Assessment of Potential Effects on Marine Avifauna due to Channel Dredging at the Port of Tauranga

Contract Report No. 6654c

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Executive Summary

Port of Tauranga Limited ('POTL' or 'the Port') is preparing an application for renewal of resource consents for maintenance and capital dredging in the southern basin of Tauranga Harbour. This assessment, undertaken by Wildland Consultants, focused on the potential effects of ongoing maintenance and capital dredging on shorebirds and pelagic avifauna, including Threatened and At-Risk species, such as the kororā/northern blue penguin. The assessment is based on the evaluation of 24 years of bird observation data, recent scientific literature, and expert reports prepared for the Fast Track Approvals Act application. The review identifies the significance of the Bay of Plenty's coastal and offshore habitats for both resident and migratory seabirds, many of which are also classified as Threatened or At Risk. While dredging and associated underwater noise may cause temporary increases in turbidity and local disturbance, these impacts are predicted to be minor and short-lived, with negligible toxicological risks and minimal effects on key bird foraging and roosting areas due to species resilience and habitat separation. Vessel lighting should be minimised in light intensity, avoid short wavelength (if practicable), shielded, and reduced over-spill to limit the attraction to seabirds at night to the vessel, which is adequately addresses by a general lighting condition in the conditions proposed. Kororā/northern blue penguins were assessed in more depth as they do not have the ability to avoid dredging activity when moving between roosting sites within the harbour and foraging sites outside of the harbour. The review findings indicate that only minor, temporary disruptions will occur, due to noise-intensive activities. Overall, the proposed activities will have less than minor effects on avian biodiversity in the harbour and surrounding marine environments, enabling the resource consents to be renewed without adverse effects.

List of Acronyms

AIS	Automatic Identification System
BHD	Back-Hoe Dredging
BOPRC	Bay of Plenty Regional Council
GLS	Global Location Sensor or Geolocators
GPS	Global Positioning System
IBA	Important Bird Area
NZCPS	New Zealand Coastal Policy Statement
PoTL	Port of Tauranga Ltd
RMS	Root Mean Square
SPL	Sound Pressure Level
TSHD	Trailing Suction Hopper Dredging

Contents

Executive Summary		**2**
List of Acronyms		**2**
1.0	**Introduction**	**4**
2.0	**Code of Conduct**	**4**
3.0	**Methods**	**4**
4.0	**Existing Data**	**5**
5.0	**Surrounding Environs**	**6**
5.1	Bay of Plenty Coastal Marine Area	6
5.2	Tauranga Harbour	7
5.3	Matakana Island	7
5.4	Mauāo	7
5.5	Moturiki	8
5.6	Motuotau	8
5.7	Mōtītī and Motunau	8
5.8	Karewa	12
5.9	Tūhua	12
5.10	Other islands	12
6.0	**Assessment of Potential Effects on Avifauna**	**14**
6.1	Overview	14
6.2	Physical effects of dredging	14
6.3	Estuary birds	17
6.4	Seabirds	19
7.0	**Assessment of Potential Effects on Kororā/Northern Blue Penguin**	**19**
7.1	Relevant background research	19
7.2	Potential effects at the Port of Tauranga	22
8.0	**Mitigation**	**23**
9.0	**Conclusion**	**23**
Acknowledgments		**24**
References		**24**
Appendix 1		**28**
Cultural values report – response to mana whenua		28

1.0 Introduction

Port of Tauranga Ltd ('PoTL' or 'the Port') is preparing a resource consent application to enable deepening and widening the existing shipping channel and to maintain the dredged areas. More specifically, the Port seeks to renew the resource consents issued in March 2013 and due to expire in December of 2027. The Port proposes to continue maintenance dredging within Tauranga Harbour, at the Harbour entrance and to complete the capital dredging authorised in 2011 and that it has proposed as part of the Stella Passage Proposal (FTAA, 25 November 2025).

The capital dredging will include:

a. Deepening the approach to Berth 1 (approximately 3 metres);

b. Deepen the existing Sitting Basins (depths vary from 1 metre to 7 metres); and

c. Deepening an area of the Passing Lane to smooth the entrance corner (approximately 7 metres).

PoTL commissioned Wildland Consultants to provide an assessment on potential effects from the dredging activity on shorebird and pelagic avifauna, including kororā/northern blue penguins (*Eudyptula minor iredalei*, At Risk – Declining).

This report assesses the potential effects of the ongoing maintenance and capital dredging programme on shorebirds and pelagic avifauna.

The author and reviewer of this report has read the Environment Court's Code of Conduct for Expert Witnesses, as contained in the Environment Court's Practice Note 2023, and has complied with it in the compilation of this report.

2.0 Code of Conduct

We confirm that we have read and comply with the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. Unless stated otherwise, this report is within our areas of expertise and we have not omitted to consider material facts known to us that might alter or detract from the opinions expressed in this report.

3.0 Methods

PoTL provided relevant background information and reports submitted to support the proposed dredging activity, including:

- 'Assessment of Underwater Noise Effects' within the project footprint (Pine 2025).
- 'Water Quality Aspects of Port of Tauranga Dredging Reconsenting' (Stewart 2026).
- 'Assessment of Effects on Marine Ecology' (De Luca 2025).
- 'Assessment of Noise Effects' (Styles 2025).
- 'Assessment of Effects on Turbidity and Morphodynamics' (de Lange 2026).
- 'Assessment of Effects: Marine Mammals' (SLR 2025).

These reports were reviewed along with relevant literature assessing the responses of shorebirds and pelagic seabirds to dredging activity and different penguin species to noise, including dredging, seismic airguns, and shipping activity.

A desktop evaluation of eBird data and an assessment of survey data collected by the Port of Tauranga was assessed to determine the birds utilising Tauranga Harbour, coastal and pelagic areas adjacent to Tauranga Harbour.

4.0 Existing Data

Data was obtained from the eBird database for the period January 2000 to October 2024 and the Port of Tauranga bird survey data (October 2021 to April 2024), and focused on bird species which forage on or within the water column, i.e. shags, petrels, gulls, penguins, albatross, gannets, prions, terns, and shearwaters. The area assessed (see Figure 1) included the entire Tauranga Harbour, the coastal area between Athenree and Pāpāmoa, and includes Tūhua/Mayor Island, Mōtītī Island, Karewa Island, Motunau Island, Rūrima Island, Moutoki Island, Moutohorā Island, and Whakaari/White Island, and pelagic areas up to 100 kilometres offshore, to account for highly mobile pelagic seabirds. Although shorebirds and pelagic avifauna can be highly mobile, this area was selected to account for and represent species that may forage within the channel dredging areas or disposal sites at some point. The data reviewed provides multiple sightings for most species. Published and unpublished literature was also reviewed.

The list below has been compiled from eBird checklists and have been observed within the proposed dredging area and/or the proposed offshore disposal area:

- Australasian gannet/tākapu (*Morus serrator*, Not Threatened).
- Black petrel/tāiko (*Procellaria parkinsoni*, Threatened – Nationally Vulnerable).
- Black shag/māpunga (*Phalacrocorax carbo novaehollandiae*, At Risk – Relict).
- Black-billed gull/tarāpuka (*Chroicocephalus bulleri*, At Risk – Declining).
- Black-fronted tern/tarapirohe (*Chlidonias albostriatus*, Threatened – Nationally Endangered).
- Buller's shearwater/rako (*Adrenna bulleri*, At Risk – Declining).
- Caspian tern/taranui (*Hydroprogne caspia*, Threatened – Nationally Vulnerable).
- Fairy prion/tītī Wainui (*Pachyptila turtur*, At Risk – Relict).
- Flesh-footed shearwater/toanui (*Ardenna carneipes*, At Risk – Relict).
- Fluttering shearwater/pakahā (*Puffinus gavia*, At Risk – Relict).
- Grey-faced petrel/ōi (*Pterodroma gouldi*, Not Threatened).
- Little black shag/kawau tūī (*Phalacrocorax sulcirostris*, At Risk – Naturally Uncommon).
- Little shag/kawaupaka (*Microcarbo melanoleucos brevirostris*, At Risk – Relict).
- New Zealand white-faced storm petrel/takahikare (*Pelagodroma marina maoriana*, At Risk – Relict).
- Northern blue penguin/kororā (*Eudyptula minor iredalei,* At Risk – Declining).
- Northern diving petrel/kuaka (*Pelecanoides urinatrix urinatrix*, At Risk – Relict).
- Pied shag/kāruhiruhi (*Phalacrocorax varius varius*, At Risk – Recovering).
- Red-billed gull/tarāpunga (*Chroicocephalus novaehollandiae scopulinus*, At Risk – Declining).
- Southern black-backed gull/karoro (*Larus dominicanus dominicanus*, Not Threatened).
- White-fronted tern/tara (*Sterna striata striata*, At Risk – Declining).

Other seabird species that have been recorded further off the coast, in pelagic waters or adjacent to the various islands, are likely to forage in the area irregularly, seasonally, or during bad weather. These species may include:

- Arctic skua (*Stercorarius parasiticus*, Non-resident Native – Migrant).
- Black-winged petrel/karetai kapa mangu (*Pterodroma nigripennis*, Not Threatened).
- Blue petrel (*Halobaena caerulea*, Non-resident Native – Migrant).
- Cape petrel/karetai hurukoko (*Daption capense capense*, Non-resident Native – Migrant).
- Common tern (*Sterna hirundo longipennis*, Non-resident Native – Vagrant).
- Cook's petrel (*Pterodroma cookie*, At Risk – Relict).
- Eastern little tern/tara teo (*Sternula albifrons sinensis*, Non-resident Native – Migrant).
- Great shearwater (*Ardenna gravis*, Non-resident Native – Vagrant).
- Little black shag/kawau tūī (*Phalacrocorax sulcirostris*, At Risk – Naturally Uncommon).
- New Zealand storm petrel/takahikare-raro (*Fregetta maoriana*, Threatened – Nationally Vulnerable).
- New Zealand white-capped albatross/toroa (*Thalassarche cauta steadi*, At Risk – Declining).
- North Island little shearwater/totorere (*Puffinus assimilis haurakiensis*, At Risk – Recovering).
- Northern Buller's albatross/totora (*Thalassarche bulleri platei*, At Risk – Naturally Uncommon).
- Northern giant petrel/pāngurunguru (*Macronectes halli*, At Risk – Recovering).
- Northern royal albatross/totora (*Diomedea sanfordi*, Threatened – Nationally Vulnerable).
- Pycroft's petrel (*Pterodroma pycrofti*, At Risk – Recovering).
- Salvin's albatross/toroa (*Thalassarche salvini*, Threatened – Nationally Critical).
- Sooty shearwater/tītī (*Ardenna griseus*, At Risk – Declining).
- White-winged black tern (*Chlidonias leucopterus*, Non-resident Native – Migrant).

