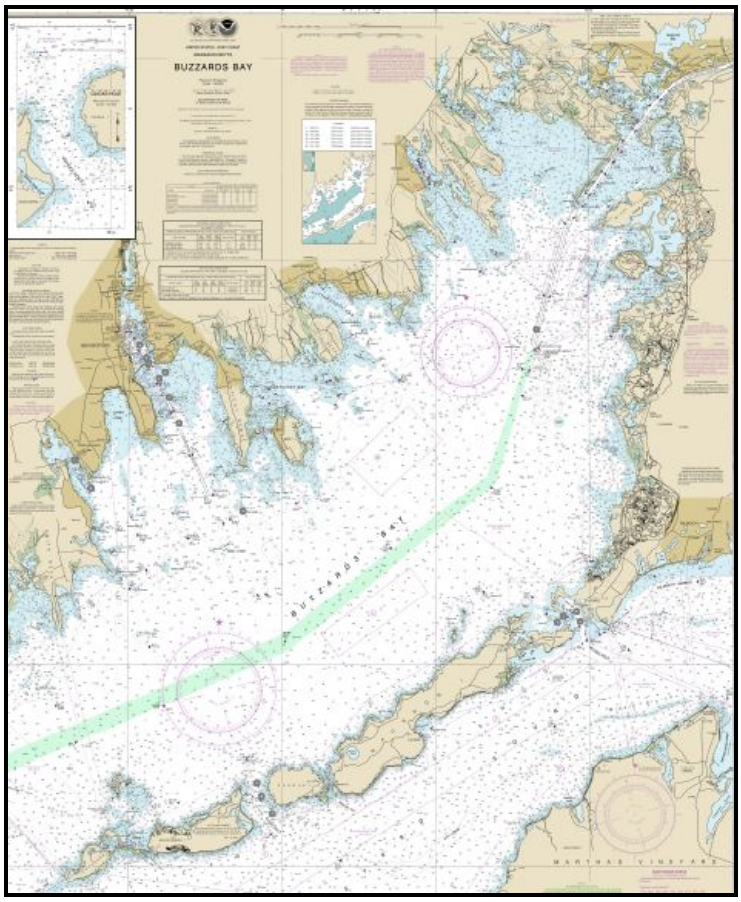
Ports and Waterways Safety Assessment

Workshop Report

Buzzards Bay, Massachusetts



United States Coast Guard
Marine Transportation Systems Directorate

Providing Navigation Safety Information
for America's Waterways Users

Table of Contents

Page

Background and Purpose

The United States Coast Guard (USCG), Marine Transportation Systems Directorate, is responsible for developing and implementing policies and procedures that facilitate commerce, improve safety and efficiency, and inspire dialogue with ports and waterway users with the goal of making waterways as safe, efficient, and commercially viable as possible.

Through the 1997 Coast Guard Appropriations Act, the Coast Guard was directed to establish a process to identify minimum user requirements for new Vessel Traffic Service (VTS) systems in consultation with local officials, waterway users and port authorities, and also to review private / public partnership opportunities in VTS operations. The Coast Guard convened a National Dialogue Group (NDG) comprised of maritime and waterway community stakeholders to identify the needs of waterway users with respect to Vessel Traffic Management (VTM) and VTS systems. The NDG was intended to provide the foundation for the development of an approach to VTM that would meet the shared government, industry, and public objective of ensuring the safety of vessel traffic in U.S. ports and waterways, in a technologically sound and cost effective way.

From the NDG came the development of the ***Ports and Waterways Safety Assessment (PAWSA) Waterway Risk Model,*** and the ***PAWSA workshop process***. PAWSA is a disciplined approach designed to identify major waterway safety hazards, estimate risk levels, evaluate potential mitigation measures, and set the stage for the implementation of selected risk reduction strategies. The process involves convening a select group of waterway users and stakeholders and facilitating a structured workshop agenda to meet the risk assessment objectives. A successful workshop requires the participation of professional waterway users with local expertise in navigation, waterway conditions, and port safety. In addition, stakeholders are included in the process to ensure that important environmental, public safety, and economic consequences are given appropriate attention as risk interventions are identified and evaluated.

The long-term goals of the PAWSA process are to:

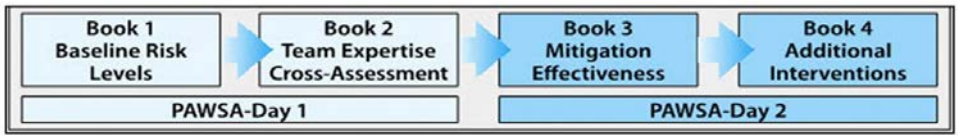
1) Provide input when planning for projects to improve the safety of navigation,
2) Further the Marine Transportation System (MTS) goals of improved coordination and cooperation between government and the private sector, and involving stakeholders in decisions affecting them,
3) Foster development and/or strengthen the roles of Harbor Safety Committees within each port, and
4) Support and reinforce the role of Coast Guard Sector Commanders/Captains of the Port (COTP) in promoting waterway and vessel traffic management activities within their geographic areas of responsibility.

59 ports/waterways have been assessed or reassessed using the PAWSA process. The risk assessment process represents a significant part of joint public-private sector planning for mitigating risk in waterways. When applied consistently and uniformly in a number of waterways, the process is expected to provide a basis for making best value decisions for risk mitigation investments, both on the local and national level. The goal is to find solutions that are cost effective and meet the needs of waterway users and stakeholders.

PAWSA Waterway Risk Model and Workshop process

The PAWSA Waterway Risk Model includes variables dealing with both the causes of waterway casualties and their consequences. In the Waterway Risk Model, risk is defined as a function of the probability of a casualty and its consequences. The diagram below shows the six general risk categories, and corresponding risk factors, that make up the Waterway Risk Model.

Waterway Risk Model					
Vessel Conditions	**Traffic Conditions**	**Navigational Conditions**	**Waterway Conditions**	**Immediate Consequences**	**Subsequent Consequences**
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic



- ***Vessel Conditions*** – The quality of vessels and their crews that operate on a waterway.
- ***Traffic Conditions*** – The number of vessels that use a waterway and how they interact with each other.
- ***Navigational Conditions*** – The environmental conditions that vessels must deal with in a waterway.
- ***Waterway Conditions –*** The physical properties of the waterway that affects vessel maneuverability.
- ***Immediate Consequences*** – The instantaneous impacts to the port as a result of a vessel casualty.
- ***Subsequent Consequences*** – The longer-term impacts felt days, months, and even years afterwards.

Workshop activities include a series of discussions about the port/waterway attributes and the vessels that use the waterway, followed by completion of work books to establish baseline risk levels, evaluate the effectiveness of existing risk mitigations, and identify additional risk intervention strategies to further reduce risk in the port / waterway. Work book 1 is used to numerically evaluate the baseline risk levels using pre-defined qualitative risk descriptions for pre-defined risk factors. Work book 2 is used to assess the expertise of participants with respect to the risk categories in the model. Those expertise assessments are used to weight inputs obtained during the other steps in the workshop process. Work book 3 is used to evaluate how effective the existing mitigation strategies are at reducing risks, and to determine if the risks are well balanced or not. For those risk factors where risk is judged to be not well balanced by existing mitigations, participants use work book 4 to identify additional risk intervention strategies and then evaluate how effective those new strategies could be at reducing risks.

Buzzards Bay PAWSA Workshop

A PAWSA workshop to assess navigation safety on Buzzards Bay was held in Wareham, Massachusetts on 7-8 February, 2018. The workshop was attended by 29 participants representing waterway users, stakeholders, environmental interest groups, and Federal, State and local regulatory authorities. The sponsor of the workshop was Coast Guard Sector Southeastern New England.

The purpose of the workshop was to bring waterway users, stakeholders and members of the Buzzards Bay maritime community together for collaborative discussions regarding the quality of vessels and their crews that operate on the waterway; the volume of commercial, non-commercial and recreational small craft vessel traffic using the waterway, navigational and waterway conditions that mariners encounter when transiting the assessment area, and the potential environmental impacts that could result from a marine casualty or incident on the waterway.

Over the two day workshop the participants discussed and then numerically evaluated each of the 24 risk factors in the PAWSA model. Baseline risk levels were first evaluated using pre-defined qualitative risk descriptions for each risk factor. Participants then discussed existing risk mitigation strategies, evaluated how effective those mitigation strategies were at reducing risk, and then determined if the risks were well balanced.

For the following 12 risk factors there was consensus (defined as 2/3 of the workshop participant teams being in agreement) that risks were well balanced by existing mitigations.

Risk Factor	Risk Level with Existing Mitigations
Bottom Type	8.2
Configuration	8.1
Visibility Impediments	6.7
Mobility	6.7
Dimensions	6.6
Personnel Injuries	5.9
Obstructions	5.7
Visibility Restrictions	5.6
Winds	5.3
Volume of Commercial Traffic	5.0
Shallow Draft Vessel Quality	5.0
Deep Draft Vessel Quality	3.0

For one risk factor (Congestion - 6.5) there was no consensus that this risk factor was well balanced or not balanced by existing mitigations.

For the remaining 11 risk factors there was ***consensus that risks were NOT well balanced*** by existing mitigations. For these risk factors the participants engaged in further discussions to identify additional risk mitigation strategies, and then evaluated how effective those new strategies could be at reducing risk. Due to workshop time constraints, only 8 of the 11 risk factors (that were not well balanced by existing mitigations) were evaluated using book 4.

