

## Port of Hampton Roads, Virginia PAWSA Workshop Report

### Introduction

A Ports and Waterways Safety Assessment (PAWSA) workshop was conducted for the Port of Hampton Roads, Virginia on 27 – 28 June, 2001. This workshop report provides the following information:

- Brief description of the process used for the assessment;
- List of participants;
- Numerical results from the Analytic Hierarchy Process (AHP)<sup>1</sup>;
- Summary of risks and mitigations discussions; and
- Port of Hampton Roads Attributes Summaries.

Strategies for reducing unmitigated risks will be the subject of a separate report.

### Assessment Process

The PAWSA process is a structured approach for obtaining expert judgments on the level of risk in a port area. The process also addresses the relative merits of specific types of Vessel Traffic Management (VTM) improvements for reducing risk in the port. Based on the Analytic Hierarchy Process, the port risk assessment process uses a select group of waterway users/stakeholders in each port to evaluate waterway risk factors and the effectiveness of various VTM improvements. The process requires the participation of local Coast Guard officials before and throughout the workshops. Thus the process is a joint effort involving waterway users, experts, and the agencies/entities responsible for implementing selected risk mitigation measures.

This methodology employs a generic model of port risk that was conceptually developed by a National Dialog Group on Port Risk and then translated into computer algorithms by the Volpe National Transportation Systems Center. In that model, risk is defined as the sum of the probability of a casualty and its consequences. Consequently, the model includes variables associated with both the causes and the effects of vessel casualties. Because the risk factors in the model do NOT contribute equally to overall port risk, the first session of each PAWSA workshop is devoted to obtaining expert opinion about how to weight the relative contribution of each variable to overall port risk. The workshop participants then are asked to establish scales to measure each variable. Once the parameters have been established for each risk-inducing factor, port-specific risk is estimated by putting into the computer model specific values for that port for each variable. The computer model allows comparison of relative risk and the potential efficacy of various VTM improvements between different ports.

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– <sup>1</sup> Developed by Dr. Thomas L. Saaty, et al, to structure complex decision making, to provide scaled measurements, and to synthesize many factors having different dimensions.

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### Participants

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

<b>Participant</b>	<b>Organization</b>	<b>Phone</b>	<b>Email</b>
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<b>Facilitation Team</b>	<b>Organization</b>	<b>Phone</b>	<b>Email</b>
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**Numerical Results**

**Book 1 – Risk Categories (*Generic Weights Sum to 100*)**

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences
20.4	22.1	23.2	7.3	12.2	14.8

**Analysis:**

Book 1 begins the process of weighting the national port risk model. The participant teams use their knowledge and the AHP process to provide weights for the six major risk categories. The contribution to the national model by the Port of Hampton Roads participants is as listed above. These participants felt that Navigational Conditions was the largest driver of risk. Waterway Configuration was a significantly lower influence.

**Book 2 - Risk Factors (*Generic Weights*)**

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences
20.4	22.1	23.2	7.3	12.2	14.8

% High Risk Deep Draft	Volume Deep Draft	Wind Conditions	Visibility Obstructions	# of People on Waterway	Economic Impacts
14.9	4.6	8.6	1.2	7.3	4.8
% High Risk Shallow Draft	Volume Shallow Draft	Visibility Conditions	Channel Width	Volume of Petroleum	Environmental Impacts
5.5	4.6	9.4	2.0	1.8	6.6
	Vol. of Fish & Pleasure	Tide & River Currents	Bottom Type	Volume of Chemicals	Health & Safety Impacts
	4.4	2.8	2.7	3.1	3.4
	Traffic Density	Ice Conditions	Waterway Complexity		
	8.5	2.4	1.4		

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### Analysis:

Book 2 further refines the weighting for the national port risk model. The participants examined the importance of the 20 risk factors to port safety and provided the above results to the national model. They determined that the following factors contribute the most to overall risk:

- % High Risk Deep Draft
- Visibility Condition
- Wind Conditions
- Traffic Density
- # People on Waterways
- Environmental Impacts

### Book 3 Factor Scales - Condition List (*Generic*)

	<i>Scale Value</i>
<b>Wind Conditions</b>	
a. Severe winds < 2 days / month	1.0
b. Severe winds occur in brief periods	2.8
c. Severe winds are frequent & anticipated	5.1
d. Severe winds occur without warning	9.0
<b>Visibility Conditions</b>	
a. Poor visibility < 2 days/month	1.0
b. Poor visibility occurs in brief periods	2.5
c. Poor visibility is frequent & anticipated	5.2
d. Poor visibility occurs without warning	9.0
<b>Tide and River Currents</b>	
a. Tides & currents are negligible	1.0
b. Currents run parallel to the channel	2.1
c. Transits are timed closely with tide	4.8
d. Currents cross channel/turns difficult	9.0
<b>Ice Conditions</b>	
a. Ice never forms	1.0
b. Some ice forms-icebreaking is rare	2.6
c. Icebreakers keep channel open	5.5
d. Vessels need icebreaker escorts	9.0
<b>Visibility Obstructions</b>	
a. No blind turns or intersections	1.0
b. Good geographic visibility-intersections	2.2
c. Visibility obscured, good communications	5.0
d. Distances & communications limited	9.0

