



# **A REVIEW OF CANADA'S SHIP-SOURCE SPILL PREPAREDNESS AND RESPONSE:**

**Setting the Course for the Future, Phase II**

**Requirements for the Arctic and  
for Hazardous and Noxious Substances Nationally**

Tanker Safety Expert Panel

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Transport  
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Tanker Safety  
Expert Panel

Comité d'experts sur la  
sécurité des navires citernes

330 Sparks Street  
Ottawa  
K1A 0N5

September 30, 2014

The Honourable Lisa Raitt, P.C., M.P.  
Minister of Transport

Minister Raitt:


We are pleased to present our second report, *A Review of Canada's Ship-source Spill Preparedness and Response: Setting the Course for the Future, Phase II - Requirements for the Arctic and for Hazardous and Noxious Substances Nationally*.

As a Panel, we had the opportunity to see firsthand the complexities involved in preparing for and responding to both oil spills in the Arctic and releases of hazardous and noxious substances nationally. Unlike the Ship-source Oil Spill Preparedness and Response Regime for spills south of 60, Canada is not starting with mature preparedness and response models for dealing with these types of incidents. Over the course of this second phase of our review, we have concluded that there are opportunities now to enhance Canada's prevention, preparedness and response requirements for the Arctic and hazardous and noxious substances to better protect the public and our environment.

We make 25 recommendations for the Arctic, and 17 recommendations for hazardous and noxious substances. We additionally make one recommendation (applicable to both phases of our review) on the management of marine casualty incidents. Our recommendations both build on existing requirements and encourage innovation to meet Canada's needs in the future. These recommendations would, if implemented, set the course for the future.

  
\_\_\_\_\_  
Captain Gordon Houston

  
\_\_\_\_\_  
Mr. Richard Gaudreau

  
\_\_\_\_\_  
Dr. Michael Sinclair

Canada





# TABLE OF CONTENTS

<b>Preface</b> .....	<b>1</b>
<b>Executive Summary</b> .....	<b>2</b>
<b>Chapter 1 The Arctic</b> .....	<b>5</b>
Introduction .....	5
The Challenges of Operating in the Arctic .....	6
The Legal Framework for Arctic Marine Transportation .....	13
Government Services in Support of Arctic Marine Transportation .....	20
The Liability and Compensation Regime .....	21
Prevention .....	22
A Modernized Navigation System for the Arctic .....	22
Nautical Charts .....	24
Sailing Directions .....	25
Ice Navigation Systems .....	26
Ice Navigators .....	27
Preparedness and Response .....	29
Preparedness and Response for Vessels .....	29
Preparedness and Response for Oil Handling Facilities .....	32
Barges as Temporary Fuel Storage .....	34
Oversight .....	35
Response Options .....	35
Regional and Localized Planning .....	36
Canadian Coast Guard Capabilities .....	38
Building Linkages .....	41
Community Training .....	41
Regional Exercise Program .....	42
Continuous Improvement .....	43
Awareness and Engagement .....	43
Improving Data for Arctic Preparedness and Response .....	44
Research Gaps and Priorities .....	46
Building a Foundation for the Future .....	49
Future Risk Assessments .....	51



**Chapter 2 Hazardous and Noxious Substances.....53**

Introduction..... 53

    Hazardous and Noxious Substances in Canada ..... 53

    International Framework for Hazardous and Noxious Substances..... 55

    Anatomy of a Response to Hazardous and Noxious Substances Incidents at Sea..... 58

A Canadian Hazardous and Noxious Substances Program ..... 61

    Canada’s Accession to the OPRC-HNS Protocol..... 64

    Preparedness and Response for Vessels and Facilities ..... 65

    Oversight and Accreditation ..... 68

    A National Contingency Plan..... 70

    Regional Planning ..... 70

    Canadian Coast Guard Capabilities..... 71

    Building Linkages ..... 73

    National Exercise Program ..... 73

Continuous Improvement ..... 75

    Awareness and Engagement..... 75

    Improving Data for Preparedness and Response ..... 76

    Research Gaps and Priorities..... 78

    Future Risk Assessments..... 79

**Chapter 3 Marine Casualty Management .....81**

**APPENDIX A – Risk Assessment Summaries.....85**

    A.1 – Arctic..... 85

    A.2 – Hazardous and Noxious Substances ..... 87

**APPENDIX B – Biographies of Tanker Safety Expert Panel Members .....90**

**APPENDIX C – Terms of Reference for the Review .....92**

**APPENDIX D – Lines of Inquiry .....94**

    D.1 – Arctic ..... 94

    D.2 – Hazardous and Noxious Substances..... 97

**APPENDIX E – Stakeholder Discussions and Sites Visited ..... 100**

    E.1 – Arctic ..... 100

    E.2 – Hazardous and Noxious Substances ..... 101

**APPENDIX F – Submissions Received ..... 102**

    F.1 – Arctic ..... 102

    F.2 – Hazardous and Noxious Substances ..... 102

**APPENDIX G – Glossary of Terms ..... 103**

**APPENDIX H – Bibliography ..... 106**

    H.1 – Arctic ..... 106

    H.2 – Hazardous and Noxious Substances..... 107

**APPENDIX I – List of Recommendations ..... 108**

    I.1 – Arctic ..... 108

    I.2 – Hazardous and Noxious Substances ..... 111

    I.3 – Marine Casualty Management..... 112





## PREFACE

The first phase of our review of the ship-source oil spill regime currently in place south of 60,<sup>1</sup> culminated in our first report, *A Review of Canada's Ship-source Oil Spill Preparedness and Response Regime—Setting the Course for the Future* (referred to henceforth as our *first report*),<sup>2</sup> which was provided to the Minister of Transport in November 2013. That report presents 45 recommendations, as well as associated findings.

We have now concluded the second phase of our review, which focused on ship-source spill prevention, preparedness and response requirements for the Arctic, as well as requirements for a hazardous and noxious substances (HNS) system nationally. This report presents our findings and recommendations for both areas of review (Arctic in Chapter 1 and HNS in Chapter 2).

We have additionally included a chapter (Chapter 3) and a recommendation on marine casualty management, which is relevant not only to the scope of our Phase II review (Arctic and HNS requirements), but also for the ship-source oil spill regime south of 60 (the subject of our first report), and other marine vessel incidents nationally.

You will note in our second report that there are some areas where we have left considerable room for the Government to consider how best to implement our proposals. We are acknowledging here that, for both the Arctic and HNS, Canada is not starting with a mature preparedness and response model as currently exists for oil spills south of 60. There is much more that needs to be done in these areas, but progress needs to be made in a measured and incremental manner.

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<sup>1</sup> In each case where north or south of '60' is discussed, this refers to 60 degrees north latitude.

<sup>2</sup> <http://www.tc.gc.ca/eng/tankersafetyexpertpanel/menu.htm>



### Chapter 1 – The Arctic

Chapter 1 of this report details the findings and recommendations of our review of the prevention, preparedness and response requirements for ship-source spills in the Canadian Arctic. In our first report we proposed recommendations that sought to improve the existing Ship-source Oil Spill Preparedness and Response Regime south of 60. A key component of the Regime is industry's role, carried out through four industry-funded and government-certified Response Organizations. These Response Organizations maintain a level of preparedness, according to Canadian regulations and standards, to respond to spills. However, the Arctic is a much more complex environment within which to prepare for and respond to spills for a number of reasons, including its climate, remoteness and lack of support infrastructure. In addition, there are no private-sector Response Organizations in place. The probability of a ship-source oil spill occurring in the Canadian Arctic is very low due to the small number of voyages and the low volume of oil transported.<sup>3</sup> Despite this low probability, the potential for a spill still exists, including the very rare one that could cause significant damage to the marine environment and impact the socio-economic, cultural and traditional practices of northern communities. Addressing the requirements for the Arctic has come at an opportune time, ahead of predicted increases to maritime traffic in the North.

In our review and subsequent recommendations to enhance Canada's ship-source spill prevention, preparedness and response in the Arctic, we considered that:

- Change is taking place in the Arctic, both in terms of the extent of multi-year sea ice, as well as economic development.
- Spill preparedness and response is more challenging in the Arctic than in Canada's southern waters. Preventing and limiting ship-source<sup>4</sup> spills are the most important improvements to be made.
- Improvements to ship-source spill preparedness and response should be incremental, based on risks and targeted at vessels, oil handling facilities, and key federal departments and agencies.
- The Canadian Coast Guard has a more important role to play in the Arctic with respect to ship-source spill preparedness and response than it does south of 60.
- Due to the ever-evolving situation in the Arctic, the Government needs to regularly review and adjust its Arctic spill preparedness and response requirements and capabilities over the longer term.
- A considerable amount of research has been done on the Arctic, including on the fate and effects of certain types of oil; however, information gaps remain that need to be prioritized and addressed.
- Ship-source spill preparedness and response in the Arctic should involve northern communities, for example, through sharing of traditional knowledge, building of awareness and other opportunities for partnership.

With these considerations in mind, we propose 25 recommendations that will set the course to improve ship-source spill prevention, preparedness and response in the Canadian Arctic.

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<sup>3</sup> Currently, the primary oil products carried as cargo in the Arctic are marine diesel, gasoline and jet fuel, all of which are non-persistent oils. Crude oil is not currently transported as cargo in the Arctic.

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<sup>4</sup> In the context of this report, ship-source spills should be understood to include any spills that could occur during the transfer of oil between a vessel and a land-based oil handling facility, as well as spills originating from vessels.

## Chapter 2 – Hazardous and Noxious Substances

Chapter 2 of our report details our findings and recommendations based on our review of the preparedness and response requirements for ship-source releases of hazardous and noxious substances (HNS) in Canadian waters.<sup>5</sup> Despite previous efforts to establish an HNS preparedness and response regime in Canada, none of these efforts have come to fruition.

Historically, there have been fewer ship-source incidents involving HNS than oil—both in Canada and worldwide—and the volume of HNS transported in Canadian waters is significantly lower than that of oil. Nevertheless, the potential for significant impacts from an HNS incident clearly exists, and the Government of Canada cannot rely solely on strong prevention measures in this area. It is time to implement proactive measures to ensure adequate preparedness and response capacity for the protection of the Canadian public and the environment.

In our review of HNS requirements, and in our recommendations that lay out a program to enhance Canada's preparedness and response to HNS releases, we considered that:

- A Canadian ship-source HNS incident preparedness and response program (HNS program) should be in line with the basic elements of the international regime, but should also integrate additional elements to address current and future Canadian realities.
- An HNS program should build bridges between the existing marine prevention, preparedness and response programs and the Transportation of Dangerous Goods Program,<sup>6</sup>

<sup>5</sup> For the purposes of this report, any reference to ship-source HNS releases is also meant to include any accidental release during the handling of HNS between a vessel and a land-based HNS facility, as well as releases originating from vessels.

<sup>6</sup> Dangerous Goods represent a subset of HNS.

as well as the respective (public and private) knowledge and expertise that support them.

- An HNS program should enable the participation of a wide variety of stakeholders that can contribute to the effective management of HNS releases, including federal, provincial, territorial, and municipal governments, and industry participants from the shipping, chemical and emergency response sectors.
- An HNS program should be scaled to risk, but applied nationally, including to the Arctic.
- An HNS program should be structured to build capacity in industry to prepare for and respond to ship-source HNS incidents, as well as releases that could occur during the handling of HNS between land-based facilities and vessels.
- An HNS program should build on and utilize the technical expertise available in the HNS producer industry to inform effective responses.
- A Canadian HNS program should leverage expertise and research that is available internationally.
- As no formal preparedness and response requirements for ship-source releases of HNS currently exist in Canada, sufficient time and resources will be required to develop and implement a mature HNS program. Notwithstanding this, efforts to begin enhancing preparedness and response to HNS releases in Canada should not be delayed.

With these considerations in mind, we propose 17 recommendations that will set the course to establish a formal ship-source HNS incident preparedness and response program in Canada.





### **Chapter 3 – Marine Casualty Management**

Marine casualty management is a complex endeavour everywhere, but particularly in Canada, where multiple jurisdictions and authorities are involved. There is a need to improve time-sensitive decision-making during incidents where the threat of pollution is a matter of debate among various implicated parties, and to ensure that decision-making is done first and foremost in the public interest. If not managed quickly and decisively to prevent escalation, such incidents could become catastrophic events - including marine pollution incidents. As such, we recommend that the Government establish a centralized marine casualty decision-making authority.

# CHAPTER 1 THE ARCTIC



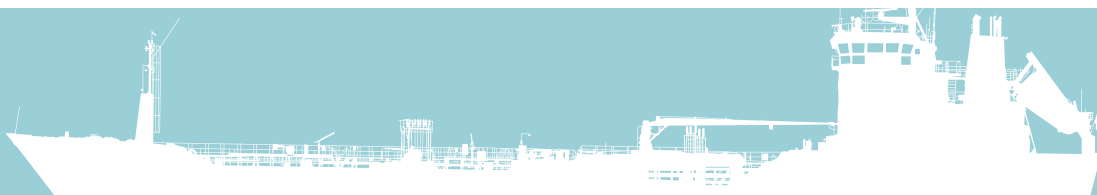
Photo credit: NEAS Group

## Introduction

Our review of ship-source spill prevention, preparedness and response in the Arctic<sup>7</sup> comes at an opportune time. Marine traffic in the North is expected to increase in the medium term due to new mining projects and, over the next several decades, there is the potential for further increases in vessel traffic as a result of oil and gas exploration as well as ships transiting the

Northwest Passage. During our discussions, stakeholders from across the Arctic indicated that now is the time to make improvements, not only to Canada's spill preparedness and response in the North, but also to strengthen the marine safety regime that seeks to prevent spills. We also strongly support the notion that the Government's primary focus at this time should be on preventing spills. Responding to spills in the Arctic is extremely challenging due to the unique features of this region, such as the presence and extent of ice, the lack of infrastructure and the potentially remote location of the spill. With this in mind, we have made a series of recommendations on how the current Arctic spill prevention regime could be strengthened.

<sup>7</sup> For the purposes of this report, the terms "the Arctic", "the North", "Canadian Arctic" and "Northern Canada" are used interchangeably, and refer to the regions of Canada located north of 60 degrees, including the Mackenzie River and Delta and Great Slave Lake, as well as Hudson Bay, James Bay, Ungava Bay, and the northern Labrador Sea.



Future improvements to government services should be targeted to the core geographical areas that are most frequented by vessels operating in the Arctic, as well as to those shipping activities that create the highest navigational risks. Federal departments and agencies are already working on this type of prioritization, and are collaborating to develop the concept of Northern Marine Transportation Corridors, with a view to improving the safety and efficiency of marine transportation in the Arctic. The Canadian Coast Guard, the Canadian Hydrographic Service (which, like the Canadian Coast Guard, is part of Fisheries and Oceans Canada), and Transport Canada are identifying key areas where navigation is taking place and forecasted to grow. They are also taking into consideration other factors such as the distribution of fish and marine mammals. Within these marine transportation corridors, the Government could better prioritize, for now and in the future, the delivery of its programs. These include the provision of core services, such as nautical charts, ice and meteorological reports, icebreaking and aids to navigation. This approach will provide users of the marine transportation corridors with a more predictable operating environment and reliable level of service, facilitating navigation and economic growth, while at the same time protecting environmental resources, which are vital to Aboriginal communities in terms of livelihoods, and cultural and traditional practices.

However, even the best prevention may not avoid all spills. There are improvements to be made to strengthen Canada's preparedness for and response to ship-source spills in the Arctic. Our proposals in this regard require incremental increases to industry's preparedness, as well as the Government's ability to provide core services and oversee industry preparedness.

In order to enhance the prevention of, preparedness for, and response to ship-source spills in the Arctic, multiple federal departments

and agencies will be required to build upon existing programs and functions. They will need additional resources to allow them to implement the recommendations contained in this chapter. We encourage the Government to make these investments to ensure that improvements can be sustained and built upon over the long term.

### **Environmental Assessment and Shipping Considerations of Resource Development**

There are a number of legislative requirements related to environmental assessment and protection that apply across Canada, including the North. Although complex, they essentially require federal regulators to assess the effects of proposed resource development projects on the environment and on potential or existing Aboriginal and treaty rights.

Currently, there are a number of resource development projects in the North that have significant shipping components, and it is likely that this number will grow due to increased development activity and the related demand for fuel and other products. The environmental assessment processes that govern these resource development projects also apply to the shipping components of these projects.

### **The Challenges of Operating in the Arctic**

The Canadian Arctic remains a frontier. To many Canadians, it is considered remote and isolated. At the same time, images of polar bears, icebergs, and vistas of pristine Arctic seascapes are a fundamental part of the Canadian psyche. The specificities of the region, such as the presence, movement, diversity and extent of ice; harsh weather; and the extreme duration of daylight hours in summer and, conversely, the extreme duration of darkness in the winter, make it a unique and daunting environment in which to live and conduct commercial activities. Nevertheless,



the northern coast of Canada has long been home to Aboriginal communities and other Northerners and, in recent years, it has increasingly attracted natural resources exploration and development projects, such as mining.

### ***Shipping Activities in the Canadian Arctic***

Marine transportation provides an interface between North and South, and is a conduit not only for critical community goods, but also information and culture. Shipping activity may be viewed by some as a symbol of change at a time when there is increasing pressure on traditional ways of life. Nonetheless, shipping plays a critical role in the sustainability and the development of the North. Indeed, both communities and resource development projects rely heavily on the South for the supply of certain goods, such as fuel. While aviation plays a big role in passenger and cargo transportation, the size and nature of the cargo, as well as lower costs associated with marine shipping have favoured it for both community resupply and supplying of various resource development projects.

Although resupply activities currently comprise the bulk of the maritime traffic in the North, there are several other maritime activities occurring in the Canadian Arctic. Many of the region's inhabitants own small boats. Commercial fishing is also important in parts of the region. Resource development projects, such as mines, also generate shipping traffic, as extracted resources are shipped to markets around the world. The North is attracting a growing number of adventurers in pleasure craft, and there is a small, but growing tourism and cruise industry. Finally, every summer, the Arctic hosts a few research vessels. Despite all these activities, the volume of traffic in the region is extremely low compared to that of Canada's southern waters. A recent assessment of the risk of ship-source spills in the Arctic commissioned by Transport Canada determined that, given the low volumes of marine traffic and oil transported in the Arctic, the probability of a ship-source spill is significantly lower in Canada's northern waters than in the rest of Canada. (See Appendix A.1 for a summary of the Arctic risk assessment.) This assessment was one of a number of sources of information that we considered in our review.



Photo credit: © Christine Germano, Aboriginal Affairs and Northern Development Canada

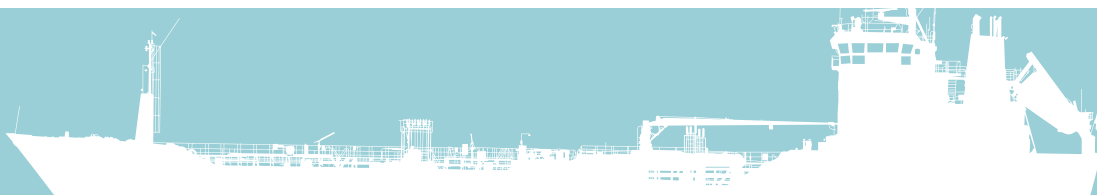
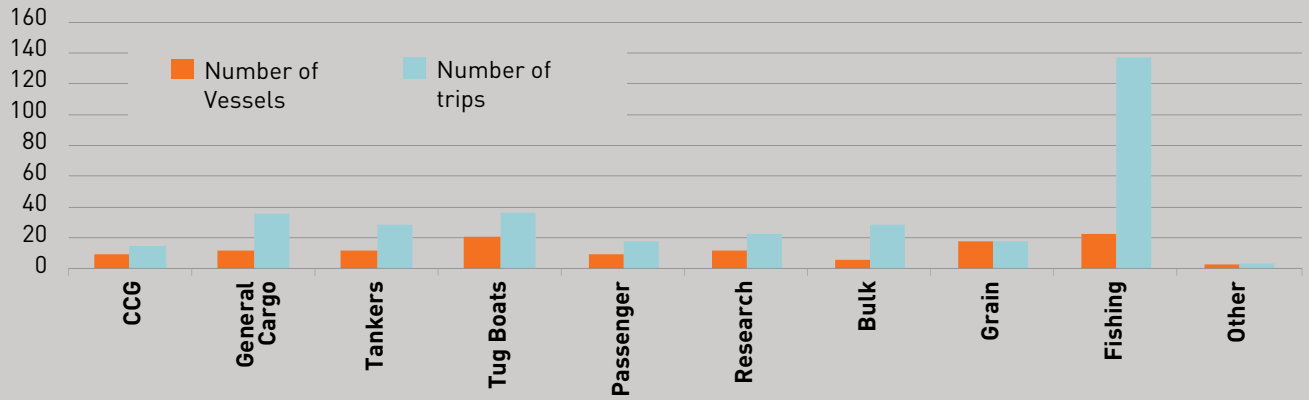
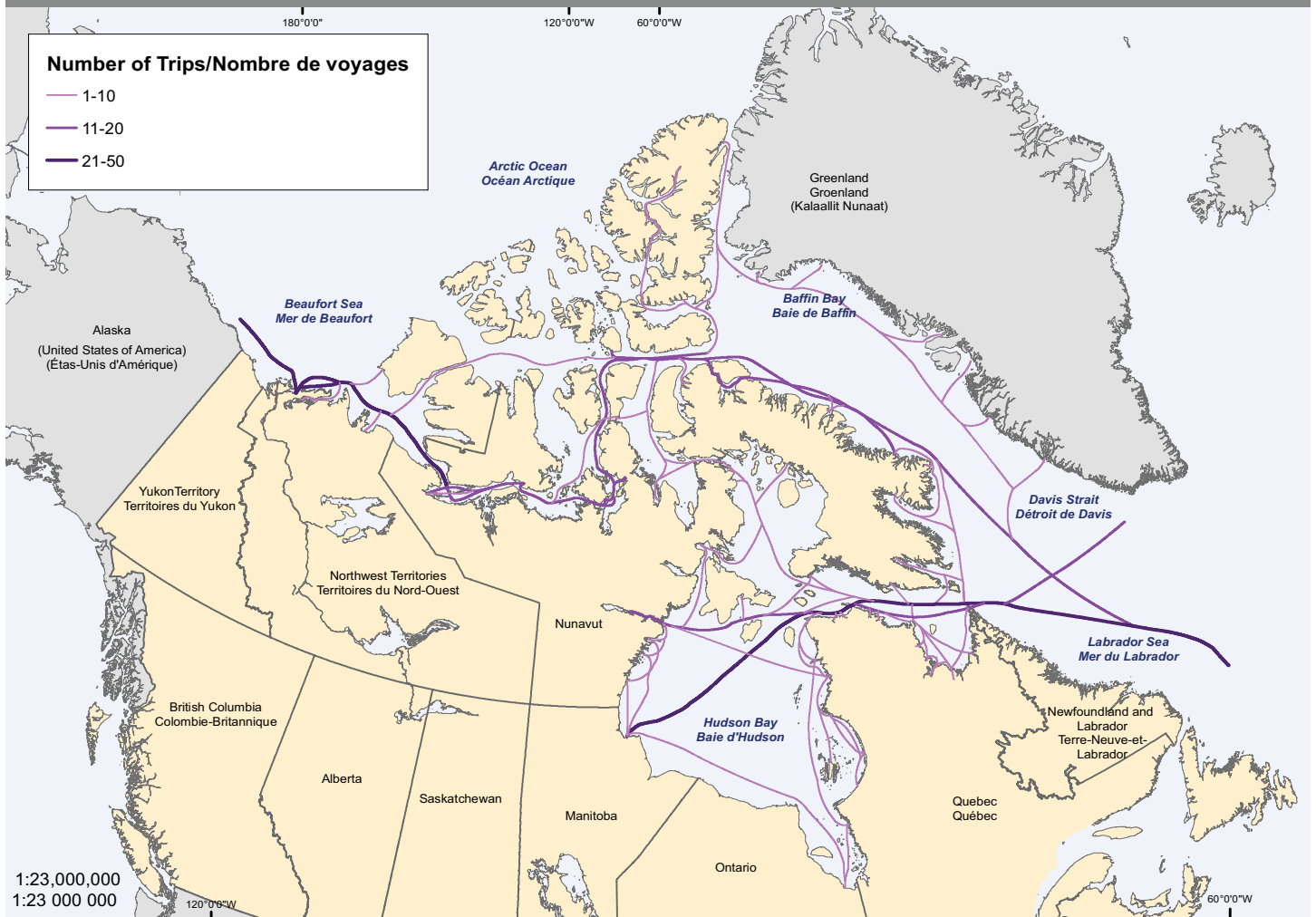


Figure 1.1 - Vessel Traffic in the Arctic (2013)



Source: Marine Communications and Traffic Services, Iqaluit

Figure 1.2 - Marine Traffic Pattern 2010



Source: Canadian Hydrographic Service

While there is much discussion of the opening of Arctic waterways, additional commercial shipping would be constrained by a number of factors, including: the presence and extent of sea ice, vessel capability, and the economics of using northern routes to ship goods. In recent decades, multi-year polar ice has been gradually receding in areas of the Arctic, such as in the waterways of Canada's Arctic Archipelago known as the 'Northwest Passage', raising the possibility of these areas becoming regularly navigable at some point in the future. When that might occur is a matter of debate; however, experts agree it is not imminent. There remain major variations in the presence of ice on a year-to-year basis. Furthermore, the ships that can operate safely in ice require stronger design characteristics and robust propulsion and steering equipment specifically designed for ice. Consequently they can carry less cargo, are less efficient, and are more costly to operate than open water vessels. These factors will likely make the Northwest Passage undesirable as a major shipping route in the near-term. However, if the economics of an Arctic development project or route offset the increased transportation costs, then ships can be built that provide for year-round navigability—essentially anywhere. Over time, as ice conditions continue to change, navigation in the Arctic will be possible for longer periods of time, removing one major constraint to commercial shipping in the Arctic.

### ***Ice and the Shipping Season***

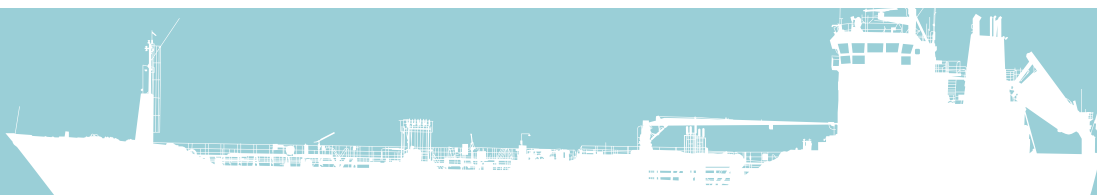
There is limited vessel activity year-round in the Arctic. Large fishing vessels are active in Baffin Bay through some winter months, and some mines ship their products year-round. Historically, the shipping season for resupply vessels has been limited to the period from early July until mid-October, due to operational considerations such as ice. In recent years, however, receding ice, improvements in vessel construction and technology, and growing community and industrial demand have resulted

in resupply vessels operating in the North a little longer each year, often starting in June and ending in November. Consequently, vessels operating late in the season may be operating in limited daylight conditions (see Figure 1.3).

### ***Marine Infrastructure***

The lack of marine infrastructure in the Arctic is also a major challenge. There are few port facilities in the North. The Port of Churchill located in northern Manitoba is the biggest with its four loading berths and the variety of marine services it provides. It is the only port in the region involved in international shipping. Apart from the Port of Churchill, there is a deep-sea port in Deception Bay, which is the only marine facility with a dock in the Nunavik area. There is some port infrastructure in place in Baker Lake, Robert's Bay and Nanisivik, in Nunavut. These were constructed to facilitate mining operations in their respective areas (the mine in Nanisivik closed in 2002). The Nanisivik port is now part of a redevelopment project led by the Department of National Defence, which will use it for naval refuelling. There are also two other harbours in the North, which can only be accessed by a limited number of vessels due to draught constraints. One is located in Tuktoyaktuk in the Northwest Territories and the other is in Cambridge Bay, Nunavut. The former is a transshipment point between cargo barged on the Mackenzie River and ocean-going vessels, while the latter is used by cruise ships and commercial barges. Both harbours provide some marine services and the communities are supported by airstrips.

There have been some projects to improve marine facilities in the North. For example, a joint federal-provincial project pursuant to the *James Bay and Northern Québec Agreement* was recently completed to improve infrastructure in northern Quebec. In the Nunavut hamlet of Pangnirtung, home to an inshore commercial fishery, the federal government funded the construction of a small craft harbour with a fixed wharf, breakwater, and a sealift ramp. In the



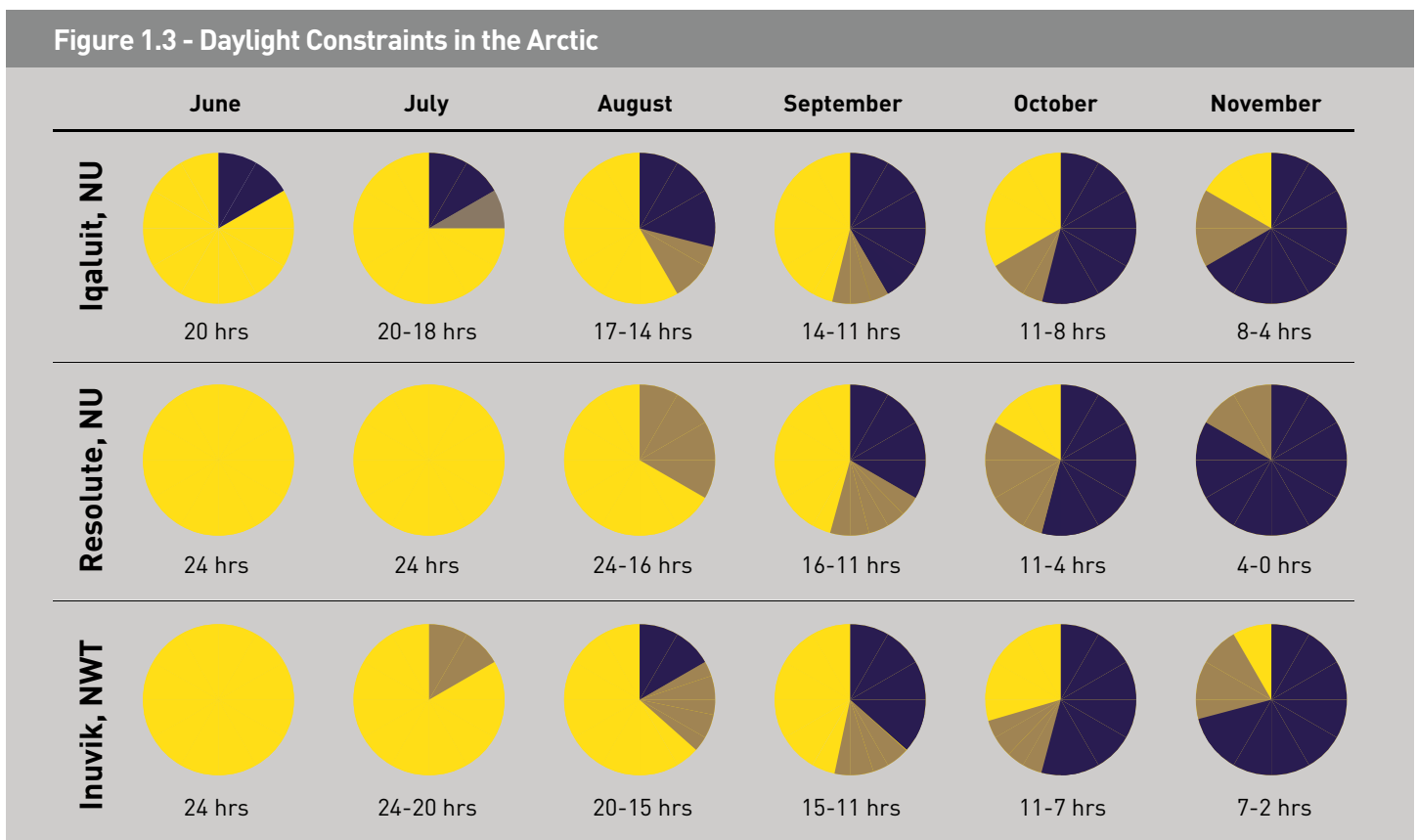
coming years, resource development projects could bring additional port infrastructure throughout the North; however, access to port facilities and basic infrastructure such as docks and wharves remains extremely limited.

This gap in marine infrastructure is mostly explained by the low level of activity in the region and environmental constraints such as ice, tidal conditions and the bathymetry of the region. The result is that the process for unloading break bulk cargo remains very similar to that used a century ago. Resupply vessels must anchor offshore, sometimes in difficult tidal or operating conditions and unload their cargo onto barges that are then towed to shore. Meanwhile, for fuel deliveries, tankers use long floating hoses to transfer products to shore tanks or oil handling facilities. Oil handling facilities in the Arctic are mostly small operations composed

of one manifold and a few tanks used to store fuel for the community or resource project. They are owned either privately or by territorial and provincial governments.

While the lack of infrastructure mainly affects vessels that have specified destinations along the Arctic coast, it can also be problematic for vessels navigating through the archipelago's internal waters. In the event of an incident, vessels would have to contend with the absence of ports and vessel repair services. This lack of readily accessible infrastructure across the Arctic makes responding to significant spills very difficult. Even if response equipment were to be prepositioned in various areas of the Arctic, gaining access to it and deploying it without full logistical support on site would prove extremely challenging, along with the difficulties and costs related to equipment maintenance and responder training.

Figure 1.3 - Daylight Constraints in the Arctic





## **Information Critical to Navigation and Communications Infrastructure**

Conditions in the Arctic not only impose constraints on marine operations in the region, but they also create a number of operational and logistical challenges for diverse activities. These difficulties must be understood and taken into account in order to ensure safe navigation in Arctic waters. They must also be considered when designing preparedness for response to spills in the North, as they will impact responders' ability to conduct a successful response operation.

Considering the hazards that vessels could encounter while navigating in the North, it is important for masters and crews to have access to the information necessary to identify safe maritime routes and conditions, including information regarding the presence of ice and weather conditions. Many existing nautical charts are outdated and a number of areas in the Canadian Arctic are currently uncharted. The lack of adequate nautical charts in the North is a significant issue. The Canadian

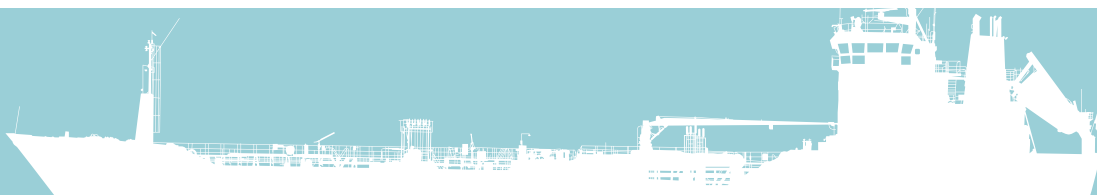
Hydrographic Service surveys and measures Canadian waterways and is working to improve the provision of charts for the area. However, a lot of work remains to be done.

Navigators rely on timely meteorological information and ice charts to select safe routes. With the gradual increase in open water as a result of polar ice melting, there are more frequent and more intense maritime storms. Navigators require accurate, long-term forecasts to plan safe voyages. Furthermore, meteorological information plays an important role in predicting ice movement and conditions.

Another element to consider when operating in the Arctic is the availability of communications technology. The information products, such as meteorological information and ice charts, that are needed for safe navigation must be transmitted by communications infrastructure that is much more limited than that available in southern areas. The Canadian Government also relies on systems to monitor traffic in the region and, in the event of an emergency, communications to alert



Transfer operation from a cargo ship to the beach, via a barge. Photo credit: NEAS Group



authorities and responders and to coordinate a timely and effective response. Currently, various communications systems are used, including medium, high and very high frequency radio communications, satellite communications, and digital technologies. Each has its limitations, which leads to some gaps in coverage within the region.

The lack of access to bandwidth that permits timely downloading of live information aboard vessels is one of the issues currently facing navigators in the North. As vessel traffic increases, more vessels will attempt to use these services at the same time and accessibility will be further reduced. Long-distance telecommunications are also limited in the North and, in the event of an emergency, phone lines and networks tend to get congested, which could limit communications between responders and support personnel outside the region. There is work to be done on the information and communications technology in the North—both to support safe navigation and its associated activities, as well as to facilitate continued cultural, social, and economic opportunities.