The following shows the results of the book 4 evaluations:

Risk Factor	Risk Level with Existing Mitigations	Risk Level with Proposed Mitigations
Aquatic Resources	8.7	8.4
Environmental	8.4	8.1
Petroleum Discharge	8.6	7.4
Water Movement	7.6	7.3
Commercial Fishing Vessel Quality	8.5	7.3
Health and Safety	8.1	6.5
Economic	6.7	6.4
Hazardous Materials Release	6.0	5.6
Small Craft Quality	9.0	Not Evaluated
Traffic Mix	7.6	Not Evaluated
Volume of Small Craft Traffic	5.9	Not Evaluated

The results of the book 4 evaluations showed that the most chosen general risk mitigation strategies to further reduce risk were to improve long-range and/or contingency planning, better coordinate activities and improve dialogue between waterway users and stakeholders; improve Notice to Mariners, navigational charts, Coast Pilots, Light Lists, Automatic Identification System (AIS), tides and current tables, weather sensors, and weather broadcasting; and establish and/or refine rules, regulations, policies, and procedures including navigation rules, pilotage rules, standard operating procedures, crew member licensing, and required training and education.

The following shows the most chosen mitigation strategies for the eight risk factors evaluated.

Risk Factor	Mitigation Strategy
Aquatic Resources	Coordination and Planning
Environmental	Coordination and Planning
Petroleum Discharge	Navigation and Hydrographic Information
Water Movement	Navigation and Hydrographic Information
Commercial Fishing Vessel Quality	Rules and Procedures
Health and Safety	Coordination and Planning
Economic	Coordination and Planning
Hazardous Materials Release	Coordination and Planning

The results of the baseline risk levels, existing risk mitigations, additional risk intervention strategies, and a representative summary of participant comments and observations are outlined in this report. Nautical charts were displayed of the assessment area for reference and to annotate geographic locations associated with participant comments and observations; excerpts from the annotated charts are included as an appendix to this report.

The primary goal of a PAWSA workshop is to further the Marine Transportation System objective of improved coordination and cooperation between government and the private sector. A PAWSA workshop is also intended to involve stakeholders in decisions affecting them, and provide the Coast Guard and members of the waterway community with an effective tool to evaluate risk and work toward long term solutions tailored to local circumstances. In support of these goals, this report should be viewed as a starting point for continued dialogue within the Buzzards Bay maritime community.

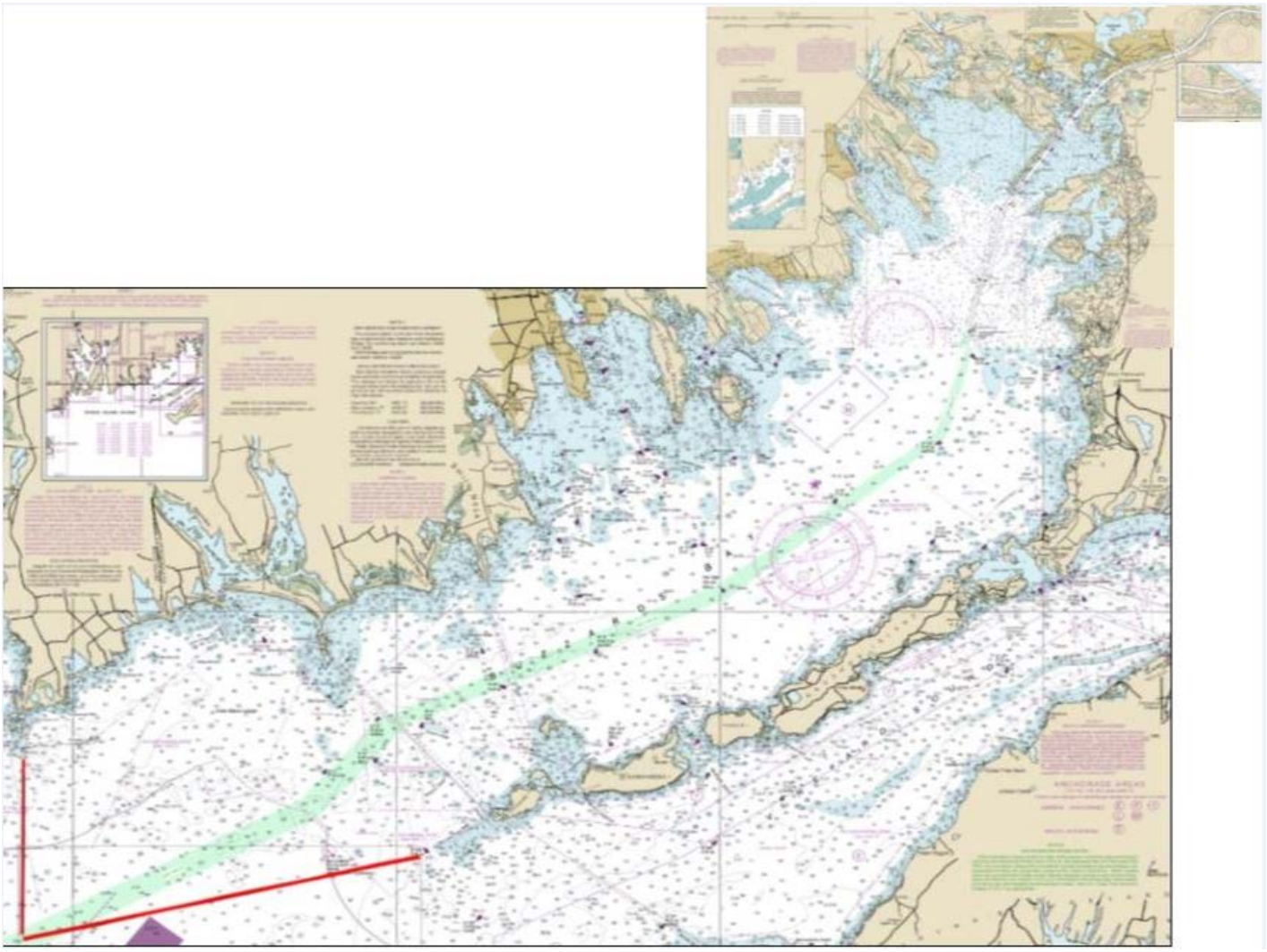
The Coast Guard will use this PAWSA report, together with other information, to determine whether, and to what extent, regulatory or other actions are needed to address navigation safety risk. Any other substantive rulemaking effort associated with Buzzards Bay will follow Coast Guard public notice and comment rulemaking procedures to allow for public participation in the process.

The United States Coast Guard, Marine Transportation Systems Directorate, extends a sincere appreciation to the workshop participants for their contributions to the Buzzards Bay PAWSA workshop. Their expertise was critical to the success of the workshop, and their recommendations will greatly assist the Coast Guard as it continues to work with Buzzards Bay stakeholders and the Commonwealth of Massachusetts to further improve safe and efficient navigation in Buzzards Bay.

Section 1: Buzzards Bay PAWSA - Assessment Area

The geographic bounds of the waterway assessment area included all waters bounded by a line from Sakonnet Point, Rhode Island southward to the north end of the Buzzards Bay traffic separation zone, to the southwestern tip of Cuttyhunk Island, Massachusetts thence through Buzzards Bay to the eastern entrance of the Cape Cod Canal. Woods Hole Passage and Quicks Hole were also included.

Nautical charts referenced and displayed were 13218, 13230 and 13236.



Section 2: Baseline Risk Levels

The first step in the Buzzards Bay PAWSA workshop was the completion of work book 1 to determine a baseline risk level value for each risk factor in the Waterway Risk Model. To establish the baseline risk levels, participants discussed each of the 24 applicable factors in the Waterway Risk Mode and selected a qualitative description for each risk factor that best described the conditions in the assessment area. These qualitative descriptions were converted to discrete values using numerical scales that were developed during earlier PAWSA workshops. What results is the risk level for each risk factor, not taking into account any actions already implemented to reduce risk in the waterway.

On those scales, 1.0 represents low risk (best case) and 9.0 represents high risk (worst case), with 5.0 being the mid-risk value. Risk values highlighted in red (values at or above 7.7) denote very high baseline risk levels; risk values highlighted in green (values at or below 2.3) denote very low baseline risk levels.

The table below shows the baseline risk level values for all risk factors as determined by the workshop participants.

Baseline Risk Levels					
Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
2.8	5.0	4.5	7.3	6.5	9.0
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
4.8	5.8	7.4	6.7	8.8	8.4
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
8.8	8.2	5.3	8.6	3.6	8.6
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
9.0	6.5	6.1	9.0	7.3	6.1

Section 3: Team Expertise Cross-assessment

The second step in the Buzzards Bay PAWSA workshop was the completion of a team expertise cross-assessment (book 2.) The team expertise cross-assessment was conducted early in the workshop process and was used to weigh the relative strengths of each team with respect to the six risk categories. The results of the team expertise cross-assessments were used to weight the inputs that each team provided in the other workbooks completed during the workshop.

After being presented with the concepts underlying the model, each participant team was asked to discuss (among themselves) how their background and experience aligns with the model. They then verbally presented their self-assessments to the other teams. These presentations gave all teams a sense of where everyone thought they were strong – or perhaps not so strong. After all teams had spoken, each team then evaluated whether they were in the top, middle, or lower third of all teams present with respect to knowledge and expertise in the six risk category areas.

The participants assessed their own and all the other participant teams' level of expertise for each of the six categories in the Waterway Risk Model.

The table below breaks down the participants' expertise for each risk category.

Team Expertise -- Distribution

Risk Category	Top 1/3	Mid 1/3	Lower 1/3
Vessel Conditions	33%	49%	19%
Traffic Conditions	22%	56%	21%
Navigational Conditions	46%	43%	11%
Waterway Conditions	51%	40%	8%
Immediate Consequences	46%	31%	23%
Subsequent Consequences	34%	30%	36%
All Categories Average	39%	42%	20%

Note: The table above breaks down the participants' expertise distribution for each risk category. The "ideal" split is an even distribution (33%) between the three expertise levels. Percentages highlighted in yellow indicate a value that is either 50% higher or 50% lower from the ideal (33%) distribution mix. Values at or above 50%, and values at or below 16%, fall into this category.