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### Channel Width

- |   |     |
|---|-----|
| a. Meetings & overtakings are easy          | 1.0 |
| b. Passing arrangements needed-ample room   | 2.5 |
| c. Meetings & overtakings in specific areas | 6.1 |
| d. Movements restricted to one-way traffic  | 9.0 |

### Bottom Type

- |  |     |
|--|-----|
| a. Deep water or no channel necessary    | 1.0 |
| b. Soft bottom, no obstructions          | 1.7 |
| c. Mud, sand and rock outside channel    | 4.7 |
| d. Hard or rocky bottom at channel edges | 9.0 |

### Waterway Complexity

- |  |     |
|--|-----|
| a. Straight run with NO crossing traffic   | 1.0 |
| b. Multiple turns > 15 degrees-NO crossing | 2.6 |
| c. Converging - NO crossing traffic        | 4.8 |
| d. Converging WITH crossing traffic        | 9.0 |

### Number of People on Waterway

- |   |     |
|---|-----|
| a. Industrial, little recreational boating  | 1.0 |
| b. Recreational boating and fishing         | 3.3 |
| c. Cruise & excursion vessels-ferries       | 5.9 |
| d. Extensive network of ferries, excursions | 9.0 |

### Petroleum Volume

- |                                       |     |
|---------------------------------------|-----|
| a. Little or no petroleum cargoes     | 1.0 |
| b. Petroleum for local heating & use  | 2.8 |
| c. Petroleum for transshipment inland | 5.7 |
| d. High volume petroleum & LNG/LPG    | 9.0 |

### Chemical Volume

- |                                       |     |
|---------------------------------------|-----|
| a. Little or no hazardous chemicals   | 1.0 |
| b. Some hazardous chemical cargo      | 2.5 |
| c. Hazardous chemicals arrive daily   | 5.8 |
| d. High volume of hazardous chemicals | 9.0 |

### Economic Impacts

- |                                   |     |
|-----------------------------------|-----|
| a. Vulnerable population is small | 1.0 |
| b. Vulnerable population is large | 3.7 |
| c. Vulnerable, dependent & small  | 5.6 |
| d. Vulnerable, dependent & large  | 9.0 |

### Environmental Impacts

- |                                      |     |
|--------------------------------------|-----|
| a. Minimal environmental sensitivity | 1.0 |
| b. Sensitive, wetlands, VULNERABLE   | 2.9 |
| c. Sensitive, wetlands, ENDANGERED   | 5.9 |
| d. ENDANGERED species, fisheries     | 9.0 |

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### Health and Safety Impacts

a. Small population around port	1.0
b. Medium - large population around port	2.7
c. Large population, bridges	5.9
d. Large DEPENDENT population	9.0

### Analysis:

The purpose of Book 3 is for the participants to calibrate a risk assessment scale for each risk factor. For each risk factor there is a low (Port Heaven) and a high (Port Hell) severity limit, which are assigned values of 1.0 and 9.0 respectively. The participants determined numerical values for two intermediate qualitative descriptions between those two extreme limits. Participants from this port evaluated the average difference in risk between the lower limit (Port Heaven) and the first intermediate scale point as being equal to 1.6; the average difference in risk between the first and second intermediate scale points was equal to 2.8; and the average difference in risk between the second intermediate scale point and the upper risk limit (Port Hell) was 3.6.

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**Book 4 - Risk Factor Ratings (*Port of Hampton Roads*)**

<b>Fleet Composition</b>	<b>Traffic Conditions</b>	<b>Navigational Conditions</b>	<b>Waterway Configuration</b>	<b>Immediate Consequence</b>	<b>Subsequent Consequence</b>
<b>% High Risk Deep Draft</b>	<b>Volume Deep Draft</b>	<b>Wind Conditions</b>	<b>Visibility Obstructions</b>	<b># of People on Waterway</b>	<b>Economic Impacts</b>
<b>3.5</b>	<b>3.4</b>	<b>2.7</b>	<b>3.7</b>	<b>5.0</b>	<b>8.7</b>
<b>% High Risk Shallow Draft</b>	<b>Volume Shallow Draft</b>	<b>Visibility Conditions</b>	<b>Channel Width</b>	<b>Volume of Petroleum</b>	<b>Environmental Impacts</b>
<b>6.2</b>	<b>5.6</b>	<b>2.2</b>	<b>3.1</b>	<b>5.9</b>	<b>9.0</b>
	<b>Vol. Fishing &amp; Pleasure Craft</b>	<b>Tide &amp; River Currents</b>	<b>Bottom Type</b>	<b>Volume of Chemicals</b>	<b>Health &amp; Safety Impacts</b>
	<b>7.4</b>	<b>3.8</b>	<b>3.9</b>	<b>3.8</b>	<b>5.6</b>
	<b>Traffic Density</b>	<b>Ice Conditions</b>	<b>Waterway Complexity</b>		
	<b>6.0</b>	<b>1.9</b>	<b>8.3</b>		

