Lower Columbia River
Workshop Report

Introduction

A Port Risk Assessment Workshop was conducted for the Lower Columbia River in Portland, Oregon, on September 11 - 12, 2000. 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) [1];
- Summary of risks and mitigations discussion;

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

Assessment Process

The risk assessment process is a structured approach to obtaining expert judgments on the level of waterway risk. 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 (AHP), 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, stakeholders, 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 workshop is devoted to obtaining expert opinion about how to weight the relative contribution of each variable to overall port risk. The experts 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 risk 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.

[1] 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.

Participants

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

Participant	Organization	Phone	Email
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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
12.4	19.0	28.0	13.3	17.7	9.6

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 Lower Columbia River participants is as listed above. These participants felt that Navigational Conditions are the largest driver of risk. Subsequent Consequences was a significantly lower influence.

Book 2 - Risk Factors *(Generic Weights)*

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences
12.4	19.0	28.0	13.3	17.7	9.6

% High Risk Deep Draft	Volume Deep Draft	Wind Conditions	Visibility Obstructions	Number of People on Waterway	Economic Impacts
8.7	4.7	2.4	7.1	5.3	1.2
% High Risk Shallow Draft	Volume Shallow Draft	Visibility Conditions	Channel Width	Volume of Petroleum	Environmental Impacts
3.7	2.8	16.9	2.8	5.7	2.8
	Vol. Fishing & Pleasure Craft	Tide & River Currents	Bottom Type	Volume of Chemicals	Health & Safety Impacts
	2.5	5.3	0.9	6.7	5.6

Traffic Density	Ice Conditions	Waterway Complexity
9.0	**3.4**	**2.5**

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 under each of the six major categories:

- Fleet Composition: High-Risk Deep Draft Vessels contribute the third highest amount of risk overall.
- Traffic Conditions: Traffic Density contributes the second highest amount of risk overall.
- Navigational Conditions: Visibility Conditions contribute the highest amount of risk overall.
- Waterway Configuration: Visibility Obstructions contribute the fourth highest amount of risk overall.
- Immediate Consequences: The Volume of Chemicals contributes the fifth highest amount of risk and the Volume of Petroleum the sixth-highest amount of risk overall.
- Subsequent Consequences: Health and Safety Impacts contribute the seventh highest amount of risk overall.

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

	Scale Value
Wind Conditions	
a. Severe winds < 2 days / month	1.0
b. Severe winds occur in brief periods	2.5
c. Severe winds are frequent & anticipated	4.6
d. Severe winds occur without warning	9.0
Visibility Conditions	
a. Poor visibility < 2 days/month	1.0
b. Poor visibility occurs in brief periods	2.1
c. Poor visibility is frequent & anticipated	4.9
d. Poor visibility occurs without warning	9.0
Tide and River Currents	
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
Ice Conditions	
a. Ice never forms	1.0
b. Some ice forms-icebreaking is rare	2.5
c. Icebreakers keep channel open	5.5
d. Vessels need icebreaker escorts	9.0
Visibility Obstructions	
a. No blind turns or intersections	1.0
b. Good geographic visibility-intersections	2.0
c. Visibility obscured, good communications	4.4
d. Distances & communications limited	9.0

Channel Width

a. Meetings & overtakings are easy	1.0
b. Passing arrangements needed-ample room	2.3
c. Meetings & overtakings in specific areas	6.7
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	1.6
c. Mud, sand and rock outside channel	4.4
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	2.7
c. Converging - NO crossing traffic	4.7
d. Converging WITH crossing traffic	9.0

Number of People on Waterway

a. Industrial, little recreational boating	1.0
b. Recreational boating and fishing	3.4
c. Cruise & excursion vessels-ferries	6.0
d. Extensive network of ferries, excursions	9.0

Petroleum Volume

a. Little or no petroleum cargoes	1.0
b. Petroleum for local heating & use	2.5
c. Petroleum for transshipment inland	4.6
d. High volume petroleum & LNG/LPG	9.0

