Assessment of Effects: Marine Mammals

Dredging Reconsent Project

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Basis of Report

This report has been prepared by SLR Consulting NZ (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Port of Tauranga Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Code of Conduct for Expert Witnesses

I, Helen McConnell, confirm that the statements made within this report are within my area of expertise and I am not aware of any material facts which might alter or detract from the findings. Whilst acknowledging this application is not before the Environment Court, I have read and agree to comply with the Code of Conduct for Expert Witnesses as set out in the Environment Court Consolidated Practice Note 2023. The content of this report is based on my qualifications and experience and are within my area of expertise. Where I rely on the evidence or opinions of others in this report, my statements clearly acknowledge this.

Summary of Expertise

The professional CV of Helen McConnell is provided as **Appendix E** of this report.

Executive Summary

The Port of Tauranga Ltd ('**POTL**') is seeking to renew its existing resource consents (RC65806 and RC65807) which allow for some capital dredging and for routine annual maintenance dredging. This report assesses the potential effects of the proposed continuation of these dredging activities on marine mammals.

Marine mammal occurrence and habitat use was determined using site-specific acoustic monitoring, the Department of Conservations ('**DOC**') sighting and stranding data and published and unpublished scientific literature. An Area of Interest ('**AOI**') was defined to encompass the coast from the north end of Waihi Beach to a point just east of Maketu, including a 20 km buffer offshore; however, sightings within Tauranga Harbour/Te Awanui were further interrogated to gain a more comprehensive understanding of how frequently species occur here, noting that whilst inside the harbour animals may be disproportionately affected by dredging due to the spatially restricted nature of the harbour.

Assessment findings suggest that waters of the AOI are used by at least 20 marine mammal species and although some foraging, breeding, resting and migratory behaviours do occur here, this habitat has not been specifically identified as ecologically significant to any marine mammal (relative to other habitat along the east coast of the North Island). In particular, all species that use the AOI have large home ranges, so the AOI would only represent a very small part of their overall distribution. With regard to marine mammal presence in Tauranga Harbour/Te Awanui, no species is resident to the harbour. However, despite high existing levels of shipping traffic here, New Zealand fur seals are regular visitors, and bottlenose dolphins and killer whales have an occasional presence as visitors.

Actual and potential effects on marine mammals from the proposed dredging activities were identified as underwater noise and vibrations, habitat modification, ship strike, exposure to contaminants, marine debris, artificial lighting and cumulative effects. Each of these potential effects has been thoroughly described and assessed in the context of the marine mammal species and habitats that could be affected, and, on this basis, the following key mitigation measures are recommended to minimise any potential adverse effects on marine mammals from the proposed dredging activities:

- Dredge equipment will be regularly maintained, including lubrication and repair of winches, generators, propulsion components and other potential noise sources in order to minimise the levels of underwater noise that are generated by dredging;
- Adoption of waste management protocols during all components of the proposed dredging activities; and
- A commitment to collect and retrieve obvious objects of marine debris during the course of dredging and to safely dispose of these onshore.

Compliance with the Marine Mammal Protection Regulations 1992 (which stipulate the requirements for operating vessels around marine mammals) and the Resource Management (Marine Pollution) Regulations 1998, will also serve to minimise potential effects on marine mammals. These are legal requirements.

The results of this assessment indicate that with the adoption of these recommended mitigations, the likelihood of adverse effects on marine mammals occurring from the proposed dredging activities are low or very low and the magnitude of any adverse effects that do occur will (at most) be minor or negligible.

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Acronyms, Abbreviations & Definitions

AEE	Assessment of Environmental Effects
AOI	Area of Interest
AUD INJ	Auditory Injury
BHD	Back Hoe Dredge
Cetacean	A taxonomic term that collectively describes ‘whales and dolphins’
CD	Chart Datum
CMA	Coastal Marine Area
DGV	Default Guideline Value
DOC	Department of Conservation
HF cetaceans	High frequency cetaceans, a recognised functional hearing group of marine mammals.
IBDA	Indigenous Biological Diversity Area
IMMA	Important Marine Mammal Area
LF cetaceans	Low frequency cetaceans, a recognised functional hearing group of marine mammals.
LSR	Listening Space Reduction
MMPA	Marine Mammal Protection Act 1978
Marine Pollution Regs	Resource Management (Marine Pollution) Regulations 1998
NZCPS	New Zealand Coastal Policy Statement
NZTCS	New Zealand Threat Classification System
OCW	Otariid seal in water, a recognised functional hearing group in terms of underwater acoustic modelling
PCW	Phocid seal in water, a recognised functional hearing group of marine mammals.
Pinniped	A taxonomic term that collectively describes ‘seals’: consisting of phocids (true seals) and otariids (fur seals and sea lions).
POTL	Port of Tauranga Limited
PTS	Permanent Threshold Shift
RCEP	Regional Coastal Environment Plan
SSC	Suspended Sediment Concentration
SST	Sea Surface Temperature
TSHD	Trailer Suction Hopper Dredge
TSS	Total Suspended Sediment
TTS	Temporary Threshold Shift
VHF cetaceans	Very high frequency cetaceans, a recognised functional hearing group of marine mammals.

1.0 Introduction

Port of Tauranga Limited ('**POTL**') was granted resource consents (RC65806 and RC65807) in 2013 to carry out dredging to deepen and widen the existing shipping channels and to continue to conduct routine maintenance dredging. The specific activities authorised by RC65806 and RC65807are listed below.

- Disturbance of the seabed by capital dredging
- Disturbance of the seabed by maintenance dredging
- Deposition of the dredged material in the coastal marine area ('**CMA**'); and
- Removal of some of the dredged material from the CMA.

These consents will expire in December 2027. POTL must replace these consents to ensure maintenance dredging can continue and planned capital work can occur as and when required. Information pertaining to the proposed dredging methodology and associated spoil deposition is presented in **Sections 2.1** to **2.4** below.

The renewal of RC65806 and RC65807 will facilitate both maintenance dredging and capital dredging to deepen the wharf sitting basins, the approach to Berth 1 and a small area in the Passing Lane to smooth the corner in the Entrance Channel.

The overall purpose of this report is twofold:

- To appraise the available marine mammal data that exists in relation to Tauranga Harbour/Te Awanui and surrounds and describe what is known about marine mammal occurrence in and around the project area; and
- To undertake a robust assessment of actual and potential environmental effects of the planned dredging and spoil disposal activities, including mitigation recommendations to ensure that effects on marine mammals can be managed to acceptable levels.

2.0 Project Description

2.1 Capital Dredging

Port of Tauranga completed Stage 1 of the capital dredging to deepen and widen the shipping channels in 2016 to allow deeper draught vessels to safely navigate the shipping channel to meet shipping demands at the time. Completion of the Stage 2 channel deepening and widening, and the creation a swinging basin at the northern end of Sulphur Point wharf will occur in accordance with existing resource consents in late 2026.

This application seeks approval for limited capital dredging namely, the deepening of the existing sitting basins (depths vary from 1 – 7 m) and the approach to Berth 1 (c. 3 m) and deepening of a small area in the Passing Lane to smooth the corner in the Entrance Channel and enhance navigational safety (c. 7 m) (the only part of the capital dredging that was not previously consented).

The proposed capital dredging site is illustrated in **Figure 1**, and the total capital dredging volume proposed is 800,000 m^3. Dredging operations will occur 24 hours/6.5 days a week and on this basis, the capital dredging is expected to take approximately six weeks to complete with the primary Trailer Suction Hopper Dredge ('**TSHD**') only berthing for refuelling, resupplying or maintenance.

Dredge cycle times for the TSHD (the time taken to dredge a full load, then to sail to and unload at the disposal site before returning to the dredge site) are expected to range from 2 – 3 hours.

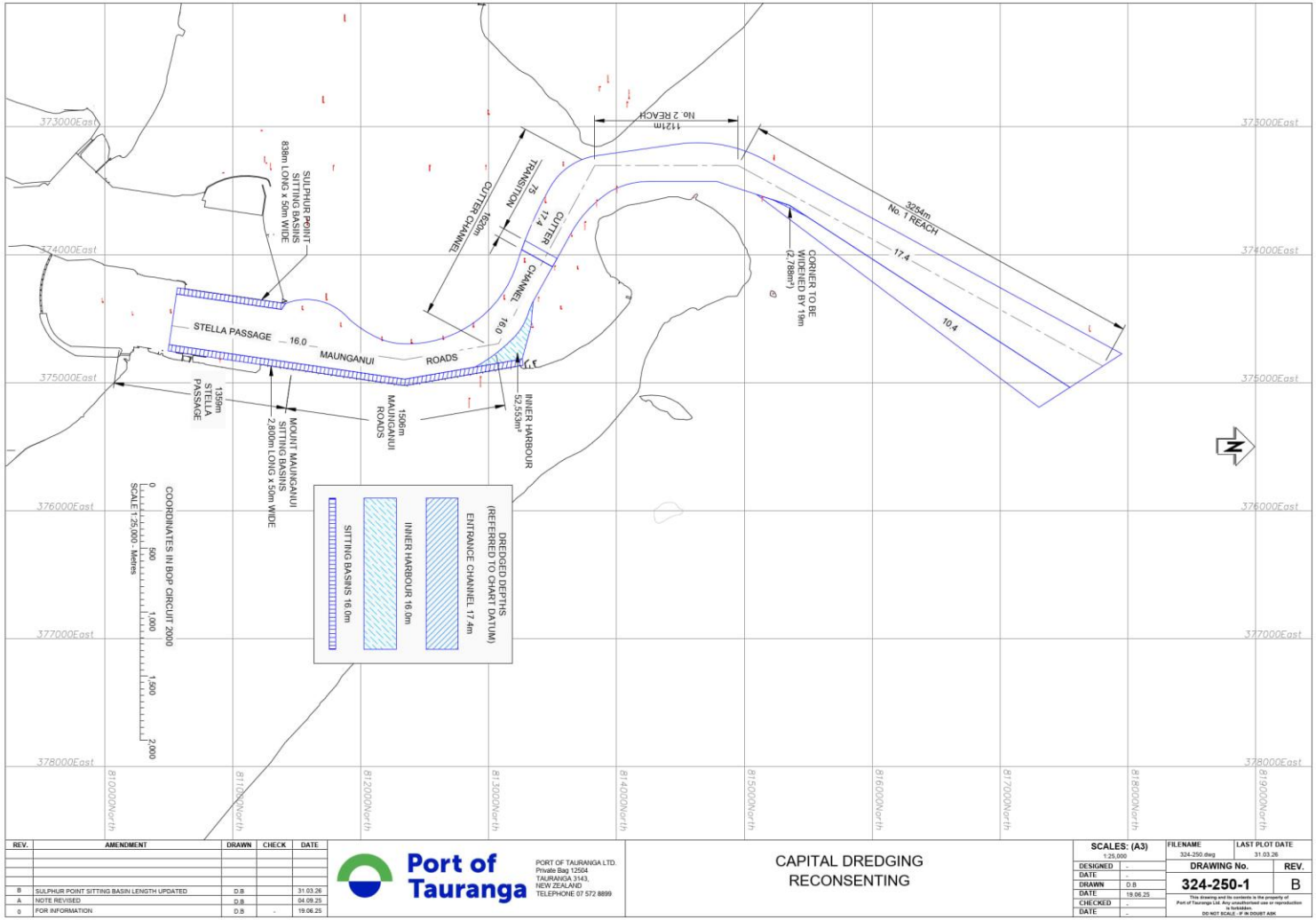


Figure 1: Area subject to proposed capital dredging.

2.2 Maintenance Dredging

Maintenance dredging will typically occur annually to the depths indicated in **Figure 2.** The volume to be dredged is 250,000 m^3 per annum averaged over 10 years, with a cap of 350,000 proposed m^3 in any one year. Dredging operations will occur 24 hours/6.5 days a week and maintenance dredging is expected to take approximately 6 weeks each year to complete with the primary TSHD only berthing for refuelling, resupplying or maintenance. As for capital dredging, dredge cycle time for maintenance dredging will be 2 -3 hours.

Within Tauranga Harbour/Te Awanui, the shipping channel is being dredged to 16.0 m below Chart Datum ('**CD**') and will be completed late 2026. Through the harbour entrance and on approach to the harbour, the channel is currently being dredged to 17.4 m below CD and will also be completed in late 2026. Maintenance dredging will preserve these deeper shipping channel profiles.

Figure 2 also includes the dredging of the Stella Passage Extension to the same depth of 16.0 m as the existing channel. While this capital dredging will occur under a separate consent, the spoil deposition associated with it is covered by this application, as is the annual maintenance dredging of this area.

2.3 Dredging Equipment

It is envisaged that a TSHD will undertake most of the proposed capital and maintenance dredging, with a Back-Hoe Dredge ('**BHD**') or a 'static ripper' being used for localised work as required[1]. The TSHD to be used for both capital and maintenance dredging is the 75 m '*Albatros*' or similar. POTL is currently utilising this TSHD for its maintenance dredging programme, so the proposed dredging under this application will represent a continuation of operations by a dredge of similar characteristics as the *Albatros* in Tauranga Harbour/Te Awanui. If any areas cannot be reached by the TSHD, a large BHD (45 – 60 m length) would be used for these discrete locations. While it is possible that other dredging methods (e.g. grab dredger, bucket ladder dredger, and cutter suction dredge) could be utilised throughout the project, the employment of these methods is unlikely. In addition, and following TSHD operations, it is common to follow up with a levelling bar to smooth out the surface of the seabed.

Once the dredged material comes aboard the TSHD the solids settle out in the hopper, and the excess dredge water is decanted through an outlet at the bottom of the vessel. This decanting of dredged water is known as overflow. In order to minimise the sediment plumes generated by TSHD activities within the harbour, controls can be implemented such as dredging with no overflowing to occur when tidal currents transport plumes towards areas of concern or limiting overflow (e.g. maximum 15 minutes) to reduce the plume.

The area subject to dredging (both capital and maintenance) is primarily comprised of sand (coarse, medium and fine) and silt (medium, fine and very fine) (de Lange, 2025).

[1] Due to the low productivity (hence increased time and expense) of a BHD or static ripper compared to a TSHD, these methods would only be used as a last resort for areas that cannot be dredged by the TSHD.

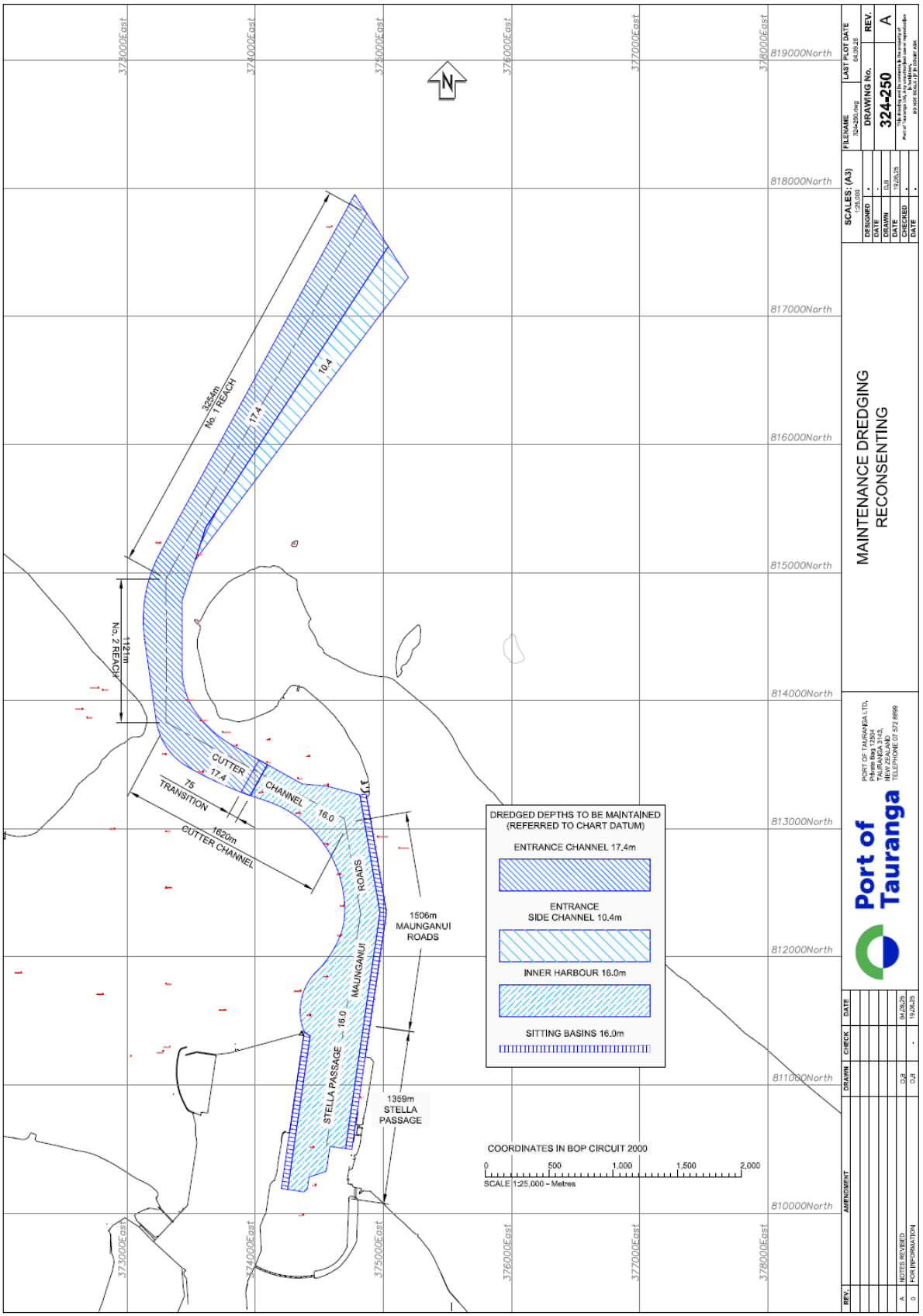


Figure 2: Area subject to proposed maintenance dredging.

All dredging activities will be supported by crew boats and survey vessels. Survey vessels are critical to any dredging campaign to provide accurate and fine scale hydrographic information that the operating dredge can base its work programme on. Survey vessels are often around 9 - 15 m in length and can be fast moving when not surveying. Crew boats transfer shore-based crew members and project staff to the dredging vessels as required. Sometimes a survey vessel will also double as a crew boat for efficiency.

2.4 Spoil Disposal

It is proposed that spoil generated from all dredging activities will continue to be disposed of in the existing spoil deposition sites (Sites A, B, C and H1 and H2) as illustrated in **Figure 3**; noting that consents for these sites require renewal as part of this application.

Offshore disposal sites H1 and H2 are the primary disposal sites which were sized and consented to take 15,000,000 m^3 of dredged material. These sites occur in water depths of 20 – 30 m. Site H1 is designated for clean sands and Site H2 for both clean sands and silty sediments. To ensure an even coverage, these disposal areas are segregated into smaller grids for sequenced deposition to ensure an even distribution across these areas through time.

Sediments generated during both capital and maintenance dredging are typically either disposed of into H1 or H2. However, additional near shore disposal grounds (A, B and C) are used for premium, clean sand that is dredged from the harbour entrance channel to ensure sediment replacement in a shoreward direction following any storm erosion losses. The potential to pump sand ashore and re-use it in port development or for beach renourishment shall also be maintained in this resource consent process.

The proposed total volume of spoil from capital dredging to be deposited under this application is 2,300,000 m^3 which includes the 800,000 m^3 from the capital dredging and an additional 1,500,000 m^3 from the Stella passage Development Consent (for which the dredging is consented, but spoil deposition is not).

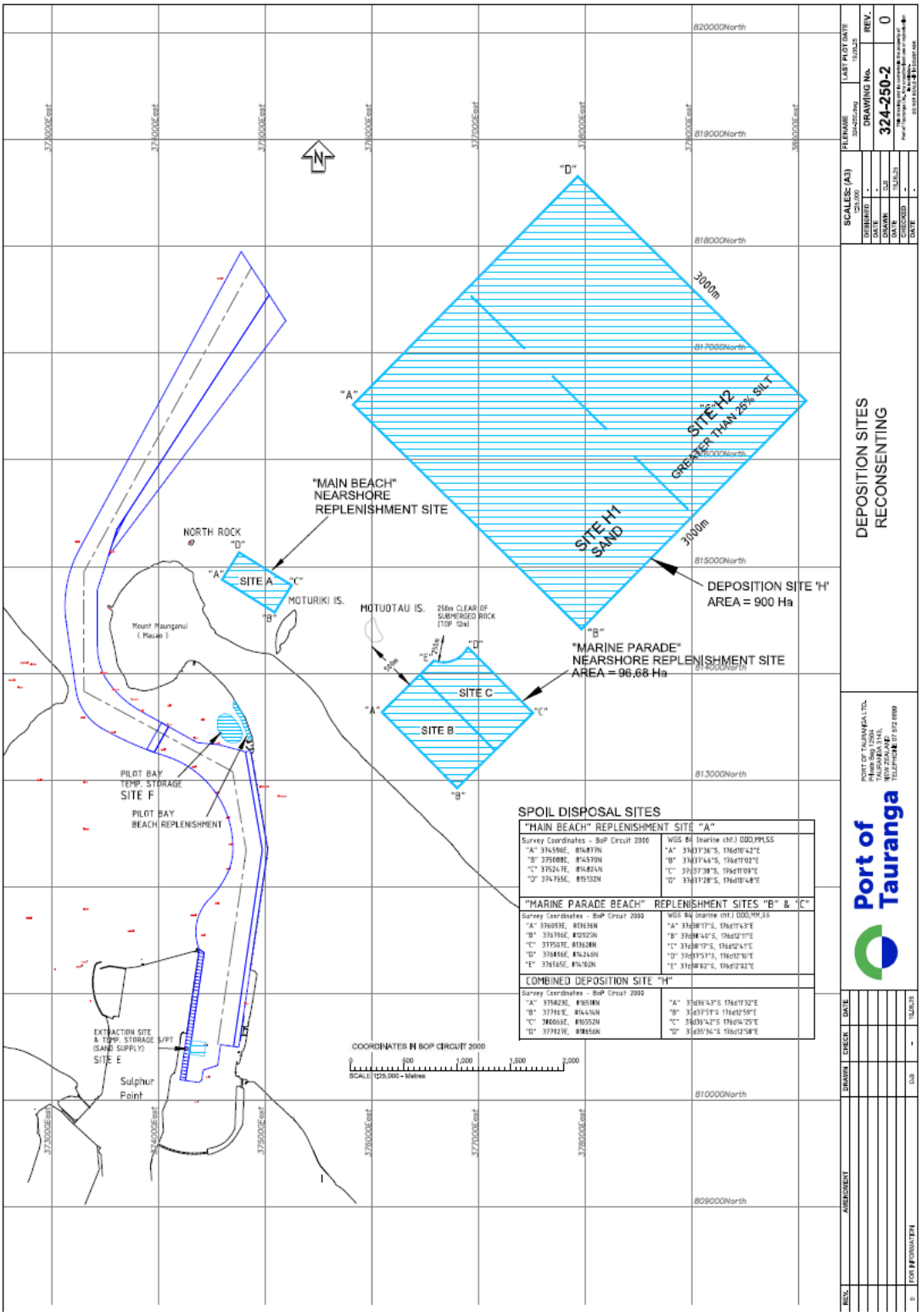


Figure 3: Offshore spoil disposal sites.

3.0 Description of the Existing Environment

This section describes marine mammal presence and habitat use of Tauranga Harbour/Te Awanui and surrounds.

3.1 Methodology

Knowledge of marine mammal distribution is typically amassed over long temporal periods utilising a combination of data collection techniques (e.g., stranding data, opportunistic sightings, systematic survey data, etc.). It is therefore important to assess multiple data sources when considering marine mammal distribution. The following data sources were used to assess the likelihood of marine mammal species being present in the vicinity of Tauranga Harbour/Te Awanui:

1 Sightings data as recorded in the DOC Marine Mammals Sightings Database from 1968 to 2025 (DOC Sightings Database) (supplied by H. Hendricks, 24/02/2025).

2 Stranding data as recorded in the DOC Marine Mammals Incident Database from 1873 to 2025 (DOC Incident Database) (supplied by H. Hendricks, 24/02/2025).

3 Additional sighting data that was provided by the DOC Tauranga Area Office.

4 Habitat modelling (Stephenson et al., 2020; Mackenzie et al., 2022).

5 Knowledge of species distribution and habitat use obtained from published and unpublished literature. Two studies were of particular importance, namely:

   a) Meissner (2015), a Massey University PhD thesis investigating marine mammal occurrence in the Bay of Plenty from historical and contemporary data; and

   b) Gaborit-Haverkort (2012), a Massey University MSc thesis investigating cetacean (whale and dolphin) occurrence in the Bay of Plenty.

6 Acoustic monitoring data collected by Styles Group from August 2022 to July 2023.

The combination of the six different data sources listed above represents the best available information on marine mammal distribution in and around Tauranga Harbour/Te Awanui and is therefore sufficient for the purpose of assessing the potential effects of the dredging reconsent application on marine mammals. In particular, site specific acoustic monitoring has been undertaken inside Tauranga Harbour/Te Awanui to quantify marine mammal presence in this confined portion of the project site. While the above data sources represent the best possible information, it is important to note:

- DOC sightings data is generally collected in a non-systematic manner by non-experts. Data gaps do not necessarily indicate an absence of cetaceans but typically reflect a lack of observation effort. Conversely, areas with high levels of sightings occur where marine mammal distributions overlap with populated areas, research programmes or regions that actively encourage public reporting of certain species;
- While the DOC stranding data gives a broad indication of species occurrence, dead animals can wash ashore well away from where they died; and sick or diseased animals may be outside of their normal range prior to death; and
- Entries in the DOC sightings and stranding databases that do not identify marine mammals to species level were excluded from the analysis.

For this assessment an Area of Interest ('**AOI**') was defined from Rapatiotio Point (at the north end of Waihi Beach) to Okurei Point (east of Maketu) including a 20 km buffer offshore. This AOI encompasses the entire project area (i.e. all areas that will be subject to proposed dredging and/or disposal) and also encompasses a large surrounding area on account that 1) marine mammals are highly mobile over large spatial scales; and 2) some project effects

could extend beyond the immediate project area. To gain a more comprehensive understanding of how frequently species occur in Tauranga Harbour/Te Awanui itself, the assessment further interrogated the sightings data to identify those that were recorded specifically within the confines of the harbour on the basis that animals here may be disproportionately affected by the project due to the spatially restricted nature of the harbour.

After reviewing all the data sources, the likelihood of each marine mammal species being present in the AOI was determined as:

- Likely - species that have a frequent presence in the AOI; hence have an increased chance of exposure to the potential impacts of the project (noting that large home ranges mean occurrence will not be continuous in the project area);
- Possible - species that occur on a less frequent basis in the AOI; hence may or may not be exposed to the potential impacts of the project; and
- Unlikely – species that are seldom reported from in and around the AOI hence probably only occur as rare visitors and are unlikely to be exposed to the potential impacts of the project.

3.2 Expected Marine Mammal Occurrence

Figure 4 provides a summary of all sightings data provided by DOC for locations within the AOI. **Figure 5** shows all reported strandings in the AOI.

Assessment of the DOC sightings and stranding data and the available scientific literature indicates that marine mammals are not resident to Tauranga Harbour/Te Awanui. There are however, two species - bottlenose dolphins, and killer whales - that occur inside Tauranga Harbour/Te Awanui as occasional visitors, and New Zealand fur seals which are regular visitors to the harbour. These three species, along with common dolphins, have a regular presence outside Tauranga Harbour/Te Awanui where sightings rates are higher.

Outside of Tauranga Harbour/Te Awanui several other species may also be present, including blue whales, minke whales, Bryde's whales, false killer whales, Gray's beaked whales, humpback whales, long-finned pilot whales, southern right whales, sei whales, and leopard seals. While rare visits inside the harbour from these species cannot be entirely dismissed (i.e. the DOC sightings record includes rare sightings of humpback whales, southern right whales, leopard seals, pilot whales, beaked whales, pygmy sperm whales, and common dolphins inside the harbour), in the Bay of Plenty these species are typically associated with more open coastal waters.

The remaining species represented in the DOC Marine Mammals Sighting Database and the DOC Marine Mammals Incident Database probably only occur as rare visitors to the AOI, hence are unlikely to be present around the proposed dredging activities.

While known whale migration routes occur through Bay of Plenty waters, most individuals travel in waters deeper than 30 m (Gaborit-Haverkort, 2012), with only southern right whales known to spend time consistently close to shore during migrations (Patenaude, 2003).

A full description of the assessment findings in relation to expected occurrence of all marine mammal species is presented in **Appendix A**, while **Table 1** below provides a summary of those species that may be present in and around Tauranga Harbour/Te Awanui, including their New Zealand Coastal Policy Statement ('**NZCPS**') policy 11 status (see **Section 3.2.3**) and their New Zealand Threat Classification System ('**NZTCS**') status (following Lundquist et al. 2025). Further to this, full ecological descriptions of the key species that are likely to be present in the AOI are provided in **Appendix B**.

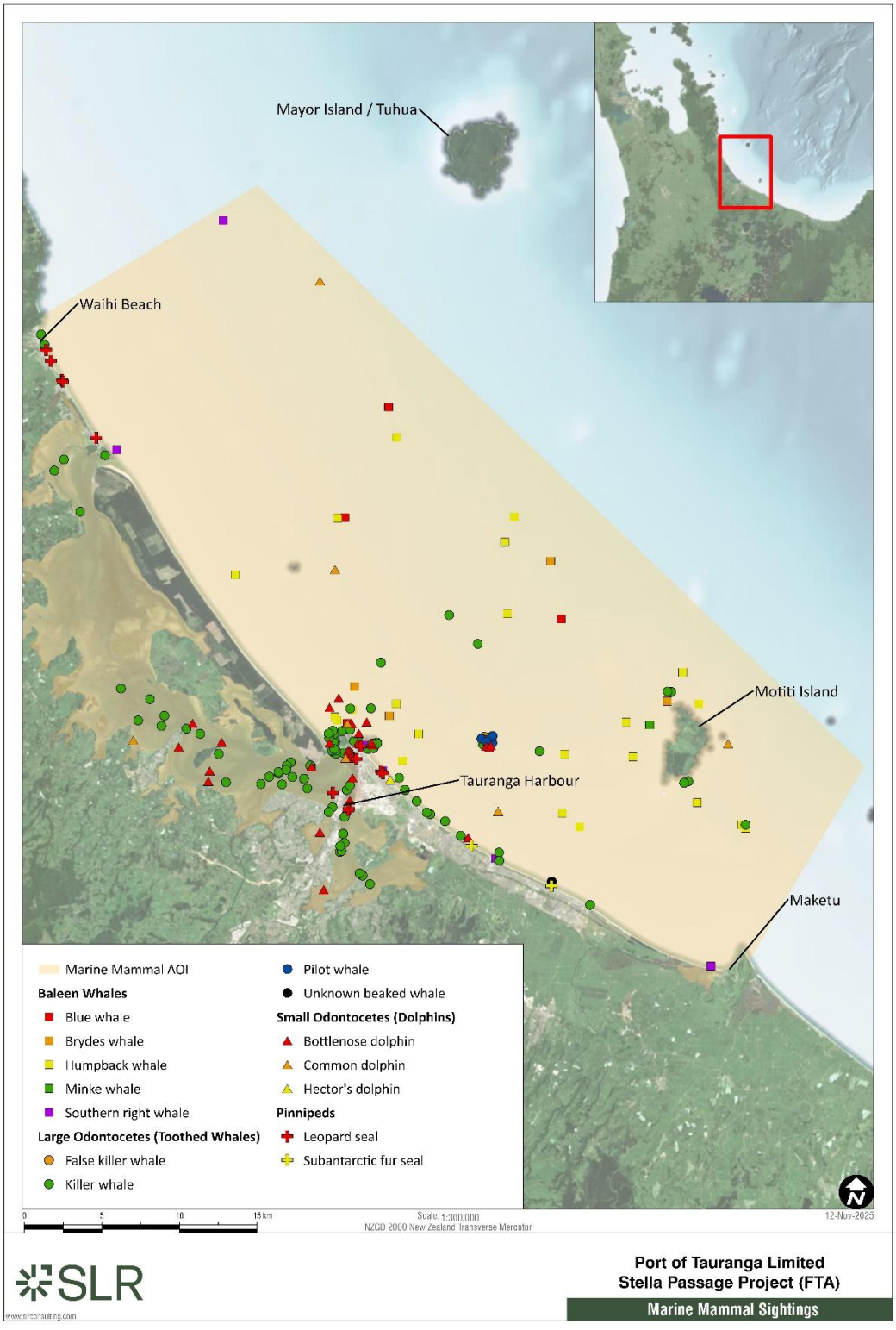


Figure 4: Marine Mammal Sightings Reported by DOC in the AOI

Notes: 1) Each depicted point represents a sighting entry within the DOC database, where each sighting entry can be either a single animal or a group of animals; 2) Where multiple sightings were reported for a single pin-point location these sightings were redistributed slightly around the original coordinates to facilitate visibility on the map; 3) When coordinates were not reported, the location description was used for mapping purposes (n = 6); and 4) Despite their presence, no marine mammal sightings outside the AOI have been included on this map.