**Analysis:**

Book 4 is the point in the workshop when the process begins to address local port risks. The participants use the scales developed in Book 3 to assess the absolute level of risk in their port for each of the 20 risk factors. The values shown in the preceding table do NOT add up to 100. Based on the input from the participants, the following are the top risks to port safety in the Port of Hampton Roads (in order of importance). Note that the highest possible value is 9.0 (Port Hell).

1. Environmental Impacts (9.0)
2. Economic Impacts (8.7)
3. Waterway Complexity (8.3)
4. Volume of Fishing and Pleasure Craft (7.4)
5. % High Risk Shallow Draft (6.2)
6. Traffic Density (6.0)
7. Volume of Petroleum (5.9)
8. Volume of Shallow Draft (5.6)
8. Health and Safety Impacts (5.6)

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Book 5 - VTM Tools (Port of Hampton Roads)

Fleet Composition	Traffic Conditions	Navigation Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences
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% High Risk Deep Draft		Volume Deep Draft		Wind Conditions		Visibility Obstructions		# of People on Waterway		Economic Impacts	
13	-0.1	16	-0.4	16	-0.4	9	0.0	11	-0.1	3	1.9
RA		RA		RA		RA		RA		RA	ALERT
% High Risk Shallow Draft		Volume Shallow Draft		Visibility Conditions		Channel Width		Volume of Petroleum		Environmental Impacts	
6	0.4	5	0.6	20	-0.8	9	0.0	11	-0.1	1	2.4
OTH	ALERT	RA	ALERT	RA		RA		RA		OTH	ALERT
Vol. Fishing & Pleasure Craft		Tide & River Currents		Bottom Type		Volume of Chemicals		Health & Safety Impacts			
4	1.5	15	-0.2	16	-0.4	13	-0.1	7	0.4		
OTH	ALERT	RA		RA		RA		RA	ALERT		
Traffic Density		Ice Conditions		Waterway Complexity							
8	0.2	16	-0.4	2	2.3						
RA		RA		CM	ALERT						

**Tool acronyms and definitions**

Key Risk Factor	
Rank	Risk Gap
Tool	ALERT

- RA Risk Acceptable
- AN Improve Aids to Navigation
- CM Improve Communications
- RR Improve Rules & Regulations
- SI Improve Static Navigation Info
- DI Improve Dynamic Navigation Info
- VTIS Vessel Traffic Information System
- VTS Vessel Traffic System
- OTH Other – not a VTM solution

**Legend**

**Rank** is the position of the Risk Gap for a particular factor relative to the Risk Gap for the other factors as determined by the participants.

**Risk Gap** is the variance between the existing level of risk for each factor determined in Book 4 and the average acceptable risk level as determined by each participant team. Negative numbers imply that the risk level could INCREASE



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and still be acceptable. The teams were instructed as follows: *If the acceptable risk level is equal to or higher than to the existing risk level for a particular factor, circle RA (Risk Acceptable). If the mitigation needed does not fall under one of the VTM tools, circle OTH (Other) at the end of the line. Otherwise, circle the VTM tool that you feel would MOST APPROPRIATELY reduce the unmitigated risk to an acceptable level.*

The **Tool** listed is the one determined by the majority of participant teams as the best to narrow the Risk Gap.

An **ALERT** is given if no mathematical consensus is reached for the tool suggested.

### Analysis:

The results shown are generally consistent with the discussion that occurred about risks in the Port of Hampton Roads. For the 13 risk factors for which there was good consensus, the participants judged the risk to be at an acceptable level already due to existing mitigation strategies.

Alerts due to poor consensus occurred because votes were split between several VTM tools, as indicated:

- Economic Impacts – RA (3), CM (1), DI (1), VTIS (1), VTS (1), OTH (3)
- % of High Risk Shallow Draft – RA (3), RR (2), VTIS (1), OTH (4)
- Waterway Complexity – RA (3), CM (4), DI (1), VTIS (1), VTS (1)
- Volume of Shallow Draft – RA (4), CM (2), RR (1), VTIS (1), VTS (1), OTH (1)
- Environmental Impacts – RA (2), CM (1), DI (1), VTIS (1), VTS (1), OTH (4)
- Volume Fishing & Pleasure Craft– RR (4), VTIS (1), OTH (5)
- Health and Safety Impacts – RA (4), DI (1), VTIS (1), VTS (1), OTH (3)

**Summary of Risks**

**Scope of the port area under consideration:** The participants defined the geographic bounds of the port area to be discussed.

