Avifauna Management Plan for the Port of Tauranga Sand Storage Site, Wharf Extensions, and Wider Port Environs

Contract Report No. 5154f

Providing outstanding ecological services to sustain and improve our environments

Wildlands

Avifauna Management Plan for the Port of Tauranga Sand Storage Site, Wharf Extensions, and Wider Port Environs

Contract Report No. 5154f

April 2025

Project Team:

Della Bennet - Report author and technical adviser

William Shaw - Report review

Prepared for:

Port of Tauranga Ltd

Private Bag 12504

Tauranga Mail Centre

Tauranga 3143

Reviewed and approved for release by:

_____

W.B. Shaw
Director/Lead Principal Ecologist
Wildland Consultants Ltd
8/04/2025

Cite this report as follows:

Wildland Consultants (2025). *Avifauna Management Plan for the Port of Tauranga sand storage site, wharf extensions, and wider port environs.* Wildland Consultants Contract Report No. 5154f. Prepared for Port of Tauranga Ltd. 71pp.

Head Office
99 Sala Street, PO Box 7137, Te Ngae, Rotorua Ph 07-343-9017 Fax 07-343-9018 Email: rotorua@wildlands.co.nz

www.wildlands.co.nz

Preface

The Port of Tauranga is Aotearoa New Zealand's largest port and intends to expand to meet current and future demands from exporters and importers. The proposed expansion is for a southern extension to the Sulphur Point wharves and a new berth between existing berths at the Mount Maunganui wharves.

The proposed Sulphur Point extension is adjacent to a site used to store and manage dredged sand, which is heavily used by a range of Threatened and At Risk coastal birds.

The Mount Maunganui expansion will affect a rock wall used as a tarāpuka/red-billed gull nesting colony and this also has kororā/blue penguin nesting burrows.

This document provides an 'Avifauna Management Plan' to address ongoing monitoring and management of birds at the Port of Tauranga in association with the following activities:

- Sand storage and management at Sulphur Point.
- Extensions to the wharf at Mount Maunganui.
- Coastal bird monitoring at the Port.
- Lighting at the Port.

The plan has been prepared to formalise existing practices and to provide enhanced management measures to protect bird colonies and avoid adverse effects during port operations and the proposed development work. Implementation of the plan will safeguard avifauna utilising the Port as a breeding site. It will be revised and updated every five years, or sooner if required, to address changes in breeding success or population trends.

The Management Plan comprises the following four sections:

- Ecological Management Plan for the Port of Tauranga Sand Pile at Sulphur Point. Previously presented as *Wildland Consultants Ltd Contract Report No. 5414e.*
- Korarā/Blue Penguin and Avian Management Plan for the Proposed Mount Maunganui Wharf Extension at the Port of Tauranga. Previously presented as *Wildland Consultants Ltd Contract Report No. 5154c.*
- Monitoring of Coastal Birds at the Port of Tauranga. Previously presented as *Wildland Consultants Ltd Contract Report No. 5154b.*
- Assessment of lighting at the Port of Tauranga. A 'new' assessment, provided as part of this report.

The 'Draft Blue Penguin and Avian Management Plan (BPAMP)' – presented as Section 2 of this report - was initially prepared in response to the December 2023 Environment Court Interim Decision for the proposed Stella Passage Development. The draft combined BPAMP was prepared to facilitate updating of avifauna management measures in consultation with the Department of Conservation and tangata whenua. Discussions were also undertaken with Ngā Tai ki Mauao with regards to opportunities to manage and restore site(s) on Matakana Island or elsewhere to provide better protection and enhance shorebird habitat. These matters will also be addressed in the Plan as they develop.

Contents

SECTION 1 - ECOLOGICAL MANAGEMENT PLAN FOR THE PORT OF TAURANGA SAND PILE AT SULPHUR POINT

1.0 Summary

As part of the ongoing use and maintenance of the Sulphur Point sand storage pile, the Port of Tauranga has developed this ecological management plan to minimise adverse effects on coastal roosting and nesting bird species that use the sand pile. The sand pile is a primary and important high tide roost for the southern half of Tauranga Harbour and provides a protected site for roosting birds during all tides. Two other small historical roost sites at Omokoroa and Tahunamanu are both subject to tidal and weather restrictions and influences[1]. The primary goal of the plan is to sustain a high tide roost suitable for Threatened and At Risk bird species while maintaining the sand pile at its current size of 5,000 square metres as a location to deposit and store dredged sand to be used for beach renourishment. The plan also provides measures to further enhance the sand pile as habitat for birds through the implementation of additional pest animals and exotic plants and other site management.

2.0 Introduction

The Sulphur Point sand pile is the site within Port of Tauranga land used to store and manage sand dredging material. The sand pile is an active work site, but nevertheless is heavily used by a range of At Risk and Threatened coastal birds as no other site within the southern half of Tauranga Harbour is protected during all tidal events[2]. It is used for depositing dredged sand from the Stella Passage, and the sand is occasionally used for beach regeneration around the Tauranga area and Port-related development. As the Port has developed and operations have expanded, the sand pile has regularly reduced in shape and size, to a remnant of its former extent. Nevertheless, a considerable diversity of avifauna species, and significant numbers of some species, have continued to use the sand pile. These bird species have high philopatry to nesting grounds and will continue to return to their natal breeding site. These species also have a certain tolerance level for anthropogenic changes over time and the levels of disturbance inevitable due to the sand pile position and use within a large and active port.

The sand pile is partially surrounded by shipping containers, providing a degree of buffering, albeit limited, from adjacent 24/7 port activities and helping to reduce disturbance of roosting and nesting birds. Furthermore, the sand pile receives protection through the Port's current mammalian predator control measures and lack of disturbance by dogs and people as it is contained within the fenced Port boundary. The sand pile is also elevated above the mean high tide level, beside the harbour margin and coast, and is unaffected by tides or extreme storm surges. However, birds do experience some disturbance from port activities, as the sand pile is adjacent to shipping container storage, and near a Port access road. In addition, in recent decades, dredged sand was deposited, moved, and taken for use elsewhere as required.

In 2023, the Environment Court directed the Port of Tauranga to protect the sand pile, and to avoid use of the sand pile for Port operational purposes. Activities on the sand pile - to provide sand for beach renourishment, including the deposition of some dredged sand on to the sand pile - will still continue.

To address requirements for the protection of the sand pile and associated At Risk and Threatened coastal birds, Port of Tauranga commissioned Wildland Consultants to provide an ecological management plan for the sand pile, which is to be implemented to protect and maintain the site as a high tide roosting and breeding site.

[1] John Heapy, Department of Conservation, pers. comm.

[2] John Heapy, Department of Conservation, pers. comm.

3.0 Bird species

3.1 Field surveys overview

The Ornithological Society of New Zealand (also known as Birds New Zealand) has undertaken surveys of waders around Tauranga Harbour since 1994. In October 2021, Port of Tauranga commenced weekly surveys during the breeding season (September to February) at the sand pile and two-weekly surveys during the non-breeding period (March to August), and the survey methodology is outlined in Chapter 3 of this report. A summary of the Ornithological Society of New Zealand and Port of Tauranga survey results are outlined in Appendix 1.

3.2 Kuaka/eastern bar-tailed godwit

Kuaka/eastern-bar tailed godwit (*Limosa lapponica baueri*, At Risk – Declining) breed in western Alaska. After breeding, the birds make an annual migration, including one to three non-stop flights of 6,000-12,000 kilometres to reach Aotearoa New Zealand (Conklin *et al.* 2021). Birds fly to Aotearoa New Zealand using the East Asian- Australasian Flyway, arriving in early September and departing early March (Battley *et al.* 2012).

Kuaka then spend their non-breeding season at different feeding and roosting sites around the country, including the Manukau Harbour, Farewell Spit, Firth of Thames, and Tauranga Harbour. Adult kuaka, along with other migratory birds and New Zealand coastal species, are highly sedentary and show high fidelity to breeding and non-breeding sites (Nechaev 1998; Battley *et al.* 2012). These areas provide benefits to individuals, including finding resources, reproducing at breeding grounds, and increasing the chance of survival from predators. While at the non-breeding grounds, kuaka undergo primary feathers moult and prepare for the northward return migration. By observing marked individuals, birds have been recorded to the age of 24 years in Aotearoa New Zealand and 29 years in southeast Australia (Conklin *et al.* 2017).

The report for regional prioritisation of migratory shorebirds of the East Asian-Australasian Flyway (Conklin *et al.* 2014) recognises Tauranga Harbour as a site of international importance. This is because it regularly supports more than 1% of the total kuaka numbers worldwide. Conklin *et al.* (2014) rank Tauranga Harbour as the fourth most important location within Aotearoa New Zealand for kuaka. High tide roosts are critical to maintaining wading and coastal bird species. The southern half of Tauranga Harbour has only three regularly used roosts, of which Sulphur Point sand pile is the largest and most important as it is always available during all tides and weather conditions. The other roosts at Omokoroa and Tahunamanu are vulnerable to spring tides and extreme weather events making them less available.

Kuaka remaining in Aotearoa New Zealand over winter are presumed to be mostly young birds less than approximately three years of age. These immature birds are highly mobile and 'sample' potential non-breeding sites before settling on a site where they will remain faithful as adults (Battley *et al.* 2020). However, it is now known that some adults occasionally overwinter in Aotearoa New Zealand. A potential explanation for overwintering kuaka is delayed maturity of young birds, injury/illness, poor condition or skipped migration as adults, but data are currently insufficient to evaluate this possibility (Conklin *et al.* 2016). Recently, *c.*400-600 kuaka have been observed overwintering in Tauranga Harbour (John Heaphy, pers comm.).

3.3 Oystercatchers

Tōrea pango/variable oystercatcher (*Haematopus unicolor*, At Risk – Recovering) have been recorded during biannual national wader counts in Tauranga Harbour during summer and winter (average 130,

range 0-218) 2005 to 2019 (Riegen and Sagar 2020). Site-specific counts at Port of Tauranga indicate that variable oystercatcher roosted on the warehouse roof (summer: average 13 birds, range 2-35; winter: average 8 birds, range 3-12) and at the sand pile (summer: average 3 birds, range 1-6; winter: average 5 birds, range 2- 10) during 2009 to 2021 (Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1).). The two warehouse sheds that were mainly used have now been dismantled due to changes in Port activity (Shed 12 May/June 2017 and Shed 11 between May/September 2020).

Weekly surveys by Port of Tauranga staff indicate the presence of variable oystercatcher in low numbers throughout the year at the sand pile (summer 2023-2024: average 4 birds, range 2-6; winter: average 2 birds, range 2-4; Appendix 1 Table 3). This is similar to the Ornithological Society of New Zealand's biannual wader surveys for the sand pile. There are no observations of tōrea pango/variable oystercatcher attempting to breed at the sand pile.

Tōrea/South Island pied oystercatcher (*Haematopus finschi*, At Risk – Declining) similarly have been recorded during site-specific counts at Port of Tauranga, indicating that South Island oystercatcher roosted on the warehouse roof (summer: average 103 birds, range 20-220; winter: average 539 birds, range 292-700) and at the sand pile with two individuals in summer of 2009 and 338 individuals during winter 2011 (Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). Weekly surveys by Port of Tauranga staff have not detected any South Island pied oystercatcher (Appendix 1 Table 2).

3.4 Dotterels

Two dotterel species have been recorded at the sand pile:

- Tūturiwhatu/northern New Zealand dotterels (*Charadrius obscurus aquilonius*, Threatened – Nationally Increasing) were observed in low numbers during the 2008 to 2021 breeding season (average of 4 individuals, range 1-10 birds) and periodic flocks during the non-breeding season (sand pile: average of 6 individuals, range 1-20 birds; warehouse roof: 11 birds in 2011; Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). The Port of Tauranga weekly surveys identify a similar trend, with an average of 5 individuals (range 1-6) during the 2023-2024 breeding season and 5 individuals (range 2-7) during the 2023 non-breeding (Appendix 1 Table 3).

  In October 2021, six juvenile birds and one nest with three eggs were recorded. Two further nests were identified in November 2021 with either three eggs or a single egg). In February 2022, three eggs were unhatched and covered in flies. October 2022 had two nests with three eggs each, however, both nests had no eggs in September. In December 2022, two new nests were detected with six eggs and five eggs successfully hatched. In November 2023, a nest contained three eggs and two chicks hatched.

  Numbers at the sand pile during the non-breeding season of 2010 were below the 1% population level (25 individuals or 11 pairs) with 20 individuals (Ornithological Society of New Zealand unpublished data). Like many other shorebirds, the species is significantly affected by introduced predators and southern black-backed gulls. In 2011, a total population estimate of about 2,500 northern New Zealand dotterels was counted during the national breeding-season census, including about 1,100 pairs (Dowding 2019).

- Pohowera/banded dotterel (*Charadrius bicinctus bicinctus*, At Risk – Declining) have been recorded around Tauranga Harbour and at the sand pile. In June 2010, a flock of 100 individuals were observed. The national population is estimated at a maximum of 50,000 birds and are declining (Pierce 2013). The species breeds throughout Aotearoa New Zealand, from coastal beaches to inland rivers, to

terrestrial habitats such as the Central Plateau. However, no records are known of birds breeding within the Tauranga Harbour.

