mitigations are Weak.  
**Green.** All others.

**Characterization Rating - Overall**  
**Red.** 60% or more teams rated as Red.  
**Orange.** 50% or more teams rated Orange or higher.  
**Green.** 50% or more teams rated as Green.

Table 3 – Example Risk Characterization survey results.

Characterization Rating for a WRF is designated as red, orange, or green. The color-coded scale for the Characterization Rating is the same as Characterization Count, but the thresholds for attributing the color designation are different. In Table 3, the numbers below each of the header columns labeled red, orange, and green represent the number of individual teams that attribute a certain risk level to that specific WRF. The Characterization Rating for a WRF is determined by plurality. The following subsections outline the thresholds for each color-coded Risk Characterization Rating designation.

- (a) A WRF is designated with a red Characterization Rating if 60% or more of the teams select that specific rating.
- (b) A WRF is designated with an orange Characterization Rating if 50% or more of the teams select that specific rating.
- (c) A WRF is designated a green Characterization Rating if 50% or more of the teams select that specific rating.

(5) At the conclusion of Day 1, PAWSA facilitators present the Risk Characterization survey results and facilitate discussion among participants to determine and validate prioritization of WRFs for use in the FQRA and mitigation development.

b. PAWSA Workshop – Day 2. The second day of the workshop is focused on fulfilling two objectives. The first is to complete the FQRA to calculate the Risk Index Number (RIN) for the highest prioritized WRFs identified during Day 1. The second is to develop mitigations for issues associated with those WRFs. The following subsections provide more detail regarding the process and methodology for executing the FQRA and WRF mitigation development.

1) Focused Quantitative Risk Assessment (FQRA). The FQRA is a process to conduct a normalized comparison between historical data and participant expertise to approximate the yearly adverse economic impact of individual WRFs on a port. The output from this calculation is called the RIN. The value of the RIN represents the annual average potential economic loss in millions of dollars based on the associated WRF. The FQRA uses existing historical data from Coast Guard vessel operational controls, waterways management operational controls, and incident investigation activities documented in the Coast Guard's Maritime Information for Safety and Law Enforcement (MISLE) database. The MISLE database is the centralized repository for capturing and reporting the information required to support Coast Guard marine safety, security, environmental protection,

and law enforcement programs and for ensuring compliance with statutory and regulatory record keeping requirements. The FQRA is a two-pronged method derived from combining the distribution of historical outcomes for a local area and the multiplication product of the likelihood and consequence for a specific scenario. Figure 1 depicts a flow chart that visually represents the process used in the FQRA.

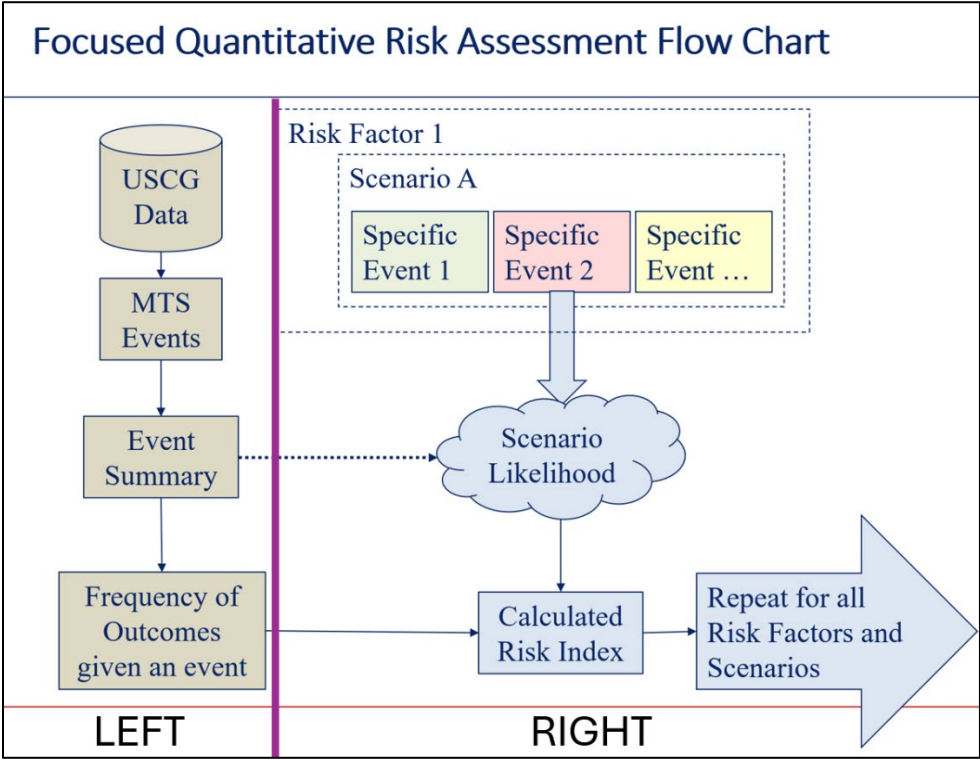


Figure 1 – FQRA Flow Chart.

- (a) During the first step of the FQRA, represented on the left side of Figure 1, Coast Guard MISLE data is synthesized to determine the historical frequency of events and their outcomes. The outputs from this first step guide the calculations used in the second step to convert qualitative stakeholder input into a quantitative metric. In this model, outcomes are unwanted consequences that are classified as safety, environmental, or economic. For more information on the Coast Guard established consequence types, severity categories, and fiscal equivalence, please see Table 1 in section B.1 of Appendix B.
- (b) During the second step of the FQRA, represented on the right side of Figure 1, participants provide qualitative data regarding the types and likelihood of an event occurring due to the issues identified for the top prioritized WRFs on

Day 1 of the workshop. To gather this information, facilitators provide participant teams with a Risk Event Form pre-populated with the prioritized WRFs and the associated top three issues for each factor that were determined during Day 1. The stakeholders use their local anecdotal knowledge of historical events to assign each issue up to three types of events that may occur due to the issue and the predicted frequency of the event. Available types of events on the Risk Event Form include allision, collision, fire/explosion, grounding, oil spill, sinking, or traffic restricted. For definitions of these event types, please see Appendix F. After selecting an event type, participants designate a predicted likelihood of the event, based on local knowledge and experience. Likelihood is the probability of an event based on local historical trends. Frequency thresholds for the likelihood designations used in the FQRA to calculate RIN are described in Table 4. The model standardizes the likelihood with incidents per fifty years to allow for easier understanding and comparison with historical numbers. The corresponding probability of each event is multiplied by the consequence value and normalized to millions of dollars, estimating the RIN to one million dollars in economic loss for an associated event.

<b>Likelihood</b>	<b>Frequency</b>	<b>Probability</b>
Very Unlikely	Once or twice in the history of the port / waterway	0.00055
Rare	Once every 50-100 years	0.006
Occasional	Once or twice every 10-20 years (2-20 every 50 years)	0.22
Probable	Once or twice every year or two (25-75 in 50 years)	1
Frequent	More than twice per year (100 in 50 years)	5

*Table 4 – Likelihood designations, frequency thresholds, and probability values used to calculate RIN.*

- (c) The model uses MISLE data, including vessel operational controls, waterways management operational controls and incident investigation activities, to group historical investigations into consequence categories. This allows normalization of stakeholder inputs using historical data. It is important to note that the data used in this model was selected for its quality and availability and is therefore limited. It does not include reports or data from all types of events reported or investigated by the Coast Guard. The historically synthesized national and local data is used to pre-assign specific values for

stakeholder qualitative input and create the frequency distribution used in the RIN calculation. During the FQRA, both the historical national events and local events are provided to stakeholders for review in handout form, prior to conducting the assessment. Please see Appendix F for the national and local event data provided to stakeholders during the PAWSA.

- (d) For the FQRA, the stakeholders select a frequency for each event, which is then multiplied by the distribution of consequences. This is added together to calculate the RIN.
- a. FQRA Results. Facilitators use the qualitative data collected in the Risk Event Forms to conduct the FQRA. This generates a RIN and estimated annual frequency for each event type, which are sortable by WRF and issue. Table 5 and 6 provide examples of RIN results and data from the FQRA. A large volume of raw data is generated from the FQRA. To keep the report concise, only RIN results for all event types and the five issues with the highest RIN values are presented in this report and can be found in Chapter 2, Section C.3. Additional raw FQRA data, including the RIN results for all evaluated issues and associated event types, is available by request from the Coast Guard Navigation Center.
- (a) The results summarized in Table 5 provide an example of the RIN and annual frequency for each event type as determined through the FQRA. The RIN represents a monetary quantification of identified risks. For the purposes of this assessment, a RIN value of '1' corresponds to a potential financial impact of \$1 million (e.g., 2.5 RIN = \$2.5 million). This quantification provides essential context for assessing the potential financial impact on the maritime system during an event.