- From seaward at the Chesapeake Bay Entrance Junction Lighted Gong Buoy “CBJ”
- Northward on the Lower Chesapeake Bay to Cove Point
- The James River to the Deep Water Terminal at Richmond
- The Elizabeth River
- Eastern Branch to the Campostella Bridge
- Southern Branch as far as the 35’ Project Turning Basin (ICW turning basin)

FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Fleet Composition</b>		
% High Risk Deep Draft	Today: <ul style="list-style-type: none"> <li>• Integrated tugs &amp; barges (ITB) often carry 30-foot drafts and are considered deep draft vessels.</li> <li>• Container ships are well maintained and crewed.</li> <li>• Container barges are deep draft vessels.</li> <li>• About 25% of transits are bulk carriers that are carrying the major tonnage of the Port. These ships tend to be less well maintained.</li> </ul> Trends: <ul style="list-style-type: none"> <li>• Larger, deeper-draft ships.</li> </ul>	Existing Mitigations: <ul style="list-style-type: none"> <li>• Active USCG Port State Control efforts encourage improvements in ship conditions and crew proficiency.</li> <li>• Mandatory pilotage provides <i>de facto</i> oversight of the conditions of ships, and ship handling skills tailored to and familiar with the waterway’s peculiarities.</li> </ul> New ideas: <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Fleet Composition (continued)</b>		
<p>% High Risk Shallow Draft</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Recreational operators are inexperienced and uninformed.               <ul style="list-style-type: none"> <li>– Poor interactions with dredging operations.</li> </ul> </li> <li>• The material condition of uninspected vessels is notably poorer.               <ul style="list-style-type: none"> <li>– 90% of CG responses are to uninspected vessel casualties</li> <li>– Tug and barge allisions are frequent</li> <li>– Lower operator experience and machinery casualties are causing accidents</li> </ul> </li> <li>• Many recreational boats are not well maintained, especially those boats trailered into the area.               <ul style="list-style-type: none"> <li>– Use of non-marine components for mechanical/electrical replacement parts creates additional explosion hazards</li> <li>– Often do not have, or do not monitor marine radios for important safety information</li> </ul> </li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Increasing numbers of recreational boaters.</li> <li>• Little Creek recreational boat traffic is expected to double.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• State of VA Marine Division &amp; local police have increased their boating law enforcement actions recently.</li> <li>• Targeted law enforcement aimed at fishing vessels.</li> <li>• Commercial fishermen speak English.</li> <li>• Coast Guard Prevention Thru People initiative at local maritime schools expands understanding of seamanship at an early stage in maritime careers.</li> <li>• CG licensing and inspections; required training or drills.</li> <li>• Commercial recreational boat towing services increase assistance options.</li> <li>• Recreational boaters use cell phones to call for assistance, expanding ability to get help.</li> <li>• EPIRBS.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• CG patrols of dredging areas.</li> <li>• Licensing or mandatory education of commercial fishermen.</li> <li>• Licensing or mandatory education of recreational boat operators</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Traffic Conditions</b>		
<p>Volume Deep Draft</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• 10,000 deep draft movements per year.                             <ul style="list-style-type: none"> <li>– Including 4,000 U.S. Navy transits.</li> </ul> </li> <li>• Large naval ships, and their attendant support fleet sometimes need the entire channel or port for transits and fleeting.</li> <li>• 13 submarines homeported in Norfolk.</li> <li>• Several aircraft carriers homeported or temporarily berthed/serviced at Norfolk/Newport News.</li> <li>• Small cruise ships regularly visiting the port.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Volume of coal shipments has dropped with competition from other countries and environmentally-driven factors.                             <ul style="list-style-type: none"> <li>– Some possibility to import coal in the future</li> </ul> </li> <li>• Container traffic is market driven and number of ship visits can vary greatly.</li> <li>• Large cruise ships will start coming to Norfolk.</li> <li>• Heavy highway traffic flows demand that bridges be opened less frequently. This can affect the efficiency of the port and the safety of deep draft movements.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Port has sufficient berthing and anchorages to support present and near future needs.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>
<b>Traffic Conditions (continued)</b>		
<p>Volume Shallow Draft</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• No discussion.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Tug &amp; tow volume receding because less cargo is being shipped, with a notable decline this year.</li> <li>• Commercial fishing is declining because of reduced fish stocks.</li> <li>• Dinner cruise traffic is steady. A new boat was added this year in Norfolk.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• CG sends out a lessons learned document to mariners after accidents.</li> <li>• Declining fishing fleet means there is less opportunity for conflict with other port users.</li> </ul> <p>New ideas</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Traffic Conditions (continued)</b>		
