Ports and Waterways Safety Assessment
Workshop Report
Passamaquoddy Bay, ME

Introduction

Risk identification and mitigation are and have been ongoing activities within the Passamaquoddy Bay area. As a step toward standardizing methodology, a formal Ports and Waterways Safety Assessment (PAWSA) for Passamaquoddy Bay was conducted in Bangor, ME, on 3-4 October 2006. A group of experts examined the waterway using the risk model pictured here.

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
Commerical Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic

The results of that workshop are provided in this report and include the following information:

- Geographical Area
- Numerical results for the factors above from the following activities:
  - Team Expertise
  - Risk Factor Rating Scales
  - Absolute Risk Levels
  - Present Risk Levels
  - Intervention Effectiveness
- Brief description of the process used for the assessment
- List of participants
- Planned Actions: Summary of risks and mitigations discussion
- Survey results presented in tabular form

Geographic Area:

The participants defined the geographic bounds of the waterway area to be discussed.

The transit route from sea to Eastport consists of passage through the Bay of Fundy to Head Harbor Passage and Friar Roads. Vessels calling on Bayside continue past Friar Roads and then traverse Western Passage towards Passamaquoddy Bay.

Numerical Results

Book 1 – Team Expertise

In *Book 1*, the participants were asked to assess their level of expertise compared to the other participants in the workshop for each of the six categories in the Waterway Risk Model. Overall, 41% of the participant teams placed themselves in the upper third, 34% in the middle third, and 25% in the lower third of all teams. This distribution is fairly typical because the participants were chosen for their acknowledged expertise.

Book 2 – Risk Factor Rating Scales

The purpose of *Book 2* is to produce the risk scale numbers that are used in *Book 3*. Participants calibrated intermediate points on the risk assessment scale for each risk factor.

On average, participants from this waterway calculated the intermediate risk points as 2.9 and 5.4, which are close to the national values (2.9 and 5.5) established by the prior PAWSA workshop participants from around the country.

A tabular display of the results of *Book 2* is found at the end of this report.

Book 3 – Absolute Risk Levels with no mitigations

The participants evaluated the absolute risk level in the waterway by selecting a qualitative descriptor for each risk factor that best described conditions in the Passamaquoddy Bay area. Those qualitative descriptors were converted to numerical values using the scales from the *Book 2* results.

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.

In the Passamaquoddy Bay area, 9 of the 24 risk factors were scored at or above the mid-risk value. They were (in descending order):

Risk Category	Score	Risk Category	Score
Visibility Restrictions	7.9	Configuration	7.7
Environmental	7.5	Aquatic Resources	7.5
Small Craft Quality	6.9	Commercial Fishing Vessel Quality	6.4
Water Movement	6.4	Economic	5.9

Hazardous Materials Release	5.3		

Specific hazardous locations identified. :

Only one location was identified as hazardous. It was the southern tip of Deer Island where the turn up north exceeds 45 degrees.

Book 4 – Present Risk Levels after applying existing mitigations

The participants examined all risk factors including those associated with the inclusion of LNG ships calling at proposed to be constructed LNG terminals and the effects of existing mitigations on those risks involving the construction of LNG facilities and movement of LNG ships in waterway. For 1 risk factor, the participants were in consensus that the risk was well balanced by existing mitigations. Consensus is defined as 2/3 of the participant teams being in agreement. For 21 risk factors, the participants were in consensus that new risks were NOT adequately balanced by existing mitigations. For the other 2 risk factors, there was not good consensus on whether existing mitigations adequately reduced risk.

Book 5 – Intervention Effectiveness

The participants selected those interventions that would be most effective in providing the largest risk improvement.

For 5 of the 21 risk factors needing additional risk reduction action, the most selected intervention category had the largest risk improvement.

Risk Category Selected	**Intervention Category**	**Specific Actions**
Vessel Conditions	Active Traffic Mgmt	• Provide regulations that rule vessel movement (includes VTS, designated traffic lanes, and radar requirements) • Require radar, AIS and VTS • Improve radio coverage • Have design in place to make the vessel safe • Conduct updated WAMS • Conduct inspections (U.S. and Canada) • Provide better communications (AIS, radio repeaters) • Provide designated traffic lanes • Provide VTS and AIS
Traffic Conditions	Active Traffic Mgmt	• Specify traffic lanes. Develop non meeting traffic situations. • Require designated one way traffic zones. • Provide designated holding zones • Provide VTS with enhanced radar coverage

		• Enhance radar and communications capabilities • Improve/upgrade ATON. Provide NDBC buoy
Waterway Conditions	Active Traffic Mgmt	• One way traffic zones. Establish designated no passing zones. • Conduct a WAMS. Stovers Ledge, Clarks Ledge • Provide Tugs • Provide updated hydrographic survey

For the next 4 of the 21 risk factors needing additional risk reduction action, the most selected intervention category had the largest risk improvement.

Risk Category Selected	**Intervention Category**	**Specific Actions**
Immediate Consequences	Coordination/Planning	Coordinate with Canada and locals on plans
Subsequent Consequences	Coordination/Planning (for 3 risk factors)	Coordinate with Canada and local governments on plans, training, and exercises.

Two consensus alerts occurred because there was a strong secondary intervention or there was not a strong majority for the most selected intervention. No consensus was reached, but the intervention categories possibly offering risk improvement are listed below.

- Volume of Small Craft Traffic, mitigated by Rules & procedures or
- Bottom Type, mitigated by Nav/Hydro information.

Assessment Process

The PAWSA process is a structured approach for obtaining expert judgments on the level of waterway risk. The process also addresses the effectiveness of possible intervention actions for reducing risk in the waterway. A select group of waterway users / stakeholders evaluate risk factors and the effectiveness of various intervention actions. Thus the process is a joint effort involving waterway experts and the agencies / entities responsible for implementing selected risk mitigation measures.

