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Hydraulic Study of ship induced Sway and Surge at a construction variant of Berth 9 of Offshore Basis Cuxhaven

Client: F+Z Baugesellschaft mbH

Location: Cuxhaven, Elbe Estuary

Construction: Offshore Basis Cuxhaven, Berth 9

Scope of Work: Simulation of ship induced sway and surge

Methodology: 2D hydrodynamic model

INTRODUCTION

For the construction of berth 9 of Offshore Basis Cuxhaven (FIG. 1) F+Z BAUGESELLSCHAFT MBH wanted to submit a different proposal. To demonstrate the serviceability of the proposed variant, ship induced sway and surge had to be simulated.

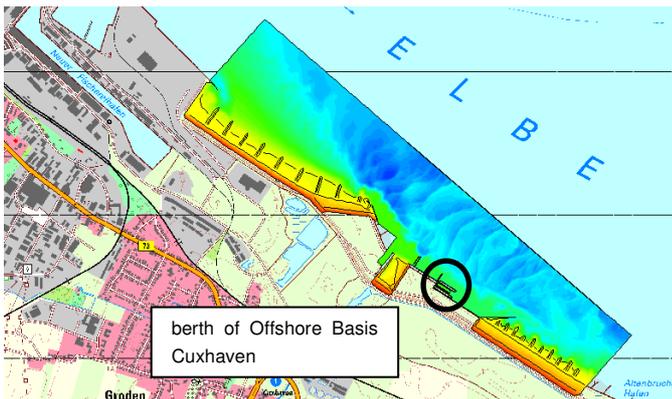


Figure 1: Location berth 9 of Offshore Basis Cuxhaven

METHODOLOGY

For this study a detailed model (Fig. 1) was extracted out of an existing 2D hydraulic model of the mouth of the Elbe Estuary between Brunsbüttel and Scharhörn. The bathymetry is based on multibeam echo soundings (density of original data is 25x25cm).

Upper and lower Boundary conditions were also taken from the regional model. Fig. 2 shows the wave of the passing ship. This wave combined with the velocity of the passing ship was taken for the boundary condition of the eastern boundary. This wave was deduced from measurements.

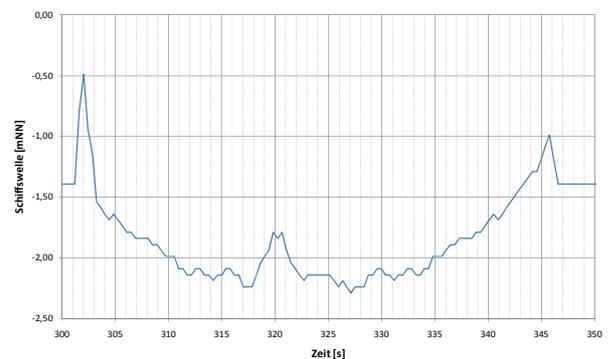


Figure 2: Wave at passing vessel

At sixteen reference points (Fig. 3) these ship induced water level variations were analyzed. Between especially selected reference points differences were calculated to estimate the gradient of the water surface

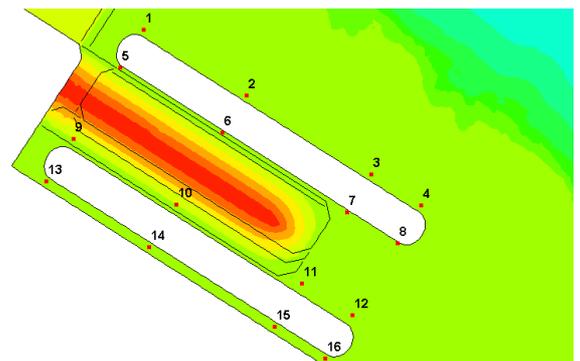


Figure 3: Reference points

RESULTS

The characteristic of the ship induced surge and sway of the variants with an opening the rear („b-2“ and „c-2“) differed only insignificantly from the concept by the building contractor.

CONCLUSIONS

Therefore we recommended the construction of variant „b-2“ or „c-2“.