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August 2025

Draft Marine Mammal Management Plan

Akaroa Wharf, New Zealand

Christchurch City Council

Contents

DRAFT

Foreword

This MMMP has been collated by Enviser Limited using the assessment content provided by the following consultants:

- Deanna Clement, Marine Mammal Expert, Cawthron
- Matt Pine, Underwater Acoustics and Marine Mammal Monitoring Expert, Styles Group Ltd

Abbreviations

MMMP: Marine Mammal Management Plan (this plan)
TTS: Temporary auditory Threshold Shift
PTS: Permanent auditory Threshold Shift
MMO: Marine Mammal Observer
MMOZ: Marine Mammal Observation Zone
EMMOZ: Extended Marine Mammal Observation Zone

1 Introduction

Christchurch City Council is proposing to replace Akaroa Wharf with a new structure built in the same location as the existing wharf, but shifted north by 1.5 – 2.5 m. In addition to the main wharf structure, two floating pontoons will be installed, one on the northern side and one on the southern side of the wharf. There is potential for the construction activities, particularly the pile driving required for the main wharf construction and the floating pontoon installation, to have effects on the marine mammal species present within Akaroa Harbour.

1.1 Purpose of the MMMP

This MMMP describes the management actions and monitoring that will be employed during the Akaroa Wharf construction works to minimise effects on marine mammal species that may be present within Akaroa Harbour. (Refer to Appendix A for the Akaroa Wharf project description.)

1.2 Species of interest

The species most likely to be present in the vicinity of the project area are Hector's dolphins (see Photograph 1), which regularly frequent Akaroa Harbour and are considered year-round residents, and to a lesser extent, New Zealand fur seals (see Photograph 2), which are seen within the wider Akaroa Harbour year-round. Southern right whales and humpback whales are also known to make seasonal visits to Akaroa Harbour and Banks Peninsula waters, while bottlenose dolphins, common dolphins and leopard seals visit occasionally (Clement & Pavanato, 2025).

Of these species, the Hector's dolphin is the only one recorded as a frequent visitor to the harbour waters and French Bay area within the vicinity of Akaroa Wharf. Hector's dolphins are listed as "Nationally vulnerable" by the New Zealand Threat Classification System and internationally as "endangered" (Baker et al. 2019) and are sensitive to disturbance from the types of underwater noise that results from general construction and marine piling activities.

Photograph 1: Upokohue/Hector's dolphin (Image credit: Dina Engel and Andreas Maecker ©)

Photograph 2: New Zealand fur seal (Image credit: Katherine Clements ©)

1.3 Underwater noise modelling

The Assessment of Effects on Marine Mammal (Clement & Pavanato, 2025) and this MMMP have been informed by the Assessment of Underwater Noise Effects on the Marine Environment (Pine, 2025). The underwater noise assessment modelled the spatial range where auditory injury, behavioural responses, auditory masking and overall audibility may occur in those species likely to be present within the project area.

Underwater noise modelling was based on 710 mm steel case piles being driven using percussive piling methods. The scenario modelled was for a pile at the outer end of the wharf with no mitigation methods. This represents the largest pile being driven in the deepest water where noise will be able to propagate further and is considered an appropriate 'worst case' envelope for the propagation of noise in this setting. The effects ranges for all other piling methods, pile types (such as the timber piles) and smaller sizes will fall within the stated ranges of this scenario.

In terms of overall audibility, modelling predicted that if no management or mitigation measures are employed percussive pile-driving noise was expected to be audible underwater across the harbour to Anchorage Bay near Wainui Wharf (~5 km away).

The potential onset of temporary behavioural responses was modelled at a group level (i.e. "all cetaceans" and "all pinnipeds" rather than by individual species). For all cetaceans (including Hector's dolphins), exposed individuals are predicted to react with low level behaviourally responses to the piling noise when they are within 502 m, but more moderate responses are predicted within 80 m (Pine, 2025). For all pinnipeds (including New Zealand fur seals) modelling predicted that low severity behavioural changes in pinnipeds may occur within 5,000 m from unmitigated percussive piling, while moderate behavioural changes in pinnipeds can be expected within 1,478 m (Pine, 2025).

Modelling also predicted the spatial ranges for the onset of permanent threshold shift (PTS) and temporary threshold shift (PTS) auditory injuries for marine mammals from unmitigated percussive impact piling methods. PTS and TTS refer to types of hearing damage caused by exposure to loud noises. PTS is permanent hearing loss or impairment and can occur suddenly through trauma or develop gradually over time from persistent loud noise. TTS refers to a short-term reduction in hearing loss which the marine mammal recovers from, when no longer exposed to the noise.

For Hector's dolphins, modelling indicates the potential spatial range of PTS onset is 189-209 m during unmitigated percussive piling (depending on season as sound propagates further in colder water) (Pine, 2025). For New Zealand fur seals, PTS could occur at a closer range of 15-16 m (depending on season) (see Figure 1) (Pine, 2025). The potential spatial range of TTS onset for Hector's dolphins during unmitigated percussive piling was determined to be 1,593 m and 175 m for New Zealand fur seals (Pine, 2025) (see Figure 2).

Hector's dolphins, which rely on high-frequency echolocation for navigation, foraging, and social communication, are also susceptible to auditory masking effects when anthropogenic noise reduces the dolphin's effective listening range and interferes with its communication or echolocation signals (Clement & Pavanato, 2025). Modelling indicates that during unmitigated percussive piling, at a distance of 1,336 m from the piling source, at least 50 percent of Hector's dolphins' active listening space may be lost due to masking, and within 208 meters, more than 75 percent of their active listening space may be reduced (Pine, 2025). For New Zealand fur seals, 50 percent listening space reduction occurs at 1,985 m.

These spatial ranges have informed the mitigation measures in this MMMP, including the size of the observation and shutdown zones. Once construction works commences, *in situ* underwater noise levels will be verified and if required, the mitigation measures will be updated.