3.5 Terns

Three tern species have been recorded at the sand pile:

- Tara/white-fronted tern (*Sterna striata striata*; At Risk – Declining) established a breeding colony at the sand pile in 2009 (150 nests), 2017 (200 nests) and 2020 (200 nests); Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). On average, 175 individuals (range 5- 400 birds) have been recorded between 2008 and 2021 at the sand pile. On four occasions, tara/white-fronted tern were recorded on the warehouse roof (summer 2011: 2 individuals; winter 2011: 1 individual and 5 individuals 2021). During the 2023-2024 breeding season, POT recorded an average of 165 birds were observed (range 30-300 individuals; Appendix 1 Table 3). Tara/white-fronted tern nest in pairs on piles within the Port of Tauranga. White-fronted tern breeds along the coast of Aotearoa New Zealand and offshore islands (Heather and Robertson 2015). Sites used successfully one year may be abandoned the following year, but many sites are regularly used. Surveys undertaken by the Ornithological Society in 1997 indicated a national population of 30,000-40,000 individuals (Heather and Robertson 2015). White-fronted tern is considered to be declining, primarily due to the effects of introduced predators (BirdLife International 2017). This species is difficult to monitor as colony locations can change between years.

- Taranui/Caspian terns (*Hydroprogne caspia*, Threatened – Nationally Vulnerable) have been observed during the breeding season at the sand pile (average 2, range 1-3 individuals; 2011-2013, 2017 [Ornithological Society of New Zealand unpublished data] and 2021; Appendix 1 Table 1). Breeding activity has not been observed at the sand pile, but within the inner harbour of Matakana Island and the northern Tauranga Harbour shellbank (John Heapy pers. comm.) An average of 18 Caspian tern (range 2-28) have also been observed at the sand pile during winter. Only one individual has been observed on the warehouse roof in 2009. The POT surveys have only detected one individual at the sand pile during the 2021-2022 breeding season (Table 3). Caspian tern is a relatively rare species, with around 1,300-1,400 breeding pairs around Aotearoa New Zealand (Fitzgerald 2013). The species is considered to be in decline, primarily due to the effects of introduced predators, human disturbance, off-road vehicles and dog disturbance.

- Tara/New Zealand fairy tern (*Sternula nereis davisae*, Threatened – Nationally Critical) have been observed during the breeding season of 2011 at the sand pile (Ornithological Society of New Zealand unpublished data).

3.6 Gulls

All three gull species known in Aotearoa New Zealand have been recorded at the sand pile:

- Tarāpuka/black-billed gull (*Chroicocephalus bulleri*, At Risk – Declining) bred at the sand pile in 2016 (five nests; Ornithological Society of New Zealand unpublished data) and on the Mount Maunganui rock wall. Two hundred and ten Individuals were observed in winter at the sand pile in 2008, and between 1-12 individuals between 2014-2017. An average of 12 individuals (range 5-20) were observed during a Port of Tauranga 2023-2024 breeding season sand pile survey (Appendix 1 Table 3). Five eggs were observed in November 2023 and 15 juveniles. Black-billed gulls are highly mobile, and colonies do not necessarily establish in the same location each year (Heather and Robertson 2015). While it is a relatively abundant species, numbers in the North Island are very low. A national census of black-billed gulls in 2016-2017 recorded a total of 60,256 nests, of which 992 nests, or 1.6%, were in the North Island (Mischler 2017).

- Tarāpunga/red-billed gull (*Chroicocephalus novaehollandiae scopulinus*, At Risk – Declining) established a breeding colony of approximately 200 nests in 2018, two nests in 2020 (Ornithological Society of New Zealand unpublished data), and produced 10 juveniles in 2021 (Port of Tauranga surveys). Tarāpunga/red-billed gull use to breed at the sand pile before shifting as a large colony to the Mount Maunganui rock wall. However, during the Port of Tauranga surveys (2023-2024), an average of 267 individuals (range 1-800 birds) were observed during the breeding season and an average of 20 individuals (range 4- 60 birds) during the2021-2022 non-breeding season at the sand pile (Appendix 1 Table 3). The species regularly breeds in a much larger colony on the rock wall of the Mount Maunganui Wharf.

- A single karoro/southern black-backed gull (*Larus dominicanus dominicanus*, Not Threatened) nest was recorded in 2016 and 2020 during the Ornithological Society of New Zealand surveys (unpublished data). During the breeding season surveys, an average of 6 individuals (range 1-20 birds) were observed between 2010 and 2020 (Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). The 2023-2024 Port of Tauranga surveys identified an average of 4 individuals (range 1-16 birds; Appendix 1 Table 3). One black-backed gull egg was observed in November 2023, but this was not incubated. Black-backed gull is a super-abundant native species that has significantly benefitted from the activities of people. It is also a predator of other bird species, taking eggs and chicks (Department of Conservation 2018). Black-backed gull control is undertaken in certain locations by DOC where predation of vulnerable species (such as braided river birds or shorebirds) is known. This is a predatory species which may require control if foraging on chicks and eggs within the sand pile or other areas within the Port.

3.7 Other species

Ngutupare/wrybill (*Anarhynchus frontalis*, Threatened – Nationally Vulnerable) is a specialist braided river bird, mostly breeding in Canterbury, with smaller populations in Otago. It migrates to estuaries and harbours of the northern North Island after breeding. The national population is estimated to be approximately 5,000-5,500 birds (Dowding 2013). Ngutupare/wrybill visit Tauranga Harbour as a wintering site and have been known to use the sand pile. Wrybill flocks have been present at three of the 14 annual Ornithological Society of New Zealand winter counts at the sand pile. Each time, numbers have been close to or above the 1% population level (71, 52, 8, and 48 birds; Appendix 1 Table 1).

Poaka/pied stilt (*Himantopus himantopus leucocephalus,* Not Threatened) have been recorded nesting at the sand pile in the early 2000's. More recently, they have only been recorded at the sand pile twice, with two birds recorded in 2011 (winter) and 2014 (summer), respectively. The size of the national population is poorly known; the estimate of 30,000 birds dates back to the early 1990s (Adams 2013). This species can be easily displaced by other species if overwhelmed and dominated by a more aggressive nesting species.

Huahou/red knot (*Calidris canutus rogersi*, At Risk – Declining) are the second most common Arctic wader to reach New Zealand. Large flocks of over 5000 birds have been recorded at Kaipara and Manakua harbours, and at Farewell Spit. Flocks between 1000-5000 have been recorded in harbours including Whangarei and Waitemata harbours and the Firth of Thames. Smaller flocks have been recorded at other estuaries and coastal lagoons. Individual birds have been recorded around the Bay of Plenty area since 2000 (eBird data search).

Ruddy turnstone (*Arenaria interpres*, Non-resident Native – Migrant) are the third most numerous Arctic wader and concentrate in locations including Parengarenga, Rangaunu, Kaipara, Manukau and Tauranga Harbours, and the Firth of Thames in the North Island. Small numbers visit coastal lagoons or estuaries when heading south (late Sept-Oct) and northwards in March-April. Individual birds and

small flocks of up to four birds have been recorded around Tauranga Harbour since 2000 (eBird data search).

4.0 Sand pile management and bird use

4.1 Overview

Sand in the sand pile is not to be used for Port operational purposes. However, the use of the sand for beach replenishment is permitted in accordance with this plan, and will require some continued deposition of sand on the sand pile. The area currently used to store dredged sand is approximately 35 metres wide by 130 metres long, covering *c.*5,000 square metres or 0.5 hectares. The sand pile height averages 2-3 metres or about 2.5 metres above road level when full. When the site is prepared to receive dredged sand, the site is reshaped to make a 'bath' shape. The base of the 'bath' can be lower than road level (approximately 0.5 metres), and the sides are formed from sand currently on-site.

When filled with pumped dredged sand, approximately 10,000 cubic metres of sand is brought ashore as a slurry consisting of approximately 25% sand and 75% water. The water drains away over several days and returns to the harbour. As the sand is pumped in, an excavator is used to move the sand around to aid drainage and to sculpt the sand pile (Plate 1). The sand can be walked on after 2-3 days. The last excavation and refill was undertaken in June 2019, during the non-breeding season, over a period of approximately three weeks. During this time, karoro/southern black-backed gulls were seen foraging in the 'bath' area (Plate 2). Two to three tōrea pango/variable oystercatchers were also seen, either on the 'bath' sand wall or foraging in the bath area (Plates 2 and 3). Two tuturiwhatu/New Zealand dotterel were seen on the seaward sand wall of the bath (Plate 4). These observations indicate that there is a degree of tolerance of sand pile maintenance and associated human activities.

Plate 1: Pumping of dredged sand into the sand pile site. June 2019. Image supplied by POT.

Plate 2: Karoro/southern black-backed gulls and three variable oystercatchers foraging at the sand pile site. June 2019. Image supplied by POT.

Plate 3: Two tōrea pango/variable oystercatchers foraging along the seaward sand wall of the sand pile site. June 2019. Image supplied by POT.

Plate 4: Two tuturiwhatu/New Zealand dotterels on the seaward margin of the sand pile site. June 2019. Image supplied by POT.

4.2 High tide roost requirements

Basic Requirements

High-tide roosting sites are selected and used by birds when they contain adequate roosting habitat, are protected from inundation, reduce the risk of individual predation or disturbance risk, lack cover or weeds, and are close to foraging habitat (Rogers 2003). Population declines in migratory shorebirds has been attributed to the loss of reliable stopover sites along the East Asian Australasian Flyway (Piersma *et al.* 2016, Studds *et al.* 2017). However, there is limited information on the area required per bird as a roosting site.

Kuaka roosting density can be estimated by comparing it with a smaller wader in the Scolopacidae family, the semipalmated sandpiper (*Calidris pusilla*, Non-resident Native – Vagrant; Jamieson 2013). Beauchamp (2012) observed roosting semipalmated sandpiper densities that ranged from 1.2 birds per square metre to an estimate for tightly grouped 100 birds per square metre. Kuaka/eastern bar-tailed godwits are considerably larger (male length 39 centimetres, 275-400 grams; female length 41 centimetres, 325-600 grams; Woodley 2013) than semipalmated sandpipers (both sexes: length 15 centimetres and 25 grams; Jamieson 2013). It is a reasonable assumption, although very conservative, that a roosting density of one kuaka/eastern bar-tailed godwit per square metre would be more than adequate. Using this assumption, and based on the Ornithological Society of New Zealand survey in October 2021, Port surveys (Table 1), 3,000 kuaka roosting on the Port of Tauranga sand pile could need *c.*3,000 square metres for roosting (one bird per square metre), plus separation between different bird species (typically beyond pecking distance to a metre or more), the sand pile edge, or areas of noise and human activity, e.g. vehicles, cranes.

White-fronted tern (*Sterna striata*) nest at densities of 3.75 nests per square metre as observed on the Ashburton/Hakatere River in 2017 (Bell and Harborne 2019). Based on the October 2021 Port surveys (Table 2), 400 white-fronted terns (200 pairs) nesting on the sand pile would require a minimum area of 54 square metres, excluding any buffer zones.

Tarāpunga/red-billed gulls (*Chroicocephalus novaehollandiae scopulinus*) are of a similar size to tarāpuka/black-billed gull (*Chroicocephalus bulleri*) and nest density can be estimated. Nest density was 1.2 nests per square metre at eight colonies and up to 3.8 nests per square metre in dense colonies (McClellan 2009). Based on the November 2023 Port surveys (Table 2), 800 red-billed gulls (400 pairs) nesting on the sand pile would require a minimum area of 334 square metres, in addition to any buffer zones.

Shorebird roost sites should have at least 100 metre buffer zones from areas of noise and human activity (Kaldor 2019). However, this is not possible at the Port of Tauranga due to the proximity of port operations and current position of the sand pile. Nevertheless, Schlacher *et al.* (2013) state that a separation distance of at least 25 metres between birds and vehicles, combined with vehicles travelling 30 kilometres per hour or slower, reduces disturbance. Based on these calculations, the sand pile site of 5,000 square metres currently provides a sufficiently-large surface area for nesting and roosting requirements.

Timing of Works

Changes in the shape and size of the sand pile, when undertaken outside of the breeding season, will not adversely affect birds as long as the general height and contour of the 5,000 square metre minimum sand pile roosting area remains similar. This is supported by the continual use of the sand pile by birds during Port operations and sand pile operations in the past. Addition or removal of sand should only be undertaken outside of the breeding season and for the purpose of providing sand for beach replenishment. See the section on 'Sand Deposition at the Site' below for further information on the sand pile roosting area shape/size during the 'bath' refilling process.

Works should be carried out within the period that spans four hours each side of low tide (i.e. eight hours in total), when birds have left the high-tide roost to forage. However, if works are required to continue during the two hour period on each side of high tide (i.e. four hours in total), then a Port of Tauranga bird survey staff member or another suitably qualified ornithologist (member of the OSNZ with a minimum of three years of shorebird identification experience), must be on-site to monitor for any returning birds to the roost site. A minimum setback distance of at least 25 metres will need to be maintained between any returning birds and all operating machinery.

Sand pile contractors should be vigilant and watch for any returning birds outside of the two hours prior to high tide. If birds return earlier, a Port of Tauranga bird survey staff member or other suitably qualified ornithologist should be notified and works should cease until a bird assessment is carried out.

Monitoring Pre-works

Prior to work commencing each day, a survey should be undertaken by a Port of Tauranga bird survey staff member or another suitably qualified ornithologist, to ensure that no roosting birds are present within the sand pile works area. If any Threatened or At Risk species are present within the sand pile site, works cannot commence. If a Non-Threatened species is present, a minimum setback distance of at least 25 metres will need to be maintained between these birds and all operating machinery.

Sand Pile Dimensions

Based on evaluation of historic photographs of the sand pile (using Google Earth Pro) with its current constraints (roading and shipping container wall, as shown in Plate 5), the minimum sand area for roosting kuaka, while including a 25 metre buffer area from East Road, should be no smaller than 5,000 square metres. This area would enable the retention of a continuous island of sand suitable for high-tide roosting habitat.

Plate 5: Aerial photograph of the sand pile and adjacent shipping container storage area and roading. November 2022.