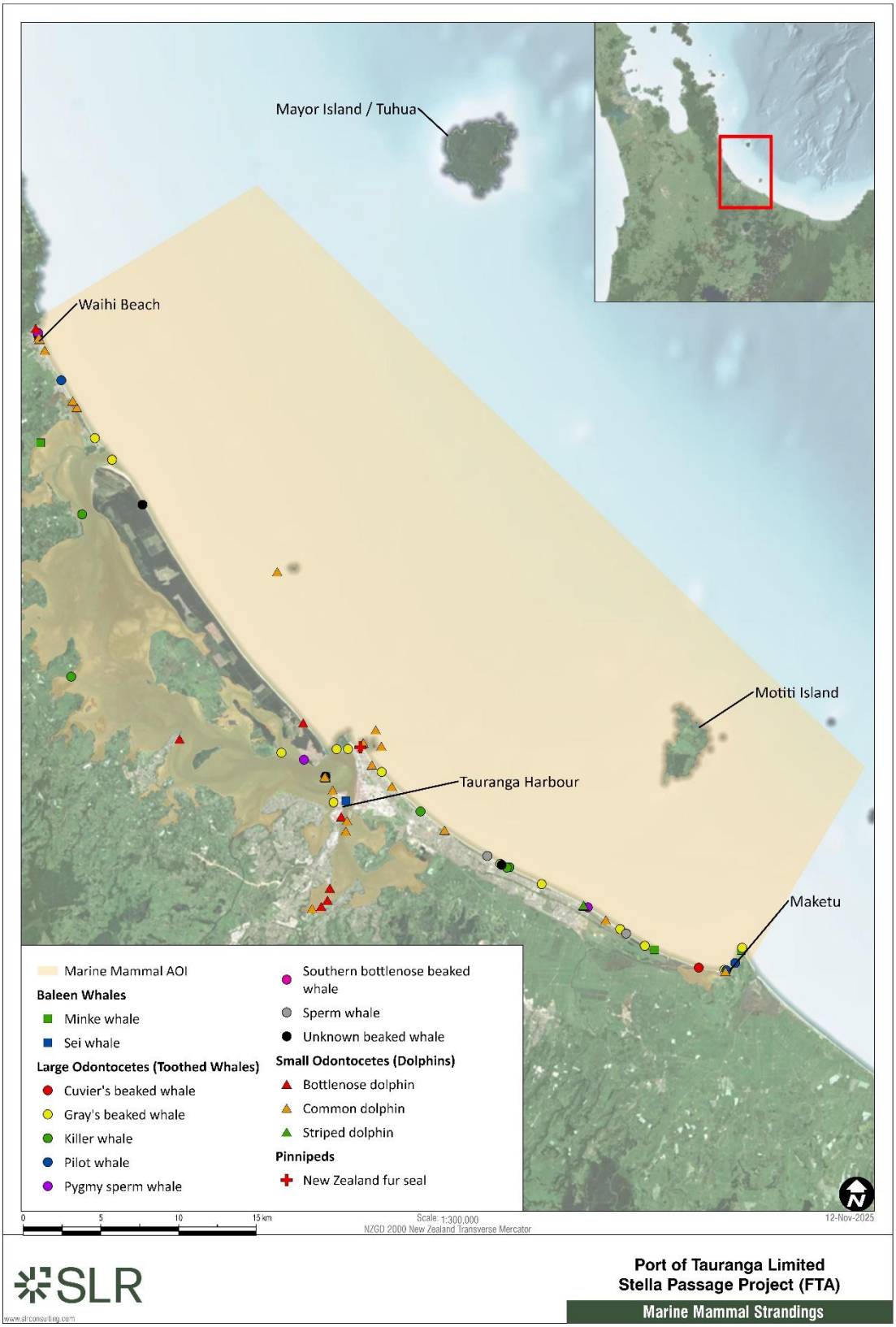


Figure 5: Marine Mammal Strandings Reported by DOC in the AOI

Table 1 Marine Mammals that are 'Likely' or could 'Possibly' occur in the AOI.

Species	Ecological Considerations	Likelihood & Frequency		Seasonal Trends
NZCPS Policy 11 status		**in Tauranga Harbour**	**in wider AOI**	
Bottlenose dolphin • NZCPS Policy 11a(i) species • Threatened (nationally vulnerable) under NZTCS	A resident population of inshore bottlenose dolphins extends from Doubtless Bay, Northland to Tauranga (Constantine, 2002). However, sightings beyond this area suggest that the overall population distribution also includes the North Island west coast (Tezanos-Pinto et al., 2013). Forty-eight sightings are reported by DOC as occurring inside the AOI, including 30 within Tauranga Harbour. Inshore sightings in shallow coastal waters typically occur in winter; and of the sightings inside Tauranga Harbour, there was a strong bias towards winter and spring. Meissner (2015) also reported higher bottlenose dolphin encounter rates in spring for Bay of Plenty waters; however acoustic monitoring also revealed a presence in autumn (see **Section 3.2.2**). Groups that occur inside the harbour are usually only present for a few days to a week at a time; however, one group was present for up to a month in a quiet part of the harbour near Omokoroa (pers. comm. Karl McCarthy, DOC, Tauranga). An occasional presence in Tauranga Harbour is therefore likely particularly in winter and spring. Calves could be present.	Likely to be present on occasional basis	Likely to be present on a frequent basis	Year round but more common in autumn/ winter/spring
Killer whales • NZCPS Policy 11a(i) species • Threatened (nationally critical) under NZTCS	Small groups of killer whales are typically seen around New Zealand where they travel an average of 100 – 150 km per day (Visser, 2000). Some groups feed predominantly on rays which can bring them into very shallow coastal waters (Visser, 2000). One hundred and thirty-two sightings have been reported from the AOI, with 73 of these occurring inside Tauranga Harbour. Meissner (2015) reported higher killer whale	Likely to be present on occasional basis	Likely to be present on a frequent basis	Year round but more common in autumn/ winter/spring

Species	Ecological Considerations	Likelihood & Frequency		Seasonal Trends
	encounter rates in winter and spring; and the DOC sightings data indicates a clear peak in sightings in spring; however acoustic monitoring also revealed a presence in autumn (see **Section 3.2.2**). Killer whales tend not to spend more than a few days inside the harbour during their visits. An occasional presence in Tauranga Harbour is likely, particularly in winter and spring. Calves could be present.			
New Zealand fur seal • Not Threatened under NZTCS	Commonly seen in coastal Bay of Plenty waters, particularly over winter months. Sightings of fur seals are becoming more common inside Tauranga Harbour, with several seals habitually using Mauao as a seasonal haul-out location. Hence, a regular presence in Tauranga Harbour and at the harbour entrance is likely. An emerging breeding colony is establishing on Motunau (Plate) Island in the Bay of Plenty (DOC, 2012), but this location is located some 30 km from the dredging and disposal sites.	Likely to be present on a frequent basis	Likely to be present on a frequent basis	Year round, but more common in winter
Common dolphins • Not Threatened under NZTCS	Commonly seen in the AOI (Gaborit-Haverkort, 2012; Meissner 2015); but only two sightings has been reported from Tauranga Harbour and the locational accuracy of one of these sightings is questionable. On this basis common dolphins are likely to be present in the wider AOI (i.e. outside the harbour) but are unlikely to occur inside the harbour. Calves could be present particularly in summer and autumn. Distribution is concentrated closer inshore in summer compared to other seasons when offshore sightings are more common.	Unlikely	Likely to be present on a frequent basis	Year round
Humpback whale • NZCPS Policy 11a(ii) species	Humpback whales migrate northwards along coastal New Zealand from May to Aug (Gibbs & Childerhouse, 2000), and southward from Sep to Dec	Unlikely	Possibly present on occasional seasonal basis	Winter/spring

Species	Ecological Considerations	Likelihood & Frequency		Seasonal Trends
• Threatened under IUCN	(Dawbin, 1956). During migrations they typically use continental shelf waters (Jefferson et al., 2008) and can approach closely to shore when passing headlands or moving through confined waters (e.g., Gibbs et al., 2017). In central Bay of Plenty waters humpback whales (n=8) were seen mostly in winter and spring in a mean water depth of 32 m (Gaborit-Haverkort, 2012); hence it is possible that humpback whales could be seasonally present in the wider AOI (i.e., outside the harbour). There are only two records of humpback whales inside Tauranga Harbour, including one record of a humpback whale mother/calf pair at the harbour entrance in October 2019 (Sunlive, 2019). Presence of this species within the harbour is highly unusual.			
Southern right whale • NZCPS Policy 11a(i) species • Threatened (nationally increasing) under NZTCS	Coastal waters around mainland New Zealand represent a historic calving ground for this species, with recent evidence suggesting a slow recolonization of this breeding range (Carroll et al., 2014). Southern right whales utilise shallow coastal waters as their winter calving and nursery grounds (Patenaude, 2003). Seven sightings have been reported from the AOI, including one inside Tauranga Harbour. All but one of the seven sightings from the AOI occurred in the colder months (July, August, September). Hence, it is possible that southern right whales could have an occasional seasonal presence. This species sometimes occurs in other harbours around New Zealand (Wellington, Otago), so rare occurrences of individual whales entering Tauranga Harbour should not be dismissed.	Unlikely	Possibly present on sporadic seasonal basis (presence is highly variable between years)	Winter/spring
Leopard seal • NZCPS Policy 11a(iv) species	Hupman et al. (2019) indicate that at least some leopard seals reside around the New Zealand coast for months at a time. A reasonable number of leopard	Unlikely	Possibly present on sporadic basis (presence	Winter/spring

Species	Ecological Considerations	Likelihood & Frequency		Seasonal Trends
• At limit of natural range •	seal reports occur in the AOI (n=13) including five inside Tauranga Harbour; hence this species could have a possible occasional presence in the wider AOI (i.e. outside the harbour), and rare occurrences of individuals entering Tauranga Harbour are possible.		is highly variable between years)	
Long-finned pilot whales • Not Threatened under NZTCS	Pilot whale sightings occur in New Zealand waters year-round (Berkenbusch et al., 2013). Long-finned pilot whales commonly strand on New Zealand coasts; with the stranding rate peaking in spring and summer (O'Callaghan et al., 2001). Pilot whales forage at depth (i.e., several hundred metres; Berkenbusch et al., 2013). In central Bay of Plenty waters pilot whales are occasionally encountered in depths greater than 50 m (Gaborit-Haverkort, 2012; n=4). This species could possibly be present in the wider AOI (i.e. outside the harbour).	Unlikely	Possibly present on occasional basis	Year round
Gray's beaked whale • Not Threatened under NZTCS	This species has a circumpolar distribution south of 30° and occurs in deep waters beyond the shelf edge (Pitman and Taylor, 2020). Based on the reasonable number of strandings reported for the AOI (n=14), it is possible that they could have an occasional presence in the wider AOI (i.e., outside the harbour).	Unlikely	Possibly present on occasional basis	Spring/summer
False killer whale • NZCPS Policy 11a(i) species • At risk (uncommon) under NZTCS	Mostly found in deep, offshore waters but also occasionally over the continental shelf and shallower areas (Berkenbusch et al., 2013). Forage down to water depths of 500 m (Shirihai & Jarrett, 2006). In central Bay of Plenty waters, false killer whales sometimes occur in large associations with bottlenose dolphins typically in water depths greater than 50 m (Gaborit-Haverkort, 2012; n=3). This species could possibly be present in the wider AOI (i.e. outside the harbour).	Unlikely	Possibly present on occasional basis	NA

Species	Ecological Considerations	Likelihood & Frequency		Seasonal Trends
Bryde's whale • NZCPS Policy 11a(i) species • Threatened (nationally critical) under NZTCS	In New Zealand, Bryde's whales are typically known from the north-eastern coastal region between East Cape and North Cape (Gaskin, 1963); with the Hauraki Gulf and Northland region supporting one of the few known resident populations in the world (Constantine et al., 2012). In central Bay of Plenty waters Bryde's whales (n=13) were seen in a mean water depth of 44 m (Gaborit-Haverkort, 2012); hence it is possible that Bryde's whales could occasionally be present in the wider AOI (i.e. outside the harbour).	Unlikely	Possibly present on occasional basis	Summer
Minke whale • Not Threatened under NZTCS	The Antarctic minke is very abundant in Antarctic waters in summer, but outside of the summer months their distribution is less well-known (Cooke et al., 2018). Southern Hemisphere Dwarf minke whales also feed in Antarctic waters in summer and have a broad latitudinal distribution in other seasons (Cooke, 2018a). Most minke whale sightings around New Zealand occur in spring; aligning with the southern migration towards the Antarctic feeding grounds (Berkenbusch et al., 2013). In central Bay of Plenty waters minke whale presence peaks in spring in mean water depths of 50 m (Gaborit-Haverkort, 2012; n=35). This species could be seasonally present in the wider AOI (i.e. outside the harbour). Calves could be present.	Unlikely	Possibly present on occasional basis	Spring
Blue whale • NZCPS Policy 11a(i&ii) species • Threatened (nationally vulnerable) under NZTCS • Threatened under IUCN	Two subspecies of blue whale occur in New Zealand waters (Antarctic and pygmy blue whales). Coastal sightings are not uncommon around New Zealand for both subspecies (Barlow et al., 2018). In central Bay of Plenty waters blue whales (n=15) are seen mostly in spring in a mean water depth of 60 m (Gaborit-Haverkort, 2012); hence it is possible that blue whales could be seasonally present in	Unlikely	Possibly present on occasional basis	Spring

Species	Ecological Considerations	Likelihood & Frequency		Seasonal Trends
	the wider AOI (i.e. outside the harbour).			
Sei whales • NZCPS Policy 11a(ii) species • Threatened under IUCN	In central Bay of Plenty waters sei whales (n=7) are seen mostly in winter and spring in a mean water depth of 44 m (Gaborit-Haverkort, 2012); hence it is possible that sei whales could be seasonally present in the wider AOI (i.e. outside the harbour).	Unlikely	Possibly present on occasional basis	Winter/spring

3.3 Acoustic Monitoring

Acoustic monitoring for marine mammals in Tauranga Harbour/Te Awanui was undertaken by Styles Group. The methodology and deployment details for this monitoring are provided as **Appendix C**. Three hydrophones (SoundTrap 600 recorders) were deployed at the locations identified in **Figure 6**. Data was collected during the following three deployment periods, noting that 1) the data collection period for each hydrophone varied as each ran out of battery or filled their memory cards at different times, and 2) monitoring over the winter season was limited:

- Deployment 1: 31/08/2022 to 04/11/2022;
- Deployment 2: 04/11/2022 to 08/03/2023; and
- Deployment 3: 09/03/2022 to 06/07/2023.



Figure 6: Hydrophone Deployment Locations in Tauranga Harbour

The bullet points below summarise the key findings from the acoustic monitoring.

- Across all deployment locations, dolphins and killer whales were the primary species detected (see **Appendix D** for detection tables). Large whales were not detected inside the harbour, but there were occasional acoustic detections of baleen calls from outside the harbour from both hydrophones at the harbour entrance.
- Of all species, dolphins were most frequently detected, and dolphin detections were recorded from all three hydrophone locations. At the harbour entrance sites (the Outer East and Outer West sites), dolphins were detected on a total of 62 days (24-hour periods from 00:00 - 24:00 hr) of the collective total 221 days that the hydrophones at these sites were collecting data (28%). On 47 of the 62 detection days, detections occurred during daylight hours (07:00 – 19:00 hr); on 12 of the detection days, detections occurred at night (19:00 – 07:00 hr), and on nine detection days, detections occurred across both day and night within a single 24-hour period. The majority of dolphin detections at the harbour entrance were made during the austral spring (n = 27) and autumn (n = 28).
- At the Stella Passage site, dolphins were detected on a total of six days from a 229-day data collection period. Five of the six detections here were of short duration (1 minute or less) indicating that dolphins typically passed quickly through this narrow channel. In four of the six instances, the Stella Passage detections could be paired over sequential days indicating that dolphins entered the inner southeast arm of the harbour one day and departed either the following day or the day after; spending up to 52 hours in the inner harbour.
- It is not possible to discern the specific dolphin species detected but based on the sightings data presented earlier in this memo it is likely that these detections were bottlenose dolphins, although occasional common dolphin detections cannot be dismissed from the harbour entrance sites.
- Killer whales were only detected from the hydrophones located at the harbour entrance (the Outer East and Outer West sites). No killer whale detections were made in Stella Passage. Of the collective 221 days of monitoring at the harbour entrance, killer whales were detected on a total of 27 days (12%). On 12 of the 27 detection days, detections occurred during daylight hours; on 13 of the detection days, detections occurred at night, and on two of the detection days, detections occurred across both day and night. The majority of killer whale detections at the harbour entrance were made during the austral spring (n = 13) and autumn (n = 12).

3.4 Environmental Values of Significance

In terms of the NZCPS, it is important to identify:

- Indigenous taxa that are identified as ‘threatened’ or ‘at risk’ in the New Zealand Threat Classification System (NZTCS) (NZCPS Policy 11(a)(i));
- Taxa listed by the IUCN as ‘threatened’ (NZCPS Policy 11(a)(ii));
- Habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare (NZCPS Policy 11(a)(iv)); and;
- Habitats in the coastal environment that are important during the vulnerable life stages of indigenous species (NZCPS Policy 11(b)(ii)); or habitats, including areas and routes, important to migratory species (NZCPS Policy 11(b)(v)).

The following marine mammal species have been identified as Policy 11(a) species.

- Bottlenose dolphin (NZCPS Policy 11(a)(i) species);
- Killer whales (NZCPS Policy 11(a)(i) species);
- Southern right whale (NZCPS Policy 11(a)(i) species);
- False killer whale (NZCPS Policy 11(a)(i) species);
- Bryde's whale (NZCPS Policy 11(a)(i) species);
- Blue whale (NZCPS Policy 11(a)(i & ii) species);
- Humpback whale (NZCPS Policy 11(a)(ii) species); and
- Sei whale (NZCPS Policy 11(a)(ii) species).

In addition, leopard seals occur as occasional visitors to the Bay of Plenty. Individual seals occurring around the New Zealand mainland have been described as occupying the limit of their natural range (Hupman et al., 2019) which has relevance to NZCPS Policy 11(a)(iv). However, relative to other locations around the mainland, low densities of leopard seal sightings occur in the Bay of Plenty (Hupman et al., 2019); hence no important habitat for this species has been identified within the AOI.

In considering environmental values of significance, marine mammal habitat must also be assessed in terms of importance during vulnerable life stages[2] and migration (NZCPS Policy 11(b)(ii) and NZCPS Policy 11(b)(v). Taking a broader approach to this, the following additional criteria should also be considered when defining important habitat:

a) Areas that support concentrations of animals (following Clark et al., 2010); and/or
b) Areas that are critical to the conservation of a species, particularly those areas that support a high proportion of a population/subpopulation (following the US Endangered Species Act 1973); and/or
c) That nearby alternative habitat of equivalent quality is limited; and/or
d) That a high proportion of sightings include calves or juveniles (following Clark et al., 2010); and/or
e) Areas that are critical for maintaining a healthy population growth rate (following Hoyt, 2011).

On this basis, important marine mammal habitat would represent areas of concentrated marine mammal presence which habitually support important ecological functions (e.g. feeding, breeding, resting) and where alternative habitat is limited. In keeping with NZCPS Policy 11(b), the regular presence of vulnerable life stages would deem an area to be important, as would habitat important for migratory species.

For the key species that are most likely to occur in the immediate vicinity of the proposed dredging area or spoil disposal sites, the following points are relevant with regard to important habitat:

- **Bottlenose dolphins**: Whilst bottlenose dolphins clearly occur in the AOI, this population ranges widely with home-ranges that commonly extend 500 km along the coastline (Constantine, 2002). The North Island population of bottlenose dolphins show varying degrees of site fidelity but generally exhibit high levels of movement (Constantine, 2002; Tezanos-Pinto, 2009), with animals seldom stable within an area for more than a few days (Mourão, 2006). Hence the AOI does not specifically

[2] Defined as when breeding, as juveniles or during migration (DOC, 2019)

support concentrations of animals. There is little information available on which to assess how bottlenose dolphins utilise the AOI, but it is assumed that feeding and resting behaviours occur here. In addition, seven of the 25 reported sightings for the AOI noted the presence of calves; hence, some breeding behaviours are expected, but these levels are not particularly high. Overall, there is no evidence to suggest that the AOI contains habitat that is specifically important during vulnerable life stages for this species and alternative habitat is plentiful through the broader AOI and beyond. This species is non-migratory.

- **Killer whales**: This species utilises habitat in the wider AOI on a relatively frequent basis, but the AOI is not known to support high concentrations of animals relative to other regions. Based on what we know about prey preferences and behaviours in other locations (Visser, 1999), benthic foraging for rays can be presumed on those occasions when this species enters Tauranga Harbour/Te Awanui. Indeed, several ray species are common inside the harbour (Cadwallader, 2020). Of the 61 reported sightings of killer whales from the AOI, 15 noted the presence of calves; hence the AOI could support some breeding behaviours. It is noteworthy that killer whales move readily between locations over large distances (Visser, 2007), While some feeding and breeding behaviours are to be expected in the AOI, there is no evidence to suggest that the AOI contains habitat that is specifically important during vulnerable life stages for this species and alternative habitat is plentiful through the broader AOI and beyond. High re-sighting rates of identifiable individuals suggest that these whales live permanently or at least semi-permanently around the New Zealand coast (Visser, 2007); hence this species if generally considered as non-migratory.
- **New Zealand fur seal**: While New Zealand fur seals will certainly occur in the AOI, foraging typically occurs further offshore and the AOI is part of the non-breeding distribution for this species. Therefore, the AOI is not considered important habitat during the vulnerable life stages of this species. It is noteworthy that an emerging breeding colony is establishing on Motunau (Plate) Island in the Bay of Plenty (DOC, 2012) which occurs slightly east of the eastern boundary of the AOI; hence while pregnant or lactating females are occasionally expected in the AOI, these individuals are expected to forage well offshore of the AOI. On this basis, the AOI does not specifically support concentrations of this species.
- **Common dolphins**: Photo-identification evidence confirms that individuals of this species readily move between locations from Hauraki Gulf to Whakatane (200 km); generally indicating that common dolphins are highly mobile throughout a large home-range (Neumann et al., 2002). Of the six reported sightings of this species from the AOI in the DOC sightings database, none noted the presence of calves. However, between March 1998 and May 2011 Gaborit-Haverkort (2012) undertook 2,364 boat-based marine mammal surveys of the central Bay of Plenty (including the waters of the AOI). Common dolphins were encountered on 1,265 of these trips (54%) and were the most frequently sighted marine mammal species. Most sightings occurred in the area between Motiti Island, Mayor Island and Waihi in water depths from <5 to 130 m; indicating that the AOI is well used by this species for feeding, travelling, resting and socialising, but no sightings occurred in Tauranga Harbour/Te Awanui. Encounter rates were highest during summer and autumn when large groups of dolphins with calves were common. The AOI clearly supports feeding, breeding and resting behaviours; however, sightings across all seasons are common in Bay of Plenty waters beyond the AOI (Gaborit-Haverkort, 2012). On this basis, the AOI is not considered to be of higher relative importance to this species compared to other areas across its large home range and alternative habitat is plentiful. This species is non-migratory.

- **Humpback whale**: Coastal sightings of this species are not uncommon along the east coast of the North Island (from North Cape to East Cape) during the southern migration period (Gibbs and Childerhouse, 2000). However, the majority of whales migrate south down the west coast of New Zealand (Dawbin, 1956). In addition, recent satellite tagging studies indicate that of those whales that do travel south down the east coast of New Zealand, many whales do not approach coastal waters but use an open ocean corridor south of the Kermadec Islands (Riekkola et al., 2018). On this basis, the southbound route along the east coast of the North Island is very much a secondary (or even tertiary) migration pathway. Dawbin (1956) found that this species typically utilises open water migratory corridors except in locations where the north/south migration route is partially obstructed by a perpendicular coastline, this explains why sightings are not uncommon in the Bay of Island, Hauraki Gulf and Bay of Plenty (following Gibbs and Childerhouse, 2000). On this basis, sightings of migrating humpback whales (including mother accompanied by calves, of which only one has so far been reported by the DOC sighting database) are to be expected from time to time in the AOI, but most migrating baleen whales travel in waters greater than 30 m (Gaborit-Haverkort (2012) and the Bay of Plenty does not constitute a major migratory corridor for this species.
- **Southern right whale**: Sightings of this species are expected to be relatively uncommon across years, and of the seven reported sightings of this species from the AOI (across 50+ calendar years), only one noted the presence of a calf. However, as the New Zealand mainland represents historic breeding habitat of this species occasional breeding activity in the AOI cannot be dismissed, but that said, the Bay of Plenty is not recognised as important habitat for this species on either a historic or contemporary basis (Carroll et al., 2014; Carroll et al., 2014a). During the breeding season around the mainland, southern right whales move readily between locations across a vast area of potential coastal winter breeding habitat. On this basis, the project sites are not considered to be specifically important during the vulnerable life stages of this species. This species does undertake an annual migration from high latitude feeding areas to temperate breeding areas, and this species is known to spend time consistently close to shore during migrations (Patenaude, 2003); however as noted above, the AOI is not routinely used by this species.

While the AOI clearly constitutes marine mammal habitat, and some feeding, breeding, resting and migration behaviours occur here, the findings above conclude that the AOI is not considered to be of greater ecological significance/importance relative to other areas of the Bay of Plenty or other parts of each species wider home range. In particular there is no evidence to suggest that the AOI itself constitutes important habitat for any marine mammal species either during vulnerable life stages or migration; neither is it considered critical to the conservation of any species or the maintenance of healthy population growth rates. Instead, and for all marine mammal species that occur here, the AOI forms part of a much larger overall distribution that collectively contributes to population health.

The remaining criteria in NZCPS Policy 11(a) and (b) were also considered and no other species, ecosystems or habitats specified in that policy are relevant to marine mammals in the AOI. In particular, the site is not in an area set aside for full or partial protection of indigenous biological diversity under other legislation which protects marine mammals or their habitats (in terms of Policy 11(a)(vi)).

In addition to, but still relating to the requirements of the NZCPS, the project site occurs in the vicinity of designated 'Indigenous Biological Diversity Areas' (**Figure 7**) as defined in the Bay of Plenty Regional Coastal Environment Plan ('**RCEP**') as follows:

- Indigenous Biological Diversity Area A (IBDA A) – areas that meet the criteria contained in Policy 11(a) of the NZCPS, which directs the avoidance of adverse effects on certain biological diversity (biodiversity) values.

- Indigenous Biological Diversity Area B (IBDA B) – areas that meet the criteria contained in Policy 11(b) of the NZCPS, which directs the avoidance of significant adverse effects on certain biological diversity (biodiversity) values and that other adverse effects on these values are avoided, remedied or mitigated.

Objective 3 or the RCEP states that "The integrity, form and functioning and resilience of ecosystems are to be safeguarded in the coastal environment by protecting areas zoned 'Indigenous Biological Diversity Areas A (or '**IBDA A**') and maintaining areas zoned 'Indigenous Biological Diversity Areas B' (or '**IBDA B**'). Further, the maintenance of indigenous biodiversity 'in general' is to be promoted, and enhancing or restoring indigenous biodiversity is promoted where it is appropriate.

For each IBDA illustrated in **Figure 7**, Schedule 2 of the RCEP makes no mention of marine mammal values, despite the fact that marine mammals clearly utilise these coastal areas from time to time.



Figure 7: Indigenous Biological Diversity Areas in the vicinity of the project site.

3.5 Important Marine Mammal Areas

A recent development in marine mammal conservation in New Zealand has been the identification of Important Marine Mammal Areas based on the recommendations of the International Union for Conservation of Nature's 'Marine Protected Area Task Force'. This task force has identified several areas of coastal New Zealand as Important Marine Mammal Areas based on their importance to marine mammals. While the AOI does not fall within an IMMA, it sits between two adjacent IMMAs: the Hikurangi Trench IMMA and the Tikapa Moana Te Moananui ā Toi Hauraki IMMA (**Figure 8**) (MMPATF, 2025). The key reason behind the designation of the Hikurangi Trench IMMA is Criterion D2: 'Diversity', where the occurrence of 22 cetacean and 3 pinniped species have been reported, while Tikapa Moana Te Moananui ā Toi Hauraki IMMA is designated on account of the following criteria:

- Criterion A: 'Species or population vulnerability', provides habitat for the following threatened species – pygmy blue whales, Bryde's whales and killer whales;
- Criterion B2: 'Aggregations', forms an integral part of the home-range for Bryde's whales;
- Criterion C2: 'Feeding areas', provides routine feeding habitat for pygmy blue whales, Bryde's whales, and false killer whales; and
- Criterion D2: 'Diversity', occurrence of 17 cetacean and 2 pinniped species.

The findings of **Section 3.2.3** are supported by the fact that the AOI has not been identified as part of a recognised IMMA.



Figure 8: Important Marine Mammal Areas in the vicinity of the AOI

3.6 Summary

Waters of the AOI are used by at least 20 species and although some foraging, breeding, resting and migratory behaviours do occur here, this habitat has not been specifically identified as ecologically significant to any marine mammal relative to other habitat along the east coast of the North Island. In particular, all species that use the AOI have large home ranges, so the AOI would only represent a very small part of their overall distribution. Despite high existing levels of shipping traffic, the available information indicates that only New Zealand fur seals use waters inside Tauranga Harbour/Te Awanui regularly, and that bottlenose dolphins and killer whales use the harbour on an occasional basis. Further to this, the offshore sites into which the dredge spoil will be disposed are located relatively close to shore (in terms of marine mammal home-ranges), and many of the open water species listed in **Table 1** will typically occur further offshore.

4.0 Assessment of Environmental Effects

4.1 Methodology

In assessing the effects of the proposed dredging reconsent project on marine mammals the following procedures were followed:

1 The actual and potential effects were identified and considered along with any recommended measures to avoid, remedy or mitigate these effects;

2 The likelihood of any residual adverse effects occurring (assuming the adoption of the recommended mitigation measures) was determined in terms of marine mammal occurrence and also considering the area over which each effect could occur. The likelihood categories used for this assessment are as follows: remote, low, moderate, high, and certain; and

3 The magnitude of any residual adverse effects (assuming the adoption of the recommended mitigation measures) in terms of ecological significance was determined according to the definitions presented in **Table 2** (adapted from MacDiarmid et al., 2014).

The results from this assessment process are summarised in **Section 7.0.**

Table 2 Magnitude of Adverse Effects

Magnitude	Criteria
Negligible	The activity may, or may not, have an effect on marine mammal taxa or habitats. Any effect would be undetectable and would be of no concern and of no ecological significance;
Minor	The activity may have a detectable effect, but the effect would be of no ecological significance to marine mammal taxa (no change to population size or dynamics) or habitat (any changes to habitat would be highly localised, <5% of total habitat area);
Moderate	The activity would have a detectable effect, and the effect would be of low ecological significance to marine mammal taxa (small change to population size or dynamics) or habitats (habitat changes are predicted over 5-20% of total habitat area);
Major	The activity would have a detectable effect, and the effect would be of high ecological significance to marine mammal taxa (substantial changes to population size or dynamics) or habitat (habitat changes are predicted to affect >20% of total habitat area); and
Severe	The activity would have a detectable effect, and the effect would be of extreme ecological significance to marine mammal taxa (local extinctions possible) or habitat (wide-scale habitat change).

As outlined in **Table 2**, the potential for interactions between marine mammals and the proposed dredging project is largely dependent on the spatial overlap between the proposed activities and marine mammal habitat. The following potential effects have been identified:

- Underwater noise and vibrations;
- Habitat modification;
- Ship strike;
- Exposure to contaminants;

- Marine debris;
- Artificial lighting; and
- Cumulative effects.

Each of these potential effects is thoroughly described in the relevant subsection below along with recommended mitigations and a concluding statement on the predicted likelihood and magnitude.

It is recognised that marine mammals are considered to be taonga (cultural treasures) to tangata whenua. The detail pertaining to the cultural significance of marine mammal species is therefore a matter for tangata whenua to determine. This assessment is undertaken from a conventional scientific perspective.

4.2 Underwater Noise and Vibrations

Marine mammals produce sound not only for communication with conspecifics (e.g., Quick & Janik, 2012), but also for foraging, navigation, reproduction, parental care, avoidance of predators, and to gain an overall awareness of their surrounding environment (Thomas et al., 1992; Johnson et al., 2009). Toothed whales and dolphins use echolocation to forage and navigate, whilst all marine mammals use passive listening to gather useful navigational cues (e.g., the sound of waves breaking on coastline etc.). On this basis underwater noise generated by human activity (e.g., shipping, seismic surveys, drilling, dredging, coastal development etc.) has the potential to affect marine mammals. Effects are typically associated with masking, behavioural changes or physical damage as discussed below.

