Ports and Waterways Safety Assessment Workshop Report

San Juan, Puerto Rico
24 – 25 April 2024

Providing Navigation Safety Information for America's Waterways Users

Released By:
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Executive Summary

Coast Guard Sector San Juan sponsored a Ports and Waterways Safety Assessment (PAWSA) workshop in San Juan, PR, from April 24, 2024, to April 25, 2024. Twenty-five participants representing a range of waterway users, stakeholders, federal, state, and local regulatory and public safety authorities met to collaboratively assess navigational safety on the waterways adjoining the Port of San Juan. Prior to the workshop, the Coast Guard Navigation Center (CG NAVCEN) facilitated a stakeholder engagement meeting on February 20, 2024, to enhance community outreach and prepare stakeholders for the formal workshop. 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. The Baseline Risk Value (BRV) and Risk Characterization for each WRF were established based on participants' survey responses. BRV quantifies the overall risk, whereas Risk Characterization assesses the potential consequence, risk trend, risk tolerance, and effectiveness of existing mitigation strategies for a specific WRF. The metrics from the BRV and Risk Characterization were combined to quantitatively prioritize WRFs to inform discussions during the next phase of the workshop. During the second day, participants reviewed and validated the aggregated survey ranking of the WRFs and conducted follow-on discussions to identify and develop risk mitigation strategies. The five numerically highest WRFs ranked by participants are documented in the table below with their associated Waterway Risk Condition. This report contains a full list of prioritized WRFs with additional details.

Waterway Risk Condition	WRF
Navigation	Bottom Type
Vessel Quality & Operation	Recreational Vessels
Traffic	Volume of Recreational Traffic
Traffic	Volume of Commercial Traffic
Traffic	Waterway Use

The 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 San Jaun Marine Transportation System (MTS). The Director of Marine Transportation Systems (CG-5PW), CG NAVCEN, and CG Sector San Juan extend their sincere appreciation to participants for their contributions to the San Juan PAWSA workshop.

TABLE OF CONTENTS

CHAPTER 1. GENERAL

A. Background and Purpose

1. 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 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 PAWSA process, which the Coast Guard established as the formal model for facilitating stakeholder discussion to identify VTM improvements and determine candidate VTS waterways. In 2020, CG NAVCEN modernized the PAWSA process to create a more flexible tool available to Sector Commanders to engage the maritime community for purposes of monitoring and improving the health of the MTS within their area of responsibility.

2. The current PAWSA process involves convening 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 WRFs. The PAWSA process is designed to convert qualitative experience, observations, and opinions of participants into quantitative assessments. This method utilizes numerical comparison among sixteen WRFs for purposes of facilitating 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 outlined in Table 1 below and further defined in Appendix B.

Waterway Risk Conditions	Navigation	Vessel Quality & Operation	Traffic	Waterway
WRFs	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. Waterway Risk Model. The PAWSA Waterway Risk Model defines risk as the product of the probability of an unwanted event and the consequences resulting from that event. Figure 1 provides a visualization of the relationship between the probability of an unwanted event for each Waterway Risk Condition and the impact of the risk in terms of Immediate and Subsequent Consequences. Appendix B provides an explanation of Immediate and Subsequent Consequences as defined by the PAWSA Waterway Risk Model.

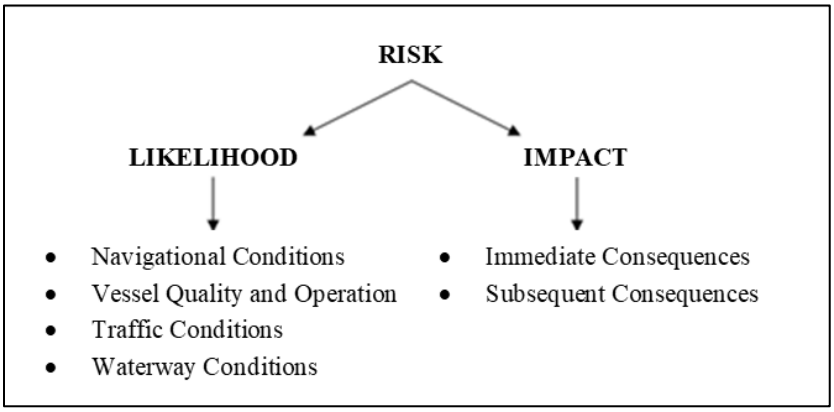

Figure 1- Relationship between risk, likelihood, and impact.

3. WRF Survey. During day one of the workshop participants are led through individual discussions for each WRF identified in Table 2. Each discussion concludes with the completion of a three-part participant survey that establishes the BRV and Risk Characterization for each risk factor. Following completion of all surveys, the WRFs are numerically prioritized by BRV and Risk Characterization from greatest to least. At the beginning of the second day of the workshop, the order of the risk factors are presented to participants for validation and consensus to prioritize mitigation strategy discussions and development. A description of the methodology to calculate the BRV and Risk Characterization is provided in the following sub-sections.

   a. BRV. This value is calculated using numerical values attained from Part One and Part Two of the survey that are then input into the formula outlined in Figure 2.

      (1) Part One. The first section of the survey asks participants to evaluate the Risk Level of a specific risk factor based on four options specific to each individual WRF. Risk Levels are presented as written options to participants. Each written option has an associated numerical value between one and four based on their likelihood. Appendix B contains a list of the WRFs and the associated Risk Level options with their attributed numerical value.

      (2) Part Two. The second section of the survey asks participants to assign the Impact Level for Immediate and Subsequent Consequences associated with each risk factor. Appendix B contains the list and definition of Immediate and Subsequent Consequences.

         (a) The Impact Level of Immediate and Subsequent Consequence are presented as three choices for each WRF. The choices correlate to the numerical values shown in Table 2.

Impact Level of Consequence	**Numerical Value**
None or hardly any impacts	0
Moderate impact	0.5
Impacts are likely severe	1

Table 2- Impact level of consequences with associated numerical value.

         (b) The numerical values for Risk Level from Part One and Impact Level from Part Two of the survey are used in the formula outlined in Figure 2 to calculate the associated BRV for each WRF. The BRV numerically ranges between zero and eight, with zero representing low BRV and eight representing high BRV.

$$\text{BRV} = (\text{Risk level}) \times \left(\frac{\sum \text{Immediate Consequences}}{4} + \frac{\sum \text{Subsequent Consequences}}{4} \right)$$

Figure 2- Risk Value formula.

b. Risk Characterization. Risk Characterization is ascertained from Part Three of the survey. It provides additional context to the BRV generated from Part One and Part Two of the survey and is mainly used by facilitators to better guide participant discussion.

(1) Part Three. The third section of the survey asks participants to evaluate Risk Characterization in terms of the Current Risk Level, Risk Trend, and Current Mitigations. Table 3 provides the associated available selections for each Risk Characterization Category. Questions to ascertain Risk Characterization are standard for all WRFs. The answers to these questions are calculated by plurality, wherein the option that was most frequently selected by participants serves as the prevalent group consensus for each question. In the event a plurality cannot be determined, PAWSA facilitators examine the raw data and determine the most appropriate selection.