It is appropriate for the overall height to be altered to allow for ongoing sand management, in accordance with provisions set out in Section 4.3, below.

Sand Deposition at the Site

Excavation and formation of a 'bath'-shaped basin suitable for sand deposition and dewatering should be undertaken immediately prior to any dredging and placement of sand at the site (i.e. within five days of dredging). This will maximise the length of time that the sand pile area is of an adequate size/shape for roosting shorebirds. Long periods of time in a 'bath' configuration will not provide sufficient area for roosting as birds roost together in groups, as a safety mechanism. 'Bath' formation should not be undertaken prior to a breeding season if refilling with sand is not going to occur until after that breeding season.

Adjacent to the harbour, the top surface of the sand 'wall' around the 'bath' basin should be shaped as a flattened platform, at least two metres wide on top, to allow birds to continue to use the site for roosting while excavation or infilling with pumped dredged sand is being undertaken.

Harbour Margin of the Sand Pile

The harbour side of the sand pile, down to mean high tide level, should be maintained and shaped, particularly after storm events, to maintain a slope that birds can use to access the site by walking. This will allow easy movement of birds between the high- tide roost and exposed tidal habitat, minimising energy expenditure.

Overall Effects

By limiting the use of sand for beach renourishment only and avoiding the removal of sand from the sand pile during the breeding season, maintaining an overall sand pile size/shape/volume, and

continuing to operate the sand pile in the same way as it is currently, the continued use of the sand pile will avoid adverse effects on Threatened and At Risk bird species which live and breed at the site.

4.3 Management measures

Timing of Works

- Addition and removal of sand from the sand pile must only be undertaken during the non-breeding season, which includes April, May, June, and July.

Sand Removal

- Sand removal for beach nourishment should be undertaken predominantly at the northern end of the sand pile. This will allow birds to roost at the greatest distance from East Road.

Sand Pile Extent and Dimensions

- Maintain an overall sand pile size, shape, and volume to provide a high-tide roost or nesting site during the breeding and non-breeding seasons.

- Preferably maintain with undulating topography to restrict sight lines so that multiple bird species can utilise the site with minimal conflict.

- Overall height can be altered to allow for sand associated with beach renourishment and to maintain a minimum footprint of 5,000 square metres (i.e. sufficiently large for a roosting/breeding area, including a buffer zone). This area must be a single body/island of sand and should be as square as practicable (avoid increasing the current width to length ratio).

- Sand removal for beach nourishment must only be accessed from East Road (at the northern end of the sand pile). The sand pile can slope towards the southern end, subject to the gradient being gentle and the overall height being comparable to the northern aspect, as birds will roost on the raised area.

- When the sand pile is predominantly situated towards the southern end footprint - more than 50 metres away from East Road - the sand pile height can be reduced to a minimum overall height of 0.5 metres above mean high spring water springs (MHWS).

Sand Deposition

- Prior to pumping of sand into the site, excavation and formation of the deposition ‘bath’ should only be undertaken within five days prior to dredging.

Works During the Non-Breeding Season

- A daily pre-works survey must be undertaken by a Port of Tauranga bird survey staff member or another suitably qualified ornithologist, prior to works commencing, to ensure that no birds are roosting on the sand pile.

- If any Threatened or At Risk species are present within the sand pile sites, works cannot commence. If a Non-Threatened species is present, a minimum setback distance of at least 25 metres will need to be maintained between these birds and all operating machinery.

- Works should be carried out within the period four hours on each side of low tide, when birds will have left the high-tide roost to forage.

- If works have not been completed before the two hours each side of high tide, a Port of Tauranga bird survey staff member or another suitably qualified ornithologist must be on-site to monitor any birds returning to the roost site and to ensure that work activity has a separation distance of at least 25 metres from any returning birds, and does not disturb them.

- If birds are present, works will not be able to commence unless the birds leave of their own accord (a Wildlife Act Authority could potentially be sought to allow disturbance of birds but this should not be necessary if the parameters above are implemented).

5.0 Noise

5.1 Overview

Noise-related disturbance of birds can affect habitat usage, life cycle stage (breeding or non-breeding period) and level of habituation (Harbrow *et al.* 2011). Also, the variation in characteristics, duration and frequency can add complexity to reactions. For example, the most extreme noise results in major impacts, which may include increased physiological stress (e.g. increased energy expenditure, reduced breeding success or reduced energy accumulation) or behavioural responses (e.g. tolerance, aversion and flight response). Several studies have been undertaken to assess an acceptable decibel (db(A)) level; however, given the different background noise levels, type of disturbance, and response, behaviour varies substantially between species and across sites and seasons (see Wright *et al.* 2010).

Habituation occurs when a reaction to a stimulus reduces over time after repeated exposure (Harbrow *et al.* 2011). Port activity noise occurs in the vicinity of the sand pile, and roosting and breeding birds are exposed to levels of activity and noise, including vehicle movements and shifting of cargo and containers. The species present are already currently subjected to unavoidable disturbance and noise from wharf activities and continue to breed and roost at the sand pile, showing habituation. However, it is acknowledged that noise is detrimental and may be having a negative effect on breeding success, possibly causing some birds to temporarily relocate (e.g. to a cargo shed roof) during short impulsive noise (e.g. pile driving or sudden loud noises; Wright *et al.* 2010), or sudden sight and sound of an aircraft or other human disturbance. Although the disturbance will be short-term, the use of the sand pile may temporarily change, which can lead to eggs or chicks being unguarded and exposed to temperature fluctuations (e.g. overheating or chilling) or predation by southern black-backed gulls or mammalian predators.

5.2 Management measures

- Continue to use shipping containers as a protective barrier to provide a noise buffer from general Port activity.

- Road traffic should approach and pass the sand pile at speeds not exceeding 30 km/h.

- All activities around the sand pile (within 100 metres of the edge of the sand pile) should be undertaken at as low a noise level as possible, as experienced at the sand pile; c.f. Wright *et al.* 2010.

- Current container maintenance practices include surface grinding and structural container repair. Grinding and structural repair should not occur closer than 50 metres and 100 metres, respectively, from the sand pile.

- Control for mammalian predators.

6.0 Pest animals

6.1 Overview

Pest animals and predatory birds (e.g. southern black-backed gulls) can disturb and possibly kill roosting birds, eat eggs, kill chicks and nesting or roosting adult birds. Rabbits can modify or destroy habitat by digging up and fouling the ground, as well as opportunistically eating eggs from nests. Karoro/southern black-backed gulls are a main predator of chicks and eggs of shorebird species that utilise braided rivers. Predator control has the potential to mitigate some of the negative effects of disturbance from Port construction work, particularly for breeding birds.

Port of Tauranga is undertaking control of some pest species around the Port, particularly rats and feral cats, which will be helping to protect breeding and roosting birds. Currently, two live feral cat traps are used at the sand pile during the nesting season and rat bait stations are being used on the southern and western boundaries.

Other pest species may also be present at the Port, such as stoats and hedgehogs. The installation of kill/bait traps for mustelids, feral cats, hedgehogs and rodents should be intensified at the sand pile, to further protect birds. If there is a continuous capture rate of rats, a toxic baiting programme may be required to reduce the population more effectively.

Cholecalciferol should be used as a knockdown toxin for rats. Cholecalciferol does not require a controlled substance licence, is effective, and is readily available. In the form of Feracol paste, Cholecalciferol is used in bait stations, reducing the risk to the public and non-target animals. It does not leave a long-term residue or bioaccumulate. The risk of secondary poisoning and by-kill from Cholecalciferol in bait stations is low (NPCA 2015). If access to Feracol paste is limited, an alternative is to use Diphacinone, in D-block, double tap or RatAbate products.

Rabbit burrows should have Magtoxin pills introduced down each burrow. Two to five pills should be placed in each burrow, as far down as possible, after all other burrows have been blocked to prevent exit. Water may need to be added to start the reaction, which releases phosphine gas. The contractor used by POT can advise on the best procedure when working on-site.

Domestic and feral cats can cause extensive losses of eggs, chicks and adults within breeding colonies. Kill traps (e.g. Timms and Steve Allen traps) should be used during the breeding season. It is acknowledged that domestic cats could be killed by this method. To reduce this risk, notification to local business and homeowners should suggest that cats are kept inside, especially during the night and early morning, during the breeding season. During the non-breeding season, live traps could be used and feral cats should be shot. If a domestic cat is caught and released away from the Port, the cat should not have learnt that the site has a potential avian food source.

Dogs are excluded from the Port of Tauranga. However, it may nevertheless be appropriate to install a sign at the sand pile to inform truck drivers and other Port users that access to the sand pile is subject to specific authorisation and that dogs are strictly prohibited, to protect any birds at the site.

Predator control should be implemented at key sites around the sand pile at the Port to target rats, cats, and possibly hedgehogs and stoats (if present) to minimise the possibility of birds being killed and eggs being destroyed. All captures should be recorded to assess the effectiveness and whether any changes in trap location, type or clearing/maintenance frequency are required. This can be monitored through trail cameras to assess the effectiveness of the predator control.

6.2 Management measures

Current Pest control consists of the following:

- Two live traps for cats should be operated during nesting season.
- Fourteen rat bait stations, monitored and refilled every two months (or as needed) by a contractor.

Trapping and pest control using toxins should be enhanced to consist of the following:

- Two Timms traps and two Steve Allen traps for feral cats during breeding and non-breeding seasons. Traps should be baited with fresh meat (rabbit, hare, fish, or chicken) at least every two weeks. Traps should be checked 2-3 times per week. Traps should be placed at either end of the sand pile, near Reid Place and East Road. Trail cameras should be positioned to ensure trapping and or poisoning is immediately effective in the breeding season.
- Eight to ten Timms traps, DOC150s or DOC200s for mustelids and hedgehogs. These should be baited with fresh or salted rabbit alternated with a hen egg and checked at least every two weeks. Traps should be positioned 100 x 100 metres apart around the perimeter of the sand pile. An additional trap line should be placed as a buffer up to 200 metres from the sand pile where practicable.
- Magtoxin should be used to reduce the rabbit populations by placing 2-5 pellets into each burrow. Rabbits can breed all year round and regular checks and control will be needed.
- Rats will be an ongoing problem as they reinvade from surrounding areas. It is important to have a well designed plan to keep these pests under control. It is important to use different poisons and pulse these so that bait is not continuously available. Leaving baits out at all times and only using one bait can produce bait shyness where animals learn from a sublethal dose. Pre-feeding for up to two weeks can also increase effectiveness and is especially needed for cholecalciferol. Pre-feeding for two weeks followed by up to 150 grams of poison for a maximum of two weeks (stations refilled during this time if they are emptied). Then remove remaining poison and leave for 2-4 weeks before repeating the process with an alternative poison. Cholecalciferol, diphaphacinone and the combined poison in Double Tap should all be used at different times. None require a Controlled Substance Licence and all are metabolised rapidly and so do not bioaccumulate.
- Rat bait stations should use either Cholecalciferol paste (Feracol), or Diphacanone D-block or RatAbate, depending on the type of bait stations used. Pre-feeding should be undertaken prior to the breeding season and checked weekly. During the non-breeding season, check 1-2 times per month and refill as required. Rat bait stations should be spaced on a 50 × 50 metres grid around the sand pile (e.g. four stations per hectare). Care must be taken, with regular checks, and any spilled bait should be removed to avoid invertebrates eating the bait or non-targeted species being exposed to secondary poisoning, e.g. banded dotterel eating invertebrates.
- Karoro/southern black-backed gull culls may be required if individuals are observed predating eggs or chicks. Pre-feed the gull(s) four to six times with bread spread with margarine to confirm that the bird(s) will take the bait and that the bread is eaten within minutes. Feed bread baited with alphachloralose mixed into the margarine after the pre-feeding period. Alphachloralose is an anaesthetic compound registered for the control of southern black-backed gulls. Remove any uneaten bread after baiting has been completed.

7.0 Pest plants

7.1 Overview

Pest plants can easily become established at the sand pile and will reduce the quality of the area as a roosting or breeding site. They also provide cover for predators. Pest plant establishment will limit the available open space for birds for roosting or breeding. Plant density will increase bird vigilance and threat awareness through scanning for potential predators and will provide cover for mammalian predators to easily approach breeding birds (e.g. predation of eggs and chicks). The sand pile site should be cleared of weeds during the non-breeding season. All activity at the sand pile must be undertaken during the four hours either side of low tide as the shorebirds will have left the site to forage, or two hours either side of high tide when following the process set out in Section 4.2 above. This will prevent any disturbance of roosting birds. Minor maintenance could be undertaken at low tide if incubating birds are not disturbed, e.g. around the edges of the sand pile area.

7.2 Management measures

Non-Breeding Season (April, May, June, and July)

- During the non-breeding season, pest plants should be pulled out and removed during the period four hours either side of low tide. It may be appropriate to undertake mechanised removal. All plant material must be removed and disposed of off-site.
- Spot-spraying could be undertaken using a biodegradable herbicide as a last resort if hand or mechanical removal is less effective.

Breeding Season (August – March, inclusive)

- Pest plant removal should only be undertaken by hand-pulling, hand-cutting or raking. All plant material must be removed and disposed of off-site.

All activity at the sand pile must be undertaken during the four hour period on each side of low tide. A Port of Tauranga bird survey staff member or another suitably qualified ornithologist must be on-site to monitor any birds returning to the roost site and to ensure that work activity has a separation distance of at least 25 metres from any birds, eggs, and chicks, and that the activity does not disturb them.

8.0 Bird monitoring

8.1 Overview

Port of Tauranga currently undertakes weekly surveys of the sand pile during the breeding season to provide baseline survey data and to further understand how birds are using the Port environs (Wildlands Consultants 2021). Bi-weekly survey counts are undertaken during the non-breeding season and non-count (bi-weekly) checks are carried out to identify that nothing unexpected is occurring (evidence of predation, sudden increase/decrease in bird numbers). All surveys are undertaken during high tide. The sand pile storage site has been subdivided into seven sub-zones, and all individuals within each count zone are recorded and totalled to give a total count for each species.