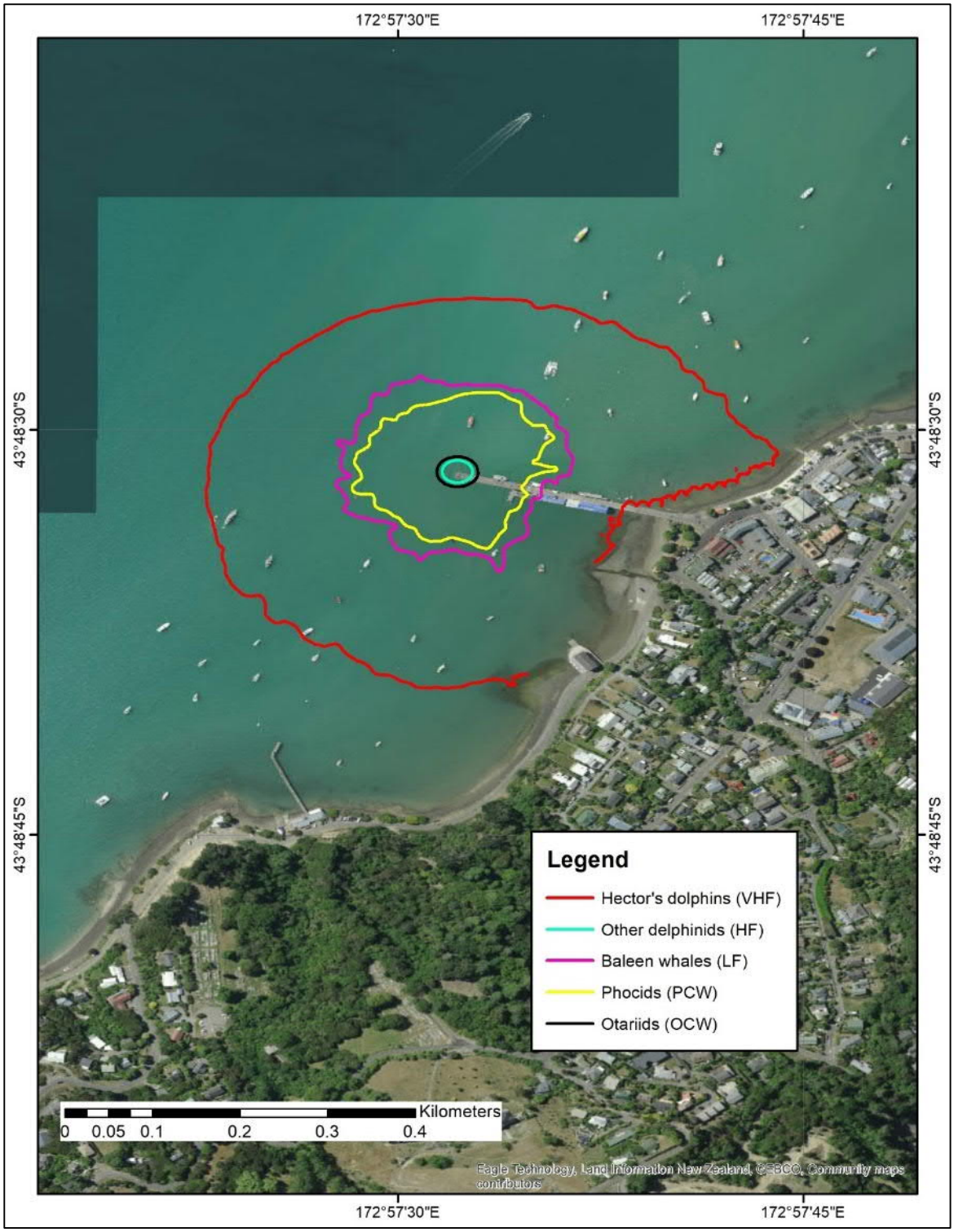

Figure 1: The predicted spatial ranges for the onset of permanent threshold shift (PTS) on marine mammals from percussive impact piling methods with no mitigation at the western edge of the proposed Akaroa Wharf area. Image used with permission from Pine (2025).

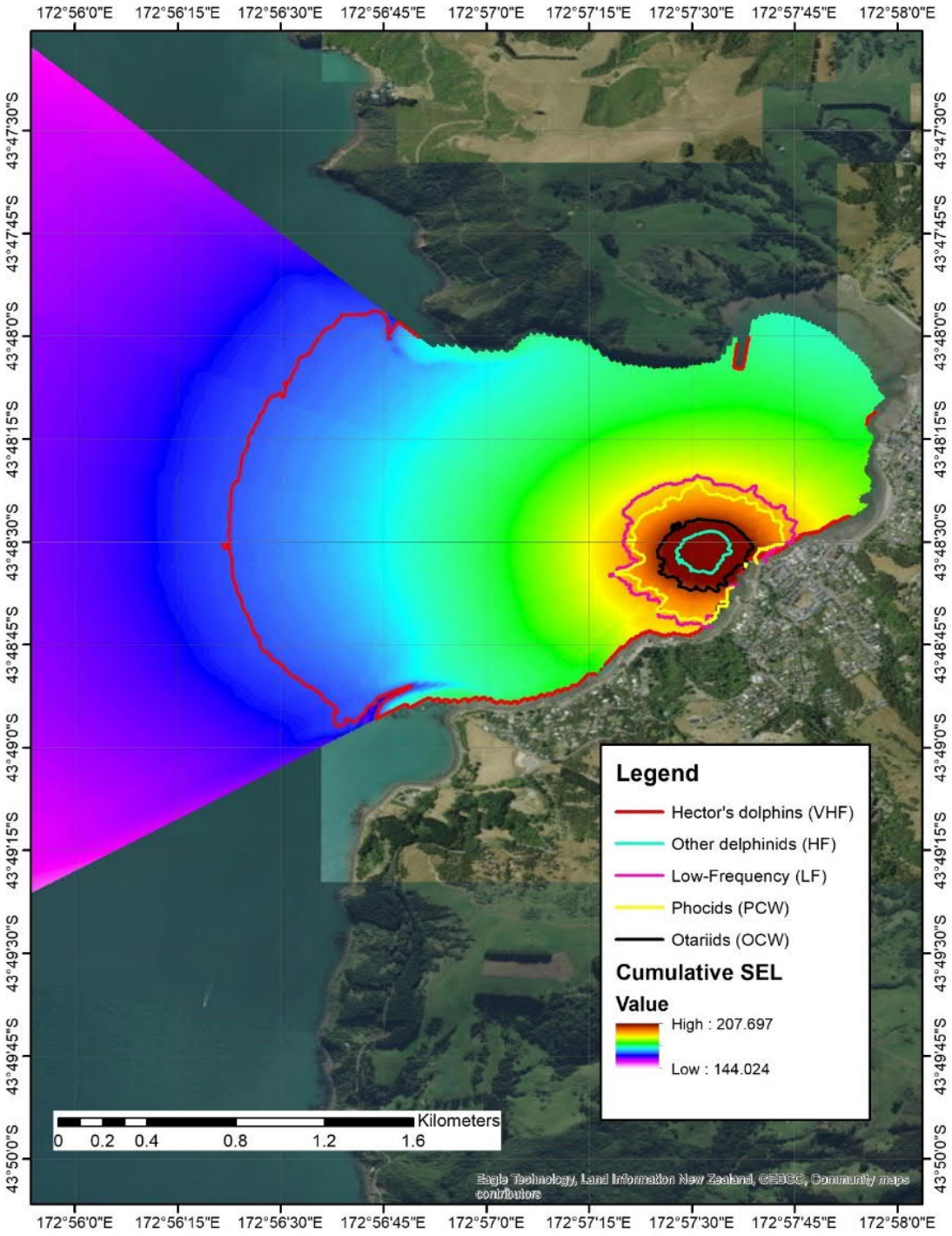

Figure 2: The predicted spatial ranges for the onset of temporary threshold shift hearing effects (TTS) on marine mammals from percussive impact piling methods with no mitigation at the western edge of the proposed Akaroa Wharf area. The colour map represents the unweighted cumulative sound exposure levels, $L_{E\text{-}24hr}$. Image used with permission from Pine (2025).

