Safe Shipping

LNG CANADA

Opportunity for British Columbia. Energy for the world

About LNG Canada

LNG Canada is a joint venture company comprised of five global energy companies with substantial experience in liquefied natural gas (LNG) – Shell, PETRONAS, PetroChina, Mitsubishi Corporation and KOGAS.

The water depth along the shipping route is very deep - up to **400 metres in some places**

LNG carriers have a maximum draft of **12.5 metres**

An LNG carrier is roughly **the same length**

as an Alaskan-bound cruise ship

The marine route at its minimum width is more than **4X wider** than required for the safe passage of two large ships

LNG has one of the best shipping records of any industry

More than **500 LNG carriers** across the world have safely delivered over **100,000 cargoes**

Up to **350** LNG vessel arrivals

every year are expected at the LNG Canada terminal at full build-out

Artist rendering of a typical LNG carrier with tug escort navigating the Douglas Channel on its way to the LNG Canada terminal at the Port of Kitimat. As part of the marine risk mitigation measures, LNG Canada is committed to providing an escort tug for every LNG carrier transit along the marine route.

Shipping and marine safety

LNG shipping has one of the best safety records in the marine industry, with over 100,000 cargoes delivered without a single loss. More than 500 LNG Carriers are currently in operation around the world.

The safe transportation of LNG on British Columbia's waterways is a key concern of the local community, shared by LNG Canada, which is why we insist on operating within the strictest safety standards and industry best practices – on land and at sea.

A large part of the reason LNG boasts such an excellent safety record is because the ships are designed and built to only transport LNG, and to very high standards. This means that every safety measure in place specifically addresses the needs of LNG shipping.

All LNG carriers adhere to rigorous safety standards and requirements that have been established through more than 50 years of commercial LNG operations, and help ensure the protection of the world's waterways.

Did you know ?

1 **LNG carriers** seldom anchor. Unlike other types of commercial shipping, LNG carriers manage their speed at sea to adjust their port arrival time to berth directly upon arrival.

2 Realizing a need in northern B.C.'s spill response planning and preparedness, **LNG Canada**, **working with local stakeholders**, conducted **multiple surveys** of **sensitive marine coastal areas** in Douglas Channel to develop **Geographical Response Plans**. These plans have been given to Western Canada Marine Response Corporation for their use in **protecting these areas** from marine oil spill incidents.

3 LNG carriers expected at LNG Canada's terminal will typically have a **Cargo Capacity** between **135,000 m³ and 180,000 m³** or the equivalent volume of water held by 52 to 68 Olympic-sized swimming pools.

4 **Every LNG carrier** that arrives or leaves the port has been designed and built to **rigorous international standards** and independent classification rules, without exception. Ships are re-inspected on a regular schedule and given a full dry dock inspection every five years.

5 **All LNG carriers** have **double hulls and cryogenic cargo** containment systems. The LNG is transported in four or five cryogenic tanks specially-designed for LNG, maximizing the **ship's safety and integrity**.

6 Built-in cargo **safety monitoring** systems ensure **all faults are quickly detected** and managed. Gas and fire detectors and emergency shutdown systems are in place to quickly detect and respond to potential issues, should they start to develop.

7 **LNG carriers** have access to real time satellite weather routing information which enables them to manage their voyage to avoid the most severe weather.

8 **Advanced navigational systems** include radar, modern global positioning systems, and automatic ship identification systems fitted to ensure ship staff and BC Coast Pilots are **fully aware** of nearby **traffic** and navigational **hazards**.

Visit our **website** or **YouTube** page to watch a video about safe shipping: **youtube.com/lngcanada**

LNG Canada shipping route

Kitimat is an ideal location for an LNG marine terminal as it is an active industrial port which offers ice-free, sheltered deep water passage for ocean-going vessels.

After LNG carriers arrive from Asia, having crossed the Pacific, they make for Triple Island pilot station, approximately 40 kilometres due west of Prince Rupert and eventually reach the Port of Kitimat transitting through Principe, Otter, Squally and Douglas Channels.