Chemical Volume

a. Little or no hazardous chemicals	1.0
b. Some hazardous chemical cargo	2.3
c. Hazardous chemicals arrive daily	4.8
d. High volume of hazardous chemicals	9.0

Economic Impacts

a. Vulnerable population is small	1.0
b. Vulnerable population is large	3.3
c. Vulnerable, dependent & small	5.3
d. Vulnerable, dependent & large	9.0

Environmental Impacts

a. Minimal environmental sensitivity	1.0
b. Sensitive, wetlands, VULNERABLE	3.2
c. Sensitive, wetlands, ENDANGERED	6.1
d. ENDANGERED species, fisheries	9.0

Health and Safety Impacts

a. Small population around port	1.0
b. Medium - large population around port	2.3
c. Large population, bridges	5.4
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. On average, participants from this port evaluated the difference in risk between the lower limit (Port Heaven) and the first intermediate scale point as being equal to 1.6; the difference in risk between the first and second intermediate scale points was equal to 2.7; and the difference in risk between the second intermediate scale point and the upper risk limit (Port Hell) was 3.9.

Book 4 - Risk Factor Ratings *(Lower Columbia River)*

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences
% High Risk Deep Draft 4.2	Volume Deep Draft 3.9	Wind Conditions 3.4	Visibility Obstructions 4.6	Number of People on Waterway 4.9	Economic Impacts 7.1
% High Risk Shallow Draft 3.2	Volume Shallow Draft 3.8	Visibility Conditions 3.0	Channel Width 5.5	Volume of Petroleum 4.9	Environmental Impacts 8.8
	Vol. Fishing & Pleasure Craft 6.6	Tide & River Currents 4.5	Bottom Type 4.4	Volume of Chemicals 2.2	Health & Safety Impacts 4.9
	Traffic Density 5.7	Ice Conditions 2.1	Waterway Complexity 6.0		

Analysis:

This 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 Lower Columbia River (in order of importance):

1. Environmental Impacts (8.8)
2. Economic Impacts (7.1)
3. Volume of Fishing and Pleasure Craft (6.6)
4. Waterway Complexity (6.0)
5. Traffic Density (5.7)
6. Channel Width (5.5)

Book 5 - VTM Tools *(Lower Columbia River)*

Fleet Composition	Traffic Conditions	Navigation Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences

% High Risk Deep Draft		Volume Deep Draft		Wind Conditions		Visibility Obstructions		Number of People on Waterway		Economic Impacts	
6	0.7	**14**	0.2	**19**	-0.5	**8**	0.7	**13**	0.2	**5**	1.1
OTH	ALERT	RA		RA		AN		RA		RA	
% High Risk Shallow Draft		**Volume Shallow Draft**		**Visibility Conditions**		**Channel Width**		**Volume of Petroleum**		**Environmental Impacts**	
6	0.7	**15**	0.0	**18**	-0.3	**8**	0.7	**16**	0.0	**2**	1.5
RA		RA		RA		OTH		RA		RA	ALERT
		Vol. Fishing & Pleasure Craft		**Tide & River Currents**		**Bottom Type**		**Volume of Chemicals**		**Health & Safety Impacts**	
		1	2.1	**11**	0.3	**10**	0.3	**20**	-0.8	**12**	0.2
		RR		RA		RA		RA		RA	
		Traffic Density		**Ice Conditions**		**Waterway Complexity**					
		3	1.3	**17**	-0.2	**4**	1.3				
		RR		RA		RA	ALERT				

Legend:

See the **KEY** (below). 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 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. Below are the tool acronyms and tool definitions.

KEY	
Risk Factor	
Rank	Risk Gap
Tool	ALERT

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

Analysis:

The results shown are consistent with the discussion that occurred about risks in the Lower Columbia River area. For 13 out of the 17 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.

