DEPARTMENT OF ECOLOGY
State of Washington

Grays Harbor Vessel Traffic Risk Assessment (GHVTRA)

Final Report

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Grays Harbor Vessel Traffic Risk Assessment (GHVTRA)

Final Report

Spill Prevention, Preparedness, and Response Program

Washington State Department of Ecology

Olympia, Washington

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Executive Summary

The Department of Ecology (Ecology) received funding in the 2017–2019 budget to conduct oil spill prevention risk assessment work. The funding supported a risk assessment for oil spills from commercial vessels in Grays Harbor, and a rail traffic risk assessment.

The goals of the Grays Harbor Vessel Traffic Risk Assessment were to:

- Assess baseline and changing oil spill risks from commercial vessels operating in Grays Harbor.
- Identify measures that could help reduce the risks of oil spills.
- Assess oil spill response preparedness.
- Identify baseline oil spill response capability.

Ecology followed the International Maritime Organization (IMO) Formal Safety Assessment (FSA) process to conduct the Grays Harbor Vessel Traffic Risk Assessment (International Maritime Organization [IMO], 2002). The FSA process includes the following steps:

- Preparatory Step: Definition of Goals, Systems, Operations
- Step 1: Hazard Identification
- Step 2: Risk Analysis
- Step 3: Risk Control Options
- Step 4: Cost Benefit Assessment
- Step 5: Recommendations for Decision Making

Ecology focused on completing the Preparatory Step and Step 1, Hazard Identification, during Fiscal Year 2018 (July 1, 2017 – June 30, 2018). Ecology's Spill Prevention, Preparedness, and Response Program (Spills Program) staff facilitated two workshops with tribes and stakeholders to conduct the Hazard Identification.

Two additional workshops extended the Hazard Identification process. The first discussed oil spill response preparedness, and the second focused on commercial fishing, tribal fishing, and recreational vessel oil spill prevention and preparedness.

Ecology added a decision point to the Formal Safety Assessment process after Hazard Identification, to determine whether there was a need to continue with Steps 2-5.

Grays Harbor overview

Grays Harbor is a large inlet on the central coast of Washington. The bay comprising Grays Harbor extends east for approximately 15 miles to the mouth of the Chehalis River (National Oceanic and Atmospheric Administration [NOAA], 2017b).

The Port of Grays Harbor operates four marine terminals in the vicinity of the cities of Hoquiam and Aberdeen (Port of Grays Harbor, 2018). Approximately 100 deep draft commercial vessels

per year call on Grays Harbor (Washington State Department of Ecology [Ecology], 2018a). There are currently no movements of crude oil by vessel in Grays Harbor. For the Grays Harbor Vessel Traffic Risk Assessment, Ecology assumed each vessel call consisted of two transits, one entering transit from sea to a terminal and one departing transit from a terminal to sea. Ecology considered anchoring to wait for a berth as part of an inbound transit.

The Port also manages the Grays Harbor Pilots and operates Westport Marina, which serves commercial fishing, tribal fishing, and recreational boats (Port of Grays Harbor, 2018). Commercial fishery landings in Westport in 2016 were the highest on the West Coast (excluding Alaska) with 108 million pounds, valued at $59 million (NOAA, 2017d).

A study for the Port of Grays Harbor found maritime activity at the Port generated 574 direct jobs and $143 million in business revenue in 2013. During the same year, commercial fishing in Westport generated 1,067 direct jobs and $204 million in business revenue (Martin Associates, 2014).

The Quinault Indian Nation has adjudicated usual and accustomed treaty fishing areas within and adjacent to Grays Harbor and the Chehalis River (United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974)).[1]

There is an active Harbor Safety Committee that meets every two months. The Grays Harbor Safety Committee publishes a Harbor Safety Plan with Standards of Care, which are designed as a reference guide for safe and environmentally sound vessel movements and operations in and around the port area (Grays Harbor Safety Committee, 2014).

Anchorages in Grays Harbor are limited and are managed by the Grays Harbor Pilots. Anchorages in Grays Harbor are not formally designated or managed by the U.S. Coast Guard (Grays Harbor Safety Committee, 2014).

Vessel traffic is managed in cooperation between the Port of Grays Harbor, Grays Harbor Pilots, vessel agents, and the terminal tenants that ships call on (Grays Harbor Safety Committee, 2014). This cooperative system includes the use of an online vessel arrival tool and database that is updated by users of the system.

Participants

Representatives from the following governments and organizations participated in one or both of the Hazard Identification workshops. Ecology acknowledges the significant input and assistance from these individuals, and from the chair, vice-chair, and members of the Grays Harbor Safety Committee. Participation in the workshops does not imply endorsement of the Hazard Identification findings and recommendations by these organizations.

- Brusco Tug & Barge
- Contanda
- General Steamship Agencies

[1] https://wdfw.wa.gov/fishing/salmon/BoldtDecision8.5x11layoutforweb.pdf

- Grays Harbor Pilots
- Marine Exchange of Puget Sound
- National Oceanographic and Atmospheric Administration, Office of Coast Survey
- National Oceanographic and Atmospheric Administration, Olympic Coast National Marine Sanctuary
- Port of Grays Harbor
- Quinault Indian Nation
- REG Grays Harbor
- The Nature Conservancy
- U.S. Coast Guard Auxiliary
- U.S. Coast Guard Marine Safety Unit Portland
- Washington Dungeness Crab Fishermen's Association
- Washington State Department of Natural Resources

Ecology would also like to thank the staff of the Port of Grays Harbor, including Westport Marina, and the Westport Maritime Museum for their assistance in arranging meeting locations, providing logistical support, and helping the Vessel Traffic Risk Assessment process run smoothly and efficiently.

Hazard Identification results

During the first Hazard Identification workshop, participants reviewed potential incidents that could result in oil spills from commercial vessels, with a goal of identifying any local factors that could contribute to these incidents. A list of local factors was the primary outcome of the first workshop.

In the second Hazard Identification workshop, participants reviewed each local factor listed in the first workshop, identified safeguards currently in place to prevent incidents, and discussed potential high-level recommendations that could improve oil spill prevention.

This process was additive by design — each local factor, existing safeguard, and high-level recommendation identified by one or more participants was retained in the workshop outcomes. To preserve the collaborative nature of the workshops, Hazard Identification did not include ranking or voting to prioritize or eliminate inputs provided by participants. The local factors, existing safeguards, and high-level recommendations that resulted from this process represent a qualitative, inclusive listing for consideration by tribes and stakeholders.

Recommendations are summarized below by topic area for current traffic levels and for potential increased traffic in the future. Many recommendations applied to multiple topic areas. For ease of reading, each recommendation in the Executive Summary is listed under one topic area. Additionally, to simplify the organization of the recommendations, Ecology combined several topics into a "Harbor Safety Plan" topic. The topic areas, local factors, and existing safeguards

associated with each recommendation are provided in the discussion of Hazard Identification Workshops 1 and 2.

Projects that had been proposed at the time of the workshops were considered when discussing future vessel traffic. Two projects had active proposals at the time of Hazard Identification Workshop 2:

- Proposed potash export facility
    - State Environmental Protection Act checklist submitted to City of Hoquiam on December 14, 2017 (BergerABAM, 2017).
    - Potential vessel traffic: 1-2 ships per week initially; maximum of 4 ships per week (BHP Billiton Ltd. [BHP], n.d.; BergerABAM, 2017).
    - Vessel size: 20,000 to 82,000 deadweight tons (BergerABAM, 2017).
    - Ecology assumed a range 52–208 vessel calls per year.
- Proposed expansion of existing liquid bulk terminal
    - Permit application packet submitted to City of Hoquiam on January 25, 2018 (City of Hoquiam [Hoquiam], 2018).
    - Potential vessel traffic: 48 vessel calls per year (Hoquiam, 2018).
    - Vessel size: Panamax to tank barge (Hoquiam, 2018).

Potential increases in traffic were discussed in qualitative terms, to consider what changes to recommendations might be prudent if vessel traffic is higher in the future than it is today. This discussion was not intended to determine risks that could potentially be associated with the two projects, and does not take the place of any environmental reviews or analysis of specific proposals. This risk assessment does not address potential impacts of increased vessel traffic to Quinault Indian Nation access to treaty resources, including usual and accustomed fishing areas.

The total number of recommendations that resulted from the Hazard Identification process should not be interpreted as an indicator of the relative risk of an oil spill in Grays Harbor. Rather, the recommendations are intended to enhance safety measures already in place at the international, national, regional, and local levels.

Collectively, these safety measures have resulted in global and national declines in the number of oil spills and the volume of oil spilled over the past three decades (Ecology, 2017; U.S. Coast Guard, 2012). The last major oil spill in the vicinity of Grays Harbor was the oil barge *Nestucca* in December 1988 (NOAA, 2017a). Since 1988, significant changes have occurred in maritime safety. Double hulls are now required for tank vessels. The quality and operation of vessels has improved. Proactive collaborations like the Grays Harbor Safety Committee provide a forum to identify issues, address potential hazards, and share best practices. Ecology looks forward to working with tribes and stakeholders to consider the recommendations from the Hazard Identification process, and continuing to strengthen oil spill prevention and preparedness for Grays Harbor.

Recommendations for current vessel traffic

Aids to Navigation

Coast Guard Sector Columbia River

- Continue and strengthen coordination with waterway users through the Grays Harbor Safety Committee on topics including aids to navigation outages, maintenance, and any potential changes and aid modernization to include buoys, fixed, ranges, and virtual aids.
- Continue to coordinate with waterway users on the status of action items from the 2015 Waterways Analysis and Management System survey (WAMS); provide regular updates to the Grays Harbor Safety Committee.
- Conduct next WAMS scheduled in 2020.
  - Address 2015 channel realignment.
  - Incorporate any changes in vessel traffic as required based on terminal projects or expansions, or trends in vessel traffic to existing terminals.
  - Consider impact of background lighting on navigation.

Grays Harbor Safety Committee

- Consider forming a subcommittee for aids to navigation, in order to provide a forum for interaction between the Coast Guard and waterway users.

Anchorages

Coast Guard Sector Columbia River

- With Grays Harbor Pilots and the Grays Harbor Safety Committee, consider whether formally designating anchorage areas would improve vessel traffic management and safety.

Grays Harbor Pilots

- With the Port of Grays Harbor, consider requesting hydrographic surveys to collect depth information outside of the navigational channel for identification of possible anchorage areas. Surveys could be conducted by Ecology, U.S. Army Corps of Engineers, and/or NOAA. Based on survey data, consider anchoring ships outside of the channel to further reduce risks of allision.

Grays Harbor Safety Committee

- Review anchorage section of Harbor Safety Plan and update if needed to better describe/show anchorage locations.

Bar and approaches

Grays Harbor Pilots

- Consider having pilot boat operator make a Securite[2] call prior to pilot boarding to inform vessels in the area of intentions and potential movements of the inbound/outbound vessel. If this practice contributes to safety, consider documenting in the Harbor Safety Plan and discuss specific interactions during Harbor Safety Committee meetings.
- With the Port of Grays Harbor, consider coordinating with NOAA and the Coast Guard to define a pilot boarding area.
- With the Grays Harbor Safety Committee and the Port of Grays Harbor, consider whether an additional wave buoy in the vicinity of the bar would provide useful information.

Currents

Grays Harbor Pilots

- Consider whether current gauges at locations in Grays Harbor would improve data and information available to vessels and pilots.
    - Potential locations could include gauges on the southwest and northeast corners of the Highway 101 Bridge across the Chehalis River, to provide information for transit planning.

Grays Harbor Safety Committee

- Engage with Northwest Association of Networked Ocean Observing Systems (NANOOS)[3] to learn where high frequency coastal surface current radars will be placed, and what capabilities they could provide.
- Consider whether integrating sensor data into the NOAA Physical Oceanographic Real Time System (PORTS)[4] would improve safety and efficiency.

Fire/explosion

Ecology

- Coordinate with local fire departments to inform them of equipment grant opportunities.[5]

Grays Harbor Safety Committee

- Consider establishing a marine firefighting subcommittee.
- With the Port of Grays Harbor consider developing a port-wide firefighting plan to cover facility and vessel fires.

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[2] *Securite* is a procedural word used in radio communications to precede a safety message (International Telecommunication Union, 2016).
[3] http://www.nanoos.org/
[4] https://tidesandcurrents.noaa.gov/ports.html
[5] https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Equipment-cache-grants

  - Plan should include training and vessel familiarization for local fire departments.
  - Once plan is developed, schedule and conduct table-top and full scale firefighting exercises to include county, city, port, facility, vessel, tug company, Ecology, and Coast Guard participants.
  - Consider availability and adequacy of on-water firefighting response capability (e.g., tugs with fire monitors or dedicated response vessels).
- With agents and the Port of Grays Harbor, work with local fire departments to help identify marine firefighting training needs and opportunities.
- Grays Harbor Pilots and the Port of Grays Harbor consider establishing accounts with the Department of Homeland Security Ship Arrival Notification System[6] to receive advance notice of ship arrivals, including information about cargo onboard.

Port of Grays Harbor

- Coordinate with agents and Coast Guard Sector Columbia River to schedule local fire department observation visits during Port State Control inspections of visiting vessels.

Fishing vessels and fishing gear

Coast Guard Sector Columbia River

- Explore ways to increase communication between the commercial vessel community (e.g., port, pilots, vessel agents) and tribal, commercial, subsistence, and recreational fishermen. Potential communications topics/methods could include:
  - Issue Local Notice to Mariners for fishery openings/closings.
  - Consider waterway safety outreach opportunities, including whether there is a need for, or opportunity to establish a Coast Guard Auxiliary program in Grays Harbor/Westport that could assist with communications, outreach, and safety boardings, and could participate in programs like the Columbia River "Make Way" campaign.

Commercial fishermen

- Continue to encourage participation in Harbor Safety Committee meetings by commercial fishermen, including participation in a potential sub-committee or working group focused on increasing communications between fishermen, and with the commercial vessel community.
- With Grays Harbor Safety Committee and in collaboration with tug operators, consider working with Washington Sea Grant and NOAA to determine if voluntary offshore Crabber/Towboat[7] lanes can be included on nautical charts.

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[6] https://dhssans.nvmc.uscg.gov/

[7] https://wsg.washington.edu/community-outreach/outreach-detail-pages/crabbertowboat-lane-agreements-download-charts-data-and-meetings/

Grays Harbor Safety Committee

- Consider ways to increase communication between the commercial vessel community (e.g., port, pilots, agents) and tribal, commercial, subsistence, and recreational fishermen, including coordination with the Quinault Indian Nation government, to coordinate fishing activities with shipping. Potential communications topics/methods could include:
    - Continue to encourage participation in Harbor Safety Committee meetings by tribal, commercial, subsistence, and recreational fishermen.
    - Consider whether it would be effective to establish a subcommittee or working group focused on increasing communications between fishermen and the commercial vessel community. Subcommittee or working group could report on recent incidents/accidents, potential improvements, upcoming fishery openings, and other activities that impact the region's fishing industry.
    - Consider ways to inform Quinault Indian Nation of commercial vessel traffic, which could include participation in the vessel traffic database system.
    - Consider how to best engage recreational fishermen regarding commercial vessel traffic and safety.
    - Consider establishing processes to reduce the potential for fish/crab gear being placed in navigational channel and tow lanes within Grays Harbor.
    - Consider whether focus sheets or safety bulletins (printed or electronic) would be an effective communications tool to describe commercial vessel operations and any specific topics of concern to commercial, tribal, and recreational fishermen.
    - Consider discussing the use of high intensity deck lights while underway with tribal fishermen, subsistence fishermen, commercial fishermen, and Grays Harbor Pilots to determine if a Harbor Safety Plan standard of care could help improve communications between fishermen and pilots and large commercial vessels. Consider the safety of fishermen as well as safe navigation of commercial vessels.

Quinault Indian Nation

- Consider exploring ways to increase communication between tribal and subsistence fishermen, tribal fisheries managers, and the commercial vessel community (e.g., port, pilots, agents). Potential communications topics/methods could include:
    - Continue to encourage participation in Harbor Safety Committee meetings by tribal fishermen, subsistence fishermen, and tribal fisheries managers.
    - Consider coordinating with tribal fisheries managers to send tribal fishery dates to Harbor Safety Committee members.
    - Consider how tribal and subsistence fisherman could receive information about commercial vessel traffic, which could include tribal participation in the vessel traffic database system.

- Consider grant funding[8] opportunities for oil spill response training

Harbor Safety Plan

Agents

- Provide Harbor Safety Plan or applicable sections/placard to inbound vessels.

Coast Guard Sector Columbia River

- Commander, Coast Guard Sector Columbia River consider attending Grays Harbor Safety Committee meetings on a periodic basis, such as semi-annually, to gain insight on local issues and priorities, maintain institutional knowledge of the area, and share information from the Sector Commander/Captain of the Port perspective.
- Vessel inspectors (Port State Control, domestic vessel, commercial fishing vessel) discuss Harbor Safety Plan with vessel masters, as time permits during inspections. Share feedback with the Harbor Safety Committee.

Ecology

- Vessel inspectors board covered (i.e., greater than 300 gross tons) cargo and passenger ships in Grays Harbor to complete Acceptable Industry Standard checklists.
  - During boardings, Ecology inspectors discuss the Harbor Safety Plan with vessel masters.
  - Collect feedback on the Harbor Safety Plan to share with the Grays Harbor Safety Committee.

Grays Harbor Safety Committee

- Consider developing tethered and untethered tug escort practices and Standards of Care; document practices in Harbor Safety Plan.

Washington Board of Pilotage Commissioners

- Consider steps to raise awareness with pilots and trainees of the Harbor Safety Plans for Grays Harbor and Puget Sound.

Offshore traffic

Grays Harbor Safety Committee

- With agents, Coast Guard Sector Columbia River, and Grays Harbor Pilots, consider issues related to vessels remaining close to shore while waiting for a berth to become available.
  - Discuss contracts and charter agreements to determine if there are solutions for vessels declaring their arrival and ready to load status that would meet the

[8] https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Equipment-cache-grants

business needs of vessels/charterers and encourage ships to remain a safe distance offshore.

  - Consider developing Harbor Safety Plan guidance and a standard of care for vessels remaining offshore, recommending vessels remain at least 25 nautical miles offshore while waiting for their pilot pick up time.

- Consider submitting change to Coast Pilot 7[9], Offshore Vessel Traffic Management Recommendations.
  - Recommendations currently state, in part, "Based on the West Coast Offshore Vessel Traffic Risk Management Project, which was co-sponsored by the Pacific States/British Columbia Oil Spill Task Force and U.S. Coast Guard Pacific Area, it is recommended that, where no other traffic management areas exist such as Traffic Separation Schemes, Vessel Traffic Services, or recommended routes, vessels 300 gross tons or larger transiting along the coast anywhere between Cook Inlet and San Diego should voluntarily stay a minimum distance of 25 nautical miles offshore…Vessels transiting short distances between adjacent ports should seek routing guidance as needed from the local Captain of the Port or VTS authority for that area." (NOAA, 2017b)
  - Consider submitting change to add a statement "Vessels remaining offshore due to a delay in berth availability or while waiting for their pilot boarding time, should voluntarily stay a minimum distance of 25 nautical miles offshore or seek routing guidance as needed from the local Captain of the Port or VTS authority for that area."

Surveys

Ecology

- Coordinate requests for hydrographic surveys using Ecology equipment with the Port of Grays Harbor, U.S. Army Corps of Engineers, and NOAA.

Grays Harbor Safety Committee

- Consider providing a forum for governments and organizations to discuss hydrographic survey needs with the U. S. Army Corps of Engineers, NOAA, U.S. Coast Guard, and Ecology.

[9] The United States Coast Pilot, published by the National Oceanic and Atmospheric Administration (NOAA), is a series of nine nautical books (volumes) that encompasses a wide variety of information important to navigators of U.S. coastal/intracoastal waters and the waters of the Great Lakes. The Coast Pilot is intended to be used as a supplement to NOAA nautical charts (NOAA, 2017b).

Recommendations to consider if vessel traffic increases

Anchorages

Grays Harbor Pilots

- Review anchorages; increased vessel traffic may make it more desirable to have designated anchorages outside of the channel.

Fire/explosion

Grays Harbor Safety Committee

- With Port of Grays Harbor, review and update port-wide firefighting plan as needed to address increased numbers and types of vessels.

Harbor Safety Plan

Grays Harbor Safety Committee

- Consider whether improvements are required for the vessel traffic scheduling database system, including whether operations and maintenance funding for the database is needed.
- Review tethered and untethered tug escort practices and Standards of Care; update practices in Harbor Safety Plan.
- With Grays Harbor Pilots, consider documenting one-way vessel traffic and tug escort practices in the Harbor Safety Plan.
- With Grays Harbor Pilots and the Port of Grays Harbor, consider need for additional escort and ship assist tugs.
- Review communication between the commercial vessel community (e.g., port, pilots, agents) and tribal, commercial, subsistence, and recreational fishermen, including coordination with the Quinault Indian Nation government, to coordinate fishing activities with shipping. Consider whether changes are required.

Grays Harbor Pilots

- With the Port of Grays Harbor, consider ways to increase communications between pilots and standardize pilot procedures where beneficial.

Washington State Board of Pilotage Commissioners

- With Grays Harbor Pilots and the Port of Grays Harbor and the Washington State Board of Pilotage Commissioners, consider increasing the number of pilots.

Surveys

U.S. Army Corps of Engineers Seattle District

- Coordinate with NOAA and Ecology to conduct hydrographic surveys inside and outside the navigation channel, to determine if dredging would be required for facility additions, expansions, after extreme flooding events, or changes in vessel traffic.

Extending the Hazard Identification process

Building on the Hazard Identification outcomes, Ecology met with representatives from the Quinault Indian Nation and stakeholder organizations to review the existing preparedness framework and discuss how to best conduct a Response Capability Assessment. The Response Capability Assessment will define the baseline operational capability of the response systems that would be used to clean up an oil spill. The goal of the study is to gain an increased understanding of the capability of the response forces that would be used to respond to oil spills in Grays Harbor. Ecology is contracting for the Response Capability Assessment. The assessment will be completed by June 2019.

During the planning process for the Hazard Identification workshops, participants noted that most spills in Grays Harbor have been from commercial fishing, tribal fishing, and recreational vessels. While beyond the scope of the Hazard Identification, these spills damage the environment and create response challenges for the community, tribes, response organizations, Ecology, and the Coast Guard. Within the context of the Grays Harbor Vessel Traffic Risk Assessment, Ecology held a workshop for commercial fishermen, tribal fishermen, and recreational boaters. The workshop provided an opportunity to identify practices to improve safety and prevent spills. Appendix D provides a summary of workshop discussions.

Formal Safety Assessment process decision

Following the Hazard Identification Workshops, Ecology considered the costs and benefits of continuing with the remaining steps of the Formal Safety Assessment process.

Ecology estimated analysis and reporting to complete the process could cost between $150,000 and $600,000.

The local factors, existing safeguards, and high-level recommendations developed in the Hazard Identification workshops provide a resource for tribes and stakeholders to consider in continuing to improve oil spill prevention and preparedness. Current vessel traffic levels and a review of global, national, and local vessel incident and spill data suggest the risk of an oil spill from a covered vessel (i.e., a tank vessel, or a cargo vessel or passenger vessel greater than 300 gross tons)[10] in Grays Harbor can be characterized as low-probability and high-consequence, as quantitative risk studies have found for other waterways.

Ecology concluded that continuing the Formal Safety Assessment is unlikely to produce substantive recommendations beyond those already identified. Ecology ended the Formal Safety

[10] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response

Assessment Process at the completion of Step 1, Hazard Identification, due to the significant resources (analysis costs, staff time, participant time) required for the remaining steps and the uncertain benefit that would result.

A consequence of not completing the Formal Safety Assessment process is that Ecology cannot provide information about the amount of risk that could be reduced by implementing the high-level recommendations, or the costs of implementation. These will have to be discussed qualitatively.

Next steps

If vessel traffic or conditions change in the future, Ecology will determine the importance of updating the Hazard Identification or completing a full risk analysis. Ecology will continue to participate in, lead, and co-lead environmental review processes for proposed projects.

Ecology will remain engaged with the Grays Harbor community through participation in the Grays Harbor Safety Committee, the Washington Board of Pilotage Commissioners, and on-going collaboration with area tribes, government agencies, industry, and non-governmental organizations. Through this engagement, Ecology will work with tribes and stakeholders to consider the recommendations from the Hazard Identification process, and continue to strengthen oil spill prevention and preparedness for Grays Harbor.

Background

Grays Harbor description

Grays Harbor is a large inlet on the central coast of Washington State, as shown in Figure 1. The entrance to Grays Harbor is about one mile wide, but shoals extending from the north and the south of the entrance reduce the navigable channel to a width of less than half a mile. The bay comprising Grays Harbor extends east for approximately 15 miles to the mouth of the Chehalis River. The bay is filled with shoals and flats, some of which are bare at low water (NOAA, 2017b).

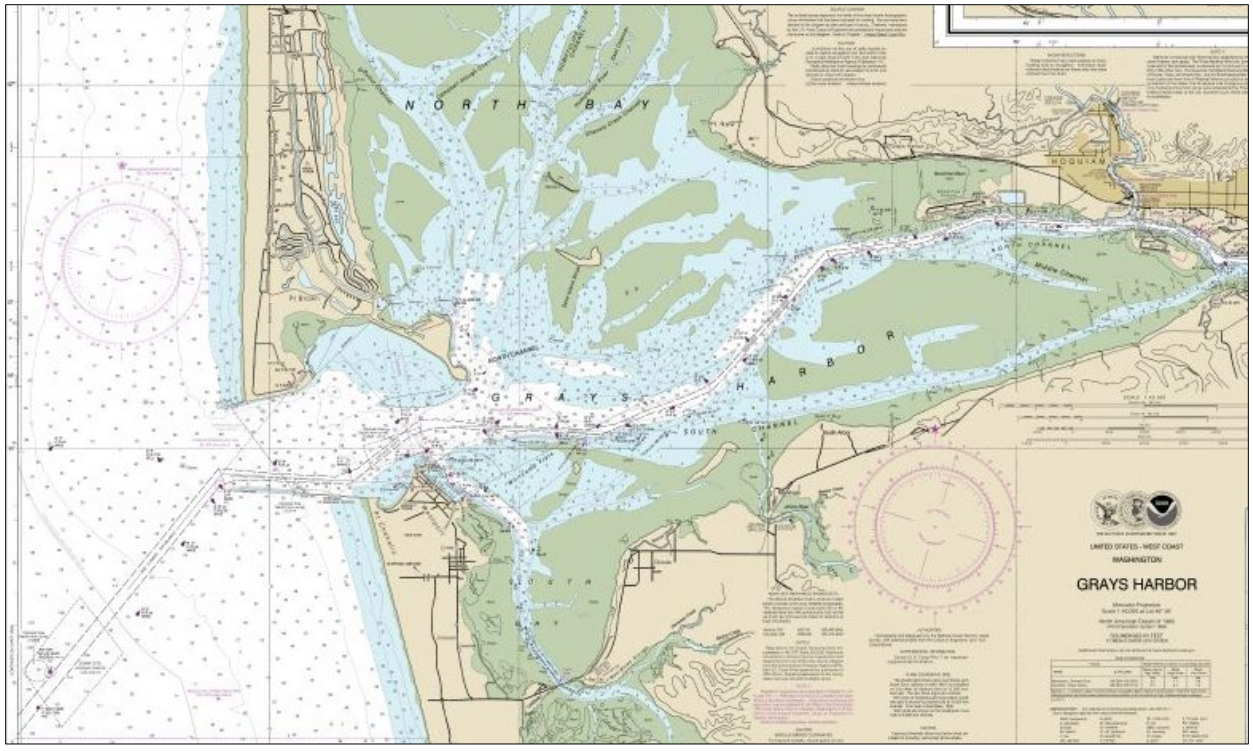


Figure 1: Excerpt of Navigational Chart 18502, Grays Harbor, Washington (NOAA, 2017c)

As with other inlets on the California, Oregon, and Washington coasts, there is a bar at the entrance to Grays Harbor. These bars form where rivers and streams empty into the Pacific Ocean, causing the river runoff to slow and deposit sediment.

The tidal current at the bar can reach considerable velocity, especially when an ebb tide is reinforced by river runoff. Dangerous conditions can develop when a swift ebb current meets swells from the Pacific at the relatively shallow bar. The change in water depth and opposing forces of current, swell, and sometimes wind, can cause breaking waves and rough seas. Conditions can change rapidly and without warning. Additionally, the area where the effects of the bar are observed changes with conditions. The true bar at Grays Harbor is considered to be from midway between Buoys 2 and 4 to the south, extending northeast to Buoy 8, see Figure 2 (Grays Harbor Safety Committee, 2014).

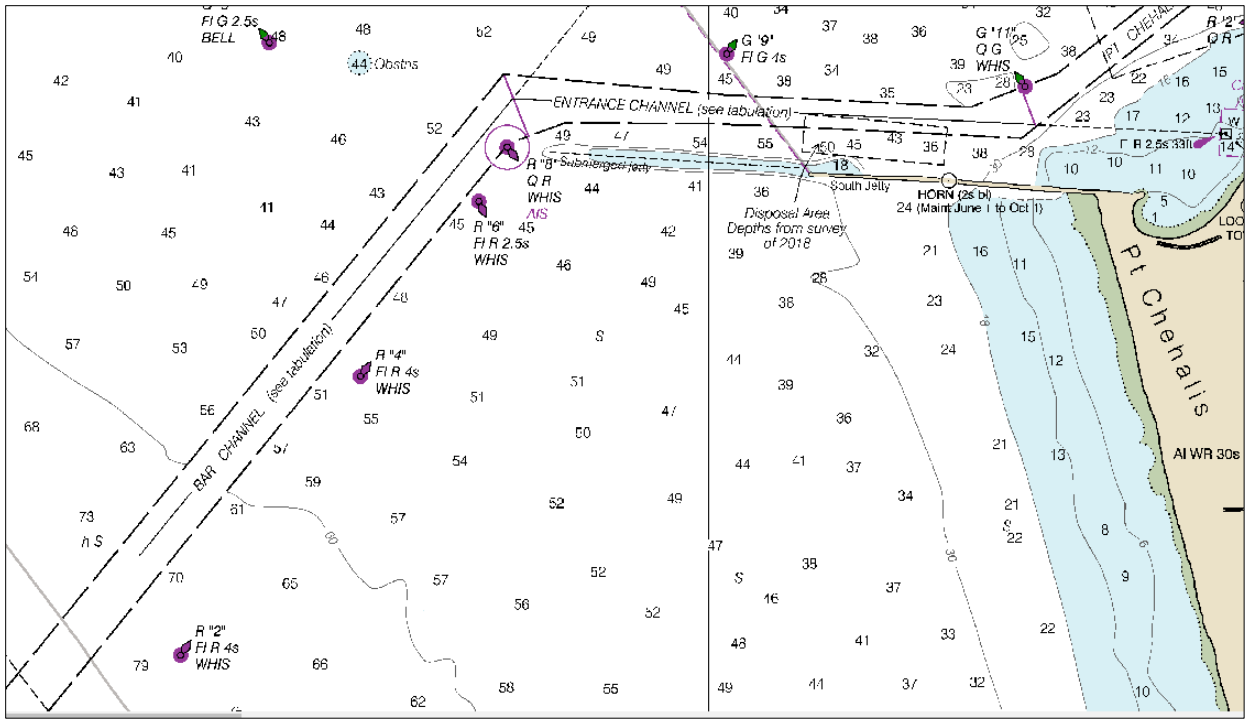


Figure 2: Excerpt of Navigational Chart 18502, showing Bar Channel and Buoys 2, 4, and 8 (NOAA, 2017c).