### **Population**

Another consideration for maritime activity in the North is the low population density. Communities in the Arctic are fairly small and are spread out along the Arctic coast. As a result, in the event of a pollution incident, the polluter will have limited initial support available locally to mount a response. In addition, response operations require trained personnel. While the Canadian Coast Guard has positioned response kits in a number of communities and provided some training to local residents to deploy the equipment, these resources remain limited. The shipping season also coincides with the season during which community members, including trained personnel, could be on the land and potentially away from the community at the time of an incident. As a result, if a significant spill were to occur in the Arctic, personnel and other resources

would need to be brought in from outside the region, either by air or by sea. The arrival of these responders in northern communities could also lead to logistical challenges in terms of accommodation, supplies and transportation. Potential polluters should factor these considerations into their spill response planning.

### **Arctic Ecosystems**

The distribution of wildlife and the characteristics of northern ecosystems are also considerations, both for navigation and for any potential ship-source spills. Marine biological productivity in the Canadian Arctic and the Arctic as a whole is characterized by highly concentrated and limited areas of high production (e.g., along continental shelves and polynyas). Thus, marine wildlife populations, such as polar bears, seals, whales, walrus, beluga, and seabird colonies, are often highly aggregated. This makes the impacts of an oil spill in the vicinity of these areas potentially much more damaging.<sup>8</sup>



<sup>8</sup> *Arctic Biodiversity Assessment 2013: Status and Trends in Arctic Biodiversity*, Conservation of Arctic Flora and Fauna, 2013.



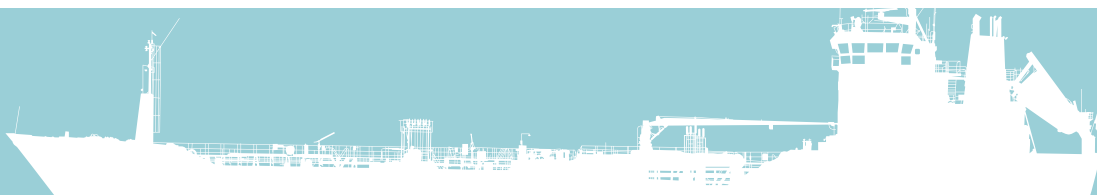
In addition, Arctic ecosystems are relatively simple, with limited functional redundancy. It is not clear how this property of Arctic ecosystems would be impacted by oil spills.

## The Legal Framework for Arctic Marine Transportation

### *International Legal Framework for the Arctic*

The Arctic is largely governed by the domestic laws of the eight Arctic states—Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States.

Drawing together three continents, the Arctic Ocean is governed by international law, particularly the law of the sea. All Arctic states, except for the United States, are parties to the 1982 United Nations Convention on the Law of the Sea (UNCLOS). The United States generally abides by UNCLOS which it considers reflective of customary international law. UNCLOS is a detailed regime that provides for the rights and obligations governing relations between states with respect to the oceans.



In May 2008, five Arctic Ocean coastal states—Canada, Denmark, Norway, Russia and the United States—stated that:

*“... an extensive international legal framework applies to the Arctic Ocean... Notably, the law of the sea provides for important rights and obligations concerning the delineation of the outer limits of the continental shelf, the protection of the marine environment, including ice-covered areas, freedom of navigation, marine scientific research, and other uses of the sea. We remain committed to this legal framework and to the orderly settlement of any possible overlapping claims.”*

The sovereignty of a coastal state over its internal waters is unfettered. Within the territorial sea, extending from the coast twelve miles into the sea, coastal states have extensive regulatory powers over a range of matters, including shipping, marine living resources and seabed resources, but restrictions apply in respect to navigation. In the exclusive economic zone, between twelve and 200 nautical miles, coastal states have fewer powers over shipping but retain sovereign rights over marine living resources and seabed resources. Of particular relevance is Article 234 of UNCLOS, which gives coastal states the right to adopt and enforce measures for the prevention, reduction and control of pollution from vessels in ice-covered areas out to the limits of the exclusive economic zone.

Also of importance is the global work on setting standards for the safety, security and environmental performance of international shipping. These standards are developed within the framework of the International Maritime Organization.

## **The Polar Code**

The International Maritime Organization is developing a mandatory international code of safety for ships operating in polar waters (Polar Code), which would apply to much of the commercial shipping in Arctic and Antarctic waters. The Polar Code negotiations are aimed at developing internationally agreed upon requirements, in order to ensure that consistent safety and environmental standards apply throughout the polar regions. These measures address factors such as ship design, construction, lifesaving and navigation equipment, as well as operational and training components. They take into account the realities of harsh environmental conditions, the limitations of search and rescue capacities, and the protection of the polar environment and ecosystems. Canada has been an active participant throughout the Polar Code negotiations and has been vocal in its support for rigorous protections.

### **The Polar Code and Our Recommendations**

As we conclude our review, efforts to develop and finalize the Polar Code continue. We support multilateral efforts to govern the operation of vessels in the Arctic and Antarctic and hope that Canada will adopt the measures set out in the Code, once finalized particularly where they further enhance the safety of navigation in these regions.

However, where the provisions of the final Polar Code may be less robust than Canada’s domestic legislation, we encourage the Government of Canada to continue to take the steps necessary to protect Canada’s cultural, social and natural heritage in the North.

## The Arctic Council

The Arctic Council is an intergovernmental forum established in 1996 to promote cooperation, coordination and interaction among Arctic states and Arctic peoples on issues of common interest—particularly issues of sustainable development and environmental protection. Forum participants include eight Arctic member states (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States) and six international Indigenous associations and councils.

Most of the work of the Arctic Council is done through its working groups and task forces, many of which have projects related to marine pollution prevention, preparedness or response currently underway. In May 2013, the Arctic Council member states signed an *Agreement on Cooperation on Marine Oil Pollution, Preparedness and Response in the Arctic* (still pending ratification at the time of writing this report), the second formal agreement<sup>9</sup> in the Council's history. The purpose of the Agreement is to strengthen cooperation, coordination and mutual assistance for oil pollution preparedness and response in the Arctic. States do not commit specific resources under the Agreement, but they do agree to maintain their own national systems, to notify each other of incidents, to request assistance if they need it, and to respond with assistance as they can.

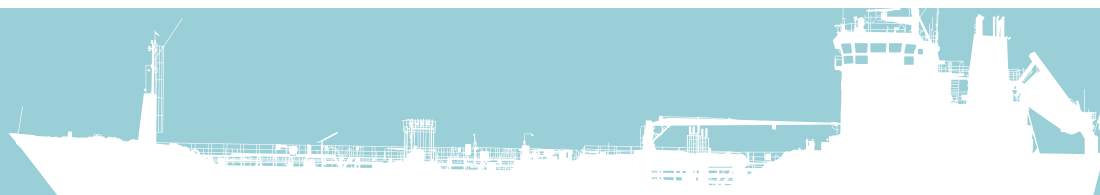
<sup>9</sup> The first Arctic Council agreement was *The Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic*, which coordinates international search and rescue coverage and response in the Arctic and establishes areas of search and rescue responsibility for each state party.

## Canada at the Arctic Council

Canada is currently Chair of the Arctic Council (2013-2015) and plays a leadership role in many of the Council's working groups and task forces. Canada is the Chair of the Arctic Monitoring and Assessment Programme Working Group, which seeks to improve pollution prevention measures and policy in order to protect the Arctic marine environment. Canada also co-chaired the project on 'Recommended Best Practices in the Prevention of Oil Spills in the Marine Environment' under the Emergency Prevention, Preparedness, and Response Working Group.

## Canadian Legislation and Regulations

Transport Canada is the lead regulatory department for ship-source spill prevention, preparedness and response in Canada. The *Arctic Waters Pollution Prevention Act* provides the foundation for pollution prevention in the Canadian Arctic and prohibits any discharge of waste, including oil, in Arctic waters except under specific circumstances outlined in subsequent regulations. The *Arctic Shipping Pollution Prevention Regulations* set out operational limits for vessels operating in various ice conditions, taking into account the extent of their ice-strengthening (if any) in accordance with recognized standards. The regulations also establish requirements for Ice Navigators and their qualifications. The *Arctic Waters Pollution Prevention Regulations* establish the basis for an operator's liability and its limits in the event of a waste release. *The Charts and Nautical Publications Regulations, 1995*, the *Navigation Safety Regulations, 1999*, the *Shipping Safety Control Zones Order*, and the *Steering Appliances and Equipment Regulations* are among the other regulations established under the *Arctic Waters Pollution Prevention Act* that support safe navigation.



A notable element of the *Arctic Waters Pollution Prevention Act* is the establishment of Shipping Safety Control Zones that set out geographic areas, each with date ranges in which particular vessels that do not meet minimum ice strengthening requirements may not navigate. A vessel may also be prohibited from entering a particular zone between certain dates if it does not have a qualified Ice Navigator on board, or is unable to obtain icebreaker assistance where it is required. These important requirements are discussed in more detail later in this chapter.

The *Canada Shipping Act, 2001* also applies to Arctic waters as do most of the 52 regulations established under the Act. For example, the *Response Organizations and Oil Handling Facilities Regulations* require oil handling facilities to have an oil pollution emergency plan that outlines specifically the procedures to follow in the event of a release, the equipment that is available for immediate use, as well as training and exercise programs that must be followed to ensure the plan's viability. These regulations are supported by the *Oil Handling Facilities Standards*, while the *Marine Personnel Regulations* lay out the specific requirements for individuals who supervise oil transfer operations north of 60. For vessels operating in Arctic waters, the *Marine Machinery Regulations*, also under the *Canada Shipping Act, 2001*, outline certain technical requirements that would enable foreign vessels to safely navigate in Canada's Arctic. In addition, the *Navigation Safety Regulations* (under the *Canada Shipping Act, 2001* and the *Arctic Waters Pollution Prevention Act*) set out the basic navigation safety requirements for all vessels navigating in Canadian waters.

### Heavy Fuel Oil Restrictions

The use of heavy fuel oils by vessels operating in cold waters has been called into question in recent years. Unlike lighter fuels, which can more easily disperse or dissipate through evaporation even in cold waters, heavy fuel oils persist and may pose a higher risk to surrounding wildlife and ecosystems. As a result, the International Maritime Organization has banned both carriage and use of heavy fuel oils on vessels transiting through the Antarctic. Additionally, Norway has taken similar action by banning the use of these fuel oils in certain waters around Svalbard.

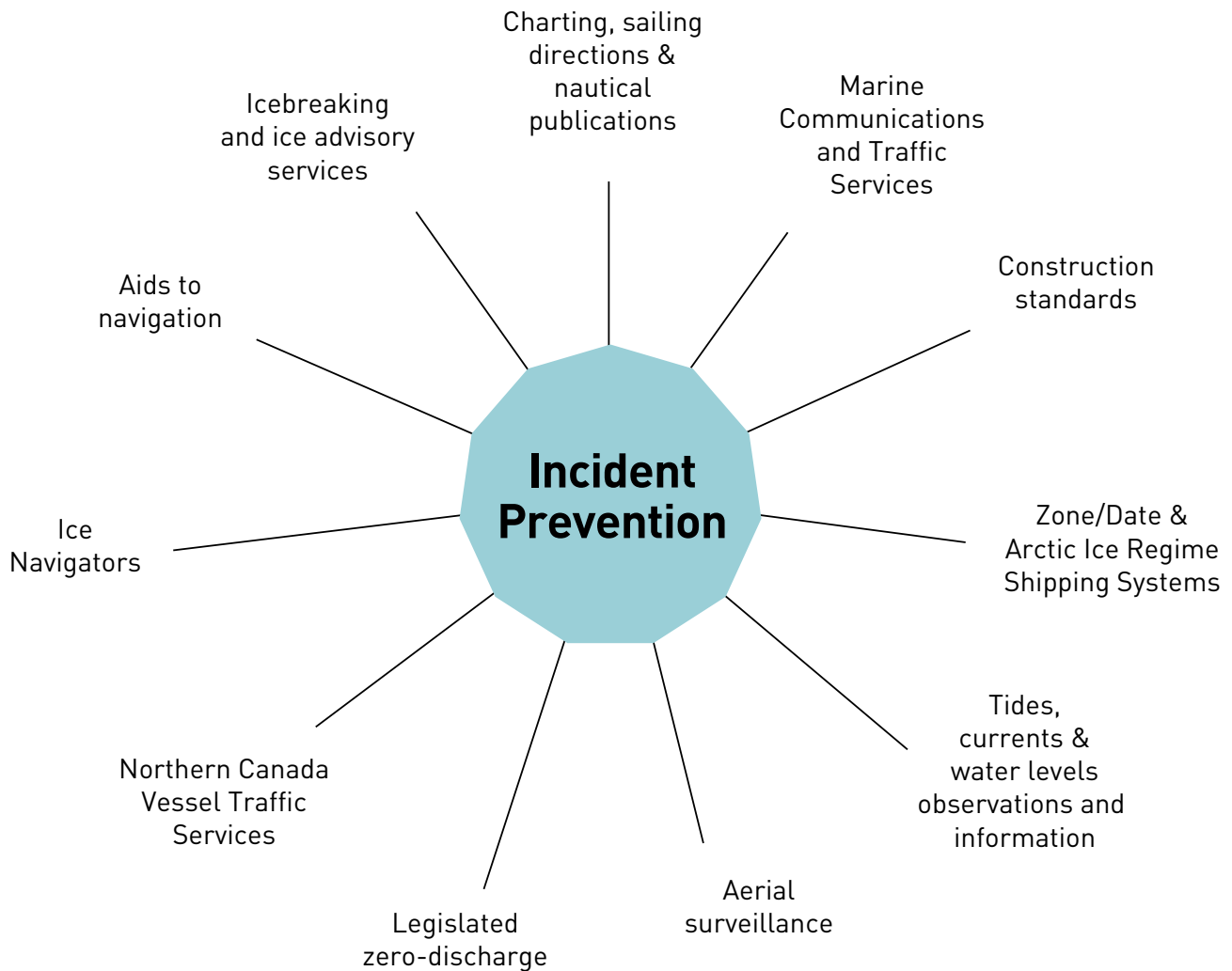
There could be a reduction in the impacts on the environment from future oil spills, should Canada similarly pursue a reduction or ban on the use and/or carriage of heavy fuel oils in the Arctic. However, we feel that this action is best undertaken multilaterally and in collaboration with other Arctic nations. Canada should collaborate with the Arctic Council and International Maritime Organization partners to explore the options around restricting or further reducing the risks of spills from the use and/or carriage of heavy fuel oils in the Arctic.



In the event of a pollution incident in the Arctic, as in the South, the Canadian Coast Guard, through the Minister of Fisheries and Oceans, has authorities under both the *Canada Shipping Act, 2001* and the *Oceans Act*. Under the former, where the Minister believes that a vessel or oil handling facility has discharged, is discharging or is likely to discharge a pollutant, he or she may take necessary measures to repair, remedy, minimize or prevent pollution damage from the vessel or oil handling facility, monitor the measures, and direct any person or vessel to take necessary measures, or to refrain from doing so. The *Oceans Act* outlines the authority of the Minister of Fisheries and Oceans related to services of the Canadian Coast Guard, including: services for

the safe, economical and efficient movement of ships in Canadian waters, the marine component of the federal search and rescue program, marine pollution response, and the support of departments, boards and agencies of the Government of Canada through the provision of ships, aircraft and other marine services.

Marine traffic through Canada's North must abide by ship reporting procedures. The *Northern Canada Vessel Traffic Services Zone Regulations* (NORDREG) set out various requirements in this regard and the geographic zones to which they apply. Established under the *Canada Shipping Act, 2001*, these regulations apply to vessels of 300 GT or more, those that are engaged in towing or





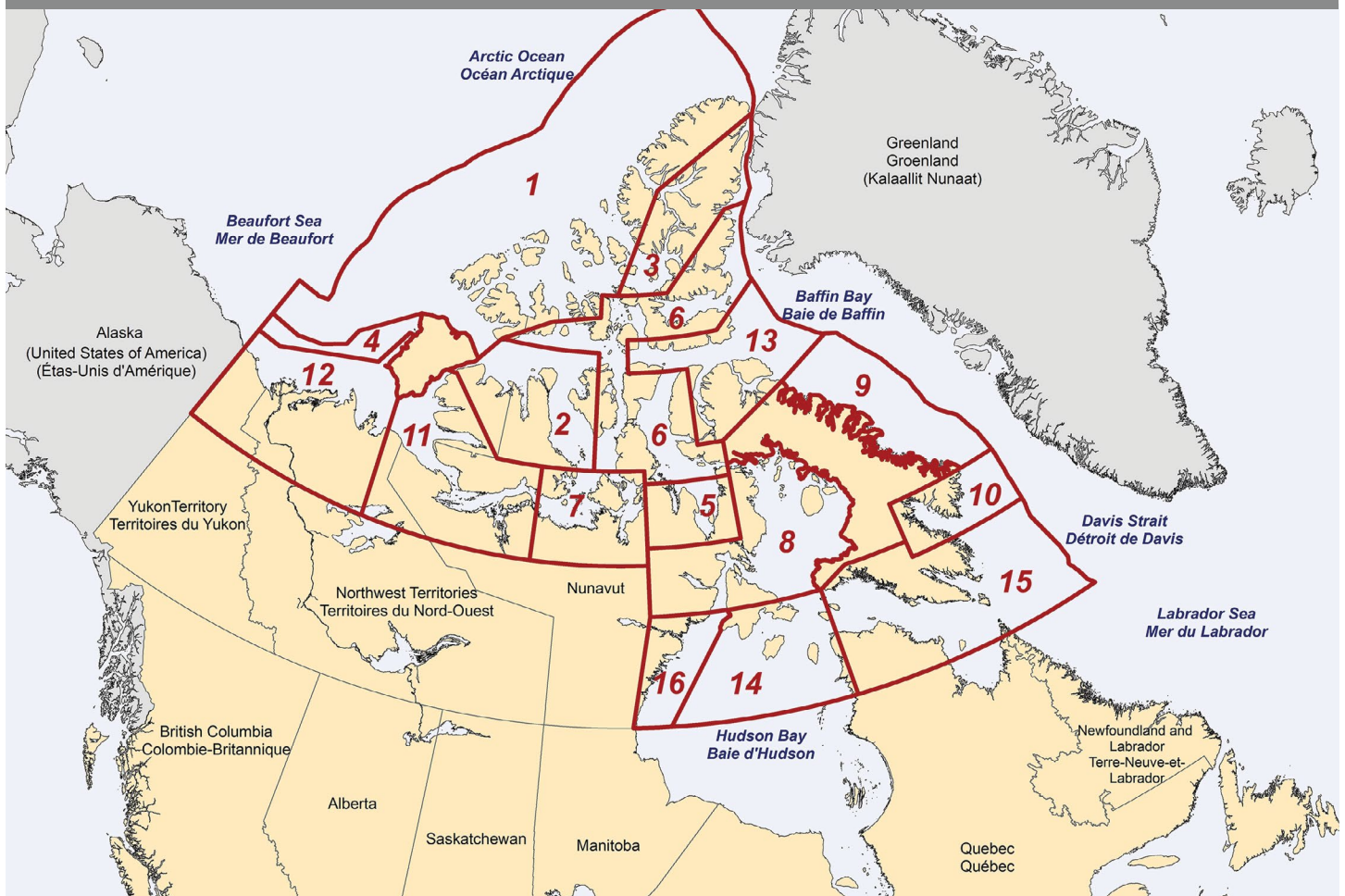
pushing another vessel (if the combined gross tonnage of the vessel and the vessel being towed or pushed is 500 GT or more), and those that are carrying pollutants or dangerous goods as cargo (or are engaged in towing or pushing such a vessel). The NORDREG zone encompasses all of Canada's Arctic waters, the Shipping Safety Control Zones (see Figure 1.4), as well as the waters of Ungava Bay, Hudson Bay, Kugmallit Bay and other smaller bodies of water not covered by the Shipping Safety Control Zones.

NORDREG requires the master of these vessels to submit four reports to the Canadian Coast Guard's Marine Communications and Traffic Services Centres unit:

- A sailing plan, before entering the NORDREG zone;
- Position reports, at regular points during the voyage;
- A deviation report, if a vessel digresses from the original Sailing Plan; and
- A final report, upon departure from the zone.

Adherence to NORDREG requirements within these zones also allows vessels access to several crucial Canadian Coast Guard services such as ice information, icebreaker assistance, and search and rescue, which are discussed in more detail later in this section.

Figure 1.4 - Shipping Safety Control Zones



In addition to the legislative framework, Transport Canada has developed various guidelines that pertain to specific activities often undertaken in Canada's North. With regard to passenger vessels, such as cruise ships, Transport Canada advises operators not only to be familiar with the content of the relevant regulations, but also to follow its *Guidelines for the Operation of Passenger Vessels in Canadian Arctic Waters*, which provide further information on such issues as pollution prevention, national security, search and rescue, and Arctic marine survival. Another important set of guidelines is the *Arctic Waters Oil Transfer Guidelines*, which outline the best practices associated with, and provide operational checklists for certified supervisors of oil transfer activities. Transport Canada also worked with the Arctic Council to develop circumpolar guidelines which have been published as the *Arctic Council Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters*.

### **Ice Navigation Systems in Canada**

Two ice-based systems are used in Canadian Arctic waters for control of navigation, each with its advantages and disadvantages. Under the *Arctic Shipping Pollution Prevention Regulations*, prescribed ships navigating in a Shipping Safety Control Zone must use one system or the other. While these systems share a common purpose—to minimize the likelihood that a ship will enter waters where ice conditions are beyond the designed safe operating parameters for the ship—they utilize different approaches to achieve that objective.

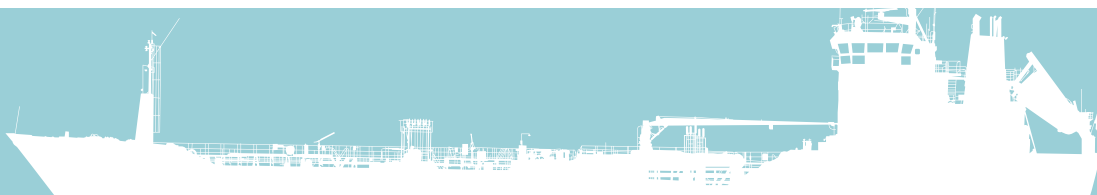
Established in 1972, the Zone/Date System separates Canada's Arctic waters into 16 Shipping Safety Control Zones based on historical ice conditions. This is a rigid system that follows a regular pattern on an annual basis. Each zone is prescribed a specific time period within which it is deemed safe (or 'open') for vessels of a certain category to navigate in those waters (vessels are assigned Types and Classes based on their ice

strengthening). Because the zones and dates do not change from year to year, operators are able to use the Zone/Date System to plan voyages well ahead of time with a degree of certainty that ice conditions will permit safe operations during the periods in which zones are 'open'.

However, historical ice data may not always reflect the reality of ice conditions in a given year. For example, the actual ice conditions within an 'open' zone may be onerous and unsafe in a heavy ice year. Conversely, following a warm winter, although light ice or even no ice may be present during the 'closed' dates, a vessel is required to wait until the 'open' calendar date arrives before entering the zone.

This lack of flexibility is addressed by the Arctic Ice Regime Shipping System, which was established in 1996 as a means to provide a greater understanding of the safe operating conditions and to add some flexibility for vessels wishing to operate outside of the prescribed dates. This system must be used when a vessel wants to operate outside the dates prescribed by the Zone/Date System. The Arctic Ice Regime Shipping System process consists of calculating an Ice Numeral using a simple formula that takes into account factors such as the concentrations of the various types of ice and the vessel's determined ice strength. This calculation is performed by an experienced Ice Navigator on board the ship, who:

- Characterizes the ice regime of the region depending on the concentration, age, and strength of ice, among other conditions.
- Obtains the vessel's Ice Multipliers, which vary with its level of ice strengthening and represent the relative risk of damage the vessel may sustain by traveling through the particular ice regime.
- Combines the two factors above through a simple calculation to generate an Ice



Numeral, which allows the master to assess the level of risk along the route and indicates whether or not to proceed through the ice regime, or to find an alternate route. Vessels are not allowed to enter an ice regime with a negative Ice Numeral.

In order to maximize the effectiveness of the Arctic Ice Regime Shipping System, information crucial to a voyage—such as timely ice charts and meteorological information—must be accurate and readily available. Because it is based on actual ice conditions, this system is not as effective for long-term voyage planning as the Zone/Date System. For shorter term, more tactical planning, however, the Arctic Ice Regime Shipping System can be more effective, as it determines whether the vessels may operate safely based on actual, observed ice levels.

### Government Services in Support of Arctic Marine Transportation

As it does south of 60, the Government of Canada offers a number of services to vessels operating in the Arctic. The Canadian Coast Guard provides vessel traffic services in the North during the shipping season. Based in the Marine Communications and Traffic Services Centre located in Iqaluit, Nunavut, marine

communications officers grant clearance to vessels entering Canadian Arctic waters under NORDREG and monitor their journeys through the mandatory reporting of their positions at call-in-points. As they communicate their positions, vessels are also provided information and advice with regard to ice, weather and marine traffic. Ice information is provided to the Marine Communications and Traffic Services Centre by the Ice Operations Centre in Montreal.

Ship surveillance is also performed using two Automatic Identification System sites in the Arctic (Iqaluit and Resolute Bay), which are operated by the Canadian Coast Guard. Accurate position information is then obtained from ships navigating in those areas. In addition, still as part of NORDREG, the Canadian Coast Guard obtains ships' information from the Long Range Identification and Tracking system. Other means of monitoring ships include space-based Automatic Identification System components, provided by private companies, which use satellite-based receivers and transceivers on virtually all Class-A surface vessels operating in the Arctic. Finally, satellite images can be used to detect ships in the Arctic. This is done through the use of Radarsat-2, which is a Canadian radar imaging satellite that provides approximately one daily over-flight of Arctic shipping areas.

The Canadian Coast Guard operates an Ice Operations Centre from Montreal during the summer, and can provide masters and shipowners with up-to-date ice information, as well as coordinating icebreaker assistance for vessels when necessary. The Ice Operations Centre collaborates with other federal programs, such as Environment Canada's Canadian Ice Service, which uses satellite imagery for ice forecasting and modelling, and disseminates daily ice information and ice charts for areas of known marine activity to units such as the Ice Operations Centre.



Marine Communications and Traffic Services Centre located in Iqaluit, Nunavut.





A National Aerial Surveillance Program aircraft conducting surveillance activities in the North.

The Canadian Ice Service also has an agreement with Transport Canada for collaborative aerial ice, pollution and maritime security patrols. The National Aerial Surveillance Program's Dash 7 aircraft is dispatched to the Arctic during the shipping season to conduct surveillance and reconnaissance flights, which are a primary means of monitoring shipping activities and detecting illegal discharges. The aircraft can also be tasked by other departments for their own purposes, further to established memoranda of understanding. For example, the Dash 7 can assist in search and rescue operations.

Government organizations collaborate on a variety of projects in the Arctic. For example, the Canadian Hydrographic Service positions staff on Canadian Coast Guard icebreakers to conduct some of its operations. The Canadian Coast Guard's icebreaking responsibility extends over the entire Canadian Arctic, as well as certain bodies of water south of 60 (such as Hudson Bay and James Bay). The icebreaking service can be comprised of everything from escort through ice-covered waters to the provision of ice formation and routing information to ensure the safe passage of ships.

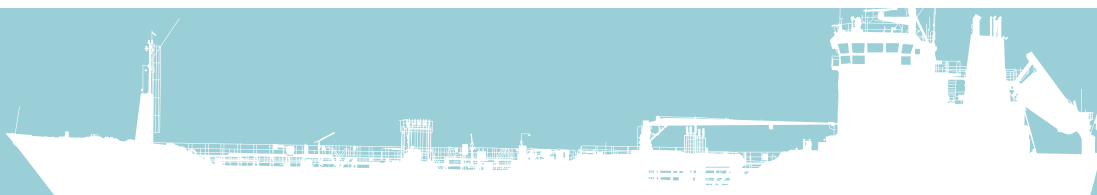
In addition to vessel traffic services, the Canadian Coast Guard provides and maintains approximately 340<sup>10</sup> seasonal aids to navigation in the North. Aids to navigation are provided to assist mariners in determining position and course, to warn of dangers or obstructions, and to advise of the location of the best or preferred route. They include fixed aids (e.g., lights, beacons, and ranges), radar aids (e.g., racons), and floating aids (e.g., buoys) that work in tandem with available nautical charts and on-board navigation equipment.

In the event of emergencies, the Government provides services such as search and rescue. While the Minister of the Department of National Defence holds overall responsibility for the federal search and rescue system, the Canadian Coast Guard monitors marine search and rescue areas for distress signals, coordinates the response to marine distress incidents, and provides response vessels and maritime personnel in support of search and rescue. The program offers assistance when it comes to saving and protecting lives at sea, including commercial shipping traffic, tour boat operations, fishing and heavy pleasure craft usage and over-water aircraft traffic.

### The Liability and Compensation Regime

The multi-tiered, international and domestic framework for liability and compensation for ship-source oil spills (set out in the *Marine Liability Act* and described in our first report) applies to incidents that occur in the Arctic as it does to incidents south of 60. This includes the strict liability of the shipowner and the cargo owner's financial contribution through the International Oil Pollution Compensation Funds for ship-source spills of persistent oil and Canada's Ship-source Oil Pollution Fund for all ship-source oil spills.

<sup>10</sup> This figure does not include aids to navigation on the Mackenzie River and Great Slave Lake.



In line with our recommendations on liability and compensation in our first report, the Government of Canada announced in May 2014 that it was introducing measures to strengthen the polluter pay regime by introducing legislative and regulatory amendments that would enhance Canada's domestic Ship-Source Oil Pollution Fund, including removing the Fund's existing per-incident liability limit of currently \$161 million in order to make the full amount of the Ship-source Oil Pollution Fund available for a single incident—currently around \$400 million. This amendment would also be applicable to oil spill incidents that occur in the Arctic.

We note that under the *Arctic Waters Pollution Prevention Act*, cargo owners are also liable for all costs and expenses related to repairing or remedying any condition that results from a deposit of waste in Arctic waters (as defined in the Act), or to reduce or mitigate any damage to or destruction of life or property that results or may reasonably be expected to result from such a deposit of waste. Under the Act, shipowners do not benefit from the same defences as they do under the *Marine Liability Act*. In addition, the costs linked to the prevention of damage are not specifically mentioned in the *Arctic Waters Pollution Prevention Act* whereas they are under the *Marine Liability Act*. In the event of an inconsistency between the provisions of the *Marine Liability Act* and the provisions of the *Arctic Waters Pollution Prevention Act* or any regulations made under them, the conflict is resolved in favor of the *Marine Liability Act*.

We conclude that these arrangements are satisfactory.

## Prevention

In our first report, we noted that prevention measures are the best protection against ship-source oil spills in Canada and we outlined the wide range of prevention measures that currently exist south of 60. In that report, we did not make any recommendations for enhancing prevention,

as we felt that Canada and the international community had already made great strides in this area. In the context of the Arctic, however, we took a closer look at the prevention measures in place to determine if they were sufficient, particularly given the unique operating environment for vessels operating north of 60. Many of the prevention measures that apply south of 60 also apply north of 60. Canada also has a wide range of additional Arctic-specific prevention measures in place that make it a world leader in some areas (e.g., Ice Navigators). At the same time, however, given the multitude of challenges that exist for operating in the Arctic (many of which we outline earlier in this chapter) and the real possibility of increased vessel traffic in the coming decades, there is a need for an enhanced focus on prevention. Targeted investments in prevention will protect Canada's Arctic and its inhabitants and save government and industry from incurring many times more in clean-up costs.

### A Modernized Navigation System for the Arctic

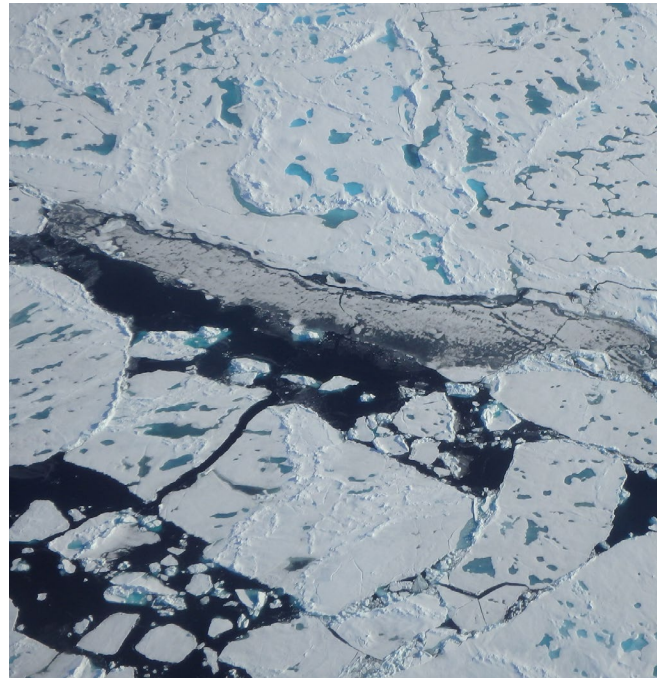
Creating a safe environment for mariners to navigate in the Canadian Arctic is a challenging task. Limited electronic communications, gaps in terrestrial radar and Automatic Identification System coverage, the remote operating environment and the presence and extent of multi-year ice all create unique challenges for mariners and the people charged with their safety. During our engagement with stakeholders, many people raised concerns over the need to upgrade and modernize navigation programs in the Arctic.

Over the past several decades, the Canadian Coast Guard has worked with the existing navigation system to support the safe movement of goods and people throughout the Arctic. However, it is necessary for the Government of Canada to update and modernize its current navigation programs to incorporate new technologies and ideas. The best option to mitigate the risks of spills is to focus on and invest in prevention.

The Canadian Coast Guard provides a number of aids to navigation throughout the Canadian Arctic to coincide with the shipping season. Floating aids are placed by icebreakers in Ungava Bay, Hudson Strait, and Frobisher Bay around the last week in June and in the western Arctic by the third week in July. These floating aids are then picked up and the fixed aids deactivated as the icebreakers leave the Arctic, generally by the last week in October. This approach has worked until recently, but it is costly, and simply expanding the current aids to navigation system to meet future needs would likely cost millions of dollars. New technologies, such as virtual aids to navigation, or traditional approaches, such as the use of fixed aids to navigation (structures affixed to the land), should be explored as options to improve the system in a cost-effective manner.

The use of new technologies is equally important for vessel monitoring in the Arctic. As described above, NORDREG establishes the Northern Canada Vessel Traffic Services Zone and a mandatory vessel reporting requirement for certain vessels entering, while operating within and upon exiting Canada's northern waters. Vessel reporting allows the Canadian Coast Guard to actively monitor the movements of vessels in order to identify which vessels could be moving into difficult ice regimes, bad weather or other hazards. However, there is always the possibility that a vessel will not report, either by mistake or intentionally, or because it is not obliged to do so. It is therefore important for the Government of Canada to have a navigational system that complements the reporting that occurs under NORDREG. In many parts of the world this is done through the use of radar and terrestrial Automatic Identification System stations. Unfortunately, these systems are only available in some sections of the Arctic, and thus alternative solutions must be found and implemented.

#### FIRST-YEAR ICE VS. MULTI-YEAR ICE

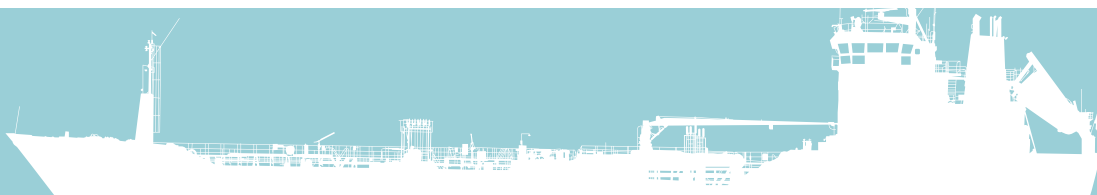


**First-year Ice:** ice that is thicker than new, recently frozen sea water, and that has no more than one year of growth.

**Multi-year Ice:** harder and generally thicker sea ice, which has survived more than one melting season (i.e., summer).