1.4 Roles and responsibilities

It is the responsibility of Christchurch City Council (CCC) to ensure that the staff responsible for implementing this plan understand and can implement the requirements of this MMMP. CCC is also responsible for ensuring any contractors working on the site understand and are able to implement

the requirements of the MMMP during their on-site work. Table 1 details the personnel responsible for implementing this MMMP.

Table 1: Summary of key contacts, roles and responsibilities

Role	Name	Contact
Engineer's representative	Jonathon Deaker	021 630 012
CCC Project Manager & Contact Person	Jane Benton	027 275 7498
Environmental Manager	Jared Pettersson (Enviser)	021 679838
Marine Mammal Observers (MMO)	TBA (Primary)	
	TBA (Will have completed the -approved MMO training)	
Main Contractor Project Manager	Gerome Mangalus (HEB)	027 531 0038
Foreman	TBA	
Subcontractor	TBA	
Technical Experts		
Marine Mammal Specialist	Dr Deanna Clement	deanna.clement@cawthron.org.nz
Underwater Noise Specialist	Dr Matt Pine	matt.pine@ocean-acoustics.com

1.5 Training requirements

To ensure construction crew are aware of the risks and the necessary management actions, all crew will attend the Marine Mammal Observation toolbox talk. This will be given by the Project Marine Mammal Specialist (Dr Deanna Clement, Cawthron) and the Project Environmental Manager (Jared Pettersson, Enviser Limited).

The Contractor will record training attendance. The Project Environmental Manager will train other relevant project personnel (i.e., site supervisors, project engineers, etc) as required and whenever new crew commence work on the project.

Reminders and updated information will be provided throughout the project.

The primary Marine Mammal Observer must be:

A suitably qualified and experienced person (holding a tertiary ecology or similar qualification and experience working with marine mammals, or a person with at least 2 years marine mammal observation experience from similar projects) that has successfully completed an appropriate MMO training course.

Any additional Marine Mammal Observers must be:

A suitably trained person that has successfully completed an appropriate MMO training course.

(The secondary MMO role may be performed by a member of the construction team, as required, provided they have successfully completed an appropriate MMO training course.)

Refer to Appendix B for details on MMO training requirements.

1.6 Statutory requirements

Upon consents being granted, Table 2 will identify the relevant consent conditions and where these are addressed in the MMMP.

Table 2: Relevant consent conditions to MMMP

Consent or Authority	Details	Section in MMMP
CRCXXXXXX	Condition X Content of MMMP	Entire
	Condition X Noise verification	Section X
	Condition X MMO	Section X
	Condition X Start procedures	Section X

1.7 Updating the MMMP

This MMMP is a live and controlled document that will be continuously reviewed and updated throughout the duration of the project. Any changes must be made in accordance with the relevant conditions outlined in resource consent CRCXXXXXX.

At the commencement of noise generating construction activities (i.e. piling), noise validation will be completed and the MMMP updated to ensure all noise management actions are appropriate. If the construction methodology or project design eliminates the need for steel piles, or otherwise significantly reduces the generation of underwater noise, the controls may be reduced to account for the reduction in potential effects/risks.

Shut-down zones will be established around the construction area to minimise any risk of hearing impairment (i.e., PTS/TTS) to marine mammals from pile-driving activities. The final size of these zone(s) will be confirmed once construction methodologies are confirmed and *in situ* underwater noise levels are verified but are anticipated to restrict any TTS effects to within 300 m or less from the piling source.

To maintain relevance, this Plan must also be reviewed at the following times and amended where necessary:

- Following any marine mammal entanglement incident or near incident.
- At the completion of each piling stage (timber jetty deck piling and steel pontoon piling).
- If the size of the piles changes or the piling method changes during the project.
- As any new marine mammal sighting or information data becomes available.
- If three or more shut-downs (due to the presence of marine mammals entering the shut - down zones during piling) occur within three consecutive days.

Following any update, the MMMP will be provided to Environment Canterbury for certification.

2 Environmental risk identification

The potential effects of the Akaroa Wharf replacement project on marine mammals were separately and comprehensively assessed (Clement & Pavanato, 2025). The assessment considered the potential effects associated with the project and identified pile-driving noise as the primary environmental risk factor and Hector's dolphin as the primary species of concern.

Pile-driving generates high source level noise that can impact marine mammals, which use sounds for communication, orientation, foraging and predator avoidance, resulting in behavioural responses (e.g. avoidance or attraction to the noise source), auditory masking, or physical hearing impairment or injury. Entanglement was identified as a potential indirect effect and measures to address it are provided in Section 4.3.1

The potential risks are summarised in Table 4 below. This includes an assessment of the residual risk, once the anticipated control or mitigation measures are implemented.

Table 4: Summary of potential effects on relevant marine mammal species from the proposed Akaroa Wharf replacement project (adapted from Clement & Pavanato, 2025).

Potential effect		Likelihood of effect	Significance level of unmitigated effect	Significance level of residual effect
General demolition/construction activities				
	Displacement effects (Behavioural/masking)	NA/Low	Nil to Negligible	Nil to Negligible
	Physical injury (TTS)	NA/Low	Nil to Negligible	Nil to Negligible
Pile-driving activities				
	Physical injury (PTS/TTS)	Low to High (species dependent)	Minor to More than Minor	Nil to Negligible
	Displacement effects (Behavioural/masking)	Low to High (species dependent)	Less than Minor to More than Minor	Negligible to Less than Minor
Other potential effects				
	Habitat loss/prey disturbance	NA to Low	Nil to Negligible	Nil to Negligible
	Entanglement	NA to Low	Nil to Less than Minor	Nil to Negligible

Table notes:

Likelihood of effect: Not Applicable (NA), Low (< 25%), Moderate (25–75%), High (> 75%)

Significance level: Nil (no effects at all), Negligible (effect too small to be discernible or of concern), Less than Minor (discernible effect but too small to affect others), Minor (noticeable but will not cause any significant adverse effects), More than Minor (noticeable that may cause adverse impact but could be mitigated), Significant (noticeable and will have serious adverse impact but could be potential for mitigation).

