Sailing Into Unknown Waters

Canada lacks the regulatory framework needed to protect the public from the security and safety risks of LNG development on the BC coast

April 2017
Cover images, clockwise from top left:

1. Armed US Coast Guard vessel enforces moving exclusion zone around LNG tanker in the Port of Boston, as required by US law. Photo courtesy USCG PA3 Donnie Brzuska. Source

2. Sinopec LNG terminal, Guangxi China — located well away from populated areas and critical land based infrastructure. Source

3. US Coast Guard Waterway Suitability Assessment LNG hazard zones applied to proposed Wespac Fraser River LNG terminal and Fraser River transit route for LNG tankers, showing extensive overlap with Richmond and Delta neighbourhoods, critical infrastructure and businesses. Source

4. LNG, burning. LNG pool fire study by Sandia National Laboratory. Source

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Voters Taking Action on Climate Change April 2017
Executive Summary

The pursuit of an LNG export industry in British Columbia is taking place without the government oversight needed to protect the public from safety and security risks.

US regulatory processes provide clear guidance on how to screen LNG proposals for these risks, and how to enforce security protocols around LNG facilities and tankers. Both are needed to protect communities and critical infrastructure from the risks posed by LNG. Similar regulatory processes could easily be established in Canada – if governments chose to make public safety and security a priority.

However, in British Columbia LNG export proponents choose siting locations according to their own criteria. When these proposals enter licensing, permitting and approval processes, those sites are taken as a given:

- NEB export licensing decisions consider only whether proposed exports will impact Canada’s domestic supply of natural gas;
- Our federal government, with responsibility for marine safety, has not established a pre-screening process for marine LNG facilities or a process for assessing the security of our waterways for the movement of LNG tankers;
- The voluntary TERMPOL review process does not consider security concerns;
- Federal Marine Transportation Security Regulations contain no terminal siting criteria or waterway assessment protocols;
- Federal and provincial environmental assessment processes address accidents, but not the likelihood and consequences of deliberate attack; and
- The BC Oil and Gas Commission, with authority over the permitting of coastal LNG facilities, does not explicitly require assessment of the risk of deliberate attack on those facilities, and excludes consideration of LNG tankers and marine approaches to proposed facilities from hazard identification and emergency planning processes.

In short, no government agency, federal or provincial, is tasked with asking fundamentally important questions:

- Is this a safe place to build an LNG terminal?
- Is this an appropriate waterway for the movement of LNG tankers?

As a result, as project reviews gain momentum, there is valid concern that approval processes will attempt to mitigate risks through design requirements for projects that should have been rejected at the outset because they are poorly sited.

The best way to manage security and safety risks around LNG development in BC is to avoid creating those risks in the first place. Canada and British Columbia need to establish transparent and well justified site selection and waterway suitability assessment processes for LNG export proposals to ensure we avoid these risks. A preliminary pre-screening process will be an important tool for eliminating poorly sited project proposals, and will save proponents and government time and money that would otherwise be spent in lengthy approval and permitting processes.
Fortunately, the hard work of developing a pre-screening process has already taken place in the United States. Studies by Sandia National Laboratories have determined justifiable hazard planning distances for assessing risk posed by proposed LNG facilities and LNG tanker movements on nearby populations and critical infrastructure.

The Sandia Laboratory findings have been incorporated into a comprehensive waterway suitability assessment process used by the US Coast Guard to screen LNG marine terminal proposals for safety and security risks. USCG waterway suitability findings from this process are used by the Federal Energy Regulatory Commission (the US agency in charge of LNG terminal approvals) in their decisions on LNG terminal proposals.

Canada should look closely at existing US regulations – they provide a ready made and proven template for developing our own pre-screening process to protect the public from LNG risks during the process of LNG terminal site selection.

However, even if government did develop a comprehensive pre-screening process, British Columbians would still face risks from LNG export projects. Our federal government has failed to establish a preparedness and response regime for ship-source incidents involving hazardous substances like LNG, despite long identifying such a regime as a priority. The LNG industry has not established a dedicated response organization such as the one in place to address oil spills. Coastal first responders are likely unprepared to deal with the serious hazards posed by a worst case incident involving loss of containment and fire on an LNG tanker. Canada has not established a regulatory regime for bunkering LNG–fuelled vessels, nor, apparently, a certification program for LNG bunker barges.

Further, existing marine security regulations in Canada are underdeveloped and reactive. They do not incorporate, as normal operating procedure, moving exclusion zones around LNG tankers that are common practice in US ports. In addition, neither our Port Authorities nor LNG proponents themselves appear adequately resourced to enforce such exclusion zones if they were applied.

While the probability of a deliberate attack or serious accident on an LNG tanker or facility may be low, the consequences for our communities or critical coastal infrastructure of such an attack could be catastrophic. Government has a responsibility to properly assess and prepare for these risks before BC exports LNG.

Our governments have shown themselves to be keen supporters of development of an LNG export industry. However, before LNG exports proceed, they must show they are just as keen to protect public safety and security from the risks posed by that industry.

BC and Canada should place a moratorium on approved and proposed LNG exports until key regulatory issues are addressed, including 1) developing a proper site screening and waterway suitability assessment process for evaluating LNG export proposals 2) establishing mandatory and enforceable security procedures to address the risk of deliberate attack on LNG facilities and tankers and 3) creating a robust preparedness and response regime for ship source incidents involving LNG, and ensuring that LNG bunkering is properly regulated and LNG bunker barges are properly certified.
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Develop an LNG Terminal Site Pre-screening Process In Canada
Incorporate Industry Siting Guidelines into Pre-screening, TERMPOL Processes
Make TERMPOL Mandatory, Include Security Risk Assessment and Gap Analysis
Develop Regulations for Moving Security Exclusion Zones Around LNG Tankers
Develop Regulations for Marine Security Exclusion Zones Around LNG Facilities
Strengthen the Marine Transportation Security Regulations
Develop a Certification Regime for LNG Bunker Barges
Develop a Regulatory Regime for Bunkering LNG-Fuelled Ships
Establish an LNG Incident Preparedness and Response Regime
Require The LNG Industry Establish an Incident Response Organization
Encourage Development of an International LNG Incident Liability Convention
Strengthen BCOGC Hazard and Risk Assessment
Increase Transparency of BCOGC Decision Making Processes
Improve BCOGC Notification and Consultation Processes
Develop Additional CSA Standards to Guide LNG Facility Permitting
Establish Security Procedures for LNG Tanker Transits Under Major Bridges
Acronyms

BCEAO  British Columbia Environmental Assessment Office
BCOGC  British Columbia Oil and Gas Commission
CEAA   Canadian Environmental Assessment Agency
CDC    Certain Dangerous Cargoes
CNR    Consultation and Notification Regulation
COTP   Captain of the Port (US Coast Guard)
CSA    Canadian Standards Association
EMR    Emergency Management Regulation
EPZ    Emergency Planning Zone
FERC   Federal Energy Regulatory Commission
HNS    Hazardous and Noxious Substances
H₂S    Hydrogen Sulphide
IGC Code International Gas Carrier Code
IMO    International Maritime Organization
LNGFR  Liquefied Natural Gas Facilities Regulation
MARSEC Marine Security
MTSR   Marine Transportation Security Regulations
NEB    National Energy Board
OPRC-HNS Protocol on Preparedness, Response and Co-operation to Pollution Protocol Incidents by Hazardous and Noxious Substances, 2000
SIGTTO Society of International Gas Tanker and Terminal Operators
SOLAS  International Convention for the Safety of Life at Sea
TERMPOL Technical Review Process of Marine Terminal Systems and Transhipment Sites
USCG   United States Coast Guard
VFPA   Vancouver Fraser Port Authority
WSA    Waterway Suitability Assessment
Part One: Overview Of The Problem

Canada has not prepared for the risks posed by LNG development

Industrial developments that pose low probability, high consequence risks to our communities must be carefully regulated by government. The security and safety risks posed by the siting of LNG terminals and the movement of LNG tankers in coastal waters fall precisely into this category, yet our provincial and federal governments have failed to establish a site pre-screening process for LNG terminals or a waterway suitability assessment process for the movement of LNG tankers near our coastal communities.

As would be expected, LNG export proponents choose terminal locations according to their most important criteria, which likely include convenience, cost, and access to markets and product. Absent government led site pre-screening or waterway suitability assessment processes – and given government’s express desire to see LNG exports move forward – it is difficult for the public to have confidence that the risks posed by proponent siting choices are being properly assessed.

This report argues that until government shows it is taking these risks seriously, by developing rigorous and transparent site selection and waterway suitability assessment processes, development of an LNG export industry in BC should be put on hold. As a review of LNG risk management procedures in the United States demonstrates, developing a risk assessment process for LNG development in BC would not be an impossible, or even difficult job – it simply requires that government slow down development of this export industry and prioritize public safety over achieving a “win” on the LNG file.

As this report shows, existing government approval processes do not require consideration of the risk of deliberate attack on LNG tankers or facilities, nor do they require careful assessment of the serious consequences that such an attack might pose for public safety. This lack of attention to risks in LNG development is unacceptable, given plans for LNG facilities and the movement of LNG tankers near our communities.
What are the health and safety risks of a serious LNG spill from a tanker?

LNG is methane (natural gas) that has been super cooled to a liquid state. LNG does not ignite in its liquid state, but evaporating LNG does burn when an ignition source is present.

If containment on an LNG tanker was breached as a result of accident or attack the greatest risk would be ignition of the evaporating LNG followed by a pool fire on the water. These fires are very intense and could cause second degree burns on exposed skin at a distance of more than a kilometre.

If spilled LNG was not exposed to an ignition source during or immediately after loss of containment, the drifting cloud of evaporating LNG would be at risk of ignition where the concentration of gas in the air was between 5 and 15 percent. If this gas were ignited it would burn back to source, resulting in a pool fire.

Loss of containment of LNG can pose additional risks in the immediate vicinity of the spill:

- When spilled over water the rapid transition of LNG from liquid to vapour phase can create a strong pressure wave (a “flameless” or “physical” explosion) leading to damage or injury from flying debris and blast forces. Risk of a physical explosion is highest in confined spaces.
- Direct exposure to spilled LNG causes cryogenic burns (frostbite). Structures can weaken or fail when exposed to supercold LNG.
- Finally, evaporating LNG could displace air and asphyxiate exposed individuals.¹

Canada needs an LNG application pre-screening process

The first step in any LNG facility application process should be to determine if proposed LNG terminal locations, and waterways that would be transited by tankers, meet minimum marine safety and security criteria. These determinations should be made by governments, not proponents, and they should be completed before any licenses, permits or certificates are issued to a project proponent.

However, government security and safety screening of LNG terminal siting proposals is not current practice in Canada. Instead, LNG proponents select project sites according to their own criteria, and then make application for NEB export licenses and environmental approval certificates.

By law, the NEB LNG export licencing process may only consider if the proposed export volumes will impact domestic natural gas requirements. It may not consider safety or security criteria. The federal and provincial environmental assessment processes focus

on assessing potential impacts to the environment, First Nations’ interests and public health arising at the location put forward by the proponent. Participation in Transport Canada’s TERMPOL process is voluntary, and the recommendations produced are non-binding. In any case, TERMPOL reviews do not address security issues.

For the most part, LNG terminal proposals complete the environmental assessment process before moving into a facility permitting process with the BC Oil and Gas Commission (BCOGC). While the BCOGC permitting process does give some consideration to hazard identification, risk assessment and management, it does not incorporate waterway suitability criteria and explicitly does not consider risks associated with LNG tankers or marine approaches to proposed terminals.

**Federal and provincial environmental assessments do not address security risks**

Both the federal and provincial environmental assessment processes require that proponents assess the impacts of their proposed projects on the environment. Both processes include specific requirements that proponents consider the likelihood and consequences of potential accidents and malfunctions and propose measures to reduce that likelihood or mitigate outcomes. Neither process requires that proponents assess the likelihood and consequences of deliberate acts like an intentionally destructive attack. Neither assessment process includes any sort of site selection pre-screening process.

As a result, as an LNG terminal proposal moves through the permitting and approvals process, no federal or provincial government agency is tasked with asking these crucial questions:

- Is this site a safe place to build a marine LNG terminal?
- Is this waterway an appropriate area for the movement of LNG tankers?
- Does this proposed terminal, and the associated movement of LNG tankers, put the public and critical infrastructure at risk from catastrophic incidents resulting from accidents or deliberate attack?

Rather than accepting proponent’s chosen sites for LNG terminals as a given, then attempting to design-out siting risks during the permitting process, Canada and BC should develop a transparent and rigorous site pre-screening process that can quickly eliminate poorly sited proposals before they enter lengthy and expensive approval processes. An outline of the existing and an improved LNG terminal approval process is shown in the two flow charts below.

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2 For more information see Chapter 9, Accidents and Malfunctions, of the BCEAO Application Information Requirements Template and Section 19(1)(a) of the Canadian Environmental Assessment Act, 2012.
The Current LNG Project Review Process: No Pre-screening, Few Linkages

NEB Export Licence: stand alone application, usually first

CEAA and/or BCEAO Environmental Assessment Certificate

deny

approve

BCOGC facility permit: requires EA certificate but process can be synchronous with EA review

deny

approve

TERMOPOL review process: voluntary participation and timing
An Improved LNG Review Process Asks Key Security Questions Up Front

Mandatory Transport Canada site/waterway pre-screening process

- fail

- pass

NEB export licence application

- deny

- approve

Mandatory TERMPOL review of marine security and safety issues

Binding recommendation

- approve

Environment Assessment Process

- approve

- deny

BCOGC Permitting Process

- deny
Terrorist attacks on LNG tankers and facilities are a legitimate threat

A 2009 report by the US Congressional Research Service states that “potential terrorist attacks on LNG terminals or tankers in the United States have been a key concern of policy makers because such attacks could cause catastrophic fires in ports and nearby populated areas.” The report also notes that the US Department of Homeland Security has included LNG tankers on a list of possible terrorist targets. 3

In a review of LNG risks to public safety conducted by the US Government Accountability Office, consulted experts rated an attack on an LNG tanker as a greater risk to public safety than an attack on a crude oil, diesel, gasoline, jet fuel, LPG or heating oil tanker.4

While the risk posed by such a threat may currently be low, the harmful consequences could be extreme, especially for incidents involving LNG tankers and facilities located near population centres and critical infrastructure. Given that terror threats and capabilities are constantly evolving, it is appropriate that decision makers carefully weigh security risks when making decisions on LNG terminal siting and the movement of LNG tankers.

Unfortunately, as this review shows, no such security assessment process takes place during LNG terminal site selection in Canada today.

Are LNG ships and terminals potential terrorist targets?

Yes, because of LNG’s explosive potential, experts say. Al-Qaeda, for example, has specifically cited LNG as a desirable target.

— Council on Foreign Relations

Existing Canadian LNG security procedures are passive and underdeveloped

Existing and proposed marine security measures for BC’s LNG export industry are vague and reactive, and plans for enforcement are undeveloped. Federal Marine Transportation Security Regulations do not provide for moving security exclusion zones around LNG tankers as part of normal operating procedure. Canada should develop requirements for such exclusion zones and ensure that enforcement agencies are adequately resourced to interdict vessels entering these zones.

Similarly, the federal Marine Transportation Security Regulations do not provide for marine security exclusion zones around LNG facilities as part of normal operating procedure. Furthermore, the authority to establish and manage exclusion zones around

LNG facilities is unclear and appears to overlap between Transport Canada, BC’s Port Authorities, and the BC Oil and Gas Commission.

**US rules offer guidance on LNG site pre-screening and security procedures**

A site pre-screening and waterway suitability assessment process needs to be developed for LNG proposals in Canada. Gaps and potential conflicts in Canada’s marine transportation security regulations need to be resolved. All of these problems must be fixed before LNG exports commence on the BC coast.

Canada need look no further than the United States for guidance on how to fix these problems. Studies conducted by Sandia National Laboratories have been particularly useful in determining justifiable hazard planning distances needed to assess risks posed by LNG facility proposals and the movement of LNG tankers near populated areas and critical infrastructure.

Results of the Sandia Laboratory Studies have been incorporated into the comprehensive waterway suitability assessment process used by the US Coast Guard to screen all LNG marine terminal proposals for safety and security risks. The Coast Guard evaluates the suitability of waterways for LNG tanker traffic that would be generated by LNG terminal proposals, and its recommendations on the suitability of siting plans are used by the Federal Energy Regulatory Commission (the US agency that permits LNG facilities) in its decisions on LNG terminal proposals.

The Canadian government should closely consider the screening procedures used by the USCG and FERC. It provides a ready made and tested template for developing our own comprehensive pre-screening procedure.

**Canada and BC need to be proactive in evaluating LNG safety and security risks**

Canadians deserve world class protection from LNG risks. That means screening and rejecting poorly sited projects at the outset, not simply trying to mitigate risks through design modifications and permitting requirements at some point well into a lengthy permitting process.

Canada must also develop proactive and properly resourced security procedures to protect LNG tankers and facilities. Moving exclusion zones around LNG tankers transiting near population centres and critical infrastructure should be a central feature of any security plan designed to protect public safety. The security procedures in place in the Port of Boston, described below, provide a useful example of measures employed in a jurisdiction where LNG security risks are taken seriously. We should expect no less in Canadian Ports where LNG exports are proposed.
The Port of Boston – a jurisdiction that takes LNG security risks seriously

The Port of Boston has had a receiving terminal for LNG imports since 1971. While the presence of this terminal in a heavily populated area has always been a concern, those concerns were heightened after the terrorist attacks of 2001 in New York and Washington. The Department of Homeland Security subsequently put the Boston LNG terminal on a list of possible terrorist targets.

The near-shore security procedures for tankers transiting through the Port of Boston are comprehensive:

- Coast Guard team boards the LNG tanker before it enters harbour for security and safety checks (prior to pilot boarding).
- Upon entering the harbour jurisdiction a security zone of 3.2 km ahead, 1.6 km astern, and 0.5 km abeam is established around the moving LNG tanker. Five or more armed response boats from the US Coast Guard, Massachusetts State and Massachusetts Environmental Police enforce the zone and ensure other craft are kept away from the LNG tanker.
- An aerial helicopter escort tracks the LNG tanker transit.
- Movements at nearby Logan International Airport are coordinated with the LNG tanker transit.
- A key bridge over the Mystic River in Boston is closed when the LNG tanker transits underneath.5

Canada needs rules for bunkering LNG-fuelled vessels and certifying LNG barges

Plans for LNG-fuelled vessels are moving forward in Canada without a fully developed regulatory regime to govern their operation, a basis for assessing bunkering6 facilities, or common guidelines for bunkering processes. Some LNG proponents indicate they intend to ship LNG by bunker barge to fuel these vessels, but it is not clear if Canada even has a certification regime in place to govern the design, construction or operation of LNG bunker barges.

Canada needs a LNG spill response regime, and a dedicated response organization

Despite having been identified as a priority since the late 1990s, Canada still has not enacted a preparedness and response regime for ship-source incidents involving hazardous substances such as LNG.

Our preparedness for a serious incident on an LNG tanker or at a marine LNG terminal is woefully underdeveloped even compared to our preparation for an oil spill. This lack of forward planning is intolerable, given the pursuit of multiple LNG export plans in BC, many of them involving terminals and LNG tanker movements near urban areas.

6 Bunkering is the process of supplying fuel to a vessel, whether from a fixed fuel line or a barge.
Furthermore, the LNG industry lacks a certified, dedicated response organization such as the Western Canada Marine Response Organization put in place to provide a qualified response to oil spills. In many locations, first responders are likely underprepared to deal with a significant incident involving loss of containment on an LNG tanker or at an LNG terminal followed by pool fire or ignition of an expanding LNG vapour plume.

Where to build LNG terminals? Far from population centres, experts suggest

Transport Canada TERMPOL Guidelines recommend “locating the terminal in a remote location or one that is well separated from urban or suburban communities.”

Society of International Gas Terminal and Tanker Operator (SITGTO) guidelines say the “jetty location should be remote from populated areas and should also be well removed from other marine traffic and any port activity which may cause a hazard.”

Outline of this report

Part two of this report examines existing regulatory procedures in the United States, including the US Coast Guard Waterway Suitability Assessment process that is central to the LNG terminal approval process in that country, and US federal regulations establishing moving security exclusion zones around LNG tankers. Part 2 also reviews LNG industry association terminal siting standards, which, if applied in Canada, could go a long way towards reducing risks from LNG development.

LNG proponents and government reviewing agencies occasionally provide lists of laws and regulations which, they argue, show this nascent industry would be carefully regulated if it were allowed to develop in Canada. Part three of this report reviews federal regulations and processes to show that this argument is false. Neither federal law, nor Transport Canada’s voluntary TERMPOL process incorporate site selection or waterway suitability processes for LNG terminals and tankers.

Federal law has kept pace with international law in the certification of LNG tankers, but it appears that no such certification process exists for LNG bunker barges or for bunkering LNG-fuelled ships. Further, Canada has not established a preparedness and response regime for incidents involving hazardous substances such as LNG.

Part four of this report reviews provincial law and regulation governing the approval of LNG facilities, led by the BC Oil and Gas Commission. This review shows that the BC
LNG approval process, as well as the required CSA standards that underlay the process, fail to consider risks to LNG tankers or hazards along the routes that would be transited by those tankers. The lack of transparency in BCOGC decision making also makes it difficult to determine how the commission evaluates risks to the public from LNG proposals.

Part five applies the findings of this report to a detailed review of the Wespac Tilbury LNG proposal on the Fraser River. US rules and industry guidelines are applied to this terminal site and the proposed movement of LNG tankers along the Fraser River to provide an initial assessment of hazards posed by the project. The application of existing federal and provincial regulations to the project application are also considered, and gaps and conflicts within Canadian law are identified. Perhaps more than any LNG proposal, the Wespac project illustrates the need for a site pre-screening and waterway suitability process to quickly eliminate poorly sited proposals.

An overall summary is provided in Part Six. Recommendations are offered in Parts Two through Five and are assembled in the Appendix in Part Seven.
Part Two: US Rules And Industry Guidelines

US Waterway Suitability Assessment: focused on security

In the United States the Federal Energy Regulatory Commission (FERC) approves construction of LNG terminals. As an early step in the application process, proponents are required to submit a Waterway Suitability Assessment\(^7\) (WSA) to the US Coast Guard (USCG) to ensure that “full consideration is given to safety and security of the port, the facility, and the vessels transporting LNG.”\(^8\) The USCG provides a recommendation to FERC on a waterway’s suitability for LNG tanker traffic, which is then used to inform FERC’s approval process.\(^9\)

The WSA process incorporates an explicit assessment of safety and security concerns at the earliest stage of the LNG terminal application process. Importantly, the WSA process requires that proponents estimate the hazards associated with a \textit{deliberate assault (e.g. a terrorist attack)} on an LNG tanker.

\begin{quote}
\textit{Importantly, the US Waterway Suitability Assessment process requires that proponents estimate the hazards associated with a deliberate assault (e.g. a terrorist attack) on an LNG tanker.}
\end{quote}

Nothing like this pre-screening process exists in Canada.

Hazard Zone Mapping: a critical feature of the WSA process

A central part of the WSA process is the mapping of “zones of concern” along the entire waterway that would be transited by LNG tankers in order to identify port features, critical infrastructure and populations at risk from hazards (e.g. thermal radiation, blast force) associated with loss of containment and ignition of LNG vapour. The hazard zone planning distances incorporated in the WSA process are based on studies conducted by Sandia National Laboratories\(^10\) at the request of the US Department of Energy. They

\begin{itemize}
\item Ibid., pg. 2.
\item Ibid., pg. 3-4. FERC is responsible for ensuring compliance with the US National Environmental Policy Act and issuing Environmental Impact Statements and Environmental Assessments. It also appears to perform facility permitting functions similar to those of the BC Oil and Gas Commission. Under an interagency agreement between FERC and the USCG, maritime security issues are addressed by FERC in the EIS/EA process. Recommendations provided by the USCG represent their “official maritime safety and security input to the agencies having jurisdiction on the facility site selection.” The USCG recommendations do not “constitute a permitting action” and “must not impose requirements or mandate conditions.” In other words, even if the USCG were to recommend a waterway as suitable for LNG tanker traffic, FERC may still decide not to permit the associated facility for other reasons.
\item Op. cit., Sandia National Laboratory, December 2004. The 2004 version of the report addresses hazards associated with LNG tankers from 125,000 to 150,000 m\textsuperscript{3} capacity. The
\end{itemize}
represent the furthest extent of risk to life and property from loss of containment on an LNG tanker resulting from an accident or deliberate attack. The hazard planning distances are described in detail in the following text box.