The PAWSA methodology employs a generic model of waterway risk that was conceptually developed by a National Dialog Group on National Needs for Vessel Traffic Services and then translated into computer algorithms by Potomac Management Group, Inc. In that model, risk is defined as the product of the probability of a casualty and its consequences. Consequently, the model includes variables associated with both the causes and the effects of waterway casualties.

The first step in the process is for the participants to assess their expertise with respect to the six risk categories in the model. Those self assessments are used to weight inputs during all subsequent steps. The second step is for the participants to provide input for the rating scales used to assess risk. The third step is to discuss and then numerically evaluate the absolute risk levels in the waterway using pre-defined qualitative risk descriptors. In the fourth step, the participants discuss and then evaluate the effectiveness of existing mitigation strategies in

reducing risk. Next, the participants are asked to offer new ideas for further reducing risk, for those factors where risk is not well balanced with existing mitigations. Finally, the effectiveness of various intervention actions in reducing unmitigated risk is evaluated.

The process produces the group's consensus of risks in this waterway and is an excellent tool for focusing risk mitigation efforts. However, risk factors evaluated as being adequately balanced may still be worthy of additional risk mitigation actions. Any reasonable steps for minimizing or preventing the impacts of marine accidents should be encouraged for the benefit of the waterway community.

Participants

The following is the list of waterway users and stakeholders who participated in the process:

Participants	Organization	Phone	Email
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Planned Actions

The catalog of risks and possible mitigation strategies derived from the Passamaquoddy Bay PAWSA workshop is set forth directly below. This provides an excellent foundation from which the local harbor safety organization can further examine and take appropriate risk mitigation actions for both near-term action and for future risk mitigation planning.

The section has been annotated to include those initial actions that appear appropriate in response to the participants' expressed concerns. Identification of initial actions will help focus subsequent discussions with the local maritime community, waterway users, and stakeholders regarding each risk, permitting the testing of each proposed action for validity and appropriateness prior to implementation. The listing of initial possible actions should be viewed as a starting point for continuing dialogue between the local maritime community, leading to clear identification of risks and well conceived mitigation measures.

Each new idea is listed along with how many times it was suggested by the participant teams in *Book 5*.

Vessel Conditions: Deep Draft Vessel Quality

Today:

- Problems from ten years ago have been corrected.
- Risk is minimum.
- Communications concerns due to limited radio coverage of Fundy Traffic; radar coverage is non existent.
- Bulkers are older than other vessels, but have suffered no casualties, yet.
- Some ships do not maintain their cranes.
- Canadians have not completed a formal aids to navigation study.

Trends:

- Deep draft vessel quality is improving
- LNG cargo and deep draft ships may be coming into the area. . Will require additional fire fighting
- Number of service vessels that support LNG will increase.
- Hazardous materials introduced into area may increase. Currently 1 ship per day calls on a port in the area.

Existing Mitigations:

- International and domestic standards have been improved.
- Crew training standards must be me (STCW).
- Standards on LNG ships is higher than normal.
- Vessels are in compliance with MARPOL requirements. US and Canada conduct port state inspections.
- Systems are in place to monitor risk.
- Fundy Traffic provides shipping information to the mariners..
- Ferry operators are very competent as they navigate through the whirlpool area. All operators speak English.
- US has compulsory pilotage requirement.
- The pilots have their own stand alone navigation system.
- Ship owners are going to redundancy to reduce insurance costs.
- Canada has a vessel clearance system that includes an advanced notice of arrival.

Trends (if LNG ships begin to call):

- Increased service vessels Additional tugs will help.
- Increased fire fighting equipment.
- Additional security issues will be added.
- USCG security zones will be added as necessary.
- ½ mile safety zone around ship transferring LNG cargo – US only.
- Training is improving
- Better communications
- Better radar.
- Radar traffic control
- AIS

New Ideas

Idea	Times	Risk Mitigation Category
• Provide regulations that rule vessel movement (Includes VTS, designated traffic lanes, and radar requirements)	10	Active Traffic Management
• Require radar, AIS and VTS	7	Active Traffic Management
• Improve radio coverage	6	Radio Communications
• Have design in place to make vessels safe	5	Rules and Procedures
• Conduct updated WAMS	5	Waterway Changes
• Inspections and Oversight	4	Enforcement
• Provide appropriate (number, size) assist/support boats…tugs, escorts, and service vessels.	4	Other Actions
• Consider vessel vetting	4	Coordination and Planning
• W.R.T. international agreements, consider the arrangements with Canada in Puget Sound and along the Detroit River as a possible best practice. Include pilots.	3	Coordination and Planning
• Add compulsory pilotage	2	Rules and Procedures
• Required mandatory training	2	Rules and Procedures
• Possibly restrict cargo	1	Rules and Procedures
• Provide size restrictions	1	Other Actions
• Provide Education and Training	1	Voluntary Training
• Use technology	1	Other Actions
• Increased Liability	1	Enforcement
• Provide terminal specific equipment.	1	Other Actions
• Build vessel to meet the unique environmental.	1	Other Actions
• Provide safety management system.	1	Other Actions
• Provide Infrastructure Improvements	1	Other Actions

Vessel Conditions: Shallow Draft Vessel Quality

Today:

- Tow/tug boats crews are not licensed (less authority and oversight); also not inspected

Trends:

- Regulations are coming.
- STCW and Responsible Carrier Program have improved the tug/barge fleet
- Tourism and number of boats will increase.
- More responder vessels.
- Increased construction.
- Need greater education to deal with additional LNG ships.
- Need to coordinate with ferries.

Existing Mitigations:

- Tugs and tows are STCW qualified.
- Additional regulations are coming to inspect tow/tug boats.
- More navigational aids to navigation.

Trends (if LNG ships begin to call):

- More responder vessels.