Risk Characterization Category	Available Selections
Current Risk Level	We could benefit by accepting more risk
	The level of risk is acceptable, keep the status quo
	Unacceptably high risk
Risk Trend	Increasing
	Decreasing
	Staying the same
Current Mitigations	Acceptable
	Acceptable, but tenuous
	Unacceptable, we need more or better mitigations

Table 3- WRF Survey Part Three, Risk Characterization categories.

CHAPTER 2. SAN JUAN PAWSA WORKSHOP

A. PAWSA Study Area

1. The geographical area for the San Juan PAWSA included the Bay of San Juan and near eastern coastal regions as depicted in Figure 3. The coordinates bounding the San Juan study area were: 18.614N, -065.954W and 18.412N, -066.160W. 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 a chartlet in Appendix D.

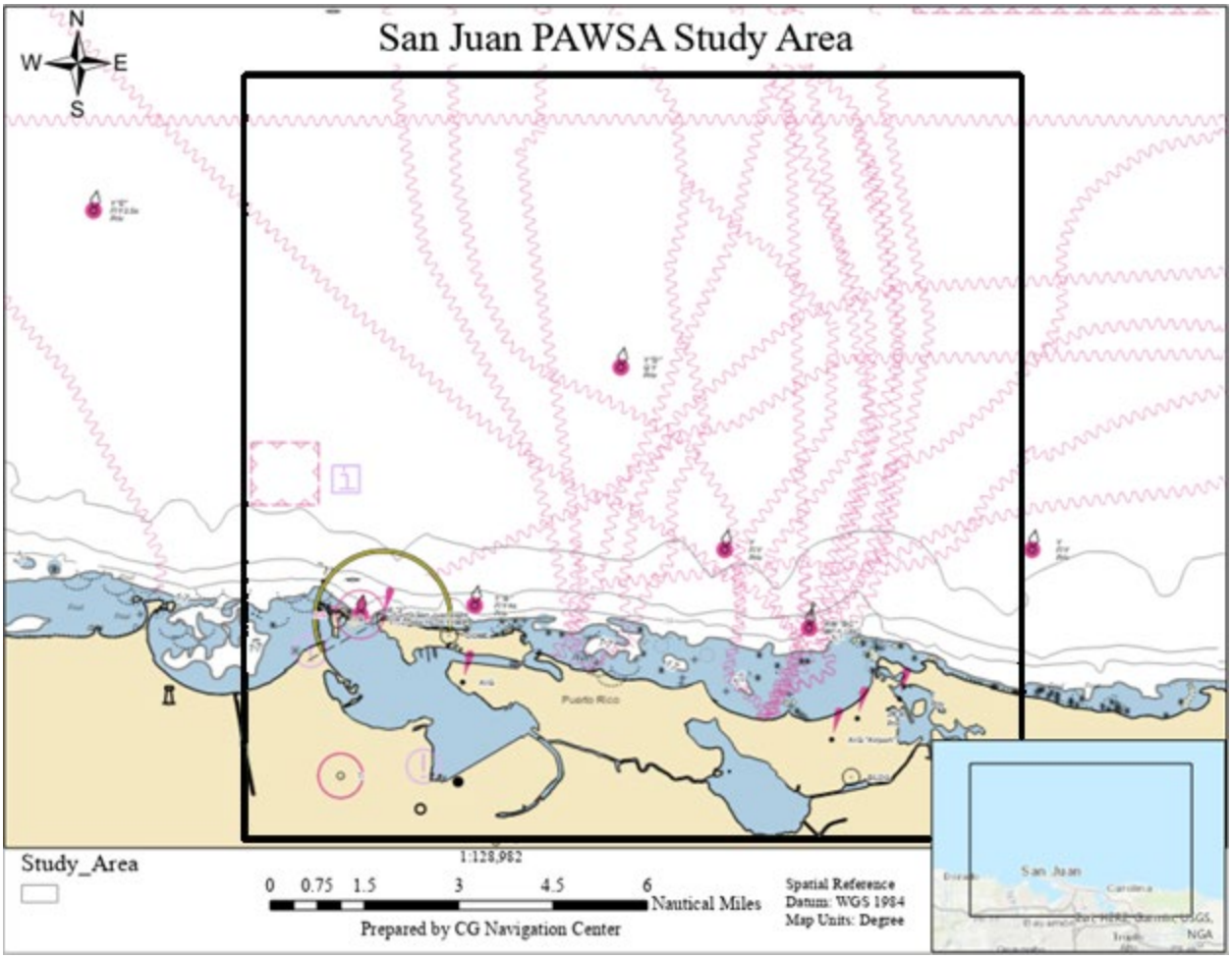

Figure 3- San Juan PAWSA workshop study area.

B. BRV

1. The resultant BRV using the methodology described in Chapter 1.C for the San Juan PAWSA workshop is depicted in Figure 4.