The data assessed comprises over 6,500 observations between January 2000 to October 2024. See Figure 1 for a visual representation of all seabird observations within the vicinity of the dredging and offshore deposit areas. This search has provided a data set that clearly indicates the suite of bird taxa utilising the subject environment.

5.0 Surrounding Environs

5.1 Bay of Plenty Coastal Marine Area

Coastal marine ecosystems and habitats, including islands, in the Bay of Plenty provide significant marine ecosystems for large populations of seabirds, which are mostly classified in Threatened and At Risk (Bay of Plenty Regional Council [BOPRC] 2021). Various maps identify the bird species present at each site and whether they breed there (Bay of Plenty Regional Council 2019; Bay of Plenty Regional Council 2021).

All coastal areas have 'habitat value' for breeding and foraging seabirds. The area also provides habitat that meets the criteria of Policy 11(a) Criteria (i) and Policy 11(b) Criteria (ii) and (v) in the New Zealand Coastal Policy Statement (NZCPS; Department of Conservation 2019; Figure 2):

Policy 11 Indigenous biological diversity (biodiversity):

To protect indigenous biological diversity in the coastal environment:

(a) Avoid adverse effect of activities on:

i. Indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists.

(b) Avoid significant adverse effect and avoid, remedy or mitigate other adverse effects of activities on:

ii. Habitats in the coastal environment that are important during the vulnerable life stages of indigenous species.

v. Habitats including areas and routes, important to migratory species.

5.2 Tauranga Harbour

Tauranga Harbour is of international significance for migratory and coastal seabirds. The tidal flats provide high tide roosts for many coastal foraging birds and meets criteria in the NZCPS Policy 11(a)(i), 11(b)(ii) and 11(b)(v) (Figures 2 and 3). These bird species forage on or within the water column and some nest within Tauranga Harbour or on the coastal islands. Port of Tauranga land and structures provides roosting and nesting habitat for kororā/northern blue penguin (*Eudyptula minor iredalei,* At Risk-Declining; nesting in rock wall burrows/crevices at Mount Maunganui), tarāpunga/red-billed gull (*Chroicocephalus novaehollandiae scopulinus*, At Risk – Declining; nests/roosts on a rock wall at Mount Maunganui and periodically at the Sulphur Point sand pile), tarapirohe/black-fronted tern (*Chlidonias albostriatus*, Threatened – Nationally Endangered, Sulphur Point sand pile), kāruhiruhi/pied shag (*Phalacrocorax varius varius*, At Risk – Recovering; roosts/nests on wharfs and piles), and karoro/southern black-backed gull (*Larus dominicanus dominicanus*, Not Threatened; roost/nests on structures and roofs and is a predator of eggs and chicks of other species).

5.3 Matakana Island

Matakana Island is Aotearoa New Zealand's largest sand bar island and is a Wildlife Refuge. Tahunamanu Spit/Island provides breeding habitat for taranui/Caspian tern (*Hydroprogne caspia*, Threatened – Nationally Vulnerable; Figures 2 and 3). There is a significant breeding site for tuturiwhatu/New Zealand dotterel (*Charadrius obscurus aquilonius*) at Panepane Point, at the eastern end of the island.

This area meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

5.4 Mauāo

Mauāo/Mount Maunganui is adjacent to the proposed channel dredging and the offshore deposit area (Figures 2 and 3). This area provides nesting and foraging habitat for kororā/northern blue penguin and ōi/grey-faced petrel (*Pterodroma gouldi*, Not Threatened), and nesting, roosting, and foraging for kāruhiruhi/pied shag.

Mauāo meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

5.5 Moturiki

Moturiki (Leisure) Island is a small coastal island accessible by a short sand spit from Mount Maunganui Beach (Figures 2 and 3). The island is situated adjacent to the proposed offshore deposit area and the existing channel boundary. Moturiki provides foraging and breeding habitat for takahikare/New Zealand white-faced storm petrel (*Pelagodroma marina maoriana*, At Risk – Relict), kororā/northern blue penguin, kuaka/northern diving petrel, tarāpunga/red-billed gull, and karoro/southern black-backed gull.

Moturiki meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

5.6 Motuotau

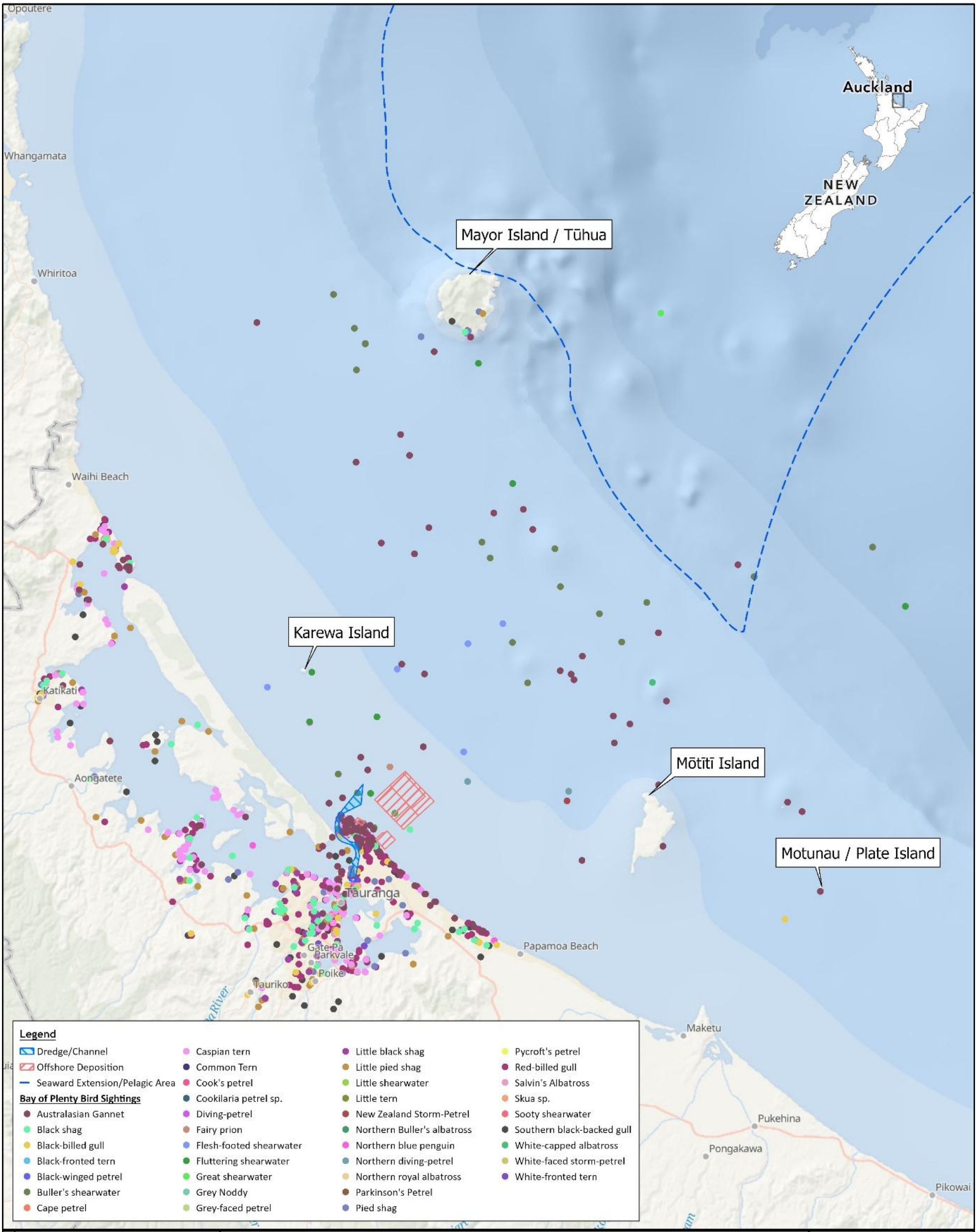
Motuotau (Rabbit) Island is a coastal island east of Mount Maunganui and is situated adjacent to the proposed offshore deposit area and the existing channel boundary (Figures 2 and 3). Motuotau provides foraging and breeding habitat for a high density of kororā/northern blue penguin, breeding kuaka/northern diving petrel, ōi/grey-faced petrel and pakahā/fluttering shearwater (*Puffinus gavia*, At Risk – Relict).

Motuotau meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

5.7 Mōtītī and Motunau

Mōtītī and Motunau (Plate) Island are situated further offshore, southeast of the proposed sediment deposition area (Figures 2 and 3).

Mōtītī is privately owned and provides foraging and breeding habitat for kororā/northern blue penguin (*Eudyptula minor iredalei,* At Risk – Declining), kuaka/northern diving petrel, tarāpunga/red-billed gull, karoro/southern black-backed gull, kāruhiruhi/pied shag, pakahā/fluttering shearwater and toanui/flesh-footed shearwater (*Ardenna carneipes*, At Risk – Relict).



Data Acknowledgment

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Figure 1. Location of seabird observations within Tauranga Harbour, the coastal area between Athenree and Pāpāmoa, and including Motiti Island, Karewa Island, Mayor Island, Motunau Island, Motuotau Island and Moturiki Island.

