WAVE RIDER ENERGY

MARINE MAMMAL MONITORING PLAN

Prepared for:

The Department of Sustainability, Environment, Water, Population and Communities

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COOE Pty. Ltd.

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1 INTRODUCTION

1.1 Background

Renewable energy is an essential part of Australia's low emissions energy mix and is important to Australia's energy security. It plays a strong role in reducing Australia's greenhouse gas emissions and accordingly, the Australian government is supportive of renewable energy industry development.

In line with Australia's need for renewable energy sources, Wave Rider Energy has proposed to locate a Wave Rider pilot plant in the high energy waters off Locks Well Beach, South Australia for up to 18 months. The greatest advantage is that the Wave Rider does not produce any greenhouse gases, harmful wastes or pollutants when converting wave energy into electrical energy. Therefore during operations, converting wave energy is virtually non-polluting, with significant benefits in the form of mitigating climate changes, securing energy supply and decoupling economic growth from resource use.

The Wave Rider project was referred to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) for assessment under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). After providing Preliminary Documentation (refer to 2009/4859), the project was approved with conditions.

1.2 Conditions of project approval

The Wave Rider pilot project was approval subject to the following conditions:

- A towing and decommissioning plan be submitted and approved prior to the action occurring
- A maintenance plan be submitted and approved prior to the action occurring
- A monitoring and management plan for Southern Right Whales, Pygmy Right Whales and Australian Sea lions be submitted and approved prior to the action occurring
- A monitoring and management plan for EPBC listed birds be submitted and approved prior to the action occurring
- A compliance report is submitted annually
- An independent auditors report is submitted.

This plan is for monitoring and managing Southern Right Whales, Pygmy Right Whales and Australian Sea lions.

1.3 Objective of this Monitoring Plan

The overall objective of this Monitoring Plan is defined as:

- To provide a comprehensive and robust program of baseline and commissioning monitoring of marine mammals to confirm quantitatively that there are no adverse effects to the whale and sea lion populations resulting from the Wave Rider.

1.4 Project Description

The pilot Wave Rider will be of experimental size and will have the following specifications:

- Length: 111 m
- Width: 13 m
- Height: 4 m
- Material: Carbon Steel
- Truss weight: 130 tonnes
- Pontoon weight: 60 tonnes
- Total weight, including axles, generators and buoys: 290 tonnes.

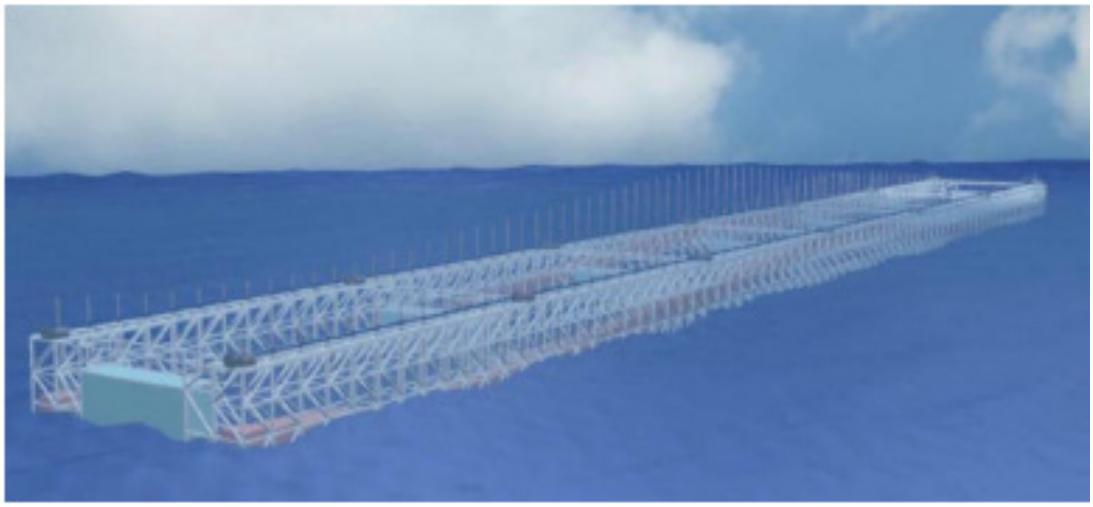

Figure 1– Modelled view of the Wave Rider

The Wave Rider will be moored to the seabed using an Admiralty-type single point mooring.