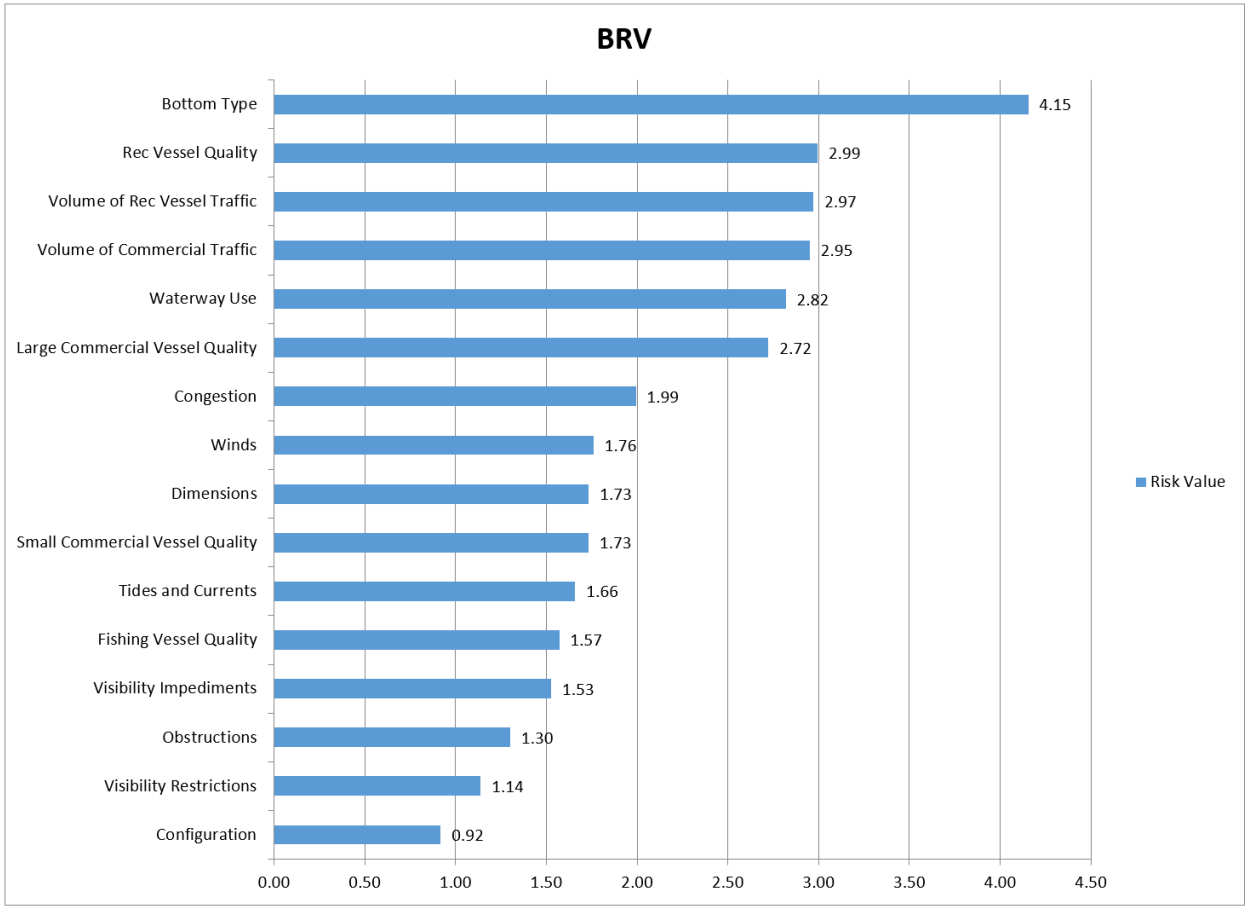

Figure 4- San Juan PAWSA workshop WRF BRV.

2. The five highest priority WRFs and their associated Waterway Risk Condition for the San Juan PAWSA prior to combining the BRV with the Risk Characterization results are documented in Table 4.

Waterway Risk Condition	WRF
Navigation	Bottom Type
Vessel Quality & Operation	Recreational Vessels
Traffic	Volume of Recreational Traffic
Traffic	Volume of Commercial Traffic
Traffic	Waterway Use

Table 4- Five highest priority WRF based on BRV.

C. Risk Characterization

1. The resultant Risk Characterization using the methodology described in Chapter 1.C for the San Juan PAWSA workshop is depicted in Table 5.

WRF Risk Characterization				
Waterway Risk Condition	**WRF**	**Current Risk Level**	**Current Risk Trend**	**Current Mitigations Are**
Navigation	Winds	Acceptable, keep the status quo.	Increasing	Acceptable but tenuous
Navigation	Tides and Currents	Acceptable, keep the status quo.	Same	Acceptable
Navigation	Visibility Restrictions	Acceptable, keep the status quo.	Same	Acceptable
Navigation	Bottom Type	Acceptable, keep the status quo.	Same	Acceptable but tenuous
Vessel Quality & Operation	Large Commercial Vessels	Acceptable, keep the status quo.	Increasing	Unacceptable, we need more/better mitigations
Vessel Quality & Operation	Small Commercial Vessels	Acceptable, keep the status quo.	Same	Unacceptable, we need more/better mitigations
Vessel Quality & Operation	Fishing Vessels	Acceptable, keep the status quo.	Same	Acceptable but tenuous
Vessel Quality & Operation	Recreational Vessels	Unacceptably high risk.	Increasing	Unacceptable, we need more/better mitigations
Traffic	Volume of Commercial Traffic	Acceptable, keep the status quo.	Increasing	Unacceptable, we need more/better mitigations
Traffic	Volume of Recreational Traffic	Unacceptably high risk.	Increasing	Unacceptable, we need more/better mitigations
Traffic	Waterway Use	Acceptable, keep the status quo.	Increasing	Unacceptable, we need more/better mitigations
Traffic	Congestion	Acceptable, keep the status quo.	Increasing	Unacceptable, we need more/better mitigations
Waterway	Dimensions	Acceptable, keep the status quo.	Increasing	Acceptable but tenuous
Waterway	Obstructions	Acceptable, keep the status quo.	Same	Unacceptable, we need more/better mitigations
Waterway	Visibility Impediments	Acceptable, keep the status quo.	Same	Unacceptable, we need more/better mitigations
Waterway	Configuration	Acceptable, keep the status quo.	Same	Acceptable but tenuous

Table 5- San Juan PAWSA workshop WRF Risk Characterization.

D. Validation WRF Prioritization.

1. The combined WRF BRV and Risk Characterization results are depicted below in Table 6. These results were presented to participants to validate the prioritization order of WRFs for mitigation strategy dialogue and development. The rows highlighted in green in Table 6 represent the highest priority WRFs for the San Juan PAWSA workshop participants following the prioritization validation discussion.

		Risk Characterization		
WRF	**BRV**	**Current Risk Level**	**Current Risk Trend**	**The Current Mitigations Are**
Bottom Type	4.15	Acceptable, keep the status quo	Same	Acceptable but tenuous
Recreational Vessels	2.99	Unacceptably high risk	Increasing	Unacceptable, need more/better mitigations
Volume of Recreational Traffic	2.97	Unacceptably high risk	Increasing	Unacceptable, need more/better mitigations
Volume of Commercial Traffic	2.95	Acceptable, keep the status quo	Increasing	Unacceptable, need more/better mitigations
Waterway Use	2.82	Acceptable, keep the status quo	Increasing	Unacceptable, we need more/better mitigations
Large Commercial Vessels	2.72	Acceptable, keep the status quo	Increasing	Unacceptable, we need more/better mitigations
Congestion	1.99	Acceptable, keep the status quo	Increasing	Unacceptable, need more/better mitigations
Winds	1.76	Acceptable, keep the status quo	Increasing	Acceptable but tenuous
Dimensions	1.73	Acceptable, keep the status quo	Increasing	Acceptable but tenuous
Small Commercial Vessels	1.73	Acceptable, keep the status quo	Same	Unacceptable, need more/better mitigations
Tides and Currents	1.66	Acceptable, keep the status quo	Same	Acceptable
Commercial Fishing Vessels	1.57	Acceptable, keep the status quo	Same	Acceptable but Tenuous
Visibility Impediments	1.53	Acceptable, keep the status quo	Same	Unacceptable, need more/better mitigations
Obstructions	1.30	Acceptable, keep the status quo	Same	Unacceptable, need more/better mitigations
Visibility Restrictions	1.14	Acceptable, keep the status quo	Same	Acceptable
Configuration	0.92	Acceptable, keep the status quo	Same	Acceptable but tenuous

Table 6- Combined BRV and Risk Characterization results for all WRFs.

2. Following subjective evaluation, participants selected Recreational Vessels, Volume of Commercial Traffic, Waterway Use, Large Commercial Vessels, and Configuration as the most significant WRFs that contributed to potential incidents in the San Juan PAWSA study area. WRFs were ordered by the participant's criticality of concern. Table 7 presents WRFs in descending priority order from high to low. Mitigation strategies were discussed and developed in this order.

Waterway Risk Condition	WRF
Vessel Quality & Operation	Recreational Vessels
Traffic	Volume of Commercial Traffic
Traffic	Waterway Use
Vessel Quality & Operation	Large Commercial Vessels
Waterway Conditions	Configuration

Table 7- Validated and prioritized WRFs listed from top to bottom.