Photo credit: © D. Lambert, Environment Canada



On May 13, 2014, the Government of Canada announced an initiative to improve navigation in Canadian waters by moving towards a navigation system that will share real-time electronic marine safety information with mariners. We support this initiative, but note that the elements outlined in the announcement applied only to Canada's southern waters. We therefore recommend that the Government of Canada work to similarly implement appropriate improvements to its navigation programs in Canada's Arctic waters.

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### RECOMMENDATION 1-1:

**The Government of Canada should expand the Modernizing Canada's Navigation System initiative to include Canada's Arctic waters, devising strategies that are appropriate for the Arctic.**

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#### Nautical Charts

Nautical charts and navigational products are essential for safely navigating Canada's waterways. They are a key tool that mariners use to move safely from place to place. In Canadian waters, all vessels must carry and use nautical charts and related publications pursuant to the *Charts and Nautical Publications Regulations* made under both the *Canada Shipping Act, 2001* and the *Arctic Waters Pollution Prevention Act*. The Canadian Hydrographic Service is responsible for maintaining, updating and creating new nautical charts and navigational products.

Unfortunately, in the Arctic, these charts and navigational products are for the most part deficient. Only a small percentage of the Canadian Arctic has been charted to an acceptable standard with some of the Arctic nautical charts currently used by mariners relying on information from the late 1800s and early 1900s. We heard unanimous agreement from stakeholders that these nautical charts need to be improved.

Canada's North represents a truly enormous challenge when it comes to creating and maintaining nautical charts, as its waters represent a greater area than all of Canada's southern waters, including the Great Lakes, combined. In addition, the remoteness of the Arctic and the short shipping season severely restrict how much work the Canadian Hydrographic Service can accomplish each year.

While the Canadian Hydrographic Service has traditionally focused its efforts in southern Canada due to the significantly higher volumes of traffic there, over the last decade it has gradually begun to increase its focus on the Arctic. In order to meet the needs of future vessel traffic in the Arctic, we conclude that this work must be accelerated now. The Canadian Hydrographic Service does not currently have the capacity to increase its efforts in the Arctic without impacting the levels of service it provides to southern Canada.

The Government of Canada should make it a priority to equip government vessels operating in the Arctic (such as Canadian Coast Guard icebreakers) with modern hydrographic equipment and to bring government hydrographers with them during voyages in the North. In addition, there exist many opportunities for government and industry to collaborate and share hydrographic knowledge, especially in relation to the work that is being done to plan shipping routes for major resource development projects in the Arctic.

There is broad support that the Canadian Hydrographic Service first focus its efforts on the areas identified through the Northern Marine Transportation Corridors initiative, as this will ensure immediate benefits to the areas most navigated in the Arctic.

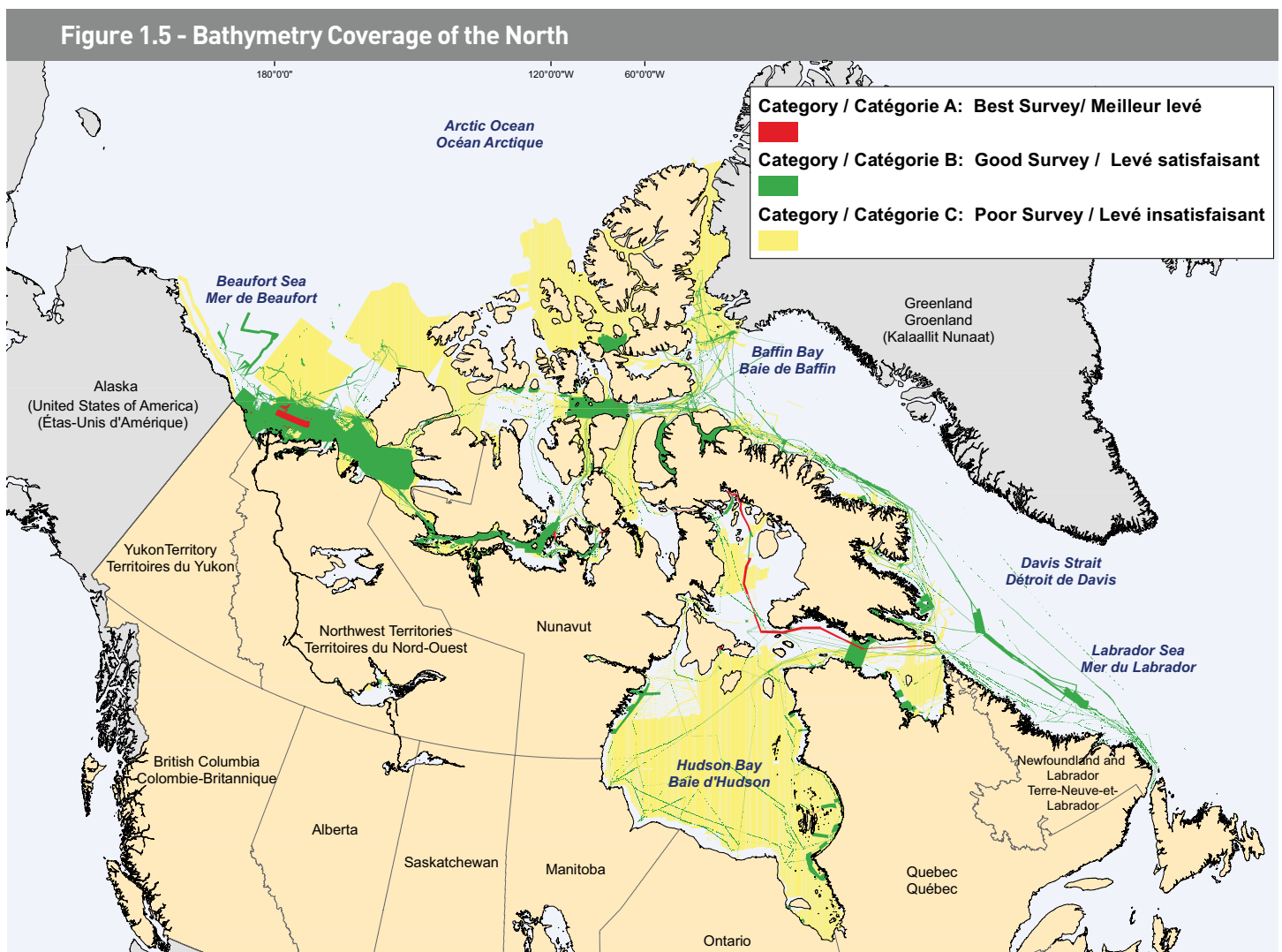


## RECOMMENDATION 1-2:

The Canadian Coast Guard and other federal organizations should prioritize placing Canadian Hydrographic Service hydrographers and their equipment aboard their vessels operating in the Arctic in order to accelerate the collection of bathymetric data in Canada's Arctic waters. With this data, the Canadian Hydrographic Service should improve the availability of modern nautical charts of Canada's Arctic waters to navigators.

## Sailing Directions

Sailing directions are used in conjunction with nautical charts and provide information that cannot be shown on a chart. They are a good tool in planning for safe access and navigation in Canadian waters. For example, they can offer detailed descriptions of the best approaches to harbours, harbour facilities, anchorages, local history, and regulations. The Canadian Hydrographic Service issues sailing directions, including for Canada's Arctic waters. However, we heard from stakeholders that sailing directions for northern Canada have not been updated in a long time, especially for the eastern Arctic.



Source: Canadian Hydrographic Service

Updated sailing directions will continue to enhance the safety of navigation, thereby supporting the avoidance of ship-source spills. However, we also understand that the improvements proposed earlier in this report to the provision of modern nautical charts and the Government's navigation programs will affect the process of updating northern Canada's sailing directions. Thus we encourage the Government to revise sailing directions as work progresses in these areas. In addition, the availability of new nautical charts would naturally trigger maintenance of the Canadian Hydrographic Service's other products and data sources such as tide, current and water level predictions and Notices to Mariners. The Canadian Hydrographic Service should revise and update the full complement of products and services that enhance navigational safety in the Arctic.

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### **RECOMMENDATION 1-3:**

**In order to further improve the safety and efficiency of marine transportation in the Arctic, as work progresses on the provision of modern nautical charts and aids to navigation in the Arctic, the Canadian Hydrographic Service should revise the sailing directions and other complementary nautical publications, services and data for the Arctic.**

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## **Ice Navigation Systems**

As described earlier, Canada uses two systems to control navigation in ice-covered waters. There are advantages and disadvantages to each system, and it is our view that there is a place for both the Zone/Date System and the Arctic Ice Regime Shipping System in Canada's Arctic.

However, these systems have been in place for decades, and there is an opportunity to review them and update them to modern standards. As mentioned earlier, the rigid Zone/Date System does not take into account inter-annual ice variations or long-term change trends in sea ice coverage. The system is currently under review and may soon get its first significant update in close to 40 years. A more regular schedule of reviews and updates may improve the accuracy of the ice zones and the date ranges.

The 'open' and 'closed' zones under the Zone/Date System are described in Schedule VIII of the *Arctic Shipping Pollution Prevention Regulations*. The regulations and the schedule should be updated to include up-to-date ship categories reflecting the International Association of Classification Societies Unified Requirements for Polar Class Ships.

Similarly, elements of the Arctic Ice Regime Shipping System are 20 years old and potentially out of date. The system should be reviewed to ensure that the best balance of parameters is factored into the Ice Numeral calculation. As well, the latest International Association of Classification Societies data on vessel capability in ice, including information on hull loading as a result of vessel speed should be incorporated.

Vessel masters choosing to navigate under the Zone/Date navigation control system may encounter ice beyond the safe design capability of their ship. Application of the Arctic Ice Regime Shipping System should be made mandatory at all times when a vessel is navigating in the vicinity of ice. This will ensure that bridge crews use appropriate caution whenever ice is present.

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#### RECOMMENDATION 1-4:

**Transport Canada should complete a review of the 16 Shipping Safety Control Zones under the Zone/Date System, based on modern satellite ice imagery, and ensure that the ice zones are reviewed and updated on a regular basis in order to reflect global climate change impacts on sea ice.**

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#### RECOMMENDATION 1-5:

**Transport Canada should amend Schedule VIII of the *Arctic Shipping Pollution Prevention Regulations* to incorporate up-to-date ship categories reflecting the International Association of Classification Societies Unified Requirements for Polar Class Ships.**

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#### RECOMMENDATION 1-6:

**Transport Canada should review the Arctic Ice Regime Shipping System to incorporate all parameters including the requirements of the International Association of Classification Societies' scientific work on hull strength and safe hull ice loads for polar classes of vessels for the calculation of Ice Numerals.**

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### Ice Navigators

Canada introduced the concept of Ice Navigator into its Arctic marine prevention regime in the 1970s and further elaborated upon it in the mid-1990s. This Canadian concept is now recognized worldwide as a best practice in Arctic navigation.

The Ice Navigator essentially acts as an advisor to a ship's master on the ice regimes through which a vessel may be navigating. The Ice Navigator is not required to be a permanent member of the crew, and may be someone who is hired to come on board temporarily while a ship is navigating through Arctic waters. Vessels that operate

frequently in Arctic waters usually have one or more persons qualified as Ice Navigators.

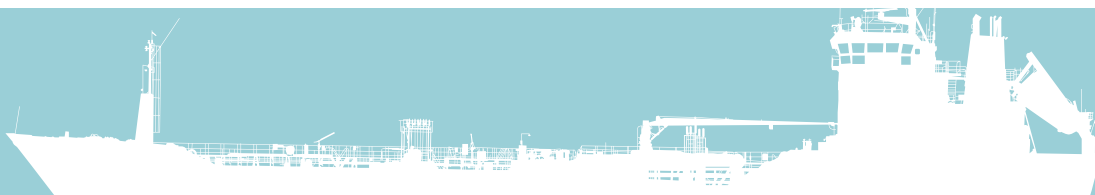
While it is generally preferable for all vessels transiting the Arctic to have the assistance of an Ice Navigator, they are only formally required aboard those vessels that meet specific criteria. The *Arctic Shipping Pollution Prevention Regulations* set out the circumstances under which an Ice Navigator is required to be on board. Specifically, an Ice Navigator is required:

- On all tankers (when carrying oil as cargo) at all times that the tanker is in a Shipping Safety Control Zone;
- When any ship over 100 GT is navigating outside the dates set out in row 14 of Schedule VIII in the *Arctic Shipping Pollution Prevention Regulations* (the Type E dates from the Zone/Date Table); or
- While using the Arctic Ice Regime Shipping System.

Beyond these requirements, it is always advisable to have an experienced person guiding the ship where there is the potential for encountering sea ice.

The *Arctic Shipping Pollution Prevention Regulations*, set out in detail the experience required to become an Ice Navigator. As per the regulations, Ice Navigators must be qualified to act as a master or person in charge of the deck watch and must, at a minimum, have served as a master or person in charge of the deck watch for a total period of at least 50 days, of which 30 days must have been served in Arctic waters while the ship was in ice conditions that required the ship to be assisted by an icebreaker or to make manoeuvres to avoid concentrations of ice that might have endangered the ship.

During the course of our engagement with stakeholders, we heard that Ice Navigators were



an important prevention layer that was generally working well, but that improvements could be made in terms of formalizing the qualifications of the Ice Navigator. There is currently no formalized training program or certification process required by regulation in Canada to demonstrate competency as an Ice Navigator. Transport Canada should create a formal endorsement for Ice Navigators. This will formalize the verifications that Transport Canada does to ensure Ice Navigators do indeed have the required experience.

### **What is the Role of an Ice Navigator?**

An Ice Navigator has very specialized knowledge and skills not typically found on board most vessels. The Ice Navigator would typically:

- Combine the more traditional aspects of passage planning with the ability to develop and adjust the most effective and safe routes under dynamic conditions.
- Be knowledgeable of ice physics to be able to: identify ice types and forms, and glacial and multi-year ice, visually interpret conditions and signs of ice in the vicinity of vessels, and interpret the various ice imagery, charts and reports that are available.
- Understand the vessel limitations based on ice class limitations, on available power and manoeuvrability, and provide advice for avoiding besetment and freeing a beset ship.
- Understand the interaction of weather conditions, currents and ice, and with the knowledge of the prevailing conditions be able to know what to expect at particular legs of the transit.

Have a complete understanding of operations with icebreakers, their requirements and the necessary communications involved in this.

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### **RECOMMENDATION 1-7:**

**Transport Canada, in consultation with the shipping industry, should pursue the establishment of a formal endorsement for Ice Navigators to ensure that they possess the required experience.**

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Canada is in the process of negotiations with other International Maritime Organization states on the development of Polar Code standards for, among many other things, the mandatory training of ships' officers for vessels operating in the Arctic. Some countries would like to see all officers on board such vessels trained for specialized ice navigation, while Canada sees the Ice Navigator concept as an alternative and perhaps more practical solution. Canada's position appears to be a sensible one, as we believe it would be costly and impractical to insist that all ships' officers have such specialized knowledge when only a portion of a voyage (the portion transiting Arctic waters) may require such expertise. We support the idea of Canada continuing to promote the requirement for Ice Navigators internationally as a best practice for navigation in international polar areas. As part of this, we support Canada's efforts at the International Maritime Organization's Polar Code negotiations to have the Ice Navigator concept accepted as meeting the requirement to have all ships' officers trained for Arctic voyages.

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### **RECOMMENDATION 1-8:**

**Transport Canada, in consultation with the shipping industry, should continue its efforts to promote internationally the concept of Ice Navigators as meeting any future Polar Code requirements to have all ships' officers trained for Arctic voyages.**

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Based on current vessel traffic levels, there appear to be enough experienced ex-Canadian Coast Guard and ex-merchant fleet officers with the required experience to be Ice Navigators. However, should there be a sudden increase in Arctic vessel traffic, there is no certainty that there would be a sufficient supply of qualified and competent Ice Navigators without proactively training them. In the longer term, a training program may be useful to ensure a sufficient number of qualified Ice Navigators to support shipping in the Arctic.

## Preparedness and Response

Our recommendations for ship-source spill preparedness and response in the Arctic build upon the existing roles of industry and government respectively. Whereas, in the past, shipowners have not been required to develop Arctic-specific plans for spills, we recommend some enhancements to ship plans for oil spills to account for the challenges of mounting responses in the Arctic. In addition, we propose a classification scheme for oil handling facilities that takes into account the unique circumstances of the Arctic and around which preparedness and response standards would be developed and applied. We also address some gaps around the use of barges for temporary fuel storage.

For government departments and agencies, we seek a renewed commitment to oversight and planning and incremental investments in preparedness. These investments in the Canadian Coast Guard's capabilities acknowledge the challenge of building private sector response capability for the Arctic, but do not replace industry's responsibility to be prepared for its own spills.

As we did in our first report, we recognize the value of having multiple spill response techniques at the responder's disposal to ensure the best net environmental benefit from the response

to a spill. Finally, effective spill responses are supported by community engagement in the planning process, appropriate exercises and involvement of northern communities through training and other opportunities.

Our intent in the following recommendations is to propose measured enhancements to spill preparedness and response in the Arctic that are relative to the level of risk that exists today and that build a solid foundation for future risk-based improvements.

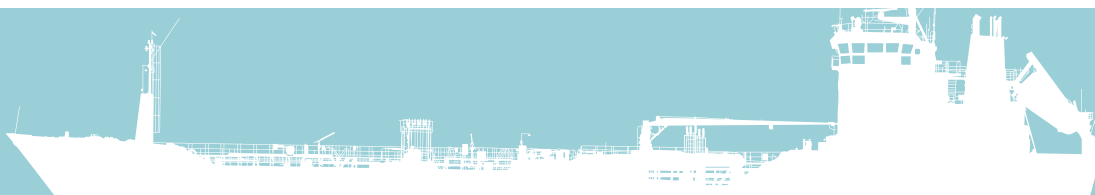


Photo credit: NEAS Group

## Preparedness and Response for Vessels

A well-designed plan is an important first step to meet oil spill response objectives. This is particularly valid for Arctic operations where response logistics are challenging and vessels may be a long way (in time and distance) from where response resources are located.

The purpose of the Shipboard Oil Pollution Emergency Plan is to provide guidance to the master, officers and crew on board the ship with respect to the steps to be taken when an oil pollution incident has occurred or is likely to occur. It outlines the procedures to be used to report an oil pollution incident, a list of authorities to be contacted, a description of the actions to be taken by crew on board to reduce or control the





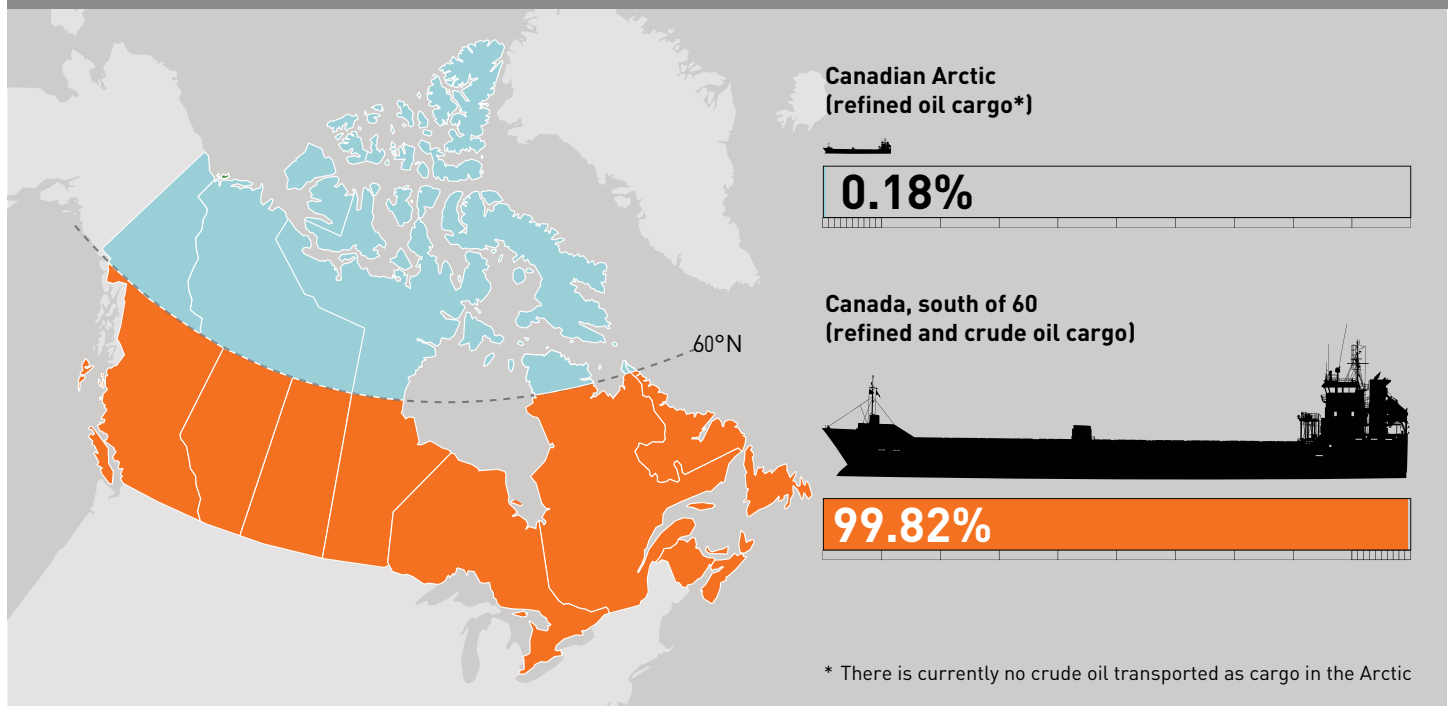
discharge of oil, as well as the procedures and point of contact for coordinating shipboard action with national and local authorities. Canada, like the International Maritime Organization, requires Shipboard Oil Pollution Emergency Plans for tankers 150 GT and above and for other vessels 400 GT and above. This includes such vessels that navigate in the Arctic. However, neither Canada nor the International Maritime Organization requires that plans address Arctic-specific issues.

While shipowners are financially responsible for pollution from vessels, in the absence of a government-certified Response Organization north of 60 or any other type of regulated response model for industry, the Canadian Coast Guard has had an important role in the preparedness and response to spills. However, in waters north of 60, as in waters south of 60, there are aspects of preparedness for spills that are the responsibility of ship and facility owners. As the ultimate responsibility for any oil spill in the Arctic rests with the polluter, the potential

polluter needs to address its component of the overall preparedness activities.

The Response Organization model used south of 60 is currently not economically viable north of 60. Given the low numbers of vessels operating in the Arctic and the equally low volume of bulk oil (including refined products) being moved (less than 1% of the total moved in Canada – see Figure 1.6), the fees that a Response Organization would need to charge the Arctic shipping industry would dramatically increase the cost of doing business, and would ultimately be passed on to communities through an increase in the price of their fuel and general cargo shipments. In addition, given the expansive geographic size of the Arctic and the limited traffic within it, at this time, it is more efficient and effective to position response equipment and resources in strategic locations and to muster these resources from outside the region, where they can be regularly maintained and where there is greater access to airlift capabilities. This preparedness strategy

Figure 1.6 - Percentage of Oil Transported as Cargo (2002-2011)



needs to be supplemented by comprehensive planning that acknowledges the need for ship and facility owners to be self-sufficient for the duration of a response operation, which could be situated far from any Arctic community, especially communities that can provide commercial accommodations, food, etc.

We propose that spill preparedness and response in the Arctic be improved through incremental changes that should not place an unmanageable burden on industry or communities. Vessels operating in the Arctic should have enhanced spill response plans to ensure that the companies operating them are prepared to mount an effective response to a spill in the Arctic. These plans should be more detailed than the Shipboard Oil Pollution Emergency Plans, because there are several unique challenges, such as logistics and the absence of designated Response Organizations, that require additional planning.

Transport Canada should establish a new requirement for certain vessels and barges operating in the Arctic to have a Shipboard Arctic Spill Response Plan. The objective of the Shipboard Arctic Spill Response Plan is to ensure that shipowners are prepared to respond to spills that could occur in the Arctic and have planned for the unique challenges associated with carrying out such a response. This plan

should include all of the current Shipboard Oil Pollution Emergency Plan requirements as well as additional requirements.

For tankers involved in transferring oil (currently only refined products), the plan should outline the vessel's on-board preparedness capability and procedures for responding to small operational spills, such as discharges during transfer operations.

To address the risk of larger spills, vessels should include in their Shipboard Arctic Spill Response Plan details of how the shipowner intends to manage a response. The Plan would clearly identify the resources that could be called upon to respond to a potential spill, and demonstrate that the shipowner has planned for the unique logistical challenges the Arctic presents, such as mobilizing response equipment, housing and feeding responders, and removing oily waste and debris from the Arctic at the end of the operation.

The prescribed vessels for which a Shipboard Arctic Spill Response Plan is required should be determined through consultation with the territorial/provincial governments, industry, and other relevant stakeholders.

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## RECOMMENDATION 1-9:

**Transport Canada should require prescribed vessels and barges, as determined in consultation with industry, territorial/provincial governments, and other stakeholders operating in Canada's Arctic waters, to have a Shipboard Arctic Spill Response Plan that includes all of the current Shipboard Oil Pollution Emergency Plan elements and additional requirements, including:**

- **For prescribed tankers, the capability on board the vessel to address small, operational spills; and**



Unloading cargo via barge in the Arctic. Photo credit: Desgagnés Transarctik Inc.

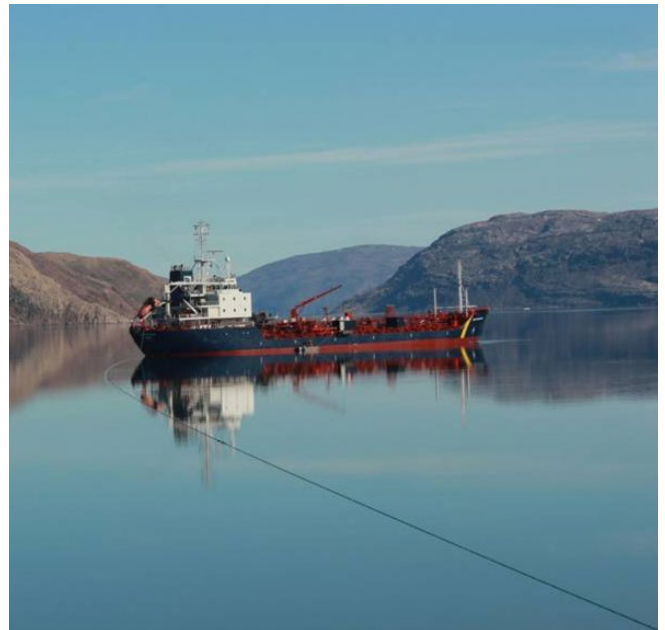
- **For all prescribed vessels, the identification and description of the response resources that would be brought in to respond to a spill that is beyond the capabilities of the crew and vessel's on-board equipment, including evidence that the shipowner has considered the logistical challenges of addressing a sustained spill response operation in the Arctic.**
- 

It is expected that the availability of commercial response services will increase for the Arctic over time. As traffic increases, the response capacity for responding to ship-source spills in the Arctic should also increase to keep pace. In future decades, the feasibility of establishing the equivalent capacity that is presently being provided by the Transport Canada-certified Response Organizations (or an alternative business model) will need to be addressed by the Government of Canada in consultation with the shipping industry. However, in the near term, for very low probability spills that are beyond the enhanced capabilities of the vessel's crew and on-board equipment, any response capabilities called in that are not resident in the Arctic will take time to arrive. It could take several days for external resources and responders to be mobilized and several more days for them to be deployed on-site at a significant spill. Weather and other adverse environmental conditions could delay the response even further. Although the probability of such spills is very low at this time, the delay of response capabilities arriving to address a significant spill is a risk that must be managed, both by navigators of Canada's Arctic waters and by the Government.

## Preparedness and Response for Oil Handling Facilities

Spill statistics indicate that the majority of ship-source spills occur during the loading and unloading of oil from vessels at oil handling facilities. While the sizes of these spills, including those on record for the Arctic, tend to be extremely small, several small spills—even where non-persistent products are involved—may have cumulative environmental impacts. Such impacts could have detrimental consequences for communities where the livelihood of the residents depends on healthy marine habitats. In assessing the adequacy of spill response preparedness at oil handling facilities during ship-to-shore transfers in the Arctic, it is necessary to examine what happens in the North, understand how it differs from the South, and determine where risks and opportunities exist.

There are no deep water wharves located in communities in the Canadian Arctic. As a result, the fuel supply of most Arctic communities is transferred from tankers to land-based storage



Fuel transfer through a floating hose during a community resupply operation at Milne Inlet, Nunavut. Photo credit: Desgagnés Transarctik Inc.

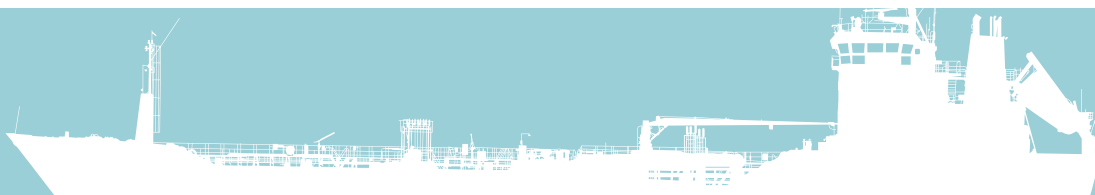


Oil handling facility in Iqaluit, Nunavut.

tanks via floating fuel hose or barges that can be beached. In Nunavut, the typical method is by floating fuel hose. Depending on bathymetry and other local conditions, the transfer hose can be up to 1,800 metres in length. Transfer operations can be interrupted by weather, tides, and ice, necessitating constant vigilance and presenting the potential need for rapid stoppage of the pumping operation and disconnection of the fuel hose. Conditions preclude surrounding the tanker and floating hose completely by oil boom. In the western Arctic, shallow draught tugs and barges are typically used; barges are beached and fuel is pumped from the barge to the oil handling facility manifold.

As outlined in the *Canada Shipping Act, 2001* and the *Response Organizations and Oil Handling Facilities Regulations*, prescribed oil handling facilities are required to have Oil Pollution Emergency Plans that outline the procedures for responding to an oil spill at the facility during transfer operations with a vessel. Oil handling facilities in the Canadian Arctic are also subject to these requirements.

National standards for response preparedness in Canada for oil handling facilities were developed by Transport Canada in consultation with interested parties representing oil handling facilities, the petroleum and shipping industries, environmental groups, provincial governments, and the Canadian Coast Guard and Environment Canada. While these standards are not solely aimed at oil handling facilities in the South, the fact is that 99% of oil cargo shipments are in the South, where oil handling facilities have rapid access to assistance from certified Response Organizations should a spill exceed the facilities' resources. In the Arctic, additional private sector response capacity may not arrive for days, if not weeks. We therefore recommend that standards for Arctic oil handling facilities' preparedness be re-examined with a view to creating unique requirements for these facilities, based on risk.





In recognition of the often unique challenges involved in transfer operations in the Arctic, Transport Canada should undertake a risk-based analysis to rank and classify Arctic oil handling facilities, using specific northern considerations. This would provide a relative rating for Arctic facilities and provide guidance as to preparedness needs. The establishment of the criteria used to classify Arctic oil handling facilities should be carried out with input from other federal and territorial/provincial authorities.

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#### **RECOMMENDATION 1-10:**

**Transport Canada, in collaboration with appropriate stakeholders, should develop a classification structure for Arctic oil handling facilities, using a risk-based analysis that considers factors relevant to Arctic operations.**

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With this analysis completed, Transport Canada should develop appropriate spill preparedness and response standards to support the development of Oil Pollution Emergency Plans that factor in preparedness and response considerations for the Arctic. Standards should be articulated for each of the newly developed classes of oil handling facilities. These standards should complement any territorial or provincial requirements relevant to spill preparedness and response that are imposed on oil handling facilities.

In addition to this, Transport Canada should review and update the *Arctic Waters Oil Transfer Guidelines*, which apply both to oil handling facilities and vessels. It is suggested that Transport Canada collaborate with the Canadian Coast Guard, Environment Canada and territorial/provincial authorities, as appropriate, to undertake these reviews, establish the standards, and revise the *Arctic Waters Oil Transfer Guidelines*.

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#### **RECOMMENDATION 1-11:**

**Transport Canada should lead the development of Arctic-specific standards that support the development of Oil Pollution Emergency Plans for oil handling facilities tailored to operations in the Arctic. They should address preparedness and response requirements for each class of oil handling facility (as per Recommendation 1-10). In addition, Transport Canada should review and update its *Arctic Waters Oil Transfer Guidelines*.**

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#### **Barges as Temporary Fuel Storage**

Barges are one of the most effective means of transporting large amounts of heavy goods within relatively shallow and calm waters, and on the Mackenzie River, they are regularly used to transport fuels for communities and resource projects. During our engagement with stakeholders, we heard that, occasionally, these barges are used not only to transport fuel, but also as a temporary storage solution, typically for diesel used to generate electricity for a temporary camp or other facility. Because the risks of spills resulting from transfer operations between the barge and land-based means of containment (such as fuel trucks or tanks) are similar to those posed by the transfer operations between oil handling facilities and vessels, we feel that additional requirements applicable to barges employed in this manner would help ensure better preparedness for such incidents. Transport Canada should impose spill prevention, preparedness and response requirements resembling those applied to prescribed oil handling facilities (as described in Recommendation 1-11) to barges used specifically for temporary fuel storage. These requirements should require companies using barges for the temporary storage of oil products to be responsible for developing adequate



response plans for spills that could occur either during transfer operations between the barge and any means of containment on land, as well as for spills that could result in the unlikely event of a hull compromise. This would ensure that such practices do not pose an additional risk to Canada's waters.

Furthermore, because the use of barges for fuel storage occurs in many other parts of the country, these proposed requirements should apply across the country, not just north of 60.

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### RECOMMENDATION 1-12:

**Transport Canada should establish requirements, applicable to prescribed barges when used for temporary fuel storage, that set out spill prevention, preparedness and response measures relative to transfer operations in line with those applied to prescribed oil handling facilities.**

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#### Oversight

Proper oversight serves a variety of functions. Foremost, it ensures that the level of preparedness required by Transport Canada of vessels and oil handling facilities is in place. However, it also serves to raise awareness within regulated entities of their responsibilities and ensures their on-going attention to their level of preparedness to respond to spills. Thus, it is important for Transport Canada to be able to provide the necessary awareness, education, monitoring and enforcement of the existing and proposed regulatory programs.

As Transport Canada develops the regulatory requirements for Shipboard Arctic Spill Response Plans, and new standards for oil handling facilities and for barges used as temporary fuel storage, there will also be a need to develop new

incremental oversight capacity above and beyond what is currently in place to ensure compliance with existing regulatory requirements.

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### RECOMMENDATION 1-13:

**Transport Canada should develop an appropriate oversight program to ensure compliance with its new requirements for prescribed vessels and oil handling facilities operating in the Arctic.**

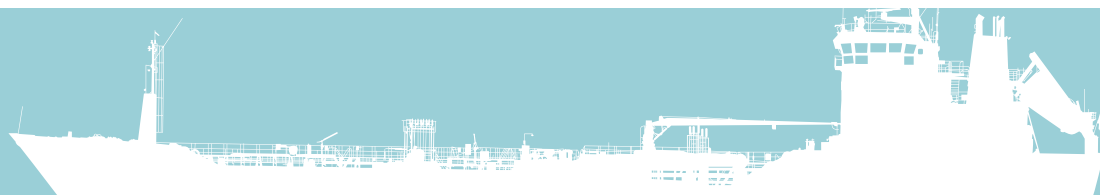
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Once the standards and guidelines for oil handling facilities in the Arctic have been articulated and implemented, Transport Canada should monitor compliance with them over the longer term to determine whether the guidelines as a whole need to be converted into regulations.

#### Response Options

The overall objective of pollution response is to implement strategies aimed at reducing or eliminating adverse effects on nearby populations and environmentally and economically sensitive resources. In the event of a spill, responders must assess the characteristics of both the product spilled and the environment in which the incident has occurred and decide on the technique that would provide the best outcome (through the use of a net environmental benefit analysis). In the event of a ship-source spill in Canada's Arctic, consideration will also need to be given to different local conditions, including the use of marine resources by local communities for socio-economic, cultural and traditional purposes, the availability of trained personnel and equipment, and the presence of infrastructure to support the response.