An alert, indicating that there was no group consensus, occurred because votes were split between several VTM tools, as indicated:

- Percent High Risk Deep Draft – RA (4), AN (1), RR (2), OTH (5)
- Waterway Complexity – RA (6), AN (1), CM (1), RR (1), DI (1), VTIS (1), OTH (1)
- Environmental Impacts – RA (4), AN (1), CM (1), RR (3), DI (1), OTH (2)

Summary of Risks

Scope of the port area under consideration: The participants defined the geographic bounds of the port area to be discussed as the sea buoy to Bonneville Dam with note that deep draft traffic ends at the I-5 bridge—significant change in mix of traffic above that bridge, including the Willamette River.

The Upper Columbia River (Bonneville Dam to Lewiston, WA) was not included due to the unique nature of its geography and trade. Instead, that waterway will be the subject of a separate risk assessment workshop.

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Fleet Composition		
Percent High Risk Deep Draft Cargo & Passenger Vessels	**Today:** • Multi-mission ships which due to mission or area of operation pose inherently higher risk • Degradation of foreign flag crews. Companies use outside contractors to hire with no regard to qualifications. – Multinational crews cause communications problems, such as increase in Chinese crew with Japanese master – 10% of ships poor quality or poor communications – 20% of ships wish they could communicate better • Quality of vessels: • Crews of U.S. ships are better than those of foreign • Quality of ships overall is going up • Priority I traffic: very little traffic in lower Columbia. Usually due to flag state, specific ship usually not an issue • Under-powered ships and ships with small rudder a problem crossing the bar under less than ideal conditions – Integrated tug and barge (ITB) units under powered – Late 70s ships designed to be under-powered to ease fuel use and costs • Fuel change over (bunker to lighter fuel) issues not usually a problem, not done during bar transit • Safe manning certificates allow container ships with crew of 9. • Crew fatigue contributes to bunkering spills and equipment failures **Trends:** • None discussed	**Existing Mitigations:** • ISO/ISM require higher crew standards to be met to obtain certificates **New Ideas:** • None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Fleet Composition (continued)		
Percent High Risk Shallow Draft Vessels	**Today:** • Fisherman have low level of understanding of boat operations and rules of the road • Jet skiers have no understanding of rules of the road • Wind surfers fail to yield to power-driven vessels in channel • Quality of some recreational vessels is very low • Seamanship knowledge minimal: do not recognize hazardous conditions—14 foot vessels in 10 foot seas • High-speed water jet operators (speed thrill) on Willamette River. • Commercial fishing and crabbers in lower Columbia – Run with high intensity vapor lights, interfere with large ship pilotage – GPS assisted collisions – Drift nets above I-5 bridge – Fatigue issues, running aground – Feel they can go where they want due to hierarchy in rules of the road pecking order • Tug fleet generally not a risk • Non commercial traffic in general is weak in knowledge of rules of the road • Local area knowledge issues – Passenger boats rotate in and out seasonally, not sure if crew are the same and what their qualifications are – Alaskan passenger vessels rotate crews, not always the same ones **Trends:** • None discussed	**Existing Mitigations:** • Tug crews better quality and better trained before allowed to operate • Technology provides better navigation and engineering equipment **New Ideas:** • Need better education of recreational boaters