The average current velocity at the bar is about 1.9 knots on a flood tide and 2.8 knots on an ebb tide, but velocities can reach 5 knots. Currents in the vicinity of the bar are reported to be erratic. The U.S. Coast Guard Captain of the Port may restrict passage or close the bar to navigation based on weather conditions. The Grays Harbor Pilots may also suspend service to commercial vessels (Grays Harbor Safety Committee, 2014).

The Grays Harbor navigation channel is maintained by the U.S. Army Corps of Engineers. Twin jetties to the north and south secure the mouth of the harbor. The deep draft channel is 22 miles long from the Pacific Ocean to the city of Aberdeen. The channel is 1,000 feet wide over the Grays Harbor Bar and 350 feet wide eastward of the bar. A dredging project scheduled to complete in the fall of 2018 will increase the channel depth from 36 feet to 38 feet, from the entrance to the Port of Grays Harbor Terminal 4 at Cow Point, see Figure 3. East of Cow Point, the channel depth is 32 feet to the last dock at South Aberdeen (U.S. Army Corps of Engineers, 2018).

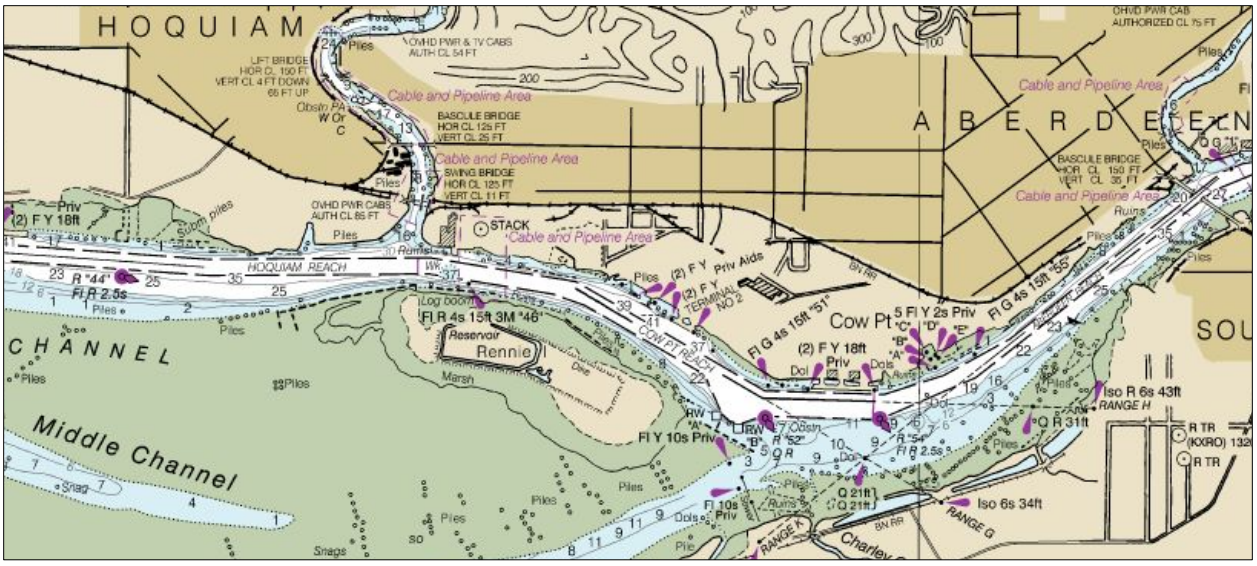


Figure 3: Excerpt of Navigational Chart 18502, showing Cow Point (NOAA, 2017c). A dredging project scheduled to complete in the fall of 2018 will increase the channel depth from 36 feet to 38 feet, from the entrance to the Port of Grays Harbor Terminal 4 at Cow Point.

The Port of Grays Harbor operates four marine terminals in the vicinity of the cities of Hoquiam and Aberdeen, facilitating the movement of liquid bulk, dry bulk, vehicles, logs, and general cargoes. The Port also manages the Grays Harbor Pilots and operates Westport Marina, which serves commercial fishing, tribal fishing, and recreational boats (Port of Grays Harbor, 2018). Commercial fishery landings in Westport in 2016 were the highest on the West Coast (excluding Alaska) with 108 million pounds, valued at $59 million (NOAA, 2017d).

Approximately 100 deep draft commercial vessels per year call on Grays Harbor. In 2017, twelve tank ships called on Grays Harbor. There were no tank barge or Articulated Tug Barge calls in Grays Harbor in 2017 (Ecology, 2018a). For the Grays Harbor Vessel Traffic Risk Assessment, Ecology assumed that each vessel call consisted of two transits, one entering transit from sea to a terminal and one departing transit from a terminal to sea. Ecology considered anchoring to wait for a berth as part of an inbound transit.

A study for the Port of Grays Harbor found maritime activity at the Port generated 574 direct jobs and $143 million in business revenue in 2013. During the same year, commercial fishing in Westport generated 1,067 direct jobs and $204 million in business revenue (Martin Associates, 2014).

Two facilities move liquid bulk cargo in Grays Harbor. Renewable Energy Group (REG) is a 100-million gallon per year bio-refinery (Renewable Energy Group Inc. [REG], 2018). Contanda is a methanol and magnesium oxide terminal with a total capacity of 320,000 barrels (Contanda, 2018). There are currently no movements of crude oil by vessel in Grays Harbor.

Deep draft vessels do not currently enter the Chehalis River and transit eastward of the U.S. Highway 101 Bridge. Tug and barge traffic does transit the Chehalis River as far eastward as the Weyerhaeuser Company Bay City Log Export Berths 1 and 2.

The Quinault Indian Nation has adjudicated usual and accustomed treaty fishing areas within and adjacent to Grays Harbor and the Chehalis River (United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974)).[11]

There is an active Harbor Safety Committee that meets every two months. The Grays Harbor Safety Committee publishes a Harbor Safety Plan with Standards of Care, which are designed as a reference guide for safe and environmentally sound vessel movements and operations in and around the port area (Grays Harbor Safety Committee, 2014).

Anchorages in Grays Harbor are limited and managed by the Grays Harbor Pilots. The primary anchorage is north of Westport and southeast of Damon Point in 30 to 60 feet of water. Up to four covered vessels (i.e., a tank vessel, or a cargo vessel or passenger vessel greater than 300 gross tons)[12] can be anchored in this area, at the discretion of the pilots. Anchorages in Grays Harbor are not formally designated or managed by the U.S. Coast Guard (Grays Harbor Safety Committee, 2014).

There is not a formal Vessel Traffic Service in Grays Harbor. As described in the Grays Harbor Safety Plan, "Vessel traffic is managed in cooperation between the Port of Grays Harbor, Grays Harbor Pilots, vessel agents, and the terminal tenants that ships call on. Brusco Tug and Barge assists in the coordination of tug and barge traffic and escorts for laden tank vessels carrying oil" (Grays Harbor Safety Committee, 2014). This cooperative system includes the use of an online vessel arrival tool and database that is updated by users of the system.

Grays Harbor Vessel Traffic Risk Assessment

Ecology received funding in the 2017-2019 budget to conduct oil spill prevention risk assessment work. The funding supported a risk assessment for oil spills from commercial vessels in Grays Harbor, and a rail traffic risk assessment. Work during the 2017-2019 biennium builds on previous studies, including:

- 2014 Marine and Rail Oil Transportation Study (Ecology, 2015).
- 2015 update to a vessel traffic risk assessment for Strait of Juan de Fuca, Puget Sound, San Juan Islands, and connecting waterways (Van Dorp & Merrick, 2017).
- 2015 and 2016 Salish Sea Oil Spill Risk Reduction Workshops (Ecology, 2016).
- 2017 Columbia River Vessel Traffic Evaluation and Safety Risk Assessment (Ecology, 2017).

Goals

The goals of the Grays Harbor Vessel Traffic Risk Assessment were to:

- Assess baseline and changing oil spill risks from commercial vessels operating in Grays Harbor.

[11] https://wdfw.wa.gov/fishing/salmon/BoldtDecision8.5x11layoutforweb.pdf
[12] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response

- Identify measures that could help reduce the risks of oil spills.
- Assess oil spill response preparedness.
- Identify baseline response capability.

Process

Ecology followed the International Maritime Organization (IMO) Formal Safety Assessment (FSA) process to conduct the Grays Harbor Vessel Traffic Risk Assessment. Adopted by the IMO in 2002, Formal Safety Assessments use a structured and systematic methodology to assess the risks relating to maritime safety and the protection of the marine environment, and for evaluating the costs and benefits of options for reducing these risks (IMO, 2002). The FSA process includes the following steps:

- Preparatory Step: Definition of Goals, Systems, Operations
- Step 1: Hazard Identification
- Step 2: Risk Analysis
- Step 3: Risk Control Options
- Step 4: Cost Benefit Assessment
- Step 5: Recommendations for Decision Making

Initial focus

Ecology focused on completing the Preparatory Step and Step 1, Hazard Identification, during Fiscal Year 2018 (July 1, 2017 – June 30, 2018). Ecology's Spills Program staff facilitated two workshops to conduct the Hazard Identification. Two additional workshops extended the Hazard Identification process. The first discussed oil spill response preparedness and the second focused on commercial fishing, tribal fishing, and recreational vessel oil spill prevention and preparedness. A schedule of all workshops is shown in Table 1.

Table 1: Grays Harbor VTRA workshop schedule and supplemental materials

Date	Event	Location	Supplemental material
January 25, 2018	Hazard Identification Workshop 1	Port of Grays Harbor	Participant handbook[13]
February 28, 2018	Hazard Identification Workshop 2	Port of Grays Harbor	Participant handbook[14]

[13] https://apps.ecology.wa.gov/publications/SummaryPages/1808017.html, supplemental document
[14] https://apps.ecology.wa.gov/publications/SummaryPages/1808017.html, supplemental document

Date	Event	Location	Supplemental material
April 3, 2018	Response Capability Workshop	Port of Grays Harbor	See Appendix C for summary
April 24, 2018	Commercial Fishing, Tribal Fishing, and Recreational Vessel Oil Spill Prevention and Preparedness Workshop	McCausland Hall, Westport Maritime Museum	See Appendix D for summary

Ecology added a decision point to the Formal Safety Assessment process after Hazard Identification to determine whether there was a need to continue with Steps 2-5.

Public outreach

Ecology developed a website for the Grays Harbor Vessel Traffic Risk Assessment with background information, workshop schedules, and updates on planning tools, workshop invitees, and upcoming events.[15]

Ecology held a public webinar on February 22, 2018 to describe the project and answer questions. Webinar material and a recording of the webinar are available on the Grays Harbor Vessel Traffic Risk Assessment website. The webinar was advertised through email and Ecology's social media accounts.

Ecology briefed participants at several conferences and meetings about the project, including the 2018 Salish Sea Ecosystem Conference in Seattle; the GreenTech 2018 Conference in Vancouver, British Columbia; the 2018 Clean Pacific Conference in Portland, Oregon; and the March 2018 Washington Coastal Marine Advisory Council meeting in Aberdeen.

The draft Grays Harbor Vessel Traffic Risk Assessment report was posted for public review and comment.

[15] During the risk assessment process, the GHVTRA website was located on Ecology's ezView site for committees, boards and workgroups, located at https://www.ezview.wa.gov/site/alias__1962/37040/overview.aspx. For current information on the GHVTRA, visit Ecology's risk assessment web page at https://ecology.wa.gov/Spills-Cleanup/Spills/Oil-spill-prevention/Risk-assessment.

Grays Harbor Hazard Identification

Methods

Hazard Identification is the first step in the Formal Safety Assessment process. The purpose is to identify a list of hazards and associated scenarios, prioritized through the use of screening criteria, which are specific to the problem under review (IMO, 2002). Hazard Identification can be accomplished through a variety of techniques, such as structured group brainstorming or Fault Tree Analysis (American Bureau of Shipping, [ABS], 2000). Ecology facilitated structured brainstorming discussions during two workshops to complete the Hazard Identification process.

During the first Hazard Identification workshop, participants reviewed potential incidents that could result in oil spills from commercial vessels, with a goal of identifying any local factors that could contribute to these incidents. A list of local factors was the primary outcome of the first workshop.

In the second Hazard Identification workshop, participants reviewed each local factor listed in the first workshop, identified safeguards currently in place to prevent incidents, and discussed potential high-level recommendations that could improve oil spill prevention.

The Hazard Identification process centered on the discussion of local factors and high-level recommendations rather than other risk components, such as the relative frequency of vessel incidents or the consequence of oil spills, for two reasons.

First, commercial vessel incidents, like collisions or groundings resulting in an oil spill, are relatively rare events both globally and in the historical data available for Grays Harbor. Ecology data for 2007–2017 show only one oil spill from a large commercial vessel: A 1-gallon hydraulic oil spill from a cargo ship in 2011 (Ecology, 2018b). The last major oil spill in the vicinity of Grays Harbor was the oil barge *Nestucca* in December 1988 (NOAA, 2017a). Rather than ask participants to provide qualitative judgments about the likelihood of these relatively rare events, the workshops sought to benefit from local knowledge and expertise about the characteristics of the commercially navigable waterway and operational practices.

Additionally, the overall Grays Harbor Vessel Traffic Risk Assessment and the Hazard Identification workshops were intended to improve oil spill prevention and preparedness. It was beyond the scope of this assessment to model potential spill consequences in terms of the fate, transport, and effect of spilled oil.

A distinguishing feature of the Hazard Identification process was the use of structured brainstorming to determine local factors, existing safeguards, and high-level recommendations. To preserve the collaborative nature of the workshops, Hazard Identification did not include ranking or voting to prioritize or eliminate inputs provided by participants. The local factors, existing safeguards, and high-level recommendations that resulted from this process should be considered an inclusive listing for consideration by tribes and stakeholders.

Planning

Ecology engaged a workgroup of representatives from governments and organizations to help guide planning for the Hazard Identification. Ecology developed a framework describing the workgroup, which is provided as Appendix A to this report.

The workgroup met four times between September 2017 and February 2018. Workgroup meetings comprised discussions of the scope for the Hazard Identification, dates and locations for the workshops, potential workshop invitees, reviews of draft Hazard Identification workshop material and tools, and updates from Ecology on workshop planning and outreach to the public regarding the Grays Harbor Vessel Traffic Risk Assessment project. The Hazard Identification scope developed through the workgroup is summarized below and provided in full as Appendix B.

Scope

Scope statements were developed by Ecology with a workgroup of representatives from governments and organizations. The final scope document agreed to by the workgroup is included as Appendix B. The key elements of the scope were:

- Hazards include hazards to navigation and vessel incidents that could result in an oil spill (e.g., collision, allision, grounding, flooding, fire/explosion, structural failure).
    - Includes consideration of meteorological/hydrographic condition, e.g., high winds, heavy seas, fog, and tides and currents, including cyclical changes and tidal extremes.
    - Does not include region-wide hazards, e.g., Cascadia Subduction Zone earthquake/tsunami.
- The fate and effect of spilled oil were considered during the Response Capability Assessment workshop. In-depth consideration of the environmental, cultural, or economic impacts of the spilled oil was beyond the scope of the Hazard Identification and Response Capability Assessment.
- Geographic boundaries:
    - Offshore from Buoy "GH" (approximately 5 nautical miles offshore) to Weyerhaeuser Company Bay City Log Export, Berths 1 and 2.
    - Workshops included discussion of offshore vessel traffic management practices westward of Buoy "GH," as noted on Hazard Identification templates 1 and 2.
- Types of vessels:
    - Commercial cargo, passenger, towing, fishing, and tank vessels > 300 gross tons
        - Includes specific hazards for different vessel types (e.g., considerations for grain ships, car carriers, etc.).
    - Commercial and tribal fishing vessels and recreational vessels < 300 gross tons

  - Were considered during the Hazard Identification workshops as operations that could impact a commercial cargo, passenger, towing, fishing, or tank vessel > 300 gross tons.
  - Ecology held a separate workshop to discuss commercial and tribal fishing vessel and recreational vessel oil spill prevention and preparedness for vessels < 300 gross tons.

- Oil spills:
  - Oil as defined by the state of Washington RCW 90.56.010: "Oil" or "oils" means oil of any kind that is liquid at twenty-five degrees Celsius and one atmosphere of pressure and any fractionation thereof, including, but not limited to, crude oil, bitumen, synthetic crude oil, natural gas well condensate, petroleum, gasoline, fuel oil, diesel oil, biological oils and blends, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil. Oil does not include any substance listed in Table 302.4 of 40 CFR Part 302 adopted August 14, 1989, under section 102(a) of the federal comprehensive environmental response, compensation, and liability act of 1980, as amended by P.L. 99-499."
- Vessel activities and incidents:
  - Definitions for vessel activities, incident types, immediate causes, and contributing factors were provided in a glossary, and were adapted from 46 CFR, RCW 88.46, Chapter 317-31 WAC, and the Pacific States/British Columbia Oil Spill Task Force Data Dictionary.
- Timeframe:
  - Focus was on current hazards, rather than future hazards.
  - Hazard Identification workshops included qualitative discussions of potential changes in hazards or offshore vessel traffic management practices as a result of projects that were proposed at the time of the workshops. Two projects that met this criteria were identified:
    - Proposed potash export facility
      - State Environmental Protection Act checklist submitted to City of Hoquiam on December 14, 2017 (BergerABAM, 2017).
      - Potential vessel traffic: 1-2 ships per week initially; maximum of 2-4 ships per week (BHP, n.d.; BergerABAM, 2017).
      - Vessel size: 20,000 to 82,000 deadweight tons (BergerABAM, 2017).
      - Ecology assumed a range 52–208 ships per year.
    - Proposed expansion of existing liquid bulk terminal

- Permit application packet submitted to City of Hoquiam on January 25, 2018 (Hoquiam, 2018).
- Potential vessel traffic: 48 vessels per year (Hoquiam, 2018).
- Vessel size: Panamax to tank barge (Hoquiam, 2018).

Hazard Identification Workshop 1

Overview

Hazard Identification Workshop 1 was held on January 25, 2018 at the Port of Grays Harbor. Participants included representatives from:

- Brusco Tug & Barge
- Contanda
- General Steamship Agencies
- Grays Harbor Pilots
- Marine Exchange of Puget Sound
- National Oceanographic and Atmospheric Administration, Office of Coast Survey
- National Oceanographic and Atmospheric Administration, Olympic Coast National Marine Sanctuary
- Port of Grays Harbor
- Quinault Indian Nation
- REG Grays Harbor
- The Nature Conservancy
- U.S. Coast Guard Auxiliary
- U.S. Coast Guard Marine Safety Unit Portland
- Washington Dungeness Crab Fishermen's Association
- Washington State Department of Ecology Spills Program

Participation in the workshop does not imply endorsement of the Hazard Identification findings and recommendations by these organizations.

Participants were provided a workshop handbook before the workshop. The handbook for Hazard Identification Workshop 1 is available on Ecology's Grays Harbor VTRA website.

Goal

During Hazard Identification Workshop 1, Ecology facilitated structured brainstorming discussions to review vessel incidents that could result in an oil spill (e.g., collisions, allisions, groundings, fires/explosions, structural failure). The goal of these discussions was to identify any

local factors that could contribute to vessel incidents. Examples of local factors included features like the submerged south jetty at the entrance to Grays Harbor, which could contribute to vessel grounding risks, and several sharp turns in the deep draft channel, which could contribute to collision, allision, and grounding risks.

Workshop tools

To promote a systematic consideration of potential local factors, Ecology defined four waterway areas, as shown in Figure 3.

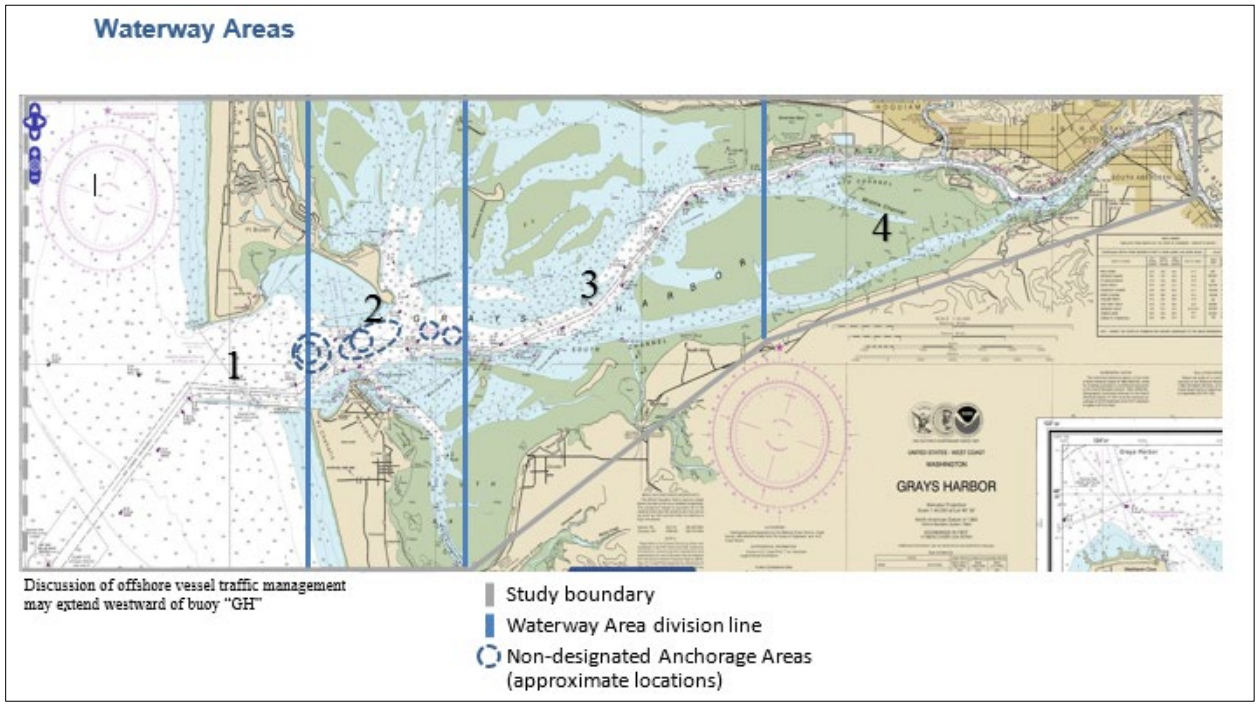
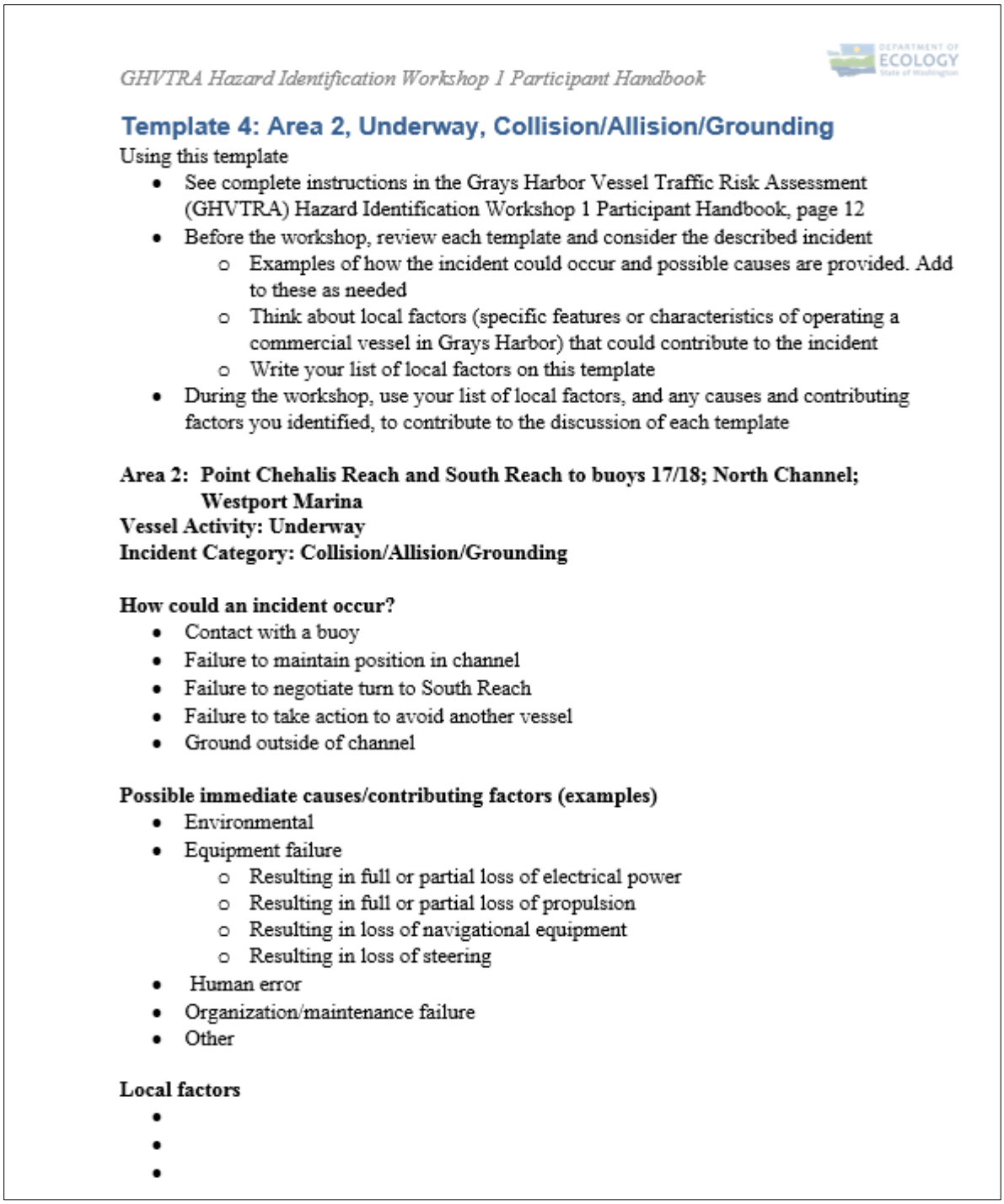


Figure 4: Waterway areas defined for Grays Harbor VTRA Hazard Identification workshops

Hazard identification templates were provided to workshop participants to guide discussions. The templates were organized by waterway area, vessel activity, and incident type. An example blank template is shown in Figure 4. The full set of templates were included in the participant handbook, available on the project website. During the workshop, Ecology reviewed each template and encouraged all participants to contribute to the discussion of local factors.



GHVTRA Hazard Identification Workshop 1 Participant Handbook

Template 4: Area 2, Underway, Collision/Allision/Grounding

Using this template

- See complete instructions in the Grays Harbor Vessel Traffic Risk Assessment (GHVTRA) Hazard Identification Workshop 1 Participant Handbook, page 12
- Before the workshop, review each template and consider the described incident
  - Examples of how the incident could occur and possible causes are provided. Add to these as needed
  - Think about local factors (specific features or characteristics of operating a commercial vessel in Grays Harbor) that could contribute to the incident
  - Write your list of local factors on this template
- During the workshop, use your list of local factors, and any causes and contributing factors you identified, to contribute to the discussion of each template

Area 2: Point Chehalis Reach and South Reach to buoys 17/18; North Channel; Westport Marina
Vessel Activity: Underway
Incident Category: Collision/Allision/Grounding

How could an incident occur?

- Contact with a buoy
- Failure to maintain position in channel
- Failure to negotiate turn to South Reach
- Failure to take action to avoid another vessel
- Ground outside of channel

Possible immediate causes/contributing factors (examples)

- Environmental
- Equipment failure
  - Resulting in full or partial loss of electrical power
  - Resulting in full or partial loss of propulsion
  - Resulting in loss of navigational equipment
  - Resulting in loss of steering
- Human error
- Organization/maintenance failure
- Other

Local factors

-
-
-

Figure 5: Example template used during Hazard Identification Workshop 1. Complete set of templates are included in the workshop participant handbook.

Results: Local factors

Ecology recorded local factors identified by participants during Hazard Identification Workshop 1, and sent the draft list of local factors to participants for review and comment following the

workshop. The draft list and the completed templates from Workshop 1 were included in the participant handbook for Hazard Identification Workshop 2, available on Ecology's website.

Following Workshop 2, Ecology removed several local factors and revised the wording of others based on participant comments received before, during, and after the workshop. The resulting list local factors are shown below in Table 2.

The list of local factors does not quantify the likelihood of incidents, accidents, or oil spills related to these features of the commercially navigable waterway of Grays Harbor. A causal relationship between the identified factors and potential oil spills should not be assumed to exist. Additionally, the number of local factors in the list does not convey any information about the relative level of oil spill risk in Grays Harbor compared to other waterways. Rather, the list of local factors was developed through structured brainstorming as an interim step in a qualitative, collaborative process. The local factors identified by participants in Hazard Identification Workshop 1 facilitated a discussion of existing safeguards and high-level recommendations during Hazard Identification Workshop 2.

Table 2: List of local factors identified during Hazard Identification workshops, incorporating participant feedback

Category	Local factor
Aids to navigation	Factor 1: The effectiveness of some aids to navigation have degraded over time due to a variety of factors, which may influence collision, allision, and grounding risks. These factors include the use of lower intensity lights on some visual aids, a channel realignment project completed in 2015 that resulted in ranges no longer indicating when a vessel was in the center of the channel, and instances of aids to navigation that have degraded or been vandalized and not been repaired or replaced. • Bar channel range, one structure removed this year. • Entrance channel range only has one working light. • Day boards not being maintained. • South Range A no longer being maintained. • North Channel Lights fixed lights C, D, E, and F have reduced intensity. • Range F rear light damaged/vandalism.

Category	Local factor
Anchorages	Factor 2: There are a limited number of non-designated anchorage areas used by the Grays Harbor Pilots, which vary by season and may be full, which may influence collision and allision risk by: • Creating potential uncertainty about the number and location of anchorage areas. • Creating potential uncertainty about which anchorage areas will be used, depending on pilot preferences and season. • Causing vessels to remain offshore when anchorages are full. • Causing inbound/outbound vessels to stay farther south in channel to avoid anchored vessels, reducing the available water space and maneuvering options for commercial vessels when anchorages are occupied. Factor 3: Some of the non-designated anchorage areas used by the Grays Harbor Pilots are partially within the channel, which may influence allision risk due to the potential for vessels at anchor to swing into or near the channel. Factor 4: Currents are strong (up to 5 knots), and there is little depth of water under the keel of anchored vessels, which may influence the risks of dragging, grounding, and allision. Factor 5: High wind speeds are relatively common in Grays Harbor, which may influence the risks of dragging, grounding, and allision.
Background lighting	Factor 6: Background lighting from Westport may influence collision, allision, and grounding risk by making it more difficult to see other vessels and navigation aids, and correctly determine other vessel's behavior and intentions. Factor 7: High intensity lights on crab/fishing vessels may influence collision, allision, and grounding risk by making it more difficult to see aids to navigation, navigation lights on the boat with the bright lights, or on other vessels around or behind the boat with bright lights. Factor 8: Background lighting at Bowerman airport may influence collision, allision, and grounding risk by making it more difficult to see other vessels and navigation aids, and correctly determine other vessel's behavior and intentions.