- At a pre-arranged point west of Triple Island, two certified B.C. Coast Pilots with extensive knowledge of the local waterways will board each LNG carrier and provide local area navigational expertise. A powerful and purpose-built tugboat will meet the LNG carrier and provide an escort, staying close to the LNG carrier, all the way to and from the terminal.
- To ensure minimal effect on the marine environment, the HaiSea built and operated five Tug boats which are environment friendly and powered by electric-battery and LNG fuel to support LNG marine operations.

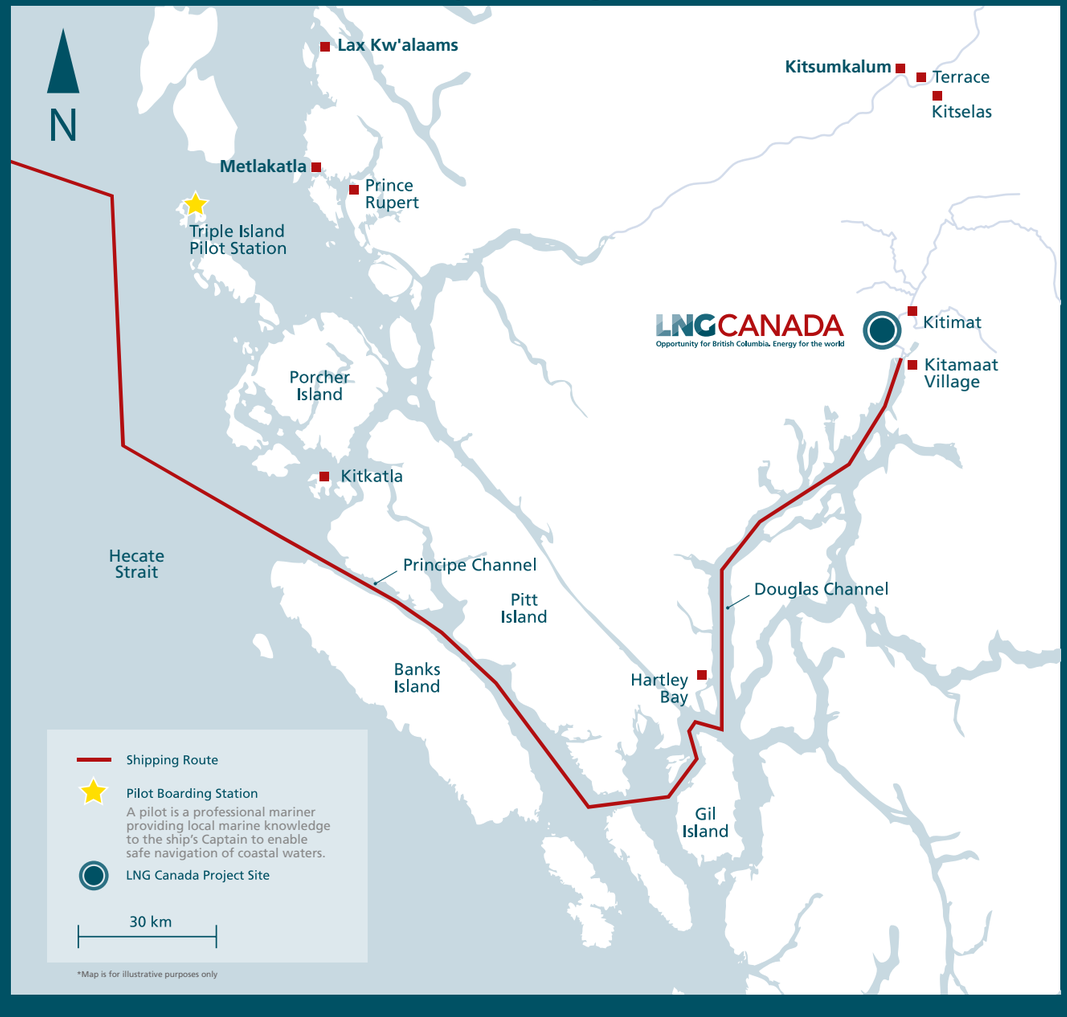
  Escort Tug - HaiSea Kermode, Escort Tug - HaiSea Warrior, Harbor Tug - HaiSea Wamis, Harbor Tug - HaiSea Weegit, Harbor Tug - HaiSea Brave
- Upon arrival in the Port of Kitimat, up to three harbour tugboats will meet each LNG carrier and assist the vessel for the remainder of the journey and onto the berth. To ensure minimal effect on the marine environment and surrounding coastline, the vessels will operate at slower speeds of between 8 and 14 knots subject to navigational safety. The vessels are to follow the **British Columbia North Coast Waterway Management Guidelines:** Notice Number 03/2022, established by Transport Canada.
- Just before entering the berth, the LNG carrier will be turned around 180 degrees by the harbour tugs, and assisted in stern first onto the jetty so that the carrier can unberth quickly and head out to sea if necessary.
- Up to 170 LNG vessel arrivals are expected at the LNG Canada terminal every year in the first phase of the project. At full project build-out (the completion of four LNG processing units, or 'trains'), up to 350 LNG vessel arrivals are expected at the port, or one ship arriving and one ship departing every day.