Section 4: Existing Risk Mitigations

The third step in the Buzzards Bay PAWSA workshop was for participants to evaluate the effectiveness of existing mitigation strategies in reducing the risk level for each risk factor. Book 3 is used for two purposes. After the participants describe the risk mitigation strategies that already exist to help reduce the risk level for their waterway, book 3 is used to evaluate the effectiveness of those strategies in reducing the risk level for each factor in the model. What results from that evaluation is the present risk level, taking into account those existing mitigations. Second, the participants decide whether the risk mitigation strategies already in place adequately balance the resulting risk level. If, for any given risk factor, there is consensus among the participants that existing mitigations do adequately deal with those risks, then that risk factor is dropped from further discussion.

For risk factors show in green there was consensus that risks were well balanced by existing mitigations.

For risk factors shown in red (Rising/No) there was consensus that risks were not balanced by existing mitigations.

For risk factors shown in yellow there was no consensus that risks were well balanced by existing mitigations.

Consensus is defined as 2/3 of the workshop participant teams in agreement.

Mitigation Effectiveness												
Vessel Conditions		Traffic Conditions		Navigational Conditions		Waterway Conditions		Immediate Consequences		Subsequent Consequences	
Deep Draft Vessel Quality		Volume of Commercial Traffic		Winds		Visibility Impediments		Personnel Injuries		Health and Safety	
2.8	3.0	5.0	5.0	4.5	5.3	7.3	6.7	6.5	5.9	9.0	8.1
Balanced		Balanced		Balanced		Balanced		Balanced		NO	
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental	
4.8	5.0	5.8	5.9	7.4	7.6	6.7	6.6	8.8	8.6	8.4	8.7
Balanced		Rising		Rising		Balanced		NO		Rising	
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources	
8.8	8.5	8.2	7.6	5.3	5.6	8.6	8.2	3.6	6.0	8.6	8.7
NO		NO		Balanced		Balanced		NO		NO	
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic	
9.0	9.0	6.5	6.5	6.1	5.7	9.0	8.1	7.3	6.7	6.1	6.7
NO		Maybe		Balanced		Balanced		Balanced		NO	

Risk Factor	
Book 1 Score	Book 2 Score
Consensus Reached?	

	EXPLANATION
Book 1 Score	Level of risk - not taking into account existing mitigations
Book 3 Score	Level of risk - taking into account existing mitigations
Balanced	Consensus that risks are well balanced by existing mitigations
Maybe	No consensus that risks are well balanced by existing mitigations
Rising / NO	Consensus that existing mitigations DO NOT adequately balance risk

Section 5: Additional Risk Intervention Strategies

The last step in the workshop process was to complete book 4 wherein workshop participants offer ideas for additional mitigation strategies. Participants suggested additional risk intervention strategies to further reduce risk, and then evaluated how successfully a proposed strategy could be at lowering risk levels.

Additional mitigation strategies were discussed for those risk factors where there was consensus that risks were not adequately balanced by existing mitigation (Rising/No) from the book 3 evaluation. Due to workshop time limitations the risk factors of Small Craft Quality, Volume of Small Craft Traffic, Traffic Mix and Congestion were not included in the book 4 evaluation/discussion process.

The table below shows the expected level of risk if taking the actions recommended by the participants.

Additional Interventions					
Vessel Conditions	**Traffic Conditions**	**Navigational Conditions**	**Waterway Conditions**	**Immediate Consequences**	**Subsequent Consequences**
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Balanced	Balanced	Balanced	Balanced	Balanced	Coordination / Planning 6.5
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Balanced	(Book 4 not completed)	Nav / Hydro Info 7.3	Balanced	Nav / Hydro Info 7.4	Coordination / Planning 8.1
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Rules & Procedures 7.3	(Book 4 not completed)	Balanced	Balanced	Coordination / Planning 5.6	Coordination / Planning 8.4
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
(Book 4 not completed)	(Book 4 not completed)	Balanced	Balanced	Balanced	Coordination / Planning 6.4

Risk Factor	
Intervention Category	
Risk Improvement	

	EXPLANATION
Intervention Category	Intervention category that most participants selected to further reduce risks
Risk Improvement	The expected level of risk that would be obtained if new mitigations measures were implemented
CAUTION - NO CENSUS ALERT	When Caution is displayed, an intervention strategy other than the one displayed was judged to provide more risk reduction that the one displayed. This is an indicator that the teams were divided in their opinions about what actions should be taken to further reduce risks for that factor. It indicates there is possibility more than "one" best mitigation measure to achieve further risk reduction.

Coordination/Planning: Improve long-range and/or contingency planning, better coordinate activities and improve dialogue between waterway users and stakeholders.

Nav/Hydro Information: Improve Notice to Mariners, navigational charts, Coast Pilots, Light Lists, Automatic Identification System (AIS), tides and current tables, weather sensors, and weather broadcasting

***Rules & Procedures*:** Establish and/or refine rules, regulations, policies, and procedures including navigation rules, pilotage rules, standard operating procedures, crew member licensing, and required training and education.

Appendix A

Participants

Paul DiGiovanni	Reinauer Transportation
Gary Oliveira	McAllister Towing
Michael Power	Boston Tug and Towing
Sean Bogus	Northeast Marine Pilots
Mark Foley	Cape Cod Canal Pilots
Charles Gifford	Nantucket Steamship Authority
Pat Welch	M/V Seastreak (New Bedford Ferry)
Neil Churchill	Massachusetts Division of Marine Fisheries
Seth Garfield	Cuttyhunk Island Shellfish Farm
Richard Schultz	U.S. Coast Guard Sector Southeastern New England
John MacPherson	U.S. Army Corps of Engineers - Cape Cod Canal
Steven Mahoney	Massachusetts Department of Environmental Protection
Steve McKenna	Massachusetts Office of Coastal Zone Management
Patrick Moran	Massachusetts Environmental Police
Isaac Perry	Marion Harbormaster
Robert Sweet	Recreational Boater – Buzzards Bay Sail and Power Squadron
Phyllis Partridge	Recreational Boater - Beverly Yacht Club
Mark Rasmussen	Buzzards Bay Coalition
Joe Costa	Buzzards Bay National Estuary Program
Elise Decola	NUKA Research
Edward Anthes-Washburn	New Bedford Harbor Development Commission
Elizabeth Leidhold	Buzzards Bay Action Committee
Michael Gomes	Buzzards Bay Task Force
Marty McCabe	Massachusetts Pilot Commissioner, District 3 (Buzzards Bay)
Steven Lehmann	NOAA Scientific Support Coordinator
Michael Bloom	NOAA Northeast Navigation Manager
Tom Pham	Massachusetts Maritime Academy
Patrick Morkis	U.S. Coast Guard Cutter Ida Lewis
Jonathan Perry	Aquinnah Wampanoag

Observers

Todd Bailey	Bourne Department of Natural Resources
Richard Bowen	Public
Byron Black	First Coast Guard District
Deb Bryant	Coast Guard Auxiliary, U.S. Coast Guard Sector Southeastern New England
Barbie Burr	Burr Brothers Boats
Greg Clear	Public
Tim Cox	Fairhaven Shellfish Constable
Brian Fournier	McAllister Towing Portland ME
Arthur Frooks	U.S. Coast Guard Sector Southeastern New England
Arnold Geller	Coast Guard Auxiliary, U.S. Coast Guard Sector Southeastern New England
Greg Glavin	Brewer Onset Bay Marina
Alyssa Hall	NUKA Research
Jeff Hall	Kirby Offshore Marine
Daniel Hubbard	First Coast Guard District
Julie Hutcheson	Massachusetts Oil Spill Prevention & Response Program
Brian Joseph	New Bedford Assistant Harbormaster
Bill Klimm	Massachusetts Maritime Academy
Karen Kutkiewicz	First Coast Guard District
Edward LeBlanc	U.S. Coast Guard Sector Southeastern New England
Paul Locke	Assistant Commissioner, Massachusetts Department of Environmental Protection
Bob McCabe	Boston Harbor Pilot
Youngmee Moon	U.S. Coast Guard Sector Southeastern New England
Roy Nash	Nash Maritime Consulting
John O'Keefe	Deepwater Wind
Richard Packard	Nuka Research

Korrin Petersen	Buzzards Bay Coalition
Jonathan Schafler	First Coast Guard District
Matthew Stevens	Ballentines Boat Shop
Matthew Stuck	First Coast Guard District
Brian Vahey	American Waterways Operators

Appendix B

The workshop participants are local subject matter experts and these comments capture their opinions and analysis, providing a general sense of the ideas discussed during the workshop. These comments provide various perspectives representing widely different interests and should not be construed to represent the views of or statements by the United States Coast Guard.

Participant Comments on Trends in the Port and Existing Risk Mitigations

Deep Draft Vessel Quality:

Trends/Observations:

- Close to 100% of deep drafts are in excellent condition and have qualified crews.
- Most deep draft vessels are foreign flagged. In very rare cases, language can be an issue.
- Manning requirements depend on flag state, vessel type and size.
- Wind farm development may increase the number of deep draft vessels. These vessels will likely be required to meet the same material condition as existing deep draft vessels.
- Integrated Tug/Barges (ITBs) operating on Buzzards Bay are less than 1600 gross tons.
- Articulated Tug/Barges (ATBs) operating on Buzzards Bay are greater than 1600 gross tons.
- ITBs and ATBs make up approximately 63% of tug/barge traffic.
- In general, ITBs and ATBs are in excellent shape. Oil companies demand it.
- ITBs and ATBs meet safety standards comparable to those for deep draft ships.
- Tugs and barges have fewer crewmembers than deep draft ships.

Existing Mitigations:

- USCG Port State Control vessel inspection program.
- USCG vessel inspection regulations.
- Tankers and tank barges are double hulled.
- Pilotage, tug escorts, and marine credentialing requirements.
- Escort tugs are required for vessels transporting petroleum products.