Care must be taken to ensure that no bird is recorded twice within a survey period and that no birds are assumed to be present. Each survey targets all breeding and roosting coastal birds, including kuaka/eastern bar-tailed godwit, tuturiwhatu/New Zealand dotterel, tōrea/South Island pied oystercatcher, tōrea pango/variable oystercatcher, tara/white-fronted tern, karuhiruhi/pied shag, and all other coastal birds.

8.2 Management measures

- For consistency between surveys, each survey will record the same details as previous surveys including details of the date, time, location, tide, wind direction, wind speed, weather condition, temperature, species, number of individuals (adult and juvenile), general breeding behaviour (nest building, incubating, feeding young, foraging, roosting), and number of eggs. Monitoring will also include recording of all stages of juvenile development (in the nest or moving around, fed by adult, or fledged).

- Surveys are ideally undertaken around high tide to provide consistence between survey records and allows for a more robust estimate between assessments.

- Land-based photographs can be used for counts of large numbers of birds, such as kuaka/eastern-bar tailed godwit and tarāpunga/red-billed gulls.

- Trail cameras or security type cameras could be used to monitor and record predator interaction and to guide additional trapping or culling measures.

- Survey results and trends will inform adaptive management actions.

Further monitoring details are outlined in the report on ‘Monitoring of coastal birds at the Port of Tauranga’ (Wildland Consultants 2021).

9.0 Management plan review

This management plan provides prescriptions for the sand pile dimensions, noise, pest animal and pest plant control, and bird monitoring. This plan should be reviewed every five years or more frequently if there are substantial changes to the Port activities, population abundances, or pest threats.

10.0 People involved

- Rowan Johnstone, Engineering Manager, Port of Tauranga. Project management of the Stella Passage Development works.

- A nominated representative for mana whenua Ngāi Tamarawaho hapū, to review this plan.

- Department of Conservation representative, to review this plan and assist as required.

- Fenna Beets or Kate Bristow, Port of Tauranga, to undertake weekly surveys at the sand pile and avian species present during the breeding season (August to March, inclusive) and monthly surveys during the non-breeding season (April to July, inclusive).

Acknowledgments

Rowan Johnstone of Port of Tauranga provided useful background information, discussion, and guidance during the preparation of this sand pile management report.

References

Adams R. 2013 [updated 2022]: Pied stilt poaka. *In* Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

Barter M. 2002: Shorebirds of the Yellow Sea: Importance, threats and conservation status. Wetlands International Global Series 9. *International Wader Studies 12, Canberra, Australia*. 112 pp.

Battley P.F., Conklin J.R., Parody-Merino A.M., Langlands P.A., Southey I., Burns T., Melville D.S., Schuckard R., Riegen A.C., and Potter M.A. 2012: Interacting roles of breeding geography and early-life settlement in godwit migration timing. *Frontiers in Ecology and Evolution 8*(52): 14 pp.

Battley P.F., Schuckard R., and Melville D.S. 2012: Movements of bar-tailed godwits and red knots within New Zealand (No. 315). *Department of Conservation*. 60 pp.

BirdLife International 2017: *Species factsheet: Sterna sterna*. Retrieved from http://datazone.birdlife.org/species/factsheet/white-fronted-tern-sterna-striata

Conklin J.R., Lisovski S., and Battley P.F. 2021: Advancement in long-distance bird migration through individual plasticity in departure. *Nature Communications 12*(1): 1-9.

Conklin J.R., Lok T., Melville D.S., Riegen A.C., Schuckard R., Piersma T., and Battley P.F. 2016: Declining adult survival of New Zealand bar-tailed godwits during 2005-2012 despite apparent population stability. *Emu - Austral Ornithology 116*(2): 147-157. https://doi.org/10.1071/MU15058

Conklin J.R., Senner N.R., Battley P.F., and Piersma T. 2017: Extreme migration and the individual quality spectrum. *Journal of Avian Biology 48*: 19-36.

Conklin J.R., Verkuil Y.I., and Smith B.R. 2014: Prioritising migratory shorebirds for conservation action on the East Asian-Australasian Flyway. *World Wide Fund - Hong Kong*.

Department of Conservation 2018: Control of black-backed gulls to protect rare braided river birds. Department of Conservation. https://www.doc.govt.nz/news/media-releases/2018/ control-of-black-backed-gulls-to-protect-rare-braided-river-birds/#:~:text=Black%2Dbacked%20gulls%20are%20known,breed%20on%20this%20braided%20river.

Dowding J.E. 2013 [updated 2022]: Wrybill | ngutu pare. *In* Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

Dowding J.E. 2019: Site of importance to shorebirds and seabirds in the Waikato region. *Waikato Regional Council Technical Report 2019/20*. 94 pp.

Fitzgerald N. 2013 [updated 2022]: Caspian tern | taranui. *In* Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

Harbrow M.A., Cessford G.R., and Kazmierow B.J. 2011: The impact of noise on recreationists and wildlife in New Zealand's natural areas: A literature review. *Department of Conservation Science for Conservation 314*. 92 pp.

Jamieson S.E. 2013 [updated 2017]: Semipalmated sandpiper. In Miskelly, C.M. (ed.) New Zealand Birds Online. Accessed 13 September 2022. Available at: www.nzbirdsonline.org.nz

Kaldor B. 2019: Bird disturbance from human activity: Potential effects from recreational activities on sea and shore birds. *Avon-Heathcote Estuary Ihutai Trust*. 32 pp.

McClellan R.K. 2009: The ecology and management of Southland's black-billed gulls. *Unpublished Doctoral Thesis in Zoology*. University of Otago. 284 pp.

Nechaev V.A. 1998: Distribution of waders during migration at Sakhalin Island. In *Migration and International Conservation of Waders: Research and Conservation on North Asian, African, and European Flyways* (pp. 225-232). International Wader Study.

National Pest Control Agencies 2015: C5 Cholecalciferol: its use for possum and rodent control. National Pest Control Agencies, Wellington. Available at: https://www.bionet.nz/assets/Uploads/Publications/C5-Cholecalcifer-2015-Nov-HR.pdf

Pierce R.J. 2013 [updated 2022]: Banded dotterel | pohowera. *In* Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

Piersma T., Lok T., Chen Y., Hassell C.J., Yang H-Y., Boyle A., Slaymaker M., Chan Y-C., Melville D.S., Zhang Z-W., and Ma Z. 2016: Simultaneous declines in summer survival of three shorebirds species signals a flyway at risk. *Journal of Applied Ecology 53*: 479- 490.

Riegen A.C. and Sagar P.M. 2020: Distribution and numbers of waders in New Zealand 2005- 2019. *Notornis 67*: 591-634.

Rogers D.I. 2003: High-tide roost choice by coastal waders. *Wader Study Group Bulletin 100*. 7 pp.

Schlacher T.A., Weston M.A., Lynn D., and Connolly R.M. 2013: Setback distances as a conservation tool in wildlife-human interactions: Testing their efficacy for birds affects by vehicles on open-coast sandy beaches. *PLoS ONE 8*(9). 15 pp.

Studds C., Kendall B., Murray N.M., Wilson H.B., Rogers D.I., Clemens R.S., Gosbell K., Hassell C.J., Jessop R., Melville D.S., Milton D.A., Minton C.D.T., Possingham H.P., Riegen A.C., Straw P., Woehler E.J., and Fuler R.A. 2017: Rapid population decline in migratory shorebirds relying on Yellow Sea tidal mudflats as stopover sites. *Nature Communications 8*: 7 pp. https://doi.org/10.1038/ncomms14895

Wildland Consultants 2021: Monitoring of coastal birds at the Port of Tauranga. *Wildland Consultants Ltd Contract Report No. 5154b*. Prepared for Port of Tauranga Ltd. 12 pp.

Woodley K. 2013 [updated 2022]: Bar-tailed godwit | Kuaka. In Miskelly, C.M. (ed.) New Zealand Birds Online. Accessed 13 September 2022. Available at: www.nzbirdsonline.org.nz

Wright M.D., Goodman P., and Cameron T.C. 2010: Exploring behavioural responses of shorebirds to impulse noise. *Wildfowl 60*: 150-167

SECTION 2 - KORORĀ/BLUE PENGUIN AND TARĀPUNGA/RED-BILLED GULL MANAGEMENT PLAN FOR THE PORT OF TAURANGA

1.0 Introduction

Port of Tauranga Limited is proposing to build new wharf extensions over several years to meet increased demands. Wharf construction is proposed for both the Sulphur Point Wharf and the Mount Maunganui Wharf. The Mount Maunganui Wharf works include a 315 metre extension with 1.6 hectares of reclamation behind the wharf, Mooring and Breasting Dolphins north and south of the Tanker Berth, as well as minor structures and reclamation of 0.18 hectares associated with Butters Landing (Figure 1). Development of the 315 metre extension to the Mount Maunganui Wharves would involve the loss of a rock wall where kororā/blue penguins (*Eudyptula minor iredalei*; At Risk – Declining) burrows have been found (Figure 2) and tarāpunga/red-billed gulls (*Chroicocephalus novaehollandiae scopulinus*; At Risk – Declining) roost and breed (Figure 3). There is also potential for kororā/blue penguins to be discovered in the rock wall along the Sulphur Point Wharf reclamation and extension site (Figure 2).

The proposed reclamation for the proposed Mount Maunganui wharf extension will cover approximately the same length of the existing rock wall as the wharf extension. Partial removal of this rock wall between Berths 11 and 16 (Cement Tanker Berth) will directly affect the red-billed gull colony that roosts and breeds here, and a small number of kororā/northern blue penguin that breed and moult within the sections of rock revetment proposed for construction of the wharf sections and for infilling/reclamation. Red-billed gulls utilise the rock wall throughout the year to roost, with breeding only occurring mid-September to February. To avoid affecting breeding birds or moulting kororā/penguins, removal of the rock wall must be scheduled to begin at the end of the penguin breeding season, which is mainly within the period July to March. However, individuals do visit the site during June for approximately five days (*c.*30 days before egg laying in July). As kororā/penguins may be present in their burrows at any time of the year, known burrows will need to be checked for kororā/penguin presence before any work is undertaken within a section of revetment. Any active breeding nests or moulting birds will be avoided, and resting birds will be removed by an approved kororā/penguin handler. However, there will be an ongoing risk of mortality of resting or moulting adults for birds that are not relocated. The actions described in this report are designed to avoid this possibility. Kororā/blue penguins are highly tolerant of noise and human activity as they currently roost and breed within a noisy Port environment. Furthermore, recent research on pile driving noise indicates that kororā/blue penguins continued to inhabit and breed successfully in a breakwater during marina construction which occurred within 12-25 metres of active burrows (Lawrence *et al.* 2023). Following completion of the works, it is expected that recolonisation of any new wall will occur quickly (e.g. modified rock wall for tarāpunga/red-billed gull roosting and breeding).

No kororā/penguins were found to be present within the area to be affected by the proposed Sulphur Point extension. However, should they be found, then the protocols applied to the Mount Maunganui wharf extension will be implemented.

To address requirements for the protection of kororā/blue penguins and tarāpunga/red-billed gulls, Port of Tauranga commissioned Wildland Consultants to prepare a kororā/penguin and avian management plan, which is to be implemented through the construction process. This involves the enhancement of the remaining section of existing rock wall to replace the habitat lost for the tarāpunga/red-billed gulls (which may also be used by kororā/penguin) and a kororā/penguin nest colony.

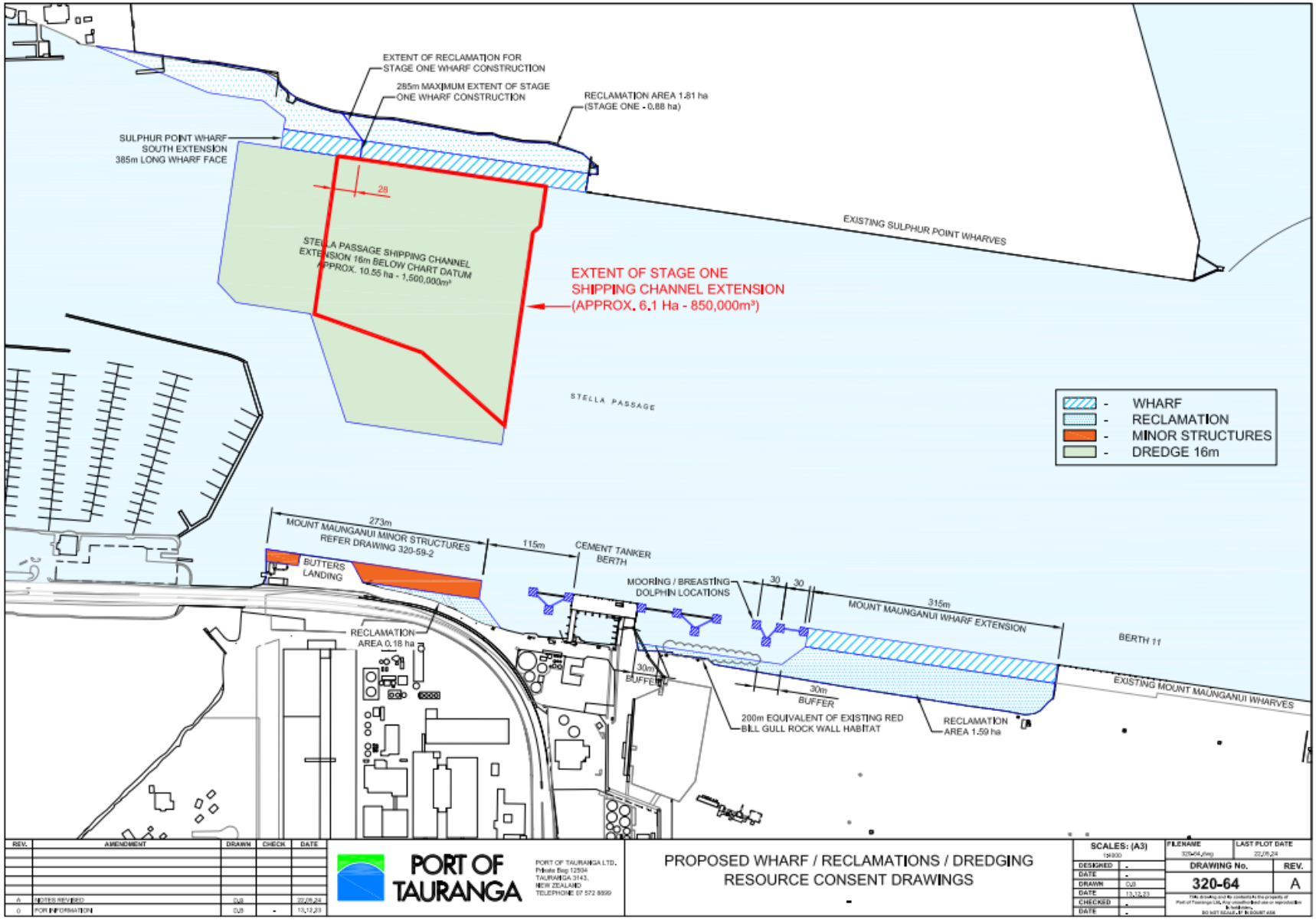

Figure 1: Location of the proposed Mount Maunganui Wharf extension, Mooring/Breasting Dolphins, minor structures, and reclamations.