The USCG guidance on the WSA process provides a useful summary of the Department of Energy’s rationale for commissioning the Sandia Laboratory studies:

A number of studies and reports have been published about the safety of LNG tankers, with varying conclusions about the likelihood and consequences of a large LNG marine spill. In order to provide the federal government and general public with a clearer picture of the risks associated with LNG tankers, the Department of Energy (DOE) tasked Sandia National Laboratories to perform an independent review of these studies and reports and then develop their own conclusions about the risks associated with LNG tankers. They were also tasked with developing guidance on a risk-based approach to assess and quantify potential threats to an LNG ship, to review potential hazards and consequences of a large spill from an LNG ship, and review risk management strategies that could be implemented to reduce both the potential for, and the risks of, an LNG spill over water. The Sandia Lab Reports, references (e) and (f), provide the foundation for the Coast Guard’s current position on LNG safety and provide a basis for evaluating the risks associated with LNG marine traffic.11

The Sandia analyses remain the definitive assessment of risks associated with LNG marine traffic today. The hazard zones identified in the analyses are central to risk assessment and risk management planning in the WSA process.

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What do the Sandia Laboratory studies say about hazard planning distances?

Hazard zone distances used in the USCG Waterway Suitability Assessment draw on studies conducted by Sandia National Laboratory in the United States. The purpose of the Sandia studies was to estimate the hazards that would be generated by the intentional breach of containment on an LNG tanker followed by loss of LNG and a pool fire or ignition of an expanding vapour plume. The analyses conclude that though the probability of such an event is low, its consequences would be severe.

The Sandia analyses define distinct hazard planning distances that should be considered when evaluating risks associated with such an incident happening near to shore (at berth or in transit).

- **Zone 1 (500m radius):** Significant impacts on public health and safety, and damage to structures and vessels. Hazard from cryogenic burns and structural damage from exposure to supercooled LNG. Hazard from pressure wave and flying debris resulting from rapid vaporization (phase transition) of the LNG. Asphyxiation hazard for those exposed to the expanding LNG vapour plume. Hazard from intense thermal radiation from pool fire if evaporating LNG is ignited. Thermal radiation flux greater than 35 kW/m² possible within this zone. Risk Management Strategies near critical infrastructure include rigorous deterrent measures such as vessel security zones, waterway traffic management and positive control over vessels. Availability of risk management resources must be carefully evaluated. Coordination among security stakeholders is crucial.

- **Zone 2 (500-1600m radius):** Hazards as for Zone 1, with severity of consequences declining over distance. Thermal radiation flux to 5 kW/m² possible at edge of zone – sufficient to result in 2nd degree burns on bare skin after thirty seconds of exposure in an open area. Risk Management Strategies that should be considered include establishing areas of refuge, community warning procedures and education programs.

- **Zone 3 (1600-3500m radius):** Conservative maximum distance within which an expanding LNG vapour cloud may still ignite if it has not yet come in contact with a source of ignition (assuming an attack leading to complete loss of containment on an LNG tanker). Resulting fireball could burn back to the spill source and could result in intense pool fire at the tanker. Risk Management Strategies include establishing areas of refuge and community education programs.

In addition to their role in terminal site pre-screening and waterway suitability assessments, the hazard planning distances presented in the Sandia analyses also provide guidance for the development of security exclusion zones around terminals and LNG tankers and notification requirements for LNG facility permitting processes.

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13 In comparison, the BC LNG Facility Regulation (Schedule 1) only allows accidental thermal radiation flux to 1.5 kW/m² outside facility boundaries when persons may be present in open areas without protective clothing.
Required content of the WSA
The USCG guidance states that the WSA "should identify credible security threats and navigational safety hazards for the LNG marine traffic, along with appropriate risk management strategies and the resources needed to carry them out."14

The following topics must be addressed in the WSA:

1. Characterization of the port, facility and LNG tanker route
The WSA must describe the facility, port and tanker transit route in relation to hazard planning distances. Factors that should be addressed include, but are not limited to, industrial, commercial and residential districts; city centres, schools, hospitals, and cultural centres; and sensitive environmental areas. The characterization should also describe population densities within hazard zones.15

2. Assessment of maritime security and safety risks
The security risk assessment should include a threat assessment (an assessment of the likelihood of an attack) and a vulnerability assessment (an assessment of the likelihood that an attack will succeed). The threat assessment should addresses, at a minimum, the various attack scenarios evaluated in the Sandia reports (sabotage, projectiles, aerial, surface and underwater threats) along the entire waterway that would be transited by LNG tankers. The security risk assessment must also include a consequence assessment that considers potential impacts on populations, critical infrastructure and the environment in relation to the hazard zones. Where consequences would be high (e.g. near population centres and critical infrastructure), gas dispersion modelling may be required to further detail impacts. The overall security risk assessment should identify key assumptions and provide a sensitivity analysis for those assumptions.

3. Identification of risk management strategies and needed resources
The WSA must provide risk management strategies for preventing attacks and mitigating their consequences and an assessment of resources needed to carry out those strategies. The WSA must include a gap analysis which identifies missing risk management resources and presents a plan to obtain them.

Proponents must develop a cost sharing plan for risk management
Critically, FERC requires proponents develop cost sharing plans with state and local agencies to ensure that cooperating agencies are readily available, have the jurisdiction to and are capable of implementing the required risk management strategies. This recommendation particularly applies to any measure involving critical resources, such as waterborne, aerial and waterfront assets used for safety/security zone enforcement and/or shoreline surveillance and monitoring.16

The USCG guidance specifically cautions proponents that the availability of USCG resources is subject to “mission prioritization and resource allocation that is based on

14 Ibid., pg. 3.
15 Ibid., WSA Enclosure (2) to NVIC 01-2011 pg. 4.
16 Ibid., pg. 7.
many variables outside the applicant’s control.” The guidance notes that risk management is a cooperative effort involving federal, state, local and private resources, and encourages proponents to develop a cost sharing plan “as early as possible.”17 The guidance also notes that resources for some procedures – such as video surveillance, bridge security, pier security sweeps, vessel escort and shoreline surveillance and monitoring – may not currently exist at the local level and may take time to fund, procure and implement.

In short, the WSA and FERC application processes make clear that applicants bear responsibility for risk management planning, and where resources are not currently available to carry out those plans, applicants must be prepared to help fund their development.

WSA timeline, process, stakeholder consultation
To ensure timely review, proponents are required to submit a Letter of Intent and preliminary WSA to the local Coast Guard Captain of the Port (COTP) as early as possible, and no later than the start of the project pre-filing period with FERC.18

According to the guidance, the preliminary WSA

need not contain detailed studies or conclusions, but it should explain the project and discuss the obvious impacts to the port and waterway from the territorial sea to the LNG facility. Risk assessments, risk management strategies and required resources should be discussed in broad terms.19

The Preliminary WSA allows the COTP to identify gaps in the proposed assessment and identify key stakeholders that will need to be involved in the assessment. The COTP is encouraged to involve standing security and safety committees, state and local governments, port stakeholders and members of the public as appropriate in review of the preliminary and full WSAs.20

The full WSA must be submitted to the COTP for review and validation by the time the proponent formally files an application with FERC. The COTP must ensure the WSA provides a “realistic and credible analysis of the public safety and security implications of introducing LNG marine traffic to the port and waterway, and the measures intended to responsibly manage the risks.”

Topics to be considered in the COTP validation process include determining if:

- appropriate stakeholders have been consulted;
- critical infrastructure has been identified;
- population densities figures are accurate;
- all credible threat scenarios have been assessed;
- risk management strategies have been identified, along with their impact on other port users; and

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17 Ibid., Enclosure (1) to NVIC 01-2011 pg. 10.
18 Ibid., Enclosure (1) to NVIC 01-2011, pg. 2. During the pre-filing period proponents gather information and draft reports that inform the formal filing of an EIS/EA application to FERC.
19 Ibid., Enclosure (3) to NVIC 01-2011, pg. 3.
20 As an example, see this call for public comment in the Federal Register from the USCG on the WSA for a proposed LNG facility in Jacksonville Florida.
resources needed to carry out those strategies have been confirmed available or a cost sharing plan to obtain them has been developed.\textsuperscript{21}

Stakeholders have 30 to 60 days to provide input, comments and recommendations to the COTP on the full WSA.\textsuperscript{22}

Once the review and validation of the WSA is complete, the COTP issues a Letter of Recommendation on waterway suitability to FERC. The COTP recommendation must be received prior to FERC issuing draft or final environmental impact statements/assessments for the project. The proponent must review and update the WSA annually prior to construction and commissioning of the facility.

**No comparable process exists in Canada**
Currently no similar assessment process exists in Canada. No federal agency assesses the security risks associated with LNG terminal proposals, and the provincial government explicitly disavows responsibility for marine safety and security issues. As described below, Transport Canada’s TERMPOL review process addresses safety, but not security risks associated with LNG tanker movements on Canadian waterways. In addition, participation in the TERMPOL review process is voluntary, and recommendations produced through TERMPOL reviews are not binding on project proponents.

**Recommendation 1.** Transport Canada should develop a pre-screening process for LNG terminal applications in Canada, modeled on the US Waterway Suitability Assessment Process. The process should be compulsory for all projects, should focus on security and public safety, and should cover both terminal sites and marine approaches to terminals. Transport Canada should have final authority to approve or deny waterway and site suitability for LNG tanker traffic and berthing based on the results of this pre-screening. This pre-screening process should take place before a project enters lengthy environmental assessment, TERMPOL review and BC Oil and Gas Commission permitting processes.

The pre-screening process should consider the feasibility of establishing static marine security exclusion zones around proposed LNG facilities and moving marine security exclusion zones around LNG tankers transiting approaches to those facilities. Where marine security exclusion zones are not feasible (e.g. because of unavoidable conflict with the Collision Regulations or the imposition of serious restrictions on other users of the marine environment) projects should be rejected.

Findings from successful pre-screenings should be used to inform environmental assessment, TERMPOL review and BC OGC permitting processes.

**US Security Exclusion Zones around LNG facilities and moving LNG Tankers**

The US Code of Federal Regulations explicitly allows for moving security exclusion zones around marine vessels and static security exclusion zones around facilities for the purpose of “safeguard[ing] vessels, facilities and other features from destruction, loss or

\textsuperscript{21} Ibid., pg. 4.
\textsuperscript{22} Ibid., pg. 3.
injury from sabotage or other subversive acts, accidents, or other causes of a similar nature."

US federal regulation authorizes a moving security exclusion zone of 3.2 km ahead, 1.6 km astern, and 0.5 km abeam of LNG tankers operating in the Port of Boston. Except for LNG tankers and their support vessels, no entry is allowed into these zones without authorization of the Coast Guard COTP. US regulations establish similar sized moving security zones around LNG tankers in Narragansett Bay (the Port of Providence).

At Cook Inlet Alaska, US federal regulation establishes a moving security exclusion zone of 1000 yards radius (914 metres) around LNG tankers. All other vessels are denied entry without the authorization of the COTP. In Chesapeake Bay (under jurisdiction of the Port of Baltimore), US Regulation establishes a moving security exclusion zone of 500 yards (460 metres) radius around transiting LNG tankers.

Static security exclusion zones have also been established through US federal regulation around LNG facilities. For example, the LNG terminal at Cove Point, Chesapeake Bay Maryland has a 500 yard (460 metre) exclusion zone.

Canada’s Marine Transportation Security Regulations do not incorporate equivalent rules for establishing moving security exclusion zones around vessels or static security exclusion zones around facilities as part of normal operating routine. Establishing such rules would improve safety at LNG terminals and along LNG tanker routes in Canada -- assuming those terminals and routes had been properly vetted through a pre-screening Waterway Suitability Assessment process. These issues are discussed in detail in Part Two of this report below.

Industry Guidelines give clear direction on where NOT to build LNG terminals

The Society of International Gas Tanker and Terminal Operators (SIGTTO) “was formed as an international organisation through which all industry participants might share experiences, address common problems and derive agreed criteria for best practices and acceptable standards.” The society provides guidance to members on a range of topics relevant to LNG tanker and terminal safety.

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24 Safety and security zones for LNG tankers operating in the Port of Boston are described in 33 CFR 165.110, Regulated Navigation Areas and Limited Access Areas, First Coast Guard District, Safety and Security Zone; Liquefied Natural Gas Carrier Transits and Anchorage Operations, Boston, Massachusetts. Regulations pertaining to Narragansett Bay are found at 165.121. Further background can be found in this earlier discussion of proposed rules for the Port of Boston: Safety and Security Zone; Liquefied Natural Gas Carrier Transits and Anchorage Operations, Boston, Marine Inspection Zone and Captain of the Port Zone. A Proposed Rule by the Transportation Department and the Coast Guard on 07/26/2002.
25 Ibid., at 165.1709: Security Zones; Liquefied Natural Gas Carrier Transits and Operations at Phillips Petroleum LNG Pier, Cook Inlet, AK.
26 Ibid., at 165.500.
27 Op. cit., at 33 CFR 165.502. Other examples of LNG facility security exclusion zones include those in the Port of Houston and in San Pedro Bay at The Port of Los Angeles/Long Beach
28 http://www.sigtto.org/
Of particular relevance to this review is the SIGTTO guidance document *Site Selection and Design for LNG Ports and Jetties*. The document “concentrates on issues that can be solved when a port is being designed and is, therefore, of interest to harbour planners and port authorities.” In BC the document should be considered by all agencies involved in approving LNG terminal proposals, including Transport Canada, Port Authorities and the BC Oil and Gas Commission.

Regarding port (approach) design, the SIGTTO guidance document recommends minimum widths for approach channels and minimum diameters for turning circles; traffic separation schemes along approach routes covering many miles; and short approach channels instead of long inshore routes.

Regarding jetty design, the guidelines recommend finding a location suitably distant from centres of population, and providing a safe position, removed from other traffic and wave action. The guidelines also state that river bends and narrow channels should not be considered appropriate locations for LNG tanker jetties.

Application of the SIGTTO siting guidelines is considered in detail in Part Five of this report, which provides a comprehensive review of the proposed Wespac LNG facility on the Fraser River.

**Recommendation 2.** Transport Canada should review and incorporate SIGTTO site selection and design guidelines into a federal LNG terminal pre-screening process and into a revised, mandatory TERMPOL process (see recommendation 3 below). Port Authorities located in BC and the BC Oil and Gas Commission should show that they have reviewed and incorporated SIGTTO site selection and jetty design guidelines into their own review processes for project proposals which pass the pre-screening process.

At the time of site selection, the level of marine risk is determined by the position chosen for the terminal and this is especially true of terminals handling hazardous cargos such as LNG

— SIGTTO industry association guidelines

**Summary: what can we learn from US rules and industry guidelines?**

Rules in place in the United States provide a clear model that Canada and British Columbia can use to develop comprehensive regulations to protect the public from LNG safety and security risks on the BC coast.

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30 Ibid., pg. 2.
31 Ibid., Appendix A pg. 23.
32 Ibid., Appendix A pg. 24.
Mapping LNG tanker and terminal hazard zones must be made standard practice in Canadian LNG terminal applications. Coastal communities must be made fully aware of the risks that are created by the LNG industry, and they must have a voice in determining if those risks are acceptable. Canada should require an LNG project pre-screening process equivalent to the US Waterway Suitability Assessment process.

The threat of deliberate attack on an LNG tanker or terminal must be explicitly assessed by proponents and reviewed by regulators in LNG terminal application processes. Proponents must also be required to conduct an assessment of the availability of risk management resources, both for the enforcement of security procedures and for responding to incidents resulting from a deliberate attack or a serious accident on an LNG tanker. When proponent assessments show that risk management resources are lacking, they must be required to develop cost sharing programs for their procurement and implementation. The cost of mitigating the safety and security risks generated by LNG exports should not fall on local communities or taxpayers in general.

Canada should follow the US practice of adopting moving security exclusion zones around transiting LNG tankers and static security exclusion zones around facilities as part of normal operating practice in order to proactively protect the public from LNG security risks.

As following sections of this report show, current regulation of safety and security risks arising from the siting of LNG terminals and the movement of LNG tankers is underdeveloped in Canada. In addition, Canada is not prepared to deal with a serious incident involving an accident on an LNG.

BC should put plans for LNG exports – both from approved and proposed projects – on hold until these gaps in regulation and preparedness are closed.
Part Three: Existing Canadian Law On LNG Terminals And Tankers

Voluntary TERMPOL process does not address security risks

Transport Canada’s TERMPOL process (Technical Review Process of Marine Terminal Systems and Transhipment Sites)\(^{33}\) is intended to identify navigation concerns related to proposed projects and make recommendations to ensure safe shipping, protect public safety and prevent pollution of the marine environment.

Entry into the TERMPOL process is voluntary, and proponents are not bound by the review committee’s recommendations. Project proponents may request a TERMPOL review to evaluate risks associated with proposed shipping routes, terminals and cargo transfer procedures related to projects involving oil, LNG and other hazardous goods.

The TERMPOL process does not evaluate security risks arising from projects.

For each TERMPOL review, Transport Canada establishes a review committee including representatives from Transport Canada, the Canadian Coast Guard, the Department of Fisheries and Oceans, Port Authorities (if applicable), Pilotage Authorities and other agencies, including provincial public safety organizations. The committee works with the proponent to identify data required for consideration, and reviews and makes recommendations on studies submitted by project proponents.

While the TERMPOL review guide notes that “locating the terminal in a remote location or one that is well separated from urban or suburban communities” is an important method for reducing risk,\(^{34}\) it is not a site selection or site screening process and does not set out standards for sites. Instead, project proponents enter the process with a site in mind, and the TERMPOL review focuses on identifying project risks and reducing those risks to acceptable levels through design and best available technology.

The TERMPOL review process is intended to provide proponents with an early assessment of the marine navigation, public safety and environmental risks posed by a project, so that the results of the review are available to inform other processes such as environmental assessment.

The TERMPOL Review Process Guide states that

Where a regulatory process such as those under the Canadian Environmental Agency, the National Energy Board or provincial authorities applies to the project, the TERMPOL Review Committee expects the proponent to:

- consider how the TERMPOL review can help to inform that review process and to align timelines if possible and as appropriate; and

\(^{34}\) Ibid., Section 3.13.9.
• provide its submission, or submissions, to the lead authority and the public, including all correspondence with the review committee related to TERMPOL review, according to the filing and timing requirements of that regulatory process.  

However, as the TERMPOL review process is entirely independent of environmental assessment and other regulatory approval processes, and participation in and timing of a TERMPOL review is at the discretion of a project proponent, there is no guarantee the results will be available in time to inform those other approval processes.

Currently, only a single TERMPOL review has been completed for an LNG facility in Canada, for the proposed LNG Canada project in Kitimat.  Pacific Northwest LNG (in Prince Rupert) and Woodfibre LNG (in Squamish) have submitted TERMPOL studies to Transport Canada for review, and recommendations are expected in 2017.  Kitimat LNG is conducting studies in preparation for a TERMPOL submission.  Wespac Tilbury LNG has indicated it will not participate in the TERMPOL process.

The chart below shows selected BC LNG proposals and their TERMPOL review status. TERMPOL reviews completed at some future date for the Pacific Northwest and Woodfibre LNG projects will have no influence on their environmental review as both projects have already received environmental assessment certificates.

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35 Ibid., Section 1.2.3.
36 LNG Canada Project TERMPOL Review Process Report TP 15287E  October 2015 In a February 2016 email LNG Canada indicates it took twelve months to complete studies required to inform its TERMPOL submission, and the TERMPOL Review Committee took six to seven months to consider those studies and issue recommendations.
37 As reported in a January 2017 email from Transport Canada staff.
38 Personal communication with proponent at project open house December 2015.
Do TERMPOL reviews inform LNG Environmental Assessments? Not to date.

<table>
<thead>
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<th>LNG Project</th>
<th>Environmental Assessment Status</th>
<th>TERMPOL Review Status</th>
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<td>EA certificate issued June 2006</td>
<td>Studies underway, will be submitted to TERMPOL committee when complete</td>
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<tr>
<td>LNG Canada</td>
<td>EA certificate issued June 2015</td>
<td>TERMPOL review complete, recommendations issued September 2015</td>
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<td>Woodfibre LNG</td>
<td>EA certificate issued October 2015</td>
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<td>Pacific Northwest LNG</td>
<td>EA certificate issued September 2016</td>
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<tr>
<td>Malahat LNG</td>
<td>Has not yet applied</td>
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What does the LNG Canada TERMPOL report say about security?

LNG Canada applied for a TERMPOL review of its proposed Kitimat LNG terminal in early 2015. The TERMPOL Review Committee (TRC) provided its report in September 2015 – the only BC LNG TERMPOL review to date. Highlights include:

- Security requirements under national and international regulatory frameworks were considered beyond the scope of the review by the TRC.
- LNG Canada was not required to and did not assess the likelihood or consequences of incidents such as a deliberate attack on an LNG tanker, nor did it propose measures to mitigate such security risks.
- LNG Canada only assessed hazards associated with accidental release of LNG from a tanker and only gave consideration to shorter hazard planning distances associated with accidental spill volumes (e.g. loss of containment in one tank). Consequently, LNG Canada concluded that gas dispersion modelling of risks to nearby communities was not necessary.
- LNG Canada stated that “project vessels will maintain safe operating distance from other marine craft” but made no mention of moving exclusion zones or how safe operating distance would be maintained if other vessels deliberately approach project vessels in an aggressive manner. The TRC stated that LNG Canada should maintain safe operating distance by adhering to the Collision Regulations and “good seamanship practices.”
- LNG Canada proposed, and the TRC agreed, that narrow portions of the LNG tanker transit route should be one-way with passing restrictions.
- LNG Canada proposed a control zone around its terminal “as a safety and security measure,” but did not specify the radius of this zone nor how it will be enforced. The TRC acknowledged that facility security exclusion zones are used in other countries, but stated that “additional work is needed to review the concept in Canada with the aim of developing a national approach.” The TRC also noted that it is not in support of moving exclusion zones.

By not considering security risks, the LNG Canada TERMPOL Review did not assess all hazards to the public from the project. As Transport Canada has not developed standard policy for security procedures such as facility exclusion zones, LNG Canada is forced to propose its own measures to fill the gap.

39 Op. cit., LNG Canada
40 Ibid., pg. 45. The TRC asked LNG Canada to conduct gas dispersion modeling, but accepted LNG Canada’s rationale for not doing so. Accidental hazard planning distances are from Sandia 2004, op. cit. The TRC report notes the BCEAO accepted LNG Canada’s accidental release scenario as a worst case scenario when issuing the project EA Certificate in 2015. Neither the BCEAO nor CEAA consider security risks in their assessment processes.
41 Ibid., pg. 34.
42 Ibid., pg. 51. The TRC’s opposition to moving exclusion zones is detailed in TERMPOL Review Process Report on the Trans Mountain Expansion Project, pgs. 27-31. Opposition in the Trans Mountain report focuses on moving exclusion zones as a safety measure, to
**Recommendation 3.** Transport Canada should standardize the TERMPOL review process and make it mandatory for all LNG terminal proposals. Recommendations produced through these reviews should be binding. Review committees should incorporate expertise from the BC Oil and Gas Commission and industry associations such as SIGTTO. There should be a clearly established time frame for entry into and completion of the review process so that siting, design, security and operational recommendations can be considered in the environmental assessment process and BC Oil and Gas Commission approvals.

A strengthened TERMPOL review process should complement, not replace, a mandatory site pre-screening process used to expediently rule out inappropriate locations for LNG terminals.

Transport Canada should ensure that the revised TERMPOL review process gives explicit consideration to the risks and consequences of deliberate attacks and results in recommendations for measures to mitigate security risks. Security risk analysis should address marine approaches to terminals as well as terminal locations themselves. The TERMPOL review process should incorporate hazard planning distances identified in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*.

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**Canada’s Marine Transportation Security Regulations Contain Gaps**

The Marine Transportation Security Regulations (MTSR)\(^{43}\) are the primary regulations governing marine security in Canada. They provide a process for establishing marine security requirement (MARSEC) levels at marine facilities and on vessels as well as procedures for operations in and interactions between vessels and facilities at different MARSEC levels. The MARSEC levels can be described as 1: Normal operations, 2: Heightened risk of a security threat or incident for a limited period, and 3: Security threat or incident is probable or imminent.

The MTSR contain no facility siting requirements. The regulations take the siting of facilities as a given and present requirements for assessing and managing security risks on site. While the regulations address security on vessels, they contain no provisions for assessing or maintaining security along waterways.

**Application to vessels**

Under section 201, the MTSR apply to vessels greater than 500 GT, or carrying more than 12 passengers, and engaged in international voyages.\(^{44}\) The MTSR do not apply to Canadian flagged vessels engaged in voyages between marine facilities in Canada.