Shallow Draft Vessel Quality:

Trends/Observations:

- Smaller vessels require smaller crews.
- Traditional tug and tows (wire boats) are typically in very good condition.
- Large yachts, which are often foreign owned and registered, are in very good material condition, but the crew may not be adequately trained and qualified. The number of large yachts is increasing.
- Cargo (gasoline, rock, etc.) is transported from New Bedford across Buzzards Bay to the Elizabeth Islands and to Vineyard Sound through Quick's Hole, and to the islands of Nantucket and Martha's Vineyard through Woods Hole Passage. Some small harbor tugs with fuel barges do not have the same inspection or credentialing requirements as the larger coastal tugs/barges.
- Some vessels in this category do not meet vessel quality standards of deep draft vessels.
- Towing vessels are only required to have 1 crew member standing watch on the bridge. Towing vessel companies often elect to have 2 crew members on the bridge when transiting the assessment area.

Existing Mitigations:

- Escort tugs and pilotage requirements.
- Extensive inspection requirements, including newly implemented Subchapter M. Most of the operators in the study area have been following these strict inspection requirements before Subchapter M was implemented.
- Strict licensing and training requirements for operators including refresher training.

Commercial Fishing Vessel Quality:

Trends/Observations:

- The fishing fleet is the focus of an oil spill reduction effort related to bilge oil discharges in New Bedford Harbor.
- Not as well maintained or crewed as the shallow and deep draft vessel categories.
- Although most of the larger fishing vessels are homeported in, and only transit through the study area en route to/from offshore fishing grounds, they still introduce risk to the waterway.
- The economics of the fishing industry limit maintenance and the number of crew.

Existing Mitigations:

- US Army Corps of Engineers (USACE) Cape Cod Canal Vessel Movement Reporting System (VMRS) vessel traffic controllers report safety discrepancies to authorities.
- New Bedford Harbor has a committee dedicated to fishing vessel safety.
- All agencies have been working together and focusing on fishing vessels for the last 2 years. Activities have included educational outreach and better enforcement of existing regulations.
- Vessels participating in the Federal Fishery Observer program must meet all safety requirements.
- The assessment area has a dedicated USCG commercial fishing vessel safety inspector.
- The fishing fleet is the focus of an oil spill reduction effort related to bilge oil discharges in New Bedford harbor.

Small Craft Quality:

Trends/Observations:

- Recreational vessel quality is average.
- The recreational boating safety education system is generally inadequate.
- 90% or more of USCG's search and rescue cases involve recreational boaters. During the busy season (Memorial Day to Labor Day), search and rescue cases average 30-40 each weekend.
- All of east and northeast Buzzards Bay, including Quicks Hole, Woods Hole, and Robinsons Hole, are popular areas for recreational boaters.

Existing Mitigations:

- Massachusetts requires a boating safety class for operators from 12 to 15 years old.
- The Power Squadron offers boating safety classes and safety pamphlets.
- The USCG has a strong presence in the recreational boating community, mainly through the USCG Auxiliary, who are very active in the area and promote boating safety through outreach, education, voluntary inspections, and a recently started paddle craft (kayaks, canoes, paddle boards, etc.) safety program.

Volume of Commercial Traffic:

Trends/Observations:

- Not all commercial traffic in Buzzards Bay continues through the Cape Cod Canal. Larger fishing vessels tend to transit via Woods Hole, Quicks Hole or Robinsons Hole.

- In 2013, 10 million short tons of cargo were shipped through the Cape Cod Canal. This decreased to 6 million short tons in 2016.
- Total transits through the Cape Cod Canal: 2011: 3,000; 2012: 3895; 2013: 4813; 2014: 2856; 2015: 1600; 2016: 1836. There are approximately 13 commercial transits through Cape Cod Canal per day. Combined with non-commercial traffic, there are over 50 vessel transits of the Cape Code Canal per day.
- Commercial traffic through the Cape Cod Canal is consistent throughout the year. Gasoline is predominantly shipped the summer, and heating oil in the winter.
- Increased cruise ship traffic (20-30 ships) from September to November.
- Increased commercial traffic in/out of New Bedford from October to March.
- Commercial waterway users have not experienced delays due to traffic.
- The Cape Cod Canal infrastructure is adequate for current traffic volumes.

Existing Mitigations:

- USACE Cape Cod Canal controls commercial vessel traffic.

Volume of Small Craft Traffic:

Trends/Observations:

- Cuttyhunk Island receives approximately 5,000 boats throughout the 80-day boating season. Traffic is extremely heavy, and infrastructure isn't adequate. A fireworks event recently attracted an additional 600 people to the island.
- Very heavy recreational traffic throughout the entire assessment area, but it's seasonal.
- Traffic generally flows from the mainland to the southern islands, and often crosses the traffic lanes used by larger commercial traffic.

Existing Mitigations:

- Participants reviewed existing mitigations listed in the PAWSA guide; no additional existing mitigation were discussed.

Traffic Mix:

Trends/Observations:

- The assessment area experiences a heavy mix of recreational, fishing and commercial vessel traffic. There are close interactions between large commercial vessels and recreational/fishing vessels.

- Recreational fishing vessels routinely fish in the navigational channel.
- There are areas where large sailing regattas take place; sailboats cross commercial traffic lanes in order to reach the regatta areas.
- Participation in the Cape Cod Canal Vessel Movement Reporting System (VMRS) only applies to vessels greater than 65 feet.
- The increasing popularity of and access to paddle craft has resulted in higher paddle craft use in the area; mostly seasonal.

Existing Mitigations:

- USACE Cape Cod Canal VMRS.
- Recommended Vessel Routes have been established and are plotted on navigational charts.

Congestion:

Trends/Observations:

- Seasonal congestion, consistent with comments included in the "Volume of Commercial Traffic" category.
- As recreational fishing tends to follow tidal movement, there is more vessel traffic an hour before and after slack water.
- Most waterway users try to avoid strong currents and transit during slack water.
- Congestion increases during the recreational boating season.

Existing Mitigations:

- USACE Cape Cod Canal VMRS.

Winds:

Trends/Observations:

- Prevailing southwest winds in the summer, and prevailing northwest winds in the winter.
- Southwest winds create a long fetch on the bay.
- Winds are well forecasted, and can exceed 20 knots several times per month.
- The area is known for rapidly changing winds.
- A National Oceanic Atmospheric Administration (NOAA) Physical Oceanographic Real-Time System (PORTS) system has not been established in the area.

Existing Mitigations:

- Weather forecasts are readily available and adequate.
- Pilots have self-imposed wind restrictions. For example, they won't transit the hurricane barrier in New Bedford during high winds.

Water Movement:

Trends/Observations:

- Cape Cod Canal diurnal tidal currents are in excess of 5 knots on a daily basis. There are horsepower restrictions for various current/tide stages. Currents affect vessel maneuverability and transit times through the Canal, but vessel traffic interactions in the Canal are well managed.
- All holes in the Elizabeth Island chain experience strong currents and large standing waves.
- Most vessels transit during slack water to avoid strong currents.
- A northwest breeze and incoming tide creates challenging navigational conditions at the passages through the Elizabeth Islands
- In locations where rivers meet the Bay, river currents and opposing winds form a dangerous combination.

Existing Mitigations:

- Tide and current predictions are readily available and adequate.
- Wave buoy in Cape Cod Bay.

Visibility Restrictions:

Trends/Observations:

- Winds and tides affect fog location and duration. Fog generally lasts for less than 24 hours.
- The Elizabeth Islands can serve as a fog boundary, with fog most likely from May to June.

Existing Mitigations:

- Sound signals, which are increasingly becoming mariner activated rather than automatic.
- Army Corps may restrict vessel traffic in the Cape Cod Canal during periods of reduced visibility.

Obstructions:

Trends/Observations:

- During cold years, ice can shut down or limit operations. Ice can pull out pilings, which float away and pose a risk to navigation. The upper bay (top 1/3) and Cape Cod Canal are most affected by ice.

Existing Mitigations:

- Waterway users and the USCG communicate well when it comes to ice reporting. Industry will voluntarily cease operations if ice poses a major risk.
- Local notice to mariners and broadcast notice to mariners announce obstructions to mariners.

Visibility Impediments:

Trends/Observations:

- The hurricane barrier in New Bedford obstructs visibility. It is approximately 20 feet tall.
- There are blind bends in the Cape Cod Canal. In certain locations, and depending upon vessel bridge height, background lighting on the banks of the Cape Cod Canal may affect visibility. This is usually associated with ongoing construction operations.
- The Cape Cod Canal walkway lights help with navigation, but the candle power was recently reduced. The reduced power is only an issue during restricted visibility.
- Two small bridges in Buttermilk Bay and Dartmouth affect small vessel visibility.
- Fort Phoenix parking lot lights in New Bedford obstruct visibility.
- Background lighting generally impedes visibility along the entire Buzzards Bay shoreline.

Existing Mitigations:

- USACE Cape Cod Canal VMRS.
- New Bedford Police boats will give traffic reports near the hurricane barrier. They will block small vessel traffic to facilitate a commercial transit if necessary.

Dimensions:

Trends/Observations:

- Vessel interactions are carefully coordinated in the Cape Cod Canal due to the narrow channel (600 feet wide). There are several areas where meeting and overtaking are not allowed.
- Meeting in the New Bedford channel is discouraged and often dangerous for large vessels.
- Quicks Hole and Woods Hole are narrow, and large vessels avoid meeting.
- Cuttyhunk Island is federal harbor of refuge, but is a small and shallow harbor, with a narrow approach channel that can wash out in storms.

Existing Mitigations:

- USACE Cape Cod Canal VMRS.

- Escort tugs help large vessels make turns.