<p>Volume Fishing &amp; Pleasure Craft</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Skyrocketing numbers of recreational boats. <ul style="list-style-type: none"> <li>– New marinas and dredging in Little Creek create an attractive waterway</li> </ul> </li> <li>• Recreational boat wakes create dangerous conditions for the dinner cruise ships.</li> <li>• Conflicts between deep draft vessels and recreational fishermen in channels. <ul style="list-style-type: none"> <li>– East end of Newport News Channel</li> <li>– Monitor-Merrimac Tunnel and James River Bridge</li> </ul> </li> <li>• Heavy spring &amp; fall snow-bird boat traffic on the ICW is increasing. <ul style="list-style-type: none"> <li>– Lock transits bunch them together</li> <li>– Speeding to make the next bridge opening increases risk of collisions</li> </ul> </li> <li>• Fishing tournaments based from Little Creek, but don't interfere with commercial traffic.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• The number of recreational boats will double in Little Creek soon.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Yacht owner organizations are starting to emphasize safety.</li> <li>• An active enforcement program by local police, Coast Guard and Virginia Marine Division.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• Speed limits in appropriate areas.</li> <li>• More targeted law enforcement incorporated with educational outreach.</li> </ul>
<b>Traffic Conditions (continued)</b>		
<p>Traffic Density</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Storms drive boats into Lynnhaven <ul style="list-style-type: none"> <li>– Dangerous conflicts at the bridge</li> </ul> </li> <li>• Fourth of July fireworks. <ul style="list-style-type: none"> <li>– Portsmouth &amp; Norfolk, York River</li> <li>– After-the-event mayhem ensues</li> <li>– Conflicts with commercial traffic</li> </ul> </li> <li>• ICW boat traffic is congested from Gilmerton Bridge as far north as Lambert Point.</li> <li>• Trailered boats <ul style="list-style-type: none"> <li>– Operators are usually less skilled</li> <li>– Boats poorly maintained</li> <li>– Drawn by festivals &amp; special events</li> </ul> </li> <li>• The locking process consolidates boat traffic that then bolts into the waterway hazardously.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Bridge tenders help direct traffic exiting the locks.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• Some form of regulating boat traffic in the vicinity of the locks; targeted enforcement.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Navigation Conditions</b>		
<p>Wind Conditions</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Sustained 20-25 knot winds are cause for concern in both deep and shallow draft vessel operation.               <ul style="list-style-type: none"> <li>– Prevailing wind is SW at 11 knots</li> <li>– Oct-March blows every day</li> <li>– Tow boat operations are hampered 10-15 days per month because of high winds</li> <li>– Military Sealift Command ships problems are at sea vs. inport</li> <li>– Thunderstorms greatly affect small boats in the summer</li> </ul> </li> <li>• Wind makes dangerously rough conditions               <ul style="list-style-type: none"> <li>– Off Lynnhaven Inlet</li> <li>– Off Newport News Point</li> </ul> </li> <li>• Pilots have trouble docking, undocking, especially when berth assignment changes require slow speeds/lower maneuverability. Occurs almost daily for coal piers.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Pilots suspend operations as appropriate in higher wind conditions.</li> <li>• Recreational boaters avoid going out in bad weather.</li> <li>• Weather forecasting.</li> <li>• Physical Oceanographic Real-Time System.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• More certain berth scheduling.</li> </ul>
<b>Navigation Conditions (continued)</b>		
<p>Visibility Conditions</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Fog in spring and fall, generally lifts quickly; experienced 12% of the time.</li> <li>• Marine casualties seldom caused by fog.</li> <li>• Southern Branch of the Elizabeth River, Cape Henry and Hampton Roads Bridge Tunnel areas notable for dense fog.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Recreational boaters avoid going out in fog.</li> <li>• Professionals are equipped to operate in reduced visibility.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Navigation Conditions (continued)</b>		
<p>Tide &amp; River Currents</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• 2 - 2.5 knot currents.               <ul style="list-style-type: none"> <li>– Often wind driven</li> <li>– Heavy rain can affect currents.</li> </ul> </li> <li>• Newport News is only place where pilots plan their transit based on the tide stage.</li> <li>• 50 x 1000 foot ships experience difficulty at Anchorage F on ebb currents, OK on the flood.</li> <li>• Cross-currents at Newport News Channel exacerbate deep draft transits.</li> <li>• York River Entrance current set is across the channel.</li> <li>• A circular current at Thimble Shoals is not as severe as some other places in the port. Pilots plan for it in their transits.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Pilots will often maintain one-way traffic at Newport News Channel.</li> <li>• Local knowledge of pilots and other professionals.</li> <li>• Tide &amp; current tables.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>
<b>Navigation Conditions (continued)</b>		
<p>Ice Conditions</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Generally never seen. Icebreaking last needed in 1977.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Rarely develops.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Waterway Configuration</b>		
<p>Visibility Obstructions</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Blind spots located at               <ul style="list-style-type: none"> <li>– Portsmouth, just south of Hospital Point</li> <li>– Norfolk Naval Shipyard</li> <li>– James River at the reserve fleet</li> <li>– Lambert Point coal facility if there is a ship berthed there</li> <li>– Gilmerton and I-64 bridges/bends</li> <li>– East Branch off #5 Norfolk Southern RR bridge</li> </ul> </li> <li>• Background lighting problem spots at               <ul style="list-style-type: none"> <li>– Waterside (Norfolk)</li> <li>– Portsmouth Marine Terminal</li> <li>– Naval Station Norfolk, high intensity lights; multi-directional (used to increase naval station security)</li> </ul> </li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Good communications.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>