Masking Effects

Masking is the reduced ability of marine fauna to perceive natural acoustic signals used by conspecifics for communication, navigation, predator avoidance, foraging etc. (e.g., Erbe & Farmer, 2000). Marine mammals must be able to perceive and effectively respond to biologically important sounds for several survival functions. Anthropogenic noise can interfere with the perception of these sounds, and this interference is referred to as 'masking'. The likelihood of masking is determined by how much overlap occurs between the frequency of animal vocalisations and the frequency of anthropogenic sounds (Richardson et al., 1995), where marine mammals are broadly separated into the following categories based on hearing capability (NMFS, 2024; Southall et al., 2019):

- Low frequency ('**LF**') cetaceans: have an auditory bandwidth between c. 0.007 kHz and 22 kHz. Species from this group that could occur in the AOI include southern right whale, humpback whale, Bryde's whale, minke whale, blue whale and sei whale;
- High-frequency ('**HF**') cetaceans: with an auditory bandwidth between c. 0.15 kHz and 160 kHz and the ability to echolocate. Noting that the hearing sensitivity of this group significantly decreases below 1-2 kHz (Southall et al., 2007). Species from this group that could occur in the AOI include bottlenose dolphin, common dolphin, killer whale, false killer whale, pilot whales, and beaked whales;
- Very high frequency ('**VHF**') cetaceans: which an auditory bandwidth between c. 0.2 kHz and 180 kHz. No species from this group are expected in the AOI;
- True seals (or phocid seals: '**PCW**'): with an auditory bandwidth between c. 0.01 kHz and 164 kHz. The only species from this group that is predicted to occur in the AOI is the leopard seal; and
- Sea lions and fur seals (or otariid seals; '**OCW**'): with an auditory bandwidth between 0.08 kHz and 20 kHz. The only species from this group that is predicted to occur in the AOI is the New Zealand fur seal.

Low frequency noises (e.g., engine noise from large ships) are more likely to lead to masking as these noises travel more readily through water than high frequency noises. These low frequency noises typically impact baleen whales that predominantly use low frequency sounds to communicate (Simmonds et al., 2004; Clark et al., 2009). Even activities that emit relatively low intensity underwater noise can cause masking, but the biological significance of any effect will depend on the significance of the habitat affected and the duration of the effect, where ongoing masking in habitat of high importance will have the greatest ecological significance.

It is also worth considering that some species are known to compensate for the effects of masking by changing their vocalisation behaviours. For example, with increasing ambient noise, right whales and bottlenose dolphins altered the frequency of their vocalisations (Parks et al., 2007; Sobreira et al 2023), bottlenose dolphins increased their calling rate (Buckstaff, 2004) and killer whales and bottlenose dolphins increased call durations (Foote et al., 2004; Sobreira et al 2023).

Behavioural Effects

While severe startle responses are possible in some circumstances when exposure to very high intensity noise occurs (Southall et al., 2019), the main behavioural effects observed in response to underwater noise are the interruption of behavioural patterns (e.g., feeding, breeding, migrating or resting) (e.g., Finneran et al., 2000) and the displacement from habitat (e.g., Thompson et al., 2013). Temporary avoidance is the most reported behavioural response by marine mammals in the vicinity of high intensity acoustic disturbance (Stone & Tasker, 2006, Pigeault et al., 2024); however, some species appear to be attracted to low/medium intensity disturbance (e.g., Wursig et al., 1998; Simmonds et al., 2004; Lalas & McConnell, 2016). Avoidance behaviours may culminate in marine fauna being displaced from habitat and detrimental effects could ensue if long-term displacement from optimal habitat occurs. NMFS (2023) provide interim guidance for the noise threshold required to elicit behavioural effects, being 120 dB_{rms} re 1 µPa for continuous noises such as dredging. However, a dose-response approach is considered best practice as this approach is able to better address the inherent uncertainty in assessing the risk of behavioural effects which is typically species and context dependent (Faulker et al., 2018; Pine, 2025).

New Zealand fur seals could be attracted to project activities. However, otariids (fur seals and sea lions) are not as sensitive to underwater noise as cetaceans and phocids (true seals) as they have small ear flaps and a cartilage valve along the external ear canal that functions to close the ear canal to water (Southall et al., 2007); hence they are expected to tolerate and habituate to underwater anthropogenic noise more readily than other species.

Physical Effects

Potential physical effects to marine mammals from underwater noise include physiological stress responses (e.g., Romano et al., 2004; Rolland et al., 2012), organ damage (Cox et al., 2006) and permanent or temporary threshold shifts (PTS or TTS, i.e. permanent or temporary hearing loss) (DOC, 2013; Lucke et al., 2009; NMFS, 2024). However, the sound intensity (energy levels, frequencies and duration) required to produce these physical effects is unknown for most marine mammals (Richardson et al., 1995). The US National Marine Fisheries Service (NMFS, 2024) provides estimates of noise thresholds that are predictive of hearing damage. According to international best practice, these thresholds are used in this assessment to predict the range over which TTS and auditory injury (AUD INJ, including PTS) could occur during the proposed dredging. Permanent physical damage to date has only been associated with very high intensity underwater noise such as military sonar (Cox et al., 2006; Ketten, 2014). Most mobile species, if given the opportunity, avoid the range in which physical effects occur.

Whether or not an ecologically significant effect from exposure to underwater noise will occur, and the magnitude of any such effect depends on a suite of factors, including noise

characteristics (frequency, volume, intensity, duration etc.), bathymetry (water depth, seabed gradient etc.), and species and life history stage (Simmonds et al., 2004). Detrimental impacts are generally greatest for marine mammals when:

- The frequency of the anthropogenic noise overlaps with the frequency of animal vocalisations resulting in masking (Erbe et al., 2016);
- The volume and intensity of the anthropogenic noise is high, and the duration is long (McGregor et al., 2013);
- The noise occurs in shallow or confined waters that provides habitat to resident animal populations with small home ranges (Forney et al., 2013);
- The marine mammal population is already of conservation concern (Weilgart, 2007); or
- Animals are subject to noise during periods of critical life history (e.g., breeding, feeding, resting, migrating etc.) (Dunlop et al., 2017).

In order to assess the potential impacts of the noise generated by the proposed dredging activities on marine mammals it is necessary to understand both the characteristics of the anthropogenic noise (i.e. characterisation of dredge noise, as discussed below) and the distribution of marine mammals in the AOI and the relative importance of this area to them. In general, the marine mammal species that are likely to be present in the immediate vicinity of dredging activities (see **Table 1**) are coastal species that have large home ranges and that are not expected to have a consistent presence inside the confines of Tauranga Harbour/Te Awanui. No marine mammal species are resident or confined to the proposed project area.

Characterisation of Dredge Noise

Underwater dredging noise is characterised as continuous, broadband sound where the main energy is low frequency; typically occurring below 1kHz (Todd et al., 2015), with peak levels below 500 Hz (Robinson et al., 2012). In addition to the standard noise components associated with shipping (e.g. propellor/thruster noise, and hull noise), operational dredge vessels also produce noise from the drag head, the overboard pumps, the suction pipes, and water/sediment discharge (Robinson et al., 2012). Given that dredging activities typically overlap in time and space with high levels of vessel traffic (e.g. in and around commercial ports) it is oftentimes difficult to separate the effects of dredging and the effects of vessel traffic (Anderwald et al., 2013).

In relation to source levels (or loudness), TSHD dredging operations typically fall within the range 160 to 188 dB re 1µPa at 1 m distance from the source (De Jong et al., 2010; Robinson et al., 2012) and backhoe dredging is substantially quieter (154-179 dB re 1µPa at 1 m; de Vos, 2017). Noise levels of static rippers usually fall between these two more commonly used dredge methodologies (Connell et al., 2023). These source levels (at frequencies below 500 Hz) do not exceed normal engine and propeller cavitation noise or hull noise that would be expected from ships (176 to 188 dB re 1µPa at 1 m: McKenna et al., 2012; Todd et al., 2015; Robinson, 2012) and the noise outputs from dredging vessels are substantially quieter than other marine industrial activities such as pile driving and seismic surveys (Robinson et al. 2012).

After measuring sounds from several TSHDs during a 2,000 ha port extension in the Netherlands (where sand was the primary material being relocated), De Jong et al. (2010) concluded that dredging itself was no louder than transit of the dredge vessel between the dredging and spoil sites. Further to this, Hoffman (2012) reported that tug noise is typically louder than dredge noise, and tugs operate frequently in (and on approach to) the Port of Tauranga.

At frequencies above 1 kHz, elevated broadband noise has been noted for some TSHDs during the extraction of coarse aggregates such as gravel, but typically not for finer aggregates such as sand (Robinson et al., 2012). The sediment characteristics of the area subject to dredging (both capital and maintenance) is primarily comprised of sand (coarse, medium and fine) and silt (medium, fine and very fine) (de Lange, 2025). No coarse aggregates were noted but cemented/compacted sediments are present at Tanea Shelf which is a discrete area at the base of Mauao/Mount Maunganui and cobbles are also present in sediments of the entrance channel (de Lange, 2025). On a broader spatial scale, Leonard et al. (2020) states that benthic sediment in Tauranga Harbour/Te Awanui is dominated by sand, although de Lange (2022, 2025) noted that fine sediment accumulates at the harbour margins and in previously dredged areas. The most recent quantitative analysis of the area that will be subject to dredging indicates that the sediment is comprised mostly of sand (70%), then fines (30%), silt (26%) and clay (6%) (de Lange, 2025); hence elevations in high frequency noise (>1 kHz) are not generally expected but may occur occasionally if cobble is encountered during the small area of deepening in the Passing Lane.

As outlined in **Section 2.3**, the proposed dredging (capital and maintenance) will largely be undertaken by the 75 m *Albatros* TSHD, or a similar vessel. The source level for the *Albatros* was measured to be 178 dB_{rms} re 1 µPa m actively dredging unconsolidated sediment (Pine, 2024). On the basis that TSHD activity will represent the noisiest component[3] of the proposed dredging, empirical measurements of underwater noise from the *Albatros* were used to model the predicted underwater noise impacts for this project (Pine, 2025). The results of this modelling are discussed below.

Underwater Acoustic Modelling

Modelling has been undertaken by Styles Group (Pine, 2025) to predict the impact of underwater noise from the proposed dredging activity on marine mammals. In particular the modelling has been tailored to specifically address the species that are identified in **Table 1** as having a likely or possible presence in the project area. The model results are presented in **Table 3, Table 4, Table 5, Table 6** and **Table 7**; and in **Figure 9** and **Figure 10** and are used in this assessment to interpret the ecological consequences for marine mammals in terms of:

- Physical effects (will the proposed dredging elicit TTS or AUD INJ in marine mammals)
- Behaviour (will the proposed dredging elicit significant behavioural responses);
- Masking (how will the proposed dredging affect the listening space);
- Audibility (how far will dredging noise be audible for marine mammals); and
- Cumulative soundscape effects (how dredging alters the existing soundscape of the area).

The key findings from the modelling are summarised in the points below, noting that in all instances the zones of predicted effect are not symmetrical around the active dredge, but the results below are based on the maximum predicted onset zone to account for the worst case scenario:

[3] Noting that BHD and static ripper dredges are typically quieter than TSHDs, so the source level of the TSHD has been used to reflect the worst-case scenario for the project.

Physical Effects:

- With regard to potential physical changes resulting in permanent or temporary hearing loss, TTS is not expected beyond 1 m of the active dredge for those species that could be present in the AOI, and no risk of AUD INJ was identified (Pine, 2025).

Behavioural Effects (**Figure 9**):

- The onset distances for low level behavioural responses (i.e., minor changes in respiration rates, swimming speed or direction of travel) in killer whales, bottlenose dolphins and common dolphins are presented in **Table 3**. For these species there is a 50% risk of low-level responses at a distance of 528 m, noting that the closer they approach the dredge the greater the risk of a response. The outer limit of response is c 1.7 km; meaning that beyond this distance no behavioural responses are expected;
- Predictions relating to moderate behavioural responses (i.e. moderate to extensive changes in swimming speeds/direction and/or diving behaviours, moderate or prolonged cessation of vocalisations, and/or avoidance) in killer whales, bottlenose dolphins and common dolphins are also presented in **Table 3**. This level of response is expected from most animals that come within 74 m of the active dredge, but beyond c. 1 km no moderate level responses are expected; and
- The onset distance for low-level behavioural response in baleen whales is greater (in line with the increased sensitivity of these species to disturbance). As presented in **Table 3**, the modelling predicts a risk gradient from 75% at c. 1.5 km to 0% at 3.5 km. Meaning that behavioural responses for these species will be limited to those individuals within 3.5 km of the active dredge.
- For seals, the risk of low-level behavioural response is restricted to within c. 2 km of the active dredge and moderate behavioural changes could occur out to c. 500 m.

Masking Effects (**Figure 10**):

- Masking effects are gauged by way of calculating listening space reduction ('**LSR**'). An animals natural listening space is the surrounding area over which animals can typically detect biologically important sounds. When anthropogenic noise is present; however, listening space reduces because the man-made noise interferes with sounds that are important for marine mammals (e.g. sounds used to detect prey or predators, or sounds used to communicate with conspecifics);
- LSR results are presented in **Table 4** and show that for dolphins and killer whales a 50% LSR is expected at 1.5 km from the active dredge but that for animals c 5.5 km from the active dredge no LSR will occur;
- For baleen whales, a 50% LSR is expected at c. 1.5 km from the active dredge but that masking effects become no longer relevant at c. 5 km (**Table 4**); and
- For seals (both PCW and OCW), the 50% LSR distances are predicted to extend out to 1.68 km and 0% LSR extending to c. 5.3 km.

Audibility:

- The active dredge will be audible above the existing soundscape for all marine mammal species to c. 8 km away (**Table 5**).

Table 3 Predicted zones of behavioural effects.

Species	Behavioural Response	Risk Isopleth (m)			
		75%	50%	25%	0%
HF (e.g. killer whales & dolphins	Low	374	528	715	1,666
	Moderate	74	109	241	985
LF (e.g. baleen whales)	Low	1,546	1,987	2,166	3,497
PCW & OCW (e.g. all seal species)	Low	1,948			
	Moderate	530			

Table 4 Predicted zones of listening space reduction.

Species	Distance from the TSHD (m)			
	75% LSR	50% LSR	25% LSR	0% LSR
HF (e.g. killer whales & dolphins)	160	1,500	2,888	5,500
LF (e.g. baleen whales)	170	1,438	2,827	5,107
OCW (e.g. fur seals)	702	1,682	2,786	5,312
PCW (e.g. leopard seals)	919	1,687	2,791	5,307

Table 5 Predicted Zones of audibility.

Species	Audibility radius (m)
HF (e.g. killer whales & dolphins)	8,336
LF (e.g. baleen whales)	8,343
OCW (e.g. fur seals)	8,348
PCW (e.g. leopard seals)	8,375

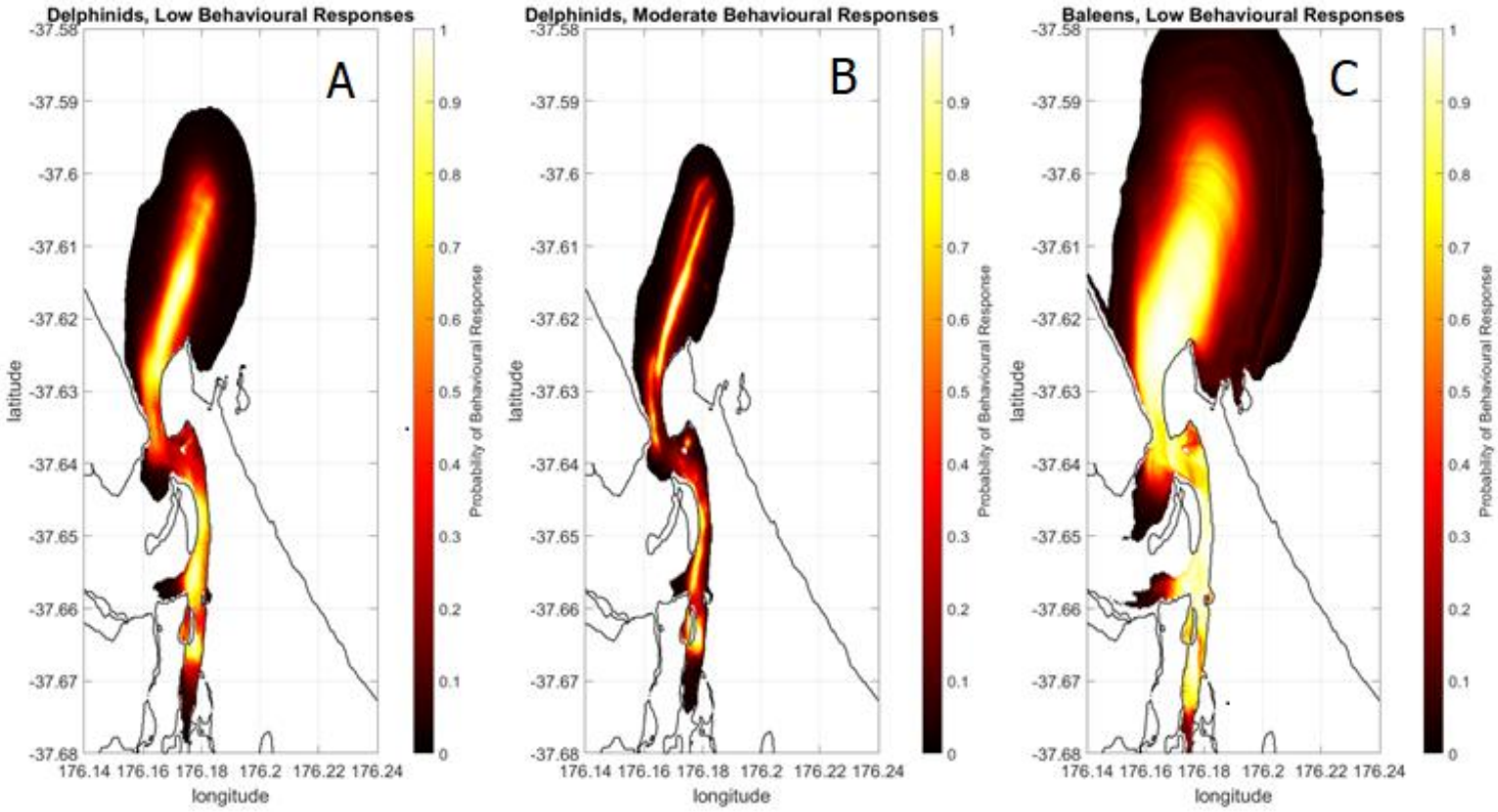


Figure 9: Extent of low (A) and moderate (B) level behavioural effects for dolphins and killer whales, and low level behavioural effects for baleen whales (C).

*Note: the plots above show the area subject to behavioural effects over the whole 2023 maintenance dredging campaign and do not represent the acoustic footprint of a single point in time (which are instead provided in **Table 3**).*

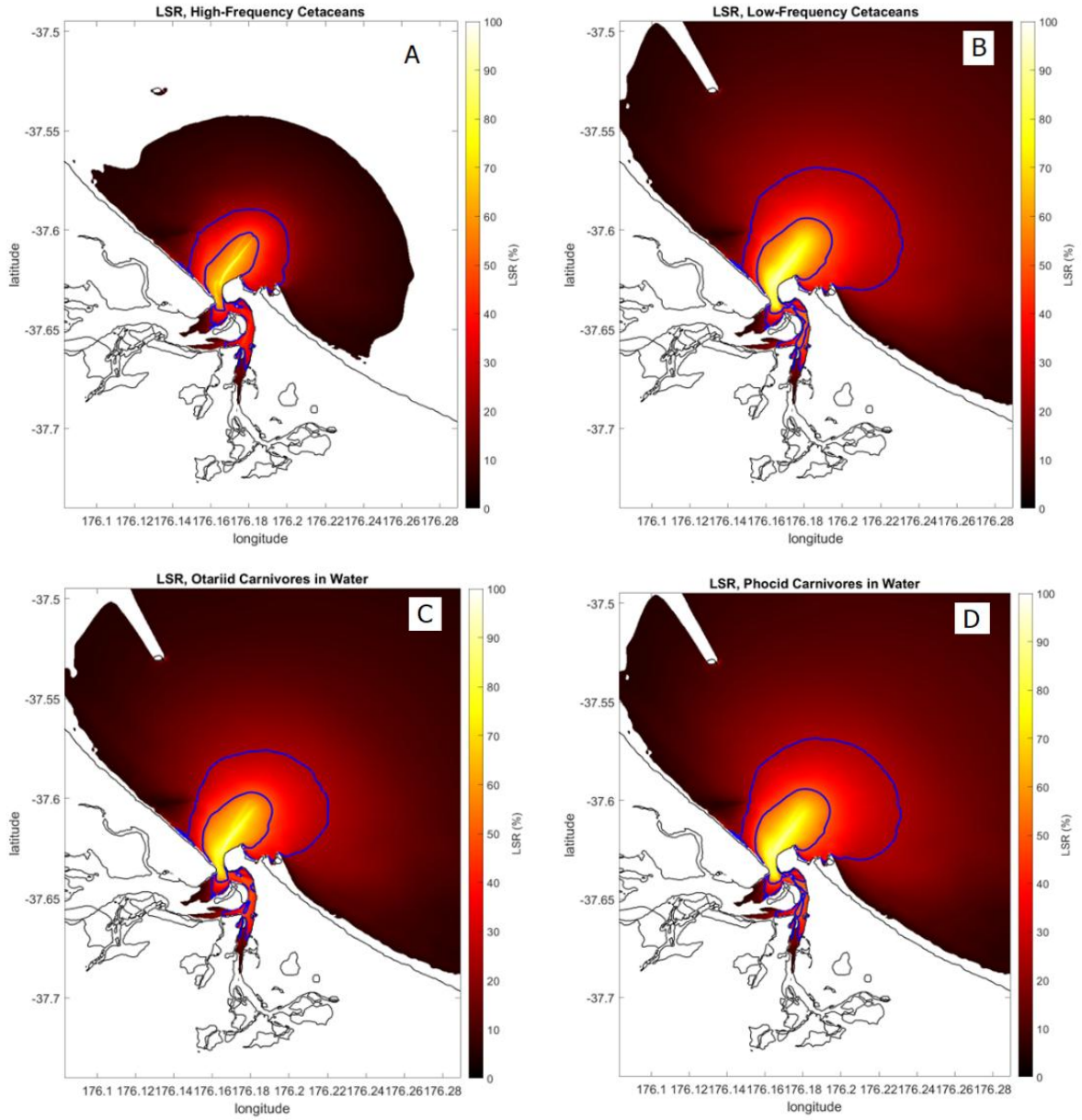


Figure 10: Predicted LSR for dolphins and killer whales (A), baleen whales (B), fur seals (C) & leopard seals (D).

*Note: the plots above show the average over the whole day and do not represent the acoustic footprint of a single point in time (which are instead provided in **Table 4**). Blue contours shown are the 50% and 25% LSR zones.*

An important part of the modelling that was undertaken was the assessment of cumulative soundscape effects associated with the proposed dredging, Pine (2025) used the AIS data from the previous maintenance dredging campaign of the *Albatros* in the Port of Tauranga and produced daily cumulative noise maps which were overlaid with AIS shipping data to make predictions about how the proposed dredging will alter the existing soundscape in the project area.

Pine (2025) concluded that the predicted soundscape change arising from the proposed dredging is negligible for habitats outside the shipping channel. Furthermore, and accounting for the different functional hearing groups of marine mammals, the cumulative noise effects of the proposed dredging are predicted to generate very small differences over the existing soundscape (**Table 6**).

Table 6 Modelled increases to the daily anthropogenic noise levels (Leq-24h dB re 1µPa) during active dredging

Group	Auditory weighting	Mean ± SE	Median	Minimum	Maximum
	unweighted	1.1 ± 0.2	0.9	0.1	4.4
Cetaceans	LF	1.2 ± 0.2	0.8	0.1	4.4
	HF	1.9 ± 0.3	1.5	0.3	4.3
	VHF	2.7 ± 0.4	2.2	0.4	6.4
Seals	PW	1.6 ± 0.2	1.3	0.2	4.3
	OW	2.0 ± 0.3	1.6	0.3	4.4

The summary statistics presented above describe the model results generated for 23 positions across the project area (including the inner harbour, Stella Passage, shipping channel, harbour entrance, and outer project site) (Figure 11). **Table 7** further explores this data, by presenting the individual calculated differences between the daily average noise levels of existing baseline and proposed dredging activity for each of these locations (reflecting raw data supplied by Matt Pine, Styles Group).

In addition, **Figure 12** presents the average 24 hr cumulative sound exposure modelled for all shipping traffic (using AIS data from May 2022 – June 2023). This illustrates the existing soundscape in the absence of dredging which provides context against which the predicted dredge noise can be assessed. **Figure 12** reflects the fact that the Port of Tauranga is a very busy waterway for commercial ships, noting that recreational craft are excluded from this analysis as they do not normally carry AIS systems; hence in reality, this existing soundscape is even noisier than depicted here.

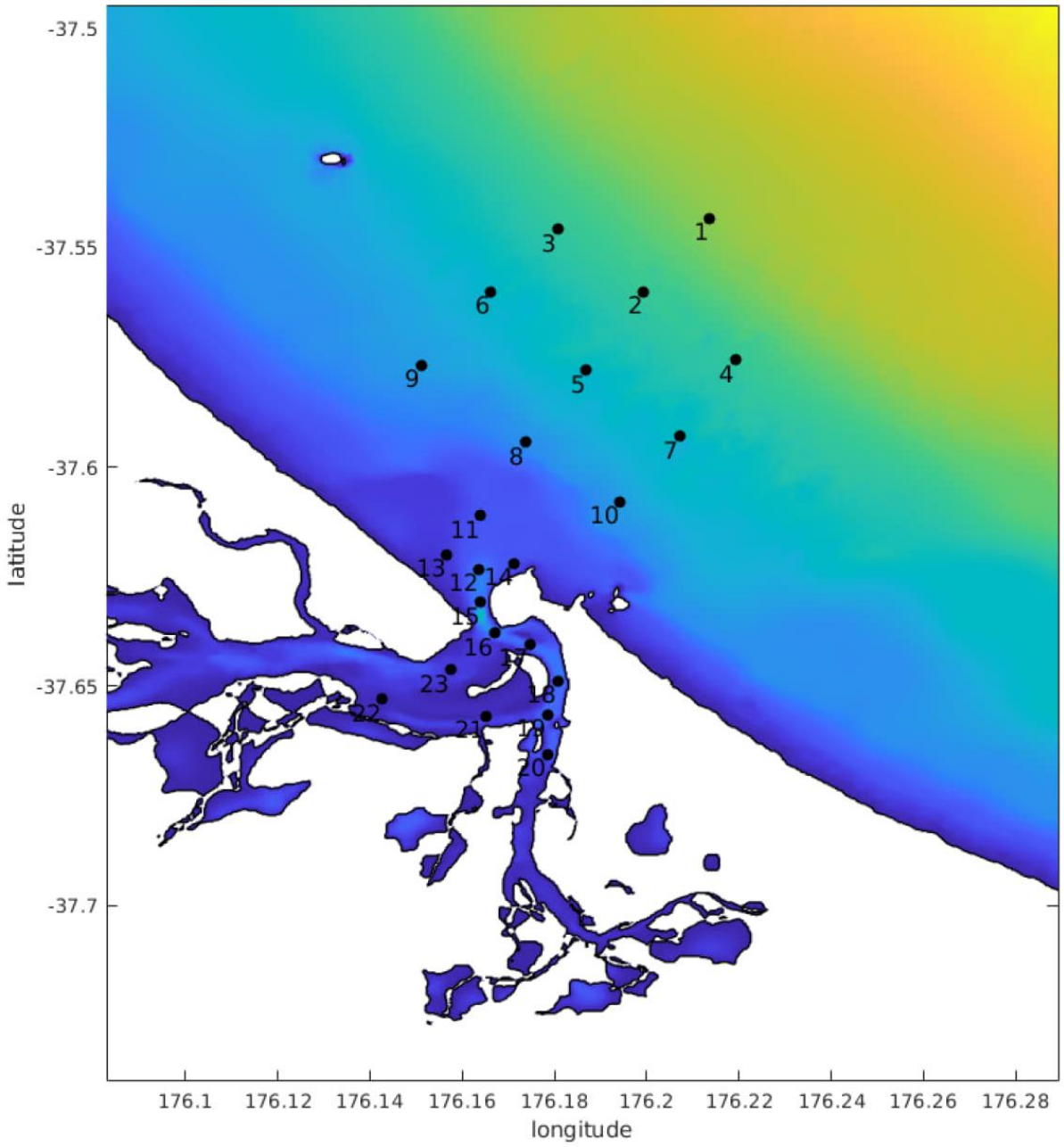


Figure 11: Positions for which predicted dB Leq differences were calculated.

Table 7 Comparison of Daily Average Underwater Noise levels between Baseline Shipping Levels and with Dredging Added

Section	Position (see Figure 8)	AIS Traffic (daily dB L_{eq})	Active Dredging (daily dB L_{eq})	Difference (daily dB L_{eq})	Average Difference of each Section
Outer (Harbour Approach)	1	125.778	125.816	0.037949	0.42 dB
	2	132.1797	132.1887	0.009034	
	3	120.3305	120.615	0.284448	
	4	124.6502	124.841	0.190753	
	5	127.8293	127.98	0.150668	
	6	120.5838	120.9971	0.413352	
	7	124.767	125.1362	0.369136	
	8	124.3727	125.6626	1.289903	
	9	117.6364	118.4546	0.818221	
	10	126.2143	126.8967	0.682465	
Entrance	11	124.95	127.2169	2.266856	1.67 dB
	12	135.8251	137.8424	2.017334	
	13	122.6306	125.7553	3.124714	
	14	138.7675	139.7077	0.940206	
	15	163.7716	163.7845	0.012891	
Channel	16	157.3644	157.3772	0.012796	0.34 dB
	17	147.2246	147.4206	0.196007	
	18	146.8762	147.6993	0.823039	
Stella	19	145.4169	145.8616	0.444666	1.56 dB
	20	128.7678	131.4437	2.675839	
Inner	21	126.1975	126.7054	0.507991	0.54 dB
	22	113.9744	114.5663	0.591959	
	23	121.3608	121.8946	0.533848	

The detailed results presented here illustrate how dredging elevates the background noise level by a small degree, but that these increases are spatially restricted to the dredging area and are not far reaching into the surrounding area; as illustrated by the decreasing sound differences from position 8 (which is on the dredged channel) and position 5 (which is further offshore and beyond the dredge area) and position 1 (which is further away again). Dredging noise has the greatest impact on the existing soundscape in the harbour entrance and Stella Passage as, in these harbour sections, the noise is confined by the surrounding geography.

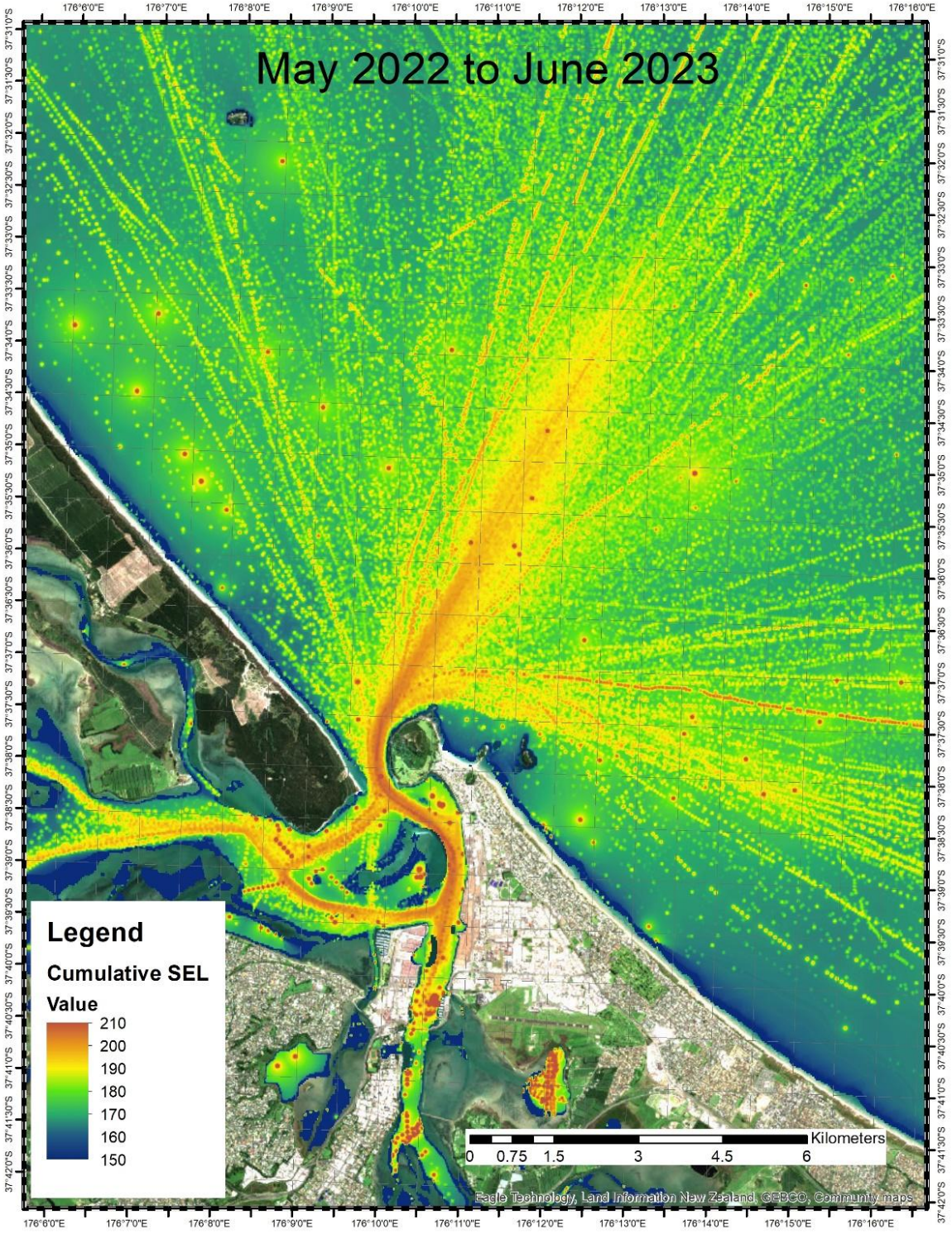


Figure 12: Average 24 hr cumulative sound exposure modelled for all shipping traffic (May 2022 – June 2023) (Pine, 2025)

Literature Review

Although very few studies have directly quantified the effects of dredging on marine mammals, the paragraphs below summarise what is available from the international literature and help to put the modelling results for the proposed dredging into context. Of high importance is that while hearing damage (i.e. physical effects) from dredging noise is theoretically possible, to date auditory injuries have not been reported from dredging activities alone (Thomsen et al., 2013).

