APPENDIX 17

ASSESSMENT OF EFFECTS ON MARINE MAMMALS

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

New Zealand Government
Te Kāwanatanga o Aotearoa

CAWTHRON

Shipyard and drydock facility at Marsden Point, Whangārei Harbour: potential construction and operation effects on marine mammals

Cawthron Report 4261

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Shipyard and drydock facility at Marsden Point, Whangārei Harbour: potential construction and operation effects on marine mammals

Deanna Clement

This report has been prepared for Ministry of Business, Innovation and Employment in respect of its application for all approvals under the Fast-track Approvals Act 2024 for the shipyard and drydock facility at Marsden Point, Whangārei Harbour. The Panel appointed to consider the application may rely on this report for the purpose of making its decision under the Fast-track Approvals Act 2024.

This report has been prepared in accordance with the Environment Court's Code of Conduct for expert witnesses, contained in the Environment Court's Practice Note 2023. The author of this report agrees to comply with the Code of Conduct, and confirms that unless otherwise stated, the issues addressed in this report are within the area of expertise of the author. No material facts have been omitted that might alter or detracted from the opinions expressed in this report. The author has worked as a marine mammal scientist for almost 25 years in Aotearoa New Zealand. She has authored (and co-authored) numerous publications and articles for both academia and the public and private sectors. She led and wrote the 2021 national guidelines for open ocean aquaculture led by Fisheries New Zealand and the chapter on underwater noise / ocean sound for the Ministry for the Environment's 2024 environmental attributes stocktake.

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Executive summary

Ministry of Business, Innovation and Employment (MBIE) is proposing to develop new shipyard and drydock facilities in Whangārei Harbour, next to Northport Limited's existing wharves. It is intended that these facilities will provide vessel maintenance, repairs and servicing for large commercial, navy and private vessels (up to 230 m). MBIE is seeking a package of consents to authorise this proposed development, which is listed in Schedule 2 of the Fast-track Approvals Act 2024. MBIE has contracted the Cawthron Institute to investigate potential effects of construction and operation of the facility on local and regional marine mammal species.

Many of Aotearoa New Zealand's marine mammal species live or pass through the northeastern coastal waters of the North Island. The species most likely to be present in the vicinity of the proposal are bottlenose / terehu and common dolphins / aihe, orcas / maki and Bryde's whales. Other species of interest include New Zealand fur seals / kekeno, leopard seals / popoiangore, and southern right / tohorā and humpback whales / paikea, as they are more seasonal visitors to the wider Te Ākau Bream Bay area.

The potential effects of the proposed shipyard construction that are most relevant to marine mammal species in the Whangārei region are: physical hearing injury and / or habitat avoidance due to the associated increase in underwater noise production from pile-driving activities. The likelihood of these effects occurring is moderate to high, and the potential consequences (i.e. injury or death of a marine mammal) are considered significant for some species without mitigation or additional management actions.

To ensure that the necessary and appropriate measures are in place to minimise these potential adverse effects to acceptable levels, several best management practices and mitigation actions (including source noise reduction, shut-down zones and real-time underwater acoustic monitoring) are required and their effectiveness regularly reviewed. Further details and information around these management and mitigation actions have been developed in a separate draft marine mammal management plan in consultation with both marine mammal and acoustic experts.

With these management and mitigation actions in place, any adverse effects from construction and operation activities are expected to be sufficiently minimised and any residual effects appropriately managed.

1. Introduction

Ministry of Business, Innovation and Employment (MBIE) is proposing to construct a new shipyard with drydock facilities at Marsden Point within Whangārei Harbour. The project will involve the development and operation of a marine maintenance facility abutting the western side of the existing Northport Limited's (NPL) port facility at Marsden Point. It includes a reclamation, vessel haul-out system, and associated wharf structures, dredging and supporting infrastructure. MBIE is seeking a package of consents to authorise this proposed development (Figure 1).

MBIE have contracted Cawthron Institute (Cawthron) to provide a technical assessment of the potential effects of the construction and operation activities on local and visiting marine mammals.

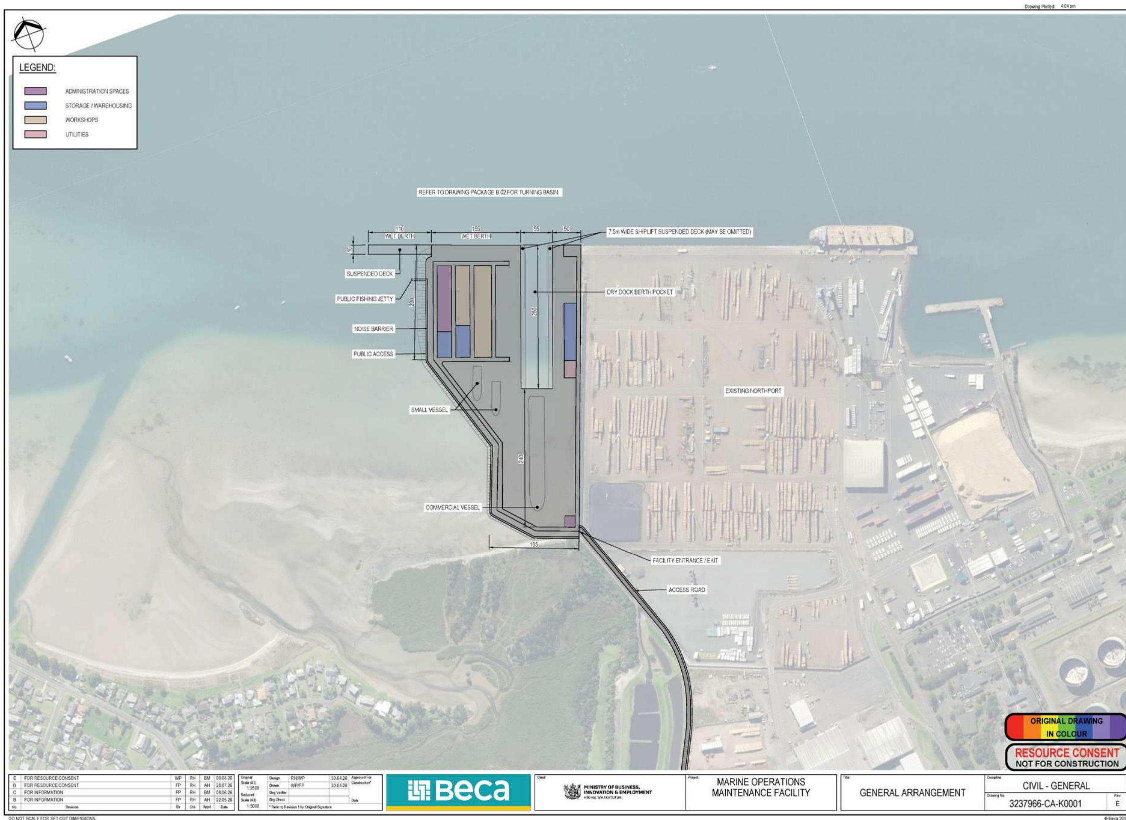

Figure 1. Layout of the proposed Ministry of Business, Innovation and Employment shipyard and drydock construction components next to Northport Limited's current facilities. Source: BECA (2026).

1.1 Scope of assessment

This report provides an assessment of potential effects on marine mammals from the construction of the shipyard and drydock facility. The report includes descriptions of the proposed reclamation activities and the existing environment from a marine mammal perspective, focusing on the following key assessment components:

1. Desktop review of the existing environment in terms of marine mammal species likely to be in the general vicinity of the proposed activities.
2. Review of national and international literature on the effects of reclamation and construction activities on marine mammals.
3. Assessment of the overall risk of potential effects in terms of their scale, duration / persistence, likelihood and possible consequences while taking into consideration findings from other project assessments.
4. Recommendations of possible management and monitoring actions to the extent required.

Limitations

Some of the detailed designs regarding the construction aspects of the project have yet to be finalised.[1] For this reason, our assessment has been undertaken for all potential methodologies and, in particular, those activities that require careful management from a marine mammal perspective, in case they are utilised.

[1] Concept design plans provided as of 8 May 2026 by BECA (2026).

2. Project overview

The shipyard and drydock facility will include a reclamation of approximately 9.7 ha. The marine maintenance operations facility will provide vessel maintenance, repairs and servicing, including but not limited to cleaning, painting and repair of commercial and naval vessels – for example, Cook Strait ferries and Royal New Zealand Navy logistics vessels, along with other vessels such as international freight vessels and super yachts. The facility has design capacity to accommodate vessels approximately 50 m to 230 m in length with displacement between 500 t and 28,000 t.

Key components of the project include:

- reclamation of seabed for hardstand and facilities, contained by piled quay walls and sloped rock revetments
- a 'cutout' to the reclamation where a vessel haul-out system is to be located, being either a floating drydock or shiplift or other lifting mechanism
- construction of a piled wharf structure to accommodate vessels either temporarily (before / after haul-out), or for extended periods where works not requiring haul-out can be undertaken
- dredging stage one: capital and maintenance dredging associated with construction and ongoing operation of the marine maintenance operations facility, including a berth pocket and a vessel turning basin to provide for safe navigation
- dredging stage two: capital dredging to ensure sufficient volume of dredge spoil is available to construct both the NDD and Northport's Vision for Growth development
- fixed plant and buildings to accommodate marine maintenance activities and materials
- sufficient working and laydown areas for marine maintenance operations, including the ability to transfer vessels to hardstand
- access to and around the marine maintenance operations facility, including a landside area for staff car parking
- public access around the edge of the reclamation to a public fishing platform.

The construction period is estimated to be approximately 3 years from mobilisation to completion of the civil infrastructure work, with a further or overlapping period of approximately 12–18 months to complete the development of the buildings (BECA 2026). Depending on which option is preferred – floating drydock or shiplift – a period of around 6 months is anticipated for the installation and commissioning of a shiplift device following the civil infrastructure completion.

2.1 Marine construction components and methodology

Formation of reclamation containment structures[2]

Rock revetment

Sand and silts gathered from dredging are used to reclaim land behind a rock revetment wall. This wall structure will typically be constructed from landside and be formed by the end-tipping of locally quarried rock core material with an outer perimeter rock armour protection. As this structure reaches deeper water, an element of the structure may be constructed using marine split hopper barges to place larger quantities of material on the base and avoid road haulage.

The inner face of this structure would typically be lined with a geofabric to contain the fill placed during the dredge and reclaim phase. There is potential that the beach and bed profile, which will form the substructure for this structure, may require some grading and preparation. This would likely be undertaken by excavator / backhoe and the materials used as fill in the appropriate reclamation containment area.

Piled structures

The remainder of the reclamation containment will likely be formed by the installation of an 'anchored combi-wall' type structure. A range of pile types are proposed for constructing the containment structures, including combi-wall sheet and piles, and open-ended, tubular steel piles ranging in diameter from 914 mm to 1,626 mm. Combi-walls would essentially be constructed of a steel tube and sheet-piled front wall, with steel tie rods running back through the reclamation to a rear sheet-piled anchor wall. Over 400, 1,626 mm piles (depending on final design) will be used in the combi-walls and shiplift.

Several driving methods have been proposed including vibro-hammer (continuous noise production) and traditional hydraulic impact hammer (impulsive noise) piling techniques from both barge and land-based platforms / plants. It is anticipated that combi-wall piling work will be undertaken from a marine plant (i.e. barge) and, as the materials are generally non-cohesive, the piles would be installed using vibro-hammer techniques, with a small percentage of the piles being hydraulic impact hammered to the final driving depth in order to test their load capacity.

With the front wall in place, the dredge and reclaim activity can commence. These two activities will overlap so that the rear anchor wall can be placed using a land-based plant on the first phase of the reclamation. With the anchor wall installed, the remainder of the dredging will be undertaken and the fill level brought up to final formation level.

Combi-wall piles and the tubular steel piles will be installed using a pile gate that consecutively pitches (lifting and placing the pile in the pile guide), sets (vibro-hammering piles into position), welds (new sections on to previously driven sections) and drives several piles in the same gate. The overall construction of the shipyard and drydock facilities are expected to take approximately 3 years, with pile

[2] Construction methodologies and details from BECA (2026), and any assumptions are based on similar Northport project works undertaken or pending.

installation occurring for varying durations throughout. It is assumed that no concurrent vibro- and hydraulic hammering will take place over the course of the day and that pile-driving will only take place during daylight hours.

Dredging and reclamation

The dredging work will be undertaken using a combination of a cutter-suction dredger and backhoe dredger. It is expected that most materials would be pumped into the containment area or cut and placed on barges.

For the site (reclamation area) to be functional in the time periods required, it is likely that ground improvement activity will be needed. This will reduce settlement periods and help meet liquefaction requirements. This activity is likely to involve one or more of the following:

- vibro-core compaction
- wick drain installation
- rolling overburden (short-term excess loading)
- roller compaction.

Jetty structure

The jetty structure will be an open-piled structure formed of driven steel pile reinforced concrete piles supporting a reinforced concrete deck structure. Approximately 168 open-ended steel 914 mm piles will be used in the suspended deck. The piles will be driven using vibro-hammer techniques with final driving undertaken with hydraulic impact hammer techniques. These piles will be installed either from working out from land or by marine plant, and the deck structure will be formed with either precast and *in situ* slab, or *in situ*-only concrete slab.

3. Description of the existing environment

Due to its large size and natural deepwater entrance channels, Whangārei Harbour has been a hub for both Māori and post-European activities. Whangārei Heads has been known as Whangārei-te-rerenga-parāoa (Whangārei, the gathering place of whales) (Piripi 1961). While this reference is also thought to be a metaphor for the gathering place of chiefs (Chetham 2015), the significance of whale migrations through this region is supported by the number of whaling stations found north near Whangamumu and along the entire eastern coastline of the North Island during the late 1800s and early 1900s (Dawbin 1956).

Land reclamation and industrial development within Whangārei Harbour began in the early 1900s (e.g. Portland Cement works), with the oil refinery at Marsden Point built in the 1960s (Waterhouse 1966). The current NPL site was constructed in the early 2000s and involved large-scale reclamation to reach the main channel near the harbour entrance (4Sight Consulting 2021). The entrance and main shipping channels currently experience year-round heavy vessel traffic involving a variety of commercial and recreational vessels. Despite decades of ongoing disturbances, several marine mammal species still regularly visit harbour waters and frequent the wider region on a regular basis, making them an important part of the existing environment.

3.1 Review approach

This report uses the same approach as the earlier 2022 assessment of NPL's reclamation project (Clement 2022) and makes assessments at temporal and spatial scales relevant to the marine mammals involved. This approach is appropriate because most marine mammals regularly range for hundreds to thousands of kilometres as part of their normal movement patterns. As a result, the importance of the proposal area is placed in the context of the species' local, regional (i.e. Te Ākau Bream Bay and Northland, respectively) and Aotearoa New Zealand-wide distributions.

In terms of the data considered, this report relies on two recent reviews that summarise the available marine mammal data and knowledge in the wider Te Ākau Bream Bay and Northland area. These reviews include:

- SLR Consulting NZ. 2026. Te Ākau Bream Bay sand extraction: marine mammal environmental impact assessment. Nelson: SLR Consulting NZ. SLR Project No. 840.030119.00001, Revision 07. Prepared for McCallum Bros Limited.
- Clement D. 2022. Potential effects of the proposed Northport reclamation on marine mammals in the Whangārei Harbour region. Nelson: Cawthron Institute. Cawthron Report No. 3652. Prepared for Northport Limited.

A list of all the compiled information sources that informed these reviews are included in Appendix 1. In addition, the following research has taken place within Te Ākau Bream Bay, Whangārei Heads and / or within Whangārei Harbour since the assessment by Clement (2022):

- first systematic surveys for marine mammals in Te Ākau Bream Bay undertaken between December 2022 and March 2024 – Tere Tohorā, Karanga Tangata[3] project collaboration between Patuharakeke, Far Out Ocean Research Collective and Earth Science New Zealand (formerly NIWA) (findings discussed in Brough et al. 2024, 2025a; Appendix 2)
- underwater acoustic monitoring for marine mammals in Te Ākau Bream Bay from 7 May to 26 June 2024 by the Styles Group (findings discussed in SLR 2026; Appendix 2)
- ongoing underwater acoustic monitoring for marine mammal in Whangārei Harbour has been conducted since 2020 by the Styles Group, with data between 2020 and 2023 summarised by Clement (2023) for NPL (Appendix 3).

Data limitations

Other than the recent studies listed above, most of the existing sighting records were collected opportunistically from public sources (e.g. Department of Conservation (DOC) sighting). Consequently, the number of opportunist sightings does not necessarily represent unique animals (i.e. the same animal may be reported by multiple members of the public, or on separate days / in separate years) or their regular distribution patterns. As collection effort is not considered with opportunistic data, favourite fishing spots and tour boat tracks are likely to be over-represented, especially during periods of more favourable conditions (e.g. summer, daylight periods). For instance, the large number of sightings recorded around the Bay of Islands and Hauraki Gulf / Tīkapa Moana regions (Figure 2) are most likely a reflection of the marine tour companies operating within these vicinities that offer marine mammal tours / swims and report their sightings to DOC.

Sighting (or the lack of sightings) records of pinnipeds were not considered a useful indicator for their occurrence patterns. Pinniped data tend to be either biased high, due to the animals' haul-out behaviour (e.g. leopard seals / popoiangore are aggressive and territorial), or biased low because their regular or expected occurrence goes unreported (e.g. New Zealand fur seals / kekeno; McConnell 2020). Instead, the locations of known pinniped haul-out sites and breeding colonies are considered more informative.

Relevant species

These data were used to determine what is currently known about the species whose occurrence, distribution and general behaviour suggest that they are most likely to be affected by the proposed project. For this assessment, more emphasis is placed on the presence and timing of an identified species in the Northland Region. Overall, those species with sightings or reports within the vicinity of harbour, its entrance and / or inner Te Ākau Bream Bay waters were considered most relevant. The potential risks of the proposed construction activities to these more relevant species (discussed further in Section 4) were then assessed based on species' life history dynamics (e.g. species-specific

[3] Collaboration between Patuharakeke, Far Out Ocean Research Collective and Earth Sciences New Zealand (formerly NIWA) with the goal of combining mātauranga Māori (holistic, evolving body of knowledge) and systemic survey information to develop a comprehensive baseline of megafauna species of Te Ākau Bream Bay and Whangārei Harbour.

sensitivities, conservation status, lifespan, main prey sources, etc.) as surmised from Aotearoa New Zealand and international data sources.[4]

3.2 Context – marine mammals

A diversity of Aotearoa New Zealand's marine mammal species live or pass through the North Island's upper and central eastern coastal waters. According to the most recent review by McConnell (2026), there are at least 31 cetacean (whales, dolphins and porpoises) and three pinniped (seals and sea lions) species recorded along the northeastern coastline of the North Island. Figure 2 highlights sightings that have occurred around Whangārei Harbour and the Te Ākau Bream Bay area over several previous decades.