New Ideas

Idea	Times	Risk Mitigation Categories
• Conduct vessel inspections (US and Canada)	9	Enforcement
• Provide Better Communication (AIS, radio repeaters)	7	Radio Communications
• Provide designated traffic lane	4	Active Traffic Management
• Provide VTS and AIS	3	Other Actions
• Require additional crew size.	3	Rules and Procedures
• Provide better instrumentation	2	Other Actions
• Examine multipurpose uses of the support craft.	2	Coordination and Planning
• Education and Training	2	Voluntary Training
• Require mandatory training	1	Rules and Procedures
• Provide Safety Zone	1	Active Traffic Management
• Develop Contingency Plans	1	Rules and Procedures
• Develop updated WAMS	1	Nav/Hydro Info
• Provide Infrastructure Improvements	1	Other Actions
• Provide Public Service Announcements	1	Other Actions
• Crossing vessels to set and follow schedules	1	Other Actions
• Mandatory Training	1	Enforcement

Vessel Conditions: Commercial Fishing Vessel Quality

Today:

- Professionalism of operators is moderate to poor.
- Vessel material condition moderate to poor.
- Seem to average two groundings per year.
- There have been some recent deaths on fishing boats
- Inland fisheries are fished by vessels that are marginally maintained..

Trends:

- Varied fisheries that require configuration changes may result in stability problems.
- More violations of rules of the road.
- Need greater education to deal with additional LNG ships.

Existing Mitigations:

- F/V traffic is minimal. The boats only go out good weather. Go out for day trips.
- Canadian fishing boats are well maintained.
- The increased market value of product is allowing for boat improvement.
- CG inspections have resulted in improved maintenance and quality of boats.

Trends:

- USCG and Canada are considering licensing requirements.

New Ideas

Idea	Times	Risk Mitigation Categories
• Consider citizenship requirements	1	Not Defined
• Provide for more enforcement of regulations, conduct more at sea boarding.	1	Not Defined
• Require mandatory or standardized equipment	1	Not Defined
• Provide more state enforcement presence	1	Not Defined
• Provide for a grant for vessel modification. Consider an excise tax break.	1	Not Defined
• Require stability criteria	1	Not Defined
• Provide better safety procedures within recreational community	1	Not Defined
• Provide tariffs on imports.	1	Not Defined

Vessel Conditions: Small Craft Quality

Today:

- Number of small craft increasing. Have recorded the highest number this year. Risk is still considered minimal.
- Increased from 3 marine event permits to 12; range from kayak races to regattas.
- USCG boardings went from 50 to 170 in three years.

Trends:

- Number of kayaks increasing (maybe involving operation with inebriation)
- STCW and Responsible Carrier Program have improved the tug/barge fleet

Existing Mitigations:

- Very few jet skis.
- Guides take out first time kayakers.
- Coast Guard conducts boating education classes.
- Locals know the area and what to expect and how to dress.

Idea	Times	Risk Mitigation Categories
• Conduct boardings/inspections (Canada and US)	9	Enforcement
• Provide information at the boat ramps…signage. Include public service announcements	6	Rules and Procedures
• Provide information at the boat ramps…signage. Include public service announcements	6	Rules and Procedures
• Provide Training	5	Voluntary Training
• Provide for more dockside inspection	4	Rules and Procedures
• Provide weather information at the boat ramps. Include public service announcements	2	Other Actions
• Require mandatory training	2	Rules and Procedures
• Licensing	2	Voluntary Training
• Rules of the Road enforced with fines	1	Enforcement
• Better communications with international agencies.	1	Radio Communications
• Provide Canadian assets		
• Need greater education to deal with additional LNG ships	1	Other Actions
• Provide small vessel auxiliary channel	1	Waterway Changes
• LNG Safety Zone Escort	1	Waterway Changes
• Conduct WAMS	1	Waterway Changes

Traffic Conditions: Volume of Commercial Traffic

Today:

- Volume is light
- Volume has decreased in the last 30 years.
- Sometimes have 4-5 ships queuing up.

Trends:

- If LNG is approved, will increase from 3.5 days to 1.3 moves every day. LNG ships can only travel on the slack tide.
- Increased tourism.
- Two new dock areas will be added; to be built well into the waterway. May restrict the movement of small vessels.

Existing Mitigations:

- Light Volume

Trends (if LNG ships begin to call):

- Ships may queue up, waiting to come in. This will increase during the winter.
- Additional tug boats will escort the LNG vessel.
- More education will be provided.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Specify traffic lanes. Develop non meeting traffic situations. Require designated one way traffic zones. Provide designated holding zones	12	Active Traffic Management
• Provide VTS with enhanced radar coverage	8	Active Traffic Management
• Enhance radar and communications capabilities.	7	Radio Communications
• Improve/upgrade ATON. Provide NDBC buoy	7	Nav/Hydro
• Provide better scheduling	5	Active Traffic Management
• Provide tug assistance. Require pilots.	3	Rules and Procedures
• Provide more and better training for the pilots	1	Rules and Procedures
• More US/Canadian presence	1	Enforcement

Traffic Conditions: Volume of Small Craft Traffic

Today:

- Three-month seasonal activity, only in the summertime.

Trends:

- Rapidly growing numbers, especially trailered boats.

Existing Mitigations:

- Activity occurs in good weather and seasonality.
- Education is available

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish small vessel traffic lanes, safety and security zones.	5	Rules and Procedures
• Enhance radar and communications capabilities. Monitor N to M information.	5	Radio Communications
• Enhance VTS, provide traffic lanes	4	Active Traffic Management
• Provide training, workshops, education. Provide Public Service Announcement	3	Voluntary Training
• Mandatory Education/training	3	Rules and Procedures
• Require Licensing	2	Rules and Procedures
• Enhanced state, Canadian and USCG presence	2	Enforcement
• Provide Weather, current (NDBC) buoy	1	Nav/Hydro
• Provide mandatory AIS	1	Active Traffic Management

Traffic Conditions: Traffic Mix

Today:

- Waterway is multiple use.
- Traffic mixes and mingles.
- Aquaculture farms exist.