Category	Local factor
Bar and approaches	Factor 9: A mix of vessel types, with varying ages, designs, and material conditions call on Grays Harbor. Older vessels or vessels that have not been well maintained may be more likely to experience structural failure or flooding casualties while crossing the bar. Factor 10: Inbound vessel position depends on where pilot boards and on weather, which may influence collision risk due to commercial vessels being outside of where other vessels may expect them to be. Factor 11: Outbound vessels sometimes transit north of the channel based on conditions to avoid breaking waves across the bar, which may influence collision risk due to commercial vessels being outside of where other vessels may expect them to be. Factor 12: The effects of the Grays Harbor Bar may be felt between Buoys 5 and 9, depending on weather conditions, tide, and current, which may influence collision, grounding, and allision risk by making ship handling more difficult and less predictable.

Category	Local factor
Channel depth/ configuration	Factor 13: Channel depth may influence collision, allision, and grounding risk by restricting available water space and maneuvering options for commercial vessels. Factor 14: Channel may shoal due to sedimentation, which may influence collision, allision, and grounding risks for commercial vessels by reducing available depth and width of the channel. Problem may be exacerbated during periods when dredging is suspended (e.g., February – June to allow for fish passage). Factor 15: Grays Harbor is shallow, with little water deep enough for navigation outside of the channel, which may influence collision and grounding risk because ships are constrained to remain within the channel, and could quickly run aground if they exit the channel. Factor 16: Multiple turns in the channel influence collision, allision, and grounding risk by increasing the complexity of the transit. Factor 17: Narrow channel widths influence collision, allision, and grounding risk by restricting available water space and maneuvering options for commercial vessels • In proximity to South Jetty. • Along South Reach. • Along Crossover Channel, and North Reach. • Along North Channel, Hoquiam Reach, Cow Point Reach, and Aberdeen Reach. Factor 18: Rocky structures (e.g., groins north of Westport, South Jetty) may influence the risk of an oil spill in the event of a grounding. Factor 19: Submerged jetty extending from South Jetty poses a navigational hazard. Vessels transiting the entrance channel may stay north in the channel to give the submerged jetty a wide berth, which could influence collision risk with an outbound vessel. Factor 20: Submerged jetty south of the entrance channel may influence grounding risk due to its proximity to the channel. Factor 21: Turning basin is 950 feet north to south and 350 feet along the southwest edge, and is surrounded by shoal water, which may influence grounding risk.

Category	Local factor
Currents	Factor 22: Current effects may be strong and vary from day to day, which may influence collision, allision, grounding, and oil spill risk by complicating ship handling, effecting the movements of a ship following a loss or reduction in steering or propulsion, and by impacting oil transfer pre-booming safety and effectiveness when pre-booming is required.[16] Factor 23: Currents can complicate the turn at Buoy 21, particularly for inbound ships on a flood current, which may influence collision, allision, and grounding risk. Factor 24: Current can make turns in the turning basin more challenging, which may influence collision, allision, and grounding risk. Factor 25: Seven rivers flow into Grays Harbor, which can effect current flow in complex and unpredictable ways, which may influence collision, allision, and grounding risk by complicating ship handling.
Fire/explosion	Factor 26: Municipal fire departments are responsible for responding to a shipboard fire, but may have limited training and experience. Factor 27: The nature of materials moved as cargo and fuel (e.g., oil, diesel, methanol, grain, wood chips) may influence the potential for fire and explosion.

[16] *Oil spill containment boom* is a floating barrier used to temporarily corral and contain spilled oil on the water's surface until it can be removed. *Pre-booming* refers to the deployment of boom prior to an oil-transfer operation, so that any spills during the transfer are contained instead of spreading to open waters.

Category	Local factor
Fishing vessels, fishing gear	Factor 28: Commercial, tribal, and recreational fishing vessels transiting to and from Westhaven Cove may influence collision, allision, and grounding risks for commercial vessels by crossing the deep draft channel at Chehalis Reach or South Reach. Factor 29: Fishing vessels, including relatively large boats, may not adhere to the channel, and may alter their behavior based on factors that may not be apparent or predictable to commercial vessels transiting in the channel, which may influence collision risk. Factor 30: Fishing vessels may be fishing in the channel, which may influence collision, allision, and grounding risk by creating potential hazards to navigation. Factor 31: Marine debris may influence collision, allision, and grounding risk by posing a hazard to navigation that commercial vessels could have to maneuver around, and by presenting a risk that debris could get caught in a commercial vessel's propeller or running gear, possibly resulting in a loss or reduction in propulsion or steering. Factor 32: Large concentrations of fishing vessels head in/out during season openers, which may influence collision risk with commercial vessels. Factor 33: Loss of a large number of crab pots in the channel could influence grounding and allision risk by posing a hazard to navigation that vessels may have to maneuver to avoid. Pots could get caught in a commercial vessels propeller or running gear, possibly resulting in a loss or reduction in propulsion or steering. Factor 34: Participants in recreational fisheries may not be familiar with the area, which may influence collision risks. Factor 35: Short fishery openings, combined with predictions of when fisheries will close can encourage fishermen, some of whom may be inexperienced or unfamiliar with the area, to fish regardless of weather or visibility, which may influence collision, allision, and grounding risks for commercial vessels by adding traffic and complicating the navigational situation. Factor 36: There are multiple fishing seasons and activity types in Grays Harbor, including commercial, tribal and recreational openings. This may influence collision risk by making it more difficult for pilots, agents, and vessels to maintain awareness of, and be prepared for, fishery openings.

Category	Local factor
Offshore traffic	Factor 37: A participant stated vessels waiting for berth have been observed loitering offshore as close as 4 nautical miles, which may influence collision risk with fishing and recreational vessels and inbound/outbound commercial traffic.
Oil transfers	Factor 38: High winds may increase the likelihood of having to secure cargo or fueling operations, and can impact the safety and effectiveness of pre-booming.[17]
Surveys	Factor 39: Lack of recent, comprehensive hydrographic surveys of the area may influence collision and grounding risk because conditions may have changed since the last survey. Commercial vessels could have more or less water space available to them than is shown on the chart. • Factor 40: Including north of the South Reach channel between Buoys 15-21, where vessels sometimes anchor.
Tugs/towing	Factor 41: No dredging is being conducted above the Highway 101 Bridge across the Chehalis river, which may influence grounding risk for tugs/barges.
Weather and visibility	Factor 42: There are periods of reduced visibility throughout the year due to fog (primarily in the summer) and rain (primarily in the fall through spring) as well as longer hours of darkness in the fall and winter, which may influence collision, allision, and grounding risk. Factor 43: Winds sometimes exceed 20 knots in the turning basin, which may influence collision, allision, and grounding risk, particularly for car carriers and roll on-roll off vessels.[18]

Additional discussions

During and after Hazard Identification Workshop 1, participants raised a number of questions, points for consideration, and clarifications.

- Vessels loitering offshore.
    - A participant stated commercial vessels have been observed loitering offshore as close as 4 nautical miles.

[17] *Oil spill containment boom* is a floating barrier used to temporarily corral and contain spilled oil on the water's surface until it can be removed. *Pre-booming* refers to the deployment of boom prior to an oil-transfer operation, so that any spills during the transfer are contained instead of spreading to open waters.
[18] *Roll on-roll off* vessels are designed so that cars and trucks can drive directly onto and off of the vessel via a ramp.

  - This situation can happen when a ship arrives off of Grays Harbor in advance of their pilot pick up time, or when the terminal where the ship is scheduled to berth is still occupied.
  - A vessel agent participating in Hazard Identification Workshop 2 noted some vessels may have contractual requirements that define where they need to be in order to declare their arrival at Grays Harbor and their readiness to load cargo. This could incentivize ships to remain close offshore.
  - The Grays Harbor Safety Plan cautions vessels against anchoring offshore, and recommends vessels remain at least 25 nautical miles offshore as an alternative to anchoring.
  - Coast Pilot 7 incorporates recommendations from the West Coast Offshore Vessel Traffic Management Project (Pacific States/British Columbia Oil Spill Task Force [OSTF], 2002), which was co-sponsored by the Pacific States/British Columbia Task Force and U.S. Coast Guard Pacific Area:
    - "Where no other traffic management areas exist…vessels 300 gross tons or larger transiting along the coast anywhere between Cook Inlet and San Diego should voluntarily stay a minimum distance of 25 nautical miles offshore. It is also recommended that tank ships laden with persistent petroleum products…should voluntarily stay a minimum distance of 50 nautical miles offshore." (NOAA, 2017b)

- Tugs and tows.
  - The scope for the hazard identification process focused on commercial vessels greater than 300 gross tons.
  - This excludes the majority of tug boats that move commodities such as wood chips within Grays Harbor and the Chehalis River.
  - Towing vessel considerations were addressed during the Hazard Identification workshops through group discussions with the towing company participant.
  - Discussions included operating practices for both tugs towing barges and escort tugs.
  - No local factors or recommendations were identified that were unique to towing vessels in Grays Harbor.
  - A participant stated tows operating outside of agreed offshore tow lanes can influence collision and allision risk.
- Coast Guard Aids to Navigation realignment.
  - Coast Guard Sector Columbia River has been working with Grays Harbor waterway users to identify changes to aids to navigation. Changes include realigning aids to the deep draft channel following work in 2015 by the U.S. Army Corps of Engineers that increased the channel depth and shifted the channel in places to better align with river flow and natural sediment scouring.

- In the spring of 2018, Coast Guard Civil Engineering Unit Oakland awarded a project to remove some aids and realign other aids to navigation to the Grays Harbor channel.
- The project will address many of the issues discussed during the workshops, and is expected to be complete in October, 2018.

Hazard Identification Workshop 2

Overview

Hazard Identification Workshop 2 was held on February 28, 2018 at the Port of Grays Harbor. Participants included representatives from:

- Brusco Tug & Barge
- General Steamship Agencies
- Grays Harbor Pilots
- National Oceanographic and Atmospheric Administration, Olympic Coast National Marine Sanctuary
- Port of Grays Harbor
- Quinault Indian Nation
- REG Grays Harbor
- The Nature Conservancy
- U.S. Coast Guard Marine Safety Unit Portland
- Washington State Department of Ecology Spills Program
- Washington State Department of Natural Resources

Participation in the workshop does not imply endorsement of the Hazard Identification findings and recommendations by these organizations.

Participants were provided a workshop handbook before the workshop. The handbook for Hazard Identification Workshop 2 is available on Ecology's website.

Goals

During Hazard Identification Workshop 2, Ecology reviewed the local factors identified during Workshop 1, and facilitated structured brainstorming discussions to determine existing safeguards and high level recommendations.

Results: Existing safeguards and high-level recommendations

Existing safeguards and high-level recommendations identified during Workshop 2 are provided below, organized by topic area. As with the local factors in Table 2, some of the wording has

been modified by Ecology since the workshop to reflect tribal and stakeholder input and for clarity.

Existing safeguards

Existing safeguards are measures intended to prevent hazards from causing vessel incidents or accidents, which could result in an oil spill. Discussions during the workshop focused on existing safeguards that are implemented at the local or regional level. These local measures supplement maritime safety programs that are administered by international organizations, federal and state government agencies, and industry (Ecology, 2017; Frittelli, Andrews, Parfomak, Pirog, Ramseur, & Ratner, 2017).

Organizations involved in maritime safety include:

- Classification Societies
- Grays Harbor Pilots
- Grays Harbor Safety Committee
- International Maritime Organization
- Marine Exchange of Puget Sound
- National Oceanic and Atmospheric Administration
- Port of Grays Harbor
- Quinault Indian Nation
- Ship owners, operators, charterers, and insurers
- Towing vessel owners/operators
- U.S. Army Corps of Engineers
- U.S. Coast Guard
- Washington Board of Pilotage Commissioners
- Washington State Department of Ecology
- Washington State Department of Natural Resources

The last major oil spill in the vicinity of Grays Harbor was the oil barge *Nestucca* in December 1988 (NOAA, 2017a). Since 1988, significant changes have occurred in maritime safety. The vessel fleet has improved as newer vessels enter service that incorporate additional safety and stability requirements, and industry groups have improved how vessels are operated and managed. Perhaps the most notable changes were the amendment of the International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL) and the passage of the Oil Pollution Act of 1990 (OPA 90). MARPOL and OPA 90 included double hull requirements for tank vessels (Ecology, 2017).

Collectively, these safety measures have resulted in global and national declines in the number of oil spills and the volume of oil spilled over the past three decades (U.S. Coast Guard, 2012).

While these trends in declining spills are encouraging, Ecology also notes that a significant oil spill could cost the state an average of $10.8 billion (based on 2006 estimates) and adversely affect 165,000 jobs. It would disrupt maritime shipping, port activities, recreation, and tourism, and cause significant harm to fish, shellfish, and wildlife resources (Ecology, 2018c).

High-level recommendations

High-level recommendations are provided for current vessel traffic levels and for potential future increases in vessel traffic. As described in the Hazard Identification Scope section, projects that had been proposed at the time of the workshops were considered when discussing future vessel traffic. Two projects had active proposals at the time of Hazard Identification Workshop 2:

- Proposed potash export facility
    - State Environmental Protection Act checklist submitted to City of Hoquiam on December 14, 2017 (BergerABAM, 2017).
    - Potential vessel traffic: 1-2 ships per week initially; maximum of 4 ships per week (BHP, n.d.; BergerABAM, 2017).
    - Vessel size: 20,000 to 82,000 deadweight ton (BergerABAM, 2017).
    - Ecology assumed a range 52–208 vessel calls per year.
- Proposed expansion of existing liquid bulk terminal
    - Permit application packet submitted to City of Hoquiam on January 25, 2018 (Hoquiam, 2018).
    - Potential vessel traffic: 48 vessel calls per year (Hoquiam, 2018).
    - Vessel size: Panamax to tank barge (Hoquiam, 2018).

Potential increases in traffic were discussed in qualitative terms, to consider what changes to safeguards and recommendations might be prudent if vessel traffic is higher in the future than it is today. This qualitative discussion was not intended to determine risks that could potentially be associated with the two projects, and it does not take the place of any environmental reviews or analysis of specific proposals. This risk assessment does not address potential impacts of increased vessel traffic to Quinault Indian Nation access to treaty resources, including usual and accustomed fishing areas.

Ecology also has responsibilities under Washington State Environmental Policy Act (SEPA).[19] For proposed new projects and expansions or changes to existing terminals and facilities, Ecology may lead, co-lead, or participate in the environmental review process, depending on the situation. This includes reviewing and commenting on SEPA checklists, environmental impact statements, and analyses of proposed projects that have the potential to impact the environment, including projects that could increase vessel traffic in Washington waters.

[19] RCW 43.21C.030

To preserve the collaborative nature of the workshops, Hazard Identification did not include ranking or voting to prioritize or eliminate inputs provided by participants. The local factors, existing safeguards, and high-level recommendations that resulted from this process should be considered an inclusive listing for consideration by tribes and stakeholders.

Aids to Navigation

Factor 1: Effectiveness of aids to navigation

- Description: The effectiveness of some aids to navigation have degraded over time due to a variety of factors, which may influence collision, allision, and grounding risks. These factors include the use of lower intensity lights on some visual aids, a channel realignment project completed in 2015 that resulted in ranges no longer indicating when a vessel was in the center of the channel, and instances of aids to navigation that have degraded or been vandalized, and not been repaired or replaced.
    - Bar channel range, one structure removed this year.
    - Entrance channel range only has one working light.
    - Day boards not being maintained.
    - South Range A no longer being maintained.
    - North Channel Lights fixed lights C, D, E, and F have reduced intensity.
    - Range F rear light damaged/vandalism.
- Existing safeguards:
    - Compulsory pilotage as required by RCW 88.16.070.
        - Two pilots assigned to Grays Harbor through Washington Board of Pilotage Commissioners.
        - Pilot experience provides a key risk control measure in the safe management of anchorages and the waterway.
        - Pilots manage vessel traffic and typically follow a practice of not meeting another deep draft vessel in the navigation channel.
        - Washington Board of Pilotage Commissioners routinely reviews the number of pilots, succession plan, current vessel traffic for Grays Harbor, and economy based projections of future vessel traffic.
        - Pilots use laptop with electronic navigation software, and independent GPS antenna(s).
    - Buoyage system for Grays Harbor, with multiple fixed and floating aids to navigation used throughout transits.
        - While some aids are damaged or no longer aligned with the channel, other aids provide visual, audible, radar, and Automated Identification System (AIS) references.
    - Local Notice to Mariners broadcast as needed.

  - Information in Coast Pilot 7 and Light List Volume 6
  - Coast Guard Sector Columbia River has funding to address range and fixed structure discrepancies. Contract is out for bid to be awarded in the current federal fiscal year.
  - Coast Guard Sector Columbia River works directly with Grays Harbor Pilots to identify and resolve concerns.
  - Coast Guard Aids to Navigation Team Astoria manages maintenance and servicing of aids and buoys in Grays Harbor.
  - Escort and ship-assist tugs are stationed in Grays Harbor.
    - Tugs are available within 15 minutes.
    - Tugs use electronic charts for navigation and incorporate AIS data.
  - Local knowledge of Grays Harbor, Bar, and approaches by many commercial and recreational vessel operators.
  - Vessel traffic scheduling database system.
  - Channel realignment/straightening project (2015–2016).
  - Coast Guard Waterways Analysis and Management System studies (WAMS).
    - Last WAMS was completed in 2015, prior to channel realignment.
  - Grays Harbor Safety Committee provides an open forum for public and private stakeholders and tribes to protect personnel, property, and the environment on the waterways of Grays Harbor.
  - Coast Guard Sector Columbia River provides updates of aids to navigation status at Grays Harbor Safety Committee meetings, including information about aids that have active Casualty Reports (CASREPs).

- High-level recommendations for current vessel traffic:
  - Coast Guard Sector Columbia River continue and strengthen coordination with waterway users through the Grays Harbor Safety Committee on topics including aids to navigation outages, maintenance, and any potential changes and aid modernization to include buoys, fixed, ranges, and virtual aids.
  - Coast Guard Sector Columbia River continue to coordinate with waterway users on the status of action items from the 2015 Waterways Analysis and Management System (WAMS) study; provide regular updates to the Grays Harbor Safety Committee.
  - Coast Guard Sector Columbia River conduct next WAMS on schedule in 2020.
    - Address 2015 channel realignment.
    - Incorporate any changes in vessel traffic as required based on terminal projects or expansions, or trends in vessel traffic to existing terminals.

- Grays Harbor Safety Committee consider forming a subcommittee for aids to navigation, in order to provide a forum for interaction between the Coast Guard and waterway users.

Anchorages

Factor 2: Limited number of anchorages

- Description: There are a limited number of non-designated anchorage areas used by the Grays Harbor Pilots, which vary by season and may be full, which may influence collision and allision risk by:
  - Creating potential uncertainty about the number and location of anchorage areas.
  - Creating potential uncertainty about which anchorage areas will be used, depending on pilot preferences and season.
  - Causing vessels to remain offshore when anchorages are full.
  - Causing inbound/outbound vessels to stay farther south in channel to avoid anchored vessels, reducing the available water space and maneuvering options for commercial vessels when anchorages are occupied.
- Existing safeguards:
  - Compulsory pilotage as required by RCW 88.16.070.
    - Two pilots assigned to Grays Harbor through Washington Board of Pilotage Commissioners.
    - Pilots' experience provides a key risk control measure in the safe management of anchorages and the waterway.
    - Pilots manage vessel traffic and typically follow a practice of not meeting another deep draft vessel in the navigation channel.
    - Washington Board of Pilotage Commissioners routinely reviews the number of pilots, succession plan, current vessel traffic for Grays Harbor, and economy based projections of future vessel traffic.
    - Pilots use laptop with electronic navigation software, and independent GPS antenna(s).
  - Grays Harbor Safety Committee provides an open forum for public and private stakeholders and tribes to protect personnel, property, and the environment on the waterways of Grays Harbor.
  - Grays Harbor Safety Plan has information and Standards of Care for vessels anchoring in Grays Harbor.
  - Local operating practices, many of which are documented in the Grays Harbor Safety Plan. Examples include tug escort for each tank vessel move, one way traffic for commercial vessels in the channel when required, and tug escort for non-tank vessels as required.

  - Escort and ship-assist tugs are stationed in Grays Harbor.
    - Tugs are available within 15 minutes.
    - Tugs use electronic charts for navigation and incorporate AIS data.
  - Frequent communications between the shipping agents, ships, pilot(s), Port of Grays Harbor, terminals, tug assist, and commercial fishing community, etc. to safely maneuver ships in and out of port.
  - USCG checks condition of the bar on a daily basis and posts bar report to Homeport.[20]
  - Pilots use NOAA Wave Rider Buoy 46211 to monitor wave conditions, and to help determine whether to board inbound vessels by pilot boat or by helicopter.
  - Vessel traffic scheduling database system.
  - Vessels provide arrival notification to the Coast Guard; Ecology receives vessel arrival information from the Marine Exchange of Puget Sound and the Merchants Exchange of Portland Oregon.
  - Marine Exchange information on shipping is available to port stakeholders.
- High-level recommendations for current vessel traffic:
  - Agents provide Harbor Safety Plan, or applicable sections/placard to inbound vessels.
  - Grays Harbor Safety Committee review anchorage section of Harbor Safety Plan and update if needed to better describe/show anchorage locations.
  - Coast Guard Sector Columbia River with Grays Harbor Pilots and Grays Harbor Safety Committee consider whether designating anchorage areas would improve knowledge of anchorage areas and information sharing about anchoring practices.
  - Ecology vessel inspectors board covered (i.e., greater than 300 gross tons) cargo and passenger ships in Grays Harbor to complete Acceptable Industry Standard checklists. During boardings, Ecology inspectors discuss the Harbor Safety Plan with vessel masters and collect feedback to share with the Harbor Safety Committee.
  - Coast Guard Sector Columbia River vessel inspectors (Port State Control, domestic vessel, and commercial fishing vessel) discuss Harbor Safety Plan with vessel masters, as time permits during inspections. Share feedback with the Harbor Safety Committee.
  - Washington Board of Pilotage Commissioners take steps to raise awareness with pilots and trainees of the Harbor Safety Plans for Grays Harbor and Puget Sound.

[20] https://homeport.uscg.mil

- High-level recommendations for potential increased vessel traffic
    - Consider whether improvements are required for the vessel traffic scheduling database system, including whether operations and maintenance funding for the database is needed.

Factor 3: Anchorages within channel

- Description: Some of the non-designated anchorage areas used by the Grays Harbor Pilots are partially within the channel, which may influence allision risk due to the potential for vessels at anchor to swing into or near the channel.
- Existing safeguards:
    - Existing safeguards as described for Factor 2.
    - Grays Harbor Pilots manage location of vessels anchored in or near the channel. There is generally sufficient depth of water and room in the channel to safely pass vessels at anchor.
- High-level recommendations for current vessel traffic:
    - High-level recommendations as described for Factor 2.
    - Grays Harbor Pilots and the Port of Grays Harbor consider requesting hydrographic surveys of anchorage areas from Ecology, USACE, and/or NOAA. Based on survey data, consider establishing/designating anchorages outside of the channel to further reduce risks of allision.
- High-level recommendations for potential increased vessel traffic:
    - Grays Harbor Pilots review anchorages. Increased vessel traffic may make it more desirable to have designated anchorages outside of the channel.

Factor 4: Currents

- Description: Currents are strong (up to 5 knots), and there is little depth of water under the keel of anchored vessels, which may influence the risks of dragging, grounding, and allision.
- Existing safeguards:
    - Existing safeguards as described for Factor 2.
    - Northwest Association of Networked Ocean Observing Systems (NANOOS)[21] received funding for two high frequency (HF) radars in Washington to measure coastal surface currents.
- High-level recommendations for current vessel traffic:
    - High level recommendations as described for Factor 2.

[21] http://www.nanoos.org/

- Consider whether current gauges at locations in Grays Harbor would improve data and information available to vessels and pilots.
    - Potential locations could include gauges on the southwest and northeast corners of the Highway 101 Bridge across the Chehalis River, to provide information for transit planning.
- Grays Harbor Safety Committee engage with NANOOS to learn where HF radars will be placed, and what capabilities they could provide.
- Grays Harbor Safety Committee consider whether integrating sensor data into the NOAA Physical Oceanographic Real Time System (PORTS)[22] would improve safety and efficiency.

Factor 5: Wind speeds

- Description: High wind speeds are relatively common in Grays Harbor, which may influence the risks of dragging, grounding, and allision.
- Existing safeguards:
    - Existing safeguards as described for Factor 2.
    - Wind data available for Westport (NOAA station 9441102) and Bowerman Airport (FAA identifier KHQM).
- High-level recommendations for current vessel traffic:
    - High level recommendations as described for Factors 2, 3, and 4.

Background lighting

Factor 6: Background lighting from Westport

- Description: Background lighting from Westport may influence collision, allision, and grounding risk by making it more difficult to see other vessels and navigation aids, and correctly determine other vessel's behavior and intentions.
- Existing safeguards:
    - Existing safeguards as described for Factor 1.
    - Pilots use radar to detect vessels, avoid collisions, and check ship position.
- High-level recommendations for current vessel traffic:
    - Coast Guard Sector Columbia River continue to coordinate with waterway users on the status of action items from the 2015 WAMS; provide regular updates to the Grays Harbor Safety Committee.
    - Coast Guard Sector Columbia River conduct next WAMS on schedule in 2020.
        - Address 2015 channel realignment.

[22] https://tidesandcurrents.noaa.gov/ports.html

  - Incorporate any changes in vessel traffic as required based on terminal projects or expansions, or trends in vessel traffic to existing terminals.
  - Consider impact of background lighting on navigation.

Factor 7: High intensity lights on crab/fishing vessels

- Description: High intensity lights on crab/fishing vessels may influence collision, allision, and grounding risk by making it more difficult to see aids to navigation, navigation lights on the boat with the bright lights, or on other vessels around or behind the boat with bright lights.
- Existing safeguards as described for Factors 1 and 6.
- High-level recommendations as described for Factor 6

Factor 8: Background lighting at Bowerman airport

- Description: Background lighting at Bowerman airport may influence collision, allision, and grounding risk by making it more difficult to see other vessels and navigation aids, and correctly determine other vessel's behavior and intentions.
- Existing safeguards as described for Factors 1 and 6.
- High-level recommendations as described for Factor 6.

Bar and approaches

Factor 9: Vessel types

- Description: A mix of vessel types, with varying ages, designs, and material conditions call on Grays Harbor. Older vessels or vessels that have not been well maintained may be more likely to experience structural failure or flooding casualties while crossing the bar.
- Existing safeguards:
  - Existing safeguards as described for Factor 1.
  - Pilots consider effect on bar crossing when there are long period swells.
  - Global safeguards, including Coast Guard Port State Control program, and International Maritime Organization, Coast Guard, and Classification Societies roles in vessel construction and maintenance of classification status.
  - Ecology vessel inspections and oil transfer inspections.
- High-level recommendations: No additional recommendations identified.

Factor 10: Inbound vessel position

- Description: Inbound vessel position depends on where pilot boards and on weather, which may influence collision risk due to commercial vessels being outside of where other vessels may expect them to be.
- Existing safeguards:
  - Existing safeguards as described for Factor 1.

  - Pilots use bridge-to-bridge communications as needed to advise vessels on their intentions and making meeting/passing arrangements.

- High-level recommendations for current vessel traffic:
  - Pilots consider having pilot boat operator make a Securite[23] call prior to pilot boarding to inform vessels in the area of intentions and potential movements of the inbound/outbound vessel.
  - If this practice contributes to safety, consider documenting in the Harbor Safety Plan and discuss specific interactions during Harbor Safety Committee meetings.
  - Pilots and Port of Grays Harbor consider coordinating with NOAA and the Coast Guard to define a pilot boarding area.
- High-level recommendation for potential increased vessel traffic:
  - Consider documenting one-way vessel traffic and tug escort practices in the Harbor Safety Plan.

Factor 11: Outbound vessels north of channel

- Description: Outbound vessels sometimes transit north of the channel based on conditions to avoid breaking waves across the bar, which may influence collision risk due to commercial vessels being outside of where other vessels may expect them to be.
- Existing safeguards as described for Factors 1, 2, and 10.
- High-level recommendations as described for Factor 10.

Factor 12: Location of Grays Harbor Bar

- Description: The effects of the Grays Harbor Bar may be felt between Buoys 5 and 9, depending on weather conditions, tide, and current, which may influence collision, grounding, and allision risk by making ship handling more difficult and less predictable.
- Existing safeguards as described for Factors 1, 2, and 10.
- High-level recommendations for current vessel traffic:
  - Grays Harbor Safety Committee and Grays Harbor Pilots consider whether an additional wave buoy in the vicinity of the bar would provide useful information.
- High-level recommendation for potential increased vessel traffic:
  - Consider documenting one-way vessel traffic and tug escort practices in the Harbor Safety Plan.

[23] *Securite* is a procedural word used in radio communications to precede a safety message (International Telecommunication Union, 2016).

Channel depth/configuration

Factor 13: Channel depth

- Description: Channel depth may influence collision, allision, and grounding risk by restricting available water space and maneuvering options for commercial vessels.
- Existing safeguards:
    - Existing safeguards as described for Factors 1 and 2.
    - Pilots monitor channel depth and effect on ship handling during each transit.
    - U.S. Army Corps of Engineers conducts frequent hydrographic surveys of the federal navigation channel.
        - Includes "tip to tail," condition, pre-dredge, progress, and post-dredge surveys.
        - Data posted to Seattle District website.[24]
- High-level recommendations for current vessel traffic:
    - Grays Harbor Safety Committee consider providing a forum for area tribes and stakeholders to discuss hydrographic survey needs with the U. S. Army Corps of Engineers, NOAA, U.S. Coast Guard, and Ecology.
- High-level recommendations for potential increased vessel traffic:
    - NOAA, USACE, and Ecology coordinate to conduct hydrographic surveys inside and outside the navigation channel, to determine if dredging would be required for facility additions, expansions, after extreme flooding events, or changes in vessel traffic.

Factor 14: Channel shoaling

- Description: Channel may shoal due to sedimentation, which may influence collision, allision and grounding risks for commercial vessels by reducing available depth and width of the channel. Problem may be exacerbated during periods when dredging is suspended (e.g., February – June to allow for fish passage).
- Existing safeguards:
    - Existing safeguards as described for Factors 1, 2, and 13.
- High-level recommendations for current vessel traffic:
    - High-level recommendations as described for Factors 1–4, and 12.
- High-level recommendations for potential increased vessel traffic:
    - Grays Harbor Safety Committee and Grays Harbor Pilots consider need for additional escort and ship assist tugs.