Event Name	RIN	Avg Frequency
Collision	10.16	2.69
Traffic Restricted	7.72	14.01
Sinking	6.61	1.60
Infrastructure Failure	5.83	5.17
Allision	4.43	3.93
Grounding	1.08	3.60
Oil Spill	0.22	0.43
HAZMAT Release	0.04	0.08
Fire/Explosion	0.01	0.00
<b>Total</b>	<b>36.11</b>	<b>31.52</b>

Table 5 – Example RIN and annual frequency results by event.

(b) The results summarized in Table 6 provide an example of RIN values broken down by WRF, issue, and event type. Stakeholders can leverage the RIN to compare the costs associated with implementing mitigation measures against the potential cost of an incident and its subsequent cascading effects, thereby optimizing resource allocation for risk reduction. For example, in Table 6, if stakeholders reported that "Groundings throughout the study area can cause the waterway to shut down for an extensive amount of time," and associate a RIN of 1.02, this indicates that the issue is estimated to cost the local maritime system \$1,020,000.

Risk_Factor	RIN	Avg Events
<b>Bottom Type</b>	<b>6.52</b>	<b>8.69</b>
<b>Groundings throughout the study area can cause the waterway to shut down for an extensive amount of time.</b>	<b>1.02</b>	<b>1.76</b>
Allision	0.09	0.08
Collision	0.00	0.00
Grounding	0.05	0.17
HAZMAT Release	0.00	0.00
Infrastructure Failure	0.10	0.08
Oil Spill	0.09	0.17
Sinking	0.00	0.00
Traffic Restricted	0.69	1.25

Table 6 – Example RIN by WRF, issue, and event type.

(c) Normalizing the impact value in dollars provides the ability to update and localize the model as needed or desired. This enables comparison between past and current results of the same port and comparisons between different ports. Port specific results generated during a workshop can be compared to existing Coast Guard data of historical events to highlight local mariner knowledge of events captured through the RIN process. Chapter 2, Section C.3. contains participant issues with the top five RIN values extracted from the FQRA results.

b. Mitigations. Following completion of the FQRA, facilitators present the Risk Characterization survey results and facilitate discussion among participants to determine prioritization of WRF for mitigation development. Stakeholders collaboratively determine the top WRFs to focus dialogue for mitigation development during the remainder of the workshop. The development of mitigation strategies is guided by facilitators using the key issues identified during discussions from Day 1. These issues are used as the starting point for participants to brainstorm mitigations to address concerns and are the same issues used in the FQRA. Facilitators assist participants in developing risk mitigation strategies that are both impactful and feasible, ideally capturing those that are well-developed

proposals with clear delineation of ownership and predicted timelines to enact change. Through this invaluable process, stakeholders make recommendations to improve safe and efficient waterways usage within the port study area, creating a comprehensive list of action items for future implementation or reevaluation.

## CHAPTER 2. NORTHERN GREAT LAKES PAWSA WORKSHOP

### A. PAWSA Study Area

1. The geographical area for the Sector Northern Great Lakes PAWSA included portions of the Saint Mary's River and waters surrounding Saint Joseph Island as depicted as the polygon in Figure 2. The coordinates of the northwest point of this polygon are 46.882°N, 085.028°W and the coordinates of the southwest point are 45.909°N, 083,838°W. Graphic representations of this study area were used to facilitate discussion with participants. Additionally, geographically referenced comments were collected during the workshop and are documented as chartlets in Appendix D.

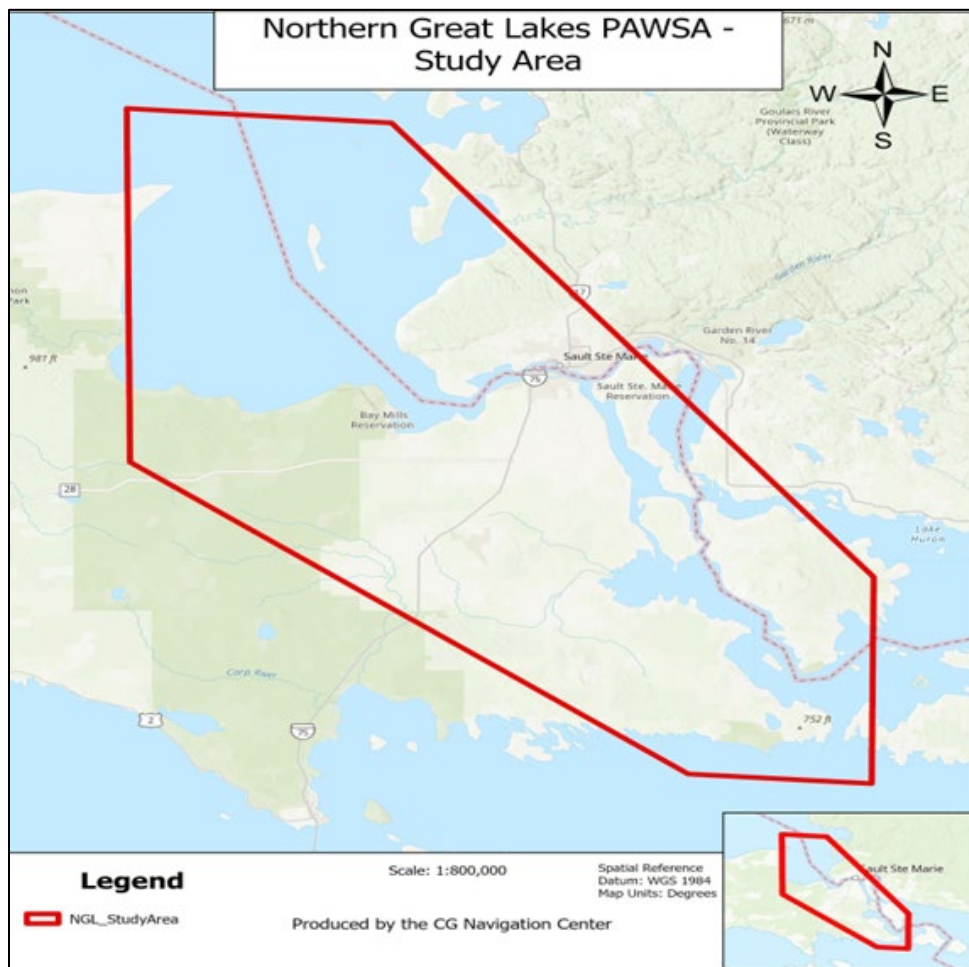


Figure 2 - Northern Great Lakes PAWSA workshop study area.

## B. Participant Validation of WRF Prioritization.

1. The Risk Characterization survey results are depicted below in Figure 3. The results are grouped by Risk Characterization. These results were presented to participants to validate the prioritization order of WRFs to facilitate the FQRA and for mitigation strategy development.
2. The Risk Characterization results indicated a generally acceptable level of existing risk in the Northern Great Lakes PAWSA study area. Most WRFs were categorized as green. However, the threshold for orange and red characterizations were met for several WRFs. Navigational Bottom was identified as the most concerning WRF. Based on participant dialogue, this is likely because the bottom type in high traffic areas is primarily comprised of rock. There was notable stakeholder discussion regarding a two-week prolonged incident involving a hard aground vessel that caused significant disruption to the Sault Locks shipping channel and interrupted maritime commerce. Overall, results indicate the Northern Great Lakes PAWSA study area has a favorable risk characterization. This appears to stem from the strong working relationships and proactive communication channels established among stakeholders within the port, which prevent emerging issues from escalating into significant safety concerns.

WRC	WRF	Characterization	Red	Orange	Yellow	Green
Navigational	Bottom	Red	7	1		3
Traffic	Congestion	Orange	3	4		4
Vessel	Rec	Orange	6	2		3
Vessel	Small	Orange	5	2		4
Navigational	Tides	Green	2	2		7
Navigational	Vis	Green				11
Navigational	Winds	Green	3			8
Traffic	Commercial	Green	1	2		8
Traffic	Rec	Green	1	2		8
Traffic	Usage	Green	1	2		8
Vessel	Fishing	Green	3	1		7
Vessel	Large	Green	1	4		6
Waterway	Config	Green	1	1		9
Waterway	Dims	Green	3	1		7
Waterway	Obstr	Green	2			9
Waterway	Vis	Green	1	2		8

**Characterization Count - Individual Team**  
**Red.** The Risk Level is Unacceptable OR the Mitigations are Unacceptable.  
**Orange.** The Risk Trend is Increasing AND the Mitigations are Weak.  
**Green.** All others.

**Characterization Rating - Overall**  
**Red.** 60% or more teams rated as Red.  
**Orange.** 50% or more teams rated Orange or higher.  
**Green.** 50% or more teams rated as Green.

Figure 3 - Risk Characterization survey results for all WRFs.