E. Risk Mitigation Strategies

1. The validated list of WRFs were 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 create specific, measurable, actionable, realistic, and timebound (SMART) goals as well as general goals. Both kinds of mitigation strategies developed by participants are represented in this report. Recommended mitigation strategies documented in this section received consensus among workshop participants. Mitigation strategies are documented in order of significance to participants.

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. <u>WRF – Recreational Vessels.</u>

   a. Hazardous operation of commercially rented jet skis pose significant safety risks. Jet ski rental companies were perceived to lack sufficient education on safe operating practices and current enforcement efforts are limited, Civil penalties for minor violations were not prioritized. Participants additionally acknowledged a critical need for more personnel to support enforcement efforts, including additional funding for staffing and asset shortfalls across all relevant agencies to include the Coast Guard, Puerto Rico Department of Natural and Environmental Resources (DRNA), Puerto Rico Planning Board (PRPB), and Fuerzas Unidas de Rápida Acción (FURA). Participants recommended the following additional mitigations:

      (1) Conduct outreach with jet ski operators through a unified campaign by the Coast Guard, Coast Guard Auxiliary, DRNA, PRPB, and FURA to develop and deliver a basic recreational vessel operations course. Topics covered would include

essential Rules of the Road information, such as passing, overtaking, head-on encounters, safe speed, awareness of no-wake zones, and designated areas of permitted operation.

(2) Draft a memorandum of understanding (MOU) that enables PRPB and FURA to compete for federal grants to support enforcement of recreational boating safety laws.

4. WRF – Volume of Commercial Traffic.

a. The Puerto Rico Ports Authority (PRPA) faces challenges with the volume of commercial traffic and a more organized vessel monitoring system is required. PRPA has limited visibility over the waterway and can only monitor vessels transmitting location via an Automatic Identification System (AIS) transponder. Participants recommended the following additional mitigation:

(1) Expand the current vessel traffic management system, known as "Port Control" on VHF-FM channel 14, until an improved vessel monitoring system can be instated. Bolster a well-trained and well-equipped Port Control with better radios, observation equipment, and windows to improve situational awareness and communication with commercial vessels.

b. There is an increased demand for available anchorages due to an increase in cruise ship vessel traffic and larger commercial vessels. Anchorage D, a Coast Guard designated special anchorage at the eastern end of San Antonio Channel, is limited to small vessels with low mast height due to its proximity to the Fernando Luis Ribas Dominicci Airport (SIG). Participants recommended the following additional mitigation:

(1) Re-visit the mast height limitations of the anchorage to accommodate larger traffic including cruise ships near SIG. Anchorage D is currently being reviewed by Coast Guard Atlantic Area to evaluate changing existing mast height requirements. As a short-term solution, seek a policy exemption or a waiver to overcome regulatory challenges until the Coast Guard's review is completed.

c. Degraded shoreside infrastructure affects the volume of commercial traffic that the Port of San Juan can safely manage. Cruise ship piers require the most rehabilitation. Pier 1 and West Army Terminal Pier are condemned for cruise ships. Pier 3 is currently accepting passenger vessels with size limitations and the Coast Guard Marine Safety Center is conducting an additional engineering review. Piers 11-14 also require repairs. Participants recommended the following additional mitigation:

(1) PRPA should invest in rehabilitation projects to renew existing piers, which may require replacing rotting mooring dolphins, or lengthening pier structures to accommodate the projected increased volume of large commercial vessels.

5. WRF – Waterway Use.

   a. Periodically, there is an increase vessel congestion at the harbor entrance due to higher volumes of two-way marine traffic and the narrow configuration of the channel. Participants recommended the following additional mitigation:

      (1) Leverage U.S. Power Squadrons, which offer a wide range of boating safety courses and seminars to the public, to increase community education of Rules of the Road and other navigational best practices.

   b. Participants discussed concerns regarding the interaction between vessels and aircrafts in shared waterways, especially in the vicinity of SIG. Federal Aviation Administration (FAA) regulations require a clear zone leading up to runways to allow aircraft to perform missed approaches. The FAA has raised concerns about the presence of sailboats with tall masts and large cruise ships within the airport's approach path and low-altitude restricted airspace. Participants recommended the following additional mitigation:

      (1) Increase coordination with the FAA to include public education on the presence of the low-altitude restricted airspace and its impact on taller vessels. Provide support by enhanced enforcement efforts.

   c. FURA, a tactical marine branch of the Puerto Rico Police Department, is stationed at Boca de Cangrejos, located behind the airport, and requires unimpeded access to the bay to respond to emergencies. However, it was noted that jet skis frequently operate at high speeds in this vicinity, posing an increased risk of collision with emergency response vessels. Participants recommended the following additional mitigation:

      (1) Install additional signage to increase jet ski operator awareness of existing recreational vessel five knot speed restrictions near Boca de Cangrejos.

6. WRF – Large Commercial Vessels.

   a. Sector San Juan lost its training feeder port designation and its civilian Marine Inspector Training Officer (MITO) in 2024 and will have a 54% reduction in marine inspector staffing by Coast Guard assignment year 2025. This staffing reduction is expected to decrease the Sector's ability to satisfy the needs of the port's domestic and foreign vessel fleet. Participants recommended the following additional mitigation:

      (1) The Coast Guard should submit the appropriate Marine Information for Safety and Law Enforcement (MISLE) information to justify the Port of San Juan's reconsideration as a feeder port and use that justification to secure a new MITO to rebuild the bench strength of qualified marine inspectors to meet operational demands.

b. The age, type of operations, and transit routes of Caribbean Cargo Ships allow them to avoid regulatory standards and adhere to looser inspection requirements. The Coast Guard is not a signatory to the most current version of the Code of Safety for Caribbean Cargo Ships (CCSS Code), resulting in inconsistent inspection requirements for these vessels. In addition to regulatory challenges, the crews of these vessels lack knowledge of safe navigation principles. Participants recommended the following additional mitigations:

(1) Close loopholes and eliminate substandard inspection requirements for Caribbean Cargo Ships. Participants agreed that this proposed mitigation would necessitate changes in the inspection standards by the Captain of the Port of San Juan, and require concurrent support by Coast Guard District 7 and Coast Guard Atlantic Area.

(2) Provide training to the Caribbean Cargo fleet on the navigational Rules of the Road. Participants further recommended that the San Juan Harbor Safety Committee be tasked with developing a training outreach program targeting these vessels and encourage inspectors to take additional time to educate their crews.