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Traffic Conditions		

Volume of Deep Draft Vessels	**Today:**
	• 5500 piloted deep draft commercial movements per year
	• 1900 vessel calls per year
	• Deep draft vessels anchored off Astoria when bar is closed
	• Vessels anchored in queue awaiting turn to on/offload due to dock space
	• Anchorages fill up with vessels awaiting bar crossing, especially when bar is closed
	  – I-5 Bridge
	  – Astoria
	  – Longview
	  – Confluence of Colombia and Willamette
	Trends:
	• Number remaining constant
	• Tonnage of vessels is increasing
		Existing Mitigations:
		• Mandatory pilotage
		New Ideas:
		• None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Traffic Conditions (continued)		
Volume of Shallow Draft Vessels	**Today:** • 50% of river traffic is shallow draft • Numerous close calls/near collisions between barges and recreational fishing vessels • Close calls particularly between sailing vessels and barge tows • Number of recreational craft above I-5 bridge increases significantly • Commercial fishing fleet – Down in volume – Down in fishing time – Seasons being cut – Gillnetting outlawed • Not enough fleeting areas to tie up idle barges • Increasing carriage by railroad which means they need their bridges at same peak passage times as vessels **Trends:** • Growth in container on barge traffic • Over last 10 years drop in deep draft and increase in tug / tow • Significant drop in log rafts • Increase in passenger vessel traffic – T and K class vessels) • Number of passenger-carrying tour vessels on weekly trips carrying older passengers is rising	**Existing Mitigations:** • None discussed **New Ideas:** • None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Traffic Conditions (continued)		
Volume of Fishing & Pleasure Craft	**Today:** • Lewis and Clark Bicentennial in two years will draw significant increase in out of area tourists and boat operators • High volume, frequently impeding commercial traffic • 150,000 registered pleasure craft in Tri-county area • 350,000 to 500,000 unlicensed boats and watercraft (kayaks, etc) • Numerous marinas for access to water • Numerous boat ramps for launching – 12% of boats in Washington are along the Columbia River – Enables anyone with a boat access to waterway • Problems with commercial traffic more due to interaction than just volume – Fishing in channels (sturgeon like deep water) – Salmon fishing boats in shallow water but smaller boats risk being swamped by transiting ship wakes • Education and awareness programs for boaters have not kept pace with tremendous increase in recreational boat and personal watercraft use • Judges do not consider boating incidents that serious **Trends:** • Significant increases seen in recreational waterway users	**Existing Mitigations:** • COTP orders to restrict traffic during certain marine events • Enforcement measures by USCG and Sheriff's Department • USCGAUX and Sheriff marine patrols provide escort services for commercial traffic to open way through fishermen in the channel • State of Oregon has instituted phased in recreational boat licensing program **New Ideas:** • Increase enforcement, i.e. writing tickets, especially for anchoring in channels, fishing in channels that impede transit of ships • Provide more assets for escort duty so more requests can be satisfied • Review response priority issues: enforce existing rules including narrow channels and fairways (anchoring) • Develop education programs for boating public • Mandatory licensing that encompass essential core knowledge in safe boating • Education should include charts, equipment, skills commensurate with intended use of the boat

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Traffic Conditions (continued)		
Traffic Density	**Today:** • Recreational fishing congestion – Buoy 10 (15 NM area) – Astoria-Megler Bridge – Longview Bridge – Hump Island – Coffin Rock – Ahle – Martin Island – St Helens/Columbia City (4 dots) – Austin Point – Confluence of Columbia and Willamette Rivers – Above I-5 bridge – Chinook Landing – Washougal – Cape Horn/Sand Island – Multnomah Falls – Hamilton Reach – Light 40 • Tugs and tows crossing bar at high tide along with deep draft • Sailboarder congestion – Wallace Island – Rooster Rock • Times of congestion – Any holiday – I-5 bridge on July 4th (shut river to commercial traffic) • Willamette River – Rose Festival, Portsmouth for first week of June – All holidays **Trends:** • None discussed	**Existing Mitigations:** • Communication and coordination between industry and festival planners • Good communication and flow of information between deep draft vessels and pilots on desired and scheduled ship movements • Good use of VHF-FM radio and cell phone to distribute information • Pilot station provides printouts of ship movements for the following days • Word of mouth via VHF-FM radio from commercial traffic to commercial traffic about where they are and where there are concentrations of recreational boaters • Windy conditions used to anticipate locations of wind surfers • Communications between commercial carriers and dinner boats • Word of mouth an effective mitigator now • Risk level for density is mitigated well, however efforts need to be ongoing **New Ideas:** • Provide seasonal cruise ships from Alaska with information on pilotage, safety, communications, river transit requirements • Education an important piece of solution