Bottom Type:

Trends/Observations:

- Numerous rocks and ledges all along the New Bedford channel.
- The assessment area is generally rocky with a hard bottom including significant reefs and ledges at the southwest entrance, e.g., Sow and Pigs and Hens and Chickens reefs.
- The only soft bottoms are near the mouths of rivers, harbors, and the Cape Cod Canal, however the Canal has hard, rocky edges.
- A number of vessels have grounded on Cleveland Ledge, which lies near the entrance to the Cape Code Canal.
- A map of vessel groundings can be found at www.buzzardsbay.org and www.northeastoceandata.org.
- All the holes along the Elizabeth Islands chain have a hard bottom.

Existing Mitigations:

- Massachusetts Coastal Zone Management has completed bottom surveys using Side Scan Sonar in approximately 80% of Buzzards Bay. They are expanding the survey work to shallower waters.
- USACE routinely surveys and dredges areas of the Cape Cod Canal, especially areas prone to shoaling.

Configuration:

Trends/Observations:

- The approach to New Bedford Harbor has sharp turns.
- Woods Hole has sharp bends.
- The entrance to Westport River has a fishhook bend and bridge.
- The Cape Cod Canal has many sharp bends.

Existing Mitigations:

- USACE Cape Cod Canal VMRS.
- Pilotage requirements and escort tugs
- Bridge-to-bridge radio call-in points.
- Commercial traffic makes regular security broadcasts to announce their location to other vessels.

Personnel Injuries:

Trends/Observations:

- There have been 3 cruise ships accidents in the assessment area: Pilgrim Bell (1985), Bermuda Star (1990), and Queen Elizabeth II (1992). There were no serious injuries.
- Local ferries and smaller cruise line vessels transit the area, but carry less than 149 people.
- Larger passenger vessels (up to 500 people) transit through the assessment area in the fall.
- There are small vessels that offer several Cape Cod Canal tours per day.
- The Massachusetts Maritime Academy training ship, which is homeported near the entrance to the Canal, can carry up to 710 people, and usually makes 2 or 3 transits per year.

Existing Mitigations:

- The Massachusetts Maritime Academy training ship takes full time doctors and nurses on its training cruise. They also complete drills with the USCG.
- The multi-agency Buzzards Bay Task Force, coordinated through Sector Southeastern New England, is a force multiplier that responds to maritime emergencies in Buzzards Bay. It has significantly improved cooperation and coordination. Since the inception of the task force, time of emergency notification to agency response assets on scene has decreased by an average of 25 minutes.
- Mariners complete emergency training and man overboard drills. They also participate in largescale exercises run by government organizations.
- Security drills also include aspects of personnel injuries.
- Escort tugs must have firefighting capabilities.

Petroleum Discharge:

Trends/Observations:

- Most tankers are capable of carrying greater than 40,000 gross dead weight tons. However, draft restrictions in the Cape Cod Canal limit cargo to less than that.
- Approximately 2-3 million tons of gasoline is shipped through the Cape Cod Canal each year.

Existing Mitigations:

- Tankers and tank barges are double-hulled.

- Pilotage requirements and escort tugs help prevent petroleum spills. Prevention is better than response. Escort tugs help if the primary vessel has a casualty. Escort tugs also have firefighting capability.
- Massachusetts provides local officials with equipment and training. Oil spill training has been completed with every Buzzards Bay community (167 first responders).
- Massachusetts Maritime Academy has an oil spill simulator, and they've added real-time current sensors in the Cape Cod Canal to improve spill modeling.
- U.S. Coast Guard has an oil spill response structure along with a spill response team (Atlantic Strike Team) located at Fort Dix, NJ, immediately deployable to Buzzards Bay.
- There are Geographic Response Plans, which are tested regularly.
- The Area Contingency Plan was updated in August 2015. A portion of the plan is exercised each year.
- Every Buzzard Bay community has a 20 foot response trailer with 1000 feet of boom. There is also 1000 feet of ocean-going boom staged at the Massachusetts Maritime Academy and in New Bedford.
- Many Oil Spill Response and Removal Organizations (OSRO) have equipment staged up and down the coast.

Hazardous Materials Release:

Trends/Observations:

- Hazardous cargos are transported through the study area. They include organic solvents, sodium hydroxide, and an occasional chlorine barge. Approximately 1 million tons of Chemicals and Related Products were shipped through the Cape Cod Canal in 2016 according to the USACE Navigation Data Center, Waterborne Commerce Statics Center. Shipment of Ethanol was discussed, however, for the purposes of the workshop discussions Ethanol was considered a petroleum product and not a hazardous materials.
- Hazardous materials are only transported on tank barges, not tank ships.
- More data is needed to determine what types of hazardous cargo are transported through the waterway and what the Hazardous Material Release risks are.

Existing Mitigations:

- Massachusetts has a hazmat response structure with a marine component.
- U.S. Coast Guard has a hazmat response structure along with a hazmat response team (Atlantic Strike Team) located at Fort Dix, NJ, immediately deployable to Buzzards Bay.

- Many Oil Spill Response and Removal Organizations (OSRO) (which include hazmat) have equipment staged up and down the coast.

Mobility:

Trends/Observations:

- The Cape Cod Canal is vulnerable to marine accidents, and the waterway has closed due to previous casualties. However, the impact was reduced by rerouting traffic around Cape Cod.
- A port closure in New Bedford would have a significant impact because there are no alternate routes. This would greatly impact the fishing industry.

Existing Mitigations:

- If a waterway is closed, vessel traffic can be rerouted.
- All parties involved with a closure communicate effectively.
- Commercial vessels have salvage plans that are approved by the USCG.
- USCG Marine Transportation System Recovery Unit, which works to reopen waterways affected by natural or manmade incidents.
- USACE Cape Cod Canal VMRS.
- Pilot requirements and escort tugs.

Health and Safety:

Trends/Observations:

- The area is densely populated, and an incident could affect more than 150,000 people.
- There are only two highway bridges and one railroad bridge for evacuating Cape Cod.
- More data is needed to determine what types of hazardous cargo is transported through the waterway and what the health and safety risks are.

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Existing Mitigations:

- Pilotage requirements and escort tugs.
- The Buzzards Bay Coalition has collected a lot of scientific data, which supports a better response.
- Response to a hazardous material release is included in the area contingency plan.

- Local responders are trained for hazardous material responses, and their capability has improved in recent years.

Environmental:

Trends/Observations:

- Buzzards Bay is designated an Estuary of National Significance. With the exception of the hurricane barrier protecting New Bedford harbor, the Buzzards Bay shoreline is natural habitat. The Buzzards Bay shoreline is important to many sensitive and threatened species.

Existing Mitigations:

- NOAA performs tactical modeling. The University of Massachusetts-Dartmouth also performs modeling.
- Shoreline preservation and restoration projects help make shorelines more resilient.
- NOAA has environmental indices that are helpful for planning responses.

Aquatic Resources:

Trends/Observations:

- There are multiple species of finfish, shellfish, and crustaceans harvested year-round.
- Aquaculture, recreational and commercial fishing is extremely important to the local economy.
- The aquaculture industry is growing.
- An oil spill could close shellfish beds for up to a year.
- Fishing vessels transit through Buzzards Bay to fish offshore.

Existing Mitigations:

- Mitigations for aquatic resources are the same as those listed in the Environmental risk factor category.

Economic:

Trends/Observations:

- An economic impact study was completed for the Port of New Bedford in 2016. Seafood contributes approximately 90% or $9.8 billion to the regional economy.

- A major oil spill would significantly impact vacation rentals, the scallop industry, and the clementine industry, which has been transporting fresh fruit into New Bedford Harbor.
- If an oil spill were to occur in Buzzards Bay, it would greatly impact Cape Cod and the surrounding islands.

Existing Mitigations:

- Aquaculture operations are very conservative with regard to closures for incidents that could affect seafood safety or quality. They will only reopen once conditions are demonstrated to be safe. They also keep great records in order to seek reimbursement following an incident.
- Commercial vessels have salvage plans and contracts.
- U.S. Coast Guard has contracts with oil spill removal organizations (OSROs) and access to Coast Guard National Strike Force for spill response.
- USCG Marine Transportation System Recovery Unit (MTSRU) monitors the economic impacts of a port closure.

Appendix C

The below is a list of additional risk mitigation strategies workshop participants identified, discussed and evaluated.. The recommended additional risk mitigation strategies listed throughout this Appendix are not ranked in any order of priority and should not be construed to represent the views of or statements by the United States Coast Guard, nor reflect a consensus of the workshop participants.

Additional Risk Mitigation Strategies

Commercial Fishing Vessel Quality:

- Establish a bilge oil reclamation/recovery facility in New Bedford Harbor.
- Create State and local regulations governing bilge oil retention and disposal on fishing vessels.
- Enhance Federal and State enforcement of bilge oil/pollution regulations.
- Increase community outreach efforts and provide educational materials to improve commercial fishing vessel owners/operators understanding of Federal and State oil pollution regulations.
- Improve dialogue and communications between commercial fishing vessel operators and other waterway users and stakeholders.
- Mandatory licensing for commercial fishing vessels operators.
- Mandatory inspections for commercial fishing vessels.
- Increase education and outreach to commercial fishing vessel operators.
- Stronger enforcement of existing Federal and state regulations.

Water Movement:

- Establish a National Oceanic Atmospheric Administration (NOAA) Physical Oceanographic Real-Time System (PORTS) system.
- Establish weather data buoys that are Automatic Identification System (AIS) capable and disseminate real-time environmental data directly to the mariner using AIS.
- Improve tide and tide current predictions and accuracy by collecting more data.
- Increase the number of real-time environmental data sensors.
- Expand the number of Aids to Navigation (ATON).
- Increased use of AIS ATON.
- Place more weather data buoys throughout the bay.
- Install a wave buoy at Buzzards Bay tower.
- Install a tide meter for the Cape Cod Canal at the Massachusetts Maritime Academy.
- Increase underwater mapping/surveying of shallow areas of the bay
- Coordinate with academia to improve tide and current modeling.