7. <u>WRF – Waterway Configuration.</u>

a. Crowley Maritime's new terminal required Coast Guard District Seven to move Graving Dock Channel Lighted Buoy 1. Waterway users stated that the new buoy location negatively impacted the safety of deep draft vessel movements within the channel. Participants recommended the following additional mitigation:

(1) Engagement with Coast Guard District Seven staff and Coast Guard Aids to Navigation Team (ANT) Puerto Rico to relocate the buoy and better mark the channel without impeding vessel traffic. Participants further recommended that this action be followed by an appropriate chart update to reflect the new buoy location.

b. The navigational ranges in the Army Terminal Channel can be blocked by low-level barges. Participants recommended the following mitigation:

(1) Raise the ranges so that they are visible above large, moored vessels. If raising the ranges is not feasible, participants recommended enhancing the rear range with a sector light as an alternative solution. Securing funding and implementing these Federal Aids to Navigation (ATON) changes requires coordination between Civil Engineering Unit Miami, ANT Puerto Rico, Sector San Juan Waterways Division, and Coast Guard District Seven staff.

c. Newly constructed commercial vessels are unable to see buoys when transiting outbound in the Army Terminal Channel due to their increased size, width, and bridge height. Participants recommended the following additional mitigation:

(1) Work with partners listed in 7.b (1) to:

(a) Install a new outbound range light in Army Terminal Channel, and

(b) Establish more visible ATON solutions that are compatible with visibility restrictions of large commercial vessels.

Appendix A. Workshop Participants

Participant	Organization
Cruises and Charters	
1. Mark Dewein	Hornblower Maritime Services Ferries
2. Jose Torres Colon	Club Náutico de San Juan
3. Ulises Torres	San Juan Cruise Port
Energy Sector	
4. Adrian Perez	Total Energies
5. Carlos Faris	New Fortress Energy
6. Vivian Suarez	Total Petroleum
Maintenance and Physical Infrastructure	
7. Alberto Garcia	Fort Buchannon
8. Natallia Lopez	Puerto Rico Maritime Group
9. Javier Torres	Puerto Rico Port Authority
10. Jose Rosario	Puerto Rico Maritime Group
Natural and Environmental Resources	
11. Alexander Avila	Puerto Rico Department of Natural and Environmental Resources
12. Carlos Matos	Puerto Rico Department of Natural and Environmental Resources
13. Tainett Olmedo	Puerto Rico Department of Natural and Environmental Resources
Port Operations	
14. Ramon Santiago	Villa Pesquera Cataño
15. Richard Flynn	San Juan Bay Pilots
16. Carlos Gutierrez	San Juan Bay Pilots
17. Eric Mercado	Centro Maritimo Pesquero
Public Safety	
18. Javier Torres	Bacardi Corporation Fire Brigade
19. Jorge Carrillo	U.S. Coast Guard
20. Robert McCurdy	U.S. Coast Guard
21. Iris Viruet Lopez	Puerto Rico Fuerzas Unidas de Rapida Acción
22. Rafael Guirano	San Juan Police Department
23. Xafal Quijano	San Juan Police Department
24. Francisco Silva	Puerto Rico Fuerzas Unidas de Rapida Acción
25. Ismael Torres	U.S. Coast Guard

Appendix B. Waterway Risk Model Terms and Definitions

A. Waterway Risk Conditions and 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 to be 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. Besides local knowledge, understanding of the rules of the road and inebriation also should be considered for this risk factor.

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.

    d. WRF - Configuration. The arrangement of a waterway, including elements such as waterway bends, multiple and converging channels, and perpendicular traffic flow.

B. WRF Survey. During the first day of the PAWSA workshop, facilitators guide participants through a discussion about each WRF. Following each dialogue, participants take a three-part survey that is used to prioritize the development and discussion of mitigation strategies during the second day of the PAWSA. The following sections provide the associated numerical values, selection options, and definitions for Part One and Part Two of the WRF Surveys that are utilized to calculate the BRV of each WRF.

1. Part One. This first section of the survey asks participants to evaluate the likelihood of a specific WRF based on four available selections. Likelihoods are presented as written options to participants. Each written option has an associated numerical value between one and four based on the likelihood of the condition. Tables 1- 4 in this appendix provide the four written options and associated point value for each WRF.

Waterway Risk Condition - Navigation	
WRF - Winds	
Selection Option	**Point Value**
Strong winds affect maneuverability less than twice a month and are well forecasted.	1
Strong winds affect maneuverability more than twice a month but are well forecasted.	2
Strong winds affect maneuverability less than twice a month but without warning.	3
Strong winds affect maneuverability more than twice a month and without warning.	4
WRF – Tides and Currents	
Selection Option	**Point Value**
Fast tidal and seasonal currents are weak.	1
Fastest tidal and seasonal currents are moderate.	2
Fastest tidal and seasonal currents are strong but do not affect maneuverability.	3
Fastest tidal and seasonal currents are strong and affect maneuverability.	4
WRF – Visibility Restrictions	
Selection Option	**Point Value**
Restricted visibility occurs less than 24 days a year.	1
Restricted visibility occurs more than 24 days a year but usually persists less than 6 hours.	2
Restricted visibility occurs more than 24 days a year but usually persists less than 24 hours.	3
Restricted visibility occurs more than 24 days a year and usually persists more than 24 hours.	4
WRF – Bottom Type	
Selection Option	**Point Value**
Deep water throughout the waterway; no channel is needed, vessel breakdown unlikely to result in grounding or allision.	1
Soft bottom with no hard obstructions.	2
Soft bottom with some hard obstructions.	3
Hard or rocky bottom.	4

Table 1- Selection options and point values for WRFs categorized under the Waterway Risk Condition – Navigation.

Waterway Risk Condition - Vessel Quality and Operation	
WRF – Large Commercial Vessel Quality and Operation	
Selection Option	**Point Value**
All of the large commercial vessels using the waterway are materially sound and are operated proficiently.	1
Most of the large commercial vessels using the waterway are materially sound and are operated proficiently.	2
Many of the large commercial vessels using the waterway are materially sound and are operated proficiently.	3
Some of the large commercial vessels using the waterway are materially sound and are operated proficiently.	4
WRF – Small Commercial Vessel Quality and Operation	
Selection Option	**Point Value**
All of the small commercial vessels using the waterway are materially sound and are operated proficiently.	1
Most of the small commercial vessels using the waterway are materially sound and are operated proficiently.	2
Many of the small commercial vessels using the waterway are materially sound and are operated proficiently.	3
Some of the small commercial vessels using the waterway are materially sound and are operated proficiently.	4
WRF – Commercial Fishing Vessel Quality and Operation	
Selection Option	**Point Value**
All of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	1
Most of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	2
Many of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	3
Some of the commercial fishing vessels using the waterway are materially sound and are operated proficiently.	4
WRF – Recreational Vessel Quality and Operation	
Selection Option	**Point Value**
All of the recreational vessels using the waterway are materially sound and operated proficiently.	1
Most of the recreational vessels using the waterway are materially sound and operated proficiently.	2
Many of the recreational vessels using the waterway are materially sound and operated proficiently.	3
Some of the recreational vessels using the waterway are materially sound and operated proficiently.	4

Table 2- Selection options and point values for WRFs categorized under the Waterway Risk Condition – Vessel Quality and Operation.