Behavioural Effects

Temporary avoidance by harbour porpoises within 600 m of a TSHD extracting sand was noted by Diederichs et al. (2010) and declines in the regular occurrence of foraging bottlenose dolphins in Aberdeen Harbour, Scotland have been linked to increased dredge intensity (Pirotta et al., 2013). In the latter study, noise (that results in masking of communication between conspecifics), in combination with suspended sediment, are thought to reduce foraging efficacy which results in dolphin groups moving to alternative foraging patches when dredging intensity is high (Pirotta et al., 2013).

More recently, Bossley et al. (2022) quantified the effect of dredging (TSHD and BHD) on bottlenose dolphins (*Tursiops aduncus*) and fur seals (*Arctocephalus forsteri*) around South Australia's main port in the lower reaches of Adelaide's Port River. The findings of this study are of particular relevance to the Port of Tauranga project due to 1) the similarity in marine mammal species present, 2) the parallel in dredge methodology used, and 3) the fact that both dredge sites are located in highly industrialised environments. In the Australian study, surveys collecting data on the presence/absence of marine mammals occurred over 876 days for dolphins (between 1992 and 2020) and 416 days for fur seals (between 2010 and 2020). Generalised linear models were used to analyse the relationship between dolphin and seal numbers and the following variables: dredging operations, season, rainfall, and sea surface temperature (SST). Despite fluctuations in numbers of both species, this study concluded that dredging operations were not responsible for these fluctuations (i.e. dredging did not affect marine mammal presence); rather, SST and season were the most important predictors of presence for both species. While this study did not investigate short term behavioural changes of individual animals near an active dredge, it did confirm no long-term avoidance of the study area.

In a similar study, Marley et al. (2017) conducted theodolite tracking of dolphins at two study sites (Perth Waters and Fremantle Inner Harbour) within an urbanised estuary in Perth, Western Australia to quantify bottlenose dolphin responses to vessel traffic and dredging activities. Like Tauranga Harbour/Te Awanui, these Perth study sites are subject to commercial shipping and high recreational vessel use. The WA study sites are however used on a more frequent basis by a resident population of bottlenose dolphins (Moiler, 2008; Chabanne et al., 2012). Key findings of this study were that dolphin sighting rates were highest at the deepwater study site (5-13 m) that experienced the highest vessel density (i.e., Fremantle Inner Harbour which experienced up to 34 vessels per hour) and which had previously been identified as a foraging hotspot (Moiler, 2008). At this site, environmental factors (i.e., tidal height and water salinity and temperature) had a greater influence on rates of dolphin occupancy than density of vessel traffic. The authors hypothesise that the value of this foraging site outweighs the cost in terms of high levels of vessel traffic.

Marley et al. (2017) also noted that no dolphins were sighted on the 12 days during which the BHD was operational, but dredging activity was restricted to the shallow study site (Perth Waters) that was primarily used as a transit site and was least frequented by dolphins. Low sample sizes hampered the analysis of any statistical relationship between dredging activity and dolphin occupancy. It is unclear therefore whether BHD use might result in avoidance by marine mammals but given the noise levels associated with BHD operations are lower than

those for TSHD, it seems unlikely that BHD operations would cause sustained avoidance responses.

Findings of the behaviour of bottlenose dolphins in the vicinity of a five-year bridge removal and replacement project in Florida are also of interest here. This study (Weaver, 2021) demonstrated that despite this location representing prime habitat (a key area for dolphin transit between two major water bodies and a rich feeding ground), dolphins adapted to around-the-clock noise pollution (from underwater demolition activities, dredging, and pile driving) by establishing feeding areas beyond the immediate zone of disturbance, and shifting temporal patterns of activity to avoid times when the level of disturbance was high. While at the outset of the project a period of initial displacement was reported, the probability of dolphin presence returned to pre-disturbance levels in the latter part of the project, suggesting an adaptation to project-related disturbance. This study provides an example of how bottlenose dolphins have in other circumstances adapted to anthropogenic disturbance in urbanised coastal environments.

Investigations to date suggest that underwater dredging noise has little impact on pinnipeds, with several studies describing no adverse reaction or no sign of disturbance (EPA, 2007; Gilmartin, 2003, as cited in Todd et al., 2015).

Masking

Overlap between marine mammal vocalisations and dredge noise is predicted to be greater for baleen whales than dolphins or killer whales, on the basis that the frequency range of baleen whale vocalisations is lower. Hence, of the cetaceans that could be present around the project area, baleen whales would be most susceptible to masking effects from the proposed dredging activities. However, as described in **Table 1**, baleen whales are not resident to the AOI but do have an occasional seasonal presence outside the harbour. While high frequency cetaceans (e.g. bottlenose dolphins and killer whales) do also use some lower frequency (below 30 kHz) sounds for communication and echolocation, their hearing range, and the frequency range over which they produce sounds, is much greater and therefore masking effects are less pronounced in these species.

Knowledge of underwater vocalisations used by pinnipeds is relatively scarce, but data confirms that they do not echolocate to forage, but often vocalise as part of underwater social interactions, including mating (Schusterman & Van Parijs, 2003). It is noteworthy that even though the LSR results (**Table 6**) suggest that the zone of masking for fur seals extends to c. 5.3 km from the active dredge, the proposed dredging activities will occur some 30 km from the nearest breeding site, so ecologically significant masking effects for this species are not predicted. Seals also can moderate their exposure to underwater noise by swimming with their heads above water (Mikkelsen et al., 2017) and they also alternate between marine foraging habitat and terrestrial haul-out habitat and while ashore are not exposed to underwater noise.

<u>General Discussion</u>

The modelling results suggest that the effects on marine mammals of underwater noise from the proposed dredging will be spatially restricted to a few kilometres around the active dredge: where 1) behavioural effects are limited to 1.7 km for dolphins and killer whales, and 3.5 km for baleen whales; 2) masking effects are limited to within 5.5 km for all species; and 3) dredging noise is no longer audible to marine mammals above background noise at c. 8 km. These findings are not dissimilar to those reported by other studies that assess the effects of dredging on marine mammals. Any effects on marine mammals from the proposed dredging are therefore unlikely to elevate risks to marine mammals above those already present from existing dredging and/or commercial shipping. In particular, animals will only be exposed to masking and behavioural effects temporarily when they approach within 5.5 km of the active dredge. The anticipated timeframe for the capital dredging proposed as part of



this application is six weeks, and while maintenance dredging will typically occur annually, it also only occurs over a short temporal window (six weeks per year).

While shipping noise has been associated with a number of detrimental effects on marine mammals, e.g. masking (Erbe et al., 2016; Sorensen et al., 2023), physiological stress (Wright et al., 2007; Rolland et al., 2012), changes in behaviour (Nowacek et al., 2007; Piwetz et al., 2019; Tennessen et al., 2024; Wisniewska et al., 2018), and changes in vocalisations (Parks et al., 2007; Putland, 2018; Sorensen et al., 2023); hearing damage or other related physical injuries are unlikely. This sentiment is echoed by Todd et al. (2015) and Thomsen et at. (2013) who both conclude that the risk of damage to marine mammal auditory systems from dredging noise is very low, and that effects are most likely to relate to masking or temporary behavioural responses. The model results for this project supports these conclusions.

While there is clear evidence that anthropogenic noise can act as a stressor to marine mammals, corresponding evidence for effects on survival or fitness are limited (Duarte et al., 2021). However, recent evidence suggests that vessel noise can reduce the ability of male killer whales to capture prey and can lead to female killer whales reducing their efforts of prey pursuit (Tennessen et al., 2024). Therefore, while vessel noise could theoretically result in reduced survival or fitness of individuals if it was persistent and widespread across an individual's home range, marine mammals that visit Tauranga Harbour/Te Awanui from time to time are expected to have ample foraging opportunities elsewhere to offset any temporary reduction in foraging efficacy that vessel noise within the harbour could impart. In particular, dredging noise will not be persistent throughout any marine mammals home range and will only occur over discrete operational periods.

The Port of Tauranga is one of New Zealand's busiest ports, yet marine mammals (particularly dolphins, killer whales and fur seals) still utilise the area despite the elevated levels of vessel activity and associated underwater noise. This suggests that at least some species are tolerant or have already habituated to relatively high levels of underwater noise and vessel activity. Habituation of bottlenose dolphins to high levels of shipping activity has recently also been reported by Mills et al (2023) where dolphins frequently foraged in the presence of multiple vessels in the Corpus Christi Shipping Cannel, Texas (the largest port in the USA that typically sees >20 vessels pass through per hour). Likewise, no behavioural changes were detected for bottlenose dolphins in response to the presence of large and medium sized vessels in the Galveston Shipping Channel, Texas, but behavioural effects were apparent when small boats and commercial trawlers were present (Piwetz, 2019). While Bejder et al. (2009) cautions that habituation should not automatically be interpreted to imply a complete absence of detrimental consequences, variation in sensitivity (or resilience) to underwater noise probably exists between species and individuals.

4.2.1 Recommended Mitigations

To minimise any adverse effects on marine mammals from dredge noise the following strategy is recommended:

- Dredge equipment will be regularly maintained, including lubrication and repair of winches, generators, propulsion components and other potential noise sources (following Thomsen et al. 2013); and
- Compliance with the Marine Mammal Protection Regulations 1992 ('**MMPR**') which stipulate the requirements for operating vessels around marine mammals (a legal requirement).

4.2.2 Assessment Results

While marine mammals have a frequent presence in and around the project area, their presence is not constant and all species with a possible presence have home ranges that

are vast compared to the project area so individuals would only be subject to dredging effects occasionally. Further to this, the AOI (including the project area) has not been identified as being specifically important habitat for any marine mammal species (see **Section 3.5**). On this basis the following observations are made:

- dredging noise is not a novel acoustic input in the AOI;
- underwater dredging noise is highly unlikely to cause TTS for any marine mammal species, and no risk of AUD INJ has been identified;
- any behavioural or masking effects from dredge noise would be temporary and spatially restricted to within 5.5 km of the active dredge; hence underwater dredging noise is not anticipated to have ecologically significant consequences to individuals or populations. In particular, and given that marine mammals typically travel large distances on a daily basis between foraging patches, the energetic consequences of any temporary displacement (should it occur) will be negligible, and chronic repeat disturbance to individuals is unlikely; and
- scientific literature suggests that dredge noise constitutes no greater threat to marine mammals than commercial vessels that also use the area.

With the adoption of the recommended mitigation measures (which POTL is proposing), the likelihood of adverse effects on marine mammals from dredge noise will be low and the magnitude of predicted effects will be (at most) minor. While dredging noise will alter the existing soundscape and could result in temporary localised behavioural effects and masking, these effects will be largely indiscernible from those of existing vessel traffic in and around the port.

4.3 Habitat Modification

Dredging activities can result in habitat modification either directly through the generation of plumes of turbidity that marine mammals can encounter, or indirectly through altering the habitat of prey species on which marine mammals rely and consequent food-web interactions (Todd et al., 2015).

Regarding direct effects, when the seabed is disturbed by the drag head of the TSHD or by the bucket being lifted through the water column in the case of a BHD, the surrounding water column will be subject to a degree of increased turbidity. Increased turbidity is also generated via overflow of sediment laden dredge water, propellor wash or during sediment disposal. If encountered by marine mammals, these areas of increased turbidity can result in patches of habitat (both temporal and spatial) that are characterised by reduced visibility. However, plumes of turbidity from dredging activities are generally confined to within a few hundred metres of the point of discharge and are short lived (Hitchcock and Bell, 2004), with most sediment sizes (including sand to fine silt) taking only minutes to settle to the sea bed as part of the near-field plume (de Lange, 2025). While very fine silt may take longer to settle (hours to days) as part of a far-field plume, far-field sediment concentrations are typically low (i.e. at the lower end of the natural range: de Lange, 2025).

Furthermore, hydrodynamic modelling for the proposed dredging (Montaño, 2024) predicts that highest suspended sediment concentrations (‘**SSC’**) will occur in the bottom layer of the water column (on account of the drag head operating at the seabed). For the most part, highest SSC values are spatially restricted to within a 200 - 600 m radius of the dredging location. While surface plumes from overflow will occur, they will be smaller and are predicted to have lower SSC values. The model results predict that disturbed sediment will settle rapidly.

Model findings of the sediment plume generated when dredge spoil is released at the disposal site/s (see Montaño, 2025) predicts that the highest concentration of sediment will

occur in the bottom layer and will reach values >100 mg/L with very high concentrations around the release locations. In the surface layer, high concentrations (≥100 mg/L) of fine silt occur only within the disposal grounds, although lower concentrations disperse beyond the disposal grounds including into the entrance of Tauranga Harbour. The dispersal footprint is predicted to be larger in winter than summer but is generally confined to the area between Matakana Island and Papamoa Beach and becomes indistinguishable from background levels (5 mg/L) at the shoreline.

While these model findings confirm that dredging activities will generate measurable sediment plumes, there is little evidence to suggest that marine mammals are adversely affected by suspended sediment as they are tolerant of turbidity and typically don't rely heavily on vision for foraging and navigation (Todd et al., 2015). Indeed, there are many examples of marine mammals generating sediment plumes themselves during normal foraging behaviours; for example, mud ring feeding in bottlenose dolphins (see Kiszka et al., 2022); and killer whales hunting for rays in shallow waters (see DOC, 2014). This in itself is indicative of tolerance for turbid conditions.

While data is limited on how fish (potential prey species of marine mammals) respond to increased turbidity, data suggests that when exposed to sub-lethal concentrations of suspended sediment, fish will swim away from a sediment plume, and this avoidance will be triggered at total suspended sediment ('**TSS'**) concentrations of 100 mg/L (NIWA, 2014). In relation to the proposed dredging activities, and in accordance with the findings of Montaño (2025), while exceedance of this threshold is predicted; relative to marine mammal home ranges and potential foraging habitats, the area of predicted exceedance is small. In addition, elevations of turbidity reduce light penetration and can affect phytoplankton and associated zooplankton, with potential flow-on effects for small planktivorous fish that are important contributors to the diet of some marine mammals. However, given that sediment plumes associated with the proposed dredging will be spatially and temporally limited any only occur for the discrete six-week dredging campaigns, effects on primary productivity and associated food web interactions will be minimal.

Modelling also confirms that during dredging, the highest values of deposition to the seabed will be mostly constrained to within 200 m of the dredge site, and beyond this, sediment deposition thickness will be below 1 cm (Montaño, 2024). At the disposal grounds, high levels of deposition to the seabed are restricted to the immediate release locations (to a maximum of 10 cm), with low level (0-2 cm) deposition occurring beyond the disposal grounds but becoming indistinguishable from background levels (5 mm) at the shoreline (Montaño, 2025).

The removal of benthic habitat and associated benthic biota should also be considered. The benthos (seabed) can be an important habitat for those marine mammal species that rely directly on benthic organisms as a primary source of food. For these species, loss of benthic biota and disturbance to the seabed has the potential to affect the quality and availability of benthic prey which ultimately can affect the health of individuals and resilience of the populations that they belong to.

Information about the foraging ecology of the marine mammal species that are likely to be present in the AOI or could possibly occur in the AOI are presented in **Table 8**. Of those specie likely to occur in the AOI (bottlenose dolphins, killer whales, New Zealand fur seals, and common dolphins), none of these species rely solely on benthic prey; instead, benthic prey contributes to a broader overall diet that includes both benthic and pelagic species. Benthic prey species that marine mammals target on the seabed are most likely to be large mobile epifauna (for example larger species of crabs and bivalves) that will be relatively tolerant of low levels of disturbance (Lohrer et al. 2004), or demersal fish that would most likely move out of heavily disturbed benthic areas.

Table 8 Foraging ecology of marine mammals that could occur in the AOI

Species	Foraging Ecology	Benthic or Pelagic Prey?
Bottlenose dolphin	Varied diet of fish and squid (Blanco et al., 2001; Gowans et al., 2008, Constantine & Baker, 1997; Wells & Scott, 2009; Fisheries New Zealand, 2025). Foraging ecology in this species is characterised by its significant plasticity in prey species and foraging strategies (Berkenbusch et al., 2013). Foraging dives in both shallow and deep habitats (to depths of over 500 m) (Wells & Scott, 2009). Diet includes both benthic and pelagic prey.	Both
Killer whales	Killer whales around the North Island are generalist foragers that opportunistically take advantage of prey (Visser, 2007) Benthic foraging for rays is common around New Zealand's coast (Visser, 1999). Diet includes both benthic and pelagic prey.	Both
New Zealand fur seal	Forage on a range of species, with relative importance of each prey item varying by season. Arrow squid are important prey in summer and autumn, lanternfish are taken year-round, barracouta and jack mackerel are major contributors to the summer diet, while red cod, ahuru, and octopus are important in winter (Harcourt et al., 2002). Diet includes both benthic and pelagic prey.	Both
Common dolphins	Diverse diet of fish and cephalopod species. Primary prey species in New Zealand are pelagic, including arrow squid, jack mackerel and anchovy, but the overall diet does include some benthic prey (Meynier et al., 2008). Diet changes with body size, sex and season (Peters et al., 2020). Diet includes both benthic and pelagic prey.	Both
Southern right whale	Utilise offshore summer feeding grounds in Antarctic waters to feed on krill by lunge feeding in mid- or surface waters. Do not typically feed during coastal winter presence in New Zealand (Carroll et al., 2011). Diet does not include benthic prey.	Pelagic only
Leopard seal	Diet includes birds, mammals, benthic and pelagic fish and invertebrates (Halls-Apsland and Rogers, 2004). Includes both benthic and pelagic prey.	Both
Long-finned pilot whales	Information is limited for this species in New Zealand, but stomach content analysis of five stranded individuals suggests a cephalopod diet of both pelagic squid and benthic octopus (Beatson et al., 2007). Diet includes both benthic and pelagic prey.	Both
Gray's beaked whale	Diet appears to vary with location but includes meso-pelagic fish and squid (Pitman et al., 2020). Diet does not include benthic prey.	Pelagic only
False killer whale	Feed on a variety of oceanic squid and fish, with diet occasionally supplemented with marine mammals (Baird, 2009). Diet does not include benthic prey.	Pelagic only
Humpback whale	Feed on krill and small pelagic schooling fish by lunge feeding in mid- or surface waters (Murase et al., 2002). Diet does not include benthic prey.	Pelagic only
Bryde's whale	Feed on schooling fish (e.g., anchovies, herring, pilchards and mackerel) (Omura, 1962), krill & plankton (Constantine et al., 2012). Diet does not include benthic prey.	Pelagic only
Minke whale	Feed on krill and a variety of other small schooling fish by lunge feeding in mid- or surface waters (Cooke et al., 2018). Diet does not include benthic prey.	Pelagic only

Species	Foraging Ecology	Benthic or Pelagic Prey?
Blue whales	Feed on krill and other zooplankton by lunge feeding in mid- or surface waters (Acevedo-Gutierrez et al., 2002). Diet does not include benthic prey.	Pelagic only
Sei whale	Feed on zooplankton, pelagic schooling fish and squid (Cooke, 2018a). Diet does not include benthic prey.	Pelagic only

Several studies of relevance to the impacts of dredging on the potential prey species of marine mammals in and around Tauranga Harbour/Te Awanui are summarised by de Luca (2025). For instance, Leonard et al. (2020) described marine species assemblages in Tauranga Harbour/Te Awanui and concluded that species diversity and abundance was relatively stable over time despite the periodic occurrence of dredging. In particular, 1) species diversity at reef and boulder habitat on the eastern side of the harbour channel was unaffected by dredging (Warren et al., 2016); 2) there was no significant difference in adult pipi abundance pre- and post-dredging at Te Paritaha sandbank (Fairlie et al., 2016; Ross and Culliford, 2018); and 3) port operations (including dredging) have had little influence on fish abundance (Battershill, 2022). The port area reportedly supports significant populations of adult fish (de Luca, 2025), including eagle ray, snapper, trevally, kingfish, gurnard, kahawai, parore, and spotty (Leonard et al., 2020. Furthermore, Battershill (2022) concluded that recolonisation and recovery of soft sediment benthic habitat in Tauranga Harbour/Te Awanui will occur relatively quickly (within 1-3 years) following dredging activity. On this basis, dredging effects associated with prey quality and availability are not expected to be of ecological significance for marine mammals. Further to this, marine mammals are highly mobile and can readily avoid areas affected by direct disturbance or suspended sediment in favour of nearby alternative habitat.

The information outlined above suggests that any resultant changes to prey availability from benthic habitat disturbance or the temporary presence of sediment plumes are highly unlikely to be of ecological significance to marine mammals.

4.3.1 Recommended Mitigations

No specific mitigations are recommended in relation to potential habitat modification effects.

4.3.2 Assessment Results

The likelihood of adverse effects on marine mammals from habitat modification (reduced visibility and reduced quality or availability of prey) during the proposed dredging activities will be very low and the magnitude of predicted effects will be negligible as:

- Dredging does not represent a novel activity either within Tauranga Harbour/Te Awanui or outside the Harbour (including the disposal sites) and despite these activities occurring here, marine mammals continue to utilise these areas;
- While sediment plumes will certainly occur as a result of dredging activities, elevated suspended sediment levels will be restricted both spatially and temporally (see Montaño, 2024 & 2025) both during dredging and spoil disposal, and because of this the footprint of the impact will be small compared to the potential marine mammal foraging habitat both inside and beyond the AOI;
- The capital dredging project is only anticipated to have a six-week duration after which annual maintenance dredging (c. six weeks per year) will be required:
- No marine mammals rely solely on the affected area for foraging habitat;

- Marine mammals are highly mobile and have ample opportunity to avoid areas of turbidity;
- Marine mammals are well adapted to forage and navigate at depth where natural light is limited or in turbid coastal waters where visibility is restricted;
- Instead of vision, toothed whales and dolphins use echolocation to navigate and detect prey and baleen whales and pinnipeds feel for prey with their sensitive whiskers (Peyensen et al. 2012; Denhardt et al. 1998);
- While some marine mammals do have a benthic component to their diets, none are solely reliant on benthic prey (consuming a mixture of benthic and pelagic prey species);
- Potential impacts of the project on small pelagic planktivorous fish populations (which are important contributors to the diet of some marine mammals, particularly dolphins) are expected to be minimal. On this basis, detectable flow-on effects to apex predators that target pelagic fish are highly unlikely;
- Any marine mammal species that do forage within the AOI can access nearby alternative foraging habitat of similar quality, noting that all the marine mammal species expected in the AOI have a home-range that is vast in comparison to the area that will be subject to disturbance effects; and
- Any area of reduced abundance of fish or other epifauna prey that results from habitat removal (i.e., dredging) or a reduction in habitat quality (i.e., suspended sediment) will be highly localised.

4.4 Ship Strike

The term ‘ship strike’ refers to the collision of a marine mammal with a vessel, and as ship strike events can result in death or life-threatening injuries to whales and dolphins, they are of global conservation concern (IWC, 2014; Nisi, 2024). A number of factors influence the likelihood of collisions, these are:

- Vessel size – larger vessels (> 80 m) are more frequently involved in collisions with marine mammals than smaller vessels (Laist et al., 2001; Jensen & Silber, 2003). Large vessels usually have deeper drafts, hence a larger strike area (Schoemann et al., 2020);
- Vessel speed – most lethal marine mammal collisions involve vessels travelling at faster speeds (> 12 knots; Laist et al., 2001; Vanderlaan & Taggart, 2007) because higher speeds increase the risk of blunt force trauma (Wang et al., 2007);
- Species – large whales are the most common victims of collisions (e.g., fin whales, right whales, humpback whales, minke whales and sperm whales) (Laist et al., 2001; Jensen & Silber, 2003; Van Waerebeek et al., 2007). However, a recent global review of ship strike incidents by Schoemann et al. (2020) found a total of 61 marine mammal species are affected by vessel collisions and incidents involving smaller species often go unreported; and
- Behaviour - species that remain at or near the sea surface for extended periods are particularly vulnerable to collisions (Laist et al., 2001; Constantine et al. 2012); as are species that are attracted to vessels (Bejder et al. 1999; Wursig et al., 1998).

All marine mammal species potentially present in the AOI are potentially at risk of collision with operational vessels. However, data indicates that large whales are at greater risk than smaller marine mammal species (Laist et al., 2001; Jensen & Silber, 2003); where the size and agility of dolphins and seals means that these groups are more successful at avoiding potential collisions (Schoemann et al., 2020).

Jensen and Silber (2003) reported that fin whales, humpback whales, minke whales, southern right whales and sperm whales were the most likely to be involved in ship-strike incidents. Of these species, humpback whales, minke whales and southern right whales could potentially be present in the AOI (see **Section 3.2.1**).

One of the primary factors affecting the severity of each ship-strike incident is vessel speed (Jensen & Silber, 2003) where the likelihood of mortality increases with increasing speed. The mean vessel speed that results in mortality following a ship strike is 18.6 knots (Jensen & Silber, 2003) and Laist et al. (2001) found that most lethal ship-strike incidents involved vessels travelling at 14 knots or faster. Vanderlaan and Taggart (2007) reported that the probability of a lethal injury drops to 0.79 at 15 knots and to <0.5 at speeds of 11.8 knots or less. The slow operational speed of dredge vessels no doubt contributes to this type of vessel being under-represented in ship strike data globally; of the 134 collisions reported globally between 1975 and 2002 only one was attributed to a dredge vessel (Jensen & Silber, 2004).

During the proposed dredging activities, the TSHD will be dredging at a speed of 2 knots. The loaded dredge travelling to the disposal site would have a maximum speed of about 14 knots, but potentially slightly faster with a full tidal flow behind them. The empty dredge returning to the harbour could be half to 1 knot faster. Based on this information, the TSHD will be travelling at speeds of up to 15 knots during transit to and from the disposal sites.

Todd et al. (2015) conducted a review of the impacts of dredging on marine mammals and noted that ship strike risk is highest while dredges are in transit to and from disposal sites as speed is greater during this part of the dredging cycle. However, Tillin et al. (2011; cited by Todd et al., 2015) found that the addition of dredging vessels in areas of high shipping traffic are unlikely to increase the overall collision risk present in an area. The DOC Incident Database lists only one ship strike incident for the AOI, that being a sei whale that arrived in Port Tauranga draped over the bulbous bow of a large ship. Furthermore, baleen whales typically migrate through Bay of Plenty waters in deeper offshore waters than those affected by the dredging activities, and the presence of migrating baleen whales is seasonally restricted (primarily winter and spring).

Despite the existing high rates of vessel traffic entering and departing the Port of Tauranga, the incidence of ship strike is remarkably low even for vessels that are much larger and faster than dredges. While the proposed dredging activities may indirectly facilitate increased levels of large ships visiting the Port of Tauranga, which could increase the ship strike risk to large whales in the AOI, the existing low levels of ship strike in the area reflects the fact that the Bay of Plenty does not support any resident concentrations of large whales and that the density of migratory whales through the region is relatively low and their presence is temporarily limited.

4.4.1 Recommended Mitigations

The Marine Mammal Protection Regulations 1992 ('**MMPR**') stipulate the requirements for operating vessels around marine mammals including:

- Avoid sudden or repeated changes in speed and direction near marine mammals;
- There should be no more than three vessels within 300 m of any marine mammal;
- Vessels should travel no faster than idle or 'no wake' speed within 300 m of any marine mammal;
- Do not circle whales and dolphins, and do not obstruct their path or cut through any group; and
- Keep at least 50 m from whales (or 200 m from any large whale mother and calf/calves).

Compliance with these regulations (which is a legal requirement) during the proposed dredging activities will serve to reduce the likelihood of marine mammal ship strike, as will the relatively slow operational speed of the dredge vessel/s.

4.4.2 Assessment Results

As a legal requirement, POTL must comply with the MMPR. POTL is aware of this obligation and will ensure that all project vessels operate in accordance with the MMPR to manage the risk of ship strike during the proposed dredging activities. On this basis, the likelihood of ship strike during dredging will be low, and the magnitude of potential effects will be negligible as no ship strike incidents are anticipated.

4.5 Exposure to Contaminants

The resuspension of contaminated sediment during dredging activities has the potential to affect marine mammals; indeed, contaminants in the marine environment that are widespread and at high levels can pose health risks to many marine fauna (e.g., Williams et al., 2020). In relation to dredging activities, marine mammals can either come into direct contact with contaminants by swimming through a sediment plume or can be exposed indirectly through the consumption of contaminated prey. Being at the top of the food chain, some marine mammals are particularly susceptible to bioaccumulating contaminants from their prey species (Moeller, 2003) and contaminants in marine mammals typically accumulate in blubber (Weisbrod et al., 2000).

The chemical contaminants of primary concern to marine mammals are persistent organic pollutants (i.e., organochlorines and organotins such as PCBs, DDT, TBT etc.), hydrocarbons (namely PAHs), and heavy metals (such as mercury, cadmium and lead) (De Guise et al., 2003); where the following serious health implications have been linked to contaminant exposure: immunosuppression, reproductive and developmental effects and endocrine disruption (Vos et al., 2003). The source of these pollutants into the marine environment is extremely varied; however, stormwater run-off is often a ubiquitous source of contaminants (Barbosa et al., 2012). Pollutant concentrations in marine mammal tissue are variable depending on contaminant bioavailability, marine mammal habitat preferences, distribution, trophic level, and foraging ecology (Mendez-Fernandez et al., 2017; Pinzone et al., 2015; Delgado-Suarez et al., 2023); where individual variation within species (or even populations) is common and linked to age, sex and individual foraging strategies (Remili et al., 2021; Schwacke et al., 2002).

Recent analysis by Williams et al. (2023) of stranded marine mammals in Great Britain suggest that despite environmental levels of persistent organic pollutants having decreased in the marine environment following the introduction of stronger international regulations around their use (e.g. Stockholm Convention, 2001), some marine mammals continue to harbour tissue concentrations that present a toxicological risk to individual health. The findings of this study noted that of the 11 species analysed, pollutant concentrations were highest in apex predators such as killer whales and bottlenose dolphins. The authors also noted that marine mammal populations that utilise habitat around industrialised areas are generally the most heavily contaminated. However, in general terms, contaminant concentrations detected in New Zealand marine mammals are considerably lower than concentrations in northern hemisphere species (Jones, 1998); however, relatively few published studies are available on this topic.

With regards to metals and hydrocarbons, some prey species of marine mammals are more susceptible to bioaccumulation; with metals typically bioaccumulating in molluscs and crustaceans (Zeng et al. 2013) and hydrocarbons bioaccumulating in bivalves (Hoffman et al., 2003). Benthic foraging marine mammals could therefore be subject to some secondary contamination through the consumption of contaminated invertebrate prey, but it is noteworthy that marine mammals can metabolise and excrete hydrocarbon contaminants



over time (see Ruberg et al., 2021), but this is not the case with metals which are well recognised to bioaccumulate and biomagnify (see Delgado-Suarez et al., 2023).