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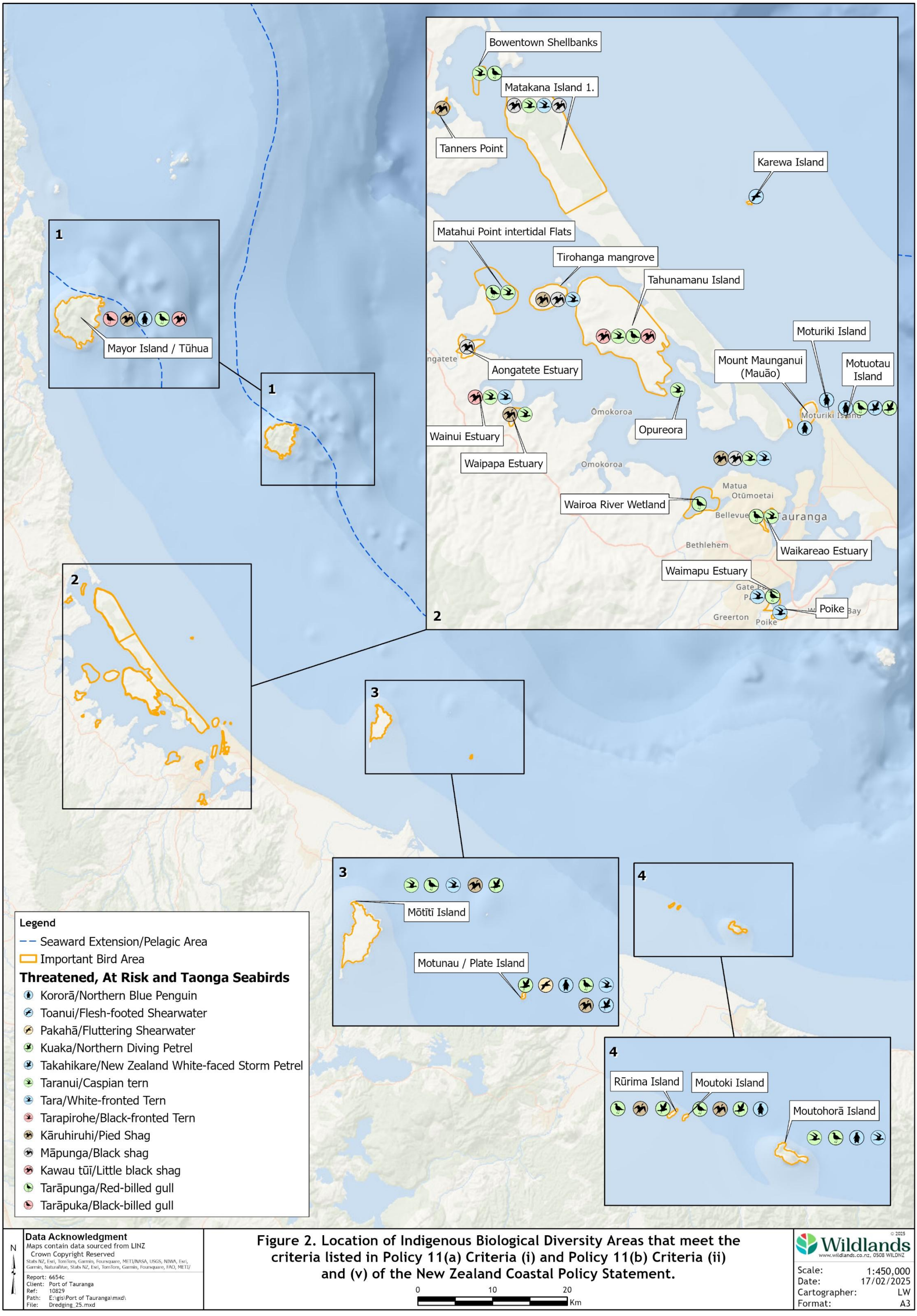


Figure 2. Location of Indigenous Biological Diversity Areas that meet the criteria listed in Policy 11(a) Criteria (i) and Policy 11(b) Criteria (ii) and (v) of the New Zealand Coastal Policy Statement.

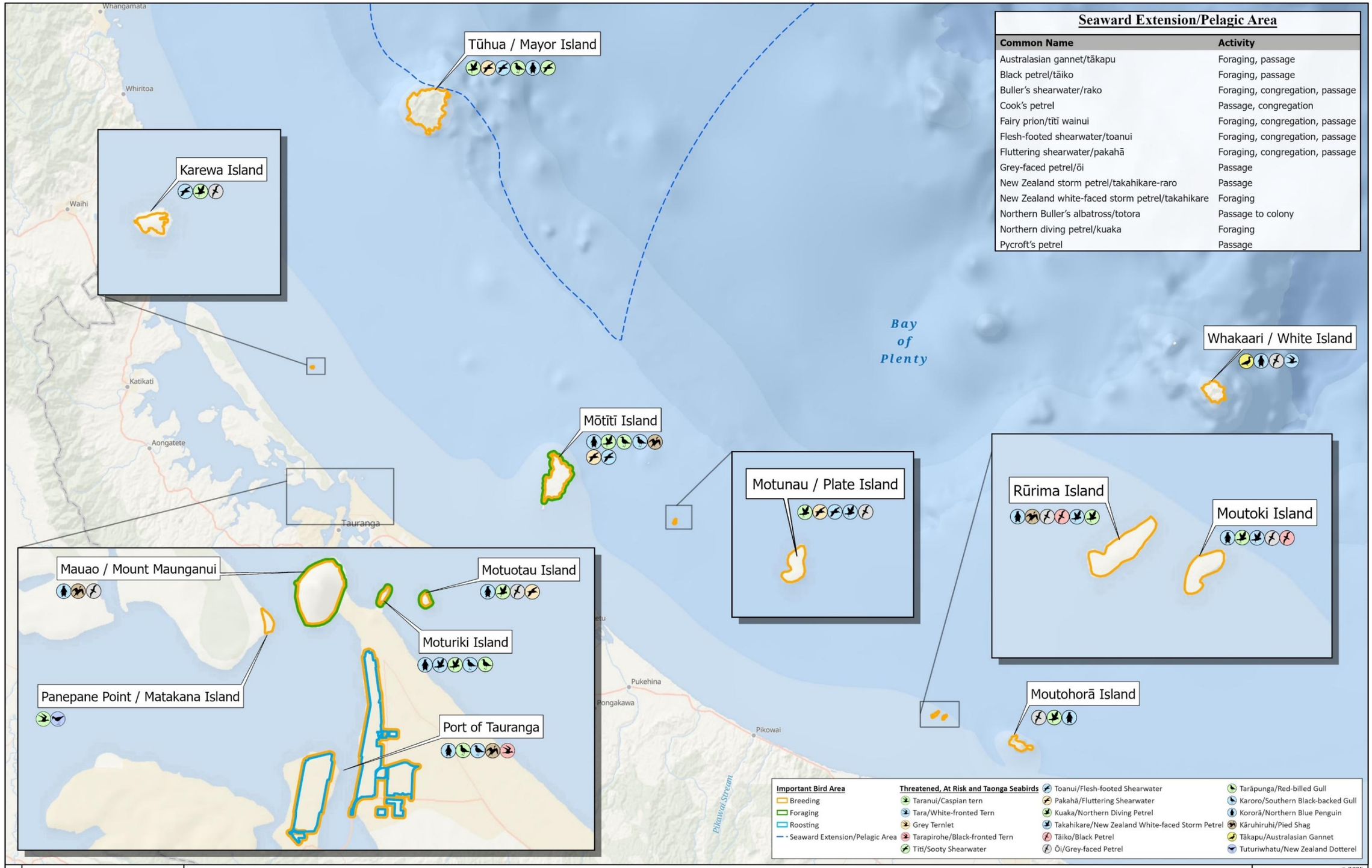


Figure 3. Location of Important Bird Areas which provide habitat for breeding, roosting or foraging of Threatened, At-Risk and Taonga seabirds

Mōtītī Island meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

Motunau (Plate) Island is owned by Ngāti Whakahemo and is a Wildlife Sanctuary that has large populations of kuaka/northern diving petrel, pakahā/fluttering shearwater and flesh-footed shearwater/toanui (*Ardenna carneipes*, At Risk – Relict), takahikare/New Zealand white-faced storm petrel and ōi/grey-faced petrel (Figures 2 and 3).

Motunau meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

5.8 Karewa

Karewa Island is a pest-free Wildlife Sanctuary administered by the Department of Conservation in close cooperation with Ngāti Ranginui (Figures 2 and 3). Karewa is situated northwest of the mouth of Tauranga Harbour, approximately nine kilometres from the existing channel boundary. This island is an important breeding area for toanui/flesh-footed shearwater (*Ardenna carneipes*, At Risk-Relict), kuaka/northern diving petrel and ōi/grey-faced petrel.

Karewa meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

5.9 Tūhua

Tūhua/Mayor Island is situated further northwest from the proposed channel dredging area (approximately 33 kilometres) and provides breeding habitat for kuaka/northern diving petrel, pakahā/fluttering shearwater, toanui/flesh-footed shearwater, tarāpunga/red-billed gull, kororā/northern blue penguin and tītī/sooty shearwater (*Ardenna griseus*, At Risk-Declining; Figures 2 and 3).

Tūhua meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

5.10 Other islands

Other islands are situated further from the proposed dredging channel and offshore sediment sediment deposition area, as discussed below:

- Moutohorā (Whale) Island is a wildlife management reserve/wildlife refuge and is an important breeding colony for ōi/grey-faced petrel (Figures 2 and 3). Kuaka/northern diving petrel, kororā/northern blue penguin and tītī/sooty shearwater also breed on Moutohorā Island. Moutohorā meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria.
- Rūrima Island is the largest island of the Rūrima Rocks and provides breeding habitat for kororā/northern blue penguin, kuaka/northern diving petrel, kāruhiruhi/pied shag and various other petrel species, which may include ōi/grey-faced petrel, tāiko/black petrel (*Procellaria parkinsoni*, Threatened-Nationally Vulnerable), and takahikare/New Zealand white-faced storm petrel (Figures 2 and 3). Rūrima meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria.
- Moutoki Island is a wildlife refuge that is pest and mammal free and is privately owned by the Rūrima Trust. It is part of the Rūrima Rocks and provides breeding habitat for kororā/northern blue penguin and various petrel species, these may include kuaka/northern diving petrel, ōi/grey-faced petrel, tāiko/black petrel (*Procellaria parkinsoni*, Threatened-Nationally Vulnerable), takahikare/New Zealand white-faced storm petrel and kuaka/northern diving petrel. This island is approximately 75 kilometres northeast of the proposed offshore disposal area. Moutoki meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria (Figure 2).

- Whakaari/White Island is an active volcano and is privately owned. Although the island is situated approximately 84 kilometres east of the proposed offshore disposal area, this island provides breeding habitat for one of Aotearoa New Zealand's largest tākapu/Australasian gannet (*Morus serrator*, Not Threatened) colonies (Figure 2). Kororā/northern blue penguin, ōi/grey-faced petrel and grey ternlet (*Procelsterna cerulea albivittata*, At Risk-Relict) breed on the island and also possibly other seabird species, such as tara/white-fronted tern (*Sterna striata striata*, At Risk-Declining). Whakaari meets the NZCPS Policy 11(a)(i) and 11(b)(ii) criteria.