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions		

Wind Conditions	**Today:**
	• Wind speeds of 20-25 knots begin to hamper safe maneuvering of ships
	• Moderate to strong through the Columbia Gorge blowing down river often times at gale strength
	• Wind draws wind surfers and they cannot be seen (Wallace Island, Rooster Rock to Bonneville)
	• Winter winds from SW, perpendicular to current in channel and anchorage at Astoria. Anchored ships are beam-to wind and drag.
	• Rice Island a dangerous wind area
	• Wind at Bar and Astoria/Young's Bay strong and cross river
	• High winds cause alignment problems for tug and tows transiting I-5 and RR bridge
	• Bar closings
	  – 14 closures each winter, usually for a period of hours, usually until tide changes
	• Wind conditions dangerous for recreational boats at:
	  – Kalama
	  – Mouth of Willamette up to Washougal
	• High winds make coming alongside difficult at all ports all along the waterway (Astoria, Vancouver, Portland)
	• Selective bar closings for recreational boats based on boat size
	Trends:
	• None discussed
		Existing Mitigations:
		• Mandatory pilotage
		• Bridge to bridge communications
		• Popular windsurfer areas well known
		• NOAA Regional Weather Center located in Portland
		New Ideas:
		• None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions (continued)		

Visibility Conditions	**Today:**
	• Fog
	  – Occurs on Columbia River bar 42 days per year
	  – Local patterns along the entire river typically lifts out in a few hours time rather than persisting for days
	• Rain thick conditions during winter storms
	• Blowing snow and freezing rain cause problems from Rooster Rock east
	• Official policy is to never shut river down
	Trends:
	• None discussed
		Existing Mitigations:
		• Ship operators and pilots determine when to move ships based on weather conditions
		New Ideas:
		• None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions (continued)		
Tide & River Currents	**Today:** • Moderate (1-3knots) throughout river system with higher levels during spring melt/extended rain freshets • Stronger currents on Bar and near Astoria • Cross currents: – Tongue Point coming out of North Channel – Tongue Point Range where Woody island channel crosses main ship channel – Brookville Clifton channel to main ship channel – Pillar Rocks – Longview where Cowlitz River enters main ship channel – Coming out of Sandy River – Washougal due to bend in channel – Mouth of Willamette River – Hamilton Island Reach • Stronger currents in Willamette River during heavy rains along headwaters **Trends:** • None discussed	**Existing Mitigations:** • River stage/level information/warnings provided through Port of Portland's River Level Forecasting system (free use for pilots, chargeable to ship owners) **New Ideas:** • None discussed
Navigation Conditions (continued)		
Ice Conditions	**Today:** • Forms once every 10 years on average • Bigger problem is freezing rain on the aids to navigation; occurs annually from Government Island east • Bar closed in 1984 due to ice conditions • River had a few inches of ice in 1978 **Trends:** • None discussed	**Existing Mitigations:** • Tugs and deep draft can easily move through ice that forms **New Ideas:** • None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration		

