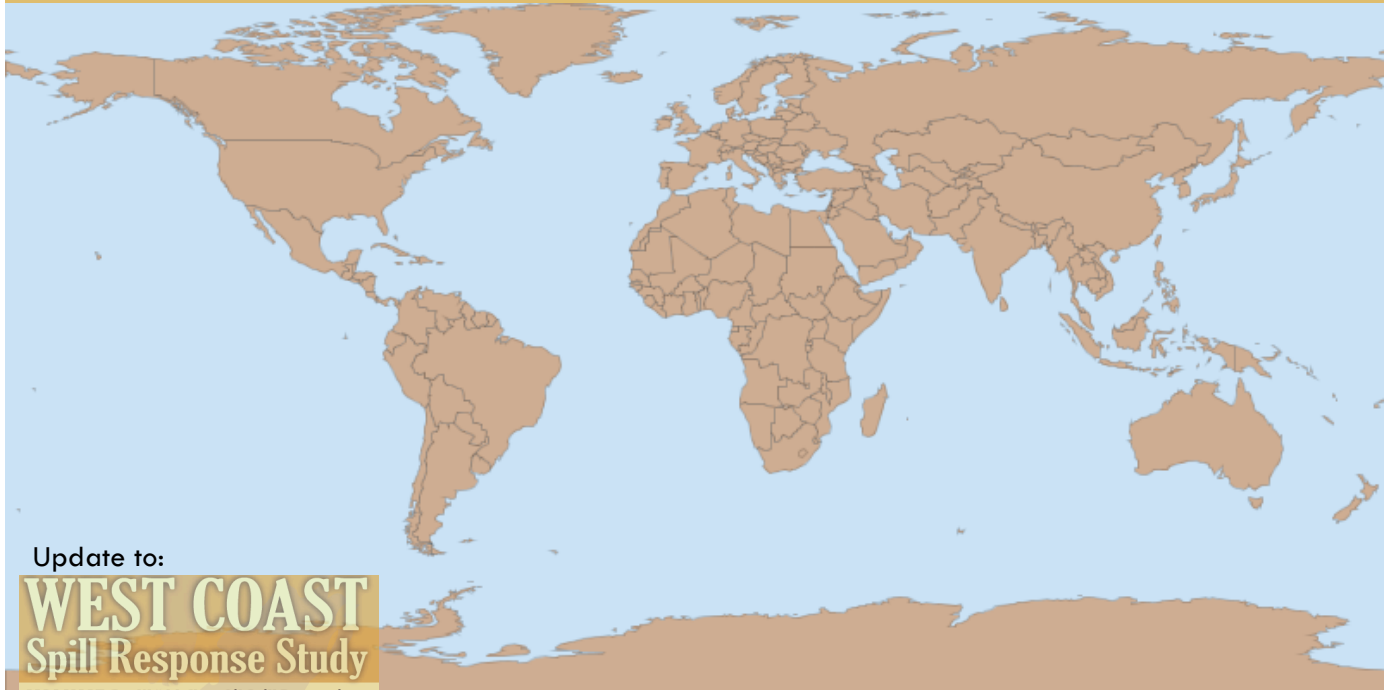


MARINE OIL SPILL PREVENTION, PREPAREDNESS, RESPONSE AND RECOVERY

WORLD-LEADING APPROACHES FROM SELECT JURISDICTIONS



Update to:

WEST COAST Spill Response Study

VOLUME 3: World-Class Oil Spill Prevention,
Preparedness, Response & Recovery System

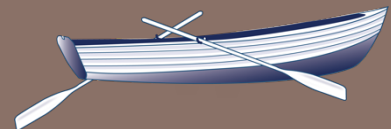


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Report to British Columbia Ministry of Environment

Prepared by:

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This report was developed by Nuka Research and Planning Group, LLC for the British Columbia Ministry of Environment. The views and opinions expressed in this report are those of the authors and do not necessarily reflect an official policy or position of the government of British Columbia.

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EXECUTIVE SUMMARY

Nuka Research and Planning Group, LLC (Nuka Research) prepared this report for the British Columbia (BC) Ministry of Environment (Ministry) to update Volume 3 of the 2013 West Coast Spill Response Study (Nuka Research, 2013b).

Purpose and Scope of Report

The purpose of this report is to provide the Ministry with examples of specific laws, regulations, policies and practices in place across the globe that stand out among world-class approaches to oil spill prevention, preparedness, response, and recovery.

The Ministry specified that this study should include: United States (US) federal agencies and west coast states; Canadian federal agencies and provinces; Europe, including the European Union (EU), individual countries, and Scandinavian/Baltic States; the United Kingdom (UK); and Australia. This report only considers **fully enacted** measures and does not present any examples of laws, regulations, programs, or practices that are pending or proposed.

Defining World-Leading Regulation and Practice

The BC government established the expectation for “world-leading” oil spill preparedness and response in 2012 with the introduction of five minimum requirements for the province to consider any new projects transporting or storing heavy oil. Two of these conditions rely on world-leading regimes for on-land and marine oil spill prevention and response.

This report presents a set of examples of specific requirements or practices in place in North America, Europe, and Australia that represent a world-

UPDATE TO WEST COAST SPILL RESPONSE STUDY

The Province of British Columbia aspires to **world-leading** marine oil spill response, prevention, and recovery systems along the west coast of Canada.

This report updates Volume 3 of the 2013 West Coast Spill Response Study by providing examples of world-leading marine oil spill practices, programs, and requirements in place today from jurisdictions within and beyond Canada.

The world-leading examples cited in this report illustrate specific approaches applied in other jurisdictions; they do not necessarily represent the **single best** approach.

The discussion of each example emphasizes how and why it is world-leading, and suggests how BC may incorporate elements from other jurisdictions in a world-leading marine oil spill prevention and response regime for the west coast of Canada.

leading approach. These examples were identified using a combination of qualitative assessment methods, including literature review, informal and formal interviews with knowledgeable experts, and primary review and analysis of statutes, regulations, guidance, and program documents.

These world-leading examples are distinguished by specific elements that could be adapted or applied by other jurisdictions seeking to enhance their marine oil spill prevention, preparedness, response, and recovery regimes. They cover a range of practices that were selected as illustrations; they do not necessarily represent the *single best* approach.

World-Leading Marine Oil Spill Prevention Examples

Oil spill prevention measures provide a barrier to stop an accident or error from resulting in an oil spill. Seven examples of world-leading marine oil spill prevention are presented.

ALEUTIAN ISLANDS RISK ASSESSMENT

The **Aleutian Islands Risk Assessment** is an example of a world-leading approach to comprehensive assessment of marine transportation risks within a specific geographic region. The risk assessment applied a methodology vetted by the US National Academies to combine local knowledge and outside technical expertise to consider vessel traffic risks and analyze risk reduction options. The outcome was an Optimal Response System that included a suite of prevention measures designed to mitigate local risks.

This report does not directly evaluate or rank the current system in place in British Columbia. However, to the extent that specific examples from other regimes are included in this report, the implication is that there are elements of these systems that exceed the current system in BC.

World-leading elements of the Aleutian Islands Risk Assessment include:

- ✓ Evaluating marine transportation risks within a specific geographic region
- ✓ Combining technical analysis with stakeholder input and independent oversight
- ✓ Funding through direct funds from plea agreement for oil spill in Aleutian Islands
- ✓ Resulting in tangible, consensus-based recommendation for optimal response system
- ✓ Including cost analysis and recommended funding and management mechanisms

Considerations for modeling BC's world-leading approach to marine oil spill prevention and response based on the Aleutian Islands Risk Assessment include:

- ◇ Conduct a multi-jurisdictional marine oil spill risk assessment that combines technical analysis with stakeholder, government, and industry input.
- ◇ Evaluate marine oil spill threats based on historic and projected vessel movements along entire BC coast, including risk of spills from cargo and fuel tanks.
- ◇ Evaluate potential consequences of marine oil spills with stakeholder and public input.
- ◇ Link marine oil spill prevention initiatives to identified risks; prioritize based on both threats and consequences.
- ◇ Specify implementation process - mechanism, timeline, responsibility, costs, etc. – when evaluating risk reduction options.

INTERNATIONALLY RECOGNIZED AREAS TO BE AVOIDED DESIGNATIONS IN ALASKA AND HAWAII

Two examples from **US Pacific states** show how the establishment of **Internationally Recognized Areas to be Avoided (ATBA)** provides a world-leading mechanism to influence the routing of international vessel traffic. The designation and implementation of an ATBA begins at the international level through the International Maritime Organization (IMO) when international vessel traffic is of concern. ATBA are designed around specific areas based either on their hazards, challenges to rescue, or sensitivity, and may or may not be

associated with a Particularly Sensitive Sea Area or other marine protected area designation (for example, at the national level).

World-leading elements of the US Areas to be Avoided designations include:

- ✓ Enhanced protection of areas vulnerable to risks from international vessel traffic
- ✓ Applicable to vessels of a certain class, regardless of flag state or voyage route
- ✓ Included on international charts for clear message to all mariners
- ✓ Compels flag states and coastal states to monitor compliance

Considerations for modeling BC's world-leading approach to protecting sensitive areas using routing measures, based on the US Areas to be Avoided, include:

- ◇ Identify highly sensitive or high priority areas where the risks associated with vessel traffic are too high to tolerate.
- ◇ Specify the special area designation and resultant routing measures in accordance with IMO guidance, and bring recommendations to IMO.
- ◇ Implement Areas to Be Avoided, Particularly Sensitive Sea Areas, or other routing measures through international charting and enforce through port state controls and coordination with flag states.

EUROPEAN VESSEL SAFETY INITIATIVES

The **European Maritime Safety Agency's (EMSA) Vessel Safety Initiatives** illustrate a world-leading approach to oil spill prevention through targeted initiatives aimed at ship-source pollution prevention. EMSA promotes a harmonized approach to vessel safety within the EU, and monitors compliance with EU and international vessel safety standards.

World-leading elements of the EMSA vessel safety initiatives include:

- ✓ Using accident investigation data to inform safety and prevention
- ✓ Real-time information about vessel safety
- ✓ Targeting enforcement to high-risk vessels and activities
- ✓ Accountability for implementation of EU and international standards
- ✓ Public access to primary databases and summary reports on ship safety and inspections (worldwide)

Considerations for modeling BC's world-leading approach to vessel safety, based on the EMSA example, include:

- ◇ Collect and analyze vessel casualty data and publish summary statistics and analysis to inform risk management and risk reduction measures.
- ◇ Evaluate sufficiency of salvage and rescue resources to respond to incidents along BC coast.
- ◇ Create transparency for port state control/inspection activities by making summary reports and appropriate data publicly available.
- ◇ Establish data-driven effectiveness measures to understand how vessel safety initiatives are influencing accident and casualty rates, and identify appropriate course corrections to maximize effectiveness.

TANKER ESCORT SYSTEM IN PRINCE WILLIAM SOUND, ALASKA

The Ship Escort Response Vessel System (SERVS) in Prince William Sound provides an example of a world-leading approach to oil spill prevention that has been operating for over 20 years in the neighboring jurisdiction of Alaska. A fleet of 11 escort and response tugs is dedicated to the system with specific capabilities tied to their role or function. Emergency towing procedures and minimum equipment standards

are in place for both escort vessels and tankers to increase the likelihood that a towing vessel can assist or save a tanker.

World-leading elements of the SERVS tanker escort system include:

- ✓ Dedicated, high-powered tugs
- ✓ Two escorts along entire 90-mile route through Prince William Sound
- ✓ Tanker route closed when conditions exceed 45 knot wind, 15 foot seas
- ✓ Required by federal statute
- ✓ Funded by industry
- ✓ Federal, state, and citizen-level oversight

Considerations for modeling BC's world-leading approach to tanker escorts, based on the Prince William Sound SERVS escort system, include:

- ◇ Evaluate capacity of escort vessels (tugs) in areas where tanker escorts are required and consider whether enhancements to number, type, or capacity of tugs would enhance safety.
- ◇ Evaluate whether tug escorts would enhance tanker safety in regions where escorts are not presently required.
- ◇ Evaluate regulatory and oversight mechanisms that compel tanker escorts and consider whether mandates are required (vs. voluntary compliance) to achieve risk reduction benefits.
- ◇ Compile and analyze data on escort tug activities (e.g. rescues or saves, other assistance rendered).

AUSTRALIAN PORT STATE CONTROL SYSTEM

Australia's Port State Control System stands out as an example of how a world-leading approach can be applied to improve the safety standards on vessels calling at ports in a country with one of the world's largest geographic expanse of marine territory.

World-leading elements of the Australian Port State Control System include:

- ✓ Targeted inspections of high-risk vessels
- ✓ Focused inspection campaigns to address areas with frequent deficiencies
- ✓ Refuse entry to ships with history of past detentions
- ✓ Use of Marine Orders to quickly implement new requirements
- ✓ Agency mission links oil pollution risk, prevention, and response
- ✓ Frequent public release of port state inspection data and summary reports

Considerations for modeling BC's world-leading approach to port state control, based on the Australian example, include:

- ◇ Collect and analyze program metrics to assess performance (i.e. measure how vessel safety is improving based on Port State Control activities).
- ◇ Target inspections by focusing on vessels with poor safety records (i.e. history of detentions, past pollution incidents, multiple violations) and prioritizing areas onboard ships with high levels of past violations (similar to Australia's Focused Inspection Campaigns).
- ◇ Analyze and publish annual Port State Control data and statistics.

NATIONAL AERIAL SURVEILLANCE PROGRAM IN CANADA

Canada's National Aerial Surveillance Program (NASP) provides an example of a world-leading oil spill prevention system by utilizing aerial overflight patrols to detect and deter pollution from ships traveling in Canadian waters. NASP provides aerial lookout to identify ship-source spills, while also monitoring marine

traffic and sea ice. The constant possibility for an overhead scan is intended to deter polluters and quickly identify and respond to a spill, while also providing evidence for post-incident legal action.

World-leading elements of the NASP include:

- ✓ High level of patrol hours when compared to other aerial surveillance programs
- ✓ Multiple, integrated technologies to track vessels, capture geo-referenced images from a range of altitudes even in darkness and low visibility
- ✓ Successful detection and prosecution of pollution violations
- ✓ Multiple governmental departments share and supplement NASP program with technology and resources

As the NASP program is already in place in British Columbia, considerations for maintaining and expanding this capacity as part of BC's world-leading marine oil spill prevention and response regime include:

- ◇ Continue to expand the number of flight hours in the west coast region.
- ◇ Continue to acquire and incorporate new and emerging technologies.
- ◇ Incorporate and analyze data from pollution incidents to identify trends and consider opportunities to link with other vessel safety and pollution prevention initiatives.

MARINE FIREFIGHTING AND SALVAGE REQUIREMENTS IN THE US

The **US marine firefighting and salvage regulations**, recently promulgated under the federal requirements that vessel and non-tank vessel operators develop oil spill contingency plans, are an example of a world-leading approach. The US government requires operators of US-flagged tank vessels and non-tank vessels over a certain size to plan for emergency towing, salvage, and marine firefighting as part of their vessel response planning. Foreign-flagged vessels calling on US ports are also subject to these requirements.

World-leading elements of the US marine firefighting and salvage requirements include:

- ✓ Operators of tank vessels and certain non-tank vessels are required to plan for emergency towing, salvage, and marine firefighting
- ✓ Federal oversight through vessel response plan reviews
- ✓ Timeframes for delivery of marine firefighting and salvage resources
- ✓ Minimum capability requirements for emergency towing, salvage, and marine firefighting based on vessel type, size, and area of operation

Considerations for modeling BC's world-leading approach to marine firefighting and salvage, based on the US example, include:

- ◇ Evaluate existing marine firefighting and salvage capacity along west coast.
- ◇ Develop additional capacity and distribute geographically commensurate with risks from vessel traffic.
- ◇ Consider mechanisms to compel shipping industry to fund marine firefighting and salvage resources.

World-Leading Marine Oil Spill Preparedness, Response, and Recovery Examples

Oil spill preparedness, response, and recovery measures provide some level of mitigation to reduce the adverse impacts from an oil spill. Six world-leading marine oil spill response examples are presented.

AUSTRALIA NATIONAL PLAN FOR MARITIME EMERGENCIES

The Australian National Plan, which recently underwent a significant revision and update, is an example of a world-leading approach to national contingency planning. National capacity includes emergency tow vessels

to prevent incidents and strategically positioned, stocked, and maintained equipment caches to respond to oil spills using either mechanical response or dispersants.

World-leading elements of the Australian National Plan include:

- ✓ Supported by risk evaluation and capability assessment
- ✓ Integrates with state, local, and industry response plans
- ✓ Emphasis on prevention through dedicated emergency towing resources funded by shipping industry
- ✓ Equipment stockpiles actively managed and information on equipment status publicly available
- ✓ Competency-based training approach with regional oversight
- ✓ Science-based approach to response decision-making
- ✓ Over 20 years of annual reporting on National Plan activities creates accountability and transparency

Considerations for modeling BC's world-leading approach to government contingency planning, based on the Australia National Plan, include:

- ◇ Identify strategic priorities for marine oil spill preparedness and response.
- ◇ Develop integrated plan across all federal, provincial, local and First Nation agencies and governments involved in oil spill prevention or response.
- ◇ Evaluate spill response capacity (equipment, personnel, response time) based on regional oil spill risks and fill any gaps in equipment stockpile quantity, type, or location.
- ◇ Establish performance-based training standards for spill responders (government and industry).
- ◇ Conduct periodic self-assessments to identify opportunities to improve or enhance national and regional response capability.

RESPONSE PLANNING STANDARDS IN US

Four **US Pacific states' oil spill response planning standards**, complemented by national requirements, are presented as examples of how world-leading response planning standards that are tied specifically to vessel operators can be used to assure minimum response capability that is linked to potential worst case spills and to drive continuous improvement in technologies and strategies for spill response.

World-leading elements of US oil spill response planning standards include:

- ✓ Planning standards are established and enforced through oil spill contingency plans
- ✓ Planning standards incorporate all aspects of spill response
- ✓ Planning standards are commensurate with oil spill potential (size, type)
- ✓ Mechanism exists to drive continuous improvement or otherwise update standards as needed
- ✓ Assumptions are transparent to interested parties
- ✓ Requirements are predictable to regulated entities

Considerations for modeling BC's world-leading approach to oil spill response planning standards, based on the US example, include:

- ◇ Establish worst case spill response volume based on total vessel cargo and fuel oil, and use worst case spill volumes to drive response capacity building.
- ◇ Consider replacing the current 10,000 tonne response organization requirement with vessel-specific standards that compel operators to contract for sufficient capacity to manage worst case discharge from vessel.
- ◇ Establish oil spill contingency planning requirements for vessels calling on BC ports.
- ◇ Develop best available technology requirements for oil spill response equipment.

ALTERNATIVE RESPONSE TECHNOLOGY DECISION-MAKING GUIDANCE IN UK

The **United Kingdom (UK) Policy on Oil Spill Treating Agents** provides an example of a world-leading approach to alternative response technologies with a clear framework for decision-making regarding the use of certain approved chemicals to treat oil spills on water and on the shoreline.

World-leading elements of the UK oil spill treating agent policy include:

- ✓ Clear, transparent, and expedited decision-making process for approval decision about agent use within one hour of request
- ✓ Efficacy and toxicity standards for approval of specific agents tied to intended use (offshore, inshore, shoreline, etc.)
- ✓ Port and operator oil spill contingency plans should include plans for dispersant use decisions and operations
- ✓ UK government has resources (aircraft and dispersants) and discretion to initiate dispersant operations

Considerations for modeling BC's world-leading approach to planning for the potential use of alternative response technologies, based on the UK example, include:

- ◇ Establish geographic zones where alternative response technologies are or are not authorized.
- ◇ Provide decision-making process regarding use of treating agents or alternative response technologies in authorized areas during an incident.
- ◇ Develop operational capacity (stockpiles, application equipment and platforms, trained personnel) to implement alternate response technologies, if authorized.
- ◇ Establish government oversight for entire life cycle of treating agent use, from testing and approval of specific products based on effectiveness, toxicity, and other criteria to incident-specific and long-term monitoring if agents are used during an oil spill.

GEOGRAPHIC RESPONSE PLANNING IN ALASKA

The **Alaska Geographic Response Strategy (GRS) program** provides an example of a world-leading approach to systematic development of GRS (also called geographic response plans or GRP) using a process that ties into existing government and industry oil spill contingency plans, applies standardized tactics based on available response resources, and includes a high level of stakeholder involvement.

World-leading elements of the Alaska GRS program include:

- ✓ Workgroup process involves local stakeholders, natural resource agencies, and spill response experts in collaborative process
- ✓ Public input into prioritization of sites
- ✓ Standardized tactics, terminology, and resource sets are used statewide by industry and government
- ✓ Operators can reference GRS to illustrate how they will meet state contingency planning requirements for sensitive area protection

Considerations for modeling BC's world-leading approach to geographic response planning, based on the Alaska example, include:

- ◇ Develop prioritization process that considers vulnerability, sensitivity, and feasibility.
- ◇ Apply a regional approach for BC that integrates with other oil spill and emergency response plans.
- ◇ Use geographic response plans to evaluate response capacity and adequacy of equipment stockpiles, and fill gaps.
- ◇ Develop local response capacity to quickly implement protection strategies ahead of an oil slick.
- ◇ Provide opportunity for public and stakeholder review and input, particularly into site selection/prioritization process.

- ◇ Utilize standard tactics and terminology.
- ◇ Test strategies during field deployments under realistic conditions, and refine plans accordingly.

USE OF FISHING VESSELS IN SPILL RESPONSE IN ALASKA

The **Alyeska SERVS fishing vessel program in Prince William Sound, Alaska (US)** is an example of a world-leading system that has created a network of trained, on-call fishing vessels and crew that can provide immediate first response to an oil spill as well as a broader network of vessels and crew to supplement ongoing cleanup operations.

World-leading elements of the SERVS fishing vessel program include:

- ✓ Membership tiers require that contracted vessels and crew must respond within 1, 6, or 24-hours of oil spill
- ✓ Approximately 400 vessels under contract, plus database of vessels-of-opportunity
- ✓ Funded by companies that ship oil through Prince William Sound
- ✓ Linked to compliance with state response planning standards
- ✓ Training program regularly reviewed and revised to reflect new technologies, tactics, or regulatory requirements
- ✓ Positive link between fishing and oil industries with financial benefits to each

Considerations for modeling BC's world-leading approach to supplementing response capacity with fishing vessels, based on the Prince William Sound example, include:

- ◇ Evaluate need for fishing vessels to supplement marine oil spill response and establish criteria for minimum numbers and types of vessels to support worst case spill response.
- ◇ Consider utilizing tier system similar to SERVS to distinguish vessels based on response availability.
- ◇ Conduct regular exercises and training, including drills to test availability of vessels to respond within their specified timeframes.
- ◇ Ensure adequate funding for program administration, training, exercises, and documentation.

OIL SPILL DAMAGE ASSESSMENT, RECOVERY, AND RESTORATION IN THE US

In the US, the documentation of spill damages, pursuit of compensation from the responsible party, and implementation of restoration projects is known as **Natural Resource Damage Assessment (NRDA)** or Natural Resource Damage Assessment and Restoration (NRDAR) and is codified in federal law and some state laws. NRDA is a well-defined process with people and plans in place for implementation prior to an oil spill so that all parties know what to expect. NRDA can be implemented for an oil spill, substantial threat of an oil spill (such as a ship grounding), or other pollution event.

World-leading elements of the US NRDA process include:

- ✓ Damage assessment and restoration and recovery planning begin immediately during spill response
- ✓ Recognizes a range of impacts to resources and their use
- ✓ Framework for primary and compensatory restoration, depending on type and severity of impacts
- ✓ Opportunity for public input and comment
- ✓ Cooperative process (agency trustees and responsible party), but trustees have ultimate authority
- ✓ NRDA applies to oil spills and potential oil spills

Considerations for modeling BC's world-leading approach to oil spill damage assessment, restoration, and recovery, based on the US NRDA example, include:

- ◇ Establish process for assessment of oil spill damages and embed process into spill response framework.

- ◇ Assign “trustee” equivalents from federal, provincial, local, and First Nation governments and agencies to implement damage assessment and restoration.
- ◇ Integrate natural resource damage assessment and restoration into polluter pays system.

World-Leading Marine Oil Spill Regime System Elements Examples

System elements describe attributes of marine oil spill regimes such as governance, funding, and oversight, and may transcend oil spill prevention and response. Three world-leading examples are presented.

NORWEGIAN GOVERNMENT OVERSIGHT

Norway’s regulation of the offshore oil and gas industry is presented as an example of a world-leading approach to government oversight and transparency. The Norwegian regulatory approach is widely recognized as an effective governance structure and is similar to the UK approach. While Norway’s regime focuses on offshore oil and gas exploration rather than shipping, many of the characteristics of this system could be applied to prevent ship-source oil spills through port and flag state controls

World-leading elements of the Norwegian oversight approach include:

- ✓ Operators have flexibility to meet government safety and prevention standards, but are held strictly accountable to their commitments
- ✓ Focus on leading indicators and near misses
- ✓ Governance approach to safety and prevention favors collaboration and dialogue but allows for punitive measures if needed
- ✓ Robust civil and criminal penalty structure for pollution
- ✓ Government audits and enforcement actions are transparent to industry and public
- ✓ Operators may be compelled to make data or studies that relate to safety of petroleum operations publicly available
- ✓ Government actively supports and participates in research and development and field testing of spill response technologies and capabilities

Considerations for modeling BC’s world-leading approach to oversight of marine oil spill prevention and response, based on the Norwegian example, include:

- ◇ Consider performance-based approach that sets measurable standards and allows some flexibility for compliance.
- ◇ Track near miss events and other leading indicators and tailor safety and prevention requirements to causality.
- ◇ Create a continuum of enforcement mechanisms that includes both civil and criminal penalties for oil spills or safety violations.
- ◇ Engage in cooperative research and development activities with industry.
- ◇ Operate transparently and require transparency from industry, including publication of studies, data, and other information of interest to the public and stakeholders.

CITIZENS ADVISORY COUNCILS IN ALASKA

The **Alaska Regional Citizens Advisory Councils** provide an example of world-leading citizen oversight systems that operate with sufficient funding and autonomy to maintain clear separation from both industry and regulators. This citizen oversight system operates with full transparency to the public they serve and to the industry that they oversee.

World-leading elements of the Alaska Regional Citizens Advisory Councils include:

- ✓ Member entities include range of regional stakeholder groups

- ✓ Clearly defined scope of activities tied to local oil operations
- ✓ Each council focuses on specific sub-region of Alaska
- ✓ Required by federal statute
- ✓ Funded by industry
- ✓ Ensures sustained citizen-level oversight as long as oil operations are underway

Considerations for modeling BC's world-leading approach to citizen oversight, based on the Alaska example, include:

- ◇ Create independent, autonomous councils with defined mission.
- ◇ Ensure broad representation of regional stakeholder interests.
- ◇ Allow participating entities to self-nominate representatives.
- ◇ Secure dedicated funding to allow Councils to undertake technical work and participate in planning and preparedness activities.

US OIL SPILL LIABILITY TRUST FUND

The **US Oil Spill Liability Trust Fund (OSLTF)** is an example of a world-leading oil spill response funding approach because it makes funding immediately accessible to federal response agencies for spill response with a high ceiling (US\$1 billion) for response costs and damages per incident. It also funds other agency activities related to oil spill preparedness and oversight. Several states have their own funds in place as well.

World-leading elements of the US OSLTF include:

- ✓ US\$50 million immediately accessible to federal response agencies for oil spill response
- ✓ Financial assurance in cases where responsible party is unknown or insolvent, or if liability caps are exceeded
- ✓ Can be accessed for oil spills and threatened oil spills
- ✓ Can be used for oil spill preparedness, response, damage assessment, or restoration
- ✓ Up to US\$1 billion available per incident
- ✓ Current fund contains approximately US\$4 billion
- ✓ Does not prevent future cost recovery actions; US government has recovered US\$1.2 billion of US\$1.67 expended to date (72%)

Considerations for modeling BC's world-leading approach to ensuring adequate funding is available for spill response and recovery, based on the US example, include:

- ◇ Evaluate fund reserves and per-incident limits to ensure that adequate funding is available to cover a worst case oil spill, based on a review of recent incident costs worldwide.
- ◇ Ensure that funding can be used for restoration and recovery activities.
- ◇ If adequate reserves exist, consider allocating funding to support preparedness and response activities.

Prevention and Response Measures as Barriers

This report uses a bowtie diagram (Figure 1) to illustrate how elements of oil spill prevention and response act as barriers between accidents or failures that may result in an oil spill.

At the center of the bowtie is an oil spill. To the left of the oil spill are all of the possible accidents, failures, or other events that may cause a spill to occur. The vertical green lines that run through the left side of the bowtie represent barriers in the form of **prevention measures** that may prevent an accident or failure from

causing an oil spill. When the prevention elements function as intended, they will interrupt the series of events that leads to an oil spill. To the right of the oil spill are the impacts or damages that are caused when a spill occurs. At this point, prevention has failed and the response system must be implemented. The vertical orange lines that run through the right side of the bowtie represent controls in the form of **response measures** that may reduce or mitigate the severity of the harm or impacts caused by an oil spill.

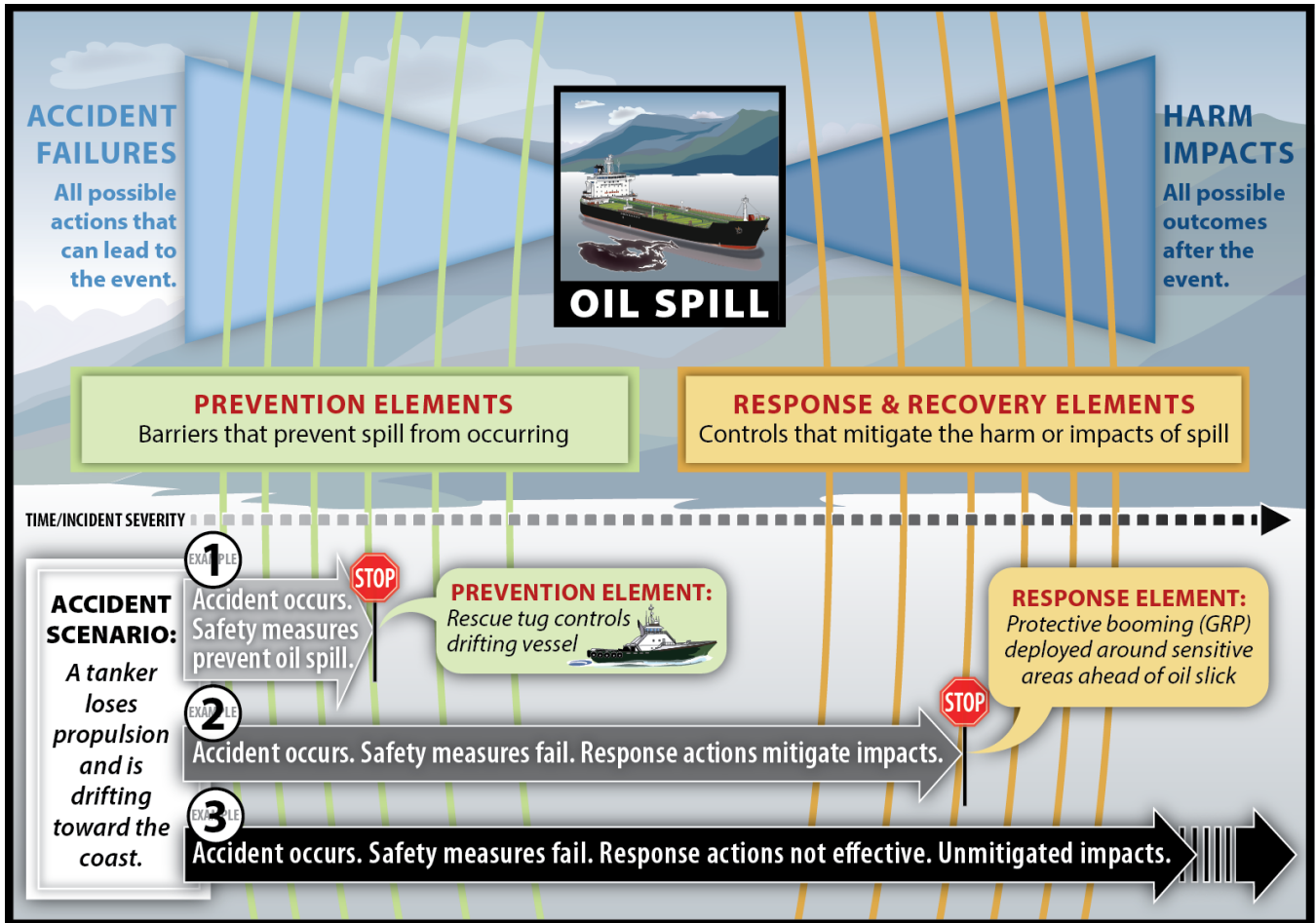


Figure 1. Hypothetical Oil Spill Scenario Showing how Prevention and Response Elements Interrupt Accident Chain

Figure 1 illustrates the importance of a balanced system that relies on a combination of prevention and response measures. A simple accident scenario is depicted: a tanker loses propulsion and is drifting toward the coast. Three variations are offered to show how different measures might influence the outcome. The first version (light gray arrow) shows a prevention element – in this case a rescue tug – controlling the drifting tanker before it hits the coastline, avoiding an oil spill. In the second version (dark gray arrow), no prevention measures are effective in preventing the tanker from grounding; it grounds and causes an oil spill. However, a response element – in this case, deployment of protective booms ahead of the oil slick – is effectively implemented and it reduces the harm caused by the spill by preventing the slick from reaching a high priority sensitive area. In the third version (black arrow), there are no successful prevention or response measures implemented. The oil spill occurs and the impacts are unmitigated.

Recommendations for a World-leading Marine Oil Spill Prevention, Preparedness, Response, and Recovery System in British Columbia

The report identifies several key concepts that are relevant to BC's aspiration for world-leading marine oil spill prevention and response and recommends that BC consider these elements in designing a world-leading regime:

1. World-leading marine oil spill prevention and response systems are **risk-based**; they continuously evaluate risks and tailor prevention and response measures accordingly. Prevention measures are informed by data from safety incidents and near-misses. Response capacity is tied to worst case oil spill scenarios. **BC can implement a risk-based approach by ensuring that oil spill prevention measures target those locations, activities, or conditions that present a high risk of oil spills and that response planning and preparedness is sufficient to manage the worst possible spill scenario, no matter how unlikely.**
2. World-leading marine oil spill prevention and response systems are **multi-layered**. They rely on a mosaic approach, with multiple layers of prevention and response in place. **A world-leading system in BC should include multiple layers of prevention and response.**
3. World-leading marine oil spill prevention and response systems take a **holistic approach** to balancing prevention and response. Marine oil spill prevention and response exist along a continuum and a world-leading system emphasizes prevention but still ensures that adequate response capacity is in place in the event that prevention systems fail. **A world-leading system in BC will balance prevention and response based on a system-wide analysis of potential incidents and consequences, rather than a piecemeal consideration of risk by project or location.**
4. World-leading marine oil spill prevention and response systems are built on a **collaborative approach**. While collaborative or consensus-based approaches can be more cumbersome than unilateral action, they often result in better outcomes. **BC's world-leading regime must bring together federal, provincial, local, and First Nation governments with industry and public interest groups to work collaboratively, build trust, and foster transparency.**
5. World-leading marine oil spill prevention and response systems create accountability within both government and industry. Accountability can be achieved through continuous examination of the system and its outcomes through auditing and oversight. **BC's world-leading regime must hold industry accountable to high standards, while government must be held accountable to stakeholders and the public at large.**
6. World-leading marine oil spill prevention and response systems strive for **continuous improvement**. World-leading regimes do not rest on their laurels; they try to continuously improve the level of spill prevention and response preparedness. **To realize a world-leading regime, BC must develop marine oil spill prevention and response initiatives with measurable objectives that can be used to evaluate program effectiveness and spur ongoing enhancements.**

With more complex, uncertain, or even ambiguous risks – such as major marine oil spills, which are low frequency high consequence incidents – the participation of scientific experts, stakeholders, and society at large in risk governance becomes more critical.

Next Steps

The province does not have direct jurisdiction over many of the issues involved in marine oil spill prevention and response; therefore implementation of a world-leading marine regime will require a broader effort that includes federal and international partners. There are a number of parallel efforts ongoing in Canada that relate to oil spill preparedness and response. As the BC government moves to implement a world-leading

marine oil spill system, there may be opportunities to synergize efforts with some of these other initiatives that are looking at similar issues.

The report stops short of assessing the present system in BC, but this may be a logical next step for BC. The elements of world-leading systems identified in this report and list of considerations for BC could be used to analyze gaps in the current system and frame the discussion of ongoing and potential new initiatives to achieve a world-leading marine oil spill regime. The six common characteristics identified through the examples in this report – risk-based, layered, holistic and balanced, accountability, collaboration, and continuous improvement – also inform the process. BC may also benefit from direct knowledge-sharing with some of the entities and governments profiled in this report, either through existing forums or by convening a workshop similar to the 2013 Land-Based Oil Spill Preparedness symposium.