Key findings from McConnell (2026), which include underwater acoustic monitoring from Pine (2025), noted that:

- It is recognised that marine mammals are of high cultural significance to local tangata whenua.
- Seven marine mammal species commonly visit Te Ākau Bream Bay and the immediate surrounds: bottlenose dolphin / terehu, common dolphin / aihe, Bryde's whale, false killer whale, pilot whale, orca / maki and New Zealand fur seal.
- Less frequently observed species that may be seen in the harbour include leopard seal,[5] southern right whale / tohorā and humpback whale / paikea, alongside sightings of deepwater, offshore species such as blue whale, sei whale, sperm whale, dwarf minke whale and Gray's beaked whale.
- Findings within Te Ākau Bream Bay and the immediate surrounds reflect previously identified marine mammal assemblage (e.g. Clement and Elvines 2015; Clement 2022) from the wider northeast region of the North Island.
- Short-term underwater acoustic monitoring from two moorings within inshore areas of Te Ākau Bream Bay from 7 May to 26 June 2024 (Pine 2025) suggested a high occurrence rate of dolphin presence that was biased slightly towards daylight hours when dolphin detection events tended to last longer.
- Most baleen whale acoustic detections over this monitoring period were of Bryde's whales and detection levels suggested presence within and well offshore of Te Ākau Bream Bay.

[4] Peer-reviewed journals, New Zealand Threat Classification System (NZTCS) – https://nztcs.org.nz/, National Aquatic Biodiversity Information System (NABIS) – www.nabis.govt.nz/, International Union for Conservation of Nature (IUCN) Red List of Threatened Species – https://www.iucnredlist.org/

[5] Owha, a well-known leopard seal that used to frequent Auckland and Northland marinas, including Marsden Cove, has not been seen since 2022.

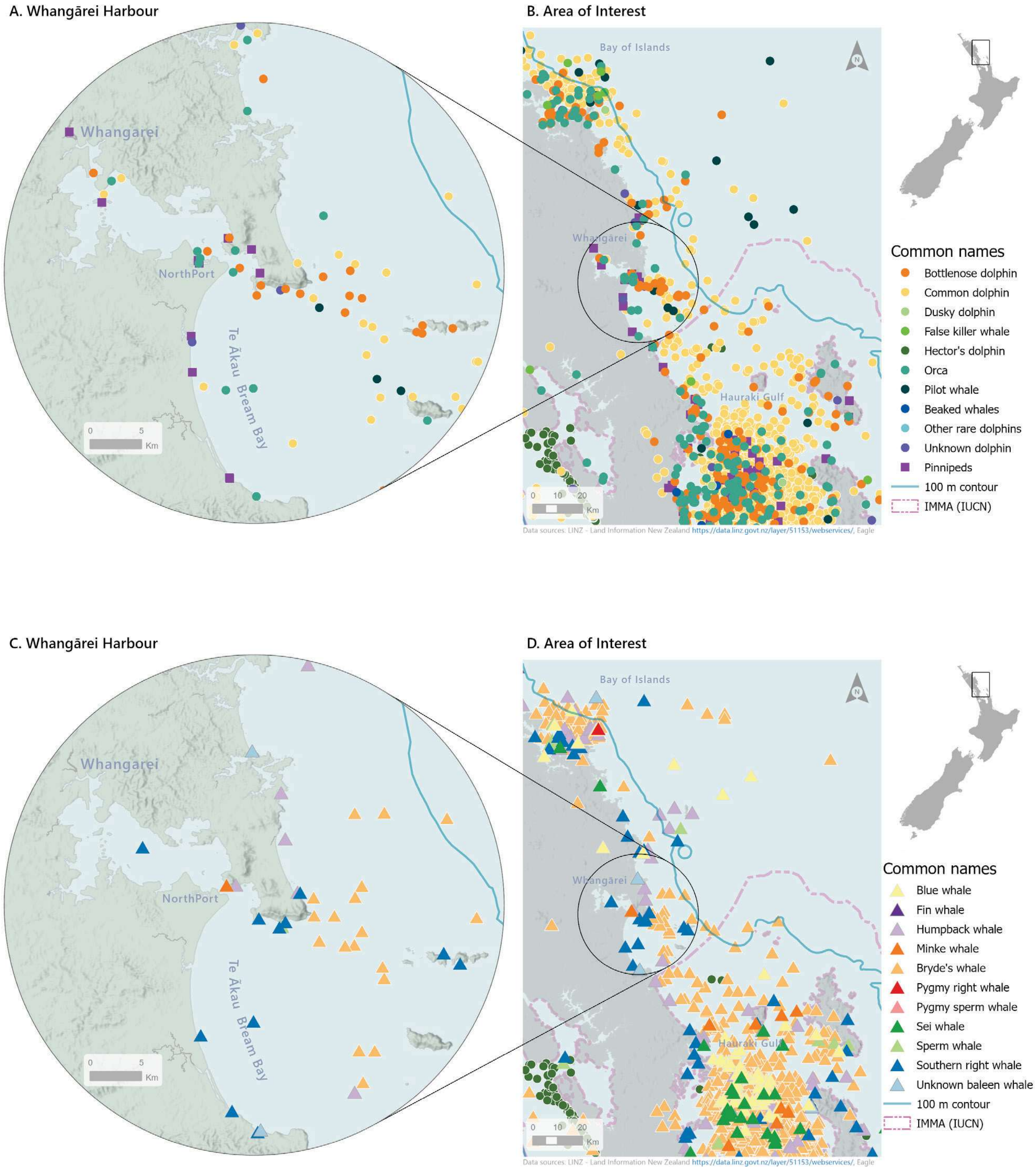

Figure 2. The distribution of Department of Conservation reported sightings (1978–2023) along the northeast coast of the North Island between the Bay of Islands and Hauraki Gulf / Tīkapa Moana. Species specifically sighted in Whangārei Harbour and Te Ākau Bream Bay are highlighted in the circular insets. Toothed whales and dolphins plus pinnipeds (i.e. leopard seal / popoiangore and New Zealand fur seal / kekeno) are shown in the top images (A and B) and whale species in the bottom images (C and D).

The Tere Tohorā, Karanga Tangata collaboration, and the subsequent Tohorā research programme, aimed to address key gaps about marine mammal occurrence, spatial and temporal distribution, behaviours and the relative importance of the Te Ākau Bream Bay and Whangārei Harbour study area. A summary of relevant findings of the Tohorā research programme (Brough et al. 2024, 2025a) that are most relevant to Whangārei Harbour waters are listed below (Appendix 2):

- Dual knowledge systems highlight the importance of this area for marine megafauna and confirm previous review findings that Te Ākau Bream Bay supports a high diversity of marine mammals (at least seven species) that are known to frequent the wider northeast region. Calves were present in a large portion of sightings across most species and seasons, as well as expected observations of foraging by all species.
- **Coastal bottlenose dolphins** are likely semi-residents of Te Ākau Bream Bay based on their presence over most months and high resighting rates of known individuals. They are described as semi-resident because they likely belong to a larger population that ranges along the northeast coast of the North Island between the Bay of Islands (Brough et al. 2025b) and Great Barrier Island / Aotea Island (Dwyer et al. 2014) in the Hauraki Gulf / Tīkapa Moana. Relative density and probability of occurrence are highest for coastal bottlenose dolphins over the warmer seasons (summer and autumn) and less common in winter and spring. Spatial distribution models predicted high probability of occurrence within Te Ākau Bream Bay and moderate probability of occurrence within Whangārei Harbour during the warmer seasons (Figure 3). A sighting of coastal bottlenose dolphins was observed inside the Whangārei Harbour near Northport.
- **Common dolphins** had the highest rates of occurrence of marine mammal in the study area. They had lower sighting rates over cooler months but were encountered all year-round (Figure 3). The programme confirmed earlier suggestions that this species prefers deeper open waters (i.e. around or beyond the Hen and Chickens Islands). Only one sighting made within the inshore waters of Te Ākau Bream Bay resulted in low predicted occurrence in the bay or Whangārei Harbour waters.
- **Bryde's whales** were observed in all seasons except winter, with greater relative densities in outer Te Ākau Bream Bay and more offshore waters. Species distribution models for Bryde's whale predicted low probability of occurrence within the shallow, inshore waters of Te Ākau Bream Bay and Whangārei Harbour (Figure 3).
- Other species observed included New Zealand fur seal, orca and a single blue whale. However, these were infrequent (two or less sightings), and only the fur seals were within inshore waters.
- Despite no observation during the study period, the importance of the area as a migration pathway for humpback whale and southern right whale over the winter months is also recognised.

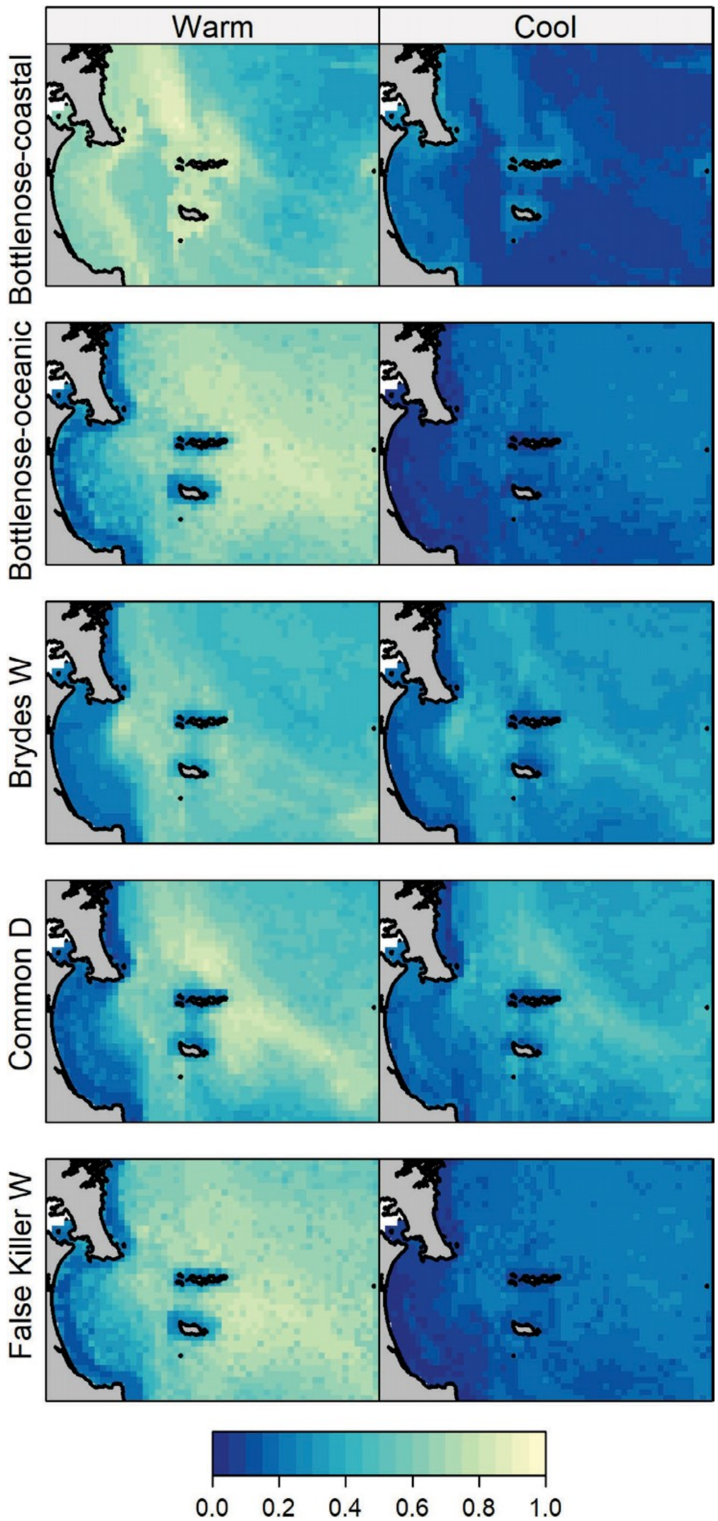

Figure 3. Probability of occurrence maps from the Tohorā research programme for the five of the more prevalent marine mammal species sighted across warm (December to March) and cool (June to September) seasons. Figures are from reproduced from Brough et al. (2025a) under the terms of the Creative Commons Attribution Licence: https://creativecommons.org/licenses/by/4.0/

Key findings from Clement's (2023) underwater acoustic monitoring within Whangārei Harbour and the entrance channel are listed below (see Appendix 3):

- Three separate acoustic moorings located within Calliope Bay (outside harbour channel), Passage Island (harbour entrance) and Sinclair Point (inner harbour), deployed between 19 June 2020 and 5 September 2023, recorded 19 separate detections. The number of monitoring days varied between hydrophone locations (Calliope = 599 days; Passage Island = 425; Sinclair = 523).
- Approximately 9% to 15% of all sampling days had at least one detection of dolphin or orca near these harbour moorings, with the highest detection rates recorded in winter and spring. Orca detections were less frequent than dolphin detections.
- Baleen whale calls were only detected at the Calliope mooring; hence, whales were most likely present within Te Ākau Bream Bay or beyond.
- Dolphin detections were made during both day and night, indicating no distinct diurnal pattern in harbour use.

Species of interest

Based the data and information collated above, those species with the greatest potential to be affected by the proposed shipyard construction are bottlenose dolphin, common dolphin, orca, New Zealand fur seal and visiting baleen whales, particularly Bryde's whale, humpback whale and southern right whale (Table 1).

While our review of the current data and knowledge suggests that there is no marine mammal species whose home range is restricted *solely* to Whangārei Harbour, the harbour does regularly support several visiting species that are threatened or endangered, such as bottlenose dolphin, orca and southern right whale. Several whale species have known migration routes through the wider Te Ākau Bream Bay area (albeit more than 5 km offshore), while Bryde's whales make use of these offshore waters year-round (e.g. Brough et al. 2024; Pine 2025).

When considering the potential implications of coastal developments on local marine mammal populations, our review considers the available species data in reference to the following:

- Section 6(c) of the Resource Management Act 1991 (RMA)[6]
- Policy 11 of the New Zealand Coastal Policy Statement 2010 (NZCPS; DOC 2025)
- New Zealand Threat Classification Series 48 for marine mammals (NZTCS; Lundquist et al. 2025)
- Policy 4.4.1 of the 'Regional policy statement for Northland' (NRC 2016)
- Northland's regional plan (NRC 2026)
    - D.2.18 Managing adverse effects on indigenous biodiversity
    - D.5.27 Underwater noise
- relevant maps and provisions in the 'Regional plan for Northland' (NRC 2026)
    - Significant Marine Mammal and Seabird Area
- IUCN's Important Marine Mammal Area (IMMA) designation (IUCN-MMPATF 2022).

[6] Section 6(c) – the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna; https://www.legislation.govt.nz/act/public/1991/69/en/latest/#DLM231907

In 2022, the IUCN designated the wider Hauraki Gulf / Tīkapa Moana and up to the southern end of Te Ākau Bream Bay as the Tīkapa Moana Te Moanaui ā Toi Hauraki IMMA (IUCN-MMPATF 2022) due to the diversity of marine mammal species present. Currently, there are no limits to be avoided or relevant legislation to be applied within these identified areas.

Table 1. Marine mammal species known to frequent Whangārei Harbour and inshore Te Ākau Bream Bay waters. Species' conservation threat status is listed according to the New Zealand Threat Classification System (NZTCS; Lundquist et al. 2025) and the International Union for Conservation of Nature (IUCN) system (ver. 3.1), as well as any relevance to Policy 11 of the New Zealand Coastal Policy Statement 2010 (NZCPS). Modified from McConnell (2026). NA = not applicable.

Common name	Species name	NZ Threat Classification System	IUNC listing	Residency category in Northland	NZCPS Policy 11 relevance
Bottlenose dolphin	*Tursiops truncatus*	Nationally vulnerable	Least Concern	Seasonal to year-round	11(a)(i) and potentially 11(b)(vi)
Common dolphin	*Delphinus delphis (including D. capensis)*	Not Threatened	Least Concern	Seasonal to year-round	NA
New Zealand fur seal	*Arctocephalus forsteri*	Not Threatened	Least Concern	Seasonal to year-round	NA
Bryde's whale	*Balaenoptera edeni*	Nationally Critical	Least Concern	Seasonal to year-round	11(a)(i) and potentially 11(b)(v)
Orca (killer whale)	*Orcinus orca*	Nationally Critical	Data Deficient	Seasonal to semi-common	11(a)(i)
Humpback whale (Oceania)	*Megaptera novaeangliae*	Migrant	Endangered	Seasonal migrant	11(a)(ii) and 11(b)(v)
Southern right whale	*Eubalaena australis*	Nationally Increasing	Least Concern	Seasonal migrant	11(a)(i) and 11(b)(v)

4. Assessment of effects

Assessing the potential impacts of coastal development activities on marine mammals is complex in that the individual species involved are likely to influence the nature of the interaction as well as the probability of an interaction occurring. Some species of whales or dolphins will be highly sensitive to any disturbance, while other species may even be attracted to activities (e.g. pinnipeds to marinas). Some individuals within a given population (such as juveniles, old, diseased or disoriented individuals) may also be more prone to becoming involved in direct interactions (e.g. Wilson et al. 2006; Kemper et al. 2003). Consequently, the type of activity, the operational procedures employed and their timing will all influence the probability of interactions occurring.

Taking these factors into consideration, this assessment follows the RMA and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012[7] for assessing risk. This approach essentially combines the likelihood or probability of an interaction occurring (e.g. the number of whales / dolphins likely to interact with an activity given its scale / duration) versus the magnitude of effect (e.g. consequence of interactions; death, injury, avoidance or no negative effect at all). The combination of likelihood and magnitude of effect leads to an overall assessment of the level of risk. The following sections describe the potential effects of pile-driving, dredging, operational vessel traffic, loss of habitat and prey species, and the cumulative impacts on marine mammals (Figure 4).

These assessments are based on available studies of coastal development activities and marine mammals (predominantly overseas), while relying on a wider range of research on Aotearoa New Zealand marine mammals and information from other assessment reports (e.g. Pine 2026). Recent national and international studies into the effects of anthropogenic (human-made) underwater noise associated with coastal activities, also known as anthrophony, demonstrate that underwater noise effects are wider ranging than previously thought and have a much larger spatial footprint than most other construction-related effects (see Clement 2024 and references within). Anthropogenic underwater noise is now recognised as a concern by several industries and regulatory agencies around the world (e.g. OSPAR Commission 2009; DPTI 2012; WODA 2013; ACCOBAMS 2013; European Commission 2017; NMFS 2018; IMO 2023; HELCOM 2023). Given the expected anthrophony associated with the proposal, this assessment largely focuses on the potential impacts of underwater noise.