The Arctic's relative isolation and low population density, low temperatures, seasonal darkness, presence of ice, and the lack of infrastructure all pose particular challenges for spill response.



The cold temperatures may decrease the efficiency of a response operation and require appropriate selection of techniques based upon the properties of the oil and the particular weathering conditions, which could include a lower evaporation rate or higher viscosity.

While there are challenges, there has also been a lot of research undertaken, internationally and in Canada, to examine the viability of response methods in Arctic waters. The effectiveness of response methods such as in-situ burning, chemical dispersion, mechanical recovery, and herders has been researched, with preliminary conclusions that they may all be potential response options for the Arctic. In fact, according to research and field tests conducted by the Norwegian research institute, SINTEF,<sup>11</sup> the presence of ice on the water surface, in some situations, may actually aid in oil spill response operations in that it slows down oil weathering, dampens the waves, and prevents the oil from spreading over large distances. In some cases, it may even extend the window of opportunity for certain response methods.

No matter the circumstances, a spill in the Arctic would be a significant challenge for responders. The availability of a full suite of response options will enhance the chances of an effective pollution response. As we did in our first report, we recommend that the Government take the steps necessary to remove the legislative impediments to the use of alternative response techniques in Canadian waters, and ensure appropriate processes for pre-assessment of their use and timely decision making at the time of a spill to approve their application, where they provide a net environmental benefit. In May 2014, the Government announced its plans to propose legislative amendments that would remove the legal impediments to the use of alternative response techniques. We support this action.

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<sup>11</sup> Report no. 32 Joint industry program on oil spill contingency for Arctic and ice-covered waters, SINTEF, 2010.

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## RECOMMENDATION 1-14:

**The Government of Canada should proceed with its recently announced plans to lift legal prohibitions on using alternative response techniques, including for Arctic spills, where such techniques would provide the best outcome, according to a net environmental benefit analysis.**

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### Regional and Localized Planning

Critical to preparedness for ship-source spills in the Canadian Arctic is effective planning, where governance, roles and responsibilities, key activities, training and exercise requirements, resources, cost recovery and financial measures, and response capabilities are clearly outlined. The Canadian Coast Guard has already done such planning, and has developed a regional response plan for the Arctic (currently being updated), under the national *Marine Spills Contingency Plan*. These plans define the Canadian Coast Guard's roles as On-scene Commander, Federal Monitoring Officer, and Resource Agency.

In our first report, we recommended that spill planning should be based on risks specific to a geographic area rather than a one-size-fits-all approach. This perspective led us to outline an Area Response Planning model, where the key players leading or overseeing a potential response are responsible for identifying the specific risks of a particular geographic area (e.g., type of product being transported, in what volumes, navigational risks, environmental sensitivities, etc.) and engaging all the stakeholders who hold key planning information and/or may have a supporting role in the response.

The planning process we are recommending for the Arctic is similar—risk-based and geographically-based, involving all public and

private players holding key planning information and/or having a supporting role in the response. What is different for the Arctic is the level of detail of the plans, the structure and requirements for industry planning, as well as the involvement of various segments of industry or their representatives.

In fact, the Canadian Coast Guard already undertakes some geographically-focused planning. It has developed a series of localized plans,<sup>12</sup> which are annexes to the regional response plan for the Arctic. These plans provide detailed response information for localized geographic areas or communities, and are meant to address the first 12-24 hours of the response. The Canadian Coast Guard's role in the ongoing maintenance of both the regional response plan and its localized annexes is critical to spill preparedness in the Arctic. This information will support the preparedness and response of shipowners and oil handling facility owners, who, through their Shipboard Arctic Spill Response Plans or Oil Pollution Emergency Plans, identify the resources needed to respond to a spill. The localized plans will also drive the response in the initial hours of the spill, while the ship and/or facility owner is organizing the arrival of their response resources, which would be used to address the spill in the longer term. Given the significantly lower volume of traffic and the relatively lower risk of spills in the Arctic, compared with that south of 60, we consider this to be an appropriate approach for planning.

In developing the localized plans, the Canadian Coast Guard conducts a risk analysis, which examines which areas are more likely to be impacted by a spill. Then, protection priorities are identified and verified, and finally, response strategies, tactics, and required response

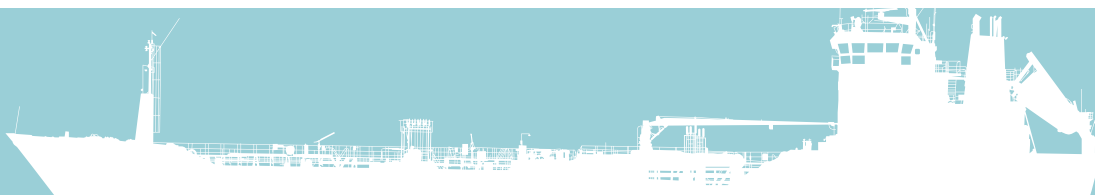
resources are defined. In the past, the Canadian Coast Guard's Senior Response Officer responsible for the Arctic has travelled annually to collect and integrate new information in the localized plans and to build relationships in the northern communities. As we have heard, communities have invaluable traditional knowledge of their local ecosystems, which would support the Canadian Coast Guard in developing localized plans. In the future, localized planning could also consider and integrate information on the response plans and capacities developed by local oil handling facilities or shipowners that operate in the area.

Furthermore, we encourage the Canadian Coast Guard to regularly and formally liaise with Environment Canada and Fisheries and Oceans Canada to ensure the most recent environmental data that has been collected by universities, the private sector and government organizations, domestically or internationally is incorporated in the regional response plan for the Arctic, as well as in the localized plans that are annexed to it. The Canadian Coast Guard should also consider wildlife management issues in their planning activities for a ship-source spill in the Arctic, in collaboration with Environment Canada, Fisheries and Oceans Canada, territorial and provincial governments, northern communities, and other relevant stakeholders.

As the regional response plan and its localized annexes contain important information on protection priorities, response strategies, and tactics, they should be made available to the public so that potential polluters and those who respond to spills on their behalf have access to them to inform their response operations.

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<sup>12</sup> The localized plans for the Arctic region are for the following regions: Keewatin, Baffin, Beaufort Sea & Amundsen Gulf, Great Slave Lake (Northwest Territories); Hudson Bay & James Bay (Central Arctic); Kitikmeot (Nunavut); and Mackenzie River & Delta (Northwest Territories and Yukon).



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## RECOMMENDATION 1-15:

**The Canadian Coast Guard should maintain and regularly update the regional response plan for the Arctic and its supporting localized plans to reflect the most recent information on key environmental resources, evolving response tactics and available response resources. These plans should be developed in consultation with local communities, industry, other government departments and agencies, and be available to the public, potential polluters and their responders.**

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### Canadian Coast Guard Capabilities

Ship-source spill preparedness and response is a private-public partnership, with the onus on the polluter to make necessary arrangements for response, and on the Canadian Coast Guard to monitor the response in its role as Federal Monitoring Officer. Under circumstances where

the polluter is unknown, unwilling or unable to fulfill its requirement to bring to bear response resources as outlined in their Shipboard Arctic Spill Response Plan or Oil Pollution Emergency Plan (as per Recommendations 1-9 and 1-11), there needs to be a contingency plan in place for a response. The Canadian Coast Guard fulfills this function in its role as On-scene Commander, and articulates plans for these events in the regional response plan for the Arctic.

It is important to recognize that the requirement for the Canadian Coast Guard's presence and activities in the Arctic is expected to grow with increased shipping activity and extended shipping seasons. The Canadian Coast Guard serves as Canada's eyes and ears on the ocean in the North. It also plays an important role in the spill prevention regime we outlined earlier in this chapter. Throughout our engagement with stakeholders, we heard that the Canadian Coast Guard's capabilities have been in decline in the Arctic, impacting its ability to keep up with the current modest increases in shipping and a lengthening shipping season. In order for the



*Photo credit: Neil MacKinnon, Fisheries and Oceans Canada*

Canadian Coast Guard to adequately fulfill its role, it will need to be physically present in the Arctic for the duration of the active shipping season. The Canadian Coast Guard therefore needs to start planning now for the increased demands on its services in the Arctic in the future.

Furthermore, we recognize the logistical challenges that shipowners operating in the Arctic will face if mobilizing response resources (such as those that may be identified in their Shipboard Arctic Spill Response Plans) that may be stationed outside the region. In these circumstances, we consider that any Canadian Coast Guard vessel in the vicinity that is equipped and crewed to provide an initial response should do so. In our view, this is in keeping with the Coast Guard's role as On-scene Commander in the case of a shipowner who is unable to provide an immediate response. In the event that the Canadian Coast Guard is able to arrive at the spill before industry resources are on-scene, its actions could be focused on limiting the spill, containing it, and protecting shoreline, as examples of initial response measures.<sup>13</sup> However, this should in no way detract from the shipowner's responsibility to prepare for and respond to its spills.

Although the Canadian Coast Guard already has equipment and capability for responding to oil spills in the Arctic, given modest increases in shipping activities in the North, it may require additional, incremental response resources for immediate responses to larger spills, pending the arrival of private sector responders. Informed by available risk information, its own response plans for the Arctic and its knowledge of ship and facility owners' response plans for the Arctic, the Canadian Coast Guard should develop strategies for incremental investments in its response

<sup>13</sup> Given that the Canadian Coast Guard's vessels are generally fully engaged in delivering other programs and services across the vast expanse of the Arctic, it may not always be the case that these vessels arrive on-scene prior to the arrival of industry response resources.

capacity that could be used to respond to spills when the polluter is unable (including temporarily while industry response resources are brought in), unwilling or unknown. These strategies should also take into account the lengthening shipping season and ensure that the Canadian Coast Guard is present in the Arctic for the duration of the active shipping season.

### **Canadian Coast Guard Response Resources North of 60**

The Canadian Coast Guard currently maintains several caches of response equipment in the Arctic to support its function as Federal Monitoring Officer or On-scene Commander. There are a total of 23 equipment depot sites in the Arctic (see Figure 1.7). Nineteen of these sites have been designed for initial on-water containment and the protection of community-specific sensitivities. Three depots, in Tuktoyaktuk, Churchill and Iqaluit, contain larger caches of equipment for responding to more significant marine pollution incidents. A rapid air transportable depot, located in Hay River, is designed to be airlifted to spill sites.

Given the vastness of the Arctic and the inefficiency of pre-positioning and maintaining adequate levels of equipment all over the Arctic, the example of the rapid air transportable depot in Hay River seems like a reasonable approach for the Arctic. While not ideal, the reality of the conditions in the Arctic means that there will be longer delays in deploying equipment. All parties need to do their best to minimize these delays and initiate the response as soon as possible. We support the idea of the Canadian Coast Guard's future investments in equipment for north or south of 60 taking advantage of the air transportation systems available to rapidly deploy equipment that can be cascaded from centralized locations.

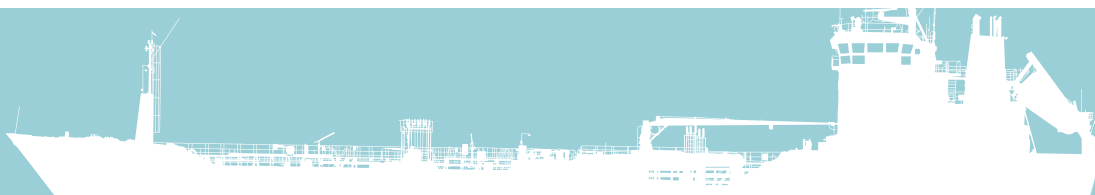




Figure 1.7 - Canadian Coast Guard Equipment Depots in the Arctic



**RECOMMENDATION 1-16:**

**Based on the regional response plan for the Arctic, and informed by risk levels, the Canadian Coast Guard should ensure it is adequately resourced—throughout the active shipping season—for its role as On-scene Commander when the polluter is unknown, unwilling or unable to fulfill its requirement to respond to a spill.**

In order to ensure an adequate capability in the Arctic, the Canadian Coast Guard must monitor changing needs and risks in the Arctic and adjust the regional response plan and associated response capabilities accordingly.

To help plan for an effective response in circumstances where it is called upon to act as On-scene Commander for a major spill, the Canadian Coast Guard should ensure that processes are in place for supplementary

response capability to be cascaded from national stockpiles or obtained through the procurement of qualified contractors. These arrangements should be defined in the Arctic regional response plan.

## Building Linkages

The Area Response Planning approach we outlined in our first report bridges an important preparedness gap. This new process serves, in part, to directly connect the Response Organizations (in place for the oil regime south of 60), the Canadian Coast Guard and Transport Canada throughout the planning and exercise process. With the implementation of this proposal, the Canadian Coast Guard, as Federal Monitoring Officer, should have a much better appreciation of the Response Organizations' plans, capabilities, equipment, resources and available tactics in the event of a spill. Essentially, the model increases readiness and response efficiencies.

In the context of preparedness in the Arctic, those relationships and insights into capabilities within industry are particularly imperative to the Canadian Coast Guard's roles as the Federal Monitoring Officer and On-scene Commander. However, under our proposed model, there are no certified Response Organizations for Arctic spills. Preparedness for spills in the Arctic will require ship and oil handling facility owners to identify in their respective spill response plans the resources they would employ to respond to a spill. We have recommended that Transport Canada continue to ensure compliance with regulated requirements by ship and oil handling facility owners, and develop an appropriate oversight model to ensure their compliance with the requirements for Shipboard Arctic Spill Response Plans and Oil Pollution Emergency Plans. There is benefit in the Canadian Coast Guard understanding the types of resources that ship and oil handling facility owners identify in their respective spill response plans, particularly when it may need to intervene as On-scene Commander

and conduct the initial response pending the arrival of private sector responders. To this end, we encourage the Canadian Coast Guard and Transport Canada to develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to the information on ship and oil handling facility owners' plans that will benefit its roles as Federal Monitoring Officer and On-scene Commander for incidents in the Arctic.

This collaboration will also help ensure that the Canadian Coast Guard has a good sense of the capabilities within the responder community, ensuring that when it is required to do so (i.e., if the polluter is unable, unwilling or unknown), the Canadian Coast Guard can contract with competent and effective responders as well as ensure that it can bring to bear its own response resources for initial response, as required.

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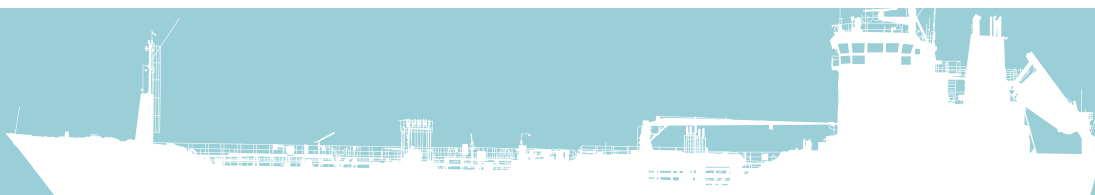
### RECOMMENDATION 1-17:

**Transport Canada and the Canadian Coast Guard should develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to information about ship and oil handling facility owners' plans for ship-source spills in the Arctic that will inform its roles as Federal Monitoring Officer and On-scene Commander.**

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## Community Training

Responding quickly and efficiently to an oil spill is critical to the effectiveness of the response. Having properly trained and equipped personnel in the North would help to facilitate the initial response. However, we understand the challenges in implementing and sustaining a training program for the diverse and remote communities that populate Canada's Arctic.



Some communities have equipment kits, provided by the Canadian Coast Guard, which are tailored to the risks in their areas. In the past, the Canadian Coast Guard provided some training to volunteers to use these resources; however, there were challenges with sustaining interest and capacity. In addition to Canadian Coast Guard efforts, some limited training was provided by certain local governments, shipowners and mining companies.

Despite these past and current efforts, in our stakeholder engagement we heard that even with training, some communities may be unable to provide assistance during a spill because of both the small size of the community and the absence of some members in the summer due to hunting, fishing and harvesting activities. We also heard that there is a need for better, more coordinated outreach with communities, and that many of them would like to have more information from ship and oil handling facility owners about how they would respond to a spill.

In general, it is our view that where there is interest at the local level, it is beneficial for community members to be trained to supplement the initial response to a spill. There are some emergency response capabilities in the Arctic that reside with organizations such as local fire departments and the Canadian Rangers. Some of these skill sets could be leveraged in a spill response situation, which could improve preparedness and response for ship-source spills.

There are diverse options that could be considered for providing this training. We are aware of oil spill training programs being developed for northern community responders. As part of the Beaufort Regional Environmental Assessment, a spill response training course for Inuvialuit and other Northerners has been developed. It focuses on the skills needed to respond to relatively minor incidents of local and regional concern and includes shoreline

protection and treatment as well as near-shore countermeasures, integrating local knowledge of coastal waters, affected shorelines, and mitigation options. As discussed earlier, the Canadian Coast Guard had previously developed a training program, but lacked the sustained funding to continue it. To supplement this, there could be opportunities for joint public-private programs, involving federal, territorial/provincial, and local governments, private educational institutions and industry. To be successful, there needs to be sustained effort in maintaining skills once initial training has been completed.

Overall, a one-size-fits-all training solution is unlikely. Instead training should be undertaken in different ways for different communities, taking into account local context. Nonetheless, we see the value in interested community members pursuing training, and doing so in a coordinated fashion with potential polluters, responders and regulators who operate in the North.

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#### **RECOMMENDATION 1-18:**

**All levels of government should cooperate to explore training options for oil spill preparedness and response at the community level in the Arctic, and encourage northern communities, educational institutions, and industry to participate in these opportunities.**

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#### **Regional Exercise Program**

The conduct of training and exercises is also a key element of preparedness for the Canadian Coast Guard to effectively carry out its oversight, command, and response functions to ensure that a response is conducted in a timely and responsible manner. The Canadian Coast Guard's regional response plan describes its vision for a Regional Exercise Program. However, more work needs to be done to implement this exercise

program in the Arctic, including soliciting the active participation of key stakeholders.

Further to updating the regional response plan and the supporting localized plans for the Arctic, the Canadian Coast Guard should ensure that these plans are appropriately exercised and that its vessel crews are trained. Exercises should integrate, as much as possible, other stakeholders, such as ship and oil handling facility owners, response contractors, Fisheries and Oceans Canada, Environment Canada, Transport Canada, and communities.

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### RECOMMENDATION 1-19:

**The Canadian Coast Guard should update and implement its Regional Exercise Program and encourage the participation of other stakeholders, such as ship and oil handling facility owners, other government departments, response contractors, and communities, as well as key international partners.**

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## Continuous Improvement

While the recommendations set out in this chapter seek to strengthen spill prevention, preparedness and response in the Arctic, there is a need to consider how to ensure continuous improvement in these areas. One step is to conduct regular engagement and outreach with the northern communities most affected by shipping in the Arctic. We also observed that while much research has been done on the Arctic, including environmental considerations, spill behaviour, and response methods in ice-infested waters, there remain some knowledge gaps. In addition, there is an opportunity to make existing research more readily accessible and more widely available for the purposes of spill preparedness and response. Most importantly, we note that the Government will need to regularly monitor



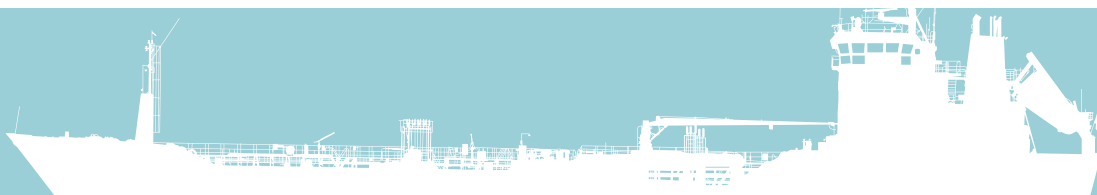
Photo credit: © Paul Vecsei, Aboriginal Affairs and Northern Development Canada

shipping-related activities in the Arctic to assess whether the proposed measures, if implemented, will be adequate to address emerging and future risks. The risks themselves will need to be re-assessed on a regular basis.

## Awareness and Engagement

Resource development in the North is a major driver of northern economic development and prosperity. However, we heard that while Aboriginal communities in the North welcome projects that offer them employment and other economic benefits, they continue to express concerns over the impact of such projects on the Arctic environment.

In the context of ship-source spill preparedness and response, it is important for local communities to be appropriately engaged early in the planning and preparedness process, and advised of any incidents that may impact their health, well-being, livelihood, and traditional practices in a timely manner.



We have also noted that there is a general lack of awareness in northern communities, among various stakeholders, and within the broader Canadian public about spill prevention, preparedness and response in the Arctic. In particular, we have heard that there are false perceptions and expectations of the roles, responsibilities and capabilities for response—particularly those related to the Canadian Coast Guard, shipowners and oil handling facility owners. There needs to be active outreach to build awareness on a number of issues, including: the risk of spills in the Arctic, the general picture of shipping activities that take place in and around communities, roles and responsibilities in preparing for and responding to a ship-source spill, and the liability and compensation regime.

The federal government needs to conduct outreach and awareness-building for ship-source spill preparedness and response in the Arctic by actively engaging communities and other stakeholders. This will be of particular importance for Inuit communities, given the importance of protecting natural resources needed for their livelihoods, as well as for cultural and traditional practices.

Should the Government accept our proposed new requirements for ship and oil handling facility preparedness and response in the Arctic (Recommendations 1-9 and 1-11), it will be important to communicate these to communities and stakeholders. Our Recommendation 1-15, in part, seeks to do this by making the regional response plan for the Arctic and its supporting localized plans available to the public. We additionally encourage federal departments and agencies to work with their co-signatories of the *Northwest Territories/Nunavut Spills Working Agreement* to update this agreement to clearly reflect the roles and responsibilities for ship-source spill preparedness and response.

As previously mentioned, we encourage the Canadian Coast Guard to continue engaging communities in developing its localized plans. Creating awareness and reaching out to communities and other stakeholders in the North is in the public's and the Government's best interests, to ensure that any existing or new requirements for spill prevention, preparedness and response in the Arctic are well understood. Awareness and outreach also foster confidence in Canada's prevention of and preparedness for ship-source spills in the Arctic.

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### **RECOMMENDATION 1-20:**

**With a view to creating awareness and fostering public confidence, Transport Canada and the Canadian Coast Guard should coordinate and conduct regular outreach to the public, especially northern communities, on prevention, preparedness, response and liability and compensation for ship-source spills.**

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### **Improving Data for Arctic Preparedness and Response**

Extensive knowledge and understanding of Arctic conditions are necessary to conduct marine activities safely and efficiently. They are also critical for preparedness and response to ship-source pollution incidents in the region. Considerable scientific information on the Arctic has been collected over the years.

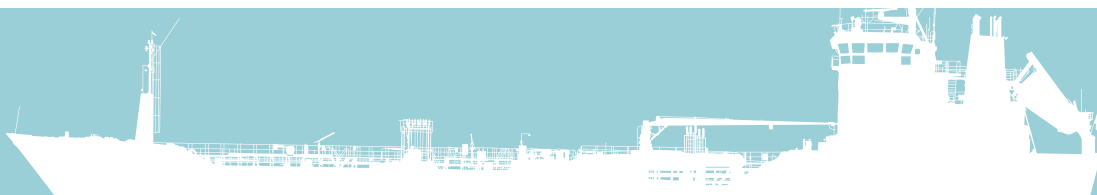
In addition, local Aboriginal populations have long observed and experienced the different aspects of the northern environment and have developed centuries-worth of traditional knowledge, which is an important source of information about the North. Research on the Arctic has also been conducted for decades, both within Canada and internationally, and has resulted in an extensive body of knowledge on Arctic waters, biological resources and migration



patterns amongst others. This research has also led to the creation of a number of new technologies. In Canada, both the public and the private sector conduct Arctic research and development. At the federal level, Environment Canada and Fisheries and Oceans Canada collect environmental and technical data on Arctic ecosystems, ocean and navigation conditions and the fate and behaviour of oil in icy waters. Different levels of government also collaborate with private stakeholders and university research teams on initiatives such as the Beaufort Regional Environmental Assessment, which aims at consolidating existing research on the western Arctic, identifying current gaps and, where possible, filling them. Other such initiatives include:

- **Environment Canada's Arctic and Marine Oilspill Program Technical Seminar** – an international technical forum about oil spills in any environment, including improving the knowledge base and technology for responding to marine oil spills in the Arctic.
- **Canadian High Arctic Research Station in Cambridge Bay, Nunavut** – once operational, in 2017, will provide a variety of scientific and technological services in the Canadian Arctic, including surveillance and monitoring, research, and education and outreach. It will comprise advanced laboratories, a traditional knowledge centre and a technology development centre.
- **Oceans Network Canada, including its Cambridge Bay Observatory** – sends real time data on weather and ice conditions and helps collect information on Arctic waters and biology.
- **ArcticNet** – brings together a network of researchers from Canadian universities, government departments and agencies, Inuit organizations and northern communities to study modernization and climate change in the Arctic.
- **Yukon College Cold Climate Innovation Program** – focuses on the development and commercialization of cold climate technologies and solutions for subarctic regions.
- **Program for Energy Research and Development** – a public/private initiative aimed at funding research and development on environmentally and economically viable ways of achieving a sustainable energy future.
- **Environmental Studies Research Fund** – a public/private initiative, which finances research on oil and gas exploration and development on Canadian frontier lands (e.g., the Arctic) through levies on these lands paid by private stakeholders.
- **Arctic Spill Technology Joint Industry Program** – an initiative where members of the International Oil and Gas Producer Association seek to improve technologies and methodologies for Arctic spill response.
- **The National Research Council of Canada's Arctic Program** – a recently announced program of research partnerships, which focuses on technology aimed at improving the lives of Northerners and advancing northern economic development, including an area of focus on northern transportation and shipping, among others.
- **International Polar Year of 2007-2008** – an international program of scientific research focused on the Arctic and Antarctic regions that led to the collection of an impressive volume of information on those regions.

As shown by this variety of programs, which is not an exhaustive list, there is a lot of data and knowledge available on the Canadian Arctic. However, access to this information is hindered by the fact that it is held independently and is not accessible through one point of access. Access



to this data is important to the development of plans, and, in the event of an oil spill, having access to technical and scientific expertise in a timely manner is critical to the success of a response operation.

Several initiatives aimed at bringing together environmental information on the North are currently at various stages of implementation (e.g., a component of the Beaufort Regional Environmental Assessment and other projects related to Land Claim Agreements), but these remain fragmented and project-based. Canada lacks a systematic approach to consolidating data on the Arctic. This gap should be addressed through joint public-private initiatives to gather data into readily accessible databases. For example, the creation of environmental resources atlases (also known as environmental sensitivity atlases), which would regroup information on Arctic environmental resources such as shoreline classification, biological resources, spawning areas and migration patterns, among others, should be considered. These atlases already exist for other countries. The National Oceanic and Atmospheric Administration in the United States is working on an Arctic Environmental Response Management Application (often referred to as Arctic ERMA) for the North. The Application consolidates various environmental data sets into a single interactive map. The possibility of using this tool more widely is currently under consideration by the Arctic Council. A tool such as this could greatly contribute to a successful response in the event of a spill in the North. The Canadian High Arctic Station, once operational, could become an excellent vehicle for the centralization of existing data on the Canadian Arctic.

The Government should work toward collating the data that has already been collected for the Canadian Arctic. This would benefit its prioritization of future research and facilitate all parties' preparedness and response to pollution events in the Arctic, including ship-source spills.

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## RECOMMENDATION 1-21:

**The Government of Canada, in partnership with territorial and provincial departments and agencies, industry, academia and international partners, should work towards ensuring broad access to and interoperability of existing data on the Canadian Arctic to support spill preparedness and response.**

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### Research Gaps and Priorities

Once existing Arctic research and knowledge have been compiled, and gaps identified, the next step will be to prioritize the areas of research to ensure the information most valuable to Canadian spill preparedness and response is addressed first. As the Arctic is vast and complex, research efforts will likely have to be focused on geographic areas of higher risk, where vessel traffic intersects with environmental sensitivities. We learned about numerous potential research themes from stakeholder feedback and expert studies. The following are some examples of gaps that will need to be addressed.

#### ***Fate and Behaviour of the Substances Transported Most Often in the Arctic and How to Best Respond to Them***

Understanding how oil will behave and change over time when spilled into water is critical for contingency planning and developing a response. It can be used to develop models that attempt to predict the behaviour of a spill. The fate and behaviour, as well as the toxicity, of various oils and chemicals have been widely studied—both in Canada and internationally—by private and public institutions alike. In Norway, for example, the independent research institute, SINTEF, regularly carries out field trials and experiments to broaden the knowledge available regarding the fate and behaviour of particular products. These

trials sometimes include the controlled release of oil into Norway's more remote waters, with the approval of its government. Additionally, the National Oceanic and Atmospheric Administration in the United States has initiated a number of key programs, including publicly available trajectory and modelling systems.

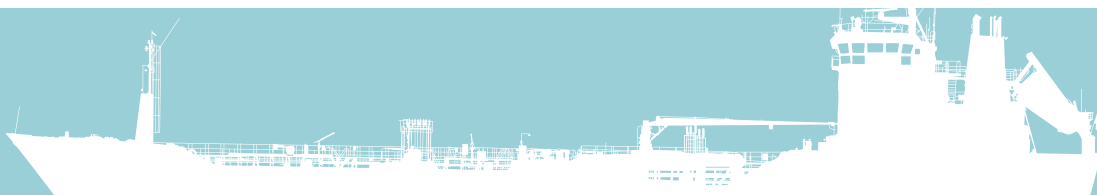
On the domestic side, Environment Canada has contributed to the body of knowledge that exists with regard to the fate and behaviour of particular products. Through its Emergencies Science and Technology Section, Environment Canada undertakes a variety of research related to releases of pollutants including: properties, behaviours, and fates of oil, fuels and other hazardous materials in the environment; effects of spills on ecosystems and habitats; use of remediation tools, including in-situ burning and spill treating agent countermeasures; and detecting and sensing the extent of spills during an incident. The results of Emergencies Science and Technology Section's research include databases of: oil properties, chemistry and behaviours; spill-treating agent effectiveness and effects; shoreline maps and sensitivity indices; and guidebooks on spill response and remediation. The Emergencies Science and Technology Section also develops and operates models that predict the behaviour of both untreated and treated oil and chemical spills. These research results, model outputs and guidance materials are used to inform incident preparedness and to develop operational plans during and post-incident.

Additionally, Fisheries and Oceans Canada's Centre for Offshore Oil, Gas and Energy Research at the Bedford Institute of Oceanography conducts research on the fate and behaviour of oil under variable environmental conditions (i.e., seawater temperatures and salinities) and sea states (i.e., wave energy and currents). Using a wave tank to simulate ocean conditions, the Centre evaluates spill treatment options and their influence on the fate and behaviour of surface and

subsurface oil spills. The Centre also develops and tests in-situ instrumentation to monitor spills and evaluate spill treatment effectiveness. Most crucially, however, the existing body of knowledge pertains largely to products that are not generally carried through the Arctic. With regard to products that are carried there—such as gasoline, marine diesel, and jet fuel—there does not seem to be a consensus on how they would behave if spilled into Arctic waters. We heard conflicting information from stakeholders regarding how they would respond to a spill of such products—a reflection of their knowledge on the products' fate and behaviour. Some advised that the best course is to let the product (such as diesel) naturally disperse, while others would attempt to contain and clean it up. These discrepancies point to some confusion and differing information on what to do during a spill. Given the remoteness of the Arctic, it is even more important for polluters and responders alike to have consistent information and know how to most effectively carry out a response. Thus, the federal government should ensure that appropriate information on fate and behaviour and response techniques for products that are most often transported in Arctic waters is available to responders, including vessel crews who may deal with operational spills. This information can feed into modelling systems in order to clearly inform responders on how to structure a safe and effective response.

### ***Detecting and Responding to Oil under Ice***

We heard that oil spill recovery under ice and in ice-infested waters requires considerably more research before proven and effective response and recovery methodologies can be developed, especially in the context of large-scale events. Some technologies for oil detection in ice-infested waters, such as synthetic aperture radar and satellite remote sensing using ultraviolet techniques, show promise, but there is currently only very rudimentary capacity to even detect oil under ice. Work in this area is currently being undertaken by both the United States Coast Guard



Research, Development, Test and Evaluation program and by European and industry partners through two rounds of the Arctic Joint Industry Program projects. The Environmental Studies Research Fund is currently funding a project for a helicopter-based remote sensing system.

### ***Testing the Effects and Effectiveness of Alternative Response Strategies***

Another area of research is the effects of dispersants and chemical herders (which act to prevent the spread of a slick) on the Canadian Arctic ecosystems and their properties during a spill clean-up. Some research has already been done on the effectiveness of bioremediation (using microorganisms to remediate environmental pollution), but there is more to understand about bioremediation in Arctic waters. Furthermore, there is still much to understand about how sea temperature, salinity, oil chemistry and marine microbial biology will impact remediation efforts.

### ***Ecosystems and Shoreline Classification***

Monitoring ecosystem conditions in advance of an incident will be critical to having the information to guide a response. There is a need to prioritize ecosystem monitoring and research of key variables along shipping corridors. An ecosystem approach allows early identification of emerging issues which might not be apparent if the focus is issue- or species-specific. Fisheries and Oceans Canada is working on the development of an Arctic Science Framework for its science sector, which focuses on ecosystem-based science. In line with this, mapping of environmental resources is a contributor to effective spill preparedness. For example, identifying and mapping species' distribution, range, and habitat in the Arctic will help to determine which areas are more sensitive to vessel movements and facilitate clean-up should there be a spill.

Finally, we heard that there is work to be done to classify the different types of shoreline across the Arctic. Environment Canada's Shoreline Clean-up Assessment Technique (also known as SCAT) is a systematic survey and documentation process already undertaken throughout Canada on selected federal marine and Great Lakes shorelines. Knowing the physical and biological properties of the coast is important as the shore composition varies from place to place, as does the resulting mechanisms necessary to properly clean up a spill. Furthermore, as sea ice recedes, more shoreline is exposed, changing classifications. Having this information in advance would help to ensure a greater understanding of the unique risks and necessary clean-up technologies that would be best suited for the area.

### ***Ocean Modelling and Monitoring***

Ocean modelling for the Canadian Arctic is a key area of research that has been identified by Fisheries and Oceans Canada, Environment Canada and the Department of National Defence. They are working together to develop an Arctic Monitoring Plan. This plan identifies the ongoing monitoring that is necessary to support emerging ocean modelling activities. It also addresses the need for real-time data collection for some parameters in the Arctic. Real-time observations are very important at critical points in the ocean and ice field so that simulation models can more accurately reflect changing environmental conditions. This ultimately helps safe navigation as well as successful clean-up and response operations in the event of an oil spill. With the lessening of ice coverage in the Arctic, there is potential for increased wave energy and changes in currents, therefore continued observations and oceanographic modelling is important. However, currently, there is no core long-term funding for the Arctic Monitoring Plan.

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## RECOMMENDATION 1-22:

**Environment Canada, in collaboration with Fisheries and Oceans Canada, territorial and provincial governments, academia, industry, and international partners, should prioritize efforts to fill the various knowledge gaps that exist pertaining to spill preparedness and response in the Arctic.**

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An initial priority should be given to increasing Canada's knowledge of the risks, fates, and behaviours of the refined products currently transported in the Arctic, such as jet fuel, gasoline and marine diesel. The obtained results should be integrated into weathering models, as well as response plans so that responders to spills in the Canadian Arctic have the best information at hand to mitigate the effects of any potential spills.

However, we recognize that Arctic research poses unique logistical challenges. Simulating Arctic conditions in a laboratory requires significant infrastructure such as large temperature controlled facilities. Field tests, with appropriate approvals and monitoring, are an important tool to study the best response techniques in Arctic conditions, as well as to help train and prepare responders for an incident. In order to properly study the effectiveness of technologies in removing or remediating oil in Arctic waters, it may be necessary to undertake field tests with actual oil releases. Currently, the *Arctic Waters Pollution Prevention Act* prohibits the release of any waste into the environment. However, it also authorizes the Governor in Council to make regulations regarding conditions under which waste, such as oil, could be deposited in the Arctic. This regulatory power has been used in the past; however, it is an unwieldy process, taking anywhere from 18 to 24 months. There could be advantages to having a rigorous yet streamlined Government authorization process to ensure that

field tests beneficial for oil spill response and preparedness can move forward in a reasonable timeframe.