TTS: Temporary auditory threshold shift

PTS: Permanent auditory threshold shift.

3 Control measures

The construction activities, and level of underwater noise particularly, associated with replacing Akaroa Wharf necessitate appropriate control measures to safeguard local and visiting marine mammals.

The main activity with the potential to adversely affect marine mammals is pile driving (Clement & Pavanato, 2025), particularly steel pile casing. Possible entanglement is considered a low risk, potential indirect effect and is discussed separately in Section 4.3.1.

Due to the large predicted spatial range for the onset of temporary threshold shift hearing effects (TTS) on Hector's dolphins (for impact driving of steel piles), using a standard observed shut-down zone will be ineffective if no management and mitigation measures are employed, instead, a combination of mitigation and management measures is necessary. In the first instance, the mitigation measures will focus on reducing underwater noise emissions at the source. These will be supported by the establishment of a Marine Mammal Observation Zone (MMOZ) and shut-down procedures to manage any residual effects.

These measures are summarised in Table 5 and described in more detail in the following sections.

Table 5: Proposed management of adverse effects of construction activities on marine mammals in Akaroa Harbour (adapted from Clement & Pavanato, 2025).

DOC = Department of Conservation, CCC = Christchurch Council. BPO = best practical option.

Potential effects	Management goal	Proposed Management Measures	Reporting/monitoring
Physical and/or behavioural responses to underwater sound from construction activities	Avoid acoustic injury and minimise disturbance to marine mammals	Pile-driving activities • Use BPO to minimise underwater noise effects. • Establish a marine mammal management plan (MMMP) • Adopt soft-start/ramping-up procedures and choose plant/techniques on the basis of minimisation of underwater noise levels (e.g., vibro-driving preferred over impact-driving). • Reduce underwater noise levels at the source using a combination of trialled reduction measures. • Designated shut-down zones with dedicated, experienced marine mammal observer(s) to maintain a watch before, during and after any pile-driving activities (during daylight hours only). • Minimise the spread of piling stages over successive seasons.	• Measure actual underwater noise levels from pile driving and other construction activities as soon as practical and adjust mitigation actions (e.g. the size of the marine mammal observation zone) accordingly. • Record and report the type and frequency of any marine mammal sightings (i.e., visual and acoustic) and interactions before, during and after pile-driving activities (including absences and effort), in a standardised format. CCC to provide records to DOC at end of project (and make publicly available, if possible. e.g., web). Include behavioural data if possible.
Marine mammal entanglement in operational gear and / or debris	Minimise entanglement and aim for zero mortality	• Avoid loose rope and/or nets (i.e., keep all ropes and nets taut). All deck lines should be tied up when not in use or under some degree of tension. • Regular maintenance/inspection of properly tensioned silt curtains or other sediment containment gear, if in use.	• Nothing required, self-checking with up-to-date records available. • In case of a fatal marine mammal incident, carcass(es) recovered and further steps taken in consultation with DOC and Ōnuku Rūnanga.

Potential effects	Management goal	Proposed Management Measures	Reporting/monitoring
		• Ensure that all support vessels and other project activities have waste management plans in place. • Record all entanglement incidents or near incidents regardless of outcome (e.g., injury or mortality).	

3.1 Operational Best Management Practices

During all phases of the Project, the general principle guiding vessel operations will be to avoid, as far as practicable, any interaction with marine mammals. To minimise the attraction (or abandonment) of marine mammals to the project area, the Contractor will follow these operational management practices:

- Crew members are not permitted to carry out activities that could attract marine mammals to the project site (e.g. fishing) or feeding other wildlife (e.g., birds, fish).
- Minimising above-water and underwater noise to reduce the attraction of marine wildlife.
- Regular maintenance of all in-water equipment and vessels (e.g., lubrication and repair of winches, generators) to reduce the production of underwater noise. Regular maintenance records should be kept up-to-date and available for CCC or DOC to review upon request.
- Ensure that all noise suppression equipment, such as mufflers and ventilation baffles are maintained in good working order.
- Use only the minimal amount of artificial lighting necessary to reduce attraction of prey fish and predators.
- Adhere to best boating guidelines around marine mammals by any project vessels to minimise any avoidance responses (see Appendix C).

3.2 Control measures to minimise pile-driving effects

Because of the low to high (species dependent) risk rating and the potential for noise-sensitive species, especially Hector's dolphins, to occur in the harbour area, the following control measures will be employed to manage the risks of pile-driving activities on marine mammals:

- Adoption of Best Practicable Option for noise emissions (Section 4.2.1).
- Verification of the *in-situ* noise levels produced from pile-driving activities and comparison to an established underwater noise limit (Section 4.2.2).
- Monitoring by trained Marine Mammal Observer(s) (MMOs) and establishment of marine mammal observation zones (MMOZ) and shut-down zones (Section 4.2.3).

3.2.1 Best Practicable Option to reduce noise emissions

Adopting the best practicable option with noise reduction measures is the most effective option for minimising effects from underwater noise in the first instance. For this project, the preferred method for minimising underwater noise emissions is the use of vibro-piling whenever possible.

Vibro- and bore-piling methods were assessed by Pine (2025) and while piling duration is longer using these methods, the amount of noise radiated from the source is substantially less compared to percussive methods. This indicates that for vibratory and bore piling methods, a MMOZ of less than 300 m is feasible and appropriate to avoid TTS effects in Hector's dolphins. For percussive piling

methods, noise reduction methods are needed to achieve a reduce the larger TTS zone to the recommended observable MMOZ, 300 m or less.

These measures can be split into two types, operational or equipment adjustments and active noise reduction measures.

3.2.1.1 Operational/equipment adjustments

These measures should always be implemented to minimise the noise (and/or effects) as far as practical. These measures include:

- Vibro-piling methods are preferred over percussive piling methods wherever possible.
- Where percussive piling is required, use a sacrificial, non-metallic (e.g., preferably timber) hammer cushion cap (or dolly) between the hammer and the top of steel piles. Dampening the impact of the hammer will achieve appreciable reductions in both underwater noise and airborne noise.
- Use the smallest possible pile size that meets the operational need. The smaller the pile, generally the lower the noise level, subject to different piling methodologies.
- Timing of works. Drive the largest steel piles (the western piles associated with the pontoons) during or as close as possible to low tide to reduce noise generated in the water column.
- Limit the number of piles driven per day to reduce the per-day noise dose.
- Pile driving restricted to daylight hours to limit the total strikes within a 24 hr period. This reduces the noise exposure levels, as the total sound energy entering the marine environment is the important measure, and allows for hearing recovery periods (e.g. overnight).
- Restrict percussive pile driving operations to a single piling rig at all times within the entire project area spanning from the Akaroa Wharf site to the temporary berth at the Akaroa Boat Ramp.