CONTENTS

Executive Summary	i
Contents.....	i
1 Introduction.....	1
1.1 Purpose and Scope	1
1.2 Defining World-Leading Regulation and Practice.....	2
1.2.1 From World-class to World-Leading.....	2
1.2.2 World-Leading Examples	5
1.2.3 Modeling a British Columbia Marine Oil Spill Regime based on World-Leading Examples	5
1.3 Organization of this Report.....	5
2 World-leading Prevention Systems.....	6
2.1 Elements	6
2.1.1 Surpass International Standards.....	6
2.1.2 Vessel Traffic Monitoring and Management	6
2.1.3 Rescue and Salvage Capability	6
2.2 Marine Oil Spill Risk Assessment	7
2.2.1 Overview	7
2.2.2 World-leading Elements.....	7
2.2.3 Governance	11
2.2.4 Considerations for British Columbia	11
2.3 Internationally Recognized Areas to be Avoided	12
2.3.1 Overview	12
2.3.2 World-leading Elements.....	12
2.3.3 Governance	14
2.3.4 Considerations for British Columbia	14
2.4 Integrated Vessel Safety Initiatives	16
2.4.1 Overview	16
2.4.2 World-leading Elements.....	16
2.4.3 Governance	18
2.4.4 Considerations for British Columbia	18
2.5 Tanker Escort Systems.....	20
2.5.1 Overview	20
2.5.2 World-Leading Elements.....	20

2.5.3	Governance	21
2.5.4	Considerations for British Columbia	23
2.6	Port State Control	24
2.6.1	Overview	24
2.6.2	World-leading Elements.....	25
2.6.3	Governance	26
2.6.4	Considerations for British Columbia	26
2.7	Aerial Surveillance Programs.....	28
2.7.1	Overview	28
2.7.2	World-Leading Elements.....	28
2.7.3	Governance	30
2.7.4	Considerations for British Columbia	30
2.8	Marine Firefighting and Salvage Requirements	31
2.8.1	Overview	31
2.8.2	World-leading Elements.....	31
2.8.3	Governance	33
2.8.4	Considerations for British Columbia	33
3	World-leading Preparedness, Response, and Recovery	35
3.1	Introduction.....	35
3.1.1	Geographic planning and prioritization	35
3.1.2	Integrated contingency planning	35
3.1.3	Response Equipment and Capacity	35
3.1.4	Trained Responders.....	36
3.1.5	Restoration and Recovery from Oil Spill Damages	36
3.2	National Contingency Plan.....	37
3.2.1	Overview	37
3.2.2	World-leading Elements.....	38
3.2.3	Governance	40
3.2.4	Considerations for British Columbia	41
3.3	Oil Spill Response Planning Standards	42
3.3.1	Overview	42
3.3.2	World-leading Elements.....	42
3.3.3	Governance	45
3.3.4	Considerations for British Columbia	45

3.4	Planning for the Use of Alternative Response Technologies.....	46
3.4.1	Summary.....	46
3.4.2	World-leading Elements.....	46
3.4.3	Governance	49
3.4.4	Considerations for British Columbia	49
3.5	Geographic Response Planning	50
3.5.1	Overview	50
3.5.2	World-leading Elements.....	50
3.5.3	Governance	53
3.5.4	Considerations for British Columbia	53
3.6	Fishing Vessel Programs	55
3.6.1	Overview	55
3.6.2	World-Leading Elements.....	55
3.6.3	Governance	58
3.6.4	Considerations for British Columbia	58
3.7	Natural Resources Damage Assessment and Restoration.....	60
3.7.1	Overview	60
3.7.2	World-leading Elements.....	60
3.7.3	Governance	63
3.7.4	Considerations for British Columbia	63
4	System Elements and Approach.....	65
4.1	Introduction.....	65
4.1.1	Oversight and Transparency.....	65
4.1.2	Continuous Evaluation and Improvement.....	65
4.1.3	Financial assurance.....	65
4.2	Government Oversight and Transparency.....	66
4.2.1	Overview	66
4.2.2	World-Leading Elements.....	66
4.2.3	Governance	69
4.2.4	Considerations for British Columbia	69
4.3	Citizens Advisory Councils.....	71
4.3.1	Overview	71
4.3.2	World-leading Elements.....	71
4.3.3	Governance	73

4.3.4	Considerations for British Columbia	73
4.4	Oil Spill Liability Trust Fund	74
4.4.1	Overview	74
4.4.2	World-leading Elements.....	75
4.4.3	Governance	76
4.4.4	Considerations for British Columbia	76
5	Discussion	77
5.1	Applying the World-Leading Examples to British Columbia.....	77
5.1.1	Summary of World-Leading Examples.....	77
5.1.2	Adapting World-Leading Models in BC	77
5.1.3	Building a World-Leading Marine Oil Spill Prevention and Response System.....	77
5.2	Characteristics of World-leading Marine Oil Spill Prevention, Preparedness, Response, and Recovery Systems	79
5.2.1	Risk-Based Approach.....	79
5.2.2	Layered Prevention and Response Elements	79
5.2.3	Holistic and Balanced.....	80
5.2.4	Collaborative Approach.....	80
5.2.5	Accountability	81
5.2.6	Continuous Improvement	82
6	Conclusion.....	89
6.1	Recommendations for a World-Leading British Columbia Marine Oil Spill Prevention and Response System.....	89
6.2	Next Steps.....	90
7	References.....	92
7.1	Interviews and Personal Communications	92
7.2	Literature Cited	92
8	Acronyms and Abbreviations.....	108

MARINE OIL SPILL PREVENTION, PREPAREDNESS, RESPONSE AND RECOVERY

WORLD-LEADING APPROACHES FROM SELECT JURISDICTIONS

October 2015 Report to British Columbia Ministry of Environment

1 INTRODUCTION

Nuka Research and Planning Group, LLC (Nuka Research) prepared this report for the British Columbia (BC) Ministry of Environment (Ministry) to update Volume 3 of the 2013 West Coast Spill Response Study (Nuka Research, 2013b). The 2013 study identified eleven key elements of a world-class marine oil spill prevention and response system, based on a broad scan of worldwide policy and practice. This report builds on the 2013 world-class study by identifying and describing practices, programs, and requirements in place today that the authors regard as world-leading because they exemplify a combination of the world-class elements described in the 2013 report.

1.1 Purpose and Scope

The Province of British Columbia seeks a world-leading marine oil spill response, prevention, and recovery systems along the west coast of Canada (BC Newsroom, 2012a). The purpose of this report is to provide the Ministry with examples of specific laws, regulations, policies and practices in place across the globe that stand out among world-class approaches to oil spill prevention, preparedness, response, and recovery.

The Ministry specified that this study should include: United States (US) federal agencies and west coast states; Canadian federal agencies and provinces; Europe, including the European Union (EU), individual countries, and Scandinavian/Baltic States; the United Kingdom (UK); and Australia. These jurisdictions were selected based on preliminary research conducted during the 2013 study (Nuka Research, 2013b) supplemented with a scan of professional literature and the authors' firsthand knowledge and experience as practitioners of oil spill prevention and response planning.

This report only considers **fully enacted** measures and does not present any examples of laws, regulations, programs, or practices that are pending or proposed.

This report focuses on marine oil spill prevention and response from vessels and shore side facilities, since these operations occur off the coast of British Columbia. However, some of the examples cited come from jurisdictions where marine oil spills may also occur from offshore oil and gas production activities. Such cases are duly noted in the text, and the implications of transferring the example to a ship-source spill regime are discussed where relevant.

In any system where oil is produced, transported, processed, or stored, oil spills can and will occur. This study highlights world-leading efforts across North America, Europe, and Australia to reduce the likelihood of a spill occurring (prevention) and mitigate the consequences of a spill if one does occur (response and recovery).

This report does not specifically analyze Canada’s present or future marine oil spill risks, but the presumption that underlies this study and that drives the Province of British Columbia’s concerns regarding marine oil spill readiness is that in any system where oil is produced, transported, processed, or stored, oil spills can and will occur. This study focuses on those activities that can be undertaken to reduce the likelihood of a spill occurring (prevention) and mitigate the consequences of a spill if one does occur (response and recovery).

1.2 Defining World-Leading Regulation and Practice

1.2.1 FROM WORLD-CLASS TO WORLD-LEADING

Volume 3 of the West Coast Spills Study, commissioned by the BC government, identified eleven key features – or elements – of world-class marine oil spill prevention and response systems, which are divided into three main categories: Prevention, Preparedness and Response, and System Elements (Nuka Research, 2013b). Figure 1.2 lists those elements, which provide the foundation for the discussion of world-leading systems in this report.

World-class: being of the highest caliber in the world.

(Merriam-Webster dictionary)

The federal government also released a report in 2013 that included recommendations for strengthening oil tanker safety in order to achieve a world-class tanker safety regime. The Tanker Safety Expert Panel report identifies 45 recommendations to strengthen oil spill prevention, response, and liability systems in Canada (Government of Canada, 2014; Transport Canada, 2013a; Transport Canada, 2013b). Many of the recommendations in the 2013 federal government report align with the world-class elements identified in the West Coast Spills Study.

The BC government established the expectation for “world-leading” oil spill preparedness and response in 2012 with the introduction of five minimum requirements for the province to consider any new projects transporting or storing heavy oil. Two of these conditions rely on world-leading regimes:

- World-leading practices for land oil spill prevention, preparedness, response, and recovery systems to manage and mitigate the risks and costs of heavy oil pipelines
- World-leading marine oil spill prevention, preparedness, response, and recovery systems for BC’s coastline and ocean to manage and mitigate the risks and costs of heavy oil pipelines and shipments

World-leading Land-based Oil Spill Regime

The BC Ministry of Environment has taken the lead on establishing a world-leading **land-based** oil spill prevention, preparedness, response, and recovery system within the province. Two intentions papers were published; the first established a general conceptual model and the second identified specific components of a world-leading system (BC Ministry of Environment, 2014; BC Ministry of Environment, 2012). The province sought public feedback and consultation on both intentions papers, and also held a symposium where spill response experts, regulators, industry, and practitioners engaged in dialogue to identify world-leading elements and systems (Rankin and Associates, 2013). One of the first tangible outcomes of this process is the creation of a new Preparedness and Response Organization (PRO) that will be in place by 2017 to implement land-based spill response in British Columbia. The BC government continues to work on related initiatives to continue to improve land-based spill prevention and response in order to achieve a world-leading system (Nagel, 2015).

World-leading Marine Oil Spill Regime

For **marine** oil spill prevention, preparedness, response, and recovery, the BC government’s aspiration for a world-leading system relies on initiatives that are largely beyond provincial jurisdiction. The regulatory and governance system for marine oil spills along Canada’s west coast relies on a network of international, federal, provincial, and local regulatory and response authorities (Nuka Research, 2013a). This report links the elements in the 2013 world-class report (Figure 1.2) to the BC government’s aspiration for world-leading

marine oil spill prevention, preparedness, response, and recovery by presenting ***specific examples from select jurisdictions*** of world-leading systems in place today that the governments of BC and Canada may look to as model approaches.

Features of a World-Class Marine Spill Prevention and Response System

PREVENTION ELEMENTS

- 1. Vessel operations surpass international safety and spill prevention standards**
 - Vessels meet or surpass international requirements
 - Vessels operate within a corporate safety culture that goes beyond compliance
- 2. Vessel traffic is monitored and, in higher risk areas, actively managed to prevent accidents**
 - Vessel movement data is compiled and archived for analysis
 - Vessel traffic is actively managed in high-risk areas
 - Marine pilots are required for large vessels transiting certain waterways
 - Escort vessels accompany certain vessels in high-risk operating areas
- 3. Rescue and salvage resources are able to be on-scene quickly enough to be effective in the event of an incident or spill**
 - Emergency towing resources are available for rapid deployment
 - Marine firefighting resources are available for rapid deployment
 - Salvage resources are available for deployment as needed to be effective
 - Potential places of refuge are identified in advance

PREPAREDNESS & RESPONSE ELEMENTS

- 4. Geographic areas are prioritized for protection from oil spills**
 - Marine and coastal resources are inventoried
 - A process is in place to prioritize areas for spill protection
 - Areas to be avoided are established as appropriate
 - Geographic response plans are developed as appropriate
- 5. Contingency planning is comprehensive, integrated, and well understood by all relevant parties**
 - Planning is integrated across jurisdictions and sectors
 - Contingency plans address all major spill response functions
 - Response planning standards ensure sufficient response capacity to respond to a worst-case spill
 - Response operating limits are identified and mitigation measures established
 - Operational tactics are defined
- 6. Sufficient equipment can be deployed quickly to respond to a worst-case spill**
 - Response inventories are up-to-date, accessible, and accurate; resources are tracked during a response
 - Response caches are strategically located, stocked, and maintained
 - Equipment is the best available for the operating environments, environmental conditions, and potential spilled substances
 - Logistical support is in place to support the response
 - Spills can be detected, tracked, and modeled as needed to perform the response
- 7. Sufficient personnel are available to respond to a worst-case spill**
 - Trained responders are available to staff a significant, prolonged response
 - All responders and response managers use the same incident management system
 - Responders are well-trained and regularly exercised
 - Volunteers are managed to maximize their effectiveness
- 8. A process is in place to restore damaged resources and promote ecosystem recovery after a spill**

SYSTEM ELEMENTS

- 9. Government ensures compliance and transparency**
 - Government authorities review and audit industry contingency plans
 - Other stakeholders are actively engaged
 - Effective enforcement mechanisms are in place
- 10. All parties actively pursue continuous improvement through research and development and the testing of planning assumptions**
 - A research and development program is in place
 - Planning assumptions are verified through drills and exercises, and plans are updated to reflect lessons learned
 - Incident reviews support continuous improvement
 - Data on spill causality and "near misses" are compiled, analyzed, and used to inform changes to systems
- 11. Financial mechanisms and resources meet needs from initiating the response through recovery**
 - Sufficient funds are available from industry and/or government to fully implement planning, response, and recovery
 - Fair compensation is awarded for environmental, fiscal, and/or social impacts

Figure 1.2. Features of a World-Class Marine Oil Spill Prevention and Response System

1.2.2 WORLD-LEADING EXAMPLES

This report presents a set of examples of specific systems or practices in place in North America, Europe, and Australia that represent a world-leading approach to marine oil spill prevention and response. These examples were identified using a combination of qualitative assessment methods, including literature review, informal and formal interviews with knowledgeable experts, and primary review and analysis of statutes, regulations, guidance, and program documents.

The examples of world-leading marine oil spill prevention, preparedness, and response systems that are included in this report illustrate a range of practices in place at different levels of authority and do not necessarily represent the single best approach.

These world-leading examples incorporate one or more of the eleven world-class elements listed in Figure 1.2 and are distinguished by specific features that could be adapted or applied by other jurisdictions seeking to enhance their marine oil spill prevention, preparedness, response, and recovery regimes. The examples cover a range of practices from different levels of authority that were selected as illustrations; they do not necessarily represent the **single best** approach.

1.2.3 MODELING A BRITISH COLUMBIA MARINE OIL SPILL REGIME BASED ON WORLD-LEADING EXAMPLES

Each element includes an in-depth profile of a single example of a world-leading approach, and highlights considerations for modeling a world-leading system within BC. The world-leading examples described in this report include a discussion of both the **jurisdictional authorities** and the **governance framework** for each example. In this context, jurisdictional authorities describe the oversight and enforcement agencies with authority over specific laws, regulations, or doctrine. Governance is used to describe a broader coalition, recognizing that the strength in many world-leading systems is rooted in a layered or “mosaic” approach where safety and risk mitigation systems rely on a collaborative process inclusive of government, industry, academia, stakeholders, and the public at large (Lindøe, et al., 2013; Renn and Graham, 2005). Both elements contribute to the oversight of marine oil spill prevention, preparedness, response, and recovery.

This report does not attempt to score or evaluate the current system in BC against these world-leading models and the authors recognize that the examples presented may not necessarily transfer directly to BC because of differences in legal and regulatory frameworks, governance approaches, and risk tolerance.

There are a number of dialogues that are ongoing along the west coast (e.g. Tanker Safety Expert Panel initiatives, enhancement to oil spill response equipment stockpiles in some regions, Area Planning pilot projects) that may be informed by these examples of world-leading oil spill prevention, preparedness, and response.

1.3 Organization of this Report

The 2013 report divided world-class features into three categories: (1) prevention elements; (2) preparedness and response elements; and (3) system elements. This follow-up study uses the same three categories to organize the discussion.

Sections 2 through 4 provide descriptions about each example, including a brief summary of the key elements, a concise list of the rationale for including the example among world-leading oil spill prevention, preparedness, response, and recovery, and a description of the governance system and jurisdictional authorities that compel each example. Section 2 presents examples that are primarily focused on marine oil spill prevention, Section 3 presents examples that are primarily focused on marine oil spill preparedness, response, and recovery, and Section 4 presents examples that represent the system elements.

Section 5 describes how prevention and response elements work together to reduce oil spill risks and discusses common themes across world-leading regimes. Section 6 presents a brief conclusion with recommendations to the BC government for how this study may be applied to their goal of establishing a world-leading marine oil spill prevention, preparedness, and response regime.

2 WORLD-LEADING PREVENTION SYSTEMS

2.1 Elements

Oil spill prevention measures provide a barrier to stop an accident or error from resulting in an oil spill. The 2013 study identified three common elements of world-class marine oil spill prevention: (1) vessel operations surpass international safety and spill prevention standards; (2) vessel traffic is monitored and, in higher risk areas, actively managed to prevent accidents; and (3) rescue and salvage resources are able to be on-scene quickly enough to be effective in the event of an incident or spill. The world-leading prevention examples presented in Sections 2.2 through 2.9 incorporate one or more of these world-class prevention elements. They also incorporate some of the system elements discussed in Section 4.

2.1.1 SURPASS INTERNATIONAL STANDARDS

The International Maritime Organization (IMO), which is the global standard-setting authority for the safety, security, and environmental performance of international shipping, establishes and oversees a framework for the shipping industry. The IMO aims to level the playing field of international shipping; however, the implementation and enforcement of IMO initiatives relies on national authorities.

World-class shipping safety and spill prevention systems are full and active participants in the IMO process. World-leading systems build on IMO standards using a range of mechanisms to encourage or compel safe vessel operations and reduce the risk of marine oil spills. In this section, examples from Australia, Europe, the US, and Canada are provided to illustrate approaches that utilize a range of governance structures to create additional layers of safety and spill prevention above the international baseline.

2.1.2 VESSEL TRAFFIC MONITORING AND MANAGEMENT

Vessel traffic monitoring and control is a common practice in most large ports and high traffic waterways. International law requires most large ocean-going vessels to have Automated Identification System (AIS) transponders, allowing their route, speed, and other information to be monitored real-time and recorded for subsequent analysis (IMO, 2003b).

World-class vessel traffic monitoring and management systems track and manage vessel movements in high traffic areas. World-leading systems utilize real-time vessel movement data to evaluate the risks posed by specific vessels or transits and take actions to mitigate risks while the vessel operates in territorial waters. World-leading systems will expand vessel tracking to proactively identify vessels that may require assistance or those that may be following unusual and potentially hazardous tracks. World-leading regimes continually evaluate the adequacy of existing risk reduction measures and anticipate future changes to vessel traffic and patterns in order to identify when or where additional safety precautions are warranted to offset increased risks.

2.1.3 RESCUE AND SALVAGE CAPABILITY

When a vessel suffers a casualty, preventing that incident from resulting in an oil spill requires quick and informed decision-making and the immediate deployment of personnel and equipment to control the vessel and minimize the damage. Once an accident has occurred, lightering remaining cargo or fuel from the damaged vessel and other types of salvage operations can be critical to mitigating the pollution impact.

World-class rescue and salvage systems have planning and resources in place to enhance the capability to rescue or assist distressed vessels. World-leading systems have dedicated resources strategically placed to render assistance in areas where the likelihood of marine accidents is high or the potential consequences of an incident are severe. World-leading systems incorporate rescue and salvage capability – including dedicated rescue tugs, emergency towing capability, marine firefighting resources, and salvage assets – into the overall marine safety and spill prevention regime.

2.2 Marine Oil Spill Risk Assessment

World-leading marine oil spill risk assessments systematically evaluate geographic or system-wide risks and tailor risk reduction and spill prevention measures to mitigate or reduce those risks.

The **Aleutian Islands Risk Assessment** is an example of a world-leading approach to comprehensive assessment of marine transportation risks within a specific geographic region.

2.2.1 OVERVIEW

The US Aleutian Islands Risk Assessment is one example of multi-stakeholder risk assessment focused on vessel traffic in a particular area. In 2008, the Transportation Research Board (TRB) of the US

National Academies recommended a risk assessment process designed to identify measures to reduce oil spills from maritime operations in Alaska's Aleutian Islands (TRB, 2008). The approach incorporates a combination of technical analysis and input from diverse stakeholders who have experience with, or interest in, maritime operations in the region and the resources that may be impacted by an oil spill. A Management Team oversaw the project, with input from an Advisory Panel and review of key deliverables by a Peer Review Panel. Public input was also invited.

The risk assessment focused on the Alaska Peninsula and Aleutian Island archipelago. This large and distinct geographic region has a mix of local vessel traffic engaged in commercial operations among the Islands and fishing and deep draft vessels in transit throughout. The assessment focused on vessels 300 GT or larger and those with at least 10,000 gallons of fuel capacity (Wolniakowski et al., 2011).

The risk assessment was conducted in two phases, beginning with analyses of vessel traffic and consequences of an oil spill in the Aleutian Islands. The project concluded in 2015 with near-consensus on the recommendations for an optimal response system for the Aleutian Islands (Nuka Research, 2015), routing measures for vessels transiting the region that were approved by the IMO (see Section 2.3), and updates to the government Subarea Contingency Plan, including additional Geographic Response Strategies and updated information on Potential Places of Refuge for stricken vessels.

2.2.2 WORLD-LEADING ELEMENTS

There are many valid approaches to marine risk assessment. The Aleutian Island Risk Assessment's stakeholder-driven approach sought to combine the benefit of local knowledge with technical analyses conducted by expert consultants.

Incorporation of Diverse Stakeholders and Local Knowledge

The Aleutian Islands Risk Assessment was led by a multi-agency Management Team with active engagement of an Advisory Panel that represented a range of stakeholders: fisheries, local government, marine industry (pilots; salvors; container ships; international shipping; oil tankers and barges; local traffic), non-governmental organizations (environmental, local), natural resource managers, and subsistence users. Members all had first-hand knowledge of the study area to contribute to the project, including local infrastructure, relevant industries, waterways and their navigation, weather, fisheries, subsistence use, and wildlife. When possible, the Management Team and Advisory Panel reviewed and agreed on assumptions or other study inputs prior to one of the many technical analyses conducted as part of the project.

What makes the Aleutian Islands Risk Assessment World-Leading?

- Evaluate marine transportation risks within a specific geographic region
- Combines technical analysis with stakeholder input and independent oversight
- Funded through direct funds from plea agreement for oil spill in Aleutian Islands
- Resulted in tangible, consensus-based recommendation for optimal response system
- Included cost analysis and recommended funding and management mechanisms

The Peer Review Panel reviewed and commented on deliverables at the end of each of the two phases of the project. This group was selected for its high level expertise in risk assessment and related technical areas. Members did not necessarily have direct experience with the study area outside the project. While the Advisory Panel was engaged in providing input throughout the project and worked to achieve consensus wherever possible, the Peer Review Panel provided independent review and comment on deliverables at the end of each project phase.

Wide Range of Technical Analysis

The Management Team and Advisory Panel benefitted from extensive technical information and analysis ranging from a vessel traffic analysis at the start of the project to a benefit-cost analysis of the recommended optimal response system at the end (DNV & ERM-West, Inc., 2010; Northern Economics, 2014). Technical input was delivered to the Management Team and Advisory Panel by a team of consultants who completed 20 studies on topics including: accident scenarios, oil spill probability and consequence analyses; weather and environmental conditions; several tug capability analyses; and an oil spill response gap analysis. The Management Team and Advisory Panel were regularly briefed on study progress and results to ensure that everyone understood the material and had the opportunity to ask questions.

In Phase A, analysis followed a process clearly outlined by the TRB that focused on quantifying risks associated with vessel traffic in the region. In Phase B, the analyses were much more driven by informing the further consideration of priority recommended risk reduction options under consideration by the Management Team and Advisory Panel. These analyses focused on the availability of tugs of opportunity in the area (and variations with season or location), characteristics of a rescue tug suited to the environmental conditions in the region, the geographic area in which a tug could be expected to be able to achieve a save depending on its home port, and a benefit-cost analysis. Technical input was also provided on salvage, oil spill response, vessel routing, and the management and funding of spill response-related organizations.

All technical reports were made public, and major reports included public review and comment periods (AIRA, 2015). Figure 2.1 shows how the inter-related technical analyses fed into the final recommendations for an optimal response system (Nuka Research, 2015).

Optimal Response System and Funding Mechanism

The Aleutian Islands risk assessment yielded a set of concrete recommendations for optimal oil spill prevention and response capability in the region. The recommended system includes a comprehensive set of complementary prevention and response measures and also provided estimated implementation costs. The risk assessment also recommended a funding and management approach to implement key recommendations. The response system recommendation included a funding mechanism where large vessel operators subject to US regulations paid for most of the costs, with a subsidy by the US government to cover vessels engaged in innocent passage that are not subject to US oil spill contingency planning laws. With a one-time appropriation by the US government of US\$15.1 million, the per-vessel cost for implementing the optimal response system was estimated at US\$13,000/year (Nuka Research, 2015).

Figure 2.2 shows a conceptual diagram of the recommended optimal response system and estimated annual costs.

OPERATING ENVIRONMENT

Characterizing Environmental Conditions in the Aleutian Islands

- Summarizes weather data used in Response Gap Analysis and Towing Analyses.

Impact of Environmental Conditions on Vessel Incident Response in the Aleutian Islands: A Response Gap Analysis

- Characterizes how often environmental conditions alone would preclude or significantly impede a range of emergency and oil spill response operations in the region.

REGULATORY REQUIREMENTS

Regulatory Resource Study

- Summarizes U.S. and Alaska regulations.
- Estimates cost of compliance.

VESSEL TRAFFIC

2012 Transits of Unimak Pass

- Updates Phase A vessel traffic study.
- Estimates innocent passage vessel transits.
- Informs per-vessel cost estimates.

CONTEXT CONTEXT CONTEXT CONTEXT

OPTIMAL RESPONSE SYSTEM ELEMENTS

EMERGENCY TOWING

Minimum Required Tug Studies

- 2013 study calculates minimum tug bollard pull needed to control representative vessel based on 2010 traffic data.
- 2014 study updates calculation for 75th percentile containership based on 2012 data.

Tug of Opportunity Study

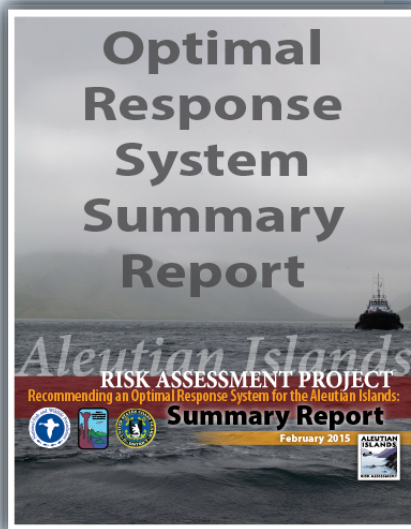
- Calculates the ability of tugs of opportunity in the region to reach various scenario locations and rescue a large ship.

Purpose Designed Towing Vessel

- Presents design and cost estimate for towing vessel intended to maximize features such as speed and seakeeping for Aleutian Islands operations.

Estimated Response Times for Tugs of Opportunity in the Aleutians

- Evaluates availability, capability, and response time for tugs of opportunity to assist 75th percentile containership at various scenario locations based on 2012 tug location data.



Best Available Technology

- Identifies best available technology tugs based on review of existing vessels and set of criteria applicable to Aleutian Islands.

Tug Location Study

- Presents geographic areas that can or cannot be reached by tugs based at different locations in the Aleutian Island.

SPILL RESPONSE & SALVAGE

Considering Options for Salvage & Oil Spill Response in Optimal Response System

- Describes approach used to identify spill response and salvage resources and system components for recommended system.

BENEFITS, COSTS, & IMPLEMENTATION

Benefit-cost Analysis of Risk Reduction Options

- Analyzes predicted benefits and costs and concludes that predicted benefits of proposed system will exceed costs of system implementation.

Considering Options for the Management & Funding of an Optimal Response System

- Describes approach used to identify nonprofit model for recommended system.

Figure 2.1. Aleutian Islands Technical Analyses Supported Optimal Response System Recommendations (Nuka Research, 2015)

Optimal Response System for the Aleutian Islands

The recommended system builds a cohesive response capacity tailored to the remote Aleutian environment and vessel traffic. The overall system is managed by a non-profit organization controlled by members comprised of vessel operators transiting the Aleutians. The system incorporates a set of coordinated risk reduction measures at each stage of the accident chain.

Cascade of Response Services



SYSTEM COMPONENTS

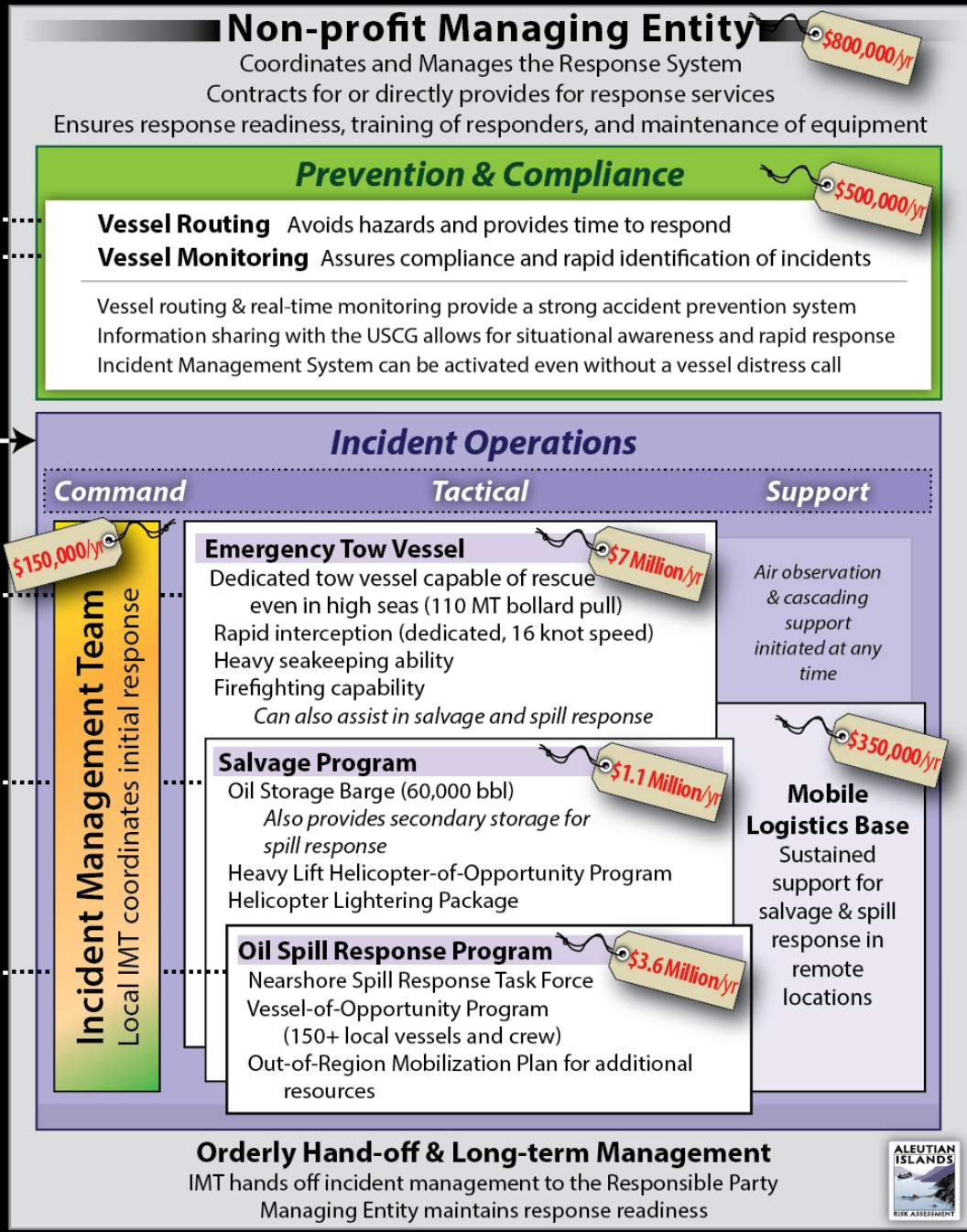


Figure 2.2. Aleutian Islands Risk Assessment Outcome: Recommended Optimal Response System with estimated annual operating costs

2.2.3 GOVERNANCE

The Aleutian Islands Risk Assessment was funded by settlement funds (US\$3 million) from the 2004 M/V *Selendang Ayu* grounding and oil spill (TRB, 2008). The US National Fish and Wildlife Foundation managed the funds. The project was governed at two levels: (1) a contract between the National Fish and Wildlife Foundation (the funder) and the facilitation consultants and other analysts dictated the activities and timeline generally; and (2) a Management Team approved a work plan at the start of each phase of the project and provided guidance throughout the project. The Management Team consisted of the National Fish and Wildlife Foundation, Alaska Department of Environmental Conservation, and US Coast Guard. This group had ultimate project control.

All project entities were convened for the purposes of this project only. They were disbanded at the conclusion of the project.

2.2.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the Aleutian Islands Risk Assessment as a world-leading approach to oil spill prevention and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

<i>Considerations for Modeling BC's World-leading Approach based on Aleutian Islands Risk Assessment</i>	
Summary of Aleutian Islands Risk Assessment	The Aleutian Islands Risk Assessment applied a methodology vetted by the US National Academies to combine local knowledge and outside technical expertise to consider vessel traffic risks and analyze risk reduction options. The outcome was an Optimal Response System that included a suite of prevention measures designed to mitigate local risks.
World-Leading Elements	<ul style="list-style-type: none"> ✓ Evaluating marine transportation risks within a specific geographic region ✓ Combining technical analysis with stakeholder input and independent oversight ✓ Funding through direct funds from plea agreement for oil spill in Aleutian Islands ✓ Resulting in tangible, consensus-based recommendation for optimal response system ✓ Including cost analysis and recommended funding and management mechanisms
Jurisdiction(s) and Authorities	Funded through a plea agreement by the responsible party for the 2004 grounding of the M/V <i>Selendang Ayu</i> in the Aleutian Islands pursuant to USSG Sec 8B1.3 and 18 USC 35553(a). The US National Fish and Wildlife Foundation dispensed the settlement funds and oversaw project implementation in coordination with state and federal agencies.
Governance framework	A Management Team consisting of the US National Fish and Wildlife Foundation, Alaska Department of Environmental Conservation, and US Coast Guard oversaw the project within the general framework provided by the funding agreement. The Transportation Research Board of the US National Academies recommended the project structure and provided peer review for several of the reports produced during the risk assessment.
Considerations for BC	<ul style="list-style-type: none"> ◇ Conduct a multi-jurisdictional marine oil spill risk assessment that combines technical analysis with stakeholder, government, and industry input. ◇ Evaluate marine oil spill threats based on historic and projected vessel movements along entire BC coast, including risk of spills from cargo and fuel tanks. ◇ Evaluate potential consequences of marine oil spills with stakeholder and public input. ◇ Link marine oil spill prevention initiatives to identified risks; prioritize based on both threats and consequences. ◇ Specify implementation process - mechanism, timeline, responsibility, costs, etc. – when evaluating risk reduction options.

2.3 Internationally Recognized Areas to be Avoided

There are different ways to designate a coastal or marine area to direct or suggest that vessel operators should modify their transit to reduce the risk of accidents or oil spills. In order to protect an area from all vessel traffic – including international vessels traveling through the area – special designations must be established through the International Maritime Organization.

Two examples from US Pacific states show how the establishment of **Internationally Recognized Areas to be Avoided (ATBA)** provides a world-leading mechanism to influence the routing of international vessel traffic.

2.3.1 OVERVIEW

Vessel routing includes the designation of traffic separation schemes, sea lanes, no-anchoring areas, areas to be avoided (ATBA), and other similar measures (IMO, 2015c). While the first routing measures were put in place for heavily trafficked port areas with the goal of reducing collisions, the designation of ATBA for environmental protection has become increasingly common (Roberts, 2005). ATBA can help to ensure that vessels stay far enough offshore to facilitate a rescue if one is needed, or avoid environmentally sensitive areas where the consequences of an accident may be particularly significant.

The IMO has two mechanisms to establish ATBA and other routing measures: stand-alone routing measures or routing measures established in conjunction with a Particularly Sensitive Sea Area (PSSA). Examples from Hawaii and Alaska are used to illustrate how two different, but related, approaches achieve world-leading oil spill prevention in the Pacific Ocean.

The IMO recognized the Papahānaumokuākea National Marine Monument in Hawaii as a PSSA in 2008. Two protective measures are associated with the PSSA – the ATBA and a ship reporting system (NOAA, 2008). In June 2015, the IMO approved ATBA around the Aleutian Islands, with routes designated through select passes (IMO, 2015a). These were put forward by the US government as a stand-alone measure not associated with a PSSA. In both Hawaii and Alaska, the ATBA extend 50 nm (92.6 km) offshore of the islands.

2.3.2 WORLD-LEADING ELEMENTS

Two examples from the US Pacific Ocean are presented to illustrate the world-leading elements of an ATBA. Both examples focus on remote island regions vulnerable to potential impacts from international vessel traffic traveling along a great circle route between western North America and East Asia (Franklin, 2008; Nuka Research, 2014).