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\(^{43}\) *Marine Transportation Security Regulations*, found under the *Marine Transportation Security Act*. Under section 11 of the MTSR, MARSEC levels are established by the Director General of Marine Security at Transport Canada.

\(^{44}\) Sometimes referred to as a “Part 2 Regulated Vessel.”

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*Sailing Into Unknown Waters* – the safety and security risks of LNG exports
Under 202-218, the Minister can issue a vessel security document to vessels that meet requirements detailed in the regulations. These include establishing a vessel security plan (described further below), designating a qualified security officer, documenting calls to marine facilities and declarations of security levels, and conducting security drills and exercises.

Under 219, the vessel must coordinate its MARSEC level with that in place at the marine facility that is its destination.

Under 221, the MTSR require that vessels (including LNG tankers) with a destination in Canadian waters provide 96 hours pre-arrival notification to Transport Canada’s Marine Security Operations Centre.\(^45\)

Information that must be provided during pre-arrival notification includes a description of the cargo, confirmation of a vessel security plan, current vessel MARSEC level and details of any defects in vessel security systems.

Under 228, vessels and facilities which are at different levels of security, or which handle Certain Dangerous Cargoes (CDCs),\(^46\) or which have particular concerns about security, shall conduct a declaration of security to ensure that all security concerns are addressed.

Sections 236-256 of the MTSR describe requirements of the vessel security plan. These included procedures at different MARSEC levels for access to vessels (including to restricted areas), cargo handling, delivery of ships stores and bunkers, and procedures that must be followed to monitor security and respond to security threats, breaches and incidents. The vessel security plan is not a public document.

Under section 14, the Minister may suspend or cancel a security plan if a vessel is not in compliance, or if operated in a way that may constitute a threat to marine security.

**Application to facilities**

A parallel set of requirements apply to facilities under the MTSR. A marine facility must designate a qualified security officer, conduct security drills and exercises, and coordinate security procedures, including declarations of security, with vessels interfacing with the facility.

The MTSR require ministerial approval of a Marine Facility Security Plan, based on an on-site assessment of vulnerabilities, for any marine facility that interfaces with vessels

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\(^45\) 4.2.9 Pre-Arrival Information Report (PAIR). Radio Aids to Marine Navigation, Canada Coast Guard 2015. If the entire voyage is less than 96 hours, at least 24 hours notice must be provided.

\(^46\) Certain dangerous cargoes (CDCs) are listed in Schedule 4 of the MTSR. LNG is considered a CDC in the MTSR when packaged in “large means of containment” as defined under the *Transportation of Dangerous Goods Regulations* or if meeting other requirements under those regulations. However, the *Transportation of Dangerous Goods Act* specifically does not apply to the bulk transport of dangerous goods where the only means of containment is the “permanent structure of the vessel.” Therefore the security sweep required under the MTSR for vessels containing CDC’s does not apply to LNG tankers.
undertaking international voyages. If the facility is within a Port Authority, the Marine Facility Security Officer must also liaise with the Port Security Committee.

Sections 316 - 346 of the MTSR describe requirements for assessing security vulnerabilities and developing a facility security plan. Under 321, the vulnerability assessment must explicitly consider the risk of deliberate attack on the facility.

The security plan must include procedures at different MARSEC levels for access to facilities (including to restricted areas), cargo handling, delivery of ships stores and bunkers, and procedures that must be followed to monitor security and respond to security threats, breaches and incidents. Section 349 provides additional security plan requirements for facilities that handle CDCs, including “conducting a security sweep of unmanned or unmonitored waterfront areas for dangerous substances and devices before a vessel’s arrival.” The facility security plan is not a public document.

Under the Marine Transportation Safety Act, Transport Canada must approve the Marine Facility Security Plan and issue a Statement of Compliance following an inspection of the facility by a security inspector. No facility may operate without a Statement of Compliance. The Minister may issue an interim Statement of Compliance where a Marine Facility Security Plan has been approved but a facility has not yet been inspected by a security inspector. Under section 14 of the MTSR, the Minister may suspend or cancel a security plan if a facility is not in compliance, or if operated in a way that may constitute a threat to marine security.

Facilities with less than 10 interfaces per year with vessels to which the regulations apply (“occasional use facilities”) are required to meet a lesser set of requirements detailed in sections 356 – 360.1 of the regulations.

**Application to Port Authorities**

Port Authorities administer the MTSR directly on lands and waters under their jurisdiction. Port Authorities must designate a Port Security Officer and develop a Port Security Plan. The Port Security Plan is not a public document.

Under section 363, the Port Security Officer shall develop the Port Security Plan with the Marine Facility Security Officers at facilities within the Port and “in consultation with representatives of federal departments and agencies, provincial and municipal governments, appropriate law enforcement agencies, emergency response providers, employers and labour at the port.” Under section 364, a Port Security Committee shall be established from these parties to coordinate security. Under 371, Port Authorities must also consider the risk of deliberate attack when conducting vulnerability assessments as part of their development of a Port Security Plan.

Sections 380 – 394 of the MTSR detail requirements for controlling access to restricted areas at Port Authorities.

**Port Security Plans**

Under 373 of the MTSR, Port Authorities must ensure that their Port Security Plans include a description of procedures, equipment and systems for access control as well as procedures, equipment and systems for monitoring the port and the surrounding area. The Port Security Plan must also include a description of procedures for security threats, security breaches and security incidents.
Security Clearance Requirements
Part 5 of the MTSR details security clearance requirements (including eligibility requirements, application processes and verification) for vessel pilots as well as persons with access to restricted areas, security responsibilities or the ability to interfere with security procedures at marine facilities and ports. However, according to Schedule 1 of the MTSR these security clearance requirements only apply to cruise ship terminals and container terminals at the Prince Rupert and Vancouver Fraser Port Authorities.

Ensuring vessel compliance with the MTSR
As a signatory to the SOLAS Convention (incorporated into Canadian law through the Canada Shipping Act, 2001) and associated MOU’s, Transport Canada marine safety inspectors are empowered through the Port State Control Program to board foreign flagged vessels to ensure their compliance with international conventions, including compliance with safety and security certification requirements. Vessels that do not meet requirements can be detained. “It is Transport Canada’s policy to inspect every foreign tanker vessel calling at a Canadian Port on its first visit to Canada and at least once a year thereafter.” The Flag State Control Program, also under the Canada Shipping Act, 2001, provides similar powers to board Canadian flagged vessels.

Missing provisions for moving security exclusion zones
The MTSR does not provide for the use of moving security zones around vessels in transit as a normal operating procedure, though the regulations do include provisions for restricting access to and monitoring movement around vessels when the MARSEC level has been raised from normal operations to heightened risk.

Under 283 (f), vessel security plan access control procedures under MARSEC Level 2 shall include, “to the extent that they are appropriate to the vessel’s operations,” “the deterrence of waterside access to the vessel, which may include, in liaison with a marine facility or a port administration, providing boat patrols.”

Under 254 (e) vessel security plan monitoring procedures under MARSEC Level 2 shall include, “to the extent that they are appropriate to the vessel’s operations,” “the coordination of monitoring with boat patrols, and with foot or vehicle patrols, if provided by a marine facility or a port administration.”

Under 256, the security plan shall include procedures for responding to security threats, breaches and incidents at all MARSEC levels by, among other things, denying access to the vessel.

Though not addressed in the MTSR, there is precedent in other Canadian law for establishing moving exclusion zones around transiting LNG tankers in Canada as a normal operating procedure.

Under section 4.2.4 of its Port Information Guide, the Saint John Port Authority has established a 0.5 nautical mile (925 metre) radius moving exclusion zone around LNG

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49 Port State Control Program.
51 Flag State Control Program.
tankers in transit within harbour limits. Section 4.2.4 also notes that “no vessel shall attempt to cross ahead or overtake an LNG tanker underway within the harbour limits.” The Port Information Guide suggests that the Port’s authority to establish this moving exclusion zone is derived from Part 1 Section 58 of the Canada Marine Act, in the “interest of safety and good order,” and not through powers delegated to the Port under the MTSR.

Under Section 8.5 of its Port Information Guide, the Prince Rupert Port Authority indicates that it “may establish a safety or security zone, either fixed or moving, around any vessel or shore structure to ensure public safety, security or the environment.” The Port Authority indicates that safety zones around LNG tankers (moving or stationary) are still to be promulgated.

The Vancouver Fraser Port Authority (VFPA) also indicates that moving exclusion zones are something that it “could consider.” However, VFPA has indicated that it is not in support of moving exclusion zones around LNG tankers transiting to and from a proposed LNG terminal site on the Fraser River.

Establishing moving security exclusion zones could be a key measure to protect LNG tankers from attack in Canadian waters. However, simply establishing a security exclusion zone around a moving vessel will be meaningless without the ability to interdict unauthorized entries into the zone. Enforcement authority for security zones must be clearly established and enforcement protocols must be fully developed and properly resourced. Project proponents should be expected to contribute to funding enforcement of exclusion zones.

**Recommendation 4.** Transport Canada should develop a national standard for moving security exclusion zones as a normal operating procedure around LNG tankers transiting within hazard planning distances of populated areas and critical infrastructure.

**Recommendation 5.** Transport Canada should revise the MTSR to require that Port Authorities establish moving security exclusion zones around LNG tankers transiting through their jurisdiction.

**Recommendation 6.** Port Authorities should work with Transport Canada and the Canadian Coast Guard to establish protocols for enforcing moving security exclusion zones around LNG tankers, including security sweeps, patrol boat escort and processes for interdicting craft that violate the security exclusion zone. Port Authorities should be required to ensure that enforcement protocols are properly resourced.

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53 Canada Marine Act Part 1 Section 58.
54 Port Information Guide Prince Rupert Port Authority December 2016 pg. 59. The wording is unclear as to whether security zones may only be ordered under the MTSR for changes to MARSEC level, or if they may be ordered by the Port Authority under normal operating conditions.
55 Ibid, pg. 59.
56 Email communication with Vancouver Fraser Port Authority December 2016. The source of the authority to establish these zones was not specified but is presumably the Canada Marine Act, as for the Port of Saint John.
Recommendation 7. Transport Canada and the Canadian Coast Guard should develop clear protocols for and fully resource the maintenance of moving security exclusion zones around LNG tankers transiting to and from proposed LNG terminals that are not located within Port Authority jurisdiction.

Missing provisions for Facility Security Exclusion Zones

The MTSR does not provide for the use of security exclusion zones around facilities as a normal operating procedure, though the regulations do include provisions for restricting access to and monitoring movement around facilities when the MARSEC level has been raised from normal operations to heightened risk.

Under 327 (f) facility security plan access control procedures under MARSEC Level 2 shall include, “as appropriate to the facility’s operations,” “coordinating with the Minister, the appropriate law enforcement agencies and, if the marine facility is in a port, the port administration for the deterrence of waterside access to the marine facility, including using waterborne patrols to enhance security around the marine facility and any vessels located there.”

Under 344 (b) facility security plan monitoring procedures under MARSEC Level 2 shall include, “as appropriate to the facility’s operations,” “increasing the frequency of foot, vehicle or waterborne patrols.”

Under 346, the facility security plan shall include procedures for responding to security threats, breaches and incidents at all MARSEC levels by, among other things, denying access to the facility.

Again, though not covered in the MTSR, there is also precedent for establishing facility security exclusion zones around LNG facilities in Canada as normal operating procedure.

The Saint John Port Authority has established a permanent exclusion zone around the Canaport LNG Terminal. When an LNG tanker is at berth, the exclusion zone is 650 metres from the “centre of the terminal.” At all other times the exclusion zone is 90 metres.57 As before, the Saint John Port Authority appears to indicate that its authority to enact this security exclusion zone derives from the Canada Marine Act and not the MTSR.

Establishing and maintaining facility security exclusion zones in BC is complicated by overlapping jurisdiction. Although both the BC government and the BC Oil and Gas Commission maintain that the regulation of marine shipping is outside their authority, the BC LNG Facilities Regulation requires that proponents submit a plot plan showing a marine control zone as part of the project application process. The single BC Oil and Gas Commission LNG facility permit issued to date includes a requirement that the proponent submit a plan for a 200 metre marine control zone around LNG tankers. The BCOGC does not make clear how this requirement is compatible with the MTSR, the Collision Regulations, federal requirements under the Navigation Protection Act, or powers delegated to Port Authorities through the Canada Marine Act.58

58 These issues are discussed in detail in following pages in this report.
**Recommendation 8.** Transport Canada should develop a national standard for marine security exclusion zones as a normal operating procedure in navigable waters around marine LNG facilities. Exclusion distances incorporated in the standard should be referenced in LNG project pre-screening processes and TERMPOL reviews to ensure that projects proposed in locations where exclusion zones are unfeasible (e.g. because they create conflict with the Collision Regulations or impose serious restrictions on other marine users) are rejected before entering lengthy review processes.

**Recommendation 9.** Transport Canada, BC’s Port authorities, and the BCOGC should work together to determine which agency has authority for establishing and overseeing operation of marine security exclusion zones at LNG terminals in BC. This determination should be completed for all possible scenarios, including where proposed terminals are i) on federal lands within port authority navigable waters jurisdiction, ii) on private lands within port authority jurisdiction, or iii) on any lands outside of port authority jurisdiction. Transport Canada should ensure that overlapping authority does not result in gaps in enforcement of security procedures.

**Recommendation 10.** Transport Canada should revise the MTSR to require that Port Authorities establish marine security exclusion zones as normal operating procedure around LNG facilities on federal lands under their jurisdiction, and that LNG facilities that are not within Port Authorities also establish marine security exclusion zones as normal operating procedure.

Security exclusion zones could be a key measure to protect LNG facilities from attack. However, such zones will have little effect if they are not enforceable. Authority to create security zones must be clearly established and protocols must be fully developed and resourced so that enforcement agencies have the ability to interdict unauthorized entries into the zone.

**Recommendation 11.** Transport Canada, BC’s Port Authorities and the BCOGC should develop clear protocols for enforcing marine security exclusion zones around facilities and should ensure those agencies charged with delivering enforcement protocols (e.g. joint Coast Guard RCMP Marine Security Enforcement Teams) are adequately resourced.

**MTSR – Multiple Shortcomings**

Whether administered directly by Transport Canada or by a Port Authority, the Marine Transportation Security Regulations do not address LNG terminal site selection or the suitability of waterways for the movement of LNG tankers. The primary issue raised in this review is not addressed by the regulations.

The MTSR only apply to international voyages. The LNG industry is still in development in BC, and proponents may pursue coastal trade in LNG if the opportunity arises. Security risks associated with such trade should be regulated under the MTSR.

The MTSR do not make provision for moving security exclusion zones around vessels or security exclusion zones around facilities as a normal operating procedure.
The vulnerability assessment required under the regulations does require consideration of the risks associated with deliberate attacks on vessels and facilities, and their potential consequences in terms of loss of life, damage to property and economic disruption. However, on this issue the regulations contain shortcomings.

At the facility level, the regulations do not specify if this assessment should include marine approaches to a facility, or simply the immediate area surrounding a facility. At the port authority level, requirements for vulnerability assessment (e.g. 371(1)(a) and 372 (2)(g) ) do require assessment of security vulnerabilities within all areas under the navigational jurisdiction of the port, which should capture marine approaches to individual facilities. However, as not all LNG facilities proposed for British Columbia are located within the jurisdiction of Port Authorities, many would not be subject to this indirect requirement for security assessment of marine approaches.

**Recommendation 12.** The MTSR only applies to vessels engaged in international voyages. Transport Canada should develop a regulatory regime to manage security risks associated with the bulk transport of LNG between marine facilities along Canada’s coasts.

**Recommendation 13.** The additional regulatory requirements for Certain Dangerous Cargoes that are included in the MTSR (e.g. a security sweep of unmonitored waters prior to vessel berthing) should be applied to LNG carried in bulk.

**Recommendation 14.** MTSR requirements for security vulnerability assessments at facilities should explicitly include marine approaches to facilities in addition to the areas immediately surrounding those facilities.

**Recommendation 15.** The MTSR should include a requirement that facility and port authority vulnerability assessments and security plans consider security risks associated with shore and ship based attacks on LNG tankers transiting along marine approaches to LNG facilities.

**Recommendation 16.** The MTSR should require that marine LNG facilities which are within port authority navigational jurisdiction but are not tenants on port controlled federal lands liaise with the port authority security committee. Port security committees should be required to consider security vulnerabilities associated with LNG facilities located on private land within their navigational jurisdiction when developing their port security plan. Facility security procedures should be fully integrated with port wide security procedures.

**Recommendation 17.** Security clearance requirements contained in the MTSR that now apply only to container facilities at the Port of Prince Rupert and the Vancouver Fraser Port Authority should be applied to all LNG facilities proposed for the BC coast.

**Certification of LNG tankers in Canada**

Under international law, LNG tankers transiting international waters must comply with the International Maritime Organization’s International Code for the Construction and
Equipment of Ships Carrying Liquefied Gases in Bulk (the “IGC code”)\(^{59}\). The IGC code applies to ships of any size, including those of less than 500 GT. The IGC code does not include design, construction or operation requirements for LNG tankers that specifically address the risk of deliberate attack.

Compliance with the IGC code is confirmed when vessels are certified by a classification society such as Lloyd's Register. These certification requirements are brought into Canadian law through the Vessel Certificates Regulations\(^{60}\) under the Canada Shipping Act, 2001.

The Vessel Certificates Regulations apply to Canadian vessels and foreign vessels in Canadian waters. Under the regulations, Canadian vessels must meet certification requirements detailed in SOLAS. SOLAS Chapter VII Part C requires that ships carrying liquefied gases in bulk comply with the design, construction and operation requirements of the IGC code. In addition, under the regulations foreign vessels must carry documents required by international conventions to which Canada is a party. These conventions are listed in Schedule 1 of the Canada Shipping Act, 2001 and include SOLAS.

In addition, the Vessel Clearance Regulations\(^{61}\) say that no gas carrier of 500 gross tonnage or more (including LNG tankers) shall receive clearance to leave a Canadian port on an international voyage unless it holds a certificate of fitness for the carriage of liquefied gases in bulk, meaning it must be certified under the IGC code. This regulation ensures that any LNG tanker at port in Canada is fit for its intended purpose before departing on an international voyage.\(^{62}\)

**Canada needs a certification regime for LNG bunker barges**

The IGC code does not define “ship.” The IMO definition of ship is that found in SOLAS, which defines a ship as a vessel greater than 500 GT, or carrying more than 12 passengers, and engaged in an international voyage. SOLAS specifically excepts ships “not propelled by mechanical means,”\(^{63}\) which means that LNG bunker barges are not covered by the IGC code. Individual Flag States must decide certification standards for LNG barges. It is not clear if Transport Canada has a federal certification program for LNG barges in place, or if it intends to develop one.\(^{64}\)

To date most attention in BC has been focused on the bulk transport of LNG by deep sea vessel on international voyages. However, the BC LNG industry is still under development and some proponents are actively seeking domestic markets as well. For example, Wespac, pursuing an LNG terminal on the Fraser River, has expressed interest in transporting LNG by barge to bunker LNG fuelled vessels. It is possible that

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59 The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.
60 Vessel Certificates Regulations. Certificates of fitness are valid for five years.
61 Vessel Clearance Regulations.
62 “Port” is not defined in the Vessel Clearance Regulations or the Canada Shipping Act, 2001, but presumably means public port as defined in the Canada Marine Act, rather than Port Authority.
63 Communication with IMO staff December 2016. See Regulations: 3 (iii).
64 Transport Canada staff have not responded to repeated requests for clarification on barge certification and other issues of federal law relating to the movement of LNG tankers in Canadian waters.
Wespac or other proponents may also explore shipping LNG by barge to remote domestic coastal locations in BC. Canada must ensure that a certification program for LNG barges is in place before proponents begin shipping LNG by that means.

**Recommendation 18.** Transport Canada should ensure that the design, construction and operation of LNG bunker barges on the BC coast takes place under an LNG specific vessel certification program equivalent to that incorporated into the IGC code for self propelled LNG tankers. Transport Canada should ensure that an LNG barge certification program is in place before allowing shipment of LNG by barge on Canada’s coast.

**Other federal maritime regulations with specific reference to LNG tankers**

Several other regulations under the Canada Shipping Act, 2001 make reference to “gas carriers” as defined by the IMO IGC code. These address specific equipment and emission requirements and include:

- Environmental Response Arrangements Regulations\(^{65}\) (only in reference to carrying oil as a cargo)
- Navigation Safety Regulations\(^{66}\) (in reference to navigation radar for vessels constructed before July 1 2002, internal communications for vessels constructed after July 1 2002, and manoeuvring information display requirements)
- Vessel Pollution and Dangerous Chemicals Regulations\(^{67}\) (in relation to the collection of volatile organic compounds and energy efficiency)
- Steering Appliances and Equipment Regulations\(^{68}\) (requirements related to steering equipment)
- Marine Machinery Regulations\(^{69}\) (design and inspection specifications for rudder actuators, steering gears and other steering system components, inspection intervals for oil engines, all related to vessel construction; appears to apply only to vessels built in Canada)
- Life Saving Equipment Regulations\(^{70}\) (requirements for survival craft)
- Marine Transportation Security Regulations\(^{71}\) (scheduled requirement for a vessel security alert system if the vessel was constructed prior to July 1 2004)

**Canada needs regulations for bunkering and operating LNG fuelled vessels**

LNG tankers are fuelled, at least in part, with LNG vapour that boils off from their own cargo. In at least one instance, an LNG project applicant in BC has also shown an

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\(^{65}\) [Environmental Response Arrangements Regulations](#).

\(^{66}\) [Navigation Safety Regulations](#).

\(^{67}\) [Vessel Pollution and Dangerous Chemicals Regulations](#).

\(^{68}\) [Steering Appliances and Equipment Regulations](#).

\(^{69}\) [Marine Machinery Regulations](#).

\(^{70}\) [Life Saving Equipment Regulations](#).

\(^{71}\) [Marine Transportation Security Regulations](#).
interest in bunkering LNG fuelled vessels. Canada clearly needs rules around the bunkering and operation of LNG fuelled vessels.

Industry and agency participants in 2014 hazard identification workshops organized by the West Coast Marine LNG Joint Industry Project Steering Committee\(^2\) identified several significant gaps in Canada’s regulatory framework for LNG-fuelled vessels.

These included:

1. no Canadian regulatory regime for inspection, construction and safety equipment for LNG-fuelled ships;
2. no Canadian regulatory regime to cover safety risks of operating LNG-fuelled ships in Canadian waterways and ports;
3. no basis for assessing LNG bunkering facilities or processes in Canada;
4. no common guidelines for port rules on LNG bunkering processes;
5. no crew training standards for LNG-fuelled ships.

The Steering Committee report\(^3\) made recommendations for developing a Canadian regulatory framework for the design and construction, operation and bunkering of LNG-fuelled vessels to address these gaps. Not surprisingly, these recommendations focused on bringing international standards then under development into force under Canadian law.

> There is no Canadian Regulatory Regime to cover the safety risks of operating LNG-fuelled ships in Canadian waterways and ports.

— Liquefied Natural Gas: A Marine Fuel for Canada’s West Coast

The IMO recently adopted the International Code for Safety of Ships Using Gases Other Than Low Flashpoint Fuels\(^4\), which provides a safety code for LNG fuelled ships.\(^5\) Given that the IGF code is now incorporated into SOLAS, to which Canada is a signatory, it would appear that as of December 2016 recommendations relating to the first point above have been acted upon. Also, amendments to the Marine Personnel Regulations from December 2014\(^6\) incorporate training requirements for LNG-fuelled ships.

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\(^2\) As reported in Liquefied Natural Gas: A Marine Fuel for Canada’s West Coast. West Coast Marine LNG Joint Industry Project Steering Committee April 2014. See also Bunkering of Liquefied Natural Gas-fuelled Vessels in North America. 2nd edition. ABS February 2015.

\(^3\) Op. cit., West Coast Marine LNG Joint Industry Project Steering Committee. Pg. 36.

\(^4\) International Code for Safety of Ships Using Gases Other Than Low Flashpoint Fuels, IMO. In force January 2017 and made mandatory under SOLAS. The IMO has also modified the Standards of Training, Certification and Watchkeeping for Seafarers Convention to ensure crew competency in handling LNG fuels. Finally, the International Organization for Standardization has adopted ISO/TC 18683, Guidelines for Systems and Installations for Supply of LNG as Fuel to Ships to create an international standard for bunkering LNG fuelled ships.

\(^5\) Use of cargo as fuel on LNG tankers is also addressed in the IGC code.