The pilot plant is designed to float with about one-third above the surface and two-thirds of the device being underwater. To secure the Wave Rider infrastructure and maintain public safety, a seafloor area of 64 ha is required.

The Wave Rider uses a series of buoys to convert the vertical movement of the waves into mechanical energy. As waves pass the buoys move up and down and this movement causes rotation of an axle that is connected via a chain, which in turn drives a generator that converts the mechanical energy into electrical energy. The axle and generator are above the water.

The Wave Rider will operate mechanically meaning that no fluids are involved, unlike other competitor's systems which make use of hydraulics. As such there will not be any danger of fluids leaking into the water. The Wave Rider will receive an environmentally friendly antifouling surface treatment to protect it from corrosion and barnacles.

At the completion of the pilot, the project area will be restored to its natural state, as stipulated within the Department of Planning Transport and Infrastructure (DPTI) seabed lease conditions.

1.5 Location

The Wave Rider pilot plant will be towed from Port Adelaide to its ultimate destination at Locks Well Beach (the centre of the site is given as coordinates 135° 0.517'E, 33° 44.505'S). Suitable mooring conditions (e.g. thick sandy sediment) exist in a 2 km2 area from the centre of the site and extend 3 km northwest towards Elliston (Geosonics Australia 2010). The Wave Rider will be moored approximately 800 m from shore at a depth of 28 m.

The Locks Well Beach site is located within a continuous line of high (40-80 m) and sheer cliffs, broken only by shorter sections of sandy beaches.

Locks Well Beach consists mainly of bare sand (Bryars 2003). Geophysical site surveys conducted 2 km2 from the centre of the proposed location showed large areas of unconsolidated sand with thicknesses greater than 3 m (Geosonics Australia 2010).

Small isolated stands of seagrasses occur in the area and patches of heavy limestone or calcarenite reef may also occur (Bryars 2003).

1.6 Project Phases

The project can be described in three activity phases:

- Towing: towing the Wave Rider to Locks Well Beach (approximately 5 days depending on weather conditions; all moving parts will be fixed during the towing phase)
- Mooring and decommissioning: mooring the Wave Rider at Locks Well Beach involves minor work to allow the Wave Rider to operate as the moving parts will be

- fixed during the towing phase, decommissioning will see the Wave Rider detached from moorings, towed into the sheltered bay to fix all moving parts prior to towing back to Port Adelaide
- Operation: monitoring the efficiency of the Wave Rider and maintenance.

2 SPECIES OF INTEREST

In accordance with the EPBC Act, three species of interest were identified. These included:

- Southern Right Whale
- Pygmy Right Whale
- Australian Sea-lion.

2.1 Southern Right Whale

The Southern Right Whale has a circumpolar distribution. In summer, the whales feed in Antarctic waters, and then migrate to temperate coastal breeding grounds; there is a major aggregation area at the Head of the Bight (31˚30'S, 131˚10'E). Southern Right Whales occur in Australian waters for breeding between May and November.

The main calving areas currently known for Southern Right Whales along the South Australian coast include Head of the Bight, Fowlers Bay, and Encounter Bay. Another area that has been used intermittently as a calving area or by small numbers of mothers with very young calves includes Sleaford Bay (near the southern tip of Eyre Peninsula). Mothers with young calves are also occasionally present at other scattered locations along the southern Australian coast. Calving Southern Right Whales that tend to be in close proximity to the shore may interact with the development.

Current identified threats for Southern Right Whales includes the resumption and/or expansion of commercial whaling, and habitat degradation through entanglement, acoustic pollution, physical injury from ship strike, built structures impacting on habitat availability and/or use (e.g. marinas, mining or drilling infrastructure), as well as changes to water quality and water flow.

2.2 Pygmy Right Whale

The Pygmy Right Whale is an inconspicuous species and has a large area of occupancy (Kemper 2006). In the Australasian region, there have been just nine sightings and twenty times as many stranding events.