Trends:

- Aquaculture is currently flat but will return to the bay; includes sea urchins, mussels.
- Additional escort vessels and service vessels will arrive.
- LNG ships will be going in or out of Grand Manan.

Existing Mitigations:

Well-marked channels show boaters the channels where ships must transit.

Trends (if LNG ships begin to call):

- Better trained and quality vessels as the new escort vessels are added.
- Safety zones may be used to address present meeting situations.
- Compulsory pilotage will be required in US and Canadian waters. (two pilots will be onboard)
- Number of pilots will increase.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish traffic patterns (maybe formally establish a one way traffic scheme); also safety zones	10	Active Traffic Management
• Provide routing and scheduling.	6	Coordination and Planning
• Enhance VTS, AIS	4	Active Traffic Management
• Provide better communications between boats, association, and community. Provide public service announcements	4	Radio Communications
• Conduct a WAMS, update Coast Pilot, consider NDBC buoy	4	Nav/Hydro
• Under education, provide a symposium/seminar.	4	Voluntary Training
• Provide an auxiliary traffic lane, VTS, day/night rules	3	Rules and Procedures
• Provide enforcement presence (USCG and Canada) and training.	2	Enforcement
• Require VHF monitoring of security channels	2	Radio Communications
• Provide recommended routes around fixed fishing gear	1	Not Developed
• Complete an updated WAMS.	1	Not Developed
• Keep Fundy Traffic system; maybe add a radar atop the CG Eastport station for more coverage; also add communication repeaters.	1	Not Developed
• Tie together agreed risk mitigations with the construction of the LNG facility	1	Not Developed

Traffic Conditions: Congestion

Today:

- There is a ferry system to Deer Island and also kayaks that sometimes compete with the deep draft for waterway use..

Trends:

- Number of head boats (whale boats) is pretty steady.
- Number of recreation boats increasing.
- Small cruise liners may be entering the waterway.
- LNG vessels will queue up.

Existing Mitigations:

- There is minimal risk.

Trends (if LNG ships begin to call)::

- VTS may come.
- AIS will be improved
- Increase number of pilots.
- Greater USCG presence.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Consider recommended routing for deep draft vessels; also safety and security zones. Formalize anchorage policies.	16	Active Traffic Management
• Require AIS on large vessels. Enhance VTS and radar	8	Active Traffic Management
• Mandatory monitoring of security channels. Enhanced communications	6	Radio Communications
• Provide traffic scheduling	4	Coordination and Planning
• Conduct a WAMS, update Coast Pilot, consider NDBC	4	Nav/Hydro
• Provide navigation instruments, equipment and publications	2	Other Actions
• Limit Hazardous cargoes	1	Rules and Procedures
• Update Coast Guard – add information on types of vessel transiting.	1	Not Developed
• Upgrade USCG resources	1	Not Developed

Navigational Conditions: Winds

Today:

- Most high winds occur in the winter.
- Sustained winds oppose tides from Bay of Fundy and cause high, rough seas – problem for the pilot boat, not for large ships.
- There is no prevailing/predictable wind in the winter.
- University of Maine removes one weather buoy. It gives real time data from internet. It was claimed to be redundant. Pilots agree there is no accurate reading on the beach and the buoy is important..
- The buoy also has temp, sea state, and current sensors that are useful for fish farming (senses when water temp is too low, keeps fish from freezing).
- Islands act as a wind block, sometimes giving erroneous readings at the wind sensors.
- Funnel affect at Western Passage. Causes wind to change direction at various locations around the island.
- Every 20 years, a storm comes up that brings strong winds; funnels through the harbor and damages the front end part of Eastport (from the storm surge).
- 30 kts is the maximum limit wind speed for thruster use on deep draft vessel.
- Maneuvering vessel depends on the direction of wind and alignment of the dock.

Trends:

- Developing vessel operational parameters.

Existing Mitigations:

- Weather avoidance practices are in place.
- Winds are seasonal and occur mostly in winter, when recreation boaters are not present.
- Buoy from University of Maine effectively monitors wind right now.
- Wind trends are historically reported.
- Buoys off Jonesport are important to provide real time weather info.
- Matinicus, Mt. Desert Rock, and Jonesport buoys are used by pilots..
- Tugs stabilize the vessel and provide a large berthing window in terms of weather and design of the pier.
- NOAA provides weather radio station.

Trends (if LNG ships begin to call):

- Establish vessel operational parameters.
- Simulations have been completed that exercise pilots at the dock and in the waterway.
- Will provide weather information at the down east meteorological tower.
- LNG ship berthing parameters will be established.
- LNG ships will have mooring tension, monitoring systems.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide PORTS, also GoMOOS, down east Meteorological tower	10	Nav/Hydro Info
• Consider z Drive Tugs	7	Other Actions
• Require berthing parameters	4	Rules and Procedures
• Provide Weather Buoys	3	Nav/Hydro Info
• Provide better weather forecasts	2	Coordination and Planning
• Provide Warning Signs for small craft	1	Other Actions
• Require freeboard limitations	1	Rules and Procedures
• Establish operating parameters	1	Rules and Procedures
• Provide better communications for forecasting	1	Radio Communications

Navigational Conditions: Water Movement

Today:

- 13 Knots current at Blueback Narrows.
- Tide and current tables are good predictors except when there are high-wind conditions that alter water levels. Study shows that predictions of slack water are less reliable.
- Small vessels are unfamiliar with currents.

Trends:

- None discussed.