3. Following subjective evaluation, participants selected Bottom Type, Small Commercial Vessels, Recreational Vessels, and Congestion as the most significant WRFs that contributed to potential incidents in the Northern Great Lakes PAWSA study area. A consensus vote amongst participants determined the ranking of WRFs according to their level of concern. Table 7 presents WRFs in descending priority order from high to low.

<b>Waterway Risk Condition</b>	<b>WRF</b>
Navigation	Bottom Type
Vessel	Small Commercial Vessels
Vessel	Recreational Vessels
Traffic	Congestion

*Table 7 - Validated and prioritized WRFs listed from high to low.*

### C. Risk Mitigation Strategies

1. RIN Results by Frequency. As detailed in Table 7, participants validated and prioritized WRFs within the Northern Great Lakes PAWSA study area. Based on this prioritization, stakeholders completed Risk Event Forms (as described in Chapter 1.B.2.b.(1)(b)) for the top four WRFs. Each form captured the top three validated issues that stakeholders deemed most pertinent for four highest prioritized WRFs. Appendix E contains a full list of these participant-presented and validated issues. The issues presented in this appendix are edited for clarity and syntax.
2. The average annual frequency for each type of event with its associated RIN value listed from highest to lowest in Table 8.

Event Name	RIN	Avg Frequency
Collision	10.16	2.69
Traffic Restricted	7.72	14.01
Sinking	6.61	1.60
Infrastructure Failure	5.83	5.17
Allision	4.43	3.93
Grounding	1.08	3.60
Oil Spill	0.22	0.43
HAZMAT Release	0.04	0.08
Fire/Explosion	0.01	0.00
<b>Total</b>	<b>36.11</b>	<b>31.52</b>

*Table 8- RIN by event type*

3. RIN Results by Issue. The five issues with the highest RIN values as identified from stakeholder surveys completed during Day 2 of the PAWSA workshop are ordered from highest to lowest in Table 9. The verbiage for the issues in Table 9 are unaltered and written as agreed upon by the participants during the FQRA. Additional data and information for the Northern Great Lakes RIN results is available by request from the Coast Guard Navigation Center.

<b>Issue #1</b>	Mariner's proficiency and understanding of Rules of the Road are insufficient, stemming from a lack of training and understanding.			
<b>Event Type</b>	<b>RIN</b>	<b>Event Type</b>	<b>RIN</b>	<b>Total RIN</b>
Allision	1.41	Infrastructure Failure	0	<b>10.89</b>
Collision	4.73	Oil Spill	0	
Fire/Explosion	0	Sinking	3.80	
Grounding	0.45	Traffic Restricted	0.51	
<b>Issue #2</b>	There is a concerning lack of awareness surrounding freighters, specifically regarding their limited maneuverability and the potential hazards for their wake.			
<b>Event Type</b>	<b>RIN</b>	<b>Event Type</b>	<b>RIN</b>	<b>Total RIN</b>
Allision	0.28	Infrastructure Failure	0.47	<b>4.07</b>
Collision	0.96	Oil Spill	0	
Fire/Explosion	0	Sinking	2.08	
Grounding	0	Traffic Restricted	0.28	
<b>Issue #3</b>	Commuter ferries are aging and require either significant maintenance or full replacement to ensure continued reliability and safety.			
<b>Event Type</b>	<b>RIN</b>	<b>Event Type</b>	<b>RIN</b>	<b>Total RIN</b>
Allision	0.51	Infrastructure Failure	0.56	<b>3.69</b>
Collision	1.58	Oil Spill	0.04	
Fire/Explosion	0.01	Sinking	0.01	
Grounding	0	Traffic Restricted	0.51	
<b>Issue #4</b>	Rock Cut poses a significant hazard to vessels due to the rocky bottom and shoreline. Runs from Neebish to Sugar Island.			
<b>Event Type</b>	<b>RIN</b>	<b>Event Type</b>	<b>RIN</b>	<b>Total RIN</b>
Allision	0.57	Infrastructure Failure	0.47	<b>3.68</b>
Collision	1.58	Oil Spill	0.04	
Fire/Explosion	0	Sinking	0	
Grounding	0.33	Traffic Restricted	0.69	
<b>Issue #5</b>	Enforcing Rules of the Road remains a persistent challenge due to limited staffing and significant funding issues within the DNR and the local Sheriff's Office.			
<b>Event Type</b>	<b>RIN</b>	<b>Event Type</b>	<b>RIN</b>	<b>Total RIN</b>
Allision	0.66	Infrastructure Failure	1.13	<b>3.22</b>
Collision	0.64	Oil Spill	0	
Fire/Explosion	0	Sinking	0.70	
Grounding	0	Traffic Restricted	0.09	

Table 9 – Highest five RIN values ranked by issue in descending order.

4. Summary of RIN Results. The data indicates that collisions, which have the highest RIN, occur most frequently on average. This finding is unsurprising, as the FQRA identified collisions as the most prevalent event type, driven by waterway and port-specific factors that contribute to the elevated RIN value. These events occur on average 31.52 times per year in the port of Sault Ste. Marie. The total annual RIN cost associated with these events is estimated at \$36.11 million

## **D. Risk Mitigation Strategies**

1. The validated list of WRFs was used to prioritize discussion and development of risk mitigation strategies. Facilitators directed participants to capture potential mitigation strategies on sticky notes, which were then consolidated and grouped to identify major themes. From this bank of action items, participants were encouraged to generate mitigation strategies for Bottom Type, Small Commercial Vessels, and Traffic Congestion. Due to time constraints, participants did not generate mitigations for throughout this subsection to provide support of documented developed mitigation strategies.
2. Participant comments are listed in Appendix C of this report and are referenced throughout this subsection to provide support of documented developed mitigation strategies.
3. Appendix E of this report contains a full list of the issues that participants presented and validated, informing the development of mitigation strategies discussed below. The issues presented in Appendix E are edited for clarity and syntax.

### WRF – Bottom Type.

1. Rock Cut, which extends from Neebish Island to Sugar Island, poses a navigational hazard to vessels due to its rocky bottom and shoreline. Participants recommended the following mitigation strategies:
  - a. Petition the St. Mary's River Harbor Safety Committee (HSC) to collaborate with the commercial shipping industry to establish and enforce standards for under-keel clearance and speed, considering vessel squat effect.
  - b. Pursue implementation of a federal regulation requiring commercial vessel operators to establish mandatory and enforceable speed restrictions and minimum under-keel clearances for their fleets.
  - c. Task the St. Mary's River HSC to use the finalized PAWSA report to raise awareness and demonstrate the need for a U.S. Army Corps of Engineers (USACE) feasibility study for purposes of assessing the potential benefits, impacts, and technical requirements for deepening Rock Cut channel.

- d. Increase USACE survey frequency along St. Mary's River channel, particularly in the area of Rock Cut, and reduce the survey grid sizes to increase hydrographic data resolution.
  - e. Investigate and implement the use of USCG buoy monitoring solutions to provide real-time depth data.
  - f. Through USACE, in coordination with the National Oceanic and Atmospheric Administration (NOAA), develop a framework mirroring that of the St. Lawrence Seaway Management Corporation in Canada and the Great Lakes St. Lawrence Seaway Development Corporation to facilitate the integration of USACE data products received from NOAA into real-time navigational bottom readings displayed on vessel navigational equipment for the Rock Cut channel.
2. While the waterway from Winter Point to Johnson Point at Hardwood Point Junction appears wide, the navigable channel's project depth varies significantly resulting in partial dredging on-behalf of USACE. A uniform depth throughout the entire channel is needed to enable safe navigation:
- a. Petition collaboration between the St. Mary's River HSC, Coast Guard, Lake Carriers' Association, Environmental Protection Agency, and other stakeholders to advocate for a USACE conducted feasibility study for to establish federal interest and assess the engineering, economic, and environmental viability of deepening the Middle Neebish Channel.
  - b. Engage with the Office of Navigation Systems (CG-NAV) which is part of the Marine Transportation Systems directorate (CG-5PW), to initiate assessment of potential changes to the Aids to Navigation (ATON) constellation to reposition and align buoys with the deepest part of the Middle Neebish Channel. Ensure coordination and stakeholder input from the International Joint Commission (IJC), the Lake Carriers' Association, and the Western Great Lakes Pilots Association prior to implementing any changes.