Records of Pygmy Right Whales in Australian waters are distributed between 32° S and 47° S, but are not uniformly spread around the coast (Kemper 2002a). The northern distribution of Pygmy Right Whales may be limited on the west and east coasts of Australia by the warm, south-flowing Leeuwin and East Australian currents (Kemper 2002a). Few records are available for NSW, eastern Victoria, and the northern part of the Great Australian Bight, while comparatively, Western Australia has fewer records than eastern Australian states (Kemper 2002a). Concentrations of stranded animals have occurred at the entrance of the gulfs in South Australia and around Tasmania, but live sightings have predominated in the former region (Kemper 2002a). The numerous strandings in Tasmania may be due to the proximity of the Subtropical Convergence, an apparently important feeding zone for Pygmy Right Whales. Areas of coastal upwelling events appear to be an important component regulating Pygmy Right Whale distribution (Kemper 2002a).

As only one sighting of a small calf with its (presumed) mother has been made, at about 35° S in South Australia, it is not possible to delineate a calving ground but Kemper (2002a) suggests it most likely that calves would be born in warmer waters of lower latitudes.

The Pygmy Right Whale calving interval, mating season, and gestation period are all unknown (Kemper 2002b). The calving season is protracted, possibly year-round, although Pavey (1992) suggests a broad calving season between May and January in Australian waters (Kemper 2002a).

2.3 Australian Sea-lion

Australian Sea-lion populations are highly vulnerable to human disturbance, particularly the breeding populations (Shaughnessy et al. 2005). In South Australia, breeding colonies exist on a number of offshore islands, particularly off western and southern Eyre Peninsula. There is one major mainland breeding colony remaining at Point Labatt. There is also a large breeding colony on the south coast of Kangaroo Island at Seal Bay. It is estimated that the population of sea lions is approximately 14,700 animals (Page & Goldsworthy 2009).

Floating structures associated with any marine energy development are likely to act as opportunistic haul-out sites that pinnipeds may utilise. Pinnipeds are known to haul out onto natural and artificial structures, and this can occur at high densities. There is the possibility that animals could injure themselves during attempts to haul out, or possibly from any moving parts.

3 RISK ASSESSMENT

3.1 Risk Assessment Methodology

Environmental risk assessment is a process for evaluating the chance that a project will cause harm to the environment and developing measures to manage and mitigate this harm. Events and entities associated with a project that have the potential to cause harm to the environment are referred to as aspects (hazards). Risk is characterised by the likelihood that an aspect will cause environmental harm and the consequences or severity of the environmental effect, taking into account assumptions and uncertainties.

Risk assessment differs from an impact assessment in that it provides a direct link between exposure to hazards and the effects of environmental harm, enabling the prediction and comparison of risk associated with scenarios.

Using the risk assessment approach developed by Campbell and Gallagher (2007), likelihood (Table 1) and consequence (Table 2) were combined using a risk matrix to qualitatively characterise risk as negligible, low, moderate, high or extreme (Table 3).

Table 1 – Measures of likelihood (adapted from Campbell and Gallagher 2007)

Level	Description
Rare	Event will only occur in exceptional circumstances
Unlikely	Event could occur in most circumstances
Possible	Event could occur
Likely	Even will probably occur in most circumstances
Almost certain	Event is expected to occur here in most circumstances

Table 2 – Measures of consequence (adapted from Campbell and Gallagher 2007)

Level	Description
Insignificant	No individual deaths, no significant effects on prey availability, foraging and breeding habitat, or changes in behaviour.
Minor	Incidental deaths of individuals, not to levels that would cause a decline in a subpopulation that is not recoverable in years.
Moderate	Persistent deaths of individuals and declines in some subpopulations. May effect on any of: prey availability, foraging habitat, breeding habitat and behaviour. In absence of additional effect, recovery occurs in years or decades.
Major	Significant loss of individuals declines in subpopulations and localised extinctions likely. Significant effects on prey availability and/or foraging and/or breeding habitat. In the absence of additional effects, recovery rates in decades or centuries.
Catastrophic	Localised extinctions, recovery of subpopulations not expected, loss of further subpopulations likely. Severe effects on prey availability and/or foraging and/or breeding habitat. In the absence of additional effects, recovery is not expected.