In areas of historical contamination, dredging has the potential to resuspend sediments and expose marine mammals to legacy pollutants both at the extraction site and the deposition site (Todd et al., 2015). However, Todd et al. (2015) noted that exposure potential from such scenarios will be spatially restricted in accordance with plume size. The likelihood of marine mammals being exposed to contaminants during the proposed dredging project is largely dependent on the quality of the sediment to be dredged. The material to be dredged during the proposed dredging activities has been tested for contaminants and the following findings are of relevance:

- Sediment chemistry analysis was conducted by Boffa Miskel in 2023 for heavy metals, PAHs, PCB and TBT. The results indicate low concentrations of all contaminants, with PAHs, PCBs, and TBT below laboratory detection limits (de Luca, 2025);
- The chemistry of pipi (shellfish) flesh was also analysed by Boffa Miskel in 2023, 2024 and 2025 and is a useful proxy for bioaccumulation potential. Concentrations of cadmium, lead, mercury, and PCBs were below the ANZ (2018) default guideline values ('**DGV**') of the Australia and New Zealand Food Standards Code. There is no DGV for PAHs, but PAHs were typically present only in very low concentrations (with the exception of one location where temporary elevations were associated with an accidental hydrocarbon spill (de Luca, 2025);
- In the pipi flesh tested, only arsenic (total) was present at concentrations above the ANZ (2018) DGV (however, the guideline value refers to inorganic arsenic which is approximately 10% or less of total arsenic) (de Luca, 2025);
- Prior to the analysis by Boffa Miskel in 2023, Leonard et al. (2020 reported that for Tauranga Harbour/Te Awanui, sediment heavy metal contamination and levels of all metals tested (As, Cd, Ch, Cu, Pb, Ni, Zn) were below the Default Guideline Values recommended by the Australia and New Zealand Guidelines for Fresh and Marine Water Quality;
- POTL have also undertaken sediment analyses for seven sites in the shipping channel and one site at the disposal site. The results of these analyses are reported by Stewart (2025). Key findings are 1) PCBs, TBTs, PAHs, and OCPs were all below laboratory detection limits, 2) metals were detected at most sites, but below DGVs, 3) antimony, cadmium, copper, mercury, and silver were below laboratory detection limits at all or most sites and well below DGVs; and
- Modelling predicts that suspended sediment plumes will be spatially and temporarily restricted (Montaño, 2024 & 2025), and this coupled with the limitations that stipulate when, where and for how long overflow will be permitted, will minimise contaminant resuspension.

Although marine mammals could occasionally be present around the extraction and disposal sites, all species potentially present have home ranges that are vast compared to any area that may be subject to reduced water or sediment quality. Hence, the overall degree of direct exposure for any individual marine mammal is likely to be low. Also, as discussed in **Section 4.3**, no marine mammal species is entirely reliant on the AOI for foraging habitat, and plenty of nearby alternative foraging habitat exists. On this basis, bioaccumulation is unlikely to occur as any contaminated areas that are subject to resuspension would represent a very small proportion of total foraging habitat for marine mammals. Further to this, the impact of exposure will be greatest in areas where high contaminant burdens overlap with areas defined as important marine mammal habitat (Williams et al., 2023). Neither of these factors are of direct relevance to the project area.

4.5.1 Recommended Mitigations

No specific mitigations are recommended in relation to potential effects from contaminant exposure.

4.5.2 Assessment Results

The likelihood of adverse effects on marine mammals from chemical contaminants (via direct and indirect exposure) during the proposed dredging activities will be very low and the magnitude of predicted effects will be negligible as:

- Sediments to be dredged do not contain concerning levels of heavy metals and the dredge techniques proposed will minimise contaminant resuspension in the event that other pollutants are present;
- Unlike fish, marine mammals do not assimilate oxygen through gills, but instead return to the surface to breathe; therefore, the uptake of contaminants in the water column is restricted to trophic pathways (e.g. food chain) or through direct contact with skin and mucous membranes;
- Marine mammals are highly mobile and have ample opportunity to avoid areas of poor water quality characterised by increased turbidity, therefore the likelihood of marine mammals spending extended periods in contact with contaminants is low; and
- Bioaccumulation associated with the consumption of contaminated prey is unlikely given the limited extent of total foraging habitat that could be affected by any contaminants that may be present and that marine mammals can metabolise hydrocarbon contaminants.

4.6 Marine Debris

Potential impacts of marine debris on marine mammals include ingestion or entanglement of manmade objects that have been lost to the marine environment. Any maritime vessel, including dredges are potential sources of debris on account of careless operations (e.g. plastic litter blowing overboard) or equipment failure (e.g. dredge equipment breaking and being lost to sea). An extreme consequence of marine debris ingestion is blockage of the digestive tract leading to death by starvation, however, sublethal effects include malnutrition, disease and exposure to toxins (summarised by Baulch & Perry, 2014). Entanglement in debris (especially loose thin lines or nets) can lead to injury or drowning.

It is noteworthy that during previous capital dredging a substantial amount of marine debris from the seabed was removed within Tauranga Harbour/Te Awanui (e.g., old tyres, shopping trolleys, rope, road cones etc) Annual maintenance dredging also removes debris (pers. comm. R. Johnstone, Port of Tauranga). Any debris is bought ashore and safely disposed of on land.

4.6.1 Recommended Mitigations

To minimise any adverse effects on marine mammals from marine debris, and in addition to compliance with the Resource Management (Marine Pollution) Regulations 1998 (the '**Marine Pollution Regs**') (which is a legal requirement) the following strategies are recommended:

- All non-biodegradable waste that is generated as part of the proposed dredging must be collected, securely stored and disposed of at an approved solid waste facility onshore;
- If any loose debris does enter the water, it must be promptly retrieved if safe to do so;

- Any lost equipment should be retrieved from the seabed, water column or foreshore if it is safe and practical to do so; and
- All project vessels must have covered waste bins and debris retrieval nets onboard.
- A commitment to collect and retrieve obvious objects of marine debris during the course of dredging and to safely dispose of these onshore.

4.6.2 Assessment Results

POTL has confirmed that the recommendations outlined above will be adopted during the proposed dredging activities. On this basis, the likelihood of marine debris effects on marine mammals is very low, and the magnitude of potential effects will be negligible.

5.0 Artificial lighting

While the proposed campaign is underway, dredging will occur 24 hours a day/ 6.5 days a week). The proposed capital works are only anticipated to take six weeks to complete. During the hours of darkness, dredge vessels will comply with standard navigation and safety lighting requirements.

Effects of artificial lighting on marine mammals at sea are not well studied but are likely to be limited to attraction and associated risks (MPI, 2013). While submerged underwater lighting will not be used during the proposed dredging activities the operational lights located on the vessel deck could generate some spill-over to sea which could potentially attract prey species of marine mammals (e.g. plankton and fish).

It is not possible to predict with any certainty how the balance between potential attraction (from artificial lights) and potential avoidance (from underwater noise) will manifest for each marine mammal species that could be present in the AOI as this will largely be driven by individual variability; whereby some individuals will be more inquisitive or more sensitive than others. At a species level, fur seals and dolphins are the most probable candidates for attraction. However, the AOI has not been identified as important habitat for any marine mammal species and the relatively slow speed of the dredge, and the agility of these species reduces any potential ship strike risk that could culminate from any potential attraction effect.

5.1.1 Recommended Mitigations

No specific mitigations are recommended in relation to potential effects from artificial lighting. Assessment Results

5.1.2 Assessment Results

On the basis of the information presented above, the likelihood of artificial lighting effects on marine mammals is very low and the predicted magnitude is negligible.

6.0 Cumulative Effects

Cumulative effects occur when the effects of an activity are added to or interact with other effects in space and time. Assessing the cumulative effect of different anthropogenic activities on wildlife populations is globally recognised as a complicated field for which quantitative tools are not widely available (Hague et al., 2022). In the absence of such tools, a quantitative assessment of cumulative effects for marine mammals is not possible but, from a qualitative perspective, the following comments are of relevance.

The potential for cumulative acoustic effects that could result when multiple underwater noise sources combine is of particular concern given the introduction of dredging noise into an already noisy port environment. The background noise levels of the AOI are elevated

largely on account of existing commercial shipping (**Figure 12**) and recreational boating, meaning that masking of some marine mammal vocalisations undoubtedly already occur. While the proposed dredging activities will add to this soundscape (and therefore the potential for masking), any cumulative noise effects from dredging will be temporary (whereby dredging noise will cease at the end of the proposed dredging campaign) and no marine mammals are confined to the zone within which the dredging noise will be audible (i.e. all species expected in the AOI have home-ranges that expand will beyond the predicted c. 5 km zone of audibility). Temporary effects are typically of greater relevance to individuals than populations (Ellison et al., 2016); hence, marine mammal populations are unlikely to be affected by cumulative noise.

It is probable that the proposed dredging will overlap with other underwater construction works that POTL is proposing. Of particular note is the proposed Stella Passage Development which involves reclamation and extensions to both the Sulphur Point and Mount Maunganui wharves. Consent for this project is being sought concurrently under a different consent application. Of particular note is that the Stella Passage project involves pile driving activities which produce intense underwater noise that will be managed primarily by the use of bubble curtains and shutdown zones when marine mammals enter the zones in which significant impacts are predicted. In the event that pile driving and dredging activities overlap spatially it is noteworthy that underwater noise is not additive, but rather the loudest noise will serve to mask the quieter noise (Clement, 2022). In these circumstances the control measures proposed to manage the effects of underwater noise from piling activities will serve to adequately protect any marine mammals that may be present from cumulative underwater noise.

When considering cumulative effects, it is also important to acknowledge other threats that marine mammals may be exposed to. Waters of the AOI, and indeed much of the northeast coast of the North Island, are subject to multiple potential threats to marine mammals or their habitat including bycatch in fishing gear, disturbance from vessel traffic, and habitat degradation. In this regard cumulative effects will be of most relevance to threatened species. The threatened species that are most likely to be present in the AOI are killer whales and bottlenose dolphins, and the potential for cumulative effects on these species is discussed below:

- Killer whales: other threats to New Zealand killer whales and their habitat include habitat degradation, noise pollution, chemical pollution, and interactions with fisheries (Visser, 2007). New Zealand killer whales have extensive home-ranges (circumnavigating the entire North Island as a minimum) and cover large distances on a daily basis (an average of 100 – 150 km per day; Visser, 2000). This life history trait has both advantages (ability to readily move to avoid disturbance) and disadvantages (exposure to a wide range of threats over a wide range of habitats). While the home-range of New Zealand killer whales is vast, the project area (including Tauranga Harbour/Te Awanui) is small in contrast and there is no specific evidence to suggest that this habitat is of high relative importance for this species.
- Bottlenose dolphins: because of their coastal nature, bottlenose dolphins are susceptible to disturbance. Dolphins that are present in the AOI are considered as part of the Northland population which ranges from at least Doubtless Bay in the north to Tauranga in the south. This population is in decline (Tezanos-Pinto et al., 2009; Brough et al., 2025) and DOC considers that adverse effects from tourism in the Bay of Islands is the main threat to this population (DOC, 2022). Here the presence of dolphin-watching boats interferes with foraging, breeding, and resting behaviours (Peters & Stockin, 2016) and the Te Pēwhairangi (Bay of Islands) Marine Mammal Sanctuary was established in 2021 to address this problem. While effects of underwater noise from dredging activities could affect bottlenose dolphin that use the

AOI, there is no specific evidence to suggest that this habitat is of high relative importance for this species.

6.1.1 Recommended Mitigations

No specific mitigations are recommended in relation to potential cumulative effects. However, any efforts to decrease the overall duration of the dredging campaign would be of benefit to reduce the time scale over which dredging noise is present in the AOI.

6.1.2 Assessment Results

On the basis of the information presented above and given that POTL has confirmed that it will adopt the preceding recommendations to manage underwater noise, the likelihood of cumulative effects is low and will be of negligible magnitude.

7.0 Response to Cultural Values Assessments

Throughout the course of their application preparation POTL have engaged with local iwi/hapū groups, several of which have provided Cultural Values Assessments. These assessments supplement the findings of this report which has been prepared from a contemporary science point of view.

Table 9 provides a summary of the cultural effects and associated management recommendations of relevance to marine mammals that were identified in these assessments and provides a response to each.

Table 9: Marine Mammal Effects Identified in Cultural Values Assessments

Potential Effect	Iwi/Hapu Comment	Response
1. Effects of underwater noise on marine mammals	a). Dredging noise adds to the cumulative soundscape of Tauranga Harbour /Te Awanui	Refer **Section 4.2.2**, which acknowledges that while dredging noise will alter the existing soundscape and could result in temporary localised behavioural effects and masking, these effects will be largely indiscernible from those of existing vessel traffic in and around the port, and any energetic consequences of temporary and localised displacement of marine mammals will be negligible. On this basis, the specific project effects will not deter marine mammals from using the project area in the future. Dredging noise is addressed through Consent Condition 10.7 of the Dredging Conditions. Furthermore, the magnitude of predicted dredge noise effects on marine mammals is minor (see **Table 10**). Cumulative effects are also discussed later in this table.
	b) underwater noise should be managed not only for injury thresholds, but also for behavioural disturbance, masking, cultural soundscape and cumulative industrial presence	Mitigation measures should be commensurate with the ecological significance of the predicted effect, where predicted effects of the proposed dredging are realistically limited to temporary, spatially constrained behavioural responses or low-level masking of marine mammals. No mitigation measures over and above those already proposed (refer **Table 10** for summary) are considered necessary.

Potential Effect	Iwi/Hapu Comment	Response
	c). Recommend live hydrophone monitoring during dredging with implementation of trigger thresholds, shutdowns and fauna response monitoring	Mitigation measures should be commensurate with the ecological significance of the predicted effect. The use of real-time hydrophone monitoring is an emerging technology and is sometimes warranted to underpin shutdown requirements for projects that 1) carry a real risk of auditory injury, or 2) occur in areas of important habitat with resident populations of conservation dependant species. Neither of these factors apply to the current project; hence the use of real-time hydrophone monitoring is considered unnecessary. Further, the underwater modelling predicts that TTS (temporary hearing impairment) is not expected beyond 1 m of the active dredge for those species that could be present in the AOI, and no risk of AUD INJ (permanent hearing impairment) was identified. On this basis, the implementation of shutdown zones is unnecessary.
	d). Recommend that POTL resource iwi-led monitoring of taonga species (including marine mammals) before during and after dredging with associated adaptive management responses	Mitigation measures should be commensurate with the ecological significance of the predicted effect. Further, POTL undertook acoustic monitoring for cetaceans in the lead-up to the Project, which provided valuable context to species presence and frequency of occurrence. However, as there are no marine mammal species that are resident to the AOI, continued monitoring (during and after the project) are considered unnecessary. In particular, the low density and infrequent present of tohorā (te reo name specifically used for southern right whales but understood to be broadly applied to mean baleen whales in this context) in the AOI would be highly unlikely to yield data that could be used to support adaptive management. There is robust evidence that tohorā are not resident to the AOI and when they do migrate through, they usually pass the project area further offshore than the zone of predicted effects (typically in waters deeper than 30 m: Gaborit-Haverkort, 2012). Despite this, the findings of this assessment assume the occasional presence of tohorā in the immediate vicinity of the project area and consider that effects are adequately managed without the need for additional monitoring.
2. Cumulative effects	a). Cumulative effects have not been adequately assessed	**Section 6.0** assesses the potential cumulative effects on marine mammals. While this assessment takes a qualitative approach (in the absence of widely available quantitative tools), it comprehensively discusses cumulative noise effects and other potential threats that marine mammals may face across their wider distribution (e.g. disturbance from vessel traffic, and habitat degradation). **Section 6.0** also recognises that cumulative effects will be of most relevance to threatened species and provides a more detailed evaluation for killer whales and bottlenose dolphins; the two threatened species most likely to interact with the proposed dredging operations.
	b) Cumulative effects of increased vessel movement and	Refer **Section 6.0** for a full assessment of cumulative effects. Further, and despite the existing high rates of vessel traffic entering and departing the Port of Tauranga,

Potential Effect	Iwi/Hapu Comment	Response
	operational activity could lead to chronic disturbance and increase collision risk	marine mammals still utilise the harbour and surrounds and the incidence of ship strike is low. **Section 4.4** acknowledges that the proposed dredging activities may indirectly facilitate increased levels of large ships visiting the Port of Tauranga, but notes that there is limited potential for increased ship strike risk. Likewise, and as discussed in **Section 4.2**, marine mammals still utilise the harbour despite existing elevated levels of vessel activity and associated underwater noise; their continued presence here is not predicted to change on account of the project and its consequences.
	c). The assessment does not utilise available datasets to evaluate temporal change, cumulative effects, or long-term ecological trajectories within Tauranga Moana	As described in **Section 3.1**, the assessment reviewed DOC marine mammal sighting data from 1968 to 2025. However, as this data is collected non-systematically, it is unsuitable for detailed evaluation of temporal changes in marine mammal presence which may have provided greater context on cumulative pressures faced by local populations through time. Instead, acoustic monitoring results provided information on seasonal occurrence which was used to inform the assessment. Describing the long-term ecological trajectories of marine mammal populations was outside the scope of this assessment.
	d). Lack of clarity regarding the cumulative effects from simultaneous operations from both the POTL dredging project and the POTL Stell Passage Development project	Refer **Section 6.0**, which identifies that the proposed dredging is likely to overlap with construction works associated with the Stella Passage Development. Modelling was not undertaken to quantify how both projects could interact simultaneously to contribute to the cumulative underwater soundscape because, as explained in **Section 6.0,** the louder component (pile driving) will mask the quieter noise (dredging) and that in these circumstances, the pile driving control measures will protect any marine mammals that may be present from adverse effects of underwater noise.
3. Frequency of occurrence of marine mammals in Tauranga Harbour/Te Awanui	a). Noted absence of killer whales during summer 2025/26 maintenance dredging	While deployment 2 of the acoustic monitoring outlined in Section 3.3 did not overlap with the specific dates of marine mammal absence reported by iwi (Dec 2025 to 7 Feb 2026), it did cover the equivalent period in summer 2022/2023; fewer marine mammals were detected over summer months compared to other seasons. Hence, the apparent absence noted by iwi may simply reflect the seasonal variability in occurrence. However, without more information on their monitoring methodology (specifically monitoring effort) it is difficult to draw any firm conclusion.
4. Cultural significance	a. The assessment process did not sufficiently consider the cultural significance of marine mammals	Refer **Section 4.1** which acknowledges that marine mammals are taonga but that the detail pertaining to the cultural significance is a matter for tangata whenua to determine. This assessment is undertaken from a conventional scientific perspective.
5. Mitigations/ management measures	a. Several additional mitigations or management	Each recommendation is discussed below: - Live hydrophone monitoring, see 1c above.

Potential Effect	Iwi/Hapu Comment	Response
	measures were recommended	- Iwi-led monitoring, see 1d above. - Taonga species incident protocol. No definition is provided for 'incident', but in the context of management, incidents typically relate to injuries, collisions, entanglements etc (i.e. interactions that cause harm). With the implementation of those mitigations proposed in **Table 10**, no incidents are anticipated; hence an incident protocol is not required. In the highly unlikely event that an incident did occur, POTL would be bound by the requirements of the Marine Mammal protection Act 1978 ('**MMPA**') to report all details directly to DOC. In addition, draft condition 18.2 requires that any physical interaction between the dredge vessel and a marine mammal is reported immediately to DOC. This goes beyond the requirements of the MMPA. - Iwi notification for any mortality events. While marine mammal mortalities are not an anticipated outcome of the project, there is no technical reason why this recommendation could not be adopted. - Vessel observation and response procedures. As outlined in 1c, the implementation of shutdown zones is unnecessary for this project, and in accordance neither are specific marine mammal observers warranted on the dredge vessels. Draft condition 18.1 requires that each marine mammal sighting will be recorded by the dredge master. - Cultural reporting of species observations. It is understood that this recommendation simply to requests that POTL provide iwi with a log of all marine mammal sightings made during the project, there is no technical reason why this recommendation could not be adopted. - Input into Marine Mammal Management Plan. On the basis that the project poses no greater risk to marine mammals than other shipping activities in and around Tauranga Harbour/Te Awanui it is considered that no specific management plan for marine mammals is required. Rather, mitigation measures to address the potential effects of dredging on these taxa have been included as draft conditions of consent.

8.0 Summary of Findings

This assessment has identified and described the potential effects of the proposed dredging activities on marine mammals. Where considered necessary, recommendations have been made to avoid, remedy or mitigate those adverse effects that have been identified. Based on the adoption of these recommendations the likelihood of each effect occurring and the predicted magnitude was determined. Assessment results are summarised in **Table 10**.

Table 10 Summary of Assessment of Effects Results for Marine Mammals

Potential Effect	Recommended Mitigations	Likelihood of Effect	Magnitude of Effect
Underwater noise and vibrations	Regularly maintained dredge equipment. Compliance with MMPR*.	Low	Minor
Habitat modification	None.	Very low	Negligible
Ship Strike	Compliance with MMPR*.	Low	Negligible
Exposure to contaminants	None.	Very low	Negligible
Marine debris	Adoption of waste management protocols. Compliance with Marine Pollution Regs*. Collect and retrieve marine debris whilst dredging.	Very low	Negligible
Artificial lighting	None.	Very low	Negligible
Cumulative Effects	None, but any efforts to decrease the overall duration of the dredging campaign would be of benefit.	Low	Negligible
** Compliance with these regulations are a legal requirement.*			

9.0 Conclusion

This report describes the marine mammal populations in the vicinity of the proposed dredging activities and assesses the potential effects on marine mammals from the proposed activities. Site-specific acoustic monitoring, data from the DOC Sightings and Stranding Databases, and accounts from published and unpublished literature was assessed to characterise the species that use the waters in and around the project area and to determine the likelihood of each species being present here.

While at least 20 marine mammal species are represented in the sightings and stranding record for the AOI, bottlenose dolphins, common dolphins, killer whales and New Zealand fur seals are the species with the most regular presence. Baleen whales (particularly southern right whales and humpback whales) are only expected sporadically and on a seasonal basis.

Analysis of all available marine mammal sightings and ecological data indicates that the AOI does not constitute significant habitat for any marine mammal species, and no marine mammals are resident or restricted to the project area. Indeed, all species with a potential presence in and around Tauranga Harbour/Te Awanui and the harbour entrance have home ranges that are vast in comparison to the project area. Further to this, there is plenty of nearby alternative coastal habitat.

Several potential effects of dredging have been identified and assessed in this report, including underwater noise and vibrations, habitat modification, ship strike, exposure to contaminants, marine debris, artificial lighting, and cumulative effects.

In particular, underwater noise modelling was undertaken by Styles Group (Pine, 2025) to determine the potential effects that the proposed dredging could have on marine mammals. These modelling results conclude that the effects on marine mammals of underwater noise from the proposed dredging will be spatially restricted as follows:

- no permanent hearing loss (i.e. AUD INJ) is expected, and temporary hearing changes (i.e. TTS) is not expected beyond 1 m of the active dredge;
- behavioural effects are limited to 1.7 km for dolphins and killer whales and 3.5 km for baleen whales;
- masking effects are limited to within c. 5.5 km for all species; and
- dredging noise is no longer audible to marine mammals above background noise at c. 8 km.

The results of this assessment found that with the adoption of the recommended mitigations, the likelihood of adverse effects occurring from the proposed dredging activities are low to very low and the magnitude of any adverse effects that do occur will (at most) be minor or negligible. Overall, no population level effects on marine mammals are expected as a result of the proposed dredging proceeding. Further, there are no predicted adverse effects that exceed the thresholds set by the NZCPS and the RCEP.

In addition to compliance with the MMPR and the Marine Pollution Regs, the following mitigations will be implemented via consent conditions:

- Dredge equipment will be regularly maintained;
- Waste management protocols will be adopted; and
- Marine debris will be collected and retrieved whilst dredging.

10.0 References

Abraham, E. R., Neubauer, P., Berkenbusch, K., and Richard, Y. 2017. Assessment of the Risk to New Zealand Marine Mammals from Commercial Fisheries. New Zealand Aquatic Environment and Biodiversity Report No. 189: Ministry of Primary Industries.

Acevedo-Gutierrez, A., Croll, D., Tershy, B. 2002. High feeding costs limit dive time in the largest whales. Journal of Experimental Biology 205: 1747-1753.

Anderwald, P., A. Brandecker, M. Coleman, C. Collins, H. Denniston, M. Haberlin, M. O'Donovan, R. Pinfield, F. Visser & L. Walshe, 2013. Displacement responses of a mysticete, an odontocete, and a phocid seal to construction-related vessel traffic. Endangered Species Research 21: 231–240.

ANZ 2018. Australia New Zealand Food Standards Code, Schedule 19 – Maximum levels of contaminants and natural toxicants. https://www.legislation.gov.au/F2015L00454/latest/text.

Baird, R. 2009. False Killer Whale. In: Encyclopaedia of marine mammals second ed. Pages 405-406.
https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.637.9926&rep=rep1&type=pdf

Barbosa, A.E., Fernandez, J.N., David, L.M. 2012. Key issues for sustainable urban stormwater management, Water Research (2012), doi:10.1016/j.watres.2012.05.029.

Barlow, D., Torres, L., Hodge, K., Steel, D., Baker, C.S., Chandler, T., Bott, N., Constantine, R., Double, M., Gill, P., Glasgow, D., Hamner, R., Lilley, C., Ogle, M., Olsen, P., Peters, C., Stockin, K., Tessaglia-Hymes, C., Klinck, H. 2018. Documentation of a New Zealand blue whale population based on multiple lines of evidence. Endangered Species Research 36: 27-40.

Battershill, C. 2022. In the matter of the Resource Management Act 1991 (the Act) and in the matter of a direct referral under Section 87G of the Act of applications for resource consents for the development of Stella Passage at the Port of Tauranga between Port of Tauranga Limited, applicant, and Bay of Plenty Regional Council, consent authority: statement of evidence of Professor Christopher Battershill.

Baulch, S., Perry, C. 2014. Evaluating the impacts of marine debris on cetaceans. Marine Pollution Bulletin 80: 210-221.

Beatson, E., S. O'Shea & M. Ogle. 2007. First report on the stomach contents of long-finned pilot whales, *Globicephala melas*, stranded in New Zealand, New Zealand Journal of Zoology, 34:1, 51-56, DOI: 10.1080/03014220709510063.

Bejder, L., Dawson, S., Harraway, J. 1999. Responses by Hector's dolphins to boats and swimmers in Porpoise Bay, New Zealand. Marine Mammal Science 15 (3): 738-750.

Bejder, L., Samuels, A., Whitehead, H., Finn, H., Allen, S. 2009. Impact assessment research: use and misuse of habituation, sensitisation and tolerance in describing wildlife response to anthropogenic stimuli. Marine Ecology Progress Series 395: 177-185. doi: 10.3354/meps07979.

Berkenbusch, K., Abraham, E.R., Torres, L.G., 2013. New Zealand marine mammals and commercial fisheries. New Zealand Aquatic Environment and Biodiversity Report No. 119. Ministry for Primary Industries, Wellington, New Zealand. 113 p.

Blanco, C., Salomon, O., Raga, J.A., 2001. Diet of the bottlenose dolphins (*Tursiops truncatus*) in the western Mediterranean Sea. Journal of the Marine Biological Association of the United Kingdom, 81: 1053 – 1058.

Bossley, M., Steiner, A., Parra, G., Saltre, F., Peters, K. 2022. Dredging activity in a highly urbanised estuary did not affect the long-term occurrence of Indo-Pacific bottlenose dolphins and long-nosed fur seals. Marine Pollution Bulletin 184 (2022) 114183.

Brough, T., Zaeschmar, J, Winterle Daudt, N., Leunissen, E., Tezanos-Pinto, G. 2025. Update on the population and spatial ecology of bottlenose dolphins in the Bay of Islands. Report prepared for the Department of Conservation by NIWA. Client report No: 2024307HN. Dated March 2025.

Buckstaff, K.C., 2004. Effects of watercraft noise on the acoustic behavior of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay. Florida Marine Mammal Science, 20, 709–725.

Cadwallader, H.F. 2020. The ecology of ray species in an urbanised estuary: seasonality, habitat use and pollutant exposure in Tauranga Harbour. PhD thesis, University of Waikato. Available online at: https://researchcommons.waikato.ac.nz/handle/10289/13466.

Carroll, E., Patenaude, N., Alexander, A., Steel, D., Harcourt, R., Childerhouse, S., Smith, S., Bannister, J., Constantine, R., Baker, C.S., 2011. Population structure and individual movement of southern right whales around New Zealand and Australia. Marine Ecology Progress Series, 432, 257 – 268.

Carroll, E.L., Rayment, W.J., Alexander, A.M., Baker, C.S., Patenaude, N.J., Steel, D., Constantine, R., Cole, R., Boren, L.J., Childerhouse, S., 2014. Reestablishment of former wintering grounds by New Zealand southern right whales. Marine Mammal Science, 30(1): 206 – 220.

Carroll, E.L., Jackson, J.A., Paton, D., Smith, T.D. 2014a. Two intense decades of 19th century whaling precipitated rapid decline of right whales around New Zealand and East Australia. PLoS ONE 9(4): e93789. doi:10.1371/journal.pone.0093789.

Chabanne, D., H. Finn, C. Salgado-Kent & L. Bedjer, 2012. Identification of a resident community of bottlenose dolphins (*Tursiops aduncus*) in the Swan Canning Riverpark, Western Australia, using behavioural information. Pacific Conservation Biology 18: 247–262.

Clark CW, Ellison WT, Southall BL, Hatch L, Van Parijs SM, Frankel A, Ponirakis D. 2009. Acoustic masking in marine ecosystems: intuitions, analysis, and implication. Marine Ecology Progress Series 395: 201-222

Clark, J., Dolman, S.J. and Hoyt, E. 2010. Towards Marine Protected Areas for Cetaceans in Scotland, England and Wales: A scientific review identifying critical habitat with key recommendations. Whale and Dolphin Conservation Society, Chippenham, UK, 178 pp.

Clement, D. 2022. Potential effects of the proposed Northport reclamation on marine mammals in the Whangārei Harbour region. Prepared for Northport Limited. Cawthron Report No. 3652. 56 p. plus appendices.

Connell, S.C., M.W. Koessler, and C.R. McPherson. 2023. Santos Barossa Darwin Pipeline Duplication: Acoustic Modelling for Assessing Marine Fauna Sound Exposure. Document 02954, Version 2.0. Technical report by JASCO Applied Sciences for Santos.

Constantine, R., Aguilar Soto, N., Johnson, M. 2012. Sharing the waters: minimising ship collisions with Bryde's whales in the Hauraki Gulf. Research Progress Report. February 2012. 22 p.

Constantine, R., Baker, C., 1997. Monitoring the commercial swim-with-dolphin operations in the Bay of Islands. DOC, Wellington, New Zealand.

Constantine, R., 2002. The behavioural ecology of the bottlenose dolphins of northeastern New Zealand: a population exposed to tourism. PhD thesis, The University of Auckland, New Zealand, 233p.

Cooke, J.G., Zerbini, A.N., Taylor, B.L., 2018. '*Balaenoptera bonaerensis'* The IUCN Red List of Threatened Species 2018: eT2480A50350661. http://dx.doi.org/10.2305/IUCN.UK.2018-1.RLTS.T2480A50350661.en. Downloaded on 27 April 2021.

Cooke, J.G., 2018a. '*Balaenoptera acutorostrata'*. The IUCN Red List of Threatened Species 2018: e.T2474A50348265, http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2474A50348265.en. Downloaded on 27 April 2021.

Cox, T.M., Ragen, T.J., Read, A.J., Vos, E., Baird, R.W., Balcomb, K., Barlow, J., Caldwell, J., Cranford, T., Crum, L., D'Amico, A.D., Spain, G.D., Fernandez, A., Finneran, J., Gentry, R., Gerth, W., Gulland, F., Hildebrand, J., Douser, D., Hullar, T., Jepson, P.D., Ketten, D., MacLeod, C.D., Miller, P., Moore, S., Mountain, D.C., Palka, D., Ponganis, P., Rommel, S., Rowles, T., Taylor, B., Tyack, P., Wartzok, D., Grisiner, R., Mead, J. and Benner, L. 2006. Understanding the impacts of anthropogenic sound on beaked whales. Journal of Cetacean Research and Management 7(3): 177-187.

Dawbin, W.H., 1956. The migrations of humpback whales which pass the New Zealand coast. Transactions of the Royal Society of New Zealand, 84(1): 147 – 196.

De Guise, S., Beckman, K.B., Holladay, S.D. 2003. Contaminants and marine mammal immunotoxicology and pathology. In Toxicology of Marine Mammals. Eds Vos, G.J., Bossart., G.D., Fournier, M., O'Shea, T.J. Published by Taylor and Francis, London.

De Jong, C.A.F., Ainslie, M.A., Dreschler, J., Jansen, E., Heemskerk, E. and Groen, W., 2010. Underwater noise of Trailing Suction Hopper Dredgers at Maasvlakte 2: Analysis of source levels and background noise. Commissioned by Port of Rotterdam. TNO report TNO-DV, p.C335.

De Lange, W. 2025. Port of Tauranga Reconsenting: Dredging Impacts - Turbidity and morphodynamics. Report Prepared for Port of Tauranga Limited.

De Lange, W. 2022. Statement of Evidence of Dr William de Lange, for the Stella Passage Environment Court hearing.

Delgado-Suarez, I., Lozano-Bilbao, E., Hardisson, A., Paz, S., Gutierrez, A. 2023. Metal and trace element concentrations in cetaceans worldwide. Marine Pollution Bulletin 192: 115010.

De Luca, 2025. Assessment of Effects on Marine Ecology: Reconsenting of Capital and Maintenance Dredging. Report prepared by Boffa Miskell Limited for Port of Tauranga. Dated 15 October 2025.

De Vos, M. 2017. Port of Napier – Wharf 6: construction noise assessment. Report Prepared for Port of Napier by Marshall Day Acoustics Limited, Auckland, New Zealand. 28 April 2017.