[24] http://www.nws.usace.army.mil/Missions/Civil-Works/Navigation/Hydrographic-Survey/Grays-Harbor/

  - Port of Grays Harbor and Grays Harbor Pilots consider ways to increase communications between pilots and standardize pilot procedures where beneficial.
  - Grays Harbor Safety Committee review tethered and untethered tug escort practices and Standards of Care; update practices in Harbor Safety Plan.

Factor 15: Grays Harbor depth

- Description: Grays Harbor is shallow, with little water deep enough for navigation outside of the channel, which may influence collision and grounding risk because ships are constrained to remain within the channel, and could quickly run aground if they exit the channel.
- Existing safeguards as described for Factors 1, 2, and 13.
- High-level recommendations as described for Factors 1–4, and 12–14.

Factor 16: Multiple turns in channel

- Description: Multiple turns in the channel influence collision, allision, and grounding risk by increasing the complexity of the transit.
- Existing safeguards as described for Factors 1, 2, and 13.
- High-level recommendations as described for Factors 1–4, and 12–14.

Factor 17: Narrow channel widths

- Description: Narrow channel widths influence collision, allision, and grounding risk by restricting available water space and maneuvering options for commercial vessels
  - In proximity to South Jetty.
  - Along South Reach.
  - Along Crossover Channel, and North Reach.
  - Along North Channel, Hoquiam Reach, Cow Point Reach, and Aberdeen Reach.
- Existing safeguards as described for Factors 1, 2, and 13.
- High-level recommendations as described for Factors 1–4, and 12–14.

Factor 18: Rocky structures

- Description: Rocky structures (e.g., groins north of Westport, South Jetty) may influence the risk of an oil spill in the event of a grounding.
- Existing safeguards as described for Factors 1, 2, and 13.
- High-level recommendations as described for Factors 1–4, and 12–14.

Factor 19: Vessels staying north of submerged jetty

- Description: Submerged jetty extending from South Jetty poses a navigational hazard. Vessels transiting the entrance channel may stay north in the channel to give the

submerged jetty a wide berth, which could influence collision risk with an outbound vessel.

- Existing safeguards as described for Factor 1.
- High-level recommendations as described for Factors 1–4, and 12–14.

Factor 20: Proximity of submerged jetty to channel

- Description: Submerged jetty south of the Entrance Channel may influence grounding risk due to its proximity to the channel.
- Existing safeguards as described for Factor 1.
- High-level recommendations as described for Factors 1–4, and 12–14.

Factor 21: Turning basin

- Description: Turning basin is 950 feet north to south and 350 feet along the southwest edge, and is surrounded by shoal water, which may influence grounding risk.
- Existing safeguards:
    - Existing safeguards as described for Factor 1.
    - Pilot/tug operator experience.
    - Buoys mark the turning basin.
    - U.S. Army Corps of Engineers surveys and dredging of turning basin and channel.
    - Tug assist for each ship turning in the basin.
    - Vessels submit advance notice of arrival and departure to the Coast Guard, and update the departure time if it varies by more than six hours from the advance notice.
    - Dredged to maintain depth (twice a year).
- High-level recommendations for current vessel traffic:
    - High-level recommendations as described for Factor 1.
    - Grays Harbor Safety Committee and Grays Harbor Pilots consider whether current gauges at locations in Grays Harbor would improve data and information available to vessels and pilots.
        - Potential locations could include gauges on the southwest and northeast corners of the Highway 101 Bridge across the Chehalis River, to provide information for transit planning.

- Grays Harbor Safety Committee consider whether integrating sensor data into the NOAA Physical Oceanographic Real Time System (PORTS)[25] would improve safety and efficiency.

Currents

Factor 22: Current strength and variability

- Description: Current effects may be strong and vary from day to day, which may influence collision, allision, grounding, and oil spill risk by complicating ship handling, effecting the movements of a ship following a loss or reduction in steering or propulsion, and by impacting oil transfer pre-booming safety and effectiveness when pre-booming is required.[26]
- Existing safeguards:
  - Existing safeguards as described for Factor 1.
  - Pilot/tug operator experience.
  - Tug escorts for all tank vessels, and for other vessels as determined by the pilot.
  - Tide and current station at Westport (NOAA station 9441102).
  - Northwest Association of Networked Ocean Observing Systems (NANOOS) received funding for two HF radars in Washington to measure coastal surface currents.
  - Pilots coordinate with tugs to conduct current checks (stop and drift).
  - Pilots and tug operators use commercial software tools such as Deep Zoom[27] to display tides and currents.
  - Pilots avoid turning a ship during max ebb.
- High-level recommendations as described for Factors 1 and 21.

Factor 23: Current effects at Buoy 21

- Description: Currents can complicate the turn at Buoy 21, particularly for inbound ships on a flood current, which may influence collision, allision, and grounding risk.
- Existing safeguards as described for Factors 1 and 22.
- High-level recommendations as described for Factors 1 and 21.

[25] https://tidesandcurrents.noaa.gov/ports.html
[26] *Oil spill containment boom* is a floating barrier used to temporarily corral and contain spilled oil on the water's surface until it can be removed. *Pre-booming* refers to the deployment of boom prior to an oil-transfer operation, so that any spills during the transfer are contained instead of spreading to open waters.
[27] http://www.deepzoom.com/

Factor 24: Current effects in turning basin

- Description: Current can make turns in the turning basin more challenging, which may influence collision, allision, and grounding risk.
- Existing safeguards as described for Factors 1 and 22.
- High-level recommendations as described for Factors 1 and 21.

Factor 25: River influence on current

- Description: Seven rivers flow into Grays Harbor, which can effect current flow in complex and unpredictable ways, which may influence collision, allision, and grounding risk by complicating ship handling.
- Existing safeguards as described for Factors 1 and 22.
- High-level recommendations as described for Factors 1 and 21.

Fire/explosion

Factor 26: Municipal fire departments

- Description: Municipal fire departments are responsible for responding to a shipboard fire, but may have limited training and experience.
- Existing safeguards:
    - REG has trailer with firefighting foam, fire department trains with trailer once per year at facility.
    - Brusco tractor tug equipped with fire monitor, and can deploy firefighting foam.
    - 911 system covers port within multiple jurisdictions.
    - Port has process for vessel fires at terminals.
- High-level recommendations for current vessel traffic:
    - Grays Harbor Safety Committee consider establishing a marine firefighting subcommittee.
    - Grays Harbor Safety Committee with the Port of Grays Harbor consider developing a port-wide firefighting plan to cover facility and vessel fires.
        - Plan should include training and vessel familiarization for local fire departments.
        - Once plan is developed, schedule and conduct table-top and full scale firefighting exercises to include county, city, port, facility, vessel, tug company, Ecology, and Coast Guard participants.
        - Consider availability and adequacy of on-water firefighting response capability (e.g., tugs with fire monitors or dedicated response vessels).

  - Port of Grays Harbor coordinate with Coast Guard Sector Columbia River and agents to schedule local fire department observation visits during Port State Control inspections of visiting vessels.
  - Grays Harbor Safety Committee with agents and the Port of Grays Harbor work with local fire departments to help identify marine firefighting training needs and opportunities.
  - Ecology coordinate with local fire departments to inform them of equipment grant opportunities.[28]
  - Grays Harbor Pilots and the Port of Grays Harbor consider establishing accounts with the Department of Homeland Security Ship Arrival Notification System[29] to receive advance notice of ship arrivals, including information about cargo onboard.
- High-level recommendations for potential increased vessel traffic:
  - Grays Harbor Safety Committee with the Port of Grays Harbor review and update port-wide firefighting plan as needed to address increased numbers and types of vessels.

Factor 27: Nature of cargo

- Description: The nature of materials moved as cargo and fuel (e.g., oil, diesel, methanol, grain, wood chips) may influence the potential for fire and explosion.
- Existing safeguards:
  - Global safeguards, including international, federal, and domestic regulations; shipboard Safety Management Systems; safe material handling and stowage procedures; facility standard operating procedures; approved prevention and response plans; and industry standards and vetting.
  - Existing safeguards as described for Factor 35.
- High-level recommendations as described for Factor 35.

Fishing vessels, fishing gear

Factor 28: Fishing vessel transits to and from Westhaven Cove

- Description: Commercial, tribal, and recreational fishing vessels transiting to and from Westhaven Cove may influence collision, allision, and grounding risks for commercial vessels by crossing the deep draft channel at Chehalis Reach or South Reach.
- Existing safeguards:

[28] https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Equipment-cache-grants
[29] https://dhssans.nvmc.uscg.gov/

- Existing safeguards as described for Factor 1.
- Washington Department of Fish and Wildlife publishes fishery seasons[30] and commercial salmon information.[31]
- Quinault Indian Nation publishes fishing regulations,[32] including season openings and closings.
- Tug operators inform fishermen of pending vessel traffic.
- Some tribal and recreational boats have VHF radios, some do not. These radios are helpful so boats can monitor Channels 16, 13, and 12.
    - Washington Sea Grant has safety training for fishermen that includes radio procedures.
    - Quinault regulations require tribal fishermen to carry operable VHF marine radios.

- High-level recommendations for current vessel traffic:
    - Coast Guard Sector Columbia River
        - Explore ways to increase communication between the commercial vessel community (e.g., port, pilots, agents) and tribal, commercial, subsistence, and recreational fishermen. Potential communications topics/methods could include:
        - Issue Local Notice to Mariners for fishery openings/closings
        - Consider waterway safety outreach opportunities, including whether there is a need for, or opportunity to establish a Coast Guard Auxiliary program in Grays Harbor/Westport that could assist with communications, outreach, and safety boardings, and could participate in programs like the Columbia River "Make Way" campaign.
    - Commercial fishermen
        - Continue to encourage participation in Harbor Safety Committee meetings by commercial fishermen, including participation in a potential sub-committee or working group focused on increasing communications between fishermen and the commercial vessel community.
        - With tug operators, consider working with Washington Sea Grant and NOAA to determine if voluntary offshore Crabber/Towboat lanes can be included on nautical charts.
        - With Grays Harbor Pilots, discuss the use of high intensity/deck lights while underway; determine if a Harbor Safety Plan standard of care could

[30] https://wdfw.wa.gov/fishing/regulations/
[31] https://wdfw.wa.gov/fishing/commercial/salmon/netting_schedules.html
[32] http://www.quinaultindiannation.com/fishingregs.htm

help improve communications between fishermen and pilots/large commercial vessels.

- Grays Harbor Safety Committee
  - Consider ways to increase communication between the commercial vessel community (e.g., port, pilots, agents) and tribal, commercial, subsistence, and recreational fishermen, including coordination with the Quinault Indian Nation government to coordinate fishing activities with shipping. Potential communications topics/methods could include:
    - Continue to encourage participation in Harbor Safety Committee meetings by tribal, commercial, subsistence, and recreational fishermen.
    - Consider whether it would be effective to establish a subcommittee or working group focused on increasing communications between fishermen and commercial vessel community. Subcommittee or working group could report on recent incidents/accidents, potential improvements, upcoming fishery openings, and other activities that impact the regions fishing industry.
    - Consider ways to inform the Quinault Indian Nation of commercial vessel traffic, which could include participation in the vessel traffic database system.
    - Consider how to best engage recreational fishermen regarding commercial vessel traffic and safety.
    - Establish processes to reduce the potential for fish/crab gear being placed in navigational channel and tow lanes within Grays Harbor.
    - Consider whether focus sheets or safety bulletins (printed or electronic) would be an effective communications tool to describe commercial vessel operations and any specific topics of concern to commercial, tribal, and recreational fishermen.
    - Consider discussing the use of high intensity deck lights while underway with tribal fishermen, subsistence fishermen, commercial fishermen, and Grays Harbor Pilots to determine if a Harbor Safety Plan standard of care could help improve communications between fishermen and pilots and large commercial vessels. Consider the safety of fishermen as well as safe navigation of commercial vessels.
- Quinault Indian Nation
  - Consider exploring ways to increase communication between tribal fishermen, tribal fisheries managers, and the commercial vessel

community (e.g., port, pilots, agents). Potential communications topics/methods could include:

  - Continue to encourage participation in Harbor Safety Committee meetings by tribal fishermen and tribal fisheries managers.
  - Consider coordinating with tribal fisheries managers to send tribal fishery dates to Harbor Safety Committee members.
  - Consider how tribal fisherman could receive information about commercial vessel traffic, which could include tribal participation in the vessel traffic database system.
  - Consider grant funding opportunities to for oil spill response training.

- High-level recommendations for potential future vessel traffic:
  - Grays Harbor Safety Committee
    - Review communication between the commercial vessel community (e.g., port, pilots, agents) and tribal, commercial, subsistence, and recreational fishermen, including coordination with the Quinault Indian Nation government to coordinate fishing activities with shipping; consider whether changes are required.

Factor 29: Fishing vessel behavior

- Description: Fishing vessels, including relatively large boats, may not adhere to the channel, and may alter their behavior based on factors that may not be apparent or predictable to commercial vessels transiting in the channel, which may influence collision risk.
- Existing safeguards as described for Factors 26.
- High-level recommendations as described for Factor 26.

Factor 30: Fishing vessels in channel

- Description: Fishing vessels may be fishing in the channel, which may influence collision, allision, and grounding risk by creating potential hazards to navigation.
- Existing safeguards:
  - Existing safeguards as described for Factor 26.
  - Voluntary offshore Crabber/Towboat lane agreements[33] provide a process to help keep crab gear out of towing lanes.
- High-level recommendations for current vessel traffic:

[33] https://wsg.washington.edu/community-outreach/outreach-detail-pages/crabbertowboat-lane-agreements-download-charts-data-and-meetings/

  - High-level recommendations as described for Factor 26.
  - Commercial crab fishermen with Grays Harbor Safety Committee and in collaboration with tug operators, consider working with Washington Sea Grant and NOAA to determine if voluntary offshore Crabber/Towboat lanes can be included on nautical charts.
  - Grays Harbor Safety Committee establish processes to reduce the potential for fish/crab gear being placed in navigational channel and tow lanes within Grays Harbor.

Factor 31: Marine debris

- Description: Marine debris may influence collision, allision, and grounding risk by posing a hazard to navigation that commercial vessels could have to maneuver around, and by presenting a risk that marine debris could get caught in a commercial vessel's propeller or running gear, possibly resulting in a loss or reduction in propulsion or steering.
- Existing safeguards as described for Factors 26.
- High-level recommendations as described for Factor 26.

Factor 32: Large concentrations of fishing vessels

- Description: Large concentrations of fishing vessels head in/out during season openers, which may influence collision risk with commercial vessels.
- Existing safeguards as described for Factors 26.
- High-level recommendations as described for Factor 26.

Factor 33: Loss of crab pots

- Description: Loss of a large number of crab pots in the channel could influence grounding and allision risk by posing a hazard to navigation that vessels may have to maneuver to avoid. Pots could get caught in a commercial vessel's propeller or running gear, possibly resulting in a loss or reduction in propulsion or steering.
- Existing safeguards as described for Factors 26.
  - A participant noted that crab pots are marked with a buoy showing ownership, which would allow contact with the owners of buoys in a channel.
- High-level recommendations as described for Factor 26.

Factor 34: Recreational fisheries

- Description: Participants in recreational fisheries may not be familiar with the area, which may influence collision risks.
- Existing safeguards as described for Factors 26.
- High-level recommendations as described for Factor 26.

Factor 35: Short fishery openings

- Description: Short fishery openings, combined with predictions of when fisheries will close can encourage fishermen, some of whom may be inexperienced or unfamiliar with the area, to fish regardless of weather or visibility, which may influence collision, allision and grounding risks for commercial vessels by adding traffic and complicating the navigational situation.
- Existing safeguards as described for Factors 26.
- High-level recommendations as described for Factor 26.

Factor 36: Multiple fishing seasons

- Description: There are multiple fishing seasons and activity types in Grays Harbor, including commercial, tribal and recreational openings. This may influence collision risk by making it more difficult for pilots, agents, and vessels to maintain awareness of, and be prepared for, fishery openings.
- Existing safeguards as described for Factors 26.
- High-level recommendations as described for Factor 26.

Offshore traffic

Factor 37: Vessels waiting for berth

- Description: A participant stated vessels waiting for berth have been observed loitering offshore as close as 4 nautical miles, which may influence collision risk with fishing and recreational vessels and inbound/outbound commercial traffic.
- Existing safeguards:
    - Existing safeguards as described for Factor 1.
    - Coast Pilot 7[34] includes offshore vessel traffic management recommendations with voluntary minimum distances from shore.
    - Vessels provide Advance Notice of Arrival information to Coast Guard.
    - Agents and pilots communicate pilot boarding window and location to vessels.
- High-level recommendations for current vessel traffic:
    - Grays Harbor Safety Committee consider submitting change to Coast Pilot 7, Offshore Vessel Traffic Management Recommendations.
        - Recommendations currently state, in part, "Based on the West Coast Offshore Vessel Traffic Risk Management Project, which was co-sponsored by the Pacific States/British Columbia Oil Spill Task Force and

[34] The United States Coast Pilot, published by the National Oceanic and Atmospheric Administration (NOAA), is a series of nine nautical books (volumes) that encompasses a wide variety of information important to navigators of U.S. coastal/intracoastal waters and the waters of the Great Lakes. The Coast Pilot is intended to be used as a supplement to NOAA nautical charts (NOAA, 2017b).

U.S. Coast Guard Pacific Area, it is recommended that, where no other traffic management areas exist such as Traffic Separation Schemes, Vessel Traffic Services, or recommended routes, vessels 300 gross tons or larger transiting along the coast anywhere between Cook Inlet and San Diego should voluntarily stay a minimum distance of 25 nautical miles offshore…Vessels transiting short distances between adjacent ports should seek routing guidance as needed from the local Captain of the Port or VTS authority for that area." (NOAA, 2017b)

        - Consider submitting change to add a statement "Vessels remaining offshore due to a delay in berth availability or while waiting for their pilot boarding time, should voluntarily stay a minimum distance of 25 nautical miles offshore or seek routing guidance as needed from the local Captain of the Port or VTS authority for that area."
    - Commander, Coast Guard Sector Columbia River consider attending Grays Harbor Safety Committee meetings on a periodic basis, such as semi-annually, to gain insight on local issues and priorities, maintain institutional knowledge of the area, and share information from the Sector Commander/Captain of the Port perspective.
    - Grays Harbor Safety Committee with agents, Coast Guard Sector Columbia River, and Grays Harbor Pilots discuss issues related to vessels remaining close to shore while waiting for a berth to become available.
        - Discuss contracts and charter agreements to determine if there are solutions for vessels declaring their arrival and ready to load status that would meet the business needs of vessels/charterers and encourage ships to remain a safe distance offshore.
        - Consider developing Harbor Safety Plan guidance and a standard of care for vessels remaining offshore, recommending vessels remain at least 25 nautical miles offshore while waiting for their pilot pick up time.

Oil transfers

Factor 38: High winds

- Description: High winds may increase the likelihood of having to secure cargo or fueling operations, and can impact the safety and effectiveness of pre-booming.[35]
- Existing safeguards:
    - Facility procedures to secure oil transfers based on wind limits.
    - There are approved alternate compliance measures for transfers at Terminal 1, as pre-booming has not been determined safe or effective for the terminal.

[35] *Oil spill containment boom* is a floating barrier used to temporarily corral and contain spilled oil on the water's surface until it can be removed. *Pre-booming* refers to the deployment of boom prior to an oil-transfer operation, so that any spills during the transfer are contained instead of spreading to open waters.

  - Two oil spill response contractors on site, with boom boat and skimmer ready to deploy.
  - REG employs a terminal agent, who represents the terminals interests on the vessel during transfers.

Surveys

Factor 39: Comprehensive surveys

- Description: Lack of recent, comprehensive hydrographic surveys of the area may influence collision and grounding risk because conditions may have changed since the last survey; commercial vessels could have more or less water space available to them than is shown on the chart.
  - *Factor 40*: Including north of the South Reach channel between Buoys 15-21, where vessels sometimes anchor.
- Existing safeguards:
  - Existing safeguards as described for Factors 1 and 2.
  - Pilots monitor channel depth and effect on ship handling during each transit.
  - U.S. Army Corps of Engineers conducts frequent hydrographic surveys of the federal navigation channel.
    - Includes "tip to tail," condition, pre-dredge, progress, and post-dredge surveys.
    - Data posted to Seattle District website.[36]
  - Last NOAA hydrographic survey conducted in 2008.
- High-level recommendations for current vessel traffic:
  - Coast Guard Sector Columbia River conduct next WAMS on schedule in 2020.
    - Address 2015 channel realignment.
    - Incorporate any changes in vessel traffic as required based on terminal projects or expansions, or trends in vessel traffic to existing terminals.
  - Grays Harbor Safety Committee provide a forum for area tribes and stakeholders to discuss hydrographic survey needs with the U. S. Army Corps of Engineers, NOAA, and Ecology.
- High-level recommendations for potential future vessel traffic:
  - U.S. Army Corps of Engineers Seattle District coordinate with NOAA and Ecology to conduct hydrographic surveys inside and outside the navigation channel, to determine if dredging would be required for facility additions, expansions, after extreme flooding events, or changes in vessel traffic.

[36] http://www.nws.usace.army.mil/Missions/Civil-Works/Navigation/Hydrographic-Survey/Grays-Harbor/

Tugs/towing

Factor 41: No dredging above Highway 101 Bridge

- Description: No dredging is being conducted above the Highway 101 Bridge across the Chehalis River, which may influence grounding risk for tugs/barges.
- Existing safeguards:
    - Currently no vessels over 300 gross tons transit above the bridge.
    - Sufficient depth of water and channel width for tug/barge traffic.
- High-level recommendations for current vessel traffic:
    - Grays Harbor Safety Committee provide a forum for area tribes and stakeholders to discuss hydrographic survey needs with the U. S. Army Corps of Engineers, NOAA, and Ecology.
    - Coast Guard Sector Columbia River conduct next WAMS on schedule in 2020.
        - Address 2015 channel realignment.
        - Incorporate any changes in vessel traffic as required based on terminal projects or expansions, or trends in vessel traffic to existing terminals.
- High-level recommendations for potential future vessel traffic as described for Factors 39 and 40.

Weather and visibility

Factor 42: Periods of reduced visibility

- Description: There are periods of reduced visibility throughout the year due to fog (primarily in the summer) and rain (primarily in the fall through spring) as well as longer hours of darkness in the fall and winter, which may influence collision, allision, and grounding risk.
- Existing safeguards as described for Factors 1, 2, and 22.
- High-level recommendations for current vessel traffic:
    - Shipping agents provide Harbor Safety Plan, or applicable sections/placard to inbound vessels
    - Ecology vessel inspectors board covered cargo and passenger ships in Grays Harbor to complete Acceptable Industry Standard checklists. During boardings, Ecology inspectors discuss the Harbor Safety Plan with vessel masters and collect feedback to share with the Harbor Safety Committee.
    - Coast Guard Sector Columbia River vessel inspectors (Port State Control, domestic vessel, and commercial fishing vessel) discuss Harbor Safety Plan with vessel masters, as time permits during inspections. Share feedback with the Harbor Safety Committee.
- High-level recommendations for potential future vessel traffic:

  - Grays Harbor Safety Committee consider whether improvements are required for the vessel traffic scheduling database system, including whether operations and maintenance funding for the database is needed.

Factor 43: Winds exceeding 20 knots

- Description: Winds sometimes exceed 20 knots in the turning basin, which may influence collision, allision, and grounding risk, particularly for car carriers and RO-RO vessels.
- Existing safeguards as described for Factors 1, 2, and 21.
- High-level recommendations as described for Factor 42.

Extending the Hazard Identification Process

After the two initial Hazard Identification workshops, Ecology facilitated two more workshops that extended the Hazard Identification process. The first served as a planning meeting for a Grays Harbor Response Capability Assessment. The second involved commercial fishermen, tribal fishermen, and recreational boaters, and it reviewed Ecology data on spills from smaller vessels, under 300 gross tons.

Response Capability Assessment

On April 3, 2018, Ecology convened representatives from governments and organizations to discuss the existing preparedness framework and encourage discussion about how best to conduct a study to analyze the on-water recovery capability for oil spill response in Grays Harbor.

Building on the Hazard Identification outcomes, the Response Capability Assessment will define the baseline operational capability of the response systems that would be used to clean up an oil spill. The goal of the study is to gain an increased understanding of the capability of the response forces that would be used to respond to oil spills in Grays Harbor.

Workshop results

During the workshop, participants:

- Discussed the current preparedness regulatory framework in Grays Harbor, including an introduction to the regulated contingency plan holders, contingency planning requirements, response contractors, and oil spill equipment types and locations.
- Reviewed the baseline preparedness picture in the area and used outcomes from the two Hazard Identification workshops to agree on the study parameters of the response equipment capability assessment.

Next steps

- Ecology works with response contractors to define response systems based on response resource inventories and locations, and response contractor best professional judgment regarding how response forces may be used.
- Ecology contracts Nuka Research and Planning group for the modeling of the response systems and the writing of the Response Capability Assessment.
- Grays Harbor technical manual and workshop summary materials are provided to Nuka Research and Planning Group, to support the Response Capability Assessment.
- Contractor delivers draft Response Capability Assessment, allowing time for Harbor Safety Committee review and comment.
- Public comment opportunity on draft study.
- Finalize study and regionally specific preparedness recommendations on or before June 30, 2019.

- Publish final study and Grays Harbor technical manual.

The Response Capability Assessment workshop summary is provided as Appendix C.

Commercial fishing, tribal fishing, and recreational vessel oil spill prevention and preparedness workshop

During the planning process for the Hazard Identification workshops, members of the planning workgroup noted that most spills in Grays Harbor have been from commercial fishing, tribal fishing, and recreational vessels. Ecology data for 2007-2017 includes 97 incidents involving vessels less than 300 gross tons (Ecology, 2018b).

While beyond the scope of the Hazard Identification, these spills damage the environment and create response challenges for the community, tribes, response organizations, Ecology, and the Coast Guard. Ecology hosted an oil spill prevention and preparedness workshop on April 24, 2018 for commercial fishermen, tribal fishermen, and recreational boaters. The objectives of the workshop were to:

- Present Ecology data on vessel incidents and oil spills.
- Listen to participant experiences with vessel incidents and oil spills.
- Connect fishermen and boaters with organizations who promote vessel safety.
- Identify potential ideas for continual improvement.

Participants in the workshop included representatives from:

- Confederated Tribes of the Chehalis Reservation
- Port of Grays Harbor
- Quinault Indian Nation
- Shoalwater Bay Tribe
- U.S. Coast Guard Sector Columbia River
- U.S. Coast Guard Station Westport
- Washington Department of Ecology Spill Prevention, Preparedness, and Response Program
- Washington Department of Ecology Water Quality
- Washington Department of Natural Resources Aquatic Resources
- Washington Department of Natural Resources Derelict Vessels
- Washington Dungeness Crab Fishermen's Association
- WEfish
- Westport Seafood, Inc.

Workshop results

During the workshop, Ecology reviewed vessel incident data from 2007 to 2018 (to date). Participants discussed a wide range of topics, including:

- Fueling practices
- Bilge pumps
- Vessel maintenance and available haul-out facilities
- Boatyard, shipyard, and vessel deconstruction permits
- Weather
- Stability
- Impacts of short seasons on safety
- Fatigue and research on the role of nutrition for fishing crews
- Coast Guard commercial fishing vessel safety inspections
- Derelict vessels and the Washington State Department of Natural Resources derelict vessel removal program and vessel turn in program
- Vessel insurance requirements
- Issues regarding fishermen removing gear from the water
- Coast Guard search and rescue procedures

The Commercial Fishing, Tribal Fishing, and Recreational Vessel Oil Spill Prevention and Preparedness Workshop summary is provided as Appendix D. The discussions documented in the summary provide insight into existing challenges and opportunities for improvement for consideration by government agencies, tribes, commercial fishermen, and Grays Harbor stakeholders.

Formal Safety Assessment Process Decision

Hazard Identification represents the first step in the five-step Formal Safety Assessment process. Following the Hazard Identification workshops, Ecology considered the costs and benefits of continuing with steps 2-5 of the process.

Step 2, Risk Analysis, is typically performed using modeling techniques that incorporate fault trees, simulation, or statistical calculations (IMO, 2002). The output of Step 2 is a prioritized list of risk areas that may require additional controls beyond existing safeguards. Step 3, Risk Control Options, uses structured discussions to identify candidate measures to control the greatest areas of risk. These measures are evaluated by repeating the quantitative analysis of Step 2, to determine potential reductions in risk. The results of Step 3 and the re-evaluation of Step 2 inform Step 4, Cost Benefit Assessment. Step 4 results in estimates of the cost effectiveness of each potential risk control option (IMO, 2002). Step 5, Recommendations for Decision Making, considers the outcomes of Steps 1-4 to present an objective comparison of alternative options, including the potential reduction of risks and cost effectiveness (IMO, 2002).

Ecology estimated analysis and reporting to complete the Formal Safety Assessment process could cost between $150,000 and $600,000. This does not include the cost of Ecology staff time, and it does not account for the value of the time spent by other participants in the process.

The local factors, existing safeguards, and high-level recommendations developed in the Hazard Identification workshops provide a resource for tribes and stakeholders to consider in continuing to improve oil spill prevention and preparedness. Current vessel traffic levels and a review of global, national, and local vessel incident and spill data suggest the risk of an oil spill from a covered vessel (i.e., a tank vessel, or a cargo vessel or passenger vessel greater than 300 gross tons)[37] in Grays Harbor can be characterized as low-probability and high-consequence, as quantitative risk studies have found for other waterways.

Ecology assessed that continuing the Formal Safety Assessment is unlikely to produce substantive recommendations beyond those already identified. Ecology ended the Formal Safety Assessment process at the completion of Step 1, Hazard Identification, due to the significant resources (analysis costs, staff time, participant time) required for the remaining steps and the uncertain benefit that would result.

A consequence of not completing the process is that Ecology cannot provide information about the amount of risk that could be reduced by implementing the high-level recommendations, or the costs of implementation. These issues will have to be discussed qualitatively.

If vessel traffic or conditions change in the future, Ecology will determine the priority of updating the Hazard Identification or completing a full risk analysis.

Ecology also has responsibilities under the Washington State Environmental Policy Act (SEPA) to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the

[37] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response

natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment" and ensure that "environmental amenities and values will be given appropriate consideration in decision making along with economic and technical considerations...." (RCW 43.21C.030).[38] For proposed new projects and expansions or changes to existing terminals and facilities, Ecology may lead, co-lead, or participate in the environmental review process, depending on the situation. This includes reviewing and commenting on SEPA checklists, environmental impact statements, and analyses of proposed projects that have the potential to impact the environment, including projects that could increase vessel traffic in Washington waters.