Existing Mitigations:

- Tide and current prediction tables and software.
- Voyage planning to avoid strong currents.
- Pilot boat precedes ship and gives traffic report. Will also act as a safety observer if radar is lost.
- Will be a current meter at down east.
- Specific transit timing based on slack water.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Transit at slack water	9	Coordination and planning
• Provide PORTS systems	8	NAV/Hydro
• Provide tugs	6	Other Actions
• Provide Weather Buoys	2	Nav/Hydro Info
• Require berthing parameters	2	Rules and Procedures
• Consider transit tide restrictions	1	Rules and Procedures
• Establish Operational Parameters	1	Rules and Procedures
• Follow/enforce required rules of the road	1	Active Traffic Management

Navigational Conditions: Visibility Restrictions

Today:

- Occur June and July…for 30 days…24 hours a day. Sometimes no fog…no predictability.
- Work with sea smog in winter.
- Occasionally snow can cause vessels to be weather-bound for days. Harder to navigate in a snow storm.
- Fog is generally localized in the bay.
- No fog at Bayside.

Trends:

- Less fog over the past 20 years.
- Do not want to respond to a casualty in the fog.
- Can not see an LNG plume in fog.

Existing Mitigations:

- Radar (increasing number of boaters have it but may not be able to use it well).
- GPS gives precise position.
- Automatic fog signals on electronic equipment.
- Commercial vessels
  - Are using chart plotting software programs (ECIDS), but may over-rely upon it.
  - Radar interpretation instruction / license endorsement.
- NOAA electronic navigation charts are free (S57 standard vector charts). See http://chartmaker.ncd.noaa.gov.

Trends:

- Tug/barge will soon be required to carry AIS.
- May reduce movement due to reduced visibility.
- Establish vessel operating procedures.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Improve Fundy Radar.	9	Active Traffic Management
• Enhance radio communication	7	Radio Communications
• Conduct a WAMS. Provide RACONS. Provide better ATON. Provide WAMS. It briefly addressed LNG additions	7	Waterway Changes
• Regulate vessel movements	6	Rules and Procedures
• Limit movement by visibility standards	4	Rules and Procedures
• Provide Weather Buoys	2	Nav/Hydro Info
• Provide PORTS	2	Nav/Hydro Info
• AIS	2	Nav/Hydro
• Establish operational parameters	2	Rules and Procedures
• Monitor VHF Security calls	1	Radio Communications

Navigational Conditions: Obstructions

Today:

- 28 foot tide range.
- Ice seldom obstructs navigation. One-in-twenty year cycle.
- Once a month (about)…debris from high tide...can include telephone poles.
- Fish pens…off all the islands.
- Consider right whales…not necessarily in the area…North and East of Campabello Island…not in the interior…in the summer. Can also see them on the eastern bay, off Eastport.

Trends:

- New piers are being built.
- LNG ships may be at anchor.

Existing Mitigations:

- Deep draft will slow and stop in the presence of whale.
- Pilot boat will listen for whales in the fog..
- LNG ships are not allowed to anchor in Canadian waters.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct a WAMS. Sovers Ledge	15	Nav/Hydro Info
• NOAA Hydrographical survey	7	Nav/Hyrdo Info
• Limit pier length	1	Coordination and Planning
• Provide enhanced VTS	1	Active Traffic Management

Waterway Conditions: Visibility Impediments

Today:

- Waterway blocked by island when leaving head harbor passage off Cherry Island…making the corner.
- Back scatter from lights on the reservation.

Trends:

- Increased LNG traffic.
- New LNG ships will moor at new piers.
- Small boats must go around piers.

Existing Mitigations:

- .Cherry Island Light increased in intensity to take care of backscatter from Eastport.
- Use Fundy Traffic to place vessels in the waterway.
- Use AIS to place vessels in waterway.

Trends:

- For LNG ships, can see over the trees.
- Channel is wide enough to provide sufficient room. Simulated casualties outboard of the moored vessels with positive results.
- Moored ships will block out shore lights.
- Small boat education.
- Provide ATON around the piers.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct a WAMS. Sovers Ledge	15	Nav/Hydro Info
•		

Waterway Conditions: Dimensions

Today:

- Head Harbor Passage is narrow (1500 ft. wide between Dog Island and Indian Point)

Trends:

- No trends discussed.

Existing Mitigations:

- .Will pass two small vessels.
- Policy is to not move deep draft ships opposing each other through the geographic area. It is all one way.

New Ideas:

Idea	Times	Risk Mitigation Categories
• One way traffic zones. Establish designated no passing zones.	10	Active traffic management
• Conduct a WAMS. Stovers Ledge	7	Nav/Hydro Info
• Provide Tugs	5	Other Actions
• Speed Restrictions	4	Other Actions
• Establish operational parameters	3	Rules and Procedures
• Provide recommended routes and VTS	3	Active Traffic Management
• Limit vessel length	1	Rules and Procedures
• Provide aid such as GoMOOS and PORTS	1	NAV/Hydro

Waterway Conditions: Bottom Type

Today:

- Bottom is hard…rock.
- F/V grounds periodically.
- S/V ground periodically.

Trends:

- No trends discussed.

Existing Mitigations:

- Shoaling well marked with buoys.
- Charting, Coast Pilot, and hydrologic publications.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide updated hydrographic survey.	13	Nav/Hydro
• Conduct a WAMS. Stovers Ledge	2	Nav/Hydro Info
• Reduce Speed	2	Rules and Procedures
• Set operational parameters. Movement based on tide	2	Rules and Procedures

Waterway Conditions: Configuration

Today:

- One turn exceeds 45 degrees.
- Seasonal risk of crossing traffic…during the summer.

Trends:

-

Existing Mitigations:

- None required
- Vessel operators talk to one another on the radio..

- **New Ideas**. Risks and mitigations were balanced. There were no ideas captured..