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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Waterway Configuration (continued)</b>		
<p>Channel Width</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Narrow channel width at the Gilmerton Bridge + there are 90 degree turns there               <ul style="list-style-type: none"> <li>– Planned span widening to 230 feet</li> <li>– However, the adjacent RR bridge span (125 feet) will not be widened for several years</li> </ul> </li> <li>• Longer ships may not be able to fully turn at Norfolk International Terminal.</li> <li>• Bridges must be ready to open for ship traffic; sometimes are not.</li> <li>• Naval security zone at Sewells Point blocks recreational boater transits, putting them into or near the channel.</li> <li>• One-way traffic frequently in James River.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Half-channel widths being deepened at Thimble Shoals and Norfolk Harbor Reach channels.</li> <li>• Perhaps in the future there will be difficulty finding dredging spoils areas               <ul style="list-style-type: none"> <li>– Risk transference from reduced environmental impact because of dredging to increased potential for ship accidents</li> </ul> </li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Coordinated efforts of USACE, CG, Navy, and pilots for channel designs, especially at transition points.</li> <li>• Charting is up to date.</li> <li>• Port has good ability to survey depths.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>
<b>Waterway Configuration (continued)</b>		
<p>Bottom Type</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Hard bottoms at               <ul style="list-style-type: none"> <li>– Turkey Is. Cutoff in James River</li> <li>– Willoughby Bank inside the bridge tunnel</li> <li>– Between Newport News and James River Bridges</li> </ul> </li> <li>• Difficult to monitor shoaling as it closes in the waterway.</li> <li>• Ships avoid anchoring in anchorages off Newport News because of their hard bottom.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Generally soft muddy bottom reduces the probability of damage in grounding.</li> <li>• Good charts and aids to navigation.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Waterway Configuration (continued)</b>		
<p>Waterway Complexity</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Intersecting channels at               <ul style="list-style-type: none"> <li>– Town Point Reach/Eastern Branch</li> <li>– ICW/Southern Branch</li> <li>– Norfolk Harbor Reach/Newport News Channel/Entrance Reach</li> <li>– York River/Chesapeake Ship Channel</li> </ul> </li> <li>• Crossing traffic at               <ul style="list-style-type: none"> <li>– Downtown Norfolk has three ferries crossing the waterway</li> <li>– Little Creek to Cape Charles across Thimble Shoals and Chesapeake Ship Channels</li> </ul> </li> <li>• Major bends in channels at               <ul style="list-style-type: none"> <li>– Gilmerton (Elizabeth River Southern Branch)</li> <li>– Thimble Shoal/Sewell Point</li> <li>– All of the James River</li> </ul> </li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Mandatory pilotage.</li> <li>• Regulated Navigation Area.</li> <li>• Very good aids to navigation.</li> <li>• Good marine communications bridge to bridge</li> <li>• Local knowledge of professional mariners.</li> <li>• Transient boaters generally not underway at night</li> <li>• Generally sufficient depths for small boats outside of the channels.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• Licensing or mandatory education of operators.</li> <li>• Improved rules for uninspected vessels that increase operators’ knowledge and responsibility; communications awareness.</li> <li>• Improve communications between deep draft and shallow draft vessels under 20 meters in length. Operators are not monitoring VHF-FM Ch 13.</li> </ul>
<b>Immediate Consequences</b>		
<p>Number of People on Waterway</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Ferry boats are carrying about 100 persons.               <ul style="list-style-type: none"> <li>– Jamestown &amp; Norfolk-based</li> </ul> </li> <li>• Small cruise ships embark hundreds at Nauticus.</li> <li>• Naval ships (aircraft carriers) carrying thousands of sailors.</li> <li>• Dinner cruises carry up to 600 persons.</li> <li>• Headboats take 30-40 people.</li> <li>• Harbor tour boats carry up to 300 people each.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Carnival Cruise lines starting operations in October with 3,000 passenger capacity will call at Nauticus.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Large Navy and Coast Guard presence to assist in mass rescue operations.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Immediate Consequences (continued)</b>		
<p>Volume of Petroleum Cargoes</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Yorktown BP/AMOCO facility receives weekly shipments of about 555,000 bbls of crude.               <ul style="list-style-type: none"> <li>– Use G anchorage to lighter tankers</li> </ul> </li> <li>• ITBs carry 150,000-500,000 bbls shipments biweekly.</li> <li>• Craney Island is a major transshipment point from a Texas pipeline and also receives 5-6 tankership deliveries per year.</li> <li>• 6 Military Sealift tankers homeported here, each with 7.5 million gallon capacity; also go to the shipyards for overhauls.</li> <li>• Additional bunkers capacities aboard other ships.</li> <li>• Tank barge traffic is about 5% of total. Steady flow on York River.</li> <li>• Some coastwise and bunker-barge movements. Through the area from Southern Branch of Elizabeth River.</li> <li>• Barge traffic to Richmond &amp; Chesterfield Power plant.</li> <li>• Some shoreside storage and transfer locations.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• State program to register storage facilities and require oil spill contingency plans.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• As discussed under Environmental Impacts.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Immediate Consequences (continued)</b>		
<p>Volume of Hazardous Chemical Cargoes</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Urea (UAN) fertilizer shipments received every ten days.</li> <li>• UAN is a booming business. Transits to:               <ul style="list-style-type: none"> <li>– Elizabeth River Southern Branch to just past Gilmerton Bridge</li> <li>– Eastern Branch inside the Campostella Bridge</li> </ul> </li> <li>• Cargoes of particular hazard               <ul style="list-style-type: none"> <li>– Styrene (Allied on Eastern Branch)</li> <li>– LPG at Atlantic Energy (Southern Branch)</li> </ul> </li> <li>• Naval hazardous materials               <ul style="list-style-type: none"> <li>– Nuclear &amp; chemical</li> </ul> </li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Steady seasonal increase in urea shipments.</li> <li>• LPG demand increasing.</li> <li>• Cove Point LNG facility re-opens 2002.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Subsequent Consequences</b>		
Economic Impacts	<p>Today:</p> <ul style="list-style-type: none"> <li>• Port is vulnerable to bridge closures on the Southern Branch. High potential for this to occur at the Jordan Bridge. Other bridges are well maintained.               <ul style="list-style-type: none"> <li>– Immediate impact; every day = \$100,000 in lost commerce below the Jordan Bridge</li> <li>– City of Chesapeake asked for a Jordan Bridge failure plan</li> <li>– Require heavy lift resources from outside the area to resolve</li> </ul> </li> <li>• Closure of the port at Sewell Point will have an immediate impact in payrolls, the movement of goods, and perhaps national security.</li> <li>• The area’s dependence on marine transportation is high. Yet, there seems to be a higher concern for smooth vehicular traffic flow over bridges.</li> <li>• Truck and rail modes are not readily available to divert cargoes.</li> <li>• NAS Oceana receives aviation fuels by barge.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Tunnels help mitigate impact as an alternate form of transportation of port goods.</li> <li>• Regulations for transit of the area (RNA).</li> <li>• Dead-ship tow policy.</li> <li>• Commercial and naval salvage capabilities.</li> <li>• Very capable tugboat fleet.</li> <li>• NAS Oceana has a substantial store of aviation fuel.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Subsequent Consequences (continued)</b>		
<p>Environmental Impacts</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• High vulnerability and environmental sensitivity of the Chesapeake Bay watershed.</li> <li>• Wetlands and breeding areas are abundant in all areas of the port.</li> <li>• Endangered turtles, whales, dolphins, fishes, birds, blue crabs &amp; oysters               <ul style="list-style-type: none"> <li>– James &amp; Rappahanock Rivers</li> <li>– Elizabeth River (Eastern Branch)</li> <li>– The Yorktown area is especially sensitive</li> <li>– Also Lynnhaven &amp; Little Creek</li> </ul> </li> <li>• Residential development along the waterway heightens awareness of well-heeled citizenry to environmental problems.</li> <li>• East Coast has done far less planning than the West Coast. Resources allocated to environmental planning and response are similarly far less than the West Coast governments.</li> <li>• Available response capability is inadequate to the worst-case scenarios of a spill in the York &amp; James Rivers and the Chesapeake Bay.</li> <li>• Smaller companies hire out planning and response, and therefore are not familiar with them.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Coast Guard inspections and preventive measures.</li> <li>• Pre-positioned cleanup equipment.</li> <li>• Qualified civilian response (OSRO).</li> <li>• Navy has tremendous response capability.</li> <li>• Moving to double-hull tank vessel requirements.</li> <li>• Navy and Coast Guard spill response exercises.</li> <li>• Good working relationships between agencies.</li> <li>• James River reserve fleet has a draft spill response plan.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• More planning events.</li> <li>• Help people to more fully understand the cost of pollution incidents, particularly the long-term costs to remediate the environment.               <ul style="list-style-type: none"> <li>– Comparison of prevention vs. remediation costs</li> </ul> </li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Subsequent Consequences (continued)</b>		
<p>Health &amp; Safety Impacts</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• About 1.5 million people live in the Hampton Roads area.</li> <li>• Limited evacuation capability, and an associated fear-factor adding to the numbers of people trying to evacuate.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Population is moving within the region, with small growth in total number of people.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Regional network of emergency response personnel. Medical personnel are linked together for mutual assistance.</li> <li>• Exercises.</li> <li>• State Department of Emergency Management has a good organization.</li> <li>• Improved technology and planning in response to hurricanes that transfers over to other incidents.</li> <li>• Few truly dangerous waterborne cargoes that would require a large-scale evacuation.</li> <li>• Drinking water is not drawn from the waterway.</li> <li>• Bridges are closed to ship transits when wind speeds exceed 30 mph.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• None discussed.</li> </ul>