Enhance Protection of Areas Vulnerable to Risks from International Vessel Traffic

Routing measures that aim to exclude vessels from certain sea areas add an additional layer of protection that encompasses international vessel traffic. In Hawaii, the US government had already designated the area as a National Marine Monument and established ATBA around the northwestern Hawaiian Islands, which were expanded through the PSSA. In Alaska, there have been routing measures in place for tankers subject to US spill response regulations since 2011, and for non-tank vessels subject to US spill response regulations since

What makes Internationally Recognized Areas to be Avoided World-Leading?

- Enhance protection of areas vulnerable to risks from international vessel traffic
- Applicable to vessels of a certain class, regardless of flag state or voyage route
- Included on international charts for clear message to all mariners
- Compels flag states and coastal states to monitor compliance

those regulations took effect in January 2014.¹ The newly designated ATBA extends to vessels in innocent passage that are not subject to US oil spill response planning jurisdiction.

Figure 2.3 shows the ATBA in Hawaii and the Aleutian Islands.² In both places, the US government’s proposal to the IMO cited the reasons why the areas warranted protection, the intended impact of the routing measures, and the reasons why the measures would not be burdensome on the shipping industry (MEPC, 2008; NCSR, 2014). In the case of a PSSA such as the one in Hawaii, a coastal state’s proposal to the IMO must explain why the area is important ecologically, culturally, or economically; how it is vulnerable to impacts of international shipping; and how an established IMO protective measure – such as a routing measure – will be effective in reducing or mitigating impacts (IMO, 2006).

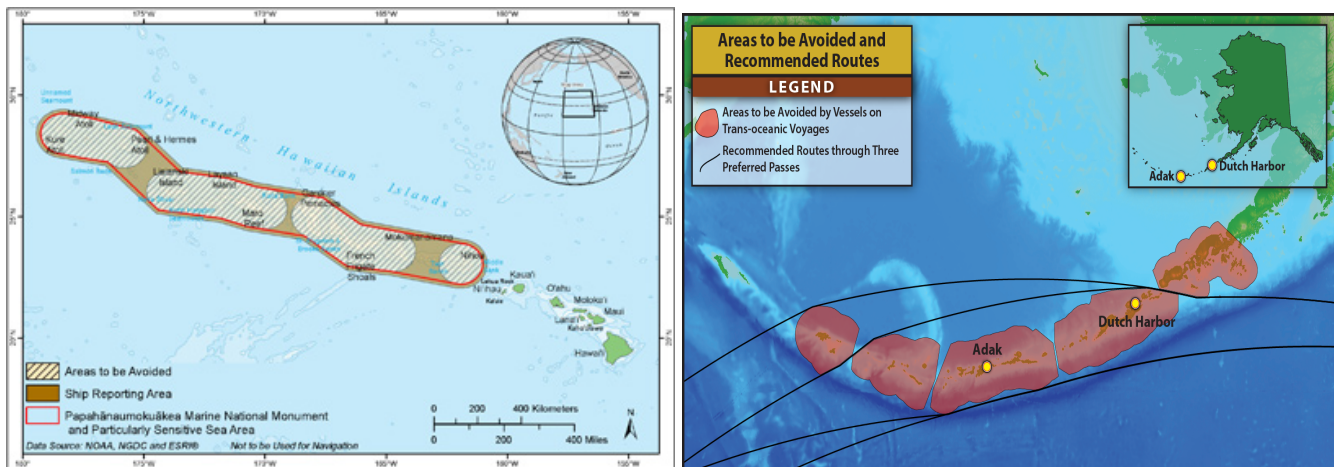


Figure 2.3. Areas to Be Avoided in Hawaii (Left) and Aleutian Islands (right)

Applicable to All Vessels of a Certain Class

An ATBA recognized by the IMO will apply to vessels regardless of flag state or voyage (including vessels in innocent passage). In both Hawaii and Alaska, the ATBA apply to deep draft vessels such as tankers, containerships, and bulkers in transit through the area; they do not limit vessels engaged in fishing activities or local trade. In Hawaii, the ATBA apply to all vessels in transit (MEPC, 2008). In the Aleutian Islands, the ATBA apply to vessels of 400 GT or larger that are passing through the region using the Northern (Bering Sea) and Southern (North Pacific) Great Circle Routes (NCSR, 2014).

International Charting with Flag and Coastal State Compliance Monitoring

All IMO-approved routing measures are noted on international charts. This is a responsibility of IMO member states once the ATBA or other routing measure is approved by the IMO. Routing information is also included in the most recently published *Ship’s Routeing* publication (IMO, 1998).

The Convention on the Safety of Life at Sea (SOLAS) [Regulation V.8(g)] states that governments “shall adhere to the measures adopted by the (IMO) concerning ships’ routeing [sic]. They shall promulgate all information necessary for the safe and effective use of adopted ships’ routeing systems. A government or governments concerned may monitor traffic in those systems. Contracting governments will do everything in their power to secure the appropriate use of ships’ routeing.”

¹ These routing measures were established as an alternative to compliance with federal oil spill prevention and response

² Aleutian Islands requirements were enacted in June 2015 and take force in January 2016.

Despite this strong direction from the IMO, the two ATBA examples cited are still technically only “recommendatory” for vessels that are not flagged to the US (or other coastal state in which they are located), or are not traveling to or from a US port. However, ATBA establish an internationally recognized standard of care and provide a mechanism for the coastal state – in these examples, the US – to take any issues or concerns about a vessel’s route to the flag state (S. Altman, personal communication, June 23, 2015). SOLAS provides for mandatory routing, but there is only one such measure in place globally and it is not an ATBA (IMO, 1998).

Before the Aleutian Islands ATBA was established, international vessel traffic along the Great Circle Route were not restricted to specific routes. This vessel transited within half a mile of shore in Etienne Bay. The ATBA will require vessels transiting the Aleutian Island chain to stay 50nm offshore.

Photo: Jeff Williams, USFWS



2.3.3 GOVERNANCE

Even while respecting the right of vessels from other countries to transit its waters,³ a coastal state may impose limited restrictions on those vessels’ activities for the purpose of environmental protection. The IMO reviews applications from coastal states to establish routing measured or Particularly Sensitive Sea Areas. Once approved by the IMO, member states are responsible for ensuring that vessels comply. The coastal state that sponsors the routing measure can enact its own implementing laws to define enforcement of the actions of its own flagged vessels or vessels visiting its ports. Other flag states are responsible for ensuring that their vessels comply with the measures. Vessel monitoring as discussed in Section 2.4 can be applied to enhance compliance oversight.

While the IMO is the only international body that can establish routing measures, per SOLAS, it cannot do so unless the appropriate coastal states are in agreement with the measure. The General Provision on Ships’ Routing describes the considerations that the IMO will weigh when evaluating a proposed routing measure (IMO, 2003a). These may include whether the routing measure can be expected to achieve the desired protection (of the environment, for example), the burden to the shipping industry, and the quality of information about the area that is available, such as oceanographic surveys and the use of navigational aids.

2.3.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the two US examples as world-leading approaches to establishing ATBA and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC’s World-leading Marine Oil Spill System based on US ATBA Examples

Summary of US ATBA examples	The world-leading designation and implementation of an ATBA begins at the international level through the IMO when international vessel traffic is of concern. ATBA are designed around specific areas based either on their hazards, challenges to rescue, or sensitivity, and may or may not be associated with a Particularly Sensitive Sea Area or other marine protected area designation (for example, at the national level).
World-Leading Elements	<ul style="list-style-type: none"> ✓ Enhanced protection of areas vulnerable to risks from international vessel traffic ✓ Applicable to vessels of a certain class, regardless of flag state or voyage route ✓ Included on international charts for clear message to all mariners ✓ Compels flag states and coastal states to monitor compliance

³ This includes both territorial waters, out to 12 nm, and the Exclusive Economic Zone.

Considerations for Modeling BC's World-leading Marine Oil Spill System based on US ATBA Examples

<p>Jurisdiction(s) and Authorities</p>	<p>Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas (PSSAs) (resolution A.982(24))</p> <p>General Provision on Ships' Routing, pursuant to the Convention on the Safety of Life at Sea (SOLAS), 1974, as amended, Chapter V/8, 10</p> <p>IMO Assembly resolutions A.572(14), A.669(16), A.826(19)</p>
<p>Governance framework</p>	<p>The IMO is the only international body authorized to establish routing measures, and does so by reviewing proposals put forward by coastal states. Ultimately, it is the flag states and coastal states who implement any enforcement actions.</p>
<p>Considerations for BC</p>	<ul style="list-style-type: none"> ◇ Identify highly sensitive or high priority areas where the risks associated with vessel traffic are too high to tolerate. ◇ Specify the special area designation and resultant routing measures in accordance with IMO guidance, and bring recommendations to IMO. ◇ Implement Areas to Be Avoided, Particularly Sensitive Sea Areas, or other routing measures through international charting and enforce through port state controls and coordination with flag states.

2.4 Integrated Vessel Safety Initiatives

Marine oil spill prevention is rooted in the safe operation of vessels to avoid accidents or errors that may cause oil spills.

The **European Maritime Safety Agency's Vessel Safety Initiatives** illustrate a world-leading approach to oil spill prevention through targeted initiatives aimed at ship-source pollution prevention.

2.4.1 OVERVIEW

The European Maritime Safety Agency (EMSA), and agency of the European Union (EU), was established by regulation in 2004 for the purpose of ensuring a “high, uniform, and effective level of maritime safety and prevention of pollution by ships.” EMSA is active across a broad range of initiatives that link oil spill prevention, preparedness, and response (EMSA, 2015).

EMSA is an example of world-leading oil spill prevention and response not only because of the directives that it implements but because many of their EU-lead initiatives reach beyond EU member states. EMSA provides several critical information management services that allow other port state authorities and members of the public to obtain information about vessel safety records. By compiling data on vessel accidents, EMSA is building a knowledge base to promote data-driven risk management and vessel safety practices. By keeping their work readily accessible through searchable databases, technical reports, and summary publications, EMSA creates a level of assurance and accountability.

2.4.2 WORLD-LEADING ELEMENTS

Accident Investigation and Statistical Analysis

EMSA's **accident investigation** program harmonizes marine casualty investigation methods across the EU, with a focus on causality. Data from marine casualties is stored in the Marine Casualty Information Platform (EMCIP) database, which is available through an Internet portal for use and access by the competent national authorities of member states. EU regulation prevents the use of data for prosecutor purposes. The database allows for the aggregation of data from a range of casualties, from near miss incidents to fatal accidents, resulting in a large catalogue of safety recommendations that build on past incidents. An annual statistical report is produced to characterize the incidents in the EMCIP database; in 2013, a total of 2,550 accidents were reported, involving 2,872 ships. The database compiles information from accidents that involve EU member states as flag state, coastal state, or substantially interested state, resulting in a database that includes incidents beyond EU territorial waters (Figure 2.4) (EMSA, 2015a).

Tracking and Management Shipping Fleet Data and Port State Inspections

EMSA takes a leadership and management role in the Equasis information service, which compiles information about the world's merchant shipping fleet. An annual statistical report summarizes the fleet population and analyzes safety trends, port state control inspection statistics, vetting programs, and other components of shipping safety and compliance with international standards. The data compiled through Equasis, and EMSA's active role in collating and analyzing this data, inform a risk-based approach to shipping safety by aggregating information from across the globe (Equasis, 2013).

EMSA implements the EU port state control directive and implementing regulations to ensure that port state controls are implemented across EU member states in a consistent and rigorous manner. EMSA actively maintains the THETIS database that compiles data on port state control inspections in near real time and is

What makes EMSA Vessel Safety Initiatives World-Leading?

- Using accident investigation data to inform safety and prevention
- Real-time information about vessel safety
- Targeting enforcement to high-risk vessels and activities
- Accountability for implementation of EU and international standards
- Public access to primary databases and summary reports on ship safety and inspections (worldwide)

available to gross tonnage, type of inspection, result of inspection, number of deficiencies, detention information, and port state⁴ (EMSA, 2010).

Data collected through both of these platforms is utilized by EMSA vessel traffic monitoring and management personnel to identify and target high risk vessels that may be operating in EU territorial waters or calling on European ports. EMSA works with a range of local authorities to target inspections based on vessel-specific risk profiles (EMSA, 2010).

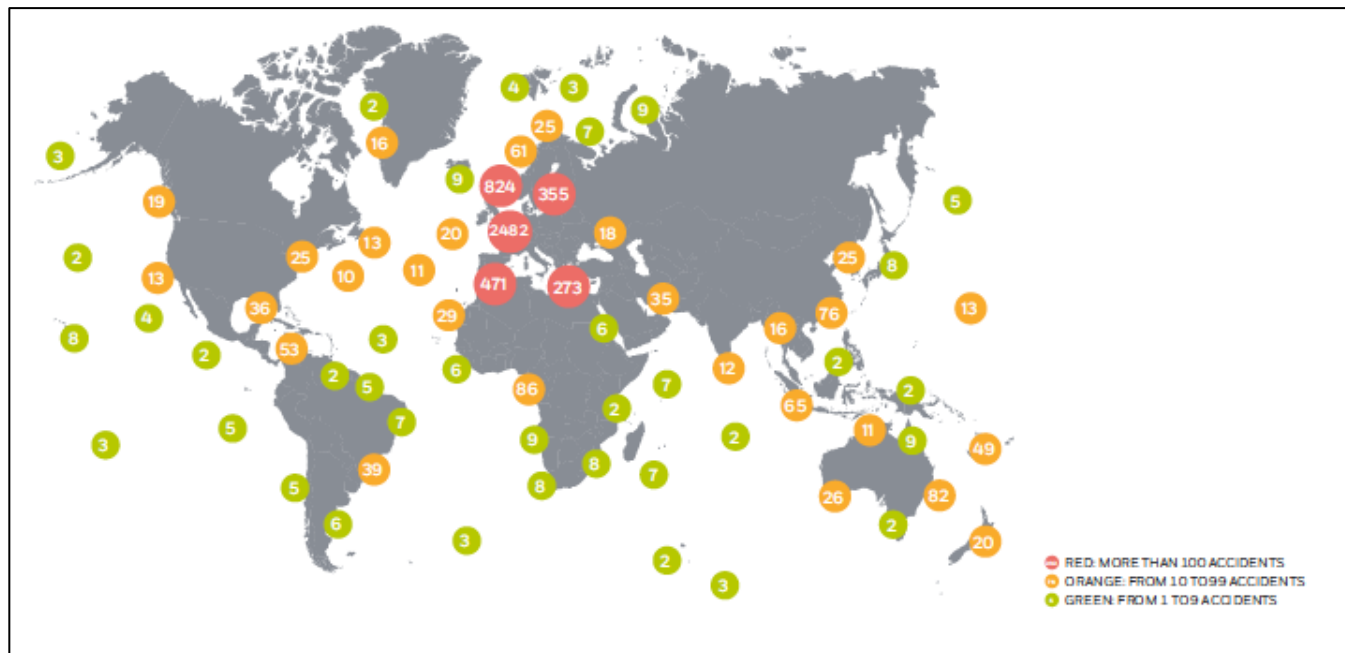


Figure 2.4. Summary of accident reports in EMCIP database⁵ (EMSA, 2014)

Verification Inspections

EMSA undertakes several important activities to verify that EU maritime safety and security legislation is fully and effectively implemented across member states. EMSA inspectors also visit non-EU states to inspect and verify training programs to comply with the international Standards for Training, Certification and Watch-keeping (STCW) to determine whether seafarers from non-EU nations should be permitted to work as crew on EU ships. EMSA also inspects the ship classifications societies that are recognized in the EU. These activities provide an independent assessment of a variety of activities that may impact vessel safety, and also provide a level of assurance to EU member states.

Vessel Monitoring and Pollution Response

In addition to their activities focused on vessel safety data compilation and analysis, EMSA undertakes a number of operational initiatives to track vessel movements, detect pollution, and responds to emergencies. EMSA provides a range of technical assistance and training programs related to shipping safety and maritime operations (EMSA, 2015).

⁴ Port state control inspection data for Canadian ports is included in this database in near real time (a data query on 6/17/2015 yielded records as recent as 6/15/2015).

⁵ EMCIP database includes accidents involving EU nations as flag state, coastal state, or substantially interested state, therefore the number of reports is substantially higher for Europe than other regions of the world.

2.4.3 GOVERNANCE

EMSA is a decentralized EU agency based in Lisbon, Portugal. An Executive Director leads a staff of more than 200 (including contractors and temporary staff) according to a 5-year strategic plan. An Administrative Board supervises the Executive Director and exercises programmatic and budgetary oversight. There is also a multi-layered system of institutional “checks and balances” common to EU institutions and agencies, including external audits, European Commission and Parliamentary oversight, and general accountability to civil and criminal laws of the EU. The 2015 budget of roughly €54.5 million is subsidized almost entirely by the European Commission (EMSA, 2015b).

EMSA is engaged in a number of inter-agency cooperative agreements and works cooperatively with member states and the European Commission. EMSA also has a number of cooperative agreements in place for information exchange with other agencies and organizations worldwide.

The relationship between EMSA and the IMO has been explored extensively in maritime law and policy reviews. Many of EMSA’s regional marine safety standards exceed IMO requirements, and this often leads to debate about the balance between a need for harmonized global shipping standards to ensure international trade versus the obligation of local and regional governments to establish and enforce enhanced safety environmental protection standards. While there are longstanding and valid arguments on both sides of this issue, EMSA is generally accepted as operating within the framework of international law and policy. EMSA plays a critical role in compliance with both regional and international requirements through the European Commission’s enforcement authorities over member states (Vatankhah, 2008).

2.4.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish EMSA as a model for world-leading vessel safety initiatives and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

<i>Considerations for Modeling BC’s World-leading Marine Oil Spill System based on EMSA Vessel Safety Initiatives</i>	
Summary of EMSA Vessel Safety Initiatives	EMSA promotes a harmonized approach to vessel safety within the EU, and monitors compliance with EU and international vessel safety standards. EMSA compiles data on ship accidents and port state inspections in Europe and worldwide, and makes this data available to other government authorities and the public through searchable databases and summary reports. Many of EMSA’s initiatives indirectly or directly strengthen vessel safety and oversight on a global scale.
World-Leading Elements	<ul style="list-style-type: none"> ✓ Using accident investigation data to inform safety and prevention ✓ Real-time information about vessel safety ✓ Targeting enforcement to high-risk vessels and activities ✓ Accountability for implementation of EU and international standards ✓ Public access to primary databases and summary reports on ship safety and inspections (worldwide)
Jurisdiction(s) and Authorities	<p>EMSA established by Regulation (EC) No 724/2004</p> <p>Accident investigation: Regulation 651/2011/EC and 1286/2011/EC</p> <p>Port state control: Directive 2009/16/EC amended by 2013/38/EU and Regulations EU 801/2010; EU 802/2010 (amended EU 1205/2012); EU 428/2010</p> <p>Verification inspections: Directive 2003/25/EC and Regulations 788/2014/EC and 391/2009/EC</p>

Considerations for Modeling BC's World-leading Marine Oil Spill System based on EMSA Vessel Safety Initiatives

Governance framework

EMSA is a decentralized EU agency with a distinct management and oversight regime. It is funded almost entirely by the European Commission. EMSA works in partnership with member state agencies and is subject to a number of checks and balances on its activities.

Considerations for BC

- ◇ Collect and analyze vessel casualty data and publish summary statistics and analysis to inform risk management and risk reduction measures.
- ◇ Evaluate sufficiency of salvage and rescue resources to respond to incidents along BC coast.
- ◇ Create transparency for port state control/inspection activities by making summary reports and appropriate data publicly available.
- ◇ Establish data-driven effectiveness measures to understand how vessel safety initiatives are influencing accident and casualty rates, and identify appropriate course corrections to maximize effectiveness.

2.5 Tanker Escort Systems

Requirements for the use of dedicated escort tugs are a common element of shipping safety regimes. Escort tugs are used in many places around the world, including the Singapore, Scotland, Newfoundland, Norway, and the US (RPG, 2012).

The **Ship Escort Response Vessel System (SERVS) in Prince William Sound** provides an example of a world-leading approach to oil spill prevention that has been operating for over 20 years in the neighboring jurisdiction of Alaska.

2.5.1 OVERVIEW

Requirements that escort vessels accompany oil tankers or other high-risk vessels during certain transits establish another layer of accident prevention above international standards. Escort vessels improve spill prevention by assigning one or more tugs to accompany certain ships through high-risk areas. The escort vessel may travel alongside or ahead of the larger ship to scout for navigational hazards, and the tugs can provide immediate assistance in the event of a steering or propulsion failure or navigational error, both of which may prevent a spill from occurring.

The oil tanker escort system in place in Prince William Sound, Alaska requires that at least two high-powered towing vessels escort all laded oil tankers through Prince William Sound (Alyeska Pipeline, 2013). This system has been in place for over 20 years, is compelled by a federal requirement under US law, and is funded by the companies that operate tankers serving the Valdez Marine Terminal at the terminus of the Trans Alaska Pipeline (Alyeska Pipeline, 2013).

The legal requirement for escort tugs in Prince William Sound was initially linked to the operation of single hull tankers; escorts were mandated for single hull tankers only. However, as the US tanker fleet completed its federally-mandated transition to double hull tankers only, the law was updated to extend the dual escort requirement to double hull tankers (P.L. 111-281). This change in US federal law reflected the fact that even though double hulls greatly reduce the potential spill volume from tanker accidents, they do not inherently prevent oil spills or accidents from occurring (PWSRCAC, 2009).

2.5.2 WORLD-LEADING ELEMENTS

The Prince William Sound tanker escort system serves four main purposes: (1) monitor conditions along the tanker route; (2) alert the tanker of potential risks or dangers; (3) assist a disabled tanker as quickly as possible; and (4) initiate oil spill containment and recovery operations right away in the event that an incident occurs. While the system is first and foremost a prevention tool, it does also enhance initial oil spill response capability, which could mitigate adverse impacts in the event of a spill. The tanker escort system has been in operation for over two decades, and in that time there have been a number of recorded incidents where escort vessels have provided assistance to vessels suffering engineering casualties to steering, propulsion, or navigation systems (PWSRCAC, 2009).

A major strength of the Prince William Sound tanker escort system is the strong oversight provided by the State of Alaska and the US Coast Guard, along with a dedicated citizens' oversight body (the Prince William Sound Regional Citizens' Advisory Council) (ANWR, 2013). The escort system itself has evolved over time, shaped by improved tug technologies and pressure from oversight bodies to evaluate and enhance capabilities (Marine Log, 2014; Mitchell, 2001).

What makes the Prince William Sound Tanker Escort System World-Leading?

- Dedicated, high-powered tugs
- Two escorts along entire 90-mile route through Prince William Sound
- Tanker route closed when conditions exceed 45 knot wind, 15 foot seas
- Required by federal statute
- Funded by industry
- Federal, state, and citizen-level oversight

Escort Vessel Roles and Operating Procedures

The dual escorts that accompany each laden tanker are assigned discrete roles: the primary escort vessel is responsible for steering or arresting the tanker in the event of an assist, and the secondary escort vessel is expected to take the tanker under control and tow it once the primary vessel has achieved a save. The escort tug fleet includes a range of vessels, with the two most capable tugs classified as Enhanced Tractor Tugs (ETT) and Prevention and Response Tugs (PRT). The tugs meet federal minimum requirements for tankers up to 200,000 dead weight tons (ETT class) and 125,000 dead weight tons (PRT class) (33 CFR 168.50). While these tugs are large and powerful, a recent study has suggested that retrofitting their winch systems, along with a few other modifications, would further enhance their performance and capability (Allan & Smoker, 2013).

In addition to the PRT and ETT, which are the most powerful tugs in the fleet, some of the escort vessels have specific capabilities such as firefighting pumps and nozzles (PWSRCAC, 2009). An operating guide (Vessel Escort Response Plan or VERP) outlines normal procedures for escorting both laden and ballasted (un-laden) tankers. These include communication procedures, speed restrictions, ice restrictions, operating limits (wind and sea state), and notification requirements. The VERP also outlines emergency procedures in the event of steering or propulsion loss or other incidents or failures, and provides a general framework for emergency towing drills and exercises. When environmental conditions exceed either 45-knot winds or 15-foot seas at a weather buoy near Hinchinbrook Entrance, oil tankers are not permitted to transit through Prince William Sound (Alyeska-SERVS, 2013).

Escort Zones

Figure 2.3 shows how Prince William Sound is separated into three escort zones. Within each zone, slightly different requirements apply to the dual escort configuration, based on the operating environment and navigational safety risks.

- The Northern Sound zone extends from the Valdez Marine Terminal, where the tankers load oil, through their transit of Valdez Narrows and Valdez Arm out to Bligh Reef. In this zone, a primary tug is tethered to the tanker, and the second tug is required to be within $\frac{1}{4}$ nautical mile, except when ice scouting. Valdez Narrows is limited to one-way tanker traffic.
- The Central Sound zone starts at Bligh Reef and extends to Hinchinbrook Entrance. Within this zone, the primary tug is not required to be tethered to the tanker but must be within $\frac{1}{4}$ nautical mile, with a second tug acting as a sentinel. The sentinel tug must be underway and ready to assist the tanker.
- The Hinchinbrook Entrance zone marks the transition between Prince William Sound and the Gulf of Alaska, and the tanker maintains two un-tethered escorts until it passes Cape Hinchinbrook. At this point, one tug is released and another assigned to remain at Cape Hinchinbrook as a sentinel until the tanker is at least 17 nautical miles out to sea.

2.5.3 GOVERNANCE

The primary driver for the Prince William Sound tanker escort system is a federal law with corresponding regulations, implemented by the US Coast Guard, that compel escort vessels in certain US waters. The federal law was originally included in the Oil Pollution Act of 1990, which linked the escort requirement to single hull tankers only. In 2010, US Congress amended the statute to apply the dual escort requirement to double hull tankers as well, ensuring its continued operation well beyond the phase-out of single hull tankers in the US.

The federal requirement for the Prince William Sound escort system is complemented by Alaska state regulations that require oil tanker owners to develop detailed Oil Discharge Prevention and Contingency Plans that outline measures for preventing and responding to oil spills in Alaska waters. The associated regulations include a requirement that all vessels under escort be operated in a manner that permits the escort vessel to render immediate assistance. There is also an explicit state regulation requiring that tankers

operating in Prince William Sound be equipped with a towing package that allows rapid deployment in the event that an escort assist is required.

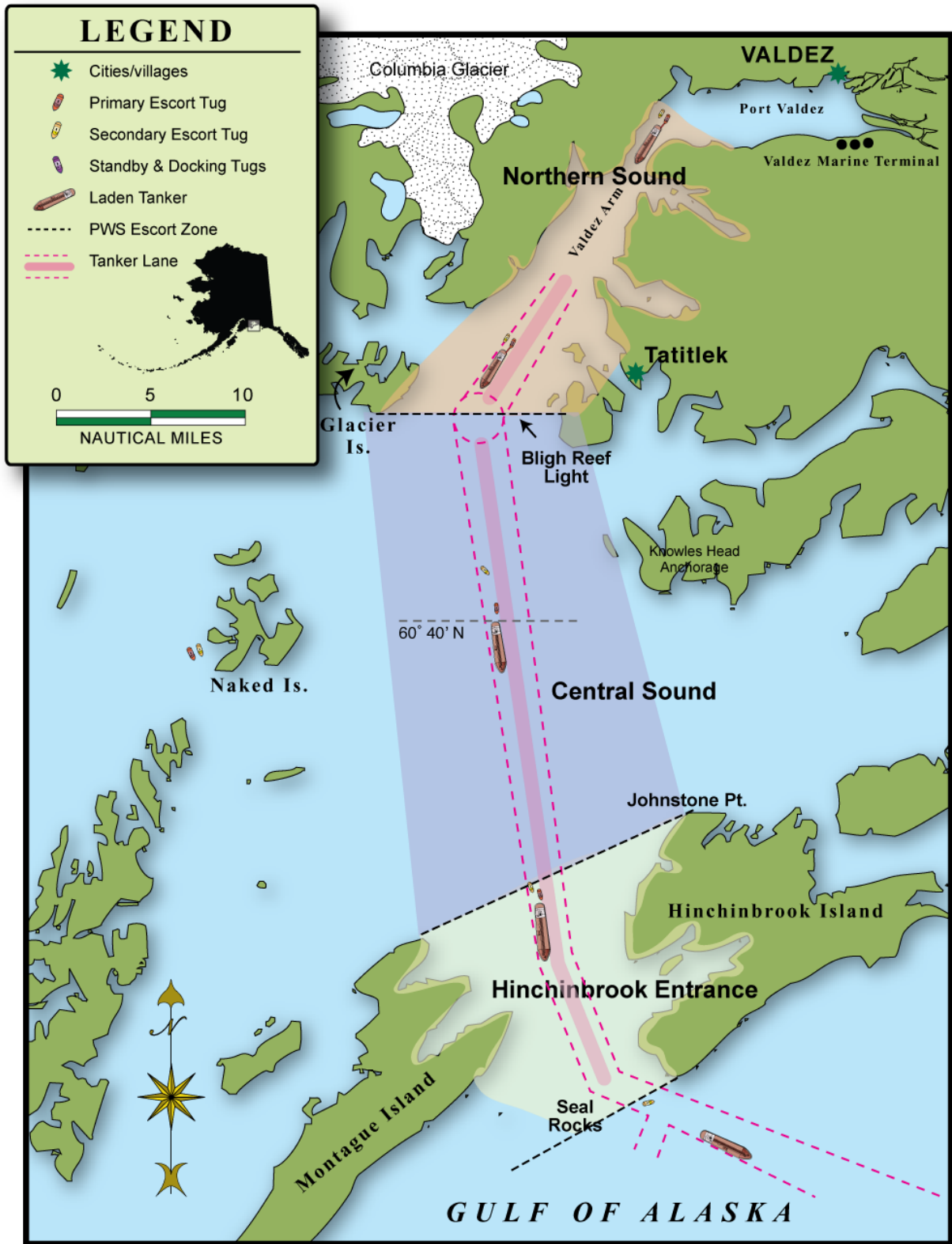


Figure 2.3. Map illustrating dual escort requirements for laden oil tankers in three escort zones in Prince William Sound, Alaska (PWSRCAC, 2009)

2.5.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the Prince William Sound tanker escort system as a model for world-leading tanker escort and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC's World-leading Marine Oil Spill System based on Prince William Sound Tanker Escort System

Summary of Prince William Sound Tanker Escort System	<p>Two escort tugs accompany each laden oil tanker along the entire 90-mile transit from the Valdez Marine Terminal until they reach the mouth of Prince William Sound, and a sentinel tug remains on station until the tanker is at least 17 nautical miles offshore. Sentinel escorts also accompany ballasted (un-laden) oil tankers along their transit to the Valdez Marine Terminal. A fleet of 11 escort and response tugs is dedicated to the system with specific capabilities tied to their role or function. Emergency towing procedures and minimum equipment standards are in place for both escort vessels and tankers to increase the likelihood that a towing vessel can assist or save a tanker.</p>
World-Leading Elements	<ul style="list-style-type: none"> ✓ Dedicated, high-powered tugs ✓ Two escorts along entire 90-mile route through Prince William Sound ✓ Tanker route closed when conditions exceed 45 knot wind, 15 foot seas ✓ Required by federal statute ✓ Funded by industry ✓ Federal, state, and citizen-level oversight
Jurisdiction(s) and Authorities	<p>US statute at 124 Stat. 2905 (P.L. 111-281); US federal regulations at 33 CFR 168 Alaska statute at AS 04.030; Alaska regulation at 18 AAC 75.027</p>
Governance framework	<p>The requirement for dual escorts of laden tankers in Prince William Sound is established in US federal law (originally passed in 1990 for single hull tankers and updated in 2010 to apply to double hull tankers) and implemented by US Coast Guard regulations. The State of Alaska also has regulations in place under their oil spill contingency planning statute that include specific provisions governing towing packages on Prince William Sound oil tankers. The Ship Escort Response Vessel System (SERVS) operated by the Prince William Sound tanker owners publishes a Vessel Escort Response Plan (VERP) as a port specific guide for operation of the tug escort system. The VERP is linked to the Prince William Sound Vessel Traffic System (VTS) manual and the Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan, both of which undergo agency review at the state and federal level. The Prince William Sound Regional Citizens' Advisory Council provides independent oversight of the system.</p>
Considerations for BC	<ul style="list-style-type: none"> ◇ Evaluate capacity of escort vessels (tugs) in areas where tanker escorts are required and consider whether enhancements to number, type, or capacity of tugs would enhance safety. ◇ Evaluate whether tug escorts would enhance tanker safety in regions where escorts are not presently required. ◇ Evaluate regulatory and oversight mechanisms that compel tanker escorts and consider whether mandates are required (vs. voluntary compliance) to achieve risk reduction benefits. ◇ Compile and analyze data on escort tug activities (e.g. rescues or saves, other assistance rendered).

2.6 Port State Control

Port state control systems are in place in most commercial ports worldwide to inspect vessels and enforce safety and prevention requirements.

Australia's Port State Control System stands out as an example of how a world-leading approach can be applied to improve the safety standards on vessels calling at ports in a country with one of the world's largest geographic expanse of marine territory.

2.6.1 OVERVIEW

Port state control is the process by which coastal states exercise their authority to ensure that foreign-flagged vessels visiting their ports comply with international requirements related to ship construction and maintenance, equipment, manning, and operations. This verification typically takes place through inspections. Port state controls include both prescriptive jurisdiction – the legal authority to create rules that apply within a port area, and enforcement powers – the authority to take action against parties that do not comply with those rules (Marten, 2014). Port state control is administered worldwide through regional agreements or Memoranda of Understanding (MoU). Most jurisdictions included in this study participate in the Paris MoU (Europe and North Atlantic), the Tokyo MoU (Asia and Pacific), the Indian Ocean MoU, or some combination (e.g. Canada participates in Paris and Tokyo and Australia participates in Tokyo and Indian Ocean). The United States maintains its own independent port state control regime (IMO, 2015b).

Port state control is an integral part of Australia's maritime safety and environmental protection regime, because as a vast island nation in the Southern Hemisphere, Australia is especially reliant on shipping to

transport goods into and out of the country. Australia has one of the largest Exclusive Economic Zones (EEZ) in the world, encompassing around 10 million square kilometers. The extent of Australia's maritime jurisdiction encompasses a significantly larger area than its landmass (approximately 7.6 million kilometers). Not only is Australia's maritime territory expansive, it also supports critical marine ecosystems, including the Great Barrier Reef. Figure 2.5 shows the expanse of Australia's maritime zones, which include an EEZ that extends 200 nautical miles off the coast of Antarctica (Geoscience Australia, 2015).

The Australian Maritime Safety Authority (AMSA) manages port state control. AMSA implements port state control activities under a national legal framework that centralizes authority

What makes Australian Port State Control World-Leading?

- Targeted inspections of high-risk vessels
- Focused inspection campaigns to address areas with frequent deficiencies
- Refuse entry to ships with history of past detentions
- Use of Marine Orders to quickly implement new requirements
- Agency mission links oil pollution risk, prevention, and response
- Frequent public release of port state inspection data and summary reports



Figure 2.5. Australia Maritime Zones (Geoscience Australia, 2015)

within AMSA and provides a number of tools to allow for stringent and agile implementation of port state control authority (Tang, 2009). AMSA applies a risk-based approach to port state control inspections that focuses their inspections on high-risk vessels based on compiled data from past inspections and basic ship information. AMSA surveyors utilize the risk rankings to inform their inspections, but are also empowered to apply local knowledge and professional judgment in deciding which vessels to inspect (AMSA, 2014a).

2.6.2 WORLD-LEADING ELEMENTS

Risk-Based Inspections

AMSA utilizes port state control inspection data to guide ongoing inspection activities, by targeting both areas onboard ships where deficiencies are most common and the highest risk vessels. This approach aligns with a general shift in Australia's approach to marine oil pollution that emphasizes evidence-based risk management and recognizes that prevention is the most critical component of any oil spill management system (discussed further in Section 3.2) (P. Irving, personal communications, June 3, 2015).

AMSA uses a risk profiling system to target high risk vessels and allocate inspection resources efficiently. AMSA's risk calculation uses multiple criteria to categorize vessels into priority groups, each of which has a specific target inspection rate. Priority 1 (highest risk) vessels have the highest probability of detecting a deficiency; Priority 4 (lowest risk) vessels have the lowest probability. AMSA sets a target to inspect 80% of all vessels that fall into Priority 1, 60% of Priority 2, 40% of Priority 3, and 20% of Priority 4. Annual review of inspection data helps to highlight overall trends in deficiencies. For example, the number of ships that fall into Priority 1 and 2 groupings has been observed to drop over recent years, indicating a possible improvement in compliance among some of the higher risk operators calling on Australian ports (AMSA, 2014c).

In addition to tracking the specific vessel's risk profile, AMSA will evaluate other factors through its vessel traffic monitoring activities which track Australian and foreign vessels from their arrival at their first Australian port to their departure from their last Australian port (AMSA, 2015i). AMSA will evaluate risk factors specific to the vessel track – i.e. environmental conditions, potential hazards, and environmental sensitivity – and may require additional safety precautions on a case-by-case basis if an individual ship transit route is considered to pose a significant risk. Such measures may vary from requiring more frequent reporting from the ship to AMSA's vessel traffic management system to dispatching an escort vessel to accompany a ship along a particularly high-risk route, at the ship owner's expense (P. Irving, personal communication, June 3, 2015).