[38] https://app.leg.wa.gov/rcw/default.aspx?cite=43.21C.030

Conclusion

The goals of the Grays Harbor Vessel Traffic Risk Assessment were to:

- Assess baseline and changing oil spill risks from commercial vessels operating in Grays Harbor.
- Identify measures that could help reduce the risks of oil spills.
- Assess oil spill response preparedness.
- Identify baseline oil spill response capability.

Ecology followed the IMO Formal Safety Assessment process to conduct the Grays Harbor Vessel Traffic Risk Assessment, with an initial focus on Step 1, Hazard Identification.

Through the Hazard Identification workshops, Ecology facilitated discussions with governments and organizations resulting in high-level recommendations for both current vessel traffic and potential increased vessel traffic in the future.

These recommendations represent an inclusive list for consideration by tribes and stakeholders, and are intended to enhance safety measures already in place at the international, national, regional, and local levels.

Building on the outcomes of the Hazard Identification workshops, Ecology gathered inputs on baseline response capability and is conducting a Response Capability Assessment. Ecology will publish the results of this assessment when available.

Within the context of the Grays Harbor Vessel Traffic Risk Assessment, Ecology also held a workshop for commercial fishermen, tribal fishermen, and recreational boaters. Ecology shared vessel incident data and learned from participants about challenges and issues they face. The workshop provided a forum to identify practices to improve safety and prevent spills.

The results of the four workshops conducted during the Grays Harbor Vessel Traffic Risk Assessment process provide a resource for tribes and stakeholders to strengthen oil spill prevention and preparedness. Ecology will remain engaged with the Grays Harbor community through participation in the Grays Harbor Safety Committee, the Washington Board of Pilotage Commissioners, and on-going collaboration with area tribes, government agencies, industry, and non-governmental organizations.

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Appendix A: Workgroup Framework

Grays Harbor Vessel Traffic Risk Assessment (VTRA)

Workgroup Framework

October 17, 2017

1. Assessment goals and workgroup purpose.
    - Department of Ecology is conducting a risk assessment of oil spills from commercial vessels in Grays Harbor. The goals of this assessment are to:
        - Characterize baseline and changing oil spill risks from commercial vessels in Grays Harbor
        - Identify measures that could help reduce the risks of oil spills
        - Assess oil spill response preparedness
        - Identify preparedness gaps and potential solutions
    - The first step of this assessment will consist of a series of Hazard Identification and Response Assessment workshops.
        - Ecology is requesting participation from stakeholders and tribal representatives to meet periodically as a workgroup.
        - The purpose of the workgroup is to help guide Ecology planning for the workshops.
2. Workgroup Structure. Ecology will invite organizations with local knowledge of vessel operations and oil spill response planning in Grays Harbor to participate in workgroup meetings. The following list represents the initial invitees to the workgroup; Ecology may invite additional participants to future workgroup meetings as needed to help with workshop planning.
    - Risk assessment sponsor
        - Department of Ecology Spills Program
    - Grays Harbor Safety Committee representatives
        - Chair
        - Vice Chair
    - Initial invited workgroup participants
        - Brusco Tug
        - Confederated Tribes of the Chehalis Reservation
        - City of Hoquiam
        - Commercial fisherman

- Contanda
- Friends of Grays Harbor
- General Steamship
- Grays Harbor Pilots
- Hoh Indian Tribe
- Makah Tribe
- National Response Corporation
- Port of Grays Harbor
- The Nature Conservancy
- U.S. Army Corps of Engineers
- U.S. Coast Guard Marine Safety Unit Portland
- Washington State Maritime Cooperative
- Washington Trollers Association
- Quileute Tribe
- Quinault Indian Nation
- Renewable Energy Group Grays Harbor
- Shoalwater Bay Indian Tribe

3. Communications.
    - The workgroup will communicate through meetings and through e-mail.
    - Ecology will coordinate meeting dates, times, and locations with workgroup participants.
    - Ecology and the Grays Harbor Safety Committee chair and vice-chair will update the Grays Harbor Safety Committee on the assessment during general meetings.
    - In addition to the scheduled meetings and workshops, Ecology will also conduct outreach to tribes, stakeholders, and members of the public who have an interest in the assessment.
        - Ecology will inform workgroup participants of outreach events when possible, and will share input received by Ecology for consideration during the workshops
        - Workgroup participants may have opportunities to participate in outreach events
4. Decision making. Because the purpose of the workgroup is to help guide Ecology planning for the Hazard Identification and Response Assessment workshops, each workgroup participant is encouraged to provide their input to Ecology. Where decisions need to be made about the content of the workshops, Ecology will strive for consensus. If consensus cannot be

reached on a decision about the content of a workshop, Ecology will note dissenting views during the workshop and in the Risk Assessment report.

5. Duration of framework. This framework remains in place through the completion of the assessment. Ecology anticipates there will be two or three workgroup meetings between October-December 2017.

Appendix B: Hazard Identification Scope

Grays Harbor Vessel Traffic Risk Assessment

Hazard Identification Scope

2017.12.26

HAZID scope statement:

Conduct a series of workshops to:

- Identify local factors associated with hazards to commercial vessel operations in Grays Harbor that could result in an oil spill.
- Develop regionally specific recommendations to improve oil spill prevention and preparedness.

Details:

- Hazards include hazards to navigation and vessel incidents that could result in an oil spill (e.g., collision, allision, grounding, flooding; fire/explosion; structural failure).
    - Includes consideration of meteorological/hydrographic condition, e.g., high winds, heavy seas, fog, and tides and currents including cyclical changes and tidal extremes.
    - Does not include region wide hazards, e.g., Cascadia Subduction Zone earthquake/tsunami.
- The fate and effect of spilled oil will be considered during the Response Capability Assessment workshop. In-depth consideration of the environmental, cultural, or economic impacts of the spilled oil is beyond the scope of the Hazard Identification and Response Capability Assessment.
- Geographic boundaries
    - Offshore from Buoy "GH" (approximately 5nm offshore) to Weyerhaeuser Company Bay City Log Export, Berths 1 and 2.
    - Workshop may include discussion offshore vessel traffic management practices westward of Buoy "GH."
- Types of vessels:
    - Commercial cargo, passenger, towing, fishing, and tank vessels > 300 gross tons.
        - Includes specific hazards for different vessel types (e.g., considerations for grain ships, car carriers, etc.).

  - Commercial and tribal fishing vessels and recreational vessels < 300 gross tons.
    - Will be considered during the Hazard Identification workshops as operations that could impact a commercial cargo, passenger, towing, fishing, or tank vessel >300 gross tons.
    - Ecology is planning a workshop to discuss commercial and tribal fishing vessel and recreational vessel oil spill prevention and preparedness for vessels less than 300 gross tons.

- Oil spills
  - Oil as defined by the state of Washington RCW 90.56.010: "Oil" or "oils" means oil of any kind that is liquid at twenty-five degrees Celsius and one atmosphere of pressure and any fractionation thereof, including, but not limited to, crude oil, bitumen, synthetic crude oil, natural gas well condensate, petroleum, gasoline, fuel oil, diesel oil, biological oils and blends, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil. Oil does not include any substance listed in Table 302.4 of 40 C.F.R. Part 302 adopted August 14, 1989, under section 102(a) of the federal comprehensive environmental response, compensation, and liability act of 1980, as amended by P.L. 99-499.
- Vessel activities and incidents
  - Definitions for vessel activities, incident types, immediate causes, and contributing factors are provided in the Glossary, and are adapted from 46 CFR, RCW 88.46, WAC 317-31, and the Pacific States/British Columbia Oil Spill Task Force Data Dictionary.
- Timeframe
  - Focus on current hazards.
  - Hazard Identification workshops will include qualitative discussions of potential changes in hazards or offshore vessel traffic management practices as a result of any projects that are proposed at the time of the workshops.
- Outcomes/products
  - Workshop 1: A list of local factors related to oil spill hazards for commercial cargo, passenger and tank vessels.

- Workshop 2:
  - For each local factor identified in Workshop 1, a description of the causes of the hazard; safeguards intended to prevent the hazard; and any high-level recommendations to reduce the likelihood or consequence of the hazard.
  - Description of any identified potential changes to hazards due to changes in vessel traffic related to proposed projects.
- Following Workshop 2:
  - A report documenting the Hazard Identification process, workshops, and results.
  - This report may be combined with the report of the Response Capability Preparedness workshop, and a report of the planned workshop discussing fishing vessel and recreational vessel oil spill prevention and preparedness.

Appendix C:
Response Capability Workshop Summary

Workshop goals

On April 3, 2018, Ecology convened a group of stakeholders to discuss the existing preparedness framework and encourage discussion about how best to conduct a study to analyze the on-water recovery capability for oil spill response in Grays Harbor. There were 18 participants in the workshop representing federal and state agencies, Quinault Indian Nation, industry, contingency plan holders, oil spill response contractors, Port of Grays Harbor, fishermen, and environmental interests.

- Workshop participants discussed the current preparedness regulatory framework in Grays Harbor, including an introduction to the regulated contingency plan holders, contingency planning requirements, response contractors, and oil spill equipment types and locations.
- Workshop participants also reviewed the baseline preparedness picture in the area and used the outcomes from the two initial Hazard Identification meetings to agree on the study parameters of the response equipment capability assessment.

What is a Response Capability Assessment?

The Grays Harbor Response Capability Assessment is a localized analysis of on-water oil recovery capability in Grays Harbor. The study is designed to define the baseline operational capability of the response systems that would be used to clean up an oil spill. The study is not looking at the probability of oil spills or environmental consequences of spills. The goal of the study is to gain an increased understanding of the capability of the response forces that would be used to respond to oil spills in Grays Harbor.

Fate and effects of spilled oil

The morning session provided an overview of the fate and effects of spilled oil. Oil spilled to the marine environment will immediately begin to move with the tides, current, and wind, undergoing physical and chemical changes through a process known as *weathering*. Oil movement and weathering depend on the type of oil spilled and the characteristics of the marine environment, including tides, current, wave energy, and water density. Spilled oil forms oil slicks which spread horizontally, becoming thinner and more difficult to recover.

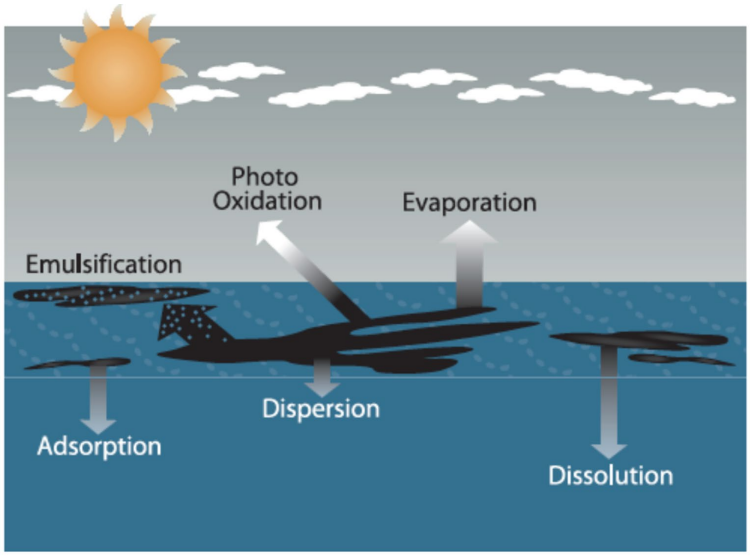

Figure 6: Simplified oil weathering model (Photo by NOAA Office of Response and Restoration)

Collecting and removing oil from the sea surface through the process of on-water skimming is a challenging, time-sensitive, and sometimes ineffective process, even in calm water. The spill response community has several tools that can be used to aid responders in understanding the fate and effects of spilled oil. The National Oceanic and Atmospheric Association (NOAA) has developed several of these spill tools.[39] During the workshop, GNOME, an oil spill trajectory modeling tool; ADIOS, an oil weathering model; ROC, a response system planning tool; and ERMA, an environmental response management tool, were discussed.

- GNOME (General NOAA Operational Modeling Environment)[40] is the modeling tool the Office of Response and Restoration's (OR&R) Emergency Response Division uses to predict the trajectory spilled oil is likely to follow in or on a body of water. GNOME uses real time environmental conditions and oil properties.
    - A trajectory model was developed for a simulated spill of 84,000 gallons of IFO 300 occurring at 0800 on April 3 in Grays Harbor. The model used historical tides and currents, and wind of 6 knots out of the ESE (see Annex A to this appendix for the model output). The GNOME model represents the oiling pattern that may be expected if no action was taken to clean up the spill. In an enclosed water body like Grays Harbor, shoreline impacts would be expected from a spill of this size.

[39] https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/response-tools/response-tools-oil-spills.html
[40] https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/response-tools/gnome.html

- ADIOS (Automated Data Inquiry for Oil Spills)[41] is NOAA's oil weathering model. ADIOS uses the spilled oil properties to explain how the oil is expected to weather (undergo physical and chemical changes) in the marine environment.
- ROC (Response Options Calculator)[42] can be used to assess system performance of oil spill response methods, including mechanical recovery, dispersant application, and the in-situ burning of oil. ROC predicts how the spilled oil will weather over time, and the volume of oil that can be recovered, treated, or burned for the response systems selected. ROC is the modeling tool that will be used to model the on-water oil recovery capability in Grays Harbor.
- ERMA (Environmental Response Management Application)[43] is an online mapping tool that integrates both static and real-time data, such as sensitive resource information, ship locations, weather, and ocean currents, in a centralized, easy-to-use format for environmental responders and decision makers. Visit the Pacific Northwest ERMA.[44]

Workshop participants noted that Grays Harbor has complex weather patterns which make spill response very challenging. A participant requested a model of the *Nestucca* oil spill. The *Nestucca* spill was identified as an important case study, and the book *Nestucca: An Oil Spill Turns Creative* was identified as a must-read if interested in the history of that spill.

Existing preparedness framework in Grays Harbor

Washington State contingency planning requirements

An overview of Washington State contingency planning requirements was provided to workshop attendees.

- Under the Oil Pollution Act of 1990 (OPA 90), states can have more stringent planning requirements than the federal government.
- Washington State contingency planning rules are more stringent then the federal vessel and facility standards.
- Oil-handling facilities, pipelines, commercial vessels, and railroads must have state-approved oil spill contingency plans.

[41] https://response.restoration.noaa.gov/adios
[42] https://response.restoration.noaa.gov/roc
[43] https://response.restoration.noaa.gov/maps-and-spatial-data/environmental-response-management-application-erma
[44] https://erma.noaa.gov/northwest/erma.html

Table 3: Regulated plan holders operating in Grays Harbor

Contingency plan type	Plan holder name	Worst case planning volume	Products covered
Facility	Renewable Energy Group, Inc. (REG)[45]	~2 million gallons	Biodiesel, vegetable oil (palm and canola)
Vessel Umbrella Plan	Washington State Maritime Cooperative (WSMC)[46]	~1 million gallons	Heavy fuel oil (IFO-380), lube oil, hydraulic
Multi-Plan Holder Vessel Plan	National Response Corporation (NRC)[47]	~1 million gallons	Heavy fuel oil (IFO-380), lube oil, diesel oil, biodiesel, vegetable oils

Washington State requires oil spill contingency plans describe the plan holder's ability to respond to oil spills. Each company is required to develop, maintain, and test their contingency plan.

Critical elements of oil spill contingency plans include:

- Notification and call out procedures to ensure response teams and resources are activated immediately.
- Identification of types of oils carried, oil properties, and potential spill volumes.
- Identification of spill management teams necessary to manage a spill or incident response using the Incident Command System.[48]
- Contracts with primary response contractors to ensure access to response equipment and trained personnel.
- Analysis of the planning standards and worst case spill volume to assess the plan adequacy.
- Commitment to conduct drills to test the plan.
- Commitment to follow the Northwest Area Contingency Plan (NWACP).
- Commitment to implement geographic response plans (GRPs).

[45] http://regi.com/about-reg/locations/biorefineries/production-mode/reg-grays-harbor-llc
[46] https://wsmcoop.org/
[47] http://nrcwaplan.nrcc.com/
[48] The Incident Command System is a management system designed support incident responses under a common organizational structure. See www.fema.gov/incident-command-system-resources for more information.

Geographic response plans

Geographic response plans (GRPs) guide early actions when oil spills happen. GRPs are made up of pre-identified strategies for specific areas of the state at risk from oil spills. The strategies are designed to minimize impacts to sensitive environmental, cultural, and economic resources. The state Legislature directed Ecology to develop and routinely update these plans. GRPs are often booming or notification strategies.

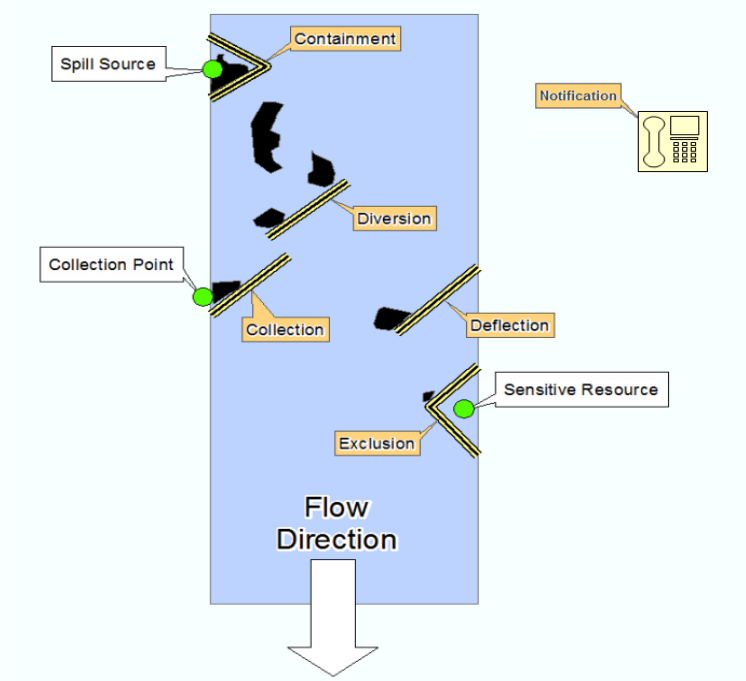

Figure 7: Common types of GRP strategies

The geographic response plan for Grays Harbor was last open for a full update in 2013. GRPs are always open for public review and comment. Deployment drills are one opportunity for a GRP strategy to be updated based on lessons learned from the deployment. The next scheduled entire plan update for the Grays Harbor GRP is 2019–2020.

During the GRP presentation, workshop participants noted that Grays Harbor has current changing direction four times per day, and that this would impact the effectiveness of the boom. When a GRP strategy is deployed, it must be maintained. The boom must be tended to be effective as the current changes over time. Also, booming strategies may not be completely effective, the goal is to minimize impacts when spills occur.

Workshop participants also recommended that there should be updated current studies — not modeling, but real-time current monitoring at the terminals.

Verifying plan adequacy

Under Washington State regulations, a geographically specific *planning standard* is applied if vessels or facilities operate or transit in certain regions of the state. An interactive map of all the planning standard locations[49] has been developed for vessels, facilities, pipelines, and railroad planning standard points.

Planning standards are used for plan evaluation. Plan holders are not penalized if the timing or other requirements vary during an actual oil spill response. Additionally, planning standards do not exempt a plan holder from their legal responsibility to contain and cleanup an oil spill that requires more equipment than what is specified in the planning standards.

The planning standard for Grays Harbor[50] details the equipment benchmarks for boom, recovery (skimming), and storage. There are specific timeframes for equipment to arrive on scene from 2–48 hours. The Grays Harbor vessel transit standard is further tailored to the waterbody, it requires equipment that is capable both in shallow water and open water operating environments.

When Ecology reviews the equipment planning standards, a GIS-based model is applied that uses a time and distance equation to evaluate access to the required response equipment and personnel to respond to a worst-case spill. Each oil spill scenario is unique, but a conceptual model allows examination of questions about capability and conclusions within an ideal framework. The assumptions built into the model come directly out of the regulation.

Table 4: Planning standard assumptions related to plan compliance review

Topic	Rule/model assumptions	Amplifying comments
Skimming capacity	Skimming capability is estimated using Effective Daily Recovery Capacity (EDRC). EDRC is a rate, typically expressed in barrels/day, and calculated as 20% of the manufacturer's nameplate recovery rate for the equipment.	EDRC is a simple one parameter model to account for limiting factors such as daylight, weather, sea state, etc. EDRC for an oil skimmer may not be an effective predictor of oil response equipment recovery capacity. EDRC may not provide an incentive for investment in efficient skimmers.
Notification	The rule says notification occurs immediately upon spill awareness.	The model assumes that there is no delay in notification. Mobilization begins after notification.

[49] https://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=a83dbed783774201958491054 6a5843e
[50] http://apps.leg.wa.gov/WAC/default.aspx?cite=173-182&full=true#173-182-405

Topic	Rule/model assumptions	Amplifying comments
Equipment mobilization	Plan holder owned: 30 minutes Primary Response Contractor owned with dedicated transport: 1 hour Non-dedicated equipment: 3 hours	The model adds the mobilization time to the total travel time, via road or water, to establish a time for equipment to cascade from a staging location to the planning standard area. To be approved as a Primary Response Contractor by the state of Washington you must have a 24 hour dispatch and commit to beginning mobilization within one hour of notification.
Travel speeds	The rule assigns a 35 mph speed for equipment to transit by road and a 5 knot speed for vessels to transit via water.	Alternative vessel transit speeds may be granted by Ecology.
Distance	Transit distance is from the equipment staging location to the nearest edge of the planning standard area.	Equipment staging locations are pulled from the Worldwide Response Resource List (an online equipment database maintained by equipment owners).

One workshop participant commented that no matter where response equipment is placed, the best on-water recovery expected is 10–20 percent of the spilled oil. A good plan may still only recover a small amount of oil. Therefore, it cannot be presumed that everything can be cleaned up. Additionally, the participant stated that pre-booming is often not effective in Grays Harbor.[51]

Every spill scenario is unique. The ability to successfully respond to an oil spill is largely dependent upon the type of oil spilled, the location of the spill, the time of year, and how quickly response forces arrive on scene.

The goal of the Response Capability Assessment is to apply a systems approach to on water oil recovery, rather than the current process which looks at a plan holder's ability to cascade linear feet of boom, EDRC recovery capability, and barrels of storage.

Oil spill response equipment overview

Regulated oil spill contingency plan holders rely on state approved oil spill response contractors (Primary Response Contractors [PRCs])[52] for access to trained personnel and equipment to meet

[51] *Oil spill containment boom* is a floating barrier used to temporarily corral and contain spilled oil on the water's surface until it can be removed. *Pre-booming* refers to the deployment of boom prior to an oil-transfer operation, so that any spills during the transfer are contained instead of spreading to open waters.
[52] https://ecology.wa.gov/Regulations-Permits/Plans-policies/Contingency-planning-for-oil-industry/Primary-response-contractors

their planning standards. There are four PRCs that are currently contracted to meet planning standards in Grays Harbor:

- Cowlitz Clean Sweep (CCS)
- Global Diving and Salvage (GDS)
- Marine Spill Response Corporation (MSRC)
- National Response Corporation (NRC)

PRCs maintain their equipment inventories in the Worldwide Response Resource List (WRRL),[53] an online equipment database that serves as an inventory and directory for spill response resources. Each piece of equipment on the WRRL has a unique id number, a description of the equipment capability, and a latitude/longitude. Ecology uses WRRL information to create an online interactive map with equipment staging locations, descriptions, and pictures.[54]

During the workshop, an overview of response equipment staged in the Pacific Northwest was provided to attendees. The equipment overview provided details on boom, work boats, oil spill response vessels, skimmers, and storage. These resources will form the recovery systems that will be evaluated in the Response Capability Assessment for Grays Harbor.

Additional equipment capabilities highlighted during the presentation included:

- Aerial observation capabilities: Plan holders must have access to personnel trained in observation of oil from aerial platforms. Additionally, vessels must have access to remote sensing (infrared or multi-spectral cameras) for the identification of oil in low visibility (fog) or at night.
- High encounter rate boom: Traditional boom may fail if towed faster than 0.75 knots. Ecology's rules require vessel contingency plan holders to have access to high encounter rate boom capable of being towed at speeds of 3 knots in waves.
- Mobile wildlife rehabilitation units: Plan holders must have contracted access to a mobile wildlife rehabilitation unit capable of supporting the needs of 100 birds and being set up anywhere within the state in 24 hours.
- Vessel of Opportunity (VOO) program: The rule requires vessel plan holders to pre-contract and pre-train VOO to supplement professional response assets. Currently, there are 12 VOO contracted for Grays Harbor. These vessels owners get regular training and participate in on-water deployment drills.

[53] https://ecology.wa.gov/Regulations-Permits/Plans-policies/Contingency-planning-for-oil-industry/Worldwide-Response-Resource-List
[54] https://apps.ecology.wa.gov/coastalatlas/storymaps/spills/spills_sm.html?&Tab=nt7

- Technical manuals[55] are planning and training documents that support our understanding of the response equipment capabilities of plan holders. Technical manuals have been developed for the San Juan Islands, Neah Bay, and Cathlamet planning standard areas.

Response Capability Study overview

Why review mechanical recovery?

Mechanical recovery of free-floating oil is the preferred method to remove oil from the environment.

Modeling capability

In order to estimate potential oil spill recovery, a model can be used to calculate the effects of some of the key variables involved in spill response effectiveness.

The Grays Harbor Response Capability Assessment will estimate the maximum potential on-water oil recovery through a series of modeled scenarios that compare the effect of different factors under idealized conditions.

The study is looking at capability, not consequences. The study will not evaluate the likelihood an oil spill will occur, and it does not consider the consequences (environmental impacts/damages) of an oil spill.

Information from the oil spill contingency planning requirements will be used to inform the analysis, but the output from the study will not affect whether regulated parties are in compliance with state or federal requirements.

Response Capability assessment process

- The study will use the Response Options Calculator, a tool developed by NOAA.
- The study is similar in scope to –the San Juan County Oil Spill Response Capacity Evaluation. This study used the Response Options Calculator. Use of the ROC for analysis in Grays Harbor allows for comparable methodology and comparable results.
- Model parameters will be adjusted to account for risk scenarios identified in Hazard Identification workshops.
- Focus is on response system capability (mechanical recovery/skimming), not the impact of the spill to the environment.
- Considerations include location, time of the spill, type of oil, season, wind speed, and spill volume. These impact the maximum capacity of response systems to recover oil at a hypothetical spill location.

[55] https://ecology.wa.gov/Regulations-Permits/Plans-policies/Contingency-planning-for-oil-industry/Technical-manuals-for-vessels

- End result is to identify an estimated maximum potential response capacity for on-water recovery.
- Study results are not intended to indicate how much oil would be recovered from an actual oil spill in real world conditions, but rather to illustrate the overall capacity of the response system.

Response Options Calculator (ROC) overview

ROC is an oil spill response model that can:

- Model how on-water oil spill response forces could be applied to various spill scenarios.
- Estimate the theoretical performance of multiple oil spill response systems by processing information provided by the modeler about environmental conditions, the oil release scenario(s), and information about the response systems.
- Show how response can be affected by the numbers, types, and configuration of response systems.
- Use weathering algorithms to make simple predictions about the changes the oil will undergo while it is exposed to the environment.
- Quickly be updated, re-run, and saved with new information.
- Display oil "mass balance" — simulate oil removal from the ocean surface by natural processes (e.g., evaporation) when the oil weathering mode is used, and by one or more response systems throughout a given simulation period. Oil remaining on the surface during a calculation interval (1 hour) is always assumed to be available to the selected response systems because oil is never allowed to "come ashore."
- ROC will give a warning if some of the data input appears to be inconsistent. For example, when attempting to model mechanical recovery in high seas, if simulated oil appears to be below its pour point.

What ROC can't do, assumptions and limitations

- ROC is not a trajectory model. It is not location specific. It is intended for modeling spills in open water outside of the influence of tides, land, ice, or debris.
- ROC assumes "best industry practices," i.e., that response occurs in the thickest oil.
- To simplify computations, ROC holds some factors constant that in reality could change. For example, a skimming system's swath width might be altered over time as the nature and amount of oil on the surface changes. However, the swath for a given response system remains constant in ROC for the duration of a simulation.
- Wind direction or ocean currents are not considered in ROC since ROC does not take into account changes in the location of a slick (relative to land) during a simulation period. The location of a slick (i.e., its proximity to shore) only comes into play as it

might affect assigned "transit times" for response systems to travel between their staging, offloading, or burn sites and the area in which they are operating.

- ROC can't model response to very thin oil slicks or "sheens" (~ 1 micron, or ~ 10^{-4} inch). Such response may not be operationally feasible.
- Oil loss due to coming ashore is not included in ROC mass balance.
- ROC simulations may not have a duration greater than five days.

Study assumptions relating to the ROC model

- Weather and environmental conditions are conducive to safe response operations.
- Oil is accessible to recovery systems (it remains floating on the water's surface).
- Skimming systems operate in oil slicks of the average thickness of the given oil for the age of the spill.
- All equipment listed in inventories is available and operates without malfunction or failure.
- Personnel are adequately trained, proficient in their required skills, and available in a timely manner.
- All necessary logistical support is available and fully functioning.
- Spill tracking and surveillance is effective, and responders are successfully directed to the slick for each operational period.

Workshop participants noted that it may not be realistic to assume 100 percent availability of equipment. Equipment may be unavailable due to maintenance issues, etc. For the purposes of the study, all the equipment will be modeled as available, the modeling of all the systems allows the identification of critical systems/assets.

Workgroup discussion

During the workshop, participants developed research questions to be addressed by the study, parameters for hypothetical response scenarios to address the research questions and the model inputs.

Scenario decision

Spilled product types

- IFO-380 (this is the common fuel type on cargo/fishing vessels).
- Biodiesel, palm oil, canola oil (products transported and handled at REG).
- Lubricating oils (found on ships operating in the area).

- Refined petroleum products: gasoline, diesel, biodiesel, jet A, BTX, ethanol (identified as potentially handled under the proposed Contanda facility expansion).

Volume

- Use the worst case fuel amount from a cargo ship operating in the area.
- Use the worst case contingency planning volume (fuel and cargo) from a tank ship operating in the area.
- 100,000 gallons so the recovery capability in Grays Harbor is comparable to the study conducted in the San Juan Islands.

Release

Workshop participants determined that the spill would be from an instantaneous release of a worst case volume based on product types and vessel specifics identified above.

Location

- Simulate a spill at the REG terminal dock using the facility worst case volume of two million gallons.
- Simulate a spill occurring at the submerged jetty (south corner).
- Simulate a spill occurring in the vicinity of Buoy 32 to 29. At this point, there is a turn in the navigation channel and a cross current.

Timeframes

Scenarios should be run for summer days (June 20) and winter days (December 20) to see issues associated with short/long operating periods of daylight as well as wind impacts. It was noted that heavy fog frequently occurs in the summer months, this limits visibility and would impact response capabilities. Info about complications from fog will be included in the final study.