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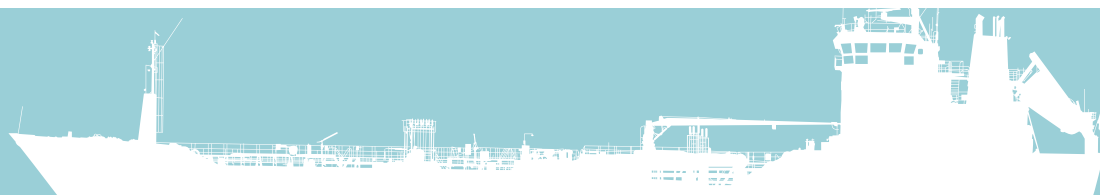
## RECOMMENDATION 1-23:

**Transport Canada, in collaboration with Environment Canada, Fisheries and Oceans Canada and Natural Resources Canada should assess the possibility of designing a rigorous yet streamlined Government authorization process, set out in regulations, to ensure that scientifically-sound field tests beneficial to oil spill response and preparedness can move forward in a reasonable timeframe, while protecting the natural environment.**

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### Building a Foundation for the Future

Our recommendations for the improvement of Arctic ship-source spill prevention, preparedness and response are based on our understanding of the scale and scope of change in shipping in Canada's Arctic. However, the Government needs to continually monitor developments, particularly vessel traffic levels in the Arctic, to ensure that additional measures are put in place when appropriate. For example, the Government of Canada will need to closely monitor Arctic shipping trends over time to determine if a mandatory pilotage regime, similar to the four pilotage areas in southern Canada, could be required for the areas at higher navigational risk in the Arctic. Another example of a program that could require additional investment in the future is the National Aerial Surveillance Program, which conducts ice and pollution surveillance flights for a few months in the Arctic each year. This program would need further capital investment in terms of logistical support (such as an aircraft hangar and maintenance equipment) to allow the program to operate over a lengthened Arctic shipping season.





In addition to monitoring the changing situation in the Arctic, in some cases, the Government will need to begin preparing and investing now for future needs. For example, the biggest, single investment that the Government of Canada will need to make in the coming decades to support marine safety in the Arctic relates to Canada's fleet of icebreakers. There are currently four medium icebreakers, three of which were built in the late 1970s and one in the early 1980s, and two heavy icebreakers, which were originally scheduled to be decommissioned in 2017 and 2020 respectively. Maintenance will be undertaken on these vessels to keep them operational for as long as possible; however, it is evident that additional ice-capable vessels will be needed to meet government service levels in the Arctic, particularly as traffic levels grow over time. This is particularly important because the Canadian Coast Guard icebreakers are one of Canada's most valuable assets when it comes to

ensuring the safe and efficient movement of vessels in the Arctic. As the fleet ages, it will become more and more challenging for the Canadian Coast Guard to respond to requests for icebreaking, vessel escorts, search and rescue, as well as to fulfill its roles of Federal Monitoring Officer and On-scene Commander in the North.

This chapter's recommendations represent our vision for how Arctic ship-source oil spill preparedness and response should be improved, based on the vessel traffic that will be present in the Arctic in the foreseeable future. However, when vessel traffic increases as new resource development projects become operational, or as a result of increased community resupply or ships transiting the Northwest Passage, the model we have outlined in this report will need to evolve. The implementation of our recommendations would lay the groundwork for this improvement by requiring all shipowners to



Photo credit: Aboriginal Affairs and Northern Development Canada

have the same minimum level of preparedness. The recommendations should also result in the identification and creation of response capacity that could be used in the Arctic.

As risks increase, and when it becomes economically viable, ship and facility owners should be required to further increase their preparedness and response capabilities. We expect that government and industry would collaborate to establish an industry-funded response capacity resident in the Arctic. This could take any number of forms (e.g., Response Organizations for the Arctic, spill response equipment cooperatives, public-private partnerships, etc.), which should be determined collaboratively between the federal, territorial, and provincial governments, and industry. Should there be offshore oil and gas exploration and/or development in the Arctic, there could be opportunities to build response capacities in collaboration with the National Energy Board and oil and gas proponents. It will be up to Government to identify and monitor the factors, indicators, and risk tolerance levels that should initiate this re-examination of our proposed preparedness and response model.

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#### **RECOMMENDATION 1-24:**

**The Government should develop a strategy to regularly monitor developments, such as vessel traffic levels in the Arctic, and to identify additional prevention, preparedness and response measures that may be required as changes in risk levels or the operating environment of the Arctic occur.**

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## **Future Risk Assessments**

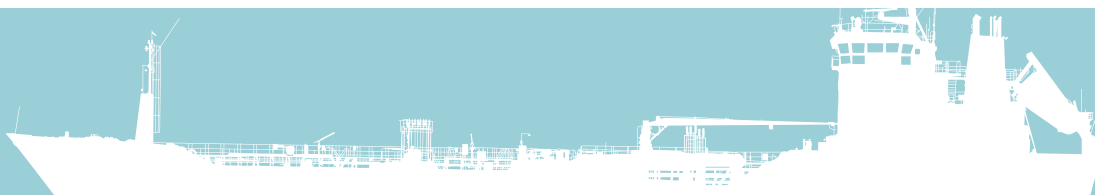
The Government's monitoring of changing needs in the Arctic should be supported by regular risk assessments. As growth in mining activities and oil and gas exploration occurs, the presence of ships in the Arctic is also expected to grow. Similarly, with population and economic growth in communities, resupply operations will increase, all of which will lead to an augmentation of the traffic in Canada's Arctic waters. Furthermore, the potential impacts of spills can vary over time, for example, given changes in the products being transported and the sensitivity of the environment to pollutants. In order to monitor these changes and the risks they generate, the Government will need to conduct regular risk assessments to assess whether current risk mitigations are meeting the changing needs. The results of these risk assessments should be made public to inform local authorities, northern communities and potential polluters, about the risks of spills in the Arctic.

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#### **RECOMMENDATION 1-25:**

**Transport Canada should regularly review and conduct risk assessments for ship-source spills in the Arctic, in order to inform policy decisions about spill prevention, preparedness and response measures for the Arctic.**

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# CHAPTER 2 HAZARDOUS AND NOXIOUS SUBSTANCES



## Introduction

### Hazardous and Noxious Substances in Canada

Hazardous and noxious substances (HNS) are moved in and out of Canadian ports every day. The International Maritime Organization defines HNS as “any substance other than oil which, if introduced into the marine environment, is likely to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the

sea.”<sup>14</sup> HNS encompasses thousands of products that are transported by ship around the world.

The marine transportation of HNS generally poses very little threat; hundreds of products are safely transported, either as bulk liquids or solids in specialized vessels or packaged and carried among general cargo on container vessels every day. A risk assessment commissioned by Transport Canada also found that the risk posed by select bulk HNS movements in Canadian waters was relatively low. Notwithstanding this result, and the fact that Canadian and

<sup>14</sup> *Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances*, 2000. International Maritime Organization, 2000.



international statistics generally point to a low historical frequency of HNS incidents, the potential impacts of a release, should one occur, could be harmful to human health (particularly in populated areas) and the environment.

### HNS Risk Assessment

In addition to other sources of information that informed our review, the results of a risk assessment of select bulk HNS movements in Canada was considered, within the context of its limitations. Although data availability limited the scope of the study to the transportation of select bulk HNS, the risk assessment found that the risk of ship-source releases of these substances, carried in bulk in Canadian waters, is relatively low. This conclusion is influenced largely by the low volumes and number of transits of HNS substances. The results are summarized in Appendix A-2.

The need for some preparedness in Canada for HNS releases in the marine environment was first identified several decades ago. In 1990, the Public Review Panel on Tanker Safety and Marine Spills Response Capability (Brander-Smith Panel) made a number of recommendations regarding the safe transportation of both oil and chemicals in Canadian waters. These included recommendations on training and certification of personnel handling chemicals, stringent standards for design, equipment and operations related to chemical substances, the creation of a national response team specializing in chemical spills, and the development of a national chemical spill response framework as well as chemical contingency plans.

In the decades that followed the publication of the Brander-Smith Panel's report, a number of attempts were made to establish a Canadian HNS preparedness and response program. However, these attempts have not been brought to a satisfactory conclusion. In the mid-1990s, Canada's Ship-source Oil Spill Preparedness and Response Regime was implemented and, thereafter, the Canadian Coast Guard began working on a Marine Chemical Emergency Response system for HNS releases. In 2004, developing and implementing an HNS program became Transport Canada's responsibility. Transport Canada identified the development and implementation of an HNS regime as a high priority in its *Sustainable Development Strategy (2007-2009)*, its *Report on Plans and Priorities 2009-2010* and its *Marine Safety Strategic Plan 2008-2015*. Despite the acknowledged need for an HNS program in Canada, such a framework has yet to be established.

The recommendations we make later in this chapter lay out the first steps in establishing a ship-source HNS incident preparedness and response program. The recommended measures are not intended to be the end point of preparedness and response in Canada, but rather the base necessary to further build industry and government capacity as risks evolve.

However, before moving to our recommendations, it is important to take note of the existing international and domestic requirements that are currently in place to reduce the risks of ship-source HNS releases, as well as the provisions for liability and compensation in the event of a release.



## International Framework for Hazardous and Noxious Substances

### Prevention

The suite of Canadian legislation and regulations that govern vessel safety, including construction standards, crew certification, inspections, navigation, vessel traffic management and pilotage, have all helped prevent major HNS incidents in Canada. Some of these domestic instruments have incorporated, or are complemented by, international codes and conventions, which address either navigation safety generally, such as the *International Convention for the Safety of Life at Sea* (SOLAS), or HNS specifically.

For example, the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* (IBC Code) and the *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IGC Code) lay out requirements for the design, construction and operation of vessels carrying certain types of HNS and specify minimum equipment to be carried on board. The *International Maritime Dangerous Goods Code* (IMDG Code) provides an international standard for packaging, containerization, and stowage, with a specific focus on the segregation of incompatible substances.

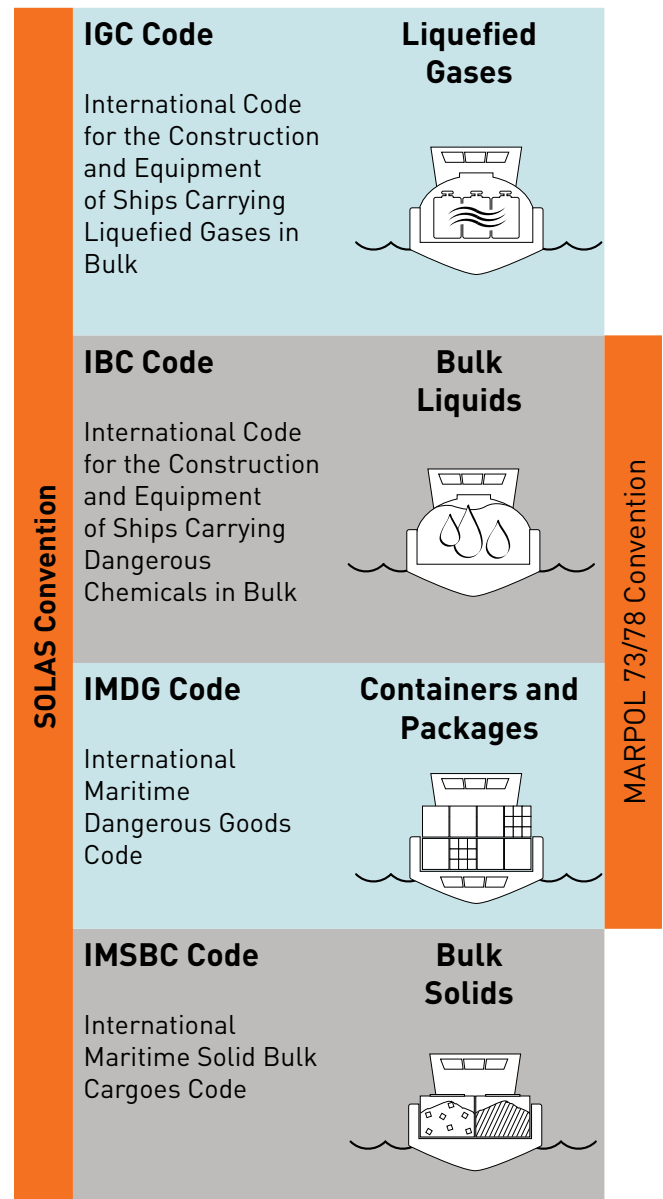
We conclude that Canada is well-served by international and domestic spill prevention measures for HNS.

### Preparedness and Response

There are some measures targeted at HNS incident preparedness and response. An Annex to the IMDG Code, the *Emergency Response Procedures for Ships Carrying Dangerous Goods*, provides guidance to enable masters and crew to respond to shipboard fires and spills involving packaged (not bulk) dangerous substances, materials or articles, or marine pollutants,

without external assistance. It is intended to aid shipowners, ship operators and other parties with developing emergency response procedures to be integrated into a ship's contingency plan. The possible dangers associated with carrying bulk cargoes such as HNS are also highlighted in the *International Maritime Solid Bulk Cargoes Code* (IMSBC Code), along with precautionary measures.

Figure 2.1 - International Standards for Carrying Cargo



In addition, Annex II of the *International Convention for the Prevention of Pollution from Ships* (MARPOL) establishes measures for the control of pollution by noxious liquid substances in bulk. It requires all vessels 150 GT or more that carry noxious liquid substances to have an approved Shipboard Marine Pollution Emergency Plan for these substances. This plan can be combined with the Shipboard Oil Pollution Emergency Plan, if the vessel is also required to have one (i.e., if the vessel is an oil tanker or a vessel 400 GT and above). However, these plans do not provide the level of detail that would be required to organize an effective response to a major HNS release.

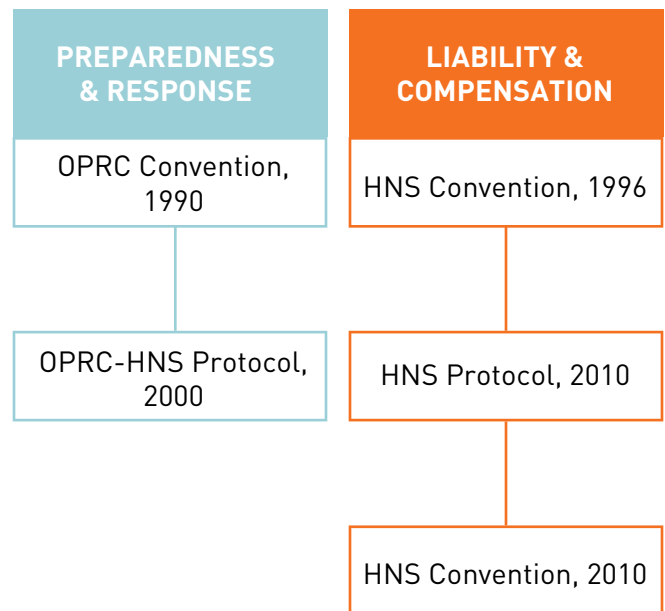
The lack of a formalized and coherent approach to HNS preparedness and response internationally has led the International Maritime Organization to renew its efforts on this, resulting in the development of the *Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000* (OPRC-HNS Protocol). The OPRC-HNS Protocol is an addition to the *International Convention on Oil Pollution Preparedness, Response and Co-operation* (OPRC Convention) and follows its main principles. The OPRC-HNS Protocol seeks to ensure that ships carrying HNS, as well as HNS handling facilities involved in handling operations to or from a ship, are subject to national preparedness and response programs similar to those already in existence for oil incidents.

The key elements of the Protocol include: requirements regarding pollution incident emergency plans for prescribed vessels, HNS handling facilities, and seaports; a national contingency plan and exercise program that includes HNS; a minimum level of prepositioned equipment; and arrangements to help coordinate and facilitate the response to an HNS incident, including international cooperation.

While Canada has not yet ratified the OPRC-HNS Protocol, some 33 countries are signatories, including Australia, Denmark, France, Germany, Japan, Norway, and Sweden.

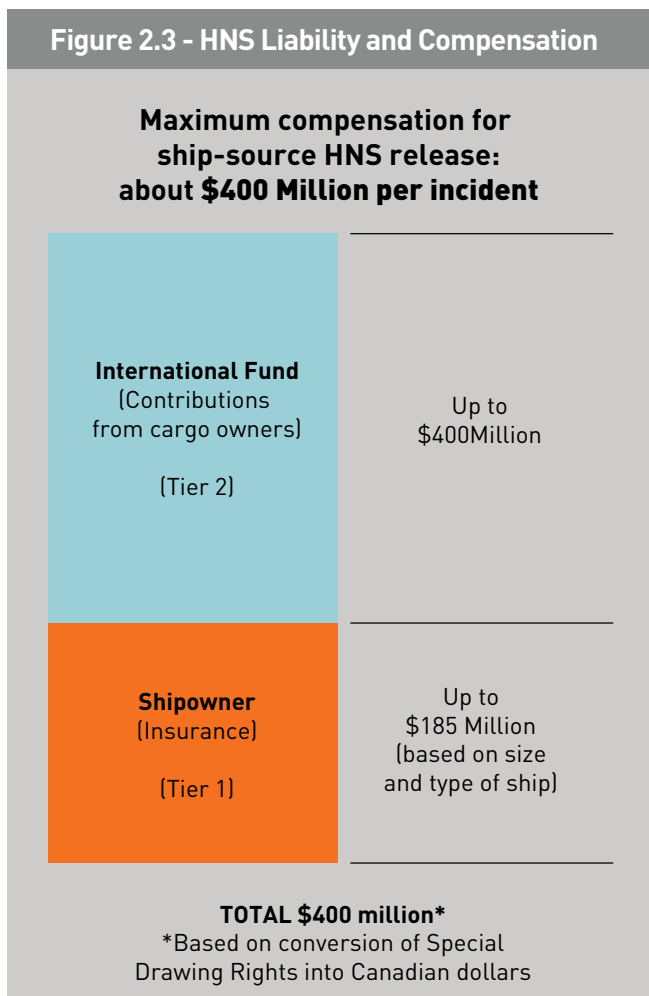
The lack of a formal preparedness and response program for HNS incidents in Canada needs to be addressed. There are strong expectations, amongst both the Canadian public and internationally, that Canada will develop and implement a preparedness and response framework for ship-source HNS releases, especially in light of the development of the OPRC-HNS Protocol. As will be outlined in our recommendations, we feel that the OPRC-HNS Protocol and its elements provide a good baseline for the development of a preparedness and response program in Canada.

**Figure 2.2 - International Regime for HNS Preparedness & Response and Liability & Compensation**



## Liability and Compensation

An international system for liability and compensation related to marine HNS transportation is also being implemented. The *International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea* (2010 HNS Convention) is based on the model that covers pollution damage caused by spills of persistent oil from tankers. Once in force, the 2010 HNS Convention will establish a two-tier system for compensation to be paid to claimants in the event of ship-source accidents at sea involving HNS.<sup>15</sup>



Shipowners would be strictly liable under the first tier in accordance with the limits of liability set out in the 2010 HNS Convention. This liability would be covered by compulsory insurance. In those cases where the insurance does not cover an incident, or is insufficient to satisfy the claims, compensation would be paid from a second tier comprised of an international fund, made up of contributions from the receivers of HNS. Contributions will be calculated according to the amount of HNS received in each Member State in the preceding calendar year.

Where damage is caused by HNS in bulk, the shipowner would normally be able to limit its financial liability to an amount between 10 million and 100 million Special Drawing Rights (SDR) of the International Monetary Fund (approximately \$16 million to \$160 million), depending on the gross tonnage of the ship. Where damage is caused by packaged HNS, the maximum liability for the shipowner is slightly higher, up to 115 million SDR (approximately \$185 million). The HNS Fund would provide an additional tier of compensation up to a maximum of 250 million SDR (approximately \$400 million), including any amount paid by the shipowner and its insurer.

The 2010 HNS Convention covers damage in the territory or territorial sea of a State party to the Convention. It also covers pollution damage in the exclusive economic zone, or equivalent area, of a Member State, as well as damage (other than pollution damage) outside the territorial sea of any State caused by HNS carried on board ships registered in the flag of the Member State. The following types of damage will be covered:

- Loss of life or personal injury on board or outside the ship carrying the HNS;
- Loss of, or damage to, property outside the ship;
- Economic losses resulting from contamination, (e.g., in the fishing, mariculture and tourism sectors);

<sup>15</sup> It should be noted that the definition of HNS in the OPRC-HNS Protocol differs from the definition of an HNS under the HNS Convention, as the latter includes non-persistent oils for which there was previously no international compensation regime (although Canada's Ship-source Oil Pollution Fund covers both persistent and non-persistent oils).



- Costs of preventive measures; and
- Costs of reasonable measures of reinstatement of the environment.

The 2010 HNS Convention will not apply to oil pollution damage from tankers, as defined in the *International Convention on Civil Liability for Oil Pollution Damage, 1992*, nor to loss or damage as covered by the *International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001*. Loss or damage caused by radioactive materials is also excluded.

Canada is taking the steps necessary to join the 2010 HNS Convention through proposed amendments to the *Marine Liability Act*, which, at the time of writing this report, were before Parliament. The Convention would come into force 18 months after 12 countries have signaled their intent to join. We conclude that Canada will be adequately served by its participation in the international 2010 HNS Convention and see no evidence that Canada would require a supplementary domestic fund.

### **Anatomy of a Response to Hazardous and Noxious Substances Incidents at Sea**

Although every incident is unique, we note that there are important differences in how incidents involving HNS releases tend to unfold in comparison to those involving oil spills. As context for our recommendations, we note it is important to understand the basics of a ship-source HNS release.

In the context of oil spills, 'response' is often synonymous with mechanical removal of the oil from the marine environment. This is particularly true in the Canadian context, where alternative response techniques (e.g., use of dispersants, in-situ burning) are not currently permitted for use by responders due to legislative impediments. However 'response' and 'removal' are not synonymous in the context of HNS incidents. Out of the thousands of HNS transported by ship,

either in bulk or in some means of containment, very few can physically be removed once they are introduced into the marine environment. The response to an HNS incident is often very different from that of an oil spill, primarily because these substances vary greatly by physical and chemical composition, fate, and behaviour. HNS have varying degrees of toxicity, water incompatibility, and flammability.

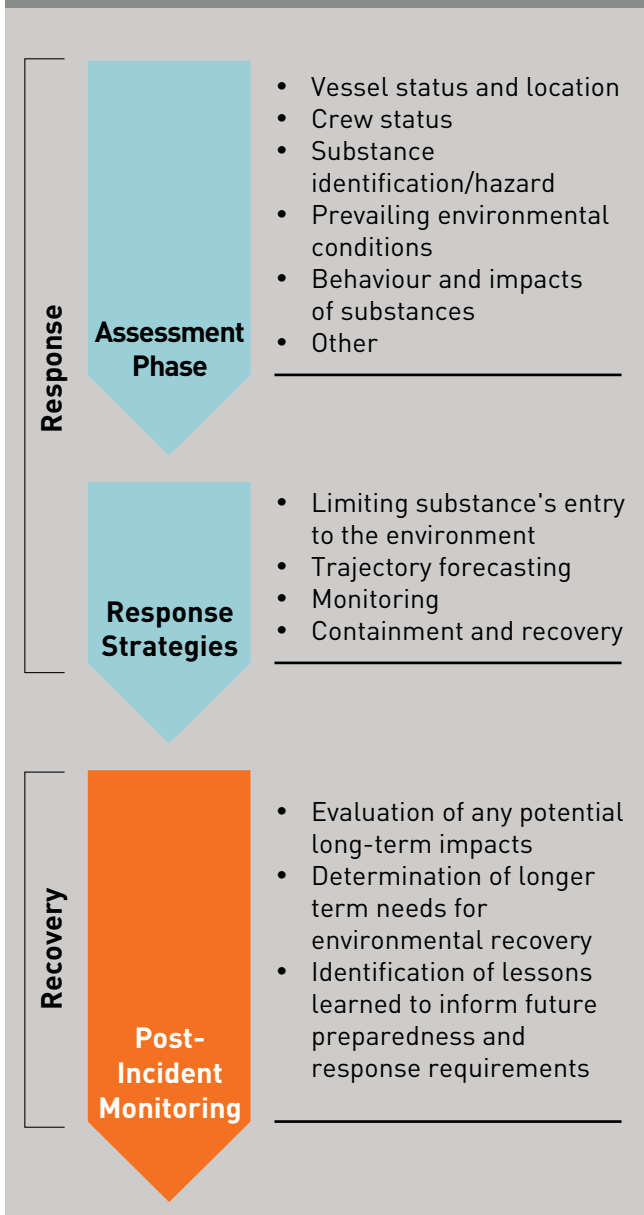
### **Initial Assessment**

Arguably the most important phase of an HNS incident response is the timely and rapid initial assessment upon which subsequent response strategies will be based. During this preliminary phase, responders identify the variables crucial to a successful and safely executed response. These variables can include factors such as:

- Crew status;
- Vessel status and location;
- Prevailing environmental conditions;
- The hazardous properties of the substance(s) released into the environment;
- The substance(s) predicted behaviour in, and impacts on, the marine environment;
- Potential impacts on urban centres in the vicinity; and
- The appropriate level of personal protective equipment that is necessary to ensure responders' safety.

This phase is crucial, as the chosen response strategy will vary greatly depending on a number of factors, including: whether the substance released tends to evaporate, dissolve, float or sink; and, if more than one product is released, how those products interact together, as well as with any fuel that may have been spilled in the same incident.

**Figure 2.4 - Anatomy of a Response to an HNS Incident at Sea**



from the vessel or transferring cargo within the vessel, which are the primary methods for preventing further release into the environment. If a substance is spilled on deck, containment is another option to prevent spillage into the water. This can involve using sorbents, booms and other materials. If the substance released has produced toxic vapours, the vessel can be manoeuvred to position the accommodations upwind to protect the crew from inhalation hazards.

### Forecasting Spill Trajectories

One of the main response strategies for HNS is to forecast the trajectory of substances that are released. This activity enables responders to identify the potential path of the substance and any sensitive resources that could be affected. Once the trajectory is known, responders can implement appropriate protection measures, such as the evacuation of a populated area in the case of a toxic plume. Trajectory forecasting can be done for evaporators, floaters and dissolvers. These forecasts are typically generated by sophisticated computer models that are available commercially or developed in-house by government agencies who have invested in such technologies.

### Monitoring

In many instances, depending on the nature of the substance and its projected behaviour, real time atmospheric and water column monitoring may be the only feasible tools to inform a broader response strategy, or may be the only response action required. Monitoring consists of analyzing the substance's toxicity and concentration in the immediate vicinity of the spill, which is necessary to ensure the safety of crew, responders and any residents in nearby areas. The monitoring process can be facilitated by specialized detectors that monitor air quality, by taking water and sediment samples, or by simple visual observation (if, for example, a 'floater' substance is coloured and easy to see).

### Response Strategies

#### Limiting Entry into the Environment

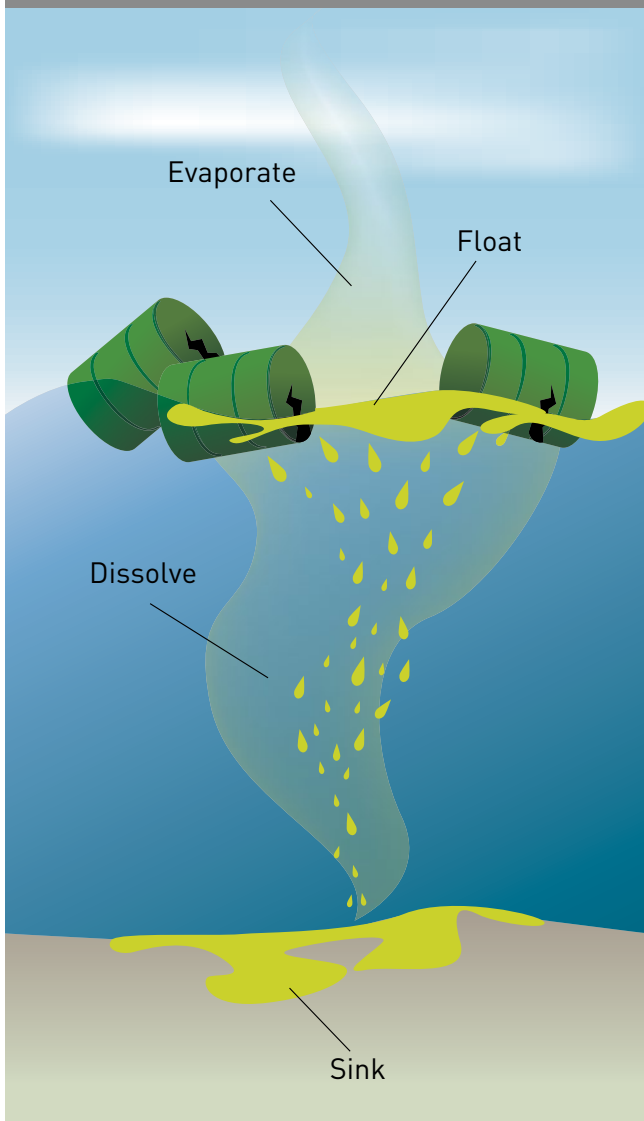
Depending on the results of the assessment phase, the next step during a response is to prevent or limit the substance's entry into the environment. This could involve lightering cargo





This response method is typical for evaporating and dissolving HNS, some of which can be extremely volatile, and/or may generate a toxic vapour cloud upon release.

Figure 2.5 - HNS Behaviours at Sea



### Containment and Recovery

For HNS that float on the water surface and/or sink to the seabed, the optimal strategy may be containment and recovery. Where it is possible to remove the pollutants that could sink to the

seabed, or at least a portion of them, this is preferable because these types of substances have the potential to contaminate the seabed and to persist in the sediment. This response strategy utilizes similar technological tools as an oil spill response, including booms, skimmers, absorbents, hoses, and storage tanks—but only if such equipment is compatible in the context of an HNS release.

### Containerized Cargo

An incident involving containerized transportation of HNS will often result in damaged containers, or containers being lost at sea. Response to a damaged container on board a ship will typically involve crew members unless they require external assistance. The initial action would be to plug or contain a leak from a container until the ship reaches a port where the damaged container could safely be removed from the vessel. Operations can be more complex when containers fall overboard. In this case, the assessment would need to identify the substances in the container(s), the hazards from these substances, and the expected behaviour and trajectory of the container (e.g., whether it will float or sink). Floating containers can be recovered using nets or cranes, or by being towed to a safe location.



Response to sunken containers will be more complex as they will need to be located using sonar and eventually recovered using divers, cranes or remotely operated submersible vehicles. In both cases, once containers are recovered, their hazardous or noxious contents will need to be contained or recovered under the supervision of specialized hazardous materials teams.

The major challenge presented by incidents involving containerized HNS cargo is that many different types of hazardous substances are transported side by side on the vessel. Given that interactions between certain substances can result in a highly volatile and/or toxic reaction, the presence of hundreds of different HNS may present a severe hazard not only to potential responders, but also to any surrounding populations. The assessment phase is again crucial when it comes to these types of incidents. Responders must obtain a detailed picture of what HNS are on board and how they may react.

### ***Environmental Considerations***

In addition to health and safety concerns, environmental considerations are critical to every decision made during a response. Because HNS and their effects on the environment have been studied less than the effects of petroleum products, monitoring programs implemented during a response are one of the best ways to assess the potential and actual damage of a spill to the surrounding environment and determine the most effective response strategies. In addition, knowledge about the hazard level of a substance can aid responders by providing the rationale for the substance's removal and/or by helping them determine which areas and ecosystems will be most impacted by the release of the HNS.

### ***Post-incident Monitoring***

When all that can reasonably be done as part of the response phase is completed, the recovery phase commences. Post-incident monitoring is conducted to evaluate long-term impacts, track the longer term needs for environmental recovery, and ensure that preparedness and response approaches continue to evolve based on lessons learned from past experiences to reduce the environmental, human health, and socio-economic impacts of HNS incidents.

## **A Canadian Hazardous and Noxious Substances Program**

The recommendations that follow lay out a measured approach to enhancing Canada's preparedness for and response to ship-source HNS releases. While there are various prevention measures in place, and a number of government programs can be leveraged, we are cognizant that a preparedness and response program for HNS would be built from the ground up. There are few models established internationally upon which to model a national HNS program. It will take time and new resources to build capacity in Canada. It will necessitate building linkages between the marine industry (with its expertise in emergency response on water), chemical producers (with their expertise in product behaviour), and the land-based hazardous materials response community (with its expertise in the response to these types of incidents). For the most part, these linkages do not exist formally today.

Our approach reflects our view that the shipping industry and the producers of HNS share joint responsibility for the risks they create, and that they should therefore each play a role in preparedness and response. While shipowners should have plans in place that identify the response resources they would call upon to respond to an HNS release, the HNS producer industry should be proactive in vetting the level of preparedness available in the responder community.



Our proposed approach for HNS shares similarities with the current Emergency Response Assistance Plan program under the *Transportation of Dangerous Goods Act* and its regulations. This program currently requires industry to have Transport Canada-approved response plans before importing or transporting certain dangerous goods (i.e., those dangerous goods of a certain quantity or concentration). The plans must also outline what is to be done to respond to an actual or anticipated release of the dangerous good.

Unlike oil, there are many different types of HNS products being shipped (well into the thousands). The diverse behavioural properties of each substance create preparedness and response complexities not seen for oil. Using a certified Response Organization model (as is the arrangement for oil spill response south of 60) is not considered to be a viable approach. The preferred model, from our perspective, is to increase requirements for the ship and facility owners to identify, in a plan, the suite of potential response options, tactics and equipment that could be employed from multiple providers depending on the incident and products involved. We also find that, given the complexity of the technical aspects of HNS response, shipowners should appoint a shore-based coordinator to provide advice on or coordinate the response, and liaise with government officials.

In our first report, we recommended that spill planning should be based on risks specific to a geographic area rather than an inflexible one-size-fits-all approach. This perspective led us to outline an Area Response Planning model, where the key players leading or overseeing a potential response are responsible for determining the specific risks of a particular geographic area (e.g., type of product being transported, in what volumes, navigational risks, environmental sensitivities, etc.) and engaging all the necessary players who hold key planning information and/or may have a supporting role in the response.

## Transportation of Dangerous Goods Program

Canada currently legislates the transportation of dangerous goods by all modes of transport within Canada. Dangerous goods is a broad classification comprising products and substances such as explosives, gases, flammable liquids and solids, oxidizing substances and organic peroxides, poisonous and infectious substances, nuclear substances as well as other substances posing a threat to people and the environment, as defined by Canada's *Transportation of Dangerous Goods Act, 1992*. Most dangerous goods would be considered HNS under the definition provided by the International Maritime Organization.

The Transportation of Dangerous Goods Directorate within Transport Canada is responsible for the development and the enforcement of regulations for the safe transportation of dangerous goods in Canada. Regulations establish standards and requirements for the containment of dangerous goods, as well as the training of personnel handling such products and substances. Regulations also require any person either offering certain dangerous goods for transport or importing them to have an Emergency Response Assistance Plan that is approved by Transport Canada. The plan describes the actions to be taken in the event of an incident involving dangerous goods in order to ensure that adequate resources and equipment are available to respond efficiently and in a timely manner. Transport Canada also conducts regular inspections of facilities where dangerous goods are handled.

The Transportation of Dangerous Goods Directorate also operates the Canadian Transport Emergency Centre (referred to as CANUTEC), which provides information on dangerous goods. CANUTEC can assist in the event of an incident involving dangerous goods by providing advice to emergency responders.

In reading our proposals for HNS, there may be some confusion as to whether we are abandoning our proposed Area Response Planning model. This is not the case. The process we are recommending is the same: it is both risk-based and geographically-based, and it involves all necessary public and private players holding key planning information and/or having a supporting role in the response. What is different, as a function of the nature of HNS, is the level of detail of the plans that result from that planning process, as well as the level of involvement of various segments of industry. In the case of the oil industry south of 60, shipowners are supported in the planning function by their relationships with certified Response Organizations, which are tied to defined areas of response and can plan—down to a tactical level—for possible response scenarios. Given the variety of HNS being shipped and their diverse behavioural properties, planning in the case of HNS lends itself towards building a menu of response capabilities that may be called upon as needed for the specific characteristics of an HNS incident. Thus, the outputs of HNS planning would be:

- Vessel plans and HNS handling facility plans, identifying the varied suite of response options that may be required and where those capabilities can be accessed.