Table 3 - Risk matrix (adapted from Campbell and Gallagher 2007)

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Rare	Negligible	Low	Low	Moderate	Moderate
Unlikely	Negligible	Low	Moderate	Moderate	Moderate
Possible	Negligible	Low	High	High	Extreme
Occasional	Negligible	Moderate	High	Extreme	Extreme
Likely	Negligible	Moderate	Extreme	Extreme	Extreme

A risk assessment workshop was undertaken by Associate Professor Simon Goldsworthy, the Leader of the Threatened, Endangered and Protected Species Subprogram at the South Australian Research and Development Institute (Aquatic Sciences). A/Professor Goldsworthy has over 20 years' experience studying pinnipeds and seabirds, and has published over 60 scientific papers. Other participants included Wallbridge & Gilbert and Wave Rider Energy personnel, and the risk assessment and was used to assess the potential interactions between the project and the marine environment for the following phases:

- Towing
- Mooring and Decommissioning
- Operations.

Further discussions have been undertaken with Dr Catherine Kemper, Senior Marine Mammals Research Scientist from the South Australian Museum. Dr Kemper brings over 30 years of marine mammal research and has been key in developing cetacean databases in South Australia and action plans for their recovery.

Management measures have been suggested to mitigate identified risks where possible.

3.2 Towing

3.2.1 Injury and death of marine mammals from collisions

Collision with protrusions above and below the water and with tow lines causing marine mammal injury and death were considered effects of the towing phase of the project and are presented in Table 4 along with the level of risk identified for each effect.

Table 4 – Risk assessment of the potential for marine mammal injury and death from collisions during towing

Effect	Likelihood	Consequence	Risk
Injury and death from collision with protrusions above water	Rare	Minor	Low
Injury and death from collision with protrusions below water	Rare	Minor	Low
Injury and death from collision with tow lines	Rare	Minor	Low

The incidence of marine mammal collisions during towing could be monitored during daylight hours of the towing phase.

3.3 Mooring and Decommissioning

The mooring and decommissioning would include that the Wave Rider would be connected or disconnected to its moorings. Decommissioning would also include the removal of all mooring components on the seabed.

3.3.1 Injury and death of marine mammals from collisions

Injury and death of marine mammals from collision with protrusions above the water was identified as a potential effect during mooring and decommissioning. However, given the

short duration of these activities (i.e. within weeks), the risk of injury and/or death of marine mammals from collision with protrusions above the water during mooring and decommissioning phases is considered to be low risk (rare likelihood, minor consequence).

3.3.2 Displacement from feeding grounds from noise

Many marine species are reliant upon sounds for communication and awareness of their surrounding environment. In particular, underwater acoustics are extremely important for whales and sea lions. Consequently noise emissions produced at various stages of the Wave Rider project may cause negative behavioural and physiological changes in marine mammals.

It is unlikely to have any impact on whales however, as individuals feed in the Antarctic waters, not along the southern coast of Australia, where they migrate for breeding/calving purposes only.

The frequency of the underwater noise emissions from the Wave Rider project is expected to overlap with the functional underwater hearing range of whale and sea lions. Underwater behavioural response is predicted to occur up to a distance in the order of several tens of metres from the Wave Rider.

Marine mammals may be displaced from part of their feeding grounds during the mooring and decommissioning phases, however, displacement of sea lions from feeding due to noise during the mooring and decommissioning phases was considered a low risk because of the short time and small area associated with this activity (possible likelihood, minor consequence).

3.4 Operation

3.4.1 Injury and death of marine mammals from collisions

Collision with protrusions above and below the water causing marine mammal injury and death were considered impacts for the operation phase of the project and are presented in Table 5 along with the level of risk identified for each effect.