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
<b>Other Risk Factors</b>		
<p>Naval Security Requirements</p>	<p>Today:</p> <ul style="list-style-type: none"> <li>• Heightened security requirements to protect naval assets from terrorist activities                             <ul style="list-style-type: none"> <li>– Ship movements are protected by armed high-speed patrol boats</li> <li>– Public doesn't expect aggressive or deadly-force reaction to their proximity to naval assets</li> <li>– Boating public curiosity to see naval ships up-close</li> </ul> </li> <li>• Naval security zone extends into the Norfolk Harbor Reach.                             <ul style="list-style-type: none"> <li>– 200 feet of the channel width is lost, but does not affect the deep draft community directly</li> <li>– Affects mostly daylight &amp; recreational boaters</li> <li>– Boaters have to divert into the channel to transit around Sewell Point</li> <li>– Transfers naval security risk to boating/shipping community with an increased risk for accidents</li> </ul> </li> <li>• High intensity lights shine into the channel; can be trained in any direction as needed; dockside sentries are armed with machine guns and are guided by military use-of-force instructions.</li> <li>• Navy facility plans will create a physical barrier to protect ship moorings.</li> <li>• Navy routinely goes to sea in a high-alert status and conducts anti-terrorism drills outbound Chesapeake Bay.</li> </ul> <p>Trends:</p> <ul style="list-style-type: none"> <li>• Expected to be steady to increasing need.</li> </ul>	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> <li>• Coast Guard training assistance to Navy boat crews for dealing with public.</li> <li>• Coordination between a navy and commercial pilots.</li> </ul> <p>New ideas:</p> <ul style="list-style-type: none"> <li>• Increased public relations efforts to make boating community aware of:                             <ul style="list-style-type: none"> <li>– Seriousness of naval security intentions</li> <li>– Restrictions and the alternatives available to the shallow draft vessel operator</li> </ul> </li> <li>• Provide an auxiliary shallow draft channel or widen the existing channel.</li> <li>• Targeted law enforcement patrols.</li> <li>• Extend RNA to require pleasure boaters to stay outside the west side of Norfolk Harbor Reach channel.</li> <li>• NOAA charting updated to reflect security areas clearly.</li> </ul>