Dehnhardt, G., Mauck, B., Bleckmann, H. 1998. Seal whiskers detect water movements. Nature 394: 235 – 236. http://www.nature.com/nature/journal/v394/n6690/abs/394235a0.html

Diederichs, A., Brandt, M. & Nehls, G. 2010. Does sand extraction near Sylt affect harbour porpoises? Wadden Sea Ecosystem, 199-203.

DOC, 2022. Bottlenose Dolphins. https://www.doc.govt.nz/nature/native-animals/marine-mammals/dolphins/bottlenose-dolphin/.

DOC, 2014. Orcas in Wellington. Department of Conservation Fact Sheet. Available online at: https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/marine-mammals/orcas-in-wellington-web.pdf

DOC, 2013. 2013 Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations. http://www.doc.govt.nz/documents/conservation/native-animals/marine-mammals/seismic-survey-code-of-conduct.pdf.

DOC, 2012. Fur seals sighted at Mount, Papamoa, Waihi Beach and Tauranga Harbour: https://www.doc.govt.nz/news/media-releases/2012/fur-seals-sighted-at-mount-papamoa-waihi-beach-and-tauranga-harbour/.

Dunlop, R.A., Noad, M.J., McCauley, R.D., Kniest, E., Slade, R., Paton. D., Cato, D.H., 2017. The behavioural response of migrating humpback whales to a full seismic airgun array. Proceedings of the Royal Society B 284: 20171901.

DOC, 2012. Fur seals sighted at Mount, Papamoa, Waihi Beach and Tauranga Harbour: https://www.doc.govt.nz/news/media-releases/2012/fur-seals-sighted-at-mount-papamoa-waihi-beach-and-tauranga-harbour/.

DOC, 2019. NZCPS 2010 Guidance Note. Policy 11: Indigenous biological diversity (biodiversity). Published by the Department of Conservation, Wellington, NZ in 2010, updated May 2019.

Ellison, W.T., Racca, R., Clark, C.W., Streever, B., Frankel, A.S., Fleishman, E., Angliss, R., Berger, J., Ketten, D., Guerra, M., Leu, M., McKenna, M., Siormo, T., Southall, B., Suydam, R., Thomas, L., 2016. Modelling the aggregated exposure and responses of bowhead whales *Balaena mysticetus* to multiple sources of anthropogenic underwater sound. Endangered Species Research, 30: 95 – 108.

EPA. 2007. Albany port expansion proposal: public environmental review. Prepared by the Environmental Protection Agency (EPA) on behalf of the Albany Port Authority (APA), Australia. 5 pp.

Erbe, C., Reichmuth, C., Cunningham, K., Lucke, K., Dooling, R., 2016. Communication masking in marine mammals: a review and research strategy. Marine Pollution Bulletin 103 (1-2): 15-38.

Erbe, C., 2002. Underwater noise of whale-watching boats and potential effects on killer whales (*Orcinus orca*), based on an acoustic impact model. Marine Mammal Science 18 (2), 394–418.

Fairlie, R., Lovett, P., Rameka, W., Taiapa, C., & Taikato, V. 2016. He Mahinga Mataitai o Te Awanui, Monitoring of Te Paritaha - Results of Benthic Monitoring of Te Paritaha Before and After A Capital Dredging Program within The Southern Tauranga Harbour, New

Zealand. A report prepared by Manaaki Te Awanui, on behalf of the Tauranga Moana Iwi Customary Fisheries Trust (TMICFT), Tauranga – New Zealand.

Faulkner RC., Farcas A., Merchant ND. 2018. Guiding principles for assessing the impact of underwater noise. Journal of Applied Ecology 55:2531-2536

Finneran, J.J., Schlundt, C.E., Carder, D.A., Clark, J.A., Young, J.A., Gaspin, J.B., Ridgway, S.H., 2000. Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions. Journal of the Acoustical Society of America, 108, 417–431.

Fisheries New Zealand. 2025. Bottlenose Dolphin (BDO). Online resource available at: https://fs.fish.govt.nz/Page.aspx?pk=37&dk=38&sc=BDO.

Foote, A.D., Osborne, R.W., Rus Hoelzel, A., 2004. Whale-call response to masking boat noise. Nature (London), 428, 910.

Forney, K.A., Slooten, E., Baird, R.W., Brownell, R.L. Jnr., Southall, B., Barlow, J., 2013. Nowhere to go: effects of anthropogenic sound on small populations of harbour porpoise, Maui's dolphin, melon-headed whales and beaked whales. 20th Biennial Conference on the Biology of Marine Mammals, Dunedin New Zealand, 9 – 13 December 2013.

Gaborit-Haverkort, T. 2012. The occurrence and habitat use of common dolphins (*Delphinus sp.)* in the central Bay of Plenty, New Zealand. MSc Thesis, Massey University, New Zealand.

Gaskin, D.E., 1963. Whale marking cruises in New Zealand waters made between February and August 1963. Norsk Hvalfangst-Tidendae, 11: 1 – 12.

Gibbs, N., Childerhouse, S., 2000. Humpback whales around New Zealand. Conservation Advisory Science Notes No. 257, Department of Conservation, Wellington.

Gibbs, N.J., Dunlop, R.A., Gibbs, E.J., Heberley, J.A., Olavarria, C., 2017. The potential beginning of a post-whaling recovery in New Zealand humpback whales (*Megaptera novaeangliae*). Marine Mammal Science, 34(2): 499 – 513.

Gilmartin, W. G. 2003. Responses of Hawaiian monk seals to human disturbance and handling. In Workshop on the Management of Hawaiian Monk Seals on Beaches in the Main Hawaiian Islands, p. 8. Marine Mammal Commission, National Marine Fisheries Service, Hawaii Division of Aquatic Resources, Kauai, Hawaii.

Gowans, S., Würsig, B., Karczmarski, L., 2008. The social structure and strategies of delphinids: predictions based on an ecological framework. Advances in Marine Biology, 53: 195 – 293.

Hague, E.L., Sparling, C.E., Morris, C., Vaughan, D., Walker, R., Culloch, R.M., Lyndon, A.R., Fernandes, T.F., McWhinnie, L.H. 2022. Same Space, Different Standards: A Review of Cumulative Effects Assessment Practice for Marine Mammals. Front. Mar. Sci. 9:822467. doi: 10.3389/fmars.2022.822467.

Hall-Apsland, S.A., Rogers, T.L. 2004. Summer diet of leopard seals (*Hydrurga leptonyx*) in Prydz Bay, Eastern Antarctica. Polar Biology 27: 729-734.

Harcourt, R.G., Bradshaw, C.J.A., Dickson, K., Davis, L.S., 2002. Foraging ecology of a generalist predator, the female New Zealand fur seal. Marine Ecology Progress Series, 227: 11 – 24.

Heithaus, M. R. & L. M. Dill, 2002. Food availability and tiger shark predation risk influence bottlenose dolphin habitat use. Ecology 83: 480–491.

Hitchcock, D. R., and Bell, S. 2004. Physical impacts of marine aggregate dredging on seabed resources in coastal deposits. Journal of Coastal Research, 20: 101–114.

Hoffman, C.A., 2012. Mitigating Impacts of Underwater Noise from Dredging on Beluga Whales in Cook Inlet, Alaska. In: The Effects of Noise on Aquatic Life. Springer, pp. 617–619.

Hoffman, D.J., Rattner, B.A., Burton, G.A., Cairns, J., 2003. Handbook of Ecotoxicology (Second Edition). CRC Press LLC, Florida, USA. pp 1293.

Hoyt, E. 2011. 'Marine Protected Areas for whales, dolphins and porpoises. A world handbook for cetacean habitat conservation and planning'. London: Earthscan.

Hupman, K., Visser, I., Fyfe, J., Cawthron, M., Forbes, G., Grabham, A., Bout, R., Mathias, B., Benninghaus, E., Matucci, K., Cooper, T., Fletcher, L., Godoy, D. 2019. From vagrant to resident: occurrence, residency and births of leopard seals in New Zealand waters. New Zealand Journal of Marine and Freshwater Research 54(1):1-23.

Hoyt, E. 2011. Marine Protected Areas for whales, dolphins and porpoises. A world handbook for cetacean habitat conservation and planning'. London: Earthscan.

Hupman, K., Visser, I., Fyfe, J., Cawthron, M., Forbes, G., Grabham, A., Bout, R., Mathias, B., Benninghaus, E., Matucci, K., Cooper, T., Fletcher, L., Godoy, D. 2019. From vagrant to resident: occurrence, residency and births of leopard seals in New Zealand waters. New Zealand Journal of Marine and Freshwater Research 54(1):1-23.

IWC 2014. Whales and Ship Strikes: A problem for both whales and vessels. International Whaling Commission. http://iwc.int/ship-strikes.

Jefferson, T.A., Webber, M.A., Pitman, L., 2008. Marine mammals of the world: a comprehensive guide to their identification. Elsevier 573.

Jensen, A. S., G. K. Silber. 2003. Large whale ship strike database. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Technical Memorandum. NMFS-OPR 25. 37 pp.

Johnson, M., Soto, N., Madsen, P. 2009. Studying the Behavioural and Sensory Ecology of Marine Mammals Using Acoustic Recording Tags: A Review. Marine Ecology Progress Series, 395:55 – 73.

Jones, P.D. 1998. Analysis of organic contaminants in New Zealand marine mammals. Conservation Advisory Science Notes No. 184. Department of Conservation, Wellington.

Ketten, D.R. 2014. Sonars and strandings: are beaked whales the aquatic acoustic canary. Acoustics Today, Summer 2014 Edition.

Kiszka JJ, Woodstock MS and Heithaus MR. 2022. Functional Roles and Ecological Importance of Small Cetaceans in Aquatic Ecosystems. Front. Mar. Sci. 9:803173. doi: 10.3389/fmars.2022.803173

Laist, D. W., Knowlton, A. R., Mead, J. G., Collet, A. S., Pod, M. 2001. Collisions between ships and whales. Marine Mammal Science, 17, 35–75.

Lalas, C., McConnell, H. 2016. Effects of seismic surveys on New Zealand fur seals during daylight hours: do fur seals respond to obstacles rather than airgun noise. Marine Mammal Science 32(2): 643-663.

Leonard, K., Culliford, D., Morrison, A., Bennion, M., & Battershill, C. 2020. Assessment of environmental effects of proposed expansion of the Port of Tauranga shipping channels and wharves (Environmental Research Institute Report 134; p. 56). Prepared for the Port of Tauranga by the University of Waikato.

Lohrer, A.M., Thrush, S.F., Hewitt, J.E., Berkenbusch, K., Ahrens, M., Cummings, V.J., 2004. Terrestrially derived sediment: response of marine macro-benthic communities to thin terrigenous deposits. Marine Ecology Progress Series. 273: 121 – 138.

Lucke, K., Siebert, U., Lepper, P.A., Blanchet, M-A. 2009. Temporary shift in masked hearing thresholds in a harbour porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. J. Acoust. Sco. Am., 125(6): 4060 – 4070.

Lundquist, D., Boren, L., Childerhouse, S., Constantine, R., van Helden, A., Hitchmough, R., Michel, P., Rayment, W., Baker, C.S. 2025. Conservation status of marine mammals in Aotearoa New Zealand, 2024. New Zealand Threat Classification Series 48. Department of Conservation, Wellington.

McConnell, H. 2021. Assessment of Environmental Effects on Marine Mammals: Stella Passage Development. Report prepared by SLR Consulting NZ Ltd for Port of Tauranga Limited. Report Number: 740.30010-R01. Dated August 2021.

Meissner, A.M. 2015. Marine mammal tourism in the Bay of Plenty, New Zealand: Effects, Implications and management. PhD Thesis, Massey University, New Zealand.

MacDiarmid, A., Boschen, R., Bowden, D., Clark, M., Hadfield, M., Lamarche, G., Nodder, S., Pinkerton, M., Thompson, D. 2014. Environmental risk assessment of discharges of sediment during prospecting and exploration for seabed mineral. NIWA Client Report: WLG2013-66. Report prepared for Ministry for the Environment.

MacKenzie, D.I.; Fletcher, D.; Meyer, S.; Pavanato, H. 2022. Updated spatially explicit fisheries risk assessment for New Zealand marine mammal populations. New Zealand Aquatic Environment and Biodiversity Report No. 290. 218 p.

Marley, S., Kent, C.S., Erbe, C., 2017. Occupancy of bottlenose dolphins (*Tursiops aduncus*) in relation to vessel traffic, dredging, and environmental variables within a highly urbanised estuary. Hydrobiologia 792, 243.

McGregor, P.K., Horn, A.G., Leonard, M.L., Thomsen, F., 2013. Anthropogenic noise and conservation. Chapter 14. In: Brumm, H. (Ed). Animal Communication and noise; Animal Signals and Communication 2. Springer Verlag, Berlin.

McKenna, M., Ross, D., Wiggins, S., Hildebrand, J. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America 131(1): 92-103.

Meissner, A.M. 2015. Marine mammal tourism in the Bay of Plenty, New Zealand: Effects, Implications and management. PhD Thesis, Massey University, New Zealand.

Méndez-Fernandez, P.; Simon-Bouhet, B.; Bustamante, P.; Chouvelon, T.; Ferreira, M.; López, A.; Moffat, C. F.; Pierce, G. J.; Russell, M.; Santos, M. B.; Spitz, J.; Vingada, J. V.; Webster, L.; Read, F. L.; González, A. F.; Caurant, F. Inter-species differences in polychlorinated biphenyls patterns from five sympatric species of odontocetes: Can PCBs be used as tracers of feeding ecology? Ecol. Indic. 2017, 74, 98−108.

Meynier, L., Stockin, K.A., Bando, M.K.H., Duignan, P.J., 2008. Stomach contents of common dolphins (*Delphinus sp*.) from New Zealand waters. New Zealand Journal of Marine and Freshwater Research, 42: 257 – 268.

Mikkelsen, L., Hermannsen, L., Beedholm, K., Madsen, P.T., Tougaard, J. 2017. Simulated seal scarer sounds scare porpoises, but not seals: species-specific responses to 12 kHz deterrence sounds. R. Soc. open sci. 4: 170286. http://dx.doi.org/10.1098/rsos.170286.

Mills, E.M.M.; Piwetz, S.; Orbach, D.N. Vessels Disturb Bottlenose Dolphin Behavior and Movement in an Active Ship Channel. Animals 2023, 13, 3441. https://doi.org/10.3390/ani13223441

MMPATF (Marine Mammal Protected Areas Task Force), 2023. Important Marine Mammal Areas, https://www.marinemammalhabitat.org/

Moeller, R.B. Jr. 2003. Pathology of marine mammals with special reference to infectious diseases. In Toxicology of Marine Mammals. Eds Vos, G.J., Bossart., G.D., Fournier, M., O'Shea, T.J. Published by Taylor and Francis, London.

Moiler, K., 2008. Bottlenose Dolphins (*Tursiops sp.)* – A Study of Patterns in Spatial and Temporal use of the Swan River, Western Australia. Curtin University Honours Thesis.

Montaño. M. 2024. Dredged plume modelling: dredging sediment plume dispersion over existing and proposed port configurations. Report prepared by Metocean Solutions for Port of Tauranga Ltd. Report date; December 2024, pp. 55 plus appendices.

Montaño. M. 2024. Nutrient and sediment dispersal. Report prepared by Metocean Solutions for Port of Tauranga Ltd. Report date; November 2024, pp. 39.

Moon, V.G., de Lange, W.P., Jorat, M.E., Christophers, A. & Moerz, T., 2013. Sub-surface stratigraphy of Stella Passage, Tauranga Harbour. Environmental Research Institute Report No 28. Client report prepared for Port of Tauranga. Environmental Research Institute, Faculty of Science and Engineering, The University of Waikato, Hamilton. 23pp.

Mourão, F. 2006. "Patterns of association among bottlenose dolphins in the Bay of Islands, New Zealand". MSc thesis, the University of Auckland, Auckland, New Zealand. 118pp.

MPI (Ministry for Primary Industries). 2013. Overview of ecological effects of aquaculture. Wellington, New Zealand. ISBN 978-0-478-40536-1.

Mullarney, J.C. de Lange, W.P. 2019. Impacts on sediment transport of proposed expansion of the Port of Tauranga shipping channels and wharves. Environmental Research Institute Report No 123. Client report prepared for Port of Tauranga, Environmental Research Institute, faculty of Science and Engineering, The University of Waikato, Hamilton, 11 pp.

Murase, H., Matsuoka, K., Ichii, T., Nishiwaki, S., 2002. Relationship between the distribution of euphausiids and baleen whales in the Antarctic (35 E–145 W). Polar Biol. 25, 135–145.

Neumann, D. R., Leitenberger, A.A., Orams, M.B. 2002. Photo-identification of short-beaked common dolphins, *Delphinus delphis*, in north-east New Zealand: A photo-catalogue of recognisable individuals. New Zealand Journal of Marine and Freshwater Research 36:593–604.

NIWA, 2014. Effects of total suspended solids on marine fish. Pelagic, demersal and bottom fish species avoidance of TSS on the Chatham Rise. Report prepared for Chatham Rock Phosphate.

Nisi, A., Welch, H., Brodie, S., Liephardt, C., Rhodes, R., Hazen, E., Redfern, J., Branch, T., Barreto, A., Calambokidis, J., Clavelle, T., Dares, L., de Vos, A., Gero, S., Jackson, J., Kennedy, R., Kroodsma, D., Leaper, R., McCauley, D., Moore, S., Ovsyanikova, E., Panigrada, S., Robinson, C., White, T., Wilson, J., Abrahms, B. 2024. "Ship collision threatens whales across the world's oceans". Science 386: 870-875.

NMFS (National Marine Fisheries Service), 2018. Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commerce. NOAA Technical Memorandum NMFS-OPR-59.

NMFS (National Marine Fisheries Service). 2023. Summary of Marine Mammal Protection Act Acoustic Thresholds, February 2023. Marine Mammal Acoustic Technical Guidance | NOAA Fisheries. National Marine Fisheries Service. Accessed 28 August 2023.

NMFS (National Marine Fisheries Service), 2024. Update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0): Underwater and In-Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts. US Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-71,182 p.

Nowacek., D.P., Thorne, L.H., Johnston, D.W., Tyack, P.L. 2007. Responses of cetaceans to anthropogenic noise. Mammal review 37(2): 81-115.

O'Callaghan, T.M., Baker, A.N., Helden, A., 2001. Long-finned pilot whale strandings in New Zealand – the past 25 years. Science poster no. 52, Department of Conservation, Wellington, New Zealand. Available from http://www.doc.govt.nz/Documents/science-and technical/SciencePoster52.pdf.

Omura, H., 1962. Further information on Bryde's whale from the coast of Japan. Scientific reports of the Whales Research Institute, 16: 7 – 18.

Parks, S.E., Clark, C.W., Tyack, P.L., 2007. Short- and long-term changes in right whale calling behavior: the potential effects of noise on acoustic communication. Journal of the Acoustical Society of America, 122 (6), 3725– 3731.

Patenaude, N.J., 2003. Sightings of southern right whales around 'mainland' New Zealand. Science for Conservation 225, Department of Conservation, Wellington, New Zealand 15 p.

Peters, K., Bury, S., Betty, E., Parra, G., Tezanos-Pinto, G., Stockin, K. 2020. Foraging ecology of the common dolphin *Delphinus delphis* revealed by stable isotope analysis. Marine Ecology Progress Series 652: 173-186.

Peters, C, Stockin, K. 2016. Responses of bottlenose dolphin (*Tursiops truncatus*) to vessel activity in Northland New Zealand. Report prepared for the Department of Conservation.

Available online at: https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/bottlenose-responses-dolphin-vessel-activity-northland.pdf

Peyensen, N.D., J. A. Goldbogen, A. W. Vogel, G. Szathmary, R. L. Drake and R. E. Shadwick. 2012. Discovery of a sensory organ that coordinates lunge feeding in rorqual whales. Nature 485: 498–501.

Pigeault, R., Ruser, A., Ramírez-Martínez, N., Geelhoed, S., Haelters, J., Nachtsheim, D., Schaffeld, T., Sveegaard, S., Siebert, U., and Gilles, A., 2024. Maritime traffic alters distribution of the harbour porpoise in the North Sea. Marine Pollution Bulletin 208: 2024, 116925.

Pine, M. 2025. Assessment of Underwater Noise Effects – Dredging reconsenting project Tauranga Harbour. Report prepared by Styles Group for Ports of Tauranga. Dated 28 January 2025.

Pinzone, M.; Budzinski, H.; Tasciotti, A.; Ody, D.; Lepoint, G.; Schnitzler, J.; Scholl, G.; Thomé, J.-P.; Tapie, N.; Eppe, G.; Das, K. 2015. POPs in free-ranging pilot whales, sperm whales and fin whales from the Mediterranean Sea: Influence of biological and ecological factors. Environ. Res. 2015, 142, 185−196.

Pirotta, E., Laesser, B. E., Hardaker, A., Riddoch, N., Marcoux, M., and Lusseau, D. 2013. Dredging displaces bottlenose dolphins from an urbanised foraging patch. Marine Pollution Bulletin, 74: 396–402.

Pitman, R.L. & Taylor, B.L. 2020. *Mesoplodon grayi.* The IUCN Red List of Threatened Species 2020: e.T13247A50366236. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13247A50366236.en. Downloaded on 27 April 2021.

Piwetz, S. 2019. Common bottlenose dolphin (*Tursiops truncatus*) behavior in an active narrow seaport. PLoS ONE 14(2): e0211971. https://doi.org/10.1371/journal.pone.0211971.

Putland, R. L., Merchant, N. D., Farcas, A., and Radford, C. A. 2018. Vessel noise cuts down communication space for vocalizing fish and marine mammals. Glob. Change Biol. 24, 1708–1721. doi: 10.1111/gcb.13996.

Quick, N., Janik, V. 2012. Bottlenose Dolphins Exchange Signature Whistles When Meeting at Sea. Proceedings of the Royal Society B 279: 2539-2545.

Remili, A.; Letcher, R. J.; Samarra, F. I. P.; Dietz, R.; Sonne, C.; Desforges, J.-P.; Víkingsson, G.; Blair, D.; McKinney, M. A. 2021. Individual Prey Specialization Drives PCBs in Icelandic Killer Whales. Environ. Sci. Technol. 2021, 55, 4923−4931.

Richardson, J.W., Greene, C.R. Jr., Malme, C.I. and Thompson, D.H. 1995. Marine Mammals and noise. Academic Press, San Diego, Ca.

Riekkola, L., Zerbini, A.N., Andrews, O., Andrews-Goff, V., Baker, C.S., Chandler, D., Childerhouse, S., Clapham, P., Dodémont, R., Donnelly, D., Friedlaender, A., Gallego, R., Garrigue, C., Ivashchenko, Y., Jarman, S., Lindsay, R., Pallin, L., Robbins, J., Steel, D., Tremlett, J., Vindenes, S., Constantine, R., 2018. Application of a multi-disciplinary approach to reveal population structure and Southern Ocean feeding grounds of humpback whales. Ecol. Indic. 89, 455–465.

Robinson, S.P., Theobald, P.D., Lepper, P.A., Hayman, G., Humphrey, V.F., Wang, L.-S., Mumford, S., 2012. Measurement of underwater noise arising from marine aggregate operations. In: The Effects of Noise on Aquatic Life. Springer, pp. 465–468.

Rolland, R. M., Parks, S. E., Hunt, K. E., Castellote, M., Corkeron, P. J., Nowacek, D. P., et al. 2012. Evidence that ship noise increases stress in right whales. Proc. R. Soc. Lond. Ser. B Biol. Sci. 279, 2363–2368. doi: 10.1098/rspb.2011.2429.

Romano, T.A., Keogh, M.J., Kelly, C., Feng, P., Berk, L., Schlundt, C.E., Carder, D.A., Finneran, J.J., 2004. Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure. Canadian Journal of Fisheries and Aquatic Sciences, 61, 1124–1134.

Ross, P., & Culliford, D. 2018. The impact of dredging on the pipi (*Paphies australis*) of Te Paritaha, Tauranga Harbour. (p. 12) [Client report prepared for the Port of Tauranga Limited. Environmental Research Institute, Faculty of Science and Engineering, The University of Waikato, Hamilton.].

Ruberg, E.J., Elliot, J.E., Williams, T.D. 2021. Review of petroleum toxicity and identifying common endpoints for future research on diluted bitumen toxicity in marine mammals. Ecotoxicology (2021): 30:537–551.

Schoeman. R., Patterson-Abrolat, C., Plon, S. 2020. A Global Review of Vessel Collisions with Marine Mammals. Frontiers in Marine Science – Marine Conservation and Sustainability.

Schusterman, R.J., Van Parijs, S.M., 2003. Pinniped vocal communication: an introduction. Aquat. Mamm. 29, 177–180.

Schwacke, L. H.; Voit, E. O.; Hansen, L. J.; Wells, R. S.; Mitchum, G. B.; Hohn, A. A.; Fair, P. A. 2002. Probabilistic risk assessment of reproductive effects of polychlorinated biphenyls on bottlenose dolphins (*Tursiops truncatus*) from the Southeast United States Coast. Environ. Toxicol. Chem. 2002, 21, 2752−2764.

Shirihai, H., Jarrett, B., 2006. Whales, Dolphins and Other Marine Mammals of the World. Princeton, Princeton University Press: 56-58.

Simmonds, M., Dolman, S., Weilgart, L. 2004. Oceans of Noise. Whale and Dolphin Conservation Society Science Report, Wiltshire, UK.

Sobreira, F. V., Luis, A. R., Alves, I. S., Couchinho, M. N., dos Santos, M. E. 2023. Raise your pitch! Changes in the acoustic emissions of resident bottlenose dolphins in the proximity of vessels. Marine Mammal Science, https://doi.org/10.1111/mms.13090

Sorenson, P., Haddock, A., Guarino, E., Jaakkola, K., McMullen, C., Jensen, F., Tyack, P., King, S. 2023. Anthropogenic noise impairs cooperation in bottlenose dolphins. Current Biology (2022), https://doi.org/10.1016/j.cub.2022.12.063

Southall BL, Bowles AE, Ellison WT, Finneran JJ, Gentry RL, Greene CR Jr, Kastak D, Ketten DR, Miller JH, Nachtigall PE 2007. Marine mammal noise-exposure criteria: initial scientific recommendations. Bioacoustics 17(1-3): 273-275

Southall, B., Finneran, J., Reichmuth, C., Nachtigall, P., Ketten, K., Bowles, A., Ellison, W., Nowacek, D., Tyack, P. 2019. Marine Mammal Noise Exposure Criteria: updated scientific recommendations for residual hearing effects. Aquatic Mammals 45(2): 125-232.

Stephenson, F., Goetz, K., Sharp, B., Mouton, T., Beets, F., Roberts, J., MacDiarmid, A., Constantine, R., Lundquist, C. 2020. Modelling the spatial distribution of cetaceans in New Zealand waters. Biodiversity research, DOI: 10.1111/ddi13035.

Stewart, M. 2024. Water quality aspects of Port of Tauranga dredging reconsenting. Report POT2201–D1, Streamlined Environmental, Hamilton, 76 pp (not including appendices).

Stone, C.J., Tasker, M.L. 2006. The effects of seismic airguns on cetaceans in UK waters. Journal of Cetacean Research and Management 8(3): 255-263.

Sunlive, 2019. Humpback whales; unusual sight in Tauranga Harbour. https://www.sunlive.co.nz/news/223080-humpback-whales-unusual-sight-tauranga-harbour.html.

Tennessen, J. B., Holt, M. M., Wright, B. M., Hanson, M. B., Emmons, C. K., Giles, D. A., Hogan, J. T., Thornton, S. J., & Deecke, V. B. 2024. Males miss and females forgo: Auditory masking from vessel noise impairs foraging efficiency and success in killer whales. Global Change Biology, 30, e17490.

Thomsen, F., Borsani, F., et al. 2013. WODA technical guidance on underwater sound from dredging. In Advances in Experimental Medicine and Biology November 2015.Available online from: https://www.researchgate.net/publication/284888311_WODA_Technical_Guidance_on_Underwater_Sound_from_Dredging/link/56af3b3408aeaa696f2fda44/download

Tezanos-Pinto, G., Baker, C.S., Russell, K., Martien, K., Baird, R.W., Hutt, A., Stone, G., Mignucci-Giannoni, A.A., Caballero, S., Endo, T., Lavery, S., Oremus, M., Olavarria, C., Garrigue, C., 2009. A worldwide perspective on the population structure and genetic diversity of bottlenose dolphins (*Tursiops truncatus*) in New Zealand. Journal of Heredity, 100(1): 11 – 24.

Thomas, J., Kastelein, R., Supin, A. 1992. Marine Mammal Sensory Systems. Plenum Press, New York.

Thompson, P., Brookes, K., Graham, I., Barton, T., Needham, K., Bradbury, G., Merchant, N., 2013. Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises. Proceedings of the Royal Society B: Biological Sciences, 280: 20132001.

Thomsen, F., Borsani, F., et al. 2013. WODA technical guidance on underwater sound from dredging. In Advances in Experimental Medicine and Biology November 2015.Available online from: https://www.researchgate.net/publication/284888311_WODA_Technical_Guidance_on_Underwater_Sound_from_Dredging/link/56af3b3408aeaa696f2fda44/download

Tillin, H.M., Houghton, A. J., Saunders, J. E., Drabble, R., and Hull, S. C. 2011. Direct and indirect impacts of marine aggregate dredging. Marine Aggregate Levy Sustainability Fund (MALSF). Science Monograph Series: No 1. 41 pp. Cited by Todd et al., 2015.

Todd, V. L. G., Todd, I. B., Gardiner, J. C., Morrin, E. C. N., MacPherson, N. A., DiMarzio, N. A., and Thomsen, F. 2015. A review of impacts of marine dredging activities on marine mammals. – ICES Journal of Marine Science, 72(2): 328-340. doi: 10.1093/icesjms/fsu187.

Vanderlaan, A.S.M., Taggart, C.T. 2007. Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science 23(1): 144 – 156.

Van Waerebeek, K., Baker, A.N., Felix, F., Gedanke, J., Iniguez, M., Sanino, G.P., Secchi, E., Sutaria, D., van Helden, A., Wang, Y. 2007. Vessel collisions with small cetaceans worldwide and with large whales in the southern hemisphere, an initial assessment. Latin American Journal of Aquatic Mammals 6(1).

Visser, I.N., 1999. Benthic foraging on stingrays by killer whales (*Orcinus orca*) in New Zealand waters. Marine Mammal Science, 15(1): 220 – 227.

Visser, I.N., 2000. Orca (*Orcinus orca*) in New Zealand waters. PhD Thesis, University of Auckland, 199p.

Visser, I.N., 2007. Killer whales in New Zealand waters: status and distribution with comments on foraging. Paper SC/59/SM19 presented to the Scientific Committee of the International Whaling Commission, Anchorage, Alaska, USA.

Vos, G.J., Bossart., G.D., Fournier, M., O'Shea, T.J. 2003. Toxicology of Marine Mammals. Published by Taylor and Francis, London.

Wang, C., Lyons, S. B., Corbett, J. J., and Firestone, J. 2007. Using ship Speed and Mass do Describe Potential Collision Severity with Whales: An Application of the Ship Traffic, Energy and Environment Model (STEEM) [Report by the University of Delaware]. Available online at: https://tethys.pnnl.gov/publications/using-ship-speed-and-mass-describe-potential-collision-severity-whales.

Warren, P., Sharp, D., & Guccione, D. 2016. Rapid Ecological Assessment of Spong and Associated Marine Communities Post Dredging in Tauranga Harbour Entrance. Prepared for Refining New Zealand by Toi Ohomai.

Weaver, A. 2021. An Ethology of Adaptation: Dolphins Stop Feeding but Continue Socializing in Construction-Degraded Habitat. Front. Mar. Sci. 8:603229. doi: 10.3389/fmars.2021.603229.

Weilgart, L.S., 2007. A brief review of known effects of noise on marine mammals. International Journal of Comparative Psychology 20(2): 159 – 168.

Weisbrod AV, Shea D, Moore MJ, Stegeman JJ 2000. Organochlorine exposure and bioaccumulation in the endangered Northwest Atlantic right whale (*Eubalaena glacialis*) population. Environmental Toxicology and Chemistry 19: 654-666.

Wells, R.S., Scott, M.D., 2009. Common bottlenose dolphin *Tursiops truncatus*. In, W. F. Perrin and B. Würsig and J. G. M. Thewissen (Ed.), Encyclopedia of marine mammals, pp. 249–255. Academic Press, United States.

Williams, R.S., Brownlow, A., Baillie, A., Barber, J.l., Barnett, J., Davison, N.J., Deaville, R., ten Doeschate, M., Murphy, S., Penrose, R., Perkins, M., Spior, S., Williams, R., Jepson, P.D., Curnick, D.J., Jobling, S. 2023. Spatiotemporal trends spanning three decades show toxic levels of chemical contaminants in marine mammals. Environmental Science and Technology. https://doi.org/10.1021/acs.est.3c01881

Williams, R.; Doeschate, M. t.; Curnick, D. J.; Brownlow, A.; Barber, J. L.; Davison, N. J.; Deaville, R.; Perkins, M.; Jepson, P. D.; Jobling, S. 2020. Levels of polychlorinated biphenyls are still associated with toxic effects in harbor porpoises (*Phocoena phocoena*) despite having fallen below proposed toxicity thresholds. Environ. Sci. Technol., 54, 2277−2286.