Table 5 – Risk assessment of the potential marine mammal injury and death from collisions during operation

Effect	Likelihood	Consequence	Risk
Injury and death from collision with protrusions above water	Rare	Minor	Low
Injury and death from collision with protrusions below water	Rare	Minor	Low
Injury and death from entrapment in moving parts below the water	Occasional	Minor	Low

Entrapment in the moving parts below water was considered more likely to occur for sea lions. The incidence of marine mammal collisions during operation could be monitored during daylight hours, and this is addressed in Section 4..

3.4.2 Marine mammal displacement from feeding (noise, shading, physical)

Risk associated with the displacement from feeding for marine mammals caused by noise, shading or the presence of the physical structure are considered to be negligible risk (occasional likelihood, insignificant consequence).

Marine mammals (sea lions only) will most likely be displaced from part of their feeding grounds during the operation phase, however, because the affected area is relatively small (64 ha exclusion zone) compared to their feeding grounds, the severity of the effect of displacement from feeding due to noise is considered minor.

3.4.3 Injury and death from collisions with navigation lights

The Wave Rider will be fitted with navigation lights which marine mammals may collide with. The risk associated with this effect is considered negligible risk for marine mammals (rare likelihood, insignificant consequence).

3.4.4 Injury and death from entanglement in Wave Rider above water

The open structure of the Wave Rider is likely to act as an opportunistic site that sea lions may utilise. Sea lions are known to 'haul out' onto natural and artificial structures, and this can occur at high densities. Although the Wave Rider can be described as a steel truss with minimal platforming, sea lions may still attempt to haul out onto the structure and may even find areas upon which to bask.

The possibility that sea lions could injure themselves during attempts to haul out or possibly from moving parts (axle, chain) has been identified as an effect with low risk (possible likelihood, minor consequence) as the Wave Rider is connected to the moorings by rope-wrapped steel and should there be any breaks in the line, it is anticipated that the net weight will cause the steel cable to sink.

The magnitude of the ecological effect on marine mammals is considered minor given the population size potentially affected and that this effect would not cause a decline in a subpopulation that could not be recovered.

To reduce risk of injury to sea lions, housing could be used to cover the chain on the buoy, the sprocket on the axle or the axle itself. The incidence of physical injury to sea lions from the Wave Rider throughout the pilot should be monitored to best understand the implications. Interactions between sea lions and the Wave Rider will be monitoring in accordance with the monitoring plan in Section 4.

3.4.5 Injury to marine mammals from accumulation of rubbish

It is possible that the truss-like structure of the Wave Rider may accumulate rubbish and other flotsam and jetsam such as plastic bags or fishing gear. The effects of this type of rubbish can be life threatening to marine mammals if ingested and is considered a hazard.

Injury to marine mammals from the accumulation of rubbish is moderate risk (occasional likelihood, minor consequence).

The incidence of litter accumulation in the truss structure throughout the pilot should be monitored to best understand the implications.

3.4.6 Acoustic effects on calving in marine mammals

Main calving and mating areas for Southern Right Whales are at the Head of the Bight, Fowlers Bay, Sleaford Bay and Victor Harbor (Kemper, pers. comm.)

In the context of the Wave Rider, any acoustic disturbance from mechanical operations needs to be monitored so that the level of effect from the Wave Rider is appropriately considered. The interruption of calving from acoustics is not known but conservatively considered to be moderate risk (occasional likelihood, minor consequence). This is despite there being no main calving area nearby (see Section 2.1).

It is recommended that noise loggers are used during operations to better quantify ongoing noise disturbance to any calving whales.

4 MONITORING PLAN

The Wave Rider Energy development is restricted to the shallow coastal waters adjacent to Locks Well Beach at a maximum depth of 28 m.

The risk assessment and proposed monitoring and management measures were developed in collaboration with specialist scientists from South Australian Research and Development Institute (Aquatic Sciences) and South Australian Museum, as detailed in Section 3.

Possible interacting activities to marine mammals associated with the development include:

- Physical presence of the anchoring system or the Wave Rider and the effects on habitat
- Construction noise
- Operational noise
- Increased vessel traffic from maintenance activities
- Physical collision with the structure.