Visibility Obstructions	**Today:**
	• Blind corners due to height of land
	  – Mouth of Willamette is major blind area
	  – Throughout waterway at every turn and bend
	  – Bugby Hole
	  – Warrior Rock
	• Background lighting problems:
	  – Approaching Astoria, both in and out bound
	  – Longview
	  – Lights at Terminal 6
	  – Steel Bridge on Willamette
	• ATON lights seem dimmer recently
	• Bird nests obstructing lights, especially ospreys, throughout the system
	• Vegetation growth affecting aids
	  – Driscol Range
	  – Duck Club
	  – Henrici Range, upper end of Government Island
	  – Warrendale Upper Range
	Trends:
	• None discussed
		Existing Mitigations:
		• None discussed
		New Ideas:
		• None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration (continued)		
Channel Width	**Today:** • Federal channel width 600 feet from Astoria up to I-5; above there channel narrows, varies from 150-600 feet • Bridges – 200-foot horizontal clearance at Vancouver RR swing bridge • Alignment between Vancouver RR and I-5 bridges due to proximity • Areas where deep draft try not to meet: – Skamokawa to Pillar Rock (Brookville) reach – Garrison below Bonneville Dam down to Cape Horn – Lower Reed Island to Government Island – Upper Willamette from Freemont Bridge to Ross Island – Mouth of Willamette River **Trends:** • None discussed	**Existing Mitigations:** • Ongoing maintenance dredging • Bridge to bridge communications • Deep draft vessels all have pilots aboard • Pilots operating procedures • Dredging to 43 feet and overdredging channel width may reduce risk but deepening will not occur soon, many environmental issues (disposal of spoils, hazardous materials on the bottom) • Risk avoidance: shippers will not bring in post PANAMAX size ships **New Ideas:** • None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration (continued)		
Bottom Type	**Today:** • Predominantly sand but some rock • Hard spots – Skamokawa – Bugby Hole – Bunker Hill – Copper Rock – Tybu Ledge (Goat Island) – Kalama – Warrior Rock Reach – Lady Island Tower – Washougal – Cape Horn – Coffin Rock – Ross Island east to dam is rock bottom – Tug dumped load of rocks in channel at RR bridge • Bottom now 40 feet with several 38-foot spots **Trends:** • None discussed	**Existing Mitigations:** • Planned dredging navigation channel to 42 feet from Columbia River Bar to Lower Columbia River/Vancouver • Ongoing maintenance dredging **New Ideas:** • None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration (continued)		
Waterway Complexity	**Today:** • Crossing and meeting at mouth of Willamette River • Longview fleeting and merging traffic • Small craft at Skipanon Waterway intersection • Chinook Landing • Swan Island Terminal into Willamette • North Portland Harbor • Both ends of Oregon Channel • Ferry crossing river at Westport • Recreational sailing regatta traffic crossing river at Longview, Portland, Vancouver between I-5 and RR bridges • Air draft issues: – Longview – St John's – Freemont – Steel Bridge – I-5 – St. John's Willamette RR bridge (waits to last minute to open-pilots feel like they are "playing chicken") • Amtrak passenger trains have priority over ships for RR bridges; information provided is not accurate today—bridge operators say 10 minutes away when in fact it is 20 minutes away **Trends:** • None discussed	**Existing Mitigations:** • Traffic coordination handled by pilots and tug boat operators • No dead spots in bridge-to-bridge communications • Good situational communications between commercial carriers on traffic ahead and behind • Rules of the Road • Aids to navigation • No accidents due to waterway complexity in recent memory • Bridge operators have local control of the RR bridges **New Ideas:** • Improve aids to navigation in identified areas • Modify rail and interstate bridges so that one bridge can accommodate rail and auto under which ships can safely navigate • AIS may help this issue with communications and positive vessel identification and positioning • Coordinate with Burlington Northern by providing longer term information on when ships are expected • Coordinate with AMTRAC to provide accurate information on where the train is and when it will really cross the bridge

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences		

Number of People on Waterway	**Today:**
	• Seasonal large cruise ship traffic
	  – 9 ships in spring and fall
	  – 2 ships in summer
	  – Run length of waterway, not just into Astoria
	• Dinner cruises
	  – Six vessels: Portland, Willamette area (60-300 pax)
	• Seasonal deep-sea fishing, 6 pax and head boats
	• Carry lots of kids on kid cruises on Willamette
	• Jet boat (20-30 pax) on Willamette
	Trends:
	• Dinner cruises up
	• Passenger vessels up
		Existing Mitigations:
		• None discussed
		New Ideas:
		• None discussed