\(^6\) Marine Personnel Regulations, in force since December 31\(^{st}\) 2014.
ships under the Standards of Training, Certification and Watchkeeping for Seafarers Convention,77 addressing recommendations related to the fifth point above.

As of January 2017 it appears that points two, three and four above are outstanding. To address these gaps the Steering Committee recommended that Transport Canada and Port Authorities

perform a risk assessment for any port or terminal for LNG-fuelled ships, using applicable principles drawn from the TERMPOL Code until such time as a new policy specific to LNG projects is available.

And that

Risk assessments be required for individual projects involving LNG bunkering facilities and operations.

Finally, the conclusion of the report reiterates that

Case-by-case risk assessments should be carried out by harbour authorities to identify and mitigate risks related to LNG vessel projects. The TERMPOL review process can be used as a guide for such assessments. The results should be incorporated into port operating procedures.78

Plans for LNG exports are moving quickly in British Columbia. Transport Canada should expedite development of a complete regulatory frame work for the design, construction, operation and bunkering of LNG fuelled ships and ensure that this framework is in place before LNG fuelled vessels come into service and LNG exports are underway.

Recommendation 19. Transport Canada should move immediately to address the outstanding regulatory gaps in LNG bunkering identified by the West Coast Marine LNG Joint Industry Project Steering Committee. Specifically, Transport Canada should develop a Canadian regulatory regime to cover safety risks of operating LNG-fuelled ships in Canadian waterways and ports; a basis for assessing LNG bunkering facilities or processes in Canada; and common guidelines for port rules on LNG bunkering processes.

Recommendation 20. Transport Canada should commit to conducting risk assessments, or directing relevant Port Authorities to conduct risk assessments, for all projects involving LNG bunkering. Port Authorities should identify risk mitigation measures and incorporate these into their Port Information Guides.

Recommendation 21. The Canadian Standards Association (CSA) should be called upon to develop a national standard for procedures for bunkering LNG-fuelled ships in Canada.

77 Transport Canada Standards of Training, Certification and Watchkeeping.
Regulation of floating LNG facilities

According to the BC Oil and Gas Commission, floating LNG production facilities – such as the one proposed by Steelhead Malahat LNG for Bamberton in Saanich Inlet – may require inspection and certification by Transport Canada under the Delegated Statutory Inspection Program. 79 On the other hand, floating LNG storage facilities – such as the one proposed for Woodfibre LNG, where production would take place on land but LNG would be stored offshore – do not require Transport Canada inspection. Woodfibre LNG proposes to make use of an older, deregistered LNG tanker for its floating storage facility, a unique and controversial proposition. 80

Floating LNG production, storage and offloading facilities do not fall under the IGC code.

Federal regulations addressing safety concerns for all marine vessels

All other regulations and international conventions falling under the Canada Shipping Act, 2001 and the Pilotage Act that generally promote vessel safety and spill avoidance apply to LNG tankers as well, including

- Collision Regulations 81 — sets requirements for equipment; application of international regulations for preventing collisions at sea
- Vessel Pollution and Dangerous Chemicals Regulations 82 — regulates air emissions from vessel operation, as well as discharge of sewage, garbage, oil and other pollutants
- Vessel Traffic Services Zones Regulations 83 -- controls the separation of marine traffic and communications between vessels
- Ballast Water Control and Management Regulations 84 – regulates ballast water on vessels entering Canadian jurisdiction
- Pacific and Atlantic Pilotage Regulations 85 — establishes compulsory pilotage areas and jurisdiction of pilotage authorities, sets standards for pilot qualifications, identifies classes of vessels requiring pilots

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80 Currently, BCOGC claims responsibility for certification of deregistered vessels used for LNG storage. See this critique of Woodfibre’s floating storage proposal for more information.
81 Collision Regulations
82 Vessel Pollution and Dangerous Chemicals Regulations.
83 Vessel Traffic Services Zones Regulations.
84 Ballast Water Control and Management Regulations.
85 Pacific Pilotage Regulations. The Pacific Pilotage Authority (PPA) has issued a Notice to Industry that details tug escort rules for vessels carrying liquids in bulk, covering Boundary Pass, Haro Strait, the Straits of Georgia and English Bay. The PPA has not responded to queries about the application of these rules to LNG tankers. The Atlantic Pilotage Authority Regulations extend the Saint John Compulsory Pilotage Area for LNG tankers transiting to and from the Canaport LNG terminal at Mispec New Brunswick (located within the jurisdiction of the Saint John Port Authority).
Canada is not prepared for a major ship-source spill of LNG

Canada’s preparedness for a serious LNG spill incident or fire on an LNG tanker or at a marine LNG terminal is woefully underdeveloped. This lack of forward planning is intolerable, given the pursuit of multiple LNG export plans in BC, many of them involving terminals and LNG tanker movements near urban areas.

Canada Lacks a Hazardous And Noxious Substances Spill Response Regime

As the Tanker Safety Expert Panel points out, despite having been identified as a priority since the late 1990s, Canada still has not enacted a ship-source hazardous and noxious substances (HNS) preparedness and response regime.86 LNG would be considered a hazardous substance under such a regime.87

Further, Canada has yet to sign on to the Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol),88 which entered into force in 2007 and now has 33 signatories. According to the Tanker Safety Expert Panel,

Key elements of the Protocol include: requirements regarding pollution incident emergency plans for proscribed 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.89

Signing on to the OPRC-HNS Protocol will be an important first step towards Canada developing a comprehensive ship-source HNS preparedness and response regime.


87 The 2000 OPRC-HNS Protocol (see below) defines HNS as a 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.


Dangerous Good or Hazardous Substance: which one is LNG?

It depends. By international agreement LNG is considered a Class 2.1 flammable gas. It is identified by UN code 1972 - Methane, Refrigerated Liquid.

LNG is considered a **dangerous good**, but not when transported by bulk LNG carrier.

In Canadian law the term “dangerous good” is applied to packaged and containerized products. An extensive regulatory regime has been developed to control handling of these products on land and sea.

LNG is scheduled in the federal Transportation of Dangerous Goods Act (TDGA). However, the act specifically exempts dangerous goods which are confined only by the “permanent structure of a vessel,” such as the hull of a bulk LNG carrier, so the TDGA does not apply to bulk movement of LNG by tanker on our coast. Likewise, the International Maritime Dangerous Goods Code, established by the International Maritime Organization, addresses the handling of LNG but only in containerized form.

Similarly, the Marine Transportation Security Regulations include special security provisions for “Certain Dangerous Cargoes” (CDCs) which include LNG, but as the definition of CDC makes reference to the TDGA these provisions do not apply to bulk movement of LNG either.

LNG is also considered a **hazardous substance**, and this designation does apply to LNG when transported by bulk carrier.

LNG’s designation as a hazardous substance is the basis for its consideration under the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (brought into Canadian law through the Marine Liability Act), and the Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000 (not yet adopted into Canadian law).
The LNG Industry Lacks A Dedicated Response Organization

The LNG industry lacks a certified, dedicated response organization comparable to the Western Canada Marine Response Organization established to provide a response to oil spills. In many locations, first responders are likely underprepared to deal with a significant incident involving loss of containment and fire on an LNG tanker or at an LNG terminal.

Transport Canada LNG Risk Assessments Are Out-dated And Incomplete

The Tanker Safety Expert Panel notes Transport Canada commissioned an assessment of the risk posed by bulk HNS movements in Canada’s waters in 2014. The Risk Assessment was a high-level, national review that considered a wide range of HNS. Risk indices were calculated as a function of tonnage of HNS, a physical and health hazard index for each HNS (considering toxicity, flammability, reactivity, and incompatibility with water) and an environmental sensitivity index for subsectors of the coast (including human use and occupation).

This assessment only considered the risk posed by existing bulk movement of HNS (up to 2012). Not surprisingly, as a result the Risk Assessment found that the risk index for LNG movements on the BC Coast as of 2012 was null.

However, in anticipation of development of an LNG industry on the BC coast, Appendix 6 to the Risk Assessment provided a brief overview of risks posed by projects proposed for the Kitimat, Prince Rupert and Douglas Channel areas. The assessment found that development of these projects individually would change the risk index from “null” to “very low” for Douglas Channel LNG and Kitimat LNG and from “null” to “medium to high” for LNG Canada, Pacific Northwest LNG and Prince Rupert LNG.

The risk assessment notes that multiple projects developed in close proximity would further increase risk. The risk assessment did not consider LNG projects proposed for the south coast (e.g. Woodfibre, Wespac Tilbury or Steelhead Malahat).

The risk assessment did not specify if or how it determined hazard planning distances associated with ship-sourced LNG incidents when calculating risk to populations, nor did it make clear if it considered the worst case scenario - significant loss of containment of LNG followed by pool fire or ignition of an expanding LNG vapour plume.


The Risk Assessment includes this important caveat:

90 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 60th Parallel North. WSP, May 2014.
The results from this study are meant to be interpreted at the national level and should not be applied to assess risk at a local scale as local factors were not considered and limits the level of details for which HNS spill risks can be described.92

Despite a current relatively very low to low risk of spills of liquefied and compressed gases, the risk may increase with the addition of large LNG future projects, which will increase volumes by at least an order of magnitude mostly in the Pacific sector and Eastern Canada. A regional risk assessment on the risk of spill caused by LNG would help better assess the effect of future projects on current risk estimates.93

To date, the Canadian government has not publicly responded to the Tanker Safety Expert Panel’s report on ship-borne HNS preparedness and response. It has not indicated if it will enact the Panel’s recommendations or commission a more detailed regional assessment of the risks associated with LNG development. This failure to act is unacceptable. As the Tanker Safety Expert Panel notes, Canadians should not have to wait for a catastrophic, maritime version of the tragedy at Lac Mégantic before government develops an organized preparedness and response program for ship-sourced LNG incidents.

Events such as the tragedy in Lac Mégantic, Quebec … have elevated public concerns and raised questions about the overall safety of moving potentially dangerous products in close proximity to population centres.

— Tanker Safety Expert Panel, Phase Two Report

**Recommendation 22.** Transport Canada should immediately acknowledge the Phase 2 Hazardous and Noxious Substances (HNS) report by the Tanker Safety Panel and present a plan and timeline for implementing the panel’s 17 recommendations to protect the public from risks associated with incidents involving LNG and other HNS.

**Recommendation 23.** Canada should sign on to the OPRC-HNS protocol immediately.

**Recommendation 24.** Transport Canada should commission an updated HNS risk assessment for the BC coast that examines the risks posed by proposed LNG terminals. The risk assessment should explicitly consider the consequences of worst case scenario incidents involving significant loss of LNG containment and fire on an LNG tanker, whether in transit or at a terminal. The risk assessment should model the fate and behaviour of LNG vapour plumes on the physical environment and human populations at the project level, and should show explicit consideration of hazard planning distances contained in the Sandia National

93 Ibid., pg. iv.
Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water.*

**Recommendation 25.** Transport Canada should place a priority on completing an LNG incident preparedness and response regime for the entire BC coast, with coverage of all areas where LNG terminals are proposed, incorporating results of an updated HNS risk assessment. This regime should be developed and in place before any LNG terminal receives final approvals and begins operation.

**Recommendation 26.** Transport Canada should require the LNG industry establish a well equipped, dedicated incident response organization (similar to Western Marine Response Corporation\(^{94}\) for oil tankers) with quick response capability to all proposed LNG terminals on the BC coast, and all waters that LNG tankers would transit. This organization should be funded by all the groups involved in exporting LNG, including gas suppliers (e.g. Fortis) and potential terminal operators (e.g. Woodfibre LNG), and all those groups should be party to the organization. The organization should be certified by Transport Canada. Regional response planning should be developed in consultation with local governments, First Nations, the province and Transport Canada (or Port Authorities where applicable). The response organization should be capable of addressing the serious consequences of significant loss of containment and fire on an LNG tanker, whether at berth or in transit.

\(^{94}\) Marine Response Organizations fall under Transport Canada oversight, through the *Response Organization and Oil Handling Facilities Regulations (Canada Shipping Act, 2001 Part 8).*
The Federal Tanker Safety Panel on Hazardous Substances (including LNG)

The expert panel released a report in September 2014 on the bulk shipment of hazardous and noxious substances (HNS - including LNG) south of the 60th parallel in Canada. The Panel’s report provides a useful review of the state of preparedness and response for HNS spills in Canada. Among their findings:

- the potential impacts of a release, should one occur, could be harmful to human health (particularly in populated areas) and the environment
- despite the acknowledged need for a preparedness and response program for ship-based HNS releases, such a framework has yet to be established in Canada
- Canada has not yet ratified the Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, even though it was adopted by the International Maritime Organization in 2000 and is now in force
- identified capacity for HNS spill response— both on ships and at facilities — is well below the level of oil spill preparedness in Canada
- it will take time and resources to build needed HNS spill response capacity in Canada. It will be necessary to build linkages between the marine industry, HNS producers, and the land based HNS response community.

The panel made 17 substantial recommendations to Transport Canada to improve preparedness and response to marine based HNS spills in Canada. To date, the government has given no indication it has acted on these recommendations.

Marine Liability Law For Ship-Source LNG Incidents Is Not Yet Developed

Canada is a State Party to the International Convention on Civil Liability for Oil Pollution Damage, and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage. These conventions are brought into Canadian law through the Marine Liability Act.

Under that act, Canada established the Marine Liability Regulations to provide a liability and compensation regime for spills from oil tankers.

Canada is also a signatory to the 2010 Hazardous and Noxious Substances (HNS) Convention, which will establish an international liability and compensation scheme for ship-source incidents involving HNS, including LNG. The Convention has not yet acquired enough signatories to be brought into force, and Canada still needs to ratify the convention. In preparation for that eventuality the government of Canada has included

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97 Marine Liability Act.
amendments (not yet in force) to the Marine Liability Act that reflect anticipated requirements under the Convention.\textsuperscript{99}

Transport Canada recently repealed the Marine Liability Regulations and replaced them with the Marine Liability and Information Return Regulations\textsuperscript{100} to incorporate reporting on HNS shipments as a preparatory step towards development of an international HNS compensation fund for ship-source incidents involving hazardous substances such as LNG.\textsuperscript{101}

Canadian law regarding liability and compensation for ship-source incidents involving LNG has kept pace with international developments. However, Canada can do more to encourage international progress in this area.

**Recommendation 27.** Canada should urge other countries to sign the 2010 HNS Convention to ensure that it is brought into force as soon as possible.

\textsuperscript{99} Amendments Not In Force, Marine Liability Act.
\textsuperscript{100} Marine Liability and Information Return Regulations, replaces the Marine Liability Regulations repealed in December 2016.
\textsuperscript{101} Details on revisions to the Marine Liability Regulations to incorporate HNS provisions are found in the Canadian Gazette.
The Role of Canada’s Port Authorities in regulating the LNG industry

Under Section 61 of the Canada Marine Act, and subject to *Marine Traffic Security Act* regulations, Canada’s Port Authorities are mandated to manage navigation, marine traffic, communications and coordination of security levels between vessels and facilities on navigable waters and federal lands under their jurisdiction. Port Authorities apply the Collision Regulations on waters under their jurisdiction, with modifications; establish restricted areas; establish requirements for compulsory tug escort; and set guidelines and permitting requirements for tankers transiting through port waters, as well as for anchoring, berthing, cargo transfer, and bunkering. Under Section 108 of the Canada Marine Act, Port Authorities can assume responsibility for Port State Control and Flag State Control programs, including appointing Enforcement Officers with power to inspect vessels for compliance and certification of fitness. Port practices and procedures are detailed in a Port Information Guide developed by each Authority.

Port Authorities are responsible for reviewing and permitting projects (e.g. marine terminals) on federal lands under their jurisdiction, and for requiring that tenants on federal port lands establish Terminal Security Plans. Port Authorities must establish Port Security Plans that include procedures for controlling access and monitoring activity at all security levels, and procedures for responding to security threats, breaches and incidents.

There are four Port Authorities in British Columbia: Nanaimo Port Authority, Port Alberni Port Authority, Prince Rupert Port Authority, and Vancouver Fraser Port Authority.

Pacific Northwest LNG and Prince Rupert LNG are proposed for federal lands within the Prince Rupert Port Authority. Wespac Tilbury is proposed for private lands within the navigational jurisdiction of the Vancouver Fraser Port Authority. Steelhead Sarita LNG is proposed for Huu-ay-aht First Nations land at Sarita Bay, near to but not within the navigational jurisdiction of Port Alberni Port Authority.

At least three LNG terminals are proposed for the Kitimat area. Currently, Kitimat is a private port and LNG projects there are proposed for private lands. In 2013 Transport Canada stated that it was “not likely” that a Port Authority would be established there – possibly because there are no federal lands in the area. Since that time Transport Canada has been considering the creation of a Public Port at Kitimat that would have jurisdiction over public waters. If designated a public port, aspects of the Canada Marine Act relating to vessel traffic and the Public Ports and Public Port Facilities Regulations would apply to the Port of Kitimat.

LNG terminals proposed for Howe Sound (Woodfibre LNG, near Squamish) and Saanich Inlet (Steelhead Malahat, near Bamberton) would not be located within Port Authorities, nor is either location currently designated a Public Port under regulation. Bunkering of LNG tankers by Woodfibre LNG would fall under Vancouver Fraser Port Authority jurisdiction if the bunkering took place in English Bay.
Summary: Gaps In Federal Law Put The Public At Risk From LNG Incidents

Proponents and reviewing agencies occasionally cite list of acts and regulations to suggest a body of law exists which protects public safety in relation to LNG facilities on our coasts or the movement of LNG tankers in Canadian waters. However, as this review has shown, there are significant gaps in those laws and regulations, and no federal agency has been tasked with the fundamental job of approving the siting of marine LNG terminals or determining the suitability of waterways for the movement of LNG tankers.

Canadian federal law includes no requirements comparable to the US Waterway Suitability Assessment process. The voluntary and non-binding TERMPOL process does not address security issues. Canada needs an LNG terminal pre-screening process that can rule out proposals that are not feasible from a public safety and security perspective. This pre-screening process must draw on existing industry association terminal siting guidelines and credible hazard planning distances such as those developed by Sandia National Laboratory. A federal LNG proposal pre-screening process will save time and money for both proponents and government and would forestall lengthy and unnecessary permitting and assessment processes.

For project proposals that pass through pre-screening, follow up assessment and permitting processes need to give more explicit attention to security issues, including security risks associated with LNG tankers, whether at berth or in transit near populated areas or critical infrastructure. To achieve this objective, Canada should broaden the scope of the TERMPOL review process to include security considerations, make participating in the process mandatory and make its recommendations binding on project proponents.

The Marine Transportation Security Regulations do not address security issues along marine approaches to terminals outside of Port Authorities and do not provide for security exclusion zones around moving LNG tankers or LNG facilities as part of normal operating procedure. Canada must develop regulations authorizing security zones around LNG facilities and moving LNG tankers, and must ensure that agencies tasked with enforcing those exclusion zones are properly resourced. These rules should apply to all shipments of LNG, whether on international voyages or as part of coastal trade.

Overlapping authority between Transport Canada, Port Authorities and the BC Oil and Gas Commission regarding security zones around LNG facilities must be clarified.

Canada has kept pace with international law in the certification of LNG tankers, but does not appear to have a certification regime for LNG bunker barges, even though LNG proponents have expressed interest in moving LNG by barge. The federal government must correct this oversight. Regulation of bunkering procedures for LNG-fuelled vessels in Canadian ports needs to be fully in place before that practice takes place.

Canada has not developed a preparedness and response regime for ship-based LNG incidents. Our preparations in this area lag far behind those for spills from oil tankers.

102 See coverage of the issue here.
103 Reported in the LNG Canada TERMPOL Report, op. cit. Public Ports and Public Port Facilities Regulations.
Canada must immediately act on the recommendations on HNS preparedness and response from the Tanker Safety Panel. Industry must play a role here by developing and funding an LNG specific incident response organization. Canada must also encourage international adoption of a LNG incident liability and compensation regime.

The federal government has deferred to British Columbia to regulate the handling and loading of LNG onto tankers at marine terminals. BC’s rules and procedures in this area are reviewed in the next section of this document.

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Other federal rules that apply to LNG facilities

LNG export terminals likely require additional federal authorizations, permits and approvals, but none deal directly with issues of safety and security. Additional requirements may include:  

- A license issued by the National Energy Board under the National Energy Board Act to allow export of LNG. As required under Section 118 of the NEB Act, in its licensing decisions on LNG exports the NEB may only consider if the proposed export volumes will impact domestic natural gas requirements. It may not consider environmental, safety or security criteria.
- Authorization under the Fisheries Act for dredging, disturbing riparian habitat, and constructing a marine jetty, if those activities will have an impact on fish.
- A Disposal at Sea permit under the Canadian Environmental Protection Act for disposal of derogate collected during berth dredging.
- Approval under the Navigation Protection Act for constructing and operating marine jetty infrastructure in navigable waters, to ensure that those structures do not interfere with navigation.
- Other laws and regulations may apply more generally as they would to any development proposal. These include prohibitions against harming species at risk, under the Species at Risk Act, or prohibitions against harming migratory birds, under the Migratory Birds Convention Act.

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104 The federal government does not cite the Canada Oil and Gas Operations Act in reference to LNG regulations for the Port Authority of Prince Rupert, though the act’s application states that it “applies in respect of the exploration and drilling for and the production, conservation, processing and transportation of oil and gas in that part of the onshore that is under the administration of a federal minister.” “Onshore” is not defined in the act except by reference to the Northwest Territories Act, which is repealed.

105 National Energy Board Act.

106 The Fisheries Act requires authorization for works in or near waters that support fish that are part of or that support a commercial, recreational or Aboriginal fishery.

107 Disposal at Sea Permit.

108 The Navigation Protection Act requires application for approval for works on, under or over navigable waters, under the Navigation Protection Program.

109 The Species at Risk Act prohibits harming aquatic species or migratory birds listed as being at risk nationally, and against harming their residences.

110 The Migratory Birds Act prohibits disturbing the nests of migratory birds, or depositing substances harmful to migratory birds in waters or lands frequented by them.
Part Four: BC Rules Around LNG Terminal Siting And Security

The BC Oil and Gas Commission LNG Facility Permitting Process

Under the Oil and Gas Activities Act, the BC Oil and Gas Commission (BCOGC) has responsibility for permitting marine LNG facilities in BC. Permitting requirements for LNG facilities are found in the LNG Facilities Regulation (LNGFR). The BCOGC LNG Facilities Permit Application and Operations Manual (the “Manual”) provides further details on the requirements presented in the LNGFR. The LNGFR states that LNG facilities must be designed and sited in accordance with Canadian Standards Association (CSA) Standard Z276 Liquefied natural gas - Production, storage, and handling. Applications for LNG facilities must also meet requirements detailed in the BCOGC’s Oil and Gas Activity Application Manual.

Hazard identification ignores risks to LNG tankers and risk of deliberate attack

Under section 2(g) of the LNGFR, proponents are required to submit design and safety studies respecting the siting of a proposed LNG facility to the Commission as part of the permit application process. Under section 2(i) of the LNGFR, the applicant must also submit the results of a preliminary hazard identification study. Under 3(1)(i) of the LNGFR the proponent may not begin construction until an updated hazard identification study is completed. Section 3.3 of the Manual indicates that siting of the facility must take into account the results of these hazard identification and safety studies.

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111 While an EA certificate must be issued for a proposed LNG facility prior to the BCOGC issuing an operating permit, the BCOGC and the BC Environmental Assessment Office have agreed an MOU which provides opportunities for concurrent review of permit applications. Applicants are not required to make use of this opportunity. The BCEAO-BCOGC MOU includes agreements on information sharing and cooperation in general. Some have questioned whether this MOU encourages “regulatory deference” that facilitates “a less stringent assessment process for industry proponents.”

112 See Oil and Gas Activities Act and LNG Facilities Regulation. LNG facilities must also meet requirements in other regulations under the Oil and Gas Activities Act, including the Environmental Protection and Management Regulation, that are not directly relevant here. Under the Safety Standards Act, the BC Safety Authority has permitting authority relating to some aspects of LNG facilities that are not of concern to this review (e.g. pressure vessels, boilers and some pressure piping and electrical installations). Coordination of permitting powers between the Safety Authority and the BCOGC are described in an MOU. The BCOGC indicates that the Wespac Tilbury LNG terminal proposal will be permitted under the Pipeline Regulation, with specific requirements drawn from the LNGFR as well. The Wespac permitting process is discussed below in Part Five of this paper.