Pelagic areas of the Bay of Plenty and the seaward extension of the northern North Island is recognised as an Important Bird Area (IBA; see Figure 2) and provides foraging, passage to colonies and areas for bird congregations (Forest and Bird 2014). The IBA is triggered by species which breed within the region and have been observed and/or GPS or GLS tracked using the area (Table 1, Figure 3). The seaward extension meets the NZCPS Policy 11(a)(i) and 11(b)(v) criteria.

Table 1 – Bird species which breed, forage, congregate, and use the Northern North Island pelagic area and have triggered identification of the area as an Important Bird Area (from Forest and Bird 2014).

Common Name	Scientific Name	Threat Classification 2021	Observed or Tracked	Activity
Australasian gannet/tākapu	*Morus serrator*	Not Threatened	Observed, GPS	00
Black petrel/tāiko	*Procellaria parkinsoni*	Threatened – Nationally Vulnerable	Observed, GLS, GPS	Foraging, passage
Buller's shearwater/rako	*Adrenna bulleri*	At Risk – Declining	Observed, GLS	Foraging, congregation, passage
Cook's petrel	*Pterodroma cookii*	At Risk – Relict	Observed, GLS	Passage, congregation
Fairy prion/tītī wainui	*Pachyptila turtur*	At Risk – Relict	Observed	Foraging, congregation, passage
Flesh-footed shearwater/toanui	*Ardenna carneipes*	At Risk – Relict	Observed	Foraging, congregation, passage
Fluttering shearwater/pakahā	*Puffinus gavia*	At Risk – Relict	Observed, GLS	Foraging, congregation, passage
Grey-faced petrel/ōi	*Pterodroma gouldi*	Not Threatened	Observed, GLS, GPS	Passage
New Zealand storm petrel/takahikare-raro	*Fregetta maoriana*	Threatened – Nationally Vulnerable	Observed	Passage
New Zealand white-faced storm petrel/takahikare	*Pelagodroma marina maoriana*	At Risk – Relict	Observed	Foraging
Northern Buller's albatross/totora	*Thalassarche bulleri platei*	At Risk – Naturally Uncommon		Passage to colony
Northern diving petrel/kuaka	*Pelecanoides urinatrix urinatrix*	At Risk – Relict	Observed, GLS	Foraging
Pycroft's petrel	*Pterodroma pycrofti*	At Risk – Recovering	Observed, GLS	Passage

6.0 Assessment of Potential Effects on Avifauna

6.1 Overview

The data assessed provides a good indication of bird species within the Tauranga Harbour, coastal areas and adjacent islands. The 24 years of data show that many bird species forage throughout the area of interest. However, the information is 'controlled' by where observers can undertake surveys, which may be from coastal land-based sites or from a boat. Observations within the proposed main offshore sediment deposition area are limited as the site is approximately two kilometres offshore. However, general observations around the coastal margin indicate the species assemblage which would utilise the dredging area and adjacent environs.

The following potential effects have been evaluated:

- Physical effects of dredging.
- Effects on estuary birds.
- Effects on seabirds.
- Effects on kororā/northern blue penguins.

6.2 Physical effects of dredging

6.2.1 Dredging methods

PoTL proposes to use international dredging companies to undertake the capital dredging programme. Therefore, the exact size of vessels to be used is unknown. However, PoTL expects most of the dredging to be undertaken by Trailing Suction Hopper Dredging ('TSHD'), and tight or difficult to reach areas, or where material encountered is sufficiently cohesive will be undertaken using Back-Hoe Dredging ('BHD'). TSHD sucks up sandy or loose material from the seabed using a long suction pipe that trails behind the ship (PoTL 2024). This dragging action allows for the extraction of material in a slurry of water, and the excavated material is sucked into the hopper using powerful pumps. This method does produce some localised turbidity within the water column. The slurry of dredge material and seawater separate in the hopper, and excess seawater can be decanted through an outlet at the bottom of the vessel. Finer sediment particles may be released through the decanted water, leading to silty water being released. To mitigate this, valves can be fitted or overflow can be limited for TSHDs, which reduces turbidity in the surrounding water.

Once the hopper is full, the dredge will travel to a specific deposition site for release, either by opening the hopper doors or through a split hull. The deposition sites are broken into a grid, allowing for small deposits over sequential areas to ensure even deposition of material across the site. Increased turbidity will occur during deposition, but disturbances will be minimal as the deposition sites vary and gaps exist between each deposit location, allowing sediment time to settle.

BHD is undertaken by a barge-mounted bucket excavator and used to remove clay, sand, pebbles, boulders and fragmented rocks (PoTL 2024). BHD is suitable for harder-to-dredge material, hard to reach areas, including berth pockets, tight corners, along toe lines of channels and other hard-to-reach places. Before works can commence, the barge is anchored to the seafloor by spuds to ensure stability and accurate excavation. As material is excavated from the seafloor, local turbidity will increase as material spills from the top of the bucket when emerging from the sea. The spillage of material can be controlled through the lifting speed. However, this increases the time period needed to undertake the work. Excavated material is then loaded onto another barge for transportation to the deposition sites.

6.2.2 Turbidity

Both dredging methods will increase the turbidity of the extraction and receiving areas (Stewart 2026). However, the effects will be localised, short-term and will have a less than minor effect on the receiving environment (Stewart 2026; Leonard *et al.* 2020). Through the dredging process and disposal of material, benthic fauna which have been collected during dredging will be released into the water column and will provide potential foraging opportunities for shorebirds and seabird species. For example, turbidity can increase the concentration of fish near the surface of the water, which can increase the foraging behaviour of terns (Lukies *et al.* 2021). A study on Australian little penguins (*Eudyptula minor*) foraging in an estuarine area with plume fronts found that they have the ability to selectively forage in waters with varying levels of turbidity as these conditions can attract and aggregate zooplankton (Kowalczyk *et al*. 20015). However, depending on the level of turbidity within the dredging and deposition area, visual foragers, such as kororā/northern blue penguins, may be inhibited from foraging within the immediate area as prey may be harder to see. Chimienti *et al*. (2023) found an increase in the time little penguins spent hunting in coastal, colder and more turbid waters off Phillip Island, Australia. In the Port Phillips Bay proposed dredging of the shipping channels, it was estimated that the area of turbidity would cover an area of approximately four kilometres wide and 18 kilometres long before settling. The visual effect of the suspended sediment can vary depending on the grain size, grain shape and colour (see de Lange 2026). However, kororā/blue penguins use above and below water navigation to move through their environment. Nevertheless, potential modification of foraging areas due to any suspended sedimentation from dredging activities, including offshore disposal of dredged material, should be less than minor as it is believed that the sediment mixes and settles reasonably quickly.

6.2.3 Noise

Pine (2025) undertook an underwater assessment of the ambient hourly sound levels (soundscape) of Tauranga Harbour and found levels of 109-138 dB (decibels) re 1 µPa (micropascal) near the harbour entrance and in the Stella Passage of 118-147 dB re 1 µPa. Vessel noise was then assessed using Automatic Identification System (AIS) traffic noise models, indicating an increase in ambient noise levels of over 15 dB for approximately 30 to 522 seconds between 1 September and 21 October 2022 near the harbour entrance and an exceedance of approximately 33 dB inside the Port Zone. However, it is acknowledged that the assessed noise level is conservative as recreational vessels do not carry AIS.

When assessing the two proposed dredging vessel types, the main focus was on the small-sized TSHD as this vessel will undertake within harbour and outside of harbour works. During July and August 2023, the Port of Tauranga undertook maintenance dredging of the shipping channel within and outside of the harbour using the small-sized TSHD *Albatros*. An average of daily maintenance dredging noise levels within and outside of the Port Zone increased by 1.1 ± 0.2 dB re 1 µPa (unweighted), 1.2 ± 0.2 dB re 1 µPa (LF-weighted), 1.9 ± 0.3 dB re 1 µPa (HF-weighted) and 2.0 ± 0.3 dB re 1 µPa (OW-weighted).

When considering noise effects on the environment in general (above water acoustics), the noise limits follow the Construction Noise Standards (Styles 2024). Styles (2024) assessed a worst-case scenario for the potential noise levels from dredging when assessing the Inner Noise Control Boundary and inside the Outer Noise Control Boundary for the Port Zone, residential, commercial, passive and active open spaces areas. Styles (2025) considered the noise levels to be reasonable at all times, and comply with the recommended noise limits for the Construction Noise Standard at the Whareroa Marae. Styles (2024) acknowledges that there will be an audible increase in dredging noise when works are undertaken close to Mauāo/Mount Maunganui and Matakana Island. However, the effects will be similar to noise generated by commercial and recreational harbour traffic, short, interspersed with quiet periods (dredge travelling to and from the disposition sites), and temporary as dredging will be undertaken within other areas.

The impact of noise on bird populations in marine environments is influenced by the specific characteristics of the bird species and their previous exposure to disturbances from noise sources (Harbrow *et al.* 2011). Variations in noise levels and species traits can lead to a range of effects, such as direct physical damage (e.g. hearing loss), increased physiological stress (e.g. higher energy expenditure or decreased energy accumulation), and behavioural responses, e.g. attraction, tolerance, aversion, and flight; National Park Service 1994.

Since dredging activities will be undertaken at a slow, steady pace with only necessary manoeuvres between the dredging site and disposal sites, and because the noise levels generated will be similar to current port activities, the overall impact of dredging on shorebirds and waders will be significantly less than that caused by commercial and recreational harbour traffic.

Flight initiation distances (FID) are often used when assessing the impact of human activities on bird populations. These distances indicate how far away birds will start to escape when approaching human activity (Livezey *et al.* 2016). Studies involving species such as stilts, avocets, sandpipers, and kuaka/eastern bar-tailed godwits in Australia, as well as plovers, herons, and egrets in North America, have shown that motorised watercraft can approach non-nesting birds to an average distance of 41 metres (ranging from 22.9 to 60.7 metres) before changes in flight-initiated behaviour are observed (Paton *et al.* 2000; Peters and Otis 2006; Rodgers and Schwikert 2002; Rodgers and Smith 1997).

For waders and shorebirds within the Tauranga Harbour, foraging and roosting activities occur away from the dredging activity. Where dredging work occurs near the sitting basins, berths and fenders, the dredge head will come within a few metres of these structures. The dredging activity in the shipping channel will be at least 50 metres from any wharves and coastal areas where shorebirds and waders may forage or roost. Overall, the potential effect on waders and shorebirds will be less than minor.

6.2.4 Artificial lighting

Dredging works will occur 24 hours a day. During the hours of darkness, dredge vessels will comply with standard navigation and operational lighting requirements.