[7] https://www.legislation.govt.nz/act/public/2012/72/en/latest/#DLM3955428

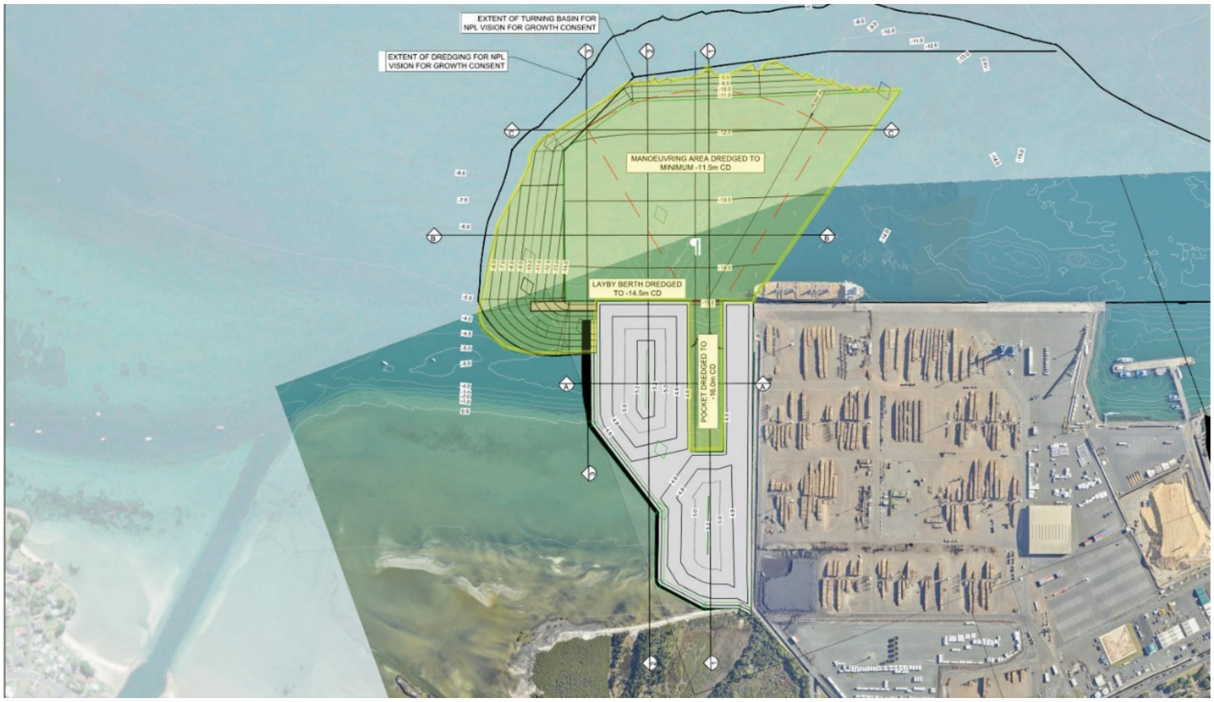

Figure 4. Indicative plan for the construction of the shipyard and drydock facilities showing the proposed extent of reclamation and dredging as well as the locations of rock walls and piled wharf structures. Source: BECA (2026).

4.1 Pile-driving activities

Background

Pile-driving is recognised as one of the 'noisiest' of all construction sounds (e.g. Madsen et al. 2006) and has been identified as the most intense underwater noises that will be produced by the shipyard project (Pine 2026). Pile-driving generates a very high source level as broadband impulses (i.e. sound pulses across a wide range of frequencies) and has a high potential to disrupt marine mammal hearing and behaviour up to many kilometres away (Madsen et al. 2006). In closer proximity, these impulses could induce acute stress and cause hearing impairment (i.e. temporary or permanent threshold shifts; e.g. Tougaard et al. 2003, 2005; Madsen et al. 2006; Bailey et al. 2010; Brandt et al. 2016; Dähne et al. 2017). In humans, the onset of a temporary threshold shift (TTS) is often described as the muffled effect your hearing might have after a loud concert; the longer the exposure time, the longer this temporary effect lasts. A permanent threshold shift (PTS) results in physical damage to hearing function and irreversible hearing loss. PTS can occur suddenly through trauma (i.e. intense impulses) or develop gradually over time from less intense but persistent noise sources.

Overseas studies on behavioural disturbance from underwater noise show that marine mammal responses tend to be highly variable between species and among individual animals, as well as being context-specific (e.g. different reactions while feeding from when communicating). The duration of exposure may also be an important factor (Southall et al. 2007, 2019, 2021). Behavioural responses can vary from low-level changes in swimming direction / speed, breathing or vocalisation rates, to more moderate-level responses (e.g. extensive changes in swimming or cessation of vocalisations), to complete abandonment or avoidance of impacted waters (Southall et al. 2007, 2019, 2021). Acoustic disturbance can also involve the 'masking' of certain communication or echolocation signals. For instance, members of the same species may find it more difficult to communicate with one another across particular frequencies or at certain sound levels while near an anthropogenic noise source.

The only studies in Aotearoa New Zealand that have focused on pile-driving noise levels and their associated effects are on Hector's dolphin / upokohue in Lyttelton Harbour / Whakaraupō (e.g. Leunissen 2017; Clement et al. 2022, 2025). Pile-driving noise was detectable above Lyttelton Harbour's already noisy background levels (i.e. ambient noise) (Leunissen and Dawson 2018). However, *in situ* noise verification and both visual and underwater acoustic detections confirmed that the establishment of a designated shut-down zone (based on TTS levels) was an effective measure for protecting Hector's dolphin from injurious pile-driving noise levels (Clement et al. 2022). Behaviourally, as sound exposure levels from impact pile-driving increased, declines in dolphin detections varied spatially, with immediate declines occurring at sites less than 1 km from the source. Clement et al. (2025) also confirmed that local animals returned to the area once piling activity finished, but full recovery to pre-piling levels was not immediate and could take several days. Based on these results, additional measures were recommended for future infrastructure developments to avoid short- and longer-term impacts (Clement et al. 2022, 2025).

The effect of pile-driving on pinnipeds is less straightforward, with reported reactions ranging from little to no response from ringed seals (*Pusa hispida*; Blackwell et al. 2004) to significantly fewer harbour seals (*Phoca vitulina*) observed in haul-out areas located 10 km from pile-driving activities (Edrén et al. 2004). However, changes in haul-out numbers of harbour seals were short term, as the general abundance of seals showed no decrease over the whole construction period. As pinnipeds also spend significant amounts of time out of the water and hauled out on shore, in-air sound levels also need to be considered, although the in-air hearing of both otariid (e.g. New Zealand fur seal) and phocids (e.g. leopard seal) are substantially less sensitive than in water (e.g. Southall et al. 2007).

Underwater noise standards

There are currently no national or standard guidelines for pile-driving activities within Aotearoa New Zealand waters. To determine the distance at which pile-driving noise levels could cause any physical impairment or injury (i.e. PTS or TTS) to local marine mammal species, most assessments in Aotearoa New Zealand have used the underwater acoustic thresholds defined by the following publication issued by the United States National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS): 'Revisions to technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing' (NMFS 2018, 2024). These thresholds are weighted, meaning that they are based on specific functional hearing groups (i.e. considers the range of hearing that a species is most sensitive to) and take into consideration the frequencies over which most of the sound energy might be concentrated for a particular sound source (i.e. pile-driving strikes). These thresholds have recently been updated and the new thresholds applied by Pine (2026) in his underwater noise assessment.

Based on what is known about the marine mammals that may be in the vicinity of the proposal area (see Section 3), the focal groups for this assessment are categorised into NMFS's updated functional hearing groups as listed in Table 2. The categories listed represent four of the five possible marine mammal functional hearing groups, noting that very high-frequency hearing dolphins (i.e. Hector's dolphin) have not been included.

Table 2. Summary of the generalised functional hearing ranges defining the different marine mammal hearing sensitivity groups used by the United States National Oceanic and Atmospheric Administration.
Source: NMFS (2024).

Hearing group	Generalised hearing range
High-frequency cetaceans (HF) e.g. toothed dolphins and whales, beaked whales	150 Hz to 160 kHz
Low-frequency cetaceans (LF) e.g. baleen whales (e.g. humpback whales / paikea, southern right whales / tohorā)	7 Hz to 36 kHz
Phocid carnivores in water (PCW) e.g. true seals, leopard seals / popoiangore	40 Hz to 90 kHz
Otariid and other marine carnivores in water (OCW) e.g. New Zealand sea lions / whakahao, New Zealand fur seals / kekeno	60 Hz to 68 kHz

Potential physical effects

Pine (2026) developed an underwater noise propagation model to estimate the potential noise levels generated by the proposed pile-driving works based on ambient noise levels measured *in situ* in Whangārei Harbour. The underwater sound measurement methods and the modelling approach undertaken by Pine (2026) are appropriate and similar to approaches adopted for the other harbour infrastructure projects around Aotearoa New Zealand that involve pile-driving activities.[8]

Pine's (2026) propagation model incorporated data on local bathymetry, water temperature, tidal flow and sediment type, all of which affect how noise travels through water. With this framework, acoustic propagation models were then built for the largest proposed steel piles (i.e. 1.6 m) at the location with the most potential impact on marine life (i.e. proposed wharf area) and used to predict the 'worst-case' distance ranges of piling-generated noise. Subject to *in situ* validation of the project's actual noise levels, the black contour lines, displayed in Figure 5 and 6, represent the predicted worst-case sound levels from impact driving methods in which cumulative TTS (TTS_{cum}) and PTS (PTS_{cum}) were estimated (Table 3).

[8] For example: Refining New Zealand Ltd, Deepening and Alignment project; Lyttelton Port Company Ltd, Capital Dredging and Cruise Berth Development projects; Port Marlborough Ltd, Waitohi Ferry Precinct Redevelopment project.

Given the distance estimates in Table 3, unmitigated impact pile-driving activities are predicted to cause the onset of TTS in high-frequency hearing animals (e.g. orca, bottlenose dolphin or common dolphin) once they enter the harbour channel near Motukaroro Island or if already in upper harbour regions (e.g. 1.3 km from the construction site; Figure 5, left image). PTS effects are also possible if an animal comes into or is already present in the harbour (and moves closer to the vicinity of the construction site (i.e. 183 m).

Any visiting baleen whales, New Zealand fur seals or leopard seals (underwater) are predicted to experience the onset of TTS at greater distances (e.g. approximately 4 km), either prior to entering the harbour (i.e. near Calliope Island) or if already present, as they approach the harbour entrance from inner harbour regions (Figure 5 and Figure 6). Hearing injury (PTS) is predicted to occur if a whale or leopard seal (underwater) moves into the harbour entrance (e.g. near Motukaroro Island) and within 1.4 km of the construction site (Table 3). For baleen whales, this level of noise may result in individual whales choosing not to enter harbour waters while pile-driving is underway. New Zealand fur seals are predicted to still enter the harbour while piling activity occurs, albeit with their heads more out of water. But their movements into some inner regions of the harbour may be affected depending on the piling location. Otariid pinnipeds are predicted to experience PTS if they approach to within 433 m of the noise source.

Potential displacement or behavioural effects

Appropriate sound-level thresholds for behavioural disturbance are currently being assessed and revised overseas (see NMFS 2016). In the interim, and based on overseas studies, Pine (2026) used the two-tiered approach of Southall et al. (2007).[9] Lower behavioural responses[10] to impulse noise can occur at sound levels as low as 140 dB_{rms} *re* 1 µPa, with more moderate responses[11] at sound levels of 160 dB_{rms} *re* 1 µPa (Table 3, Figure 6). Based on these two-tiered unweighted thresholds, the distance ranges for potential low- and moderate-level behavioural effects were estimated similarly for all species (Table 3, Appendix 4).

As the series of figures in Appendix 4 demonstrates, the potential low-level behavioural noise from the shipyard's unmitigated impact pile-driving is expected to spatially propagate outside the Whangārei Harbour entrance towards Calliope Island and further up the three channels of the inner harbour waters. These results suggest that any animal attempting to enter or leave the harbour underwater will likely exhibit at least low-level behavioural responses while piling is underway. However, as Pine (2025) notes, the actual behavioural responses will depend on the species, location and temporal aspects (i.e. context is important).

While these behavioural thresholds are much lower than the noise levels generated by most commercial and recreational vessels (i.e. OSPAR 2009; Todd et al. 2015), animals are expected to respond more adversely to intermittent and unexpected noise than more consistent or regular intervals of noise, such as that generated by ships. These effects are why management measures such as a 'soft start' or 'ramping up' are used by piling operators to avoid sudden or unexpected full-force piling noise.

[9] Southall et al.'s (2007) approach was instrumental in formulating the basis of the NMFS (2018) underwater noise threshold levels.
[10] Defined as minor level changes in swimming direction / speed, breathing or vocalisation rates.
[11] Defined as extensive changes in swimming or cessation of vocalisations, complete abandonment or avoidance.

Pine (2026) also calculated distances from piling activity where the associated noise levels might interfere with an animal's ability to clearly hear some natural acoustic signals – also known as acoustic masking (e.g. members of the same species trying to communicate across particular frequencies / levels while in the proximity of the operating pile-driver). Appendix 5 figures demonstrate the estimated reductions in an animal's listening space (e.g. the volume of ocean around an individual), or Table 3 lists when acoustic masking might occur as an animal approaches a pile-driving source. For all species, the greatest reduction to their listening space (> 75%) would be when they are entering or leaving the harbour at its narrowest point, and within a 2.3 km to 3.6 km radius from the piling source (Table 3, Appendix 4).

Table 3. Estimated distance ranges of unmitigated noise level generated from impact pile-driving[12] over winter temperatures for potential hearing effects (permanent threshold shift [PTS], temporary threshold shift [TTS]), behavioural impacts[13] and listening space reduction (LSR; i.e. masking) of the four functional hearing groups in Pine (2026). HF = high-frequency hearing group, LF = low-frequency hearing group, PCW = phocid pinniped group in water, OCW = otariid pinniped group in water.

Threshold criteria		**HF** (orca, bottlenose dolphin, other delphinids)	**LF** (baleen whale)	**PCW** (leopard seal)	**OCW** (New Zealand fur seal)
		Max. distance (m)*	Max. distance (m)*	Max. distance (m)*	Max. distance (m)**
PTS		183	1,400	1,400	433
TTS		1,888	4,081	4,088	4,005
140 dB low (10%) behavioural threshold		4,052#			
160 dB moderate (50%) behavioural threshold		568			
LSR (masking) #		**HF** (orca, other delphinids)	**LF** (baleen whales)	**PCW** (leopard seal)	**OCW** (New Zealand fur seal)
		Max. distance (m)*	Max. distance (m)*	Max. distance (m)*	Max. distance (m)**
Percentage reduction	**0%**	10,000	10,000	10,000	10,000
	25%	6,559	6,559	6,559	6,559
	50%	3,891	3,891	3,891	3,891
	75%	2,312	3,556	3,547	3,182

* Where available, these distances were based on the relevant species audiogram data (Pine 2025). Masking results for whales were calculated based on fin whale audiograms.

** Range based on northern fur seal audiogram in the absence of New Zealand fur seal / kekeno audiogram.

LSR – the narrowest distance from the construction site to the northern side of harbour (Motukaroro Island and Reotahi Bay) is only 1.3 km.

[12] Vibro-piling methods are not included, as noise levels were assessed by Pine (2025) to be lower than impact driving based on the expected durations of piling as per the proposed schedule.

[13] The probability of a behavioural response occurring at varying distances from a piling source could not be calculated through the dose–response method. See Pine (2026) for more details.

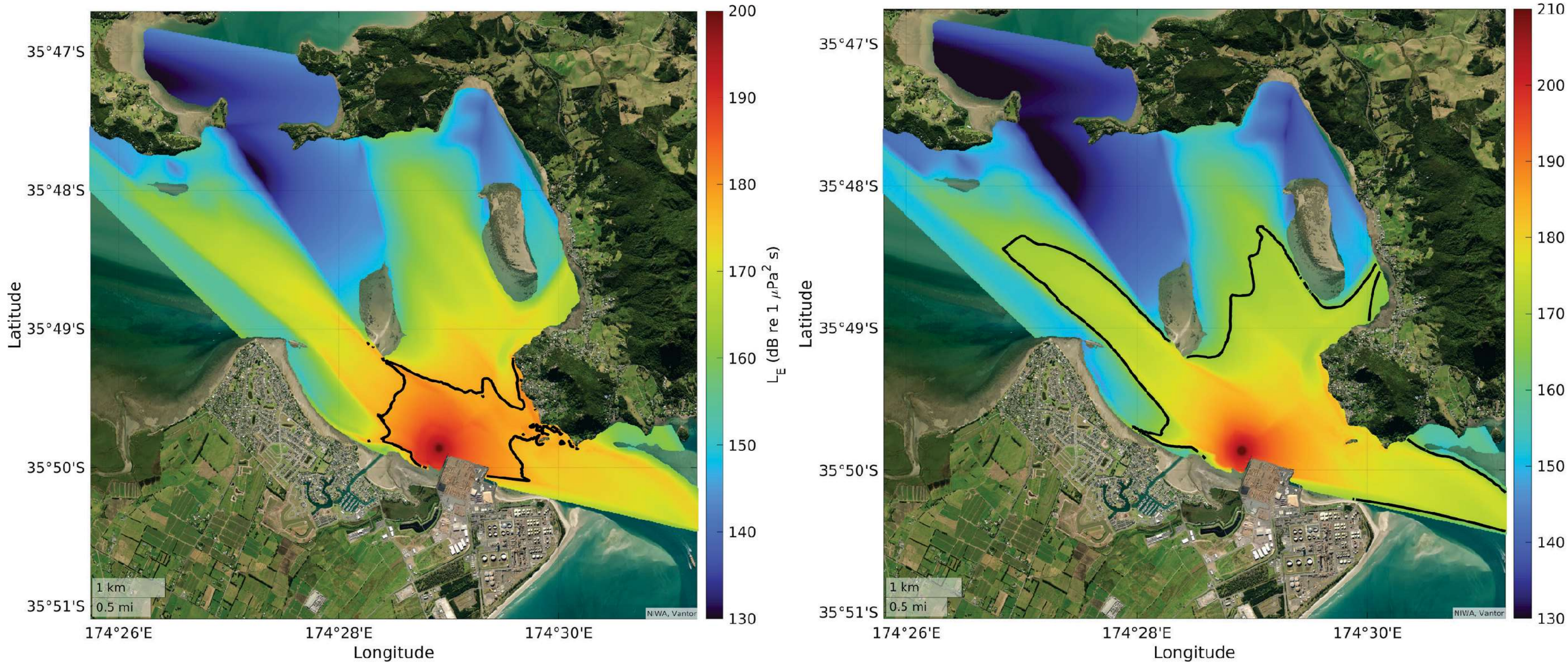

Figure 5. The predicted spatial ranges for the onset of temporary threshold shift (TTS) from **unmitigated percussive impact piling** within the shipyard construction area for **high-frequency hearing animals** (HF; e.g. bottlenose dolphin / terehu, orca / maki) in the left panel and for **low-frequency hearing animals** (LF; e.g. baleen whale) in the right panel. These diagrams demonstrate how sound propagates from the pile-driving source as a gradient of colour, with red representing the highest sound levels and blue representing the lower sound levels. The black contour lines represent the locations at which these levels are predicted to exceed TTS within the relevant hearing groups.