Since 2000, AMSA has periodically conducted Focused Inspection Campaigns on vessels visiting Australian ports. These campaigns focus on a particular area of a vessel, and provide an opportunity for surveyors to conduct a more detailed inspection that targets areas of concern based on port state controls statistics. Each campaign focus and timeframe is advised to the shipping industry through Marine Notices that are issued one month prior to commencement. Nine focused inspection campaigns have been completed to date, in areas including bridge visibility and collision avoidance, oil pollution prevention and waste management practices, bridge operations, and mooring arrangements (AMSA, 2015f).

Enforcement of Detention and Bans on Ship Entry

The Navigation Act of 2012 gives AMSA broad authorities to detain foreign vessels in port following noted deficiencies during port state control inspections. AMSA publishes monthly detention lists summarizing the number of ships inspected and detained and identifying the name and length of detention for specific ships that are held in port to correct noted deficiencies (AMSA, 2015c). For example, the monthly report from April 2015 notes that 313 foreign vessels were inspected, resulting in 765 deficiencies. Of the 313 foreign vessel inspected, 20 were detained (approximately 6.4%) for periods ranging from two hours to six days (AMSA, 2015d).

Australia also acts proactively to prevent ships with poor safety records from entering ports within Australia's territorial waters or EEZ. The Navigation Act of 2012 establishes a strong framework for AMSA to ban ships from entering Australian ports. Vessels that have been released from detention on the condition of corrective actions but do not carry those actions out before returning to port in Australia may be banned for 3 months. Vessels that have been detained three times in a two-year period may be refused access to Australian ports for 12 or 24 months, depending upon the severity of the deficiencies and the safety record of the vessel owners. Since this policy took effect in July 2013, AMSA has issued four refusals of access. The most recent and most severe example is a 12-month ban on entry of an Indonesian-flagged container ship issued in January 2015. Information on refusal of entry is published on the AMSA website, and this most recent ban was announced with a press release (AMSA, 2015e).

While both of these activities – detaining ships at port and banning ships from entry into ports – are within the authorities of other port state control programs, Australia implements both practices aggressively and transparently.

Use of Marine Orders and Marine Notices

Marine Orders are a form of delegated legislation under Australia's Commonwealth laws. Marine Orders are regularly amended in response to changes in international law, industry requirements, and technological developments, providing an efficient mechanism for Australia to quickly give effect to these requirements in Australian law. There are close to 100 Marine Orders currently in force under Australia's Navigation Act and Prevention of Pollution from Ships Act (AMSA, 2015b). AMSA publishes an annual regulatory plan to keep operators and the public apprised of planned changes to regulatory standards, including Marine Orders. In many cases, consultation opportunities are provided (AMSA, 2015a).

2.6.3 GOVERNANCE

AMSA, as a regulatory agency, has jurisdiction over both ship-source⁶ marine oil spill prevention – through ship safety and environmental protection programs that include port state control – and ship-source marine oil spill response. This broad jurisdictional authority centralizes responsibility within a single agency for both preventing and responding to marine oil spills from ships. The concepts of safe shipping and clean seas are clearly linked in the agency's vision and mission statements, and the practical effect is a shipping safety regime that is closely linked to oil pollution prevention and response preparedness. The agency takes a forward-looking approach to maritime safety regulation that is enhanced by the agency's stewardship responsibilities for the marine environment (AMSA, 2014c, Irving, 2015).

While AMSA has broad jurisdictional authorities and programmatic responsibilities, the agency is held accountable under general administrative requirements that apply to Commonwealth agencies. The 2013-2014 annual report includes a performance assessment with specific targets, indicators, and results. This creates accountability within the agency to clearly defined performance targets, and also provides visibility to the public about the agency's priorities and accomplishments (AMSA, 2014c).

2.6.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the Australian Port State Control system as a model for world-leading port state control and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

⁶ The National Offshore Petroleum Safety and Emergency Management Authority (NOPSEMA) oversee offshore oil and gas facilities and activities in Australia. NOPSEMA and AMSA work together to implement the National Plan for Marine Environmental Emergencies.

Considerations for Modeling BC's World-leading Marine Oil Spill System based on Australian Port State Control

Summary	Australia's port state control system relies on strong national laws and a strict enforcement approach. It is implemented through agency directives (Marine Orders) that can be quickly implemented and updated, and it uses a risk-based approach to target ship inspections.
World-Leading Elements	<ul style="list-style-type: none"> ✓ Targeted inspections of high-risk vessels ✓ Focused inspection campaigns to address areas with frequent deficiencies ✓ Refuse entry to ships with history of past detentions ✓ Use of Marine Orders to quickly implement new requirements ✓ Agency mission links oil pollution risk, prevention, and response ✓ Frequent public release of port state inspection data and summary reports
Jurisdiction(s) and Authorities	<p>Navigation Act 2012 and associated Marine Orders</p> <p>Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and Marine Orders</p> <p>Protection of the Sea (Harmful Anti-fouling Systems) Act 2006</p> <p>Marine Safety (Domestic Commercial Vessel) National Law Act 2012</p>
Governance framework	International conventions are adopted in national laws granting AMSA broad regulatory and enforcement powers over port state control in Australia. Approximately 50 surveyors at 16 ports conduct inspections. AMSA regularly publishes Marine Orders and Marine Notes to keep the industry and public aware of activities and requirements. Monthly port state control reports are available on the internet, along with annual program reports and annual reports that rate the agency's performance against specific targets.
Considerations for BC	<ul style="list-style-type: none"> ◇ Target inspections by focusing on vessels with poor safety records (i.e. history of detentions, past pollution incidents, multiple violations) and prioritizing areas onboard ships with high levels of past violations (similar to Australia's Focused Inspection Campaigns). ◇ Analyze and publish annual Port State Control data and statistics.⁷ ◇ Collect and analyze program metrics to assess performance (i.e. measure how vessel safety is improving based on Port State Control activities).

⁷ The Transport Canada Port State Control website contains annual reports from 1998-2010 and summary statistics from 2003-2008 but nothing more recent.

2.7 Aerial Surveillance Programs

Aircraft and satellites routinely engage in surveillance activities to detect and track oil spills and monitor other vessel activities (such as fishing, migration, or illegal drug trafficking) around the world (Bonn Agreement, 2013). Aerial surveillance is integral to both oil spill prevention and response.

Canada's National Aerial Surveillance Program (NASP) provides an example of a world-leading oil spill prevention system by utilizing aerial overflight patrols to detect and deter pollution from ships traveling in Canadian waters.

2.7.1 OVERVIEW

Locating oil in water is essential to initiating and sustaining an effective response. Methods such as tracking buoys, satellite imagery, aerial surveillance, or visual observations from aircraft and vessels are all employed to monitor oil in water. Canada utilizes the NASP to patrol Canadian Pacific, Atlantic, and Great Lakes waters to discourage and detect oil spills. NASP is an example of a world-leading spill prevention and response system because it proactively monitors Canada's extensive coastline and provides a deterrent to potential polluters while also looking for accidental spills (Transport Canada, 2015).

NASP was originally established in 1991 by the Canadian Coast Guard to perform non-military patrols focused primarily on identifying marine pollution and enforcing the International Convention for the Prevention of Pollution from Ships (MARPOL), but also to maintain marine security and monitor sea ice (Armstrong et al., 2008; CASR, 2013).⁸ In 2003, Transport Canada assumed responsibility for NASP and updated and improved the program by upgrading remote sensing equipment, increasing flight hours, and expanding to non-traditional flight patterns to cover less trafficked parts of the country, including the Arctic (Lundgren et al., 2011; Transport Canada, 2015). In 2013, NASP was expanded to ensure "the systematic surveillance and monitoring" of maritime traffic in Canadian waters as part of the World Class Tanker Safety System (CASR, 2013).

Currently, the program maintains three aircraft, located in Vancouver, BC, Moncton, NB, and Ottawa, ON, with the latter moving to Iqaluit, NU for Arctic-shipping season (Transport Canada, 2015). Four contracted private industry aircraft supplement the fleet (Pearce, 2015).

2.7.2 WORLD-LEADING ELEMENTS

While major, catastrophic oil spills can have significant impacts to marine ecosystems, cumulative smaller discharges actually contribute a higher rate of marine oil spills than major accidents (GESAMP, 2007; NRC, 2003). The NASP program allows Canada to monitor territorial waters for these smaller operational discharges as well as major catastrophic spills (Bertazzon et al., 2014).

Pollution Surveillance Aircraft and Detection Technology

NASP maintains three dedicated aircraft strategically positioned in British Columbia, New Brunswick, and Ontario, supported by an additional four contracted private aircraft (Lundgren et al., 2011; Transport Canada, 2015). These planes monitor shipping activity and are able to detect oil discharges, intentional or unintentional, using human observation and a variety of remote sensing and communications/vessel tracking

What makes Canada's National Aerial Surveillance Program World-Leading?

- High level of patrol hours when compared to other aerial surveillance programs
- Multiple, integrated technologies to track vessels, capture geo-referenced images from a range of altitudes even in darkness and low visibility
- Successful detection and prosecution of pollution violations
- Multiple governmental departments share and supplement NASP program with technology and resources

⁸ A predecessor program began conducting pollution patrols on the Great Lakes in 1968 (Armstrong, 2008).

technologies including satellite communications (INMARSAT), AIS, side-looking airborne radar (SLAR), infrared and ultraviolet scanners, and thermal and infrared cameras (Pearce, 2015). Transport Canada coordinates NASP's remote sensing activities with other federal efforts including Marine Aerial Reconnaissance Team (MART)'s maritime safety activities and other programs like EC's Integrated Satellite Tracking of Pollution (ISTOP), which uses satellites to detect pollution at sea (Transport Canada, 2015).

Detection Statistics and Enforcement

Since 2007-2008, the number of patrol hours per fiscal year has ranged from 1,814 to 3,877. NASP activity increased significantly in the 2013-2014 fiscal year as part of Canada's world-class tanker safety system initiatives. Statistics from 2014-2015 show 3,842 patrol hours resulting in overflight of 19,551 vessels with 322 pollution sightings (Pearce, 2015). By comparison, seven nations that are party to the Bonn Agreement⁹ flew a total of 3,522 patrol hours in 2013, resulting in 220 detections of suspected pollution events (Bonn Agreement, 2013). NASP data is used in enforcement and prosecution of pollution incidents, acting as a deterrent that may prevent future illegal discharge (Pearce, 2015).

Figure 2.6 shows the aerial coverage for 2013-2014 NASP overflights.

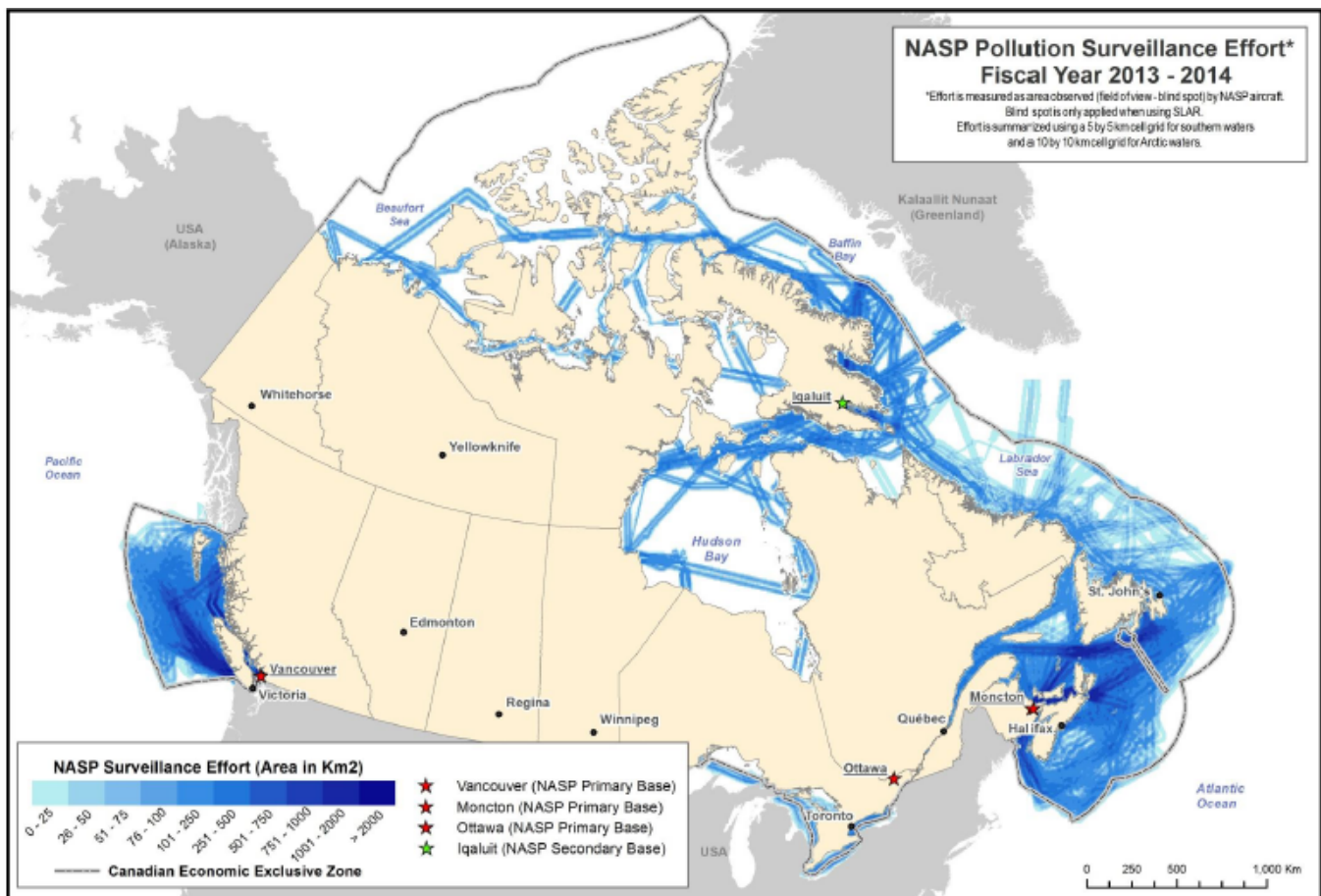


Figure 2.6. NASP Surveillance Efforts 2013-2014 (Pearce, 2015)

⁹ The seven countries are Belgium, Denmark, France, Germany, Netherlands, Norway, and Sweden. While the UK is also included in Bonn Agreement reporting, the UK flights are pollution verification and not detection, and are therefore not included in this comparison with Canada.

2.7.3 GOVERNANCE

NASP is a government-funded program that is part of Transport Canada (TC). NASP is the primary tool for not only TC, but also the Department of Fisheries and Oceans (DFO) and Environment Canada (EC), to enforce legislation regarding illegal discharges from ships (Armstrong et al., 2008).

2.7.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish Canada's National Aerial Surveillance Program as a model for world-leading aerial surveillance. As this program is already in place in British Columbia, the considerations listed in the table relate to aspects of the program that should be maintained and could be expanded as part of BC's world-leading marine oil spill prevention and response regime.

Considerations for Incorporating Canada's National Aerial Surveillance Program into a World-Leading Marine Oil Spill System in BC

Summary	NASP provides aerial lookout to identify ship-source spills, while also monitoring marine traffic and sea ice. The constant possibility for an overhead scan is intended to deter polluters and quickly identify and respond to a spill, while also providing evidence for post-incident legal action.
World-Leading Elements	<ul style="list-style-type: none"> ✓ High level of patrol hours when compared to other aerial surveillance programs ✓ Multiple, integrated technologies to track vessels, capture geo-referenced images from a range of altitudes even in darkness and low visibility ✓ Successful detection and prosecution of pollution violations ✓ Multiple governmental departments share and supplement NASP program with technology and resources
Jurisdiction(s) and Authorities	<p>MARPOL Convention 73/78 (International Convention for the Prevention of Pollution from Ships)</p> <p>Safeguarding Canada's Seas and Skies Act (S.C. 2014, c. 29)</p>
Governance framework	NASP is funded and maintained by Transport Canada since 2003 (Transport Canada, 2015). Information from NASP is passed to departmental and Environment Canada (EC) regional offices and used to enforce legislation related to ship-source pollution. In 2013, dedicated funding was secured as part of World-Class Tanker Safety System improvements.
Considerations for BC	<ul style="list-style-type: none"> ◇ Continue to expand the number of flight hours in the west coast region. ◇ Continue to acquire and incorporate new and emerging technologies. ◇ Incorporate and analyze data from pollution incidents to identify trends and consider opportunities to link with other vessel safety and pollution prevention initiatives.

2.8 Marine Firefighting and Salvage Requirements

Salvage and marine firefighting are two separate but related components of shipboard emergency preparedness. Having adequate resources available to quickly and efficiently control shipboard fires and undertake marine salvage activities may help to prevent a shipboard casualty (like a fire, grounding, or collision) from becoming a pollution event (Huntington et al., 2015).

The **US marine firefighting and salvage regulations**, recently promulgated under the federal requirements that vessel and non-tank vessel operators develop oil spill contingency plans, are an example of a world-leading approach. The US system requires that vessel operators have contracts in place to ensure that marine firefighting and salvage resources can be on-scene and operating within certain time limits (USCG, 2008).

2.8.1 OVERVIEW

US federal regulations require certain tank and non-tank vessels to have in place a Vessel Response Plan (VRP) or Non-tank Vessel Response Plan (NTVRP) that assure a certain level of preparedness for oil spills (33 CFR 155). In 2008, the US Coast Guard published a final rule expanding the oil spill contingency planning requirements for tank and non-tank vessels to include marine firefighting and salvage (USCG, 2008).

The US regulations for VRP and NTVRP submittal apply to all US-flagged tank vessels (tankers or barges), US-flagged non-tank vessels (over 400 gross tons) and to foreign-flagged tank and non-tank vessels transiting US territorial waters that call on a US port. The 2008 salvage and marine firefighting requirements, which took effect in 2011 for tank vessels and 2014 for non-tank vessels, require operators to demonstrate that they have sufficient services and resources for towing, salvage, and spill response on contract (or otherwise available) in each Captain of the Port (COTP) area¹⁰ in which the vessel operates (33 CFR 155.4020). The specific requirements vary depending upon the area (COTP area) in which the vessel operates and its total fuel capacity.

2.8.2 WORLD-LEADING ELEMENTS

Requirements for Minimum Salvage Capabilities

US regulations require several different types of marine firefighting and salvage-related services for vessels operating within 50 miles of a designated port area; each with different timeframes by which actions must be taken or resources must be on-scene. All tank and non-tank vessels with an oil-carrying capacity of 2,500 barrels (bbl) or more must specify that salvage services, which include emergency towing, will be on-scene at different times depending on whether the incident takes place within 12 or 50 miles of the Captain of the Port city (33 CFR 155.4030(b) and 33 CFR 155.5050(i)). Non-tank vessels with a capacity less than 2,500 bbl do not need to have these resources under contract, but need to plan for their use (33 CFR 155.5050(i)(2)).

Table 2.2 summarizes these requirements.

What makes the US Marine Firefighting and Salvage Requirements World-Leading?

- Operators of tank vessels and certain non-tank vessels are required to plan for emergency towing, salvage, and marine firefighting
- Federal oversight through vessel response plan reviews
- Timeframes for delivery of marine firefighting and salvage resources
- Minimum capability requirements for emergency towing, salvage, and marine firefighting based on vessel type, size, and area of operation

¹⁰ Captain of the Port Areas are jurisdictional designations that are used to assign enforcement and oversight authority for a given geographic area to a specified US Coast Guard operational or administrative unit. A ranking officer is assigned as Captain of the Port and has certain authorities under US law and regulation to enact navigational safety requirements and enforce federal regulations within that area.

Plans submitted by tank and non-tank vessel operators subject to the full requirement must also specify that the salvage contractor can deliver pumping resources to the scene that are capable of offloading the vessel's largest cargo tank in 24 hours of continuous operation (33 CFR 155.4030(f)). Similarly, if the vessel will travel in waters of 40 feet or deeper, resources must be available to remove cargo and fuel in the depth of water traversed (up to 150 feet) (33 CFR 155.5030(h)).

Table 2.2. Response timeframes for US salvage services, based on location

Category	Service(s)	Response Time Requirement	
		Incident occurs 12 miles or less from COTP city	Incident occurs 12 - 50 miles from COTP city
Assessment and Survey	Remote assessment and consultation	1 hour	1 hour
	Begin assessment of structural stability	3 hours	3 hours
	On-site salvage assessment	6 hours	12 hours
	Structural stability assessment	12 hours	18 hours
	Hull and bottom survey	12 hours	18 hours
Stabilization	Emergency towing	12 hours	18 hours
	Salvage plan	16 hours	22 hours
	External emergency transfer operations	18 hours	24 hours
	Emergency lightering	18 hours	24 hours
	Other refloating methods	18 hours	24 hours
	Making temporary repairs	18 hours	24 hours
	Diving services support	18 hours	24 hours
Specialized Salvage Operations	Special salvage operations plan	18 hours	24 hours
	Subsurface product removal	72 hours	84 hours
	Heavy lift	Estimated ¹¹	Estimated

Marine Firefighting Requirements

Controlling shipboard fires and preventing explosions will minimize environmental damages as well as risks to crewmembers and possibly even to public safety. While most vessels have onboard equipment to fight small shipboard fires, a large vessel fire or explosion will require firefighting support from vessels with high-capacity pumps or fire suppression foams. In some cases, this equipment is located on escort or rescue tugs already on scene in high-risk areas; in other cases, non-towing fireboats may be available from ports or harbors.

US regulations establish timeframes for how quickly marine firefighting services must be able to respond to a vessel, based on the location of that vessel in relation to a Captain of the Port city. The regulations specify that an operator must identify in their vessel response plan contracted resources for fire assessment and shipboard firefighting, including both equipment and trained personnel. The delivery timeframes required range from 2 to 18 hours, as shown in Table 2.3 (33 CFR 155.4030).

US regulations specify that a vessel response plan must list *“the proper type and amount of extinguishing agent needed to combat a fire involving your vessel’s cargo, other contents, and superstructure. If your primary extinguishing agent is foam or water, you must identify resources in your plan that are able to pump, for a minimum of 20 minutes, at least 0.016 gallons per minute per square foot of the deck area of your vessel, or an appropriate rate for spaces that this rate is not suitable for and if needed, an adequate source of foam. These*

¹¹ Contracts for heavy lift services are required, but there is no set timeframe for their arrival on scene.

resources described are to be supplied by the resource provider, external to the vessel's own firefighting system" (33 CFR 155.4030(g)).

Table 2.3. Response timeframes for US salvage services, based on location

Category	Service(s)	Response Time Requirement		
		Incident occurs at pier	Incident occurs 12 miles or less from COTP city	Incident occurs 12 - 50 miles from COTP city
Marine Firefighting	Remote assessment and consultation	1 hour	1 hour	1 hour
	On-site fire assessment	2 hours	6 hours	12 hours
	External firefighting teams	4 hours	8 hours	12 hours
	External vessel firefighting systems	4 hours	12 hours	18 hours

Requirements for Emergency Towing

Emergency towing is included in the US salvage and marine firefighting requirements for vessel and non-tank vessel response plans. Regulations define emergency towing as “the use of towing vessels that can pull, push, or make-up alongside a vessel...to ensure that a vessel can be stabilized, controlled or removed from a grounded position. Towing vessels must have the proper horsepower or bollard pull compatible with the size and tonnage of the vessel to be assisted” (33 CFR 155.4025).

An operator’s vessel response plan must also identify suitable towing vessels with adequate bollard pull, horsepower, and other characteristics. The towing vessel must be able to operate in winds of 40 knots [33 CFR 155.4030(e)].

2.8.3 GOVERNANCE

The US marine firefighting and salvage requirements are codified in federal law and implemented by US Coast Guard regulations (33 CFR 155). Compliance is assessed through the federal vessel and non-tank vessel response plan review process, which requires operators to submit plans for review every five years for vessels subject to US jurisdiction, which include US-flagged tankers, barges, and non-tank vessels over 400 gross tons, as well as foreign-flagged tankers, barges, and non-tank vessels over 400 gross tons that call on US ports.

2.8.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the US marine firefighting and salvage requirements as a model for world-leading shipboard emergency preparedness and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC’s World-leading Marine Oil Spill System based on US Marine Firefighting and Salvage Requirements

Summary

The US federal government requires operators of US-flagged tank vessels and non-tank vessels over a certain size to plan for emergency towing, salvage, and marine firefighting as part of their vessel response planning. Foreign-flagged vessels calling on US ports are also subject to these requirements, which specify timeframes and minimum capability for emergency towing, salvage, and marine firefighting that is tied to the vessel’s size, oil-carrying capacity, and area of operation.

Considerations for Modeling BC's World-leading Marine Oil Spill System based on US Marine Firefighting and Salvage Requirements

World-Leading Elements	<ul style="list-style-type: none"> ✓ Operators of tank vessels and certain non-tank vessels are required to plan for emergency towing, salvage, and marine firefighting ✓ Federal oversight through vessel response plan reviews ✓ Timeframes for delivery of marine firefighting and salvage resources ✓ Minimum capability requirements for emergency towing, salvage, and marine firefighting based on vessel type, size, and area of operation
Jurisdiction(s) and Authorities	<p>Final Rule: USCG-1998-3417, 73 FR 80649, Dec. 31, 2008 Implementing Regulations: 33 CFR 155 Subpart I (Salvage and Marine Firefighting)</p>
Governance framework	<p>Federal regulatory requirements implemented by the US Coast Guard. Vessel and non-tank vessel response plans are subject to review every five years by the Coast Guard.</p>
Considerations for BC	<ul style="list-style-type: none"> ◇ Evaluate existing marine firefighting and salvage capacity along west coast. ◇ Develop additional capacity and distribute geographically commensurate with risks from vessel traffic. ◇ Consider mechanisms to compel shipping industry to fund marine firefighting and salvage resources.

3 WORLD-LEADING PREPAREDNESS, RESPONSE, AND RECOVERY

3.1 Introduction

Oil spill preparedness, response, and recovery measures provide some level of mitigation to reduce the adverse impacts from an oil spill. The 2013 study identified five common features of world-class marine oil spill response: (1) geographic areas are prioritized for protection from oil spills; (2) contingency planning is comprehensive, integrated, and well understood by all relevant parties; (3) sufficient equipment can be deployed quickly to respond to a worst-case spill; (4) sufficient trained personnel are available to respond to a worst-case spill; and (5) a process is in place to restore damaged resources and promote ecosystem recovery after a spill. The world-leading marine oil spill response examples presented in Sections 3.2 through 3.7 incorporate one or more of these world-class response elements and also incorporate one or more of the system elements described in Section 4.

3.1.1 GEOGRAPHIC PLANNING AND PRIORITIZATION

Various forms of geographic response plans (GRP) and strategies (GRS) are in place for thousands of coastal and inland sites across North America. Pre-planning for spill protection or response at highly vulnerable or sensitive sites saves time during the critical first hours of an oil spill (or potential spill) and provides field-ready deployment plans for responders (Landry, 2012; USEPA, 2009).

World-class marine oil spill response systems develop GRP or GRS for high priority coastal sites. World-leading jurisdictions have established a systematic approach to GRP or GRS development that includes local, provincial/state, and federal government, tribes or First Nations, natural resource trustees, response organizations, industry, and other local stakeholder or environmental groups. World-leading GRP and GRS are widely available (typically published on the Internet) and are regularly tested and updated.

3.1.2 INTEGRATED CONTINGENCY PLANNING

Contingency planning is a form of emergency preparedness that is common across most areas of the globe at both the industry and government levels. Government contingency plans typically provide a framework for oil spill response, and are often complimented by regional, local, or port-specific plans. Industry contingency plans are usually specific to an operator or activity and should align with government plans (IMO, 2010; USEPA, 2013).

World-class marine oil spill response systems have a comprehensive network of oil spill contingency planning in place that is inclusive of all major oil spill response functions and activities, scalable to the incident specifics, and complemented by a regular exercise program. World-leading systems have an active contingency planning process to ensure plans are well understood by all parties (government, tribal, industry), transparent to the public, linked to sufficient response capacity to implement a worst case response, and supported by a standing planning body responsible for maintaining and updating the plan and ensuring its ongoing relevance.

3.1.3 RESPONSE EQUIPMENT AND CAPACITY

Marine oil spill response requires the deployment of specialized equipment before the oil spreads too thin to be recovered or treated. Response capacity describes the amount and type of equipment available in the region, how quickly it can be deployed, how much oil it can clean up, and whether there are operating limits above which response equipment may not be safe or effective to operate (Crawford et al., 2005; IMO, 2010; OGP, 2011a).

World-class spill response systems incorporate response capacity requirements by setting minimum standards based on the type and magnitude of spill risks in a region of operations. World-leading response systems hold individual operators accountable with standards for minimum levels of equipment capacity, planning, and logistics to clean up a worst-case spill. World-leading systems also incorporate incentives or other mechanisms

to encourage the use of best available technology. World-leading systems provide a framework that defines the types of response technologies – i.e. mechanical response, dispersants, in-situ burning – that are preferred and establish parameters for their use that include capability assessments, permitting or authorization processes.

3.1.4 TRAINED RESPONDERS

Marine oil spill response is a labor-intensive process that requires a large number of trained personnel to perform functions including on-water operations, aerial surveillance, beach cleanup, incident management, wildlife response, salvage and lightering, waste management, communications, and a range of other activities. A major marine oil spill response may require more than 10,000 people to implement (Exxon Mobil, 2008).

World-class spill response systems include a roster of trained personnel that can be mobilized to support response operations. World-leading systems go a step beyond by treating response personnel as part of response capacity. They have systems in place to ensure that operators can adequately staff all aspects of spill response operations with appropriately trained personnel. World-leading systems utilize dedicated responders, contractors, and community-based response programs like fishing vessels-of-opportunity. World-leading systems establish volunteer management protocols to deal with the high numbers of volunteers that often converge on a major coastal oil spill response.

3.1.5 RESTORATION AND RECOVERY FROM OIL SPILL DAMAGES

Marine oil spills have the potential to cause significant short- and long-term adverse impacts to the ecosystem and the people who rely upon it for food, recreation, spiritual and cultural values, and economics (EVOSTC, 2009). The process of assessing impacts and restoring injured resources is integral to spill response preparedness (IMO, 2010).

World-class spill response systems have an established process for evaluating spill damages, restoring injured resources, and compensating parties who experience damages as a result of the oil spill. World-leading systems proactively involve a broad coalition of potentially impacted parties in both the pre-spill and post-spill processes, establishing baseline data that informs damage assessment, restoration, and recovery.

3.2 National Contingency Plan

Contingency planning is the process of gathering information, assessing spill risks, identifying potentially impacted resources, developing spill response strategies, and establishing procedures for mobilizing and deploying spill response resources. Planning for oil spills and other marine emergencies is a shared responsibility of industry and government. The IMO has characterized effective contingency planning as: (1) integrated across agencies and companies or organizations who may participate in a response, (2) inclusive of all major spill functions, (3) flexible and capable of achieving a worst-case response, (4) designed with an understanding of the potential for environmental conditions to impact the response, and (5) developed with enough detail that specific response tactics are defined in advance (IMO, 2010).

Most coastal nations have adopted some form of a national contingency plan for oil spill response, and many countries have additional layers of planning at the regional, state/provincial, port or local levels. **The Australian National Plan**, which recently underwent a significant revision and update, is an example of a world-leading approach to national contingency planning that is based in a critical review of risks and an analysis of response capabilities.

3.2.1 OVERVIEW

In 2014, Australia published a significantly revised National Plan for Maritime Environmental Emergencies (National Plan). The National Plan, originally published in 1973, provides “a single, national, comprehensive and integrated response arrangement to minimise the impacts of marine pollution from vessel casualties and spills from offshore petroleum facilities, as well as other environmental impacts arising from a maritime environmental emergency, upon the Australian community, environment, cultural and heritage resources, economy and infrastructure” (AMSA, 2015h).

The plan was revised to address issues that were identified during a 2011-2012 review of shipping and offshore petroleum incidents that had challenged the previous version of the National Plan. This review included a marine oil spill risk assessment that considered risk by region and activity, as well as a capability assessment that considered the adequacy of regulatory regimes, prevention measures, response equipment, training, funding, and cost recovery (DNV, 2011; Storrie, 2014). The review yielded 47 recommendations for improvement, with four key areas of change identified as:

- Establishing a single response arrangement to manage maritime casualty and pollution incidents
- Improving the strategic management and governance of the response arrangements
- Integrating maritime casualty and marine pollution response arrangements within the Australian Emergency Management Arrangements
- Addressing capability gaps, including aligning resource allocation based on the changing risk environment

These recommendations resulted in a change to the governance structure, integration with state and local emergency management authorities, adoption of a common incident management system, strategic upgrade to national equipment stockpiles, expanding emergency towing capabilities, and implementation of a

What makes the Australia National Plan World-Leading?

- Supported by risk evaluation and capability assessment
- Integrates with state, local, and industry response plans
- Emphasis on prevention through dedicated emergency towing resources funded by shipping industry
- Equipment stockpiles actively managed and information on equipment status publicly available
- Competency-based training approach with regional oversight
- Science-based approach to response decision-making
- Over 20 years of annual reporting on National Plan activities creates accountability and transparency

functional approach to handling environmental science and technical services. (P. Irving, personal communication, June 3, 2015; Storrie, 2014)

3.2.2 WORLD-LEADING ELEMENTS

Integration of National, State, and Local Government

Australia’s National Plan provides the foundation for oil spill contingency and emergency response planning at all levels. The Foreword to the plan states, “Marine pollution plans prepared by all the Australian government jurisdictions, port corporations, industry and operators of offshore petroleum facilities underpin this National Plan. These plans provide detailed information to implement the provisions outlined in this document” (NPSCC, 2014). Figure 3.1 shows how the National Plan, which implements international conventions and agreements at the national level, integrates with and supports more detailed planning at the state, local, and industry level.

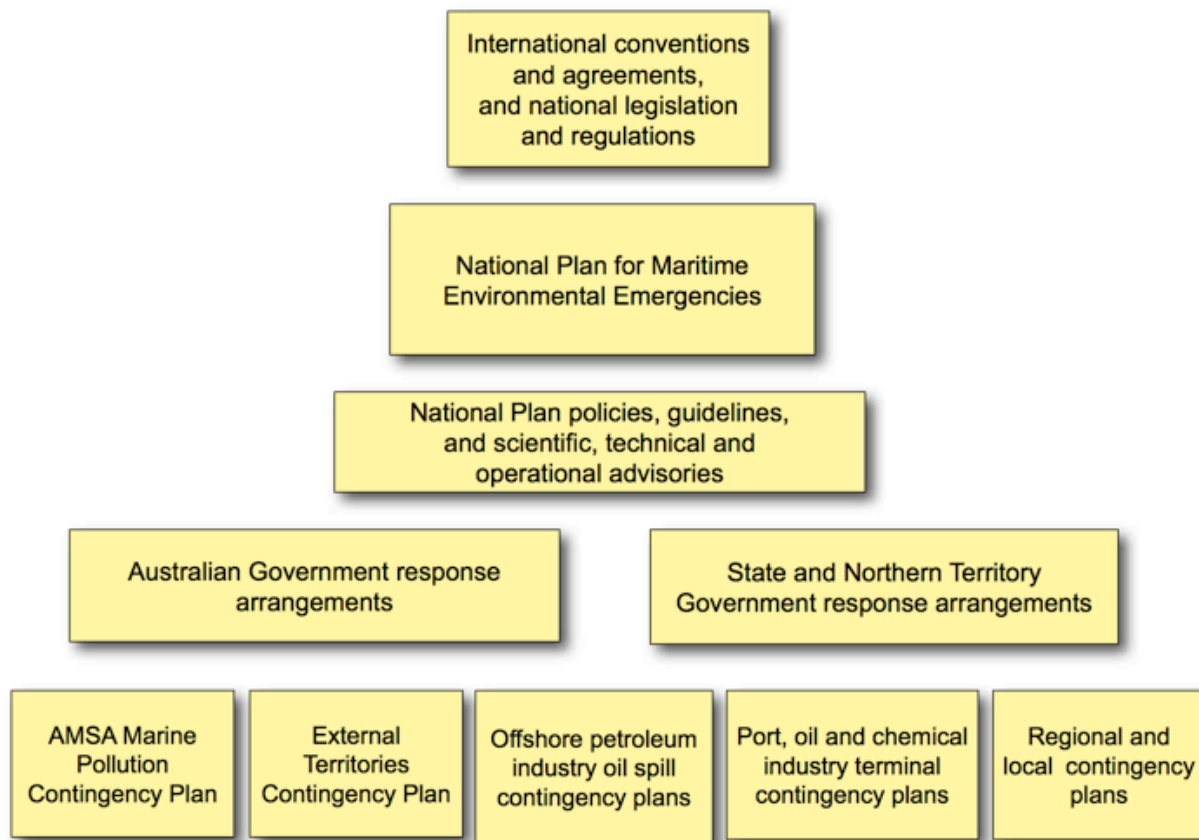


Figure 3.1. Framework for Australia National Plan (NPSCC, 2014)

The National Plan clearly acknowledges that management of oil spills and other marine emergencies is a multi-jurisdictional process that also includes industry and business, non-government organizations, and the public. The national oil spill response capability exists in a broader context of emergency management that bridges local, state, and federal government. In particular, Australian states have strong capabilities for all-hazard emergency management (e.g. floods, fires). At the same time, local communities have a major stake in preventing, preparing for, responding to and recovering from oil spills, and are critical to the overall process. The National Plan provides a single, integrated response arrangement through a cooperative process with four core elements:

- All parties fostering a cooperative relationship to ensure maritime environmental emergencies are managed in the interests of the Australian community;
- Recognizing the commitment of all stakeholders to collaboration across all levels of government, industry stakeholders and the community;
- Emphasizing the development and maintenance of cooperative relationships, teamwork, consultative decision making and shared responsibilities; and
- All stakeholders committing to support the National Plan arrangements when an incident occurs, regardless of source or location.