Many bird species can be disoriented by artificial light sources, including seabird species (Commonwealth of Australia, 2020). The most commonly affected species are petrels, shearwaters, albatrosses, terns and some penguins. The main concern with vessel lighting is the potential for bird strike with structures.

The spectral composition of light is thought to affect attraction: white and blue light are highly attractive to all seabirds (Commonwealth of Australia, 2020). All seabirds are sensitive to the violet-blue spectrum and short wavelength (400-500 nm). However, the intensity of lights can be more important than colour, and the placement of the light source within the surrounding environment can influence a bird's attraction. The dredging activity will occur within the Tauranga Harbour and adjacent to Mauāo/Mount Maunganui and Matakana Island, where sky glow from commercial and residential lighting is already altering the marine environment. The addition of dredging activity lighting will have minimal cumulative effect on the surrounding environment, with a less than minor to negligible effect.

However, to further minimise the effects of bird strike risk, any lighting that is not necessary to ensure safe operation or navigation should be turned off. Lighting should be shielded to prevent horizontal (over 45 degrees) and vertical (towards the sky) spill, where possible. Lighting should be downward facing on the intended surface (vessel deck, trailing arm and draghead), limited spill-over onto the sea,

and at as low an intensity as practicable (Commonwealth of Australia, 2020). Lights on deck and within the vessel should also be turned off when not required. This mitigation is adequately addressed by a general lighting condition in the conditions proposed.

Any spill-over light may attract fish and zooplankton to the surface, increasing foraging opportunities for seabirds, including kororā/northern blue penguins by providing an additional food source. However, it is more likely that they will continue into the open ocean to regular foraging areas. Gulls, shags and terns may also be opportunistic to forage on any fish or zooplankton that come to the surface. This could have a positive effect on foraging birds. However, the noise and dredging activity may cause the birds to avoid this potential food source.

6.3 Estuary birds

Potential effects on estuary birds have been reviewed in relation to Dr Stewart's water quality assessment, Dr De Luca's assessment of marine ecology, and Dr de Lange's coastal processes report, taking account of sedimentation, turbidity, toxicity, and food resources for avifauna.

Stewart (2025) states that the assessment of sediment toxicity from dredging has generally very low toxicity outside of the Port area but is higher within Tauranga Harbour near urban sites due to stormwater outflows. Sediment from dredging sites is also generally low in toxicity and is consistent with the receiving environment. Furthermore, shellfish flesh toxicant concentrations are also very low. According to the Australian and New Zealand Guidelines for Freshwater and Marine Water Quality default guideline values, they are within the safe consumption limits (De Luca 2025). However, the fact that fish and shellfish have contamination levels considered safe for humans does not automatically mean that seabirds and shorebirds are protected from adverse effects. Birds often have different physiological tolerances and detoxification mechanisms than humans. A contaminant level acceptable for occasional human consumption might be harmful if birds are exposed to it continuously. Furthermore, humans typically consume only small amounts of these animals, whereas seabirds and shorebirds might rely on the entire organism and consume them very frequently. This means that even low-level contaminants can accumulate over time (e.g. bioaccumulation) and potentially reach harmful levels in birds. Some chemicals, such as mercury and persistent organic pollutants, can affect neurological function, reproduction and overall health in birds (Vitzuete *et al.* 2019). Even if the level seems 'safe' by human standards, different bird species can have varying sensitivity to these contaminants, so what is safe for one species might be harmful for another.

Nevertheless, birds can reduce or eliminate accumulation of contaminants through excretion, transfer to eggs or eggshells, and moulting feathers (Vitzuete *et al.* 2019). Bioaccumulation or cumulative effects come from chronic exposure through a diet of contaminated prey, which can lead to health issues in birds that might not be immediately apparent. Long-term studies often show that even modest contamination can impair reproductive success or lead to other sub-lethal effects (Vitzuete *et al.* 2019).

Avifauna have evolved in various habitats and under different environmental conditions which can naturally release trace metals into the environment (e.g. volcanic events, soil or rock weathering, wildfires, geothermal activity, floods and storms). Avifauna have various methods of excreting or sequestering heavy metals including mercury, lead, cadmium, selenium, manganese, and chromium (Burger 1994; Burger & Gochfeld 1999; Finger *et al*. 2017; Furness *et al*. 1990). These methods can include birds excreting heavy metals by deposition in the uropygial gland (preening gland), salt gland, feathers, faeces, and eggs/eggshell (Burger 1994; Finger *et al*. 2017; Pedrobom *et al.* 2021).

Furness *et al*. (1990) studied mercury levels in chick and adult feathers of tarāpunga/red-billed gull (*Chroicocephalus novaehollandiae scopulinus*, At Risk – Declining) in Kaikōura. Mercury is accumulated throughout the year and deposited into the feathers which were then moulted each autumn. Salt glands in Laysian albatross (*Phoebastria immutabilis*, Non-resident Native – Vagrant) had high concentrations of some metals (e.g., lead), suggesting that some species may use the salt gland (which is used for the excretion of sodium chloride) as an excretory organ for heavy metals (Burger & Gochfeld 1999). Mercury in feathers of common terns also illustrates the loss of this metal through the moult process and the body burdens of selenium, chromium, and manganese showed no toxic hazards at the levels found within this species (Burger *et al.* 1994). Fourteen species of albatross and petrels that were collected as fisheries by-catch found that Procellariiformes may be able to demethylate mercury into the less toxic inorganic form and transfer any remaining methyl mercury into plumage during moult. Cadmium concentration was recorded to be high in kuia/grey petrel (*Procellaria cinerea*, At Risk – Relict) and tītī/sooty shearwaters (*Ardenna griseus*, At Risk – Declining) but did not reach the level of 100-200µg g^{-1} wet mass thought to cause toxic effects.

Furthermore, bioaccumulation can take weeks, months or years, depending on the contaminant concentration and the exposure length. However, seabirds are less sensitive to mercury and cadmium than other bird species because they evolved with exposure to natural background levels of these elements in seawater (Burger *et al.* 2009). Nevertheless, blood levels provide an estimate of daily intake. For example, mercury concentration thresholds in avifauna blood can be used as a benchmark for daily consumption levels (Ackerman *et al.* 2014; Ackerman *et al.* 2016; Evers *et al.* 2008; Heinz *et al.* 2009; Scheuhammer *et al.* 2007):

- Low Risk: 0.2 to <1.0 µg/g wet weight (ww).
- Moderate Risk: 1.0 to <3.0 µg/g ww.
- High Risk: 3.0 to <4.0 µg/g ww.
- Severe Risk: ≥4.0 µg/g ww.

By assessing these limits (micrograms per gram; µg/g) and assessing the monitoring results for mercury in 30 grams of pipi flesh, as identified by de Luca (2025), the range detected was <0.01 to 0.012 µg/kg (micrograms per kilogram). The daily intake risk to avifauna is minor to negligible for bioaccumulation.

As there is no detectable increase in shellfish toxicity from dredging activity, the effect will be less than minor to negligible on estuarine food resources for wading and shorebirds. Furthermore, De Luca (2025) identifies that the marine environment within and adjacent to the proposed dredging and disposal areas are of Moderate to High ecological values overall, identifying existing habitat modification from previous dredging campaigns has limited to no effect. However, there is a high diversity of indigenous marine organisms within the soft and hard shorelines in the southern basin of Tauranga Harbour, with diverse and abundant fish present. These findings indicate that the environment provides foraging resources for waders and shorebirds, and the overall effect of dredging on these species will be less than minor.

Water quality assessment by Stewart (2026) also shows negligible effects on water temperature, pH, salinity, and dissolved oxygen (DO) from dredging and disposal activity.

Overall, due to the short term/temporary activity throughout the Port and coastal areas during dredging and deposition and the settlement of sediment, the overall effect of dredging will be less than minor.

6.4 Seabirds

Seabirds travel significant distances from breeding/roosting sites and forage over large areas. The overall impact of previous and proposed dredging on seabirds will be minor as alternative areas will be available away from any active dredging area or offshore deposit site. Disturbance of foraging birds by activities associated with dredging will be minor, as seabirds can avoid dredging sites and offshore deposition areas. Nevertheless, turbid waters may result in the accumulation of prey concentrations near the ocean surface, and species such as gulls, shags and terns may choose to forage within the dredging and offshore deposition areas (Lukies *et al.* 2021). Shallow-plunge-diving seabirds, such as terns, will forage within turbid waters. It is likely that turbidity changes the predator-prey relationship between the foraging birds and their prey, as turbidity can concentrate small fish closer to the water's surface or fish will aggregate and move away from the turbidity (Lukies *et al.* 2001). If benthic species are displaced during dredging (collected during dredging activity) and become available to seabird species near the water's surface, this could positively affect these species by providing an additional food resource, providing a positive effect.

7.0 Assessment of Potential Effects on Kororā/Northern Blue Penguin

7.1 Relevant background research

Potential effects on kororā/northern blue penguins arriving at or leaving the Port area and passing near the inner harbour dredging site required further consideration as these birds swim through the water column and cannot avoid the area through the use of flight. Sediment from sea-based activities can increase turbidity and affect navigation for penguins (Lukies *et al.* 2021). However, any sediment in the water column due to dredging activity will mix and settle reasonably quickly (MetOcean 2024) and the water column should be relatively free from turbidity when kororā are travelling through any dredging sites. Furthermore, penguins are central place foragers during the breeding season (Agnew *et al.* 2015), and it is unknown whether they forage within the offshore deposition sites as there are very few eBird observations within these areas. Modelling by MetOcean (2024) indicates that sediment suspended from the drag head will settle out of suspension almost immediately, predominantly near the seabed. Furthermore, any overflow of turbid water from the hopper can be controlled through dredge management by withholding water and allowing the sediment to settle within the hopper before releasing the water (de Lange 2026, Stewart 2026).

Consideration has been given to the effects of underwater noise generated above the current soundscape by dredging activities on kororā/northern blue penguins. Unlike other seabirds and shorebirds, penguins cannot fly over areas to avoid disturbances. Instead, they must remain at the surface or swim underwater while foraging or transiting through a site.

7.1.1 Underwater noise – general

Anthropogenic noise, including shipping noise, has been shown to adversely affect marine mammals and can potentially affect penguin behaviour in several different ways:

- Communication disruption: marine mammals and penguins use vocalisations for communication, especially during the breeding season (e.g. mating and chick-rearing periods). Shipping noise can interfere with these vocalisations, making it more difficult for individuals to find mates and coordinate parental care. This can affect their reproductive success (Ahmed 2022).