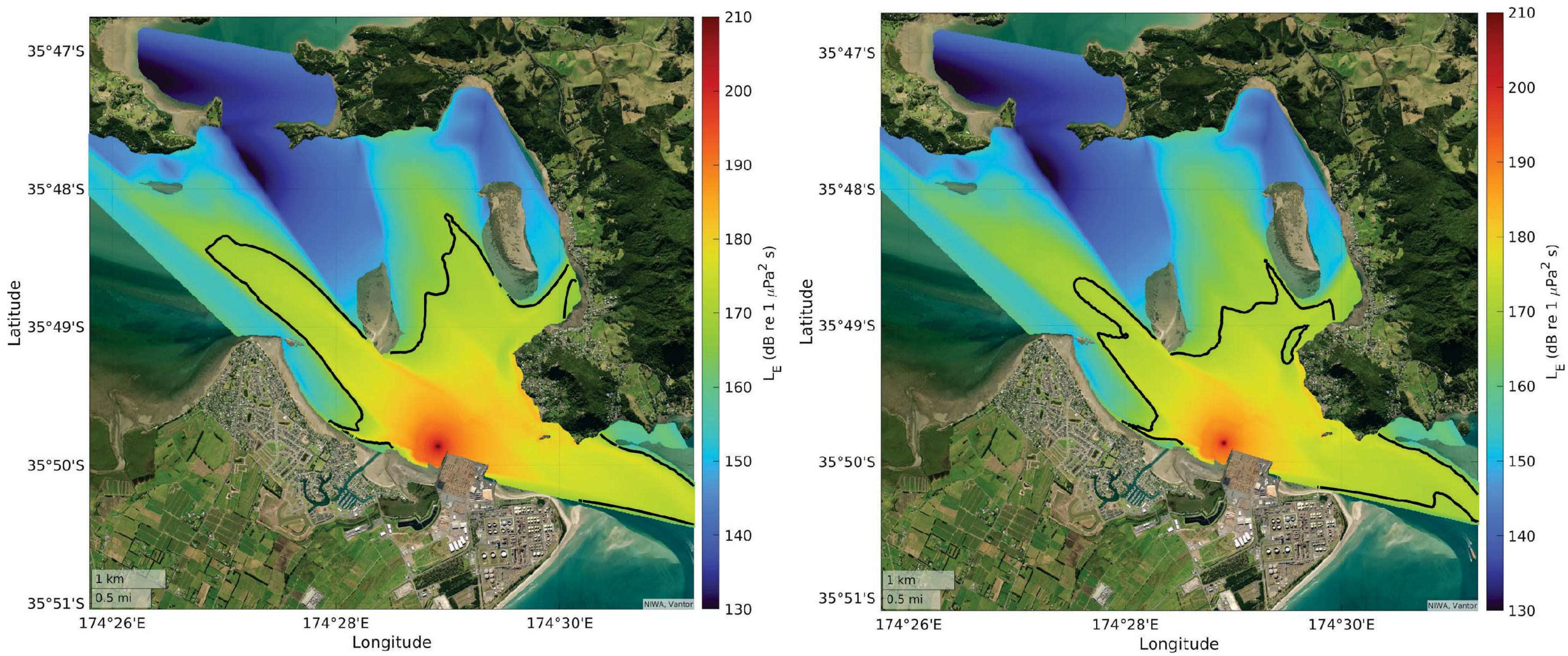

Figure 6. Predicted spatial ranges for the onset of temporary threshold shift (TTS) from **unmitigated percussive impact piling** within the shipyard construction area for **phocid pinnipeds** in water (PW; e.g. leopard seal / popoiangore) in the left panel and for **otariid pinnipeds** in water (OW; e.g. New Zealand fur seal / kekeno) in the right panel. These diagrams demonstrate how sound propagates from the pile-driving source as a gradient of colour, with red representing the highest sound levels and blue representing the lower sound levels. The black contour lines represent the locations at which these levels are predicted to exceed TTS within the relevant hearing groups.

Summary

Based on the sound models of Pine (2026) and combined with the review of local species occurrences, unmitigated pile-driving activities are predicted to have a moderate to high likelihood of causing TTS impairment and / or PTS injury for most dolphin species and orca if individual animals are near the harbour entrance (Table 4). While greater propagation of low-frequency soundwaves associated with piling activities is predicted, the likelihood for TTS and PTS occurring is considered more moderate for low-frequency hearing species, such as humpback whale and southern right whale, due to fewer and more seasonal occurrences near the harbour.

In addition, unmitigated pile-driving noise will elicit varying levels of acoustic masking and / or short-term behavioural responses at variable distances up to several kilometres from the source, depending on the species and group status (e.g. lone male vs mother / calf) (Table 4). The relevant factors that underlie this assessment are listed below and discussed further in Section 5.1.

Spatial and temporal factors

- Underwater noise produced from the proposed pile-driving activities will occur intermittently throughout the proposed construction duration.
- The assumed pile-driving system will use both vibro-hammering and traditional impact hammering, which will limit the number and amount of piling within any one day.
- The proposed piling schedule estimates the driving of one to four piles per day, and all piling activity will be restricted between Monday and Saturday and during daylight hours only.
- Recent visual and underwater acoustic monitoring confirm that several species live and regularly pass through Te Ākau Bream Bay, some of which visit Whangārei Harbour waters (some more seasonally than others).
- A few individual baleen whales visit the harbour and / or inner Te Ākau Bream Bay waters in any one year (i.e. one to three animals), most of which have a strong seasonal presence (e.g. winter migrations for humpback whale and southern right whale). The exception being the more year-round presence of Bryde's whale.
- Patuharakeke Te Iwi Trust Board considers that the harbour and Te Ākau Bream Bay are important for marine mammals from a cultural (and ecological) perspective (Patuharakeke Te Iwi Trust Board, 2022). Findings from their recent research programme, Tohorā, suggests Te Ākau Bream Bay is an important part of the larger northeastern home ranges of both bottlenose dolphin and Bryde's whale while regularly used by a wide diversity of other marine mammal species.

Known acoustic factors

- Shut-down zone management can help avoid PTS_{cum} or TTS_{cum} effects by ceasing all piling activity if and when species enter a standard designated zone (e.g. less than 300–500 m). However, the predicted unmitigated zones are too large and expansive to manage without additional noise reduction methods and mitigation options put in place (see Section 5.1).

- Management options, such as soft starts and ramping-up procedures, will help reduce some low behavioural responses (e.g. changes in swimming direction / speed, breathing or vocalisation rates) by avoiding sudden or unexpected full-force piling noise.
- The semi-enclosed nature of the harbour entrance acts as a natural acoustic boundary and limits noise effects to mainly entrance and harbour waters. Underwater noise effects are unlikely to affect other visiting dolphins, pinnipeds or migrating whales located outside the harbour entrance or within the wider Te Ākau Bream Bay.
- Different sources of underwater noises can be but are not always additive or cumulative. The 'loudest' noise (i.e. pile-driving) will cover up other noises generated nearby from other construction activities (e.g. dredging) and / or potentially mask an approaching vessel.
- If two similar pile-drivers are operating at the same time, then it is possible that PTS or TTS thresholds will be reached over a shorter exposure period (less than 24 hours).

Table 4. Summary of potential effects on relevant marine mammal species from the proposed shipyard and drydock construction. TTS = temporary auditory threshold shift, PTS = permanent auditory threshold shift, MMMP = marine mammal management plan, BPO = best practicable option, MMOZ = marine mammal observation zone.

Proposal activity and potential environmental effects	Spatial scale of effect on marine mammals	Persistence / duration of effect for marine mammals	Consequences for marine mammals	Likelihood of effect	Significance level of effect (without management options)	Proposed management actions / avoidance factors / mitigation options	Significance level of residual effect (with management options)
• **Other construction activities (including rock walls, reclamation)** ○ **Displacement effects (behavioural / masking)**	**Small to Large** • dependent on final method / sounds produced • behavioural responses predicted at larger distances	**Short to Persistent** • construction expected to be completed within 3 years • various durations with varying levels of noise	**Individual Level** • individuals may avoid or approach activities	**NA / Low** • TTS • masking • behavioural	**Nil to Negligible**	• Localised, intermittent activity of short durations but continuing for months and / or years • Relevant environmental factors (may naturally help dampen underwater noise production) • *In situ* measurements of underwater noise levels from construction activities and adjust mitigation if necessary (MMMP)	**Nil to Negligible**
• **Pile-driving activities:** ○ **Physical injury (TTS / PTS)**	**Small to Large** • PTS and TTS vary with species, from 1.9 km to 4.1 km	**Short to Persistent** • dependent on exposure, hearing damage and recovery periods between events, intermittent piling over 3 years	**Individual to Regional Level** • hearing impairment or injury of endangered / threatened individuals or groups in the harbour or entrance	**Moderate to High** • dolphin / orca **Moderate** • baleen whales	**More than Minor to Significant** • PTS • TTS	• *In situ* verification of underwater noise levels from piling activities and adjust mitigation if necessary (MMMP) • Use of confined bubble curtains to reduce noise levels produced from piling activities • Establishment of a construction site shut-down zone (CMMOZ) of 500 m in which piling activities will cease if a high-frequency hearing species enters (MMMP) • Establishment of an entrance shut-down zone (BMMOZ) near the entrance in which piling activities will cease if a whale enters, or on standby if other marine mammals enter (MMMP) • Establishment of an exit shut-down zone (EMMOZ) off One-Tree Point in which piling activities will cease if a marine mammal is moving towards the harbour entrance to leave crosses into the area (MMMP) • Real-time acoustic moorings around the harbour entrance and within the channels (across from construction site) monitoring for marine mammal detections and noise levels • Operations restricted to weekday and daylight hours only (MMMP) • Reduce unexpected noise by using ramping up and / or soft starts (MMMP) • Intermittent piling (1–4 piles per day) (MMMP) • Single piling rig method used at any one time • BPO used in method selection (MMMP) • Regular maintenance and upkeep of piling equipment (MMMP) • Low probability of baleen whale presence in the harbour area	**Negligible to Less than Minor** • TTS **Negligible** • PTS
○ **Displacement effects (behavioural / masking)**	**Large** • behavioural responses / masking predicted over 500 m to 10 km	**Short to Persistent** • dependent on exposure and recovery periods between events; intermittent piling over 3 years	**Individual to Regional Level** • abandonment or avoidance of harbour by individuals or particular age groups (e.g. mother / calves) • possible acoustic masking between conspecifics when within harbour waters	**Low** • moderate behavioural responses **Moderate to High** • low behavioural responses • masking	**Less than Minor to More than Minor** • behavioural • masking		**Negligible to Less than Minor** • behavioural • masking

Proposal activity and potential environmental effects	Spatial scale of effect on marine mammals	Persistence / duration of effect for marine mammals	Consequences for marine mammals	Likelihood of effect	Significance level of effect (without management options)	Proposed management actions / avoidance factors / mitigation options	Significance level of residual effect (with management options)
• **Dredging activities** ○ **Physical injury (TTS / PTS)** ○ **Displacement effects (behavioural / masking)**	**Small to Large** • potential TTS only when next to dredger (< 1 m) • behavioural / masking responses predicted at several hundred metres but up to 1.6 km	**Short to Persistent** • possibly intermittent over weeks / months • construction over 3 years	**Individual Level** • individuals may avoid or approach dredging activities, individuals subject to potential behavioural responses and acoustic masking when within close proximity	**NA** • PTS / TTS **Low to Moderate** • behavioural • masking	**Nil to Less than Minor**	• Regular maintenance and proper upkeep of all dredging equipment and the vessel / platform • *In situ* verification of underwater noise levels from dredging activities and adjust mitigation if necessary • Localised activity of short durations (hours to months) • Low probability of whale presence near proposal area	**Nil to Less than Minor**
• **Operational shipping traffic** ○ **Marine mammal / vessel collision risk**	**Large** • Occasional ship transits between ports and the northeastern coastline	**Short to Persistent** • limited movement of ships but for duration of consent • animals only present in region for a day to weeks	**Individual to Population Level** • death or injury of endangered or threatened species vs death of non-threatened dolphin or pinniped	**Low**	**Less than Minor**	• Low probability of whale encounter outside winter (other than Bryde's whale) • Adoption of boating behaviour guidelines • Support / encourage expansion and uptake of the Hauraki Gulf transit protocol for shipping that include speed limits and crew member on watch while transiting through destinated waters in daylight hours	**Negligible to Less than Minor**
• **Operational gear and / or debris** ○ **Marine mammal entanglement**	**Small to Medium** • limited to immediate waters around construction sites	**Short to Persistent** • construction expected to be completed within 3 years	**Individual to Population Level** • death or injury of endangered or threatened species vs death of non-threatened dolphin or pinniped	**NA to Low**	**Nil to Less than Minor**	• Loose rope, lines, nets or other debris avoided (MMMP) • Compliance with NZ Maritime Rules Part 180 • Properly tensioned silt curtains or other sediment containment gear regularly maintained / inspected	**Nil to Negligible**
• **Habitat loss / disturbance** ○ **Prey disturbance or loss**	**Medium to Large** • complete loss of reclaimed habitat; disturbance limited to immediate waters and habitats adjacent to construction sites	**Short to Persistent** • re-colonisation of most habitats (except reclaimed areas) will begin after disturbance has ceased; boat scour persistent for wharf lifetime • lighting throughout consent, night-time only	**Individual Level** • individuals may avoid or approach activities	**NA to Low**	**Nil to Negligible**	• Previous or ongoing disturbance to nearby seabed from associated Port activities • No unique feeding habitats in the proposed areas • No known attraction effects due to current wharf lighting (prey or marine mammals)	**Nil to Negligible**

Definition of terms used in table:

- Spatial scale of effect: Small (tens of metres), Medium (hundreds of metres), Large (> 1 km)
- Persistence of effect: Short (days to weeks), Moderate (weeks to months), Persistent (years or more)
- Consequence: Individual, Regional, Population level
- 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).

4.2 Dredging activity

The act of breaking and / or removing bottom substrate in itself is not expected to directly affect any marine mammals known to frequent Whangārei Harbour. However, the associated increase in the production of underwater sound and physical disturbance within the harbour are the more likely to impact marine mammals. Noises produced from dredging activities differ from pile-driving in that they are non-impulsive, generally continuous broadband sounds that tend to occur at frequencies mostly below 1 kHz (Todd et al. 2015).

Dredge-related sound levels will be dependent on the specific vessel(s) selected to undertake the proposed works, as well as the type of seabed materials to be broken and / or removed. The proposal currently anticipates that three types of dredge platforms – a trailer-suction hopper dredger, cutter-suction dredger and backhoe (BHD or excavator-type) dredger – will likely be used from both land and floating barges. Pine (2022) estimated that underwater sound levels generated from the proposed dredging work could range between 164 and 175 dB *re* 1 µPa @ 1 m[14] based on actual noise measurements for similar dredge platforms in the published literature (see Pine 2022, appendix D). Pine (2022) used these estimated source levels to spatially model the propagation of dredge-generated noise and predict the potential extent of any potential hearing effects for local marine mammals.

Similar to pile-driving, the hearing thresholds are based on the NMFS (2024) recommended levels for non-impulsive sounds. Behavioural response and auditory masking ranges are based on a continuous noise approach known as dose–response curves (Joy et al. 2019), which estimate the probability of a response occurring at different noise levels (i.e. distances from the source) and can be species-specific were data are available. Further details about this approach can be found in Pine (2022).

Using the source levels considered to represent the 'worst-case' scenario for dredging, no PTS levels are predicted for any marine mammals, and TTS is estimated to occur only if an animal is within 1 m or less of the operating dredge, regardless of dredge type or location (Table 5; Pine 2022). Underwater noises generated from the disposal of dredged material within the reclamation areas will be significantly lower than dredge noise and further dampened by any temporary and permanent seawall structures.

As demonstrated in Table 5 and 6, the initial onset distance for any low-level behavioural responses to dredging noise will only occur when animals are within 1.6 km or less of the dredging location, regardless of method (Table 5, Figure 7). These predicted distance ranges decrease for any potentially moderate-level behavioural responses to within 600 m or less from the dredger. Any short-term auditory masking effects between two individuals of the same species are predicted to occur within distances similar or less to behavioural responses (Table 6Figure 8.

[14] The term 'dB *re* 1 µPa @ 1 m' represents the sound pressure level that has been back calculated to a standardised distance of 1 m from the source and is often known as source level.

Table 5. Summary of the estimated cumulative PTS, TTS and behavioural zones for the different marine mammal hearing group categories for dredging methods from Pine (2022). LF = low-frequency hearing group, HF = high-frequency hearing group, OW = otariid pinniped group, PW = phocid pinniped group, PTS = permanent threshold shift, TTS = temporary threshold shift, NA = data not available to calculate.