Artist rendering of an LNG carrier approaching the Port of Kitimat. Upon arrival at the port, up to three harbour tugboats will be used to manoeuver the ship safely onto a berth specifically designed to accommodate LNG carriers only.

Over the last 20 years, the **Port of Kitimat** has sheltered more than **4,300 deep-sea vessels**.
- District of Kitimat*

*Source: District of Kitimat, available at: http://www.kitimat.ca/EN/main/business/invest-in-kitimat/port-of-kitimat/export-economy.html

LNG Canada Shipping route (294 Km) as per **BC North Coast Waterway Management Guidelines**



What is TERMPOL?

TERMPOL stands for Technical Review Process of Marine Systems and Transshipment Sites. It is a voluntary technical review of a project's shipping route and marine terminal. The TERMPOL identifies navigational and marine transportation-related issues, and provides recommendations and findings to support a safe shipping environment.

LNG Canada conducted a number of surveys, engaged with First Nations and undertook a quantitative risk analysis to prepare our TERMPOL submission for Transport Canada. Transport Canada's TERMPOL Review Committee (TRC) reviewed the submission between March and August 2015. From this review the TRC produced a report completed in October 2015 that is publically available through Transport Canada's website: http://www.tc.gc.ca/eng/publications-marine-abstracts-598.html

LNG Canada is the **first LNG project in B.C.** to successfully complete a **TERMPOL review**

LNG Canada's TERMPOL looked at vessel characteristics, our shipping route, navigability and the marine terminal operations in Kitimat Harbour associated with vessel operations.

The Transport Canada led TRC made 28 recommendations and 29 findings in their review, which reinforce and reconfirm LNG Canada's commitment to safety related to the marine route, LNG carriers, marine terminal, tugboats and overall project marine activities. All recommendations will be addressed in due course between now through construction and start-up to the final decommissioning of the marine terminal.

For example, the TRC supports LNG Canada's continued engagement with communities along the shipping route from Triple Island Pilot Station to the marine terminal regarding general awareness of LNG, LNG carrier operations from the perspective of marine risks and their mitigations.

The TRC also found that LNG Canada's commitment to examine all LNG carriers before they arrive at the marine terminal is an industry best practice that will help achieve safety objectives that are over and above Transport Canada's regulatory requirements. And, LNG Canada's commitment to provide enhanced weather monitoring at the marine terminal will contribute to the safe passage of all domestic vessels in the local waters.