- Foraging behaviour: noise pollution from ships can alter foraging patterns. For example, masking natural sounds can make it harder for animals to detect prey, reducing foraging efficiency. This increased difficulty in finding food can result in an individual expending more energy and time to meet their dietary needs (Ahmed 2022).
- Stress and health: chronic exposure to shipping noise can induce stress in mammals and penguins. Elevated stress levels can compromise their immune systems, making them more susceptible to diseases and potentially reducing their overall fitness and lifespan (Ahmed 2022; Rojano-Donate *et al.* 2023).
- Habitat avoidance: marine animals might avoid areas with high levels of noise pollution, leading to habitat displacement. This avoidance can limit their access to crucial feeding grounds and breeding sites, further affecting their population dynamics and conservation status (Ahmed 2022; Rojano-Donate *et al.* 2023).

7.1.2 Auditory abilities of penguins

Research on the auditory ability of various penguin species is limited to a few studies, e.g. gentoo penguin, *Pygoscelis papuaI*, and African penguin, *Spheniscus demersus*. Sørensen *et al.* (2020) found that gentoo penguins (*Pygoscelis papuaI*, n=7) reacted to underwater noise bursts when played noises within a holding tank at Odense Zoo, Denmark, at sound pressure levels between 100 and 120 dB re 1 µPa RMS (root mean square). The penguins showed no reactions at 100 dB, but more than 60% exhibited strong reactions at 120 dB re 1 µPa. This indicates that penguins can detect and respond to underwater noise, suggesting sensitivity to anthropogenic noise similar to many species of marine mammals.

The study took into account the ambient noise levels when analysing responses of penguins to sound bursts. The 20 dB increment increase in received level was sufficient to change the reaction of the birds from no observable response to a strong aversive response, indicating that the 20 dB increase in noise level above the ambient noise was enough to elicit a response from the penguins. All startled responses were away from the loudspeaker within the holding tank, and this directional response could be associated with the speaker being a visual cue of the source of the sound. The penguins could also have detected the increase in the sound field when approaching the speaker and responded by swimming towards the lower sound level. Nevertheless, reactions of captive species can provide an indication of response, but the level of response may not be consistent within a wild population.

Wever *et al.* (1969) found that black-footed penguins (*Spheniscus demersus*) are most sensitive to sounds between 600-4000 Hz through cochlear potential by playing tones and recording the penguins' response and vocalisations (grunts and brays) and kororā/blue penguins have in-air vocalisations ranging between 1000-5500 Hz as identified by analysing chick begging calls (Nakagawa *et al.* 2001).

7.1.3 Underwater noise effects

Pichegru *et al.* (2022) highlight the significant negative impacts of underwater noise on African penguins. The increased maritime traffic and associated noise levels in Algoa Bay, South Africa, have led to a substantial decline in penguin populations. A significant rise in maritime traffic occurred between 2013 and 2020, with the frequency of vessels doubling and bulk carriers increasing tenfold. Since 2015, the ambient underwater noise levels were approximately 140 dB re 1 µPa and increased by 2 dB Sound Pressure Level (SPL) following the initiation of ship-to-ship bunkering of fuel, doubling underwater noise intensity. This has led to an 85% decline in penguin numbers on St Croix Island since 2016, which correlates to the increased noise levels.

Similarly, seismic surveys for oil and gas exploration have been observed, causing behavioural changes that are likely affecting penguin survival and reproduction (Pichegru *et al.* 2017). African penguins were observed foraging further away during seismic activities, increasing their overall foraging effort and avoiding areas with active seismic operations. On average, penguins foraged within 65 kilometres of their colony in the absence of seismic activity compared to 77 kilometres during seismic testing, indicating a direct disturbance from the noise. This increased foraging effort and changes in foraging locations could impact penguin reproductive success and survival due to higher energy expenditure and stress. Seismic testing produces very sudden, intense noise, with the air guns generating loud, sharp sounds directed at the seabed and can reach levels of 230-255 dB re 1 µPa at 1 metre and are typically low frequency (10-100 Hz). This intense noise propagates horizontally, making it detectable up to 50-75 kilometres in shallow waters and even farther in deep waters. This sudden and intense noise from seismic testing can significantly disrupt marine life but it is unclear whether the shift in penguin foraging location could also be due to prey distribution shift. Nevertheless, the proposed Tauranga Port maintenance and capital dredging will not produce noise levels anywhere near these levels and will not be invasive for kororā/northern blue penguins.

The impact of underwater noise on kororā/little penguins has been subject to concern, given the scarcity of data on the negative effects of such noise on seabirds. Research indicates that anthropogenic noise is audible to penguins, with peak hearing ranges between 200 and 6000 Hz, and extending above 10 kHz (Wever *et al.* 1969; Woehler 2002). This hearing range coincides with the vocalisation frequencies of some penguins and overlaps significantly with the frequencies of construction noise, suggesting potential noise effects (Thiebault *et al.* 2019). As discussed above, Sørensen *et al.* (2020) found that penguins exhibited clear behavioural responses at noise levels at different graded levels with minor behavioural responses beginning at levels above 100 dB re 1 µPa, stronger reactions at levels above 115 dB re 1 µPa, and more than 60% of test subjects strongly reacting at 120 dB re 1 µPa. Nevertheless, these reactions were recorded in penguins held in a holding tank at Odense Zoo, Denmark. These findings identify the sensitivity of penguins to underwater noise when in very close proximity to the noise source.

7.1.4 Marine traffic effects

Although it did not directly assess auditory effects on penguins, one study has assessed changes in little penguin breeding on Phillip Island, Australia, due to marine traffic changes (Dupuis *et al.* 2023). This species (little penguin *Eudyptula minor*) is a close relative of the kororā/northern blue penguins (*Eudyptula minor iredalei*). The research investigated whether marine traffic adversely affected the foraging and provisioning behaviour of adult little penguins. Shipping traffic was assessed between 2014 (average of 212 vessels) and 2020 (average of 297 vessels), and the mass gain in weight of chicks was evaluated during provisioning, colony attendance, diet (stable isotope analysis), and foraging behaviour (GPS tracking).

The study identified a significant difference in overlap of penguin distribution at sea compared to marine traffic. The overlap between marine traffic and little penguins in 2020 was significantly lower than in 2017 and 2018 but higher than in 2015, indicating that marine traffic is a significant factor affecting the foraging behaviour of little penguins, with higher traffic leading to reduced foraging efficiency. However, there was no difference in colony attendance across seasons or breeding stages, and no difference in the meal size provided to chicks. The isotopic data indicated that little penguins were using different isotopic niches between 2010 and 2020, confirming that the little penguins were foraging in coastal and oceanic waters at different trophic levels. One aspect that the study did not assess was whether there were any changes in El Niño and La Niña events within the study period (Sun *et al.* 2022), which could contribute to the changes in foraging locations and prey availability.

7.2 Potential effects at the Port of Tauranga

Pine (2023) provides an assessment and conservative approach to evaluate the potential risks of noise exposure on kororā/little penguins. The listening space calculations and general audibility assessments indicate that the maximum distances for potential behavioural effects due to percussive piling noise could extend up to 6,158 metres, trail-suction hopper dredger of 3,926 metres, backhoe dredger of 1,243 metres, and cutter-suction dredger noise might be audible up to 947 metres.

Pine (2025) emphasises the importance of considering context-related variables and the existing ambient noise levels in the area, as these factors will significantly influence the potential for actual impacts on penguins. Given the lack of specific data for kororā/northern blue penguins, a conservative methodology should and has been applied in this instance. It has, therefore, been assumed that penguin hearing thresholds are limited by ambient sound levels. This approach will ensure that potential noise-induced effects are adequately considered and mitigated.

An assessment of the Port of Tauranga was undertaken to evaluate the underwater noise effects of dredging activities to deepen and widen shipping channels (Pine 2025). The focus was on various marine mammals and cumulative noise modelling of the existing environment between 2022 and 2023 to determine the changes in soundscape arising from the proposal and using the small-sized TSHD *Albatros* during maintenance dredging. This assessment focused on understanding the existing underwater noise environment and predicting the cumulative noise effects of proposed activities.

The underwater soundscape is crucial for marine animals and penguins, as it plays a significant role in their communication, navigation, and foraging behaviours. Elevated underwater noise levels, primarily from shipping and other vessel activities, can have profound effects on these species. At the Port of Tauranga, hourly noise levels were recorded to range from 109 to 138 dB re 1 µPa near the harbour entrance and from 118 to 147 dB re 1 µPa within the Stella Passage (Pine 2025). These noise levels are considerably higher than what would have been natural background levels (although such levels have probably not been experienced for several decades due to the existence of the Port and the popularity of the Harbour for recreation) due to the continuous movement and operations of commercial and recreational vessels. Such elevated noise levels can mask important acoustic signals, leading to stress, reduced foraging efficiency for marine animals, behavioural responses, habitat avoidance and habitat exclusion.

For penguins, which rely on auditory cues for locating prey and avoiding predators, increased noise pollution can disrupt these critical behaviours. Pine (2025) highlighted that vessel noise was detected at up to 161 dB re 1 µPa, raising the ambient noise levels by over 15 dB for durations ranging from 30 to 522 seconds. This persistent elevation in noise can lead to auditory masking, where important biological sounds are drowned out by anthropogenic noise, making it difficult for penguins to detect and respond to these cues. Pine (2025) has identified that some auditory masking will occur for penguins within the 800-1200 Hz range when sound levels reach 90-160 dB re 1 µPa. In a worst-case scenario, the most significant level of masking will occur when penguins are within 64 metres of the sound source, resulting in a more than 75% reduction in their listening space. However, kororā/little penguins can navigate around the dredging activity when moving through the marine environment, thereby minimising any short-term/temporary loss of audio cue. Kororā/little penguins can swim up to eight kilometres per hour (Gales *et al.* 1990). Therefore, any masking effect will be minor.

In accordance with Sørensen *et al.* (2020), when noise levels exceed 15 dB above ambient levels, then kororā/little penguins in the Port of Tauranga may react to activities within the Port. Nevertheless, kororā/northern blue penguins have continued breeding within the Port environs throughout the current vessel activity regime, indicating the nesting population has habituated to current ambient noise levels. Pine (2025) assessed the increase in ambient noise levels concerning marine mammals.

Cumulative noise effects of maintenance dredging on delphinids (high-frequency cetaceans, including orca/killer whales, bottlenose and common dolphins, and pilot whales) were found to range between 0.3 dB re 1 µPa (outside the Port Zone) and 4.3 dB re 1 µPa (immediate dredge area inside the Port Zone), giving an average (±SE) over the whole area of 1.9 ± 0.3 dB re 1 µPa. For baleen whales (low frequency) and fur seals (Otariidae), the cumulative effects averaged an (±SE) increase of 1.2 ± 0.2 dB re 1 µPa and 2.0 ± 0.3 dB re 1 µPa, respectively. These differences are very small relative to any predicted soundscape change arising from dredging inside the Port.