2.0 Management plan summary

2.1 Overview

As part of the Mount wharf extension and Sulphur Point reclamation and wharf extension, the Port of Tauranga has developed this kororā/blue penguin and avian management plan to minimise adverse effects on the tarāpunga/red-billed gull and kororā/blue penguin populations within the existing rock wall and surrounding construction site. The primary goal of the plan is to achieve no net loss of tarāpunga/red-billed gulls and kororā/blue penguins in the vicinity of the works. The aim of no net loss acknowledges that some individuals may leave the area for a period of time, new individuals may take up residence at the site during construction, or a permanently lost individual is replaced by fledglings from the current population. Monitoring will be undertaken to assess penguin numbers prior to construction (baseline) and post-construction.

This management plan has been compiled based on experience with the Whakarire Avenue (Napier) Penguin Management Plan (Wildland Consultants 2020a), Hardinge Road (Napier) Penguin Management Plan (Wildland Consultants 2019a), and the Napier Port Avian Management Plan (Wildland Consultants 2019b).

Kororā/blue penguin are a charismatic species and of great interest to the Tauranga community and iwi, information regarding the proposed surveying, relocation and future housing (nesting box colony and alternative nesting sites within the replacement rock walls) will be provided on the Port of Tauranga website.

The following section is a summary of the 'Kororā/Blue Penguin and Avian Management Plan for the Port of Tauranga'.

2.2 Kororā/blue penguin – summary of management measures

- Prior to Mount Maunganui rock wall removal: The Mount Maunganui Wharf kororā/penguin population, including the area to be affected (Figure 3), will be surveyed twice during the breeding season using a conservation dog trained to locate kororā/penguin burrows (e.g. October and December). GPS coordinates will be recorded for all burrows. A survey was undertaken in August 2019 at the beginning of the breeding season where a trained kororā/penguin dog indicated 16 active sites along the Mount Manganui rock wall. More birds would be expected to be located during the peak of the breeding season in October to December.

- Prior to wall removal: a new nesting box colony will be developed and landscaped ready to receive kororā/penguins.

- Prior to wall removal: potential burrows in the affected area will be located by a trained kororā/penguin dog during the start of the non-breeding season (April to June) and checked using a burrowscope. All burrows will be made inaccessible by rock wall wrapping, including any potential roosting crevices. Any kororā/penguins which are detected within the rock wall will be relocated to the nesting box colony.

- During Mount Maunganui rock wall dismantling: a kororā/penguin handler will be available to relocate any kororā/penguins which are incidentally detected within the rock wall area and relocated to the nesting box colony.

- Action plan: to manage all situations (e.g. resting, breeding and moulting) where kororā/penguins, their chicks or eggs are discovered within the revetment to be affected.

- Nest box colony: Port of Tauranga will construct a nest box colony within the Port environs to offset the permanent loss of nesting habitat within adjacent revetments. It is suggested that the colony could be located south of Berth 16, immediately adjacent to the Butters offices and workshop. An existing rock wall at this site faces south and west. However, the rock wall is not of a construction which is suitable for kororā/penguins to form burrows within the structure. Modification of the site is required. The southern end (Plate 1) has an area of ground on which nesting boxes can be installed and some indigenous plants are already present in this area. The western section of wall (Plate 2) contains lengths of concrete and would need to be added to (e.g. rocks) before nesting boxes can be established. Both sites will need ramps installed to allow easy penguin access. Penguins may also choose to nest under the Butters office building, and the area should be fenced off to prevent penguin activity and smell disturbing staff. The nesting box colony site should be covered with soil, grassed, and planted with indigenous shrubs and flaxes (e.g. *Phormium cookianum*), to provide shade and shelter. Approximately 13 boxes will be established to provide burrow habitat for translocated penguins and individuals looking for a new nesting site prior to and during rock wall covering and replacement may also utilise these boxes (Appendix 2). This colony would provide the opportunity to transfer resting or near moult completion kororā/penguins from the affected revetment area, if they are present. Moulting kororā/penguins from the Mount Maunganui Wharf site will be translocated to this nest box colony, which is a short distance from the construction site.

- Concrete pipes will be used as nest sites within the new Mount Maunganui rock wall: During the construction of the new Mount Maunganui wharves, large concrete pipes (*c.*300 millimetre diameter) will be embedded in the new wall approximately one metre above mean high tide and angled to allow any water to drain. Each of the 20 pipes will be located approximately every 10 metres along the rock wall. Furthermore, the replacement rock wall will be constructed with rocks of a similar size to the existing rock wall, allowing kororā/penguins to establish new burrows as the wall is completed. These concrete pipe burrows can also be established in the Sulphur Point rock wall or strategically within the sand pile.

- Post-construction: kororā/penguin population will be surveyed twice during the first two breeding season after construction of the Mount Maunganui Wharves has been completed (e.g. October and December), to confirm whether kororā/penguins have taken up residence in any new wall structures (e.g. construction of a purpose-built rock wall for red-billed gulls south of the dismantled wall, closer to the Tanker Berth).

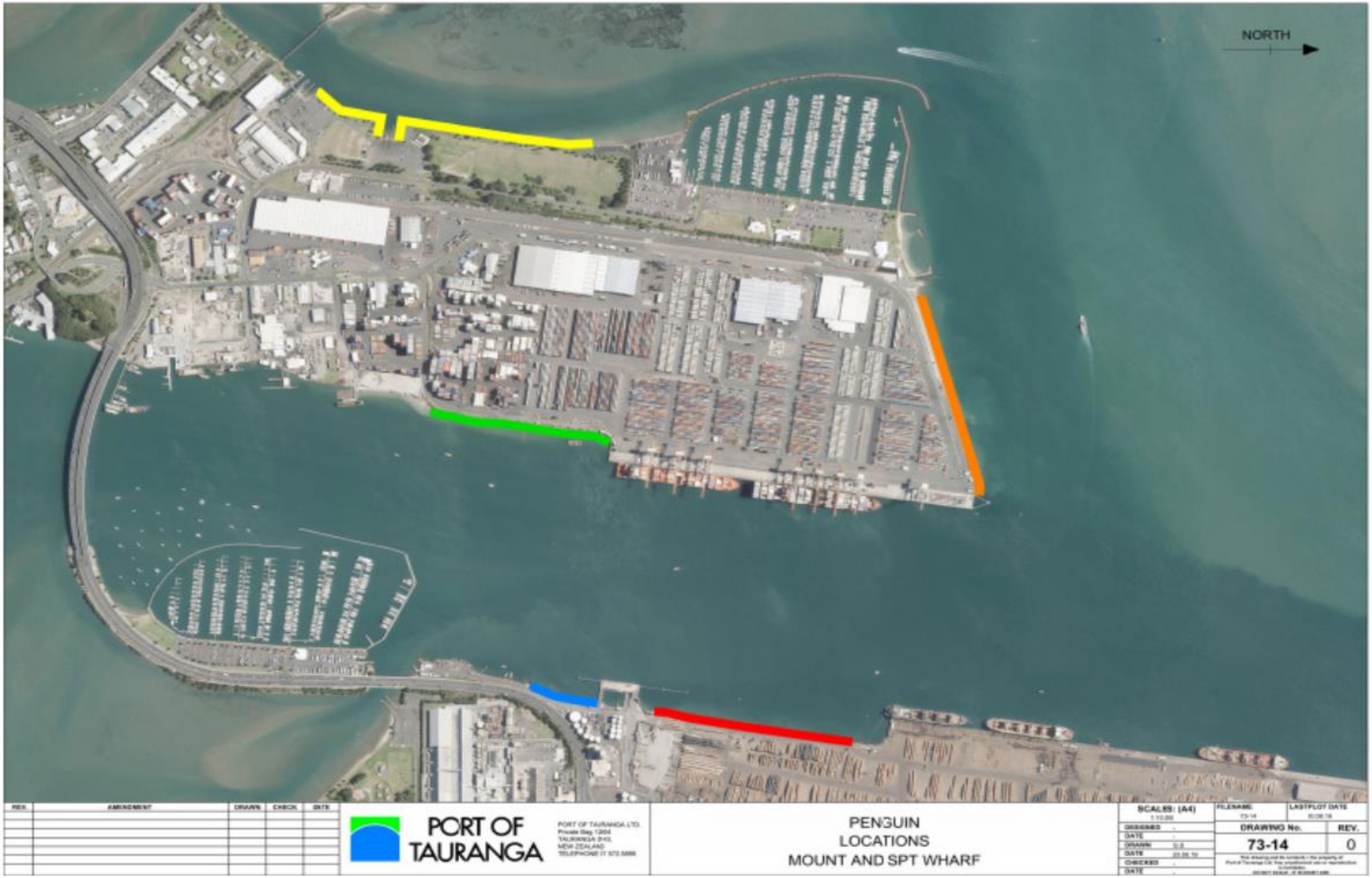

Figure 2: Location of kororā/blue penguins found in the 2019 survey. The red and blue lines are in the general location of the two Mount Maunganui Wharf extensions. The green and orange lines are located within the Port's Sulphur Point wharf. The yellow line is outside of the Port (from Wildland Consultants 2020). Sixteen kororā/blue penguins were identified in the red area and two within the yellow area. No kororā/blue penguins were detected within the blue, orange or green areas.

Figure 3: Port of Tauranga key bird locations

Plate 1: Site proposed for kororā/blue penguin nest box colony at Butters Point, looking east.

Plate 2: Site proposed for kororā/blue penguin nest box colony at Butters Point, looking north.

2.3 Tarāpunga/red-billed gulls – summary of management measures

Prior to wall removal: The Port of Tauranga will either retain 200 metres of the existing rock wall, or modify a section of the existing wall to provide the same footprint, or construct a purpose-built rock wall south of the dismantled wall, closer to the Tanker Berth. This area will provide tarāpunga/red-billed gull with a site further along the rock wall to roost and breed. The modification will involve increasing the height of the wall as it is current too low for red-billed gulls to use.

During rock wall removal: Partial construction of the southern Mount Maunganui Wharf extension and building activity will influence birds returning to the Port of Tauranga for the breeding season to seek an alternative roosting and nesting site. This disturbance will displace birds to roost and breed further along the rock wall within the modified area.

Non-lethal deterrents should be installed (e.g. trip wires) should be installed at Butters Landing, to prevent a colony of tarāpunga/red-billed gulls establishing at the proposed penguin nesting box site.

3.0 Kororā/blue penguin biology and ecology

3.1 Population status

Kororā/blue penguin are found throughout Aotearoa New Zealand[1] and are classified as At Risk – Declining (Robertson *et al.* 2021). Kororā/penguins present around the Port of Tauranga are the northern blue penguin subspecies.

Tauranga supports a significant kororā/penguin population, concentrated at Mauao (Mount Maunganui) 800 nests, Moturiki (Leisure Island) 200 nests, and Motuotau (Rabbit Island) 400 nests[2], with at least 1,400 nests in total at these three sites. Other locations around the wider Tauranga area include Waikareao, Matapihi and Waipu.

3.2 Habitat

Kororā/blue penguins are widespread around the coastline of Aotearoa New Zealand, roosting and nesting in colonies or sometimes singly. Colonies are generally small, numbering only a few pairs. The largest colonies include the Oamaru population that comprises more than 450 breeding pairs (Agnew and Houston 2020). Birds can nest some distance inland, and in virtually any habitat, including coastal dunes, scrub and forest, farmland, and residential areas (Marchant and Higgins 1990). Kororā/blue penguins can habituate to artificial lighting, which does not affect colony use (Rodríguez *et al.* 2017).

Birds breed in a wide variety of burrow types, including burrows that they excavate, burrows they commandeer off other birds (such as sooty shearwaters, *Puffinus gavia*), or they use logs, caves, crevasses in rocky shorelines, under houses and custom-made nest boxes (Braidwood *et al.* 2011, Marchant and Higgins 1990). At Port of Tauranga, kororā/penguins' nest within the seawall at the Mount Maunganui Wharf and possibly within the Sulphur Point seawall.