Immediate Consequences: Personal Injuries

Today:

- In the past, have had small cruise ships.
- Ferries are small vessels….45 people…passenger vessel to Campabello, car ferry and another one to Campobello.
- 500 meter zone established by Sandia is tank ship is breeched.
- Lacking in spill response personnel and equipment.

Trends:

- 110-120 PAX vessel. Possibly increasing to 300-400 PAX vessels.
- LNG vessels moving throughout the waterway.
- Must establish an international joint response to an LNG casualty.
- USCG responders are inside the destruction zone.
- Minimal response capability for both U.S. and Canada. The mill, 25 miles away, is the only available hazmat response.
- Roadways may be obstructed by tree strewn roads. Route 1 is primary road for assistance to travel.
- Need additional training for response to LNG release/explosion.

Existing Mitigations:

- No cruise ships.
- Joint Marine Contingency Plan…has an exception for LNG

Trends:

- New crews and shape.
- LNG emergency response people will hold meeting with local responders.
- Regulation process will identify safety assets that must be supplied for the emergency plan before the process can move forward.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Update and develop training plans. Include international	11	Voluntary Training
• Provide emergency radio channels and an additional radio tower. Provide enhanced communications to all agencies and bi national	10	Radio Communications
• Develop/update contingency plans, include international. Provide egress routes	10	Rules and Procedures
• Enhance cell phone coverage	6	Other Actions
• Provide emergency medical personnel and medical clinics and life flight	4	Coordination and Planning
• Provide warning system and emergency broadcast	3	Other Actions
• Conduct interagency/international training/simulations/exercises	2	Voluntary Training
• Limit hazardous cargos	1	Rules and Procedures
• Conduct safety audit inspection	1	Enforcement

Immediate Consequences: Petroleum Discharge

Today:

- 200 annual ship transits by deep draft vessels…2,000 tons (500,000 gallons) of bunkers per ship. Two vessels are present in the waterway at any one time.
- Petroleum products
  - Eastport and Bayside does not handle petroleum cargo.

Trends:

- Will need plan to fuel all the support vessels.

Existing Mitigations:

- Joint bi-national agreement between US and Canada for oil spill response.
- Canadian spill response equipment in St. Johns; USCG response equipment in Portland, ME.
- Six hours to respond.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide more response/preposition teams and equipment; include OSROs	10	Coordination and Planning
• Provide more response training	6	Voluntary Training
• Provide better cell coverage and a tower.	6	Radio Communications
• Designate response vessels as multi purpose escorts and spill response vessels	4	Rules and Procedures
• Re-establish Quoddy Oil Spill Coop.	4	Coordination and Planning
• Provide speed limits	1	Rules and Procedures
• Improve bi-lateral agreements	1	Coordination and Planning
• Provide tug escort	1	Other Actions
• Consider ship/cargo owner liability	1	Other Actions

Immediate Consequences: Hazardous Materials Release

Today:

- Bulk ammonium nitrate is shipped to Bayside and Eastport. One ship a year….2,000 tons.

Trends:

- Increasing due to LNG.

Existing Mitigations:

- .None in place.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct training/drills/exercises (consider CANUSLANT)	10	Coordination and Planning
• Conduct facility inspections. Provide additional USCG resources	5	Enforcement
• Provide better education/outreach, certifications	4	Voluntary Training
• Improve radio communications	3	Radio Communications
• Develop evacuation contingency planning	2	Coordination and Planning
• Conduct LNG carrier oversight	2	Enforcement
• Designate response vessels as multi purpose escorts and spill response vessels; also tug escorts	2	Other Actions
• Improve first responder training…fire fighting, hazmat, pers casualties.	1	Other Actions
• Establish speed limits	1	Rules and Regulations
• Develop response management	1	Coordination and Planning
• Boom docked vessels	1	Other Actions
• Improve cell coverage	1	Other Actions

Immediate Consequences: Mobility

Today:

- Route one running along the shore can be shut down.
- Dear Island and Campobello can not receive some goods if the waterway is shut down (seasonal)

Trends:

- LNG will be moving and gas will be piped regionally/nationally..

Existing Mitigations:

- Small vessels have an alternate channel…size to tug at high water..

Trends:

- Other ports will supply the pipeline.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Improve alternate means of transportation … local highway … to move response equipment.	6	Other Actions
• Explore salvage capabilities	4	Other Actions
• Provide enhanced communications.	1	Radio Communications
• Conduct air patrols	1	Enforcement
• Install and use mooring system arrangements for local tide range	1	Coordination and Planning
• Provide tug escort	1	Other Actions

Subsequent Consequences: Health and Safety

Today:

- Relative to Passamaquoddy Bay, everything is still a rural area – population is 1500-3500 persons.
- Eastport has up to 2000 population
- Consider WSA…1000 people per quarter mile.
- A discharge may affect fish processors.
- Ammonium Nitrate posses an explosion problem.
- No formal evacuation plans.
- Lack of firefighting capability.

Trends:

- LNG ships will be entering the area.

Existing Mitigations:

- Prevailing wind would disperse a gas.
- Calas is nearest hospital…20 miles away…bed capacity of 25. Eastern Maine Medical Center….move by helicopters.
- Area is rural with few people in a large area.
- Planning with nuclear plan has been completed with both countries.
- Multiple fire fighting organizations have worked together to combat shore side fires (forest fires).