## **Summary of Port of Hampton Roads Waterway Navigational Attributes**

### ***Ship Channel Complexity & Configuration***

- Thimble Shoals – 1000 ft wide, 13 miles long
- Norfolk Harbor – 800 ft wide, 19.6 miles long
- Newport News – 800 ft wide, 6.9 miles long
- James River – 200-300 ft wide, 90 miles long

### ***Converging or Crossing Traffic***

- Some at channel junctions

### ***Ship Channel Traffic***

- Moderate

### ***Recreational Activity***

- Seasonally very heavy

### ***Bottom***

- Mud

### ***Visibility***

- Generally very good, most channels are long straight stretches

## **Port of Hampton Roads Vessel Traffic Management Profile (Presently in place)**

### ***Aids to Navigation (USCG and Private)***

- Lighted & Unlighted – Fixed & Floating

### ***Regulated Navigation Areas (RNA)***

- RNA in place for Chesapeake Bay entrance and Hampton Roads, VA and adjacent waters.  
33 CFR 165.501

### ***Vessel Traffic Systems (VTIS/VTS)***

- None

## **Port of Hampton Roads Planned and Anticipated Changes**

### ***Planned Infrastructure Developments***

- Deepening channel to 50 ft inbound, 55 ft outbound

### ***Planned New Terminal***

- Addition of a fourth marine terminal at Craney Island

### ***Planned Third Bridge Tunnel Crossing***

- Will aid in ground transportation to and from current and new terminals

### ***New Intermodal Connection***

- Proposed long-term partnership with U.S. Navy, Norfolk International Terminals, and Norfolk Southern to make shipping more efficient and lower traffic congestion