114 See 4(1)(a) of the LNGFR. Canadian Standards Association (CSA) CAN/CSA-Z276-15 - Liquefied natural gas (LNG) - Production, storage, and handling (2015). Relevant CSA standards are discussed in more detail in the following pages of this paper. The LNGFR states that as an alternative to complying with CSA Z276, applicants may submit to the Commission a report on a quantitative risk assessment showing that risks associated with the design and siting of the proposed facility are as low as reasonably possible and fall within the range identified in Schedule 2 of the regulation.

115 Oil and Gas Activity Application Manual.
Section 2.1.4 of the Manual states that proponents must submit a plot plan to the Commission. The plot plan must include key LNG facilities and their Hazard Planning Zones. Marine vessel approaches to terminal berths are not required to be shown in plot plans.

The Manual glossary provides a definition of Hazard Planning Zone as “the geographical area within which persons, property or the environment may be affected by a hazard arising from the LNG facility.” The concept is not further developed in the Manual nor is there explicit guidance on how to determine the size of hazard planning zones or notification and consultation procedures within such zones. The term Hazard Planning Zone is not mentioned in the LNGFR or CSA Z276.

Section 2.1.7 of the Manual states that

The Commission expects the applicants to have completed comprehensive design and safety studies when determining siting for the facility.

The applicant must submit relevant studies that demonstrate the considerations taken into account by the applicant in siting the facility. These reports can include relevant drawings or graphics that illustrate issues to be addressed in the facility design and safety plan (for example, plot plans showing risk contours).

Section 2.1.7 of the Manual also provides a list of risks that should be considered in facility siting, including forces of nature, adjacent activities that could impact the facility, and a range of incidents resulting from the release and ignition of LNG. The list does not include risks associated with deliberate attacks. Section 2.1.7 does not require applicants consider risks along the marine approaches to facilities nor risks to berthed LNG tankers, nor does the LNGFR or CSA Z276.

**Recommendation 28.** The BCOGC should require proponents consider LNG tankers at berth facility assets for the purpose of hazard identification and risk assessment studies submitted to the commission.

**Recommendation 29.** For the purposes of hazard identification and risk assessment studies submitted to the commission, the BCOGC should require proponents give explicit consideration to hazards associated with the movement of LNG tankers on the marine approaches to proposed facilities where those marine approaches pass near to populated areas and critical infrastructure.

**Recommendation 30.** The BCOGC should require that hazard identification studies, risk assessment studies, damage prevention plans and safety and security management plans requested from proponents in the permitting process incorporate explicit consideration of the potential for deliberate attack on facilities (including berthed LNG tankers) and tankers transiting along marine approaches to and from facilities. When conducting these studies and developing these plans proponents should be required to model the consequences of worst case

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117 Ibid., pg.27.
outcomes for attacks, including significant loss of containment of LNG, leading to an expanding vapour plume and fire.

**Lack of transparency in BCOGC decision making reduces public confidence**

The BCOGC has indicated it will not publicly release studies required under 2(g) and 2(i) of the LNGFR and Sections 2.1.4 and 2.1.7 of the Manual, arguing that release of these studies will harm the interests of a third party, presumably the LNG proponent.118

The BCOGC has refused to make public the siting and hazard identification studies submitted by LNG proponents as part of their application package. This stance will not improve public confidence in the transparency of BC’s LNG facility permitting process.

This refusal makes it impossible for the public to provide comment to the BCOGC on siting and risk assessments for LNG facility applications in an informed manner and within a time frame relevant to the permitting process. This refusal also adds to concerns about the lack of transparency in BCOGC decision making.

**Recommendation 31.** To increase the transparency of BCOGC project risk assessment and permitting, the hazard identification, risk assessment and related studies required by the BCOGC under 2(g) 2(i) and 3(1)(i) of the LNGFR (and as described in 1.7, 2.14 and 2.1.7 of the LNG Facility Permit Application and Operations Manual) should be made available to the public when submitted. The BCOGC should direct proponents to structure these studies in such a way that information that may harm business interests can be compartmentalized and removed before public disclosure.

Further, Section 25 of the LNGFR allows the BCOGC to exempt permit holders from provisions under the regulation. Section 5.4 of the Manual states that if an exemption is granted, it may be replaced with conditions. The Manual does not specify if exemptions or conditions will be made public, nor if persons and entities within hazard planning distances or emergency planning zones must be made aware of exemptions or conditions.119

**Recommendation 32.** All exemptions to requirements under the LNGFR, and any associated conditions assigned as a result of those exemptions, should be made public by the BCOGC immediately. Persons and entities within hazard planning

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118 A February 2017 request to the BCOGC for the studies required in support of the application for an LNG facilities permit from LNG Canada was first met with a response requiring a Freedom of Information request, then a follow up letter indicating the FOI request would be subject to third party review (presumably LNG Canada), and finally by a April 2017 letter denying the FOI request entirely on the basis of section 21 of the Freedom of Information and Privacy Act – “Disclosure harmful to business interests of a third party.” The BCOGC issued a LNG facilities permit to LNG Canada in December 2015.

distances and emergency planning zones who may be impacted by these exemptions and conditions should be directly informed of their existence.

**BCOGC site screening process: too little, too late?**

The BCOGC expects proponents to submit studies showing that they have given consideration to safety considerations and hazard planning distances when choosing a site. However, BCOGC requirements for determining hazard planning distances are not clearly developed in the regulations or documents used to assist proponents in submitting applications.

In any case, BCOGC consideration of these siting studies takes place so late in the overall LNG facility approval process that it is hard to conceive how they might lead to a proposal being rejected, even if the BCOGC deemed it was poorly sited. By the time a project application reaches the BCOGC, it is likely the project will have already received an NEB export license and an environmental assessment certificate from the provincial and federal governments and thus will have developed significant momentum.

In fact, past BC government statements expressing keen support for the successful commissioning of an LNG facility appear to presuppose project approval by the BCOGC. To give just one example, the BC Premier praised an apparent final investment decision by backers of the proposed Woodfibre LNG project near Squamish in November 2016, welcoming the proponent's decision as the start of an LNG export industry in BC. However, as of February 2017, Woodfibre LNG has not even applied to the BCOGC for an LNG facilities permit. The Premier’s statements suggest that project go-ahead will be determined by final investment decisions by proponents rather than a rigorous and objective review of project proposals by government agencies. 120

*By the time an LNG export proposal reaches the BCOGC permitting process it will have developed considerable momentum – and likely the enthusiastic backing of the BC government. Will this create pressure to mitigate risks through design on projects that should have been rejected outright?*

It is reasonable to be concerned that prior investment of time and resources by proponents in earlier approval processes – and the BC government’s express desire to see LNG facilities built – could place pressure on the BCOGC to attempt to mitigate risks through design requirements for projects that should have been rejected through a pre-screening process because they are poorly sited. This concern is compounded by the lack of transparency in BCOGC decision making processes, making it difficult for the public to have confidence that project risks will be carefully and rigorously assessed by our public regulator.

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120 See the BC government November 2016 news release on the Woodfibre LNG announcement, and this February 2017 screenshot of Woodfibre LNG’s “pre-application phase” status on the BCOGC major projects web page. Also in February 2017, the Detailed Project Description page for the Woodfibre LNG project on the BCOGC website lists the application start date as “TBD.” It appears government has shown full support for the project even before its regulator has reviewed any siting or hazard identification studies required in support of a permit application.
Security and Emergency Management Planning for LNG terminals

Under section 8 of the LNGFR, before the LNG facility is commissioned the operator must submit to the BCOGC an Emergency Response Plan and a Security Management Plan that both comply with CSA Z276.

Section 4.1.1 of the Manual directs proponents to CSA Z246.1\textsuperscript{121} for further detail on preparing the Security Management Plan and CSA Z246.2\textsuperscript{122} for guidance on preparing the Emergency Response Plan. The Manual indicates that

The security management plan should provide a systematic approach for maintaining the facility’s fence line and marine control zone around the LNG facility. The security management plan should cover all areas under the control of the permit holder including onshore, foreshore property and water lots.\textsuperscript{123}

An emergency response plan should ensure that, in the event of an incident, all necessary actions are taken for the protection of the public, the environment and workers. The plan should include documented emergency response plans, required equipment, training requirements, identification of trained personnel and plans for emergency drills and exercises.\textsuperscript{124}

Unclear application of notification procedures to LNG facility permit applications

It is not clear if or how emergency planning zones are determined for LNG facilities by proponents or the BCOGC, nor is it clear how the BCOGC expects facility operators to consult with persons or entities within those zones for emergency planning purposes.

Section 4.3.5 of the Oil and Gas Activities Application Manual indicates that facilities must develop Emergency Response Plans and submit them to the Commission in accordance with Section 7 of the Emergency Management Regulation (EMR).\textsuperscript{125} Section 7 of the EMR states that applicants must submit a plan that identifies the emergency planning zone (EPZ) for the activity covered by the plan. An EPZ is defined as the area that encompasses all the hazard planning zones of the activities covered by the plan. However 2 (d) of the EMR states that the regulation does not apply to the construction, operation or maintenance of a liquefied natural gas facility.

Section 4.3.5 of the Oil and Gas Activities Application Manual states that EPZs are determined based on H\textsubscript{2}S (hydrogen sulphide) content of a product or pipeline; however, the BCOGC Emergency Management Manual states that EPZs are determined based on H\textsubscript{2}S content, or, where H\textsubscript{2}S is not present, “by taking into consideration the types of hazards and risks arising from the oil and gas activity that is the subject of the plan.”\textsuperscript{126}

The LNGFR, CSA Z276 and the LNG Facility Permit Application and Operations Manual do not mention EPZ’s, though CSA Z246.2 does. CSA Z246.2 defines EPZ as “a

\textsuperscript{121} Updated to CAN/CSA-Z246.1-17 - Security management for petroleum and natural gas industry systems 2017. Latest version of the document not reviewed for this report.
\textsuperscript{122} CAN/CSA-Z246.2-14 - Emergency preparedness and response for petroleum and natural gas industry systems (2014).
\textsuperscript{123} Liquefied Natural Gas Facility Permit Application and Operations Manual, pg.47.
\textsuperscript{124} Ibid., pg.46.
\textsuperscript{125} Under the Oil and Gas Activities Act. See Emergency Management Regulation.
predetermined geographical area surrounding a well, pipeline, or facility containing hazardous product that requires specific emergency response planning.\footnote{127}{Op. cit., CSA Z246.2 pg.14.}

Section 9 of CSA Z246.2 says operators shall have a process to determine EPZs and refers to Annex A for further guidance. Annex A provides some further detail on what should be considered in the determination of EPZ’s, but also refers the applicant back the relevant provincial authority -- in this case the BCOGC -- for specific end points and modelling criteria.\footnote{128}{Ibid., pg.29.}

Section 6 (3) the Consultation and Notification Regulation (CNR)\footnote{129}{The Consultation and Notification Regulation, under the Oil and Gas Activities Act.} states that notification and consultation distances for LNG facility applications are the greater of 3300 m or the distance determined in accordance with Schedule A of the EMR. The 3300 m distance roughly corresponds to the outer hazard planning distance identified by Sandia National Laboratories, though there is no explicit acknowledgement in the CNR that this notification and consultation distance corresponds to an EPZ for LNG facilities, nor any indication that applicants are required to consult for the purposes of emergency management planning.

The process for calculating hazard planning distances needs clarification

Guidance on calculating hazard planning distances, emergency planning zones and emergency notification requirements for LNG facility applicants is underdeveloped in the LNGFR and the Manual and makes reference to regulation which explicitly does not apply to LNG facilities. CSA standards referenced on this matter direct applicants back to the BCOGC for guidance.

In direct communication, the BCOGC indicates that “a combination of submissions and analysis contributes to development of hazard planning distances and EPZ’s” for LNG facilities, including submissions required under “sections 2 (g), 2 (h), 2 (i), 3 (1)(d)(i), 3(1)(d)(ii) and 3 (1)(e) of the LNGFR and consequence analysis required under CSA Z276.”\footnote{131}{Email communication with BCOGC November 2016. Unfortunately the term “consequence analysis” is not used in CSA Z276-15.}

The BCOGC appears to have discretion on determining hazard planning distances and corresponding emergency planning zones and notification distances, making it difficult for the public to determine how these distances are calculated and who should be notified or consulted about risks associated with proposed LNG facilities.

**Recommendation 33.** BCOGC should clarify processes for calculating hazard planning distance and emergency planning zones for LNG facilities – including facilities permitted under the Pipeline Regulation. Marine hazard planning distances should be transparently developed to a justifiable standard and should give explicit consideration to conclusions identified in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*. Hazard planning distances for

\footnote{127}{Op. cit., CSA Z246.2 pg.14.}
\footnote{128}{Ibid., pg.29.}
\footnote{129}{The Consultation and Notification Regulation, under the Oil and Gas Activities Act.}
\footnote{130}{Schedule A of the EMR calculates distance based on H2S content of the product. As noted earlier, 2 (d) of the EMR states that the regulation does not apply to LNG facilities.}
\footnote{131}{Email communication with BCOGC November 2016. Unfortunately the term “consequence analysis” is not used in CSA Z276-15.}
individual projects should be plainly described so the public can clearly understand how risks from proposed LNG facilities are assessed, and which persons and entities are entitled to emergency planning zone notification and consultation. Non-H₂S risk notification requirements should be clarified. When calculating hazard planning distances and emergency planning zones, applicants should be required to consider hazards associated with berthed LNG tankers, hazards associated with LNG tankers transiting marine approaches to LNG facilities, and hazards associated with deliberate attack.

Recommendation 34. The notification requirements under the Emergency Management Regulation should be used as the basis of a more robust BCOGC public consultation process for all LNG terminal proposals, not just those permitted under the Pipeline Regulation. The BCOGC should require that proponents provide municipalities, First Nations, persons and entities within emergency planning zones of LNG proposals with clear assessments, in plain language, of the potential risks to public safety, the environment, nearby business and properties from deliberate or accidental incidents leading to loss of containment of LNG and fire at their proposed facility or on LNG tankers at berth or in transit along marine approaches to the facility. These summaries should be posted online for review by the general public. Proponents should be required to seek feedback from municipalities, First Nations, persons and entities within emergency planning zones regarding the impact of these consequences. This feedback should be transparently considered in the development of project proposals and Emergency Management Plans, and proponents should be required to show that project consequences have been reduced where ever possible.

Marine Control Zones Around LNG Facilities – Who Is In Charge?
The BCOGC states that marine shipping is outside its mandate and that issues related to shipping are addressed by other regulators. The BC government has also acknowledged that marine traffic and the shipping of LNG remain federal responsibilities under the authority of Transport Canada. BCOGC permitting processes do not require proponents to consider risks associated with LNG tankers or marine approaches to terminals.

However, section 2.1.4 of the Manual states that the plot plan must show the marine control zone for LNG tankers at berth and the facility’s marine security provisions (tug boat pens, heliport, emergency response centers, oil spill response centre, and safe anchorages for LNG tankers).

As of December 2016, one LNG terminal has been permitted by the BCOGC on provincial crown land – the proposed LNG Canada facility in Kitimat. The BCOGC permit includes a requirement that the permit holder submit and implement “a plan for implementation of a marine control zone around the LNG tanker berths of 200m while loading/de-inerting operations are in progress” “to the satisfaction of the Commission.” The marine control zone is defined as “an area surrounding marine infrastructure where

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132 See for example discussion of this issue by the BCEAO working group for the Wespac Tilbury Marine Jetty project as reported in the February 5 2016 meeting minutes.
133 See this BC government press release on the Federal Port Development Act.
A permit holder would control access during specified activities in the interest of public safety.  

Assuming they lie on navigable waters, the marine control zone requirements of the BCOGC LNG facility permitting process may be in conflict with federal regulations. Neither the LNGFR nor the Manual provide any detail on how the BCOGC coordinates efforts with Transport Canada in the development of marine control zones around LNG terminals to ensure compliance with federal Marine Transportation Security Regulations, the Collision Regulations, and the Navigation Protection Act.

**Recommendation 9.** (repeated) Transport Canada, BC’s Port authorities, and the BCOGC should work together to determine which agency has authority for establishing and overseeing operation of marine security exclusion zones at LNG terminals in BC. This determination should be completed for all possible scenarios, including where proposed terminals are i) on federal lands within port authority navigable waters jurisdiction, ii) on private lands within port authority jurisdiction, or iii) on any lands outside of port authority jurisdiction. Transport Canada should ensure that overlapping authority does not result in gaps in enforcement of security procedures.

**Recommendation 11.** (repeated) Transport Canada, BC’s Port Authorities and the BCOGC should develop clear protocols for enforcing marine security exclusion zones around facilities and should ensure those agencies charged with delivering enforcement protocols (e.g. joint Coast Guard RCMP Marine Security Enforcement Teams) are adequately resourced.

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135 The BCOGC permit for LNG Canada is found here. In its submission to the TERMPOL review process, op. cit., pg. 51, LNG Canada indicated it would implement an additional control zone, of “broader parameter” around the terminal as a security measure. The size of this control zone is not further specified, nor are measures for its enforcement.
**The BCOGC will have permitting authority for LNG facilities on federal Port Lands in the Port Authority of Prince Rupert.**

Transport Canada has adopted a regulatory regime for the design, construction and operation of LNG terminals on federal lands in the Port of Prince Rupert. The regulations fall under the *Canada Marine Act* and are based on the BCOGC LNGFR. The regulations authorize the BCOGC to regulate LNG facilities on federal port lands on behalf of the government of Canada. The regulations also incorporate, by reference, all regulations under the BC *Oil and Gas Activities Act*, all regulations under the BC *Drinking Water Protection Act*, and selected regulations under the BC *Environmental Management Act*.

In February 2015 the Province of BC introduced Bill 12, the *Federal Port Development Act*. The intention of the act is to allow BC to enter agreements to manage LNG terminals and enforce provincial law on federal port lands. The BC government explicitly acknowledges that “marine traffic and LNG shipping operations will not be affected by this bill and will continue to be led by Transport Canada.”

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**CSA National Standards relevant to BCOGC LNG facility permitting**

CSA Z276, discussed below, is referenced in the LNGFR as a required standard for LNG facilities. CSA Z246.1 and Z246.2, also discussed below, are not referenced in the LNGFR, but applicants are referred to them in the Manual. All three standards specifically exclude LNG tankers and marine approaches to LNG terminals from consideration.

**CSA Z276-15, Liquefied natural gas - Production, storage, and handling**

CSA Z276 is the primary reference standard in the LNGFR and its requirements are applicable under that regulation. Z276 specifically excludes consideration of berthed and loading LNG tankers as facility assets and makes no mention of marine approach criteria. The standard does not require consideration of the risk of deliberate attack. The key problem raised in this overview is not addressed by Z276.

The CSA has indicated that it intends to update Z276 to incorporate risk assessment for LNG facilities and marine LNG terminals. Public documents available from CSA do not specify if that update will incorporate site and marine route selection criteria nor do they provide a time frame for that update.

In section 5.1.1 CSA Z276 makes general reference to terminal siting criteria:

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136 Port of Prince Rupert Liquefied Natural Gas Facilities Regulations In force 2016-09-30. See VTACC/Skeena Wild submission to Transport Canada on shortcomings in the regulations related to accountability, transparency and site selection processes.

137 Liquefied Natural Gas Facility Regulation July 2014.

138 *Drinking Water Protection Act*.

139 *Environmental Management Act*, including the Public Notification Regulation.


141 *CAN/CSA-Z276-15 - Liquefied natural gas - Production, storage, and handling*.

142 January 2015 CSA presentation, slide 22. No information regarding an update to CSA Z276 appears on the CSA website as of December 01 2016.
An evaluation plan shall be developed that addresses the suitability of the plant site being considered, taking into account the following factors:

a) provision for minimum clearances, as stated in this Standard, between LNG containers, flammable refrigerant storage tanks, flammable liquid storage tanks, structures, and plant equipment, both with respect to plant property lines and each other;
b) all-weather accessibility to the plant for personal safety and fire protection, except where provisions are made on site;
c) the degree to which the plant can, within the limits of practicality, be protected against forces of nature, including severe weather patterns;
d) adjacent activities; and
e) other factors applicable to the specific site that have a bearing on the safety of plant personnel and the surrounding public. The review of such factors shall include an evaluation of potential incidents and of the safety measures incorporated into the design or operation of the facility.

The requirements in 5.1.1 of Z276 correspond to requirements outlined in section 2 of the LNGFR. 5.1.1 does not require consideration of security risks, nor does it require application of hazard planning distances to determine risks to nearby populations or critical infrastructure.

Section 11.4 of CSA Z276 addresses marine shipping and receiving of LNG. It provides guidance on requirements, design and protection of LNG transfer components.143

Section 12.7 addresses security, and requires a security assessment for all physical structures and operational plans. Section 12.7 also presents minimum requirements for controlling access, lighting, and peripheral enclosure (on land only). Section 12.7 directs the reader to CSA Z246.1-13, Security Management for Petroleum and Natural Gas Industry Systems (discussed below), for further guidance.

Section 12.10.1 requires continually monitored ship to shore communications capability.

Section 13.3.3 lays out requirements for emergency procedures that include “at a minimum, emergencies that arise from operating malfunction, structural collapse of part of the LNG plant, personnel error, forces of nature, and activities carried out adjacent to the plant.”144 Section 13.3.3 does not specifically require consideration of emergencies that result from deliberate attack.

Section 13.3.10 addresses marine shipping and receiving, including development of a contingency plan for incidents in the LNG transfer area, a mooring plan, and requirements for the LNG transfer process. Section 13.3.10 makes no requirements for a security sweep or inspection of the berthing area prior to arrival of an LNG tanker, nor for the maintenance of a marine security zone during LNG transfer.

Section 13.3.10.6 creates a requirement that bunkering at LNG facilities be done by pipeline rather than by barge.

Section 13.6 requires the operator develop a security plan based on the results of the assessment conducted in 12.7. Section 13.6 requires operators ensure coordination of security issues with marine vessel operators.

**CSA-Z246.1 Security management for natural gas industry systems**

The LNGFR does not specifically reference CSA-Z246.1-13 as a required standard. However, Section 1 (Scope) of the standard indicates that it applies to all natural gas industry systems and all operators, regardless of the size or number of their assets.

Z246.1 explicitly excludes security or emergency preparedness issues related to LNG tankers. LNG tankers are not considered facility assets and so are not included in threat, vulnerability or security risk assessment processes. Z246.1 does not address site and marine route selection criteria.

Section 9 of Z246.1, Physical Security Measures, makes no mention of securing a marine perimeter, nor does it provide any guidance on conducting sweeps of approaches and berthing areas during LNG tanker approach and departure, or establishing and maintaining a marine exclusion zone around an LNG facility during LNG transfer to a tanker.

Z246.1 does provide guidance on risk assessment and management, information security management, security training and clearance, other aspects of physical security, and incident management. Z246.1 does call for worst case scenario assessment, and does explicitly call for consideration of the risk of terrorist attacks.

**CSA Z246.2 Emergency preparedness and response for natural gas industry systems**

While the LNGFR does not reference CSA-Z246.2-14 as a required standard, Section 1 (Scope) of the standard indicates that it applies to all natural gas industry systems and all operators, regardless of the size or number of their assets.

CSA Z246.2 makes no reference to marine route and site selection criteria. Z246.2 explicitly excludes emergency preparedness issues related to LNG tankers. LNG tankers are not considered facility assets and so are not included in hazard identification or emergency response planning processes.

Z246.2 states that operators must develop an incident management system and emergency response plan and a system for communicating with external stakeholders that may be impacted by an emergency.

Section 8 states that an operator shall have a process for identifying, analyzing and inventorying all hazards, and processes for evaluating, managing and mitigating consequences of those hazards.

Section 9 states that an operator shall have a process to determine emergency planning zones.

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145 Updated to CAN/CSA-Z246.1-17 - Security management for petroleum and natural gas industry systems 2017. Latest version of the document not reviewed for this report.
Annex A provides further guidance on identifying hazards and establishing emergency planning zones. A.8 discusses approaches to risk assessment and directs operators to various external resources for assistance in identifying hazards. A.9 directs the operator to consult provincial regulatory agencies (in this case, the BCOGC) for “specific end points and consequence modelling criteria when determining emergency planning zones” but also highlights the following factors that should be taken into consideration:

- population density;
- presence of high density buildings such as schools and buildings containing vulnerable people such as hospitals and other health care facilities;
- access/egress routes;
- local emergency response capabilities and resources; and
- public warning systems.147

**Recommendation 35.** CSA should be called on to develop specific guidance for marine LNG terminal site selection, incorporating consideration of the siting guidelines developed by SIGTTO.

**Recommendation 36.** CSA should be called on to develop guidance for security threat, vulnerability and response preparedness for marine LNG terminals. This guidance should explicitly consider LNG tankers to be facility assets when berthed at LNG terminals or in transit on marine approaches to terminals. This guidance should explicitly consider the risk of deliberate attack on LNG terminals (including LNG tankers), their consequences, and their prevention.