Petroleum Discharge:

- Expand the number of Geographic Response Plans.
- Improve and test Geographic Response Plans.
- Increase the number of crew members required on towing vessels. (It was noted that the new "Subchapter M" regulations that will start to be enforced in the summer of 2018 may already address this mitigation.)
- Gain Federal support of the Massachusetts Oil Spill Prevention Act (MOSPA) tug escort requirements.
- Increase equipment/resources and training for responding to an oil spill.
- Increase contingency planning and the frequency of table top drills.
- Conduct more large scale oil spill response exercises.
- Conduct routine sampling of vessel cargo and bilges.
- Increase public outreach on oil spill endpoints to better protect sensitive habitats.
- Improve data collection, coordination and sharing between Federal and State authorities.
- Improve Natural Resource Damage Assessment coordination and planning between Federal and State authorities.
- Upgrade the Cape Cod Canal Vessel Movement Reporting System (VMRS) to an active Vessel Traffic Management system with the authority to control vessel movements and ensure vessels remain in the channel.
- Record VMRS interventions and actions to provide lessons learned.
- Identify areas where vessels are deviating from established channels and determine if ships are entering areas to be avoided, compile data on "out of channel" incidents.
- Establish a National Oceanic Atmospheric Administration (NOAA) Physical Oceanographic Real-Time System (PORTS) system.
- Place more weather data buoys throughout the bay.

Hazardous Materials Release:

- Conduct a hazardous material commodity flow study.
- Increase contingency planning and the frequency of table top drills.
- Increase the number of crew members required on towing vessels.
- Establish weather data buoys that are AIS-capable and disseminate real-time environmental data directly to the mariner using AIS.

Health and Safety:

- Expand the number of Geographic Response Plans.
- Continue to improve and test Geographic Response Plans.
- Conduct a hazardous material commodity flow study
- Identify specific populations/communities that are at risk in coastal areas.
- Practice evacuation drills and complete more tabletop exercises.
- Conduct routine sampling of vessel cargo and bilges.
- Install a wave buoy at Buzzards Bay tower.
- Establish a National Oceanic Atmospheric Administration (NOAA) Physical Oceanographic Real-Time System (PORTS) system.
- Increase public outreach and education.
- Increase contingency planning and the frequency of table top drills.
- Place more weather data buoys throughout the bay.
- Upgrade the Cape Cod Canal Vessel Movement Reporting System (VMRS) to an active Vessel Traffic Management system with the authority to control vessel movements and ensure vessels remain in the channel.
- Gain Federal support of the Massachusetts Oil Spill Prevention Act (MOSPA) tug escort requirements.

Environmental:

- Improve Natural Resource Damage Assessment coordination and planning between Federal and State authorities.
- Increase public outreach and training on oil spill response strategies and endpoints.
- Improve data collection and sharing between Federal and State authorities.
- Increase training on how to place off shore oil pollution containment boom.
- Increase contingency planning and the frequency of table top drills.
- Conduct a hazardous material commodity flow study
- Expand the use of AIS to broadcast environmental data.
- Increase offensive oil spill response capabilities and oil spill containment training.
- Conduct routine sampling of vessel cargo and bilges.

- Create base line data of aquatic habitats and species to aid in pollution response operations.
- Increase the number of crew members required on towing vessels.
- Place more weather data buoys throughout the bay.
- Improve coordination between the scientific community and academic institutions.
- Prevent releases through active vessel traffic management and controls.
- Educate local officials and the public on cleanup priorities and expectations.
- Gain Federal support of the Massachusetts Oil Spill Prevention Act (MOSPA) tug escort requirements.

Aquatic Resources:

- Establish procedures for moving aquaculture products to areas unaffected by an incident.
- Place more weather data buoys throughout the bay.
- Conduct mapping of shell fish resources and their locations.
- Improved data collection and sharing between Federal and State authorities.
- Improve Natural Resource Damage Assessment coordination and planning between Federal and State authorities.
- Conduct a hazardous material commodity flow study
- Increase public outreach and training on oil spill response strategies and endpoints.
- Create base line data of aquatic habitats and species to aid in pollution response operations.
- Conduct routine sampling of vessel cargo and bilges.
- Gain Federal support of the Massachusetts Oil Spill Prevention Act (MOSPA) tug escort requirements.

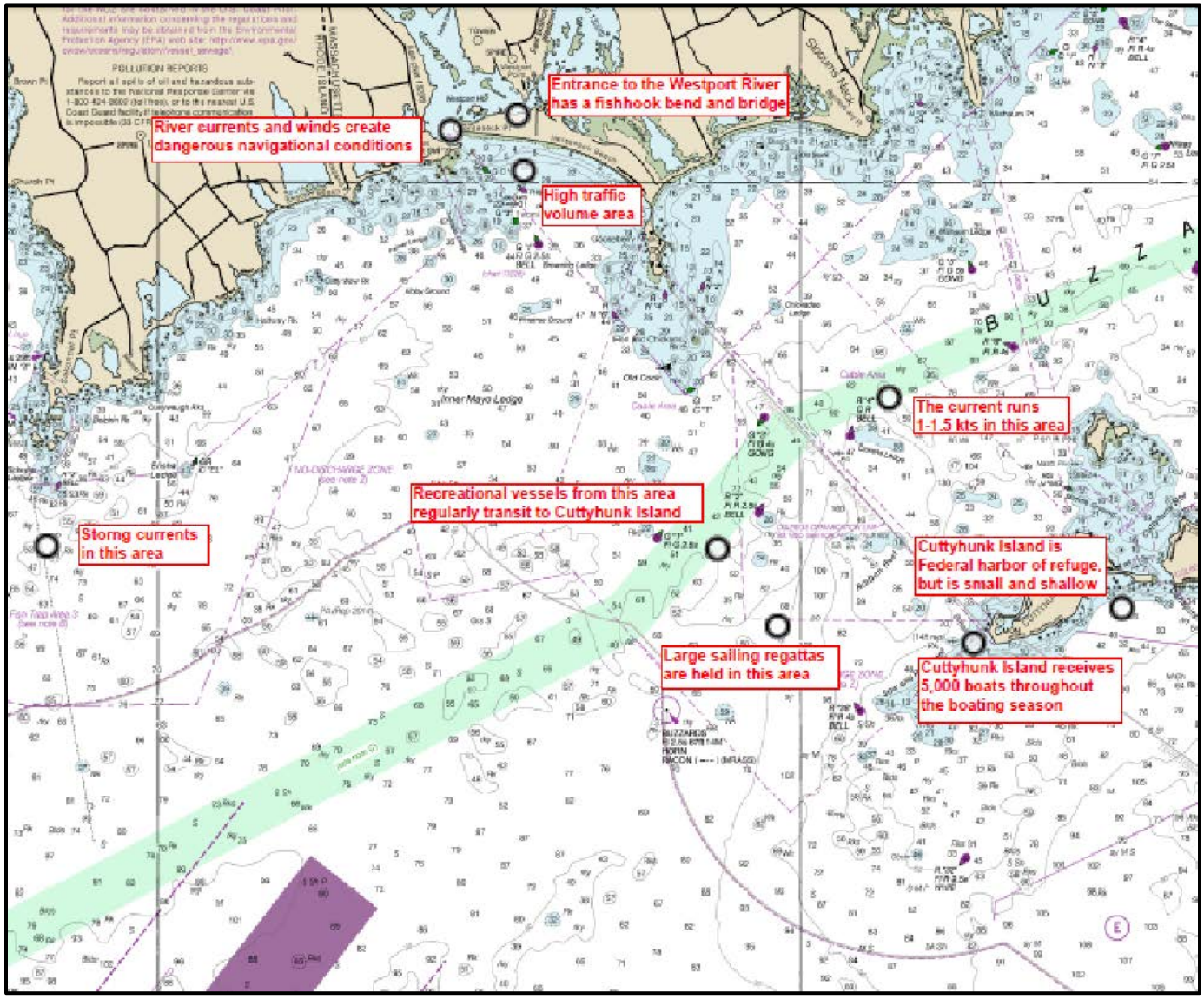
Economic:

- Develop standard procedures for closing and reopening fisheries after an oil spill.
- Prepare a post spill fisheries management plan.
- Identify areas vulnerable to spills and prepare booming strategies to block them off.
- Ensure emergency response plans are up to date and accurate.