Trends:

- Have identified the disaster area.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Develop/update contingency plans, include international. Provide egress routes	9	Rules and Procedures
• Provide warning system and emergency broadcast	7	Other Actions
• Update and develop training plans. Include international. Include marine firefighting. Provide PSAs	5	Voluntary Training
• Pre position equipment	4	Coordination and Planning
• Provide enhanced firefighting capability; land and water	4	Other Actions
• Formalize US Canadian agreements	3	Coordination and Planning
• Provide emergency medical personnel and medical clinics and life flight	2	Coordination and Planning
• Enhance cell phone coverage. .	1	Other Actions
• Limit hazardous cargos	1	Rules and Procedures
• Conduct interagency/international training/simulations/exercises	1	Voluntary Training
• Conduct predictive modeling	1	Coordination and Planning
• Develop web page	1	Other

Environmental

Today:

- 250 feet around the island of Eastport….developmemt setback.
- Cobcook Bay is a sensitive area.
- Endangered species is high.
- Cultural Resources for tribal based, archeological based in area.
- Some ships change from bunkers to diesel (no. 2) when entering port. No. 2 oil will taint fish where black oil bunkers will not. Some ship use no. 2.

Trends:

- LNG ships will enter the waterway, resulting in more traffic. More emissions will result…air, noise, invasive species.
- Pure methane is not an issue (non fire form) to the environment. If on fire, will drop down to a couple of inches below the water
- Vessel strike risk to the right whale.
- Current LNG ships use boil off from cargo tanks. Some use IFO fuel. IFO taints fish.
- New ships…bunker tanks are double hulled…may not be used here.
-

Existing Mitigations:

- Ballast water program required.
- Right whale monitoring…voluntary.
- Fundy traffic notifies ships of whale sighting.

Trends:

- LNG ships do not deballast.
- New ships use diesel fuel, heavy fuel oil…2000 tons.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct training/drills/exercises (consider CANUSLANT) and develop priorities	7	Coordination and Planning
• Better real time for Nav/hydro information, PORTS	7	Nav/Hydro Info
• Provide response/equipment training	4	Voluntary Training
• Conduct predictive modeling	3	Other Actions
• Develop evacuation contingency planning and spill response	2	Coordination and Planning
• Develop routing for environmentally sensitive areas	2	Active Traffic Management
• Develop and formalize an environment/whale information system	2	Other Actions
• Provide prepositioned resources.	2	Coordination and Planning
• Contract with NRC	1	Other Action
• Provide better data on bunkers	1	Rules and Procedures
• Develop response management, OSROs	1	Coordination and Planning
• Provide better education/outreach, certifications	1	Voluntary Training
• Improve radio communications	1	Radio Communications
• Develop Web Page	1	Other Actions

Subsequent Consequences: Aquatic Resources

Today:

- Many species are harvested throughout the geographic area:
- Fish farming (Agricultural more impacted/conducted than commercial and recreational fishing)…clammers operate in the area. Sea cucumbers, herring.
- Recreational fishing…extensive in the summer.
- Includes life cycle…lobster, scallops, herring. Will probably use that year of fishing in the event of a spill.
- Ecotourism is increasing.
- Extensive fisheries throughout of the Bay:
  - Commercial shell fishing, lobster, quahog, scallops; and fin fish…a year-round activity.
  - Recreational fishing is very active.

Trends:

- Fishing and Ecotourism is increasing.
- LNG ships increase will restrict the water and reduce the number of spaces to fish.

Existing Mitigations:

- Existing authorities to close shellfish beds.
- NOAA has the only sensory analysis lab available to test and chemically analyze fitness of fish product.
  - State and local capabilities.
- Seasonality of a pollution event can protect the resource to some degree.
- Whale alerts are provided by Fundy Traffic.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish fisheries opening and closing protocols. Include Canada	6	Rules and Regulations
• Improve communications, call down list	6	Radio Communications
• Develop and formalize an environment/whale information system	2	Other Actions
• Develop Web Page	2	Other Actions
• Develop response management, Aquacultures	1	Coordination and Planning
• Provide better education/outreach, certifications	1	Voluntary Training

Subsequent Consequences: Economic

Today:

- Fish contaminated with hazardous material cannot be sold.
- For definition purposes, in the Aqua fisheries, impact is great and felt internationally. More than $2M per year. Would do a fisheries closure for potential area of impact.
- Severe economic effects would be felt in within two weeks of a port closure.
- Salmon is sold along the east coast.
- Lobster is sold along the east coast and internationally.
- Sea urchins are sold internationally.
- Income from tourism and fishing would be affected, even if there is just an impression that the area has been "tainted" by spills, etc.
- Repayment for loss of income from oil spill.
- May not be able to get product to market…may affect the region and nation.
- A major casualty would affect tourism…St. Andrews is a major resort community. This includes whale watching tours.
- 350K tons a year paper mill would not be able to ship.
- Bayside…depends on how long…lose one ship a week.
- Letit Passage at 1500 feet wide could affect the small boat traffic.

Trends:

- LNG industry will increase jobs, support vessels.
- People may stop coming to tourist area in Canada (St. Andrews)…a less environmentally pristine area...also at Campobello Island.
- Additional traffic may push the whales elsewhere.
- Consider tax issues.
- Most issues will be local and regional.

Existing Mitigations:

- Energy Policy Act (US only):
  - Provide emergency response plan
  - Provide cost sharing plan to provide additional resources. Between company and local community.
- Possible new international agreements in the making.