Additional considerations identified by workshop participants

- ROC (the modeling tool) does not consider the effect of currents. The final report should include a narrative that discusses currents in Grays Harbor, almost always 1–2 knots and 4–5 knots at the entrance.
- Grays Harbor Pilots set windows for when they move vessels (4 hour window) to ensure desired current at the turning basin. Consider these timeframes when setting the release in the model.
- Look at Advanced Notice of Transfer information and vessel manifests to determine other products that may be carried on ships that are not being delivered or transferred in Grays Harbor.

Questions to consider

- How does the difference in response times affect potential oil recovery at the mouth of Grays Harbor compared to at the terminals?
- How does the type of oil spilled, spill volume, time of day of the spill, season (summer/winter), or wind speed affect potential oil recovery?
- How do delays in response (delayed notification), type of response forces used, and night operations affect potential oil recovery?
- How would additional response resources staged in Grays Harbor County affect response capability?

Next steps

- Ecology works with response contractors to define response systems based on response resource inventories and locations, and response contractor best professional judgment regarding how response forces may be used.
- Grays Harbor technical manual and workshop summary materials are provided to contractor to support the Response Capability Assessment.

Delivered by end of biennium — June 30, 2019

- Ecology contracts for the modeling of the response systems and the writing of the Response Capability Assessment.
- Contractor delivers draft Response Capability Assessment, allowing time for Harbor Safety Committee review and comments.
- Public comment opportunity on draft study.
- Finalize study and regionally specific preparedness recommendations.
- Publish study and Grays Harbor technical manual.

Additional supporting information

- Oil Spill Contingency Plan Regulations, Chapter 173-182 WAC.[56] Current regulations and equipment planning standards that apply to > 300 gross ton vessels, tank vessels and barges, facilities and primary response contractors.

[56] http://apps.leg.wa.gov/WAC/default.aspx?cite=173-182

- Primary Response Contractors (PRCs)[57] are companies or cooperatives with equipment and personnel that respond to oil spills. To be cited by an oil spill contingency plan holder (large vessels, oil handling facilities, pipelines, or railroads must have contingency plans) to meet planning standards, the contractor must be approved by Ecology.
- San Juan County Oil Spill Response Capacity Evaluation.[58] A study conducted for San Juan County similar in scope to what we are proposing for Grays Harbor.
- Response Options Calculator.[59] The ROC provides performance estimates of oil spill response systems for mechanical recovery using skimmers. ROC incorporates dynamic oil weathering algorithms that provide time-dependent oil concentrations and oil conditions to be addressed by the assigned response systems.
- Technical manual.[60] A planning and training document, technical manuals support Ecology's understanding of plan holder response equipment capabilities. They also support the best achievable protection review cycle for response systems, training, and staffing.
- Best Achievable Protection (BAP)[61] requiring best technology, staffing levels, training procedures, and operational methods in covered vessel oil spill plans.
- Geographic response plans (GRPs) are plans that guide oil spill response in Washington. Each GRP is written for a specific area (for example, Grays Harbor),[62] and include tactical response strategies tailored to a particular shore or waterway at risk of injury from oil.
- Spills Story Maps.[63] Interactive spill preparedness and oil transportation maps.

[57] https://ecology.wa.gov/Regulations-Permits/Plans-policies/Contingency-planning-for-oil-industry/Primary-response-contractors
[58] http://www.sjcmrc.org/media/17468/sjc-oil-spill-evaluation.pdf
[59] http://www.genwest.com/projects/
[60] https://ecology.wa.gov/Regulations-Permits/Plans-policies/Contingency-planning-for-oil-industry/Technical-manuals-for-vessels
[61] https://ecology.wa.gov/Regulations-Permits/Plans-policies/Contingency-planning-for-oil-industry/Best-Achievable-Protection
[62] http://www.oilspills101.wa.gov/northwest-area-contingency-plan/geographic-response-plans-grps/list-of-geographic-response-plans/
[63] https://apps.ecology.wa.gov/coastalatlas/storymaps/spills/spills_sm.html?&Tab=nt1

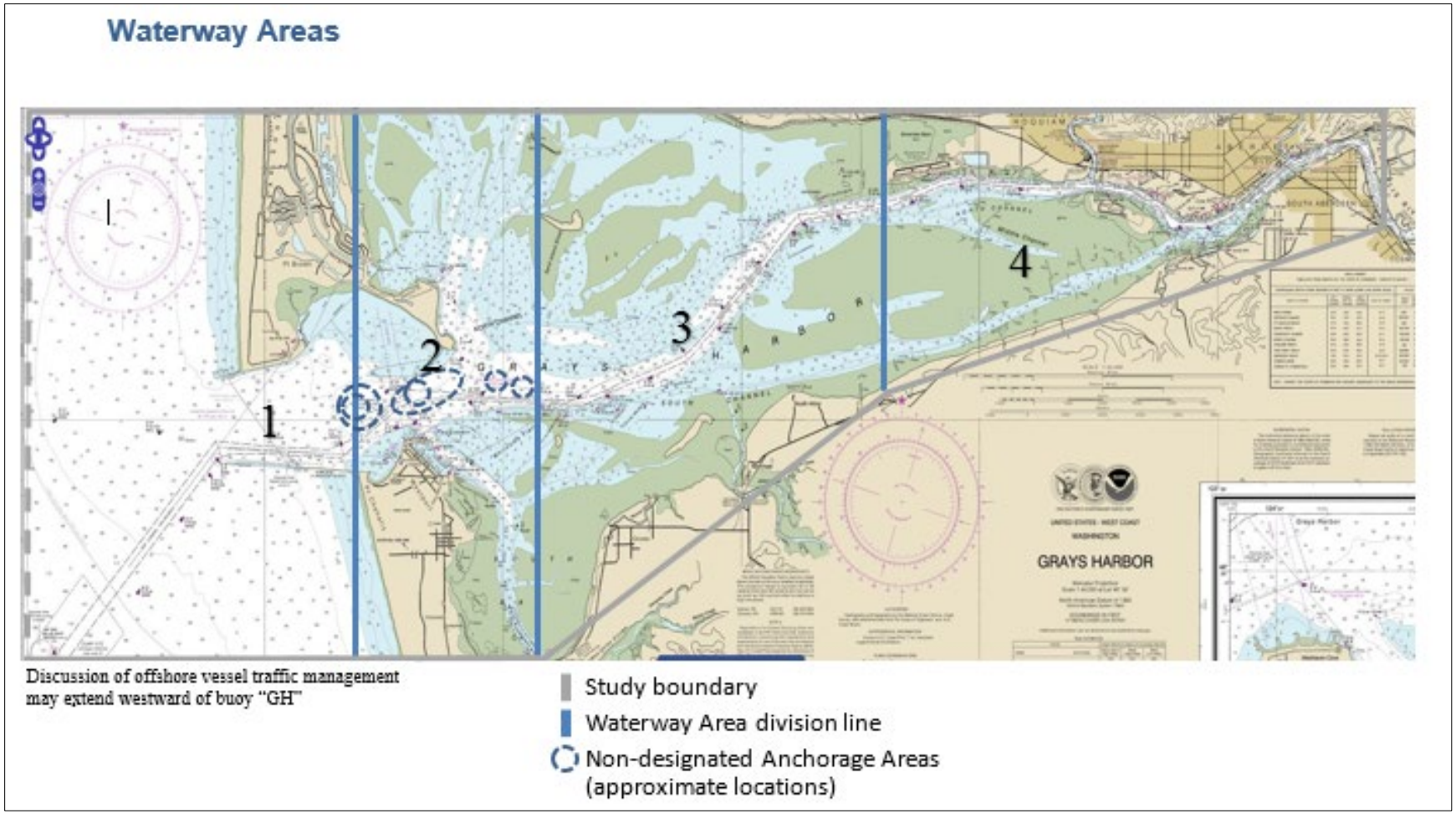

Figure 8: Waterway areas map

Glossary and references

Glossary

Allision – vessel striking a fixed or semi-fixed object such as a pier, bridge, an anchored vessel, or buoy (adapted from OSTF, 2014).

Anchor – to use the anchor to secure a ship to the sea floor (National Geospatial-Intelligence Agency, 2017).

Anchorage – an area where vessels may anchor, either because of suitability or designation (National Geospatial-Intelligence Agency, 2017).

Boom – flotation boom or other effective barrier containment material suitable for containment, protection or recovery of oil that is discharged onto the surface of the water. Boom also includes the associated support equipment necessary for rapid deployment and anchoring appropriate for the operating environment. Boom will be classified using criteria found in the ASTM International F 1523-94 (2007) and ASTM International F 625-94 (reapproved 2006),[64] and the Resource Typing Guidelines found in the Worldwide Response Resource List (WRRL) user manual.

Bulk – a material that is stored or transported in a loose, unpackaged liquid, powder, or granular form capable of being conveyed by a pipe, bucket, chute, or belt system.[65]

Cascade – to bring in equipment and personnel to the spill location in a succession of stages, processes, operations, or units.

Cargo vessel – a self-propelled ship in commerce, other than a tank vessel or a passenger vessel, three hundred gross tons or more, including but not limited to, fishing vessels and freighters.[66]

Collision – vessels striking each other (adapted from OSTF, 2014).

Covered vessel – a tank vessel, or a cargo vessel or passenger vessel greater than 300 gross tons.[67]

Dedicated – equipment and personnel committed to oil spill response, containment, and cleanup that are not used for any other activity..

Disabled vessel – a vessel that needs assistance, whether docked, moored, anchored, aground, adrift, or underway. This does not mean a barge or any other vessel not regularly operated under its own power.[68]

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[64] https://www.astm.org
[65] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[66] Chapter 317-31 WAC, Cargo and Passenger Vessels--Substantial Risk
[67] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[68] 46 CFR 10.107, Definitions in Subchapter B

Discharge – any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.[69]

Effective Daily Recovery Capacity (EDRC) – the calculated capacity of oil recovery devices that accounts for limiting factors such as daylight, weather, sea state, and emulsified oil in the recovered material.

Facility – any structure, group of structures, equipment, pipeline, or device, other than a vessel, located on or near the navigable waters of the state that transfers oil in bulk to or from a tank vessel or pipeline that is used for producing, storing, handling, transferring, processing, or transporting oil in bulk.[70]

Fire/explosion – uncontrolled ignition of gas or liquid (adapted from OSTF, 2014).

Fishing vessel – a vessel engaged in the commercial catching, harvesting or processing of fish, or in tendering to or from vessels that catch, harvest or process fish.[71]

Grounding – vessel striking the waterway bottom with enough force to damage the vessel (adapted from OSTF 2014).

Flooding – water intrusion into areas on a vessel not intended to hold water (adapted from OSTF, 2014).

Hazardous substances – both dry and liquid substances, listed in Table 302.4 of 40 C.F.R. Part 302 adopted August 14, 1989, under section 102(a) of the Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by P.L. 99-499, including methanol, ethanol styrene, and xylene.[72]

Interim storage – a site used to temporarily store recovered oil or oily waste until the recovered oil or oily waste is disposed of at a permanent disposal site.

Local factor – unique or specific feature of operating commercial vessels in Grays Harbor, such as the channel configuration, hydrographic features, local weather patterns and conditions, tide and current variations, aids to navigation configurations, or local operating practices. The Hazard Identification process is focused on local factors that could contribute to an incident resulting in an oil spill by a commercial vessel.

Loss of electrical power – failure of the main electrical system to provide power meeting the needs for vessel operation; stopping a vessel while underway to complete repairs of the electrical system is considered a loss of electrical power (adapted from OSTF, 2014).

Loss of navigational equipment – a partial loss of propulsion, steering, electricity, or navigational equipment that results in a vessel being unable to maintain its intended track clear of navigational hazards or other vessels without assistance.[73]

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[69] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[70] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[71] Chapter 317-31 WAC, Cargo and Passenger Vessels--Substantial Risk
[72] 40 CFR 302
[73] Vessel Incident Checklist. Washington SPPR Program Evaluation of Vessel Incidents and Emergencies

Loss of propulsion – failure of the propulsion system to propel the vessel as designed; the shutdown of a vessel's propulsion system while underway to complete repairs is considered a loss of propulsion (adapted from OSTF, 2014).

Loss of steering – failure of the steering system to control the vessel's heading as designed; stopping a vessel while underway to complete repairs of the steering system is considered a loss of steering (adapted from OSTF, 2014).

Marine facility – any facility used for tank vessel wharfage or anchorage, including any equipment used for the purpose of handling or transferring oil in bulk to or from a tank vessel.[74]

Mobilization – means the time it takes to get response resources readied for operation and ready to travel to the spill site or staging area.

Mooring – the act of securing a craft to the ground, a wharf, pier, quay, etc. (adapted from National Geospatial-Intelligence Agency, 2017).

Navigable waters of the state – those waters of the state, and their adjoining shorelines, that are subject to the ebb and flow of the tide and/or are presently used, have been used in the past, or may be susceptible for use to transport intrastate, interstate, or foreign commerce.[75]

Nondedicated – those response resources listed by a Primary Response Contractor for oil spill response activities that are not dedicated response resources.

Nonpersistent oil – a petroleum based oil such as gasoline, diesel or jet fuel, which evaporates relatively quickly.[76]

Nonpetroleum oil – oil of any kind that is not petroleum-based, including but not limited to biological oils such as fats and greases of animals and vegetable oils, including oils from seeds, nuts, fruits, and kernels.[77]

Oil – "Oil" as defined in RCW 88.40 (RCW 88.40.011, 1990).

Passenger vessel – a ship of three hundred or more gross tons with a fuel capacity of at least 6,000 gallons carrying passengers for compensation.[78]

Persistent oil – a petroleum based oil that does not meet the requirements of a nonpersistent oil.[79]

Plan holder – an owner or operator person who submits and implements a contingency plan consistent with RCW 88.46.060[80] and 90.56.210[81] on the person's own behalf or on behalf of one

[74] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[75] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[76] Adapted from Chapter 173-182 WAC, Oil Spill Contingency Plan
[77] Adapted Chapter 173-182 WAC, Oil Spill Contingency Plan
[78] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[79] Adapted from Chapter 173-182 WAC, Oil Spill Contingency Plan
[80] http://app.leg.wa.gov/RCW/default.aspx?cite=88.46.060
[81] http://app.leg.wa.gov/RCW/default.aspx?cite=90.56.210

or more persons. Where a plan is submitted on behalf of multiple persons, those covered under that plan are not considered plan holders for purposes of this chapter.

Planning standards – goals and criteria Ecology will use to assess whether a plan holder is prepared to respond to the maximum extent practicable to a worst case spill. Ecology uses planning standards for reviewing oil spill contingency plans and evaluating drills.

Primary Response Contractor (PRC) – a spill response contractor that has been approved by Ecology and is directly responsible to a contingency plan holder, either by a contract or other approved written agreement.

Recovery system – a skimming device, storage, work boats, boom, and associated material needed such as pumps, hoses, sorbents, etc., used collectively to maximize oil recovery.

Severe weather conditions – observed nautical conditions with sustained winds measured at 40 knots and wave heights measured between 12 and 18 feet.[82]

Ship – any boat, ship, vessel, barge, or other floating craft of any kind.[83]

Spill – an unauthorized discharge of oil into the waters of the state.[84]

Structural failure – failure of a structure or structural component, including tank plating or shell (OSTF, 2014).

Systems approach – the infrastructure and support resources necessary to mobilize, transport, deploy, sustain, and support the equipment to meet planning standards, including mobilization time, trained personnel, personnel call out mechanisms, vehicles, trailers, response vessels, cranes, boom, pumps, storage devices, etc.

Tank vessel – a ship that is constructed or adapted to carry, or that carries, oil in bulk as cargo or cargo residue, and that operates on the waters of the state, or transfers oil in a port or place subject to the jurisdiction of this state.[85]

Technical manual – a manual intended to be used as a planning document to support the evaluation of Best Achievable Protection systems for potential response capability of plan holder owned and PRC dedicated and nondedicated equipment.

Underway – vessel not moored or anchored.

Vessel emergency – a substantial threat of pollution originating from a covered vessel, including loss or serious degradation of propulsion, steering, means of navigation, primary electrical generating capability, and seakeeping capability.[86]

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[82] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[83] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[84] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[85] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[86] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response

Worldwide Response Resource List (WRRL) – equipment list established and maintained by spill response equipment owners.

Worst case spill – for a facility, the entire volume of the largest above ground storage tank on the facility site complicated by adverse weather conditions, unless Ecology determines that a larger or smaller volume is more appropriate given a particular facility's site characteristics and storage, production, and transfer capacity; or for a vessel, a spill of the vessel's entire cargo and fuel complicated by adverse weather conditions.

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Annex A to Appendix C – Grays Harbor exercise trajectory analysis

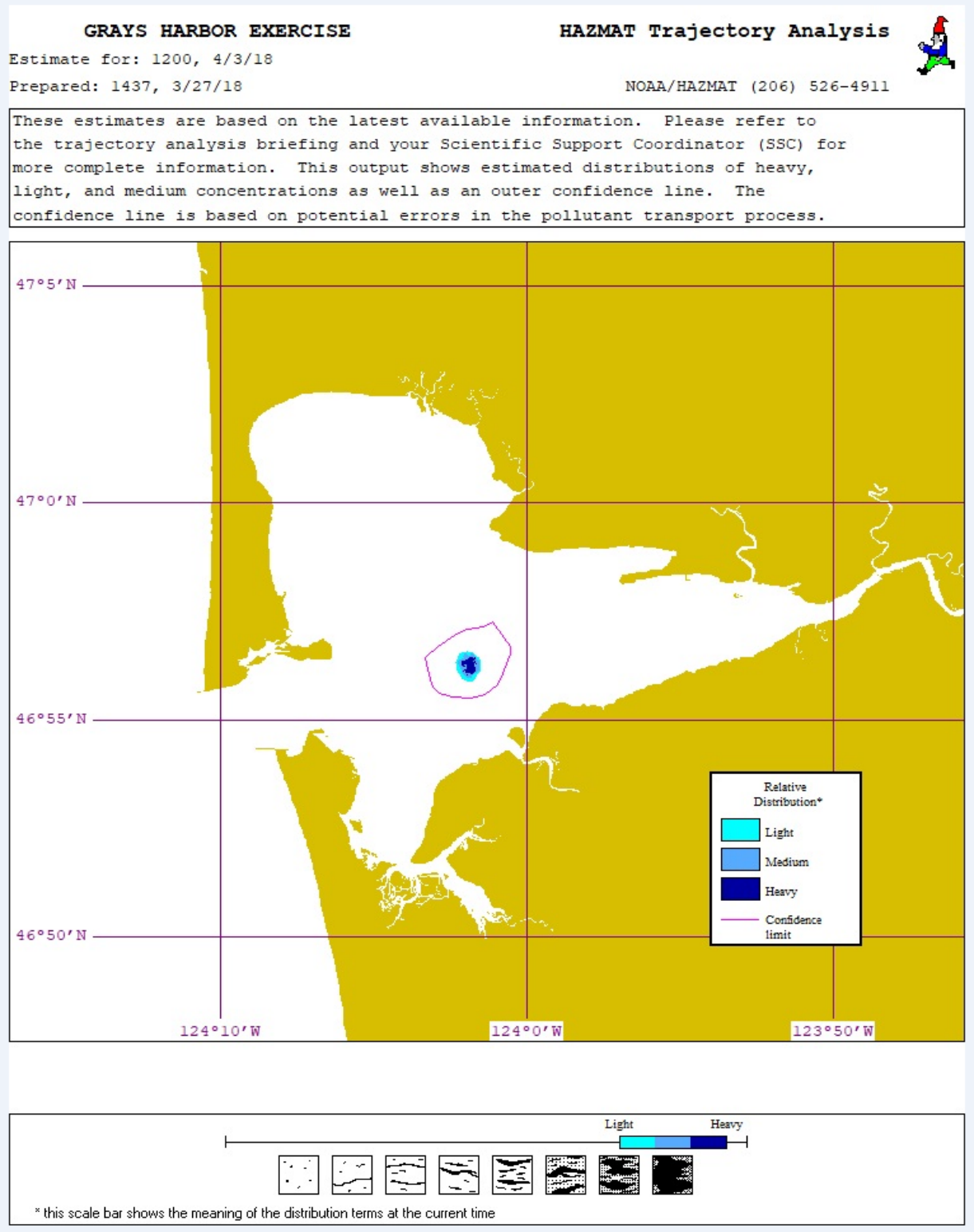


Figure 9: HAZMAT trajectory analysis for spill simulation at 1200 hours, 4/3/2018

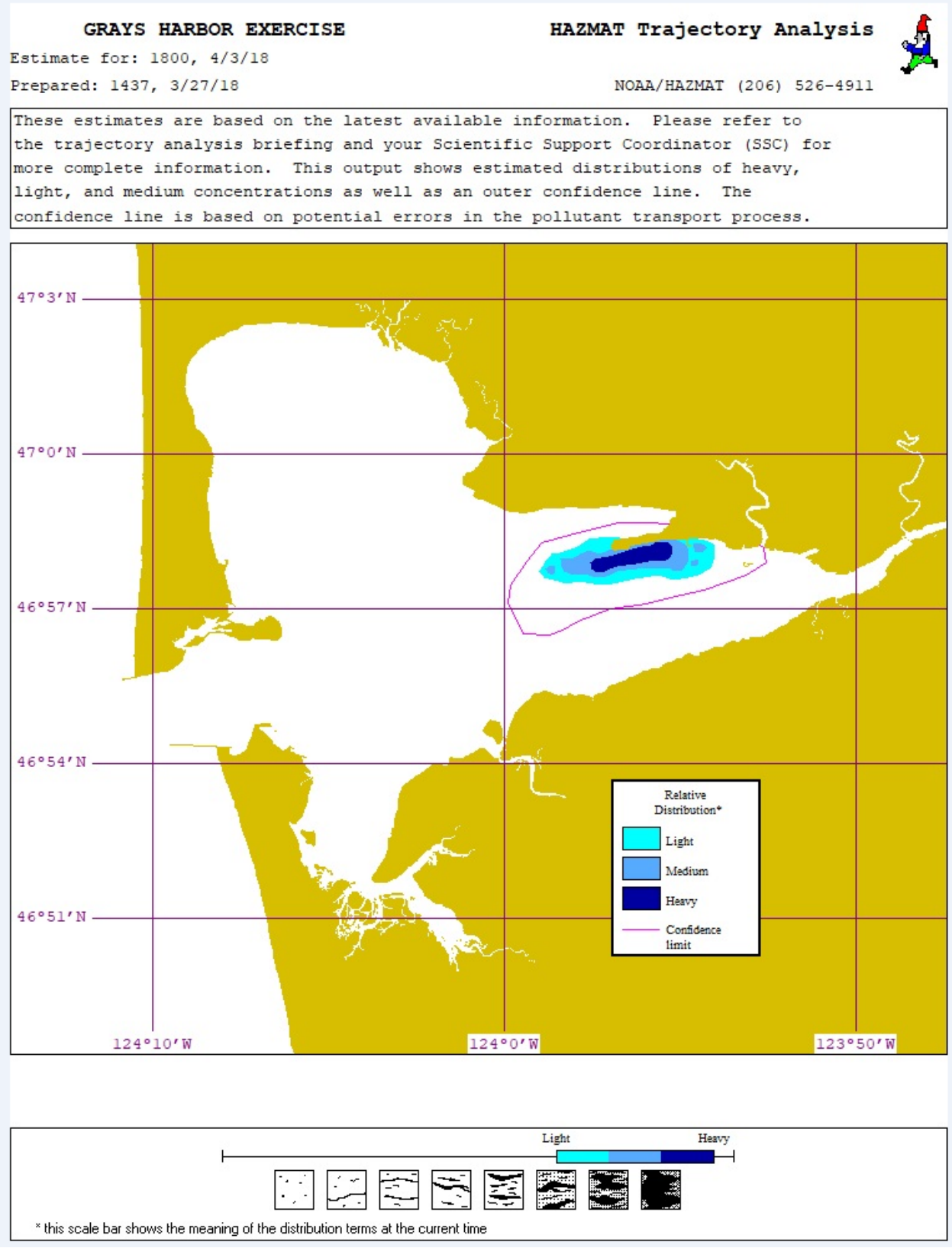


Figure 10: HAZMAT trajectory analysis for spill simulation at 1800 hours, 4/3/2018

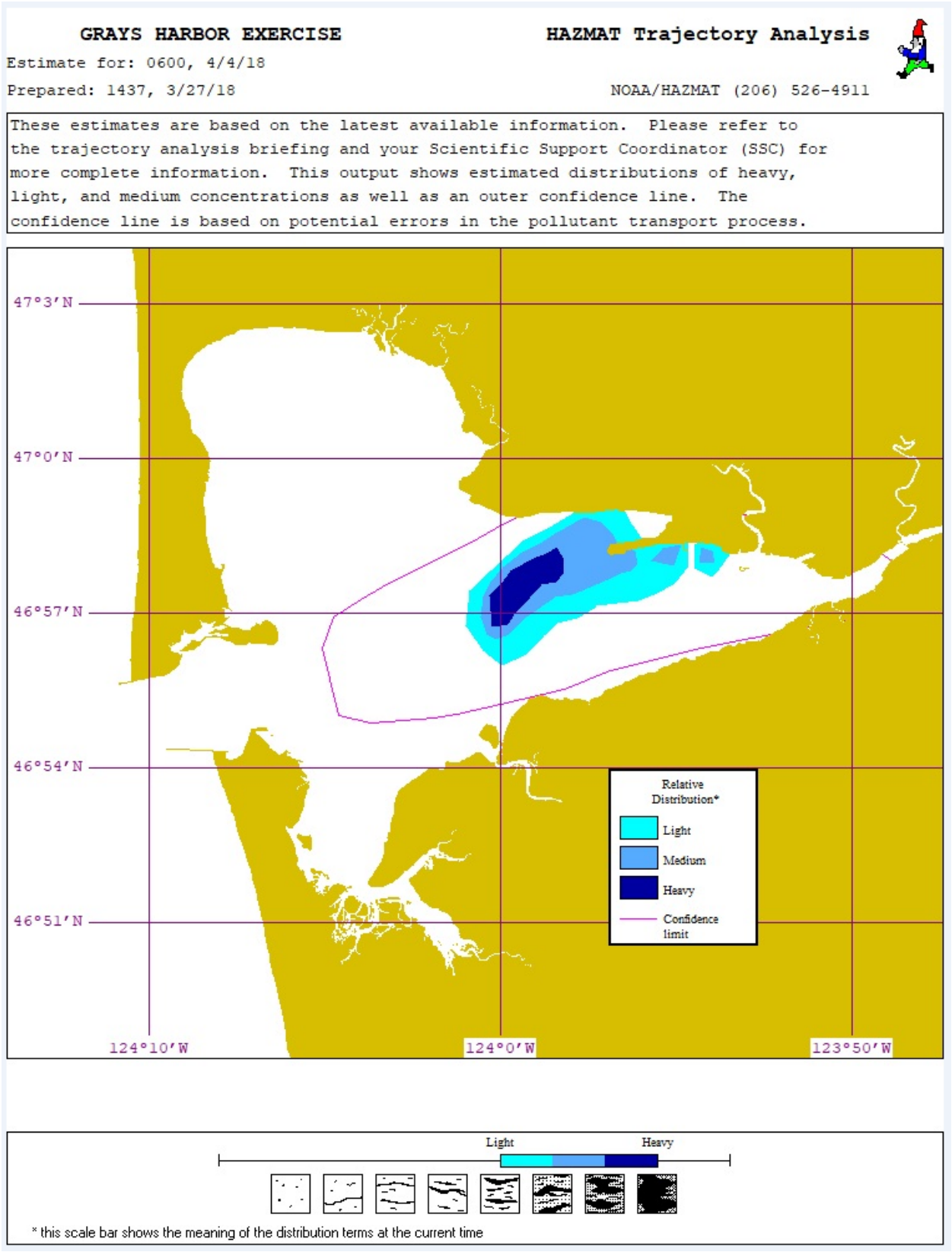


Figure 11: HAZMAT trajectory analysis for spill simulation at 0600 hours, 4/4/2018

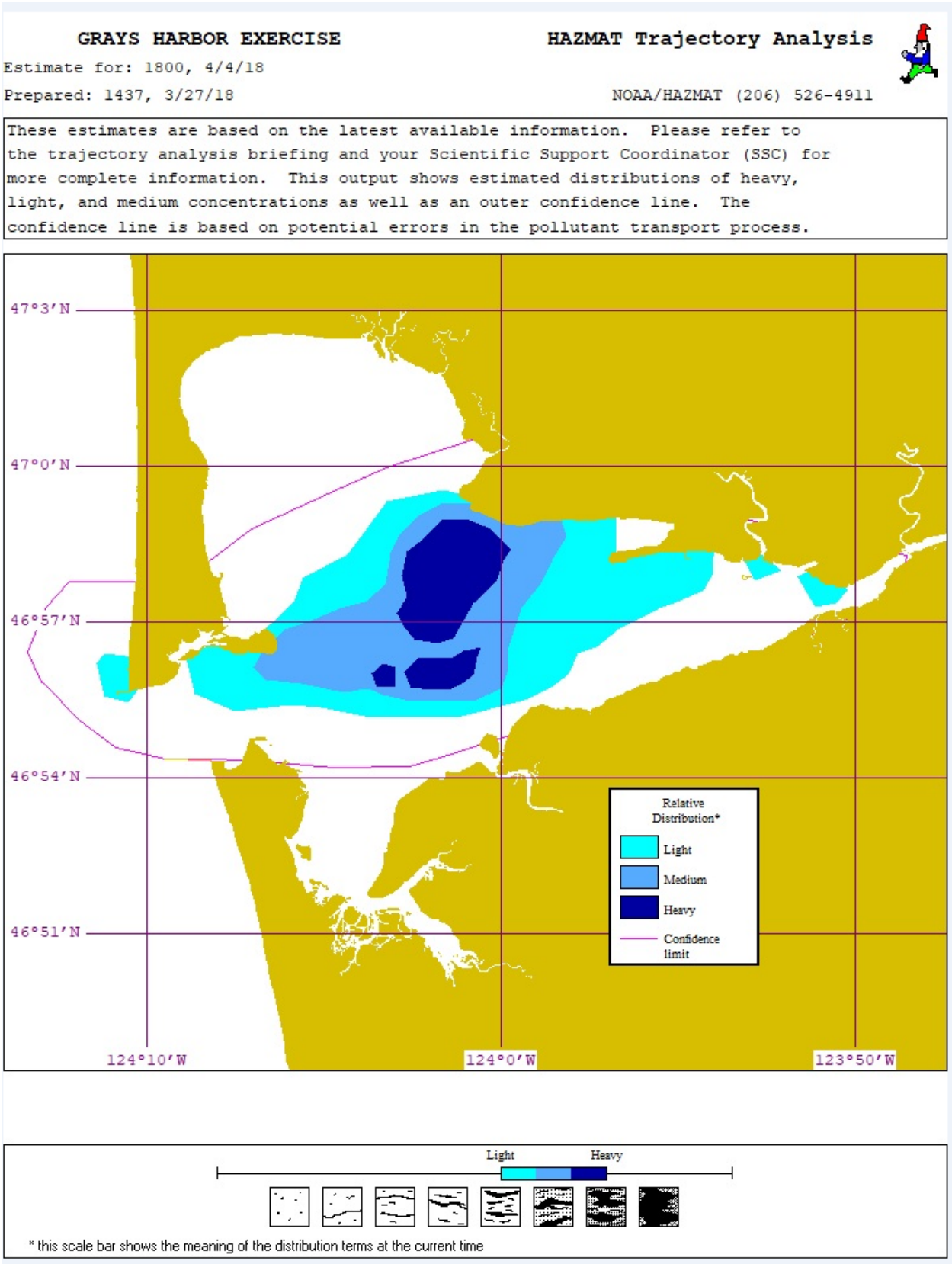


Figure 12: HAZMAT trajectory analysis for spill simulation at 1800 hours, 4/4/2018

