

# Design of the Eden Wave Attenuator Including Assessment of Cruise Ship and Tug Propeller Wash Impacts and Construction Progress

Ben Morgan<sup>1</sup> and Ruwan Seneviratne<sup>2</sup>

<sup>1</sup> Advisians, Sydney, Australia; [ben.morgan@advisian.com](mailto:ben.morgan@advisian.com)

## Summary

The Port of Eden is an active working port on the New South Wales Far South Coast. On occasion, the port is exposed to significant wind and wave conditions which can affect maritime safety. A wave attenuator designed by Advisian is currently being constructed to provide a safer harbour for local and visiting vessels and improve the protection of existing maritime infrastructure within Snug Cove. The design involved several specialist studies including Computational Fluid Dynamics modelling.

*Keywords: ports, maritime structures, propeller wash*

## Introduction

The Port of Eden is an active working port which supports a variety of recreational, commercial and port vessel operations on the New South Wales Far South Coast. On occasion, the port is exposed to significant wind and wave conditions which can affect maritime safety in the port and increase the risk of damage to vessels that are moored in Snug Cove or berthed on either the Mooring Jetty or Multi-purpose Jetty.

As manager of the bed and foreshore of Snug Cove, Transport for New South Wales is responsible for delivery of the Eden Safe Harbour Project. The key objectives of the Project included the following:

- create a sheltered waterway area in Snug Cove;
- provide the opportunity for future development in the lee of the attenuator;
- not to negatively impact on existing port operations;
- be delivered by the end of the year 2022; and,
- not to cause a significant environmental impact.

The objectives were achieved by installing a fixed panel wave attenuator at the location shown in Figure 1.

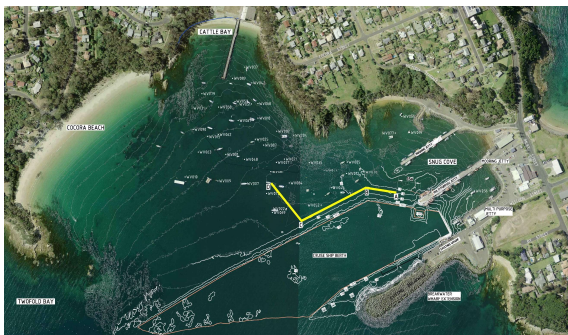


Figure 1 –Design attenuator alignment (attenuator alignment shown in yellow)

## The Design

The design was developed by Advisian that generally comprise a series of steel pile pairs supporting precast concrete panels as shown in Figure 2. The design was undertaken with consideration of the site conditions, End User Requirements and outcomes of stakeholder workshops. Design considerations included:

- sea and swell approaching the site;
- propeller wash generated by tugs and cruise ships;
- variable geotechnical conditions
- proximity of existing harbour infrastructure and operations including cruise ship arrivals;
- minimum design life of 50 years;
- impacts of changes to existing wave and current conditions on natural and build assets; and,
- presence of ecological sensitive areas.

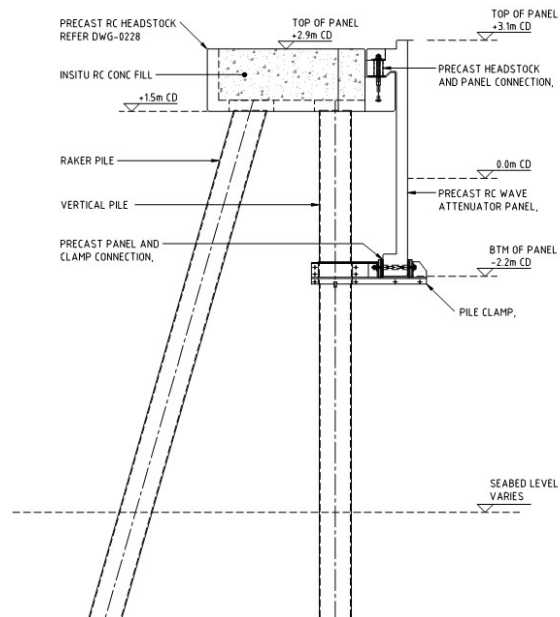


Figure 2 - Typical wave attenuator section

The design involved several specialist studies including:

- Hydrodynamic numerical wave and current modelling;
- Vessel simulations of approaching cruise ships and tugs; and,
- Computational Fluid Dynamics (CFD) modelling of propeller wash.

### Assessment of Propeller Wash

The wave attenuator design required the structure to withstand forces from cruise ship and tug propulsion systems. Assessment of such propeller wash impacts on the wave attenuator and surrounding area was undertaken using a range of tools including ship simulation studies, 2D and 3D CFD modelling of the propeller wash (refer Figure 3), and a risk analysis in consultation with the Port Authority of New South Wales. The findings of the assessment were used to confirm the wave attenuator alignment and develop appropriate design loads for structural design.

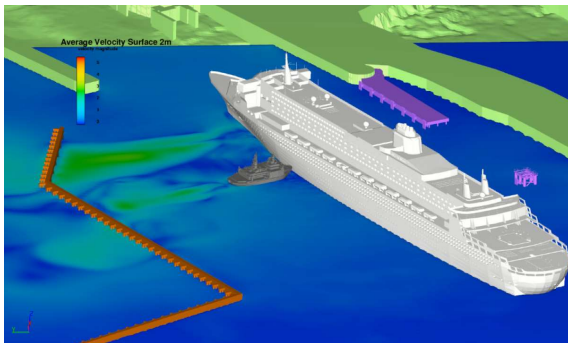


Figure 3: A typical representation of the 3D CFD model

### Construction

Austral commenced construction of the Eden Wave Attenuator at the start of 2022 and is proposed to be completed by end of 2022. Figure 4 shows the installation of the piles using a jack-up barge.



Figure 4: Pile installation of the Eden Attenuator using a jack-up barge.

### References

- [1] Advisian (2021), Eden Safe Harbour Project Detailed Design Report
- [2] PIANC (2015), Guidelines for Protecting Berthing Structures from Scour caused by Ships, PIANC Report No. 180.
- [3]. Smartship (2015), Eden Breakwater Wharf Upgrade Stage 2, Smartship Maritime Simulations, 3-5 May 2015.
- [4] WorleyParsons (2018), Eden Safe Harbour Project Wave Attenuator Computational Fluid Dynamics Modelling of Propeller Wash.
- [5] WorleyParsons (2018), Eden Safe Harbour Project Wave Attenuator Propeller Wash Assessment.