		Cutter-suction dredger				Trailer-suction hopper dredger				Backhoe dredger			
	Chance of impact occurrence*	**LF (baleen whale)** Max distance (m)	**HF (orca, other delphinids)** Max distance (m)	**PW (leopard seal)** Max distance (m)	**OW (New Zealand fur seal)** Max distance (m)	**LF (baleen whale)** Max distance (m)	**HF (orca, other delphinids)** Max distance (m)	**PW (leopard seal)** Max distance (m)	**OW (New Zealand fur seal)** Max distance (m)	**LF (baleen whale)** Max distance (m)	**HF (orca, other delphinids)** Max distance (m)	**PW (leopard seal)** Max distance (m)	**OW (New Zealand fur seal)** Max distance (m)
PTS		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TTS		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Low behavioural response #	**0%**	621	422	505	505	1,635	935	1,033	1,033	608	368	377	377
	25%	577	290			1,202	544			514	263		
	50%	503	202			1,055	451			468	185		
	75%	425	168			884	327			398	178		
Moderate behavioural response ^	**0%**	NA	293	197	197	NA	585	461	461	NA	259	202	202
	25%	NA	138			NA	324			NA	135		
	50%	NA	90			NA	245			NA	93		
	75%	NA	58			NA	171			NA	57		

* Where available, these were based on the relevant species audiogram data (Pine 2022).
# For whales, the received level at which there was 50% risk of a low behavioural response occurring was set at 120 dB *re* 1 µPa (based on bowhead whale behavioural responses to continuous noise; Southall et al. 2007) and for MF species, 129.5 dB *re* 1 µPa was used (based on orca / maki behavioural data; Joy et al. 2019).
^ No data available to inform received level for moderate behavioural effects for whales. MF species were based on orca data (Joy et al. 2019) with a 50% risk of a moderate behavioural response occurring at 137.2 dB *re* 1 µPa.

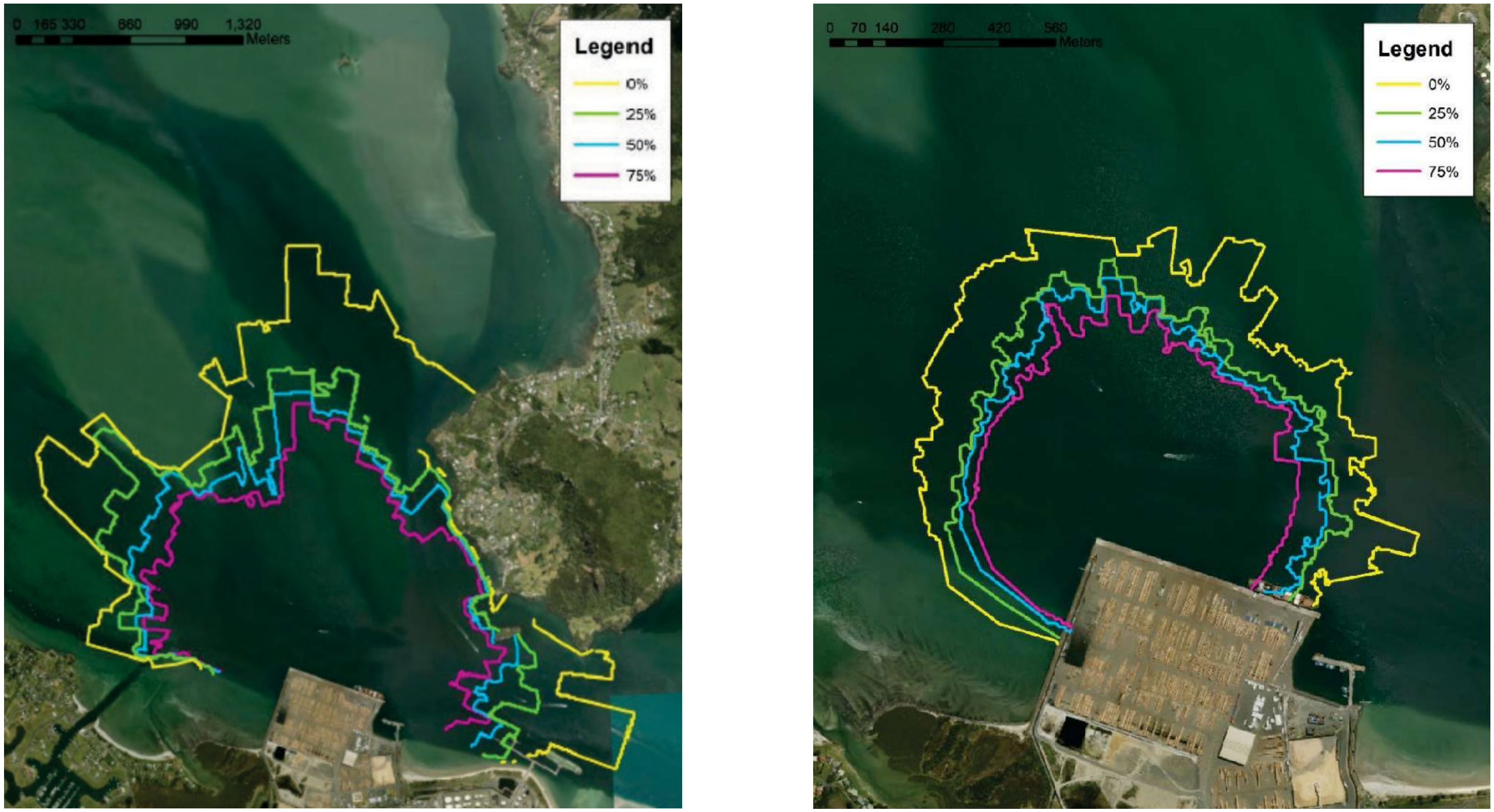

Figure 7. Examples of the likelihood of dredging noise from a trailer-suction hopper dredger (left) and a cutter-suction dredger (right) eliciting **low behavioural responses from baleen whales** during dredging within the proposed dredge area. The pink contour represents the distance in which there is a 75% chance of a visiting whale exhibiting low behavioural responses to dredge noise, while the yellow contour is the distance at which no low behavioural effects are expected to occur beyond. See Table 5 for actual distances.

Table 6. Summary of the estimated distances at which the percentage of an animal's listening space may be reduced (also known as acoustic masking) in the different marine mammal hearing group categories for all dredging methods from Pine (2022). LF = low-frequency hearing group, HF = high-frequency hearing group, OW = otariid pinniped group, PW = phocid pinniped group, NC = source too low to calculate an effect.

		Cutter-suction dredger				Trailer-suction hopper dredger				Backhoe dredger			
		LF* (baleen whales)	**HF (orca, other delphinids)**	**PW (leopard seal)**	**OW** (fur seal)**	**LF* (baleen whales)**	**HF (orca, other delphinids)**	**PW (leopard seal)**	**OW** (fur seal)**	**LF* (baleen whales)**	**HF (orca, delphinids)**	**PW (leopard seal)**	**OW** (fur seal)**
	Percent reduction	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)	Max distance (m)
Listening space (masking)	**0%**	415	398–403	578	434	1,081	1,027–1,055	1,190	1,102	334	304–308	591	343
	25%	260	236–251	327	263	537	650–657	828	758	161	146–148	236	172
	50%	24	34–41	191	70	259	308–333	420	395	NC	NC	NC	NC
	75%	NC	NC	NC	NC	31	34–36	134	78	NC	NC	NC	NC

* Masking result for whales were calculated based on fin whale audiograms.
** Masking range based on northern fur seal audiogram data in the absence of New Zealand fur seal / kekeno audiogram.

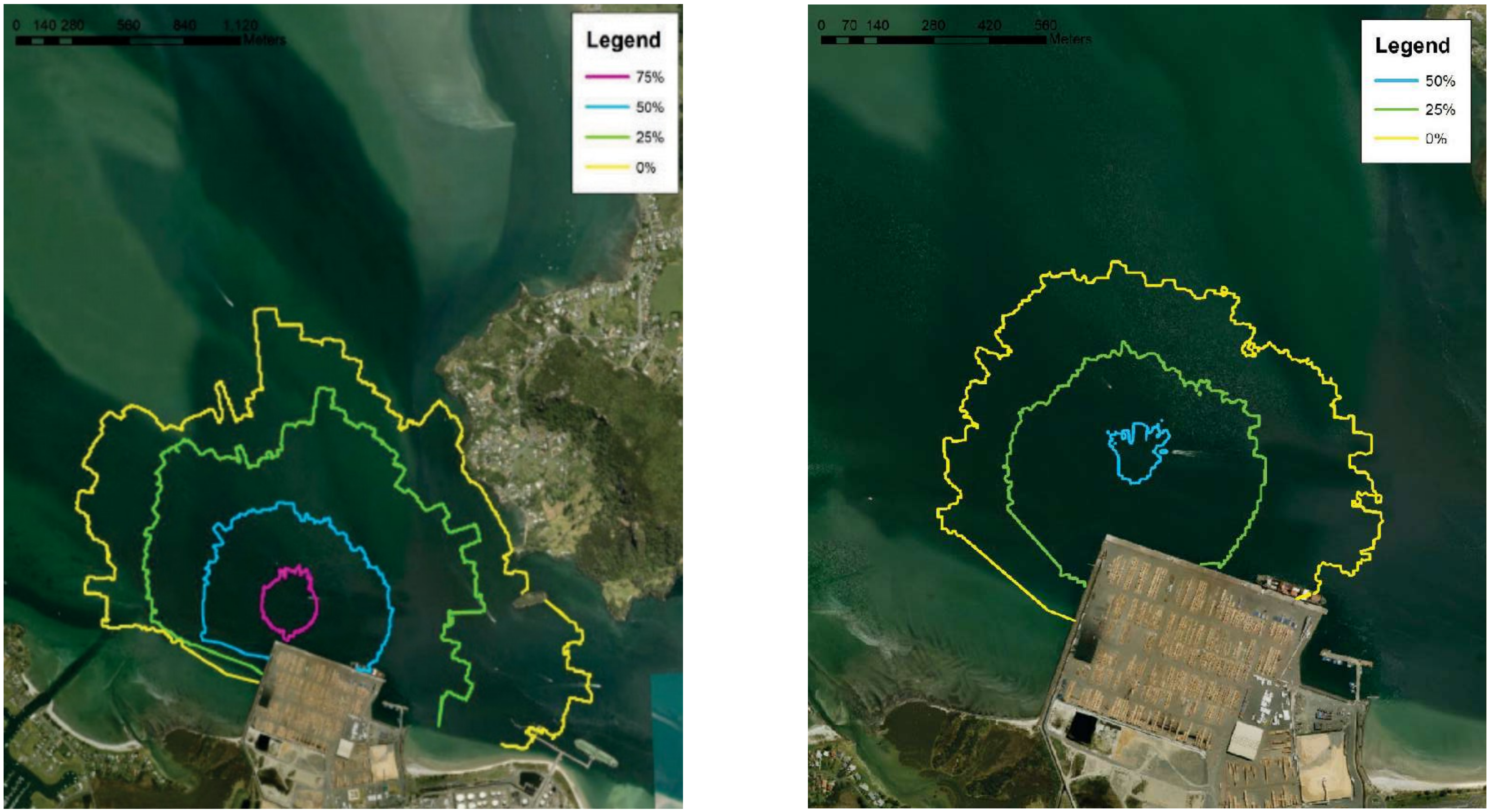

Figure 8. Examples of the likelihood of dredging noise from a trailer-suction hopper dredger (left) and a cutter-suction dredger (CSD) (right) **reducing the listening space** or causing acoustic masking in a **leopard seal / popoiangore** during dredging within the dredge area. Note that the models suggest that this species' listening space will not be reduced (e.g. acoustical masked) by more than 50% with a CSD; hence, no pink contours are included. See Table 6 for actual distances.

Summary

Based on the predicted modelling results by Pine (2022), any effects from dredging-generated underwater noises will likely be transitory and non-injurious. Effects will be predominantly limited to the momentary masking of some noise signals and a range of potential behavioural responses to within a kilometre or less of the dredging location, depending on the species. The likelihood of any hearing injury effects (TTS or PTS) occurring is considered not applicable (Table 5). The most relevant factors contributing to this assessment are summarised below:

Spatial and temporal factors

- Most whale, dolphin and pinniped species known to frequent Whangārei Harbour and the wider Te Ākau Bream Bay waters are currently exposed to similar types and levels of underwater noise from commercial and recreational vessels transiting along the North Island's eastern coastline.
- Migrating whales are sighted within Te Ākau Bream Bay area each year, with most restricted mainly to winter months and some spring months, and generally in deeper, more offshore waters (e.g. further than 5 nm to 10 nm). The exception being the more year-round presence of Bryde's whale.
- Dredge material will be used for reclamation (and will not be required to be barged for disposal elsewhere), and the potential for any boat strike of local marine mammals from the proposed dredge platforms is considered not applicable.

Known acoustic factors

- Lower-frequency, continuous noise generated by the proposed dredge vessels and activities are not expected to exceed any PTS criteria nor TTS criteria at greater than 1 m from dredge.
- Dredging activities will represent a more stationary (albeit intermittent) source of continuous noise over the proposed construction duration.
- Similar to other commercial vessels, a range of potential behavioural and masking responses are possible, but the risk for a response for most species is greatest (> 75%) only if an animal remains in close proximity to the dredge.
- Underwater noise levels are not necessarily additive or cumulative. The 'loudest' noise (e.g. commercial vessels) can often cover up other noises generated nearby.

4.3 Vessel strike from operational vessel traffic

The potential for any boat strike on local marine mammals from the construction work is considered to be so low as to be *de minimis*.[15] However, developing the shipyard and drydock capabilities in Whangārei Harbour means that more large ships will be expected to visit the port, harbour and the wider area each year. While the transiting of commercial ships to and from Whangārei does not require

[15] Too small to be meaningful or taken into consideration.

resource consent, this section addresses the potential for collision between vessels and marine mammals, and assesses the predicted risk.

In Aotearoa New Zealand waters, vessel strikes are often associated with large fast vessels, such as collisions between container or carrier ships and baleen whales. Between 1996 and 2014, 17 Bryde's whale deaths within the Hauraki Gulf / Tīkapa Moana have been attributed to vessel strike and the speeds at which commercial ships pass through the area (Constantine et al. 2015). Numerous reviews have found that the likelihood of vessel strike also depends on operational factors, including vessel type, speed and location (Van Waerebeek et al. 2007). Although all types and sizes of vessels have hit whales, the most severe collisions (e.g. fatal injury or mortality) occurred with large (> 80 m) ships, travelling at speed (Laist et al. 2001; Jensen and Silber 2004). Overall, the greatest increase in both the risk of a collision and the likelihood that it will result in severe injury or death occurs at speeds over 11 knots (Vanderlaan and Taggart 2007; Gende et al. 2011).

While the proposed shipyard and drydock facility is aimed at large commercial (i.e. Cook Strait ferries) and naval vessels, they may also service international freight vessels and super yachts (between 50 m and 230 m). Based on the layout, the facility can accommodate between 12 and 24 vessels per year per dock / hardstand, with vessels docked for up to 21 days on average. Most of these vessels are expected to travel to the facility from other Aotearoa New Zealand destinations (i.e. Ports of Auckland, Picton) rather than from overseas. North-bound ships would likely transit through current shipping routes in the Hauraki Gulf / Tīkapa Moana or around Great Barrier Island / Aotea Island before heading towards Whangārei Heads. These ships will constitute an increase in the shipping traffic moving through Te Ākau Bream Bay waters than has occurred to date.

In this case, the species considered most vulnerable to any potential vessel collisions include Bryde's, humpback and southern right whales, and to a much lesser extent, bottlenose dolphin and orca because of their current endangered species status rather than proneness for vessel strike. Despite this potential increase in north-bound vessel traffic due to the proposed port projects, the likelihood of a vessel strike (injury or mortality) associated with the proposal is assessed as *low* for migrating baleen whales, odontocete and pinniped species This conclusion is based on the relevant factors as summarised below:

Spatial and temporal factors

- Low probability of port-related commercial ships encountering a migrating whale within Whangārei Harbour and the wider Te Ākau Bream Bay region, as currently only one to three individual whales are sighted within inshore waters each year.
- Most migrating whales pass by Hen (Taranga) and Chickens Islands in deeper, more offshore waters (e.g. further than 5 nm to 10 nm), and most whales are present for a limited period each year; mainly in the winter months and some spring months, and most only remain for a day or up to a week.
- Most odontocete and pinniped species known to frequent Whangārei waters are in regular contact with all types and speeds of commercial and recreational vessels throughout their entire distributional range, with few to no reported ship strikes.

Known collision factors

- Vessel traffic is expected to increase mainly from the south where these commercial and naval ships are based.
- Any expansion of the Hauraki Gulf Transit Protocol into and behind Whangārei waters provides the best chance of significantly reducing any fatal injuries and mortalities of baleen whales due to vessel collisions in this region. It has been estimated that the implementation of the protocol in the Hauraki Gulf / Tīkapa Moana (i.e. reducing average speed to 10 knots) reduced the probability of a lethal ship strike from 51% to 16% by 2013 (Riekkola 2013), with no further strikes reported since late 2014 (Cranswick et al. 2025).
- Most dolphin species have a general attraction to boats and safely approach and / or bow-ride with numerous vessels. New Zealand fur seals often respond neutrally to boats when in the water (although they may bow-ride occasionally).

4.4 Operational loss debris and possible entanglements

A major hazard for marine mammals is the marine debris associated with construction activities and potential entanglement (Laist et al. 1999) and / or ingestion. Loose, thin lines (e.g. lines used to tie up boats, floats and other equipment) and nets (e.g. silt curtains) can pose an entanglement risk, especially when nets, ropes and lines are lost or discarded.

Construction-associated debris generation can generally be prevented with proper waste management programmes in place (e.g. secure onboard storage of lines, nets and waste) in order to comply with the New Zealand Maritime Rules Part 180.[16] Regardless, a clear requirement within the construction management plan should ensure that all waste and materials are accounted for, with any accidental release of material being rapidly collected.

There has been no known entanglement of a marine mammal in silt curtains (or similar structures) within Aotearoa New Zealand or overseas. Curtains are often solid material or fabric that produce a noticeable acoustic footprint of which echolocating animals are aware. Properly tensioned and maintained hanging silt curtains generally have 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, when regularly inspected, provide no openings in which marine mammals might enter the contained area.

4.5 Habitat loss / disturbance on prey species

The potential ecological effects from any loss of existing intertidal, subtidal and benthic biota and loss or alteration of the habitats within the immediate region of the proposed activities are discussed in detail in the ecological assessment (Kelly and Sim-Smith 2026). The report acknowledges the permanent

[16] https://www.maritimenz.govt.nz/about-us/rules/all-rules/marine-protection-rules-part-180/

loss of approximately 5.4 ha of intertidal and 4.6 ha of subtidal habitat to reclamation, which are considered high value. While the assessment notes that important habitat for fish will be affected, the impacts on potential marine mammal prey species (i.e. fish) are expected to be low and temporary, based on the following factors:

- The effect of disturbing or losing important fish habitat within the dredging and reclamation footprints is assessed as low at all scales.
- Although noise from pile-driving may disturb fish, most are expected to leave the area and will return once construction is complete.
- Observations from around Northport indicate that similar, high-value habitats and ecological features do reform once dredging ceases.