- Regional plans, led by the Canadian Coast Guard, that support and complement industry's plans for the response to HNS releases.

### The Role of the Canadian Coast Guard in HNS Incidents

Under the *Canada Shipping Act, 2001*, in the event of a ship-source pollution incident, the Canadian Coast Guard is responsible for monitoring the response and using its authorities and powers to ensure the response is appropriate. This is equally applicable for both ship-source oil spills and for ship-source releases of HNS.

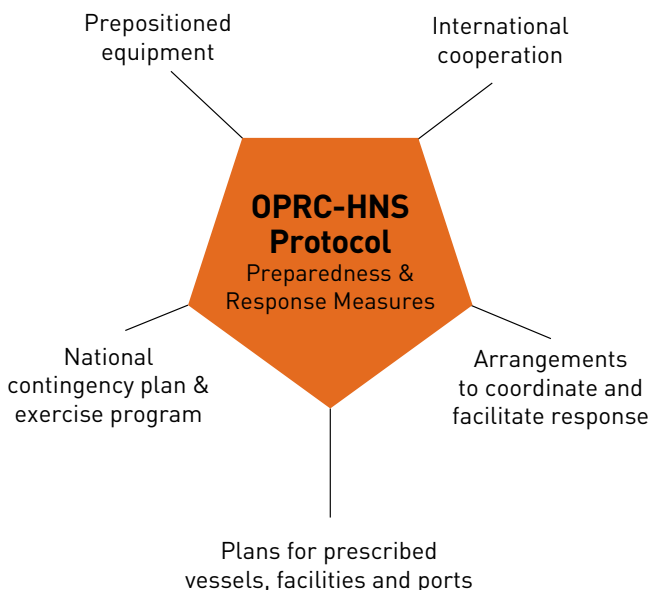
Just as industry, over time, will need to build its preparedness and response capacity to fulfill its plan requirements, so too will the government departments and agencies that oversee and support the proposed program. The Canadian Coast Guard's mandate to ensure appropriate responses to marine pollution incidents applies equally to HNS releases as it does to oil spills. It will require incremental new funding to build its knowledge, expertise and capacity to carry out this mandate, as well as to integrate HNS considerations into regional plans. Transport Canada will require incremental resources to properly oversee the new regulated requirements of the program, and Environment Canada and Fisheries and Oceans Canada require sustained funding to build their capacity to provide the scientific advice needed to support response operations. Furthermore, the nature of HNS integrates a new set of federal participants. Health Canada and the Public Health Agency of Canada will play a role in incidents where there are potential public health impacts. Their activities can include providing: scientific advice and risk assessment for public health consequence management; surge capacity for analytical laboratory support to measure levels of





known contaminants; surge capacity for medical countermeasures, supplies and personnel in support of local medical authorities; and public health advisories, alerts and warnings. They can also assist in addressing the recovery component by providing support, where appropriate, for long-term public health consequences. In addition, Public Safety Canada can coordinate federally and intergovernmentally with provincial and territorial governments.

Finally, we emphasize that the proposals and recommendations that follow do not establish the end point of HNS preparedness and response in Canada. These are initial steps to build capacity and move the yardstick, so to speak, of preparedness and response for HNS in Canada. As a better understanding of HNS shipping risks in Canada develops, the approach we propose can be scaled to adjust to those risks, and as they evolve, the Government should regularly reassess the adequacy of preparedness and response capacity.



## Canada's Accession to the OPRC-HNS Protocol

As discussed earlier, the OPRC-HNS Protocol is an addition to the OPRC Convention, and follows its main principles. The OPRC-HNS Protocol aims to ensure that there are preparedness and response measures in place around the world to protect against pollution from ships carrying HNS. These measures are similar to those already in place for ship-source oil spills, and include:

- Pollution incident emergency plans for prescribed vessels, HNS handling facilities, and seaports, as deemed appropriate;
- A national contingency plan and exercise program that includes HNS;
- A minimum level of prepositioned equipment;
- Arrangements, including communication procedures and coordination mechanisms, to help coordinate and facilitate the response to an HNS incident; as well as
- International cooperation with respect to all aspects of HNS preparedness and response.

To date, Canada has not signed on to the OPRC-HNS Protocol.

The OPRC-HNS Protocol provides a basic framework for the development of a national program for HNS preparedness and response. Canada's national program for HNS preparedness and response should, in our view, be built around the elements of the OPRC-HNS Protocol. Canada should take the necessary steps, many of which are outlined in subsequent recommendations, to accede to the OPRC-HNS Protocol.



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## RECOMMENDATION 2-1:

**Canada should take the necessary steps to accede to the OPRC-HNS Protocol, including developing a national HNS preparedness and response program.**

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### Preparedness and Response for Vessels and Facilities

As is the case for oil spills, the primary responsibility for preparing for and responding to ship-source HNS releases rests with the potential polluter. As a result, vessels carrying HNS and facilities involved in the handling of HNS between facilities and ships should have the appropriate plans in place to respond to HNS releases.

Under the international conventions, there are provisions that require vessels of 150 GT and above carrying bulk liquid HNS to have a

Shipboard Marine Pollution Emergency Plan on board. These plans must include a procedure to report both spills and incidents that could lead to a spill, to the nearest coastal country as well as up-to-date 'points of contact' lists for organizations that would be contacted in case of a spill. The plans must also give clear guidelines to the ship's personnel on how to control discharges.

Although useful, these current plans provide far less detail and the identified capacity is well below that defined for oil spill preparedness in Canada. Further, HNS is carried in Canadian waters in many forms, not just liquid bulk, and we consider that shipowners should also be prepared to respond to incidents involving solid bulk HNS that may be carried in dry bulk carriers and on barges, as well as HNS that is carried in smaller packages, often within containers on board large cargo vessels. The latter may benefit from guidance provided through the International Maritime Organization's *Emergency Response Procedures for Ships Carrying Dangerous Goods*. However, the remaining vessels (i.e., those carrying solid bulk HNS) are currently only required to have a plan to deal with a spill of the fuel used to propel the vessel.

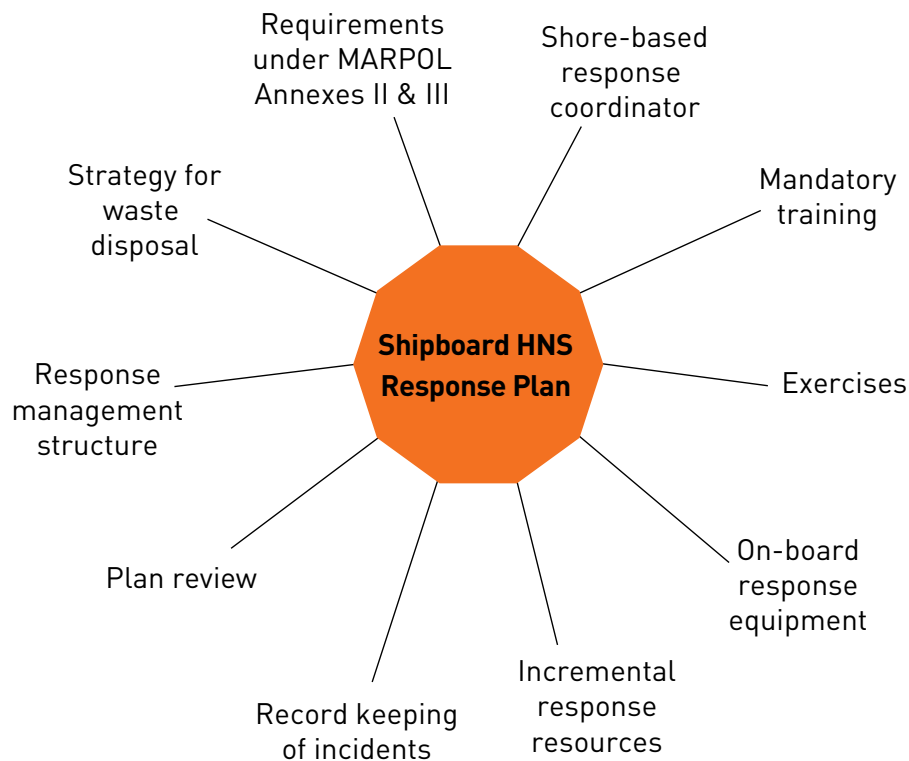
Although the risks related to HNS releases in Canada overall are relatively low, given the potential impacts that HNS can pose to human health and the environment, the Government of Canada should expand the requirement for shipboard emergency plans to include all vessels of a prescribed size and class, involved in carrying HNS. The size and class of vessels that would be required to have these plans should be determined in consultation with industry. However, it is our view that the requirements should cover not just bulk liquid carriers, but also dry bulk carriers, barges and container ships.

In addition, there are several elements not currently included in the Shipboard Marine Pollution Emergency Plans required for bulk liquid carriers that we consider should apply to all



vessels transporting HNS to help ensure an appropriate response to an incident, should one occur. We propose that ships transporting HNS be required to have a Shipboard HNS Response Plan that includes the following elements:

- The identification of a shore-based response coordinator appointed by the shipowner, who would possess the competencies, knowledge and experience to:
  - Advise, or coordinate the response on behalf of the shipowner in the event of an HNS incident.
  - Serve as a liaison between the Government of Canada and the shipowner to facilitate the timely transfer of critical information, such as the cargo manifest and stowage plans.
- The identification of response resources which, in the event of an HNS incident that cannot be managed by the resources available on board the ship, could be used to respond, including the services that municipalities may be able to bring to bear while the ship is in port. These resources could either be provided by the shipowner or through a contract with an emergency response contractor.
- A mandatory training plan for the crew.
- An exercise program that includes regular exercising of the emergency procedures, ideally including the crew and other necessary parties, such as the shore-based response coordinator and local first responders.
- On-board equipment so that vessels can deal with small incidents that are contained within the vessel.



- A record, maintained aboard the vessel, of any pollution incidents.
- The review of the plan at regular intervals and after any event where the plan is initiated. All changes made to the plan as a result of these reviews should be tracked.
- A description of the incident management system that would be used in the event of an HNS incident.
- A strategy for the disposal of wastes associated with an HNS release.

These elements would help build much stronger capacity in the marine transportation industry, as well as the emergency response industry, to be able to address HNS incidents in Canadian waters.

### Refining the Legal Definition of HNS for Canadian Regulations

The international definition of HNS included in the OPRC-HNS Protocol is very general. It can be interpreted to include thousands of substances ranging from dangerous chemicals such as sulphuric acid to relatively benign materials such as iron ore. It also includes both bulk HNS and packaged HNS carried in cargo containers. When implementing our recommendations and developing the required legislation and regulations, the Government of Canada will likely require a more precise definition of HNS. We firmly believe that this definition needs to be developed via a thorough consultation process with both industry and the public. While we do not provide a definition for HNS in this report, we conclude that any legal definition should include both bulk and packaged HNS and should be broad enough to include any substance that could cause harm to people or the environment.

### RECOMMENDATION 2-2:

**Transport Canada, in consultation with industry, should require vessels of a prescribed size, type and class that carry HNS, either in bulk or packaged forms, to have a Shipboard HNS Response Plan. This plan should include all of the requirements currently outlined under MARPOL Annexes II and III, as well as additional requirements, such as: a shore-based response coordinator; identification of response resources; preparedness activities, such as training and exercises; on-board equipment; a waste disposal strategy; record keeping; and an incident management system to be used during a response.**

As outlined in the OPRC-HNS Protocol, facilities involved in moving HNS to and from ships should also have HNS Response Plans. The *Canada Shipping Act, 2001* already outlines the requirements for oil handling facilities to have emergency plans. Similarly, such requirements should exist for HNS handling facilities, including those that handle bulk and packaged HNS. Elements of the HNS handling facility plans could include:

- The policies that the operator of the facility will follow in the event of an HNS incident;
- A description of the activities that will be carried out in the event of an HNS incident;
- A list of resources, including the types and quantity of equipment for use on scene during a response to an HNS incident at the facility;
- Contact information for third party responders;
- Details of the training and exercise program for staff of the facility; and
- Health and safety protocols.



Transport Canada will need to develop classes of HNS handling facilities, as it has done for oil handling facilities. Classes could be defined based on risk factors such as the type of operation (container handling terminals, bulk liquid, and solid HNS handling facilities) and volume and type of HNS handled.

In developing these new requirements, Transport Canada should work closely with Environment Canada. Environment Canada's existing *Environmental Emergency Regulations* under the *Canadian Environmental Protection Act, 1999*, promote proper environmental emergency planning for Canadian facilities that use or store select hazardous substances. The regulations also apply to specified substances located at terminals/facilities at ports and to the loading and unloading of specified substances at terminals/facilities in Canada.<sup>16</sup>

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### RECOMMENDATION 2-3:

**Transport Canada should require HNS handling facilities of prescribed classes (to be determined through consultation with industry) to develop HNS Response Plans to ensure adequate response to pollution incidents that could occur during the handling of HNS between a vessel and a facility.**

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By mandating these HNS Response Plans for HNS handling facilities, Canada would meet the OPRC-HNS Protocol's requirement for facilities to have plans. It would also be of great benefit for

HNS handling facilities to involve municipalities in the development of their HNS Response Plans.

### Oversight and Accreditation

We recognize that Transport Canada has extensive experience in developing oversight programs aimed at ensuring compliance with both international transportation law and Canadian transportation legislation and regulations. This experience includes several oversight programs in the area of marine safety related to control of domestic and foreign vessels, marine personnel qualification and certification and protection, control of marine infrastructure, and maritime domain awareness and protection. While the oversight program for oil spill preparedness and response that we recommended in our first report is well-suited for the oil regime south of 60, which is highly regulated and in which response capability is certified, we envision the oversight program for HNS preparedness and response being modelled in a different manner.

We believe an oversight program that would be most appropriate for HNS is one that would follow more closely the models and expertise that are already in place for the road and rail sectors, with regard to Transport Canada's oversight of the transportation of dangerous goods. Under the Transportation of Dangerous Goods Program, Transport Canada oversees compliance with the requirement to have an Emergency Response Assistance Plan. Transport Canada reviews the Emergency Response Assistance Plans to ensure applicable requirements are met and to determine the overall quality of the plan. While there are key differences between the regulatory regimes for the transportation of dangerous goods and those being proposed here for the marine transportation of HNS, we feel that a similar regulatory approach, one that focuses on the plans of the ship and facility owners (rather than a certification process such as the one in place for the Response Organizations for oil spills

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<sup>16</sup> Environment Canada's *Environmental Emergency Regulations* (E2 Regulations) outline the HNS that, under various conditions such as contact and/or inhalation, can become toxic to humans. These substances are generally referred to as 'E2' substances, and include those that were used in the risk assessment we considered for this report, such as benzene, ethylene, propylene, and ammonium nitrate. Toxicity to humans and chemical behaviour (such as potential to explode) are the two main factors by which the substances are categorized.

south of 60), will provide a substantial increase in the level of preparedness and capacity to respond to HNS incidents in Canada.

At a minimum, Transport Canada would need to review plans to ensure that a ship or facility owner has developed a plan that meets the required criteria. For example: does the shipowner's plan identify a shore-based coordinator as well as response resources? Are provisions made for training and exercises? The assessment of the overall quality of the plans would need to determine if they are appropriate to the specific owner (i.e., shipowner or facility owner) and if the response resources identified in those plans are suited to the task. As with any new regulatory system, a measured approach will help promote capacity over time.

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#### **RECOMMENDATION 2-4:**

**Transport Canada should develop an appropriate oversight program to ensure compliance with the new requirements regarding HNS Response Plans for ships and facilities for ship-source HNS incidents.**

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Although oversight of regulated activities is properly a government responsibility, we believe that the effectiveness of this function can be augmented significantly through new industry verification or accreditation programs. Canadian and international companies that produce HNS have critical technical knowledge about the nature, behaviour, and impacts of their products, as well as the response tactics that are the most effective. They therefore have an important role to play in making sure their knowledge feeds into and offers another level of assurance regarding preparedness.

In studying what industry has done in terms of preparedness for incidents involving dangerous goods, we were particularly impressed with the proactive stance taken by the Chemistry Industry

Association of Canada over the past several years. The Association has long been a proponent of 'Responsible Care' and its members are required to choose the safest mode, route and carrier possible to move their products. As part of Responsible Care, the Chemistry Industry Association of Canada conducts independent verifications of its member companies and their transportation partners every three years. The Association leads 'verification teams' composed of industry experts, public advocates and representatives chosen by local communities. All verification reports, including identified areas for improvement and requirements for corrective action, are published on the Chemistry Industry Association of Canada's website.

In more recent years, the Association has developed a Transportation Emergency Assistance Program (TEAP or TEAP III as its latest version is known). Under the program, all Association members must meet two standards, which together seek:

- To establish minimum requirements for each member company's Transportation Emergency Response Plan.
- To ensure that companies confirm that their transportation emergency response provider is capable of responding to their specific commodities and means of containment.

This is just one example of a model (albeit a land transportation model for now) that could be encouraged at the intersection of the HNS production and marine transportation sectors.

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#### **RECOMMENDATION 2-5:**

**Transport Canada should encourage domestic industry associations to strengthen verification and accreditation programs for their members involved in the marine transportation of and response to ship-source incidents involving HNS.**

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## A National Contingency Plan

Article 4 of the OPRC-HNS Protocol requires signatories to establish a national system for responding swiftly and promptly to pollution incidents, which would include, at a minimum a national contingency plan. The Canadian Coast Guard has a *Marine Spills Contingency Plan*, in which the *National Chapter* applies to marine pollution incidents occurring in Canadian waters. In addition, Transport Canada has the *Environmental Prevention and Response National Preparedness Plan*, which details the preparedness capacity of the marine spill response regime. However, both of these plans principally outline the organizations' respective roles and responsibilities for a ship-source oil spill incident, and do not specifically address governance of an HNS incident.

To ensure that all interested parties (all levels of government, industry, ports, the public, etc.) are aware of roles and responsibilities for preparing for and responding to an HNS incident, this information should be outlined in an overarching national contingency plan—either as part of the existing *Marine Spills Contingency Plan*, or as a standalone plan for HNS. This would be a high level plan for incidents of national significance, and would not replace operational plans by industry. The national plan should include details on governance, roles and responsibilities, training and exercise requirements for the Canadian Coast Guard, resources, cost recovery and financial measures, and response capacities that can be contracted in the event that the Canadian Coast Guard becomes the On-scene Commander (i.e., when the polluter is unknown, unwilling or unable to respond). Given the particularities of HNS events and depending on the nature of the emergency, other federal government organizations such as Environment Canada, the Public Health Agency of Canada and Health Canada should also be designated as either primary departments or supporting departments, under the purview of the Federal

Emergency Response Plan. As the coordinating department for the Federal Emergency Response Plan, and with its links to provincial emergency management organizations, Public Safety Canada should work closely with the Canadian Coast Guard, Transport Canada, provinces and territories to support planning and readiness activities.

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### RECOMMENDATION 2-6:

**The Canadian Coast Guard, in collaboration with Transport Canada, Environment Canada, Public Health Agency of Canada, Health Canada and Public Safety Canada, should lead the development of a national contingency plan for ship-source releases of HNS that are of national significance.**

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### Regional Planning

In line with our first report, we are of the view that planning for ship-source releases of HNS needs to take into account the differences that exist between regions in Canada in regard to vessel traffic, movements of HNS, as well as environmental and socio-economic factors.

The Area Response Planning model detailed in our first report, and more particularly planning for oil spills, lends itself to a *scenario-based* approach. Tactical plans can be developed that outline how oil spills will be addressed with booms, skimmers and alternate response techniques under a limited set of possible scenarios. On the other hand, the varied types of HNS being shipped and their diverse behavioural properties create additional complexities—the potential release scenarios for HNS are virtually endless. The preferred model is to build contingency scenarios that cover a suite of response options, tactics and equipment that can be called upon, like a menu, during the initial assessment of and response to an HNS release.

The Canadian Coast Guard should lead regional planning, which would be an adapted version of the Area Response Planning process outlined in our first report. In the context of HNS, the objective would be to understand the general marine movements of HNS within a region, and who would be involved in a response, including representatives from industry, private sector responders, local first responders, and federal monitors. This approach is, in our view, commensurate with the risk involved in HNS incidents as well as the nature of HNS incidents.

The regional plans would detail how the combined resources from various jurisdictions (federal, provincial, territorial, municipal, industry, etc.) may be activated and brought together in a timely manner to respond to a ship-source HNS incident. This would include the identification of the roles and responsibilities of local stakeholders, such as law enforcement, public health services, fire services, hazardous materials team, and the manner in which they would be integrated in the response. This could also include a list of similar organizations in the United States, with which there may be mutual aid arrangements for emergencies.

For regional planning to be effective, it is critical that local stakeholders be provided the opportunity to be involved in the planning process. We encourage the Canadian Coast Guard to build on and apply the established networks, knowledge and resources developed from the Area Response Planning process (for oil spill preparedness and response) to the HNS planning process. Given the role that local responders and government agencies may have to play in the areas of public health and safety, the Canadian Coast Guard should actively seek the collaboration of local stakeholders, such as ports, communities, local public health services, fire services, environmental agencies, police departments (for evacuations and establishing safety perimeter lines), and other levels of government in the regional planning. Close linkages with Public Safety Canada should also be

used to integrate planning efforts with provinces, territories, and their emergency management organizations. These partners' contributions to ship-source HNS releases should be reflected in the regional plans.

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## RECOMMENDATION 2-7:

**The Canadian Coast Guard should lead regional planning for ship-source releases of HNS, in collaboration with Transport Canada. The Canadian Coast Guard should invite other relevant stakeholders and communities to participate in the regional planning process, and should make the regional plans available to the public.**

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### Canadian Coast Guard Capabilities

Due in part to the low incidence of HNS spills in Canadian waters, the Canadian Coast Guard does not currently possess the expertise required to adequately fulfill its role as Federal Monitoring



Officer or On-scene Commander in the event of a major HNS release. Since the majority of the pollution incidents reported to the Canadian Coast Guard involve oil spills, the practical experience related to HNS incidents is difficult to obtain and maintain. Nonetheless, it is critical that the Canadian Coast Guard have sufficient knowledge of the intricacies and complexities of an HNS incident (e.g., public health and safety, roles of local emergency management services, general HNS response options and tactics, etc.). Building on this knowledge and experience will enable the Canadian Coast Guard to effectively carry out its Federal Monitoring Officer and On-scene Commander functions, ensuring an effective and timely pollution response. Furthermore, given the potential health hazards posed by HNS incidents, it is important for the Canadian Coast Guard, like the responders, to have the appropriate knowledge in order to protect themselves and the public while carrying out their duties.

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#### **RECOMMENDATION 2-8:**

**The Canadian Coast Guard should ensure that its officials have the appropriate training to develop new expertise and competencies required to carry out its Federal Monitoring Officer and On-scene Commander functions under the proposed HNS program.**

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Federal response capabilities required for responding to HNS incidents must be commensurate with the associated level of risk. Although the Canadian Coast Guard has some equipment and capability for oil spills, it does not possess similar tactical capabilities (equipment and technical expertise) for HNS. Given the significantly lower volume of HNS movements in Canadian waters, for cases where the polluter is unknown, unwilling or unable to respond, we consider that the appropriate mechanisms would

be for the Canadian Coast Guard to convene an initial assessment team (potentially comprised of public and private sector experts) at the onset of an incident to provide a preliminary assessment of the situation. Following the initial assessment, the Canadian Coast Guard should then ensure that the capability for response is established. This can either be done by the Canadian Coast Guard executing its authorities to direct a responder to take action, or via the formal procurement of qualified contractors. As per the polluter pays principle, the Canadian Coast Guard should seek compensation for its expenses either directly from the polluter (when known), and/or from the international HNS Fund (when it is operational).

Environment Canada and Transport Canada<sup>17</sup> can provide some hazardous materials technical expertise during an incident; however, given the wide range of substances for which a response may be required, it is important that the Canadian Coast Guard identify those contractors capable of providing technical expertise and responding to releases of HNS in a marine environment. Much of this identification work should occur during the regional response planning process.

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#### **RECOMMENDATION 2-9:**

**The Canadian Coast Guard should ensure it has the flexibility to quickly contract with appropriate technical experts and responders in the event a polluter is unknown, unwilling or unable to respond to an HNS release.**

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A key player in incident management for environmentally significant events is the Environmental Emergencies Science Table, chaired by Environment Canada's National Environmental Emergencies Centre in Montreal.

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<sup>17</sup> Such as the Canadian Transport Emergency Centre (also known as CANUTEC).

As indicated in our first report, the coordination and delivery of the Government's scientific and environmental advice would be enhanced by the on-site presence of an Environment Canada advisor during a response, when requested by the Canadian Coast Guard in its role as On-scene Commander or Federal Monitoring Officer. Furthermore, given the importance of ensuring public health and safety during an HNS release, we encourage the Science Table to engage the Public Health Agency of Canada, Health Canada and local public health agencies during an incident.

### Building Linkages

The Area Response Planning approach we outlined in our first report bridges an important gap in ship-source oil spill preparedness by directly connecting the Response Organizations, the Canadian Coast Guard and Transport Canada throughout the planning and exercise process. Thus, in the event of a spill, the Canadian Coast Guard, as Federal Monitoring Officer, will have a much better appreciation of the Response Organizations' plans, capabilities, equipment, resources and available tactics. Essentially, the model increases readiness and response efficiencies.

In the context of preparedness for an HNS incident, we believe that such relationships and such insight into capabilities within industry are critically important to the Canadian Coast Guard's role as the Federal Monitoring Officer. However, we recognize that the suite of recommendations we have made to improve spill preparedness and response for HNS do not, on their own, provide the same opportunities for the Coast Guard to build these relationships and insights. For one, under our proposed improvements, there are no certified Response Organizations for HNS incidents to develop plans on behalf of industry. Rather, preparedness for HNS incidents will require ship and HNS facility owners to identify, in their respective spill response plans, the resources they would employ to respond to a spill.

Although Transport Canada would review these plans as part of its oversight program to ensure compliance with requirements, and responders may be accredited by industry, the response capability of these third party responders would not be certified by Transport Canada, as it is for Response Organizations.

However, we recognize the benefits of the Canadian Coast Guard understanding the types of resources ship and facility owners identify in their respective spill response plans. To this end, we encourage the Canadian Coast Guard and Transport Canada to develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to the information on industry's plans that will benefit its roles as Federal Monitoring Officer and On-scene Commander.

This will also help ensure that the Canadian Coast Guard has a good sense of the capabilities within the responder community, ensuring that when it is required to (i.e., if the polluter is unable, unwilling or unknown), the Canadian Coast Guard can contract with competent and effective responders.

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### RECOMMENDATION 2-10:

**Transport Canada and the Canadian Coast Guard should develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to information about industry's plans for HNS incidents that will inform its roles as Federal Monitoring Officer and On-scene Commander.**

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### National Exercise Program

To validate regional planning under the National Contingency Plan, elements of the plans, as well as senior officials' decision-making, should be exercised on a regular basis. This would reinforce an understanding of roles and responsibilities,





maintain effective relationships among all key players, and ensure the effectiveness of procedures, arrangements, resources and decision-making. The Canadian Coast Guard already has a national exercise program to exercise the skills and knowledge needed for the response to a marine pollution incident. However, with the new proposed requirements for HNS preparedness, the Canadian Coast Guard and several supporting departments and agencies have little capacity to fully integrate HNS into their plans and future exercises.

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### **RECOMMENDATION 2-11:**

**The Canadian Coast Guard should develop and maintain a national exercise plan to regularly validate both the National Contingency Plan for HNS and region-specific planning and readiness for HNS.**

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Further to this, it is our view that there is immense value in the participation of Environment Canada and Fisheries and Oceans Canada experts in preparedness activities for HNS releases, such as regional planning and exercises. Without their valuable input, the preparedness process will be incomplete. However, throughout the first phase of our review, we heard evidence that the ability of these departments to fully participate in preparedness activities relative to the oil regime had declined over time. We can only surmise that their ability to engage in a new HNS program will be even more tenuous. In addition to the scientific input for preparedness, there is a critical need for timely scientific advice during an actual response. During an incident, the Canadian Coast Guard, acting as the Federal Monitoring Officer or On-scene Commander, may need:

- Health and safety information for first responders and potentially impacted populations;

- Fate and behaviour information (specific to the incident, which may involve more than one HNS substance, in various volumes and concentrations);
- Spill trajectory and dispersion modelling;
- Spill clean-up priorities and countermeasures;
- Meteorological, sea-state and ice forecasts and warnings;
- Air/water monitoring support;
- Location and sensitivity of wildlife and ecosystems;
- Advice on ecosystem recovery objectives; and
- Expertise on marine mammals, such as whales and seals, and their sensitivity to the particular hazardous and noxious substance(s) released.

During our engagement sessions, it became apparent that Environment Canada and Fisheries and Oceans Canada do not have the resources to provide this support during an HNS incident. It is important that the scientific expertise be available in all aspects of the HNS preparedness and response program, including research and development toward implementing supporting operational systems (e.g., chemical and physical properties of HNS products in varied receiving environments, accurate weather, ocean currents and ice information, and atmospheric and aquatic dispersion modelling). We therefore encourage the Government to make targeted investments to ensure that federal experts can participate at all stages of preparedness and response.

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## RECOMMENDATION 2-12:

**Environment Canada and Fisheries and Oceans Canada should improve their ability to respond to HNS incidents and to participate in preparedness activities for HNS incidents, such as regional planning and exercises, to conduct research and development toward implementing supporting operational systems, as well as to provide scientific expertise and HNS modelling capabilities during an HNS incident in support of the response.**

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### Continuous Improvement

While the recommendations set out in this chapter seek to formalize an HNS preparedness and response system in Canada, there is a need to consider what will be required beyond these fundamental steps to ensure that the system is improved upon both for the short term and long term. Given the existing knowledge and awareness gaps that exist with respect to marine movements of HNS in Canada, and preparedness and response requirements for an HNS release, the Government needs to continually monitor developments and seek to address these gaps. In particular, the Government will need to continue to collect data on the movements of bulk and containerized HNS, to research the fate, behaviour and effects of HNS, and to reassess the risk posed by releases of ship-source HNS to determine what additional requirements are needed.

### Awareness and Engagement

As discussed earlier, there are a number of complexities related to an HNS incident, including potential impacts on public health and safety, the environment, and specific response tactics. We believe proactive communication with the public is essential to raise awareness on these issues, as well as to provide clarity on the actual

versus perceived risks associated with incidents involving certain HNS. Events such as the tragedy in Lac Mégantic, Quebec, although not a marine incident, have elevated public concerns and raised questions about the overall safety of moving potentially dangerous products in close proximity to population centres.

In our first report, we provided a recommendation (Recommendation #34) which sought to foster public confidence in the Ship-source Oil Spill Preparedness and Response Regime. Given that we are proposing new requirements for the preparedness and response of ship-source HNS incidents, the Government of Canada needs to build public awareness of the context in which HNS are transported by ship, the potential risks of releases of certain products, and what capabilities are in place for responding to an incident.

As described earlier in this chapter, the Government of Canada commissioned a pan-Canadian spills risk assessment, which included a report on: *Phase 2, Part A: Spills of Select Hazardous and Noxious Substances (HNS) Transported in Bulk South of the 60th Parallel North*. As previously mentioned, the results of this assessment, as well as all future risk assessments should be made public to increase awareness about the actual risks associated with ship-source releases of select HNS, by providing



a current picture of the areas of relative risk in Canada. This type of information, if shared with the public, will further improve its understanding of the transportation of HNS and its related risks.

In line with our recommendation from our Phase I review, as well as the regional planning functions outlined in Recommendation 2-7 in this report, interested parties, including provinces, territories, municipalities, local communities, and Aboriginal organizations, should be appropriately and meaningfully engaged in the planning for ship-source HNS incidents. Awareness needs to be built on fundamental principles of the proposed HNS system and its overall structure, including roles and responsibilities. In addition, once Canada joins the HNS Convention, which provides for a liability and compensation regime for ship-source incidents involving HNS, this should be part of the information that is provided as part of public awareness.

### **National Framework for Ship-source Spills**

In our first report, we recommended that the Government develop and publish a National Framework for Ship-source Oil Spills (Recommendation #36). The purpose of this framework is to clarify and make available to the public essential facts on the system in place in Canada to prepare for and respond to spills from ships.

In the context of our second review, we would like to reiterate our recommendation, but amend it to include all spills from ships, including oil and HNS, whether they occur south or north of 60.

This knowledge-building is in the public's and the Government's best interest, to ensure that existing or new requirements for HNS incident preparedness and response are well understood and to foster confidence in the system.

Given the importance of protecting public health and safety during an HNS incident, we additionally note that communications during a response is critical to effective incident management. We encourage the Canadian Coast Guard in its role as Federal Monitoring Officer or On-scene Commander to ensure that pertinent information is being disseminated in a timely manner to all parties involved in the response, including local public health and safety authorities. This would equip these authorities with the information needed to inform the public and alleviate concerns.

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### **RECOMMENDATION 2-13:**

**With a view to raising public awareness and fostering public confidence in the existing system and any new requirements for preparedness and response for HNS incidents, Transport Canada and the Canadian Coast Guard should conduct regular outreach to the public to communicate the level of risk that Canada faces. Transport Canada and other relevant federal departments and agencies should also explain how the system functions, including its prevention, preparedness, response, and liability and compensation components.**

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### **Improving Data for Preparedness and Response**

Timely access to accurate and comprehensive information on the movement of HNS in Canadian waters is vital when planning for a potential HNS incident. For example, information on the properties and fate and behaviour of the substances being moved regularly in an area will inform decision-makers and responders on the hazards that could be posed by those substances entering the marine environment.

However, over the course of our review, it became apparent that data on the movement of HNS is not being collected by the Government of Canada. Statistics Canada, through the Marine Origin-Destination Survey, did collect information on all substances moved in Canadian ports until spring 2012 when the survey was cancelled. However, while information on HNS moved in bulk was well documented by the survey, information on packaged or containerized HNS movements was and is not maintained in a manner that is conducive to performing analyses. Often, the information on HNS transported in containers is simply listed as “general cargo.” This broad classification provides no value in the context of preparing for or responding to an HNS spill, or developing policies to ensure the Government has appropriate rules in place. This major gap has limited our understanding of the risk associated with container traffic and will be a major challenge when preparing for potential incidents that involve packaged HNS.

We were also interested to learn that the Commissioner of the Environment and Sustainable Development noted this as a major problem in its 2010 Fall Report to Parliament. The report stated that, “officials from Transport Canada informed us that one of the challenges they face in establishing a regime is that the data on the type and quantity of hazardous and noxious substances transported by ship is not at a level of detail appropriate for the Department’s needs.”<sup>18</sup> The Commissioner of the Environment and Sustainable Development recommended that, “In order to facilitate the development of a hazardous and noxious substances regime in Canada, Transport Canada should take the necessary steps to ensure that it has adequate data on the type and quantity of hazardous and noxious substances transported by ship in Canada.”

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<sup>18</sup> 2010 Fall Report of the Commissioner of the Environment and Sustainable Development, Chapter 1: Oil Spills from Ships, Commissioner of the Environment and Sustainable Development, 2010.

Unfortunately, the necessary steps to create a system that would provide this information have yet to be taken. Transport Canada has started a process to replace the Marine Origin-Destination Survey, but this work is still in the development stage and, as currently planned, would not supply all of the information required for HNS preparedness and response. The Government of Canada should therefore work quickly to remedy this situation and put in place a comprehensive database that tracks the movement of HNS, in bulk and in packaged form, throughout Canadian waters.

At a minimum, the database should include information on vessel transits, detailed HNS cargoes by vessel, total volumes imported and exported, as well as the port of origin or destination of the cargoes. This information should be used by the Government of Canada to help update and review the HNS program.

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#### **RECOMMENDATION 2-14:**

**For the purposes of developing government policies and for preparing for HNS incidents, Transport Canada should work with the Canadian Coast Guard to gather data on the movements of HNS in Canadian waters, including both bulk and containerized shipments. This database should incorporate information from all applicable sources.**

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While data on the movement of HNS will be useful in preparing for a potential incident, other information is required to aid in the response. Information on a vessel’s cargo and the location of specific substances within a vessel is critical for decision-makers and responders during an HNS incident. The type, quantity and even location of HNS on board a vessel can all have impacts on how the response is managed, and ultimately, on the success of the response.