## WRF – Small Commercial Vessels.

1. Due to vessel capability restrictions, some vessels, including smaller tugs and ferries, cannot operate during ice conditions. Participants recommended the following mitigation strategies:
  - a. Collaborate with VTS and the COTP to establish minimum capability requirements for vessels requesting transit through the locks during ice conditions. The VTS should continue to collect and analyze vessel performance data to inform risk assessments and operational decisions.
  - b. Increase small commercial vessel awareness of float and brash ice hazards on the St. Mary’s River. Petition the Coast Guard to issue seasonal Notices to Mariners (NTM) from November to May, outlining these dangers. Supplement seasonal NTMs with targeted outreach using social media outlets (e.g., Instagram, Facebook).
2. Ferry crews are mandated a minimum of a five-hours rest after a 12-hour shift by the Eastern Upper Peninsula Transportation Authority (EUPTA) workforce regulations. During the rest period, crews are unavailable for recall. As a result, a situation may arise where no ferry captains are available to provide first responder or patient transportation to and from the local inhabited islands, Sugar and Neebish, in the event of an emergency. Participants recommended the following mitigation strategies:
  - a. Employ a dedicated ferry captain by EUPTA to remain available for immediate deployment to support emergency response to the local islands. Saint Mary’s River HSC is currently in collaboration with EUPTA to address staffing and crew rest challenges.
  - b. Conduct a public service announcement campaign to remind island residents to direct emergency calls to Coast Guard Station Sault Ste. Marie or the Sheriff’s Office and not through commercial ferry operators to ensure a timely and effective response in the event of an emergency.
  - c. Consider implementing an emergency response exception to the fatigue limits outlined in 46 CFR 15.710 for ferry operators.

WRF – Traffic Congestion.

1. Vessel traffic fluctuations are influenced by seasonal operational demands. Unscheduled lock closures necessitated by ice accumulation and essential flushing procedures at the Soo Locks also contribute to these disruptions. The previous referenced factors elevate traffic congestion and heighten the risk of maritime accidents. Participants recommended the following mitigation strategy:
  - a. Engage with local law enforcement to formalize and enforce temporary periods of one-way traffic restriction at Mission Point.

### Appendix A. Workshop Participants

<b>Participant</b>	<b>Organization</b>
1. Greg Postma	Chippewa County Emergency Management
2. Paul Christensen	Interlake Steamship Company
3. Brent Belanger	Ojibway Marine Services
4. Mark Eitrem	Saint Mary's Riverkeeper
5. Tom Farnquist	Saint Mary's Riverkeeper
6. Tim Moher	Saint Mary's Riverkeeper
7. Les Townsend	Saint Mary's Riverkeeper
8. Robin Bouschor	Sault Ste. Marie Tribe of Chippewa Indians
9. Abraham McLarahmore	United States Army Corps of Engineers
10. Douglas Price	United States Customs and Border Protection
11. Lauren Hatfield	United States Coast Guard
12. Justin Bravatto	United States Coast Guard
13. Brian Hawkins	United States Coast Guard
14. Jason Radcliffe	United States Coast Guard
15. Tim Haak	Western Great Lakes Pilots Association

## Appendix B. Waterway Risk Model Terms, Definitions, and Focused Quantitative Risk Assessment (FQRA)

**A. Waterway Risk Conditions and Waterway Risk Factor (WRF) Definitions.** The Ports and Waterway Safety Assessment (PAWSA) Waterway Risk Model utilizes sixteen WRFs categorized under four Waterway Risk Conditions. Definitions for each Waterway Risk Condition and their associated WRF are defined in this section.

1. Waterway Risk Condition - Navigation. The environmental conditions that affect vessel navigation, such as wind, currents, and weather.
  - a. WRF - Winds. The difficulty in maneuvering vessels resulting from increased and unpredictable winds, particularly if the wind is from abeam.
  - b. WRF - Tides and Currents. The difficulty in maneuvering vessels caused by water movement flow and speed, often affected by seasonal variations and sustained winds. Tide rips and whirlpools can be created by strong currents and affect the maneuverability of smaller vessels. The frequency of occurrence and the location of the strongest currents in the waterway are critical considerations (e.g., if current speed can exceed vessel speed, timing is critical when transiting the area).
  - c. WRF - Visibility Restrictions. The natural conditions that may prevent a mariner from seeing other vessels, aids to navigation, or landmarks, such as fog, severe rain squalls, etc.
  - d. WRF - Bottom Type. The material on the waterway bottom or just outside the channel, such as hard rock, mud, coral, etc.
2. Waterway Risk Condition - Vessel Quality and Operations. The quality of vessels and their crews that operate on a waterway. Each waterway has what are considered high risk vessels, such as old vessels, vessels with poor safety records, vessels registered in certain foreign countries, vessels belonging to financially strapped owners, vessels with inexperienced crews and operators, etc. When assessing risk, the following items should be considered (as appropriate) for each risk factor: maintenance, age, flag, class society, ownership, inspection record, casualty history, language barriers, fatigue related issues, and local area knowledge.
  - a. WRF - Large Commercial Vessels. The quality of the large commercial vessel itself and the proficiency and quality of the crew. Large vessels are those ocean-going vessels, often in international trade, that usually are constrained by their draft to use dredged channels where such channels exist. Large vessels include such things as oil tankers, container ships, break bulk cargo ships, and cruise liners.
  - b. WRF - Small Commercial Vessels. The quality of the small commercial vessel itself and the proficiency and quality of the crew. Small vessels include

all other commercial craft EXCEPT commercial fishing vessels. Examples include tugs and towboats, offshore supply vessels, charter fishing boats, and small passenger vessels (inspected under 46 CFR Subchapters T and K), such as dinner cruises and ferries.

- c. WRF - Commercial Fishing Vessels. The quality of the commercial fishing vessel itself and the proficiency and quality of the crew. These vessels are included because they are not required to undergo annual vessel inspections nor are the crewmembers required to hold USCG licenses; therefore, there may be a greater potential for increased incidents involving commercial fishing vessels.
  - d. WRF - Recreational Vessels. The quality of the recreational vessel itself and the proficiency and operating knowledge of the individuals who operate them. Recreational vessels include all boats used for noncommercial purposes (e.g., pleasure craft or craft used by indigenous people for transportation or subsistence fishing). They can be powered by an engine, the wind, or human exertion. Examples include yachts, personal watercraft (a.k.a., jet skis), and kayaks.
3. Waterway Risk Condition - Traffic Conditions. The number of vessels that use a waterway and their interactions.
- a. WRF - Volume of Commercial Traffic. The amount of commercial vessel traffic using the waterway (i.e., the more vessels there are on the water, the more likely that there will be a marine casualty). Deep draft and shallow draft commercial vessels as well as commercial fishing vessels are included in this risk factor. Shoreside infrastructure is also addressed in this risk factor (i.e., can it handle the volume of commercial traffic within the waterway).
  - b. WRF - Volume of Recreational Traffic. The amount of non-commercial vessel traffic using the waterway. The volume may vary depending on the time of day, the day of the week, the season of the year, or during a major marine event.
  - c. WRF - Waterway Use. The interaction between vessels or boats of different sizes using the same waterway and their maneuvering characteristics. Conflicts occur as risk increases with each type of vessel's maneuvering characteristics and actions that are often different and unpredictable (e.g. commercial mariners and recreational mariners using deep draft vessels and shallow draft vessels within the same waterway).
  - d. WRF - Congestion. The ability of the waterway to handle the volume and density of traffic. Risk increases when a large number of vessels uses a small geographic area for an extended period of time. Risk also increases substantially when you get a larger than normal number of vessels together for a short time (e.g., fishing tournament or short season commercial fishery).

4. Waterway Risk Condition - Waterway Conditions. The physical properties of the waterway that affect vessel maneuverability.
  - a. WRF - Visibility Impediments. The man-made objects (e.g., moored ships, condominiums, background lighting, etc.) or geographic formations (e.g., headlands, islands, etc.) that prevent a mariner from seeing aids to navigation or other vessels.
  - b. WRF - Dimensions. The room available for two vessels to pass each other within the waterway.
  - c. WRF - Obstructions. Floating objects in the water that impede safe navigation and could damage a vessel, such as ice, debris, fishing nets, etc. Fixed objects such as wrecks, pipelines, overhead wires, derelict piers, fixed bridges, and permanently moored vessels.
  - d. WRF - Configuration. The arrangement of a waterway, including elements such as waterway bends, multiple and converging channels, and perpendicular traffic flow.

**B. Focused Quantitative Risk Assessment (FQRA) Background.** As described in Chapter 1 Section B.2.b.(1), the Risk Index Number (RIN) is calculated for participant prioritized WRF issues using the FQRA process. Details are provided in the following sections regarding the consequence component of the FQRA.

1. Consequence. Table 1, as referenced in Chapter 1 Section B.2.b.(1).(a), displays the Coast Guard established consequence types, severity categories, and descriptions. Each consequence category is quantified in dollar value to allow comparison between consequence types. The fiscal equivalence for each consequence category provides economic weight for the RIN.