3.2.1.2 Active noise reduction measures

Bubble curtains will be used in combination with the operational measures to reduce piling noise to a level that avoids TTS effects at distances beyond 300 m. Bubble curtains are known to reduce the amount of noise entering the water column (Clement & Pavanato, 2025) by surrounding the noise source (in this case, the pile) with a continuous vertical wall of bubbles.

Radiating sound is reduced by a combination of processes, and the effectiveness is determined by various aspects of the bubble curtain, including the bubble size and density, the distance from the pile, and the thickness of the bubble curtain. The design of the bubble curtain needs to achieve a dense continuous curtain of bubbles around the pile, from the seabed to the water surface. It is expected that the design of the bubble curtain equipment may require adjustments and improvements to achieve the desired performance.

3.2.2 Verification of *in-situ* underwater noise levels

Acoustic monitoring to characterise *in-situ* noise levels, confirm compliance with the underwater noise limit and to evaluate the effectiveness of the bubble curtain, shall be undertaken as soon as possible once works commence.

The noise monitoring should be undertaken, at a minimum, at the compliance monitoring point, which shall be located 300 m from the piling source with other sample points along a distance gradient.

The underwater noise at that measuring point shall have a (VHF weighted) cumulative SEL ($_{LE24\text{-}hr}$) limit of no more than 144 dB re 1 μPa^2•s at 300 m.

The predictive underwater noise propagation modelling (Pine, 2025) will be validated by the Underwater Noise Specialist. The Marine Mammal Specialist will then recommend any modifications to the proposed management measures (i.e., size of shut-down zones, pile strikes per day etc). If only timber piles are being driven, the size of the MMOZ may reduce significantly.

To assist the evaluation of noise levels, the contractor must keep good and accurate records of when piling activity starts, stops and the type of activity (i.e. method). This includes any drilling operations. This information will be used to extract the piling noise levels from the collected data.

3.2.2.1 Methods to characterise noise

To characterise the underwater noise, measurements of the underwater noise shall be taken as soon as practicable and during normal operating conditions:

- on each of the different pile diameters used, or at a minimum the largest steel pile
- for sufficient time to characterise the noise produced by the piling activity
- measured as the single strike Sound Exposure Level (SEL) that will be accumulated over a 24-hr period
- SEL shall be derived from the maximum combined noise within mid-to-higher water depths (not the surficial layer), from the impact driven and vibro-driven piling operations over sufficient time to obtain sufficient SELs for the day.

The methodology for collecting the underwater noise measurements will be determined by the underwater acoustician, but will likely include:

- Measurements taken during good weather conditions (Beaufort scale 0-3) to minimise natural noise sources (waves etc).
- Soundtrap HF autonomous recorders to continuously record all sounds from these same fixed locations, using the following method:
    - Installation of the recorders on bottom-mounted moorings.
    - The recorders will be attached to the line in a way that prevents noise contamination from the mooring or the connection to the mooring.
    - Recordings shall be collected for a full day's piling if weather and tidal conditions allow.
- Additional mobile noise measurements may be collected, also using SoundTrap HF recorders. This will be achieved by:
    - Deploying a recorder(s) from a small vessel with a tether to reduce noise contamination from the vessel.
    - Measuring sound at multiple locations around the pile driving source (i.e., multiple bearings), multiple distances (log based, i.e., 50m, 100m, 200m, 500m, 1000m) and at two depths for each location: 1-2m and 5m or mid depth in shallow water locations.

Recordings should be of sufficient duration to capture the variations in piling noise during pile driving.

3.2.3 Establish a Marine Mammal Observation Zone

A marine mammal observation zone (MMOZ) shall be established (and its size confirmed following *in situ* underwater noise level verification) that goes out to 300 m or less from the noise source (at both piling locations – Akaroa Wharf site and Akaroa Boat Ramp), to protect Hector's dolphins, other cetaceans, and New Zealand fur seals.

The zone size of 300 m (or less) for all marine mammals has been informed by:

- the Assessment of Effects on Marine Mammals (Clement & Pavanato, 2025)
- noise propagation modelling within French Bay (Pine, 2025)
- the shape of French Bay
- the lack of appropriate viewing platforms
- the year-round presence of Hector's dolphins
- the implementation of active noise reduction techniques (i.e. bubble curtains)
- previous research demonstrating that for Hector's dolphins, a single, elevated observer's reliability at sighting an animal significantly decreases after a distance beyond 300 m (Dawson et al. 2004).
- Previous research on Hector's dolphins' immediate and short-term behavioural responses to pile-driving noise in Lyttelton Harbour (Clement et al. 2025)

Monitoring of the MMOZ will involve at least one dedicated, experienced marine mammal observer (MMO) maintaining an effective lookout station at an elevated, fixed platform near the piling site. The MMO may need to adjust their position from time-to-time to account for obstructions and conditions.

3.2.4 Standard operating procedures (SOP) for MMOZ

This section discusses several standard operation procedures (SOP) that must be undertaken by contractors during piling activities to protect against any noise effects. These include pre-start, soft start, normal operation, stand-by operation, shut-down procedures and post-piling observation.

The marine mammal observer (MMO) associated with the pile-driving works will be familiar with the SOPs and will document the process. A record must be kept of all sightings, delayed start-up or enforced shut-downs due to the presence of marine mammals. Details of any shut-down event should be captured on the Marine Mammal Sighting Form (see Appendix D).

The MMO must have equipment that enables them to be in constant contact with the piling crew, this should be a VHF/UHF radio by preference.

3.2.4.1 Pre-start procedure

To minimise the risk to any marine mammals already present in French Bay overnight prior to piling starting in the morning (for piling at Akaroa Wharf) and Childrens Bay (for piling for the temporary berth at the Akaroa Boat Ramp)), a pre-start scan should be undertaken by at least two MMOs[1] first thing in the morning (and after any extended breaks in piling greater than 1 hour) for at least 30 minutes prior to piling commencing. This may require the use of a boat to ensure the area is adequately covered.

If steel piles are not being driven and noise monitoring indicates a much-reduced noise footprint, the risks posed to marine mammals will be reduced. If this is the case, the second MMO may not be

[1] One primary MMO (Suitably Trained and Experienced) and one secondary MMO (Suitably Trained). Refer to Section 1.5 for training requirements.

required to undertake the survey. The primary MMO, or another properly briefed staff member could undertake this wider survey before work starts for the day. This will be assessed and confirmed upon completion of in situ underwater noise verification.

If any mammal(s) are present in or near to the MMOZ (for either French Bay or Childrens Bay depending on the location of piling works), or within French Bay/Childrens Bay (but outside the MMOZ) prior to pile-driving commencing, operations will be suspended until the mammal(s) has relocated out of the MMOZ and clear of French Bay/Childrens Bay. This is to ensure that mammals are not present when piling starts as the noise levels may dissuade them from leaving to more open waters.