Links Prevention and Response

Australia's National Plan review resulted in a shift toward evidence-based risk management, with an emphasis on oil spill prevention. The Australian coastline has been segmented into eleven emergency towage vessel regions, with different levels of emergency towing capability based on regional risks (DNV, 2011). A dedicated emergency towing vessel based in Cairns provides emergency towing capability for the Far North Queensland and the Torres Strait region, which was identified as a high risk area during the National Plan risk evaluation process. For ten other major port areas, there are contracted towing vessels under agreement with AMSA. These agreements specify that the tugs must be equipped and crewed to go 200 nautical miles offshore and ready to get underway within 2-4 hours of notification. A third tier of vessels-of-opportunity are also available to hire on emergency contract as needed (AMSA, 2015k; Storrie, 2014).

AMSA has appointed a Maritime Emergency Response Commander (MERCOT) to act on behalf of AMSA in the event of an actual or potential marine pollution risk. MERCOT has the authority to dispatch emergency towing vessels to assist a vessel at risk of an incident. The operator is responsible for all response costs, including emergency towing, under Australia's "polluter pays" principle. AMSA's risk-based approach expands the polluter pays principle to fund preparedness activities, such as emergency towing, by applying a levy to commercial ships visiting Australian ports (AMSA, 2015k; AMSA, 2015l).

Since 1994, AMSA has published annual reports that document all incidents where tugs were deployed, pollution incidents, and potential pollution incidents. The annual reports describe oil spill preparedness training and response exercises that were conducted during that year, discuss past and ongoing initiatives related to spill prevention, response, recovery, and liability, and identify strategic priorities for the subsequent year. This reporting process provides an accountability link within the National Plan and also provides transparency to stakeholders and the public (AMSA, 2015m).

Oil Spill Capability Review and Enhanced Equipment Stockpiles

The 2011-2012 National Plan review identified "a number of capability gaps which if left unaddressed could reduce the effectiveness of response operations" (Storrie, 2014). The review considered the location and contents of national equipment stockpiles, and identified concerns with the mixed composition of some stockpiles and the age of equipment. The review recommended upgrading the equipment stockpiles in two locations (Dampier and Townsville) adjacent to high-risk areas. It also recommended standardization of oil spill response equipment storage and maintenance, including a formalized process for auditing national stockpiles to ensure their proper maintenance and upkeep (AMSA, 2012).

AMSA has implemented an online spill response equipment management and tracking system with both public and contractor portals that identifies detailed inventories for ten national equipment stockpile locations, listing all equipment and providing status updates (operational, non-operational, maintenance due). The online equipment database includes mechanical recovery equipment, safety equipment, dispersant stockpiles, and aircraft availability (NEMO, 2015).

Training Framework

AMSA has created a comprehensive training framework to support a national spill response capability. This systematic competency-based approach ensures that individuals and agencies with roles in oil spill response are trained to perform their respective roles. Online and classroom training courses include core Incident Management Team training as well as specialist courses aligned with the Australian Incident Management System (AIMS), the national incident management framework. Additional training courses include aerial observations, wildlife response, shoreline cleanup, and health and safety. Desktop, practical, and combined exercises are also part of the training framework. Each state and territory has an assigned training coordinator responsible for coordinating training within the jurisdiction. Additional workshops are held to bring together individuals with common roles across jurisdictions, such as marine pollution controllers or training coordinators (AMSA, 2015n).

Functional, Science-Based Approach

The National Plan emphasizes the importance of environmental, scientific, and technical data to support oil spill response decision-making. One element of this approach is a formal arrangement with Commonwealth Scientific and Industrial Research Organisation (CSIRO), which acts as an expert scientific advisory body during response operations. This arrangement allows Incident Controllers to access the Australian and international scientific community to support response decision-making (Storrie, 2014).

This approach also emphasizes the importance of baseline data to evaluate oil spill risks and understand potential consequences. One example of an ongoing effort is the Great Australian Bight Research Program, jointly sponsored by CSIRO in coordination with the industry, state government, and several research and academic institutions. Multi-disciplinary research teams are collecting data on pelagic ecosystems, benthic biodiversity, apex predators, petroleum geology, and regional socio-economics. The AU\$20 million research effort includes stakeholder outreach and expert review. Outputs will include models to inform ecological risk assessments (MISA, 2015).

3.2.3 GOVERNANCE

Figure 3.2 shows the National Plan governance structure.

The Council on Transport and Infrastructure (COTI), established in 2011, brings together commonwealth, state, territory and New Zealand Ministers with responsibility for transport and infrastructure issues, as well as the Australian Local Government Association. COTI has responsibility for the National Plan. A National Plan Strategic Coordination Committee (NPSCC), comprised of senior commonwealth, state, and territory officials, sets policy direction and oversees implementation of the plan. A National Plan Strategic Industry Advisory Forum (NPSIAF) serves as an independent industry-focused body to provide strategic input to the NPSCC on the National Plan. Each jurisdiction maintains a coordination group “to ensure effective whole of government decision making within the National Plan arrangements.” These groups may be state or local emergency management or hazard committees, and each jurisdiction promulgates their own plans to coordinate with the National Plan (NPSCC, 2014). Finally, the NPSCC has three active Technical Groups: the Marine Pollution Prevention Technical

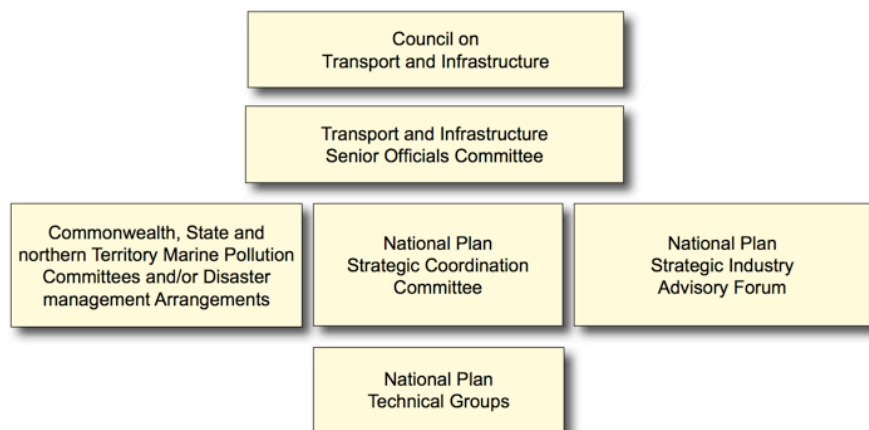


Figure 3.2. Governance Structure for Australia National Plan (NPSCC, 2014)

Group, the Marine Pollution Preparedness and Response Technical Group, and the Marine Pollution Recovery Technical Group (AMSA, 2015j).

3.2.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the Australia National Plan as a model for world-leading national contingency planning and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC's World-Leading Marine Oil Spill System based on Australia National Plan

<p>Summary</p>	<p>Australia's recently revised National Response Plan is rooted in a risk evaluation and capability assessment that establishes a risk-based prevention and response system. The national plan is closely integrated with state, local, and industry oil spill and emergency plans. National capacity includes emergency tow vessels to prevent incidents and strategically positioned, stocked, and maintained equipment caches to respond to oil spills using either mechanical response or dispersants. Over 20 years of annual reporting on National Plan activities creates accountability and transparency.</p>
<p>World-Leading Elements</p>	<ul style="list-style-type: none"> ✓ Supported by risk evaluation and capability assessment ✓ Integrates with state, local, and industry response plans ✓ Emphasis on prevention through dedicated emergency towing resources funded by shipping industry ✓ Equipment stockpiles actively managed and information on equipment status publicly available ✓ Competency-based training approach with regional oversight ✓ Science-based approach to response decision-making ✓ Over 20 years of annual reporting on National Plan activities creates accountability and transparency
<p>Jurisdiction(s) and Authorities</p>	<p>Australian Maritime Safety Act 1990 Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Protection of the Sea (Civil Liability for Bunker Oil Pollution Damage) Act 2008 Protection of the Sea (Civil Liability) Act 1981</p>
<p>Governance framework</p>	<p>National Plan Strategic Coordination Committee (NPSCC) implements plan with oversight from Council on Transport and Infrastructure (COTI). An industry advisory forum provides policy input, and technical working groups focus on prevention, response, and recovery issues. NPSCC activities are closely coordinated with state and local jurisdictions.</p>
<p>Considerations for BC</p>	<ul style="list-style-type: none"> ◇ Identify strategic priorities for marine oil spill preparedness and response. ◇ Develop integrated plan across all federal, provincial, local and First Nation agencies and governments involved in oil spill prevention or response. ◇ Evaluate spill response capacity (equipment, personnel, response time) based on regional oil spill risks and fill any gaps in equipment stockpile quantity, type, or location. ◇ Establish performance-based training standards for spill responders (government and industry). ◇ Conduct periodic self-assessments to identify opportunities to improve or enhance national and regional response capability.

3.3 Oil Spill Response Planning Standards

In some industries, regulatory compliance can be evaluated using metrics representative of actual performance (e.g., air emissions or energy consumption). In the case of oil spill response planning, however, the metrics or standards used to determine oil spill readiness are by necessity hypothetical and reliant on numerous assumptions. Response planning standards establish target thresholds for oil spill response preparedness that can be measured and compared to provide an indicator of oil spill response capabilities.

Oil spill response planning standards drive the establishment of a response system that reflects the potential size and location of oil spills in the area. Response planning standards may require a certain capacity at a national, regional, provincial/state, or local/port level. They may apply to a specific operator or to the response organizations that are responsible for containing and cleaning up oil.

Four **US Pacific states' oil spill response planning standards**, complemented by national requirements, are presented as examples of how world-leading response planning standards can be used to assure minimum response capability that is linked to potential operations and to drive continuous improvement in technologies and strategies for spill response.

3.3.1 OVERVIEW

Response planning standards for oil spills from tankers and non-tank vessels over 400 gross tons apply to all US-flagged vessels and vessels that call on US ports. Planning standards in US federal regulations require the planholder (vessel owner or operator) to indicate that they can deliver a certain amount of boom, skimming, and storage equipment to various locations by different time limits.¹² US federal response planning standards are established in regulation, and compliance is assessed through US Coast Guard review of operator oil spill contingency plans.

Several US states, including Alaska, Washington, Oregon, and California, have implemented additional contingency planning requirements for vessels operating in their waters.

3.3.2 WORLD-LEADING ELEMENTS

Response planning standards are in place for the US Pacific states that border Canada to the north and south. These state-level requirements are generally more stringent than the federal regulations, with some similarities in approach. California, Oregon and Washington all apply similar standards, while Alaska has a slightly different approach. All states monitor and enforce compliance through operator oil spill contingency plan review (Pacific States/BC Oil Spill Task Force, 2009). This practice is consistent with many elements of US oil spill policy where the federal government establishes baseline requirements, while states layer additional requirements to suit local risks and risk tolerance.

What makes US Pacific States Oil Spill Response Planning Standards World-Leading?

- Planning standards are established and enforced through oil spill contingency plans
- Planning standards incorporate all aspects of spill response
- Planning standards are commensurate with oil spill potential (size, type)
- Mechanism exists to drive continuous improvement or otherwise update standards as needed
- Assumptions are transparent to interested parties
- Requirements are predictable to regulated entities

¹² The time limits vary with distance from shore and distance from the primary port in designated zones.

Planning Standard Incorporates Different Aspects of Response

The three continental states – California, Oregon, and Washington – apply a fairly prescriptive response planning standard, similar to the US federal approach, that establishes minimum timeframe for equipment delivery (feet of boom, recovery capacity, storage volume) to various areas, with the amount of equipment tied to the potential worst case spill volume. Alaska’s approach links the standard to the worst potential spill volume from a vessel and requires the operator to show that they have resources in place to undertake all of the ancillary but critical response functions that occur during an oil spill, not just immediate containment and recovery of the spill.

The State of Alaska does not prescribe equipment delivery times but instead requires the operator to show in their plan how they will cleanup a spill of a certain size in 72 hours. Alaska’s requirement for tank vessels (tankers or barges) carrying crude oil has two basic requirements: (1) the vessel operator must be able to clean up a specified volume (50,000 bbl for vessels that carry less than 500,000 bbl of cargo and 300,000 bbl for vessels that carry more than 500,000 bbl of cargo) of oil within 72 hours; and (2) the operator must have enough resources operational within 72 hours to clean up 60% of an oil tanker’s cargo volume (18 AAC 75.438). Alaska requires that non-tank vessel operators (vessels over 400 gross tons) show that they have enough capacity to clean up 15% of the non-tank vessel’s fuel oil capacity within 48 hours (18 AAC 75.441). Alaska’s regulations allow operators to reduce their planning standard volume by up to 30% if they employ specific prevention measures.

Using detailed scenarios, the State of Alaska requires tank vessel operators to explain how they would conduct tracking and surveillance, skimming and containment, storage, waste management, protection of environmentally sensitive areas, and wildlife management for a variety of spills including a response planning standard-sized discharge. Scenarios must include calculations that show how available equipment (skimmers, boom, oil storage) can recover the volume of oil specified in the applicable planning standard (18 AAC 75.425(e)(1)(F)).

Response Planning Requirements Drive Continuous Improvement

World-leading response planning standards may drive continuous improvement by incentivizing operators to use enhanced technologies. The ability of regulators to drive technological innovation through response planning standards varies by regulatory context and implementation approaches. The concept of Best Available Technology (BAT) is included in most of the US Pacific state response planning regulations, with varying approaches to implementation.

Washington provides an example of a world-leading approach through its recently enacted Best Achievable Protection (BAP) requirements. The purpose of these requirements are to “ensure that our state achieves the highest standards of protection through requiring best technology, staffing levels, training procedures and operational methods in covered vessel oil spill plans” (Department of Ecology, 2015). The Washington Department of Ecology has identified the areas that it intends to focus on in a 5-year BAP review cycle (2013-2017) and a timeline for potential updates to regulations (see Figure 3.3). Priorities for the current 5-year cycle include heavy oils, dedicated storage, shoreline cleanup requirements, technical manuals, aerial surveillance requirements, 4-hour planning standard requirements, and vessels of opportunity. Developments in these areas could result in updates to vessel oil spill plan requirements that enhance spill response capacity (Department of Ecology, 2015; WAC 173-182).

Best Achievable Protection Review Cycle					
	2013	2014	2015	2016	2017
Implement NEW BAP Contingency Plan Rule Requirements					
Group V Oils Requirements					
Dedicated Storage Requirements					
Shoreline Cleanup Requirements					
Technical Manuals					
Aerial Surveillance Requirements					
4 Hour Planning Standard Requirements					
Vessels of Opportunity					
Identify Areas of BAP/BAT Review Cycle (2013-2017) Focus					
Implement BAP Review Process Steps					
Create BAP/BAT Technology Review Assessment Process					
Interview Experts on New Response Technologies					
Review/Rate Response Technologies and Processes					
Solicit Response Technologies For Review					
Solicit BAP Review Focus Areas					
NWACP Ad Hoc Equipment Committee Meeting (once annually)					
Conduct Equipment Gap Analysis					
Review WAC 173-182 Planning Standards					
Convene Advisory Group to Discuss Results of BAP Review Process & Planning Standard Review					
Announce Intent to Update WAC 173-182 based on BAP Review					

Figure 3.3. Washington Department of Ecology's Best Achievable Protection Review Cycle (Department of Ecology, 2015)

Public Transparency and Predictability for Regulated Parties

The US Pacific states' approaches to response planning standards are implemented through a state-level oil spill contingency planning processes. Contingency plan reviews, which vary slightly in approach across the four example states, require that operators or plan holders show their compliance in a document that is reviewed by regulatory agencies and the public.

Even with prescriptive regulations, there are numerous assumptions required to determine whether an operator meets a response planning requirement. These include, but are not limited to, the way equipment will be combined and deployed, vessel used for different tasks, number of personnel required, recovery rates, storage requirements (including the recovery of water and debris in addition to oil), mobilization time, transit speeds and distances, and logistical support. Regular, public plan reviews provide an opportunity for regulators and the public to review and comment on the plans and their underlying assumptions. Inclusion of the public in the plan review process provides a level of transparency that allows the public to understand and evaluate how planning standards are applied (Pacific States/BC Oil Spill Task Force, 2009).

A predictable regulatory standard also benefits industry, even if this is subject to changes with the goal of continuous improvement. In implementing the BAP review cycle, for example, the Washington Department of Ecology has specified the areas of potential improvement that it intends to focus on for the current and upcoming five-year planning cycles. This provides an indication to industry of the regulating body's priorities (Department of Ecology, 2015).

In the example jurisdictions presented, response planning standards are presented on paper and are not considered to be a *performance* standard. However, an operator's capability to meet planning standard is

evaluated through both planned exercises and unannounced drills that test assumptions and capabilities as described in contingency plans (Pacific States/BC Oil Spill Task Force, 2009).

3.3.3 GOVERNANCE

Each state’s relevant department evaluates contingency plans submitted by the regulated entities operating vessels or facilities. Plans are approved based on criteria defined in state regulations promulgated by the state agency or department under state statute. Plan review and approval incorporates a public comment component, and in some states multiple agencies or organizations have elevated status to review plans and request information from operators. Plan review cycles are five years in all example jurisdictions.

3.3.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the US oil spill response planning standards as a model for world-leading response preparedness and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC’s World-Leading Marine Oil Spill System based on US Pacific States Oil Spill Response Planning Standards

Summary	Response planning standards in US Pacific states compel operators to ensure that they have sufficient capacity available in a given region to clean up a worst case oil spill. Operators must describe their capability in government-reviewed oil spill contingency plans. State regulations encourage continuous improvement to response technologies and some require periodic formal assessment of best available technologies. The public has the opportunity to review and understand operator plans and compliance.
World-Leading Elements	<ul style="list-style-type: none"> ✓ Planning standards are established and enforced through oil spill contingency plans ✓ Planning standards incorporate all aspects of spill response ✓ Planning standards are commensurate with oil spill potential (size, type) ✓ Mechanism exists to drive continuous improvement or otherwise update standards as needed ✓ Assumptions are transparent to interested parties ✓ Requirements are predictable to regulated entities
Jurisdiction(s) and Authorities	<p>Alaska regulation: 18 AAC 75</p> <p>Washington regulation: WAC 173-182</p> <p>Oregon regulation: 340-142-0060</p> <p>California regulation: 14 CCR 1(4)</p> <p>US federal regulations: 33 CFR 155</p>
Governance framework	The designated agency or department in each state implements that state’s regulations related to oil spill contingency planning. Response planning standard compliance is assessed through operator-level oil spill contingency plan review (including opportunity for public review and comment) and verified through drills and exercises.
Considerations for BC	<ul style="list-style-type: none"> ◇ Establish worst case spill response volume based on total vessel cargo and fuel oil, and use worst case spill volumes to drive response capacity building. ◇ Consider replacing the current 10,000 tonne response organization requirement with vessel-specific standards that compel operators to contract for sufficient capacity to manage worst case discharge from vessel. ◇ Establish oil spill contingency planning requirements for vessels calling on BC ports. ◇ Develop best available technology requirements for oil spill response equipment.

3.4 Planning for the Use of Alternative Response Technologies

In most countries, mechanical recovery of oil spills using boom and skimmers is the preferred technique for responding to marine oil spills. However, there are alternative response technologies – such as the use of chemical dispersants or treating agents or in-situ burning of oil on the water’s surface – that may be preferred in some situations. National policies vary in how they treat alternative response technologies; a few countries have banned the use of oil spill treating agents, while others have no explicit policy governing their use. Most countries that allow the use of alternative response technologies, particularly dispersants, have established policies or guidelines that govern their use. Examples include the US, Australia, and Norway (DeCola, 2002; ITOPF, 2015a).

The United Kingdom (UK) Policy on Oil Spill

Treating Agents provides an example of a world-leading approach to alternative response technologies with a clear framework for decision-making regarding the use of certain approved chemicals to treat oil spills on water and on the shoreline. The UK also has operational planning and resource capacity in place to deploy dispersants within the window-of-opportunity while the oil is still dispersible.

3.4.1 SUMMARY

In the UK, oil spill treating agents (dispersants and other chemicals that may be applied to break up an oil slick) are a primary and preferred response option for offshore oil spills, provided that they are applied according to criteria established by the Marine Management Organisation (MMO). The Maritime and Coastguard Agency (MCA) has dedicated aircraft under contract and the UK government has equipment stockpiles that include dispersants and dispersant spraying equipment (ITOPF, 2015b).

3.4.2 WORLD-LEADING ELEMENTS

Clearly Defined Approval Process

While the UK government favors the appropriate use of dispersants to treat offshore oil slicks, they recognize that indiscriminate application of chemical treating agents may cause more environmental harm than good. Contingency planning guidance from the MCA states, *“Thoughtless and uncontrolled use of chemicals in the sea or on the shoreline to treat oil can cause more problems than would have occurred if the oil had been left alone.”* However, dispersants may also create a net environmental benefit by dispersing surface oil into the water column to avoid impacts to seabirds and to prevent slicks from washing up on shorelines (MCA, 2012).

Dispersants work best when they are applied to fresh, relatively thick oil slicks; therefore, rapid decision-making is essential to effective treatment (NRC, 2005). Several jurisdictions around the world have decision-making guidance that facilitates the process of selecting dispersants as a response option and securing the necessary permissions to apply them. In the UK, MMO approval is required to use an oil spill treating agent when water depth is less than 20 meters or application site is within 1 nautical mile of such water depths. Approval is also required for any subsea applications (MMO, 2015a).

What makes the UK Policy on Oil Spill Treating Agents World-Leading?

- Clear, transparent, and expedited decision-making process for approval decision about agent use within one hour of request
- Efficacy and toxicity standards for approval of specific agents tied to intended use (offshore, inshore, shoreline, etc.)
- Port and operator oil spill contingency plans should include plans for dispersant use decisions and operations
- UK government has resources (aircraft and dispersants) and discretion to initiate dispersant operations

In instances where approvals are sought for a specific incident, a 24-hour system is in place to facilitate quick decision-making. MMO will respond within one hour to all requests to use approved treating agents in UK waters (MCA, 2012). Figure 3.4 presents a flow chart that summarizes the decision-making criteria that the MMO and other authorities apply in determining whether or not to approve the use of a treating agent.

Approval to use oil spill treatment products flowchart

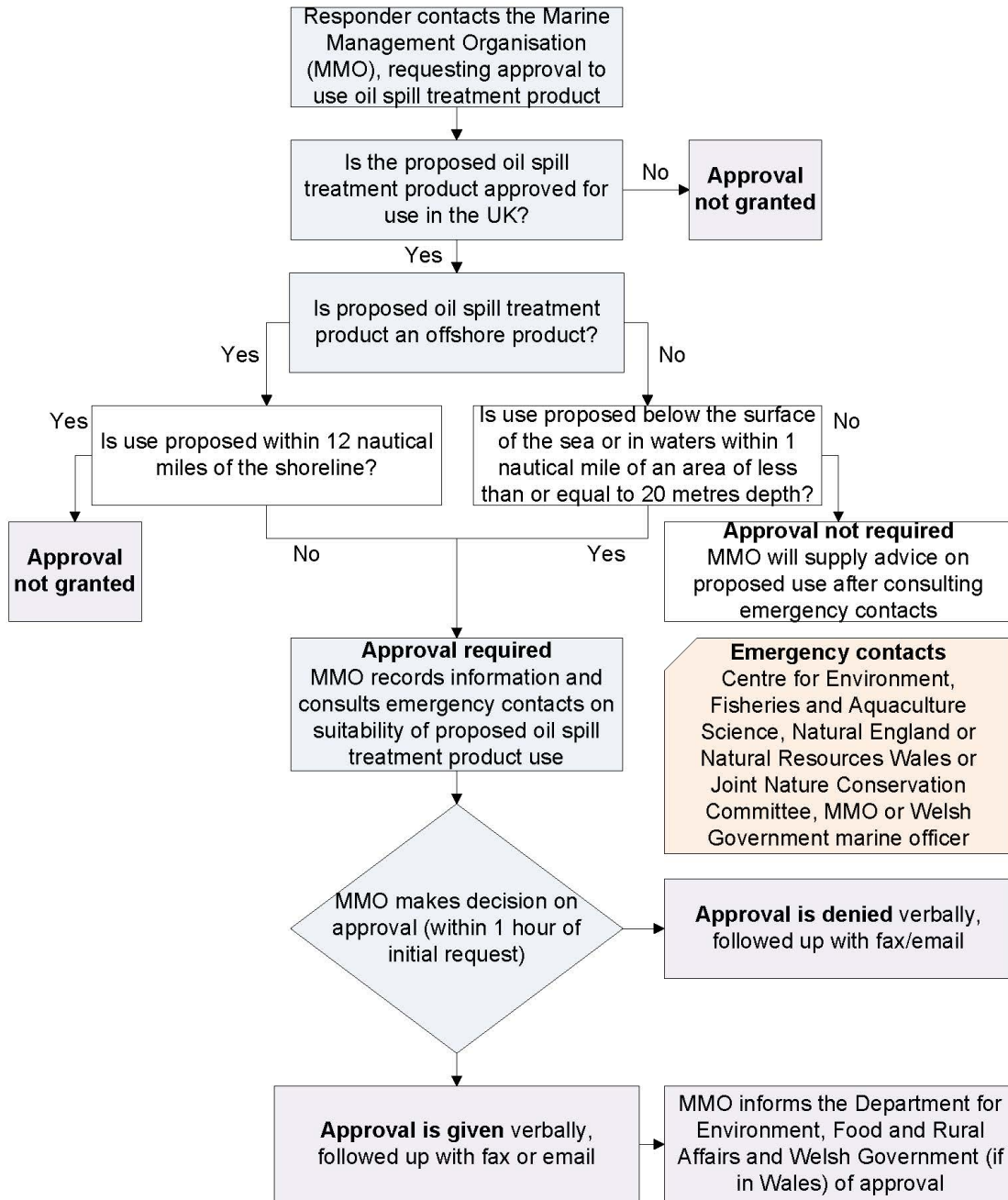


Figure 3.4. UK Oil Treating Agent Approval Process (MMO, n.d.)

Oil treating agents that have been approved for use by the MMA may be used in the UK without MMO authorization in instances where there is a risk to human life or the safety of an offshore platform or vessel (i.e. fire or explosion risk), but MMO and the appropriate natural conservation authority must be notified of the use. There are also standing approvals – agreements between the MMO and local harbor authorities – that allow the use of treating agents in pre-defined areas without explicit authorization. These standing approvals may apply other limits, such as maximum quantity that can be applied. As with the other exception, there is a requirement to notify the MMO any time a standing approval is applied, and users are encouraged to consult with government authorities even in instances where use is pre-authorized, if possible (MMO, 2015a; MCA, 2012).

Efficacy and Toxicity Standards for Agent Approval

The UK approval process applies only to chemical agents that have been vetted through a process that evaluates the efficacy and toxicity of the agent. This process provides some assurance that products have the potential to effectively treat an oil slick and that the toxicity risks are known.

Efficacy testing must be conducted according to established protocols that specify the laboratory testing methods and procedure. Different types of tests are required depending on the type of agent (e.g., dispersant, sorbent, degreaser) and – for dispersants – whether the product is intended for use inshore or offshore. To gain UK government approval, dispersants must meet minimum efficacy standards based on the chemical properties and application ratio of the dispersant (Department for the Environment, Food, and Rural Affairs, 2007; MMO, 2014).

The UK approval process specifies two toxicity tests to consider potential impacts to marine species. The first evaluates toxicity to brown shrimp as a representative of at-sea species and the second evaluates toxicity to the common limpet as a representative of rocky shoreline species. Dispersants intended for use within 12 nautical miles of the coast must pass both toxicity tests; offshore approval requires only the brown shrimp toxicity test. Additional toxicity tests apply to bioremediation agents (Kirby et al., 1996; MMO, 2014).

Approval of a dispersant or other treating agent is valid for five years (MMO, 2014). Stockpiled dispersants that are maintained in original manufacturer packaging must be re-tested every ten years; dispersants that have been transferred to containers other than manufacturer packaging must be re-tested every five years (MCA, 2012). An updated list of approved products and their parameters for use is maintained by the MMO (MMO, 2015b).

Operational Planning and Capacity

The MCA Contingency Planning for Marine Pollution Preparedness and Response Guidelines for Ports encourage port and oil-handling facility contingency plans to describe the conditions under which treating agents like dispersants might be used, and the criteria that should be used to select response options. Plans that include treating agents as a response option should also identify sensitive areas and fishery resources that may be vulnerable to adverse impacts from treating agents, and describe measures that will be taken to protect these areas. Port and operator plans should also identify the person(s) responsible for seeking approval from the UK government. Plans should also describe the type, amount and location of dispersant stockpiles (MCA, 2012).

Dispersant effectiveness requires accurate application (NRC, 2005). The MMO provides basic operational guidance on how to spray dispersants, including health and safety considerations (MMO, 2015c). The National Contingency Plan outlines the MCA's authority to initiate dispersant operations either upon request from an operator or port authority, or on their own initiative. The MCA has aircraft under contract and the government has dispersant stockpiles available. Additional capacity (aircraft, dispersant chemicals, and application equipment) is available through private sector contractors (ITOPF, 2015b).

3.4.3 GOVERNANCE

The MMO has decision-making authority to approve or not approve the use of dispersants. The MMO and the Department for Food, Environment, and Rural Affairs evaluate toxicity and efficacy testing data and approve specific treating agents for use in UK waters. The MCA has equipment and plans in place to apply dispersants from aircraft or vessels in response to a direct request or at their own discretion.

3.4.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the UK Policy on Oil Spill Treating Agents as a model for decision-making to guide the use of alternate response technologies and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC's World-Leading Marine Oil Spill System based on UK Policy on Oil Spill Treating Agents

Summary	<p>The UK government's policy toward the use of oil spill treating agents is clear and transparent. A decision-making flow chart is used to expedite decisions about when agents may be used, and response capacity includes both government and contractor resources. There is a framework for testing efficacy and toxicity, and only government-approved chemicals can be authorized for use. There is an expectation that port and operator oil spill contingency plans will establish criteria for deciding whether or not to use dispersants.</p>
World-Leading Elements	<ul style="list-style-type: none"> ✓ Clear, transparent, and expedited decision-making process for approval decision about agent use within one hour of request ✓ Efficacy and toxicity standards for approval of specific agents tied to intended use (offshore, inshore, shoreline, etc.) ✓ Port and operator oil spill contingency plans should include plans for dispersant use decisions and operations ✓ UK government has resources (aircraft and dispersants) and discretion to initiate dispersant operations
Jurisdiction(s) and Authorities	<p>Marine and Coastal Access Act 2009</p> <p>Marine Licensing (Exempted Activity) Order 201</p> <p>Contingency Planning for Marine Pollution Preparedness & Response Guidelines for Ports (2012)</p> <p>The National Contingency Plan (2014)</p>
Governance framework	<p>The MMO has decision-making authority to approve or not approve the use of dispersants. The MMO and the Department for Food, Environment, and Rural Affairs evaluate toxicity and efficacy testing data and approve specific treating agents for use in UK waters. The MCA has equipment and plans in place to apply dispersants from aircraft or vessels in response to a direct request or at their own discretion.</p>
Considerations for BC	<ul style="list-style-type: none"> ◇ Establish geographic zones where alternative response technologies are or are not authorized. ◇ Provide decision-making process regarding use of treating agents or alternative response technologies in authorized areas during an incident. ◇ Develop operational capacity (stockpiles, application equipment and platforms, trained personnel) to implement alternate response technologies, if authorized. ◇ Establish government oversight for entire life cycle of treating agent use, from testing and approval of specific products based on effectiveness, toxicity, and other criteria to incident-specific and long-term monitoring if agents are used during an oil spill.

3.5 Geographic Response Planning

Geographic Response Plans (GRP) or Geographic Response Strategies (GRS) are location-specific strategies to protect vulnerable sites that are of particular ecologic or socioeconomic importance. GRP and GRS have been developed in many jurisdictions around the world – some plans are developed by operators, some by response contractors, and others by government agencies.

The **Alaska GRS program** provides an example of a world-leading approach that ties into existing government and industry oil spill contingency plans, applies standardized tactics based on available response resources, and includes a high level of stakeholder involvement.

3.5.1 OVERVIEW

GRPs and GRSs combine local knowledge and protection priorities with oil spill response tactical and logistical planning to provide a tool that facilitates quick deployment of protection strategies before oil reaches sensitive sites. In Alaska, where responders must be prepared to protect approximately 33,000 miles of coast, much of it in remote undeveloped areas, geographic response planning was first introduced into the regional state/federal contingency planning process in 1998 (Mutter et al., 2003). A model approach based on an agency/industry/stakeholder workshop and a pilot project in Southcentral Alaska resulted in a series of guiding principles that have been applied to GRS development at more than 400 sites statewide over the past 15 years (Robertson et al., 2000):

- The GRS should identify sensitive resources at risk and set priorities for their protection.
- The GRS should contain workable techniques to protect sensitive areas.
- The GRS document should be designed to meet the needs of responders in the field.
- The strategies should be flexible so they can be modified, as necessary, to fit the prevailing conditions at the time of a response.
- The GRS should not unnecessarily duplicate information contained in other government oil spill contingency plans.
- The GRS document must be easy to use, validate, and update and inexpensive to produce.
- The GRS development process should increase public awareness of response plans before an incident occurs.
- The GRS should utilize standard terminology and tactics.

The Alaska GRS program systematically developed GRS for sites across the state by applying these general principles.

3.5.2 WORLD-LEADING ELEMENTS

Consensus Workgroup Process

GRS development follows the same general process throughout the State of Alaska. First, workgroup participants identify all sensitive areas that have the potential to be classified as “Areas of Major Concern” under the criteria established in the governing Subarea Plan.¹³ These potential sites are then evaluated

¹³ In Alaska there are 10 Subarea Plans that serve as regional state/federal oil spill contingency plan. The Subarea Plans are sub-components of a statewide Unified Plan, which in turn falls under the umbrella of the US National Contingency Plan.

What makes Alaska Geographic Response Strategies World-Leading?

- Workgroup process involves local stakeholders, natural resource agencies, and spill response experts in collaborative process
- Public input into prioritization of sites
- Standardized tactics, terminology, and resource sets are used statewide by industry and government
- Operators can reference GRS to illustrate how they will meet state contingency planning requirements for sensitive area protection

based on the additional criteria of 1) risk of being impacted from a marine oil spill; and 2) feasibility of successfully protecting the site with existing technology (ADEC, 2011).

Using this process, the workgroup selects a preliminary list of sites. These candidate sites are then released for public input. Feedback on site selection is solicited from tribal representatives, user groups, environmental organizations, and the general public. Based on the feedback received, the workgroup then makes the final site selections. In many Subareas, GRS development has followed a phased schedule, so that candidate sites that are not selected for immediate GRS development may be revisited in the future (ADEC, 2011).

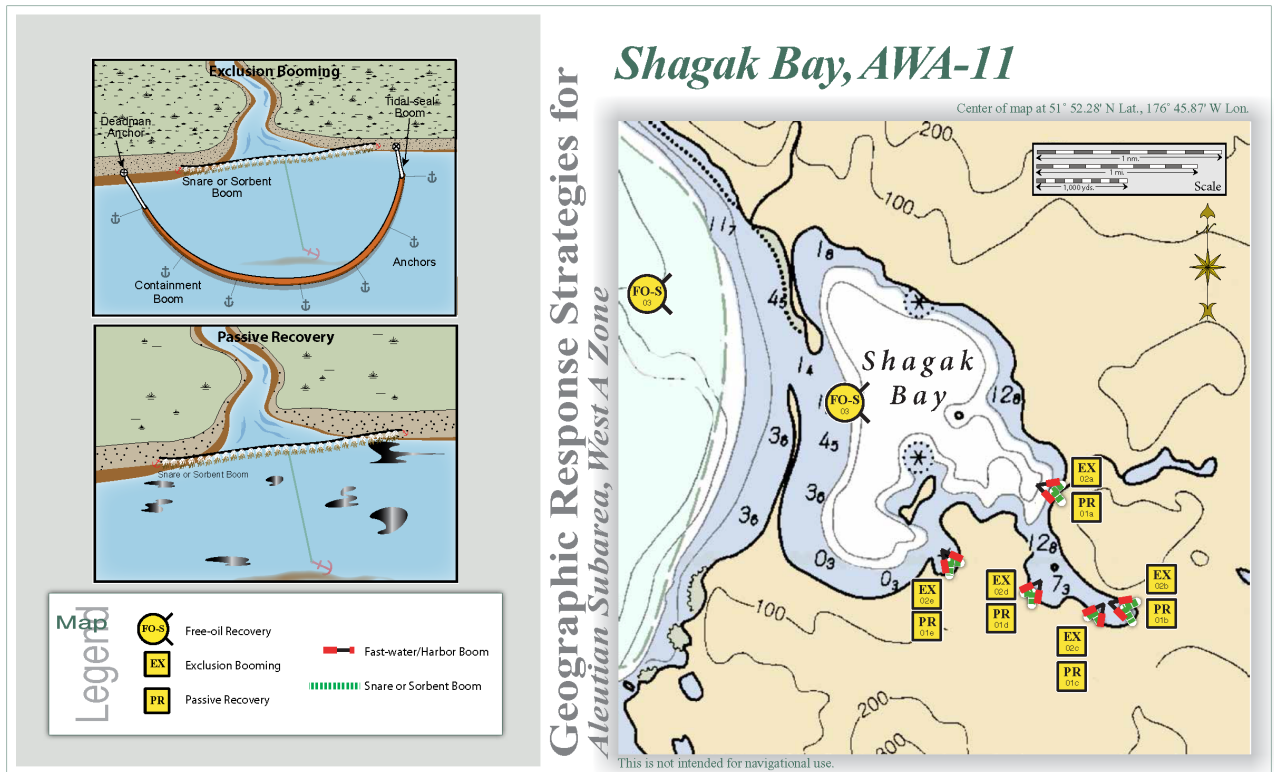
Once site selection is complete, an Operations/Tactics committee, composed of spill response professionals, is formed to develop draft strategies for each site selected. Once completed, the draft strategies are reviewed and approved by the entire workgroup. The final GRS are forwarded to the appropriate Subarea Committee with the recommendation that they be adopted as part of the Subarea Contingency Plan. GRS are not considered final until the Subarea Committee has approved them (ADEC, 2011).