		Severity Categories				
		Cat I	Cat II	Cat III	Cat IV	Cat V
<b>Consequence Type</b>	<b>Safety</b>	Injuries up to permanent disability.	One to 5 Deaths	6 to 15 Deaths	16 to 50 Deaths	51 or more Deaths
	<b>Environmental (Oil)</b>	Minor releases (of less than 100 gal)	Medium releases (of 100 to 5000 gal) OR local marine resource stock collapse for 1 to 5 years.	Disruption of the ecosystem (of 5000 to 50k gal) OR local marine resource stock collapse for 5 to 10 years.	Serious disruption of the ecosystem (of 50k to 500k gal) OR local marine resource stock collapse for 10-50 years.	Catastrophic disruption of the ecosystem (of more than 500k gal) OR local marine resource stock collapse for more than 50 years.
	<b>Economic</b>	Vessel damage, structure damage, economic activity, or port disruptions that incur less than \$50k economic losses in total.	Between \$50k and \$250k economic losses in total.	Between \$250k and \$5M economic losses in total.	Between \$5M and \$250M of economic losses in total.	More than \$250M of economic losses in total.

Table 1 – Severity categories by consequence type.

- a. The following subsections explain how monetary values for different consequences are derived for each consequence type.
  - (1) *Safety*. These estimates use the Department of Transportation value of statistical life. The guidance is intended for analyses assessing the benefits of preventing fatalities. Reflecting 2025 inflation, a single death is equivalent to \$12.5 million.
  - (2) *Environmental*. These estimates use the Environmental Protection Agency’s Basic Oil Spill Cost Estimation Model (BOSCM). This is an adaptable model that allows for customizable inputs regarding spill recovery methods and efficiency, oil type, cultural factors, and impacted ecosystem descriptors to predict cost of an oil spill. Each of these inputs modifies the cost calculation in a different way. Once customizations for the model are set, three functions are combined to get total cost. These consist of direct response costs, socioeconomic and secondary costs, and environmental damage costs. Due to the extensive prep work required to use BOSCM, the FQRA does not customize the model for individual

ports. Instead, very conservative factors are selected with a bias towards over-estimating the cost and accounting for inflation adjusted to 2025. The primary limitation of this method is that not all environmental damage is caused by oil. An analysis of environmental damage costs from all maritime incident sources is difficult to estimate. Oil spill costs are the proxy that was selected until better models are found.

- (3) *Economic*. This is the estimated dollar value for economic loss. It includes losses from vessel damage, facility damage, and economic activity.

## Appendix C. Participant Comments

### A. Background.

1. This appendix documents participant observations and recommendations expressed during the workshop with respect to specific issues of concern within the study area. Discussion during the first day of the workshop was recorded and subsequently transcribed using professional services. Comments were compiled and categorized by most applicable Waterway Risk Condition and WRF.

### B. Waterway Risk Condition – Navigation.

#### 1. WRF – Winds.

- a. The Sugar Island Ferry, operated by the Eastern Upper Peninsula Transportation Authority (EUPTA), experiences seasonal disruptions due to ice accumulation in its docking area. Prevailing northerly winds drive brash ice southward, which leads to build-up in the docking area located east of downtown Sault Ste. Marie near Clyde's Drive-In restaurant. This ice accumulation results in ferry delays and service cancellations. The ferry normally operates on a 30-minute schedule.
- b. High winds cause vessels to require tugboat assistance to safely navigate the Soo Locks, especially when prevailing winds are directionally perpendicular. Tug escorts are not compulsory, and are considered essential during high-wind conditions.
- c. The lower portion of St. Mary's River lacks real-time wind sensors to provide mariners with current meteorological conditions.

#### 2. WRF – Currents and Tides.

- a. The absence of a water level gauge located at the southern mouth of West Neebish Channel limits situational awareness of water levels for northbound vessels. NOAA websites, specifically [Water Levels: NOAA Great Lakes Environmental Research Laboratory](#) and [Station Selection - NOAA Tides & Currents](#) provide water level data with a delay of 6-12 minutes. This is insufficient for mariners to make navigational decisions in real-time.
- b. Subsurface currents, which diverge significantly from surface observations, complicate oil spill trajectory prediction and containment efforts.

2. WRF – Visibility Restrictions.

- a. National Weather Service fog forecasts, which only provide probabilities, are inadequate for precise navigation. Visibility can vary significantly over short distances; for example, the lower St. Mary's River might be clear while dense fog obscures the upper river. It is common for vessels within one mile of one other to experience drastically different visibility conditions. This phenomenon mainly occurs when temperatures quickly change, such as in the early fall and later spring.
- b. The existing network of four live cameras, maintained by USACE Detroit District, monitors 77 miles of navigable waterway but provides inadequate and uneven coverage due to frequent malfunctions. Portions of the waterway are unmonitored by the camera network which limits the network's usefulness because weather conditions vary greatly between camera locations.
- c. There is insufficient weather observation coverage on Neebish Island due to the limited number of real-time weather sensors. A denser network of sensors is needed to provide a more accurate and granular image of weather conditions across the region.

3. WRF – Bottom Type.

- a. Rock Cut, which extends from Neebish Island to Sugar Island, presents a navigational hazard to vessels due to its rocky bottom and shoreline.
- b. While the waterway from Winter Point to Johnson Point at Hardwood Point Junction appears wide, the navigable channel's dredged depth varies significantly resulting in partial dredging on-behalf of USACE. A uniform depth throughout the entire channel is desired.
- c. A grounding incident that occurred in early 2025 disrupted the Great Lakes Waterway shipping channel and impacted Coast Guard activities and commercial shipping for a two-week period. Groundings are more prevalent in the downriver portion of the channel due to its narrow width and rocky riverbed.
- d. Standard protocol is to dispose of dredged material outside of the channel; the inadvertent repositioning of large debris during dredging operations has altered navigable depths in certain areas. These localized variations can present navigational challenges and increase the risk of grounding for vessels operating both within and adjacent to the channel.
- e. Channel dredging in West Neebish Channel, near Rock Cut, has created rock piles that pose navigational hazards to recreational boaters. In some areas, these submerged rock piles reside inches below the surface. There are instances where waterway users unfamiliar with the area have struck submerged rock piles.

C. Waterway Risk Condition – Vessel Quality and Operation.

1. WRF- Large Commercial Vessels.

- a. Large vessels have experienced power failures while transiting in the study area. Limited maneuvering space within Sault Ste. Marie's narrow channels on the St. Mary's River drastically increases the consequences of propulsion casualties and increases risk of groundings or collisions.
- b. Vessel traffic bypasses the St. Mary's River rapids using either the Soo Locks or the Sault Ste. Marie Canal. These canals are critical for shipping between Lake Superior and Lake Huron and were built around the hazardous rapids that previously hindered navigation.
- c. Language barriers among foreign vessel crews and recreational boaters presents a significant communication challenge increasing risk while navigating the waterway.
- d. Equipment standardization and data synchronization are two key principles to enhancing maritime safety. It is critical that charts onboard commercial vessels are kept updated. A vessel's chart is only reliable if it reflects the latest weekly Local Notice to Mariners (LNM) and any subsequent Broadcast Notices to Mariners (BNM).
- e. A portion of the commercial fleet operating in the study area consists of aging vessels, raising concerns about their structural integrity and susceptibility to mechanical failure. These risks are compounded by inconsistent Coast Guard inspection protocols, which impede uniform oversight of the fleet's overall condition.
- f. Pilots from both U.S. or Canada are required onboard all foreign-flagged vessels transiting from Montreal to Duluth. Navigating the shared waterways between the U.S. and Canada, particularly the Great Lakes-St. Lawrence Seaway system, involves a complex web of regulations for marine pilots. While the two countries cooperate closely, significant inconsistencies exist in their rules and operational structures. These differences primarily revolve around governance, rate-setting, and operational procedures.

2. WRF – Small Commercial Vessels.

- a. Smaller tugs and ferries, including those designated for emergency response, are not equipped for operation in icy conditions. These vessels lack ice-breaking capabilities necessary to operate safely in these environments.

- b. The Sugar Island Ferry is privately managed by EUPTA and serves commuters between Sault Ste. Marie and Sugar Island. The ferry system is operationally inefficient due to aging ferry vessels and supporting infrastructure requires modernization.
  - c. Recent allocation of a new ferry to Sugar Island, despite possessing low commuter traffic, has raised questions about resource prioritization in relation to community benefit.
3. WRF- Commercial Fishing Vessels.
- a. Placement of fishing nets in designated shipping channels create navigational hazards. Deployment location of nets in the vicinity of Whitefish Point is dictated by water temperature variations and results in scattered net positioning. These nets are challenging to detect by other waterway users, even under favorable weather conditions.
  - b. Derelict fishing gear, referred to as "ghost nets," is an escalating environmental and navigational issue. Some nets remain submerged for years, ensnare marine life, and pose navigational risks to vessel traffic.
4. WRF-Recreational Vessels.
- a. Recreational vessel operators demonstrate poor proficiency and understanding of Navigation Rules.
  - b. Recreational vessel operators lack awareness of the limited maneuverability of large commercial vessels and the potential hazards caused by their wakes.
  - c. Budget cuts have forced the Michigan Department of Natural Resources (DNR) and the Chippewa County Sheriff's Office to limit routine patrols so there are an adequate number of personnel available to respond in the event of an emergency.
  - d. Differing regulations along the U.S. and Canadian maritime border create confusion for boaters traversing the boundary. There are questions regarding jurisdiction regarding which authorities are responsible for responding to incidents involving U.S. vessels in Canadian waters and vice versa.

