

Noise Monitoring Report

Wave Swell Energy King Island Project – UniWave200

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Photo credit: Wave Swell Energy

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Executive summary

Wave Swell Energy (WSE) deployed the UniWave200 Wave Energy Converter (WEC) at Grassy Harbour, King Island, in early 2021. The project received planning and environmental approvals from King Island Council. A licence and lease for the WEC footprint and marine cable route was received from Crown Land Services.

There is a relatively high background noise from a working port and mine within close proximity to the deployment zone. Due to this context, and expected low noise emissions, the environmental impact assessment documents concluded there was very low risk of noise impacts to recreational beach users and marine fauna from the project.

The installation was approved by King Island Council without a requirement for detailed noise modelling or baseline noise measurements. There were no complaints from stakeholders or the general public regarding noise disturbances, and no evidence for any impact on marine fauna arising from noise emissions.

During operation, WSE undertook a campaign of noise monitoring to provide input for future assessments, and for scoping more detailed studies for future projects. Eight locations above water and on land were selected, and sound pressure levels were measured with a hand-held device, and the results recorded and collated.

The results confirm that noise levels from the turbine operation at the WEC itself increased with turbine operational speed. The noise from the airflap vents was consistent across turbine speeds.

For receptors at the nearest accessible point on the beach (50m from the WEC), the highest recorded sound level was 64.3dB, which is a little louder than normal conversation, and a little softer than a washing machine.

For monitoring locations on the water or the beach at 100m from the WEC or beyond, little discernable increase in noise with operation of the turbine and increasing turbine speed was detected.

It is not possible to directly compare the results of the noise monitoring to the proposed limits for vessels and motors operated on water in the EPA guidelines, as the monitoring locations were generally greater distances than those in the proposed EPA limits. This reflected the exclusion zones created for the WEC, and the minimum distance of a potential receptor on the beach to the device.

The EPA Guideline proposed limit is 74dB measured at 25m distance. The readings taken in the noise monitoring campaign did not exceed 64.3dB measured at 50m distance.

The noise monitoring program for the King Island UniWave200 project collected limited data (no baseline, limited acoustic detail eg frequency, tonal components, impulsiveness, modulation etc), however it verifies the expectations of the pre-approval environmental assessment documents. The results provide useful scoping information for designing acoustic studies if required for future projects in noise sensitive environments. These studies should also consider the need for measurement of vibration in the underwater environment.

1 Introduction

The primary purpose of Wave Swell Energy's UniWave200 King Island project was to validate the models used in the creation of the technology, in particular to demonstrate and validate the technology's power conversion process. These results provide WSE with a baseline and the tools and inputs from which to develop the technology further as part of Project Bluefire, the company's planned technology enhancement program.

The Uniwave200 WEC was installed in Grassy Harbour, King Island, in early 2021, and connected to the island's electricity grid. After a successful period of energy generation and data capture, the decommissioning of the WEC and associated infrastructure commenced in early 2023.

1.1 Purpose and scope of this document

This document outlines the regulatory and approval framework for the project, describes the noise monitoring program that was undertaken, presents the results of the monitoring, and discusses the results.

1.2 Environmental Approvals and assessment criteria

The project received planning approval, including environmental conditions, from King Island Council. A Licence and Lease from Crown land services was also obtained, with conditions.

The potential noise impacts on recreational shoreline users, nearby residents, and marine fauna were expected to be minimal. Background noise including from the adjacent working port, the operations on Group 6 Metals mining lease and reclamation area, and the noise from waves breaking onto the breakwater and the beach was expected to mask the noise from the turbine within the WEC.

Due to this context and the expected low noise emissions from the device, there were no specific noise assessment criteria required in the approval documents. No baseline measurements or noise modelling was required, or undertaken.