Immediate Consequences (continued)		
Volume of Petroleum Cargoes	**Today:** • 10% of total tonnage is petroleum • 15-35 tank barges per month • 8 tank barges moving per day for bunkering • Six small (to point of not even being recoverable) spills in last 2 years with average of 900 bunker movements per year • Unattended barges left tied to ship. Concern for being hit by debris or parting lines. Barges occasionally being unloaded without tankermen onboard **Trends:** • Spills down • Short-term trend is up due to closing Olympia pipe line and will remain up until line is repaired	**Existing Mitigations:** • None discussed **New Ideas:** • None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences (continued)		
Volume of Hazardous Chemical Cargoes	**Today:** • Two anhydrous ammonia barges • Occasional benzene barge • Caustic soda barge every 3-4 weeks • Nuclear waste • Occasional chlorine barges • Repairs on LNG barges • Containerized HAZMAT under 5% • Principal HAZMAT facilities – From sea to Vancouver, Longview, Willamette – Anhydrous ammonia and caustic soda from Willamette to the east – Hazardous containers to Portland Terminal 6 **Trends:** • None discussed	**Existing Mitigations:** • Very low number of HAZMAT containers • CG inspects virtually all HAZMAT containers **New Ideas:** • None discussed

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Subsequent Consequences		
Economic Impacts	**Today:** • Have not had river closures. – Have had restricted areas where river is open above and below affected area – Closing river would have immediate consequences from public relations perspective—worldwide effect on how and where goods are shipped – Stigma of having river system shut down is long term and economically disastrous; some permanent shift in cargo likely – Closed during flood of 1996 with disastrous effects for port economy • If river were closed to navigation, impact would be immediate and national in scope. – For international community-immediate – Next pay day for ports – 2nd largest grain export port in the country – Intermodal transfer points for autos and containers – Portland moves 30M tons of cargo per year – Longview and Vancouver each move about 6M tons per year **Trends:** • None discussed	**Existing Mitigations:** • Tugs available but with up to 6 to 7 hour response time depending upon location of grounded vessel • Tugs have adequate horsepower to free grounded ships • Astoria is homeport for salvage tug with ground tackle; not continuously manned—48-hour ramp-up time. Not always in port • Adequate resources are considered to be relatively immediately available **New Ideas:** • Need tug in Astoria with more horsepower than current tug has

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Subsequent Consequences (continued)		
Environmental Impacts	**Today:** • NMFS Endangered Species Act in place throughout the river system. No specific endangered species habitats designated • Major pollution incident would have a very high impact on endangered species. • 9 threatened/endangered water species in river • Drilling/exercises to meet regulations requirements; not to learn weak and strong areas **Trends:** • None discussed	**Existing Mitigations:** • Captured in Regional Response Plans for Washington and Oregon • Pre-positioned response equipment • Contingency plans • Facility contingency plans • Vessel response plans • Tugboat response plans • Past spills have had positive response and successful outcomes • Two OSROs along Columbia River; both seem well prepared – Equipment exceeds state requirements – Extensive drilling and interacting – Cite response to New Carissa grounding • Dynamics of river currents could preclude complete capture but short of that, ready to respond • Dynamic process with continued improvements and updates • Trained people in place now can serve as nucleus for greater effort **New Ideas:** • Avoid complacency; continue the contingency plan review process • Longer term relationship with the regulatory body (USCG) whose people rotate every 4 years or so • One-stop call up to report emergency and generate response

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Subsequent Consequences (continued)		
Health & Safety Impacts	**Today:** • Population areas – Astoria 12,000 – Longview 30,000 – St Helens 8,000 – Kalama 4,000 – Vancouver/Portland 1,000,000 – Camas and Washougal 5,000 • Potable water supplies not affected-reservoirs and wells • Industrial intakes for co-generation plant in Vancouver **Trends:** • None discussed	**Existing Mitigations:** • None discussed **New Ideas:** • None discussed