Trends:

- People like to look at big ships.
- May add $250M to a taxable base
- Young people may remain in the area.
- Will provide site specific compensation package to local fishermen.
- Will provide trap replacement program…US Canadian.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Marine System Recovery	10	Coordination and Planning
• MOU joint Canada US response	7	Other Actions
• Fishermen compensation plan	5	Other Actions
• Trap replacement program	2	Other Actions
• LNG via offshore terminal	1	Coordination and Planning
• Develop web page.	1	Other Actions

Book 2 Tabular Results:

Risk Factor	A Value	B Value	C Value	D Value
Deep Draft Vessel Quality	1.0	3.0	5.6	9.0
Shallow Draft Vessel Quality	1.0	3.0	5.6	9.0
Commercial Fishing Vessel Quality	1.0	3.0	5.6	9.0
Small Craft Quality	1.0	3.0	5.6	9.0
Volume of Commercial Traffic	1.0	3.0	5.3	9.0
Volume of Small Craft Traffic	1.0	2.8	5.7	9.0
Traffic Mix	1.0	2.3	4.7	9.0
Congestion	1.0	2.7	5.0	9.0
Winds	1.0	2.5	5.2	9.0
Water Movement	1.0	2.9	5.0	9.0
Visibility Restrictions	1.0	2.9	5.7	9.0
Obstructions	1.0	2.0	4.5	9.0
Visibility Impediments	1.0	3.1	5.5	9.0
Dimensions	1.0	3.1	5.5	9.0
Bottom Type	1.0	2.4	5.1	9.0
Configuration	1.0	2.8	5.3	9.0
Personnel Injuries	1.0	3.1	5.7	9.0
Petroleum Discharge	1.0	3.8	6.2	9.0
Hazardous Materials Release	1.0	3.7	6.2	9.0
Mobility	1.0	3.0	5.3	9.0
Health and Safety	1.0	3.1	5.6	9.0
Environmental	1.0	3.2	5.9	9.0
Aquatic Resources	1.0	2.8	5.5	9.0
Economic	1.0	3.1	5.7	9.0

Book 3 Tabular Results:

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
1.3	1.3	4.5	3.9	3.0	2.5
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
1.7	1.6	6.4	3.3	2.1	7.5
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
6.4	3.1	7.9	7.0	5.3	7.5
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
6.9	2.1	3.5	7.7	3.2	5.9

Book 4 Tabular Results:

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	
1.3	2.4	1.3	4.6	4.5	6.0	3.9	3.9	3.0	6.5	2.5	6.2
RISING		RISING		RISING		Balanced		RISING		RISING	
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental	
1.7	2.9	1.6	4.1	6.4	7.1	3.3	3.4	2.1	4.2	7.5	8.1
RISING		RISING		RISING		RISING		RISING		RISING	
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources	
6.4	6.3	3.1	5.2	7.9	7.8	7.0	7.3	5.3	7.3	7.5	8.1
Maybe		RISING		NO		RISING		RISING		RISING	
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic	
6.9	6.8	2.1	4.7	3.5	5.1	7.7	6.8	3.2	4.9	5.9	6.3
NO		RISING		RISING		Maybe		RISING		RISING	

KEY

Risk Factor	
Book 3	Book 4
Consensus	

Book 3	Absolute level of risk
Book 4	Level of risk taking into account existing mitigations
Balanced	Consensus that risks are well balanced by existing mitigations
Maybe	No consensus that risks are adequately balanced by existing mitigations
NO	Consensus that existing mitigations do NOT adequately balance risk

Book 5 Tabular Results:

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**
Active Traffic Mgmt	Active Traffic Mgmt	Nav / Hydro Info	Balanced	Radio Communications	Other Actions
1.8	4.1	5.9		6.4	5.9
Shallow Draft Vessel Quality	**Volume of Small Craft Traffic**	**Water Movement**	**Dimensions**	**Petroleum Discharge**	**Environmental**
Enforcement	Rules & Procedures	Rules & Procedures	Active Traffic Mgmt	Other Actions	Coordination / Planning
2.7	3.9 Caution	6.4	2.8	3.7	6.9
Commercial Fishing Vessel Quality	**Traffic Mix**	**Visibility Restrictions**	**Bottom Type**	**Hazardous Materials Release**	**Aquatic Resources**
Balanced	Active Traffic Mgmt	Rules & Procedures	Nav / Hydro Info	Coordination / Planning	Coordination / Planning
	4.7	7.2	6.7 Caution	7.2	8.0
Small Craft Quality	**Congestion**	**Obstructions**	**Configuration**	**Mobility**	**Economic**
Voluntary Training	Active Traffic Mgmt	Nav / Hydro Info	Balanced	Other Actions	Coordination / Planning
6.5	4.0	4.8		4.8	6.2

KEY	
Risk Factor	Intervention category that was judged most effective in further mitigating risk
Intervention	Expected improvement in risk level if new mitigation measures were implemented
Risk Improvement	Caution — No consensus alert

Legend:

The intervention category listed is the one category that most participant teams selected for further reducing risks. The Risk Improvement is the perceived reduction in risk when taking the actions specified by the participants. A green Balanced indicates that no intervention is needed and risk is balanced in the waterway, and a yellow Caution indicates that there was a difference between the most effective category and the category most selected by the participants for action. Intervention category definitions are:

Coordination / Planning	Improve long-range and/or contingency planning and better coordinate activities / improve dialogue between waterway stakeholders
Voluntary Training	Establish / use voluntary programs to educate mariners / boaters in topics related to waterway safety (Rules of the Road, ship/boat handling, etc.)
Rules & Procedures	Establish / refine rules, regulations, policies, or procedures (nav rules, pilot rules, standard operating procedures, licensing, RNAs, require training and education, etc.)
Enforcement	More actively enforce existing rules / policies (navigation rules, vessel inspection regulations, standards of care, etc.)
Nav / Hydro Info	Improve navigation and hydrographic information (PORTS, BNTM, charts, coast pilots, AIS, tides and current tables, etc.)
Radio Communications	Improve the ability to communicate bridge-to-bridge or ship-to-shore (radio reception coverage, signal strength, reduce interference & congestion, monitoring, etc.)
Active Traffic Mgmt	Establish/improve a Vessel Traffic Service (info, advice and control) or Vessel Traffic Information Service (information and advice only)
Waterway Changes	Widen / deepen / straighten the channel and/or improve the aids to navigation (buoys, ranges, lights, LORAN C, DGPS, etc.)
Other Actions	Risk mitigation measures needed that do NOT fall under any of the above strategy categories