**Recommendation 37.** CSA should be called on to develop national standards for hazard planning distances around LNG terminals and LNG tankers, whether at berth or in transit. CSA should give consideration to the conclusions reached in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water* in order to develop these standards.

**Recommendation 38.** The BC Government should explicitly incorporate CSA Z246.1 and Z246.2 as required standards in the LNGFR.

**Recommendation 39.** The BCOGC should explicitly incorporate the planning factors identified in Annex A of CSA Z246.2 into its hazard zone and emergency planning zone determinations.

**Summary: BCOGC Permitting Process Does Not Address The Problem**

The BC LNG Facilities Regulation and the BCOGC permitting process do not require hazard identification or risk assessment and management for incidents involving LNG tankers, whether berthed at a facility or in transit. The LNGFR is likewise silent about hazard identification or risk assessment and management along marine routes used to approach LNG facilities. The LNGFR does not require proponents consider risk of deliberate attack in risk assessments. All of the CSA standards reviewed here also exclude LNG tankers from consideration as facility assets, and exclude marine approaches from consideration in hazard planning processes.

147 Ibid., pg. 29.
As a result, incidents with potentially serious public safety consequences – such as a deliberate attack on an LNG tanker, berthed at an LNG facility or transiting near population centres or critical infrastructure – are not given any consideration in the BCOGC permitting process for LNG facilities. This regulatory gap puts the public at risk.

The BC LNGFR, BCOGC guidance and CSA standards should be revised to incorporate consideration of berthed LNG tankers as facility assets for the purpose of hazard identification or risk assessment and management, and should also give consideration in assessment process to risks associated with tanker transits along marine approaches to LNG terminals.

The LNGFR should explicitly incorporate CSA Z246.1 and CSA Z246.1 as required standards applicable to LNG facilities.

Marine exclusion zones incorporated into BCOGC permits for LNG facilities may be conflict with federal authority to regulate shipping and navigation. This conflict must be resolved.

BCOGC hazard planning and emergency planning distances for LNG facilities are not clearly defined, and the Commission appears to have discretion in determining their scope. These planning rules need to be made transparent and explicit so that the public can have confidence in their application and can anticipate notification regarding risks and emergency planning procedures.

The lack of transparency in BCOGC decision making reduces public confidence in this government regulator and is an obstacle to timely and well informed public input into Commission decision making. All studies and reports submitted to the BCOGC in support of LNG facility applications should be made public.

To the extent they exist, BCOGC site assessment processes occur so late in the overall LNG facility application process that it is difficult to see how they could have any influence over LNG terminal site selection. Further, considering the BC government’s intense desire to see an LNG facility commissioned in BC, it is reasonable to be concerned that the BCOGC will attempt to mitigate project risks through design requirements rather than reject a project application as poorly sited.

In short, the fundamental problem identified in this report is not resolved through the BC LNG facility permitting process. Canada needs to develop an LNG facility terminal siting and pre-screening process to ensure that the public is not put at risk by poorly sited LNG terminals.

Other provincial rules that apply to LNG facilities
Various other provincial laws and regulations may also apply to the construction and operation of LNG facilities but are not relevant to this review. Many of these (such as water use and discharge permitting) are handled by the BCOGC through the province’s “single-window” regulatory streamlining process.148

148 BC Oil and Gas Commission Permitting Process web page.
Part Five: In Focus – Wespac LNG Proposal On The Fraser River

Project description

This LNG export terminal would be located at Tilbury Island in Delta, approximately 21 km from the mouth of the Fraser River, adjacent to the existing Fortis natural gas liquefaction facility.  

Wespac has been working to develop an LNG export facility in Metro Vancouver since 2012 and has been working with Fortis BC since 2013 to source export markets for LNG produced at the Tilbury Island site. Wespac is also exploring the potential to provide bunkering services to LNG-fuelled vessels, by barge, also using LNG sourced from the Fortis facility.

In May 2015 Wespac received approval from the National Energy Board for the export of 4.76 billion cubic metres of natural gas each year (approximately 3.5 Mt/yr.). Fortis cannot provide this volume of LNG to Wespac without further expansion beyond that already underway at their Tilbury Island liquefaction facility.

Also in May 2015 Wespac submitted an application for environmental assessment for its proposed Tilbury Island LNG terminal to the Canadian Environmental Assessment Agency (CEAA) and the BC Environmental Assessment Office (BCEAO). The project is now undergoing assessment by the BCEAO under a substitution agreement with CEAA.

Wespac considers itself a midstream service provider and only claims responsibility for the LNG from the time it would be pumped out of the Fortis storage tank until it would be loaded into vessels berthed at the proposed jetty. Wespac asserts that shipping LNG on the Fraser River and beyond, and the movement of LNG tankers on marine approaches to the terminal, are the responsibility of the carriers themselves and not

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149 This review is based on documents that are publicly available at the Wespac project page on the BCEAO website as of January 2017, as well as a response to an Access to information request to the Vancouver Fraser Port Authority from 2016.

150 See “Wespac Energy Group, Company and BC LNG Project Overview October 2012” at page 58 of VFPA Access to Information Response 52100-20-004-2016. The proponent’s NEB export licence application also shows coordinated planning effort with FortisBC affiliates (paragraphs 7 through 11). Wespac has collaborated with Fortis since in 2013 in the effort to secure an LNG export contract with Hawaiian Electric, according to an application by Hawaiian Electric to the Hawaii Utilities Commission (pg. 50 of the pdf) The possibility of exporting LNG to Hawaiian Electric was quashed by a decision by the Hawaiian Utilities Commission in 2016. Presumably Wespac and Fortis continue to seek out export markets.

151 As reported in the BCEAO working group for the Wespac Tilbury Marine Jetty project August 23 2016 meeting minutes.

152 Government of Canada Press Release: NEB approves Wespac Midstream LNG export licence

153 The Fortis Tilbury Island LNG facility is currently under expansion to “meet the growing LNG demands of the transportation sector, remote communities and industry in BC.” The focus appears to be on domestic use and presumably could include bunkering LNG-fuelled vessels. Fortis indicates it will pursue further expansion if export contracts are secured. The expansion now underway will bring liquefaction capacity at the Tilbury Island facility to 33 million cubic feet of natural gas per day. The export volume allowed under Wespac’s NEB licence is equivalent to 400 million cubic feet of natural gas/day.
Wespac. However, CEAA and BCEAO have required that Wespac assess effects of the project to the pilot station at Sand Heads in the Strait of Georgia in the environmental assessment process.

The proposed terminal would have an annual export capacity somewhat larger than the proposed Woodfibre LNG terminal near Squamish and about one quarter the size of the export capacity of the Pacific Northwest LNG terminal proposed for Prince Rupert.

The Project Summary Description states that the terminal would generate up to 90 LNG tanker trips (of 65,000-90,000 m³ LNG capacity) and 34 LNG barge trips (up to 7500 m³ LNG capacity) each year. Wespac states it will not own and operate LNG tankers. However, it also states that tankers would be custom built to serve the facility. Wespac has not provided design specifications for these tankers beyond indicating that they would prefer them to be of larger beam than the Vancouver Fraser Port Authority (VFPA) currently allows on the two-way navigation channel of the south arm of the Fraser River. Wespac does not specify if it would own and operate the LNG bunker barges that would use its facility.

Responsibility for the care, safety and control of the LNG carriers, LNG barges and, upon loading, the LNG product will generally lie with the receivers and vessel operators

— Wespac Midstream, project description

Massey Tunnel Removal – Implications For LNG Tankers On The Fraser River

The proponent indicates that their projections of LNG exports and tanker traffic stand independent of plans to remove the Massey Tunnel on the South Arm of the Fraser River. However, deepening and widening the navigation channel in the river after tunnel removal may well allow for larger LNG tankers to serve the proposed terminal.

What does the US Waterway Suitability Assessment say about project risk?

If it were meeting requirements under US regulations, Wespac could have submitted a preliminary WSA to the Coast Guard as early as 2013, when it began working with Fortis BC to seek buyers for LNG produced at the Fortis Tilbury Island liquefaction facility. Wespac would have been required to submit a complete WSA by the time it began

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156 Op. cit., Project Description, updated with revised shipping numbers in 2015 submission to BCEAO. A 7500 m³ barge represents a capacity of approximately 2100 Gross Tons.
157 Telephone conversation with proponent and consultants October 18 2016.
application for an environmental assessment with CEAA and the BCEAO in May 2015. Under US regulations that full WSA would have included a characterization of the facility, the port, and the waterway that would be transited by LNG tankers.

Under US regulations, Wespac would have been required to apply hazard planning distances identified in the USCG WSA process in its assessment of security and safety risks around its proposed terminal and along the tanker route.

The map image below provides a simplified representation\(^{159}\) of the application of the WSA hazard planning distances to the proposed Wespac Tilbury LNG terminal and the LNG tanker transit route along the shipping channel of the Fraser River. The locations of first responder facilities, critical infrastructure and population centres that fall within or near to hazard planning zones are noted. (A live version of this map is available via the footnote below so interested readers can identify the individual schools, retirement homes, fire halls etc. that are indicated in the static image provided here.)

The image shows that riverfront condominiums and an entertainment complex in Richmond are located within the 500 metre hazard zone, as are some industrial areas in both Richmond and Delta. Within this zone, the intense heat resulting from loss of containment on an LNG tanker followed by an LNG pool fire would result in significant impacts on public health and safety and would be sufficient to damage structures. Two points of critical infrastructure – the approved location for the Vancouver Airport Jet Fuel Terminal and the future ten lane crossing of the Fraser River – are also within the 500 metre hazard zone.

Under US regulations, Wespac would also be required to map population density within hazard planning zones. The map image shows that large areas of the communities of Ladner and Steveston, including several schools and seniors homes, fall within the 1600 metre hazard zone along the LNG tanker route. The Sandia analysis notes that thermal hazards from an LNG pool fire, while lower in this zone, can still result in second degree burns on bare skin within thirty seconds at the outer edge of the zone. Three first responder facilities, a Delta fire hall, a Richmond RCMP detachment and the Steveston marine search and rescue station, are also located within the 1600 metre hazard zone. The Steveston search and rescue station would likely be expected to play a role in responding to a ship-source LNG incident on the Fraser River. Environmentally sensitive areas along the Fraser River also fall within the 1600 metre zone.

\(^{159}\) A more accurate representation of hazard zones in Delta and Richmond would require considering the effect of topography, wind patterns, etc. on the behaviour of a dispersing LNG vapour plume. Points of interest are approximate due to coordinate rounding. View the live version of the map to identify individual points of interest.
Waterway Suitability Assessment Hazard Zone Mapping Applied To The Project

As part of the WSA process, Wespac would also be required to assess security risks along the LNG tanker route, including risks from shore based, surface, subsurface and aerial attack involving sabotage, projectiles, small vessel approaches, etc. Wespac would be required to assess the likelihood of attack, the likelihood of the success of an attack, and the consequences of such an attack on surrounding communities, industrial areas and the environment. Wespac would be required to make key assumptions in this assessment explicit, and show a sensitivity analysis for those assumptions.

Wespac would be required to identify risk management strategies for the 500 metre hazard zone such as shoreside monitoring, river based patrols and security sweeps, daylight only transits of the river to improve monitoring, control of small boat marinas that could be used to stage attacks, and procedures for closing the proposed ten lane Fraser River bridge when LNG tankers are transiting the river. Wespac would also be required to identify the resources needed to carry out these risk management strategies and enforce security protocols.

Under US regulations Wespac would also be required to identify risk management strategies (and resources needed to carry them out) for the 1600 metre hazard zone,
such as developing an education plan and a public warning system, and establishing areas of refuge.

Finally, Wespac would be required to conduct a gap analysis to identify risk management resources available among local, provincial and federal government agencies, and it would be required to present a cost sharing plan to ensure that all needed resources were in place and operational prior to commissioning and operation of the facility.

Wespac presents no evidence in project documents that it has voluntarily undertaken these steps. In fact, Wespac explicitly disavows responsibility for LNG tankers once they leave its facility. The federal and provincial environmental assessment processes require that Wespac assess impacts to the mouth of the Fraser River, but those assessment processes do not give any consideration to security issues.

In summary, application of the US Waterway Suitability assessment process to the proposed Wespac LNG project would show that populations of concern and critical infrastructure are within the high danger 500 metre hazard zone created by the movement of LNG tankers to and from the project site. The assessment would undoubtedly show that there are significant gaps in the resources needed to successfully manage security risks in this zone, and would place a burden of responsibility on Wespac to develop and fund those resources. Finally, participation in this process would place significantly greater stakeholder consultation demands on Wespac, given the likely requirement to develop education programs and community warning procedures and establish areas of refuge within the communities of Delta and Richmond.

What do SIGTTO siting guidelines say about this location?

Wespac indicates that it became an associate member of the SIGTTO in 2015. Wespac notes that this membership gives it access to information on industry best practices and “the ability to implement these best practices in its LNG operations.”\(^{160}\) However, it does not appear that Wespac made use of guidance offered in the SIGTTO document *Site Selection and Design for LNG Ports and Jetties*\(^{161}\) when it selected the Fraser River terminal site.

Among the SIGTTO terminal siting guidelines that are relevant to the Fraser River site:

- “Short approach channels are preferable to long inshore routes which carry more numerous hazards.”
- “Jetty location should be remote from populated areas and should also be well removed from other marine traffic and any port activity which may cause a hazard.”
- “River bends and narrow channels should not be considered as appropriate positions for LNG carrier jetties.”
- “Traffic separation schemes should be established in approach routes covering many miles.”
- “Ship movements by nearby ships, when the LNG carrier is pumping cargo, should be disallowed.”

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\(^{160}\) [http://wespactilbury.ca/about-wespac/](http://wespactilbury.ca/about-wespac/)

\(^{161}\) *Site Selection and Design for LNG Ports and Jetties* SIGTTO Information Paper No. 14, 1997.
“Channel width should be about five times the beam of the ship (approximately 250 meters)“.
“Turning areas should have a minimum diameter of two to three times the ship’s length (approximately 600 to 900 meters) 162

The proposed Fraser River LNG terminal site conflicts with these guidelines in numerous ways:

• The Fraser River approach is long, winding and narrow;
• A riverside condominium development at Riverport Way in Richmond lies less than 2 km downstream from the terminal site and within 200m of the LNG tanker route. A large multi-purpose entertainment complex is located next to the condominium development. Other downstream residential developments are also located within the 1600 metre hazard zone along the route that would be transited by LNG tankers;163
• A jet fuel terminal will be located just downstream from the proposed LNG terminal, at a distance of less than 300 m to the centreline of the two way marine shipping channel that would be transited by LNG tankers. The terminal will feature a berth for jet kerosene tankers and barges, fuel storage tanks and a fuel pipeline;164
• The Fraser River deep sea navigation channel allows for two way vessel traffic and is only 200 m wide – narrower than SIGGTO’s 250 metre channel width guidance. TERMPOL guidance documents specify that one-way channel width should be at least four times the design vessel breadth, and two-way channels should be at least seven times the design vessel breadth.165 Wespac is asking the Vancouver Fraser Port Authority to allow LNG tankers 38m wide to service the terminal — wider than the existing 32.25m vessel beam currently allowed on the river.166 This design breadth translates into a 152 metre wide one way channel, or a 266 metre wide two way channel under TERMPOL guidance; and
• As noted in Part One of this paper US federal regulations require moving security exclusion zones of 500 metres or more around LNG tankers transiting port areas – likely an impossible requirement on the narrow Fraser River. The Fraser river is used by a wide variety of vessels, including working fishing boats, tugs, barges, ocean going freighters and pleasure craft.

Site pre-screening argues against an LNG facility at this location

Application of US Waterway Suitability Assessment hazard zone mapping to the proposed terminal site and the associated transit route for LNG tankers shows that this project would put first responders, population centres and critical infrastructure within critical 500 metre and 1600 metre hazard zones.

The Proponent’s Project Summary Description gives no indication that the SIGTTO siting guidelines were applied in selecting the proposed terminal location. Clearly, the proposed site would fall far short of meeting those siting guidelines if they were applied.

162 Appendix A, Site Selection and Design for LNG Ports and Jetties SIGTTO 1997 Information Paper No. 14
163 Shown in the overview image above.
164 Shown in the overview image above.
165 As noted in the LNG Canada TERMPOL Review Report, op. cit., pg. 31.
Based on available information, it appears the site was selected by Wespac LNG because it is convenient to the existing Fortis LNG compression and storage facility and will provide export capacity for that facility — not because it represents an ideal, or even suitable, site for an LNG terminal.

Wespac Declines Participation In The TERMPOL Review Process

Wespac indicates that it does not intend to participate in the TERMPOL process, citing the lengthy timeframe for the process. Wespac states that it will conduct an “equivalent study following the same guidelines” which it will submit to Transport Canada.

In public project documents Wespac indicates that it intends to voluntarily conduct three studies relevant to this topic: a Marine Navigational Risk Assessment, a Marine Manoeuvrability Simulation, and a Quantitative Risk Analysis. Wespac has indicated the Marine Navigational Risk Assessment will be incorporated as an appendix to the Application for Environmental Assessment. Wespac says that new LNG tankers will be custom built to serve its proposed terminal. It has not made design specifications for these vessels public, but presumably they are in place and are being used in the simulations and assessments noted above.

Transport Canada has indicated that Wespac must submit navigation studies as part of a “Navigation Protection Act package” and that this package may be sent to a “TERMPOL review committee” for consideration “if needed.”

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167 Personal communications with project proponent at Wespac Tilbury BCEAO Delta Open House December 2 2015. While the proponent cited the length of time the TERMPOL process requires as reason for pursuing an independent study, it is worth noting that LNG Canada reports it took twelve months to complete studies required by its TERMPOL review committee, and the TERMPOL review committee and Transport Canada took six to seven months to consider those studies and issue a report. The Wespac proposal has already been before the BCEAO since May 2015 — twenty-three months. The table of contents for Wespac's proposed "TERMPOL-equivalent" study is found in VFPA Access to Information Request Response 52100-20-004-2016 at page 178. It does not address security issues.


169 For example in the Technical Working Group comments on responses on the draft Application Information Requirements, November 2016.

170 BCEAO Wespac Tilbury Marine Jetty Project Working Group #1 Meeting Notes July 21 2015. The TERMPOL Review Process guide (at 1.2.4) notes that reviews under the Navigation Protection Act focus specifically on works in waters that pose a risk to navigation, whereas the TERMPOL review process focuses on overall vessel and navigation safety associated with projects.
Finally, it is worth noting that the guide to the TERMPOL review process provides examples of how proponents can reduce or mitigate risk including “locating the terminal in a remote location or one that is well separated from urban or suburban communities.” The site Wespac proposes for its LNG terminal is neither remote nor well separated.

The guide to the TERMPOL review process provides examples of how proponents can reduce or mitigate risk, including “locating the terminal in a remote location or one that is well separated from urban or suburban communities.” The site Wespac proposes for its LNG terminal is neither of those things.

Careful assessment of the marine safety risks posed by the bulk export of LNG is important, especially when an LNG terminal is proposed for a narrow heavily trafficked river channel in a built up urban area. Participation in a rigorous marine safety risk assessment process should not be left to the discretion of project proponents.

Recommendation 3. (repeated) Transport Canada should standardize the TERMPOL review process and make it mandatory for all LNG terminal proposals. Recommendations produced through these reviews should be binding. Review committees should incorporate expertise from the BC Oil and Gas Commission and industry associations such as SIGTTO. There should be a clearly established time frame for entry into and completion of the review process so that siting, design, security and operational recommendations can be considered in the environmental assessment process and BC Oil and Gas Commission approvals.

A strengthened TERMPOL review process should complement, not replace, a mandatory site pre-screening process used to expediently rule out inappropriate locations for LNG terminals.

Transport Canada should ensure that the revised TERMPOL review process gives explicit consideration to the risks and consequences of deliberate attacks and results in recommendations for measures to mitigate security risks. Security risk analysis should address marine approaches to terminals as well as terminal locations themselves. The TERMPOL review process should incorporate hazard planning distances identified in the Sandia National Laboratory report Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water.

No consideration of the risks and consequences of deliberate attack

None of the Wespac project documents publicly available as of January 2017 provide an assessment of the risk of deliberate attack on an LNG tanker, whether berthed or in transit on the Fraser River, leading to the breach of containment and significant loss of LNG. None of the project documents assess the consequences to the public of an LNG pool fire or ignition of an expanding LNG vapour plume resulting from such a loss of containment on a tanker, whether berthed or in transit. None of the project documents present an assessment of the resources needed to reduce the risk of deliberate attack or enforce security procedures at the facility or around LNG tankers.

When asked about its decision to not directly assess the risk of deliberate attack on tankers or their facility, Wespac states that “a release of LNG, whether accidental or by deliberate action, would be treated the same way.” This response is inadequate. It does not acknowledge that though the results of an accidental or deliberate release of LNG may be the same, the causes will not, and will very likely require different specific measures to ensure their prevention.

Wespac’s assessment of risks from accidents is also inadequate. The project Application information Requirement addresses risks associated with release of LNG in Chapter 9, Accidents and Malfunctions, where the focus is an “unexpected occurrence or unintended action” or the “failure of a piece of equipment, a device, or a system to function normally.”

In Chapter 9 Wespac indicates that it will consider the risk of accident or malfunction leading to explosion and/or fire during LNG loading, LNG transfer, or at the Fortis liquefaction facility itself. It is not clear if Wespac intends to consider the risk of loss of containment and fire from LNG tankers themselves while at berth. Oddly, while Chapter 9 indicates the proponent will consider the risk of vessel grounding, as well as collision or allision, the latter two including loss of LNG “where applicable,” it does not commit to assessing risk of fire resulting from such loss of LNG containment on an LNG tanker in transit.

In short, Wespac project documents fail to address the worst-case scenario outcome of significant loss of containment on an LNG tanker (berthed or in transit) followed by fire, whether caused by accident, malfunction, or deliberate attack.
communities deserve a transparent, rigorous and justifiable assessment of the likelihood and consequences of such an incident.

**Recommendation 30.** (repeated) The BCOGC should require that hazard identification studies, risk assessment studies, damage prevention plans and safety and security management plans requested from proponents in the permitting process incorporate explicit consideration of the potential for deliberate attack on facilities (including berthed LNG tankers) and tankers transiting along marine approaches to and from facilities. When conducting these studies and developing these plans proponents should be required to model the consequences of worst case outcomes for attacks, including significant loss of containment of LNG, leading to an expanding vapour plume and fire.

**Recommendation 40.** As part of a mandatory TERMPOL assessment, proponents should be required to complete a formal gap analysis of regional preparedness and response capabilities for a deliberate attack resulting in loss of containment of LNG and fire from an LNG tanker, whether berthed at a proposed facility or in transit on marine approaches to or from the facility.

**Wespac Security Plans – Deemed Inadequate In July 2016, Current Status Unclear**

In December 2015 Wespac submitted a memorandum entitled *WesPac LNG Marine Terminal – Preliminary Security Enforcement Procedures Overview* to VFPA in order to receive feedback on the legality of enforcing a patrolled security zone around the proposed facility.\(^{175}\)

The introduction to the memorandum states the document outlines security enforcement procedures at the facility that are “intended to prevent unauthorized access to the Jetty and any occupying ship, and the transfer of illegal substances, weapons, devices or personnel.” The document describes specific procedures for all MARSEC levels and is clearly intended to respond to requirements detailed in the MTSR. The document also briefly describes procedures for responding to emergencies. No mention is made of security procedures for vessels in transit to and from the proposed facility.

The memorandum proposes a “static marine security zone” of 250 metre radius from the LNG loading platform. On shore the security zone would “merge” with existing “security area(s) established and maintained” by neighbouring land owners (including FortisBC).

Communications between VFPA and Transport Canada indicate that as of July 2016 VFPA had asked the proponent to “come up with some different ideas to enforce security.”\(^{176}\) A security procedures plan is not included in public project documents available on the BCEAO website as of January 2017. The finalized security plan may not be a public document.

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\(^{175}\) The draft security procedures memorandum and communications between Wespac and VFPA, between VFPA and Transport Canada and VFPA internally on this matter are found in VFPA Access to Information Response 52100-20-004-2016 at pages 41-47, 194 and 198-199, and in this portion of the ATIP response package at page 53.

\(^{176}\) Contained in VFPA Access to Information Response 52100-20-004-2016 at page 53.
Is A Marine Security Exclusion Zone in the Fraser Feasible? Who would be in charge?

The Wespac Tilbury Project Description Document briefly describes establishing a “marine security zone” around the facility.