D. Waterway Risk Condition – Traffic.

1. WRF - Volume of Commercial Traffic.

- a. Vessels obtain their position in the queue approximately three miles prior to reaching the locks. Current lock infrastructure is insufficient to handle the increasing volume of vessel traffic. A lock malfunction or closure risks significant congestion and widespread disruption to waterway operations.
- b. There is a lack of sufficient shoreside maintenance facilities and pier space available to service the commercial fleet.
- c. Commercial vessels operate at varying speeds based on their design and operational requirements. Some vessels struggle to comply with posted speed restrictions. For example, the lowest gear of clutch ahead may only allow the vessel to reach a minimum of 6 kts.
- d. Increased volume of commercial vessel traffic places strain on existing lock infrastructure and accelerates wear on critical equipment. Resulting in more frequent vessel traffic interruptions due to unplanned gate repair and maintenance.
- e. The Soo Lock's role as the sole passage point for commercial traffic creates significant waterway vulnerability. Prior lock closures resulted in a three-day vessel backlogs that exceeded available pier capacity.

2. WRF - Volume of Recreational Traffic.

- a. The Trans Superior River Swim, a long-distance event from Sault Ste. Marie, MI to Duluth, MN, and sailboat races are examples of authorized marine events within the waterway. Broadcast Notices to Mariners (BNMs) typically notify mariners in advance of these events.
- b. Waterway traffic density has increased since the COVID-19 pandemic. This increase is partially attributed to increased sales of waterfront properties and recreational vessel activity. This trend is most pronounced during the summer.
- c. Unpermitted marine events, notably a fishing tournament, occurred on the waterway without authorization.

3. WRF – Waterway Use.

- a. Dredging and buoy tender operations are generally well-coordinated and minimally interfere with large vessel traffic. Advance briefings ensure safe and efficient deconfliction within the waterway.
- b. The increasing presence of autonomous vessels raises operational and regulatory

concerns. While Lake Superior State University operates autonomous vessels within the waterway, the wider availability of these technologies may lead to experimentation by less experienced operators, and potentially create safety hazards near freighters and fishing vessels.

- c. Cruise ship transits through the Soo Locks to Lake Superior, followed by subsequent return transits, result in disruptions to freighter traffic. The expanding cruise ship fleet in the Great Lakes region demands proactive management to mitigate commercial delays and resultant increased congestion.

#### 4. WRF – Congestion.

- a. Unexpected lock and waterway closures disrupt traffic schedules. Limited pier space, scarce navigable waters on each side of the locks, limited maneuverability of large ships, and unplanned lock closures collectively contribute to congestion.
- b. Unsafe following distances between vessels are caused by a combination of waterway congestion and vessel operator handling practices. Navigation of vessels in close quarters situations reduces the effectiveness of emergency stopping procedures and increases risk of collision.
- c. The limited channel width at Mission Point requires a temporary one-way traffic area. Vessels coordinate passing arrangements to avoid encountering opposing traffic.
- d. Economic trends drive commercial and recreational vessel traffic volume. Current economic indicators suggest a downturn in waterway activity and corresponding decrease in vessel transits.

#### E. Waterway Risk Condition – Waterway.

##### 1. WRF – Dimensions.

- a. The Soo Lock's narrow channel limits contingent options for large vessels in the event of emergencies or unscheduled lock closures.
- b. The configuration of the East and West Neebish Channels limit the ability of tugs and other assist vessels to respond effectively to potential groundings of large vessels. There are limited points in these channels for vessels to maneuver due to the narrowness of the waterway and extremely tight quarters and potential for groundings to occur.

## 2. WRF – Obstructions

- a. Ice accumulation and pack ice near Soo Locks present hazards to vessels. Flushing operations require opening the gates to allow the accumulation of ice to flow out.
- b. From December to May, seasonal ice formation in the vicinity of the Soo Locks impedes maritime operations. While ice-breaking activities offer a degree of mitigation, these efforts must be carefully timed. The combination of cleared ice and other dynamic environmental factors can result in ice accumulation and stacking within the channel, posing a subsequent navigational hazard.
- c. During the winter and subsequent spring thaw, there is an increase in trees and debris in the waterway. This is primarily because the weight of ice and snow causes tree limbs to snap, and the resulting high water levels from the melting carry this debris into the water.

## 3. WRF – Visibility Impediments

- a. Urban background lighting presents low impact on navigation in the St Mary's River, in the vicinity of Soo Locks.
- b. Overgrown vegetation obscures the day boards and impedes maintenance access to the Pointe Aux Pins and Bayfield Rock range lights and day boards.

## 4. WRF – Waterway Configuration

- a. Planned winter closure of the West Neebish Channel forces two-way traffic through the Middle Neebish Channel and increases the risk of collision.
- b. Despite visible Aids to Navigation (ATON) at the north end of Lake George, increased numbers of groundings on the sandbar indicate the need for a Coast Guard Waterways Analysis Management System study to verify if this is the optimal placement for the ATON constellation.
- c. Big Point Buoy #7 is off-station tending slightly outside of the Vidal Shoals Channel.
- d. The alignment of the West Neebish Channel between Moon Island and the Mud Lake gate is flawed. This creates a dangerously narrow passage and causes the channel to be misaligned with its entry.
- e. The channels split on the north and south sides of Neebish Island are unmarked, causing confusion to approaching vessels. The Munuskong Channel on the east side of the island is intended for northbound traffic and the West Neebish Channel (also known as the Rock Cut) on the west side of the island is intended for southbound traffic.

## Appendix D. Geospatial Participant Comments

Facilitators captured participant observations that made specific geographic references. Those observations were then transferred to an ArcGIS online web-application to generate the chartlets reflecting the location and specific context of each comment. The chartlets are included below and represented as Figures 1-3.

<b>Geospatial Comments</b>	
<b>Point</b>	<b>Comment</b>
1	Big Point Lighted Buoy 7 is off station.
2	Relocate the Soo Locks vessel queue 1-2 miles east or west of the locks to prevent traffic backlogs from accumulating in the St. Mary's River.
3	The buoy gates at MacArthur Lock and Poe Lock have shifted off station and are not in alignment.
4	A wind sensor at Cedar Point improves navigational safety by providing mariners with up-to-date information to adjust sail plans in accordance with environmental conditions.
5	A camera and wind sensor in this location provides Soo Lock operators and mariners with a real-time information feed to inform sail plans and ship handling. Lock coordinators also use this information to aid planning of the queuing process for the Soo Locks.
6	Although the East Neebish Channel is marked with buoys, the channel depth is uneven and one side is deeper than the other.
7	Missing, old, and rotting day boards in the Point Aux and Vidal Shoals Channels make these towers unsafe to climb and difficult to see with the unaided eye.
8	In this area, the St. Mary's River dredged channel is rocky with narrow checkpoints. The channel has a deep and a shallow side. The shallow side requires either dredging or repositioning of its buoys to better indicate the safe water in the navigable channel.
9	Due to the tight turn and strong currents at Mission Point, vessel captains generally observe one-way passage in this area.
10	Water level sensors at the Sabin, Davis, Poe, and MacArthur locks provide depth measurement readings used to schedule ship entries.
11	The wind indicator at Winter Point is poorly positioned. Relocate it to the peninsula's southernmost point to provide more accurate readings for maritime traffic.
12	Near West Neebish Channel Downtown Lighted Buoys 5 and 6, the depth of the West Neebish Channel quickly shallows outside of the navigable channel.
13	Green Buoy 23 in the Sailors Encampment Channel is off station and outside the charted channel.
14	Cameras and weather sensors in the West Neebish Channel assist mariners by providing up-to-date wind and traffic data.
15	Cameras and weather sensors in the East Neebish Channel provide assist mariners by providing up-to-date wind and traffic data.
16	Pier space is limited in this position, and available space at the De Tour docks are in disrepair.