4.6 Cumulative impacts

Marine mammals passing through Whangārei Harbour and the wider Te Ākau Bream Bay region are exposed to a variety of other anthropogenic activities that generate underwater noise, including large-scale commercial shipping, recreational boating and commercial fishing vessels (e.g. fishing trawls). The underwater noise model (Pine 2026) is based on actual measurements of the current ambient (i.e. background) noise that incorporates these existing aspects of the current harbour environment.

Underwater noise generated by different activities within proximity of each other and across the wider harbour can interact in different ways. The loudest source usually covers up the other sources rather than all sources cumulatively making the environment noisier. This effect is particularly true for activities that make different types of noise (i.e. pulses vs continuous) or generate noise in different ranges of frequencies. In the case of this proposal, if pile-driving and dredging (or similar underwater noise-generating activity) are taking place in the vicinity of the proposal site at the same time, the louder pulses of piling that occur each time the hammer falls will likely be heard over the top of the more constant low-frequency noise of the dredger.

However, and as discussed in the previous sections, the overall cumulative effect of several similar noise sources can result in the cumulative noise thresholds (i.e. TTS_{cum} or PTS_{cum}) being reached over an exposure period that is much shorter than the standard 24 hours. For example, two similar pile-drivers operating at the same time in the proposal area would reach the maximum number of daily hammer strikes (used in modelling predictions) much earlier in the day, and any further exceedances would then result in much larger cumulative noise contours (i.e. TTS_{cum} or PTS_{cum} distances) from the source.

Alternatively, the duration of underwater noise disturbance is also an important consideration. Other consented, but currently unimplemented, marine development projects within the lower harbour region include the Refining NZ Channel Deepening project, the construction of NPL's Berth 4 and the recently consented Eastern Reclamation. If the proposed consent was implemented consecutively with these projects, underwater noise levels could potentially be elevated for over 8 years: Refining NZ – 6 months to 1 year, Berth 4 – 2.5 years, Eastern Reclamation – 2.5 years, assuming no overlap or delays, and the proposed shipyard construction – 3 years.

From an underwater noise management perspective, it would be better to complete as many 'noisy' activities simultaneously and over as short a duration as possible, but only when it is safe to do so (i.e. no marine mammal in the harbour or harbour entrance area); for example, construction of this shipyard and drydock facility could be carried out at the same time as Northport's Eastern Expansion project, rather than spreading the impact across several years.

5. Effects management

The activities of the proposal that have been assessed as more likely to adversely affect local and visiting marine mammals in the vicinity of the proposed shipyard site are those that generate high levels of underwater noise, namely pile-driving activities, and, to a lesser extent, dredging. Management actions are required, as the predicted unmitigated distances of pile-driving generated noise (greater than 4 km for TTS thresholds) are too large and widespread to be effectively managed using a standard observed shut-down zone for marine mammals (MMOZ). The scale of these predicted noise impacts and extended timeline of the proposal (more than 3 years) necessitate implementing several management and mitigation measures to reduce and minimise underwater noise effects on marine mammals (discussed further in Section 5.1 and Table 8).

It is considered necessary to reduce the potential adverse effects for all high-frequency hearing species to within an achievable and effective marine mammal observation zone (MMOZ) distance (no more than 500 m), thus avoiding any TTS and PTS effects while minimising behavioural effects. For baleen whales (a low-frequency hearing species), the goal will be to avoid their potential exposure to TTS and PTS effects (and any subsequent behavioural or masking effects) through an actively managed shut-down zone at the harbour entrance. This zone will be monitored by multiple marine mammal observers (MMOs) and a real-time detection system comprised of several underwater hydrophones placed near the harbour heads / entrance and within harbour channels.

To ensure that the most appropriate measures are in place for all possible effects, a separate draft marine mammal management plan (MMMP) has been developed in consultation with both marine mammal and underwater acoustic experts. This plan outlines in detail the procedures referred to in the summary of effects table (Table 4) and the measures discussed in Section 5.1 and Table 8. In particular, the MMMP lays out the timelines for management actions and implemented mitigation procedures. The plan will also give effect to any consent conditions to ensure the intended performance standards are being met by the MMMP's methods and procedures. The final MMMP should be reviewed and consulted on with DOC, iwi and other stakeholders prior to commencement of any operations.

5.1 Management measures

The draft MMMP requires the consent holder to identify and adopt the best practicable option (BPO) to minimise the adverse effects on marine mammals from underwater noise emissions. Key recommended effects mitigation measures and actions are listed in Table 8 while detailed underwater noise mitigation measures are discussed further below:

- **Use of a sacrificial, non-metallic hammer cushion cap (or dolly)**. The noise modelling by Pine (2026) assumes that all impact piling works use a dolly cushion. This cushion is made of wood (preferred), nylon or polymer plastic and sits between the hammer and the top of the pile, where it is used to reduce wear. By dampening the impact of the hammer, appreciable reductions in both underwater noise and airborne noise are achieved with this method.

- **Verification of in situ noise levels**. The actual underwater noise levels produced from pile-driving activities are to be verified at the start of the project using passive or real-time underwater acoustic detectors. Results will be reviewed against the same parameters used for acoustic modelling by Pine (2026), and any necessary adjustments will be made to mitigation actions (e.g. revised MMOZ size) prior to any further pile-driving activities taking place.
    - A real-time acoustic detection system will be used as the primary and ongoing control to ensure the shut-down zone matches the predicted TTS zone for high-frequency hearing species (i.e. less than 500 m). These detectors will quantify the accumulated dose of noise over 24 hours in real-time and send out an alert to stop piling so that it does not exceed 178 dB *re* 1 µPa 2•s (for high-frequency hearing species) at 500 m.
- **Reduction of noise levels generated at the source**. Several operational considerations may help reduce the source level of underwater noise produced by pile-driving activities to minimise any hearing effects:
    - *Piling method*. The preferred method for minimising underwater noise would be the use of vibro-driving, whenever possible. This technique generates a continuous and generally lower level of sound compared to the intense, discrete pulses from impact driving. However, full consideration must be given to other environmental factors such as substrate type and duration implications (i.e. 'best practicable option').
    - *Pile size / type*. The smallest possible pile size that meets the specific operational need should be used – generally, the smaller the pile, the lower the noise level (subject to different piling methodologies). The materials that the piles are made of, or pile type, in order of increasing noise generation are: timber, concrete and steel piles.
    - *Daily / weekly limits*. Limiting pile-driving to weekdays and daylight hours restricts the total strikes within a 24-hour period and allows for hearing recovery periods (e.g. overnight, weekend).
- **Reduction of underwater noise propagation**. The use of bubble curtains, coffer dams, isolating sheet piles or jacket technology around the piling area are known to reduce the amount of noise that enters the water column. However, the strong tidal and current conditions within Whangārei Harbour mean bubble curtains will not sustain a proper flow and density of bubbles from the seabed to the surface around the piles themselves. Confined bubble curtains, similar to a coffer dam, consist of a heavy-duty fabric tube placed around each pile prior to driving, air is then pumped through the water trapped between the two piles. The outer pile helps contain the bubbles and maintain the density of bubbles needed to reduce the overall noise being generated. Pine (2026) modelled the potential noise level reductions that can be achieved when using confined bubble curtains (see Table 7, Figure 9 and 10).
- **Establishment of MMOZs**. The establishment of MMOZs, i.e. shut-down zones, around both the shipyard construction area and harbour entrance area minimises the risk of hearing impairment (i.e. TTS / PTS) to marine mammals from pile-driving activities. The presence of any marine mammals within these zones would require the cessation of pile-driving, with no recommencement or continuation until the animal has left the predetermined zone. Given the noise propagation estimates, the shape of the harbour and its entrance, and the year-round presence of dolphins, the construction site MMOZ should be 500 m or less from the piling source for all cetaceans and pinnipeds, and the entrance MMOZ should span the harbour entrance from

Marsden Point to Reotahi Bay (approximately 1.3 km), pending *in situ* verification. Operational requirements include:

- *Monitor the MMOZ*: This will involve at least one dedicated, experienced MMO maintaining an effective lookout station at an elevated, fixed platform near the piling site and two to three dedicated, experienced MMOs at elevated lookout stations at the harbour entrance near Marsden Point (i.e. Refining NZ boat jetty or suitable building) and /or across the harbour near Mount Aubrey Lookout.
- *MMO to continuously scan for the presence of marine mammals prior to, during and following any pile-driving activities (which will take place during daylight hours only)*:
    - To minimise the risk to any marine mammals already present in Whangārei Harbour (i.e. overnight prior to piling starting in the morning), MMOs will undertake a pre-start review of all overnight detections recorded from the harbour entrance and inner harbour acoustic mooring(s) to determine the probability of marine mammals being present in the harbour.
    - Additional on-water surveys will be undertaken by at least one MMO first thing in the morning from the inner harbour branches towards the port facilities. The purpose of these surveys is to scan for the presence of any marine mammals in these harbour channels. If any animal(s) are present in the harbour prior to the start of pile-driving, operations will be suspended until the animal(s) has been sighted or acoustically detected leaving the harbour entrance.
    - A central contact point should be established with DOC to obtain up-to-date regional sighting information for the duration of the project, particularly regarding nearby visiting baleen whales or orca sightings. 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 Te Ākau Bream Bay region.

- **Use of soft-start or ramping-up procedures**. The use of these procedures means that pile-driving energy is gradually increased to normal operating levels. They are recommended to give nearby animals (i.e. those close to or just outside the MMOZs) an opportunity to move away from the area before sound levels increase to an extent that may cause discomfort or injury (i.e. TTS). This process is also expected to help mediate some more moderate and / or low behavioural responses from nearby animals, giving them a chance to habituate to the pulses of sound over time before the noise level increases.

Table 7. Estimated distance ranges of **mitigated noise level** generated from impact pile-driving over winter temperatures for potential hearing effects (permanent threshold shift [PTS], temporary threshold shift [TTS]), behavioural impacts and listening space reduction (LSR; i.e. masking) of the four functional hearing groups in Pine (2026). HF = high-frequency hearing group, LF = low-frequency hearing group, PCW = phocid pinniped group in water, OCW = otariid pinniped group in water.

Threshold criteria		HF (orca, bottlenose dolphins, other delphinids)	LF (baleen whales)	PCW (leopard seal)	OCW (New Zealand fur seal)
		Max. distance (m)*	Max. distance (m)*	Max. distance (m)*	Max. distance (m)**
PTS		38	451	368	183
TTS		461	3,785	3,335	1,888
140 dB Low (10%) behavioural threshold		2,950[#]			
160 dB Moderate (50%) behavioural threshold		227			
LSR (masking) [#]		**HF (orca, other delphinids)**	**LF (baleen whales)**	**PCW (leopard seal)**	**OCW (New Zealand fur seal)**
		Max. distance (m)*	Max. distance (m)*	Max. distance (m)*	Max. distance (m)**
Percentage reduction	**0%**	9,759	9,759	9,759	9,759
	25%	5,603	5,603	5,603	5,603
	50%	3,402	3,776	3,776	3,776
	75%	1,632	2,911	2,902	2.533

* Where available, these distances were based on the relevant species audiogram data (Pine 2025). Masking results for whales were calculated based on fin whale audiograms.
** Range based on northern fur seal audiogram in the absence of New Zealand fur seal / kekeno audiogram.
# LSR – the narrowest distance from the construction site to the northern side of harbour (Motukaroro Island and Reotahi Bay) is 1.3 km.

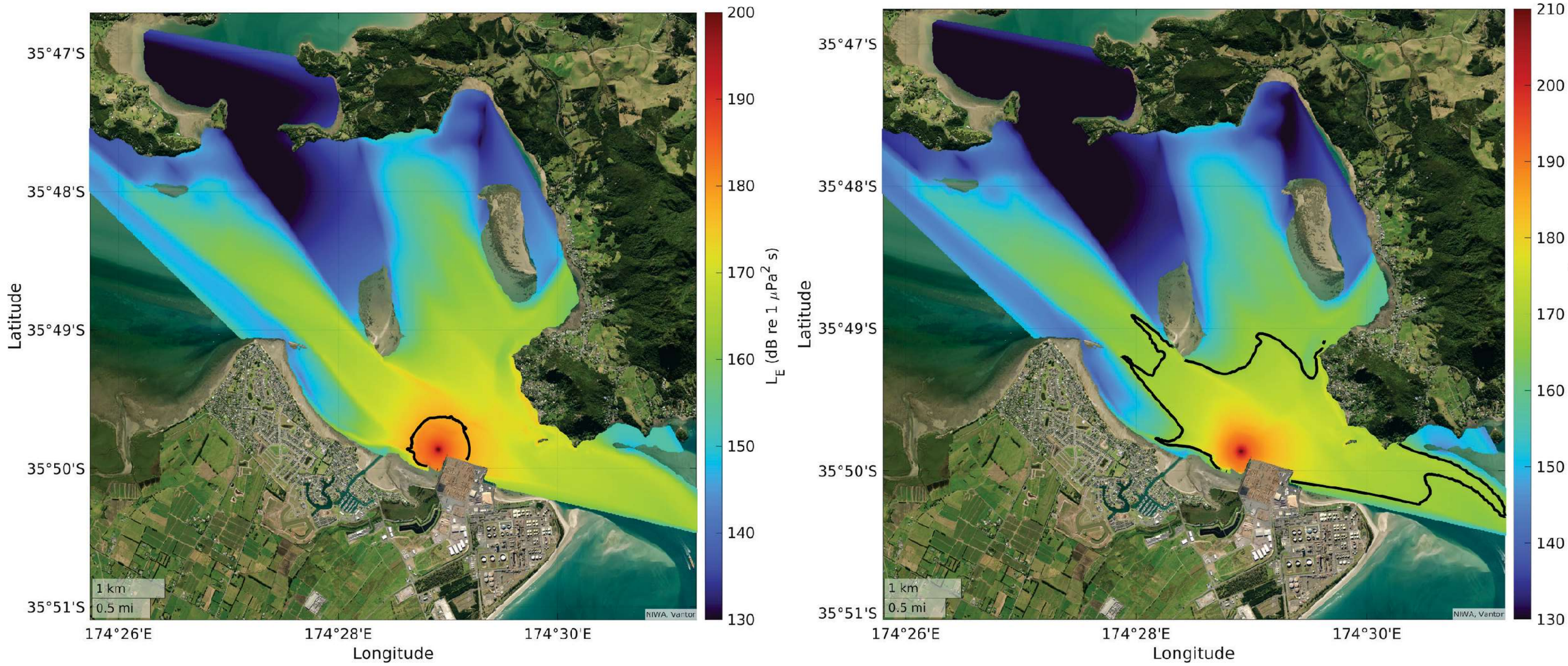

Figure 9. The predicted spatial ranges for the onset of **temporary threshold shift** (TTS) **from percussive impact piling and confined bubble curtains** within the shipyard construction area for **high-frequency hearing animals** (HF; e.g. bottlenose dolphin / terehu, orca / maki) in left panel and for **low-frequency hearing animals** (LF; e.g. baleen whales) in the right panel. These diagrams demonstrate how sound propagates from the pile-driving source as a gradient of colour, with red representing the highest sound levels and blue representing the lower sound levels. The black contour lines represent the locations at which these levels are predicted to exceed TTS within the relevant hearing groups.

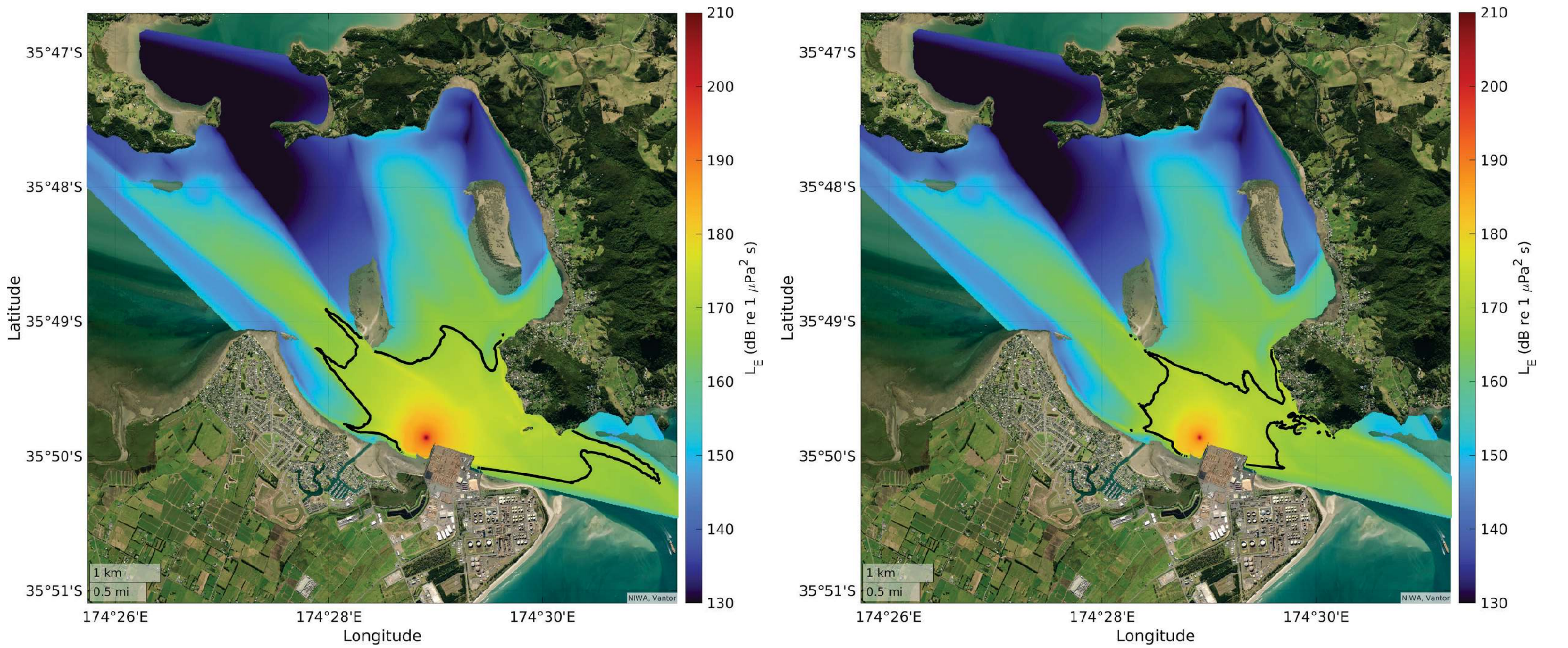

Figure 10. The predicted spatial ranges for the onset of **temporary threshold shift** (TTS) from **percussive impact piling and confined bubble curtains** within the shipyard construction area for **phocid pinnipeds** in water (PW; e.g. leopard seal / popoiangore) in left panel and for **otariid pinnipeds** in water (OW; e.g. New Zealand fur seal / kekeno) in the right panel. These diagrams demonstrate how sound propagates from the pile-driving source as a gradient of colour, with red representing the highest sound levels and blue representing the lower sound levels. The black contour lines represent the locations at which these levels are predicted to exceed TTS within the relevant hearing groups.