If steel piles are not being driven, the need to delay whilst an animal is in French Bay/Childrens Bay can be reassessed following noise monitoring.

MMOs should focus on the Marine Mammal Observation Zone (MMOZ) but should also scan beyond the zone and up to a 1 km radius from the source, where visibility allows. Observations should be made from an elevated vantage point if possible (i.e., in the absence of a high vantage point, a large observation zone may require an additional vessel to provide a sufficient observation platform).

3.2.4.2 Soft-start procedure

If marine mammals have not been sighted within or are likely to enter the MMOZ during the pre-start procedure, the soft-start procedure may commence. The 'soft- start' or 'ramping up' procedures shall comprise a gradual increase of piling energy to normal operating levels over a period of 5-10 minutes. The purpose of a soft start is to give any nearby unseen mammals (i.e. close to or just outside the marine mammal observation zone (MMOZ)) an opportunity to move away from the area before sound levels increase to an extent that may cause discomfort or injury. This process is also expected to help mediate more moderate and some low behavioural responses from nearby animals, giving them a chance to habituate to the pulses of sound over time before increasing the noise level.

The soft start procedure should also be used after long breaks of more than 30 minutes in piling activity when associated visual observations have ceased. Visual observations for marine mammals within the MMOZ should be maintained by the MMO(s) throughout soft starts.

In some instances, such as pile testing which requires immediate full energy, soft starts will not be possible. Testing situations will occur only in optimal visibility conditions (i.e., MMO can easily and confidently observe the MMOZ for the required period) when the designated MMO shall ensure that the exclusion zone has been closely monitored for 30 minutes and that no mammals have been present in that period.

3.2.4.3 Normal operating procedure

If marine mammals have not been sighted within or are not likely to enter the MMOZ during the soft-start procedure, piling may start at full impact energy. MMO(s) should continuously undertake visual observations during piling activities and shut-down periods. The pre-start procedure should be used after breaks longer than 30 minutes in piling activity and visual observations, or if visual observations are hampered by poor visibility.

3.2.4.4 Stand-by operating procedure

If a marine mammal is sighted near the observation zone during the soft start or normal operating procedures, the operator of the piling rig should be placed on stand-by ready to shut down the piling rig. The MMO(s) should continuously monitor the marine mammal in sight.

3.2.4.5 Shut-down procedure

If a marine mammal is sighted within or about to enter the shut-down zone, the piling activity must be stopped immediately. If a shut-down procedure occurred, piling can only restart if:

- The sighted marine mammals have been observed to move outside the observation zone, or
- 30 minutes have lapsed since the last marine mammal sighting

When piling restarts, it shall recommence using the soft-start procedure.

3.2.4.6 Post-piling observations

The MMO(s) should maintain a watch of the MMOZ (and beyond) for at least one hour after pile driving activity has ceased (or as long as daylight allows). Observers are looking for any indication of marine mammal presence in the wider vicinity to evaluate the duration of effect that piling activities might be having.

3.2.4.7 Poor visibility procedure

Poor visibility is defined as sea fog (on the water surface), winds greater than 20 kts and/or rain or sun glare that obstructs more than 50 percent of MMOZ. If any of these conditions occur to an extent that makes it too difficult for the MMO to visually inspect the MMOZ for marine mammals, then piling activities should be postponed until conditions improve. If the MMOZ is prone to strong sea chop or afternoon sea breezes (i.e., wind greater than 20 kts), and does not adversely affect piling operations, an additional MMO should be employed at a second observation location to ensure adequate coverage of the MMOZ.

If, during periods of poor visibility, there are more than three shut-downs due to marine mammals within the MMOZ, piling activities should be stopped for the remainder of the day.

3.2.5 Seasonal piling

Piling work has been programmed so that most of the piling work occurs over the cooler months of late autumn/winter when fewer animals are present in the harbour.

3.3 Control measures to minimise other effects

Possible entanglement has been identified as potential effect resulting from the Project. The risk of this effect is considered low and will be managed by the control measures specified below.

3.3.1 Possible entanglement

Marine debris from construction activities presents a possibility of entanglement for marine mammal species with whales, dolphins and pinnipeds often attracted to floating debris. Marine debris from coastal developments may include lost ropes, support buoys, bags and plastics. Loose thin lines and nets (including silt curtains) can pose an entanglement risk, especially when nets, ropes and lines are lost or discarded.

Construction-associated marine debris can be prevented in well-maintained coastal projects with proper waste management programmes. The possible entanglement risks posed by this project will be managed through the following controls:

- Waste management protocols outlined in the Project EMP (e.g., secure onboard storage of lines, nets, and waste) to comply with the Maritime Protection Rules Part 180 (Dumping of Waste or Other Matter).

- Hanging silt curtains (if used) will be properly tensioned with plenty of spaces between the seabed and material for animals to manoeuvre under and around with few opportunities for entanglement.
- Fully enclosed standing silt curtains (if used) will be regularly inspected to check there are no openings for marine mammals to enter the contained area.
- During the demolition phase, debris shall be cleared from any encircling debris boom at the end of each day, or earlier if adverse weather is predicted during the day. The aim of this measure is to prevent debris loading the boom, causing a rupture and loss of debris to the wider harbour.

4 Monitoring and reporting

Monitoring and reporting measures will allow the CCC Project Manager and Contractor to adjust mitigation where necessary to manage any risk of impacts on marine mammals. Monitoring and reporting requirements are set out in the following sections.

4.1 Monitoring

Monitoring will be undertaken by the MMOs, the Underwater Noise Specialist and the Marine Mammal Specialist. Monitoring focuses on behaviour responses of marine mammals to piling using visual observations by the MMO(s) on the piling platforms (and/or any alternative observation platform/vessel) and passive acoustic detections of marine mammals' presence around Akaroa Harbour.

Baseline stations were established across Akaroa Harbour in 2023 (see Pine 2023), and it is recommended that underwater acoustic monitoring continues at the established baseline stations while pile-driving activities are underway. Combining visual and passive acoustic monitoring data will determine marine mammal behavioural responses to the various pile driving activities and noise levels. It will also enable mitigation improvements, for example, a more effective-sized MMOZ or better observation techniques.

4.1.1 Visual monitoring

Before, during and after pile driving operations, the MMO(s) must visually monitor the area around the pre-determined MMOZ from the piling activity as well as scanning the wider area of the Harbour. Each observer will have electronic or hard copies of the Marine Mammal Sighting Forms (Appendix D) with them at all times. When a marine mammal is sighted this will be reported on the sighting form sheets.