*Table 1 - Geospatial Comments*

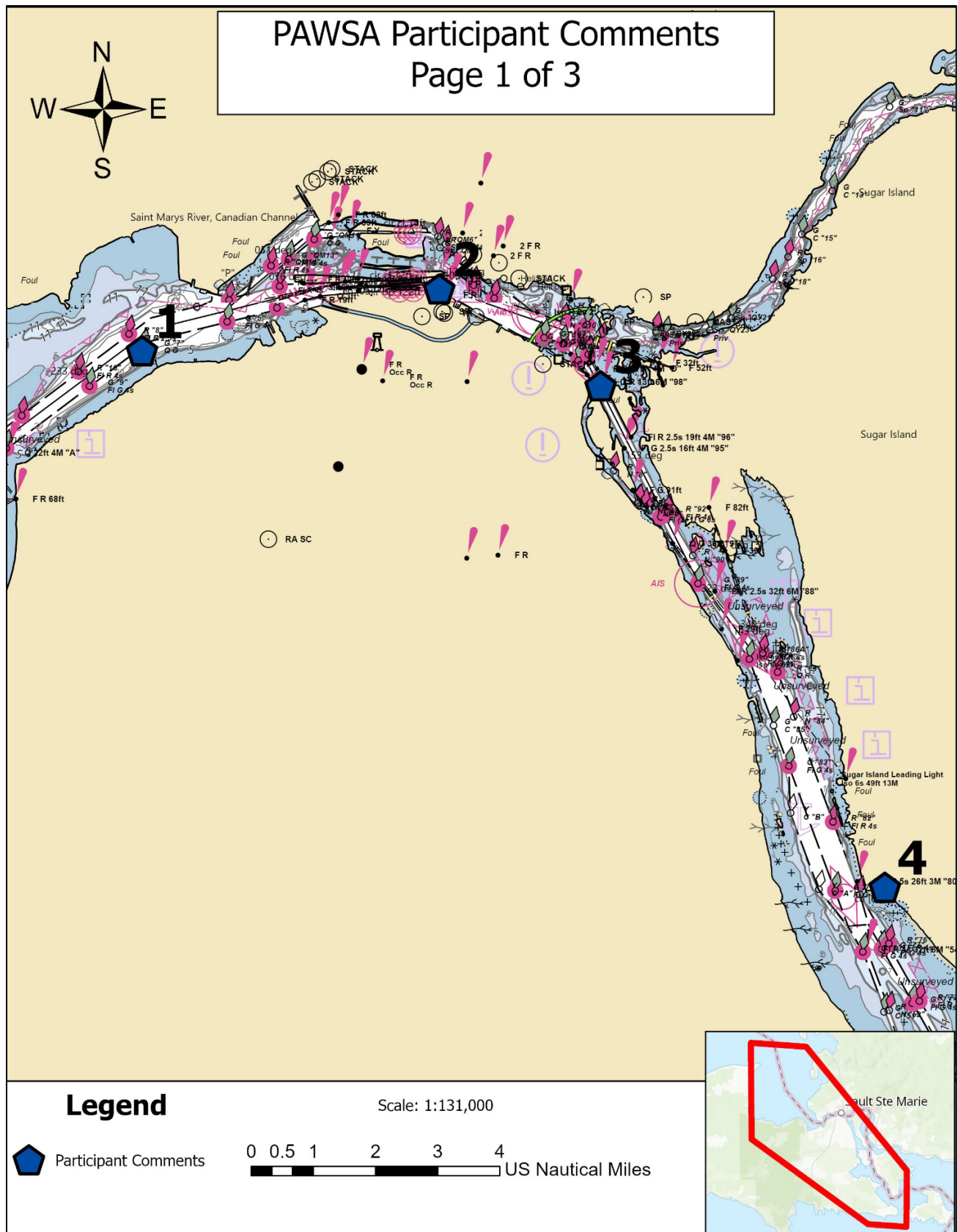


Figure 1- Mapped location of geospatial comments 1-4.

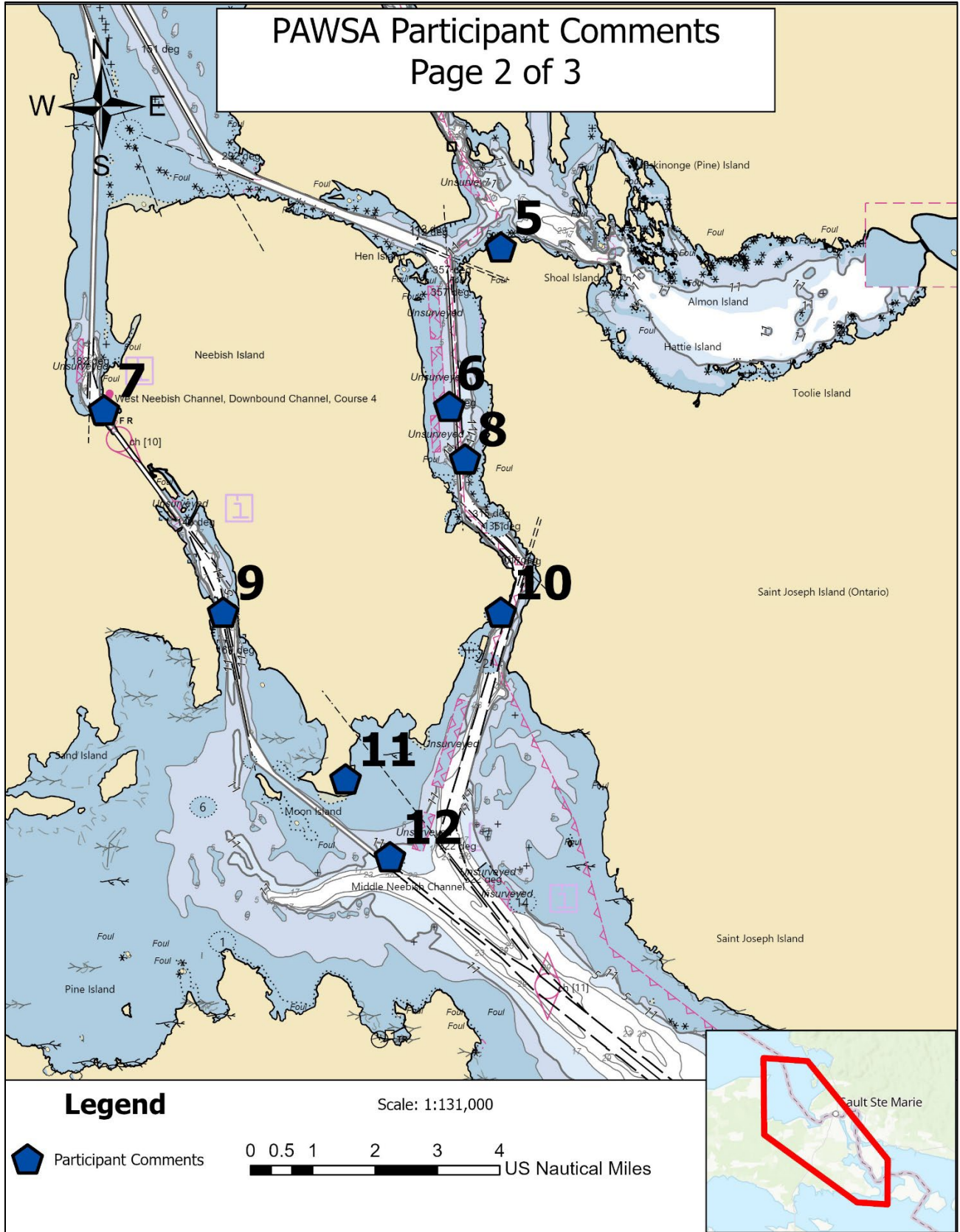


Figure 2- Mapped location of geospatial comments 5-12.