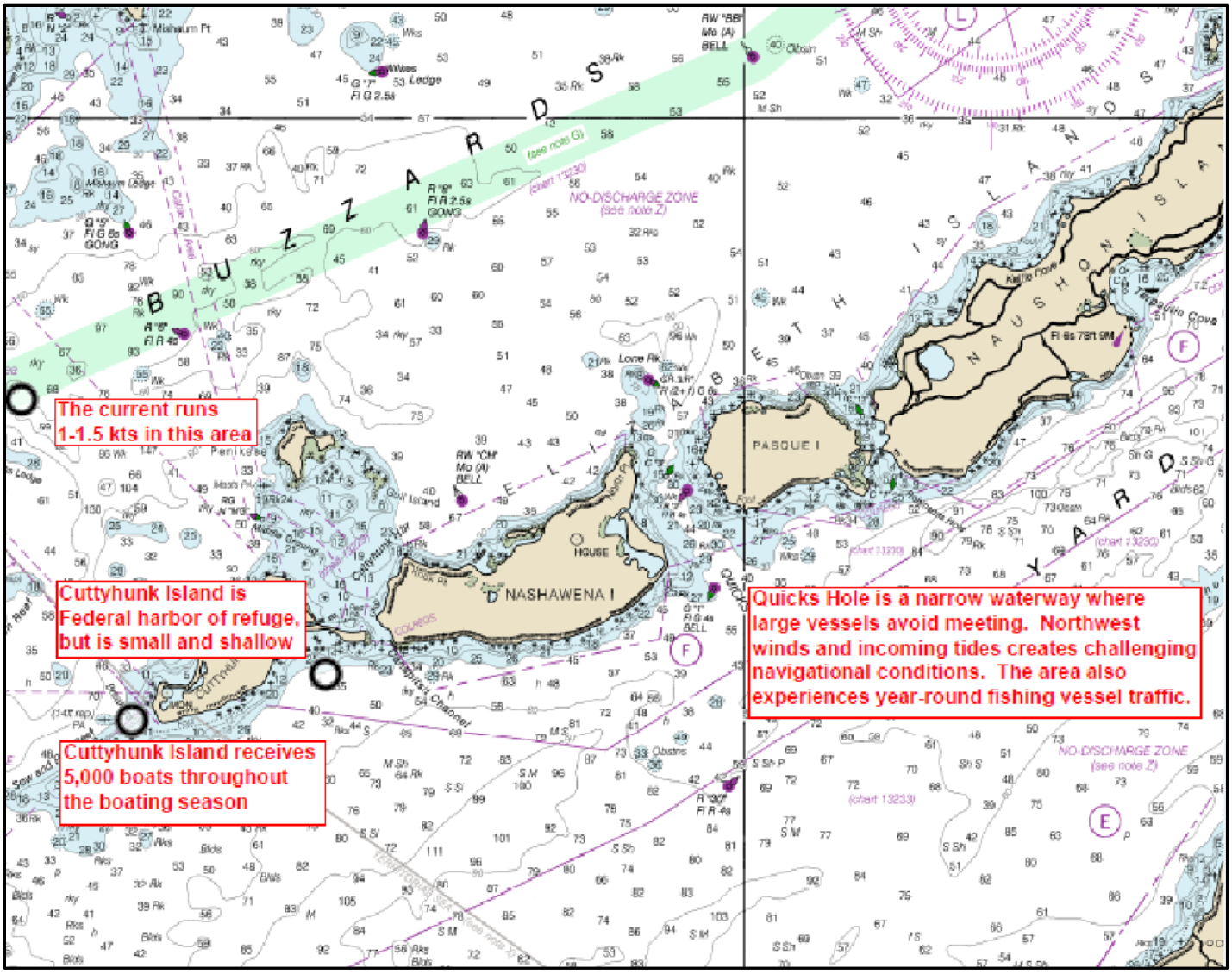
Appendix D

Navigation Charts with Participant Comments

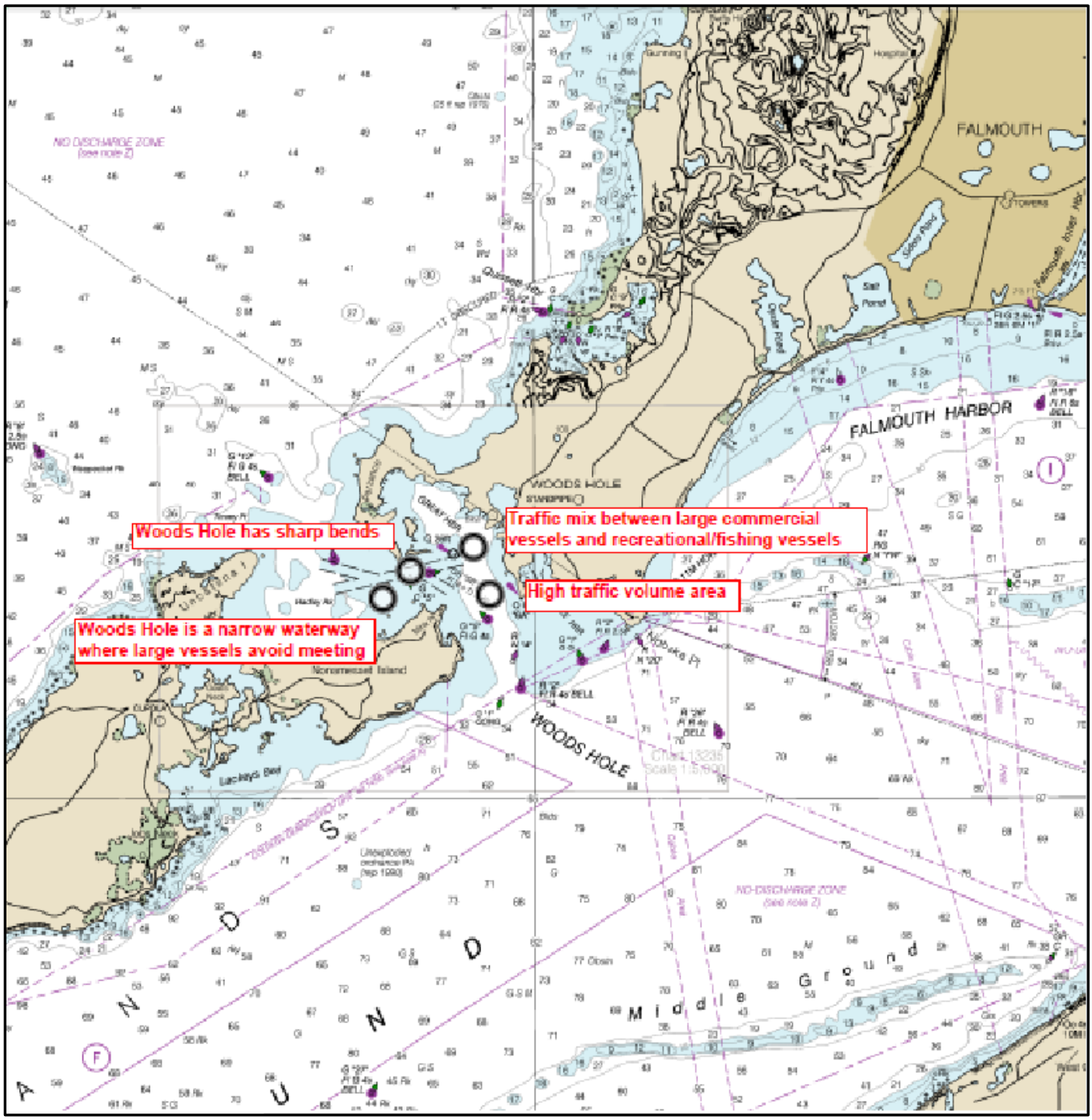
Western Entrance to Buzzards Bay – Chart 13218



