

Under Keel Clearance Wave & Current Modelling The Rip, Port Phillip Bay

The Rip, at the entrance to Port Phillip Bay, experiences strong currents that interact with ocean swell to produce abnormally high waves during ebb tides. BMT WBM assisted the VCA to assess the feasibility of establishing a dynamic under keel clearance (DUKC) system for assisting ship navigation through the Rip with computer modelling and derivation of algorithms that could be used in a real time predictive manner as input to the DUKC.

The study utilised existing tide gauges and the wave recorder at Point Lonsdale as reference data. 2D/3D RMA finite element modelling was undertaken of the tidal currents, from which current speed prediction algorithms were derived for several locations along the shipping channel. SWAN wave modelling was undertaken at regional and local scales, determining wave propagation characteristics in each of the swell frequency bands and for a range of deep water swell directions.

From the wave modelling, frequency and direction dependent relationships between the wave conditions at Point Lonsdale and locations along the shipping channel and at several recorder locations were derived. These formed the basis of a predictive spreadsheet for use in the DUKC.

The extent of potential error in the predicted wave heights was determined by statistical analysis of the differences between the predicted and recorded values on a record by record basis. For each record, the apparent error was determined both within several frequency bands and across the whole spectral range.

The study showed that good predictions could be made, noting that the recorded data itself, both at the Point Lonsdale reference recorder and at the Rip contain errors. Changes in the location of the reference recorder were recommended to facilitate less complex and extreme transformations and achieve potentially better outcomes.

Client

Victorian Channels Authority (VCA)

Date

2000 – 2001

Services & Expertise Provided

2D & 3D FE hydrodynamic modelling of tidal currents;

Joint wave and current modelling to analyse directional spectra propagation from the Southern Ocean to the Rip and the wave recording site;

Determination of predictive algorithms for water levels, currents and spectral wave components; and

Statistical analysis of apparent algorithm errors based on correlation of predicted outcomes with recorded data.

