



# INCREASING CHANNEL DEPTH INCREASES TRADE TOURISM TRAFFIC BUSINESS



Shipping changes day by day and with new continent-crossing possibilities opening in the Panama canal, larger ships will be routed through the Caribbean. This may call for an assessment the existing port and access channel dimensions, if there is a wish to have calls from the larger ships.

CBCL from Canada and DHI from Denmark, both associate members of PMAC, have decades of experience in assisting ports and harbours in assessments, design, construction and monitoring of new facilities. This flyer gives an overview of the steps to take and where we can assist you in being part of the future Caribbean port system. The route from considering new access channel or new harbour goes through a range of steps, which we have illustrated below.



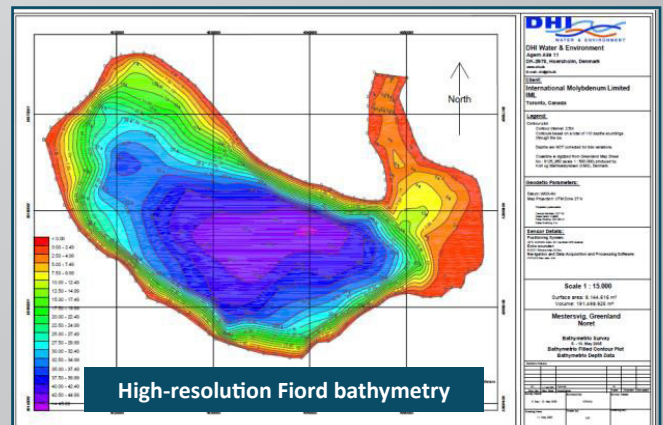
## Introduction

The need for changing the access conditions for a port may come from changes in the dimension or type of ships calling and may go from simple maintenance dredging to deepening the access channels or even to make new access channels. Below you will find descriptions of the different tasks and steps involved in marine works, and where we can assist you in the process.

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## Bathymetry

The bathymetry of the port area and the adjacent marine area is the kingpin for understanding the possibilities for working with access changes. Many ports rely on older sea charts, but it is recommended to get a complete update of the bathymetry in and around the



port area. This can be done by e.g. single- or multibeam echo- sounder mounted on a boat and it is a fast and reliable method with high precision, enabling port work with a very important basis for future decisions.

## Currents and waves

The local current and wave regime under normal and storm conditions may set strict boundaries for how to develop a port and the access channels to it. Metocean data are most often available, but may have to be improved locally by deploying current and wave measuring devices, such as ADCP's. In addition it may also be an advantage to carry out specific analyses of hurricanes and return periods to assess the forces of nature, which must be put into the construction-equation.



## Biological habitat mapping

Marine construction will always pose a potential threat to the environment and especially in the tropics, where e.g. corals are under a high level of protection. Some coral species are very sensitive to even small changes in currents, waves and suspended material and it is therefore of utmost importance to investigate the marine habitats in the vicinity of the ports. Such surveys may include assessment of corals, benthic flora and fauna, fish and other biological valuable assets. Basically, habitat maps, made in e.g. GIS, are very important tools for the planning and execution of marine works and with

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modern technologies, rough habitat mapping can take advantage of satellite and aerial images, which can be processed to provide basic maps. These can then be used for developing specific monitoring programs to fill the gaps and provide knowledge down to species level.

## Underwater noise

Most marine works will cause noise, both above and below the sea surface. Underwater noise travels very far and may cause devastating impacts on a wide range of marine species, especially marine mammals and turtles. It is therefore important to make assessments of the expected noise levels from e.g. sheet-piling and from dredging methods to provide suggestions for mitigating measures, which could link to seasonality, or to direct noise-reduction measures. Due to the fact that noise travels far we are capable of modelling the spreading of underwater noise and based on the results provide impact maps. These maps may easily show impacts in neighbouring countries! We are also able to deploy sound-monitoring equipment, which can be used to assess the local/regional and seasonal occurrence of whales and use this knowledge to plan for noisy operations.

## Geotechnical assessment of the seabed: (CBCL)

Geotechnical conditions are of prime importance when assessing dredging requirements for new channel construction. There are two (2) major aspects to be considered.

The actual soil conditions of the seabed to be dredged. Soft silt layers will require strict environmental controls as they will dissipate readily through the water column and cause siltation plumes. Sands and gravels are the easiest to dredge, although the geotechnical characteristics have to be known to determine stable side slopes under water and to size and specify the most optimum dredge equipment. The presence of hard till containing boulders or bedrock has to be located and assessed, these items are hard to dredge and may require special equipment or under water blasting. In these cases, the costs can be much higher than that of conventional