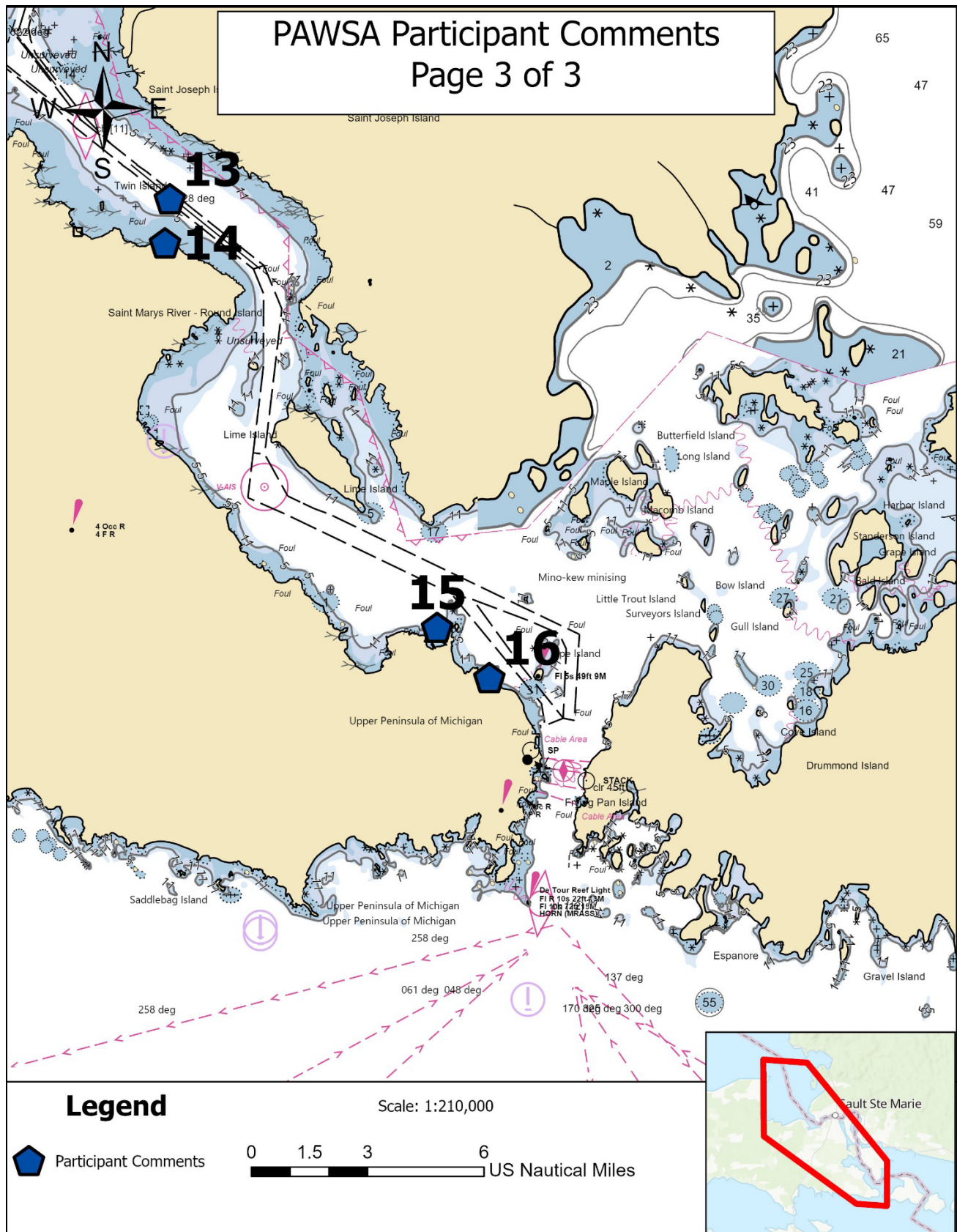


Figure 3- Mapped location of geospatial comments 13-16.

## Appendix E. Waterway Risk Factor Issues

Following Day 1 workshop discussions, participants were asked to identify and prioritize the top three issues related to each of the top four WRF's. The following is a summary of the prioritized issues as selected by the participants. These issues are not listed in priority order and are also documented in Chapter 2.C preceding each mitigation strategy. Please note that some of the WRFs had fewer than three issues identified.

### 1. WRF – Bottom Type.

- a. Rock Cut poses a navigational hazard to vessels due to its rocky bottom and shoreline, which runs from Neebish Island to Sugar Island.
- b. While the waterway from Winter Point to Johnson Point at Hardwood Point Junction appears wide, the navigable channel's dredged depth varies significantly resulting in partial dredging on behalf of USACE. A uniform depth throughout the entire channel is desired.

### 2. WRF – Small Commercial Vessels.

- a. Due to vessel capability restrictions some vessels, including smaller tugs and ferries, cannot operate during ice conditions.
- b. Ferry crews are mandated by local Eastern Upper Peninsula Transportation Authority (EUPTA) workforce regulations to have five hours of rest after a 12-hour shift. During the rest period, crews are unavailable for recall. As a result, ferry captains may be unavailable to reach islands during an emergency due to crew fatigue limits.

### 3. WRF – Recreational Vessels.

- a. Recreational vessel operators demonstrate a lack of proficiency and understanding of Navigation Rules.
- b. A lack of awareness exists among recreational vessel operators regarding the limited maneuverability of freighters and potential hazards caused by their wakes.
- c. Due to budget cuts, the Michigan Department of Natural Resources (DNR) and the Chippewa County Sheriff's Office have scaled back responses to non-urgent notifications.

### 4. WRF – Traffic Congestion.

- a. Vessel traffic fluctuations are influenced by seasonal operational demands. Unscheduled lock closures necessitated by ice accumulation and essential flushing procedures at the Soo Locks also contribute to these disruptions. The previous referenced factors elevate traffic congestion and heighten the risk of maritime accidents.

## Appendix F. National and Local Event and Consequence Data

**A. National and Local Event and Consequence Data.** As referenced in Chapter 1 Section B.2.b.(1)(c), the following section displays the tables and definitions for event types included in the handout provided to stakeholders prior to conducting the FQRA. The model uses national and local Coast Guard MISLE data that are both updated as appropriate. The national event data in Table 1 contains information through September 2025. Table 2 and 3 contain the local event data for Sector Northern Great Lakes that was derived prior to the workshop.

1. Event Types. During the FQRA process on the second day of the PAWSA, participants complete Event Forms that are pre-populated with issues validated during the first day of the PAWSA to enable RIN value calculations. An example of an event form completed by participants for this workshop is included below as Figure 1.

<b>PAWSA Location:</b> <input type="text" value="Sault Ste Marie"/>	<b>Risk Factor:</b> <input type="text" value="Bottom Type"/>
<b>Team Number:</b> <input type="text" value="3"/>	

Issue	Event	Frequency
Rock Cut poses a significant hazard to vessels due to the rocky bottom and shoreline. Runs from Neebish to Sugar Island.	Collision	Frequent
	Grounding	Occasional
Waterway from Winter Point to Johnson Point appears wide; however, only half the channel is dredged to a deeper depth due to charted depth. Army Corp dredges channel based on charted depth, but its not consistent throughout. Participants would like to see one charted depth for the entire channel.	Grounding	Rare
	Grounding	Frequent
Groundings throughout the study area can cause the waterway to shut down for an extensive amount of time.	Grounding	Rare

Populated by PAWSA facilitators based on Day 1	Completed by Participants on Day 2
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*Figure 1 – Example event form from the Sector Northern Great Lakes PAWSA.*

2. For each issue listed, participants select up to three event types that may occur due to the associated issue. For example, if "Groundings throughout the study area can cause the waterway to shut down for an extensive amount of time," then collision, grounding, or traffic restricted are examples of three event types a participant may select that could occur because of this issue. Definitions for the nine event types available during the FQRA are provided below:

- i. **Allision:** Vessel runs into stationary structure.
- ii. **Collision:** Vessel runs into another vessel.
- iii. **Fire/Explosion:** Fire or explosion.
- iv. **Grounding:** Vessel draft exceeds water depth.
- v. **HAZMAT Release:** Hazardous Material container breached or no longer working as designed (tank, package, pipe, etc.)
- vi. **Infrastructure Failure:** Infrastructure stops working or damaged from non-vessel source.
- vii. **Oil Spill:** Oil container breached or no longer working as designed (tank, pipe, etc.)
- viii. **Sinking:** Vessel stops floating as designed. Capsizing is a sub-type of sinking.
- ix. **Traffic Restricted:** Traffic not flowing normally; NOT from any event listed.

3. National Events. Table 3 provides data capturing the record of the yearly average of national events used in the FQRA process.

National Events		
Event	Total Events	Yearly Avg
Allision	11,179	429.96
Collision	3,118	119.92
Fire/Explosion	2,442	93.92
Grounding	14,794	569.00
Oil Spill	77,603	2,984.73
Sinking	4,457	171.42
Traffic Restricted	6,816	262.15
<b>Total</b>	<b>120,409</b>	<b>4,631.12</b>

*Table 1 – Total and yearly average of national events.*

4. Local Events. The data capturing the record of local events used in the FQRA process is specific to the port for the PAWSA. Table 2 and 3 provide the local event and consequence data provided to stakeholders prior to conducting the FQRA for the Sector Northern Great Lakes PAWSA workshop.

Event	Total Events	Annual Events (avg)
Allision	44	1.7
Collision	18	0.7
Fire/Explosion	19	0.7
Grounding	102	3.9
Oil Spill	422	16.2
Sinking	31	1.2
<b>Total</b>	<b>636</b>	<b>24.5</b>

Table 2 – Total and yearly average of local events for the Sector Northern Great Lakes PAWSA workshop study area.

Type	Allision	Collision	Fire/Explosion	Grounding	Oil Spill	Sinking	Traffic Restricted
<b>⊖ Economic</b>							
Ec0	Occasional	Occasional	Probable	Probable	Probable	Probable	
Ec1	Occasional	Probable	Occasional	Occasional	Rare	Occasional	Probable
Ec2	Occasional			Occasional			Occasional
Ec3	Occasional	Occasional		Occasional			Occasional
Ec4							Rare
Ec5							Occasional
<b>⊖ Environmental</b>							
En0	Probable	Probable	Probable	Probable	Occasional	Probable	
En1		Occasional	Occasional	Rare	Probable	Occasional	
En2					Rare		
<b>⊖ Safety</b>							
Sa0	Probable	Probable	Probable	Probable	Probable	Probable	
Sa1	Rare		Occasional	Rare	Rare	Rare	
Sa2					Rare		

Table 3 – Local event consequences and likelihood for the Northern Great Lakes PAWSA workshop study area.