Several high profile international incidents involving container vessels in recent years have highlighted the need for more work to be done so that cargo manifests and loading plans can be immediately transmitted to the relevant authorities in the event of an incident. This information should be rapidly accessible. Decision-makers, both in government and in industry, need this information immediately so that they can make informed decisions during the response. The United Kingdom has started to work on a system and the Government of Canada should learn from its efforts when developing this new system for sharing information between producers and responders.

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### **RECOMMENDATION 2-15:**

**Transport Canada should work with the Canadian Coast Guard, other relevant government departments and agencies, and industry to improve the process for sharing cargo manifests and stowage plans in a timely manner in the event of an HNS incident.**

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### **Research Gaps and Priorities**

As we noted in our first report, Environment Canada and Fisheries and Oceans Canada have a variety of scientific authorities and operational capabilities that support preparedness and response efforts with regard to ship-source oil spills. While this remains true for HNS releases, the nature of HNS creates an added dimension for human health that implicates the Public Health Agency of Canada and Health Canada.

### **Research and Development on Oil Products and Spill Responses**

Building on scientific research already announced in March 2013 for non-conventional petroleum products, recent announcements by the Government to further strengthen Canada's tanker safety system identified a number of new activities with respect to research and development. Namely, the Government will:

- Conduct leading-edge research on new oil products and their behaviour if spilled in Canadian waters, to help determine the window of opportunity for response;
- Undertake research on the effectiveness of a range of response measures and tools to support real-time sampling and monitoring during an incident by responders;
- Conduct research on pre-treatment of oil at source; and
- Deliver a new funding program to encourage research and development of new/enhanced mechanical response techniques.

Aligned with our current recommendation of also improving the understanding of properties of HNS (Recommendation 2-16), these initiatives will position the Government to inform emergency planners and spill responders, and develop better modelling capabilities.

For HNS incident preparedness, both Environment Canada and Fisheries and Oceans Canada have important scientific advisory roles to play in providing information that is essential for effective planning for HNS incidents. Accurate weather, ice and ocean current conditions are essential to ensure safe navigation, minimize risk, and provide an efficient and effective response should a ship-source spill occur. Information on the fate and behaviour of HNS substances moving in Canadian waters (whether in bulk or in packaged/containerized form) will be critical for regional planning and for future risk assessments. While some of this information already exists, it has not been reviewed and made easily accessible in the same way as fate and behaviour information on oil products. Environment Canada and Fisheries and Oceans Canada should consolidate and review any existing information on the fate and behaviour of HNS carried in Canadian waters and identify any potential gaps in their knowledge. We suggest starting with the 25 substances identified in the 2014 HNS Risk Assessment (refer to Appendix A.2). Once a process is in place to gather the appropriate level of data for containerized HNS, which could take a number of years, priorities should be assessed to determine which additional substances to include—both from bulk and containerized movements.

In addition, there is work to be done to understand the biological effects of HNS when they enter the marine environment, including the atmosphere, and how these effects may impact human health and the environment. This information will inform response priorities and approaches.

In order to fill any gaps in knowledge of relevance to Canadian HNS shipping, Environment Canada and Fisheries and Oceans Canada should seek to perform additional research and development toward implementing operational systems so that responders have access to the information they will need during a response. As research projects can be costly and require specialized expertise, we recommend that the Government of Canada look to establish partnerships with industry, and Canadian and international research institutions, where possible. For example, France's Centre of Documentation, Research and Experimentation on Accidental Water Pollution (also known as CEDRE), the United Kingdom's National Chemical Emergencies Centre, and Norway's SINTEF would be well-positioned to partner with Canadian agencies to share knowledge and resources. Related discussions are already underway between Transport Canada and CEDRE, and this initiative should continue to be pursued. These joint projects should also be used to leverage the knowledge and expertise that already exists on HNS around the world. The priorities for these research projects should be established through a consultative process that involves government, industry, and other stakeholders as appropriate. By pursuing active international scientific collaboration, all parties can ensure that their response to any potential HNS incident is appropriate, timely, and effective.

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#### **RECOMMENDATION 2-16:**

**Environment Canada and Fisheries and Oceans Canada should collaborate broadly to improve their understanding of the fate, behaviour, and effects of the HNS currently transported in Canadian waters, starting with the substances studied in the 2014 HNS Risk Assessment.**

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## Future Risk Assessments

As described in Appendix A.2, the Government of Canada commissioned a pan-Canadian spills risk assessment, which included a report on: *Phase 2, Part A: Spills of Select Hazardous and Noxious Substances (HNS) Transported in Bulk South of the 60th Parallel North*.

We suggest that the results of HNS risk assessments be reviewed and updated on a regular basis by Transport Canada, in collaboration with the Canadian Coast Guard and Environment Canada. In addition, subsequent reviews should look not only at the risks associated with the releases of select substances transported in bulk, but also of those transported in packaged form once the data becomes available. The results of the 2014 HNS risk assessment, as well as all future updates, should be made available to the public to increase awareness of the risks associated with ship-source releases of HNS.

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### **RECOMMENDATION 2-17:**

**Transport Canada should regularly review and update the national risk assessment for HNS being transported in Canadian waters, and make these results public.**

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# CHAPTER 3 MARINE CASUALTY MANAGEMENT



Emergencies at sea, such as vessel groundings, engine failures, loss of propulsion or steering, and on-board fires are familiar occurrences to many mariners. With standard procedures and training, most of these events are handled on board with few impacts to the crew, the vessel itself or the environment. On rare occasions, a broader and sustained response effort is required to rapidly mitigate the situation to prevent escalation into a catastrophic event, like a major collision, a sinking, or a spill.

This chapter reflects the culmination of our research, consultations and deliberations throughout both Phases I and II of our review. Our two reports focus primarily on improvements

to ensure Canada is prepared for and able to respond to spills or to react quickly when there are clear and imminent risks of a spill. In contrast, this section of our second report seeks to address situations where the risk of pollution is a matter of debate among various implicated parties. Such events need to be managed quickly and decisively to prevent escalation into a catastrophic event, including a marine pollution incident.

Managing a marine casualty in Canada is a complex endeavour. It can involve multiple federal, provincial/territorial, and municipal authorities. Depending on the situation, different expertise may be required quickly to avert a catastrophic event and support the mitigation



efforts (e.g., tugs, firefighters, cranes, pumps and barges, welders, etc.). The sheer number of authorities involved and the different powers that may be brought to bear in a marine casualty can make decision-making very complex, challenging, and, at times, slow—all of which increase the risk of spills. In some instances, the distribution of powers and authorities can lead to ‘decision-making by committee’ as the authorities involved debate over the best course of action and who has the jurisdiction or power to make key decisions. As has occurred during some unfortunate marine incidents in the past, this approach may not ensure the timeliness of decisions that is required to ensure the best possible outcome.

After the February 1996 grounding of the oil tanker *MV Sea Empress* (a single-hulled oil tanker) off the coast of Wales, which resulted in 72,000 m<sup>3</sup> of crude oil being released, the government of the United Kingdom appointed Lord Donaldson to conduct a review of the incident. The review concluded that the decision-making by committee, which occurred during the response, was highly ineffective. The review urged the government to take a stronger role in managing future marine casualties and recommended that a single decision-maker be appointed who has the power to make and enforce decisions on behalf of the United Kingdom government, in the public interest. As a result of this review, the United Kingdom created the position of the Secretary of State’s Representative for Maritime Salvage and Intervention (also referred to as ‘SOSREP’) within the United Kingdom’s Maritime and Coastguard Agency.

We share Lord Donaldson’s view that timely decision-making, in the public interest, is one of the most important factors in protecting people and the environment from the effects of a marine casualty. Compare the fate of the *MV Sea Empress* to that of the *MSC Napoli*, a container vessel in the English Channel that was seriously damaged during a storm in 2007 while en route from Belgium to Portugal. The vessel was to be towed to Portland Harbour in England for repairs.

En route, the vessel’s condition deteriorated and the decision was made to beach the vessel in southern England, where it was quickly lightered and only minor pollution resulted. This decision was made quickly because all of the powers required to direct this action resided in one person, the Secretary of State’s Representative for Maritime Salvage and Intervention. In this case, the Secretary of State’s Representative acted quickly because any delay could have resulted in the vessel breaking apart in the English Channel and potentially polluting the whole region for years.<sup>19</sup>

Australia, with a jurisdictional landscape comparable to that of Canada (i.e., a federal model of government, with powers divided between the national government and various sub-national governments), has adopted a similar marine casualty management model by way of a Maritime Emergency Response Commander (also known as the MERCOM), within the Australian Maritime Safety Authority. This position was the result of lengthy negotiations between the Australian Commonwealth and its territorial and state governments. The Maritime Emergency Response Commander can intervene in incidents within federal waters and, under certain circumstances, in state or territorial waters (i.e., those waters within three nautical miles of the coast). The Maritime Emergency Response Commander is able to act to address the incident in question, but in doing so, will consider the reasonable views and stated positions of the relevant state(s), Northern Territory and other relevant stakeholders. It is recognized that these entities represent economic, environmental, community and social interests that could be impacted by the Maritime Emergency Response Commander’s decisions.<sup>20</sup> Australia has found that, overall, a predetermined mutual understanding between all levels of government,

<sup>19</sup> *MSC Napoli Incident: Maritime and Coastguard Agency’s Response*, Maritime and Coastguard Agency, 2008.

<sup>20</sup> *National Plan for Maritime Environmental Emergencies*, Australian Maritime Safety Authority, 2014.



and a thorough consideration of their positions, has led to decreased tensions and more efficient decision-making during time-sensitive incidents.

As discussed earlier, vessel emergencies can often be managed on board by trained crew, using standard procedures with few impacts to the crew, the vessel itself or the environment. However, when this is not the case, both Transport Canada and the Canadian Coast Guard (through the authorities of the Minister of Transport and the Minister of Fisheries and Oceans) have powers to intervene in maritime casualties. Furthermore, Port Authorities have certain powers to direct vessels that are about to enter or depart the port. These various powers can lead to conflicting directions. When pollution occurs, or there is a clear risk of pollution, the Canadian Coast Guard, with its role as Federal Monitoring Officer or On-scene Commander is well-positioned to act or direct a response. The Canadian Coast Guard's implementation of the Incident Command System will facilitate this even further.

However, some past marine casualties in Canada have demonstrated that there exists an operational grey zone when the threat of pollution is a matter of debate. It is here that an opportunity exists to dramatically improve decision-making to ensure that decisions are taken first and foremost in the public interest, rather than being influenced primarily by jurisdictional, political or financial pressures.

Given Canada's complex jurisdictional landscape, the management of marine casualties is clearly a complicated problem and one that the Government of Canada should examine closely. In our view, there are valuable lessons to be learned from the United Kingdom and Australian approaches, as represented respectively by the Secretary of State's Representative for Maritime Salvage and Intervention and the Maritime Emergency Response Commander. These two positions consolidate the critical and time-sensitive decision-making powers in one person who is authorized by national and, in some cases,

sub-national authorities to make decisions that are in the public interest. Throughout our engagement with industry stakeholders, as well as with international counterparts, we heard near-unanimous support for these decision-making models. We urge the Government of Canada to examine the benefits presented by these models.

### Places of Refuge

Over the last 18 months, we have heard many concerns over places of refuge. Finding the ideal location to shelter a vessel in distress is a challenge, but also a critical part of a coastal State's contingency planning. The International Maritime Organization recognizes that the best option to minimize pollution from a vessel suffering from a casualty is to transfer the polluting cargo and fuels off the vessel and that this is best done in a place of refuge. However, the decision to bring a potentially-polluting vessel to a coastal area can create both environmental and economic concerns, from local populations and authorities.

While these decisions must be taken on a case-by-case basis, we were impressed by Norway's approach. In Norway, the government maintains and continuously updates a list of possible places of refuge, which is publicly available. This enables the public to openly comment on the potential sites and highlight important (and perhaps unknown) considerations to the government, so that any risks or challenges can be considered as part of the decision. The United States Coast Guard uses a similar approach that builds places of refuge considerations into its Area Contingency Plans.

Should the Canadian Government appoint an official similar to the Secretary of State's Representative or the Maritime Emergency Response Commander, this type of regular consultation on places of refuge could be an essential part of that position's role.



We consider that a new centralized decision-making authority's powers of intervention should be triggered when a marine incident has caused or threatens material damage to a vessel, and in the opinion of the centralized decision-making authority:

- The occurrence may, or will cause significant pollution to Canada's waters or coastline; and
- The use of the powers is urgently needed.

In addition, the key functions of a centralized decision-making authority should include:

- Acting at the earliest point during a marine casualty incident to assess the risk to safety, to expedite the conclusion of any such incident, and to ensure that increasing risk is evaluated and appropriate measures taken to prevent or respond to such an escalation.
- Monitoring all response measures to significant marine casualty incidents.

- If necessary, exercising ultimate control by implementing the powers of intervention, acting in the overriding interests of Canada and its environment.
- Participating in major national and international exercises.
- Reviewing all activities after significant incidents and exercises, and sharing lessons learned.

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### RECOMMENDATION 3-1:

**The Government of Canada should improve the timeliness of decision-making for marine casualties by establishing a centralized marine casualty decision-making authority acting in the public interest, similar to those authorities established in the United Kingdom and Australia.**

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## A.1 – Arctic

In May 2013, Transport Canada commissioned a Canada-wide risk assessment to examine the probability and the potential impacts of ship-source spills. The risk assessment was conducted by WSP<sup>21</sup> (a professional services firm with considerable environmental expertise), which subcontracted SL Ross (a consulting firm specializing in the behaviour of oil and chemical spills) for portions of the work. Like our review, the risk assessment was divided into two phases. The first phase of WSP's risk assessment, which we referenced in our first report, assessed the relative risk of ship-source oil spills in Canadian waters south of 60. Part A of the second phase of WSP's study focused on the relative risk of ship-source spills of select HNS transported in bulk in Canadian waters south of 60 (refer to Appendix A.2 for a summary of that study). Part B of the second phase of WSP's study, *Phase 2, Part B: Oil and Select Hazardous and Noxious Substances (HNS) Spills North of the 60th Parallel*, focused on ship-source oil spills and HNS releases north of 60, as well as the waters connected to the Arctic region (Hudson Bay, James Bay, Ungava Bay and Labrador Sea).

The objective of Part B of WSP's study was to provide a strategic-level assessment of the relative risks associated with ship-source oil and HNS spills in the Canadian Arctic. The results enable a comparison of the relative risks between regions in the Arctic, as well as the relative risk in the Arctic compared with that south of 60. The risk levels are expressed in relative terms and do not constitute a determination of absolute risk. To address the specific features of the Arctic, the methodology applied for the Phase I risk assessment (ship-source oil spills south of 60) was modified, as described hereafter.

## Methodology for the Arctic Risk Assessment

In the Arctic risk assessment, the Canadian Arctic waters were divided into 18 sub-sectors, based on ecoregions and traffic density, and the probability and the potential impacts of ship-source oil spills were calculated for each sub-sector. The risk was calculated for a spill of refined cargo products (mainly marine diesel, gasoline, and jet fuel) and fuel oil (for vessel propulsion) occurring in each sub-sector. The risk for crude oil spills was not calculated, as no crude oil is currently moved in the Canadian Arctic. In addition, the relative risk was not estimated for the larger spill size range (greater than 10,000 m<sup>3</sup>) because the spill frequency for refined cargo products and for fuel are both estimated to be zero for this spill range—there have not been any records of spills of this magnitude worldwide over the past 10 years. For fuel, a spill greater than 10,000 m<sup>3</sup> is not likely to occur, given that even the largest vessels operating worldwide do not have the capacity to carry this much fuel on board for their own propulsion.

The Arctic risk calculation was based on the following equation:

***Environmental Risk Index = Probability x Potential Impacts***

In this equation, the probability of spills occurring was combined with the potential impacts for each spill size to produce an environmental risk index for each sub-sector. A comparative analysis of the current risks of ship-source oil spills across Canada was conducted using the values of the environmental risk index.

To estimate the probability of oil spills of various types and sizes occurring in Canadian waters, the last 10 years of spills data from the Canadian Coast Guard were analyzed, and for larger spill ranges, where there have been no reported spills in the past ten years, worldwide incident data was compiled. Had only

<sup>21</sup> Formerly known as GENIVAR.



historical spill data from Canada been used, the probability for the larger spill sizes would have been zero, as there have been no spills over 30 m<sup>3</sup> in the Canadian Arctic in the last ten years. However, wherever bulk refined oil is moved, there is always a small possibility that a spill could occur. Thus, assuming that the history of spills for the larger spill size ranges worldwide might approximate the Canadian Arctic's future spill probabilities, WSP factored this global data against the volume of refined oil movements in the Canadian Arctic.

The risk assessment also considered future trends in Arctic shipping activity and generally found that the traffic in the Arctic is reasonably predictable, and for the most part is limited seasonally by the logistical challenges of operating in the Arctic. Modest growth in marine traffic associated with the community supply sector is expected by 2020, along with similarly limited growth in marine traffic associated with the oil and gas and tourism sectors, and no growth expected in the fisheries sector. Significant growth in marine traffic associated with the mining sector is expected by 2020, tied to the initiation of production at key sites.

Overall, the probability of oil spills in the Canadian Arctic is significantly lower than in the rest of Canada, mostly as a result of lower traffic and lower volumes of oil transported over the last 10 years. For example, the volume of refined cargo products transported in the Arctic represents 0.18% of the Canadian total for the years 2002 to 2011.

Potential impacts were factored in the determination of the risk in each of the Arctic sub-sectors. The environmental and socio-economic variables that were considered in the Environmental Sensitivity Index include: shoreline characteristics and ice cover, biological resources (including traditional knowledge on fish, marine mammals, and other key species and habitats) and human uses (including local

fisheries, tourism, coastal populations, and port cargo). The potential impacts in the Canadian Arctic varied among sub-sectors but, in general, higher potential impacts were found to be in the southern Arctic sub-sectors compared with the northern sub-sectors.

## Risk Results

The combination of the probability and impact calculations produced the environmental risk index, which allowed WSP to compare the risks for each sub-sector in the Arctic. It was determined that there is a relatively very low risk across the Canadian Arctic for a ship-source oil spill.

When comparing the relative risk between the sub-sectors in the Arctic, it was found that the areas of highest relative risk within the Arctic are the Hudson Strait and the coast of Labrador, mostly due to higher volumes of oil transported and traffic in these areas. Meanwhile, relatively lower risk was observed mostly in the western and northern Arctic. All sectors in the Arctic are still considered very low risk when compared with the rest of Canada.

### Probability vs. Impact of a Spill

Although the probability of a spill occurring in the Canadian Arctic is very low, there is the potential for it to cause significant damage and to disrupt subsistence and traditional practices of Inuit and Aboriginal communities.



## A.2 – Hazardous and Noxious Substances

One of the many inputs to our review was the HNS risk assessment study, *Phase 2, Part A: Spills of Select Hazardous and Noxious Substances (HNS) Transported in Bulk South of the 60<sup>th</sup> Parallel North*, conducted by WSP on behalf of Transport Canada, which we considered within the context of its scope and limitations. The objective of this strategic-level assessment was to not only determine the relative overall risks associated with spills of select HNS in bulk from ships, but to also create a way of comparing the relative risks between five categories of substances across the country. The five categories, within which the select substances share similar behaviour when spilled are: coke and asphalt products, liquefied and compressed gases, organic substances, inorganic substances, and animal and vegetable oils. The risk levels (ranging from relatively very low to relatively very high) thus speak in relative terms and do not constitute an absolute determination of risk.

The substances within each category were selected based initially on the volumes—starting with those transported in bulk with an average of over 10,000 m<sup>3</sup> per year in Canadian waters—and then further narrowed based on the assessment of potential hazard posed to human health and the environment. Only substances transported in bulk were assessed in the analysis due to the unavailability of detailed data for containerized HNS cargo. Table 1 presents the five categories of HNS and the 25 substances included in the assessment.

For the HNS risk assessment, WSP used the same coastline divisions south of 60 as it did in its Phase I assessment for oil spills, which had a total of 29 sub-sectors, and determined the relative risk of HNS spills for each. The overall risk calculation for each sub-sector, expressed as the environmental risk index, was the product of three components:

**Environmental Risk Index = probability X potential impacts X hazard**

In this equation, the mean annual tonnage for each HNS category was used as a proxy for spill probability as there were insufficient spill statistics available to generate a reliable spill frequency estimate, such as return periods,<sup>22</sup> which were calculated for oil in the first risk assessment on ship-source oil spills south of 60. In the equation, the hazard variable, unique to the HNS risk assessment, is a function of several metrics: toxicity, flammability, reactivity, water incompatibility, and extent to which the substance can spread in the environment. The potential impacts on humans and the environment were estimated based on the physical, biological and socio-economic (including population exposure risk to HNS) sensitivities in each sub-sector that could be impacted by an HNS spill.

The risk assessment found that there were significant variations in tonnage between the different categories of HNS transported across the country, which was a key factor influencing the frequency of incidents, and ultimately the risk calculation. WSP noted that the largest movements of HNS, and therefore the highest spill frequencies, generally occur in populated areas where there are large port facilities. Specifically, the three areas of relatively higher risk within Canada are the Vancouver area, the St. Lawrence Seaway and the shipping lanes through the Gulf of St. Lawrence.

WSP assessed that HNS are not transported in large quantities in the Arctic. With minimal select HNS substances moved in a very small number of shipments in the Arctic in the ten most recent years of data, the analysis concluded that the probability, and consequently risk, of an HNS spill in the Arctic is currently extremely low. (See Figure A.1)

<sup>22</sup> Return period is an estimate of the average number of years between spills.



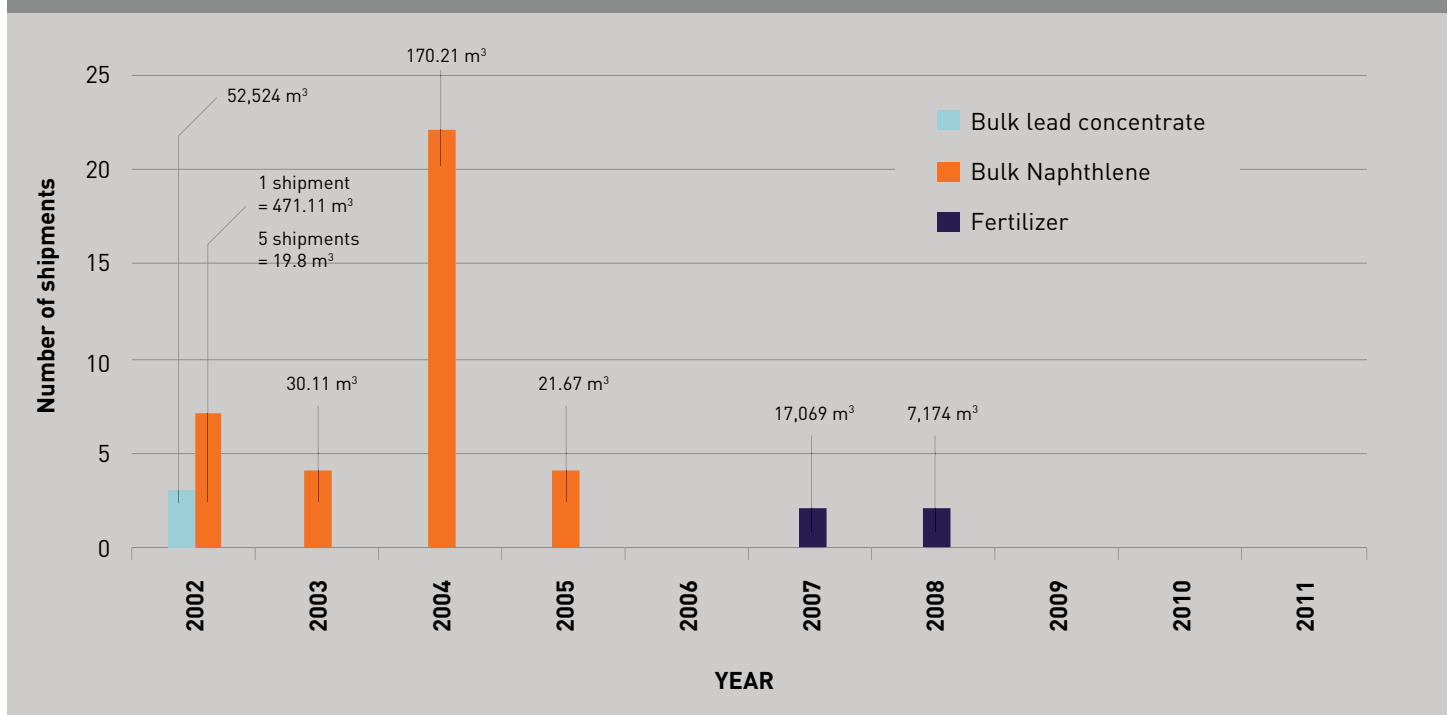


Looking specifically at the bulk movement of coke and asphalt products south of 60, the risk varies across the country. On the West Coast, the risk is lower with only the northern coast of British Columbia seeing a relatively elevated level of risk.

Along the St. Lawrence River and in the Great Lakes, the risk is higher, due to the potential for a spill to occur in close proximity to large population centres. That being said, the impact of such a spill would likely be limited.

Table 1: 25 Substances Included in the Assessment				
Coke and Asphalt	Liquefied and Compressed Gas	Organic Substances	Inorganic Substances	Animal and Vegetable Oils
Coke products	Acetylene	Benzene	Ammonium Nitrate	Animal and Vegetable Oils
Asphalt	Ethylene	Isooctane	Calcium Fluoride	
Reformate	Natural Gas	Linear Alkylbenzene	Caustic Soda	
	Propylene	Methanol	Fertilizer	
		Naphthalene	Lead Concentrate	
		Octane	Nickel Sulphate	
		Toluene	Sulphur	
		Xylene	Sulphuric Acid	
			Urea Ammonium Nitrate	

Figure A.1 - Select HNS Transported in Bulk in the Arctic (Number of shipments and volumes by year)



For liquefied and compressed gases (primarily liquefied natural gas) transported in bulk south of 60, the risk of spills was relatively very low. The only region of the country with a relatively medium/high risk of spills for liquefied natural gas was the Bay of Fundy, primarily as a result of traffic into Canaport LNG's terminal. However, the report also indicated that a number of liquefied natural gas projects proposed for northern British Columbia could result in an increase to the risk level in this area if they were to proceed.

For inorganic substances transported in bulk, overall, the risk south of 60 is generally relatively low to medium, except in two key areas. On the West Coast, the risk is relatively very high in southern-British Columbia due to the large volume of inorganic substances that are moved into and out of Port Metro Vancouver. On the East Coast, the risk is relatively low, except in the Gulf of the St. Lawrence, where the risk is relatively medium and along the St. Lawrence River where the risk is relatively high.

For organic substances transported in bulk, overall, the risk south of 60 varies across the country. On the West Coast, the risk is relatively very low, except in southern British Columbia, which has a relatively high risk. On the East Coast, there are several areas where the risk is relatively high, mainly in the Gulf of the St. Lawrence and along the St. Lawrence River. The risk is also relatively high for the Halifax area and the Cabot Strait.

For animal and vegetable oils transported in bulk, overall, it was found that the risk south of 60 was relatively very low, mostly due to low volume transported and low toxicity. The only region of the country with a relative (to the rest of Canada) low risk was the Vancouver area.

Overall, the study identified that the risk of ship-source spills from the selected bulk HNS (25 substances) is low across Canada. This is due, in part, to the low volumes of HNS that are moved

in bulk in Canadian waters. The three areas of relatively higher risk within Canada are the Vancouver area, the St. Lawrence River and the shipping lanes through the Gulf of St. Lawrence, as these areas see the largest volumes of HNS moved in close proximity to major urban centres or environmentally sensitive areas.

We considered this risk assessment as part of our overall deliberations. However, given the limitations in the scope of the risk assessment, we understand that much work still needs to be done to really understand the overall risk in Canada, particularly for packaged HNS.

### **Characteristics and Potential Hazards of Liquefied Natural Gas**

Liquefied natural gas is natural gas that has been cooled to approximately minus 160° C and reduced to a liquid state. It is a clear, colourless and odourless substance that is non-corrosive and non-toxic.

Potential hazards associated with liquefied natural gas are due to its basic properties including its extremely cold nature and its dispersion and flammability characteristics.

Notably, liquefied natural gas will freeze any material with which it comes into contact. Liquefied natural gas is neither explosive nor flammable in its liquid form. It only becomes flammable or explosive (in a confined environment) when it is warmed to its gaseous state, is mixed with air, and comes into contact with an ignition source. However, it is important to note the rigorous safety system that is in place for the marine transport of liquefied natural gas.



## Gordon Houston

Panel Chair



Captain Gordon Houston is the former President and CEO of the Vancouver Fraser Port Authority. He attended Edinburgh University's Nautical Campus receiving the designation of Master Mariner in 1975. He also holds a nautical science diploma from Aigburth Nautical College. After a seagoing career spanning three decades, Captain Houston joined the Prince Rupert Port Corporation as Harbour Master in 1988. Later, he joined the Vancouver Port Authority, as Deputy Harbour Master, and then as Harbour Master where, among his other duties, he represented the Port during the creation of Canada's current Ship-source Oil Spill Preparedness and Response Regime.

In 1996, he moved into the Port's executive ranks, as Vice President, Operations. After five years in this role, Captain Houston was appointed President and CEO of the Vancouver Port Authority where he oversaw the amalgamation of the three ports in the Lower Mainland.

## Richard Gaudreau

Panel Member



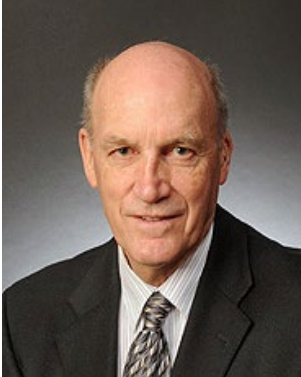
Mr. Richard Gaudreau practiced law from 1969 until the end of 2012. His experience includes all activities related to maritime and admiralty law, particularly ship purchasing/selling/financing/chartering, carrier liability, environmental law, collisions, salvage and all aspects of marine and Protection and Indemnity (P&I) insurance. He also practiced in all activities related to international trade. He has vast experience before Canadian and Québec courts, including the Supreme Court of Canada.

He was the chairperson of several Québec and Canadian marine-related organizations, including the St. Lawrence Economic Development Council. Mr. Gaudreau has been involved in numerous arbitrations, both as a lawyer and an arbitrator. He has chaired a number of public inquiries and has studied and contributed to the drafting of maritime and port legislation and regulations in Canada and abroad.

From 2000 until 2010, Mr. Gaudreau taught post graduate courses in marine transportation management at l'Université du Québec à Rimouski. He served as a Lieutenant in the Canadian Naval Reserve. Mr. Gaudreau was an active member of the National Coalition on the Coast Guard Recovery Program and the Canadian Bar Association.

## Michael Mackay Sinclair

Panel Member



Dr. Michael Sinclair is the former Director of the Bedford Institute of Oceanography in Dartmouth, Nova Scotia. He holds a Ph.D. in Oceanography from the University of California's Scripps Institution of Oceanography. He also attended Queen's University in Kingston, Ontario and Southampton University in the U.K., where he earned his B.Sc. and M.Sc., respectively.

After positions at the Scripps Institution of Oceanography and the Université du Québec à Rimouski, Dr. Sinclair joined the Bedford Institute in 1978. By 1988, he was appointed to the position of Director, Biological Sciences Branch for the Department of Fisheries and Oceans at the Bedford Institute. In 2000, Dr. Sinclair was appointed Director of the Bedford Institute and Regional Director of Science, Maritimes Region, for the Department of Fisheries and Oceans.



### Background

As a result of the *Exxon Valdez* oil spill and growing public concern for the marine environment, the Government of Canada appointed the Public Review Panel on Tanker Safety and Marine Spill Response Capacity (Brander-Smith Panel) in June 1989. The three-member panel was given the mandate to review and evaluate: (i) the measures currently in place to ensure the safe movement of oil and chemicals by tanker and tank barge through Canadian waters; (ii) Canada's ability to respond to marine spills of these products and, (iii) the Canadian and international legislation and Conventions which regulate the movement of oil and chemicals including the provisions for compensation for damages resulting from spills.

The Government implemented a large number of the Panel's recommendations, which led to the development of Canada's current Ship-source Oil Spill Preparedness and Response Regime. While the Regime has met existing needs, the dynamics of oil transportation have changed appreciably since then; oil shipments have increased significantly, as has the transport of potential pollutants such as liquefied natural gas and other HNS. These changes, as well as new proposed marine terminals on Canada's West Coast, make it an opportune time to conduct a review of Canada's current Ship-source Oil Spill Preparedness and Response Regime.

Budget 2012 provided funding for a number of measures to create a world-class tanker safety preparedness and response Regime. A key component of these measures will be the creation of a Panel, which will review Canada's current Ship-source Oil Spill Preparedness and Response Regime and make recommendations to the Government of Canada on the development of a world-class tanker safety and oil spill preparedness and response Regime.

### Panel Composition

The Panel will be comprised of a Chair and two Panel members. Candidates for appointment should have a range of technical, legal, and/or practical expertise in ship-source spill preparedness and response. Special advisors may also be appointed to support the Panel's work north of 60° latitude and to assist in engaging Aboriginal Groups in the review. The Chair and Panel members will work part-time, although they may be required to work full-time during certain phases of the project.

### Scope of the Review

The Panel is mandated to conduct a broad review of the current Regime as it pertains to oil handling facilities and ship-source oil spill preparedness and response. The Panel will assess the Regime's structure, functionality and the overall efficiency and effectiveness of the system, as well as analyze the requirements for hazardous and noxious substances, including liquefied natural gas. It will also examine the linkages with the marine liability and compensation regime. Once the review is complete, the Panel will submit their findings, along with recommendations on how to improve Canada's Ship-source Oil Spill Preparedness and Response Regime to world-class status, to the Minister of Transport for consideration.

The review will have two components. The first component will focus on the Regime currently in place south of 60° north latitude, while the second component will focus on the requirements needed for the Arctic as well as a national review of the requirements for HNS, including liquefied natural gas.



## Elements of the Review

**Pan-Canadian Risk Assessment** – In support of the Panel, Transport Canada will conduct an objective, evidence-based risk assessment of the potential for a ship-source oil or HNS spill, including liquefied natural gas, in Canadian waters. The risk assessment will provide a documented, credible base of risk information, for use in the review of current arrangements for spill prevention, preparedness, response, and recovery.

**Background Technical Research and Analysis** – Transport Canada will develop a series of technical papers and studies on Canada's Ship-source Oil Spill Preparedness and Response Regime, as well as models in other jurisdictions, to establish a technical foundation and to assist the Panel in understanding key issues.

**Stakeholder Engagement** – The Panel will meet with provincial and territorial governments and industry stakeholders, including Response Organizations, owners and operators of oil handling facilities, vessel owners and operators and industry associations. The Panel will also meet with key Aboriginal organizations and will seek input from First Nations in coastal areas. A web portal will also be established to accept public submissions. The Panel will also have the option to conduct a limited number of targeted engagement sessions with individuals or organizations who submit through the web portal. No sessions open to the general public will be conducted.

## Review Panel Secretariat

A full-time Secretariat will be established within Transport Canada under the direction of an Executive Director. The Secretariat will have key responsibilities in supporting the fulfillment of the Panel's mandate. It will develop a work plan, research plan and engagement materials for the Panel's approval. It will receive and analyze stakeholder submissions and provide support to the Panel as it prepares the reports. The Secretariat will also be responsible for administration, communications, organization of engagement activities; and the management of the research program. The Secretariat will provide the link to Transport Canada, other government departments and central agencies. In addition, the Marine Safety and Security Directorate will provide the Panel with in-house technical expertise and analysis in the area of oil spill preparedness and response and the administrative resources as required.

## Key Deliverables and Timelines

The Panel will be appointed in March 2013 and will be required to submit two reports. The first report will provide an assessment of the Regime south of 60° north latitude and must be completed by November 15, 2013. This report will be followed by a second report, due by September 2014, on the requirements for an Arctic regime and a national regime for HNS.



### D.1 – Arctic

These Lines of Inquiry are intended to provide general structure to the Panel's review and draw out information and perspectives through written submissions or face-to-face discussions that will be useful in the Panel's deliberations. The Panel is not limited to considering questions outlined in these Lines of Inquiry.