During construction and throughout the operational phase of the Project a marine security zone will be established around jetty operations and the Offshore Facilities. Once a security zone is established, only Project-related and authorized vessel traffic will be permitted to enter this restricted area. A small craft will be stationed at the floating dock to patrol the security zone if necessary.

The exact extent of the security zone will be determined through the final design of the Project. During this process, consideration will also be given to local river conditions, applicable marine regulatory BMP requirements, input from Aboriginal groups, and PMV.\(^\text{177}\)

The document does not specify the size of the security zone, though the memorandum submitted to VFPA suggests a radius of 250 metres from the LNG loading platform. As a comparison, the Port of Boston authorizes security and safety exclusion zones of 400 to 500 yards (366 to 457 metres) around berthed or anchored LNG tankers.\(^\text{178}\) Applying the Boston standard at the proposed Wespac Tilbury Island Terminal site may well conflict with vessel movement on the navigation channel on the Fraser River.

The Project Description Document does not describe what would happen if a vessel entered the security zone while an LNG tanker was loading, nor does it assess impacts on other river users (e.g. recreational users, fishers and deep sea vessels transiting past the proposed terminal).

The document does not explain how the security zone will mesh with existing requirements under the Navigation Protection Act, the Marine Transportation Security Regulations, Port Authority regulations or the BCOGC regulations, nor does it acknowledge potential conflict with the Collision Regulations.

In any case, if a marine security exclusion zone around the proposed facility is not feasible given navigation requirements of pre-existing marine users, rather than reducing


the size of the exclusion zone the proposal should be rejected by the authorizing agency. Public safety must not be put at risk to enable incompatible projects to go forward.

*If a marine security exclusion zone around a proposed LNG facility is not feasible given navigation requirements of existing marine users, rather than the size of the exclusion zone the proposal should be rejected. Public safety must not be put at risk to enable incompatible projects to go forward.*

It appears from the minutes of the project technical working group (established by the BCEAO for the assessment process) that regulatory responsibility for a marine security zone around the proposed terminal is still under debate.

MIB asked about marine security zone for LNG carriers and who would be responsible for enforcing. TC indicated PMV would likely have jurisdiction. The proponent indicated it is currently discussing security zone/enforcement with PMV. PMV clarified this project is not within lands administered by PMV but is within its navigational jurisdiction. TC would have some role approving a terminal security plan for any operating port within Canada.

OGC noted security management falls under regulations as well, which PMV oversees. TC noted final marine security plan is not done until after facility is built. Such plans do not apply to exclusion zones on the water.179

**Recommendation 8.** (repeated) Transport Canada should develop a national standard for marine security exclusion zones as a normal operating procedure in navigable waters around marine LNG facilities. Exclusion distances incorporated in the standard should be referenced in LNG project pre-screening processes and TERMPOL reviews to ensure that projects proposed in locations where exclusion zones are unfeasible (e.g. because they create conflict with the Collision Regulations or impose serious restrictions on other marine users) are rejected before entering lengthy review processes.

**Recommendation 9.** (repeated) Transport Canada, BC’s Port authorities, and the BCOGC should work together to determine which agency has authority for establishing and overseeing operation of marine security exclusion zones at LNG terminals in BC. This determination should be completed for all possible scenarios, including where proposed terminals are i) on federal lands within port authority navigable waters jurisdiction, ii) on private lands within port authority jurisdiction, or iii) on any lands outside of port authority jurisdiction. Transport

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179 BCEAO Wespac Tilbury Marine Jetty Project Working Group #3 Meeting Notes February 4 2016. MIB = Musqueam Indian Band, TC = Transport Canada, PMV = VFPA, and OGC = BCOGC.
Canada should ensure that overlapping authority does not result in gaps in enforcement of security procedures.

**How would security measures impact the planned ten lane Fraser River bridge?**

The proposed Wespac LNG terminal would be located upstream of the new Fraser River bridge planned for the site of the existing Massey Tunnel. In the Port of Boston, the busy Tobin bridge over the Mystic River is closed each time an LNG tanker transits underneath to and from the Distrigas LNG facility in Everett Massachusetts.\(^{180}\) Transits are coordinated with tides and, where possible, occur during non-peak traffic hours.\(^{181}\) Neither the province of BC nor the VFPA have yet acknowledged the need for similar security procedures at the new bridge if an LNG terminal is approved on the Fraser River.

**Recommendation 41.** Port Authorities should work with the provincial government to review bridge closure procedures in the Port of Boston and elsewhere in order to develop appropriate security procedures for any situations where LNG tankers will transit under major bridges. The impact of such security procedures on bridge traffic should be evaluated before planning for bridge construction or assessment of the proposed LNG terminal proceed further.

If a Fraser River LNG terminal goes ahead, will the Port Authority and the Province coordinate security closures of the new ten lane Fraser River Bridge when LNG tankers transit the river, as do the Port of Boston and the Massachusetts State Police when LNG tankers transit the Mystic River?

**Vancouver Fraser Port Authority jurisdiction over Fraser River LNG**

The proposed Wespac LNG terminal would lie within the navigational jurisdiction of the Vancouver Fraser Port Authority (VFPA). However, shore-based components of the terminal would be on private land, not federal land under Port Authority jurisdiction.\(^{182}\) Water-based components would sit upon the provincial bed of the river. The result is a complex situation with overlapping jurisdiction between the Port Authority, Transport Canada and the BCOGC, with the BCEAO acting as lead/coordinating agency on environmental and navigational risk assessment.

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\(^{180}\) Tobin Bridge closure procedure confirmed through telephone conversation with Massachusetts State Police Marine Division December 2016.

\(^{181}\) Further details on security procedures for LNG tanker transits in the Port of Boston found in “U.S. Coast Guard: Countering Maritime Security Risk LNG shipments: an example of the Coast Guard layered security approach”, Edward Lundquist, *Defence Media Network* January 2012.

\(^{182}\) The Vancouver Fraser Port Authority held the head lease to the offshore portion of the Project site but allowed it to expire at the end of 2014.
The Port’s role in regulating LNG tankers on waters under its jurisdiction

VFPA has jurisdictional authority over aspects of this project relating to navigation, including project berth and approach dredging – if and where it interferes with river traffic or the port maintained navigation channel; a marine security zone around the proposed terminal – if it interferes with navigation; any required special operating procedures for transiting LNG tankers that exceed the current beam width allowed on the river; and any impacts that passing LNG tankers may have on other river users or infrastructure.

LNG tankers travelling to and from the proposed Fraser River LNG terminal would be transiting waters under VFPA jurisdiction and so would have to comply with procedures and processes detailed in the Port Information Guide. The current version of the Port Information Guide\textsuperscript{183} does not explicitly address procedures for the movement of LNG tankers in Port waters, and only generally addresses the movement of vessels on the South Arm of the Fraser River.

The VFPA has indicated that Temporary Special Operating Procedures would need to be developed to address the movement of LNG tankers that exceed the current beam width restriction on the Fraser River of 32.25 metres. These procedures would involve a special, case by case authorization for each vessel transit to and from the proposed facility, maintaining one way traffic in the South Arm navigation channel during those transits, and would include requirements regarding pilotage, use of tethered tugs, maximum speed and draft, operational restrictions based on wind speed, and over taking restrictions. VFPA has indicated other requirements (e.g. vessel spacing and interactions with fishing vessels and tug-barge combinations) may also apply.\textsuperscript{184}

According to the Port Information Guide, VFPA currently requires 24 hours pre-notification of arrival, departure and movement within the port of tankers carrying liquid cargos in bulk, including LNG. Tankers planning to transit through Port waters also require a Marine Operating Permit issued by VFPA.

The Port Information Guide currently contains no procedures for the operation of LNG barges or the bunkering of LNG fuelled vessels in waters under VFPA jurisdiction, such as at anchorages in English Bay.

The Port Information Guide notes that VFPA port authority patrol vessels are made available to clear traffic and provide oil tanker escort services through First and Second Narrows during transit windows “whenever possible,” suggesting this practice is not a

\textsuperscript{183} Vancouver Fraser Port Authority Port Information Guide August 2016. The Port Information Guide is updated regularly.

\textsuperscript{184} Detailed in VFPA Access to Information Response 52100-20-004-2016. See page 288 and letter at page 364. Fraser River Pilots (at pages 270, 278) suggest that a temporary special operating procedure requirement for LNG tankers on the Fraser River would make the project untenable. Note that the Access to Information response is only complete to mid 2016 and the situation has likely developed further since then; a January 2017 article in the Vancouver Sun reports the Fraser River Pilots stating that the LNG tankers transiting the Fraser River will have two pilots on board and “up to” three tethered escort tugs. (As a comparison, the Port of Saint John Port Information Guide (at 4.3.2) requires three tethered tugs for LNG tankers accessing the Canaport LNG terminal, found in relatively open waters compared to the site of the proposed Wespac LNG Terminal in the Fraser River. The Port of Boston reportedly requires four tethered tugs for LNG tankers transiting to the Distrigas LNG Terminal, according to this July 2010 article from Boston Magazine.)
normal operating procedure.\textsuperscript{185} VFPA has not indicated if it will provide escort service to LNG tankers on the Fraser River. In response to a question on this matter VFPA responds

> It is likely that an LNG vessel proceeding to Wespac terminal would have an escort tug and as such it may not be required for our patrol vessels to also attend. However, if there are particular parts of the transit, or particular times of the day or year that the Fraser River Pilots feel a port authority vessel would be beneficial to safety, it is something we may consider implementing. We would defer to the expertise of the Fraser River Pilots in determining the potential needs for a patrol vessel escort in addition to tugs.\textsuperscript{186}

VFPA has indicated that it does not support the implementation of Moving Exclusion Zones around LNG tankers on the Fraser River, stating that they could be disruptive to the Collision Regulations. However, VFPA indicates that it is something that it "could consider."\textsuperscript{187}

In comparison, US federal regulation authorizes a moving exclusion zone of 3.2 km ahead, 1.6 km astern, and 0.5 km abeam of LNG tankers operating in the Port of Boston. Except for LNG tankers and their support vessels, no entry is allowed into these zones without authorization of the Coast Guard COTP.\textsuperscript{188}

There is no doubt that the Fraser River Pilots are highly qualified and experienced in safely managing marine traffic on the Fraser River. However, the federal government, and its representative the VFPA, should retain responsibility for assessing security risks and determining proper security procedures regarding the escort of LNG tankers near population centres and critical infrastructure.

**Recommendation 4.** (repeated) Transport Canada should develop a national standard for moving security exclusion zones as a normal operating procedure around LNG tankers transiting within hazard planning distances of populated areas and critical infrastructure.

\textsuperscript{186} Email communication with VFPA December 2016.
\textsuperscript{187} Ibid.
\textsuperscript{188} Safety and security zones for LNG tankers operating in the Port of Boston are described in the US Code of Federal Regulations, Part 165, Regulated Navigation Areas and Limited Access Areas, First Coast Guard District. Safety and Security Zone: Liquefied Natural Gas Carrier Transits and Anchorage Operations, Boston, Massachusetts.
Recommendation 6. (repeated) Port Authorities should work with Transport Canada and the Canadian Coast Guard to establish protocols for enforcing moving security exclusion zones around LNG tankers, including security sweeps, patrol boat escort and processes for interdicting craft that violate the security exclusion zone. Port Authorities should be required to ensure that enforcement protocols are properly resourced.

The Port’s role in regulating an LNG facility on the Fraser River

The proposed Wespac Tilbury LNG terminal would not be located on federal port lands under VFPA jurisdiction. VFPA is neither the landlord nor a permitting agency for this project.

Nonetheless, VFPA states that any marine operations taking place at the proposed facility would be subject to the Port’s authority to ensure that all marine operations within their navigational jurisdiction are carried out safely. These operations include berthing, bunkering and cargo transfer – the loading of LNG.189 As noted earlier, VFPA has authorizing powers with regard to project dredging, in so far as it interferes with navigation, or interfaces with the VFPA maintained navigation channel in the Fraser River. The proponent will have an obligation to ensure a dredged berth pocket and approach channel do not impact on the port maintained navigation channel, and that dredging itself does not impact on navigation or the environment.190

The Port Information Guide does not specifically address the operation of LNG facilities, with the exception of section 13.3, which states that all facilities within Port jurisdiction that are engaged in the bulk transfer of liquids, including liquefied gases, must follow the appropriate ship/shore checklist for that process.191

VFPA indicates that as LNG would be a new commodity for the Port, section 13.3 of the Port Information Guide may be further developed, for example by incorporating SIGTTO standards for relevant procedures and practices.192

The VFPA Port Information Guide does not present procedures for the bunkering of LNG-fuelled vessels at berth. As noted earlier, Canada does not have a national regulatory regime for bunkering LNG-fuelled vessels, nor is there a CSA Standard in place for this procedure.

Recommendation 42. Port Authorities should not allow bunkering of LNG-fuelled vessels until Transport Canada has responded to the recommendations

189 Op. cit., email communication with VFPA.
191 International Safety Guide for Oil Tankers and Terminals Ship/Shore Check-List, Appendix B (Part D) of the Port Information Guide August 2016 edition. In an email exchange from December 2016 VFPA states “The transfer of cargo, in many circumstances, is already adequately regulated by international and national standards. A port authority will generally only add additional requirements that represent localized practices and procedures that must also be followed in addition to the existing standards.” Clearly, Port Authority requirements under the Port Information Guide for the transfer of LNG should be coordinated with requirements put forward in any facility permit issued by the BCOGC.
192 Email exchange with VFPA December 2016.
of the West Coast Marine LNG Joint Industry Project Standing Committee and has developed a national regulatory regime for this procedure.

As detailed in the Port Information Guide, VFPA has an extensive set of practices to manage security on federal Port lands under its jurisdiction. These include a gate access system, video surveillance, ground patrols, perimeter security and intrusion detection and a system for incident reporting.

However, because the proposed Wespac LNG facility would not be a tenant on federal Port land, it seems unlikely it would receive these benefits of tenancy. Further, given that the Wespac facility would not be on federal port lands under VFPA jurisdiction, there does not appear to be a requirement for the project security officer to liaise with the port security officer.

**Recommendation 16.** (repeated) The MTSR should require that marine LNG facilities which are within port authority navigational jurisdiction but are not tenants on port controlled federal lands liaise with the port authority security committee. Port security committees should be required to consider security vulnerabilities associated with LNG facilities located on private land within their navigational jurisdiction when developing their port security plan. Facility security procedures should be fully integrated with port wide security procedures.

**The Port should play a lead role in managing LNG security risks**

VFPA would have a central role in ensuring security along the marine approaches to the proposed LNG terminal — especially because the proponent denies any responsibility for the product once it is loaded onto LNG tankers. If security of transiting LNG tankers is not the responsibility of project proponents, then it is clearly the responsibility of the federal government and its representative VFPA.

VFPA must reconsider its opposition to moving security exclusion zones around LNG tankers. VFPA must work with local governments, the province and the federal government to ensure that adequate capability is in place to enforce marine exclusion zones around LNG facilities and LNG tankers transiting near population centres and critical infrastructure.

VFPA must ensure that the risks and consequences of a deliberate attack on an LNG facility or an LNG tanker within its navigational jurisdiction are thoroughly assessed and prepared for, and that response plans are adequately resourced. Protecting public safety is a clear responsibility of the federal government and its representative VFPA.

VFPA must work with regional and provincial governments to ensure that adequate resources are available to respond to worst case scenario incidents involving the loss of containment of LNG from a tanker followed by a pool fire or ignition of an LNG vapour cloud.

VFPA must ensure that facility security plans are thoroughly integrated with Port security plans. Overlapping authority between VFPA and the BCOGC must be identified and conflicts must be resolved.

Finally, VFPA must ensure that no bunkering of LNG fuelled vessels takes place within its jurisdiction until a national regulatory regime for LNG bunkering is put in place.
The BCOGC “hybrid” permitting process for this project

According to the proponent, the Wespac LNG project will enter the BCOGC permitting process if and when the project receives an environmental assessment certificate.\(^\text{193}\)

The BC Oil and Gas Commission indicates that if an application is received from Wespac it will be processed under the Pipeline Regulation with additional requirements from Sections 4, 8 and 15 of the LNGFR.\(^\text{194}\) This “hybrid” permitting process would be applied because Wespac proposes to build a berthing facility and LNG transfer infrastructure (a “pipeline”) that would be connected to the existing Fortis BC Tilbury Island liquefaction facility.

In any case, as with other LNG facility applications Wespac will be required to complete design and safety studies and a hazard identification study as part of determining siting for the facility and submit those to the BCOGC early in the application process. Wespac must also submit a plot plan showing a marine control zone and marine security provisions. Wespac will also be required to submit Emergency Response and Security Management Plans prior to commissioning the facility.

Given that Wespac has been working with Fortis since 2013 to secure contracts for LNG exports from Fortis’s Tilbury Island liquefaction facility, it would be reasonable to conclude that they have already conducted studies to determine that the site adjacent to the Fortis facility is a safe location for an LNG terminal. If Wespac has conducted these studies, it should make them public.

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Wespac has been working with Fortis since 2013 to secure contracts for LNG exports, so it’s reasonable to conclude that they have already conducted their own studies which show the Fraser River site is a safe location for an LNG terminal. If so, they should make those studies public.

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The BC Pipeline Regulation – application to the Wespac project

The Pipeline Regulation does not include LNG tankers and marine approach routes in hazard identification and risk assessment requirements because those vessels and marine routes are not considered facility assets. As with the LNGFR, the permitting process under the Pipeline Regulation fails to address site selection and marine route hazard concerns raised in this report. In addition, the Pipeline Regulation does not

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\(^{193}\) Telephone conversation with proponent and consultants October 18 2016.

\(^{194}\) Email exchange with BCOGC staff November 2016. Specific sections of the LNGFR that would be applied to the Wespac Tilbury proposal include Section 4 – Engineering design and LNG facility siting, Section 8 – Safety and loss management, and Section 15 – Noise and light control. These would trigger requirements under earlier sections of the LNGFR as well (such as 2.1.4 and 2.1.7). See Part Three of this paper for a full review of the LNGFR and related CSA standards. As shown in this screen clipping of the BCOGC Major Projects web page, as of February 2017 the Wespac project is described as a facility. The Pipeline Regulation falls under the Oil and Gas Activities Act.
include any specific requirements that applicants consider the risk of deliberate attack when assessing hazards.

Under 3 (1) the Pipeline Regulation stipulates that a pipeline permit holder may only design, construct and operate a pipeline in accordance with the standards laid out in CAN/CSA Standard Z662.195

CSA-Z662 incorporates design requirements for pipelines based on nearby population density and land use, but does not incorporate any requirements or criteria for the overall siting or routing of pipelines. CSA-Z662 references CSA-Z246.1 on requirements for the implementation of a security management system as part of safety and loss management programs generally. CSA-Z662 also presents requirements for pipeline patrolling to identify unauthorized activities.

Under Section 7(1) the Pipeline Regulation requires that proponents develop and implement a Damage Prevention Program. The BCOGC Oil And Gas Activity Application Manual196 suggests proponents follow guidelines developed by the BC Common Ground Alliance to develop a Damage Prevention Program.197 The guidelines are intended to protect buried pipelines from “external/third party threats to the integrity of the infrastructure”198 and include general recommendations for surveillance and monitoring. The guidelines appear to be primarily oriented to increasing public awareness about buried infrastructure to avoid accidental damage (e.g. “call before you dig”), rather than damage resulting from deliberate and intentional acts like terrorism.

Neither the Pipeline Regulation nor the Pipeline Tab in the Oil and Gas Activity Permit Application Manual make any references to security.

Pipeline applications – notification and consultation requirements
Under the Oil and Gas Activities Act a pipeline applicant must carry out consultation and notification requirements before submitting their application. These requirements are detailed in the Consultation and Notifications Regulation (CNR). The CNR states that for pipeline projects the consultation and notification distance is the larger of 200m or the distance determined in accordance with Schedule C of the Emergency Management Regulation. Schedule C calculates hazard planning distance based on maximum potential incidental release of H₂S from a pipeline and would not apply to the Wespac proposal as H₂S is entirely stripped from the natural gas product prior to liquefaction at the Fortis BC Tilbury Island facility. A 200m consultation and notification distance for the Wespac project would be inadequate given the hazard planning distances for LNG tankers identified by Sandia National Laboratories.

In contrast, the CNR states that the consultation and notification distance for LNG facilities is 3300 metres where H₂S concerns are not present.

Recommendation 43. The BCOGC should commit that any LNG project permitted under the Pipeline Regulation will be required to meet the 3300 metre

196 Oil and Gas Activity Application Manual Version 1.5 November 2016.
197 Recommended Practice For Damage Prevention Programs. BC Common Ground Alliance, March 2011 Final.
198 Ibid., pg. 5.
consultation and notification distance requirements established for LNG facilities in the Consultation and Notification Regulation, rather than the 200 metre pipeline consultation and notification distances found in the Consultation and Notification Regulation.

Emergency planning zone and notification requirements for Wespac

Pipelines must also meet design and operational requirements under the Emergency Management Regulation (EMR). Under Section 7 of the EMR, pipeline proponents must submit an Emergency Response Plan prior to commissioning a pipeline. The Emergency Response Plan must include a map which identifies the Emergency Planning Zone (EPZ) surrounding the pipeline, based on hazard planning distances.

Section 3(1) the EMR requires that, prior to submitting the Emergency Response Plan to the BCOGC, a pipeline proponent must share information on hazard risks with local authorities, First Nations, municipal governments, the Ministry of Transport, and any rights holders or occupiers of land within the EPZ distance. The proponent must also request that these parties describe how they may be impacted by an emergency, and the proponent must factor those responses into development of the Emergency Response Plan.

According to section 3.2.1 of the Emergency Management Manual, hazard planning distance (and hence the EPZ) is determined according to a schedule in the regulation based on the H₂S content of the product in the pipeline, or

For hazards other than hydrogen sulphide, the permit holder must calculate the hazard planning distance by taking into consideration the types of hazards and risks arising from the oil and gas activity that is the subject of the plan.

Given the absence of H₂S concerns in the case of the proposed Fraser River LNG terminal, it is clearly the “other than hydrogen sulphide” calculation that Wespac will need to perform in determining hazard planning distances and the emergency planning zone for the proposed Fraser River project. However, both the EMR and the Emergency Management Manual are silent on how hazard planning distances are calculated.

In direct communication, the BCOGC indicates that hazard planning distance is derived from the results of the Hazard Identification Study and Process Hazard Analysis required under 4 (1) (b) of the LNGFR (and likely to be required for the Wespac proposal). The BCOGC also indicates that Wespac will likely be required to submit a Plot Plan under 2.1.4 of the Manual. The Plot Plan must identify key LNG facilities and their hazard planning zones, marine control zones for vessels during loading, and any marine security provisions at the facility.

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199 Emergency Management Regulation, also under the Oil and Gas Activities Act. Note that under Application 2 (d), the EMR does NOT apply to construction, operation or maintenance of an LNG facility. Presumably however the EMR does apply in the case of the Wespac facility, given it is being permitted under the Pipeline Regulation.


201 Ibid., pgs. 23-24.

202 Email communication with BCOGC Landowner Liaison, November 2016.
Recommendation 33. (repeated) BCOGC should clarify processes for calculating hazard planning distance and emergency planning zones for LNG facilities – including facilities permitted under the Pipeline Regulation. Marine hazard planning distances should be transparently developed to a justifiable standard and should give explicit consideration to conclusions identified in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*. Hazard planning distances for individual projects should be plainly described so the public can clearly understand how risks from proposed LNG facilities are assessed, and which persons and entities are entitled to emergency planning zone notification and consultation. Non-H$_2$S risk notification requirements should be clarified. When calculating hazard planning distances and emergency planning zones, applicants should be required to consider hazards associated with berthed LNG tankers, hazards associated with LNG tankers transiting marine approaches to LNG facilities, and hazards associated with deliberate attack.

Recommendation 34. (repeated) The notification requirements under the Emergency Management Regulation should be used as the basis of a more robust BCOGC public consultation process for all LNG terminal proposals, not just those permitted under the Pipeline Regulation. The BCOGC should require that proponents provide municipalities, First Nations, persons and entities within emergency planning zones of LNG proposals with clear assessments, in plain language, of the potential risks to public safety, the environment, nearby business and properties from deliberate or accidental incidents leading to loss of containment of LNG and fire at their proposed facility or on LNG tankers at berth or in transit along marine approaches to the facility. These summaries should be posted online for review by the general public. Proponents should be required to seek feedback from municipalities, First Nations, persons and entities within emergency planning zones regarding the impact of these consequences. This feedback should be transparently considered in the development of project proposals and Emergency Management Plans, and proponents should be required to show that project consequences have been reduced where ever possible.