TERMPOL studies

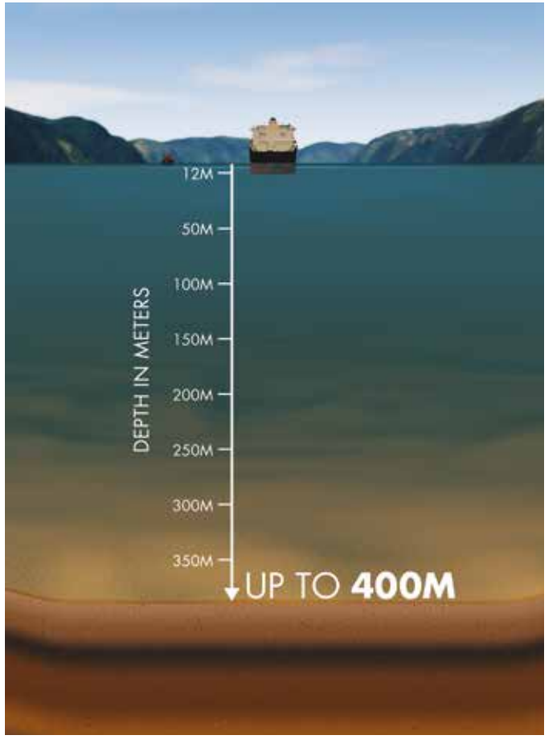
LNG Canada undertook a number of studies to help inform the TRC and their report.

For example, we studied our shipping route to understand potential risks and we also evaluated vessel wake and how it could affect shoreline harvesting, small craft safety, and shoreline erosion. We engaged First Nations directly and held marine workshops in 2014 and 2015 with local stakeholders to ensure we captured their local knowledge and issues.

Some of our findings included the following:

- The Douglas channel at its minimum width is more than four times wider than the minimum width required for the safe passage of two large ships.
- A typical LNG carrier for the LNG Canada project is roughly 300 metres long with a draught of less than 12.5 metres when fully loaded. At average depths of between 200 and 400 metres, the waters of the Douglas Channel and Port of Kitimat are ideal for accommodating deep sea shipping of this size.
- The average estimated speed of the LNG carriers visiting the LNG Canada marine terminal is 9.4 knots or about 17 kilometres an hour. LNG carriers, always under the advice of experienced B.C. coast pilots, will adjust their speed along the route for navigational safety taking into consideration weather conditions, other marine traffic, the presence of marine mammals and schedules.
- Even using very conservative numbers the maximum wake generated is within or less than the existing wake already experienced on the coast from cruise ships to tugboats to general cargo vessels and ferries.

Visit our **YouTube** page to watch a wake simulation video:
youtube.com/lngcanada