For the purposes of gathering views and information for the Arctic review, the Panel is considering the waters north of 60° north latitude, including the Mackenzie River and Delta, as well as Great Slave Lake, Hudson Bay, James Bay and Ungava Bay. Throughout this document, these waters may be referred to as 'the Arctic'. The review extends to both Arctic ship-source oil spills and ship-source releases of hazardous and noxious substances (HNS) (i.e., HNS incidents). The review does not extend to preparedness and response to spills that may result from oil and gas exploration or drilling.

#### The Arctic Environment

1. The Arctic provides a unique operating environment, both for navigators and regulators. What factors, including future considerations, should be considered while developing spill prevention, preparedness and response requirements for the Arctic?
2. Are there particularities and/or differences between regions of the Canadian Arctic that should be considered?
3. Are there sensitive areas where vessel traffic presents particular concerns? Where are they? What makes them sensitive areas?
4. What mechanisms are in place for outreach and engagement of northern communities in spill preparedness and response?

#### Prevention

5. What measures and resources are currently in place to prevent marine spills in the Arctic?
6. What additional navigation support and resources are needed for safe shipping in the Arctic?
7. What preventative practices could be undertaken at HNS and oil handling facilities and/or during HNS and oil transfers?
8. What more can shipowners and/or oil handling facility operators do to prevent or reduce potential impacts of incidents?
9. Should the current practice of overwintering fuel in barges in landfast ice be reconsidered? Why or why not?

#### Existing Response Capacities

10. Are the vessels currently operating in the Arctic capable of responding to a spill of their bunkers or oil/HNS cargos? If not what do they need?
11. What private-sector and public-sector resources are available currently to respond to ship-source spills in the Arctic?
12. Are there facilities in place in the Arctic to treat or dispose of waste from an oil spill or release of HNS? How could these waste products be dealt with in the event of a spill?
13. Is there any existing capability in the Arctic to treat wildlife affected by HNS or oil?

#### Preparedness and Response

14. What preparedness and response requirements are necessary for the Arctic?

15. To whom should these requirements apply?
16. Should the Arctic be treated differently than the parts of the country south of 60° in terms of response capacity and response time requirements? Why or why not?
17. How should the placement of spill response equipment be determined for the Arctic?
18. What spill response techniques are appropriate and effective for oil spills and HNS incidents in Arctic waters?
19. Should the use of dispersants, in-situ burning and other response techniques be permitted in the Arctic if they yield a net environmental benefit?
20. Are the availability, the frequency and the quality of training and exercises in the Arctic adequate? Who should participate in training and exercises?
25. Are there roles for other local parties to play in the response to an oil spill or HNS incident in the Arctic?
26. Do the *Arctic Waters Pollution Prevention Act*, *Canada Shipping Act 2001*, and *Marine Liability Act* provide an effective basis for a ship-source preparedness and response regime in the Arctic? Are there changes required to create a coherent spill preparedness and response regime?
27. How could a spill preparedness and response regime for the Arctic be funded?
28. How could a regulatory preparedness and response regime for the Arctic be overseen and enforced?
29. What opportunities exist for bilateral, multilateral, or circumpolar cooperation in the Arctic (e.g., Denmark, Alaska, and Arctic Council)? How should this influence Canada's regime?

### **Roles, Responsibilities and Legal Framework**

21. Should the regime(s) for Arctic oil spill and HNS incident preparedness and response be structured the same way as the Ship-source Oil Spill Preparedness and Response Regime in place south of 60°?
22. What should be the role of private stakeholders (e.g., potential polluters, response contractors) in terms of ship-source oil spill or HNS incident preparedness and response in the Arctic?
23. What should be the role of the Canadian Coast Guard (CCG) in ship-source oil spills or HNS incidents in the Arctic?
24. To what extent and how should local communities participate in spill preparedness and response?

30. Are there international best practices (ship-source or other) that should be considered when creating a regime in the Arctic?

### **Research and Development**

31. Are there gaps in knowledge on the behaviour, fate and effects of oils and HNS in icy waters?
32. Are there gaps in knowledge on response techniques to address these spills in icy waters?
33. Who should be responsible for funding and conducting this research?



## D.2 – Hazardous and Noxious Substances

These Lines of Inquiry are intended to provide general structure to the Panel’s review and draw out information and perspectives through written submissions or face-to-face discussions that will be useful in the Panel’s deliberations. The Panel is not limited to considering questions outlined in these Lines of Inquiry.

As Canada has recently signalled its intent to ratify the International Maritime Organization’s *International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 2010* (2010 HNS Convention), the Panel’s review will not include liability and compensation matters, but will focus on matters pertaining to preparedness and response for ship-source HNS incidents. Once brought into force, the 2010 HNS Convention would establish a liability scheme to compensate victims in the event of a spill of HNS at sea. In order to implement the 2010 HNS Convention in Canadian law, the Government has proposed amendments to the *Marine Liability Act*. These proposed amendments form part of Bill C-3, *Safeguarding Canada’s Seas and Skies Act*.

The International Maritime Organization has also adopted a *Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000* (OPRC-HNS Protocol) that provides a high-level framework for international cooperation on preparing for and responding to HNS incidents in the marine environment. Although the OPRC-HNS Protocol is in force, Canada is not a party. The Panel’s review of ship-source HNS incidents will undoubtedly contribute to the Government’s policy regarding accession to the OPRC-HNS Protocol.

Notwithstanding the Panel’s future recommendations on a potential Ship-source Hazardous and Noxious Substances (HNS)

Incident Preparedness and Response Regime in Canada, for the purposes of gathering views and information for the review, the Panel is considering vegetable and animal oils, liquefied natural gas and liquefied petroleum gas, among many other substances, as part of HNS.

References to ‘regime’ in this document refer to a potential future Ship-source HNS Incident Preparedness and Response Regime, unless indicated otherwise.

### Coverage

1. How should HNS be defined for the purposes of a Canadian ship-source incident preparedness and response regime?
2. What types of substances should be included in a Canadian regime for HNS? What is the rationale for their inclusion? What criteria should be used to inform the future inclusion of additional substances?
3. Should a regime address HNS transported in bulk or in packaged form (e.g., containers), or one or the other? Why?

### Prevention

4. What measures are already undertaken, either by government or industry, to prevent ship-source HNS incidents?
5. What additional measures should be taken to reduce the risk of a ship-source HNS incident?

### Existing Response Capabilities

6. What private-sector capability currently exists to respond to HNS incidents in the marine environment, including at HNS handling facilities, on board vessels that carry HNS, and with emergency response contractors?

7. What public-sector capability, at all levels of government, currently exists to respond to or oversee the response to HNS incidents in the marine environment?
8. What response techniques exist for responding to various HNS incidents in the marine environment? Are all of them authorized under current legislation? If not, under what circumstances should they be authorized?

### Preparedness and Response

9. What preparedness and response requirements should be incorporated into a new HNS regime?
10. To whom should these requirements apply?
11. Is the current reporting/record keeping of HNS cargo on vessels in Canada adequate to prepare for and respond to HNS incidents? What could be done to improve the quality and accessibility of the information?
12. Are there international best practices (ship-source or other) that should be considered when creating a national HNS incident preparedness and response regime?
13. How do health and safety considerations for both responders and adjacent populations impact preparedness and response for HNS incidents?
14. What scientific advice and expertise is required during an HNS incident? Does this expertise currently exist, either in government or private industry? What expertise needs to be developed in Canada?
15. How should response capacity for an HNS regime be developed? What factors should be considered?

### Roles, Responsibilities and Legal Framework

16. Should a separate preparedness and response regime for HNS be created, or should the existing Ship-source Oil Spill Preparedness and Response Regime be expanded to include HNS? Why or why not?
17. Could Canada's Response Organizations fulfill the role of responder to certain ship-source HNS incidents, as they currently do for ship-source oil spills?
18. What factors would need to be considered in broadening the Response Organizations' mandate to include HNS?
19. If adopted, should the requirements for an HNS regime be integrated into current legislation, such as the *Canada Shipping Act, 2001* and the *Arctic Waters Pollution Prevention Act*, or should new legislation be created?
20. How should an HNS regime interact with the regulations for the transportation of dangerous goods in Canada?
21. What role should the Canadian Coast Guard play in an HNS incident?
22. What are the current roles and responsibilities of other levels of government (provincial and municipal) in this area? Are any of these governments considering new prevention, preparedness and response requirements that could be of benefit to a national regime?
23. What other parties (i.e., first response agencies, health agencies, marine services, etc.) have a role in the preparedness for or response to ship-source HNS incidents? What role could they play?





24. Should responders be provided immunity from liability in the context of their response, as they are in the Ship-source Oil Spill Preparedness and Response Regime under the *Canada Shipping Act, 2001*?
25. How could a future HNS incident preparedness and response regime be financed or funded?
26. How should an HNS regime be overseen and enforced?

### **Research and Development**

27. How should priorities for HNS-related research and development be established?
28. Who should be responsible for funding and conducting this research?

### E.1 – Arctic

#### Stakeholder Discussions

Listing of Canadian organizations with which the Panel held discussions:

- Aboriginal Affairs and Northern Development Canada
- Arctic Regional Advisory Council
- Avalon Rare Metals Inc.
- Baffinland Iron Mines Corporation
- Canadian Association of Petroleum Producers
- Canadian Coast Guard
- Canadian Hydrographic Service
- Canadian Ice Service
- Canadian Maritime Law Association
- Canadian Northern Economic Development Agency
- Cooper Barging Service Ltd.
- Environment Canada
- Fédération des Coopératives du Nouveau-Québec
- Fisheries and Oceans Canada
- Foreign Affairs, Trade and Development Canada
- Government of Manitoba, Department of Aboriginal and Northern Affairs
- Government of Manitoba, Department of Conservation and Water Stewardship
- Government of Manitoba, Department of Infrastructure and Transportation
- Government of Manitoba, Department of Mineral Resources
- Government of Northwest Territories, Department of Environment and Natural Resources
- Government of Northwest Territories, Department of Public Works and Services
- Government of Northwest Territories, Department of Transportation
- Government of Nunatsiavut, Department of Lands and Natural Resources
- Government of Nunavut, Department of Community and Government Services

- Government of Nunavut, Department of Economic Development and Transportation
- Government of Nunavut, Department of Environment
- Groupe Océan
- Island Tug and Barge Ltd.
- Kitikmeot Inuit Association
- Kivalliq Inuit Association
- Mackenzie Delta Spill Response Corporation
- Makivik Corporation
- National Energy Board
- NEAS Group
- Northern Transportation Company Limited
- Nunavik Marine Region Impact Review Board
- Nunavut Impact Review Board
- NWT & Nunavut Chamber of Mines
- Oceans Network Canada
- Petro-Nav
- Prolog Canada Inc.
- Shell Canada
- Shipping Federation of Canada
- Transport Canada
- Woodward Group of Companies

Listing of international organizations with which the Panel held discussions:

- Alaska Chadux Corporation
- Alaska Clean Seas
- Alaska Department of Environmental Conservation
- Royal Danish Navy
- Gard
- Norwegian Clean Seas Association for Operating Companies (NOFO)
- Norwegian Coastal Administration
- SINTEF (Norway)
- United States Coast Guard, District 17

#### Sites Visited

- Canadian Coast Guard Marine Communications and Traffic Services, (Iqaluit, Nunavut)
- SINTEF SeaLab (Trondheim, Norway)



## E.2 – Hazardous and Noxious Substances

### Stakeholder Discussions

Listing of Canadian organizations with which the Panel held discussions:

- Association of Canadian Port Authorities
- Atlantic Emergency Response Team
- Canadian Coast Guard
- Canadian Emergency Response Contractors Alliance
- Canadian Fuels Association
- Canadian Industrial Transportation Association
- Canadian Maritime Law Association
- Canadian Shipowners Association
- Canaport LNG
- Chamber of Shipping of British Columbia
- Chemistry Industry Association of Canada
- Chevron Canada
- Coastal First Nations
- Eastern Canada Response Corporation
- Énergie Valero Inc.
- Environment Canada
- Gitxaala Nation
- Haisla First Nation
- Halifax Port Authority
- Health Canada
- IMTT-Quebec
- International Ship-Owners Alliance of Canada
- Irving Oil Terminals & Pipelines
- Island Tug and Barge Ltd.
- Kinder Morgan
- Lax Kw'alaams First Nation
- LPG Emergency Response Corporation
- Metlakatla First Nation
- Natural Resources Canada
- Neptune Bulk Terminals
- Public Health Agency of Canada
- Quantum Murray
- Quebec Regional Advisory Council
- Shipping Federation of Canada
- Squamish First Nation
- Transport Canada

- Vancouver Fire Department
- Western Canada Marine Response Corporation

Listing of international organizations with which the Panel held discussions:

- Braemar Howells
- Centre of Documentation, Research and Experimentation on Accidental Water Pollution (CEDRE)
- International Tanker Owners Pollution Federation Limited (London, United Kingdom)
- Maritime Emergency Response Commander, Australian Maritime Safety Authority
- National Chemical Emergencies Centre (United Kingdom)
- Public Health England
- Public Health Wales
- Secretary of State's Representative for Maritime Salvage and Intervention (United Kingdom)
- United Kingdom Maritime and Coastguard Agency

### Sites Visited

- Centre of Documentation, Research and Experimentation on Accidental Water Pollution (CEDRE) (Brest, France)
- National Chemical Emergencies Centre (Didcot, United Kingdom)
- National Environmental Emergencies Centre, Environment Canada (Montreal)

### F.1 – Arctic

The following organizations provided a written submission/documentation to the Tanker Safety Expert Panel:

- Arctic Regional Advisory Council
- Canadian Marine Pilots' Association
- Government of Manitoba, Transportation and Infrastructure
- Government of Nunavut, Department of Economic Development & Transportation
- Government of Nunavut, Department of Environment
- Government of Yukon, Department of Environment
- International Tanker Owners Pollution Federation Limited (ITOPF)
- ITB Marine Group
- Kitikmeot Inuit Association
- Kivalliq Inuit Association
- Makivik Corporation
- Petro-Nav
- Shipping Federation of Canada
- Tulaktarvik Inc.
- University of Manitoba
- Woodward Group of Companies

### F.2 – Hazardous and Noxious Substances

The following organizations provided a written submission/documentation to the Tanker Safety Expert Panel:

- Canadian Marine Pilots' Association
- Canadian Society for Chemical Engineering
- Cefic (European Chemical Industry Council)
- Chemistry Industry Association of Canada
- City of Vancouver
- Company of Master Mariners of Canada
- Government of British Columbia, Ministry of Environment
- Government of Newfoundland and Labrador
- Government of Ontario, Ministry of Transportation & Ministry of Environment and Climate Change (Joint Submission)
- Government of Quebec, Department of Sustainable Development, Environment and the Fight against Climate Change
- International Tanker Owners Pollution Federation Limited (ITOPF)
- Intertanko
- Irving Oil Ltd.
- Island Trust Ltd.
- North Shore Emergency Management Office (City of North Vancouver)
- North Vancouver District, Sustainable Community Development Department
- Quebec Regional Advisory Council
- Shipping Federation of Canada
- Union of British Columbia Municipalities
- Vancouver Coastal Health



## APPENDIX G – GLOSSARY OF TERMS

**Aids to Navigation:** devices or systems, external to a vessel, which are provided to assist mariners in determining position and course, to warn of dangers or obstructions or to advise of the location of the best or preferred route. (Canadian Coast Guard)

**Berth:** a designated mooring location within a port or a harbour where vessels may be temporarily secured, usually for the purpose of loading and/or unloading cargo.

**Barges:** flat-bottomed vessels, which usually carry various types of freight, and are mainly built for river and canal transportation. Most barges are not suitable for navigating an ocean or sea. (The Barge Association)

**Bathymetry:** the practice of measuring water depth relative to sea level at various places in a body of water, and deriving analytical information from such measurements. Similar to topographic maps' portrayal of overland terrain, bathymetric maps represent the depth and shape of the land that lies underwater, with variation in sea-floor relief depicted by colour and contour lines. (National Oceanic and Atmospheric Administration)

**Bioremediation:** the treatment of pollutants or waste (as in an oil spill) by the use of microorganisms (as bacteria) that break down the undesirable substances. (Merriam-Webster)

**Break bulk:** commercial goods that are neither transported within a cargo container nor in bulk (e.g., grain or liquid in the holds or tanks of a vessel) and include goods such as equipment, construction material, automobiles or oil and gas in small containers.

**Chemical dispersion:** the process of using chemicals to accelerate the process of natural dispersion of pollutants. (International Tanker Owner Pollution Federation)

**Classification Society:** a non-governmental organization that establishes and maintains technical standards for the construction and operation of ships and offshore structures. It validates that marine structures are constructed in line with those standards, and carries out regular inspections to ensure that existing structures remain in compliance. It also helps ensure basic and consistent marine safety practices around the world.

**Dispersants:** a group of chemicals designed to be sprayed onto oil slicks to accelerate the process of natural dispersion. (International Tanker Owner Pollution Federation)

**Ecoregion:** a large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions. (World Wildlife Fund)

**Exclusive Economic Zone:** the area of the sea adjacent to and beyond the territorial sea, extending out to 200 nautical miles from the baselines within which a coastal state has sovereign and jurisdictional rights over exploration and management (e.g., scientific research and protection of the marine environment), and economic exploitation of living and non-living resources in the waters above the seabed, in the seabed and beneath the seabed. (Fisheries and Oceans Canada)

**First-year ice:** ice that is thicker than new, recently frozen sea water and that has no more than one year of growth.

**Hazardous and noxious substance:** any substance other than oil which, if introduced into the marine environment, is likely to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea. (International Maritime Organization)



**Heavy fuel oil:** a black, low-grade fuel of tar-like consistency. It is composed mostly of carbon, hydrogen, sulphur and other impurities such as ash, metals, and water. Heavy fuel oil is obtained from the petroleum distillation process after other lighter petroleum products such as gasoline and kerosene have been distilled off. Heavy fuel oil is a by-product or residue—along with asphalt—of the distillation process. (Statistics Canada)

**Herders:** chemical surface-active agents used to clear and contain oil slicks on the surface of open water.

**Ice class:** a classification of vessels that meet certain requirements to navigate in thick ice, and are equipped with several forms of rudder and propeller protection, among other measures.

**Internal waters:** all waters landward of a coastal state's jurisdictional coastline. (Fisheries and Oceans Canada)

**In-situ burning:** a technique used to contain oil spills that consists of burning spilled oil on the water.

**Lightering:** the process of transferring cargo between two vessels, usually of different sizes.

**Liquefied Natural Gas:** a natural gas primarily composed of methane with small quantities of ethane and propane that has condensed into a liquid state. (Canadian Center for Energy)

**Manifold:** a pipe or fitting with several openings for funneling the flow of liquids or gases.

**Mariculture:** a subset of marine aquaculture that is also known as offshore fish farming that focuses on cultivating marine organisms for food in a salt- and fresh-water environments.

**Multi-year Ice:** harder and generally thicker sea ice, which has survived more than one melting season (i.e., summer).

**Net environmental benefit analysis:** the process of considering advantages and disadvantages of different spill response options (including no response) to arrive at a spill response decision resulting in the lowest overall environmental and socio-economic impacts.

**Oil:** petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products. (*Canada Shipping Act, 2001*).

**Oil handling facility:** a facility, including an oil terminal, that is used in the loading or unloading of oil to or from vessels. (*Canada Shipping Act, 2001*).

**Oil tanker:** means a vessel constructed or adapted primarily to carry oil in bulk in its cargo spaces and includes a combination carrier (a vessel designed to carry oil or solid cargoes in bulk), a noxious liquid substances tanker and a gas carrier that is carrying a cargo or part cargo of oil in bulk. (*Environmental Response Arrangements Regulations*)

**Pilotage:** the services provided by experienced local pilots in various regions of the country to help ships traverse Canadian waters safely. Pilotage services are mandatory in areas where the level of risk is heightened.

**Polar class:** vessels that have been designed, built, and equipped to allow them to navigate safely in ice-covered waters. There are seven different Polar classes, all of which represent varying operational capabilities and strength of steel ships based on seasons of operation and certain ice conditions.

**Polynya:** a geographical area of open water that is surrounded entirely either by land and/or sea ice, and can include an area of melted or unfrozen water within an ice pack. This can occur either by ecological processes that prevent sea ice formation, or that facilitate the drift of sea ice around the open water area.



**Racon:** a radar transponder commonly used to mark maritime navigational hazards. It works by receiving signals and/or radar pulses, and demonstrating their position on a radar display.

**Response Organization:** a qualified person to whom the Minister of Transport issues a certificate of designation under subsection 169(1) of the *Canada Shipping Act, 2001*. (*Canada Shipping Act, 2001*)

**Special Drawing Rights (SDR):** a “claim to currency” created by the International Monetary Fund and used as a unit of account by the International Monetary Fund and other international organizations. The value of the SDR is based on a basket of currencies (i.e., U.S. dollar, Euro, Pound Sterling and Japanese Yen).

**Tonne:** in the context of oil, the equivalent of about 1,100 litres or about 7 barrels of oil (this may vary depending on the type and density of oil).

**Vessel:** a boat, ship or craft designed, used or capable of being used solely or partly for navigation in, on, through or immediately above water, without regard to method or lack of propulsion. (*Canada Shipping Act, 2001*)

### H.1 – Arctic

*After-Action Report from CANUSNORTH 2012*, Canadian Coast Guard, 2012.

*After-Action Report from Operation Nanook*, Canadian Coast Guard, 2010.

*Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic*, Arctic Council, 2013.

*Arctic Council Emergency Prevention Preparedness and Response Working Group (EPPR) Meeting – Final Report*, Arctic Council, November 8, 2013.

*Arctic Council Emergency Prevention Preparedness and Response Working Group (EPPR) Meeting – New project - IMO Guide Oil Spill Response in Ice and Snow*, Arctic Council, 2013.

*Arctic Council Emergency Prevention Preparedness and Response Working Group (EPPR) Progress Report 2011-13*, Arctic Council, May 15, 2013.

*Arctic Council Emergency Prevention Preparedness and Response Working Group (EPPR) Strategic Plan*, Arctic Council, June 2013.

*Arctic Shipping Pollution Prevention Regulations (C.R.C., C.353)*, Transport Canada.

*Arctic Waters Oil Transfer Guidelines (TP 10783E)*, Transport Canada, 1997.

*Arctic Waters Pollution Prevention Regulations (C.R.C., C.354)*, Transport Canada.

*Beaufort Regional Environmental Assessment (BREA) Mid-Term Report*, Gaea Consultants and DPRA Canada, 2013.

*Beaufort Sea Oil Spills State of Knowledge Review and Identification of Key Issues*, Environmental Studies Research Fund, 2010.

*Behaviour of Oil and Other Hazardous and Noxious Substances (HNS) Spilled in Arctic Waters*, SINTEF, 2011.

*BREA Results Forum - Overwintering of Barges in the Beaufort - Assessing Ice Issues and Damage Potential*, National Research Council, 2013.

*Central and Arctic Regional Response Plan*, Canadian Coast Guard, 2008.

*Everything You Need to Know About Marine Fuels*, Chevron Global Marine Products, 2007.

*Filing Requirement for Offshore Drilling in the Canadian Arctic*, National Energy Board, 2011.

*Joint Industry Program on Oil Spill Contingency for Arctic and Ice-Covered Waters – Summary Report*, SINTEF, 2010.

*Marine Investigation Report – Grounding – Tanker Nanny*, Transportation Safety Board of Canada, 2012.

*Marine Spills Contingency Plan - National Chapter*, Canadian Coast Guard, 2011.

*Oil Spills in Arctic Waters: An Introduction and Inventory of Research Activities and USARC Recommendations*, US Arctic Research Commission and the US Army Corps of Engineers, 2012.

*Responding to Oil Spills in the U.S. Arctic Marine Environment*, National Research Council, 2014.

*Review of Offshore Drilling in the Arctic*, National Energy Board, 2011.



*Review of Oil Spill Trajectory Modelling in the Presence of Ice*, Fisheries and Oceans Canada, 2011.

*Risk Assessment for Marine Spills in Canadian Waters, Phase 2, Part B: Oil and Select Hazardous and Noxious Substances (HNS) Spills North of the 60<sup>th</sup> Parallel North*, WSP, May 2014.

*Spill Line Contractor Procedures*, Northwest Territories/Nunavut Spills Working Agreement signatories, 2014.

*Spills in the Northwest Territories*, Northwest Territories Department of Environment and Natural Resources, 2005-2012.

*Strategic Plan for Oil spill Research in Canadian Arctic Waters*, Environmental Studies Research Fund, 2014.

*Working Together – What Government and Other Agencies Do if Canadian Arctic Waters are Threatened by a Spill*, AANDC, 2003.

## **H.2 – Hazardous and Noxious Substances**

*2010 Fall Report of the Commissioner of the Environment and Sustainable Development, Chapter 1: Oil Spills from Ships*, Commissioner of the Environment and Sustainable Development, 2010.

*Are HNS Spills More Dangerous Than Oil Spills?*, International Tanker Owners Pollution Federation, 2009.

*HNS Convention*, International Maritime Organization, 2010.

*Liquefied Natural Gas: Properties and Reliability*, Natural Resources Canada, 2013.

*Marine Chemical Emergency Response Regime*, Major Industrial Accidents Council of Canada (MIACC), 1997.

*Protocol on Preparedness, Response and Co-Ordination to Pollution Incidents by Hazardous and Noxious Substances (OPRC-HNS Protocol)*, International Maritime Organization, 2000.

*Risk Assessment for Marine Spills in Canadian Waters, Phase 2, Part A: Spills of Select Hazardous and Noxious Substances (HNS) Transported in Bulk South of the 60<sup>th</sup> Parallel North*, WSP, May 2014.

*Ship-Source Hazardous & Noxious Substances (HNS) Incident Preparedness and Response Regime Information Paper*, Transport Canada, 2010.

*Transportation Emergency Assistance Program (TEAP III)*, Chemistry Industry Association of Canada, 2013.

I.1 – Arctic

Number	Recommendation
1-1	The Government of Canada should expand the Modernizing Canada’s Navigation System initiative to include Canada’s Arctic waters, devising strategies that are appropriate for the Arctic.
1-2	The Canadian Coast Guard and other federal organizations should prioritize placing Canadian Hydrographic Service hydrographers and their equipment aboard their vessels operating in the Arctic in order to accelerate the collection of bathymetric data in Canada’s Arctic waters. With this data, the Canadian Hydrographic Service should improve the availability of modern nautical charts of Canada’s Arctic waters to navigators.
1-3	In order to further improve the safety and efficiency of marine transportation in the Arctic, as work progresses on the provision of modern nautical charts and aids to navigation in the Arctic, the Canadian Hydrographic Service should revise the sailing directions and other complementary nautical publications, services and data for the Arctic.
1-4	Transport Canada should complete a review of the 16 Shipping Safety Control Zones under the Zone/Date System, based on modern satellite ice imagery, and ensure that the ice zones are reviewed and updated on a regular basis in order to reflect global climate change impacts on sea ice.
1-5	Transport Canada should amend Schedule VIII of the <i>Arctic Shipping Pollution Prevention Regulations</i> to incorporate up-to-date ship categories reflecting the International Association of Classification Societies Unified Requirements for Polar Class Ships.
1-6	Transport Canada should review the Arctic Ice Regime Shipping System to incorporate all parameters including the requirements of the International Association of Classification Societies’ scientific work on hull strength and safe hull ice loads for polar classes of vessels for the calculation of Ice Numerals.
1-7	Transport Canada, in consultation with the shipping industry, should pursue the establishment of a formal endorsement for Ice Navigators to ensure that they possess the required experience.
1-8	Transport Canada, in consultation with the shipping industry, should continue its efforts to promote internationally the concept of Ice Navigators as meeting any future Polar Code requirements to have all ships’ officers trained for Arctic voyages.





Number	Recommendation
1-9	<p>Transport Canada should require prescribed vessels and barges, as determined in consultation with industry, territorial/provincial governments, and other stakeholders operating in Canada's Arctic waters, to have a Shipboard Arctic Spill Response Plan that includes all of the current Shipboard Oil Pollution Emergency Plan elements and additional requirements, including:</p> <ul style="list-style-type: none"> <li>• For prescribed tankers, the capability on board the vessel to address small, operational spills; and</li> <li>• For all prescribed vessels, the identification and description of the response resources that would be brought in to respond to a spill that is beyond the capabilities of the crew and vessel's on-board equipment, including evidence that the shipowner has considered the logistical challenges of addressing a sustained spill response operation in the Arctic.</li> </ul>
1-10	<p>Transport Canada, in collaboration with appropriate stakeholders, should develop a classification structure for Arctic oil handling facilities, using a risk-based analysis that considers factors relevant to Arctic operations.</p>
1-11	<p>Transport Canada should lead the development of Arctic-specific standards that support the development of Oil Pollution Emergency Plans for oil handling facilities tailored to operations in the Arctic. They should address preparedness and response requirements for each class of oil handling facility (as per Recommendation 1-10). In addition, Transport Canada should review and update its <i>Arctic Waters Oil Transfer Guidelines</i>.</p>
1-12	<p>Transport Canada should establish requirements, applicable to prescribed barges when used for temporary fuel storage, that set out spill prevention, preparedness and response measures relative to transfer operations in line with those applied to prescribed oil handling facilities.</p>
1-13	<p>Transport Canada should develop an appropriate oversight program to ensure compliance with its new requirements for prescribed vessels and oil handling facilities operating in the Arctic.</p>
1-14	<p>The Government of Canada should proceed with its recently announced plans to lift legal prohibitions on using alternative response techniques, including for Arctic spills, where such techniques would provide the best outcome, according to a net environmental benefit analysis.</p>
1-15	<p>The Canadian Coast Guard should maintain and regularly update the regional response plan for the Arctic and its supporting localized plans to reflect the most recent information on key environmental resources, evolving response tactics and available response resources. These plans should be developed in consultation with local communities, industry, other government departments and agencies, and be available to the public, potential polluters and their responders.</p>
1-16	<p>Based on the regional response plan for the Arctic, and informed by risk levels, the Canadian Coast Guard should ensure it is adequately resourced—throughout the active shipping season—for its role as On-scene Commander when the polluter is unknown, unwilling or unable to fulfill its requirement to respond to a spill.</p>

Number	Recommendation
1-17	Transport Canada and the Canadian Coast Guard should develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to information about ship and oil handling facility owners' plans for ship-source spills in the Arctic that will inform its roles as Federal Monitoring Officer and On-scene Commander.
1-18	All levels of government should cooperate to explore training options for oil spill preparedness and response at the community level in the Arctic, and encourage northern communities, educational institutions, and industry to participate in these opportunities.
1-19	The Canadian Coast Guard should update and implement its Regional Exercise Program and encourage the participation of other stakeholders, such as ship and oil handling facility owners, other government departments, response contractors, and communities, as well as key international partners.
1-20	With a view to creating awareness and fostering public confidence, Transport Canada and the Canadian Coast Guard should coordinate and conduct regular outreach to the public, especially northern communities, on prevention, preparedness, response and liability and compensation for ship-source spills.
1-21	The Government of Canada, in partnership with territorial and provincial departments and agencies, industry, academia and international partners, should work towards ensuring broad access to and inter-operability of existing data on the Canadian Arctic to support spill preparedness and response.
1-22	Environment Canada, in collaboration with Fisheries and Oceans Canada, territorial and provincial governments, academia, industry, and international partners, should prioritize efforts to fill the various knowledge gaps that exist pertaining to spill preparedness and response in the Arctic.
1-23	Transport Canada, in collaboration with Environment Canada, Fisheries and Oceans Canada and Natural Resources Canada should assess the possibility of designing a rigorous yet streamlined Government authorization process, set out in regulations, to ensure that scientifically-sound field tests beneficial to oil spill response and preparedness can move forward in a reasonable timeframe, while protecting the natural environment.
1-24	The Government should develop a strategy to regularly monitor developments, such as vessel traffic levels in the Arctic, and to identify additional prevention, preparedness and response measures that may be required as changes in risk levels or the operating environment of the Arctic occur.
1-25	Transport Canada should regularly review and conduct risk assessments for ship-source spills in the Arctic, in order to inform policy decisions about spill prevention, preparedness and response measures for the Arctic.



## I.2 – Hazardous and Noxious Substances

Number	Recommendation
2-1	Canada should take the necessary steps to accede to the OPRC-HNS Protocol, including developing a national HNS preparedness and response program.
2-2	Transport Canada, in consultation with industry, should require vessels of a prescribed size, type and class that carry HNS, either in bulk or packaged forms, to have a Shipboard HNS Response Plan. This plan should include all of the requirements currently outlined under MARPOL Annexes II and III, as well as additional requirements, such as: a shore-based response coordinator; identification of response resources; preparedness activities, such as training and exercises; on-board equipment; a waste disposal strategy; record keeping; and an incident management system to be used during a response.
2-3	Transport Canada should require HNS handling facilities of prescribed classes (to be determined through consultation with industry) to develop HNS Response Plans to ensure adequate response to pollution incidents that could occur during the handling of HNS between a vessel and a facility.
2-4	Transport Canada should develop an appropriate oversight program to ensure compliance with its new requirements regarding HNS Response Plans for ships and facilities for ship-source HNS incidents.
2-5	Transport Canada should encourage domestic industry associations to strengthen verification and accreditation programs for their members involved in the marine transportation of and response to ship-source incidents involving HNS.
2-6	The Canadian Coast Guard, in collaboration with Transport Canada, Environment Canada, Public Health Agency of Canada, Health Canada and Public Safety Canada, should lead the development of a national contingency plan for ship-source releases of HNS that are of national significance.
2-7	The Canadian Coast Guard should lead regional planning for ship-source releases of HNS, in collaboration with Transport Canada. The Canadian Coast Guard should invite other relevant stakeholders and communities to participate in the regional planning process, and should make the regional plans available to the public.
2-8	The Canadian Coast Guard should ensure that its officials have the appropriate training to develop new expertise and competencies required to carry out its Federal Monitoring Officer and On-scene Commander functions under the proposed HNS program.
2-9	The Canadian Coast Guard should ensure it has the flexibility to quickly contract with appropriate technical experts and responders in the event a polluter is unknown, unwilling or unable to respond to an HNS release.
2-10	Transport Canada and the Canadian Coast Guard should develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to information about industry's plans for HNS incidents that will inform its roles as Federal Monitoring Officer and On-scene Commander.

Number	Recommendation
2-11	The Canadian Coast Guard should develop and maintain a national exercise plan to regularly validate both the National Contingency Plan for HNS and region-specific planning and readiness for HNS.
2-12	Environment Canada and Fisheries and Oceans Canada should improve their ability to respond to HNS incidents and to participate in preparedness activities for HNS incidents, such as regional planning and exercises, to conduct research and development toward implementing supporting operational systems, as well as to provide scientific expertise and HNS modelling capabilities during an HNS incident in support of the response.
2-13	With a view to raising public awareness and fostering public confidence in the existing system and any new requirements for preparedness and response for HNS incidents, Transport Canada and the Canadian Coast Guard should conduct regular outreach to the public to communicate the level of risk that Canada faces. Transport Canada and other relevant federal departments and agencies should also explain how the system functions, including its prevention, preparedness, response, and liability and compensation components.
2-14	For the purposes of developing government policies and for preparing for HNS incidents, Transport Canada should work with the Canadian Coast Guard, to gather data on the movements of HNS in Canadian waters, including both bulk and containerized shipments. This database should incorporate information from all applicable sources.
2-15	Transport Canada should work with the Canadian Coast Guard, other relevant government departments and agencies, and industry to improve the process for sharing cargo manifests and stowage plans in a timely manner in the event of an HNS incident.
2-16	Environment Canada and Fisheries and Oceans Canada should collaborate broadly to improve their understanding of the fate, behaviour, and effects of the HNS currently transported in Canadian waters, starting with the substances studied in the 2014 HNS Risk Assessment.
2-17	Transport Canada should regularly review and update the national risk assessment for HNS being transported in Canadian waters, and make these results public.

### I.3 – Marine Casualty Management

Number	Recommendation
3-1	The Government of Canada should improve the timeliness of decision-making for marine casualties by establishing a centralized marine casualty decision-making authority acting in the public interest, similar to those authorities established in the United Kingdom and Australia.