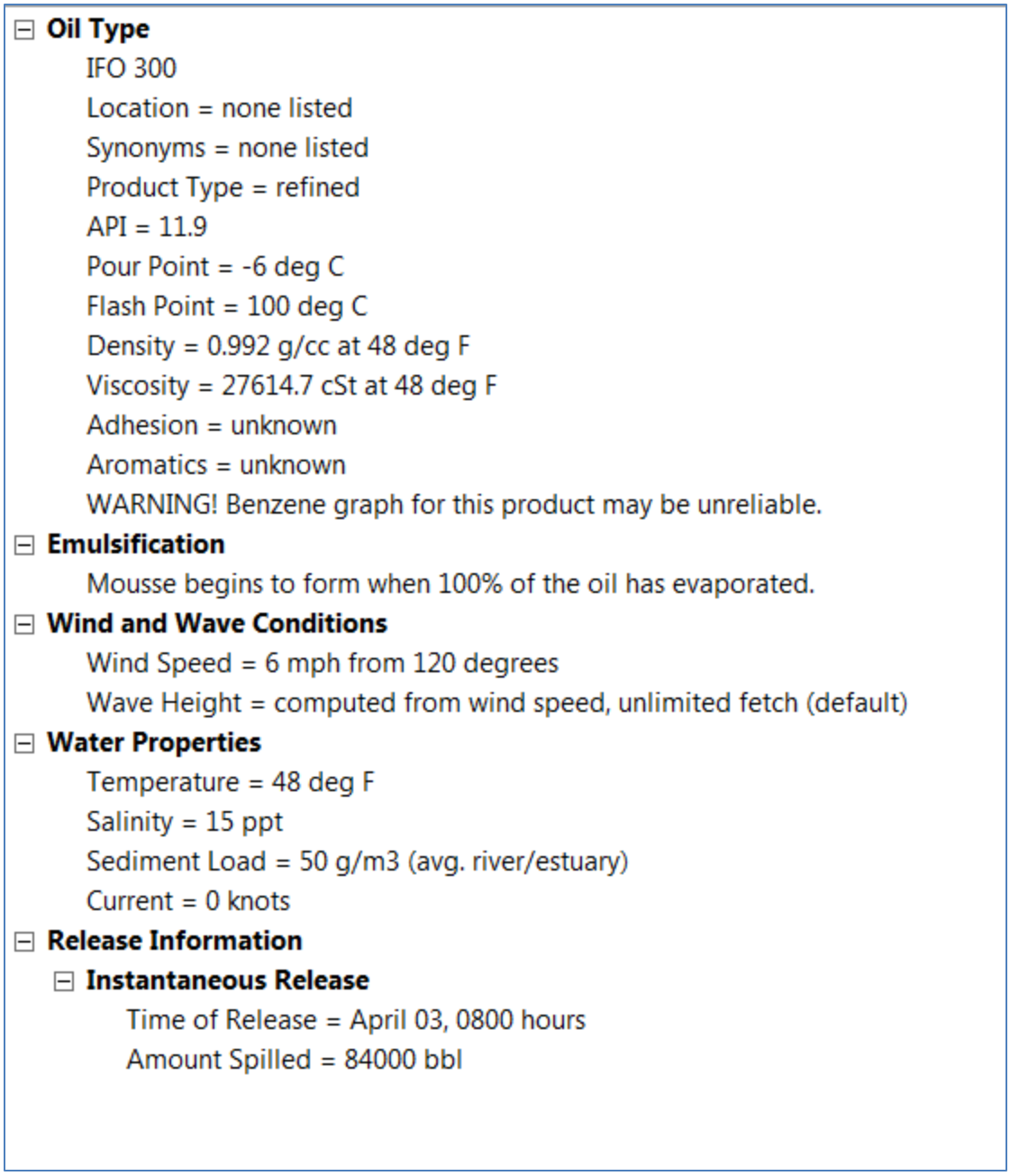
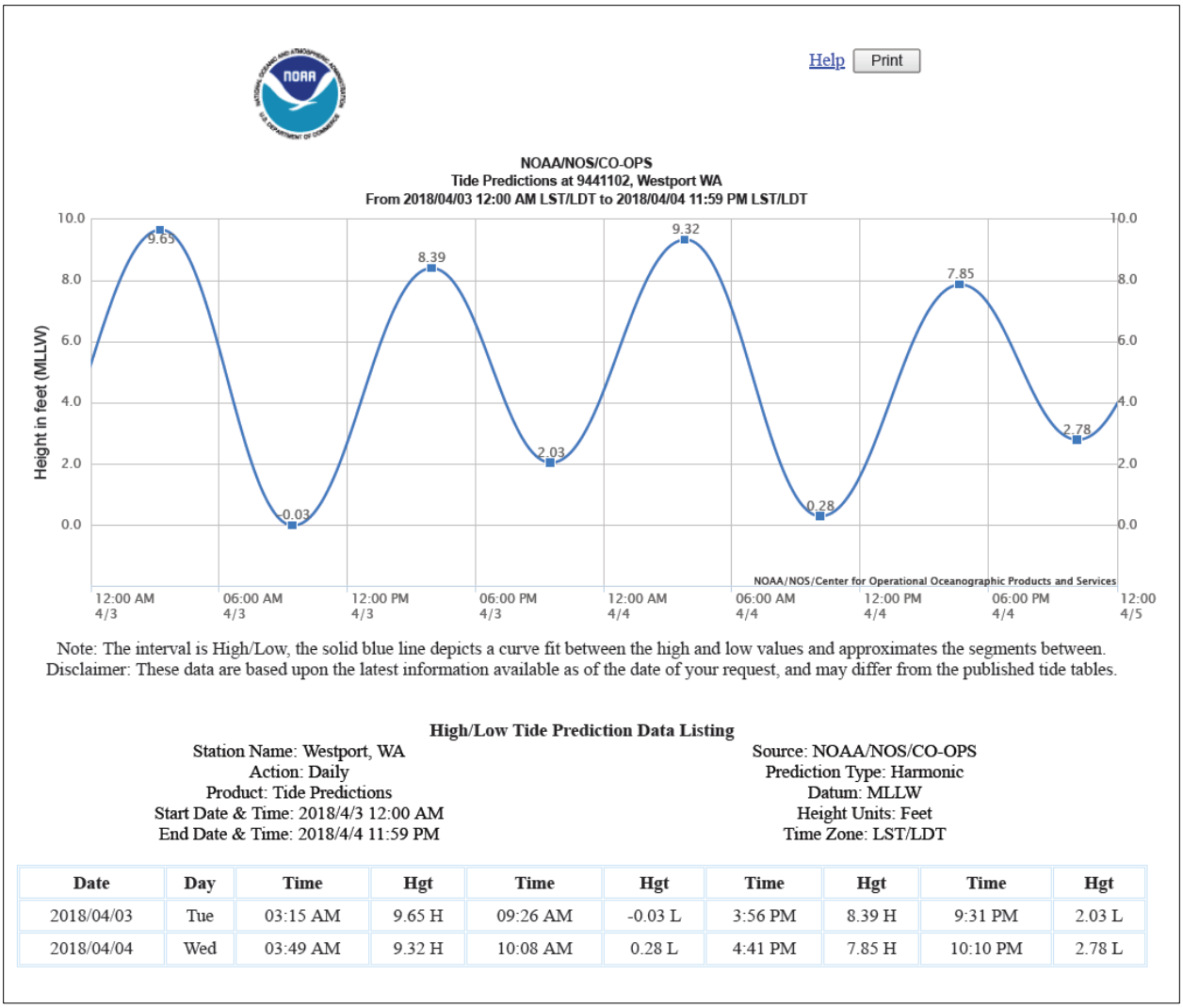


Figure 13: NOAA ADIOS oil weathering details for IFO 300



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Westport, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2018/4/3 12:00 AM
End Date & Time: 2018/4/4 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2018/04/03	Tue	03:15 AM	9.65 H	09:26 AM	-0.03 L	3:56 PM	8.39 H	9:31 PM	2.03 L
2018/04/04	Wed	03:49 AM	9.32 H	10:08 AM	0.28 L	4:41 PM	7.85 H	10:10 PM	2.78 L

Figure 14: NOAA predicted tides and current information The tides and current information were used in the development of the trajectory pictured in the preceding trajectory figures.

Appendix D: Commercial Fishing, Tribal Fishing, and Recreational Vessel Oil Spill Prevention and Preparedness Workshop Summary

Background and objectives

Ecology hosted an oil spill prevention and preparedness workshop for Grays Harbor commercial fishermen, tribal fishermen, and recreational boaters on April 24, 2018.

This workshop was the fourth event in the Grays Harbor Vessel Traffic Risk Assessment process, which focuses on oil spills from commercial vessels in Grays Harbor. The goals of the Grays Harbor Vessel Traffic Risk Assessment are to:

- Assess baseline and changing oil spill risks from commercial vessels operating in Grays Harbor.
- Identify measures that could help reduce the risks of oil spills.
- Assess oil spill response preparedness.
- Identify baseline response capability.

Three previous workshops focused on hazards related to oil spills from large commercial vessels (greater than 300 gross tons) operating in Grays Harbor:

- Hazard Identification Workshop 1: January 25, 2018
- Hazard Identification Workshop 2: February 28, 2018
- Response Capability Workshop: April 3, 2018

Large commercial vessels typically carry significant quantities of oil, either as fuel or as cargo. Accidents and oil spills from large commercial vessels are relatively rare events, however, both globally and in the historic data available for Grays Harbor. Ecology data for 2007–2017 show only one oil spill from a large commercial vessel: A 1-gallon hydraulic oil spill from a cargo ship in 2011. The last major oil spill in the vicinity of Grays Harbor was the oil barge *Nestucca* in December 1988.[87]

Incidents involving smaller vessels, such as fishing vessels and recreational vessels occur much more frequently. Ecology data for incidents within Grays Harbor for 2007–2017 includes 97 incidents involving vessels less than 300 gross tons. Ecology did not include reports of a sheen where no source could be identified; there were approximately 12 reports without a source in the data reviewed for this workshop.

Within the context of the Grays Harbor Vessel Traffic Risk Assessment, Ecology held a workshop for commercial fishermen, tribal fishermen, and recreational boaters to discuss

[87] National Oceanic and Atmospheric Administration (NOAA). (2017). Incident News: T/B Nestucca. Website. Accessed December 6, 2017. https://incidentnews.noaa.gov/incident/6641

incident data, and identify any potential ideas that could improve safety and help prevent oil spills.

The objectives for the workshop were to:

- Present Ecology data on vessel incidents and oil spills.
- Listen to participant experiences with vessel incidents and oil spills.
- Connect fishermen and boaters with organizations who promote vessel safety.
- Identify potential ideas for continual improvement.

Workshop agenda

9:00 WELCOME AND INTRODUCTIONS – Scott Ferguson, Jason Reichert, and Scott Wurster

9:25 OIL SPILL DATA AND SPILL PREVENTION

- Types of incidents
    - Fueling, underway, moored, and other
- For each type of incident:
    - How can we reduce incidents and spills?

11:30 LUNCH AND DISCUSSION

- What else do you deal with that impacts your work? (Examples – economics, safety, crewing, available boatyards)

12:15 OIL SPILL DATA AND SPILL PREVENTION, CONTINUED

1:30 PARTNER ROUNDTABLE

- U.S. Coast Guard Station Westport; Sector Columbia River
- Washington Department of Natural Resources Derelict Vessel Program
- Washington Department of Ecology Water Quality Program

2:30 SUMMARY AND NEXT STEPS

3:00 ADJOURN

Participants

The workshop was advertised on social media, in the Westport Marina newsletter, with flyers posted at Westport Marina, and through direct email and phone calls to tribes, fishermen's associations, government agencies, and individuals. Twenty-eight people attended the workshop. Participating organizations were:

- Confederated Tribes of the Chehalis Reservation
- Port of Grays Harbor
- Quinault Indian Nation
- Shoalwater Bay Tribe
- U.S. Coast Guard Sector Columbia River
- U.S. Coast Guard Station Westport
- Washington Department of Ecology Spills Prevention, Preparedness, and Response
- Washington Department of Ecology Water Quality
- Washington Department of Natural Resources Aquatic Resources
- Washington Department of Natural Resources Derelict Vessels
- Washington Dungeness Crab Fishermen's Association
- WEfish
- Westport Seafood, Inc.

Discussion

The workshop opened with introductions and a review of workshop objectives and the agenda. The workshop facilitators, staff from the Ecology Spills Prevention section, discussed oil spill reporting requirements, and briefly talked about the effects of oil spills on fish before presenting Ecology data.

Ecology incident data

Ecology maintains data on reported vessel incidents (e.g., oil spills, groundings, sunken vessels) in Washington waters. For this workshop, Ecology reviewed incidents within Grays Harbor for a 10-year period, 2007–2017. A summary of the data used in the workshop is provided in Annex A.

The data contains 97 reports. The majority of the reports (80) are oil spills events, or loss of vessel events (vessel sank, or grounded and broke apart) where all oil on board is assumed to have spilled. Seventeen reports are incidents where no spill was observed; these incidents are included in the data because the nature of the incident (i.e., derelict vessel, flooding, grounding, and loss of steering near shore) could have led to a spill. The intent is to present the most comprehensive data possible, to inform discussions of incident and spill prevention.

Categorizing the reports by type of vessel, 70 of the 97 incidents involved fishing vessels, 21 are recreational vessels, and 6 are other types of vessels (e.g., public vessel, tug, barge, work skiff, oil spill response vessel). The percentage of incidents per vessel category is shown in Figure 15.

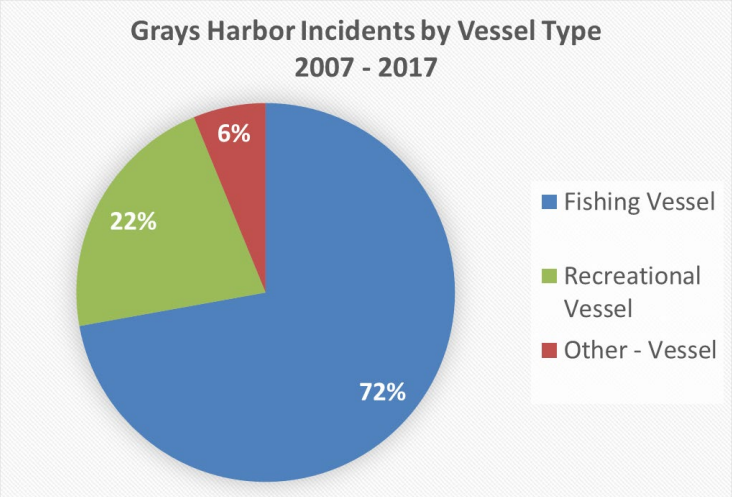


Figure 15: Grays Harbor incidents by vessel type, 2007-2017

Figure 16 shows fishing vessel incidents by vessel activity. Most fishing vessel incidents (57 percent) occurred while the boat was moored. A third (33 percent) of fishing vessel incidents happened while the vessel was underway, and the remaining 10 percent were related to fueling.

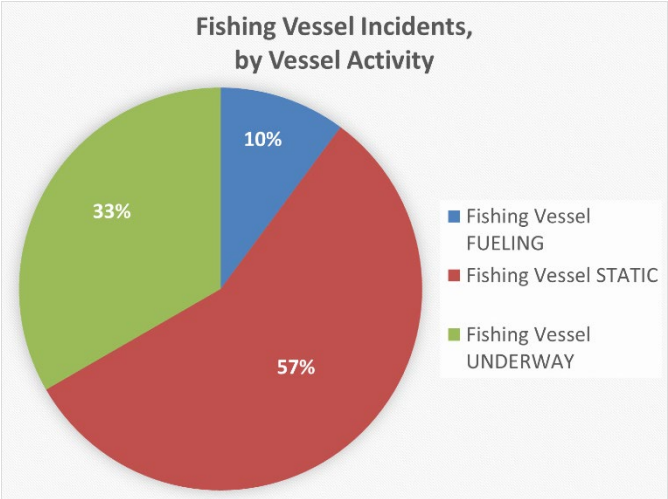


Figure 16: Fishing vessel incidents by vessel activity, 2007–2017

The majority of fishing vessel incidents, whether underway or moored, involved flooding, sinking, and bilge pumping incidents, as shown in Figure 17. Fuel related spills were most often caused by overfilling a tank.

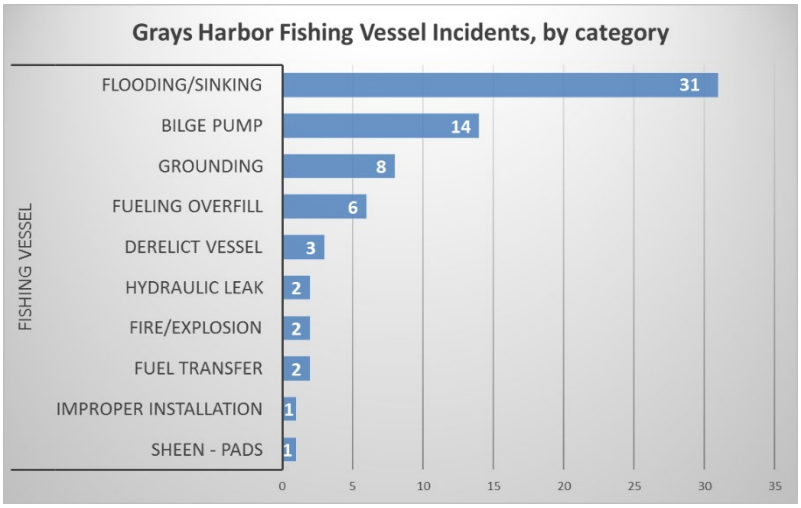


Figure 17: Fishing vessel incidents per incident category, 2007–2017

Figure 18 shows recreational vessel incidents by vessel activity. Recreational vessel incidents were more evenly distributed between underway (38 percent) and moored (38 percent) incidents. Twenty-four percent of incidents involved fueling.

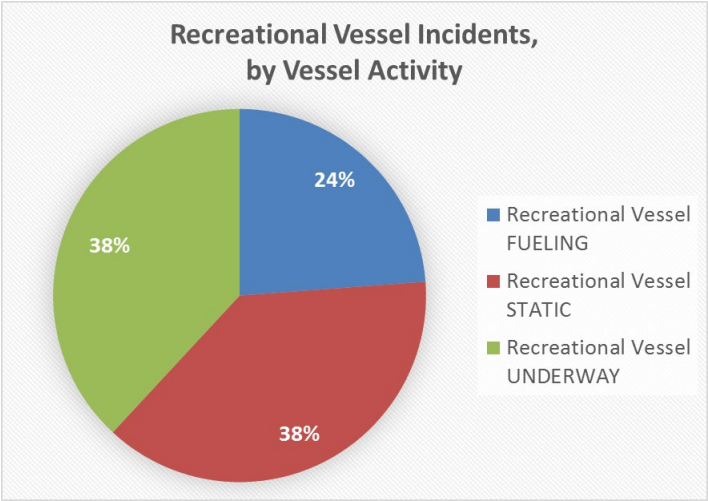


Figure 18: Recreational vessel incidents shown by vessel activity, 2007–2017

Over half the recreational vessel incidents involved flooding or sinking, as shown in Figure 19.

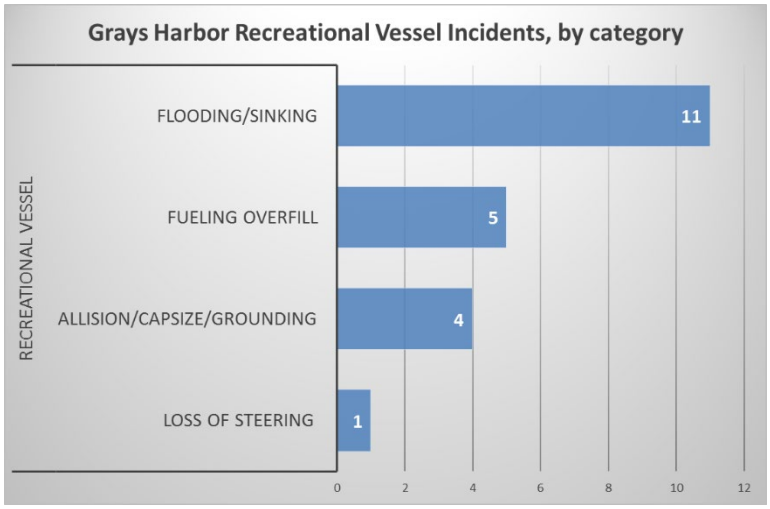


Figure 19: Recreational vessel incidents per incident category, 2007–2017

During the review of the data, a participant asked how much oil was spilled in the incidents shown. Ecology noted that not all reports include an estimated amount of oil spilled. For the 63 incidents that reported an amount spilled to water, the total was 10,150 gallons, with an average of 161 gallons per incident.

7,950 gallons of the 10,150 gallons were from incidents where the vessel was lost (vessel sank, or grounded and broke apart). In these incidents, the total amount of oil on board the vessel, if known, was assumed to be spilled.

After reviewing the incident data for Grays Harbor, Ecology facilitated discussions organized by vessel activity: fueling, underway, and moored.

Fueling incidents

Participants described their experiences with fueling vessels.

- Representatives from a tribe noted that most of their fishing involves smaller boats that can be trailered, and refueled while out of the water.
- A participant spoke about the practices that he followed during a 45-year career of active fishing.
    - His boats had set procedures for fueling, which included:
        - Checking the level of fuel tanks using gauge stick.
        - Determining a target amount or level to stop fueling.
        - Stationing one person at the fueling nozzle, one person at the tank, and one person where they could monitor the fuel gauge, if applicable.
        - Putting pads around the nozzle, and where the nozzle could drip.

  - He noted that he only had one incident where fuel spilled, when they did not have a person tending the nozzle, and the pumping rate from the dock was higher than expected.
  - He advised that being attentive during fueling operations is key.
- A Coast Guard participant said they have formal procedures for refueling boats, which include laying sorbents around the deck of the boat; taking soundings before, during, and after fueling; and placing pads under the fuel nozzle and tank vents.
- Another Coast Guard participant recommended vessel operators exercise caution when refueling vessels with multiple tanks, to ensure that the fuel system valves are aligned to fill the intended tank.
- A Port of Grays Harbor participant noted that one of the boats they operate has the fuel tank vent on the side of the vessel, with no way to rig a containment bag or bucket. They put an absorbent pad over the vent while fueling to ensure that fuel does not go in the water.
- Ecology discussed several general observations from fueling spills that were not specific to Grays Harbor.
  - Measuring and monitoring the amount of room left in your tanks prior to and during fueling is the first line of defense against fuel spills.
  - Each tank vent should have some form of containment to catch fuel drips and over fills.
  - Distraction and cell phone use by people involved in fueling is often a precursor to a spill.
  - Inexperience also plays a frequent role in fuel spills, especially if crew members are new, or if they have an incomplete understanding of the vessel's fuel system or the transfer plan.
  - Conducting an internal transfer (e.g., transferring from a storage tank to a day tank) while refueling adds to the complexity of the operation and has led to a number of spills.
  - For boats with open scuppers, a best practice is to plug or block the scuppers while fueling.

Underway incidents

Ecology asked participants what practices they use to prevent underway incidents.

- A Coast Guard participant noted that leaving bilge pumps aligned to automatically discharge when activated by a float switch can lead to oil spills. He recommended configuring float switches to sound an alarm when there is a high level of liquid in the bilge.
- A participant discussed the maintenance practices used by their boats.

  - Insurance requires boats to be hauled out of the water at least twice every five years for inspections, maintenance, and repairs.
    - This participant said they haul boats out of the water twice a year when they can, as a good practice.
    - Depending on the fishing season, funds for maintenance can be limited, and they may only be able to haul boats out every two years.
    - There is only one facility to haul large boats out of the water in Grays Harbor. Boats generally have to travel to the Columbia River or ports within the Strait of Juan de Fuca or Puget Sound, which is expensive, inconvenient, cuts into fishing seasons, and can be unsafe depending upon the vessel and time of year.
  - Boat captains and engineers regularly check vessel systems several times a day while underway to monitor conditions. Boats typically carry spare parts so they can make repairs to critical equipment at sea if needed.
- A participant described insurance requirements and noted several practices that can help reduce the risk of an incident underway.
  - Many fishermen insure their boats through a self-insurance pool. Often, insurance pools have polices that members are expected to follow, which can include regular marine surveys and haul outs, standards for watch hours, required equipment such as watch stander alarms (alarms that repeatedly sound at short intervals, and must be acknowledged to silence the alarm), and policies for drug and alcohol use.
  - The Coast Guard requires commercial fishing boats to carry drug testing equipment, for use in the event of an incident.
  - Fundamental steps that can improve safety include using watch stander alarms to help combat the effects of fatigue and sleep deprivation and the use of bilge alarms.
- A Coast Guard participant also discussed the challenges related to the extreme conditions commercial fishermen face off of Grays Harbor.
  - He stated that during Dungeness crab seasons, fishermen are working hard to make the most of short openings. This can lead to long hours on the water, with boats operating at night and in heavy weather.
  - Running into fishing gear or marine debris such as a submerged tree can result in a casualty.
  - Propeller shaft issues (e.g., leaking packing or stuffing box), broken hoses, sprung planks, and down-flooding through hatches and deck fittings can all result in excessive amounts of water entering a vessel.
- A Port of Grays Harbor participant said regulations and permit requirements for haul-out facilities makes it hard to establish new facilities. The Port looked into installing a tidal grid so people could do some out-of-water maintenance, but found the work that can be accomplished on a tidal grid, a work dock, or in the water at a marina slip is limited (e.g.,

owners cannot scrape paint or repaint the hull while the boat is over the water). The Port decided not to proceed with installing a tidal grid.

  - The Grays Harbor area only has one commercial haul out facility. If it is occupied, vessels have to travel along the coast to Port Angeles/Puget Sound or cross the Columbia River Bar, which can be a hazardous trip.

- Ecology noted that enclosed spaces on boats that can trap water, such as a lazarette or live well, can increase the risk of flooding.
  - Ecology provided a link to the Coast Guard *Best Practices Guide to Vessel Stability: Guiding Fishermen Safely Into the Future.*[88]
  - The best practices guide provides an introduction to stability concepts and terms, and describes specific situations relevant to fishermen, including free surface effect, down-flooding, dangers in heavy seas, dangers caused by towing or lifting fishing gear, and tips for prudent seamanship and damage control.
  - In the discussion of free surface effect, the guide states:[89]
    - "Failure to maintain the integrity of a fishing vessel's watertight envelope can significantly reduce a fishing vessel's overall stability due to unintentional flooding.
    - "If this minor flooding goes unnoticed, such as at the rudder post or in a lazarette, the gradual reduction in initial stability, or the feel of the vessel, may go unnoticed.
    - "After down-flooding occurs, the vessel's overall stability is reduced because:
      - "The center of gravity "G" is shifted farther outboard as the water sloshes to the low side.
      - "The freeboard is reduced because of the added weight, causing the deck edge to submerge faster.
      - "In cases of severe down-flooding, the vessel may not return to the upright condition, but will hang or 'loll' at the angle of heel where the new righting arm curve goes through zero…."
- Ecology asked participants if there are improvements they are aware of that could help prevent underway incidents.
  - A participant noted the Coast Guard commercial fishing vessel dockside safety exam program has a positive impact, and expressed appreciation for Coast Guard inspectors minimizing at-sea inspections for vessels with current decals, especially during fishing seasons.

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[88] http://www.fishsafe.info/USCGbestpracticeguidetovesselstability2004.pdf
[89] United States Coast Guard. *A Best Practices Guide to Vessel Stability: Guiding Fishermen Safely Into the Future, Second Edition*. (2004). Department of Homeland Security.

- A participant commented that commercial fishing vessels tend to be unique, where each boat has variations in the configuration of equipment, tanks, electrical systems, hydraulics, and other systems. This makes it challenging to provide general guidelines.
- A participant expressed a concern with any changes to fishing limits or seasons that would encourage recreational boaters to enter offshore fisheries. As an example, spot prawn grounds are located 30 miles or more offshore,[90] and spot prawns are typically fished with bottom traps that need to be deployed and recovered in deep water (200+ feet). Increases in catch limits that could create an incentive for recreational boaters to fish for spot prawns offshore, which could increase risks for underway incidents.

Groundings

Workshop participants discussed grounding incidents, as a subset of underway incidents. Ecology asked participants to describe causes of grounding events. Fatigue was noted as a primary cause. Other factors participants mentioned included loss of propulsion and loss of steering casualties that result in a grounding.

- Causes for loss of propulsion/steering can include bad fuel, clogged fuel filters, loss of hydraulic systems, loss of electrical power, navigation equipment failures, and human error, such as loss of situational awareness or judgment errors.
- While discussing fatigue, Ecology cited a study which found sleep deprivation impairs cognitive and motor functions[91] similar to the effects of increases in blood alcohol levels.[92]
    - For example, 16 to 18 hours of being awake is equivalent to a blood alcohol level of 0.05.
    - Performance after approximately 18 to 20 hours awake is equivalent to a blood alcohol level of 0.1.
- Participants noted that working 19 to 22 hours or longer is common when fishing.
- A participant reiterated that watch alarms are extremely helpful; while not required, they are considered good practice.
    - Ecology noted that watch alarms can keep crew members awake, but they don't reduce the effects of fatigue.

[90] https://wdfw.wa.gov/fishing/shellfish/shrimp/limits.html
[91] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1739867/
[92] Williamson A, Feyer A. *Moderate Sleep Deprivation Produces Impairments in Cognitive and Motor Performance Equivalent to Legally Prescribed Levels of Alcohol Intoxication*. Occup Environ Med. 2000 October; 57(10): 649–655

  - Ecology suggested that anticipating fatigue, and planning ahead through the use of tools like checklists, standard procedures, and safety briefs for operations, can improve safety.

- A participant described research conducted by the Fishermen Led Injury Prevention Program (FLIPP)[93] that pointed to the positive role good nutrition can play in increasing performance and safety at sea.
  - FLIPP also has sample crew agreements[94] that can help improve communications and increase productivity.
  - Additionally, FLIPP researchers published survey data about crabbing related injuries,[95] and fishermen's insights on safety.
- A participant said one factor that helps safety in general is fishing boats typically operate at low speeds (~7 knots). Situations develop relatively slowly, allowing captains time to recognize hazards, make decisions, and adjust actions if needed.