This consensus process involves a range of experts in different phases of the project: local stakeholders, natural resource agencies, and the public have a role in establishing protection priorities. Response experts then develop tactics to protect the sites using available resources, and the final plans undergo an additional level of workgroup review before adoption into the statewide plan. The resulting plans have buy-in from both response professionals and the public, and help to establish clear and consistent expectations for spill response. Operators who are required to submit oil spill contingency plans under Alaska state regulations can use the GRS in their oil spill response scenarios to demonstrate compliance with sensitive area protection requirements.

Standard Tactics and Terminology

The Alaska GRS utilize standard tactics and terminology. The ongoing GRS development process helped to spur a related effort to develop a statewide oil spill response tactics guide, which incorporates protective booming and spill recovery tactics that are typically used in coastal GRS as well as additional tactics for safety, logistics, and on-water recovery operations (ADEC, 2014). Standardized tactics and terminology for equipment, operating environments, and other technical language helps to ensure that responders from across the state have a common understanding of how to implement tactics.

Figure 3.5 shows the tactics map for a GRS from the Aleutian Islands Subarea. The chart on the right hand side shows five exclusion booming arrays with passive recovery as a backup. On the left, basic tactical diagrams show how the booming arrays are deployed. A more detailed description of the exclusion booming and passive recovery tactics is provided in the Spill Tactics for Alaska Responders manual (ADEC, 2014). Standard icons are used on the tactics maps throughout all of the Alaska GRS, providing a shorthand that is familiar to local responders and corresponds to the statewide tactics manual.



March 1, 2015

DRAFT This tactic map is a working draft being used to develop a Geographic Response Strategy at this location. The tactics represented here have not been approved by the Subarea Committee and should not be considered final. If you have questions or comments please contact us by email at contact@nukaresearch.com.

NUKA Research & Planning Group, LLC.

Figure 3.5. Example of Alaska GRS Tactics Map

Detailed Logistical Planning and Resource Lists

The Alaska GRS are two-page documents that are typically used in paper format by responders in the field. Figure 3.6 shows the second page of the GRS in Figure 3.5. It contains detailed implementation instructions, logistical information, and response equipment lists to guide field responders in implementing the tactics. The standard icons used on the map are carried through to the tactics table for ease of use. Information about staging areas and site access is provided, including special instructions related to navigation, responder safety, and other site-specific issues. The tables also indicate whether the GRS has been field-tested through a deployment exercise. Often, these exercises may result in refinements or changes to the GRS.

The level of detail in GRS resource lists also makes it possible to use these plans to evaluate response capacity for a given region and to identify any capability gaps (e.g., lack of appropriate vessels to access the site or proximity of local boom caches). While the GRS are not performance or planning standards, they are integral to the contingency planning and preparedness process.

ID	Location and Description	Response Strategy	Implementation	Response Resources	Staging Area	Site Access	Resources Protected (months)	Special Considerations
AWA-11-01 PR	Shagak Bay Same Locations as AWA-11-02	Passive Recovery Use passive recovery for rapid deployment prior to oil impacts and the arrival of fast boom. Place passive recovery boom across the entrance to the salmon streams in Shagak Bay. Move the boom to maximize the protection of the salmon streams in Shagak Bay.	Place and anchor snare line or sorbent boom across the identified creek mouths. Move to arrays further back into the streams if the sea state precludes deployment. Replace as necessary to maximize the recovery. <u>Boom Lengths:</u> Same as AWA-11-02	Deployment Equipment 800 ft. snare line or sorbent boom 5 ea. small anchor systems 20 ea. anchor stakes Vessels/Personnel/Shift Same as AWA-11-02 Tending Vessels/Personnel/Shift Same as AWA-11-02	Vessel Platform	Via marine waters Chart 16471	Same as AWA-11-02	Vessel master should have local knowledge. Title 16 permitting required from ADFG. Title 41 permitting required from ADNDR
AWA-11-02 EX	Shagak Bay a. Lat. 51° 51.731'N Lon. 176° 43.295'W b. Lat. 51° 50.962'N Lon. 176° 42.721'W c. Lat. 51° 50.908'N Lon. 176° 42.844'W d. Lat. 51° 51.071'N Lon. 176° 43.585'W e. Lat. 51° 51.206'N Lon. 176° 44.321'W	Exclusion Exclude oil from impacting Shagak Bay.	Deploy anchors and boom with skiffs (class 6). Exclude the entrance to the streams with fast-water/calm-water boom. Place the boom in a chevron pattern in front of the sorbent boom and extend into the ocean in front of the sorbent boom. If the sea state precludes this is strategy, deploy further back in the stream. Tend throughout the tide. <u>Boom Lengths:</u> a. 150 ft. b. 200 ft. c. 150 ft. d. 200 ft. e. 100 ft.	Deployment Equipment 800 ft. fast-water/calm-water boom 5 ea. small anchor systems 20 ea. anchor stakes Vessels 1 ea. class 3 2 ea. class 6 Personnel/Shift 7 ea. vessel crew Tending Vessels 1 ea. class 3 2 ea. class 6 Personnel/Shift 5 ea. vessel crew	Vessel Platform	Via marine waters Chart 16471	Marine mammals- sea otter Fish - chum salmon, pink salmon Birds- shorebird nesting Habitat- exposed rocky shoreline	Vessel master should have local knowledge. Fast-water boom is specified for logistical consideration. Larger boom maybe used if available. Site Survey- 7/22/2015 Tested- Not yet
AWA-11-03 FO-S	Shagak Bay Nearshore waters in the general area of: Lat. 51° 51.925'N Lon. 176° 45.239'W	Free-oil Recovery Maximize free-oil recovery in the offshore & nearshore environment of Shagak Bay depending on spill location and trajectory.	Deploy free-oil recovery strike teams upwind and up current of Shagak Bay. Use aerial surveillance to locate incoming slicks.	Deploy multiple free-oil recovery strike teams as required to maximize interception of oil before it impacts sensitive areas.	Adak- 25 nm	Via marine waters Chart 16471	Same as AWA-11-02	Vessel master should have local knowledge.

AWA-11

NOTE: Sensitive resource information can be found on other maps which can be accessed through the sensitive area section of the NWI Sub-Area Contingency Plan: http://dc.alaska.gov/nwp/rep/plans/scp_al.htm

Figure 3.6. Example of Alaska GRS Tactics Table

3.5.3 GOVERNANCE

The Alaska Department of Environmental Conservation (ADEC) has taken the lead role in funding GRS and coordinating workgroups statewide, although there have been several other government, non-government, and industry funding partners over the life of the program. Workgroups are co-chaired by ADEC, the US Coast Guard, Department of Interior, and Environmental Protection Agency. The GRS are adopted into the governing Subarea Contingency Plan and become part of the state/federal oil spill and hazardous materials response planning framework (ADEC, 2015).

3.5.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish Alaska’s approach to Geographic Response Strategies as a model for geographic response planning and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC’s World-Leading Marine Oil Spill System based on Alaska Geographic Response Strategies

Summary

GRS are developed through a consensus workgroup process that involves local stakeholders, natural resource agencies, and spill response experts. There are several opportunities for public review and comment on site selection and GRS tactical plans. GRS are developed using a standard menu of tactics with icons that are based in a statewide manual. Operators may reference GRS in their oil spill contingency plans to show how they will protect sensitive areas.

Considerations for Modeling BC's World-Leading Marine Oil Spill System based on Alaska Geographic Response Strategies

World-Leading Elements	<ul style="list-style-type: none"> ✓ Workgroup process involves local stakeholders, natural resource agencies, and spill response experts in collaborative process ✓ Public input into prioritization of sites ✓ Standardized tactics, terminology, and resource sets are used statewide by industry and government ✓ Operators can reference GRS to illustrate how they will meet state contingency planning requirements for sensitive area protection
Jurisdiction(s) and Authorities	Alaska Unified Plan for Oil and Hazardous Substance Releases and Subarea Contingency Plans
Governance framework	Workgroups chaired by state and federal agencies include participation from industry, local and tribal governments, and stakeholder groups. Final plans are incorporated into regional oil spill contingency plans.
Considerations for BC	<ul style="list-style-type: none"> ◇ Develop prioritization process that considers vulnerability, sensitivity, and feasibility. ◇ Regional approach for BC that integrates with other oil spill and emergency response plans. ◇ Use geographic response plans to evaluate response capacity and adequacy of equipment stockpiles, and fill gaps. ◇ Develop local response capacity to quickly implement protection strategies ahead of an oil slick. ◇ Provide opportunity for public and stakeholder review and input, particularly into site selection/prioritization process. ◇ Utilize standard tactics and terminology. ◇ Test strategies during field deployments under realistic conditions, and refine plans accordingly.

3.6 Fishing Vessel Programs

Local fishing vessels have been used to supplement marine oil spill response operations for decades in regions of North America, Europe, and Australia (The Glosten Associates, 2005). Vessel-of-opportunity (VOO) programs have been used as a tool for *ad hoc* hiring of local fishing boats and their crew to support response operations. The 2010 well blowout in the Gulf of Mexico was notable for the use of over 10,000 local fishermen and thousands of vessels in the cleanup (Gutman et al., 2011). These types of programs provide an opportunity for community involvement in oil spill response by utilizing local mariners for a variety of roles.

In some jurisdictions, including several US states, BC, Newfoundland, Norway, and the UK, dedicated training programs are in place to assure that local fishing fleets have the training and certifications needed to participate in oil spill response operations.

The **Alyeska SERVS fishing vessel program in Prince William Sound, Alaska (US)** is an example of a world-leading system that has created a network of trained, on-call fishing vessels and crew that can provide immediate first response to an oil spill as well as a broader network of vessels and crew to supplement ongoing cleanup operations (PWSRCAC, 2015).

3.6.1 OVERVIEW

Alyeska Pipeline Service Company (APSC),¹⁴ in collaboration with the Ship Escort/Response Vessel System (SERVS), funds and maintains a fishing vessel coordination program that trains hundreds of local fishing vessels and their crew and tracks availability through a regional database. The program is distinguished by the fact that the first-strike fishing vessels can be on-scene and fully operational within hours of activation (R. Robertson, personal communication, June 25, 2015). The program is linked directly to the Prince William Sound tanker operators' state-approved oil spill contingency plan, which provides assurance to regulators and the public that the fishing vessel program has adequate numbers of vessels and crew available to meet state response planning requirements.

3.6.2 WORLD-LEADING ELEMENTS

Assurance of Response Times and Numbers of Vessel and Crew

The Alyeska SERVS fishing vessel program is structured to ensure that a minimum number of vessels and crew are available on stand-by to respond to incidents at any time. Vessels-of-opportunity are also included in the program, but the contracted vessels form the core of the program and create a level of assurance that this capability will be available to support a local spill response.

The SERVS program is categorized into four Tiers of responders (vessels and crew). All contracted vessels (Tier 1 and 2) are paid to be in the program, with variable compensation that is based on the contractual response time and the vessel size. The vessels are hired and their crew compensated for participation in field exercises, classroom instruction, and on-water training (R. Robertson, personal communication, June 25, 2015).

What makes the Alyeska SERVS Fishing Vessel Program World-Leading?

- Membership tiers require that contracted vessels and crew must respond within 1, 6, or 24-hours of oil spill
- Approximately 400 vessels under contract, plus database of vessels-of-opportunity
- Funded by companies that ship oil through Prince William Sound
- Linked to compliance with state response planning standards
- Training program regularly reviewed and revised to reflect new technologies, tactics, or regulatory requirements
- Positive link between fishing and oil industries with financial benefits to each

¹⁴ Alyeska is the consortium of oil companies that transport oil through the Trans-Alaska Pipeline from the production fields on the North Slope of Alaska to the Valdez Marine Terminal, where the oil is loaded onto tankers and shipped to market.

The fishing vessel coordinator, a paid employee of Alyeska SERVS, manages the program and is supported by contracted fishing vessel administrators in the six coastal communities where contracted vessels are home-ported. The coordinator reports weekly on the availability status of Tier 1 vessels and monthly on the status of Tier 2 fishing boats. Figure 3.7 shows the three most common fishing vessel types in the SERVS program.



Seiner

Seiners are typically between 35 and 58 feet long. The cabin is toward the bow, while the stern consists of a flat deck and a low rail around it. Fish holds take up the center portion of the boat. Seiners use a picking boom attached to their boat for hauling in their purse seine. Most seiners have a small skiff that works in concert with them. The crew of a seiner usually numbers four.



Stern picker

Stern pickers range from 30 to 40 feet long. Their cabins are near the bow. They are smaller than seiners and have a reel and roller on the aft deck for reeling gillnet on and off. Stern pickers usually have a crew of two.



Bow picker

Bow pickers run about 26 to 36 feet in length. The cabin sits at the rear of the vessel and the gillnet reel is at the bow. Bow pickers typically have a crew of two.

Figure 3.7. Three Most Common types of Fishing Vessels in ALYESKA SERVS program (PWSRCAC, 2007)

Specialized Training to Support a Range of Response Functions

Annual SERVS fishing vessel training is offered as a three-day course in the spring and fall, during times that are selected to avoid conflict with fishing seasons. Training ranges from classroom instruction to hands-on practice with response equipment to on-water deployments. The curriculum incorporates hazardous materials operator training required under Alaska and US law and includes additional material specific to hydrocarbons. The program is revised as new technologies or tactics become available and as a result of lessons learned during drills, exercises, or incidents. Vessels and crewmembers are compensated for time spent in training (PWSRCAC, 2015; R. Robertson, personal communication, June 25, 2015).

Vessels and crew that complete the SERVS fishing vessel training have capabilities that include: oil spill containment and recovery; sensitive area identification and protection; equipment maintenance and repair; decontamination of vessels and equipment; shoreline cleanup; logistics support; public information; damage assessment; transportation of personnel and equipment; and communications support (PWSRCAC, 2015). Tier 1 vessel crewmembers have additional training in site safety and characterization of human health hazards, and are fit tested to wear air-purifying respirators. They are also guaranteed to participate in three response exercises per year (R. Robertson, personal communication, June 25, 2015).

In 2010, SERVS-trained responders were hired to help clean up the Deepwater Horizon oil spill in the US Gulf of Mexico, supplementing professional responders from around the world. The responsible party (BP) paid the responders for their efforts, and in the event that they responded to a spill in Alaska, they would also be

compensated directly by the responsible party under US and Alaska laws (R. Robertson, personal communication, June 25, 2015).

Link to State-approved Oil Spill Contingency Plans

In Alaska, operators of tank and non-tank vessels are required to develop oil spill contingency plans for review and approval by the Alaska Department of Environmental Conservation on a five-year cycle. In Prince William Sound, the consortium of companies that ship oil from the Valdez Marine Terminal prepare a joint contingency plan, supplemented by vessel-specific appendices, that demonstrates compliance with the state's response planning standard. For the Prince William Sound tanker operators, the state response planning standard is to “contain or control and clean up within 72 hours” a 300,000 bbl (47,700 m³) oil spill on water (18 AAC 75.438).

The Alaska state oil spill contingency planning regulations require that operators include in their plans “a written description of a hypothetical spill incident and response that demonstrates a plan holder's ability to respond to a discharge of each applicable response planning standard volume within the required time frames using the resources described in the contingency plan and that identifies the spill location, time of year, and time of day, the source and cause of the spill, the quantity and type of oil spilled, the relevant environmental conditions, including weather, sea state, and visibility, the spill trajectory, and the expected timeline for response actions, describing response actions to be taken; the response scenario must be usable as a general guide for a discharge of any size, must describe the discharge containment, control, and cleanup actions to be taken, which clearly demonstrate the strategies and procedures adopted to conduct and maintain an effective response...” (18 AAC 75.425(e)(1)(F)). In order to meet these requirements, the Prince William Sound tanker contingency plan relies directly on approximately 400 Tier 1 and Tier 2 fishing vessels that are available through the program.

Table 3.1 shows the minimum number of vessels required to meet commitments in the state contingency plan, along with the estimated number of vessels available through the fishing vessel program. The link between the fishing vessel program and the tanker operators' state-approved oil spill contingency plan ensures that the capability will be maintained, because the operators rely on these vessels to meet their response planning standard. The oil spill contingency plan is reviewed by the State of Alaska every five years, with opportunity for public review and comment. The Prince William Sound Regional Citizens' Advisory Council (discussed in Section 4.3) also reviews and comments on the contingency plan, and has been an active auditor of the fishing vessel program (Harvey Consulting, 2009).

While Alyeska SERVS funds the fishing vessel program directly, including dedicated fishing vessel coordinators, the program costs are significantly lower than the costs associated with directly maintaining and crewing an additional 400+ dedicated response vessels (R. Robertson, personal communication, June 25, 2015).

Table 3.1. SERVS Fishing Vessel Program Response Tiers

Category	Response Time Requirement	Number of Vessels Identified in Contingency Plan as Required for Worst Case Spill Response	Number of Vessels under Contract
Rapid Response Group (subset of Tier 1)	Must respond within 1 hour of oil spill	4	8
Tier 1	Must respond within 6 hours of oil spill	50	60+
Tier 2	Must respond within 18 hours of oil spill Must respond within 24 hours of oil spill	40 185	300+
Tier 3	Vessels-of-opportunity; no formal training or contracts	No requirement	Casual database with contact information for vessels in multiple fishing ports

Positive Connection between Fishing and Oil Industries

When an oil spill occurs, local fishing fleets can suffer significant impacts. In Alaska, there is a long history of distrust between the fishing industry and the oil industry, some of it dating back to the Exxon Valdez oil spill, which impacted local fisheries for salmon, herring, crab, shrimp, rockfish and sablefish (EVOSTC, 2015). The SERVS fishing vessel program has provided a common interest for the fishing and oil industries in this region to share information and build mutual trust and understanding. The program provides a source of income and employment for local fishermen while empowering these local stakeholders to provide a first-strike spill response capability that could reduce the impacts of an oil spill. The oil industry also benefits from access to local knowledge and expertise, and the program fosters public confidence in the local oil spill response system (R. Robertson, personal communication, June 25, 2015).

3.6.3 GOVERNANCE

Alyeska SERVS funds and administers the fishing vessel program. There is no regulatory requirement for the program *per se*, but because the Prince William Sound tanker operators rely on the contracted fishing vessels to meet their state response planning standard (see Section 3.3), the program is integral to the tanker operators’ ability to comply with state regulations.

3.6.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the Alyeska SERVS Fishing Vessel Program as a model for utilizing fishing vessels for spill response and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC's World-Leading Marine Oil Spill System based on Alyeska SERVS Fishing Vessel Program in Alaska

<p>Summary</p>	<p>The Alyeska SERVS fishing vessel program creates a community-based first-strike spill response capacity in the Prince William Sound region. Contracted vessels must meet minimum response times that range from 1 to 24 hours. Annual training that is regularly updated ensures that vessels and crews are capable of a range of spill response functions. There are financial incentives for both the oil industry and the fishing vessels and crewmembers. Because the tanker operators rely on the 400+ fishing vessels in the program to meet their state oil spill planning requirements, the program has a regulatory imperative.</p>
<p>World-Leading Elements</p>	<ul style="list-style-type: none"> ✓ Membership tiers require that contracted vessels and crew must respond within 1, 6, or 24-hours of oil spill ✓ Approximately 400 vessels under contract, plus database of vessels-of-opportunity ✓ Funded by companies that ship oil through Prince William Sound ✓ Linked to compliance with state response planning standards ✓ Training program regularly reviewed and revised to reflect new technologies, tactics, or regulatory requirements ✓ Positive link between fishing and oil industries with financial benefits to each
<p>Jurisdiction(s) and Authorities</p>	<p>Alaska regulations establishing response planning standards for crude oil tankers at 18 AAC 75.438, 18 AAC 75.425, 18 AAC 75.445</p>
<p>Governance framework</p>	<p>The fishing vessel program is run by Alyeska SERVS with oversight from the State of Alaska and the Prince William Sound Regional Citizens' Advisory Council.</p>
<p>Considerations for BC</p>	<ul style="list-style-type: none"> ◇ Evaluate need for fishing vessels to supplement marine oil spill response and establish criteria for minimum numbers and types of vessels to support worst case spill response. ◇ Consider utilizing tier system similar to SERVS to distinguish vessels based on response availability. ◇ Conduct regular exercises and training, including drills to test availability of vessels to respond within their specified timeframes. ◇ Ensure adequate funding for program administration, training, exercises, and documentation.

3.7 Natural Resources Damage Assessment and Restoration

Oil spill impacts begin immediately and may endure for weeks, months, years, or decades (EVOSTC, 2009). While some spill impacts may be obvious and relatively easy to quantify, such as reduced tourism business or a number of oiled seabirds, other impacts may be more ephemeral, such as the loss of access to a recreational area.

In the US the documentation of spill damages, pursuit of compensation from the responsible party, and implementation of restoration projects is known as **Natural Resource Damage Assessment (NRDA)** or Natural Resource Damage Assessment and Restoration (NRDAR)¹⁵ and is codified in federal law and some state laws. NRDA can be implemented for an oil spill, substantial threat of an oil spill (such as a ship grounding), or other pollution event.

The *Cosco Busan* oil spill in San Francisco Bay in 2007 provides one example of how the United States' world-leading approach to natural resource damage assessment and restoration is implemented.

3.7.1 OVERVIEW

The Oil Pollution Act of 1990 established NRDA for oil spills in US waters (33 USC 2706(b)). The purpose of NRDA is to “*make the public whole*” following an oil spill. This is distinct from the responsible party’s liability for the cost of response activities, civil or criminal penalties, or other third party claims.

NRDA is implemented through a three-phase process: pre-assessment, restoration planning, and restoration implementation. During the pre-assessment phase, trustees representing federal, state, local and tribal interests will determine whether to pursue restoration based on the nature and extent of impacts and agency authority. Restoration planning results in a determination of restoration needs based on review of data from the assessment. Finally, restoration projects are conducted and the results monitored (NOAA, 1996).

In 2007, the *Cosco Busan* spilled 53,569 gallons (202 m³) of oil into San Francisco Bay after an allision with the Bay Bridge. Beaches and fisheries were closed, and many activities on or near San Francisco Bay cancelled. Most spill response activities occurred during the first two months after the spill, but the response was not officially completed until just over a year later. Six state and federal trustee agencies implemented a NRDA to quantify the injuries and conduct restoration projects (*Cosco Busan Oil Spill Trustees, 2012*). Through the NRDA process, the trustee agencies identified and quantified the damages to the public, in dollars. A US\$32.3 million settlement was negotiated with the responsible party and is now being dispensed by the trustees to implement 12 restoration projects. In the case of the *Cosco Busan* settlement, US\$5 million was used for bird restoration projects, US\$4 million for habitat restoration, US\$2.5 million for fish and eelgrass restoration, US\$18.8 million for recreational improvements, and US\$2 million for administration and oversight (*Cosco Busan Oil Spill Trustees, 2012*).

3.7.2 WORLD-LEADING ELEMENTS

The US damage assessment and recovery process (NRDA) is an example of a world-leading approach that treats restoration and recovery as a separate but critical component of oil spill response and recovery. The

What makes the US Natural Resources Damage Assessment World-Leading?

- Damage assessment and restoration and recovery planning begin immediately during spill response
- Recognizes a range of impacts to resources and their use
- Framework for primary and compensatory restoration, depending on type and severity of impacts
- Opportunity for public input and comment
- Cooperative process (agency trustees and responsible party), but trustees have ultimate authority
- NRDA applies to oil spills and potential oil spills

¹⁵ NRDA is used here as the more common term. It includes restoration.

US NRDA process is described here in general terms, with specific examples from the *Cosco Busan* process provided to illustrate key points.

Plan in Place to Begin Data Collection for Restoration During Response

As with any aspect of oil spill response, planning in advance yields a better outcome. Although NRDA is more prominent later in the process when restoration is the only activity underway, the process starts almost immediately. Federal guidance documents describe the type of pre-incident planning that trustee agencies can implement, including:

- Identifying a multi-disciplinary team with expertise and availability in different regions,
- Establishing notification procedures,
- Identifying vessels and other support services that may be needed to conduct sampling or other studies,
- Identifying contractors,
- Compiling baseline data on natural resources and human uses in the region that may be affected by an oil spill,
- Developing data management systems, and
- Identifying funding procedures and contractual arrangements (NOAA, 1996).

The NRDA process was initiated almost immediately when the *Cosco Busan* oil spill occurred. The US National Oceanic and Atmospheric Administration issued a Notice of Intent to Conduct Restoration Planning that named the trustee agencies, identified the responsible parties, and provided justification for NRDA based on preliminary data collection and jurisdictional review. Figure 3.8 shows the sampling locations for the *Cosco Busan* NRDA process (*Cosco Busan* Oil Spill Trustees, 2007; Westerholm, 2007).

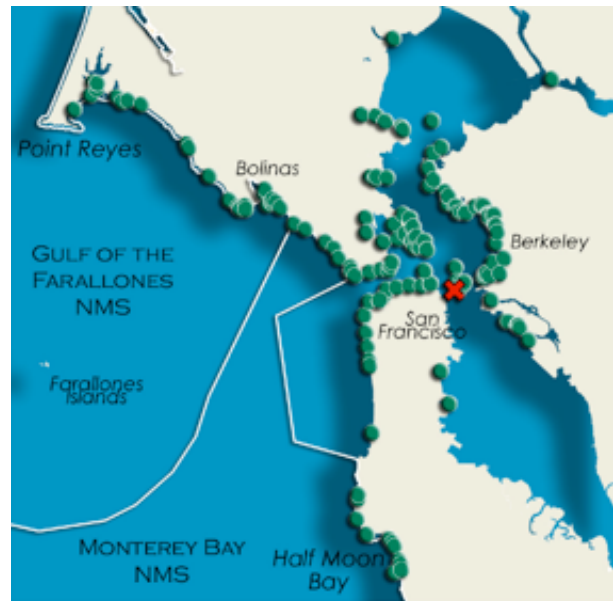


Figure 3.8. NRDA sampling locations during *Cosco Busan* oil spill

Recognizes Different Types of Spill Impacts

California state laws and US federal laws recognize that there can be many different types of oil spill impacts. The laws indicate which types of impacts are subject to damage claims. Both include:

- Natural resources (including loss of use and costs of assessing the damage)
- Property
- Subsistence use
- Revenues (including loss of taxes, fees, profit shares, etc.)
- Profits and earning capacity
- Additional public services required as a result of the spill response (Section 1002(b)(2) of the Oil Pollution Act of 1990).

In the case of the *Cosco Busan* spill, the NRDA process identified and quantified impacts to wildlife, habitat, and human recreational activities. The following impacts were estimated:

- 6,849 birds of 65 species killed
- 14-29% of the winter herring spawn lost due to widespread egg mortality

- 3,367 acres of shoreline habitat impacted, with recovery expected to take from a few months to several years
- 1,079,900 user-days lost for activities, including recreational fishing, beach use, and surfing (Cosco Busan Oil Spill Trustees, 2012).

Cooperative Process when Possible

While NRDA involves many issues that can be contentious, it is intended to be a cooperative process not only among different trustee agencies at different levels of government but also with the responsible party. Trustees are required by regulation to invite the responsible party or parties to participate in a NRDA and all parties are encouraged to create binding agreements governing their work together. Guidance documents provide several criteria for the trustees' consideration in engaging with the responsible party or parties. These may range from simply notifying the responsible party of NRDA-related actions to the responsible party suggesting and participating in assessment procedures. Even where cooperative efforts proceed, the trustees retain the right to cease participation by the responsible party at any time (NOAA, 1996).

Trustees must also coordinate with the agencies implementing a response, which can be done through pre-incident agreements that delineate how agencies implementing a NRDA will coordinate with those implementing the response (NOAA, 1996).

The responsible parties accepted the trustee agencies' invitation to participate in the *Cosco Busan* NRDA and did so actively, including participating on a workgroup of scientists, economists, and other specialists formed by the trustees. However, a written agreement was never signed as agreement could not be reached on all terms of the document proposed by the trustees (Cosco Busan Oil Spill Trustees, 2012).

The public is also invited to comment on the NRDA process, as required in Section 1006(c)(5) of the Oil Pollution Act of 1990. In the *Cosco Busan* NRDA, this was conducted through public meetings, fact sheets and other information posted online, comments on the draft restoration plan, press releases, and a short YouTube video explaining the restoration plan while it was still in draft (Cosco Busan Oil Spill Trustees, 2012).

Goal is Restoration

The ultimate goal of NRDA is restoration of injured resources. This is entirely separate from punishing, fining, or correcting actions of the party responsible for a spill or incident. NRDA may be conducted even when an incident does not spill oil (for example, to restore injured seabed resources when a ship runs aground). The trustees who conduct the assessment subsequently manage restoration projects using the funds from a NRDA settlement (or the NRDA portion of a settlement), which cover the costs of the assessment and project oversight. There are two kinds of restoration projects under NRDA: primary restoration aims to accelerate the return of conditions to the way they were before the spill, while compensatory restoration seeks to compensate for losses before resources return to their pre-spill baseline. Where impacts are minimal or there are ready options for effective primary restoration, less compensatory restoration will be needed (NOAA, 1996).

Criteria for consideration in selecting projects are outlined in Section 990.54(a) of the Oil Pollution Act of 1990: (1) The cost to carry out the alternative; (2) The extent to which each alternative is expected to meet the trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses; (3) The likelihood of success of each alternative; (4) The extent to which each alternative will prevent future injury as a result of the incident, and avoid collateral injury as a result of implementing the alternative; (5) The extent to which each alternative benefits more than one natural resource and/or service; and 6) The effect of each alternative on public health and safety.

The trustees for the *Cosco Busan* spill considered these six factors but also identified 12 additional criteria that they considered when selecting projects. These included the educational and research value, cost, opportunities for collaboration, and ability to document benefits to the public, among others (Cosco Busan Oil Spill Trustees, 2012).

In the case of the Cosco Busan NRDA, 12 restoration projects were developed out of more than 25 suggested (Figure 3.9). These included creating habitat for several bird species; restoring eelgrass, sandy beach, salt marsh, mudflat, and rocky intertidal areas; and creating a process to fund projects to enhance human recreational uses in the affected area. These projects were linked directly to injured resources (Cosco Busan Oil Spill Trustees, 2012).

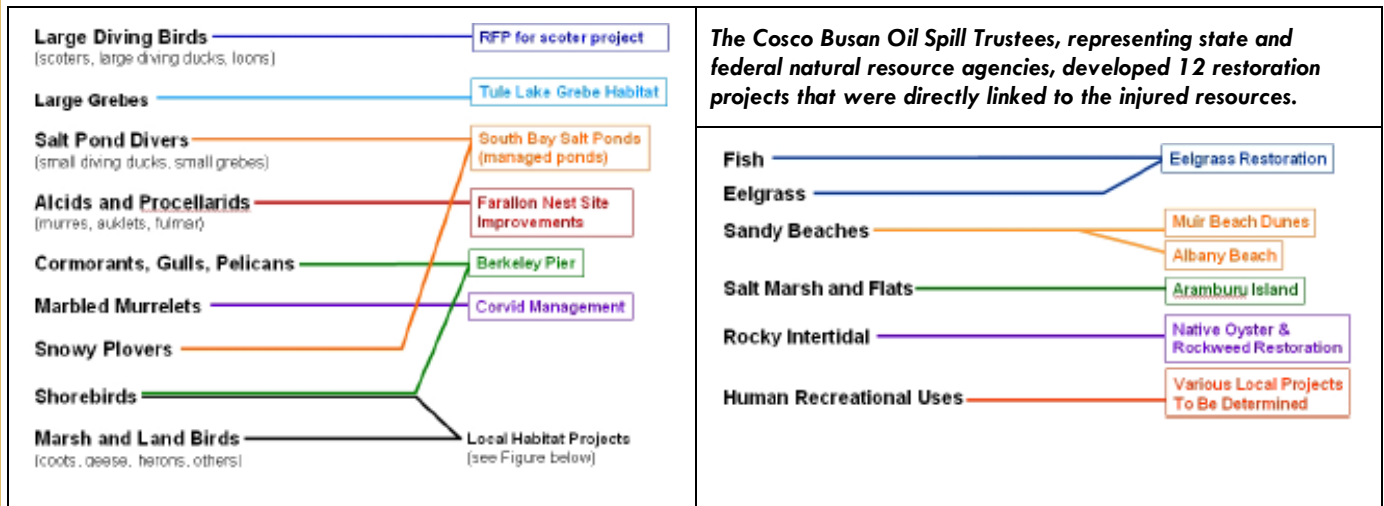


Figure 3.9. Cosco Busan NRDA Restoration Projects

3.7.3 GOVERNANCE

NRDA is implemented by the relevant trustee agencies authorized in statute to represent the public's interest related to various resources at the state or federal level. The trustee agencies implement the process defined in state and federal statute and regulation. At the US federal level, this is the Clean Water Act (as modified by the Oil Pollution Act of 1990) when damages result from an oil spill or potential oil spill.¹⁶ There are related liability and compensation elements to the National Marine Sanctuaries Act (16 USC 1431) and Park System Resource Protection Act (16 USC 191j) as well, if a national marine sanctuary or national park is affected.

When trustees are developing restoration projects, they must comply with review and consultation requirements under other federal statutes governing environmental policy, fish and wildlife, coastal zone management, endangered species, and others. For the Cosco Busan, a federally-mandated Environmental Assessment is included with the final damages assessment and restoration plan (Cosco Busan Oil Spill Trustees, 2012).

In California, NRDA is governed by the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990 and California Fish and Game Codes, and must comply with multiple other mandates for consultation and review similar to the federal requirements mentioned above. In the case of the Cosco Busan, the trustee agencies consisted of two state-level entities (California Department of Fish and Game and California State Lands Commission) and four federal entities (NOAA, US Fish and Wildlife Service, National Park Service, and Bureau of Land Management).

3.7.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the US Natural Resources Damage Assessment approach as a model for assessing oil spill damages and ensuring restoration of injured resources, and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

¹⁶ NRDA for other hazardous releases is governed by the Comprehensive Environmental Response, Compensation, and Liability Act.

Considerations for Modeling BC's World-Leading Marine Oil Spill System based on US Natural Resources Damage Assessment (NRDA) Approach

<p>Summary</p>	<p>NRDA is a well-defined process with people and plans in place for implementation prior to an oil spill so that all parties know what to expect. The responsibility to fund restoration and recovery is established in law. The process is intended to be cooperative where possible, but the authority of the trustee agencies responsible for protecting – or restoring – resources on behalf of the public is paramount.</p>
<p>World-Leading Elements</p>	<ul style="list-style-type: none"> ✓ Damage assessment and restoration and recovery planning begin immediately during spill response ✓ Recognizes a range of impacts to resources and their use ✓ Framework for primary and compensatory restoration, depending on type and severity of impacts ✓ Opportunity for public input and comment ✓ Cooperative process (agency trustees and responsible party), but trustees have ultimate authority ✓ NRDA applies to oil spills and potential oil spills
<p>Jurisdiction(s) and Authorities</p>	<p>US federal level: 33 USC 2706(b) [Oil Pollution Act of 1990 Section 1002(b)(2)] Regulations at 15 CFR 990 State of California (example – other US states have similar laws): Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990, Article 8.5, Section 8670.56.5(h) California Fish and Game Codes (2014, 5650, 12016)</p>
<p>Governance framework</p>	<p>A Trustee Council is established for each oil spill or incident where NRDA is implemented. The Trustee Council includes representatives from state and federal, and sometimes local or tribal, natural resource agencies. The Trustee Council oversees the development and implementation of a restoration plan, which typically involves multiple projects aimed at restoring injured resources.</p>
<p>Considerations for BC</p>	<ul style="list-style-type: none"> ◇ Establish process for assessment of oil spill damages and embed process into spill response framework. ◇ Assign “trustee” equivalents from federal, provincial, local, and First Nation governments and agencies to implement damage assessment and restoration. ◇ Integrate natural resource damage assessment and restoration into polluter pays system.

4 SYSTEM ELEMENTS AND APPROACH

4.1 Introduction

The 2013 study identified three common system elements of world-class marine oil spill response: (1) government ensures compliance and transparency; (2) all parties actively pursue continuous improvement through research and development and the testing of planning assumptions; and (3) financial mechanisms and resources meet needs from initiating the response through recovery. Many of these system elements have been described in the examples of world-leading prevention (Section 2) and response (Section 3). The examples presented in Sections 4.2 through 4.4 highlight specific examples or practices that represent one or more system elements. Many of these examples also tie back to world-leading prevention or response examples described earlier in this report.