4.1 Habitat use

It is anticipated that whale migrations will be in a south-north movement (Kemper, pers. comm.). Community members who have been trained in whale behaviour and identification will be used to alert Wave Rider Energy to the presence of whales along the coast as they migrate towards Locks Well and Elliston so that active monitoring can be undertaken.

To identify whether or not the pilot plant interacts with marine mammal habitat use, whale and sea lion monitoring will be undertaken at least every two weeks during the winter months. Two control sites will be established - one at Elliston which is approximately 5 km north of the project site, and the second control site 5 km south of Locks Well beach, where the wave energy and coastline is similar. Abundance and behaviour will be recorded at all three sites, and approximate distance to the Wave Rider will be recorded at the project site.

Historical data, if available, will also be assessed and compared to the data collected in these abundance surveys.

Using a qualified marine ecologist, surveys and records will be undertaken from shore. Behaviours to be noted at the control and project sites include:

- Group size – e.g. single adult female, female with calf etc.
- Surfacing frequency – does the mammal surface more frequently at the project site compared to the control sites
- Swimming behaviour – frequency of breaching, sailing, spy hopping, tail slapping; do the mammals actively investigate the Wave Rider, or do they show avoidance behaviours
- Distance to Wave Rider – determine how far away mammals are from the pilot plant
- Foraging (sea lion only)
- Haul out attempt (sea lion only)
- Possible inquiry – note any physical injuries
- Collision – was any physical interaction with the Wave Rider observed

Observational data collected will be provided to South Australian Museum personnel for behavioural interpretation.

A post decommissioning habitat use survey at the three sites will also be undertaken. This is summarised in Table 6.

Table 6 – Habitat use survey summary

Species	Data	Location	Project stage
Southern Right Whale	Abundance; behaviour	Project Site, Control Site (x2)	Operation (every two weeks during winter; as notified by public) Decommissioning (x1 winter survey)
Pygmy Right Whale	Abundance; behaviour	Project Site, Control Site (x2)	Operation (every two weeks during winter; as notified by public) Decommissioning (x1 winter survey)
Australian Sea-lion	Abundance; behaviour	Project Site, Control Site (x2)	Operation (every two weeks during winter) Decommissioning (x1 winter survey)

4.1.1 Unacceptable levels of habitat use impacts

The Wave Rider is position in a high energy sandy coastline, anchored in less than 30 m of depth. The risk of mobile faunal displacement from this habitat was considered

negligible during a formal risk assessment, however it may provide haul out strata for sea lions. Haul out may affect the operational efficiency of the Wave Rider and may cause injury or mortality. Limits of impact and emergency response from Wave Rider are addressed in Section 4.4.

4.2 Noise

Physiological impacts, such as hearing damage and increase stress, may occur as a result of noise pollution. Noise impacts on marine mammals are often divided into behavioural and physiological impacts (Southall et al. 2007). Possible behavioural responses to noise include changes in vocalisation, resting, diving and breathing patterns, changes in mother-infant spatial relationships, and avoidance of the noise source. Masking of biologically important sounds may interfere with communication and social interaction, and cause changes in behaviour as a result.

The hearing sensitivity of marine animals generally varies with frequency. Audiograms are therefore used to represent the sensitivity to sounds of different frequencies. An audiogram of a species relates the absolute threshold of hearing (in dB re 1 µPa) of that species to frequency, and shows the frequency bandwidth over which species can hear. A species' hearing is most sensitive at frequencies where its absolute threshold of hearing is lowest. For example, humans are most sensitive to sounds between 2 and 4 kHz where the absolute hearing threshold is lowest.

The sensitive hearing range for the species of interest are defined in Table 7.

Table 7 – Species specific sensitive hearing ranges

Species	Most sensitive hearing range	Impact	Continuous noise exposure criteria (dB re 1 µPa (rms))
Southern Right Whale	7 Hz to 22 kHz	Behavioural	120
		Physiological	180
Pygmy Right Whale	7 Hz to 22 kHz	Physiological	120
		Behavioural	180
Australian Sea-lion	1 Hz to 30 kHz	Physiological	120
		Behavioural	190

The frequency content of the predicted underwater noise emissions from the pilot Wave Rider is expected to overlap with the functional underwater hearing range of the Southern and Pygmy Right Whales and the Australian Sea Lion.