Table 8. Proposed management goals and practices to reduce or avoid the risk of any adverse effects of from the proposed construction activities on marine mammals in Whangārei Harbour. DOC = Department of Conservation, NRC = Northland Regional Council, BPO = best practicable option, MMOZ = marine mammal observation zone.

Potential effects	Management goal	Best management practice	Reporting / monitoring
Physical and / or behavioural responses to underwater sound from construction activities	1. Avoid acoustic injury and minimise disturbance to marine mammals	1a. Use BPO to minimise underwater noise effects. 1b. Establish a marine mammal management plan (MMMP) for: <u>Dredging activities</u> 1c. Regular maintenance, proper upkeep of all dredging equipment and vessels (e.g. lubrication and repair of winches, generators). <u>Pile-driving activities</u> 1d. Adopt soft-start / ramping-up procedures and choose plant / techniques on the basis of BPO. 1e. Pre-start morning checks of the harbour to avoid trapping animals within the harbour. 1f. Reduce piling noise propagation with confined bubble curtains. 1g. 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); at the construction site MMOZ at 500 m (or less) from piling source and the MMOZ across the harbour entrance). 1h. Verify and continuously monitor noise levels with real-time underwater noise detection system.	• Measure initial underwater noise levels from mitigated pile-driving, dredging and other construction activities and adjust / implement any mitigation actions based on these data, if necessary. • 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. Annual records provided to DOC and NRC and made publicly available (e.g. web). Include behavioural data if possible.

Potential effects	Management goal	Best management practice	Reporting / monitoring
Marine mammal / vessel strike due to increased vessel activity	2. Minimise the risk of vessel collisions with any marine mammal and aim for zero injury / mortality	2a. Encourage shipyard-related ships to adopt best boating guidelines for marine mammals (see Appendix 5). 2b. Formally support and establish a similar protocol to the Hauraki Gulf Transit Protocol for Commercial Shipping that includes speed limits, crew watches and reporting of sightings to reduce any chances of mortality from vessel strikes.	• Consistent with the Hauraki Gulf's voluntary shipping protocol, the shipyard will maintain records of all reported vessel strike incidents or near incidents regardless of outcome. • In case of a fatal marine mammal incident, carcass(es) recovered (if possible) and given to DOC, and further steps taken in consultation with DOC to reduce the risk of future incidences. Tangata whenua notified.
Marine mammal entanglement in operational gear and / or debris	3. Minimise entanglement and aim for zero mortality	3a. 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. 3b. Regular maintenance / inspection of properly tensioned silt curtains or other sediment containment gear. 3c. Ensure that all support vessels and other project activities have waste management plans in place. 3d. Record all entanglement incidents or near incidents regardless of outcome (e.g. injury or mortality).	• Nothing required, self-checking with up-to-date records available. • In case of a fatal marine mammal incident, carcass(es) recovered and given to DOC, and further steps taken in consultation with DOC to reduce the risk of future incidences. Tangata whenua notified.

6. Summary

The purpose of this report is to describe the existing marine environment in terms of the local and visiting marine mammals that use Whangārei Harbour and the wider Te Ākau Bream Bay area and assess the potential effects of the construction and operation of the proposed shipyard and drydock activities on marine mammals. Several recent reviews and research programmes have identified the species of marine mammals in the area that may be potentially affected by the project, including bottlenose dolphin / terehu, common dolphin / aihe and orca / maki, and occasional visitors such as New Zealand fur seal / kekeno, Bryde's whale, southern right whale / tohorā and humpback whale / paikea.

Although all dredging and construction activities were considered, pile-driving was identified as the main activity that could potentially adversely affect any marine mammals in the vicinity of the proposed shipyard site through high underwater noise levels. Underwater acoustic modelling predicts that pile-driving noise is expected to be detectable across the harbour, throughout the harbour entrance and within large portions of the lower harbour channels. Given the potential for both permanent (PTS) and temporary hearing impairment (TTS) for any marine mammal species within the harbour and its entrance channel, management and mitigation actions are necessary to minimise adverse effects.

A separate draft marine mammal management plan (MMMP) has been prepared in consultation with both marine mammal and underwater acoustic experts. The MMMP will ensure that appropriate measures are in place during construction to adopt practices that consider the best practicable option (BPO) to minimise any potential adverse effects. Active management is required and mitigation measures are based around a combination of reduced source noise levels, visually detecting marine mammals (from dedicated marine mammal observers), and a real-time underwater acoustic detection system operating within the harbour entrance and construction site area. Further, the effectiveness of these actions will need to be initially verified *in situ* and regularly reviewed to ensure they are adequately reducing noise levels and allowing for safe passage of animals in and out of the harbour, especially given the potential severity of any unmitigated noise levels.

With these mitigation measures in place, piling and dredging activities are expected to only elicit short-term, non-injurious behavioural responses. There is also potential for momentary masking of some acoustic signals from visiting high-frequency hearing species prior to entering the harbour and / or while in close proximity to construction activities. Overall, the combination of actions outlined in this report is expected to sufficiently minimise any adverse effects from the proposed construction and operation activities and appropriately manage any residual effects. Finally, and in regard to potential cumulative effects on marine mammal from several pending infrastructure projects, it would be better to complete as many 'noisy' activities simultaneously and over as short a duration as possible.

7. Appendices

Appendix 1. Additional sources of marine mammal data and information

In addition to the sources indicated in Section 3.1, more broad-scale, regional information is available for most marine mammals that use the general Whangārei Harbour / Te Ākau Bream Bay region. Multiple and finer-scale studies have been undertaken in both the Bay of Islands to the north and in the wider Hauraki Gulf / Tīkapa Moana region to the south. The studies and databases used to make any summaries and assessments of the marine mammal species discussed in this report are listed below:

- DOC opportunistic database and stranding record database.
- Marine mammal tourism data in the Bay of Islands and Hauraki Gulf region.
- National Aquatic Biodiversity Information System (NABIS).
- Scientific research through University of Auckland:
  - R. Constantine – various studies in Bay of Islands, Bryde's whales in the Hauraki Gulf, and humpback whales / paikea around Aotearoa New Zealand
  - G. Tezanos-Pinto – research on bottlenose dolphins / terehu in the Bay of Islands, and Bryde's whales in Hauraki Gulf
  - E. Carroll – various studies on southern right whales / tohorā.
- Scientific research through Massey University at Albany:
  - K. Stockin –various studies on common dolphins / aihe, bottlenose dolphins and Bryde's whales in the Hauraki Gulf
  - N. Wiseman – studies on Bryde's whales in Hauraki Gulf
  - S. Dwyer – various papers on cetaceans in the Hauraki Gulf and Great Barrier Island / Aotea Island
  - K. Hupman – various papers on common dolphins in the Hauraki Gulf and leopard seals / popoiangore.
- Orca Research Trust – various papers on New Zealand orcas / maki.
- Berkenbusch K, Abraham ER, Torres L. 2013. New Zealand marine mammals and commercial fisheries. Wellington: Ministry for Primary Industries. New Zealand Aquatic Environment and Biodiversity Report No. 119.
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- Stephenson F, Goetz K, Sharp BR, Mouton TL, Beets FL, Roberts J, MacDiarmid AB, Constantine R, Lundquist CJ. 2020. Modelling the spatial distribution of cetaceans in New Zealand waters. Diversity and Distributions. 26:495–516.

Appendix 2. Baseline surveys of marine megafauna in Te Ākau Bream Bay to support kaitiakitanga

Refer to reports listed below:

Brough T, Kereopa H, Zaeschmar J, Leunissen E, Shirkey T. 2024. Baseline surveys of marine megafauna in Te Ākau / Bream Bay to support kaitiakitanga. Tere Tohorā, Karanga Tangata: a collaboration between Patuharakeke, Far Out Ocean Research and the National Institute of Water and Atmospheric Research. Dunedin: National Institute of Water & Atmospheric Research Ltd. NIWA Client Report No: 2024202HN. Appendix 2_Brough et al. (2024).pdf

SLR Consulting NZ. 2026. Te Ākau Bream Bay sand extraction: marine mammal environmental impact assessment. Nelson: SLR Consulting NZ. SLR Project No. 840.030119.00001, Revision 07. Prepared for McCallum Bros Limited. Appendix 2_SLR Consulting NZ (2026).pdf

Appendix 3. Summary of Northport marine mammal monitoring data

The following data were collected and presented as part of the resource consent application for Northport Limited's reclamation proposal. While additional acoustic mooring data has been collected since 2023, the data has not yet been processed in a summary format to be included here.

A3.1 Summary of Whangārei marine mammal acoustic monitoring results

Clement D. 2023. Statement of rebuttal evidence of Deanna Marie Clement (potential effects of proposed Northport reclamation on marine mammals). Resource consent application by Northport Limited before the Whangarei District Council and the Northland Regional Council. Dated 3 October 2023.

Northport Limited undertook an underwater acoustic monitoring programme in order to collate ambient background noise for further noise propagation modelling and effects radii. Figure 1 [i.e. Figure A3.1][17] shows the deployment locations of the three separate moorings. The underwater recorders also collected any echolocation clicks and calls from the various odontocete (toothed whales) and baleen whale species that were vocalising as they travelled in and out of the Whangārei Harbour entrance and near the moorings.

Figure 1 [A3.1]. The deployment and retrieval locations of the three monitoring moorings in relation to the relevant bays.

[17] Figure and table numbering from original document; renumbering in square brackets applied to current report.

Results

Nineteen separate deployments were made starting on 19 June 2020 and ending on the 5 September 2023. As Table 1 [i.e. Table A3.1] highlights, recorders were not deployed continuously across the three moorings or over the entire three years of sampling. More information on the acoustic programme is included in Pine (2022). The dataset suffered from the normal field work problems (e.g. missed sampling periods, failed equipment, bad weather delays, battery or memory failure, data corruption, etc.). Due to some of these reasons, the data itself has been more difficult to analyse than most and is one of the reasons that the final data were not fully available until now.

Table 1 [A3.1]. A list of the deployment dates and the actual sampling days at each of the different mooring locations. Dashed lines indicate breaks of more than one month in deployments. * two recorders were deployed at this location over the same period.

Year	Start Date	End Date	Calliope	Passage Island	Sinclair
2020	19/06/2020	24/07/2020	33	31	55*
	24/07/2020	28/08/2020	35	35	0
	28/08/2020	08/10/2020	38	38	30
	05/10/2020	29/10/2020	24	0	29
	29/10/2020	02/12/2020	34	34	34
2021	07/07/2021	30/08/2021	46	6	0
	30/08/2021	02/10/2021	33	33	0
	05/10/2021	18/11/2021	0	0	44
	18/11/2021	21/12/2021	25	38	34
2022	21/12/2021	21/01/2022	31	35	0
	21/01/2022	26/02/2022	36	38	26
	05/05/2022	05/06/2022	31	33	31
	09/09/2022	16/10/2022	35	34	37
2023	20/12/2022	20/01/2023	31	21	0
	20/01/2023	22/02/2023	31	0	31
	20/02/2023	21/03/2023	29	17	29
	21/03/2023	21/04/2023	30	0	27
	12/05/2023	14/06/2023	37	32	32
	14/06/2023	05/09/2023	41	0	82

Table 2 [i.e. Table A3.2] provides a summary of the total number of sampling days and detections events at each of the three moorings. Calliope (at the entrance to the harbour) recorded more sampling effort, as well as detections, while Passage Island had the least effort. The total number of days in which at least one detection was recorded was standardised by the total days of effort at each mooring over the seasons. Overall, detection rates indicated that dolphins / orca were only present and vocalising in the harbour entrance area around 9 to 15% of the days sampled.

As evident in Figure 2 [i.e. Figure A3.2], lower rates of detections were found over summer and autumn at all three locations despite high effort levels in same cases. These findings are in general agreement with the most odontocete species' occurrence trends discussed in Clement (2022). Detections rates were fairly similar at the two mooring locations inside the harbour entrance (i.e. Passage Island and Sinclair) while generally greater at Calliope over most seasons even after standardising for the differences in effort. This finding suggests that not all odontocetes visiting the harbour entrance chose to travel past Taurikura Bay and into the harbour. Interannual variation between detections was also notable (Figure 3 [i.e. Figure A3.3]). In general, detection rates were greater during 2020 than most other equivalent seasons in subsequent sampling years.

Table 2 [A3.2]. Summary of the total number of recorded vocalisation detection events for all odontocetes species and associated parameters with moorings at Calliope, Passage Island and Sinclair across various deployments between 19 June 2020 to 5 September 2023.

Mooring	No. of days recording	No. of minutes detected	No. of events	No. days with at least one detection	Percent days with detections
Calliope	599	1,509	150	89	15%
Passage Island	425	593	91	38	9%
Sinclair	523	937	100	51	10%

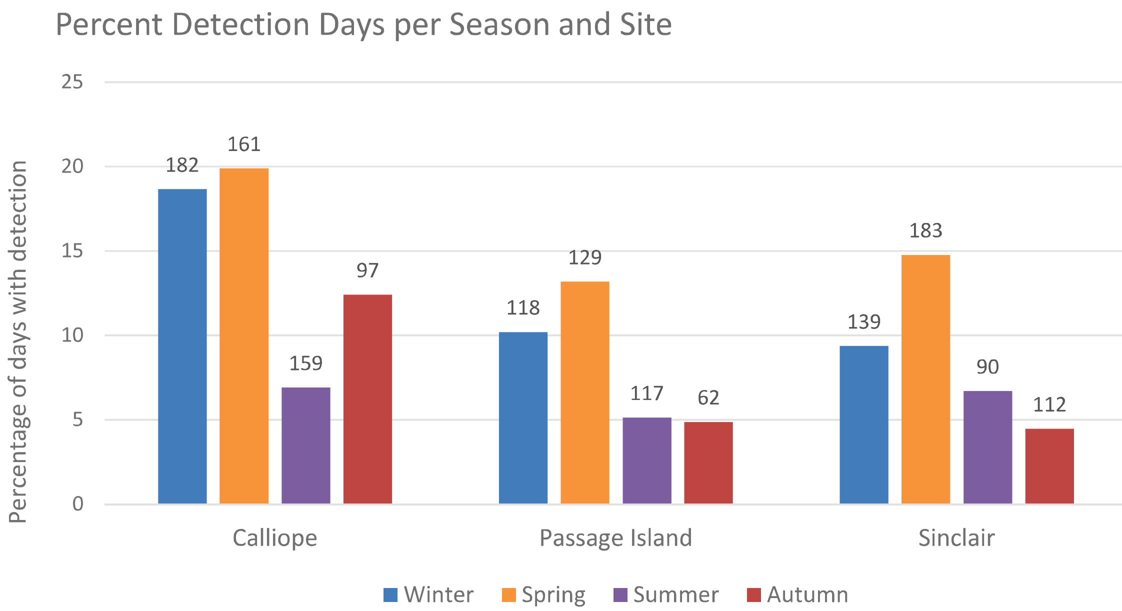


Figure 2 [A3.2]. The proportion (%) of days with dolphin detection events (i.e. days with at least one detection) standardised by the number of sampling days for each season[18] and by mooring location. Numbers at the top of the columns represent the total sampling days in each season for each mooring across all three sampling years.

[18] Standard austral seasonal definitions were used. Winter = June, July, August; Spring = September, October, November; Summer = December, January, February; Autumn = March, April, May.

Figure 3 [A3.3]. The number of underwater acoustic sampling days with no dolphin detections (yellow bars) and the number of sampling days with at least one dolphin detection (green bars) by season for each separate mooring over the three sampling years.

Dr Pine was able to distinguish some orca vocalisations from other mid-frequency odontocete species. With underwater acoustics, the larger the size of the animal, the louder they can vocalise. As orca calls are able to travel the furthest of the delphinids, they are more likely to be picked up by the acoustic mooring stations.

Orca calls were heard on three separate days at Calliope mooring and on one of the same days at Passage Island over a 10 day period in September / October 2020. Approximately a month later (November 2020), orca were detected twice over the course of the same day at Sinclair mooring. Orca calls were not heard again until in September 2021 when two separate occasions were detected 11 days apart and later in March 2023 on one occasion from the Passage Island mooring. We note that the seasonality of these detections are in line with expectations from Clement (2022). From the time of the detections, these orca visits may have lasted between several minutes and up to several hours, the acoustics cannot determine duration accurately given duty cycling and detection distances.

Baleen whales were detected only at the Calliope mooring but are not yet available. As these low-frequency calls can be detected at distances greater than 10 kilometres from the whale, a single recorder cannot triangulate the caller's location. Hence, it was assumed these calls were from Te Ãkau Bream Bay or beyond as no whale calls were recorded at the other moorings.

Multiple odontocete detections were often recorded on the same day. Unfortunately, the recorders are not able to distinguish between the vocalisations of individual dolphins and so cannot determine if it is the same group entering and leaving the harbour or just new groups passing by. Clusters of events also occurred over multiple days usually lasting between 2 to 4 days when it appears several groups are moving back and forth along the channels near the moorings. The longest continuous detection events in which animal remained near the recorders varied from 61 and 94 minutes. These findings also support the general dolphin trends discussed in Clement (2022).

Finally, whether dolphins may be using the harbour more or less during day or night-time hours was also assessed. The time of each detection was simply categorised into a breakdown of day-time (06:01 to 18:00) vs night-time (18:01 to 06:00) hours, but does not consider the changes in season or daylight savings at the moment (Figure 4 [i.e. Figure A3.4]). At this stage, it appears that dolphins are using these areas of the harbour fairly equally between day and night. More variation between day and night detections appears to occur at the Passage Island and Sinclair moorings, but the low number of detections in some seasons make any further interpretation questionable.