As kororā/northern blue penguins will predominantly forage within the Bay of Plenty, any noise disturbance should only affect the kororā/northern blue penguins when leaving and returning to their burrows within the Port or nesting around the base of Mauāo (Mount Maunganui), on Motuatau Island, and Moturiki (Leisure Island) if dredging is occurring within the area. Although Pine (2025) has predicted the increase in soundscape change arising from dredging and has filtered the noise levels to account for the different functional hearing groups of marine mammals, these predicted increases are very small and should not affect kororā/northern blue penguins.

Kororā/northern blue penguins that nest within the Port of Tauranga pass through the harbour entrance to forage offshore and navigate through maintenance dredging activities when they are being undertaken. Kororā/northern blue penguins will forage up to 30 kilometres from their nesting colony within coastal waters and in water depths of up to 100 metres (Lukies 2019; Mattern 2001; Poupart *et al.* 2017). Ongoing maintenance dredging and the addition of capital dredging will have a limited increased level of effect on kororā/northern blue penguins as they leave and return to their nesting burrows if dredging activity is being undertaken during the hours before dawn and after dusk and if sound levels exceed 15 dB above ambient levels. However, this will not prevent kororā/northern blue penguins from moving through the Port environs if the most noise-intensive activity occurs during daylight hours, which is when kororā/northern blue penguins will be at sea foraging or incubating eggs or moulting within their burrows. When considering the increase in ambient soundscape modelling for marine mammals, we are of the opinion that the overall effect on kororā/northern blue penguins will be **minor**.

8.0 Mitigation

No specific mitigation measures are suggested in relation to avifauna. However, vessel lighting can be minimised through turning off any unnecessary lighting which is adequately addressed by a general lighting condition in the conditions proposed.

9.0 Conclusion

Studies and assessments reviewed for this project show that turbidity, noise and artificial lighting can have a minor to less than minor effect on estuary birds and seabirds. Any turbidity caused by the dredging activity will be limited and will settle quickly. Shore and seabirds are highly mobile and can move between locations to avoid temporarily unsuitable foraging habitat. However, any fish, zooplankton or benthic fauna brought to the surface through active dredging or deposition may increase foraging opportunities for certain bird species which could provide a positive effect.

Increased underwater noise from active dredging and vessel movement will have less than minor effect on the highly mobile shore and seabirds. However, underwater noise can affect penguins, including kororā/northern blue penguins. Research has shown that penguins are sensitive to noise, reacting strongly to levels that are 20 dB re 1 µPa above ambient levels. However, kororā/northern blue

penguins still breed within the Tauranga Harbour, where shipping activity can increase noise levels by around 33 dB re 1 µPa above ambient levels. Furthermore, the predicted increase in noise from dredging activity may be around 4.3 dB re 1 µPa.

Cumulative increased noise from dredging and ship traffic at the Port of Tauranga could potentially disrupt kororā/northern penguin behaviour as they navigate areas undergoing dredging. However, it is unlikely that this will lead to stress or decreased foraging efficiency, as these penguins primarily forage offshore and can avoid areas during dredging operations. Overall, even with a conservative approach, the anticipated effects are expected to be minor.

Due to the short term/temporary activity throughout the Port and coastal areas during dredging and deposition and the settlement of sediment, the overall effect of dredging will be less than minor and any airborne noise from human activities should not lead to cumulative effects on kororā/northern blue penguins, including during the crucial times of two hours after dusk and two hours before dawn, when the penguins are most active.

Artificial lighting on the dredging vessels will add very little additional light to the current sky glow from the commercial and residential lighting and will have less than minor to negligible effect on the seabirds. To further reduce any potential attraction of seabirds to the dredging activity, lighting should be directional on essential equipment when in use, and unnecessary lighting should be turned off. This mitigation is adequately addressed by a general lighting condition in the conditions proposed. Any light spill onto the sea may attract fish and zooplankton to the surface, providing a potential food source for kororā/northern blue penguins, gulls, shags and terns.

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Appendix 1

Cultural values report – response to mana whenua

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
Ngāti Ranginui Fisheries Trust	[100(d)]	Temporary local disturbance to birds through vessel activity, noise, turbidity, lighting, bird strike, and disposal operations. For most seabirds and estuary birds, effects are minor as they can move to other foraging areas. Turbidity impacts visual foragers, such as kororā, but can also create feeding opportunities for terns, gulls, and shags in terms of fish concentrating near the surface.	Ngāti Ranginui Fisheries Trust has reported the same findings as outlined in this report. Any adverse effects on avifauna will be temporary and minor. These effects are discussed and addressed throughout this report.	Noise: Sections 5.2.3, 6.1 and 6.2 Turbidity: Sections 5.2.1, 5.2.2, 5.4, and 6.1 Artificial lighting and bird strike: Section 5.2.4 Disposal operations: Sections 5.2.2, 5.2.3, and 5.3
	[100(e)]	Kororā swim through the harbour between nesting / roosting sites and offshore foraging areas and therefore cannot avoid dredging in the same way flying birds can. Multiple effects to kororā are identified including reduced foraging visibility in turbid water, communication disruption from noise, stress/health effects from chronic noise exposure. International penguin research shows that underwater noise can trigger strong aversive responses and shipping noise has been associated elsewhere with population decline.	Kororā/blue penguins can forage in areas where turbidity congregates fish and zooplankton, and can navigate by looking above and below water to move through their environment. Kororā/little penguins can navigate around underwater noise fields and can swim up to eight kilometres per hour to pass through noisier areas. Their ability to move through noisier areas would only temporarily affect communication, and any masking effect would be minor.	Turbidity: Section 5.2.2. Noise: Sections 6.1.2 and 6.2
	[100(f)]	There is some concern that birds may be impacted by daily intake / bioaccumulation of contaminants consumed through shellfish. Contaminants are expected to be eliminated through excretions or transferred into eggshells.	Avifauna have evolved various methods of excreting or sequestering heavy metals and excreting them by deposition in the uropygial (preening) gland), the salt gland, feathers, faeces, and eggs/eggshell.	Sections 5.4 and 5.5

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
	[102]	Kaitiaki monitoring of impacts to taonga species (including benthic invertebrates, avifauna and marine mammals) during and after dredging campaigns. Where adverse impacts are identified, a requirement for adaptive management responses, including avoidance, remediation or restoration measures, with ongoing kaitiaki monitoring and assessment of their effectiveness, and a clear response where those measures are not achieving their intended outcomes.	PoTL undertakes surveys to monitor internationally, nationally, and locally significant populations of birds within the port environment to maintain a good understanding of bird use of the Port environs. This data is used to help inform decisions on future Port management options and on how best to manage avifauna within the Port environment.	
Ngā Pōtiki	[109(a)]	To mitigate the cultural effects on Kaitiakitanga, the Trust requests: Cumulative effects assessment and response: PoTL undertakes a comprehensive assessment of cumulative effects of Port activities on taonga species use of the harbour; and identifies actions to avoid, remedy, or mitigate those effects over time.	PoTL has engaged experts to undertake cumulative effects assessments. This report addresses the effects on avifauna and provides measures to avoid, remedy, or mitigate those effects. Also see response to Ngāti Ranginui Fisheries Trust [100(f)].	Sections: 5.2.4, 5.3, and 6.2
Tauranga Moana Iwi Customary Fisheries Trust	7.6	Trustees consistently describe observed reductions in pipi, tuangi (cockles), kina, pāua, kuku/kūtai (mussels), kōura (crayfish), resident and migratory birdlife and abundance across customary gathering areas within Te Awanui and surrounding coastal environments. The evidence presented reinforces TMICFT's position that cumulative effects on customary fisheries, mauri, and cultural relationships with the moana are ongoing, intergenerational, and cannot be appropriately assessed in isolation.	Many factors can affect bird populations within an area, including changes in prey abundance, weather patterns, tidal levels, age structure of the population (foraging birds or stage of prey development), time of year (breeding or non-breeding), migration (national and international avifauna), predation (mammalian or avian), and human activity or disturbance. Foraging locations and patterns can vary from day to day. Food resources will fluctuate, leading to changes in foraging activity and bird movements within the area. This does not necessarily mean that the observed population of birds in a specific area has decreased. PoTL undertakes regular monitoring within the port environment, including areas adjacent to the port that will be dredged. This will allow for observation of any change in avifauna populations.	

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
Ngāi Tamarawaho	13.6	**Noise, lighting, turbidity and habitat pathways:** The cultural issue is disturbance to relationships between species, habitat, tohu, soundscape and mauri. The technical reports identify pathways including underwater noise, behavioural disturbance, masking, artificial lighting, turbidity, habitat modification and changes to prey or foraging conditions. Ngāi Tamarāwaho do not overstate those technical effects where the reports do not support doing so. The cultural concern is that repeated disturbance can alter the balance between species, habitat, tohu and mauri even where no measurable population decline is predicted. Lighting is particularly relevant because night dredging may affect birds, kororā, darkness, seasonal tohu and the cultural character of the harbour. Ngāi Tamarāwaho effect finding: conditions should require lighting controls, cultural observation, reporting of unusual species behaviour, and integration of hapū observations with technical monitoring.	Ngāi Tamarawaho acknowledge the findings within this report but highlight the further relationship between hapū, manu, tohu and the cultural landscape of Te Awanui. Lighting recommendations are outlined in this report to further minimise the effects on avifauna. However, any effect will be less than minor to negligible, if not positive, if zooplankton or fish congregate and provide a food resource for birds. PoTL undertakes regular monitoring within the port environment, including areas adjacent to the port that will be dredged. This will allow for observation of any unusual avifauna behaviour. Also, see response to Ngāti Ranginui Fisheries Trust [102] above.	Lighting: Sections 5.2.4 and 7.0
Ngāti Hangarau	Table 1, page 41	Seabirds and kororā are inherited treasures (*taonga tuku iho*). Artificial lighting must be strictly managed, and cultural monitors resourced to protect navigational pathways. We do not consider it appropriate to conduct dredging during the season when the kuaka/hakakao are preparing to migrate.	Ngāti Hangarau are concerned that kuaka/eastern bar-tailed godwits will be affected due to dredging activity while the birds are preparing to migrate to the Northern Hemisphere. Studies have shown that kuaka/eastern bar-tailed godwits utilise habitat throughout the East Asian-Australasian Flyway and are habituated to low-level, continuous background noise. This is consistent with the proposed dredging activity, and their foraging and roosting activities will occur away from the dredging activity.	Section 5.2.3