Hydraulic incidents

Ecology reviewed several best practices for preventing and reducing the effects of hydraulic spills. These included routine inspections of hoses and fittings, considering a scheduled replacement plan for hoses, and using hydraulic hose wrap or burst sleeves to prevent a high pressure jet of hydraulic fluid in the event of a hose leak or failed fitting. Serious injuries can result if a person is struck by this pressurized fluid.

- A participant noted that their vessels carry spares, and replace hoses when they degrade.
- Another participant agreed, and said commercial fishing boats typically don't have a scheduled replacement plan as a preventive measure. They have an inspection plan, and replace with on-board spares as needed.

Moored incidents

Ecology described incidents and spills that typically occur while a boat is moored. These include bilge pumping issues, and leaking decks, hulls, and fittings. The potential for a boat to flood, sink, and spill increases when a boat is left unattended or becomes derelict.

- A Port of Grays Harbor participant noted many people do not routinely visit their boat while it's moored. Westport Marina staff do a lot of checking on boats. At the time of the meeting, there were no currently designated derelict vessels in the marina, but there are boats that are not maintained or moved often. Some vessels require regular oversight by marina staff to prevent them from sinking. Rain makes it more likely neglected boats will

[93] http://health.oregonstate.edu/labs/osh/resources/flipp
[94] http://health.oregonstate.edu/sites/health.oregonstate.edu/files/labs/kincl/pdf/sample_crew_agreement_09182017_fillable.pdf
[95] http://health.oregonstate.edu/sites/health.oregonstate.edu/files/labs/kincl/pdf/flipp_infographic_niosh.pdf

take on water, and power outages could prevent bilge systems from operating, resulting in boats sinking. The port has limited employees to cover these neglected vessels.

- A participant said some insurance pools require boats to have a bilge alarm that is connected to a siren and a strobe light.
- Ecology noted that a system which allows remote notification of boat owners (e.g., through a phone app) when there is an alarm could be helpful. There are several systems on the market that provide remote monitoring of vessel location and conditions.
- An additional Port of Grays Harbor participant stated that boats in marinas, other than transient boats, are required to provide proof of marine insurance.
    - This is not typically an issue with active fishing boats, but it can become a problem for owners who don't have enough money to insure or maintain their boat.
    - A challenge for owners who want to sell is that boats over 65 feet and greater than 40 years old must be surveyed within 30 days prior to transferring ownership, and buyers must have marine insurance for the vessel.[96] There are limited facilities for hauling a boat out of the water for a survey in Grays Harbor, and the expense and difficulty of having a survey completed creates a barrier to selling boats. This can be especially true for owners who do not have the resources to maintain their boat. Additionally, hauling a boat out to be surveyed often requires that the boat be insured and have a current registration.
- Participants asked if boat owners can transfer ownership of a vessel that is essentially worthless. Washington Department of Natural Resources (DNR) does have a vessel turn-in program[97] for boats less than 45 feet in length. The turn-in program is funded through the Derelict Vessel Removal Program (discussed in the Partner Roundtable section below), and may not spend more than $200,000 per biennium. This amount is usually used up quite quickly. Some participants recommended the turn-in program have access to more funding, as it appears to be a good solution to a hard problem.
- A participant from an area tribe noted they are using Environmental Protection Agency (EPA) clean diesel grants to help address vessels that are at risk of becoming derelict.

Other issues

Ecology asked participants what other issues (e.g., economics, safety, crewing, availability of boat yards) impact their work.

- Several participants noted that it is unlawful to possess a crab pot that belongs to another person,[98] and suggested that a legislative solution or rule fix is needed to enable fishermen to deal with crab pots that are left in the water.

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[96] https://www.dnr.wa.gov/programs-and-services/aquatics/derelict-vessels/large-and-older-vessel-ownership-requirements
[97] https://www.dnr.wa.gov/programs-and-services/aquatics/derelict-vessels/vessel-turn-program
[98] http://apps.leg.wa.gov/wac/default.aspx?cite=220-340-440

  - Fishermen will typically recover pots that have not been pulled out of the water, and place them on a dock in Westport Marina.
  - Fishermen will call the pot owner, if the owner can be identified.
  - This is generally seen as a good practice, as it prevents the loss of expensive fishing gear, and it keeps pots from becoming abandoned and continuing to trap crabs.
  - There is also a need for a better solution of where to store pots that have been picked up. Leaving pots on a dock can interfere with dock access and maintenance. It also results in the marina staff having to clear off the dock and dispose of gear periodically.

- A participant said old and recovered fishing gear can be turned in through the Fishing for Energy[99] program, which offers no-cost disposal. Collected gear is either recycled, or converted into renewable energy at an energy-from-waste site.
- Participants discussed issues related to disposal of oil and hazardous waste at Westport Marina.
  - As at other ports and marinas, Westport controls access to dumpsters and oil recycling containers, to prevent the dumping of unknown or hazardous materials.
  - This can result in people leaving "orphan waste" by the disposal area, if they drop off when the gate is locked.
  - Participants commented that having extended hours, or a phone number to call, could help, as fishermen may work on their boats at night and on weekends.
- Participants discussed seafood offloading.
  - One participant noted that there is not a public hoist or crane for boats to offload their catch and heavy equipment. This would be very beneficial for maintenance as well.
  - Boat owners may travel to a different port if they can get a better deal for offloading, and sometimes enter into contracts with buyers for their catch. The contract may specify an offload location.
- A participant asked about the Coast Guard practice of requiring vessel operators experiencing a casualty to contact a commercial entity first, to determine if there is a commercial option for towing or assistance.
  - Coast Guard participants said the Maritime Search and Rescue Assistance Policy provides guidelines for how the Coast Guard will respond to a request for assistance (U.S. Coast Guard Addendum to the United States National Search and Rescue Supplement to the International Aeronautical and Maritime Search and Rescue Manual, Section 4.1).[100]

[99] http://www.nfwf.org/fishingforenergy/Pages/home.aspx
[100] https://www.dco.uscg.mil/Portals/9/CG-5R/manuals/COMDTINST%20M16130.2F.pdf

        - The guidelines refer to direction from Congress in 1982 "…to further minimize the possibility of Coast Guard competition or interference with...commercial enterprise."
        - Per the guidelines, the Coast Guard will initiate an immediate response if a vessel is in distress (mariner in immediate danger).
        - Coast Guard resources do not normally provide immediate assistance in non-distress cases if alternative assistance (e.g., commercial firm, marina, private organization, Good Samaritan) is available.
        - If alternative assistance is not immediately available, the Coast Guard will broadcast a Marine Assistance Request on VHF Channel 16.
        - The Coast Guard may assist in a non-distress situation when no higher priority mission exists, and no other capable resource is reasonably available.
    - Coast Guard participants emphasized they do not delay in launching a response if a vessel is in distress, including a vessel that is drifting towards a hazard like the submerged jetty or a lee shore.

Partner roundtable

Partner organizations provided a brief overview of the programs they represent, and discussed several specific topics related to the workshop.

- Coast Guard Station Westport
    - Noted that commercial fishing vessel safety inspections are required for the Dungeness crab fleet and ground fish fleet.
    - Station Westport currently has a qualified commercial fishing vessel inspector, which is unusual for a smaller station. The inspector is due to transfer, however. The station is working to get another person qualified.
    - Discussed at-sea boardings. If a boat has a current safety inspection decal, the Coast Guard will conduct an abbreviated check.
- Department of Natural Resources Derelict Vessel Program
    - Described the Derelict Vessel Program,[101] which addresses abandoned or sunken vessels in Washington waters.
    - The program works with other state agencies; park districts; port districts; and cities, towns and counties.
    - Reimburses up to 90 percent of the cost of removing and disposing vessels. The remaining 10 percent of costs can be "in-kind" services.

[101] https://www.dnr.wa.gov/programs-and-services/aquatics/recovering-derelict-vessels

  - Funded through recreational vessel registration fees, commercial vessel fees, and the Aquatic Lands Enhancement Account.
  - The program budget for 2017–2019 was $2.5 million. As of March, 2018, over half of the biennium's funds had been committed, with approximately $1 million remaining.
  - Costs for removing derelict vessels vary; a single boat can cost as much as $850,000 to $1 million to remove.
  - In the previous biennium, the program removed approximately 120 boats.
  - Program prioritizes boats for removal. They are currently focusing on the highest priority cases, both because public entities are dealing with lower priority vessels, and to conserve the remaining budget.
- Department of Ecology Water Quality Program
  - Described the three types of permits Water Quality issues, related to vessel maintenance and deconstruction.
    - Boatyard general permits[102]
      - Permits are for service businesses engaged in construction, repair, or maintenance of small vessels, where at least 85% of the boats they work on are 65 feet or less in length.
      - No work is performed on the water except for inside the boat superstructure.
    - Vessel deconstruction general permits[103]
      - Permits are for dismantling any portion of a vessel hull, topside, or superstructure while the vessel is over water, on a dry dock, or on a barge.
      - Vessel deconstruction fees cover Ecology costs to write the permit and do follow up inspections.
      - The fee per permit is based on the number of permits Ecology expects to issue. If more permits are issued, the fee per permit could decrease.
    - Shipyard permits are tailored for individual shipyards to address specific operations and waste streams.

Next steps

In general, participants felt the vessel incident data did not indicate a need for a significant change in operating practices. Additionally, due to the small-business nature of commercial fishing, and the wide variation in boat design, equipment, and operations, participants noted it is

[102] https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Boatyard-general-permit
[103] https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Vessel-Deconstruction-General-Permit

difficult to provide general guidelines and practices that are likely to result in a measurable difference in accident and oil spill incidents.

Several participants indicated that more could be done to educate recreational boaters, who may be less familiar with Grays Harbor and the offshore environment, about safety and spill prevention. This education could include changes to Washington State mandatory boater education,[104] implementation of a dock-walker program at Westport Marina, and informational signs at boat ramps and marina docks.

Ecology noted that Washington Sea Grant[105] delivers education and outreach to recreational boaters, commercial fishermen, and marina operators. Washington Sea Grant (WSG) has provided safety training, technical guidance, and research to Washington State fishing and seafood communities for over 40 years. Examples include providing workshops on first aid and marine safety at sea, hosting conferences to bring current research to the public, and training retail seafood handlers.

A participant recommended Ecology determine if the spill data could be organized to show incidents related to specific fisheries, which would allow discussions with different user groups.

Conclusion

The workshop provided an opportunity for Ecology to share vessel incident data with commercial fishermen, tribal fishermen, waterway users and managers, and partner agencies. It also served as a forum for Ecology to learn from participants about challenges and issues they face, and practices to improve safety and prevent spills. Finally, the workshop promoted discussion, information sharing, and connections between participants.

Ecology's Spills Program will remain engaged with the Grays Harbor community, through ongoing work in spill prevention, preparedness and response, and will seek future opportunities to share data and program information.

[104] http://parks.state.wa.us/442/Mandatory-Boater-Education
[105] https://wsg.washington.edu/

Annex A to Appendix D – vessel incident data

The table below provides data on vessel incidents reported to Ecology in Grays Harbor and offshore between 2007 and 2017, for vessels less than 300 gross tons. The column "High Level Incident Category" combines information from several elements reported to Ecology (e.g., vessel activity, incident cause). This column was added to organize the data for the Commercial Fishing, Tribal Fishing, and Recreational Vessel workshop.

Table 5: Vessel incidents reported to Ecology in Grays Harbor and offshore, 2007–2017, for vessels less than 300 gross tons

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
5/7/2007	WESTPORT MARINA	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	PERSERVERANCE	1				
10/7/2007	Westport Marina Float 15	Oil Spill	Hydraulic leak	MOORED	Fishing Vessel	LADY LILLIAN	2	77		59	1959
12/22/2007	WESTPORT MARINA	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	FURY		48.7		29	1985
12/28/2007	Aberdeen Old fish dock	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel						
1/21/2008	North jetty near Westhaven, north of Westport	Oil Spill	Flooding/Sinking	UNDERWAY	Fishing Vessel	HAESHIN	500	69	WOOD	89	1937
1/23/2008	COPALIS BEACH	Non-Oil Spill	Grounding	UNDERWAY	Fishing Vessel	ANNA MARIE		78	STEEL		

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
2/9/2008	WESTPORT MARINA	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	RESTLESS C	5	60			
4/10/2008	WEST PORT MARINA	Non-Oil Spill	Fire/explosion	MOORED	Fishing Vessel	LADY ROSEMARY		77		142	1977
5/6/2008	Mouth of John`s River at Grays Harbor	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	BAY POINT	80	50			
5/13/2008	GRAYS HARBOR MARINA	Oil Spill	Grounding	MOORED	Fishing Vessel	RENEE MARIA	1	42			1986
5/29/2008	WEST HAVEN FLOAT 11	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	DREAM		42	WOOD		
6/27/2008	28TH STREET BOAT RAMP	Vessel Casualty	Derelict Vessel	MOORED	Other - Vessel	HALLELUJAH		30	STEEL		
7/31/2008	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Fishing Vessel	ST. KRISTINE	2	43.8		32	1989
9/19/2008	Grays Harbor Bar	Oil Spill	Flooding/Sinking	UNDERWAY	Fishing Vessel	MISS MICHELLE	220	58	FIBERG LASS	74	1993
9/26/2008	Float #11 Westport Marina	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	SWELL RIDER	24	73.3	STEEL	158	1974

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
1/21/2009	Terminal 1 / Port of Grays Harbor	Non-Oil Spill	Flooding/Sinking	MOORED	Other - Vessel	Northern Retriever		185.5	STEEL	1117	1943
4/5/2009	GRAYS HARBOR	Oil Spill	Hydraulic leak	UNDERWAY	Other - Vessel	ESSAYONS	1	350	STEEL	7248	1983
4/14/2009	PACIFIC OCEAN	Oil Spill	Flooding/Sinking	UNDERWAY	Fishing Vessel	Renee Marie	500	31			
5/26/2009	28th Street Boat Launch	Oil Spill	Allision/Capsize/Grounding	MOORED	Recreational Vessel	Cristobal	50	47	WOOD		
9/9/2009	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Fishing Vessel	FOUR C's		40			1987
9/11/2009	Westport Marina Float 8, Slip J.	Oil Spill	Flooding/Sinking	MOORED	Recreational Vessel	BOB TOY		26	FIBERGLASS		1991
9/13/2009	WESTPORT MARINA, FLOAT 21, SLIP J	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	LILJA	2	33	WOOD	10	1935
10/9/2009	Masco Fuel Dock	Oil Spill	Bilge Pump	FUELING	Fishing Vessel	SENJA		64	FIBERGLASS		1971

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
11/22/2009	WESTPORT MARINA Float 17 (5?)	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	FLEET	10	58			
1/25/2010	F/V CONTROLLER BAY	Oil Spill	Fuel transfer	MOORED	Fishing Vessel	CONTROLLER BAY	17	78.1	Steel	183	2002
3/27/2010	Pacific Ocean	Oil Spill	Hydraulic leak	UNDERWAY	Fishing Vessel	Czarina	1	50	STEEL	53	1969
5/1/2010	Lower Wishkaw River under Hoquiam bridge.	Oil Spill	Derelict Vessel	MOORED	Fishing Vessel	JENK (Suspected Name)	20		WOOD		
5/27/2010		Non-Oil Spill	Derelict Vessel	MOORED	Fishing Vessel	SITKIN ISLAND		152.4	STEEL	369	1944
6/3/2010	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Recreational Vessel	THE LOST VIKING	1	72		53	1987
6/28/2010	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Other - Vessel	GRC 43	2	143	COMPOSITE		
8/17/2010	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Fishing Vessel	FOUR C`S	1	40			1987

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
10/29/2010	WESTHAVEN BOAT BASIN FLOAT 10	Oil Spill	Improper installation	MOORED	Fishing Vessel	SWIFTY	2				
11/4/2010	Westport Marina	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	White Eagle		39	Wood	16	1929
1/29/2011	Masco Fuel Dock	Oil Spill	Bilge Pump	FUELING	Fishing Vessel	VICIOUS FISHER	3	77	STEEL		1980
5/2/2011	WESTPORT MARINA	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	SHRILEY R	2	49.8		46	1951
5/9/2011	Westport Marina	Non-Oil Spill	Derelict Vessel	MOORED	Fishing Vessel	SITKIN ISLAND		152.4	STEEL	369	1944
5/24/2011		Non-Oil Spill	Flooding/Sinking	MOORED	Recreational Vessel			45			
5/31/2011	SOUTH JETTY-GRAYS HARBOR	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Recreational Vessel		90	24	ALUMINIUM		
6/6/2011	HALF MOON BAY	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	JB	250	45.6	WOOD	14	1918
7/30/2011	WEST HAVEN STATE PARK	Oil Spill	Grounding	UNDERWAY	Fishing Vessel	MISS ELORA	335	37	WOOD		

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
8/5/2011	Float 17 Westport Marina	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	ANNA LOVISA	250	50	WOOD	50	1950
9/22/2011	BEACH AT OCEAN SHORES	Oil Spill	Grounding	UNDERWAY	Fishing Vessel	DARE II	114	48.3	WOOD	41	1944
9/27/2011	DAMON POINT	Non-Oil Spill	Grounding	UNDERWAY	Other - Vessel			18	ALUMINIUM		
10/28/2011		Non-Oil Spill	Flooding/Sinking	UNDERWAY	Fishing Vessel	MICHAEL LISA		57.7	STEEL	109	1972
11/7/2011	Quinalt Tribal Enterprises, Wishkah River, tribal docks near 600 Market Street, Aberdeen WA	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	N/A		24	FIBERGLASS		
4/15/2012	Westport Marina Float 17	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	CENTENNIAL JEWEL	0	45	Wood	29	1950
5/4/2012	8TH STREET DOCK	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	NAUGHTY AUDI	10	30	ALUMINIUM		

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
6/21/2012		Oil Spill	Flooding/Sinking	UNDERWAY	Recreational Vessel	Miss Kelly	600	51.6		51	1985
6/29/2012	17 Nm W off Grays Harbor	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	QUEST	250	47		35	1992
8/22/2012	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Recreational Vessel	No Name - Westport Shipyard new build	2				
10/12/2012	Grays Harbor	Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	KOPRINO	450	86	WOOD	87	1926
5/15/2013	Westport Seafoods Dock	Oil Spill	Fuel transfer	MOORED	Fishing Vessel	Tani Rae	30	82.2	STEEL	161	1972
5/20/2013	32 miles off coast, west of Grays Harbor	Oil Spill	Fire/explosion	UNDERWAY	Fishing Vessel	ARCTIC STORM	0	314	STEEL	3858	1942
7/2/2013	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Recreational Vessel	KONA-KAI					
9/6/2013	Westhaven State Park	Non-Oil Spill	Grounding	UNDERWAY	Fishing Vessel	Andrianna		73.5		116	1979

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
9/19/2013	Grays Harbor	Oil Spill	Flooding/Sinking	UNDERWAY	Recreational Vessel		3	16			
9/27/2013	Jolly Rogers FFD fuel dock	Oil Spill	Fueling Overfill	FUELING	Fishing Vessel	Lady Allison	1	46			
10/1/2013	4 Miles off Ocean Shores	Oil Spill	Allision/Capsize/Grounding	UNDERWAY	Recreational Vessel	The Rock	30				
5/16/2014	West Haven Marina Pier 8	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	SWELL RIDER		73.3	STEEL	158	1974
10/4/2014		Vessel Casualty	Flooding/Sinking	MOORED	Recreational Vessel	CHERYL ROSE N JR		24	FIBERGLASS		1970
10/5/2014		Oil Spill, Vessel Casualty	Allision/Capsize/Grounding	UNDERWAY	Recreational Vessel		10	16	ALUMINIUM		
4/18/2015	Pacific Ocean-27 Miles W. of Ocean Shores	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	Corsair	2000	49.6	STEEL	54	1968
7/20/2015	Westport Fuel Dock	Oil Spill, Vessel Casualty	Fueling Overfill	UNDERWAY, FUELING	Fishing Vessel	SAINT JUDE	2	46.1	ALUMINIUM	33	1989
8/11/2015	Surf Zone near SR 115 Beach Access	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	TAMERA		42	WOOD		1972

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
8/27/2015	North Jetty	Non-Oil Spill	Flooding/Sinking	UNDERWAY	Recreational Vessel	TWIN DOLPHIN 2		36	FIBERGLASS	17	1996
9/22/2015	Float 21 Westport	Oil Spill, Vessel Casualty	Flooding/Sinking	MOORED	Fishing Vessel	Marie II	10	44	Wood	26	1940
10/3/2015	GH- GRAYS HARBOR/CHEHALIS RIV	Oil Spill	Allision/Capsize/Grounding	UNDERWAY	Recreational Vessel		14	18			
10/22/2015	Near Chehalis River Bridge	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	PACIFIC CAPES	2	91.3	STEEL	197	1977
11/13/2015	Wishkah River at Aberdeen	Non-Oil Spill	Flooding/Sinking	MOORED	Recreational Vessel	MAMALA		60	Wood	38	1930
12/6/2015	Westport Marina	Oil Spill, Vessel Casualty	Flooding/Sinking	MOORED	Fishing Vessel	Persistence	182	67	Wood		
1/16/2016	Pacific Ocean 5 miles from Ocean Shores	Non-Oil Spill	Loss of steering	UNDERWAY	Recreational Vessel	Forever and Ever		37.5		20	1988
4/15/2016	Grays Harbor Entrance, North of North Jetty (wreck	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	Privateer	3525	74	STEEL		1970

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
5/23/2016	Pacific Ocean at Ocean Shores	Non-Oil Spill	Grounding	UNDERWAY	Fishing Vessel	Jamie Marie		79.8	STEEL	190	1988
6/4/2016	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Recreational Vessel	Knot too Shabby	25	70	FIBERGLASS	79	2004
6/11/2016	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Recreational Vessel	Island Time	0.5				
7/15/2016	Westport Marina, Float 5	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	ZOEA	84	47	FIBERGLASS	31	1979
7/15/2016	Westport Marina, Float 5	Oil Spill	Bilge Pump	MOORED	Fishing Vessel	ZOEA	84	37			
8/8/2016	Lake Minard	Non-Oil Spill	Flooding/Sinking	MOORED	Recreational Vessel	19-Foot Bayliner		19			
8/20/2016	Pacific Ocean Shoreline near Westport Light	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	ILA	53	36.8	WOOD	14	1943
9/5/2016	Westport Marina (Westhaven)	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	LADY LILLIAN	100	77	STEEL	142	1976
9/5/2016	Wishkah River	Oil Spill	Flooding/Sinking	MOORED	Recreational Vessel		1				

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
9/8/2016	Copalis Beach Area	Non-Oil Spill	Grounding	UNDERWAY	Fishing Vessel	Trinity		70	STEEL	88	1975
10/7/2016		Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	Taplow		57.8	WOOD	39	1945
10/23/2016	Grays Harbor	Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	PACIFIC RIM		60	WOOD		
11/1/2016	Westport Marina Float 17	Oil Spill,Vessel Casualty	Flooding/Sinking	MOORED	Fishing Vessel	Restless C	5	46.1	WOOD	30	1944
11/25/2016	Westport Marina	Oil Spill, Vessel Casualty	Flooding/Sinking	MOORED	Fishing Vessel	Charlotte	100	40.7	WOOD	23	1934
12/7/2016	North of Moclips Beach	Non-Oil Spill	Grounding	UNDERWAY	Fishing Vessel	Qualay Squallum		58	STEEL	73	1989
1/19/2017	Port of Westport Marina - Float 19	Oil Spill	Sheen - pads	MOORED	Fishing Vessel	PACIFIC ROOSTER	1	46		40	1990
4/15/2017	Westport Marina Float 11	Non-Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	LADY GRACE		70.2	WOOD	77	1928

Incident date	Location	Incident type	High level incident category	Moored/ underway/ fueling	Vessel type	Vessel/facility name	Spill to water qty (gal)	Size (ft)	Hull type	Tons Gross Registered Tons	Year built
7/5/2017	Hoquiam River	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	DONNA	15	46	WOOD		
7/26/2017	Hoquiam River	Oil Spill, Vessel Casualty	Flooding/Sinking	MOORED	Fishing Vessel	Perwyn	50	43	WOOD	22	1950
7/27/2017	Hoquiam River	Oil Spill	Flooding/Sinking	UNDERWAY	Other - Vessel	Roger	1				
8/15/2017	Westport Marina	Oil Spill, Vessel Casualty	Flooding/Sinking	MOORED	Recreational Vessel		0.02	26	FIBERGLASS		
11/6/2017	Hoquiam River - "Mart's Marina"	Oil Spill, Vessel Casualty	Flooding/Sinking	MOORED	Fishing Vessel	Two Sisters	5	34	WOOD		1949
1/25/2018	200 yards NW of Westport	Oil Spill, Vessel Casualty	Flooding/Sinking	UNDERWAY	Fishing Vessel	RAMONA WN69599V		31.5	FIBERGLASS	8	
2/7/2018	Masco Fuel Dock	Oil Spill	Fueling Overfill	FUELING	Fishing Vessel	Tani Rae	19	82.2	STEEL	161	1972
3/2/2018	Hoquiam River	Oil Spill	Flooding/Sinking	MOORED	Fishing Vessel	LADY GRACE		70.2	WOOD	77	1928

Glossary

Allision – vessel striking a fixed or semi-fixed object such as a pier, bridge, an anchored vessel, or buoy (adapted from OSTF, 2014).

Anchor – to use the anchor to secure a ship to the sea floor (National Geospatial-Intelligence Agency, 2017).

Anchorage – an area where vessels may anchor, either because of suitability or designation (National Geospatial-Intelligence Agency, 2017).

Bulk – a material that is stored or transported in a loose, unpackaged liquid, powder, or granular form capable of being conveyed by a pipe, bucket, chute, or belt system.[106]

Cargo vessel – a self-propelled ship in commerce, other than a tank vessel or a passenger vessel, three hundred gross tons or more, including but not limited to, fishing vessels and freighters.[107]

Collision – vessels striking each other (adapted from OSTF, 2014).

Covered vessel – a tank vessel, or a cargo vessel or passenger vessel greater than 300 gross tons.[108]

Disabled vessel – a vessel that needs assistance, whether docked, moored, anchored, aground, adrift, or underway. This does not mean a barge or any other vessel not regularly operated under its own power.[109]

Discharge – any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.[110]

Facility – any structure, group of structures, equipment, pipeline, or device, other than a vessel, located on or near the navigable waters of the state that transfers oil in bulk to or from a tank vessel or pipeline that is used for producing, storing, handling, transferring, processing, or transporting oil in bulk.[111]

Fire/explosion – uncontrolled ignition of gas or liquid (adapted from OSTF, 2014).

Fishing vessel – a vessel engaged in the commercial catching, harvesting or processing of fish, or in tendering to or from vessels that catch, harvest or process fish.[112]

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[106] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[107] Chapter 317-31 WAC, Cargo and Passenger Vessels--Substantial Risk
[108] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[109] 46 CFR 10.107, Definitions in Subchapter B
[110] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[111] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[112] Chapter 317-31 WAC, Cargo and Passenger Vessels--Substantial Risk

Grounding – vessel striking the waterway bottom with enough force to damage the vessel (adapted from OSTF 2014).

Flooding – water intrusion into areas on a vessel not intended to hold water (adapted from OSTF, 2014).

Hazardous substances – both dry and liquid substances, listed Table 302.4 of 40 CFR Part 302 adopted August 14, 1989, under section 102(a) of the Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by P.L. 99-499, including: methanol, ethanol styrene, xylene.[113]

Local factor – unique or specific feature of operating commercial vessels in Grays Harbor, such as the channel configuration, hydrographic features, local weather patterns and conditions, tide and current variations, aids to navigation configurations, or local operating practices. The focus for the Hazard Identification process is on local factors that could contribute to an incident resulting in an oil spill by a commercial vessel.

Loss of electrical power – failure of the main electrical system to provide power meeting the needs for vessel operation; stopping a vessel while underway to complete repairs of the electrical system is considered a loss of electrical power. (adapted from OSTF, 2014)

Loss of navigational equipment – a partial loss of propulsion, steering, electricity, or navigational equipment that results in a vessel being unable to maintain its intended track clear of navigational hazards or other vessels without assistance.[114]

Loss of propulsion – failure of the propulsion system to propel the vessel as designed; the shutdown of a vessel's propulsion system while underway to complete repairs is considered a loss of propulsion. (adapted from OSTF, 2014)

Loss of steering – failure of the steering system to control the vessel's heading as designed; stopping a vessel while underway to complete repairs of the steering system is considered a loss of steering. (adapted from OSTF, 2014)

Marine facility – any facility used for tank vessel wharfage or anchorage, including any equipment used for the purpose of handling or transferring oil in bulk to or from a tank vessel.[115]

Mooring – the act of securing a craft to the ground, a wharf, pier, quay, etc. (adapted from National Geospatial-Intelligence Agency, 2017).

Navigable waters of the state – those waters of the state, and their adjoining shorelines, that are subject to the ebb and flow of the tide and/or are presently used, have been used in the past, or may be susceptible for use to transport intrastate, interstate, or foreign commerce.[116]

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[113] 40 CFR 302
[114] Vessel Incident Checklist. Washington SPPR Program Evaluation of Vessel Incidents and Emergencies
[115] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[116] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response

Nonpersistent oil – a petroleum based oil such as gasoline, diesel or jet fuel, which evaporates relatively quickly.[117]

Nonpetroleum oil – oil of any kind that is not petroleum-based, including but not limited to: Biological oils such as fats and greases of animals and vegetable oils, including oils from seeds, nuts, fruits, and kernels.[118]

Oil – "Oil" as defined in RCW 88.40 (RCW 88.40.011, 1990).

Passenger vessel – a ship of three hundred or more gross tons with a fuel capacity of at least six thousand gallons carrying passengers for compensation.[119]

Persistent oil – a petroleum based oil that does not meet the requirements of a nonpersistent oil.[120]

Severe weather conditions – observed nautical conditions with sustained winds measured at 40 knots and wave heights measured between 12 and 18 feet.[121]

Ship – any boat, ship, vessel, barge, or other floating craft of any kind.[122]

Spill – an unauthorized discharge of oil into the waters of the state.[123]

Structural failure – failure of a vessel's stress-bearing components, including tank plating or the hull (adapted from OSTF, 2014).

Tank vessel – a ship that is constructed or adapted to carry, or that carries, oil in bulk as cargo or cargo residue, and that: operates on the waters of the state, or transfers oil in a port or place subject to the jurisdiction of this state.[124]

Underway – vessel not moored or anchored.

Vessel emergency – a substantial threat of pollution originating from a covered vessel, including loss or serious degradation of propulsion, steering, means of navigation, primary electrical generating capability, and seakeeping capability.[125]

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[117] Adapted from Chapter 173-182 WAC, Oil Spill Contingency Plan
[118] Adapted Chapter 173-182 WAC, Oil Spill Contingency Plan
[119] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[120] Adapted from Chapter 173-182 WAC, Oil Spill Contingency Plan
[121] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[122] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[123] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[124] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response
[125] Chapter 88.46 RCW, Vessel Oil Spill Prevention and Response