The BCOGC permitting process for the Wespac proposal does not address key issues

BCOGC permitting processes for LNG facilities under the Pipeline Regulation do not address the core siting or security issues raised in this report.

As with the LNGFR, LNG facilities permitted under the Pipeline Regulation are not required to assess hazards and risks associated with LNG tankers or the movement of those tankers along marine approaches near terminals.

As with the LNGFR, the Pipeline Regulation does not incorporate a site pre-screening procedure in the application process. The Pipeline Regulation does not require proponents consider risk of deliberate attack when considering siting for pipelines, or in this case LNG facilities permitted under the regulation.

BCOGC public engagement processes around LNG facility permitting should also be made more transparent. The BCOGC should clarify notification and consultation distances required for LNG proponents applying for permitting under the Pipeline Regulation. The BCOGC should also clarify Emergency Planning Zone notification and
consultation distances for LNG facilities that are permitted under the Pipeline Regulations. These distances should be transparent and justifiable and based on sound recommendations, such as those incorporated in Sandia National Laboratory analyses.

**Summary: Is the Fraser River a good location for an LNG terminal?**

**All Evidence Argues “NO”**
Perhaps more than any other LNG export proposal in BC, Wespac’s plan for an LNG terminal on the Fraser River calls out for a formal site pre-screening process.

Wespac has not given any indication it has assessed the risk of deliberate attack on its proposed facility or LNG tankers. Wespac gives no indication it has considered the consequences of deliberate or accidental incidents leading to outcomes involving significant loss of containment of LNG on an vessel, berthed or in transit, followed by pool fire or ignition of a drifting LNG vapour plume. Wespac has explicitly denied responsibility for LNG tankers once they leave its terminal.

Based on available evidence it appears that Wespac has chosen a location on the Fraser River for its proposed LNG terminal because it is conveniently located next to the existing Fortis Natural Gas Liquefaction facility, not because it is an ideal, or even suitable, location for an LNG terminal from a risk or public safety perspective.

The proposal for an LNG terminal on the Fraser River triggers approval processes involving the Vancouver Fraser Port Authority, Transport Canada and the BC Oil and Gas Commission. However, none of these agencies appear to be tasked with answering two fundamental questions:

- Is the Fraser River a safe place to build an LNG terminal?
- Is the Fraser River a suitable waterway for the movement of LNG tankers?

Overlaying US Waterway Suitability Assessment hazard planning zones to the proposed terminal location and marine approaches to the site show that populations and critical infrastructure would be put at risk by this project. Further, the proposed terminal location on the narrow, winding and heavily trafficked Fraser River clearly does not meet siting guidelines developed by SIGTTO, the industry association. Even voluntary TERMPOL guidelines argue against this location.

In short, the answer to both questions above is clearly “No.” This project should not go forward in this location.

However, as no one agency has authority to answer these questions, project permitting processes take the proponent’s proposed terminal location as a given. As project momentum builds through NEB export licence approval and the (likely) issuing of an environmental assessment certificate, it is reasonable to be concerned that the key questions of site selection will be ignored and agencies with remaining project approval powers – such as the BCOGC – will attempt to mitigate risks associated with the project and its location through design requirements, when in fact the project should have been rejected outright in a preliminary site screening process.
The public is not well served by the permitting process in place for an LNG terminal on the Fraser River and the project should not proceed at this location.

Other concerns raised by this project proposal that are applicable more broadly are noted below.

**Problems with the proponent’s plan for bunkering LNG-fuelled vessels**
The proponent indicates an interest in bunkering LNG–fuelled vessels in domestic and possibly international waters (e.g. Puget Sound). It is not clear that a national certification regime is in place for LNG bunker barges. Further, Canada does not have a regulatory regime in place to govern LNG bunkering. LNG proponents should not be allowed to engage in bunkering until both these issues are resolved.

**Problems with security exclusion zones around facilities and LNG tankers**
Given the proposed location for the facility on the heavily trafficked Fraser River, plans for a marine security exclusion zone around the terminal may conflict with the rights of other river users and the Collision Regulations or the Navigation Protection Act. It is unclear which public agency – the Port Authority, Transport Canada or the BCOGC – has final authority to approve a marine security exclusion zone around the facility. Navigation rights of existing river users clearly have priority, and public safety should not be compromised by reducing the size of a marine security zone in order to eliminate conflict with river users and allow a poorly sited project to proceed.

Neither the proponent nor the Vancouver Fraser Port Authority have presented plans for establishing or enforcing moving exclusion zones around LNG tankers transiting near populated areas or critical infrastructure along transits to the proposed LNG terminal. The proponent has indicated security around LNG tankers is not its responsibility, and the Port Authority has indicated it is not in support of moving security zones – even though they are standard practice in the United States and Atlantic Canada.

VFPA is right to be concerned that moving exclusion zones around LNG tankers would create conflict in the narrow, winding and heavily trafficked Fraser River channel. The way to resolve this conflict is not to prohibit moving exclusion zones around LNG tankers, but rather to prohibit LNG tankers on the river.

**Problems with the proponent’s assessment of risks**
Wespac has not given any indication it has assessed the risk of deliberate attack on its proposed facility or LNG tankers. Wespac gives no indication it has considered the consequences of deliberate or accidental incidents leading to a worst-case scenario outcomes involving significant loss of containment of LNG on an tanker, berthed or in transit, leading to an escaping vapour plume and fire.
Other problems with security plans and procedures
The proponent intends to provide LNG bunkering services to vessels using bunker barges. The federal MTSR currently only apply to ships engaged in international voyages. Domestic marine trade in LNG should not be allowed until Transport Canada revises the MTSR to cover domestic marine traffic.

The proponent plans a facility on private land within Port Authority navigational jurisdiction. All LNG facility security plans should be fully integrated with Port Authority security plans in these circumstances.

Conflicts with nearby critical infrastructure
The proposed project would be built just upstream of an approved jet fuel terminal. LNG tankers transiting the Fraser River would pass within a few hundred metres of this terminal and would also pass below the approved new ten lane Fraser River bridge. Neither the proponent nor government appear to have assessed the consequences for either infrastructure if there were a nearby accidental or deliberate incident involving loss of containment of LNG from a tanker, followed by fire. Neither the proponent nor government appear to have assessed measures to mitigate risks from such an incident.

Gaps in the BCOGC approval process
BCOGC site assessment criteria are inadequate. They do not consider LNG tankers to be facility assets for the purposes of risk assessment, nor do they consider risks associated with the movement of LNG tankers on marine approaches to facilities. They do not require assessment of the risk of deliberate attack.

The BCOGC should ensure that LNG facility projects permitted under the Pipeline Regulation provide notification requirements for facilities (3300 metres) rather than pipelines (200 meters).

The BCOGC permitting requirements for public notification about project risks are vague on how proponents should estimate hazard planning distances for the purposes of emergency planning notification.

Municipalities, First Nations, persons and entities located within hazard planning zones for LNG facilities and LNG tanker transit routes require notification of the likelihood and consequences of deliberate or accidental incidents involving LNG facilities and LNG tankers. They deserve a meaningful role in deciding if those risks are acceptable. The BCOGC permitting process should be revised to resolve this shortcoming.
Part Six: Conclusions

It is time for our federal and provincial governments to take the risks that LNG export proposals pose for our communities and our coast seriously. Neither Canada nor BC have established a process for properly assessing the security and safety risks associated with proposed sites for LNG facilities and waterways that would be transited by LNG tankers.

This failure to act in the public interest is unacceptable. The movement and handling of LNG pose clear risks to the public and critical infrastructure, and the effort to establish an LNG export industry in British Columbia should be put on hold until a transparent and well justified process for screening the security and safety risks posed by LNG proposals is established.

Practices already in place in the United States provide a model for improving LNG export regulations in Canada. The first step must involve acknowledging both the real risk of deliberate attack on LNG facilities and tankers and the consequences such an attack would bring to our communities and critical infrastructure.

Canada must establish a credible pre-screening process for marine LNG facility proposals and a waterway suitability assessment process for the movement of LNG tankers that reflects best practices and industry association guidelines. Proposals must pass through this pre-screening before they enter costly and time consuming federal and provincial permitting and approval processes.

Proposals that pass pre-screening should be required to participate in a mandatory and binding federal TERMPOL review process that incorporates explicit consideration of marine security risks.

Existing federal security regulations must be revised to consider risks to LNG tankers and risks along marine approaches to facilities. Our governments must be prepared to protect our communities and critical infrastructure from the consequences of an attack on LNG exports by establishing and enforcing exclusion zones around LNG facilities and moving LNG tankers as part of normal operating procedure.

Provincial permitting processes, led by the BCOGC, must explicitly acknowledge the risk of deliberate attack and include LNG tankers and marine approaches to facilities in hazard identification and emergency planning processes. Conflicts and gaps between provincial and federal authority to regulate LNG exports (such as authority to establish marine security exclusion zones around facilities) must be identified and resolved.

Canada and British Columbia must also develop a preparedness and response regime for incidents involving LNG, and the industry must develop and fully resource a dedicated response organization. Regulations for bunkering LNG-fuelled vessels and certification processes for LNG bunker barges must be established before bunkering takes place.
Part Seven: Appendix – collected recommendations

Recommendations are organized by theme in the Appendix but are numbered as they appear in the text.

Develop an LNG Terminal Site Pre-screening Process In Canada

**Recommendation 1.** Transport Canada should develop a pre-screening process for LNG terminal applications in Canada, modeled on the US Waterway Suitability Assessment Process. The process should be compulsory for all projects, should focus on security and public safety, and should cover both terminal sites and marine approaches to terminals. Transport Canada should have final authority to approve or deny waterway and site suitability for LNG tanker traffic and berthing based on the results of this pre-screening. This pre-screening process should take place *before* a project enters lengthy environmental assessment, TERMPOL review and BC Oil and Gas Commission permitting processes.

The pre-screening process should consider the feasibility of establishing static marine security exclusion zones around proposed LNG facilities and moving marine security exclusion zones around LNG tankers transiting approaches to those facilities. Where marine security exclusion zones are not feasible (e.g. because of unavoidable conflict with the Collision Regulations or the imposition of serious restrictions on other users of the marine environment) projects should be rejected.

Findings from successful pre-screenings should be used to inform environmental assessment, TERMPOL review and BC OGC permitting processes.

Incorporate Industry Siting Guidelines into Pre-screening, TERMPOL Processes

**Recommendation 2.** Transport Canada should review and incorporate SIGTTO site selection and design guidelines into a federal LNG terminal pre-screening process and into a revised, mandatory TERMPOL process (see recommendation 3 below). Port Authorities located in BC and the BC Oil and Gas Commission should show that they have reviewed and incorporated SIGTTO site selection and jetty design guidelines into their own review processes for project proposals which pass the pre-screening process.

Make TERMPOL Mandatory, Include Security Risk Assessment and Gap Analysis

**Recommendation 3.** Transport Canada should standardize the TERMPOL review process and make it mandatory for all LNG terminal proposals. Recommendations produced through these reviews should be binding. Review committees should incorporate expertise from the BC Oil and Gas Commission and industry associations such as SIGTTO. There should be a clearly established time frame for entry into and completion of the review process so that siting, design, security and operational recommendations can be considered in the environmental assessment process and BC Oil and Gas Commission approvals.
A strengthened TERMPOL review process should complement, not replace, a mandatory site pre-screening process used to expediently rule out inappropriate locations for LNG terminals.

Transport Canada should ensure that the revised TERMPOL review process gives explicit consideration to the risks and consequences of deliberate attacks and results in recommendations for measures to mitigate security risks. Security risk analysis should address marine approaches to terminals as well as terminal locations themselves. The TERMPOL review process should incorporate hazard planning distances identified in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*.

**Recommendation 40.** As part of a mandatory TERMPOL assessment, proponents should be required to complete a formal gap analysis of regional preparedness and response capabilities for a deliberate attack resulting in loss of containment of LNG and fire from an LNG tanker, whether berthed at a proposed facility or in transit on marine approaches to or from the facility.

**Develop Regulations for Moving Security Exclusion Zones Around LNG Tankers**

**Recommendation 4.** Transport Canada should develop a national standard for moving security exclusion zones as a normal operating procedure around LNG tankers transiting within hazard planning distances of populated areas and critical infrastructure.

**Recommendation 5.** Transport Canada should revise the MTSR to require that Port Authorities establish moving security exclusion zones around LNG tankers transiting through their jurisdiction.

**Recommendation 6.** Port Authorities should work with Transport Canada and the Canadian Coast Guard to establish protocols for enforcing moving security exclusion zones around LNG tankers, including security sweeps, patrol boat escort and processes for interdicting craft that violate the security exclusion zone. Port Authorities should be required to ensure that enforcement protocols are properly resourced.

**Recommendation 7.** Transport Canada and the Canadian Coast Guard should develop clear protocols for and fully resource the maintenance of moving security exclusion zones around LNG tankers transiting to and from proposed LNG terminals that are not located within Port Authority jurisdiction.

**Develop Regulations for Marine Security Exclusion Zones Around LNG Facilities**

**Recommendation 8.** Transport Canada should develop a national standard for marine security exclusion zones as a normal operating procedure in navigable waters around marine LNG facilities. Exclusion distances incorporated in the standard should be referenced in LNG project pre-screening processes and TERMPOL reviews to ensure that projects proposed in locations where exclusion zones are unfeasible (e.g. because they create conflict with the Collision
Regulations or impose serious restrictions on other marine users) are rejected before entering lengthy review processes.

**Recommendation 9.** Transport Canada, BC’s Port authorities, and the BCOGC should work together to determine which agency has authority for establishing and overseeing operation of marine security exclusion zones at LNG terminals in BC. This determination should be completed for all possible scenarios, including where proposed terminals are i) on federal lands within port authority navigable waters jurisdiction, ii) on private lands within port authority jurisdiction, or iii) on any lands outside of port authority jurisdiction. Transport Canada should ensure that overlapping authority does not result in gaps in enforcement of security procedures.

**Recommendation 10.** Transport Canada should revise the MTSR to require that Port Authorities establish marine security exclusion zones as normal operating procedure around LNG facilities on federal lands under their jurisdiction, and that LNG facilities that are not within Port Authorities also establish marine security exclusion zones as normal operating procedure.

**Recommendation 11.** Transport Canada, BC’s Port Authorities and the BCOGC should develop clear protocols for enforcing marine security exclusion zones around facilities and should ensure those agencies charged with delivering enforcement protocols (e.g. joint Coast Guard RCMP Marine Security Enforcement Teams) are adequately resourced.

**Strengthen the Marine Transportation Security Regulations**

**Recommendation 12.** The MTSR only applies to vessels engaged in international voyages. Transport Canada should develop a regulatory regime to manage security risks associated with the bulk transport of LNG between marine facilities along Canada’s coasts.

**Recommendation 13.** The additional regulatory requirements for Certain Dangerous Cargoes that are included in the MTSR (e.g. a security sweep of unmonitored waters prior to vessel berthing) should be applied to LNG carried in bulk.

**Recommendation 14.** MTSR requirements for security vulnerability assessments at facilities should explicitly include marine approaches to facilities in addition to the areas immediately surrounding those facilities.

**Recommendation 15.** The MTSR should include a requirement that facility and port authority vulnerability assessments and security plans consider security risks associated with shore and ship based attacks on LNG tankers transiting along marine approaches to LNG facilities.

**Recommendation 16.** The MTSR should require that marine LNG facilities which are within port authority navigational jurisdiction but are not tenants on port controlled federal lands liaise with the port authority security committee. Port security committees should be required to consider security vulnerabilities associated with LNG facilities located on private land within their navigational...
jurisdiction when developing their port security plan. Facility security procedures should be fully integrated with port wide security procedures.

**Recommendation 17.** Security clearance requirements contained in the MTSR that now apply only to container facilities at the Port of Prince Rupert and the Vancouver Fraser Port Authority should be applied to all LNG facilities proposed for the BC coast.

**Develop a Certification Regime for LNG Bunker Barges**

**Recommendation 18.** Transport Canada should ensure that the design, construction and operation of LNG bunker barges on the BC coast takes place under an LNG specific vessel certification program equivalent to that incorporated into the IGC code for self propelled LNG tankers. Transport Canada should ensure that an LNG barge certification program is in place before allowing shipment of LNG by barge on Canada’s coast.

**Develop a Regulatory Regime for Bunkering LNG-Fuelled Ships**

**Recommendation 19.** Transport Canada should move immediately to address the outstanding regulatory gaps in LNG bunkering identified by the West Coast Marine LNG Joint Industry Project Steering Committee. Specifically, Transport Canada should develop a Canadian regulatory regime to cover safety risks of operating LNG-fuelled ships in Canadian waterways and ports; a basis for assessing LNG bunkering facilities or processes in Canada; and common guidelines for port rules on LNG bunkering processes.

**Recommendation 20.** Transport Canada should commit to conducting risk assessments, or directing relevant Port Authorities to conduct risk assessments, for all projects involving LNG bunkering. Port Authorities should identify risk mitigation measures and incorporate these into their Port Information Guides.

**Recommendation 21.** The Canadian Standards Association (CSA) should be called upon to develop a national standard for procedures for bunkering LNG-fuelled ships in Canada.

**Recommendation 42.** Port Authorities should not allow bunkering of LNG-fuelled vessels until Transport Canada has responded to the recommendations of the West Coast Marine LNG Joint Industry Project Standing Committee and has developed a national regulatory regime for this procedure.

**Establish an LNG Incident Preparedness and Response Regime**

**Recommendation 22.** Transport Canada should immediately acknowledge the Phase 2 Hazardous and Noxious Substances (HNS) report by the Tanker Safety Panel and present a plan and timeline for implementing the panel’s 17 recommendations to protect the public from risks associated with incidents involving LNG and other HNS.

**Recommendation 23.** Canada should sign on to the OPRC-HNS protocol immediately.
**Recommendation 24.** Transport Canada should commission an updated HNS risk assessment for the BC coast that examines the risks posed by proposed LNG terminals. The risk assessment should explicitly consider the consequences of worst case scenario incidents involving significant loss of LNG containment and fire on an LNG tanker, whether in transit or at a terminal. The risk assessment should model the fate and behaviour of LNG vapour plumes on the physical environment and human populations at the project level, and should show explicit consideration of hazard planning distances contained in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water.*

**Recommendation 25.** Transport Canada should place a priority on completing an LNG incident preparedness and response regime for the entire BC coast, with coverage of all areas where LNG terminals are proposed, incorporating results of an updated HNS risk assessment. This regime should be developed and in place before any LNG terminal receives final approvals and begins operation.

**Require The LNG Industry Establish an Incident Response Organization**

**Recommendation 26.** Transport Canada should require the LNG industry establish a well equipped, dedicated incident response organization (similar to Western Canada Marine Response Corporation for oil tankers) with quick response capability to all proposed LNG terminals on the BC coast, and all waters that LNG tankers would transit. This organization should be funded by all the groups involved in exporting LNG, including gas suppliers (e.g. Fortis) and potential terminal operators (e.g. Woodfibre LNG), and all those groups should be party to the organization. The organization should be certified by Transport Canada. Regional response planning should be developed in consultation with local governments, First Nations, the province and Transport Canada (or Port Authorities where applicable). The response organization should be capable of addressing the serious consequences of significant loss of containment and fire on an LNG tanker, whether at berth or in transit.

**Encourage Development of an International LNG Incident Liability Convention**

**Recommendation 27.** Canada should urge other countries to ratify the 2010 HNS Convention to ensure that it is brought into force as soon as possible.

**Strengthen BCOGC Hazard and Risk Assessment**

**Recommendation 28.** The BCOGC should require proponents consider LNG tankers at berth facility assets for the purpose of hazard identification and risk assessment studies submitted to the commission.

**Recommendation 29.** For the purposes of hazard identification and risk assessment studies submitted to the commission, the BCOGC should require proponents give explicit consideration to hazards associated with the movement of LNG tankers on the marine approaches to proposed facilities where those marine approaches pass near to populated areas and critical infrastructure.
**Recommendation 30.** The BCOGC should require that hazard identification studies, risk assessment studies, damage prevention plans and safety and security management plans requested from proponents in the permitting process incorporate explicit consideration of the potential for deliberate attack on facilities (including berthed LNG tankers) and tankers transiting along marine approaches to and from facilities. When conducting these studies and developing these plans proponents should be required to model the consequences of worst case outcomes for attacks, including significant loss of containment of LNG, leading to an expanding vapour plume and fire.

**Increase Transparency of BCOGC Decision Making Processes**

**Recommendation 31.** To increase the transparency of BCOGC project risk assessment and permitting, the hazard identification, risk assessment and related studies required by the BCOGC under 2(g) 2(i) and 3(1)(i) of the LNGFR (and as described in 1.7, 2.14 and 2.1.7 of the LNG Facility Permit Application and Operations Manual) should be made available to the public when submitted. The BCOGC should direct proponents to structure these studies in such a way that information that may harm business interests can be compartmentalized and removed before public disclosure.

**Recommendation 32.** All exemptions to requirements under the LNGFR, and any associated conditions assigned as a result of those exemptions, should be made public by the BCOGC immediately. Persons and entities within hazard planning distances and emergency planning zones who may be impacted by these exemptions and conditions should be directly informed of their existence.

**Recommendation 33.** BCOGC should clarify processes for calculating hazard planning distance and emergency planning zones for LNG facilities – including facilities permitted under the Pipeline Regulation. Marine hazard planning distances should be transparently developed to a justifiable standard and should give explicit consideration to conclusions identified in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*. Hazard planning distances for individual projects should be plainly described so the public can clearly understand how risks from proposed LNG facilities are assessed, and which persons and entities are entitled to emergency planning zone notification and consultation. Non-H₂S risk notification requirements should be clarified. When calculating hazard planning distances and emergency planning zones, applicants should be required to consider hazards associated with berthed LNG tankers, hazards associated with LNG tankers transiting marine approaches to LNG facilities, and hazards associated with deliberate attack.

**Improve BCOGC Notification and Consultation Processes**

**Recommendation 34.** The notification requirements under the Emergency Management Regulation should be used as the basis of a more robust BCOGC public consultation process for all LNG terminal proposals, not just those permitted under the Pipeline Regulation. The BCOGC should require that proponents provide municipalities, First Nations, persons and entities within emergency planning zones of LNG proposals with clear assessments, in plain language, of the
potential risks to public safety, the environment, nearby business and properties from deliberate or accidental incidents leading to loss of containment of LNG and fire at their proposed facility or on LNG tankers at berth or in transit along marine approaches to the facility. These summaries should be posted online for review by the general public. Proponents should be required to seek feedback from municipalities, First Nations, persons and entities within emergency planning zones regarding the impact of these consequences. This feedback should be transparently considered in the development of project proposals and Emergency Management Plans, and proponents should be required to show that project consequences have been reduced where ever possible.

**Recommendation 43.** The BCOGC should commit that any LNG project permitted under the Pipeline Regulation will be required to meet the 3300 metre consultation and notification distance requirements established for LNG facilities in the Consultation and Notification Regulation, rather than the 200 metre pipeline consultation and notification distances found in the Consultation and Notification Regulation.

**Develop Additional CSA Standards to Guide LNG Facility Permitting**

**Recommendation 35.** CSA should be called on to develop specific guidance for marine LNG terminal site selection, incorporating consideration of the siting guidelines developed by SIGTTO.

**Recommendation 36.** CSA should be called on to develop guidance for security threat, vulnerability and response preparedness for marine LNG terminals. This guidance should explicitly consider LNG tankers to be facility assets when berthed at LNG terminals or in transit on marine approaches to terminals. This guidance should explicitly consider the risk of deliberate attack on LNG terminals (including LNG tankers), their consequences, and their prevention.

**Recommendation 37.** CSA should be called on to develop national standards for hazard planning distances around LNG terminals and LNG tankers, whether at berth or in transit. CSA should give consideration to the conclusions reached in the Sandia National Laboratory report *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water* in order to develop these standards.

**Recommendation 38.** The BC Government should explicitly incorporate CSA Z246.1 and Z246.2 as required standards in the LNGFR.

**Recommendation 39.** The BCOGC should explicitly incorporate the planning factors identified in Annex A of CSA Z246.2 into its hazard zone and emergency planning zone determinations.

**Establish Security Procedures for LNG Tanker Transits Under Major Bridges**

**Recommendation 41.** Port Authorities should work with the provincial government to review bridge closure procedures in the Port of Boston and elsewhere in order to develop appropriate security procedures for any situations where LNG tankers will transit under major bridges. The impact of such security
procedures on bridge traffic should be evaluated before planning for bridge construction or assessment of the proposed LNG terminal proceed further.

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