Nest sites are used throughout the year, and the same nest site is often used year-to-year.

[1] Recent genetic research recommends that the New Zealand blue penguin and Australian fairy penguin be split into distinct species (Grosser *et al.* 2015).

[2] https://www.westernbaywildlife.nz/penguin-monitoring/

3.3 Breeding cycle

The breeding cycle of kororā/blue penguin is shown in Table 1. Dates can vary between locations. In some instances, egg-laying can occur as late as December, resulting in a protracted breeding season.

Table 1 – Indicative breeding cycle of kororā/blue penguins, based on Flemming (2013) and Dann (2013). Red highlighting indicates burrow occupancy stage in the breeding cycle.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Burrow occupation												
Egg laying												
Guarding young												
Moulting												

Moulting usually occurs after breeding has been completed. During this period of 2-3 weeks, the loss of waterproofing means that an adult bird cannot enter water. After moulting, the birds undertake extensive foraging trips, which can last for more than a week before they return to their burrow. This short period around April-May is the only time when kororā/blue penguin presence in burrows is significantly reduced. Prior to the onset of breeding (June), a pair will remain in the nest together for about five days, approximately 30 days before the first egg is laid. The pair then return to the sea for a number of days before returning and remaining ashore for another five days, when the first egg is laid.

Kororā/blue penguins usually lay two eggs which are incubated by both the male and female in stints of 1-10 days. Incubation lasts approximately 35 days. Chicks fledge at 7-9 weeks. Pairs can re-lay if clutches fail, and sometimes begin a second nest after breeding successfully (Agnew *et al.* 2014).

3.4 Foraging

Kororā/blue penguins are known to travel significant distances from the colony when foraging, with examples of more than 45 kilometres and up to 214 kilometres (Hoskins *et al.* 2008; Poupart *et al.* 2017; Preston *et al.* 2007).

Kororā/blue penguins are typically demersal divers - feeding on the sea bottom - and are thought to use the seabed to trap their prey (Chiaradia *et al.* 2007). They have been shown to dive to 55 metres, but generally feed in shallower waters (e.g. Chiaradia *et al.* 2007; Hoskins *et al.* 2008). The few dietary studies undertaken in Aotearoa New Zealand indicate that the species takes a variety of inshore species of small fish and squid (Flemming *et al.* 2013; Fraser and Lalas 2004; van Heezik 1990).

3.5 Threats

Kororā/blue penguins are potentially affected by many threats and perhaps the most widely recognised is introduced predators. Cats (*Felis catus*), dogs (*Canis familiaris*), ferrets (*Mustela furo*), and stoats (*Mustela erminea*) can prey on eggs, chicks, and adult kororā/penguins; and rats (*Rattus* spp.) may prey on eggs (Agnew *et al.* 2014). The impact of particular pest predators appears to vary between sites (see Challies and Burleigh 2004; Stahel and Gales 1987; Perriman and Steen 2000; Karl and Best 1982; Stevenson and Woehler 2008; Dann 1992; Heber *et al.* 2008).

Perhaps the most striking reports of predation have been those resulting from dogs. A population at Cape Foulwind was decimated by dogs over a few nights, losing 22 adults (Musson 2012), and the predator involved was confirmed by veterinarians.

Kororā/blue penguins are also vulnerable to collisions with vehicles when they cross roads to obtain access to breeding sites (Heber *et al.* 2008; Dann 2013), with small boats within the marinas, and possible effects of climate change have been relatively well researched in Australia, with authors identifying both positive and negative effects resulting from sea temperature increases (references in Dann 2013). In early 2018, high levels of mortality of kororā/penguins were reported, particularly from northern areas of Aotearoa New Zealand and western Bay of Plenty. Department of Conservation seabird expert Graeme Taylor suggested a rapid change from an El Niño period to a La Niña event caused major food supply changes, resulting in mass mortality of newly fledged birds[1].

Other threats include encroachment of coastal developments into breeding areas, as well as increased activities within marine areas, and pollution, particularly oil spills (e.g. Stella Passage Mobile oil spill in 2015). The wreck of the Rena resulted in 383 oiled kororā/penguins being admitted to a wildlife facility for rehabilitation, and 90 dead oiled birds were collected (Sievwright 2014; Riddell and Kessels 2013).

3.6 Port of Tauranga kororā/penguin population

Port of Tauranga undertook a kororā/blue penguin survey at various locations within the Port during the early breeding period in August 2019. The survey was undertaken with a specialist conservation dog trained to detect seabirds, and the handler, Joanna Sim (DabChickNZ). Sixteen detections were made within the rock wall by the Mount Maunganui Wharf (Figures 2 and 3).

4.0 Tarāpunga/red-billed gull biology and ecology

4.1 Population status

Tarāpunga/red-billed gulls are found throughout Aotearoa New Zealand and are classified as At Risk-Declining due to the significant declines at three of Aotearoa New Zealand's largest colonies at Three Kings Islands, Mokohinau Islands, and Kaikoura (Mills *et al.* 2018).

4.2 Habitat

Tarāpunga/red-billed gulls are widespread around the Aotearoa New Zealand coastline, and generally breed and roost in large colonies (Heather and Robertson 2015), frequenting estuaries, harbours, open coastlines, and parks in coastal cities. Most birds will leave the breeding colony in autumn and undertake seasonal movements to wintering sites, e.g. from Kaikoura to Wellington Harbour. Most birds will remain within 400 kilometres of their breeding colony (Heather and Robertson 2015).

4.3 Breeding cycle

The breeding season has a long egg-laying period from mid-September to February (Heather and Robertson 2015). Colony numbers will start building up around mid-July, but nesting sites are not occupied until early August. Nests are usually at ground level on shellbanks, sandspits, gravel beaches, rocky headlands, and rocky inlets. Incubation takes 21-27 days; chicks fledge at about 37 days and are fed for another *c.*30 days (Heather and Robertson 2015). The normal clutch size is two eggs, and adults and chicks have high site fidelity and return to the same colony they previously bred or were hatched. If successful at a particular site, adults will return the next year to that colony (Mills *et al.* 2018).

[1] https://www.nzherald.co.nz/nz/little-blue-penguins-death-numbers-cause-concern/GRKRPJ7SBSR77YKKQVKLNVM6Y4/

4.4 Foraging

Birds will commute 20 kilometres or more each day from a roosting/breeding site and offshore foraging sites (Heather and Robertson 2015). The diet of breeding adult red-billed gulls and nestlings consists mainly of krill, but also small fish, terrestrial invertebrates, fishing discards, and food discards in urban areas and rubbish dumps.

4.5 Threats

Tarāpunga/red-billed gulls are threatened by mammalian predators, including cats (*Felis catus*), ferrets (*Mustela furo*), stoats (*Mustela erminea*), hedgehogs (*Erinaceus europaeus*), and rats (*Rattus* spp.), as well as avian predators, such as southern black-backed gulls (*Larus dominicanus dominicanus*) (Mills *et al.* 2018). Long-term declines in red-billed gull numbers may also be driven by changing sea temperatures altering the distribution and abundance of marine organisms (Mills *et al.* 2008; Frost and Taylor 2016; Frost 2017).

4.6 Port of Tauranga tarāpunga/red-billed gulls

During a site visit 6 December 2021, approximately 600 red-billed gulls were roosting and nesting at the rock wall of the Mount Maunganui Wharf (Plate 5). Regular monthly bird surveys at the site commenced in January 2022. During the November 2023 survey of the southern log yards and rock wall, up to 800 red-billed gulls were recorded (Figure 3).

Plate 5: Tarāpunga/red-billed gulls roosting and nesting at the rock wall at the Mount Maunganui Wharf, looking south.

During 2024, tarāpunga/red-billed gulls started roosting on the clear ground at Butters Landing, the site that has been identified for a new penguin nesting box colony (Plate 6). There is the potential for a more permanent colony to become established at this site.

Plate 6: Newly-establishing tarāpunga/red-billed gull colony at Butters Landing. 27 January 2025.

Establishment of roosts and nests at Butters Landing indicates that the Port environment provides a safe habitat for avifauna. The Butters Landing site has an amenity building used by Port staff for tea and meal breaks. Formation of the gull colony here has resulted in droppings covering the building, staff vehicles, and pathways, creating an unhygienic environment and significantly increasing human health risks. Additionally, with the current global spread of avian influenza, which can also infect mammals, and this heightens these health concerns. Although Aotearoa New Zealand has not yet encountered the highly infectious strain of avian influenza (H5N1), it is transmitted worldwide by migratory birds. Moreover, the sand pile at the Port serves as an important roosting area for kuaka/eastern bar-tailed godwit, which migrate between the Port and global regions where this infectious strain is present. It is important to implement measures to prevent any adverse effects that could disrupt Port operations.

5.0 Potential ecological effects

5.1 Overview

The area affected by rock wall removal is an important roosting and nesting site for tarāpunga/red-billed gulls and is the largest coastal mainland colony in the Bay of Plenty[1]. The affected rock wall also comprises a relatively small proportion of potential and known kororā/blue penguin habitat provided by rock revetments that extend around the Port of Tauranga.

Removal of rock wall between Berths 11 and 16 should be programmed for the period between late March and early July as this will minimise potential overlap with the breeding period for tarāpunga/red-billed gulls and kororā/blue penguins, and therefore minimise the possibility of penguin eggs and chicks being present in burrows when work commences, as well as impacts on breeding tarāpunga/red-billed gulls.

5.2 Kororā/blue penguins

Port of Tauranga estimates that the construction or extension of the Mount wharf will take approximately 18-24 months to complete. Dismantling of the rock wall and construction of the wharf

[1] Colony size details provided by John Heaphy, Department of Conservation.

could be staged, starting and finishing one section at a time. Alternatively, the rock wall could be removed, and the revetment made inaccessible prior to wharf construction, e.g. the revetment could be wrapped, preventing access or the large boulders could be removed to the high water line and lowered into the water as part of the construction programme.

At the time when removal of the rock wall commences (e.g. early April), all or most chicks will have fledged, and adults that have bred may be moulting or heading out to sea for a number of weeks following their moult, or may be resting in the burrow. This means that the proposed rock wall removal is unlikely to affect nests, but could affect adults if they are present in the burrow. If an adult is detected within a burrow, as determined during the pre-construction survey, a minimum setback distance of at least 20 metres will be maintained between the active burrow and all operating machinery until the bird leaves of its own accord or is relocated by the kororā/penguin handler. Particular care will be taken to avoid the loss of late-season nests, fledglings or moulting adults.

5.3 Tarāpunga/red-billed gulls

Construction of the Mount wharf extension will remove the existing rock wall where tarāpunga/red-billed gulls currently roost and nest, requiring the colony to relocate elsewhere (e.g. sand pile, within or outside of Port environs).

The gull colony is likely to attempt to re-establish in relatively close proximity to its last location, such as further south along the rock wall, a cargo shed roof, the Sulphur Point sand pile, the newly-forming Butters Landing roost, or another relatively undisturbed location with suitable surfaces for breeding. Alternatively, if no suitable habitats exist within the Port, birds will move elsewhere. This could include birds relocating nearer to or within the Tauranga Airport boundary, which may increase the risk of bird strikes with aircraft. Tauranga Airport is situated close to Tauranga Harbour and estuary, which are used by many bird species, and the airport has mitigation measures to address these risks. Nevertheless, increased numbers of red-billed gulls at or close to the airport environment is not desirable.

The colony's current location within the Port is likely to provide the birds with considerable protection from predation by terrestrial mammals. If birds re-establish outside of the Port, this protection may be lost, and productivity may be reduced as a result. If the gull colony remains at the present location to breed while construction is occurring nearby. In that case, the colony will be subjected to increased levels of disturbance and this may lead to reduced productivity. To minimise this effect, the Port of Tauranga will leave approximately 200 metres or equivalent surface area of the existing rock wall or construct a purpose-built rock wall south of the dismantled wall, closer to the Tanker Berth, enabling the gulls to remain within their present colony location. Monthly monitoring of the site will assess changes in tarāpunga/red-billed gull colony numbers.

Management actions set out in the following sections aim to avoid any loss of nests or adults as a result of the dismantling of the rock wall. Successful implementation of management actions will result in minimising adverse effects (primarily the temporary loss of roosting area).

5.4 Tara/white-fronted tern

A few tara/white-fronted tern pairs use stand-alone piles to roost and breed near the Mount Manganui wharf.

6.0 Kororā/penguin management and mitigation

6.1 Identification and monitoring of affected burrows

As noted above, the Port environs were surveyed for kororā/blue penguins in August 2019 and that survey located burrows within the area to be affected. Good site knowledge will enable stringent management to be implemented.

During the pre-construction phase, the 16 potential kororā/penguin burrows identified using a conservation dog in 2019 should be searched thoroughly to properly locate each burrow and identify its inhabitants. Furthermore, the whole rock wall which will be affected during works will be searched by a kororā/penguin dog and handler to identify any additional breeding/roosting sites that are now being occupied. A burrowscope should be used where burrows are too deep to view or reach by hand. If a nest is present, then the burrow obviously contains a breeding pair. Otherwise, burrows may require a return visit in the early evening to determine the presence of inhabitants. Joanna Sim and her dog Rua (or another dog handler with similar skills and experience) will undertake this search before any rock wall removal commences. Any handling and translocation of kororā/penguins during the construction phase will be undertaken by appropriately trained, experienced and permitted personnel.

Burrows that are identified during the search should be marked. A small mark should be made on the footpath above the burrow, and the burrow should be photographed and described in detail, so that they can be revisited as required.

