Boskalis

PROJECT SHEET

LNG CANADA
DREDGING AND DISPOSAL SERVICES

BOSKALIS

Boskalis is a leading global marine contractor and services provider. With safety as our core value, we offer a wide variety of specialist activities to the oil & gas and renewables sectors. These activities include marine installation and decommissioning, seabed intervention, marine transport and services, subsea services and marine survey. In addition, Boskalis is a global dredging contractor, provides towage and terminal services across the globe and delivers marine salvage solutions.
By understanding what drives our clients we are able to provide the solutions that enable them to meet their specific business goals. For this reason we are constantly looking for new ways to broaden and optimize our offering and are committed to expanding our proposition, supported by our financial strength. With our committed professionals in engineering, project management and operations, 500 specialized vessels and an unprecedented breadth of activities in 90 countries across six continents we help our clients push boundaries and create new horizons.

INTRODUCTION

The LNG Canada project is developed by a joint venture of Shell, Petronas, PetroChina, Korea Gas Corporation and Mitsubishi for the construction of an LNG (liquefied natural gas) export terminal. Boskalis was involved at an early stage in the project and provided value engineering through an early contractor involvement arrangement. An important aspect was the processing of the dredged material, some of which was contaminated. Due to environmental regulatory requirements, the project was executed in three seasons between September 2018 and March 2021. The selection of equipment and the development of the work method were specifically chosen to comply with the very stringent environmental and safety requirements.

LNG CANADA PROJECT

LNG Canada (LNGC) is the first large-scale LNG export terminal in Canada. The gas is extracted in the north of British Columbia and transported through a pipeline to the Port of Kitimat, approximately 1,500 kilometers north of Vancouver.
The Port of Kitimat is located at the end of a fjord and within the territories of the Haisla, descendants of the original inhabitants of Canada now known as First Nations. The Canadian government requires projects like LNGC to involve the First Nations as much as possible. LNGC has been very successful in involving the First Nations in this project.

FEATURES

Client	LNG Canada Development Inc., Shell
Location	Kitimat, British Columbia, Canada
Period	2018 - 2021
Long-term driver	Growth energy consumption

A Overview of project site
B Trailing suction hopper dredgers Beachway and Shoreway at work

LNG Canada Project comprised a total investment value of USD 42 billion and consisted of the following activities:

- Construction of a 670 km long onshore gas pipeline
- Relocation of the export facility of former site owner RioTinto
- Dredging of LNG berth area
- Dredging of new RioTinto berth area
- Construction of Module Offloading Facility, LNG loading facility and RioTinto export terminal
- Transport modules from Asia to Kitimat
- Construction of LNG Plant

BOSKALIS SCOPE OF WORK

Boskalis was awarded the dredging works with a total volume of 2,000,000 m³. To enable construction of the LNGC facility, some of the existing activities of the ore and aluminum company Rio Tinto first had to be moved to a new location in the port. Boskalis dredged and deepened the western and eastern sections of the port basin to allow for the relocation of Rio Tinto's activities to a new site on the west side and the construction of loading facilities for LNG carriers on the east side.

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CONTAMINATED SOIL

Extensive soil surveys in 2016 mapped out the presence of contamination in the different soil layers in the area to be dredged. The entire area was then split up into sections measuring 25 square meters and in soil layers of 25 centimeters. So, precision dredging was required, as well as an ongoing monitoring process with surveys, close supervision of progress and the associated planning adjustments. Contaminated material was classified in five categories, each with its own developed method for dredging and disposal. Three of the five types of contaminated mater)ial were disposed on site while two of the five types of contaminated material were transported off site for further treatment and disposal. The contaminated material was stored in the onshore disposal site which was lined with impermeable liner by Boskalis' specialized subsidiary Cofra and subsequently capped. Uncontaminated material had to be transported 3 km offshore and carefully discharged at 20 m below sea level into a designated disposal area.

JIGSAW PUZZLE

Not all parts of the Port were subject to the same permit regime, and so the soil model resembled a jigsaw puzzle. This meant that the project team had an enormous challenge: managing all the processes, ensuring accurate documentation for the soil flows, and execution in line with the different permit requirements. The grab dredger Alex II and backhoe dredger Cornelius first removed the contaminated soil, loading the hopper barges for onshore processing. In the next step, the cutter suction dredger Edax dredged the clean soil, which was transferred to the specially adapted trailing suction hopper dredgers Beachway and Shoreway. Those two vessels discharged the material three kilometers offshore.

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ENVIRONMENTAL REGULATIONS

The local environmental regulations for the protection of various fish species and other marine fauna, such as whales, permitted dredging only from September to mid-February, while the offloading of clean soil offshore was allowed only from December to mid-February. To prevent turbidity, the trailing suction hoppers dredgers deposited the material at a depth of at least 20 meters below the sea level and were using a range of monitoring systems to make sure the water stayed clear. In addition, Marine Mammal Observers

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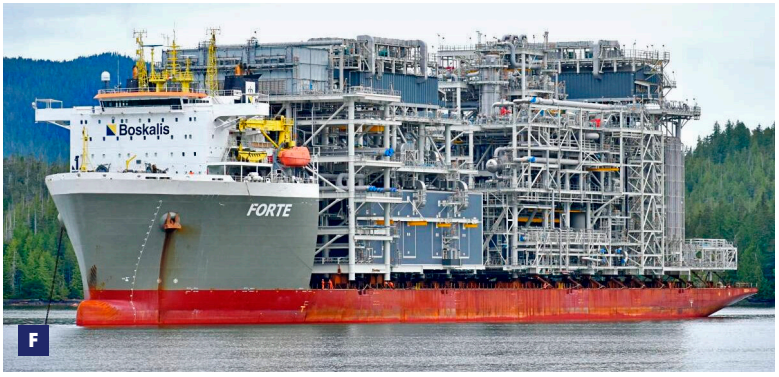
on board the vessels were on the outlook for whales, dolphins or seals. Dredging was shut down if whales or dolphins came to within three hundred meters distance.

Next to the strict environmental conditions, very stringent health and safety requirements and targets applied to the project. The Boskalis NINA (No Injuries, No Accidents) program was adopted and deemed exemplary in managing safe execution of the works.

TRANSPORT OF MODULES

The modules for the LNG Terminal were constructed in Asia. In addition to the dredging works, Boskalis Heavy Marine Transport performed 11 voyages with modules for the LNG Plant using heavy transport vessels Forte and Transshelf between October 2021 and July 2023. The modules were fabricated in China and Singapore, and transported from there to Kitimat in Canada.



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C Cutter suction dredger Edax discharging via pipeline
D Emptying barge at offloading facility
E Backhoe dredger Cornelius loading a barge
F Modules arriving in Kitimat on heavy transport vessel Forte

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