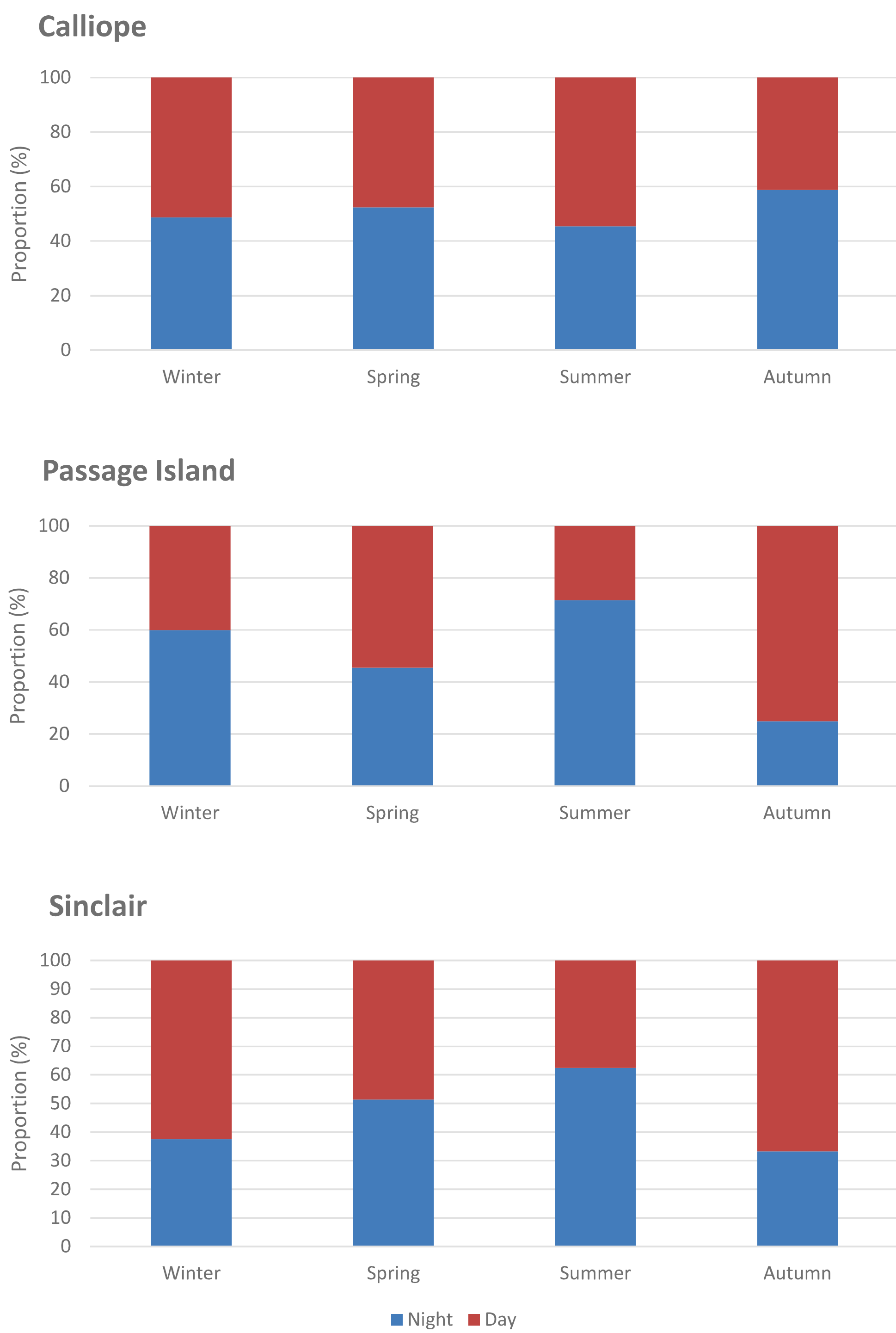
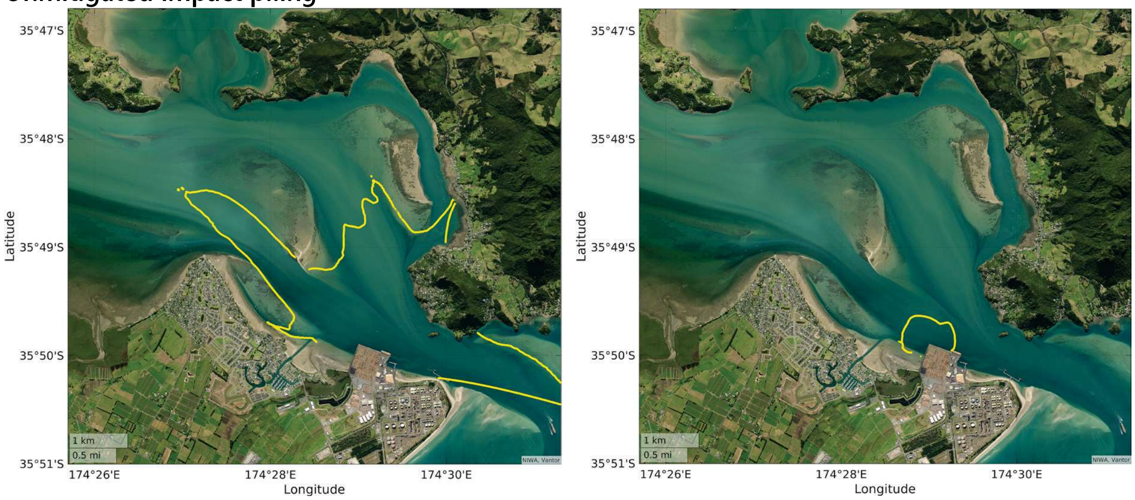


Figure 4 [A3.4]. The proportion of all detections that occurred during the day-time (06:01 to 18:00) or during the night-time (18:01 to 06:00) for each mooring across all seasons.

Appendix 4. Behavioural and listening space reduction plots for the different functional hearing groups (Pine 2026)

Unmitigated impact piling



Mitigated impact piling

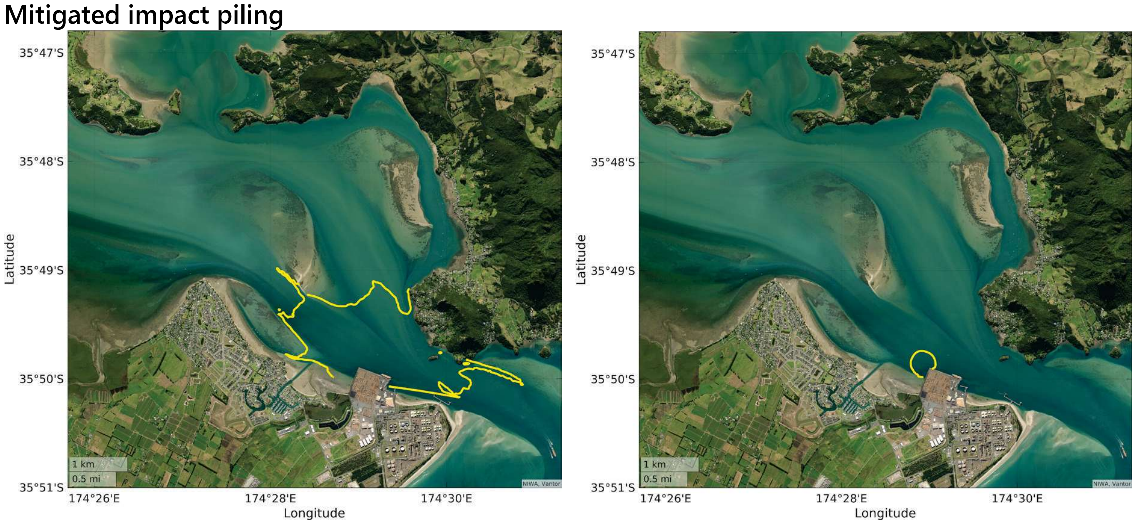
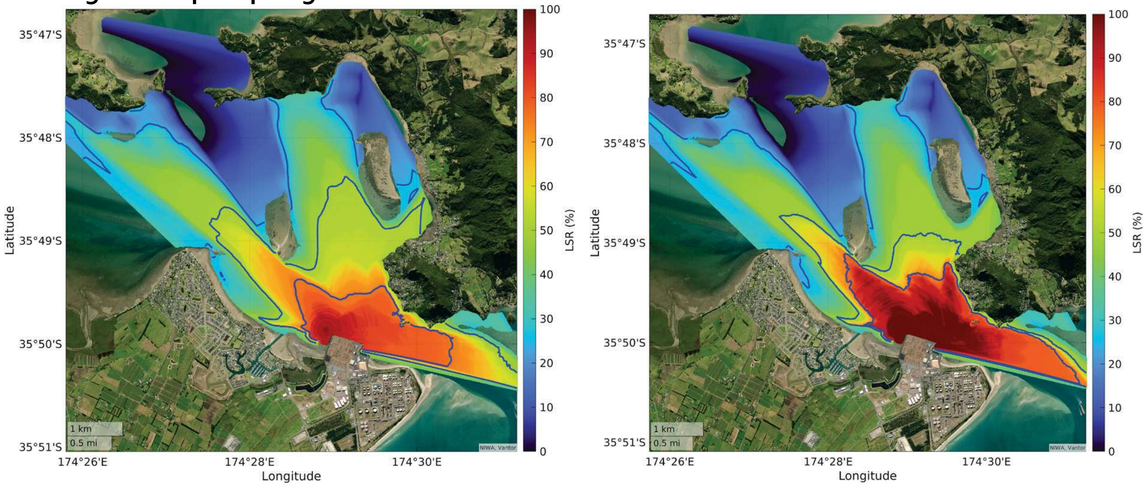


Figure A4.1. Distance contour plots of the predicted **low behavioural responses** (left side) and **moderate behavioural responses** (right side) for all species from **unmitigated percussive impact piling activities** (top figures) and **percussive impact piling with confined bubble curtains** (bottom figures) within the shipyard construction areas (Pine 2026).

Unmitigated impact piling



Mitigated impact piling

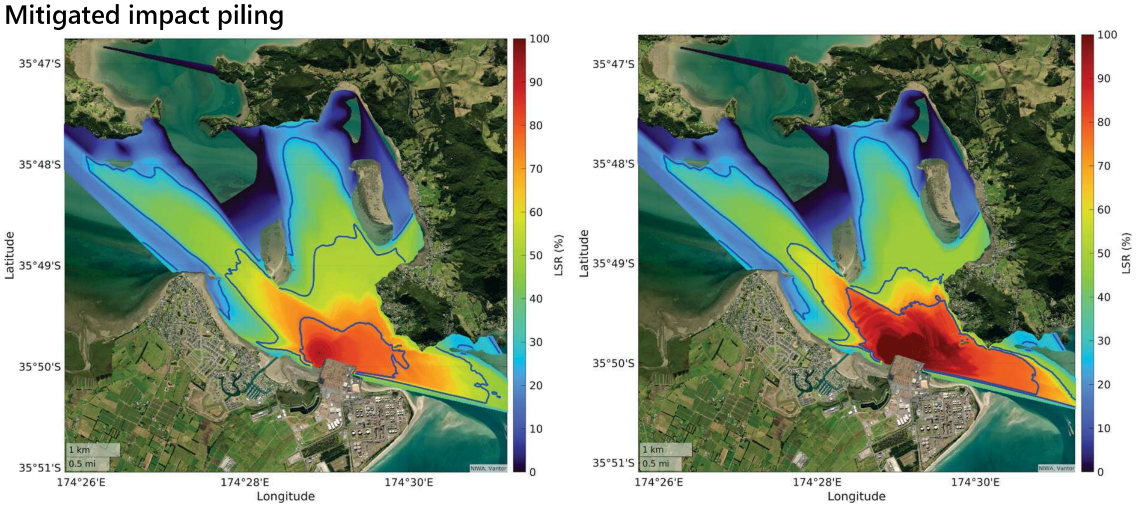
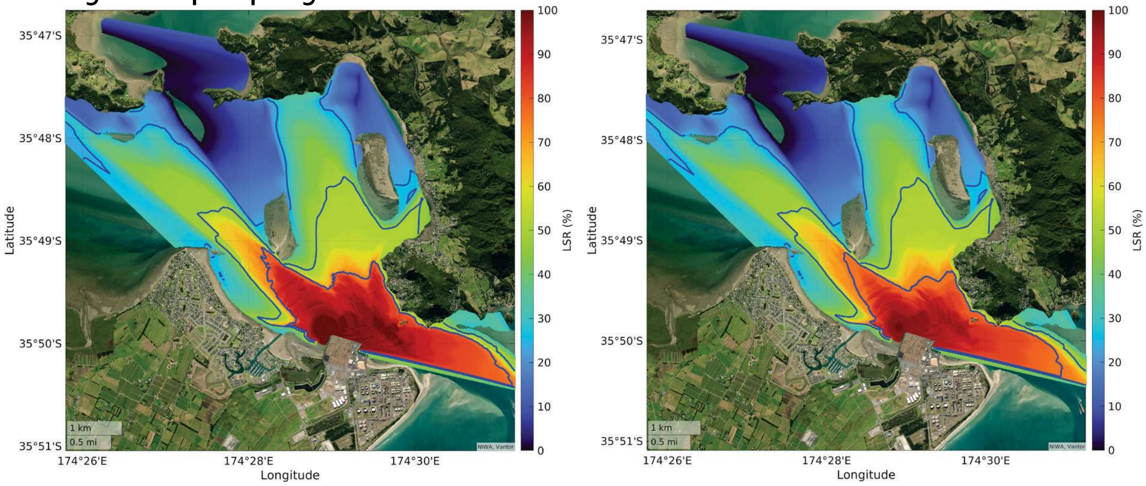


Figure A4.2. Distance contour plots of the predicted **reduced listening space risk** (as a decreasing quarterly percentage) from **unmitigated percussive impact piling** (top figures) within the shipyard construction area compared with **percussive impact piling and confined bubble curtains** (bottom figures) for both **high-frequency hearing species** (e.g. bottlenose dolphin / terehu) on the left side and **low-frequency hearing species** (e.g. baleen whales) on the right side. For instance, the smallest contour signifies the area around pile-driving activities where an animal's listening space has reduced to 75% of its unimpacted extent due to acoustic masking effects (Pine 2026).

Unmitigated impact piling



Mitigated impact piling

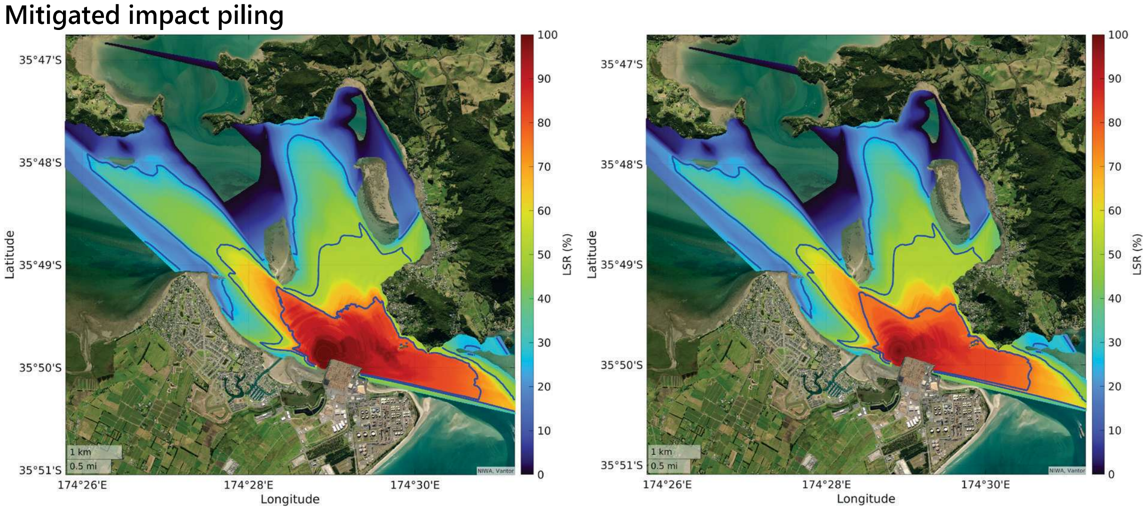


Figure A4.3. Distance contour plots of the predicted **reduced listening space risk** (as a decreasing percent) from **unmitigated percussive impact piling** (top figures) within the shipyard construction area compared with **percussive impact piling and confined bubble curtains** (bottom figures) for both **phocid pinnipeds in water** (e.g. leopard seal / popoiangore) on the left side and **otariid pinnipeds in water** (e.g. New Zealand fur seal / kekeno) on the right side. For instance, the smallest contour signifies the area around pile-driving activities where an animal's listening space has reduced to 75% of its unimpacted extent due to acoustic masking effects (Pine 2026).

Appendix 5. Best boating behaviour guidelines around marine mammals

In the unlikely case that a vessel should encounter a marine mammal while transiting to or from the shipyard, they should be encouraged to implement the following 'best practice' boating behaviours. These guidelines are based on those recommended by DOC (and with regard to the Marine Mammal Protection Regulations 1992), along with additional extra precautions to reduce any chance of collision. Above all else, skippers will do their best to operate their vessels so as not to disrupt the normal movements or behaviour of any marine mammal in line with the Marine Mammal Protection Regulations 1992.

General practice

If a whale or dolphin is sighted, but not directly in the path of the vessel:

- Keep boat speed constant and / or slow down while maintaining current direction
- Avoid any abrupt or erratic changes in direction
- Maintain or resume normal operating speeds once well away from animals.

Large baleen whales – such as Bryde's or southern right whales

If a whale is sighted directly in the path of the vessel:

- If the whale is far enough ahead of the vessel (e.g. > 500 m) and can be avoided, slow to 'no-wake' if necessary and maintain a straight course away from the immediate sighting area (where practicable)
- If the whale is too close to the vessel and cannot be avoided, immediately place the engine in neutral and allow the boat to drift to one side of the sighting area where practicable (do not assume the whale will move out of the way)
- Avoid any abrupt or erratic changes in direction while at speed
- Once the whale has been re-sighted away from the vessel, slowly increase speed back to normal operation levels.

If a cow / calf pair is sighted within 500 m of an underway vessel:

- Gradually slow boat while maintaining a course away from the immediate sighting area (where practicable)
- Allow the pair to pass
- Once the pair has been re-sighted away from the vessel (> 500 m), slowly increase speed back to normal operation levels
- Avoid any abrupt or erratic changes in direction while at speed.

If a whale and / or cow / calf pair approaches a stationary vessel:

- Keep the engine in neutral, and allow the animal to pass
- Maintain or resume normal operating speeds once well way from animals (> 500 m).

Small to medium whales and dolphins – such as bottlenose dolphin or orca

If a dolphin(s) is sighted directly in the path of the vessel:

- Keep boat speed constant and / or slow down while maintaining a course slightly to one side of the group, do not drive through the middle of a pod
- Avoid any abrupt or erratic changes in direction
- Maintain or resume normal operating speeds once well way from animals.

If a dolphin(s) approaches an underway vessel to bow-ride or ride the stern wave:

- Keep boat speed constant and / or slow down while maintaining course
- Avoid any abrupt or erratic changes in direction
- Do not drive through the middle of a pod
- Maintain or resume normal operating speeds once well way from animals (> 500 m).

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