

PROJECT SHEET

PORT EXPANSION PROJECT, RAS LAFFAN, QATAR
MARINE ENVIRONMENTAL MONITORING

INTRODUCTION

The Ras Laffan project is one of the largest maritime engineering projects in the world. Over a period of 3 years more than 3000 specialists have been working together to create the largest LNG harbor in the world. The main activities covered by the contract were:

- 24 million m³ dredging of waterways (widening of existing waterways and additional shelters)
- 29 million m³ reclamation (areas for tank storage, container handling and future docks)
- The construction of 33 km of breakwaters.

The works include a marine monitoring program. The purpose of this monitoring program is to sustain an environmental management and control platform in order to ensure that the works comply with the environmental requirements. The ultimate aim of the monitoring program is to minimize the impact on the marine environment. Hydronamic, the in-house engineering consultant, was responsible for the design and execution of the environmental monitoring program.

HYDRONAMIC'S ENVIRONMENTAL ENGINEERS

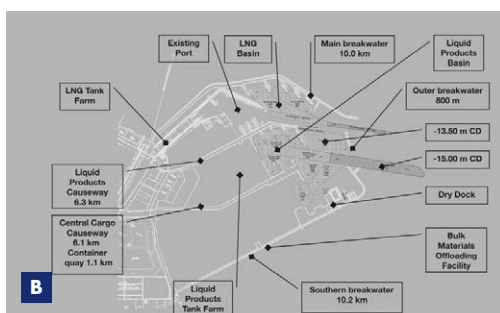
Over the past decade, Hydronamic has gained extensive experience in environmental monitoring around dredging works as the demand from clients to monitor the impact on the marine environment related to dredging works has increased.

FEATURES

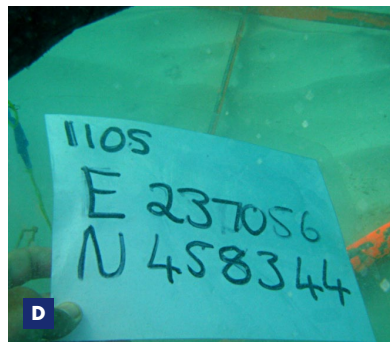
Client	Qatar Petroleum (QP)
Location	Ras Laffan, Qatar
Period	2005 / 2009
Contractor	Boskalis Westminster Middle East Ltd and Jan de Nul Dredging Ltd (joint venture)



- A** Location map
- B** Main characteristics of the Ras Laffan Project
- C** Satellite image of the project, taken in May 2009
- D** Benthic survey of the borrow area
- E** Turtle hatchling on the project site finding its way to sea



In collaboration with the Boskalis survey & electronics department, the IT department and the Boskalis Dolman laboratory, Hydronamic has further professionalized its environmental monitoring on the basis of experience from completed projects. This has resulted in the use of standard monitoring equipment, the preparation of standard installation, testing and calibration procedures and the establishment of a help desk. During its environmental monitoring activities, Hydronamic plays a leading role in the preparation of environmental monitoring plans, and posts qualified and experienced Environmental Managers and Environmental Engineers to Boskalis dredging projects.



MARINE ENVIRONMENTAL SETTING OF THE PROJECT

Prior to construction, an environmental impact assessment was drafted for the Ras Laffan Port expansion project in order to comply with environmental standards, commitments and legislative requirements. The impact assessment identified potential effects on seawater quality, fish, fish habitat and marine turtles. Moderate effects on seawater quality were foreseen during construction, with the main ones being the influence of increased turbidity levels. A monitoring program was therefore implemented to monitor the influence of the dredging and reclamation works on turbidity.

WATER QUALITY MONITORING

The monitoring activities on the dredging and reclamation project focused on water quality, and in particular on the total suspended solids concentration (TSS). The monitoring activities provided information to identify the impact of the work on water quality parameters. Background monitoring activities started prior to the dredging and reclamation activities, and baseline and compliance monitoring during execution. Baseline monitoring was conducted every six months and generated data about physical (TSS), chemical (DO, PH, salinity etc) and bio-chemical (BOD, COD) water quality parameters.

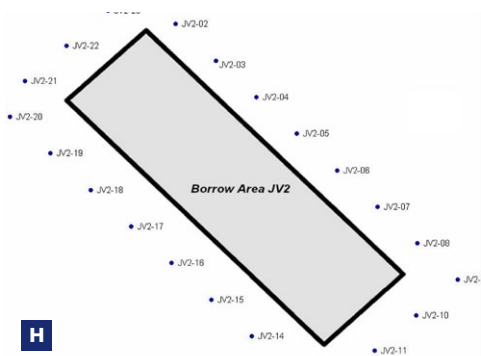
Background monitoring was carried out for comparison with the compliance monitoring and baseline monitoring data gathered during the marine works. The background data provided a frame of reference for the evaluation of the impact of the work on water quality. Compliance monitoring involved the monitoring of four water quality parameters, namely suspended solids concentration [mg/l], water temperature [°C], and turbidity [NTU]. The TSS in the water was determined by measuring turbidity, which was converted into TSS by using a turbidity – TSS relationship. This relationship was established at the start of the project and updated frequently throughout the project. Compliance monitoring took place daily and continuously during the entire construction period at 31 pre-defined monitoring locations around the port and 44 locations distributed around the two borrow areas located 10-20 km from the port.

MONITORING OF TURTLE NESTING & ADDITIONAL MONITORING

In addition to water quality monitoring, there was turtle nesting monitoring along the beach area. This involved identifying turtle tracks and nests. The beach area was cleaned up to maintain a clean nesting area. The monitoring was conducted during the nesting period from April to November. The purpose of the turtle monitoring was to minimize the disturbance of marine turtles during construction work. During the project stage, additional monitoring programs were developed for specific purposes. Benthic surveys of the borrow areas were conducted as a pre-condition for offshore silt dumping activities.

CONCLUSIONS

The dredging, reclamation and breakwater works for the Ras Laffan port expansion project were successfully executed in an environmentally sensitive area. No negative effects were found on turbidity or water quality. The monitored water quality parameters showed compliance with the requirements. In addition, turtle nesting on the adjacent beaches progressed unhindered.



- F** Turbidity monitoring near TSHD Cornelis Zanen
- G** Monitoring vessel of the project site
- H** Monitoring boundaries of the borrow area
- I** Seagrass found near the project site
- J** Marked turtle nest at the project site
- K** Hatched out turtle eggs

Royal Boskalis Westminster N.V.
PO Box 43
3350 AA Papendrecht
The Netherlands
T +31 78 69 69 000
F +31 78 69 69 555
royal@boskalis.com
www.boskalis.com