- What species of marine mammal is sighted?
- Date and time the marine mammal is sighted.
- At what stage of piling operations is the marine mammal sighted (e.g., pre-start, soft start, normal operation, stand-by operation, shut-down or post operations)?
- At what approximate distance is the marine mammal visible?
- Heading and distance from the observer location (or vessel if on water).
- Direction in which the animal is travelling.
- If the marine mammal is present while the pile driving operation changes, what is its reaction (e.g., does it immediately leave, does it leave and return, does it stay)?
- Short description of the animal(s) and their behaviour.
- Mitigation action taken, if any.

- Observer name and position.
- Photographs and video footage are recommended.
- Local weather conditions and sea state.

Marine mammal sightings will be logged and reported using the form in Appendix D. Through its normal inspection and validation procedures, CCC will undertake periodic audits of the MMO performance, qualifications, and effectiveness. The CCC personnel undertaking the audit(s) will also have attended and passed an approved MMO training course.

4.1.2 Underwater acoustic monitoring

Passive underwater acoustic monitoring within the project area will occur before, during and after piling activities using the established baseline stations (see Pine 2023) across Akaroa Harbour while pile-driving activities are underway. This monitoring can assist in verifying actual sound levels while determining the potential presence of any behavioural effect(s) and at what sound level(s) they may be occurring. These results can therefore help determine the efficacy of implemented management actions for further monitoring throughout future wharf construction projects in Akaroa Harbour.

5 Department of Conservation contact

A central contact point should be established with DOC to obtain up-to-date regional sighting information for the duration of the project, including any sightings of visiting baleen whales or orca. With this information, the MMO can anticipate and verify the potential presence or absence of these species and any other animals sighted in or near the project area. The MMO should also monitor news and social media for any information about marine mammals reported in the wider Banks Peninsula region.

In addition, CCC shall collate and share any observer sighting data with DOC at completion. Contact persons and contact details:

- DOC Contact: TBC

6 Reporting

The following table sets out the reporting frequency.

Table 5: Written reporting requirements

Information	Timeframe
Marine mammal observer watch and sighting forms must be provided to the CCC Project Manager	Weekly
Provide marine mammal observation sheets and any monitoring data to DOC	At the end of the project
Noise verification data collated and reported to CCC Project Manager and DOC	Provide relevant reports to DOC within two weeks of providing to Environment Canterbury
Completion Report	Within one year of completing the project

7 References

Baker CS, Boren L, Childerhouse S, Constantine R, van Helden A, Lundquist D, Rayment W, Rolfe JR 2019. Conservation status of New Zealand marine mammals, 2019. New Zealand Threat Classification Series 29. Department of Conservation, Wellington. 18 p.

Clement D, Pavanato H. 2025. Replacement of Akaroa Wharf: assessment of effects on marine mammals. Nelson: Cawthron Institute. Cawthron Report 4105. Prepared for Christchurch City Council.

Clement DM, Pavanato H, Lenky C, Pine MK. 2025. Immediate and short-term effects of pile-driving on Hector's dolphin in Lyttelton Harbour, Aotearoa New Zealand. Frontiers in Marine Science. Volume 12. DOI: 10.3389/fmars.2025.1554536

Dawson S, Slooten E, DuFresne S, Wade P, Clement D. 2004. Small-boat surveys for coastal dolphins: line-transect surveys for Hector's dolphins (Cephalorhynchus hectori). Fishery Bulletin. 102(3):441–451.

Pine M. 2023. Underwater Noise Effects on the Marine Environment. Pile driving for Drummonds Wharf. Prepared for Christchurch City Council. 21 November 2023.

Pine M. 2025. Underwater Noise Effects on the Marine Environment. Akaroa Wharf Redevelopment. Prepared for Christchurch City Council. 24 July 2025.

8 Applicability

Enviser Limited has prepared this report for Christchurch City Council in accordance with the agreed scope. No other party, aside from Christchurch City Council and other parties involved in delivering the project, may rely on this report, or any conclusions or opinions within it, for any purpose without the express written permission of Enviser Limited. This does not preclude the use of this report to inform the consenting of the project.

The opinions and conclusions within this report are based on the information that was viewed during the preparation of the report.

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9 Appendices

Appendix A – Project description

Akaroa Wharf has reached the end of its design life, and it is no longer economically viable to maintain the existing structure. CCC is seeking to rebuild a new wharf in the existing wharf's location. The new wharf structure needs to accommodate the modern needs of both commercial and recreational wharf users and will incorporate floating pontoons on both the northern and southern faces to meet the demand for additional berth space.

The existing wharf will be demolished, using standard deconstruction techniques staged from marine based plant. Floating booms will be installed to prevent the loss of floating debris, piles will be removed or cut at seabed level.

Key features

The Akaroa Wharf will be rebuilt in the existing wharf's location but shifted north by 1.5 – 2.5 m. The wharf will be approximately 185 m long and 8 m wide for most of its length and the existing buildings will be left in their current state. The new wharf will follow a similar form to the existing wharf but with the following features of interest to the marine mammal management:

- The proposed wharf will be offset from its existing alignment by 1.5 – 2.5 m to the north.
- New floating pontoons will be arranged on the northern and southern faces of the main wharf. The pontoons will be accessed from the main wharf by gangways.
- Wharf materials will include reinforced concrete decking, steel-encased concrete piles, timber fender piles and timber deck elements along with various wharf fittings (bollards, lighting etc).
- To facilitate construction, a small loading ramp will be constructed on the southern side of the Akaroa boat ramp. This will require a temporary reclamation, disturbance of the seabed, placement of geotextile, granular fill and rip rap protection. 2-4 steel piles (610mm diameter) will be driven along the southern side of the existing boat ramp to form a training wall to facilitate the barge loading/unloading.
- The seaward approach to this ramp will require dredging to facilitate barge access. The dredge channel will extend approximately 90 m from the shoreline, be approximately 30 m wide. In total, approximately 1,500 m^3 of seabed will be dredged with the spoil removed to/placed either to the south of the berth pocket, or to the west where existing dredge spoil, from dredging for the boat ramp access channel, is currently placed. Dredging will be undertaken via mechanical excavator, either based on a barge, or from shore at low tide, or a combination of both.

Wharf construction methodology

The construction methodology will be finalised following engagement of the Lead Contractor, but is expected to include the following:

- Construct the 'L-wall' to provide support and staging space for the piling.
- Temporary platforms/grillage installed on the capping beam to allow the piling rig to advance to the next bent. Temporary piles, the same diameter (or smaller) as the permanent piles may be installed to support the temporary works.
- Installation of 44-55 steel-cased concrete piles (710 mm diameter) for the main wharf, which will be socketed into the underlying basalt.