Noise levels are expected to drop off with increasing distance from the pilot plant. The predicted levels are compared with the behavioural disturbance criterion of 120 dB re 1 µPa for the Southern and Pygmy Right Whales and the Australian Sea Lion (see Table 2), and the predicted typical lowest and highest ambient underwater noise levels within the study area of 90 and 110 dB re 1 µPa.

Based on the predicted ambient underwater noise environment of 90 to 110 dB re 1 µPa, the zone of audibility is predicted to extend between 100 m and 2 km underwater.

Noise emissions from the pilot plant are not expected to cause any physiological impacts on any of the considered species.

Underwater behavioural response is predicted to occur in all three species up to a distance in the order of several tens of metres from the pilot plant.

A hydrophone will be used to determine the noise generated by the Wave Rider. This will be carried out prior to commissioning of the pilot plant site, and at two control sites. Three separate sampling events will be recorded.

When the Wave Rider is operational, hydrophone measurements will be taken at the project site, and then at approximately 20 m intervals to a minimum distance of 100 m, or until there are no discernible noises generated from the Wave Rider. This noise profile can be used in conjunction with the habitat use survey to determine if noise generated is causing an 'exclusion' zone around the Wave Rider.

Noise monitoring and analyses will be undertaken by suitably qualified acoustic engineers.

4.2.1 Unacceptable levels of noise

Noise profiles and modelling have been based on best-available data and literature. No physiological effects (including mortality) are predicted as a result of the Wave Rider.

Behavioural responses are predicted to occur within tens of meters of the Wave Rider. Should the pilot plant exceed 150 dB re1 µPa at 1 m levels from the device, Wave Rider Energy will determine the cause of the excessive sound through maintenance of the pilot plant. This may require towing of the pilot plant to the calmer bay waters at Elliston for mechanical adjustments. Should this not resolve the emitted sound levels, appropriate noise mitigation will be considered. It is not possible to establish mammal exclusion zones, or 'ramp up' the activity as occurs during hydrohammering, seismic and military activities. These ramp up activities are thought to provide mammals an opportunity to respond prior to the larger sounds being generated. The Wave Rider will not generate noise at the levels that these seismic, dredging and hydrohammering activities do, and operates within the high wave energy environment as continuously

as the waves are generated. Should mechanical adjustments not resolve the emitted sound levels, retrofitting bubble 'curtains' will be investigated.

Wave Rider Energy is committed to conducting thorough noise monitoring to understand the effects of the Wave Rider compared to the ambient conditions. These data may be used to best inform the development of commercially-sized plants.

4.3 Vessel monitoring

An exclusion zone has been established to limit recreational and commercial vessels around the Wave Rider. This exclusion zone is in accordance with the South Australian Department for Planning Transport and Infrastructure. The exclusion zone represents an improvement in context of the existing free vessel access condition, and accordingly, no monitoring of these vessels will be undertaken.

Maintenance activities undertaken by Wave Rider Energy vessels will be recorded. Any interaction with EPBC species will be reported to the Department within 24 hours or as soon as reasonably practical.

4.3.1 Unacceptable levels of vessel interaction

A reduction in vessel traffic is predicted due to the establishment of an exclusion zone. Accordingly, there is no unacceptable limit established for the three species.

4.4 Collision

The original monitoring plan issued in June 2012, recommended that close proximity behavioural information will be gathered by mounting a video camera to a buoy for one week prior to the pilot Wave Rider being commissioned. One hour of footage will be sampled from each dawn, midday and dusk period each day of that week. However, given the sea conditions likely to prevail during this time, capturing close proximity behaviour information will be difficult using this method. A camera attached to a buoy will experience lateral, vertical and rotational displacement movements that would significantly reduce the probability of adequately viewing marine mammals in close proximity to the Wave Rider. *Consequently it is recommended that close proximity behavioural information prior to commissioning is collected at the same time by land-based observers as per the habitat use element of the MMM Plan.*

Once commissioned, interactions will be monitored using a permanently fixed video camera to avoid aversion behaviour from human presence. Video footage will be used to sample interactions of marine mammals with the Wave Rider.