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
Ngāi Tukairangi	Page 45 and 46	Key avifaunal concerns raised by Ngāi Tukairangi include: • Disturbance of roosting birds on the Sulphur Point sand pile which is used by internationally significant numbers of kuaka for feeding and roosting. It is also used by many other taonga manu that include many at risk, declining bird species. • Removal of 315m of rock wall inhabited by kororā (little blue penguin) nesting sites, tarāpunga (red-billed gulls) which are native birds - at risk, declining – *and we believe also tarāpuka (black-billed gulls) which are endemic birds – are also at risk of declining.*	The discussion during Forum Three shifted from the intended topic of dredging to the Stella Passage application. This may have caused confusion to the attending members from Ngāi Tukairangi. The proposed dredging activity will be undertaken within a busy port environment, and the dredging activity in the shipping channel will be at least 50 metres from any wharves and coastal areas where shorebirds and waders may forage or roost. Noise levels will be similar to the current background noise, and dredging activities will be undertaken at a slow, steady pace. With the distance between avifauna habitat and dredging activity, and the short term/temporary activity of dredging within any given site, the assessed cumulative effects from noise and dredging activity will be less than minor on these species and locations.	Noise: Section 5.2.3 Flight Initiated Distance: Section 5.2.3
	Table on page 86	No prior baseline monitoring exists at this Port. "Not all known sites" assessed for both Bennett's assessment for both CAMDR and Stellar Passage, but did not model combined scenario. Historical contamination effects on breeding baseline not considered. Combined avifauna effects from both Port projects requiring simultaneous modelling not completed. DDT baseline outside scope. MITCF absent from forum discussion.	PoTL undertakes surveys to monitor birds within the port environment. Also**, the** Ornithological Society for New Zealand **(**OSNZ) undertake surveys twice a year within the Tauranga Harbour. This information was considered when undertaking the assessments for both applications. Contamination and bioaccumulation are addressed within this report. Also see response to Ngāti Ranginui Fisheries Trust [100(f)]. It is unclear why DDT has been focused on. Stewart's (2026) report addresses DDT levels within the dredging environment.	Sections 5.4 and 5.5

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
Te Kapu Ō Waitaha	6.6	**Taonga species: marine mammals, avifauna and fish:** Required outcomes: a. taonga species incident protocol b. immediate notification to Waitaha of marine mammal, bird, fish or shellfish mortality events c. lighting controls to reduce seabird and kororā attraction d. vessel observation and response procedures e. cultural reporting of species observations f. inclusion of taonga species in Waitaha Mauri Report Cards	If an injured or dead indigenous bird is discovered, the Department of Conservation would be notified. Lighting effects are addressed in this report. PoTL undertakes regular monitoring within the port environment, including areas adjacent to the port that will be dredged. Survey summary reports will be provided to the Department of Conservation and will be made available to other interested parties and will be made available on the Port of Tauranga's website.	Artificial lighting and bird strike: Section 5.2.4
Ngāti Pūkenga	5.5.1	**The assessment relies on a degraded baseline:** From a kaitiakitanga perspective, the appropriate question is not whether the proposed dredging will cause a further measurable decline from the current modified state – it is whether the proposed activity is consistent with the obligation to restore and enhance Te Moana o Tauranga over time. The avifauna report does not engage with that question. Its use of an already-degraded baseline predetermines its conclusion that effects are "less than minor" by comparing proposed activity against a starting point that itself represents accumulated harm.	The report is focused on effects of the proposal on avifauna within the existing environment, rather than restoration or enhancement. The avifauna that forage and breed in the Tauranga Harbour are highly mobile and can leave the area if conditions become unfavourable. Additionally, the baseline data provides a reliable reference for assessing any potential changes in bird populations or behaviours.	
	5.5.2	**Scope confined by the revised application – but cumulative risks remain:** Ngāti Pūkenga submit that the avifauna assessment is required to address the cumulative effects of all concurrent dredging operations, including those proceeding under existing consents, not merely those for which new consent is now sought. The failure to do so artificially constrains the scope of the assessment and systematically undercounts the total effect on seabirds, shorebirds, and taonga species over the combined dredging period.	Cumulative effects have been considered when preparing this report.	Section 5.4

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
	5.5.3	**The kororā/northern blue penguin assessment structurally inadequate:** Ngāti Pūkenga consider that any consent conditions must include a specific operational restriction on high-noise dredging activities during the pre-dawn and post-dusk periods in the immediate vicinity of kororā transit routes.	A conservative approach was taken to address noise effects on kororā/little penguins. The dredging will be at a slow, steady pace with interspersed quiet periods (dredge travelling to and from the disposition sites), The report (Pichegru et al. 2022) referred to by Ngāti Pūkenga addresses the reaction of African penguins to noise levels that double due to significant rise in maritime vessel traffic and a tenfold increase from bulk carriers. The proposed dredging operations will not increase noise levels to this extent.	Sections 5.2.3 and 6.1.3.
	5.5.4	**Threatened species list does not adequately drive the assessment:** Ngāti Pūkenga refer to 'The presence of Nationally Critical and Nationally Endangered species in or near the proposed dredge and disposal footprint is a significant finding that, under New Zealand Coastal Policy Statement Policy 11(a), requires the assessment to demonstrate that adverse effects on these species will be avoided, not merely minimised or mitigated. Any approval should require the establishment of a fully protected, undisturbed high tide roost at Sulphur Point, recognising its role as the only consistently available roost in the southern harbour. Given the acknowledged uncertainty and the absence of robust population level assessment, the consent should require the preparation and implementation of a harbour-wide shorebird habitat management plan, developed in partnership with mana whenua and independent ecological experts. While the cause is disputed, given the fact that Panepane Point has been lost or significantly degraded, the consent should also require the Port to develop and implement a habitat restoration and offset programme, with clear timeframes and	Regarding Policy 11, the area affected by the dredging activity is small compared to the surrounding environment, and avifauna are highly mobile. The Threatened avifauna species referred to travel significant distances and forage over large areas. Regarding the Sulphur Point sand pile, this area will not be changed during the dredging operations. Regarding monitoring, see the responses to Ngāti Ranginui Fisheries Trust [100(f)], Ngāi Tamarawaho (13.6), Ngāi Tukairangi, (Table on page 86) and Te Kapu Ō Waitaha (6.6) above. The suggestion by Ngāti Pūkenga for beach replenishment to re-establish roosting or nesting function at Panepane or other suitable locations is considered an area for further investigation.	

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
		performance outcomes. This could include sediment management or replenishment initiatives to re-establish roosting or nesting function at Panepane or other suitable locations. However, any offset must be treated cautiously, recognising that replacement habitat is not guaranteed to be used, particularly for migratory species with strong site fidelity.		
	5.5.5	**Artificial lighting assessment understates cumulative risk:** The report's treatment of artificial lighting is cursory. It acknowledges that white and blue light are highly attractive to seabirds, that short-wavelength light presents particular risks of disorientation and bird strike, and that the dredging will operate 24 hours per day. It recommends general lighting management measures – directing lights downward, minimising spill onto the sea surface – and notes that these are addressed by "a general lighting condition in the conditions proposed." However, it does not specify what that general condition requires, does not assess the cumulative light contribution of round-the-clock dredging against the existing sky-glow from the commercial port, and does not evaluate the consequences for korōrā – identified as one of the species most sensitive to light-induced disorientation – of additional light sources during their pre-dawn and post dusk transit periods. Given that this species is At Risk – Declining, the adequacy of a "general lighting condition" to which the report cross references but does not specify must be questioned.	The addition of the dredging activity to the already existing sky-glow will have a negligible effect due to the commercial and residential lighting that is already altering the marine environment. Kororā/blue penguins nest within the Tauranga Harbour and surrounding islands and forage within the area, and are habituated to these environmental conditions. The lighting recommendations of the dredging activity are outlined within this report, including downward facing, shielded, low intensity as practicable, turned off when not in use, and limiting spill-over onto the sea. The light-spill from the dredging activity could increase foraging opportunities for seabirds, including kororā/northern blue penguins, by attracting fish and zooplankton to the surface.	Section 5.3.4

CVR Party	Page/ Paragraph Number	Tangata Whenua Comment	Response	Location in Report
	5.5.6	**The toxicological analysis transfers human standards to avian consumers inappropriately:** Ngāti Pūkenga submit that a comprehensive avian contaminant risk assessment, based on the full suite of analytes relevant to urban harbour sediments, is required before the "negligible risk" conclusion can be accepted.	Further details on accumulation and reduction or elimination of contaminants through excretion, transfer to eggs or eggshells, and moulting feathers have been addressed in Section 5.3. Also see response to Ngāti Ranginui Fisheries Trust [100(f)] and Ngāi Tukairangi (Table on page 86).	Section 5.3
	5.5.7	**No monitoring or adaptive management framework for avifauna:** Section 7.0 of the avifauna report addresses mitigation. It states: "No specific mitigation measures are suggested in relation to avifauna." This statement, in a report assessing effects on multiple Threatened and At Risk species within a complex harbour system subject to 24-hour industrial dredging for a period of up to six weeks for capital works and ongoing maintenance over a long consent term, is inadequate. The report does not propose any programme of avifauna monitoring before, during, or after dredging operations. It does not identify trigger indicators that would prompt operational review. It does not recommend any requirements for pre-dredge surveys of korōrā breeding activity, tarapirohe nesting at Sulphur Point, or the use of the offshore disposal sites by foraging seabirds. The absence of a monitoring framework means that the "less than minor" effects conclusion cannot be verified, and any adverse effects that do occur will be detected – if at all – only after they have become established.	This resource consent application is to continue the ongoing maintenance requirement of the PoTL and to enable deepening through capital dredging in discrete locations of the existing shipping channel. Monitoring is occurring within the Port environment, including the dredging area adjacent to Sulphur Point and Mount Manganui. The Ornithological Society for New Zealand (OSNZ) also undertakes surveys twice a year within the Tauranga Harbour. These data provide avifauna counts before the widening or deepening of the existing shipping channel. See response to Ngāti Ranginui Fisheries Trust [102], Ngāi Tamarawaho (13.6), and Ngāi Tukairangi (Table on page 86). The area affected by the dredging activity is small compared to the surrounding environment and avifauna are highly mobile, and will forage opportunistically.	

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