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- Vibro piling methods (using a 100-ton crawler crane with an ICE 28RF vibro hammer) will be used to drive the piles as far as possible. This is a variable frequency, resonance free hammer that minimises vibration and reduces noise.
- A percussion piling hammer will then be used to drive the piles until the desired embedment into the basalt is achieved. If the required embedment cannot be achieved with percussive piling, the pile may need to be removed, and a drill used to pre-drill a socket into the basalt before the pile is re-driven.
- Piles to be filled with concrete and the capping beams put in place.
- A second, marine-based piling crew, will undertake a similar operation with a piling rig based on the barge. The marine-based rig will work from the outer end, install piles and then demolish the existing wharf. Once it has met up with the land-based rig, it will assist the land-based operation with the capping beams and placement of concrete in the piles. The marine-based plant will also be used to remove all the old timber piles that clash with the new, with the remainder cut at seabed level using hydraulic shears. (Note, piling operations will occur at a single rig at all times to limit cumulative noise.)
- Install 18 intermediate timber piles.
- Install formwork and pour the topping slab (concrete deck).
- Install fender piles (up to 30, driven into the seabed but not socketed into the basalt).
- Install floating pontoons (north and south) including the piled platforms, gangways and associated services (water, power and fuel on the southern pontoon only). Approximately 12-16 steel piles (710 mm diameter) are expected to be required.

Appendix B - Marine mammal observer (MMO) requirements

As many of the control measures are triggered by the sighting of a marine mammal, a key part of these measures is having a MMO on continuous watch throughout pile driving operations. All MMOs on the project will, at a minimum, have attended and passed a MMO training course specialised in construction observing methods. The Primary MMO shall also have experience undertaking MMO duties.

The MMO training course comprises two parts, an online component and a practical component, these will cover:

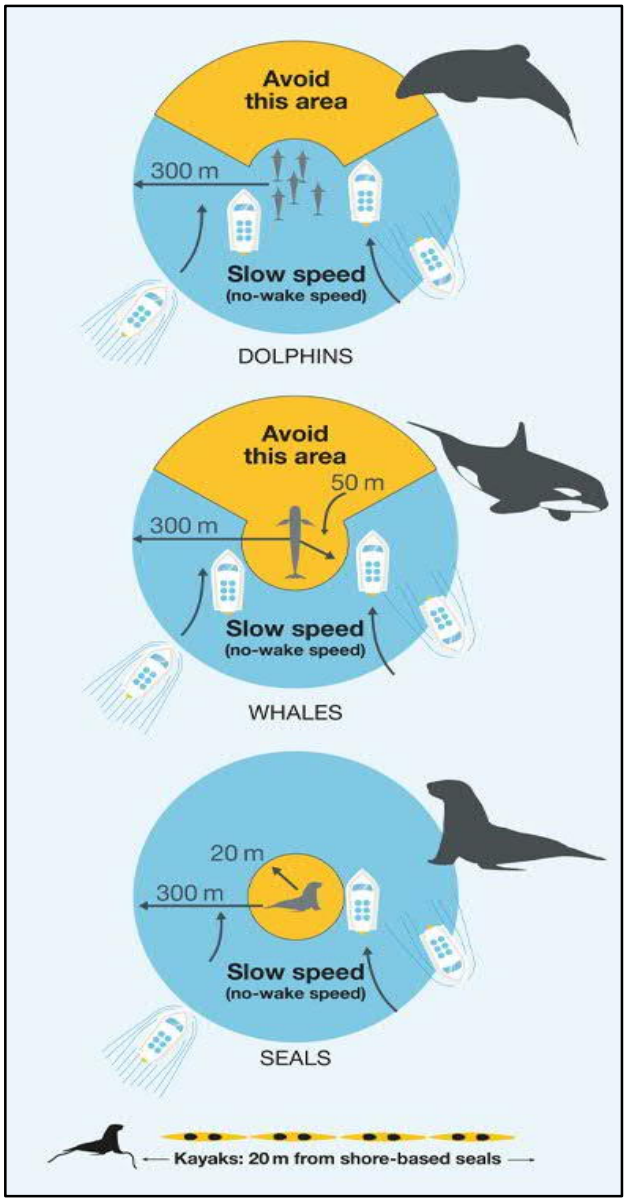
1. Online component
    - NZ law and requirements of the code
    - The role of observers
    - NZ marine mammals
    - Marine Mammal Acoustics and underwater sound
    - Visual observations
    - Navigation
    - Weather and Environmental conditions
    - Passive acoustic monitoring
    - Vessel health and safety
    - General observer issues

2. Practical component
    - MMO equipment
    - Navigation (compass use, bearings etc)
    - Calculating distance (reticule binoculars etc)
    - Plotting marine mammal detections and track logs
    - Marine Mammal identification
    - Detection procedures
    - Completing DOC reporting forms

The observer(s) has two general duties:

1. To detect, record and report the presence of marine mammal within the wider operations area.
2. To enforce noise control measures, including documenting any action taken (if necessary).

Appendix C - DOC guidelines for vessel interactions



Appendix D – Marine Mammal Sighting Forms

Date	Pile driver type/name	Pile number	Time at start of encounter	Time at end of encounter

Observer name	Location / position on land	Water depth (metres), Beaufort, glare:

Species	Bearing/angle to animal (when first sighted)	Distance to animal (when first sighted)

Description (include features: size, colour and pattern, shape and position of dorsal fin, direction and shape of blow)	Total number	Number of adults
	Number of juveniles	Number of calves

Behaviour (at start of sighting and any changes observed relative to changes in pile driving activity) (Feeding, resting, travelling, socialising, breaching, bowriding etc – see reference sheets)	Photograph taken Y N Direction of travel (compass) N S NE SW E W SE NW variable stationary

Direction of travel (relative to platform) Towards Away Parallel (east or west direction) Variable Stationary Other (explain)	Piling activity at first animal detection Normal Soft start Pre-start Post-observation Stand-by Shut-down	Piling activity at last animal detection Normal Soft start Pre-start Post-observation Stand-by Shut-down

Time animals entered mitigation/exclusion zone	Action taken None required Delayed start Stand-by Shut down	Time animals left mitigation/exclusion zone
	Length of time mitigation employed	

MARINE MAMMAL OBSERVER WATCH LOG

Observer name and location: ……

Observer watch start/end times: ……..

Piling start/end times……

START A NEW LINE FOR EACH NEW START-UP OF PILE DRIVER.

RECORD FOR ALL WATCHES EVEN IF NO MARINE MAMMALS ARE SEEN

Date / time	Pile number	Pre-start		Soft Start		Normal operation		Post-observation	
		Observer initial	Mammals sighted?	Observer initial	Mammals sighted?	Observer initial	Mammals sighted?	Observer initial	Mammals sighted?

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