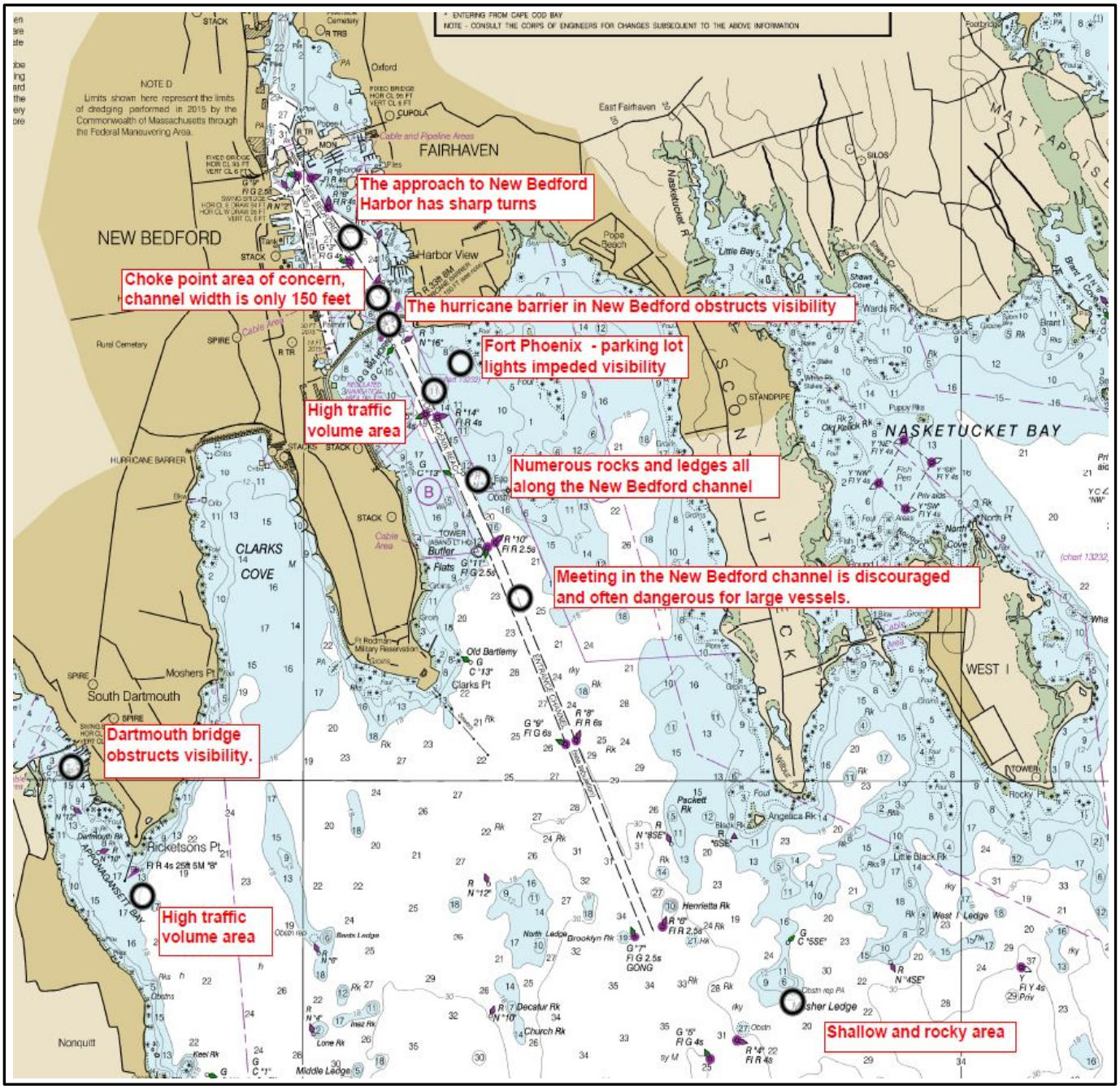
Quicks Hole - Chart 13230



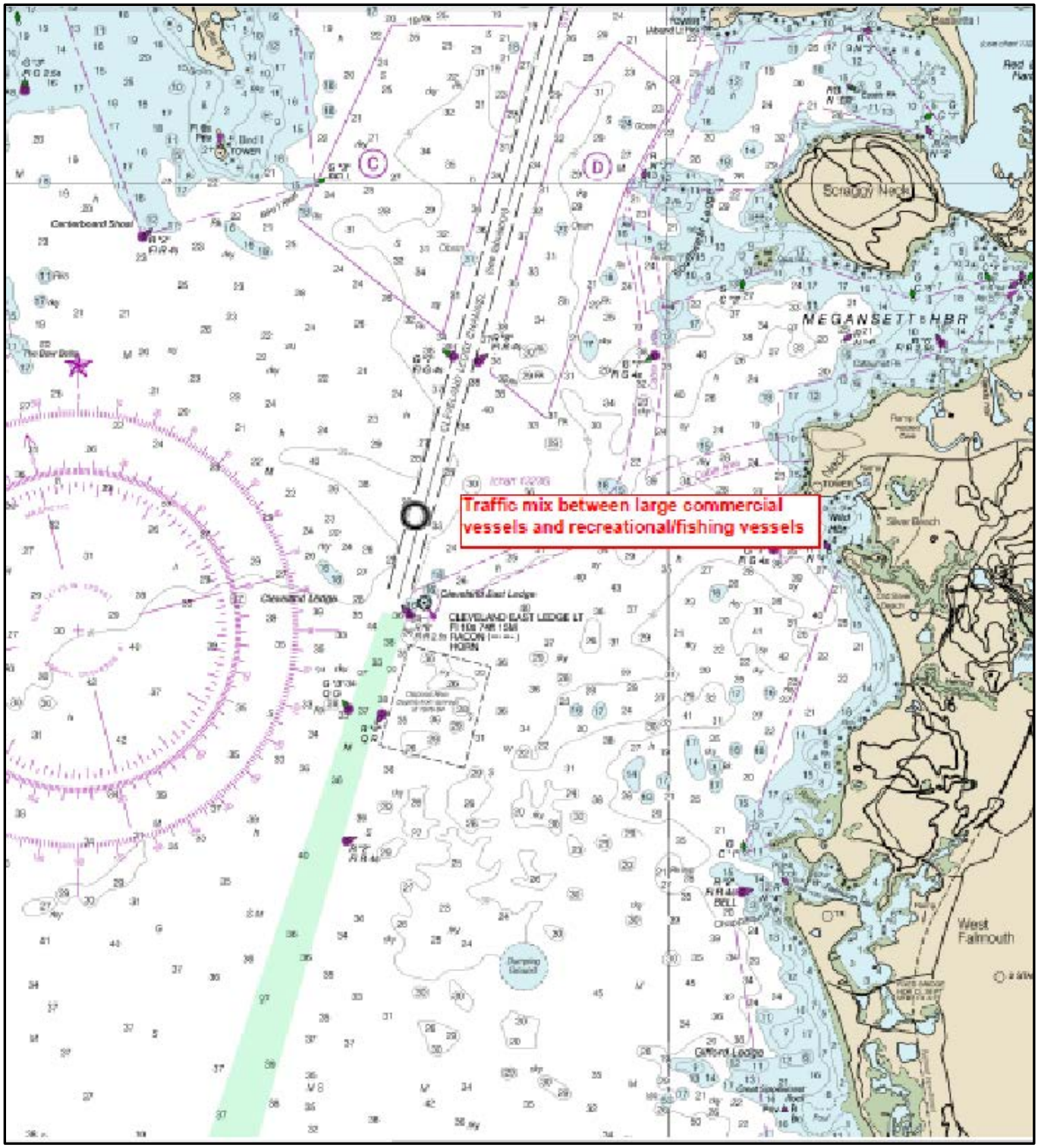
Woods Hole - Chart 13230



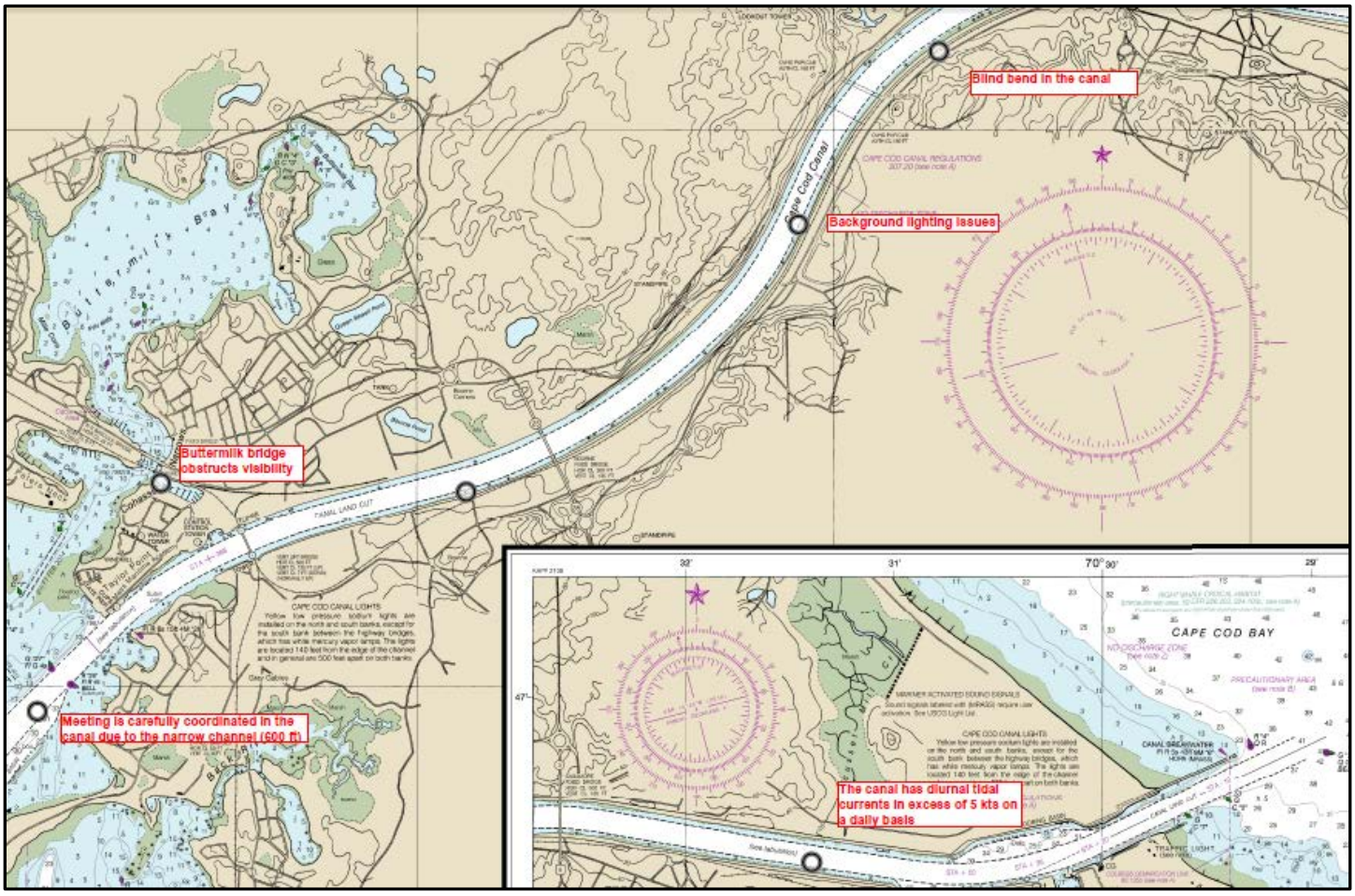
New Bedford Harbor - Chart 13230



Cleveland Ledge - Chart 13236



Cape Cod Canal - Chart 13236



Appendix E

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Appendix F

Abbreviations and Acronyms

ACP – Area Contingency Plan

AIS – Automated Identification System

ANPRM – Advance Notice to Proposed Rule Making

ATON – Aids to Navigation

BWI – Boating While Intoxicated

COTP – Captain of the Port

EPA – Environmental Protection Agency

GRP – Geographic Response Plans

GRS – Geographic Response Strategies

IMO – International Maritime Organization

MARAD – Maritime Administration

MOSPA – Massachusetts Oil Spill Prevention Act

MTS – Marine Transportation System

MTSRU – Marine Transportation System Recovery Unit

NDG – National Dialogue Group

NEPA – National Environmental Policy Act

NMFS – National Marine Fisheries Service

NOAA – National Oceanic Atmospheric Administration

OCIMF – Oil Company International Marine Forum

OSLTF – Oil Spill Liability Trust Fund

OSRO – Oil Spill Response Organization

PAWSA – Ports and Waterways Safety Assessment

PDF – Personal Flotation Device

PSC – Port State Control

PORTS - Physical Oceanographic Real-Time System

RNA – Regulated Navigation Areas

SIRE – Ship Inspection Report Program

SOLAS – Safety of Life at Sea

STCW – Standards of Training, Certification and Watchkeeping

TMSA – Tanker Management Self-Assessment

TMSS – Towing Management Safety System

USACE – United States Army Corps of Engineers

USCG - United States Coast Guard

VHF – Very High Frequency

VMRS – Vessel Movement Reporting System

VTM – Vessel Traffic Management

VTS – Vessel Traffic Service