Waterway Risk Condition - Traffic	
WRF – Volume of Commercial Traffic	
Selection Option	**Point Value**
Light commercial traffic.	1
Moderate Commercial Traffic.	2
Heavy commercial traffic but waterway infrastructure handles load easily.	3
Heavy commercial traffic and vessels regularly have to wait for berths.	4
WRF – Volume of Recreational Vessel Traffic	
Selection Option	**Point Value**
Light recreational use of the waterway.	1
Moderate recreational use of the waterway.	2
Heavy recreational use of the waterway but seasonal.	3
Heavy recreational use of the waterway year-round.	4
WRF – Waterway Use	
Selection Option	**Point Value**
Predominately a single use waterway serving one interest.	1
Multiple use waterway but no conflicts occurring.	2
Multiple use waterway and some minor conflict occurring.	3
Multiple use waterway and major conflicts occurring.	4
WRF – Congestion	
Selection Option	**Point Value**
No congestion ever occurs in the waterway.	1
Congestion only occurs in small areas for limited times.	2
Congestion occurs regularly but flow of vessel traffic is not impeded.	3
Congestion occurs regularly and flow of vessel traffic is impeded.	4

Table 3- Selection options and point values for WRFs categorized under the Waterway Risk Condition – Traffic.

Waterway Risk Condition – Waterway Condition	
WRF – Visibility Impediments	
Selection Option	**Point Value**
No visual impediments on the waterway.	1
Visibility impediments that do not impact navigation.	2
Visibility impediments that sometimes impact navigation.	3
Visibility impediments that often impact navigation.	4
WRF – Dimensions	
Selection Option	**Point Value**
No waterway constrictions.	1
Waterway constrictions (width and depth) exist but never impact navigation.	2
Waterway constrictions (width and depth) exist and sometimes impact navigation.	3
Severe waterway constrictions often impact navigation.	4
WRF – Obstructions	
Selection Option	**Point Value**
No obstructions.	1
Some obstructions not affecting navigation.	2
Obstructions sometimes affect navigation.	3
Obstructions often affect navigation.	4
WRF – Configuration	
Selection Option	**Point Value**
Current waterway configuration is adequate for navigation.	1
Current configuration is inadequate but does not pose a safety concern.	2
Current configuration poses a safety concern.	3
Current configuration poses a significant safety concern.	4

Table 4-Selection options and point values for WRFs categorized under the Waterway Risk Condition – Waterway Condition.

2. Part Two. This portion of the survey asks participants to assign an Impact Level for Immediate and Subsequent Consequences for each WRF. Definitions for terms associated with Part Two of the Survey are provided in this section.

    a. Immediate Consequences. The instantaneous impacts of a vessel casualty (i.e., what happens right after a collision, allision, or grounding). These include the following events or categories –

        i. Personnel Injuries. The maximum number of expected casualties. People can be injured, killed, or need to be rescued.

        ii. Petroleum Discharge. The largest petroleum spill in the most probable worst-case scenario.

iii. Hazardous Materials Release. The largest chemical or hazardous material spill in the most probable worst-case scenario.

iv. Mobility. The infrastructure that is critical to the Marine Transportation System within the waterway (i.e., the significant structures upon which moving people and cargo through the marine transportation system depend). The waterway can be blocked and the shoreside Marine Transportation System can be disrupted, ultimately causing greater problems moving cargo through a port—both on the water and ashore.

b. Subsequent Consequences. The longer-term effects of a marine casualty that are felt hours, days, months, and even years afterwards, such as shoreside facility shut-downs, loss of employment, destruction of fishing areas, decrease or extinction of species, degradation of subsistence living uses, and contamination of drinking or cooling water supplies. These include the following events:

i. Health and Safety. The potential consequences to the community that lives or works on or near the waterway. Risk is increased when more people live or work in close proximity to a waterway.

ii. Environmental. The risks to wetlands and endangered species and how sensitive people are to the quality of their environment. The more sensitive, the more people will expect in terms of both preparedness and response effectiveness for any marine accident that threatens environmental quality.

iii. Aquatic Resources. Water dwelling life forms harvested for commercial or recreational reasons. Timing of a marine casualty could affect the seriousness of the consequences (i.e., some species are only in the waterway at certain times of the year).

iv. Economic. The extent of the impact if a particular waterway is closed for some period.

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. Hurricane season, which spans from the end of May to the end of November, significantly impacts port operations due to unpredictable wind conditions. Hurricanes are well-forecasted by the Caribbean Coastal Ocean Observing System (CARICOOS), which mariners heavily rely upon for real-time weather data and storm predictions.

b. During hurricane season, wind conditions have a significant impact on vessel operations in the port. High winds can disrupt the schedule of large vessels, including cruise ships, which may opt to skip San Juan if wind speeds are excessively high. This decision is often made in real-time, based on immediate weather updates. Instances have been noted where high winds have caused tankers to remain in-port for extended periods of up to three days, although such prolonged disruptions are rare. While there is no published standard for wind speed thresholds to halt operations, the deciding factor rests in the judgment of the ship's captain.

c. Smaller fishing vessels, 18' to 25' in length, are particularly vulnerable to wind conditions. In the northern part of the island, winds of 20 to 25 knots can severely restrict fishing activities, allowing only 10 to 15 days of favorable conditions per month. Fishermen often must adjust their schedules to avoid peak wind periods, usually fishing during calmer early mornings or late afternoon hours.

d. Outside of hurricane season, winds are typically predictable as early morning light winds increase to prevailing easterly winds of 15 to 20 knots by mid-morning, peaking around 1400 to 1500, before gradually calming down by evening.

2. WRF - Tides and Currents.

a. Currents within the Port of San Juan contribute to the accumulation of debris within the harbor, which pose safety concerns to smaller fishing vessels. Additionally, currents combined with crosswinds can increase the risk of vessel groundings within the harbor.

b. The predictability and seasonality of tides and currents also play a role in port

operations. There are exceptionally seasonal high tides that can reach 30’ to 35’ and impact the entire northern side of the island.

c. The effects of tides and currents vary based on the type of vessel. Small vessels are more susceptible to wind and current conditions, affecting their maneuverability and safety. Larger commercial vessels are less impacted but need to coordinate passing arrangements with smaller vessels to safely navigate multi-use waterways.

3. WRF – Visibility Restrictions.

a. Heavy rain is a significantly restricts visibility in the Port of San Juan. During rain squalls, visibility is reduced dramatically to a quarter mile, or occasionally less. Intense rain events, which typically last 15-20 minutes, pose challenges to navigation. Pilots often wait for the rain to pass before proceeding with their approach.

b. A combination of fog and rain is significant when it occurs, particularly at night, but does not consistently hinder operations or port activities. Effective use of radar is valuable to captains in detecting incoming squalls, although predicting their intensity remains difficult.

c. Saharan dust storms, occurring primarily in June and July, significantly impact vessel navigation and port operations by reducing visibility from 8 nautical miles to as low as 1 or 2 nautical miles. These storms, which bring in large quantities of dust from the Sahara Desert, are well-predicted, allowing mariners time to prepare. However, their increasing frequency and intensity poses ongoing challenges. Accurate forecasting helps mariners prepare for these events, but their severity is often unpredictable and requires port partners to remain adaptable when they occur.