This initial check would address the following:

- Locate kororā/blue penguin burrows during the breeding season and adult moult (typically July to April, inclusive) and obtain information on resident birds and burrow construction.
- Allow for dismantling of the rock wall outside of the breeding season, to avoid nesting birds, over the period April to early July, or thereabouts.
- Identify and undertake a staged programme to pre-construction wrap the rock wall outside of the breeding season (as per the Napier Port methodology) to discourage birds from using the rock wall. This would be once the trained kororā/penguin dog and handler have confirmed that each section is clear of penguins. If all staged works cannot be completed during the non-breeding period, some deconstruction work can be completed for a short period within the breeding season.
- This would only be undertaken once the nesting box colony is built and monitoring of nest box occupancy has commenced.

6.2 Action plan

Dismantling of the Mount Maunganui rock wall will be undertaken outside of the typical kororā/blue penguin breeding and moult season, which is usually July-March However, it is possible that some older chicks may remain in burrows, or that adults may be present during the day. These adults may be resting, moulting, or possibly guarding a late chick. Similarly, the proposed construction period may take 18-20 months, and some limited dismantling of the wall may be necessary during the breeding season, but only in the event that successful relocation of kororā/penguin and tarāpunga/red-billed gulls has occurred. This will be assessed during the regular Port avifauna surveys.

The Action Plan will be implemented during the dismantling of the rock wall. Details are set out below and address the possibility that nests will be uncovered containing eggs and/or chicks, moulting adults, resting adults, and the possible injury of individuals.

Methods

Prior to wrapping of a section of the rock wall, burrow sites identified during the survey prior to removal of the rock wall will be checked using a burrowscope. If a burrow is found to be active, three main actions will be implemented subject to the contents of the burrow:

- One or two resting adults (no down feathers present): ensure that the nest site does not contain eggs or chicks.
    - If adult(s) can be reached by hand, capture and box the adult(s) and relocate to the nest box colony. This would be undertaken by someone with a permit to handle kororā/blue penguins.
    - After the relocation of any birds to the nest box colony, ensure that all burrows and wall section has been wrapped by the end of the day to prevent birds from re-entering.
    - If adult(s) are present but cannot be reached, move further along the rock wall and confirm no birds are present before wrapping. The new section being assessed should be at least a minimum of 10 metres away from the occupied nest, or 15 metres where practicable.
    - Return to the occupied burrow the following day to check on the inhabitants. Continue work when the adults have left.

- One or two moulting adults: if the moult is near completion (new feathers are evident over most of the body), transfer the bird(s) to the Port nest box colony by someone with a permit to handle kororā/blue penguins.
    - If adult(s) can be reached by hand, box the adult(s) and relocate to the nest box colony. This would be undertaken by someone with a permit to handle kororā/blue penguins.
    - If adult(s) cannot be reached, return to the burrow the following day to check on the inhabitants. Note that the moulting period lasts 10-18 days. Continue work when the adults have left.
    - After the relocation of any birds to the nest box colony, ensure that the burrow and wall section has been wrapped by the end of the day to prevent birds from re-entering.

- Egg and/or chick: Avoid the area until the nest is complete, i.e. a chick has fledged. Wrapping of the rock wall will commence within another section that is at least a minimum of 10 metres away from the nest, or 15 metres where practicable.

For rock wall removal/creation, the following measures will be implemented:

- Excavation around the revetment, and placement of new rocks on the existing rock wall, will be undertaken using an excavator and a highly-skilled operator. Any removal or addition of rocks using the excavator must be done carefully, to avoid rolling or movement of other rocks. All work must be based on the assumption that kororā/penguins may be present in other parts of the rock wall but were not identified in previous surveys.

- If an adult does manage to find a gap in the wrapped wall and is uncovered while the rock wall is being dismantled, all work will cease until a person with a kororā/penguin handling permit indicates that the work can start again.

- The permitted handler will be in attendance during all deconstruction activity and will be fully equipped to deal with all possible outcomes. Equipment will include:

- Gloves.

- Special boxes for the transfer of adults.
- Nets with a long pole for the retrieval of moulting birds from the water if they initially elude capture.
- If a kororā/penguin is injured then it must be taken immediately to Tauranga Animal Rescue and Rehabilitation Centre[1]. Further assistance can be provided by the Western Bay Wildlife Trust[2] who have permitted penguin handlers. The local Department of Conservation office must be notified immediately (0800 ASK DOC [0800 275 362] or info@doc.govt.nz). If advice is required on management of a particular bird, specialist veterinarians at the Auckland Zoo[3] can also be consulted.
- If a kororā/penguin is killed, the local Department of Conservation office must be notified immediately.

6.3 Key risks and management of them

- ***Risk***: A late chick or egg is found in a burrow within the affected revetment.
- ***Management***: Work will not be undertaken within this section of revetment until the chick has fledged, and in the case of an egg, until the egg has hatched and the chick has fledged. Work can proceed at another section of the revetment that is at least a minimum of 10 metres away from the nest, or 15 metres where practicable.
- ***Risk***: One or more adults are found in a burrow within the affected revetment, but are out of reach and cannot be removed by hand.

  Management: Work will not be undertaken within this section of revetment until the birds are absent. In the case of a resting bird, this is likely to be the following day. In the case of a moulting bird, this may be many days.
- ***Risk***: It is possible that new burrows may have been occupied since the 2019 survey and the pre-construction survey, and the search dog may not have found some of the burrows that are present.

  Management: The revetment to be affected will be checked using a burrowscope by on-site personnel prior to wrapping. All of the revetment will be treated as if burrows may be present during deconstruction with appropriate handlers on site. If added directly to the existing rock wall, boulders will be placed to avoid rolling rocks during construction.
- ***Risk***: An adult (or a pair of birds) that are found in a burrow and relocated to the nest box colony return to another location within the affected revetment that has not been previously identified.

  Management: The affected revetment will be checked using a burrowscope by on-site personnel prior to wrapping. All of the revetment will be treated as if burrows may be present during deconstruction with appropriate handlers on site. If added directly to the existing rock wall, boulders will be placed to avoid rolling rocks during construction.

[1] Tauranga Animal Rescue and Rehabilitation Centre, 56 Fraser Street, Tauranga 3112; phone (07) 579 9115.
[2] Western Bay Wildlife Trust; phone 0800 Sick Penguin (0800 742 573).
[3] Auckland Zoo, Motions Road, Western Springs, Auckland 1022; phone (09) 360 3805

- ***Risk***: Birds transferred as pairs to the nest box colony abandon the box, and return to the revetment. Kororā/blue penguins have strong homing tendencies, and this may be a significant risk.

  Management: The affected revetment will be wrapped at the start of the non-breeding season to prevent birds from re-accessing the site. All of the revetment will be treated as if burrows may be present during deconstruction with appropriate permitted penguin handlers on site. If added directly to the existing rock wall, boulders will be placed to avoid rolling rocks during construction.

- ***Risk***: Work will be undertaken at a time when kororā/penguins are least likely to be present. However, in the event that a kororā/penguin is present, injury or mortality is possible.

  Management: The Department of Conservation will be notified of the work programme. If injury occurs, work will stop and methods will be reviewed in consultation with the Department. If rocks cannot be removed precisely, work will stop and methods will be reviewed.

6.4 Monitoring

The Port of Tauranga will investigate the potential for the Butters Point nesting box colony to be used as a research site. The nesting box colony provides an ideal location for ongoing monitoring within a controlled environment. Each nesting box will provide easy access for scientific research on the nesting success of each breeding pair. Each penguin and any fledglings should be flipper banded and marked with a microchip Passive Integrated Transponder (PIT tag) using subcutaneous implantation at the base of the neck, by a permitted practitioner. This will allow each bird's activity to and from the colony to be recorded by installing a PIT tag reader on the access ramps to the nesting box colony. Each bird should also be sexed and measured: weight, flipper length, and bill length, width, and depth.

Nest boxes should be inspected fortnightly throughout the breeding season (July to January, inclusive), and nest box contents should be recorded during each visit (e.g. adult, egg, or chick). These data will provide ongoing information about the kororā/penguins utilising the Port of Tauranga and breeding success. This will inform ongoing management of kororā/penguin within the Port of Tauranga

During the non-breeding period (April-June), each nesting box should be checked and replenished with dry native grass as nesting material. The condition of the nesting box (e.g. dry/weatherproof) should be checked before the breeding season commences.

7.0 Tarāpunga/red-billed gull management and mitigation

7.1 Overview

Avoidance of adverse effects on tarāpunga/red-billed gulls requires that all work involving the dismantling of the Mount Maunganui rock wall should be undertaken outside of the breeding season and must also align with the non-breeding season of the kororā/penguin (April-June, inclusive). Activity associated with wrapping the rock wall to prevent kororā/penguins from accessing the burrows and dismantling the rock wall will influence tarāpunga/red-billed gulls to relocate to alternative habitat. The 200 metres of existing rock wall to be retained, a modified section of the existing wall, or a purpose-built rock wall will be completed to enable the tarāpunga/red-billed gull colony to relocate. This work will be undertaken during the kororā/penguin non-breeding season one year before any construction work is undertaken on the remaining rock wall.

7.2 Action plan

Attraction to the new rock wall location will be facilitated using a combination of gull decoys and a stereo system playing recordings of gull calls at colonies. This should be done without altering the existing colony location (by asphalting, for example) to allow gulls to start moving along the rock wall and begin using the *c.*200 metre new location due to attraction alone. This will allow birds to become settled in the new location before stopping them from using their existing location.

This Action Plan will be implemented before and during the dismantling of the Mount Maunganui rock wall, and the following methods will be used:

- Prior to rock wall removal: the purpose-built rock wall or modification of the existing rock wall will be undertaken close to the Tanker Berth. Before constructing this wall, a trained kororā/penguin dog and handler will confirm the section of wall is clear of any breeding or moulting adult penguins and fledgling. The rock wall section will be wrapped to prevent birds from accessing the site while the new red-billed gull all is constructed. Once complete, all wrapping will be removed to allow kororā/penguins to use the concrete pipes and naturally occurring areas what can be used as burrows within the rock wall.

- New tarāpunga/red-billed gull colony: gull decoys and a stereo system playing recordings of gull calls should be installed to attract tarāpunga/red-billed gulls. Calls should be played during daylight hours and should commence no later than July, as birds return for the next breeding season. Once the system is in place, calls should be played daily. Monitoring of the site should be undertaken once a week to assess whether birds are attracted to the site and whether nesting activity occurs.

- During rock wall removal: by undertaking partial construction of the southern Mount Maunganui Wharf extension would leave a significant area of rock wall undisturbed, allowing time for the gulls to relocate further south along the wall. Building activity will influence birds returning to the area to seek an alternative roosting and nesting site.

- Tauranga Airport: Port of Tauranga should inform the Tauranga Airport wildlife control team prior to dismantling of the rock wall, so that they can monitor any changes in tarapunga/red-billed gull attendance levels at the airport. If bird numbers increase beyond the previously surveyed levels, then further mitigation may be required, such as further modification or increased construction of the purpose-built rock wall or modification of the existing rock wall.

Action plan to dissuade tarapunga/red-billed gulls from establishing a colony at Butters Landing:

- Active management is required to dissuade tarāpunga/red-billed gulls from roosting or nesting at Butters Landing, to enable the site to function as a nesting colony for kororā/blue penguins. To achieve this, non-lethal deterrents, such as trip wires, can be installed to block landing and walking areas. These can be set up outside the breeding season and after the penguin boxes have been installed, ensuring they do not interfere with the penguins' pathways.
- Additionally, as indigenous shrubs and flaxes establish and grow around the nesting boxes, they will further discourage tarāpunga/red-billed gulls from nesting on the ground, as they typically breed on rocky headlands, cliffs, beaches, islands, sandspits, and shell banks.

8.0 People to be involved

- Rowan Johnstone, Engineering Manager, Port of Tauranga. Project management of the Stella Passage Development works.
- A nominated representative for mana whenua Ngāi Tukairangi hapū to review this plan.
- Department of Conservation representative to review this plan and assist as required.
- Port of Tauranga staff who hold a permit that allows them to handle and move kororā/blue penguins within the Port environs and may be called upon to handle kororā/penguins during construction.
- Additional assistance and support of penguin permit holding members of the Western Bay Wildlife Trust could support and assist during the pre-construction surveys, dismantling of the rock wall, penguin relocation and ongoing monitoring of the nesting box colony.
- Iwi representative may also assist with monitoring by joining the Port of Tauranga staff during their monitoring surveys.
- Joanna Sim (DabchickNZ) and her dog Rua undertook the surveys in August 2019, and should undertake further surveys before construction.

Acknowledgments

Rowan Johnstone of Port of Tauranga provided useful background information and very useful discussion during a site visit in December 2021.

References

Agnew P. and Houston D. 2020: Tourism and little penguins: a comparative study of survival and reproductive parameters. *Wildlife Research 47*: 349-358.

Agnew P., Houston D., Lalas C., and Wright F. 2014: Variation in reproductive performance of little penguins (Eud*yptula minor*) attributable to double brooding. *Journal of Ornithology 155*: 101-109.

Braidwood J., Kunz J. and Wilson K-J. 2011: Effect of habitat features on the breeding success of the blue penguin (Eud*yptula minor*) on the West Coast of New Zealand. *New Zealand Journal of Zoology 38*(2): 131-141.

Challies C.N. and Burleigh R.R. 2004: Abundance and breeding distribution of the white-flippered penguin (*Eudyptula minor albosignata*) on Banks Peninsula, New Zealand. *Notornis 51*: 1-6.

Chiaradia A., Ropert-Coudert Y., Kato A., Mattern T., and Yorke J. 2007: Diving behaviour of little penguins from four colonies across their whole distribution range: bathymetry affecting diving effort and fledging success. *Marine Biology 151*: 1535-1542.