During the first week of operations, one hour of footage will be sampled from each dawn, midday and dusk period each day. All interactions, including behaviours will be

recorded. Any incidence of EPBC-listed bird (e.g. penguins) and/or mammal strike, injury or mortality will be reported within 24 hours of occurrence. Should no incidents be recorded, monitoring at dawn, midday and dusk will be undertaken for one day a week for the duration of the first month of operations.

If after one month no interactions have been recorded, monitoring frequency will be reduced to once a month, excluding Southern Right Whale calving periods between May and October. During May and October, one hour of footage will be randomly sampled on a weekly basis.

If at any point during the operations phase there is a negative interaction or injury to marine mammals, monitoring frequency will again intensify with the monitoring program recommencing from the beginning (as during the first week of operations).

4.4.1 Unacceptable levels of collision

It is considered that while the risk of sea lion collision was rated as low, a limit of collision-based mortality on 0.0003% of the population over the pilot period is established. This is based on an Australian sea lion population estimate of 14,700 (Page & Goldsworthy 2009). Should this be exceeded, emergency response procedures will be followed.

Any collision-related deaths between Southern Right Whales and/or Pygmy Right whales with the Wave Rider will instigate emergency response measures. That is, there is no acceptable limit associated with the mortality of EPBC-listed whale species. Should the Wave Rider cause injury to these species, the whale and dolphin rescue hotline will be contacted, and the incident investigated with South Australian Museum senior research scientists.

5 EMERGENCY RESPONSE

The purpose of environmental performance monitoring is to measure conformance with, and the effectiveness of, established environmental limits, controls, and processes identified.

In the case of the Wave Rider pilot project, it is intended that the trial period for the technology is also the appropriate period to monitor environmental performance such that should the pilot project successfully operate as intended, the full scale Wave Rider can be modified to work more efficiently and sensitively.

Design has already eliminated the potential for hydraulic leaks and incorporated bird scaring devices to mitigate impacts against EPBC-listed fauna.

Should the Wave Rider cause injury to a marine mammal, National Parks and Wildlife Services will be notified as soon as practicable. This is the South Australian whale and dolphin rescue hotline. Any stranding events will be reported and investigated by senior scientists from the South Australian Museum.

Given the nature of the Wave Rider and the wave climate, the pilot plant needs to be towed to the calmer bay at Elliston for in depth modifications and fixing of the buoys to prevent movement. There is no 'shutdown' possible in the shorter term.

Should the incident of collision deaths exceed the identified threshold limit, the Wave Rider will be towed from site to the sheltered bay at Elliston. Consideration during this decommissioned period will include seasonal movements and the potential for seasonal closure(s) of the wave energy converter.

6 COMPLIANCE AND REPORTING

It is the responsibility of Wave Rider Energy to maintain a record of procedures employed during operations. Such records should be auditable and account for aspects of the operation that relate to legislative approvals and regulations. Additionally, information on the species of interest sighted during the survey may be useful in the planning and assessment of future marine industry activities.

A report on the conduct of the survey, and any mammal interactions, should be provided to the Department within two months of survey completion. The report should, at a minimum, contain:

- Location, date and start time of the survey;
- Name, qualifications and experience of any Marine Mammal Observers (or research scientists) involved in the survey;
- Location, times and reasons when observations were hampered by poor visibility or high winds;
- Location and time of any start-up delays, power downs or stop work procedures instigated as a result of whale sightings;
- Location, time and distance of any mammal sighting including species where possible;
- Physical description of features, group size, ages/size/sex categories if determinable;
- Date and time of survey completion.

7 CONCLUSION

As many new and innovative renewable energy developments are proposed to decrease Australia's greenhouse emissions and reliance on traditional energy sources, it is important that robust data are collected to during pilot studies to best inform new developments. This monitoring plan has focused on protected species identified during a Commonwealth assessment against the Environment Protection and Biodiversity Conservation Act 1999. It will assist in understanding interactions and limitations for future commercially-sized Wave Rider energy converters.

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