4. WRF – Bottom Type.

a. In San Juan, the bottom type at the harbor entrance is comprised of mud, sand, and rocks. Rocks are predominant at harbor entrance. Grounding at the harbor entrance have caused significant port disruptions. A recent grounding caused a major port closure and highlighted the critical importance of the harbor entrance. Approximately 90% of all imports to Puerto Rico pass through San Juan. A prolonged closure could result in significant economic loss for the island.

b. The primary mitigation measure for vessels entering San Juan Harbor is the requirement for pilot assistance. Pilots, with their extensive knowledge and skill, play a crucial role in navigating vessels safely into the port. Additionally, there are specific regulations for larger vessels, mandating equipment checks prior to port entry. Compliance with these regulations varies, and some vessels, particularly cruise ships, have obtained waivers to reduce the frequency of these checks.

C. Waterway Risk Condition - Vessel Quality and Operations.

1. WRF - Large Commercial Vessels.

   a. Loss of propulsion is a critical issue, especially with older vessels. This problem can arise from various factors, including air in the diesel lines during fuel transfers or insufficient maintenance. Older vessels, particularly those running at full speed for extended periods before entering ports, are more susceptible to propulsion loss. This issue underscores the importance of regular maintenance and the potential need for new regulations to address power loss in commercial vessels.

   b. The automatic AIS settings on large commercial vessels are often incorrect, which can lead to significant navigational errors. Issues such as incorrect vessel dimensions and improperly positioned antennas can cause the vessel to appear in the wrong location on electronic navigation systems. This discrepancy can pose severe risks, especially as larger vessels visit the port and reliance on electronic navigation increases.

2. WRF - Small Commercial Vessels.

   a. Concerns were raised about the quality of small commercial vessels, including charter boats. Participants noted that many operators of these vessels lack proper licensing. Instances were reported where vessels posed a risk of collision by not adhering to navigational rules. Specific mention was made of a tugboat failing to maintain proper lookout that almost caused a marine casualty.

   b. The proficiency and quality of crew members on small commercial vessels were identified as significant risk factors. Participants stated that there was a noticeable variation in compliance and proficiency among crews, particularly concerning the adherence to navigational rules and local protocols. The issue of operators not being familiar with the Rules of the Road was emphasized and was attributed to a deficiency in training and experience. Additionally, there is a shortage of credentialed mariners, leading to less stringent testing requirements and hiring of less experienced crew members, which affects the overall safety of port operations.

   c. Regulatory compliance among small commercial vessels, particularly Caribbean cargo ships, is inconsistent. These vessels often operate under different flags and may not adhere as strictly to regulations, leading to reduced levels of compliance and more frequent equipment failures. Participants noted that when these types of vessels are found to be highly deficient, they are sometimes abandoned. The aged fleet of Caribbean cargo ships, often repurposed from other vessel types, further complicates regulatory enforcement and safety management.

3. WRF - Commercial Fishing Vessels.

   a. Commercial fishing vessels typically have capacity to operate up to 30 nautical miles offshore. Compliance practices aboard commercial fishing vessels are lacking. It is logistically challenging to verify vessels meet required safety standards, such as the

availability and proper use of safety equipment like life rafts and Emergency Position Indicating Radio Beacons.

b. Compliance issues for commercial fishing vessels was partially attributed to discrepancies between local Puerto Rican and federal regulations. Participants stated that differences between local and federal regulations caused inconsistencies and operator confusion regarding safety practices and equipment requirements aboard commercial fishing vessels.

4. WRF - Recreational Vessels.

a. There is often no requirement for certification or proof of navigation training for individuals renting recreational vessels. In many areas, individuals can rent boats with basic identification and a payment method. There is no requirement to demonstrate navigational competence or completion of a boating safety course. Lack of mandatory training results in a high number of inexperienced operators on the water.

b. The influx of rental vessels, particularly in popular tourist areas, significantly contributes to the congestion and complexity of waterway navigation. Rental vessels, operated by inexperienced tourists, are often found obstructing navigation paths, entering restricted zones, and causing disruptions for other waterway users. Jet ski rentals are frequently seen in prohibited areas and posing challenges for law enforcement and other maritime operations.

D. Waterway Risk Condition - Traffic.

1. WRF - Volume of Commercial Traffic.

a. The volume of commercial traffic is impacted by inadequate training and equipment available to San Juan Port Control staff. This results in a lack of synchronization with the San Juan Bay pilots, leading to inefficiencies and miscommunications regarding vessel movements. The absence of advanced AIS equipment and proper surveillance tools hampers the effective flow of vessel traffic, highlighting San Juan Port Control's need for better observational equipment and training for staff.

b. Effective management of commercial vessel traffic is further hindered by the lack of a comprehensive vessel traffic system (VTS) in the port. Unlike other ports where tower control is equipped with cameras and advanced monitoring equipment, the local port control lacks such infrastructure. This inadequacy forces reliance on basic and outdated systems that are primarily used for billing purposes rather than ensuring the safety and efficiency of vessel movements. The current system's limitations contribute to potential risks and inefficiencies in handling the commercial traffic volume.

2. WRF - Volume of Recreational Traffic.

a. Recreational vessel traffic in the San Juan area includes jet skis, boat rentals, and small sailboats. Small sailboats used for sailing schools pose navigational hazards due

to their inability to maneuver quickly, especially when larger vessels are present. Major events, such as the Christmas lights parade, significantly increase traffic volume, complicating navigation with more than 80 boats participating and coinciding with cruise ship departures. Despite effective overall organization, the lack of communication between large vessels and small boats remains a risk, necessitating enhanced protocols and better equipment such as radar, AIS, and communication devices.

b. Participants identified a need for more comprehensive training and better equipment for managing recreational traffic. Jet skis pose significant risks due to erratic behavior and limited operator knowledge, which could be mitigated by licensing requirements and increasing public safety patrols. Patrols by the Coast Guard and other agencies are limited by resource availability. More consistent presence and coordination between federal, state, and local law enforcement personnel is needed.

3. WRF - Waterway Use.

a. The increased presence of autonomous vessels, such as gliders, creates additional complexity for safe navigation in the marine transportation system. Autonomous vessels are currently restricted to specific areas, but potential proliferation of these vessels could exacerbate existing risks.

b. Managing pier space presents challenges with the growing number of cruise ship passengers. Some piers are underutilized, and seasonal high-traffic periods require meticulous scheduling to avoid congestion.

4. WRF – Congestion.

a. Participants discussed the importance of identifying choke points within the port and specifically identified the sea wall as the critical vessel traffic choke point. Congestion is generally well-managed, but near misses occasionally occur.

b. Participants emphasized the need for improved and consistent communication with the Coast Guard to maintain clear channels and ensure mariners were adhering to proper protocols. There was a reported issue of the Coast Guard not responding to radio calls and underscored the necessity for ongoing communication and coordination with port partners and mariners.

E. Waterway Risk Condition – Waterway.

1. WRF – Dimensions.

a. The port's and ongoing dredging efforts are key to maintaining navigability. The Army Corps of Engineers (USACE) actively dredges the channel to ensure adequate depth for the current volume and size of vessel traffic, but there are concerns about the port’s future ability to accommodate increasingly wide vessels.

b. San Juan is expected to become a destination for larger ships, but there are a limited number of cruise ship terminals. Infrastructure enhancements have not kept pace with annual increases in ship size. The current waterway configuration can support the complement of existing vessel traffic, but an increase in both vessel volume and size will require changes to existing port infrastructure to sustain safe and efficient port operations.