A desktop assessment of the potential impacts of the Project on the marine environment was conducted by Marine Solutions Tasmania Pty Ltd. The desktop assessment considered potential impacts on Little Penguins, and cetaceans and seals, as outlined in the following excerpts:

“Above water noise levels have the potential to impact little penguins through masking of biologically relevant sounds and have the potential to affect nesting behaviour. However anthropogenic noise is considered ‘of less concern’ for Little penguins. Little penguins swimming past the unit could utilise avoidance behaviour, and it is unlikely that noise will be heard at levels warranting concern from individuals on the shore. . .

Consideration of cetaceans and seals should be included for any development likely to create underwater acoustic disturbances. Due to their mobile and migratory nature, and the proximity of the development to the shore, it is expected that any

presence of threatened whales or seals in the vicinity of the development will be short in duration. . . .

The development is predicted to create minimal noise pollution as there are no underwater moving parts or underwater pressure vacuums. There may be some underwater noise produced due to vibrations from the turbine through the unit, however this is expected to be minimal, and no greater than ambient underwater noise or underwater noise produced by regular shipping operations in the harbour.

The development is not considered to pose a threat to marine mammals.”

1.3 Sources of noise from the wave energy converter

The wave energy converter is an Oscillating Water Column (OWC) technology, which is an artificial blowhole consisting of a chamber that is open underneath the waterline. As waves pass the OWC, the water rises and falls inside, forcing the air to pass by a turbine at the top of the chamber. This turbine generates electricity, and is the primary source of noise from the device. There are also valves which control and direct air to the turbine, and these are an additional source of noise during operation.

1.4 Noise assessment during operations

No noise complaints from recreational users or residents were received by WSE or King Island Council during the project operating period.

There was no evidence of noise impacting the behaviour of marine fauna, including Little penguins.

The noise monitoring campaign, as outlined in Section 3 below, was undertaken in early 2023 prior to decommissioning of the WEC.

2 Noise policy and guidelines

The overarching principles and objectives for noise management in Tasmania are provided in the *Environment Protection Policy (Noise) 2009*.

The main legislation controlling environmental noise in Tasmania is the *Environmental Management and Pollution Control Act 1994* – particularly section 53, which deals with 'environmental nuisance'. Specific requirements relating to noise levels and hours of operation are principally covered by the *Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2016* and permits issued for particular activities.

As described in Section 1 above, no noise limits were set by the approval authority for the UniWave200 project on King Island. Given this, reference has been made to noise limits contained in the *EPA Noise Limit Guidelines 2016* (the Guidelines).

The Guidelines are not directly enforceable. However, they may assist in demonstrating compliance with the provisions of the relevant laws and regulations, and the general common law requirement for owners and users of noise-producing vehicles and equipment to respect the health, amenity and values of other members of society.

There is no limit proposed in the Guidelines for Wave Energy technology, however the table below presents the limits proposed for vessels and motors being operated on water that have been endorsed by the Director, EPA.

Item	Noise Limit (dB(A))	Measurement Distance (m)
Vessels	74	25
Outboard Motors	74	25
Vessel at an Organised Racing Event	95	30

Table 1: Extract from EPA Noise Limit Guidelines 2016 for Vessels and Motors being operated on water

3 Design of monitoring program

The noise monitoring program was devised and undertaken in-house by Wave Swell Energy. As far as possible, the equipment, locations and protocols used are in accordance with the EPA *Noise Measurement Procedures Manual 2008*.

Noise monitoring was conducted above water at various locations and using equipment and protocols as outlined in Sections 3.1 - 3.3 below.

An underwater microphone was used to record the noise at the entry to the OWC and at 20m distance from the OWC opening. This measurement did not provide a sound pressure reading, however the recording is available for interpretation of sound characteristics that may be relevant to devising noise monitoring to assess impacts on marine life in future projects using similar technology.

3.1 Locations

Eight locations were selected for the above water measurement of sound with a hand held measuring device. These are shown on Figure 1, and are:

1. Top deck of the device 1m offset from turbine
2. Back deck of the device 1m offset from flap vents
3. 50m from the device on the beach at closest point
4. 100m south of the device on the water (from a boat)
5. 100m from the device on the beach to the west
6. Tasport – closest business approx. 215m
7. Portlinks apartments – closest accommodation approx. 420m
8. 2850 Grassy road – house in closest township (Grassy) approx. 2.5km

3.2 Equipment

The equipment used was a Protech C-DSM1 Handheld Sound Level Meter which conforms to the IEC651 type 2, ANSI S1.4 type 2 for sound level meters. The User manual, containing equipment specifications, is included in Appendix A.