Wisniewska, D.M., Johnson, M., Teilmann, J., Siebert, U., Galatius, A., Dietz, R., Madsen, P.T., 2018. High rates of vessel noise disrupt foraging in wild harbour porpoises (*Phocoena phocoena*). Proc. R. Soc. B Biol. Sci. 285 (1872), 20172314. https://doi.org/10.1098/rspb.2017.2314.

Wright, A.J., Soto, N.A., Baldwin, A.L., Bateson, M., Beale, C.M., Clark, C., Deak, T., Edwards, E.F., Fernndez, A., Godinho, A., Hatch, L.T., Kakuschke, A., Lusseau, D., Martineau, D., Romero, M.L., Weilgart, L.S., Wintle, B.A., Notarbartolo-di Sciara, G., Martin, V., 2007. Do marine mammals experience stress related to anthropogenic noise? International Journal of Comparative Psychology 20 (2), 274–316.

Wursig, B., Lynn, S.K., Jefferson, T.A., Mullin, K.D. 1998. Behaviour of cetaceans in the Northern Gulf of Mexico relative to survey ships and aircraft. Aquatic Mammals 24: 41–50.

Zaeschmar, J.R., Tezanos-Pinto, G., Dwyer, S.L., Peters, C.H., Berghan, J., Donnelly, D., Meissner, A.M., Visser, I.N., Weir, J.S., Judkins, A.G., Brough, T., Guerra, M., Kozmian-Ledward, L., and Stockin, K.A. 2020. “Occurrence, site fidelity, and associations of oceanic common bottlenose dolphins (*Tursiops truncatus*) off northeastern New Zealand”. Marine Mammal Science, 1 – 16. DOI:10.1111/mms.12711.

Zeng, Y., Huang, X., Gu, B., Zhang, D, Zhang, X., Ye, F., 2013. Analyzing biomagnification of heavy metals in food web from the pearl river estuary, South China by stable carbon and nitrogen isotopes. Fresenius Environmental Bulletin. Vol. 22, no. 6.

Appendix A Marine Mammals and their Likelihood of Occurrence in the AOI

Assessment of Effects: Marine Mammals

Dredging Reconsent Project

Port of Tauranga Limited

SLR Project No.: 840.030179.00001

17 August 2026

Common Name	Scientific Name	NZ Conservation Status (Lundquist et al., 2025)	IUCN Conservation Status www.redlist.org	DOC Incident database (No. of stranding events inshore of AOI)	DOC Sightings data (No. reports inside Tauranga Harbour/No. of reports in Marine Mammal AOI)**	Modelled habitat suitability of AOI (Stephenson et al., 2020/MacKenzie et al., 2022)	Acoustic detections in Tauranga Harbour	Likelihood of Presence in the AOI
Andrew's beaked whale	*Mesoplodon bowdoini*	Data deficient	Data deficient	0	0	Low / Low	0	Unlikely
Blue whales	*Antarctic blue whales Balaenoptera musculus intermedia* *Pygmy blue whales Balaenoptera musculus brevicauda*	Migrant Nationally vulnerable	Critically endangered Endangered	0	0/7	Low / Low - Moderate	0	Possible in waters outside Tauranga Harbour
Antarctic fur seal	*Arctocephalus gazella*	Vagrant	Least Concern	0	0	NA / Nil	0	Unlikely
Minke whales	*Antarctic minke whale Balaenoptera bonaerensis* *Dwarf minke whale Balaenoptera acutorostrata*	Migrant Data deficient	Near Threatened Least concern	4	0/2	Low / Moderate	0	Possible in waters outside Tauranga Harbour
Arnoux's beaked whale	*Berardius arnuxii*	Data deficient	Least concern	0	0	Low / Low - Moderate	0	Unlikely
Blainville's/Dense beaked whale	*Mesoplodon densirostris*	Data deficient	Least concern	0	0	Low / Low	0	Unlikely
Bottlenose dolphin	*Tursiops truncatus*	Nationally vulnerable	Least concern	7	30/48	Low – Moderate / Low - Moderate	Yes	Likely in waters both inside and outside Tauranga Harbour
Bryde's whale	*Balaenoptera edeni*	Nationally critical	Least concern	0	0/9	Low – Moderate / Moderate	0	Possible in waters outside Tauranga Harbour
Common dolphin	*Delphinus delphis*	Not threatened	Least concern	23	2/7***	Low – High / Low - Moderate	Possibly	Likely in waters outside Tauranga Harbour
Crab eater seal	*Lobodon carcinophaga*	Vagrant	Least concern	0	0	NA / Low	0	Unlikely
Cuvier's beaked whale	*Ziphius cavirostris*	Uncommon	Least concern	3	0	Low / Low - Moderate	0	Unlikely
Dusky dolphin	*Lagenorhynchus obscurus*	Not threatened	Least concern	0	0	Low / Low	0	Unlikely
Dwarf sperm whale	*Kogia sima*	Data deficient	Least concern	0	0	NA / Moderate - High	0	Unlikely
False killer whale	*Pseudorca crassidens*	Uncommon	Near Threatened	0	0/3	Low / Low	0	Possible in waters outside Tauranga Harbour
Fin whale	*Balaenoptera physalus*	Migrant	Vulnerable	0	0	Low / Moderate - High	0	Unlikely
Fraser's dolphin	*Lagenodelphis hosei*	Data deficient	Least concern	0	0	NA / Low	0	Unlikely
Ginkgo-toothed whale	*Mesoplodon ginkgodens*	Data deficient	Data deficient	0	0	NA / Moderate	0	Unlikely
Gray's beaked whale	*Mesoplodon grayi*	Not threatened	Least concern	14	0/0	Low / Low - Moderate	0	Possible in waters outside Tauranga Harbour
Hector's beaked whale	*Mesoplodon hectori*	Data deficient	Data deficient	0	0	NA / Moderate	0	Unlikely
Hector's dolphin	*Cephalorhynchus hectori hectori*	Nationally vulnerable	Endangered	0	0/1	Low / Nil - Low	0	Unlikely

Common Name	Scientific Name	NZ Conservation Status (Lundquist et al., 2025)	IUCN Conservation Status www.redlist.org	DOC Incident database (No. of stranding events inshore of AOI)	DOC Sightings data (No. reports inside Tauranga Harbour/No. of reports in Marine Mammal AOI)**	Modelled habitat suitability of AOI (Stephenson et al., 2020/MacKenzie et al., 2022)	Acoustic detections in Tauranga Harbour	Likelihood of Presence in the AOI
Hourglass dolphin	*Lagenorhynchus cruciger*	Data deficient	Least concern	0	0	Low / Nil - Low	0	Unlikely
Humpback whale	*Megaptera novaeangliae*	Migrant	Least concern	0	2/27	Low – Moderate / Moderate	0	Possible in waters outside Tauranga Harbour
Killer whale	*Orcinus orca*	Nationally critical	Data deficient	6	73/132	Low – Moderate / Moderate	Yes	Likely in waters both inside and outside Tauranga Harbour
Leopard seal	*Hydrurga leptonyx*	Migrant	Least concern	0	5/13	NA / Low - High	0	Possible in waters outside Tauranga Harbour
Lesser/pygmy beaked whale	*Mesoplodon peruvianus*	Data deficient	Least concern	0	0	NA / Nil - Low	0	Unlikely
Long-finned pilot whale	*Globicephala melas*	Not threatened	Least concern	4	0/8****	Low / Low - Moderate	0	Possible in waters outside Tauranga Harbour
Māui's dolphin	*Cephalorhynchus hectori maui*	Nationally critical	Not assessed	0	0	Low – Moderate / Nil - Low	0	Unlikely
Melon-headed whale	*Peponocephala electra*	Vagrant	Least concern	0	0	NA / Moderate	0	Unlikely
New Zealand sea lion	*Phocarctos hookeri*	Nationally endangered	Endangered	0	0	NA / Low	0	Unlikely
New Zealand fur seal	*Arctocephalus forsteri*	Not threatened	Least Concern	1	Common, generally unreported	NA / High	possibly	Likely in waters both inside and outside Tauranga Harbour
Pantropical spotted dolphin	*Stenella attenuata*	Vagrant	Least concern	0	0	NA / Low	0	Unlikely
Pygmy killer whale	*Feresa attenuata*	Vagrant	Least concern	0	0	NA / Moderate	0	Unlikely
Pygmy right whale	*Caperea marginata*	Data deficient	Least concern	0	0	NA / High	0	Unlikely
Pygmy sperm whale	*Kogia breviceps*	Uncommon	Least concern	3	0	Low / Low	0	Unlikely
Ramari's beaked whale	*Mesoplodon eueu*	Data deficient	Least concern	0	0	NA / High	0	Unlikely
Risso's dolphin	*Grampus griseus*	Data deficient	Least concern	0	0	Low / Low	0	Unlikely
Ross seal	*Ommatophoca rossii*	Vagrant	Least concern	0	0	NA / Nil	0	Unlikely
Rough-toothed dolphin	*Steno bredanensis*	Data deficient	Least concern	0	0	NA / Moderate	0	Unlikely
Sei whale	*Balaenoptera borealis*	Migrant	Endangered	1	7****	Low / Moderate	0	Possible
Shepherd's beaked whale	*Tasmacetus shepherdi*	Data deficient	Data deficient	0	0	Low / Low	0	Unlikely
Short-finned pilot whale	*Globicephala macrorhynchus*	Data deficient	Least concern	0	0	Low / Low	0	Unlikely
Southern bottlenose whale	*Hyperoodon planifrons*	Data deficient	Least concern	1	0	Low / Low	0	Unlikely
Southern elephant seal	*Mirounga leonina*	Nationally critical	Least concern	0	0	NA / Low	0	Unlikely
Southern right whale	*Eubalaena australis*	Nationally increasing	Least concern	0	1/7	Low – Moderate / Low	0	Possible in waters outside Tauranga Harbour

Common Name	Scientific Name	NZ Conservation Status (Lundquist et al., 2025)	IUCN Conservation Status www.redlist.org	DOC Incident database (No. of stranding events inshore of AOI)	DOC Sightings data (No. reports inside Tauranga Harbour/No. of reports in Marine Mammal AOI)**	Modelled habitat suitability of AOI (Stephenson et al., 2020/MacKenzie et al., 2022)	Acoustic detections in Tauranga Harbour	Likelihood of Presence in the AOI
Southern right whale dolphin	*Lissodelphis peronii*	Uncommon	Least concern	0	0	Low / Low	0	Unlikely
Spade-toothed whale	*Mesoplodon traversii*	Data deficient	Data deficient	0	0	NA / Moderate	0	Unlikely
Spectacled porpoise	*Phocoena dioptrica*	Data deficient	Least concern	0	0	Low / Low	0	Unlikely
Sperm whale	*Physeter macrocephalus*	Declining	Vulnerable	2	0	Low / Low	0	Unlikely
Strap-toothed whale	*Mesoplodon layardii*	Data deficient	Least concern	0	0	NA / Low - Moderate	0	Unlikely
Striped dolphin	*Stenella coeruleoalba*	Data deficient	Least concern	1	0	Low / Low	0	Unlikely
Subantarctic fur seal	*Arctocephalus tropicalis*	Vagrant	Least concern	0	0/2	NA / Nil	0	Unlikely
Weddell seal	*Leptonychotes weddelli*	Vagrant	Least concern	0	0	NA / Nil	0	Unlikely

Appendix B Ecological Summaries for key marine mammal species

Assessment of Effects: Marine Mammals

Dredging Reconsent Project

Port of Tauranga Limited

SLR Project No.: 840.030179.00001

17 August 2026

Bottlenose dolphins

This species is listed as 'Nationally Vulnerable' by the New Zealand Threat Classification Scheme on account of its very small, fragmented population (Baker et al., 2019); it is therefore considered to be a NZCPS policy 11(a) species.

Bottlenose dolphins in New Zealand represent four genetically distinct populations inhabiting; Northland, Marlborough Sounds, Fiordland (Tezanos-Pinto et al., 2009), and Otago/Stewart Island (Brough et al., 2015); plus, an oceanic ecotype (Zaeschmar et al., 2020). Bottlenose dolphins seen in and around Tauranga Harbour are part of the 'Northland' population which extends from Doubtless Bay to Tauranga and numbers 418 – 487 dolphins (Constantine, 2002). Constantine (2002) reported the range of the North Island population to be from Doubtless Bay to Tauranga; however, sightings beyond this area suggest that the overall range includes the North Island west coast (Tezanos-Pinto et al., 2013) and beyond into parts of the eastern Bay of Plenty (Zaeschmar et al., 2020). Dolphins from this population range widely along the east coast of north-eastern New Zealand, with home-ranges that commonly extend 500 km along the coastline (Constantine, 2002). Across this range, dolphins show varying degrees of site fidelity but generally exhibit high levels of movement (Constantine, 2003; Tezanos-Pinto, 2009), with animals seldom stable within an area for more than a few days (Mourão, 2006). Genetic interchange with this population and pelagic groups of Pacific Ocean dolphins has also been documented (Tezanos-Pinto et al., 2009), with dolphins found further offshore in summer and closer inshore in shallower waters in winter (Constantine, 2002). Bottlenose dolphins have a varied diet of fish and squid (Blanco et al., 2001; Gowans et al., 2008; Constantine & Baker, 1997; Wells & Scott, 2009; Fisheries New Zealand, 2025) and forage in both shallow and deep habitats (to depths of over 500 m) (Wells & Scott, 2009). Foraging ecology in this species is characterised by its significant plasticity in prey species and foraging strategies (Berkenbusch et al., 2013).

The analysis of the DOC Sightings Database suggests that bottlenose dolphins are likely to have an occasional presence around Tauranga Harbour as this species is routinely sighted in the AOI (48 sightings total), including inside Tauranga Harbour (30 sightings) (see Appendix 1). Several of the sightings from the AOI, noted the presence of calves; hence this habitat could support some breeding behaviours.

In addition to the DOC Sightings Database records, Gaborit-Haverkort (2012) undertook 2,364 boat-based marine mammal surveys of the central Bay of Plenty (including the waters of the AOI) between March 1998 and May 2011. Throughout this study 53 sightings of bottlenose dolphins were made, including two within Tauranga Harbour. Sightings of this species were made throughout the year, but encounter rates peaked in winter. Most sightings from this study occurred in waters less than 50 m deep (range 4 – 109 m). Group size ranged from two to 50+ individuals and calves were recorded on five occasions primarily during summer and autumn.

Meissner (2015) assessed marine mammal sightings from a range of validated sources (experts, tour operators and mariners) in the Bay of Plenty to determine historical and seasonal presence of species between 2000 and 2010. Of the 2,049 marine mammal encounters included in the analysis, 81 involved bottlenose dolphins of which five appear to have occurred inside Tauranga Harbour. Encounters occurred year-round with encounter rates highest in spring. The median water depth of bottlenose dolphin encounters was 98 m.

The information above clearly indicates that bottlenose dolphins utilise habitat in and around Tauranga Harbour. While there is little specific information available about how dolphins utilise habitat in the AOI, we do however know that this population ranges widely; hence the proposed project area would represent only a small portion of any individual dolphins' home-range and their presence within the harbour is infrequent.

Killer whales

This species is listed as 'Nationally Critical' by the New Zealand Threat Classification Scheme on account of its very small population size (Baker et al., 2019); it is therefore considered to be a NZCPS policy 11(a) species.

New Zealand killer whales (also known as orca) have been studied since 1992 and the New Zealand population is believed to be made up of at least three sub-populations based on geographic distribution; a North Island only subpopulation, South Island only subpopulation, and North and South Island subpopulation (Visser, 2000), but the overall population size is small (65 – 167 individuals: Visser, 2000). Recent genetic analysis supports geographical segregation of the population and suggests a degree of site fidelity within subpopulations (Olavarria et al., 2014). New Zealand killer whales are wide-ranging, with some whales estimated to travel on average 100 – 150 km per day (Visser, 2007). High re-sighting rates of identifiable individuals suggest that these whales live permanently or at least semi-permanently around the New Zealand coast (Visser, 2007). The presence of killer whales along the North Island's east coast peaks between August and October, remaining relatively high in November, with a secondary peak in May/June (Visser, 2000; 2007). The year-round presence of immature animals suggests that a distinct breeding season is lacking for New Zealand killer whales (Visser, 2000).

The diet of New Zealand killer whales has been recorded to include 27 species of prey, ten of which have not been recorded for killer whales elsewhere (Visser, 2000). These prey species can be categorised into four main types: rays, sharks, finfish, and cetaceans. Benthic foraging for rays is common around New Zealand's coast and appears to be unique to New Zealand killer whales (Visser, 1999; Duignan et al., 2000). Killer whales present around the North Island (the 'North Island only subpopulation' and the 'North and South Island subpopulation') are generalist foragers that opportunistically take advantage of prey (Visser, 2007) and forage extensively inside enclosed harbours and estuarine areas (Visser, 2000).

An analysis of the DOC Sightings Database suggests that killer whales are likely to be occur in and around Tauranga Harbour as sightings in the AOI are relatively common (132 sightings in total), and sightings certainly occur inside Tauranga Harbour (n=73). Several of these sightings records noted the presence of calves; hence this habitat could support some breeding behaviours.

During the 2,364 surveys undertaken (over three years) by Gaborit-Haverkort (2012) 45 sightings of killer whales were made, including four within Tauranga Harbour. Sightings of this species were made throughout the year, but encounter rates peaked in spring. Sightings were made over the depth range 4 – 115 m (mean = 39 m). Group size ranged from one to 30+ individuals and calves were recorded on 15 occasions primarily during spring and autumn.

Of the 2,049 marine mammal encounters analysed by Meissner (2015), 105 involved killer whales including some inside Tauranga Harbour. Encounters occurred year-round with encounter rates highest in winter and spring. The median water depth of killer whale encounters was 70 m.

Killer whales clearly utilise habitat in the AOI on a relatively frequent basis, and based on what we know about prey preferences, habitat use could include benthic foraging for rays in shallow waters (including Tauranga Harbour). As killer whales readily move large distances between locations (Visser, 2007), the proposed project area would represent only a small portion of any individual whale's home-range; hence the AOI is not specifically considered to be important during the vulnerable life stages of this species, and their presence within Tauranga Harbour itself is occasional and inconsistent, although sightings are least common in the harbour in summer.

New Zealand fur seals

While the DOC sighting record does not include any records of New Zealand fur seals, this species is likely to be present in the AOI as fur seals are commonly seen in coastal Bay of Plenty waters, particularly over winter months (DOC, 2012; Bay of Plenty Times 2018). In addition, seasonal (winter) sightings of fur seals are becoming a regular occurrence inside Tauranga Harbour, for example the following sighting locations were reported in the winter of 2018: Koromiko Street, Kopurererua Valley Reserve, Tauranga Marina, and Welcome Bay (Bay of Plenty Times, 2018). Both the DOC Sighting and Stranding Databases are biased low for this species, as terrestrial haul-out behaviour and regular occurrence in coastal waters means that most sightings go unreported. This species is listed as 'Not Threatened' by the New Zealand Threat Classification Scheme (Baker et al., 2019).

New Zealand fur seals are widespread around rocky coastlines of the New Zealand mainland and offshore islands. A reliable total abundance estimate is not available for this species but estimates in the vicinity of 100,000 individuals have been suggested (Harcourt, 2001). Most breeding locations for this species occur on the South Island, this species is expanding its range northwards following the cessation of commercial and subsistence hunting (Lalas & Bradshaw, 2001) and regular breeding now occurs as far north as Gannet Island in Waikato (Bouma et al., 2008) and an emerging breeding colony is establishing on Motunau (Plate) Island in the Bay of Plenty (DOC, 2012). The New Zealand non-breeding distribution is much wider, extending from Three Kings Islands in the north to the Subantarctic islands in the south. Several haul-out locations (non-breeding) occur in and around the AOI, including Karewa Island, Motiti Island, Mayor Island and Plate Island (Meissner, 2015). Mauao also supports small numbers of fur seals ashore, mostly during winter (DOC, 2012).

This species forages well offshore and returns to shore every few days to rest (Boren, 2005). New Zealand fur seals forage on a range of species, with the relative importance of each prey item varying by season. Arrow squid are important prey items in summer and autumn, lanternfish are taken year-round, barracouta and jack mackerel are major contributors to the summer diet, while red cod, ahuru, and octopus are important winter prey species (Harcourt et al., 2002). In general, the diet of New Zealand fur seals shifts from a squid dominated diet in summer and autumn, to mixed fish dominated in winter (Harcourt et al., 2002). Foraging habitats vary with season and sex although inshore and deeper offshore foraging habitat is used throughout the year (Harcourt et al., 2002). Females tend to forage over continental shelf waters, with males using deeper continental shelf breaks and pelagic waters (Page et al., 2005).

Of the 2,049 marine mammal encounters analysed by Meissner (2015), 90 involved fur seals, including some that occurred inside Tauranga Harbour. Encounters occurred year-round with encounter rates highest in winter and spring. The median water depth of fur seal encounters at sea was 82 m.

Meissner (2015) also conducted boat-based surveys of her own and noted that at-sea fur seal occurrence was typically higher in deeper waters, but that the number of fur seals occurring in the Bay of Plenty is low overall compared to other regions of New Zealand, indicating early stage recolonisation following historic exploitation. Mayor Island and Plate Island supported the largest concentrations of animals ashore with up to 15 individuals present in winter; however, only three pups were encountered in the western Bay of Plenty between 2010 and 2013.

While New Zealand fur seals will certainly occur in and around the AOI (particularly in the colder months), foraging typically occurs further offshore and Tauranga Harbour is considered part of the non-breeding distribution for this species. Therefore, the proposed development site does not constitute important habitat during the vulnerable life stages of this species.

Common dolphins

This species is listed as 'Not Threatened' by the New Zealand Threat Classification Scheme (Baker et al., 2019) and is therefore not considered under NZCPS Policy 11a(i) or (ii).

Common dolphins occur in all regions of New Zealand; however, most sightings occur around the North Island and upper South Island (Berkenbusch et al., 2013). While total abundance is unknown, it is likely to be substantial (Berkenbusch et al., 2013), with an estimate of c. 18,000 individuals using the North Island alone (Abraham et al., 2017). Stomach content analysis of stranded and by-caught common dolphins in New Zealand revealed a diverse diet of fish and cephalopod species, with arrow squid, jack mackerel and anchovy identified as the primary prey species (Meynier et al., 2008).

As described by Gaborit-Haverkort (2012) and Meissner (2015) common dolphins are the species most frequently encountered in the wider AOI (i.e., outside of Tauranga Harbour). Of the 2,049 marine mammal encounters analysed by Meissner (2015), 1,552 involved common dolphins, with this species being the most frequently encountered of all marine mammals in the Bay of Plenty. Encounter rates were highest in summer and autumn when dolphins were typically observed in shallower water (median 56 m) than winter and spring (82 m and 64 m respectively). Meissner (2015) also conducted boat-based surveys and noted strong seasonality of common dolphins associated with the warm seasons (December to April). The following distributional hotspots were identified for common dolphins in the Bay of Plenty: over the shelf break (100-200 m depth), around islands and reefs (e.g., east of Mayor Island, Penguin Shoal, Pudney Rock, northeast of Motiti Island).

Between March 1998 and May 2011 Gaborit-Haverkort (2012) undertook 2,364 boat-based marine mammal surveys of the central Bay of Plenty (including the waters of the AOI). Common dolphins were encountered on 1,265 of these trips (54%) and were the most frequently sighted marine mammal species. No common dolphins were encountered within Tauranga Harbour during these surveys with the sightings mostly occurring in the area between Motiti Island, Mayor Island and Waihi in water depths from <5 to 130 m. Encounter rates were highest during summer and autumn when large groups of dolphins with calves were common; hence the AOI could support some breeding behaviours.

Photo-identification evidence confirms that individuals of this species readily move between locations from Hauraki Gulf to Whakatane (200 km); generally indicating that common dolphins are highly mobile throughout a large home-range (Neumann et al., 2002). On this basis the AOI would represent only a small portion of a much wider home-range.

Stephenson et al. (2020) undertook habitat modelling using a wide range of environmental variables to predict the probability of occurrence of marine mammal species throughout New Zealand's Exclusive Economic Zone. Modelling results are presented in Appendix A. It is noteworthy that the modelling indicates a low probability of occurrence for common dolphins inside Tauranga Harbour increasing to a moderate-high probability of occurrence within a short distance offshore. The sightings data from the DOC Sighting Database, Meissner (2015) and Gaborit-Haverkort (2012) support this finding.

On the basis of the information presented here, common dolphins are likely to be present in the AOI but are unlikely to occur within Tauranga Harbour.

Appendix C Acoustic Monitoring Deployment Details, Tauranga Harbour (Provided by Styles Group)

Assessment of Effects: Marine Mammals

Dredging Reconsent Project

Port of Tauranga Limited

SLR Project No.: 840.030179.00001

17 August 2026

Deployment Details for Tauranga Harbour

Sites:
Three monitoring sites were established inside Tauranga Harbour (Figure 1). The coordinates for each site in Figure 1 are:

- Stella Passage: S 37.66603 E 176.17662.
- Outer West: S 37.63975 E 176.16666.
- Outer East: S 37.637700 E 176.170230.

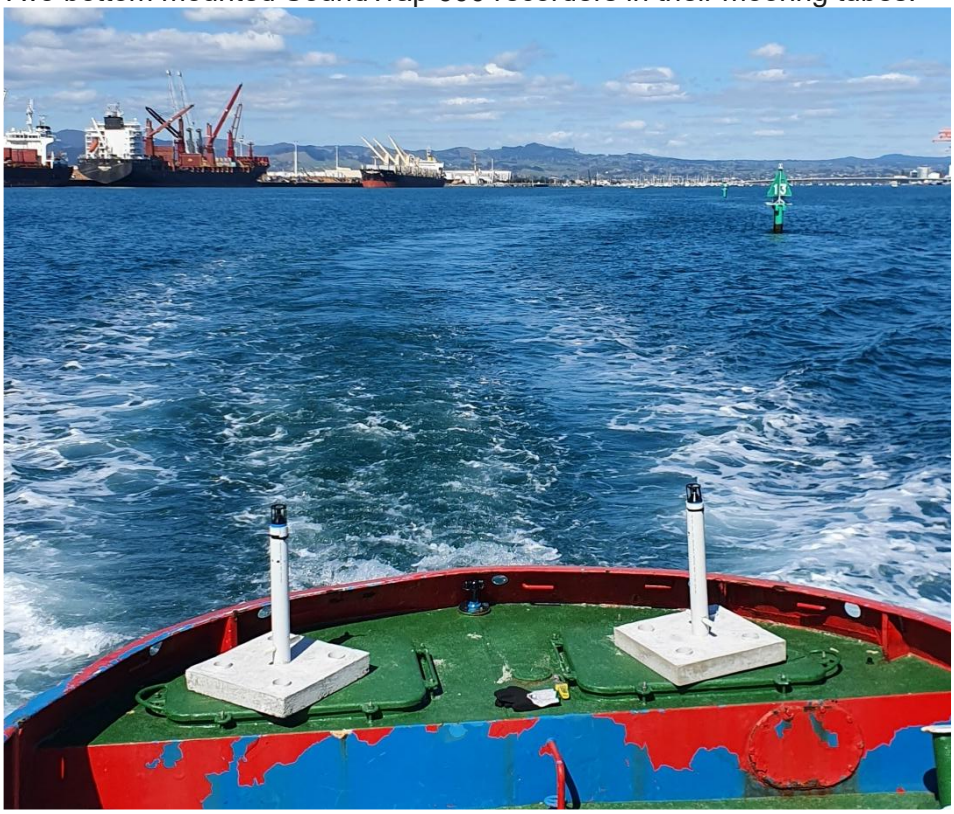
Figure 1:



Acoustic recorders

Acoustic data were collected using calibrated SoundTrap recorders from Ocean Instruments NZ (Figure 2). Each monitoring site contained a single hydrophone.

Figure 2: Two bottom mounted SoundTrap 600 recorders in their mooring tubes.



Deployments

Each monitoring site was serviced when the batteries and memory of each SoundTrap recorder needed changing. This was scheduled to be every 1.5 months, however, due to the Port's operational timelines or weather conditions, this was sometimes delayed.
The dates of each deployment were:

- Deployment 1: 31/08/2022 to 04/11/2022
- Deployment 2: 04/11/2022 to 08/03/2023
- Deployment 3: 09/03/2022 to 06/07/2023

Data Collected:

For each deployment, because the recorders were operating independently, each ran out of battery or filled their memory cards at different times. Therefore, while the deployment periods covered dates listed above, it did not necessarily mean that data were collected over that whole time.
The periods over which data were collected are summarized in Table 1.

Table 1: Summary of data collected

Monitoring Site	Deployment Period	Period when data were collected
Deployment 1		
Outer East	31/08/2022 – 04/11/2022	31/08/2022 – 29/10/2022
Outer West		31/08/2022 – 04/11/2022
Stella Passage		31/08/2022 – 19/10/2022
Deployment 2		
Outer East	04/11/2022 – 08/03/2023	04/11/2022 – 02/01/2023
Outer West		04/11/2022 – 19/12/2022*
Stella Passage		04/11/2022 – 06/02/2023
Deployment 3		
Outer East	09/03/2023 – 06/07/2023	09/03/2023 – 11/06/2023
Outer West		09/03/2023 – 22/05/2023*
Stella Passage		09/03/2023 – 31/05/2023

*Instrument had technical issues and stopped

Data analysis

Data has been analysed for Deployment 1 and Deployment 2. Data from Deployment 3 are currently being analysed as only recovered last week (10 July 2023).

Dolphins and killer whales were the primary species being detected. Large whales were not detected inside the harbour during Deployment 1 and Deployment 2. There were occasional acoustic detections of baleen calls from outside the harbour from the Outer East and Outer West sites.