2. WRF – Obstructions.

a. Floating debris, such as tree trunks and other materials, are prevalent after heavy rainfall or hurricanes. Presence of these obstructions is typically broadcast to mariners, but the speed and efficiency of their removal varies. Past issues with sunken sailboats in the San Antonio Canal were addressed post-Hurricane Maria by the USACE and the Coast Guard. There are existing concerns in the port regarding derelict, abandoned and sunken vessels.

b. Sediment buildup, caused by riptides or excessive rain, can block navigation routes and restrict access for fishermen. The accumulation of sediment requires costly interventions by the USACE, which have not been adequately addressed since recent natural disasters including Hurricane Maria. Limited resources further complicate efforts to clear sediment. Previously available docks are now unusable due to sediment accumulation. Participants emphasized the need for better management and removal of obstructions, improved coordination between relevant authorities, and sufficient resources to address these ongoing challenges in maintaining safe and navigable waterways.

3. WRF – Configuration.

a. Lighted Buoy #1 at Graving Dock Channel should be adjusted to more accurately mark the channel's navigable depth.

b. During dredging operations in Army Terminal Channel, Federal Aids to Navigation (ATON) are often temporarily removed from the channel and cause confusion to mariners.

c. There were discussions about the challenges posed by anchorage areas, particularly in the central channel near the entrance of El Morro. Vessels anchored in this area without proper lighting create hazards for other traffic. Specific concerns were raised about the designated anchorage area near Pan American Pier, where the presence of anchored vessels complicates docking for large cruise ships. This has led to conflicts and the need for potential rule changes to address the issue.

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 a chartlet reflecting the location and specific context of each comment. The chartlet is included below with corresponding comments at the end of this appendix.

Geospatial Comments	
Point	**Comment**
1	Strong winds at the entrance to the harbor significantly impact large commercial vessels with large sail areas, such as container vessels and cruise ships.
2	At the entrance of San Juan Bay, the sea state during hurricane season, can cause swells up to 20 feet. During this period, the CARICOOS weather application is essential for obtaining daily weather reports.
3	Due to the potential for high winds at the entrance of San Juan Bay, the CARICOOS weather application is essential for determining the feasibility of navigation each day.
4	Additional pier space is required. It is necessary to maximize the utilization of the current pier space and continue expansion efforts to accommodate the projected increase in large commercial vessel traffic.
5	The placement of Anchorage D should be reevaluated due to its impact on commercial traffic at nearby piers.
6	The western limits of Anchorage D extend to the Pan-American cruise ship pier (PADE) and Pier 14. This presents a challenge to vessels docking at those piers.
7	During periods of heavy rainfall, large debris from rivers and creeks can enter the bay, and pose a significant navigational safety concern. Debris can sometimes be found throughout the bay, moving with the wind and current.
8	In the port of Cataño, there is an urgent need to remove accumulated sediment and a large tree. The dock is occasionally utilized by emergency medical rescue teams and firefighters during municipal activities or emergencies.
9	Periods of heavy rainfall result in a significant influx of debris into the bay which can delay marine traffic and, at times, necessitate the cancellation of operations or vessel movements.
10	A sizable metal platform in close proximity to the Puma Energy Pier is a potential hazard and warrants removal.

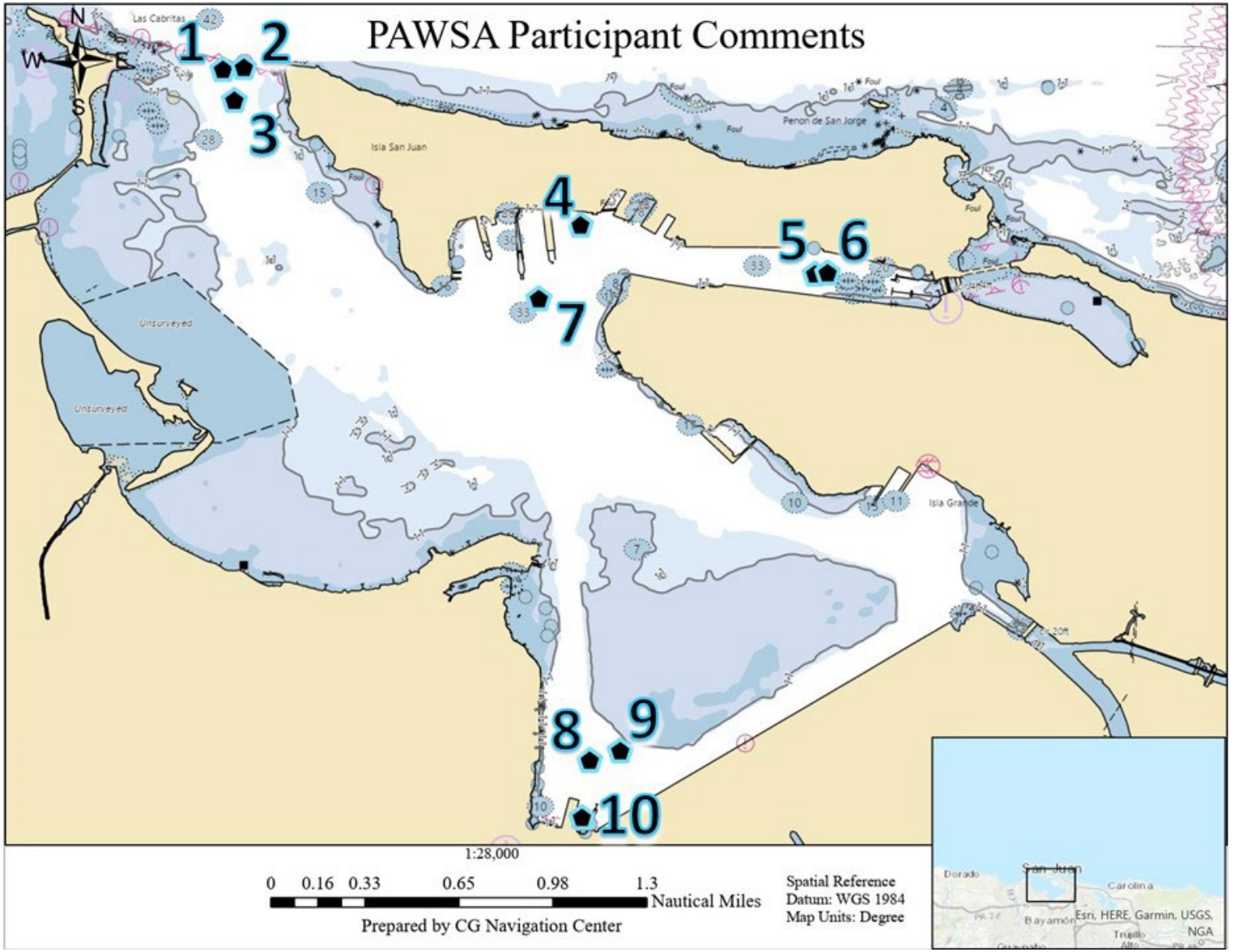

Figure 1- Mapped location of geospatial comments.