4.1.1 OVERSIGHT AND TRANSPARENCY

Marine oil spill prevention and response systems rely on safe and diligent operations by industry (vessel or facility operators) and response organizations. The examples cited in this report describe the general governance framework in place for various world-leading practices, and these vary from direct regulatory imperative to voluntary measures. The mechanisms that compel each example vary, but all have some level of third-party oversight that holds operators accountable.

World-leading oil spill prevention and response systems rely on oversight systems that are clearly defined, consistently applied, and transparently implemented. World-leading systems create a level of comfort among both the regulated industry and the concerned public that a strong and effective governance system is in place.

4.1.2 CONTINUOUS EVALUATION AND IMPROVEMENT

Oil spill prevention and response systems rely, to varying degrees, on both human and engineered technology. While this report focuses on examples of world-leading approaches to marine oil spills, in reality there will always be opportunity to refine or improve any system.

World-leading marine oil spill prevention and response systems do not rest on their laurels. Many of the examples cited in this report represent systems or regimes that strive for continuous improvement. Many of the examples described are ongoing, active systems that are continuously adjusting their focus and approach based on feedback from research science, data analysis, peer review, or third-party oversight.

4.1.3 FINANCIAL ASSURANCE

To varying degrees, all of the examples cited in this report rely on a source of funding. Funding for oil spill preparedness and response typically involves a mix of public and private resources. In the discussion of world-leading prevention and response examples, consideration was given to whether dedicated funding had been established to compel or ensure a given practice. In this section, financial assurance is also considered as a stand-alone issue as it relates to availability and sufficiency of dedicated funds as well as adequacy of legal mechanisms to make sure that polluters pay for the full cost of oil spill cleanup and recovery.

World-leading marine oil spill prevention and response systems recognize the importance of “cradle-to-grave” funding for all aspects of marine oil spills. This expands beyond just the cost of cleaning up and oil spill to include prevention initiatives, research and development of response technologies, and damage restoration and recovery initiatives that address the full range of oil spill impacts. World-leading systems use a variety of mechanisms to hold operators accountable for all potential liabilities or damages that they may cause, while also ensuring adequate funding for government oversight and enforcement.

“The ways that regulators seek to solve problems will vary, but by definition they will involve some application of or enforcement of rules...Sometimes the rules are structured to give regulated entities flexibility and shared responsibility, encouraging them to solve problems themselves; however, even in these situations, regulators will provide oversight.”

Interim report of the Alberta Best-in-Class Regulator Initiative (2015)

4.2 Government Oversight and Transparency

Government oversight of industry activities related to marine oil spill prevention and response ensures that required measures are in place and that all parties are held to the same standards. Under the United Nations' Convention on the Law of the Sea, countries enact policies to fulfill their roles as flag states, coastal states, and port states. The countries considered in this study operate in all three capacities, and all of them also impose measures that exceed those required in international instruments as discussed in the examples throughout this study.

Approaches to government oversight of industry activities vary across legal approaches and cultures. **Norway's regulation of the offshore oil and gas industry** is presented as an example of a world-leading approach to government oversight and transparency. The Norwegian regulatory approach is widely recognized as an effective governance structure and is similar to that taken in the UK (OSC, 2011). While Norway's regime focuses on offshore oil and gas exploration rather than shipping, many of the characteristics of this system could be applied to prevent ship-source oil spills through port and flag state controls.

4.2.1 OVERVIEW

Effective government oversight of industry activities establishes clear expectations that address the risks of concern, is transparent to both industry and the public regarding whether those expectations are being met, and establishes compelling enforcement mechanisms if expectations are not met (Wagner, 2015). Norway's regulatory regime governing offshore petroleum operations is provided here as an example of performance-based supervision, a non-prescriptive form of oversight that involves working with regulated entities to establish plans and clarify expectations for safe operations. The independent Petroleum Safety Authority (PSA) establishes strict safety standards, and companies are obligated to describe how they will meet these standards (Braut and Lindøe, 2010). The agency works with the industry and trade unions to identify issues, review plans, and monitor technological innovations, all within the context of promoting a culture of safety (Baram, 2010). While these requirements extend to vessels only when they are engaged in transfer, storage or drilling at an offshore facility, the overall approach is notable for its emphasis on accident prevention and its ability to apply strict liability and both civil and criminal penalties if a spill occurs (Petroleum Activities Act of 1996).

4.2.2 WORLD-LEADING ELEMENTS

Performance-based Approach Combines Flexibility with Accountability

Health, safety, and environmental standards for industry are set in statute and regulation. Under the performance-based regulatory approach, the government sets standards but allows the industry significant flexibility in meeting those standards. In addition to the statutory and regulatory language, the PSA in Norway clarifies expectations by publishing non-binding guidelines with options for how requirements may be met. However, once the government is satisfied that a company is prepared to proceed safely, the

What makes Norwegian Government Oversight of Oil and Gas Activities World-Leading?

- Operators have flexibility to meet government safety and prevention standards, but are held strictly accountable to their commitments
- Focus on leading indicators and near misses
- Governance approach to safety and prevention favors collaboration and dialogue but allows for punitive measures if needed
- Robust civil and criminal penalty structure for pollution
- Government audits and enforcement actions are transparent to industry and public
- Operators may be compelled to make data or studies that relate to safety of petroleum operations publicly available
- Government actively supports and participates in research, development, and field testing of spill response technologies and capabilities

Acknowledgement of Compliance issued is legally binding and companies must follow the safety and prevention measures to which they commit (PSA, 2015a).

Norway's regulatory language clearly establishes safety as a priority on equal footing with maximizing production from a petroleum deposit (Braut and Lindøe, 2010). Health, Safety and Environmental (HSE) Framework regulations make clear that the expectation of safety applies not only to operations overall, but to the actions of the individual engaged in planning for or implementation of petroleum activities:

*Petroleum activities shall be **safe and prudent**, both in relation to an individual and an overall consideration of all the factors of importance to planning and implementation of petroleum activities as regards health, environment and safety. A high level of health, environment and safety shall be established, maintained and further developed.* [Section 8 of HSE Framework Regulations]

While safety is a priority, operators and regulators also take a holistic approach to considering risks and risk mitigation associated with different kinds of operations. Operators must examine the risks associated with their facilities or vessels and propose a system of internal controls and response plans designed to meet objectives that they set to minimize or mitigate risks (Braut and Lindøe, 2010). This also allows for flexibility to adapt to new conditions or update systems and technologies without corresponding regulatory changes (Baram, 2010).

Address Problems Before a Spill Results

Companies have the ultimate responsibility to ensure the safety of their operations. Although the PSA strives to address issues through dialogue with the industry, there are requirements in place to help identify issues early in the causal chain and, if necessary, impose escalating enforcement action.

Norway's Management Regulations require companies to notify the PSA if certain incidents occur, with each case handled by a case officer. The process of notifying the regulator of small incidents before they escalate into oil spills can lead to corrective actions that prevent a major incident. The PSA works cooperatively with the operator to try to address the issue through corrective actions, although the agency can undertake enforcement actions if the cooperative approach does not work (PSA, 2015a).

The PSA's focus on *leading indicators*, sometimes referred to as *near-miss events*, provides an opportunity to intervene before a minor problem results in a major incident or oil spill (OGP, 2011). It also allows the regulator to compile information across the entire sector about the types of failures that may lead to major oil spills.

Cooperative Approach is Accompanied by Strong Enforcement Mechanisms

Companies have the ultimate responsibility to ensure the safety of their operations, though this must be done in a way that satisfies regulators. Norway's PSA begins with the goal of a cooperative approach that involves not just the government and operators but also labor unions. All three parties participate in identifying both potential problems and technological developments, with the goal of reaching agreement among all parties when determining that an operator's safety management approach is acceptable (Baram, 2010). In addition, the PSA convenes a Regulatory Forum, which brings together representatives from government, industry, and trade unions to consider overarching issues related to regulatory development and other matters (PSA, 2015a).

Companies also have means of engaging employees to identify and address problems before they escalate as part of their system of internal controls. This includes a committee for workers and managers to discuss safety issues, a safety representative elected by workers at each worksite, and access to on-call experts in health and safety to advise on and help resolve disputes (Karlsen and Lindøe, 2006 in Baram, 2010).

While a cooperative approach is preferred, the PSA has the authority to issue orders, fines, or require operations to stop for safety reasons. The PSA can go so far as to report the matter to law enforcement if legally-binding orders are not followed, or to recommend that an operator be “excluded from the petroleum industry.” Figure 4.1 shows the hierarchy of Norway’s policy instruments to promote safety in the offshore oil and gas industry (PSA, 2015b).



Figure 4.1. Norway’s governance approach to offshore oil and gas safety (PSA, 2015a)

Civil and Criminal Penalties for Oil Pollution

Just as Norway’s oil spill prevention and safety regime allows for a range of enforcement mechanisms Norwegian law includes both civil and criminal punishment in pollution cases (Pozdnakova, 2012).

Norway adheres to strict liability, meaning the polluter and associated parties will be held liable for damages, with the occasional exception for *force majeure*, or Acts of God. If a licensee has been ordered by the government to pay out compensation and does not do so within set time limits, the damaged party can seek compensation from the spiller through further legal action (PAA, 1996). Fisherman who are adversely impacted by an oil spill are entitled to specific compensation under the Petroleum Activities Act, which specifies that polluters must compensate fisherman for financial losses through lump sum or fixed annual payments. Additionally, compensation can be claimed for fishing time lost due to clean up and associated activities, such as locating, marking, and retrieving objects to authorities (Library of Congress, 2015a; Library of Congress, 2015b).

Four laws establish criminal punishment as a result of pollution, depending on both severity and context. The Petroleum Activities Act states that a fine or a maximum of three months’ imprisonment can be applied for willful or negligent violations of the provisions outlined in the Act. In severe cases, a sentence of one to two years in jail is possible (Library of Congress, 2015). The Ship Safety and Security Act (2007) states that those physically working on a ship or acting on behalf of a company that willfully or negligently neglect technical and operational safety, personal safety on board, or environmental safety are liable to be fined or receive imprisonment for one to two years maximum. The Pollution Control Act (1981) stipulates that serious pollution violations can be punished by prison sentences of up to five years, with “very serious” offenses qualifying for ten years in prison (Etkin, 2003). The Norwegian Penal Code also has provisions for criminal punishment for pollution (Library of Congress, 2015b). Although intended for terrorist acts, it reinforces the Norwegian social conscience that pollution is a grave offense and can be punishable by 10-15 years in prison (Pozdnakova, 2012).

Research and Development Activities

The Norwegian government supports an active research and development program along with an annual oil spill field exercise program that both focus on continuous improvement of spill response capability (Reed et al., 2002; NOFO, 2013). Norway has held annual oil-on-water exercises since the 1980s. These exercises are used as an opportunity to practice equipment deployment tactics and to evaluate new or emerging technologies. This program is somewhat unique in that it is based on intentional discharges of oil in order to test and refine new technologies (NASA, 2015; Reed et al., 1993). The Norwegian government uses the information collected and lessons learned from on-water exercises and research and development trials to drive ongoing acquisition of new oil spill response equipment and technologies (Bjerkemo, 2010). The major oil spill response organization in Norway has also used modeling tools to evaluate on-water oil spill response capacity and to compare clean-up options (Eckroth et al., 2015).

Transparent to Industry and Public

The Petroleum Safety Authority posts information on its website regarding government approvals of industry activity (Acknowledgements of Compliance), audits, and investigations into problems that emerge such as near-miss incidents (PSA, 2015a). The PSA also has the authority to compel operators to make information “that is of importance for safety” publicly available, through regulation or administrative action (Framework Regulations, Section 32).

Norwegian regulations require that operators make certain information, data, and studies available to the public. For example, compiled data on oceanographic or meteorological conditions, as well as seismic studies, which have significance to the overall safety of petroleum operations must be made publicly available (Management Regulations, Section 41 and Facilities Regulations, Section 17).

4.2.3 GOVERNANCE

The Petroleum Safety Authority oversees health, safety, and environment for the offshore petroleum industry in Norway through implementing the Framework Regulations. While this provides the overall framework, related regulations dealing with different issues are handled jointly with other agencies.

The Norwegian Coastal Authority has responsibility for governmental preparedness against acute pollution, and has nation-wide administrative authority in the case of acute pollution incidents. The Coastal Authority makes sure that preparedness is appropriately dimensioned in proportion to the risk.

In the event of a spill, legal action related to spill compensation is first addressed in local courts where the damage occurred and affected (PAA, 1996). The Ministry of Industry and Energy decides where a suit should be brought if the damage occurred outside a set court district or there is dispute whether any or multiple court districts have been affected by pollution (Schwartz, 2010/2011). The Norwegian Supreme Court handles major oil spill prosecutions.

4.2.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the Norwegian approach to oversight of offshore oil and gas operations as a model for government oversight and transparency, and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC’s World-Leading Marine Oil Spill System based on Norwegian Government Oversight of Oil and Gas Activities

Summary

Norway applies a non-prescriptive approach to self-regulation of the petroleum industry, backed up with a strong enforcement policy. Companies must identify risks and develop plans for the safe operation of their vessels and facilities based on the risks specific to their operations.

Considerations for Modeling BC's World-Leading Marine Oil Spill System based on Norwegian Government Oversight of Oil and Gas Activities

World-Leading Elements	<ul style="list-style-type: none"> ✓ Operators have flexibility to meet government safety and prevention standards, but are held strictly accountable to their commitments ✓ Focus on leading indicators and near misses ✓ Governance approach to safety and prevention favors collaboration and dialogue but allows for punitive measures if needed ✓ Robust civil and criminal penalty structure for pollution ✓ Government audits and enforcement actions are transparent to industry and public ✓ Operators may be compelled to make data or studies that relate to safety of petroleum operations publicly available ✓ Government actively supports and participates in research and development and field testing of spill response technologies and capabilities
Jurisdiction(s) and Authorities	<p>Petroleum Activities Act of 1996 HSE Framework Regulations of 2001, 2011 Activities Regulations (Emergency Preparedness found in Chapter XIII) Management Regulations (including risk and emergency preparedness analysis in Reg. 17) Facilities Regulations of 2005, 2010 Ship Safety and Security Act (Act of 16 February 2007 No. 9 relating to ship safety and security) Pollution Control Act (Act of 13 March 1981 No. 6 concerning protection against pollution concerning waste) Norwegian Penal Code</p>
Governance framework	<p>The Petroleum Safety Authority (PSA) is an independent government regulator that oversees health, safety, and environmental issues associated with the operations of the Norwegian petroleum industry. The PSA cooperates with other federal agencies on the oversight of different elements of these operations.</p> <p>The Norwegian Coastal Authority has responsibility for governmental preparedness against acute pollution, and has nation-wide administrative authority in the case of acute pollution incidents. The Coastal Authority makes sure that preparedness is appropriately dimensioned in proportion to the risk.</p>
Considerations for BC	<ul style="list-style-type: none"> ◇ Consider performance-based approach that sets measurable standards and allows some flexibility for compliance. ◇ Track near miss events and other leading indicators and tailor safety and prevention requirements to causality. ◇ Create a continuum of enforcement mechanisms that includes both civil and criminal penalties for oil spills or safety violations. ◇ Engage in cooperative research and development activities with industry. ◇ Operate transparently and require transparency from industry, including publication of studies, data, and other information of interest to the public and stakeholders.

4.3 Citizens Advisory Councils

Citizen engagement and oversight of oil and gas activities has been occurring since at least the 1970s, when the Sullom Voe Oil Spill Advisory Committee was established in the UK to conduct environmental monitoring, provide feedback on oil spill response plans, and participate in drills and exercises (SOTEAG, 2013). The One Ocean initiative in Newfoundland and Labrador provides a mechanism for the local fishing industry to collaborate with oil and gas operators on spill preparedness and response (Rustad, 2011).

The **Alaska Regional Citizens' Advisory Councils** provide an example of world-leading citizen oversight systems that operate with sufficient funding and autonomy to maintain clear separation from both industry and regulators. World-leading citizen oversight systems operate with full transparency to the public they serve and to the industry that they oversee.

4.3.1 OVERVIEW

The US Oil Pollution Act of 1990, which established the federal vessel response planning discussed in Section 2.8 and 3.3, also established two citizen oversight organizations in Alaska. The stated purpose of the councils was to “*involve local citizens in the process of preparing, adopting, and revising oil spill contingency plans,*” as one means of avoiding the complacency that many blamed for the *Exxon Valdez* oil spill of 1989 (33 USC 2701, Sec 5002).

Two councils exist in Alaska: the Prince William Sound Regional Citizens' Advisory Council (RCAC) and the Cook Inlet RCAC. In Prince William Sound, residents had already started creating a citizens' group concerned with the operations of the Valdez Marine Terminal and associated tankers before the *Exxon Valdez* oil spill in 1989; however, it was only after the spill occurred that the operating companies, through the Alyeska Pipeline Service Company, agreed to fund the group. This funding requirement was then codified in law through the Oil Pollution Act (Devens, 2000).

The Act is fairly prescriptive in defining the councils, but also allows for alternative approaches as long as the federal government certifies that they provide the same essential purpose. Both organizations operate under the alternative option and are subject to certification every three years by the US Coast Guard. With governing boards including representatives of local communities, tribes, and interest groups, the councils provide a mechanism for ongoing citizen collaboration with government regulators and companies on oil spill prevention and response, even as most of the general public may not have the time or expertise to engage (Stephens, 1994).

4.3.2 WORLD-LEADING ELEMENTS

Citizen oversight can take many forms. Although they are more limited in their scope of potential strategies to influence company operations than other nonprofit organizations, the Regional Citizen Advisory Councils in Alaska benefit from having the consistent funding needed to play a long-term oversight role that directly involves local communities and is entirely focused on the operations that create the potential for oil spills affecting those communities. Following the Deepwater Horizon oil spill in the US Gulf of Mexico, the National Commission established to identify lessons learned from that event recommended that an advisory council modeled on those created in Alaska should be established for the Gulf of Mexico region and be funded by offshore lease holders. While that has yet to happen, the recommendation acknowledged the important role that citizen oversight has played in improving oil spill prevention and response preparedness in Alaska (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011).

What makes Alaska Regional Citizens Advisory Councils World-Leading?

- Member entities include range of regional stakeholder groups
- Clearly defined scope of activities tied to local oil operations
- Each council focuses on specific sub-region of Alaska
- Required by federal statute
- Funded by industry
- Ensures sustained citizen-level oversight as long as oil operations are underway

Scope of Activities Limited to Local Oil Operations

The scope of the councils is described in statute and in their contracts with the operating companies (their funders). When using funding from the companies, they must focus on actual or potential impacts associated with crude oil terminal and tanker operations, including: environmental monitoring; review and comment on operator contingency plans and permits; terminal operations and environmental monitoring; port operations and vessel traffic; and education and outreach. Each council has a clearly defined geographic and operational scope. For example, the Prince William Sound RCAC may use their industry funding for issues related to the Valdez Marine Terminal and along the tanker routes and adjacent waters, but not the Trans Alaska Pipeline itself. The Cook Inlet RCAC may use their industry funding for crude oil operations only. Neither group can expand their focus to environmental issues that do not have a clear nexus to their operational mandate (RCAC & APSC, 1990).

The citizens advisory councils have built a substantial body of expertise and institutional knowledge related to oil operations that represent potential risks to their member entities. Where they do not have the knowledge in-house, their funding base allows them to hire technical experts (Devens, 2000).

Dedicated Long-Term Funding Source

The companies conducting crude oil operations in Cook Inlet and Prince William Sound are required to fund the government-approved citizen advisory councils as long as crude oil operations are underway.¹⁷ The Oil Pollution Act mandated an initial funding level of US\$2 million/year for Prince William Sound, and half that for Cook Inlet, with provisions for increases over time.¹⁸ The statute compels industry funding as long as the councils' activities stay within the statutory limitations: they cannot use lawsuits to pursue their goals, and their activities, at least those implemented through the funding guaranteed by law, must focus on the environmental monitoring or oil spill prevention and response as broadly defined in statute.

The fact they are established in federal law and have relatively secure funding provides a much higher level of assurance that the citizen oversight role will be maintained.

Transparency

The citizens advisory councils both uphold and benefit from transparency of operations. At the organizational level, board meetings are open to the public and, as nonprofit organizations, annual financial statements and audits are available. The work of the councils also benefits from requirements in the Oil Pollution Act of 1990 and in Alaska state regulations that contingency plans and other information about company operations be shared with the organization.

Autonomy

Although they are certified by the US Coast Guard and funded by the oil industry, the advisory councils operate as independent, non-profit organizations. As an example, the contract that exists between the oil companies operating in Prince William Sound and that advisory council stipulates the following:

“The Committee [Council] is willing to participate in the citizens’ advisory process for the public and Alyeska on a permanent basis only on the conditions it can be truly independent from Alyeska and that Alyeska provide the Committee with a permanent source of adequate funding...In order to enhance the legal and political autonomy of the Committee, it shall be formed as a nonprofit corporation” (RCAC and APSC, 1990).

¹⁷ Approval of company contingency plans is contingent upon their providing the required funding to one of the two councils [33 USC 2732 (k)].

¹⁸ In 2014, Congress increased the base level of funding for Cook Inlet Regional Citizens Advisory Council to “at least” US\$1.4 million, with a provision for increase tied to inflation, by amending OPA90 (Public Law 113-281, Sec. 318). Prince William Sound Regional Citizens’ Advisory Council is now funded more than US\$3 million annually by the operating companies (BDO USA, LLP, 2014).

4.3.3 GOVERNANCE

The councils are self-governing organizations with their own staffs and bylaws overseen by a board of directors. Each member entity – which include local governments, Alaska Native organizations, and interest groups such as fishing– assigns a representative to the board of directors. State and federal government representatives participate as *ex officio* (non-voting) members.

The councils each have their own contracts with the funding companies, which delineate how funds may be used and the independence of the councils from company influence. The US Coast Guard implements the required federal government certification of the councils through a triennial request for public comments and review (33 USC 2732(o); 80 CFR 8335; 79 CFR 19347).

4.3.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the Alaska Regional Citizens Advisory Councils as a model for citizen oversight of oil industry and tanker operations, and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC's World-Leading Marine Oil Spill Response System based on Alaska Regional Citizens Advisory Councils

Summary	The Alaska Regional Citizen Advisory Councils are independent citizen oversight organizations with dedicated industry funding and a clearly defined mandate rooted in national law. The regional councils include representatives of local communities and interest groups, selected by the organizations they represent. The councils have complete autonomy as long as they operate within their federal mandate, and the US Coast Guard certifies them triennially.
World-Leading Elements	<ul style="list-style-type: none"> ✓ Member entities include range of regional stakeholder groups ✓ Clearly defined scope of activities tied to local oil operations ✓ Each council focuses on specific sub-region of Alaska ✓ Required by federal statute ✓ Funded by industry ✓ Ensures sustained citizen-level oversight as long as oil operations are underway
Jurisdiction(s) and Authorities	<p>US Oil Pollution Act of 1990 (33 USC 2701, Sec 5002)</p> <p>Alaska regulations (18 AAC 75.410, 18 AAC 75.415, 18 AAC 75.455) gives councils standing to review and comment on operator state-level oil spill contingency plans</p> <p>Contracts with industry and organizational bylaws</p>
Governance framework	The councils are self-governed, with a Board of Directors made up of individuals from each member entity. State and federal government agencies participate as non-voting members.
Considerations for BC	<ul style="list-style-type: none"> ◇ Create independent, autonomous councils with defined mission. ◇ Ensure broad representation of regional stakeholder interests. ◇ Allow participating entities to self-nominate representatives. ◇ Secure dedicated funding to allow Councils to undertake technical work and participate in planning and preparedness activities.

4.4 Oil Spill Liability Trust Fund

In order for both public and private entities to respond immediately to an oil spill – both to mitigate impacts and to begin the damage assessment process – they must know they can recover any costs expended. Under the polluter-pays system, the responsible party is ultimately responsible for these costs. However, having a ready source of existing funding is critical to a prompt response so assets can be mobilized without delays caused by uncertainty about whether the responsible party has been identified or has the ability to pay. Oil spill response funds exist at the international and national levels, with varying caps and constraints on their use.

The US has adopted its own approach to oil spill liability and compensation which has a broader definition of damages, covers oil spills from sources, and applies a more strict form of liability than the international conventions in place (Kim, 2003; Schoenbaum, 2012). The **US Oil Spill Liability Trust Fund (OSLTF)** is an example of world-leading oil spill response funding because it makes funds immediately accessible to federal response agencies for spill response. It also funds other agency activities related to oil spill preparedness and oversight. Several states have their own funds in place as well (Kim, 2003).

4.4.1 OVERVIEW

As with many aspects of oil spill response in the US, the funding and use of the OSLTF was established through the Oil Pollution Act of 1990. The US Coast Guard manages the fund, which is used to pay for the following costs associated with oil spill response and impacts:

- Response expenses incurred by state and federal government or other parties, as long as they align with the National Contingency Plan
- Activities conducted by trustees to initiate the NRDA process (see Section 3.7)
- Response expenses and damages if a spill originates with a foreign offshore development
- Costs or damages not paid by a responsible party
- Costs associated with federal agency activities under the Oil Pollution Act of 1990 (USCG, 2006)

The OSLTF consists of two parts: the Emergency Fund and Principal Fund. The Emergency Fund is readily available to support response activities and the commencement of NRDA. The Principal Fund is used to pay claims resulting from an oil spill, fund agencies implementing responsibilities under the Oil Pollution Act of 1990, or research and development activities (USCG, 2013). Ongoing contributions to the fund come from costs recovered from responsible parties, taxes collected on domestic oil production and foreign oil import (the original tax ended in 1994, but it has been reinstated in subsequent legislation twice), penalties resulting from oil spill cases, and interest (USCG, 2013).

What makes the US Oil Spill Liability Trust Fund World-Leading?

- US\$50 million immediately accessible to federal response agencies for oil spill response
- Financial assurance in cases where responsible party is unknown or insolvent, or if liability caps are exceeded
- Can be accessed for oil spills and threatened oil spills
- Can be used for oil spill preparedness, response, damage assessment, or restoration
- Up to US\$1 billion available per incident
- Current fund contains approximately US\$4 billion
- Does not prevent future cost recovery actions; US government has recovered US\$1.2 billion of US\$1.67 expended to date (72%)

4.4.2 WORLD-LEADING ELEMENTS

Financial Assurance Enables Prompt Response

A robust spill response requires immediate action by both public and private entities. While ultimately the responsible party, when there is one, is obligated to pay for response costs and damages, the OSLTF allows responders to begin activities immediately without waiting to determine who the responsible party is or their ability or willingness to pay. The Emergency Fund is an annual US\$50 million available to federal responders and trustee agencies during a response. An additional US\$100 million from the Principal Fund can be used for activities usually funded through the emergency fund if US\$50 million is not sufficient. Up to \$1 billion is available overall for response costs and damages per incident (USCG, 2013). To date, more than US\$1.67 billion has been expended in emergency funds and nearly US\$1.2 billion recovered from responsible parties through the life of the Fund (NPFC, 2015) The OSLTF is currently more than US\$4 billion (Buie, 2015; NPFC, 2015).

Ensures Compensation for Damages Regardless of Responsible Party or if Liability Limits are Exceeded

The OSLTF provides up to US\$1 billion per incident for removal costs and damage claims in the event that a responsible party is not identified, unable to pay, or exceeds liability limits (variable for different types of vessels and facilities, and eliminated in cases of gross negligence or willful misconduct, per 33 USC § 2704). From 1990 – 2014, the OSLTF paid more than US\$810 million for removal costs or damages with just over half this amount paid in cases where the liability limits were exceeded (USCG, 2014b). This illustrates the role of the OSLTF in providing an additional level of protection in a polluter-pays system. In addition, the Oil Pollution Act of 1990 (Section 2718(a)) is explicit that US states can still impose liability requirements; several have done so and have also established funds similar to the OSLTF (Schoenbaum, 2012).

For example, one of the larger claims paid in 2014 (US\$907,231.72) went to an Alaska oil spill response organization. Alaska Chadux Corporation responded to a spill from a stricken fishing vessel in the Bering Sea in 2013 under contracts to both the US Coast Guard and the responsible party (the vessel owners). Spill response costs exceeded the vessel owners' limit of liability, so Alaska Chadux Corporation filed a claim for US\$955,484.84 to the OSLTF after first presenting it to the responsible party. Based on review of the documentation submitted, the National Pollution Funds Center issued payment for most of the amount requested (USCG, 2014a).

Damage claims can be filed under the same fairly broad definition discussed for NRDA in Section 3.7. While some damages relate to restoring natural resources, damage claims can also be filed for costs associated with additional public services that are ancillary to the response but important. An example cited on the National Pollution Funds Center website is a local government needing to provide additional traffic management during the response to a nearby spill (USCG, 2015b).

Applies to All Oil Spills to Navigable Waters and Incidents Representing a Substantial Threat of a Spill

The OSLTF can be accessed for response actions or damages associated with an oil spill to navigable US waters or shorelines whether from a ship, pipeline or other onshore facility, or offshore facility. It can also be used for response actions associated with an incident that represents a substantial threat of such an oil spill [33 CFR 133.3(b)] and for damages resulting from either type of incident.

Contributes to Federal Agency Spill Preparedness and Oversight Activities

The OSLTF is used to support federal agency activities under the Oil Pollution Act of 1990. In 2014 the Fund expended approximately US\$112 million to the US Coast Guard, Bureau of Safety and Environmental Enforcement, Environmental Protection Agency, and the Pipeline and Hazardous Materials Safety Administration. Funds were expended for oversight and enforcement, reimbursement to states for oversight

and enforcement, research and development, Ohmsett operations (the federal oil spill response test facility in New Jersey), management and operating expenses, and other activities (NPFC, 2015).

4.4.3 GOVERNANCE

The US Coast Guard's National Pollution Funds Center manages the OSLTF according to the provisions of Section 1 of the Oil Pollution Act of 1990 and related regulations (33 CFR 133, 33 CFR 136, 33 CFR 137, 33 CFR 138). The US Coast Guard Authorization Act of 2010 requires annual reporting of expenditures greater than US\$250,000.

4.4.4 CONSIDERATIONS FOR BRITISH COLUMBIA

The table below summarizes the elements that distinguish the US Oil Spill Liability Trust Fund as a model for assuring adequate funds are available to implement spill response, recovery, and restoration, and highlights considerations for applying a similar approach to achieve a world-leading system in BC.

Considerations for Modeling BC's World-Leading Marine Oil Spill Response System based on US Oil Spill Liability Trust Fund

Summary	<p>The OSLTF provides an immediate source of funds to facilitate the prompt initiation of response activities and damage assessments. It also provides an additional level of protection to responders and the public above liability limits, or in the event that a responsible party cannot be identified. It applies to spills to navigable waters of the US, or incidents in which no oil is released but there is a substantial threat of a spill. This includes spills from vessels, pipelines and onshore facilities, and offshore facilities. Up to US\$1 billion is available per incident.</p>
World-Leading Elements	<ul style="list-style-type: none"> ✓ US\$50 million immediately accessible to federal response agencies for oil spill response ✓ Financial assurance in cases where responsible party is unknown or insolvent, or if liability caps are exceeded ✓ Can be accessed for oil spills and threatened oil spills ✓ Can be used for oil spill preparedness, response, damage assessment, or restoration ✓ Up to US\$1 billion available per incident ✓ Current fund contains approximately US\$4 billion ✓ Does not prevent future cost recovery actions; US government has recovered 72% of expenditures
Jurisdiction(s) and Authorities	<p>US law establishing the fund (pre-1990): 26 USC 9509 (Oil Pollution Act of 1990, Section 1012) US regulations: 33 CFR 133, 33 CFR 136, 33 CFR 137, 33 CFR 138</p>
Governance framework	<p>The US Coast Guard administers the fund through the National Pollution Funds Center.</p>
Considerations for BC	<ul style="list-style-type: none"> ◇ Evaluate fund reserves and per-incident limits to ensure that adequate funding is available to cover a worst case oil spill, based on a review of recent incident costs worldwide. ◇ Ensure that funding can be used for restoration and recovery activities. ◇ If adequate reserves exist, consider allocating funding to support preparedness and response activities. ◇ Consider creating a provincial fund to supplement national fund.

5 DISCUSSION

5.1 Applying the World-Leading Examples to British Columbia

5.1.1 SUMMARY OF WORLD-LEADING EXAMPLES

The BC government commissioned this study to inform their ongoing efforts to create a world-leading marine oil spill prevention and response system. Rather than prescribe a specific formula, this report presents 16 examples from select jurisdictions¹⁹ of regulations, practices, or programs that characterize a world-leading approach. The report suggests specific actions that BC may consider in modeling their system after these examples. Table 5.1 (at the end of this section) extracts from the discussion of each world-leading example the list of elements that distinguish that system and the considerations for BC in adapting the example to a world-leading marine oil spill regime for the west coast.

5.1.2 ADAPTING WORLD-LEADING MODELS IN BC

A range of jurisdictional authorities – from local or port-level directives through international treaty law – implement the world-leading examples presented in this report, with different approaches to regulating oil spill prevention, preparedness, response, and recovery. There are strengths and weaknesses to all approaches, and many of the variations reflect differences in societal norms and values (Mearns, 2013).

Because of the range of regulatory approaches in the jurisdictions considered, the jurisdictional mechanism in place in each example may not be directly transferrable to BC. This is not to say that such examples cannot be implemented against a range of regulatory regimes, only that implementation approaches should be tailored to suit Canada’s regulatory framework and jurisdictional authorities.

5.1.3 BUILDING A WORLD-LEADING MARINE OIL SPILL PREVENTION AND RESPONSE SYSTEM

Bowtie diagrams are a common method for illustrating how elements of oil spill prevention and response can form a barrier that either prevent an oil spill from occurring or reduces the adverse impacts if a spill does occur (Naess, 2012; Rousand, 2011). Bowtie diagrams are typically approached from the middle, which is the hazardous event. In Figure 5.1, the middle of the bowtie shows an oil spill resulting from a simple accident: a tanker loses propulsion and is drifting toward the coast.

“Leading countries have developed regulatory regimes that differ in several respects, particularly with regard to supervising and fostering self-regulation by industry, and all are engaged in a continuing quest for increasingly robust regulation.”

*Risk Governance of Offshore
Oil and Gas Operations
Cambridge University Press 2013*

¹⁹ This study only considered examples from North America, Europe, and Australia as specified in the contract scope.

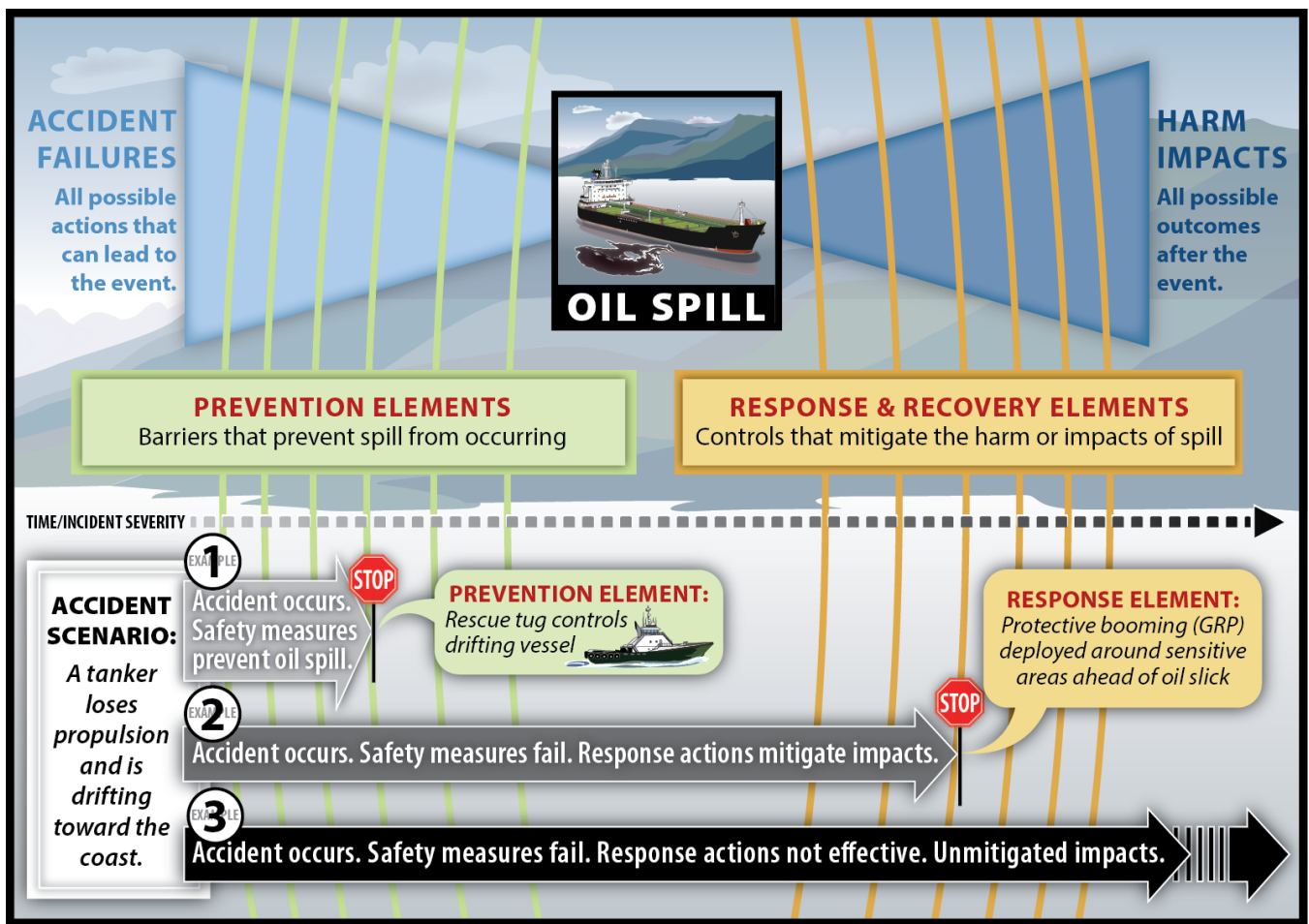


Figure 5.1. Hypothetical Oil Spill Scenario Showing how Prevention and Response Elements Interrupt Accident Chain

The vertical green lines that run through the left side of the bowtie represent barriers in the form of **prevention measures** that may prevent an accident or failure from causing an oil spill. When the prevention elements function as intended, they will interrupt the series of events that leads to an oil spill. Multiple lines are meant to represent that multiple prevention elements are necessary to provide barriers to the range of failures or accidents that could cause oil spills. In this example, a single prevention measure – in this case a rescue tug – is depicted in scenario 1 (light gray arrow) as controlling the drifting tanker before it hits the coastline, avoiding an oil spill.