Calibration and user advice was provided by the equipment supplier.



Figure 1 Locations of sound level recording

3.3 Protocol

Sound level measurements and records were made by the Wave Swell technical team using a protocol which referenced the EPA *Noise Measurement Procedures Manual 2008*.

Several readings were taken at each location, and reading which picked up extraneous noise such as passing cars or vessels were excluded. Peak sound pressure levels were recorded at a set range of operational speed of the turbine at each location.

4 Results

4.1 Meteorological conditions

The meteorological conditions at the time of the recordings were:

- Prevailing southerly breeze 15-20 knots
(onshore breeze averaging 18 knots – approx. 9.26 m/s)
- Clear skies
- Sea state: 1m swell
- Tide: low

4.2 Sound pressure levels

The results from the sound pressure readings were compiled and are presented below.

Reading Location	Operational Speed of Turbine			
	0 RPM	1000 RPM	1500 RPM	2000 RPM
1. On device - 1m from Turbine	68.9 dB	82.1 dB	94.7 dB	113.6 dB
2. Back deck 1m from Airflap vents	Varied consistently 88.5 dB to 91.2dB			
3. Beach - 50m from device	58.1 dB	59.6 dB	60.7 dB	64.3 dB
4. Beach - 100m to the West	57.7 dB	57.7 dB	57.7 dB	57.7 dB
5. 100m South of device (boat)	57.0 dB	57.0 dB	57.0 dB	57.0 dB
6. TasPort Port - Closest Business	55.8 dB	55.8 dB	55.8 dB	60.1 dB
7. Portlinks - Closest residence	55.1 dB	55.1 dB	55.1 dB	55.6 dB
8. WSE house - 2850 Grassy Road	39-42 dB	Values not affected at WSE house		

Table 2: Average peak sound pressure readings above water at all locations

5 Discussion and conclusions

The results presented above essentially verify the expectations outlined in the pre-approval environmental assessment documents.

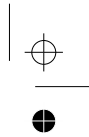
It is not possible to directly compare the results of the noise monitoring to the proposed limits for vessels in the EPA guidelines, as the monitoring locations were generally greater distances than those in the proposed limits. This reflected the exclusion zones created for the WEC, and the minimum distance of a potential receptor on the beach to the device.

The Guideline limits proposed for vessels was 74dB measured at 25m distance. The readings taken in the noise monitoring campaign did not exceed 64.3dB measured at 50m distance.

Within the context of the King Island project, the results indicate that:

- At the device itself, the noise associated with the turbine increases with turbine operational speed
- The airflap vent noise is reasonably consistent across the range of turbine speeds
- A receptor on the beach at the closest accessible point to the WEC would potentially notice a marginal increase in noise with turbine operation and increased turbine speed. A peak sound pressure of 64.3dB was recorded at the highest turbine speed, which is equivalent to a little louder than normal conversation, and a little softer than a dishwasher or washing machine
- A receptor on the beach at 100m distance, or on the water at 100m distance, or at the nearest business or residence would perceive only marginal, if any, increase in noise with operation of the turbine and increasing turbine speed
- Receptors in the nearest suburb would not discern the operational noise of the WEC, even though the background noise (presumably waves breaking on the beach and breakwater) was substantially lower than at the locations nearer the beach

Although the noise monitoring program collected limited data (no baseline, limited acoustic detail eg frequency, tonal components, impulsiveness, modulation etc) the monitoring is considered to provide useful scoping information for designing acoustic studies if required for future projects in noise sensitive environments. These studies should also consider the need for measurement of vibration in the underwater environment.



Sound Level Meter User Manual



**Please read this manual before switching the unit on.
Important safety information inside.**