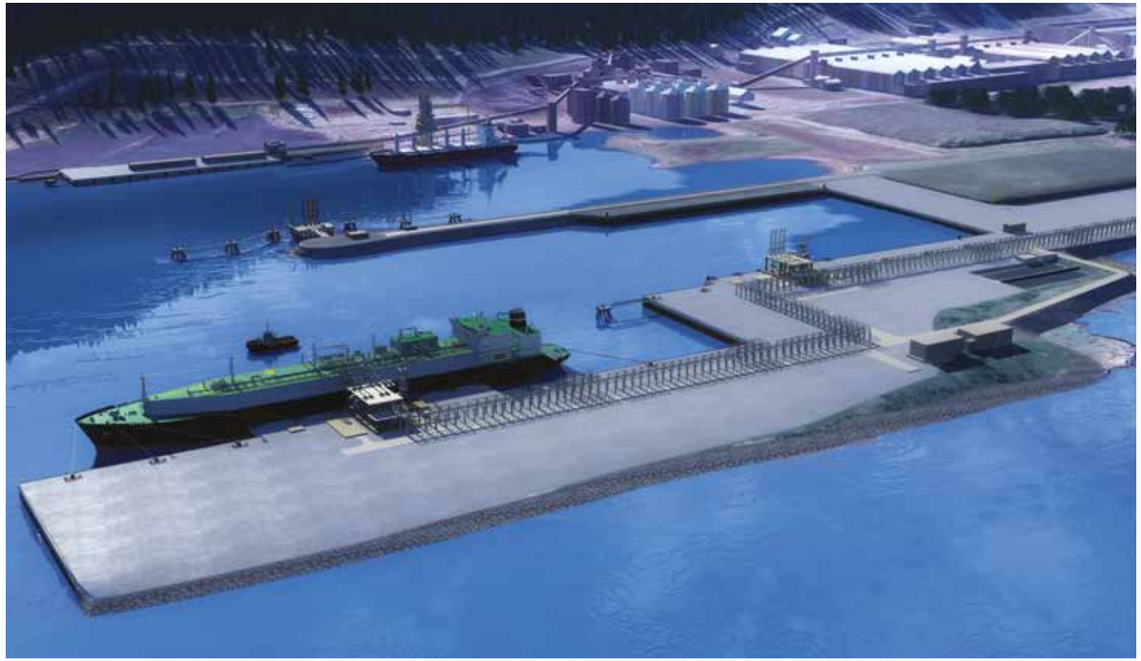


Artist rendering of the average 200 metre to 400 metre water depths of the Douglas Channel. These are ideal depths for the safe navigation of LNG carriers.

Planning for safety

Safety is part of our core values and a critical aspect in our ability to deliver energy responsibly. We have made a commitment to the community to protect our neighbours, employees and contractors, and we will consider their safety as our highest priority in every decision we make.

Over the past few years, we have spent time with local residents and stakeholders to better understand their marine risk concerns related to the project, and what we can do to address these concerns. We understand the importance the community places on navigational safety in British Columbia's coastal waters along the route to the Port of Kitimat. Specifically, the TERMPOL report address (among many other things) three of the most important issues identified by the public.



Artist rendering of the LNG Canada marine terminal.

Concerns we've heard from the public…	Significant prevention measures in place for each LNG carrier*
LNG carrier grounding or collision	• Two certified BC Coast Pilots on board provide expert coastal route knowledge • Captain and crew experienced in LNG carrier operations • Detailed passage planning from berth to berth • Multiple radars, GPS, AIS and electronic charts on board • Ship's hull is doubled and includes reinforced collision bulkheads • Operate at slower speeds (≈14 knots+) to provide more react time and lessens impact damage • Dedicated tug escort along coastal route and three powerful harbour tugs at terminal for berthing • Increased buoyage/navaids along coastal route • Canadian Coast Guard provides continuous traffic monitoring via MCTS Prince Rupert
LNG carrier traffic disrupting local marine activities	• Information on local waterway usage for ship's crews • Continuous listening watch on local VHF radio channels/frequencies used • On board BC Coast Pilots provide local waterway user knowledge and proactive communication • LNG carrier operators will follow the marine rules of the road • Maintain safe operating distances with other vessels • Operate at slower speeds (≈14 knots+) to provide more react time and reduced wake • Ship wake waves do not exceed currently experienced coastal activity range (<65cm) • Escort tug to provide immediate support and additional lookout • Navigational route is to follow the **British Columbia North Coast Waterway Management Guidelines** to minimize interaction with local marine users+
LNG carrier hitting a whale	• Navigating at slower speeds (≈8 to 10 knots) during active season to provide more react time and reduced noise+ • Marine mammal awareness information for ship's crews • On board BC Coast Pilots provide local marine mammal awareness • Continuous lookout for marine mammal activity while navigating • Information shared from local monitoring and observations • Incidents reported to Fisheries and Oceans Canada shared with ship's crews • Navigational routing chosen to minimize exposure+

+Note: Subject to navigational safety at all times.

*Note: the prevention measures listed in this table represent some of the measures identified in the TERMPOL report. For more comprehensive information please refer to Transport Canada's website: http://www.tc.gc.ca/eng/publications-marine-abstracts-598.html

The **LNG Canada shipping** route is

294km

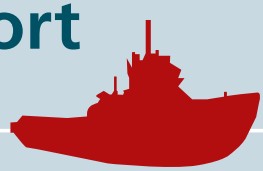
From the pilot station to the terminal in the **Port of Kitimat**

"Throughout the life of our project, we will continue to work with the community to preserve the ways people use and enjoy the waters we will share."

Capt. Atiq Ahmed , Marine Manager,
LNG Canada

Each LNG carrier will have an

escort tug



between Triple Island and Kitimat during all transits

Please contact us with questions, interests or to learn more.
Toll-free: 1.855.248.3631 | Email: info@lngcanada.ca | Website: lngcanada.ca
YouTube: youtube.com/lngcanada | Facebook: facebook.com/lngcanada

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