To the right of the oil spill are the impacts, harm or damages that are caused when a spill occurs. At this point, prevention has failed and the response system must be implemented. The vertical orange lines that run through the right side of the bowtie represent controls in the form of **response measures** that may reduce or mitigate the severity of the harm or impacts caused by an oil spill. As with prevention, multiple lines represent the layers of response elements that should be in place to control an oil spill and reduce the damages it creates. In this example, scenario 2 (dark gray arrow) no prevention measures are effective in preventing the tanker from grounding; it grounds and causes an oil spill. However, a response element – in this case, deployment of protective booming ahead of the oil slick – is effectively implemented and it reduces the harm caused by the spill by preventing the slick from reaching a high priority sensitive area.

In the third version of this scenario (black arrow), there are no successful prevention or response measures implemented. The oil spill occurs and the impacts are unmitigated because both the prevention and response barriers failed. This very simple scenario illustrates the importance of building a system with many layers of planning, preparedness, and capability in place on both sides of the bowtie – both prevention and response elements.

The bowtie diagram shows a progression of time and incident severity moving from left to right. While this is a conceptual model only, it is useful to consider that different prevention and response elements may interrupt the incident at various points along this continuum. Prevention measures that are effective early in the causal chain may be considered a first line of defense against an oil spill occurring. If those initial measures fail, there may still be opportunities for other prevention measures to work before the oil spill occurs. Similarly, moving to the right from the center of the oil spill, after the oil spill occurs, certain response measures may be more or less impactful in mitigating adverse impacts. The farther away from the oil spill that the response or mitigation measure occurs, in both space and time, the more significant the damages. This includes not only controls to clean up the oil spill, but recovery mechanisms that can be used to restore and replenish injured resources and environments.

5.2 Characteristics of World-leading Marine Oil Spill Prevention, Preparedness, Response, and Recovery Systems

Figure 5.1 provides a simplistic view very complex system, but it can be used to demonstrate several key concepts that are relevant to BC's aspiration for world-leading marine oil spill prevention and response.

World-leading marine oil spill prevention and response systems:

- (1) are risk-based;
- (2) are multi-layered;
- (3) take a holistic approach to balancing prevention and response;
- (4) are strengthened by collaboration;
- (5) create accountability at all levels; and
- (6) strive for continuous improvement.

5.2.1 RISK-BASED APPROACH

The first example included in this report is the Aleutian Islands Risk Assessment (Section 2.2), which applied a formal, semi-quantitative method to evaluate the risks from shipping through the Aleutian Islands and resulted in the identification, prioritization, and ongoing implementation of both prevention and response measures that address the identified risks. Many other examples cited in this report also reflect a risk-based approach to prevention and response. Several of the examples cited – such as the EMSA vessel safety initiatives (Section 2.4), the Australian port state control approach (Section 2.6), and the Norwegian government oversight (Section 4.2) – continuously compile and evaluate data on incidents and near-misses and use this information to prioritize prevention measures.

Oil spill response preparedness should also tie back to risks. Several of the world-leading examples presented here – such as the Australian National Plan (Section 3.2), the response planning standards in the US (Section 3.3), and geographic response planning in Alaska (Section 3.5) – link oil spill response planning and preparedness to the scope and scale of risks. For example, US response planning standards require that every vessel operator identify the worst case discharge based on the total volume of oil carried as cargo or fuel and plan for adequate equipment and personnel to clean up such a spill. In Australia, equipment stockpiles are evaluated against a range of potential spills to ensure that each region or port area has sufficient capacity to manage a major spill. Geographic response planning in Alaska considers both sides of the risk equation – probability and consequence – in prioritizing sensitive sites for protection.

5.2.2 LAYERED PREVENTION AND RESPONSE ELEMENTS

Generalized oil spill prevention measures are depicted in Figure 5.1 with green lines and response measures with orange lines; each line represents a different prevention element. The simple scenario shown in this figure includes a single example of prevention (rescue tug) and of response (Geographic Response Plans). Failure of either one allows the incident to progress; if the rescue tug fails, a spill occurs and if the response tactics fail,

the spill impacts sensitive shorelines. World-leading oil spill prevention and response systems do not rely on a single prevention or response element, but rather on **multiple layers** of prevention and response elements.

One approach to evaluating the oil spill prevention examples highlighted in this report for possible implementation in BC would be to consider where each example might fall on the bowtie. For example, prevention measures such as keeping vessels out of high-risk areas (Areas to be avoided, Section 2.3), conducting aerial surveillance to deter unsafe activities (NASP, Section 2.7) or targeted inspection of high-risk vessels and use of enforcement actions to keep them out of certain ports (EMSA initiatives in Section 2.4 or Australian port state control in Section 2.6) may help avoid or minimize an accident. Prevention measures like escort systems (Prince William Sound, Section 2.5) or requirements that vessels have marine salvage, rescue and firefighting resources under contract (US regulations, Section 2.8) would provide a subsequent layer of prevention in the event that a vessel had a problem or emergency by ensuring that resources are nearby to intervene.

The bowtie method can also be used to evaluate how response measures work together to afford the highest potential for controlling and cleaning up an oil spill while limiting adverse impacts. Response measures that intercept the spill as close as possible in space and time to the time the spill occurs will typically be most effective in mitigating impacts. All of the examples of response measures in Section 3 involve some level of pre-planning to ensure that resources, personnel, and strategies are in place for a rapid and effective response. A response planning standard (US Pacific States, Section 3.3) that requires operators to have specified levels of equipment and personnel on-scene within a certain time period increases the likelihood of an adequate response. Clear decision-making criteria for incorporation of scientific data and expertise (Australia, Section 3.2) or for decision-making regarding treatment options (UK, Section 3.4) helps lay the groundwork for rapid and informed decisions. Developing and maintaining a network of strategically positioned equipment stockpiles (Australia, Section 3.2) or trained, contracted fishing vessels (Alyeska SERVS, Section 3.6) creates another layer of safeguard. Integration of restoration and recovery into the response phase (US NRDA, Section 3.7) lays the groundwork for thorough damage assessment and commensurate restoration activities.

5.2.3 HOLISTIC AND BALANCED

While prevention and response are used as categories to organize the discussion in this report, they are in fact closely interrelated, and a world-leading marine oil spill prevention and response system should contemplate prevention and response as interrelated components of a single system.

Section 4 of this report discusses system elements that span the continuum between marine oil spill prevention and response. These system elements are not directly represented in Figure 5.1, because they are not barriers *per se* – they are characteristics of the system as a whole. Each of the three examples of system elements relate to both prevention and response.

The Norwegian government oversight system discussed in Section 4.2 emphasizes oil spill prevention but recognizes that spills can and will occur. Norway is widely regarded as a world leader in oil spill response technology and plays a leading role in many joint industry projects to improve response capability. Citizen oversight in Alaska (Section 4.3) monitors prevention measures like the tanker escort system (Section 2.5) and also reviews response planning and capability through contingency plan reviews (Sections 3.3 and 3.6). The US Oil Spill Liability Trust Fund (Section 4.4) exists primarily to cover response and recovery costs, but may be used for incidents where pollution is a threat, and the availability of ready funding could play a role in preventing a spill from occurring.

5.2.4 COLLABORATIVE APPROACH

Many of the world-leading examples are built on a **collaborative approach**. While collaborative or consensus-based approaches can be more cumbersome than unilateral action, they can also be much more effective. Marine oil spills often spread beyond jurisdictional boundaries, and a major spill response will

involve dozens of agencies and organizations. Collaborative approaches to planning build relationships and trust, and may improve the ability of these groups to work together during a response.

In some cases, such as the Alaska fishing vessel program (Section 3.6) and the Norwegian approach to oil and gas oversight (Section 4.2), the collaboration is between government and industry. Other examples are based in multi-jurisdictional collaboration, like Australia's National Plan (Section 3.2), the UK's oil spill treating agent policy (Section 3.4), or the US natural resource damage assessment process (Section 3.7). Several of the examples, like the Aleutian Islands Risk Assessment (Section 2.2), Alaska geographic response planning (Section 3.5), the Norwegian approach to oil and gas oversight (Section 4.2), and the regional citizens advisory councils (Section 4.3) include stakeholders and citizens in the process.

Transparency is a necessary component of collaboration and is highlighted as a key element of many of the world-leading examples, such as the EMSA vessel safety initiatives (Section 2.4), Australia's National Plan (Section 3.2), US oil spill response planning standards (Section 3.3), the UK's oil spill treating agent policy (Section 3.4), and the Norwegian approach to oil and gas oversight (Section 4.2). Regulatory bodies that operate with transparency to the regulated community and the public may be more successful in implementing initiatives to strengthen marine oil spill prevention and response. Many of the regimes presented in this report (e.g. Norway, UK, EU) conduct self-audits and publish summary reports and raw data for review by industry and public stakeholders.

Several of the regimes highlighted in this report – most notably Norway and the UK – are characterized by a shift toward inclusive governance in regulating offshore oil and gas activities (Renn, 2013). Inclusive governance is characterized by elements of collaboration and transparency. These include: strong institutional mechanisms; transparent decision-making; informal networks to manage risks; financial resources; technical resources; and human resources (including institutional knowledge and expertise). With more complex, uncertain, or even ambiguous risks – such as major marine oil spills, which are low frequency high consequence incidents – the participation of scientific experts, stakeholders, and society at large in risk governance becomes more critical (Renn, 2013).

5.2.5 ACCOUNTABILITY

For each world-leading example, a list of jurisdictional authorities is included to trace the law, regulation, or practice back to the doctrine that compels it. This is not always an entirely straightforward process, because different regimes have varying degrees of reliance on regulatory or statutory language as compared to enforcement practice or oversight culture. Despite these differences in regulatory design and practice, most of the examples in this report create a strong **accountability** structure. Examples include the EMSA vessel safety initiatives (Section 2.4), Australia's National Plan (Section 3.2), and the Norwegian approach to oil and gas oversight (Section 4.2).

Three of the regimes highlighted in this report – Australia, Norway, and the UK – rely on a co-regulatory model where the government establishes performance-based rules and then takes on the role of mentor. Operators are expected to self-regulate to meet the performance standards, and government intervenes as a last resort when operators are out of compliance (Lindøe et al., 2013).

The US is also cited as an example of world-leading oil spill prevention, preparedness, response, and recovery; however, the US federal regime tends to be more prescriptive, rooted in a command-and-control approach that requires strict compliance with regulatory standards. Still, this system creates accountability to clearly defined standards, as illustrated by the oil spill response planning standards (Section 3.3) and the marine firefighting and salvage requirements (Section 2.8). While the US regime has undertaken some recent initiatives that incorporate performance-based elements, its overall approach – generally regarded as effective – is still highly prescriptive when compared to regimes such as Norway or Australia (Blakstad, 2013).

A final element of accountability relates to funding for oil spill prevention, preparedness, response, and recovery. Many of the examples in this report rely on dedicated funding sources. In the case of the Aleutian

Islands Risk Assessment, funding came through a settlement following an oil spill (Section 2.2). Other examples, such as the Prince William Sound tanker escort system (Section 2.5), the US oil spill trust fund (Section 4.4) and the regional citizens advisory councils (Section 4.3), are industry-funded based on legal and regulatory imperatives. Many of the world-leading examples receive ongoing funding through government, such as the EMSA vessel safety initiatives (Section 2.4), Australia's port state control (Section 2.6), Canada's aerial surveillance program (Section 2.7), and geographic response planning in Alaska (Section 3.5). In the US, the oil spill trust fund (Section 4.4) assures that the natural resource damage assessment process (Section 3.7) can be fully implemented.

5.2.6 CONTINUOUS IMPROVEMENT

A final common theme among the world-leading examples of marine oil spill prevention and response is the element of continuous improvement. They strive to improve and enhance their overall effectiveness at preventing oil spills from occurring or responding to mitigate their impacts. This manifests in several different ways, such as the use of new and emerging technology in the Canadian NASP program (Section 2.6) or creating incentives for best available technology through the US response planning standards (Section 3.3). Several of the examples focus on program metrics to self-evaluate and drive programmatic change. Both examples from Australia incorporate continuous improvement: the National Plan (Section 3.2) includes a mechanism to periodically evaluate oil spill response capacity and adjust national stockpiles appropriately. The port state control system (Section 2.6) uses a data-driven approach to calibrate inspections to target high risk vessels and to focus inspections on vessel systems with a high level of past violations. The Norwegian approach to oil and gas oversight (Section 4.2) drives a significant research and development effort to enhance marine oil spill response technologies and overall capacity.

Table 5.1. Examples of World-Leading Marine Oil Spill Prevention, Preparedness and Response Elements and Considerations for Modeling BC System

Example	World-leading Elements	Modeling BC System based on Example
OIL SPILL PREVENTION		
Aleutian Islands Risk Assessment (Alaska, US)	<ul style="list-style-type: none"> ✓ Evaluate marine transportation risks within a specific geographic region ✓ Combines technical analysis with stakeholder input and independent oversight ✓ Funded through direct funds from plea agreement for oil spill in Aleutian Islands ✓ Resulted in tangible, consensus-based recommendation for optimal response system ✓ Included cost analysis and recommended funding and management mechanisms 	<ul style="list-style-type: none"> ◇ Conduct a multi-jurisdictional marine oil spill risk assessment that combines technical analysis with stakeholder, government, and industry input. ◇ Evaluate marine oil spill threats based on historic and projected vessel movements along entire BC coast, including risk of spills from cargo and fuel tanks. ◇ Evaluate potential consequences of marine oil spills with stakeholder and public input. ◇ Link marine oil spill prevention initiatives to identified risks; prioritize based on both threats and consequences. ◇ Specify implementation process - mechanism, timeline, responsibility, costs, etc. – when evaluating risk reduction options.
Areas to be Avoided (Alaska and Hawaii, US)	<ul style="list-style-type: none"> ✓ Enhance protection of areas vulnerable to risks from international vessel traffic ✓ Applicable to vessels of a certain class, regardless of flag state or voyage route ✓ Included on international charts for clear message to all mariners ✓ Compels flag states and coastal states to monitor compliance 	<ul style="list-style-type: none"> ◇ Identify highly sensitive or high priority areas where the risks associated with vessel traffic are too high to tolerate. ◇ Specify the special area designation and resultant routing measures in accordance with IMO guidance, and bring recommendations to IMO. ◇ Implement Areas to Be Avoided, Particularly Sensitive Sea Areas, or other routing measures through international charting and enforce through port state controls and coordination with flag states.
EMSA Integrated Vessel Safety Initiatives (European Union)	<ul style="list-style-type: none"> ✓ Using accident investigation data to inform safety and prevention ✓ Real-time information about vessel safety ✓ Targeting enforcement to high-risk vessels and activities ✓ Accountability for implementation of EU and international standards ✓ Public access to primary databases and summary reports on ship safety and inspections (worldwide) 	<ul style="list-style-type: none"> ◇ Collect and analyze vessel casualty data and publish summary statistics to inform risk management and risk reduction measures. ◇ Evaluate sufficiency of salvage and rescue resources to respond to incidents along BC coast. ◇ Create transparency for port state control/inspection activities by making summary reports and appropriate data publicly available. ◇ Establish data-driven effectiveness measures to understand how vessel safety initiatives are influencing accident and casualty rates, and identify appropriate course corrections to maximize effectiveness.

Example	World-leading Elements	Modeling BC System based on Example
Prince William Sound Tanker Escort System (Alaska, US)	<ul style="list-style-type: none"> ✓ Dedicated, high-powered tugs ✓ Two escorts along entire 90-mile route through Prince William Sound ✓ Required by federal statute ✓ Funded by industry ✓ Federal, state, and citizen-level oversight 	<ul style="list-style-type: none"> ◇ Evaluate capacity of escort vessels (tugs) in areas where tanker escorts are required and consider whether enhancements to number, type, or capacity of tugs would enhance safety. ◇ Evaluate whether tug escorts would enhance tanker safety in regions where escorts are not presently required. ◇ Evaluate regulatory and oversight mechanisms that compel tanker escorts and consider whether mandates are required (vs. voluntary compliance) to achieve risk reduction benefits. ◇ Compile and analyze data on escort tug activities (e.g. rescues or saves, other assistance rendered).
Australia Port State Control	<ul style="list-style-type: none"> ✓ Targeted inspections of high-risk vessels ✓ Focused inspection campaigns to address areas with frequent deficiencies ✓ Refuse entry to ships with history of past detentions ✓ Use of Marine Orders to quickly implement new requirements ✓ Agency mission links oil pollution risk, prevention, and response ✓ Frequent public release of port state inspection data and summary reports 	<ul style="list-style-type: none"> ◇ Target inspections by focusing on vessels with poor safety records (i.e. history of detentions, past pollution incidents, multiple violations) and prioritizing areas onboard ships with high levels of past violations (similar to Australia's Focused Inspection Campaigns). ◇ Analyze and publish annual Port State Control data and statistics. ◇ Collect and analyze program metrics to assess performance (i.e. measure how vessel safety is improving based on Port State Control activities).
Canadian National Aerial Surveillance Program	<ul style="list-style-type: none"> ✓ High level of patrol hours when compared to other, similar programs ✓ Multiple, integrated technologies to track vessels, capture geo-referenced images from a range of altitudes even in darkness and low visibility ✓ Successful detection and prosecution of pollution violations ✓ Multiple governmental departments share and supplement NASP program with technology and resources 	<ul style="list-style-type: none"> ◇ Continue to expand the number of flight hours in the west coast region. ◇ Continue to acquire and incorporate new and emerging technologies. ◇ Incorporate and analyze data from pollution incidents to identify trends and consider opportunities to link with other vessel safety and pollution prevention initiatives.

Example	World-leading Elements	Modeling BC System based on Example
US Marine Firefighting and Salvage Requirements	<ul style="list-style-type: none"> ✓ Operators of tank vessels and certain non-tank vessels are required to plan for emergency towing, salvage, and marine firefighting ✓ Federal oversight through vessel response plan reviews ✓ Timeframes for delivery of marine firefighting and salvage resources ✓ Minimum capability requirements for emergency towing, salvage, and marine firefighting based on vessel type, size, and area of operation 	<ul style="list-style-type: none"> ◇ Evaluate existing marine firefighting and salvage capacity along west coast. ◇ Develop additional capacity and distribute geographically commensurate with risks from vessel traffic. ◇ Consider mechanisms to compel shipping industry to fund marine firefighting and salvage resources.
OIL SPILL PREPAREDNESS, RESPONSE, AND RECOVERY		
Australia National Contingency Plan	<ul style="list-style-type: none"> ✓ Supported by risk evaluation and capability assessment ✓ Integrates with state, local, and industry response plans ✓ Emphasis on prevention through dedicated emergency towing resources funded by shipping industry ✓ Equipment stockpiles actively managed and information on equipment status publicly available ✓ Competency-based training approach with regional oversight ✓ Science-based approach to response decision-making ✓ Over 20 years of annual reporting on National Plan activities creates accountability and transparency 	<ul style="list-style-type: none"> ◇ Identify strategic priorities for marine oil spill preparedness and response. ◇ Develop integrated plan across all federal, provincial, local and First Nation agencies and governments involved in oil spill prevention or response. ◇ Evaluate spill response capacity (equipment, personnel, response time) based on regional oil spill risks and fill any gaps in equipment stockpile quantity, type, or location. ◇ Establish performance-based training standards for spill responders (government and industry). ◇ Conduct periodic self-assessments to identify opportunities to improve or enhance national and regional response capability.
US Pacific States Response Planning Standards	<ul style="list-style-type: none"> ✓ Planning standards are established and enforced through oil spill contingency plans ✓ Planning standards incorporate all aspects of spill response ✓ Planning standards are commensurate with oil spill potential (size, type) ✓ Mechanism exists to drive continuous improvement or otherwise update standards as needed ✓ Assumptions are transparent to interested parties ✓ Requirements are predictable to regulated entities 	<ul style="list-style-type: none"> ◇ Establish worst case spill response volume based on total vessel cargo and fuel oil, and use worst case spill volumes to drive response capacity building. ◇ Consider replacing the current 10,000 tonne response organization requirement with vessel-specific standards that compel operators to contract for sufficient capacity to manage worst case discharge from vessel. ◇ Establish oil spill contingency planning requirements for vessels calling on BC ports. ◇ Develop best available technology requirements for oil spill response equipment.

Example	World-leading Elements	Modeling BC System based on Example
UK Policy on Oil Spill Treating Agents	<ul style="list-style-type: none"> ✓ Clear, transparent, and expedited decision-making process for approval decision about agent use within one hour of request ✓ Efficacy and toxicity standards for approval of specific agents tied to intended use (offshore, inshore, shoreline, etc.) ✓ Port and operator oil spill contingency plans should include plans for dispersant use decisions and operations ✓ UK government has resources (aircraft and dispersants) and discretion to initiate dispersant operations 	<ul style="list-style-type: none"> ◇ Establish geographic zones where alternative response technologies are or are not authorized. ◇ Provide decision-making process regarding use of treating agents or alternative response technologies in authorized areas during an incident. ◇ Develop operational capacity (stockpiles, application equipment and platforms, trained personnel) to implement alternate response technologies, if authorized. ◇ Establish government oversight for entire life cycle of treating agent use, from testing and approval of specific products based on effectiveness, toxicity, and other criteria to incident-specific and long-term monitoring if agents are used during an oil spill.
Alaska Geographic Response Strategies	<ul style="list-style-type: none"> ✓ Workgroup process involves local stakeholders, natural resource agencies, and spill response experts in collaborative process ✓ Public input into prioritization of sites ✓ Standardized tactics, terminology, and resource sets are used statewide by industry and government ✓ Operators can reference GRS to illustrate how they will meet state contingency planning requirements for sensitive area protection 	<ul style="list-style-type: none"> ◇ Develop prioritization process that considers vulnerability, sensitivity, and feasibility. ◇ Regional approach for BC that integrates with other oil spill and emergency response plans. ◇ Use geographic response plans to evaluate response capacity and adequacy of equipment stockpiles, and fill gaps. ◇ Develop local response capacity to quickly implement protection strategies ahead of an oil slick. ◇ Provide opportunity for public and stakeholder review and input, particularly into site selection/prioritization process. ◇ Utilize standard tactics and terminology. ◇ Test strategies during field deployments under realistic conditions, and refine plans accordingly.

Example	World-leading Elements	Modeling BC System based on Example
Alyeska SERVS Fishing Vessel Response Program (Alaska, US)	<ul style="list-style-type: none"> ✓ Membership tiers require that contracted must respond within 1, 6, or 24-hours of oil spill ✓ Approximately 400 vessels under contract, plus database of vessels-of-opportunity ✓ Funded by companies that ship oil through Prince William Sound ✓ Linked to compliance with state response planning standards ✓ Training program regularly reviewed and revised to reflect new technologies, tactics, or regulatory requirements ✓ Positive link between fishing and oil industries with financial benefits to each 	<ul style="list-style-type: none"> ◇ Evaluate need for fishing vessels to supplement marine oil spill response and establish criteria for minimum numbers and types of vessels to support worst case spill response. ◇ Consider utilizing tier system similar to SERVS to distinguish vessels based on response availability. ◇ Conduct regular exercises and training, including drills to test availability of vessels to respond within their specified timeframes. ◇ Ensure adequate funding for program administration, training, exercises, and documentation.
US Natural Resources Damage Assessment	<ul style="list-style-type: none"> ✓ Damage assessment and restoration and recovery planning begin immediately during spill response ✓ Recognizes a range of impacts to resources and their use ✓ Framework for primary and compensatory restoration, depending on type and severity of impacts ✓ Opportunity for public input and comment ✓ Cooperative process (agency trustees and responsible party), but trustees have ultimate authority ✓ NRDA applies to oil spills and potential oil spills 	<ul style="list-style-type: none"> ◇ Establish process for assessment of oil spill damages and embed process into spill response framework. ◇ Assign “trustee” equivalents from federal, provincial, local, and First Nation governments and agencies to implement damage assessment and restoration. ◇ Integrate natural resource damage assessment and restoration into polluter pays system.

SYSTEM ELEMENTS

Norwegian Government Oversight of Oil and Gas Activities

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| <ul style="list-style-type: none"> ✓ Operators have flexibility to meet government safety and prevention standards, but are held strictly accountable ✓ Focus on leading indicators and near misses ✓ Governance approach to safety and prevention favors collaboration and dialogue but allows for punitive measures if needed ✓ Robust civil and criminal penalty structure for pollution ✓ Government audits and enforcement actions are transparent to industry and public ✓ Operators may be compelled to make safety data or studies publicly available | <ul style="list-style-type: none"> ◇ Consider performance-based approach that sets measurable standards and allows some flexibility for compliance. ◇ Track near miss events and other leading indicators and tailor safety and prevention requirements to causality. ◇ Create a continuum of enforcement mechanisms that includes both civil and criminal penalties for oil spills or safety violations. ◇ Engage in cooperative research and development activities with industry. ◇ Operate transparently and require transparency from industry, including publication of studies, data, and other information of interest to the public and stakeholders. |
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Alaska Regional Citizens Advisory Councils

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| <ul style="list-style-type: none"> ✓ Member entities include range of regional stakeholder groups ✓ Clearly defined scope of activities tied to local oil operations ✓ Each council focuses on specific sub-region of Alaska ✓ Required by federal statute ✓ Funded by industry ✓ Ensures sustained citizen-level oversight as long as oil operations are underway | <ul style="list-style-type: none"> ◇ Create independent, autonomous councils with defined mission. ◇ Secure dedicated funding to allow Councils to undertake technical work and participate in planning and preparedness activities. |
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US Oil Spill Liability Trust Fund

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| <ul style="list-style-type: none"> ✓ US\$50 million immediately accessible to federal response agencies for oil spill response ✓ Financial assurance in cases where responsible party is unknown or insolvent, or if liability caps are exceeded ✓ Can be accessed for oil spills and threatened oil spills ✓ Can be used for oil spill preparedness, response, damage assessment, or restoration ✓ Up to US\$1 billion available per incident ✓ Current fund contains approximately US\$4 billion ✓ Does not prevent future cost recovery actions; US government has recovered 72% of expenditures | <ul style="list-style-type: none"> ◇ Evaluate fund reserves and per-incident limits to ensure that adequate funding is available to cover a worst case oil spill, based on a review of recent incident costs worldwide. ◇ Ensure that funding can be used for restoration and recovery activities. ◇ If adequate reserves exist, consider allocating funding to support preparedness and response activities. ◇ Consider creating a provincial fund to supplement national fund. |
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6 CONCLUSION

There is no blueprint for “world-leading” marine oil spill systems or regimes. Specific regulations, laws, policies, and practices in place in any given jurisdiction are influenced by differences in geography, politics, legal systems, and governance approaches. These differences make it nearly impossible to rank regimes against one another, and the intent of this report is not to issue an international scorecard. Instead, it presents specific examples of marine oil spill prevention and response practices that are renowned as particularly effective and offers these as established models for British Columbia to consider in building a world-leading regime for the west coast of Canada. The discussion of each example emphasizes **how** and **why** it is considered to be world-leading, with the understanding that some adaptation may be required to apply these practices to Canada’s west coast.

6.1 Recommendations for a World-Leading British Columbia Marine Oil Spill Prevention and Response System

The examples presented in this report range from local port initiatives to IMO designations. For the BC government, some of the examples presented could be adopted or adapted at the provincial level, while others would require federal or multi-jurisdictional initiatives. Each example includes details about jurisdictional authorities and governance that may inform BC’s prioritization of the types of initiatives to pursue independently.

The 16 examples of world-leading marine oil spill prevention and response systems are distilled down to key elements in the body of the report and in Table 5.1. Considerations for BC in adapting some or all of these elements are also listed. Both lists identify tangible elements that could be used to evaluate the existing system in BC and focus efforts on areas where enhancements are needed.

In aggregating this list of world-leading marine oil spill prevention and response system elements, six general themes emerge regarding common characteristics: (1) risk-based approach; (2) multi-layered system; (3) holistic approach; (4) collaboration; (5) accountability; and (6) continuous improvement. These principles may inform BC and partner jurisdictions as they consider enhancements and improvements to the existing marine oil spill prevention and response system.

BC can implement a **risk-based approach** by ensuring that oil spill prevention measures target those locations, activities, or conditions that present a high risk of oil spills and that response planning and preparedness is sufficient to manage the worst possible spill scenario, no matter how unlikely. Ongoing collection and analysis of data from incidents and near-misses should be used to refine and improve oil spill prevention and response systems. Quantitative data is important for analyzing trends and evaluating effectiveness, but qualitative data – such as observations from professional mariners or marine inspectors – may be equally important to collect and review.

A world-leading marine oil spill prevention system for BC should have **multiple layers** of prevention and response in place. Prevention measures should target different components of risk, and should consider how each measure might interrupt the chain of events that could lead to an oil spill. Prevention is critical, but there will be occasions when prevention barriers fail, and a world-leading system is prepared for the worst. A world-leading marine oil spill response system for BC should include multiple layers of response planning and readiness along with sufficient resources to implement a major marine oil spill response.

BC’s world-leading marine oil spill prevention and response system in BC should take a **holistic approach** to balancing prevention and response. Even systems with world-leading prevention elements in place still experience oil spills. A world-leading system emphasizes prevention but still ensures that adequate response capacity is in place in the event that prevention systems fail. A holistic approach requires that the entire system be considered in preventing and responding to oil spills. Initiatives that are tied to a single energy

project or a single risk-causing activity must be integrated into a system-wide approach. In order for a prevention or response measure to reduce risks and consequences, it must be available across the entire system and not tied to a specific facility or operational sector.

As the BC and Canadian governments moves forward with new initiatives for marine oil spill prevention and response, it is critical to incorporate an **accountability structure**. The examples in this report include a number of different approaches to holding operators accountable to standards or regulations. Government authorities should also be accountable to stakeholders and the public at large. Auditing and oversight is a key component to many of the examples included here, and this is a critical distinction of world-leading regimes.

A world-leading marine oil spill prevention and response regime in BC must be **collaborative and transparent**. Marine oil spills bring together federal, provincial, local and First Nation governments, along with the private sector and the public. Efforts to work collaboratively on oil spill prevention and response initiatives will build relationships and trust. Transparency to the public and the regulated industry will also contribute to building trust and creating predictability.

Finally, a world-leading regime does not rest on its laurels; it incorporates mechanism for frequent self-evaluation to drive **continuous improvement**. Marine oil spill prevention and response initiatives should be designed with a clear purpose and measurable objectives that can be used to evaluate program effectiveness and spur refinement and improvement.

6.2 Next Steps

The province does not have direct jurisdiction over many of the issues involved in marine oil spill prevention and response; therefore implementation of a world-leading marine regime will require a broader effort that includes federal and international partners. There are a number of parallel efforts ongoing in Canada that relate to oil spill preparedness and response. As the BC government moves to implement a world-leading marine oil spill system, there may be opportunities to synergize efforts with some of these other initiatives that are looking at similar issues.

In addition to the federal Tanker Safety Expert Panel discussed in Section 1.3, there are world-class initiatives underway within Transport Canada, Environment Canada, and Natural Resources Canada. The Canadian Council of Ministers of the Environment is engaged in an assessment of environmental emergency response across Canada that may yield recommendations for improving marine oil spill preparedness and response. The Alberta Energy Regulator (AER) has initiated a Best-in-Class Regulator Initiative to answer two overarching questions: (1) how regulatory excellence should be defined; and (2) how progress toward regulatory excellence should be measured (Coglianese and Shils, 2015). The final convener's report, due out in summer 2015, will provide a framework that may contribute to efforts by Canadian federal and provincial agencies, including BC, to enhance their governance of marine oil spill prevention, response and recovery.

The report stops short of assessing the present system in BC, but this may be a logical next step for BC. The elements of world-leading systems identified in this report and list of considerations for BC could be used to analyze gaps in the current system and frame the discussion of ongoing and potential new initiatives to achieve a world-leading marine oil spill regime. The six common characteristics identified through the examples in this report – risk-based, layered, holistic and balanced, accountability, collaboration, and continuous improvement – also inform the process.

BC may also benefit from direct knowledge-sharing with some of the entities and governments profiled in this report. Existing forums for sharing best practices regarding oil spill prevention and response, such as international agreements like the Paris and Tokyo MOUs, professional conferences such as Environment Canada's annual Arctic Marine Oil Pollution seminar, or standing organizations like the States/BC Oil Spill Task Force, provide an opportunity to discuss these issues. BC may also consider convening a workshop similar

to the 2013 Land-based Oil Spill Preparedness symposium to focus discussion specifically on BC's marine oil spill prevention and response system and to develop consensus about priorities for achieving a world-leading regime.

7 REFERENCES

Research for this report was conducted through a primary review of professional literature and supplemented by interviews with practitioners and experts. The research process was diligent but not exhaustive, and the seventeen examples included in this report are not meant to be an exclusive list of single best practices.

7.1 Interviews and Personal Communications

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8 ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AER	Alberta Energy Regulator
AIMS	Australian Incident Management System
AIRA	Aleutian Islands Risk Assessment
AMSA	Australian Maritime Safety Authority
ANWR	Alaska National Wildlife Refuge
APSC	Alyeska Pipeline Service Company
ATBA	Areas to be avoided
AU	Australia
BAP	Best achievable protection
BAT	Best achievable technology
bbl	Barrel
CASR	Canadian American Strategic Review
CCR	California Code of Regulations
CFR	Code of Federal Regulations (US)
COTI	Council on Transport and Infrastructure (Australia)
COTP	Captain of the Port (US)
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DFO	Fisheries and Oceans Canada
DNV	Det Norske Veritas
EC	European Commission
EEZ	Exclusive Economic Zone
EMCIP	European Marine Casualty Information Platform
EMSA	European Maritime Safety Agency
ERM	Environmental Resource Management
ESI	Environmental Ship Index
ETT	Enhanced tractor tug
EU	European Union
EVOTC	Exxon Valdez Oil Spill Trustee Council
GESAMP	Joint group of Experts on the Scientific Aspects of Marine Environmental Protection
GRP	Geographic Response Plan
GRS	Geographic Response Strategy
GT	Gross tons
HSE	Health, Safety and Environmental
IMO	International Maritime Organization
ITOPF	International Tanker Owners Pollution Federation
LNG	Liquefied natural gas
LLP	Limited Liability Partnership
MARPOL	International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency (UK)

MEPC	Marine Environment Protection Committee (EC)
MERCOM	Maritime Emergency Response Commander (Australia)
MISA	Marine Innovations South Australia
MMO	Marine Management Organisation (UK)
MoU	Memorandum of Understanding
MT	Metric ton
NASP	National Aerial Surveillance Program (Canada)
NCSR	Sub-committee on Navigation, Communications, and Search and Rescue (US)
NEMO	National Environmental Maritime Operations (Australia)
NOAA	National Oceanic and Atmospheric Administration (US)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority (Australia)
NPFC	National Pollution Funds Center (US)
NPSCC	National Plan Strategic Coordination Committee (Australia)
NPSIAF	National Plan Strategic Industry Advisory Forum (Australia)
NRC	National Research Council (US)
NRDA	Natural Resources Damage Assessment
NRDAR	Natural Resources Damage Assessment and Restoration
NTVRP	Non-tank Vessel Response Plan
OECD	Organisation for Economic Co-operation and Development
OGP	International Association of Gas & Oil Producers
OPA	Oil Pollution Act (US)
OSC	Oil Spill Commission (US)
OSLTF	Oil Spill Liability Trust Fund (US)
PAA	Petroleum Activities Act (Norway)
P.L.	Public law (US)
PRO	Preparedness and Response Organization
PRT	Preparedness and Response Tug
PSA	Petroleum Safety Authority (Norway)
PSSA	Particularly Sensitive Sea Area
PWSRCAC	Prince William Sound Regional Citizens' Advisory Council
RCAC	Regional Citizens Advisory Council
RPG	Response Planning Group
S.C.	Safeguarding Canada
SERVS	Ship Escort Response Vessel System
SOLAS	UN Convention on Safety of Life at Sea
SOTEAG	Shetland Oil Terminal Environmental Advisory Group
STCW	Standards of Training, Certification and Watchkeeping
TC	Transport Canada
TRB	Transportation Research Board
UK	United Kingdom
UN	United Nations
US	United States
USC	United States Code
USCG	US Coast Guard
USEPA	US Environmental Protection Agency

USFWS	US Fish and Wildlife Service
VERP	Vessel Escort Response Plan
VOO	Vessel of opportunity
VRP	Vessel Response Plan
VTs	Vessel Traffic Service
WAC	Washington Administrative Code
yr	Year