Appendix D Acoustic Detections, Tauranga Harbour (Provided by Styles Group)

Assessment of Effects: Marine Mammals

Dredging Reconsent Project

Port of Tauranga Limited

SLR Project No.: 840.030179.00001

17 August 2026

Acoustic Detections from Outer East Site – Deployment 1

DEPLOYMENT 1			
Start	End	Duration	Species
31-08-2022 15:09	31-08-2022 15:10	0:01:00	Dolphin
01-09-2022 3:54	01-09-2022 3:54	0:01:00	Killer whale
01-09-2022 4:25	01-09-2022 4:25	0:01:00	Killer whale
01-09-2022 20:50	01-09-2022 20:51	0:01:00	Killer whale
02-09-2022 2:07	02-09-2022 2:07	0:01:00	Dolphin
02-09-2022 3:07	02-09-2022 3:08	0:01:00	Killer whale
02-09-2022 13:33	02-09-2022 13:37	0:04:00	Dolphin
02-09-2022 15:01	02-09-2022 15:01	0:01:00	Dolphin
04-09-2022 17:05	04-09-2022 17:26	0:21:00	Killer whale
04-09-2022 20:27	04-09-2022 20:27	0:01:00	Killer whale
07-09-2022 11:38	07-09-2022 11:38	0:01:00	Dolphin
09-09-2022 12:35	09-09-2022 12:35	0:01:00	Killer whale
09-09-2022 19:00	09-09-2022 19:00	0:01:00	Killer whale
09-09-2022 19:25	09-09-2022 19:25	0:01:00	Killer whale
18-09-2022 12:55	18-09-2022 12:55	0:01:00	Dolphin
18-09-2022 16:46	18-09-2022 16:46	0:01:00	Dolphin
18-09-2022 20:16	18-09-2022 20:16	0:01:00	Dolphin
24-09-2022 22:06	24-09-2022 22:25	0:19:00	Killer whale
25-09-2022 16:58	25-09-2022 16:58	0:01:00	Dolphin
26-09-2022 0:16	26-09-2022 0:18	0:02:00	Killer whale
27-09-2022 19:01	27-09-2022 19:06	0:05:00	Killer whale
06-10-2022 1:31	06-10-2022 1:33	0:02:00	Killer whale
07-10-2022 11:49	07-10-2022 11:49	0:01:00	Dolphin
07-10-2022 12:32	07-10-2022 12:32	0:01:00	Dolphin
07-10-2022 14:09	07-10-2022 14:09	0:01:00	Dolphin
11-10-2022 7:32	11-10-2022 7:32	0:01:00	Dolphin
11-10-2022 15:23	11-10-2022 15:23	0:01:00	Dolphin
12-10-2022 5:20	12-10-2022 5:20	0:01:00	Dolphin
15-10-2022 15:41	15-10-2022 15:41	0:01:00	Dolphin
16-10-2022 13:25	16-10-2022 13:25	0:01:00	Killer whale

Acoustic Detections from Outer East Site – Deployment 2

DEPLOYMENT 2			
Start	End	Duration	Species
05-11-2022 10:22	05-11-2022 10:27	0:05:00	Dolphin
05-11-2022 12:33	05-11-2022 13:01	0:28:00	Dolphin
05-11-2022 13:30	05-11-2022 14:00	0:30:00	Dolphin
05-11-2022 15:51	05-11-2022 15:51	0:01:00	Dolphin
07-11-2022 17:19	07-11-2022 17:19	0:01:00	Dolphin
12-11-2022 14:21	12-11-2022 14:21	0:01:00	Dolphin
17-11-2022 14:09	17-11-2022 14:10	0:01:00	Killer whale
24-11-2022 17:31	24-11-2022 17:31	0:01:00	Killer whale
24-11-2022 18:12	24-11-2022 18:12	0:01:00	Killer whale
02-12-2022 5:56	02-12-2022 5:59	0:03:00	Killer whale
04-12-2022 12:34	04-12-2022 12:34	0:01:00	Dolphin
04-12-2022 13:20	04-12-2022 13:26	0:06:00	Dolphin
06-12-2022 15:37	06-12-2022 15:37	0:01:00	Dolphin
16-12-2022 15:59	16-12-2022 15:59	0:01:00	Dolphin
17-12-2022 8:24	17-12-2022 8:24	0:01:00	Dolphin
19-12-2022 5:23	19-12-2022 5:23	0:01:00	Dolphin
19-12-2022 9:44	19-12-2022 9:44	0:01:00	Dolphin
19-12-2022 13:15	19-12-2022 13:15	0:01:00	Dolphin
22-12-2022 13:22	22-12-2022 13:22	0:01:00	Dolphin
26-12-2022 9:53	26-12-2022 9:53	0:01:00	Dolphin
26-12-2022 18:19	26-12-2022 18:19	0:01:00	Dolphin
30-12-2022 13:41	30-12-2022 13:41	0:01:00	Dolphin
31-12-2022 10:45	31-12-2022 10:45	0:01:00	Dolphin
01-01-2023 10:21	01-01-2023 10:21	0:01:00	Dolphin

Acoustic Detections from Outer East Site – Deployment 3

DEPLOYMENT 3			
Start	End	Duration	Species
16-03-2023 21:00	16-03-2023 21:00	0:01:00	Dolphin
16-03-2023 21:21	16-03-2023 21:21	0:01:00	Dolphin
19-03-2023 12:31	19-03-2023 12:31	0:01:00	Dolphin
29-03-2023 22:59	29-03-2023 22:59	0:01:00	Dolphin
01-04-2023 0:27	01-04-2023 0:27	0:01:00	Dolphin
01-04-2023 0:50	01-04-2023 0:50	0:01:00	Dolphin
01-04-2023 12:10	01-04-2023 12:16	0:06:00	Dolphin
09-04-2023 7:16	09-04-2023 7:16	0:01:00	Dolphin
10-04-2023 14:29	10-04-2023 14:29	0:01:00	Dolphin
10-04-2023 14:50	10-04-2023 14:50	0:01:00	Dolphin
18-04-2023 11:26	18-04-2023 11:26	0:01:00	Dolphin
18-04-2023 11:49	18-04-2023 11:50	0:01:00	Dolphin
18-04-2023 13:23	18-04-2023 13:23	0:01:00	Dolphin
18-04-2023 14:28	18-04-2023 14:28	0:01:00	Killer whale
20-04-2023 14:21	20-04-2023 14:22	0:01:00	Dolphin
23-04-2023 11:23	23-04-2023 11:23	0:01:00	Dolphin
29-04-2023 14:22	29-04-2023 14:22	0:01:00	Dolphin
05-05-2023 7:03	05-05-2023 7:10	0:07:00	Killer whale
05-05-2023 7:49	05-05-2023 7:52	0:03:00	Killer whale
05-05-2023 8:50	05-05-2023 8:50	0:01:00	Killer whale
08-05-2023 16:29	08-05-2023 16:30	0:01:00	Killer whale
10-05-2023 20:27	10-05-2023 20:27	0:01:00	Dolphin
14-05-2023 1:03	14-05-2023 1:07	0:04:00	Dolphin
17-05-2023 16:46	17-05-2023 16:47	0:01:00	Dolphin
18-05-2023 0:20	18-05-2023 0:20	0:01:00	Dolphin
18-05-2023 7:55	18-05-2023 7:55	0:01:00	Dolphin
18-05-2023 8:28	18-05-2023 8:42	0:14:00	Killer whale
22-05-2023 13:09	22-05-2023 13:09	0:01:00	Killer whale
25-05-2023 13:32	25-05-2023 13:32	0:01:00	Dolphin
02-06-2023 4:48	02-06-2023 4:48	0:01:00	Dolphin

Acoustic Detections from Outer West Site – Deployment 1

DEPLOYMENT 1			
Start	End	Duration	Species
01-09-2022 20:48	01-09-2022 20:55	0:07:00	Killer whale
02-09-2022 0:39	02-09-2022 0:39	0:01:00	Dolphin
02-09-2022 3:08	02-09-2022 3:08	0:01:00	Killer whale
02-09-2022 8:59	02-09-2022 9:06	0:07:00	Dolphin
03-09-2022 1:05	03-09-2022 1:05	0:01:00	Dolphin
03-09-2022 4:10	03-09-2022 4:10	0:01:00	Dolphin
03-09-2022 17:49	03-09-2022 17:49	0:01:00	Dolphin
03-09-2022 18:14	03-09-2022 18:14	0:01:00	Dolphin
03-09-2022 23:24	03-09-2022 23:24	0:01:00	Dolphin
03-09-2022 23:47	03-09-2022 23:47	0:01:00	Dolphin
04-09-2022 18:23	04-09-2022 18:23	0:01:00	Killer whale
04-09-2022 20:27	04-09-2022 20:27	0:01:00	Killer whale
05-09-2022 8:38	05-09-2022 8:38	0:01:00	Dolphin
05-09-2022 15:47	05-09-2022 15:47	0:01:00	Killer whale
05-09-2022 20:57	05-09-2022 20:57	0:01:00	Dolphin
08-09-2022 9:34	08-09-2022 9:34	0:01:00	Dolphin
10-09-2022 13:11	10-09-2022 13:11	0:01:00	Dolphin
13-09-2022 22:35	13-09-2022 22:35	0:01:00	Killer whale
24-09-2022 22:05	24-09-2022 22:23	0:18:00	Killer whale
26-09-2022 0:18	26-09-2022 0:18	0:01:00	Killer whale
26-09-2022 4:40	26-09-2022 4:40	0:01:00	Dolphin
27-09-2022 19:01	27-09-2022 19:09	0:08:00	Killer whale
07-10-2022 11:49	07-10-2022 11:49	0:01:00	Dolphin
07-10-2022 18:14	07-10-2022 18:14	0:01:00	Dolphin
11-10-2022 21:34	11-10-2022 21:34	0:01:00	Dolphin
12-10-2022 22:11	12-10-2022 22:13	0:02:00	Killer whale
16-10-2022 9:12	16-10-2022 9:12	0:01:00	Dolphin
16-10-2022 12:12	16-10-2022 12:12	0:01:00	Dolphin
16-10-2022 12:55	16-10-2022 12:55	0:01:00	Dolphin
18-10-2022 19:27	18-10-2022 19:27	0:01:00	Dolphin
25-10-2022 15:05	25-10-2022 15:05	0:01:00	Dolphin
28-10-2022 11:02	28-10-2022 11:02	0:01:00	Dolphin
28-10-2022 16:52	28-10-2022 16:52	0:01:00	Dolphin

Acoustic Detections from Outer West Site – Deployment 2

DEPLOYMENT 2			
Start	End	Duration	Species
09-11-2022 16:18	09-11-2022 16:23	0:05:00	Unknown (Possible Pinniped)
14-11-2022 17:37	14-11-2022 17:37	0:01:00	Dolphin
16-11-2022 15:55	16-11-2022 15:57	0:02:00	Dolphin
17-11-2022 13:38	17-11-2022 13:38	0:01:00	Killer whale
21-11-2022 11:02	21-11-2022 11:02	0:01:00	Unknown (Possible Pinniped)
21-11-2022 14:04	21-11-2022 14:04	0:01:00	Unknown (Possible Pinniped)
02-12-2022 5:39	02-12-2022 6:00	0:21:00	Killer whale
12-12-2022 10:01	12-12-2022 10:01	0:01:00	Dolphin
12-12-2022 11:27	12-12-2022 11:27	0:01:00	Dolphin

Acoustic Detections from Outer West Site – Deployment 3

DEPLOYMENT 3			
Start	End	Duration	Species
15-03-2023 14:59	15-03-2023 15:09	0:10:00	Dolphin
16-03-2023 1:55	16-03-2023 1:55	0:01:00	Dolphin
16-03-2023 20:59	16-03-2023 21:26	0:27:00	Dolphin
17-03-2023 1:55	17-03-2023 2:12	0:17:00	Killer whale
17-03-2023 2:51	17-03-2023 2:51	0:01:00	Killer whale
17-03-2023 11:37	17-03-2023 11:37	0:01:00	Dolphin
17-03-2023 23:53	18-03-2023 0:11	0:18:00	Killer whale
25-03-2023 17:35	25-03-2023 17:35	0:01:00	Dolphin
26-03-2023 17:00	26-03-2023 17:01	0:01:00	Dolphin
27-03-2023 17:26	27-03-2023 17:26	0:01:00	Killer whale
02-04-2023 8:10	02-04-2023 8:23	0:13:00	Dolphin
02-04-2023 10:35	02-04-2023 10:48	0:13:00	Dolphin
02-04-2023 11:19	02-04-2023 11:27	0:08:00	Dolphin
08-04-2023 8:41	08-04-2023 8:41	0:01:00	Dolphin
09-04-2023 5:40	09-04-2023 5:40	0:01:00	Killer whale
09-04-2023 19:46	09-04-2023 19:46	0:01:00	Killer whale
09-04-2023 20:21	09-04-2023 20:21	0:01:00	Killer whale
10-04-2023 11:11	10-04-2023 11:11	0:01:00	Dolphin
10-04-2023 16:12	10-04-2023 16:12	0:01:00	Dolphin
11-04-2023 17:23	11-04-2023 17:23	0:01:00	Dolphin
17-04-2023 12:55	17-04-2023 13:09	0:14:00	Killer whale
18-04-2023 14:05	18-04-2023 14:05	0:01:00	Killer whale
27-04-2023 16:52	27-04-2023 16:52	0:01:00	Dolphin
01-05-2023 23:05	01-05-2023 23:05	0:01:00	Dolphin
05-05-2023 13:29	05-05-2023 13:29	0:01:00	Dolphin
08-05-2023 16:24	08-05-2023 16:28	0:04:00	Killer whale
09-05-2023 3:18	09-05-2023 3:18	0:01:00	Dolphin
12-05-2023 20:59	12-05-2023 20:59	0:01:00	Killer whale
13-05-2023 22:02	13-05-2023 22:08	0:06:00	Killer whale
14-05-2023 18:10	14-05-2023 18:11	0:01:00	Dolphin
17-05-2023 16:45	17-05-2023 16:46	0:01:00	Killer whale
18-05-2023 8:32	18-05-2023 8:32	0:01:00	Dolphin
20-05-2023 3:52	20-05-2023 3:52	0:01:00	Dolphin

Acoustic Detections from Stella Passage – Deployments 1, 2 & 3

DEPLOYMENT 1			
Start	End	Duration	Species
21-09-2022 16:00	21-09-2022 16:00	0:01:00	Dolphin
23-09-2022 20:00	23-09-2022 20:00	0:01:00	Dolphin
DEPLOYMENT 2			
Start	End	Duration	Species
10-11-2022 19:00	10-11-2022 19:00	0:01:00	Dolphin
11-11-2022 16:50	11-11-2022 16:51	0:01:00	Dolphin
19-11-2022 14:00	19-11-2022 14:00	0:01:00	Dolphin
DEPLOYMENT 3			
Start	End	Duration	Species
31-03-2023 13:46	31-03-2023 14:02	0:15:00	Dolphin

Appendix E Ciriculum Vitae of Helen McConnell

Assessment of Effects: Marine Mammals

Dredging Reconsent Project

Port of Tauranga Limited

SLR Project No.: 840.030179.00001

17 August 2026

Helen McConnell, MSc, BSc

Principal | Marine Science | Asia-Pacific

Helen is a trained marine ecologist whose professional experience started in 2002. Helen's career has spanned research, teaching, policy development, and environmental consultancy all with a strong focus on marine ecology and conservation. She has been involved in a wide range of marine and coastal projects both in the private and public sectors. Helen specialises in marine mammal ecology and effects of coastal developments, oil and gas activities, and aquaculture on marine mammals. Helen is skilled in communicating concepts of marine ecology to a broad audience and has authored numerous client reports, statements of evidence, best practice guidelines and scientific publications.

As well as extensive coastal experience, Helen has been involved with several offshore projects both in New Zealand and Australia. In recent years Helen has specialised in the preparation of environmental impact assessments, environmental plans, marine consent and resource consent applications, and the provision of expert witness services during consent hearings, with a particular focus on marine mammal impacts.

Helen has authored or co-authored 13 peer-reviewed publications relating to marine mammal ecology and oiled wildlife response.

Education

- Master Science, Marine Science (Distinction), University of Otago (2001)
- Bachelor of Science Zoology, University of Otago (1997)

Project Experience Examples

Resource Consent Applications

Wharf Reconstruction, Akaroa (2025)

Helen was engaged by Environment Canterbury (ECan) as a marine mammal expert to assist a Coastal Permit Application that was lodged by Christchurch City Council to reconstruct and expand the existing Akaroa Wharf facilities. Helen provided several technical reviews of the application documentation relating to marine mammals, including advising on conditions of consent. This application is still under consideration by ECan.

Marina Upgrade, Magazine Bay, Lyttelton (2025)

Helen was engaged by Environment Canterbury (ECan) as a marine mammal expert to assist a Coastal Permit Application that was lodged by Christchurch City Council to upgrade the existing Magazine Bay Marina facilities. Helen provided a comprehensive technical review of the application documentation relating to marine mammals, including advising on conditions of consent. This application is still under consideration by ECan.

Maintenance Dredging, Port Taranaki (2025)
Maintenance dredging is required at Port Taranaki to remove accumulated sediments to ensure an adequate depth is preserved for large cargo vessels to navigate the port safely and efficiently. SLR has been engaged by Port Taranaki to prepare a Coastal Permit Application to allow ongoing maintenance dredging. As part of this application, Helen has assessed the potential effects of dredging on marine mammals. The application will be ready to lodge mid-2025.

Wharf Extension, Reclamation and Dredging, Northland Regional Council (2023)
Helen was engaged by Northland Regional Council as a marine mammal expert to assist a Coastal Permit Application that was lodged by Northport Ltd to construct, operate, and maintain an expansion of the existing port facility to increase freight storage and handling capacity. This application, including Helen's expert evidence, was heard before the Council in October 2023.

Wharf Extension and Dredging, Port of Tauranga Ltd (2023)
Helen was engaged by Port of Tauranga Ltd as a marine mammal expert to assist with the port's Coastal Permit Application to extend the Sulphur Point and Mount Maunganui wharves and to conduct capital dredging works to extend the swing basin. This application, including Helen's expert evidence, was heard before the Environment Court in February 2023. An interim decision to provisionally grant the application was issued in December 2023.

Mussel Spat Farm, Waikato Regional Council (2023)
For this project Helen was engaged as a marine mammal expert by Waikato Regional Council to critically review the applicant's information pertaining to the potential effects of a proposed spat farm on marine mammals. This proposed farm overlaps with the distribution of New Zealand's critically endangered Māui dolphins. So very careful assessment of potential effects on this conservation dependant species was required.

Open Ocean Salmon Farm, Marlborough District Council (2021)
For this project Helen was engaged as a marine mammal expert by the Marlborough District Council to critically review the applicant's information pertaining to the potential effects of the proposed Blue Endeavour Marine Farm in the outer Marlborough Sounds on marine mammals. This application represents the first open ocean fish farm application to be granted in New Zealand. Helen presented expert evidence and participated in the hearing to assist with the decision-making process and with the drafting of consent conditions.

Mussel Farm Installation and Operation, Ponui Aquaculture Ltd Coastal (2020)
This application was to establish a new mussel farm in the Firth of Thames. Helen was engaged by the applicant as a marine mammal expert to assess the potential effects of the proposed farm structures and operations on marine mammals, preparing evidence and appearing before the Auckland Council hearing in 2020. This application was granted.

Mussel Spat Farm Installation and Operation, Ohinau Aquaculture Ltd (2019)
For this project, Helen was engaged as the marine mammal expert on behalf of the applicant to assess the potential effects on marine mammals from the establishment of a mussel spat collecting farm in Mercury Bay, Coromandel Peninsula. In association with this application, I prepared statements of evidence and appeared before the Waikato Regional Council hearing (2019) and an appeal hearing before the Environment Court (2020). The applicant was granted consent in 2023, and the first farm structures will be installed in 2024.

Aquaculture Management Plans, NZ King Salmon Ltd (2014)
Resource consent conditions for proposed marine finfish farms require the development of management plans. In 2014, Helen prepared a Marine Mammal and Shark Management Plan to minimise the impacts of salmon farms on protected species within the Marlborough Sounds, and a Nuisance Wildlife Management Plan to minimise the adverse effects from wildlife on residents and amenities around newly consented finfish farms.

Kaheru-1 Exploration Well, South Taranaki, NZ Oil & Gas Ltd (2014)
This project involved assessing environmental effects for a Coastal Permit to drill an exploration well 12 km off the South Taranaki Coast. Potential effects on the marine and coastal ecosystems, along with existing interests were assessed. Consent was granted in late 2014.

Marine Seismic Surveys – Marine Mammal Impact Assessments

Otway Basin 3D Seismic Survey, Victoria and South Australia, TGS Ltd (2023-2024)

An Environmental Plan (EP) has recently been prepared in relation to acquisition of a 3D marine seismic survey in the Otway Basin off the south coast of Australia (SA, VIC). The EP is currently with the Australian regulator (NOPSEMA) awaiting decision. The assessment of potential impacts of noise on marine mammals was a critical part of this EP as the proposed operational area overlaps with several Biologically Important Areas for marine mammal

species (blue whales and southern right whales). On this basis numerous control measures have been developed to ensure that marine mammal populations will be sufficiently protected from the underwater noise generated by the seismic operations.

Bonaparte 3D Seismic Survey, Western Australia, Schlumberger Ltd (2023-2024)
An EP was prepared in relation to acquisition of a 3D marine seismic survey on the Northwest Shelf of Australia (WA). The EP was approved by NOPSEMA, and the survey was successfully acquired in early 2024.

3D Seismic Surveys, North Taranaki, NZ Surveys 2020 Ltd (2022)
Under the EEZ Act 2012 compliance with the Department of Conservation's (DOC) Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations is mandatory. In accordance with the Code of Conduct, Marine Mammal Impact Assessments (MMIA) for two transitional surveys in North Taranaki ('Turangi' and 'Waitara') were submitted to DOC in 2022. The transitional nature of these surveys saw them bridge a data gap between an existing marine 3D seismic survey and land-based 3D seismic data. Both surveys were successfully completed in 2022.

4D Seismic Survey, Taranaki, Shell Taranaki Ltd (2017)
In accordance with the Code of Conduct, a Marine Mammal Impact Assessment (MMIA) for the 'Māui' 4D marine seismic survey was prepared in late 2017 and the survey was successfully completed in early 2018.

3D Seismic Survey, Taranaki – Schlumberger Ltd (2017)
Helen prepared an MMIA for a large Operational Area along the west coast of the North Island in 2017 and the survey was successfully acquired in the summer of 2017/2018.

3D Seismic Survey, East Coast, Schlumberger Ltd (2016)
Helen prepared an MMIA for a large Operational Area along the east coast of the North Island and the top of the South Island. This survey was successfully acquired over a six-month operational period.

3D Seismic Survey, Taranaki, PGS Ltd (2016)
MMIAs were prepared for two survey blocks in Taranaki (south and west). These multi-client surveys were conducted successfully over the 2016/2017 summer. Stakeholder engagement during the preparation of the MMIAs resulted in collaborative revisions to the proposed Operational Areas to avoid acquiring data in the Territorial Sea.

3D Seismic Survey, Taranaki, Todd Energy Ltd (2015)
Helen prepared an MMIA for the 'Trestles' Seismic Survey off Cape Egmont Taranaki. This survey was successfully acquired in February 2015.

3D Seismic Survey, North Otago, NZ Oil & Gas (2013)
An MMIA was completed for the 'Endurance' Seismic Survey off the northern coast of Otago in late 2013. Atypical sound loss modelling results for this survey gave rise for the need for additional mitigation measures (extended mitigation zones in shallow parts of the Operational Area). This survey was completed successfully in accordance with the additional mitigations.

Marine Consent Applications

Kupe Development Drilling, Taranaki, Beach Energy Ltd (2022)
This project involved drafting and lodging a Marine Consent application for a development drilling programme at the Kupe Field in the South Taranaki Bight. As part of this consent application, a thorough environmental impact assessment was undertaken, for which Helen drafted the sections of relevance to marine mammals and gave evidence at the Environment Protection Authority (EPA) hearing. This application was granted in March 2023.

Iron Sand Extraction, South Taranaki, Trans Tasman Resources Ltd (2016)
In 2016, Trans-Tasman Resources Ltd (TTR) obtained a marine consent to extract iron sand in the South Taranaki Bight. Helen assisted with the preparation of an environmental monitoring and management programme to be undertaken both prior to extraction activities commencing (baseline) and throughout the operational extraction period (impact). In particular, Helen drafted the Marine Mammal Management Plan and the Seabird Mitigation Management Plan. This application has been appealed and remains in the court system.

Māui Field Operations, Taranaki, Shell Todd Oil Services Ltd (2015)
This project involved the preparation of expert witness evidence relating to marine mammals and oiled wildlife response, and the presentation of this evidence at the STOS Marine Consent hearing. This evidence assessed the potential impacts of ongoing production at the Māui Field on marine mammals. It also outlined the potential effects of oil on wildlife and the suite of options available to respond to wildlife in the event of an oil spill. This application was granted by the Environmental Protection Authority in 2015.

Maari Development Drilling, Taranaki, OMV NZ Ltd (2014)
This project involved drafting and lodging a Marine Consent application for OMV to continue their development drilling programme at the Maari Field. As part of this consent application, a thorough environmental impact assessment was completed. This application was granted by the Environmental Protection Authority on 15 December 2014. This project also involved the preparation of expert witness evidence in relation to marine mammals and oiled wildlife response. This evidence provided a detailed assessment of the current knowledge regarding marine mammal distributions in Taranaki as well as discussing the potential impacts of the Maari field development drilling activities on marine mammals. Evidence was also presented in relation to the potential effects of oil on wildlife in the event of an oil spill and the available response options.

Oiled Wildlife Response

Oiled Wildlife Contingency Planning, New Zealand, Maritime NZ (2008-2013)
While working at Massey University, Helen played a key role in managing a large and ongoing oiled wildlife response contract with Maritime New Zealand. A key component of this contract was the maintenance of the wildlife specific information in NZ's national and regional oil spill contingency plans and the development of the National Oiled Wildlife Response Team through annual training courses. Standard Operating Procedures for Oiled Wildlife Response were also developed by Helen as part of this project.

Oiled Wildlife Contingency Planning, Western Australia, Apache, Chevron, Woodside, Vermillion, BHP Billiton, INPEX (2013)
Helen was instrumental in the preparation of an Oiled Wildlife Response Plan for the Northwest Shelf region of Western Australia. This project included the identification of wildlife sensitive sites, the development of preferred response strategies, and preparing recommendations on contingency equipment and response management structure.

Rena Wildlife Response, Bay of Plenty, Maritime NZ (2011-2012)
Helen was involved with the co-management of the oiled wildlife response component of the CV Rena oil spill: New Zealand's worst environmental maritime disaster in history. This project was complex and high profile. Specific tasks included:

- Overall management of the Oiled Wildlife Response and the Oiled Wildlife Planning Team.
- Identification of wildlife populations and priority wildlife habitats at risk of contamination.
- Day-to-day planning for the recovery of oiled wildlife, the release of treated wildlife, and end-point determination for the clean-up of habitat.

- Consultation with key stakeholders (Department of Conservation, local indigenous groups, non-government organisations, public), and
- The preparation of plans for the post-release survival and reproductive monitoring of little blue penguins and New Zealand dotterels.

Marine Mammal Research

General Marine Mammal Field Research (1998-2015)
Throughout her academic and professional career, Helen has been involved in various marine mammal field research projects around the New Zealand mainland, in the New Zealand subantarctic and further afield in the Pacific islands. These projects were funded by several different private and public sources. Helen's key research experience includes:

- Diet of NZ sea lions in the Subantarctic and Stewart Island.
- Population monitoring of NZ sea lions at Otago Peninsula, Catlins and Stewart Island (photo identification and tagging studies); and
- Cetacean surveys in coastal waters of NZ and Fiji (photo ID and biopsy techniques).

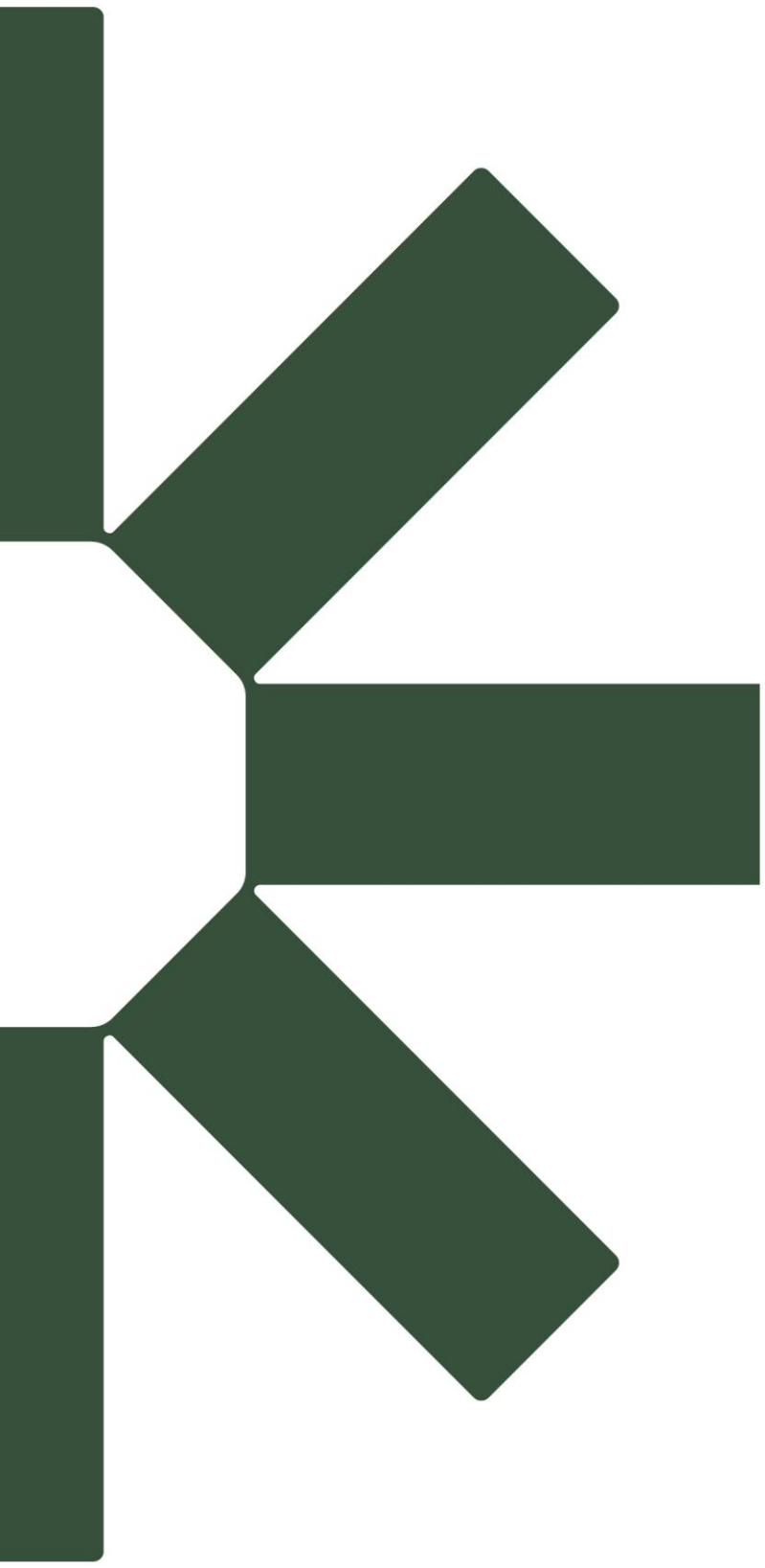
In particular, Helen has been involved in the following subantarctic expeditions:

- Sea lion pup production survey of Campbell Island in autumn 2003.
- Annual population monitoring of sea lions at the Auckland Islands during summer 2008.
- Annual winter sea lion diet surveys at the Auckland Islands from 2010–2013; and
- Sea lion diet survey at the Snares in 2013.

Publications

- Hunter, S., Tennyson, A., Bartle, S., Miskelly, C., Waugh, S., **McConnell, H.**, Morgan, K., Finlayson, S., Baylis, S., Chilvers, B.L., Gartrell, B. 2019. Assessing avian mortality during oil spills: a case study of the New Zealand MV 'Rena' oil spill, 2011. Endangered Species Research 39:303-314.
- Sievwright, K.A., Battley, P.F., **McConnell, H**., Armstrong, D.P., Morgan, K.J. 2019. Survival rates of oil-rehabilitated and non-rehabilitated little penguins after the C/V Rena oil spill, New Zealand. Marine Pollution Bulletin 146: 317-325.
- Gartrell, B.D., Browne, A., Clumpner, C., Dwyer, B., Hunter, S., Jensen, M., **McConnell, H**., Michael, S., Morgan, K.J., Nijman, P., White, B.J., Ziccardi, M. 2019. Captive husbandry and veterinary care of seabirds during the MV Rena oil spill response. Wildlife Research 46(7): 610-621.
- Sievwright, K.A., Battley, P.F., **McConnell, H**., Chilvers, B.L., Morgan, K.J. 2019. Post-release breeding success of little blue penguins following the C/V Rena oil spill, New Zealand. Marine Pollution Bulletin 149 (2019) 110553.
- Lalas, C., **McConnell, H.** Effects of seismic surveys on New Zealand fur seals during daylight hours. Marine Mammal Science 32 (2): 643 - 663. *DOI: 10.1111/mms.12293.*
- **McConnell, H**., Morgan, K., Sine, A., Leung, Y., Ward, J., Chilvers, B.L., Gartrell, B. 2015. Using seawater for cleaning oil from sea bird feathers. Methods in Ecology and Evolution 6(10). *DOI: 10.1111/2041-210X.12413.*
- **McConnell, H.M.,** Gartrell, B.D., Chilvers, B.L., Finlayson, S.T., Bridgen, P.C.E., Morgan, K.J. 2015. Baseline hydrocarbon levels in New Zealand coastal and marine avifauna. Marine Pollution Bulletin 94(1): 290 – 298. *DOI: 10.1016/j.marpolbul.2015.02.001*

- Lalas, C., **McConnell, H**., Meynier, L. 2014. Estimating size of opalfish (*Hemerocoetes* spp.) from otoliths: implications for analyses of New Zealand sea lion diet. New Zealand Journal of Marine and Freshwater Research 48(1): 1 – 14. *DOI: 10.1080/00288330.2013.816326.*
- Gartrell, B.D., Collen, R., Dowding, J.E., Gummer, H., Hunter, S., King, E.J., Laurenson, L., Lilley, C.D., Morgan, K.J., **McConnell, H.M**., Simpson, K., Ward, J.M. 2013. Captive husbandry and veterinary care of northern New Zealand dotterels (*Charadrius obscurus aquilonius*) during the CV Rena oil-spill response. Wildlife Research 40: 624 – 632.
- IPIECA-OGP (contributing author). 2014. Wildlife Response Preparedness: good practice guidelines for incident management and emergency response personnel. OGP report No. 516. Published by IPIECA, London, UK and OGP, Brussels, Belgium.
- Lalas, C., **McConnell, H**. 2012. Prey of Auckland Island shags (*Leucocarbo colensoi*) in winter. Notornis 59: 130 – 137.
- Childerhouse, S., Gibbs, N., McAlister, G., McConkey, S., **McConnell, H**., McNally, N., D. Sutherland. 2005. Distribution, abundance, and growth of New Zealand sea lion *Phocarctos hookeri* pups on Campbell Island. New Zealand Journal of Marine and Freshwater Research 39: 889 – 898.
- McConkey, S.D., **McConnell, H**., Lalas, C., Heinrich, S., Ludmerer, A., McNally, N., Parker, E., Borofsky, C., Schimanski, K., G. McIntosh. 2002. A northward spread in the breeding distribution of the New Zealand sea lion *Phocarctos hookeri*. Australian Mammalogy 24: 97 – 106.
- McConkey, S.D., Heinrich, S., Lalas, C., **McConnell, H**., N. McNally. 2002. Pattern of immigration of New Zealand sea lions *Phocarctos hookeri* to Otago, New Zealand: Implications for management. Australian Mammalogy 24: 107 – 116.



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