Cullen J.M., Montague T.L. and Hull C. 1991: Food of little penguins *Eudyptula minor* in Victoria: comparison of three localities between 1985 and 1988. *Emu 91*: 318-341.

Dann P. 1992: Distribution, population trends and factors influencing the population size of little penguins *Eudyptula minor* on Phillip Island, Victoria. *Emu 91*: 263-272.

Flemming S.A. 2013: Little penguin. *In*: Miskelly C.M. (ed.) New Zealand Birds Online. https://nzbirdsonline.org.nz/species/little-penguin.

Flemming S.A., Lalas C., and van Heezik Y. 2013: Little penguin (*Eudyptula minor*) diet at three breeding colonies in New Zealand. *New Zealand Journal of Zoology 37*(2): 199-205.

Fraser M.M. and Lalas C. 2004: Seasonal variation in the diet of blue penguins (*Eudyptula minor*) at Oamaru, New Zealand. *Notornis 51*: 7-15.

Frost P.G.H. 2017: *Population status and trends of selected seabirds in northern New Zealand*. Retrieved from the Department of Conservation website: http://rgdoi.net/10.13140/ RG.2.2.24166.32327

Frost P.G.H. and Taylor G.A. 2018: The status of the red-billed gull (*Larus novaehollandiae scopulinus*) in New Zealand, 2014-2016. *Notornis 65*: 1-13.

Gauthrie K 2016: Staunch penguin a match for stoats, but not dogs. Predator Free New Zealand. Accessed November 2020 http://predatorfreenz.org/staunch-penguins-match-stoats-not-dogs/

Grosser S., Burridge C.P., Peucker A.J. and Waters J.M. 2015: Coalescent modelling suggests recent secondary contact of cryptic penguin species. *PLoS ONE 10*: e0144966. doi:10.1371.

Heber S., Wilson K-J. and Molles L. 2008: Breeding biology and breeding success of the blue penguin (*Eudyptula minor*) on the West Coast of New Zealand's South Island. *New Zealand Journal of Zoology 35*: 63-71.

Hoskins H.J., Dann P., Ropert-Coudert Y., Kato A., Chiaradia A., Costa D.P., and Arnould J.P.Y. 2008: Foraging behaviour and habitat selection of the little penguin *Eudyptula minor* during early chick rearing in Bass Strait, Australia. *Marine Ecology Progress Series 366*: 293-303.

Karl B.J and Best H.A. 1982: Feral cats on Stewart Island; their foods, and their effects on kakapo. *New Zealand Journal of Zoology 9*: 287-294

Kowalczyk N., Blake N. and Finger A. 2013: St Kilda Breakwater Development: Penguin Protection Project 2013. Final Report. Prepared for Port Phillip Ecocentre Inc. 45 pp.

Lawrence B.C., Bull L.S., Arden S.C., and Warren V.E. 2023: Effect of piling on little blue penguin. *Springer* 9-90. 23 pp.

Marchant S. and Higgins P.J. 1990: *Handbook of Australian, New Zealand & Antarctic birds*. Vol. 1, Ratites to ducks, P. AB. Oxford University Press.

Mills J.A., Drive M.M., Yarrall J.W., Bradford-Grieve J. M., and Morrissey M. 2018: Major changes in the red-billed gull (*Larus novaehollandiae scopulinus*) population at Kaikoura Peninsula, New Zealand; causes and consequences: a review. *Notornis 65*: 14-26.

Mussen D 2012: Dogs savage precious blue penguin colony. Stuff. Accessed November 2020. http://www.stuff.co.nz/environment/7183183/Dogs-savage-precious-blue-penguin-colony.

Perriman L. and Steen H. 2000: Blue penguin (*Eudyptula minor*) nest distribution and breeding success on Otago Peninsula, 1992 to 1998. *New Zealand Journal of Zoology 27*: 269-275.

Poupart T.A., Waugh S.M., Bost C., Bost C.A., Dennis T., Lane R., Rogers K., Sugishita J., Taylor G.A., Wilson K.J., and Zhang J. 2017: Variability in the foraging range of *Eudyptula minor* across breeding sites in central New Zealand. *New Zealand Journal of Zoology 44*: 225-244.

Riddell D. and Kessels G. 2013: Options for ongoing management of MV Rena grounding: assessment of ecological effects on avifauna. Report prepared for P&I Services Limited. Kessels and Associates Ltd., Hamilton.

Robertson H.A., Baird K., Dowding J.E., Elliott G.P., Hitchmough R.A., McArthur N., Makan T.D., Miskelly C.M., O'Donnell C.F.J., Sagar P.M., Scofield R.P., Taylor G.A., and Michel P. 2021: Conservation status of birds in Aotearoa New Zealand, 2021. *New Zealand Threat Classification Series 36*. Department of Conservation, Wellington. 47 pp.

Rodríguez A., Holmberg R., Dann P., and Chiaradia A. 2017: Penguin colony attendance under artificial lights for ecotourism. *Journal of Experimental Zoology*. 2018; 329: 457–464

Sievwright K.A. 2014: Post-release survival and productivity of oiled little blue penguins (*Eudyptula minor*) rehabilitated after the 2011 C/V Rena oil spill. *Unpublished Masters Thesis in Conservation Biology*. Massey University, Palmerston North.

Stahel C. and Gales, R. 1987: Little Penguins: Fairy Penguins in Australia. New South Wales University Press, Kensington.

Stevenson C. and Woehler E.J. 2007: Population decreases in little penguins *Eudyptula minor* in southeastern Tasmania, Australia, over the past 45 years. *Marine Ornithology 35*: 71-76.

van Heezik Y. 1990: Diets of yellow-eyed, Fiordland crested, and little blue penguins breeding sympatrically on Codfish Island, New Zealand. *New Zealand Journal of Zoology 17*: 543-548.

Walls G. 1998: Motu-o-kura (Bare Island), Hawkes Bay: Monitoring since rat eradication. *Conservation Advisory Science Notes No. 215*. Department of Conservation, Wellington.

Wildland Consultants 2019a: Blue penguin management plan: Hardinge Road erosion protection works. *Wildland Consultants Ltd Contract Report No. 5158.* Prepared for Napier City Council. 27 pp.

Wildland Consultants 2019b: 6 Ngā Manu - Avian Management Plan Napier Port. *Wildland Consultants Ltd Contract Report No. 4900.* Prepared for Port of Napier Ltd. 41 pp.

Wildland Consultants 2020: Assessment of effects on birds of proposed Port of Tauranga wharf developments. *Wildland Consultants Ltd Contract Report No. 5154*. Prepared for Port of Tauranga Ltd. 56 pp.

Wildland Consultants 2020a: Blue penguin management plan, Whakarire Avenue, Napier. *Wildland Consultants Ltd Contract Report No. 5636*. Prepared for Napier City Council. 20 pp.

SECTION 3 – MONITORING OF COASTAL BIRDS AT THE PORT OF TAURANGA

1.0 Introduction

Port of Tauranga Limited commissioned Wildland Consultants to provide a bird monitoring plan to assess the numbers of birds roosting and nesting in the port environs. Tauranga Harbour is a very large tidal estuary that supports internationally, nationally, and locally significant populations of many shorebird and wetland species. Port of Tauranga is located on the eastern side of the harbour. As the Port continues to operate and develop over the coming years, the bird survey data collected will provide a baseline and will establish and maintain a good understanding of bird use of the Port environs. This data will be used to help make informed decisions about future Port management options and how best to manage the presence of avifauna within the Port environment.

This report provides the Port of Tauranga with a survey design, monitoring frequency, and methodology for undertaking bird counts.

2.0 Survey methods

2.1 Overview

The Port environment has been divided into count zones based on:

- Port infrastructure.
- Known sites of interest, e.g. the red-billed gull colony and the sand storage site.

The intention is to undertake total counts within each count zone, similar to the methods used by Smith *et al.* (2015) and Bycroft and Shaw (2021).

2.1.1 Survey Zones

The Port environment has been divided into 10 zones for the bird counts, as shown in Figure 1.

The count zones include terrestrial sites and sites on-water, within *c.*100 metres of wharf infrastructure:

- 1 – Northern old wharf – commonly used by variable oystercatchers.
- 2 – Harbour adjacent to northern wharf.
- 3 – Central wharf.
- 4 – Harbour adjacent to Central wharf.
- 5 – Seawall and proposed new wharf (red-billed gull colony).
- 5a – Adjacent to Butters buildings.
- 6 – Harbour adjacent to 5 and 5a.
- 7 – Sand storage site.
- 8 – Harbour adjacent to Sulphur Point.
- 9 – Northern end of Sulphur Point.
- 10 – Container terminal

Note that the boundaries of these count zones can be amended to reflect physical habitat character and the practicalities of undertaking counts but, after initial field evaluation, zone 'boundaries' should be maintained as much as it is possible to do so.

Figure 1: Proposed bird count zones at the Port of Tauranga

Bird counting within the zones with the exception of Site 7 Sand Storage Pile is carried out from accessible locations that may or may not be available every count (e.g. free berths adjacent to areas 2 and 4) and predominately confined to observations from internal Port Roads due to safety in operational areas. Nevertheless, any restriction to data collection will be noted to identify data collection issues during analysis, including weather conditions, tide, traffic, or Port operations which are impeding the assessment and any increased noise.

2.1.2 Health and Safety

All staff undertaking avifauna surveys within the Port of Tauranga must comply with all health and safety policies and procedures, including wearing the appropriate PPE. However, avifauna behaviour should be monitored for disturbance-related effects and birds should not be approached, to avoid stress or desertion.

2.1.3 Bird Counts

All individuals within each count zone are recorded and totalled to provide a total count for each species. Bird counts will be undertaken in each count zone and no bird will be knowingly counted twice.

Port of Tauranga staff have already been undertaking counts at the sand storage site since October 2021, which has been subdivided into seven sub-zones. Counts should continue on the same basis at this site, and sub-zones could also be created in other zones if it is useful to do so.

Care should be taken so that no bird is recorded twice within a survey period and no birds are assumed to be present. Each survey should target all breeding and roosting coastal birds, including kuaka/eastern bar-tailed godwit, tuturiwhatu/New Zealand dotterel, tōrea/South Island pied oystercatcher, tōrea pango/variable oystercatcher, tara/white-fronted tern, karuhiruhi/pied shag, and all other coastal birds.

Other methods could also be used, such as:

- Land-based photographs, which can be used for counts of large numbers of birds, such as the red-billed gull colony.
- Drone/UAV images – if care is taken to not disturb birds (small UAV model, quiet, good camera, and no flashing lights), this would be a useful technique for counting large numbers of birds at the red-billed gull colony and the sand storage site. Flight initiation and landing should be undertaken ≥ 50 metres away from the any nesting birds and flight height should be ≥ 50 metres above ground-nesting birds (Edney *et al.* 2023; Gutherie 2020).

The following must be noted, however:

- The Port is within the flight path zone for Tauranga Airport.
- A licensed drone/UAV operator would be required to do this work.

2.1.4 Survey Timing

Monthly surveys are being undertaken throughout the Port of Tauranga to establish a good baseline data set. Each survey is based around high tide.

<u>Sand pile surveys</u>

The sand pile surveys are undertaken weekly during the summer (September to February) to identify all species roosting and breeding activity at the site, providing insight into general breeding behaviour, including number of nests, eggs and fledglings. All surveys are undertaken during high tide. If early

breeders are detected, weekly surveys should commence in August and continue until any late nesters have completed. This may require weekly surveys to continue into March.

Fortnightly surveys are undertaken to record shorebirds that utilise the sand pile site during the winter months (March to August). A further site check is undertaken during the non-count week to identify that nothing unexpected is occurring (evidence of predation, sudden increase/decrease in bird numbers). All surveys are undertaken during high tide.

These surveys will also determine whether more tarāpunga/red-billed gulls are using the site during the Mount Manganui Wharf development compared to previous survey periods.

Tarāpunga/red-billed gulls

Monthly monitoring has been undertaken at the sand pile since October 2021 and January 2022 throughout the Port environment. These surveys provide baseline data on general tarāpunga/red-billed gulls' habitat use.

As a proactive approach, weekly surveys should be initiated approximately one year prior to the start of Mount Manganui Wharf development commencing. These surveys should continue during the 18-24 months of works, and for at least two years after completion. These surveys will provide further in-depth information on seawall use, movement and any displacement of tarāpunga/red-billed gulls during the development, ensuring that there is no net loss of gulls from the area. Monthly monitoring should then continue in line with the pre-construction monitoring plan.

Kororā/blue penguin

In August 2019, a trained kororā/penguin dog and handler surveyed Mount Manganui Wharf and identified 16 active sites along the rock wall. This survey will be repeated during the breeding season before works commence to identify the current occupancy of the rock wall at the Mount Manganui Wharf. A further survey will be undertaken the end of the breeding season and moult period to confirm no birds are present within the rock wall. As each section is confirmed clear, the rock wall section will be wrapped. Deconstruction of the wall will commence once the area has been secured. At the conclusion of each deconstruction day, the wall section will be re-wrapped if works have not been completed.

Once the kororā/penguin nesting box colony is completed, monthly monitoring checks should be undertaken to assess if kororā/penguins start using the site of their own accord.

2.1.5 Survey Data

Each survey should record date, time, location, tide details, wind direction, wind speed, weather condition (e.g. fine, mist, rain), temperature, species, number of individuals (adult and juvenile), behaviour (nest building, incubating, feeding young, foraging), and the number of eggs (Appendix 3). Monitoring should also include the stages of juvenile development.

2.1.6 Survey Personnel

All Port of Tauranga field observers should be familiar with undertaking bird counts and must be very familiar with coastal species. Counts should be undertaken by as few observers as possible, to prevent any violations of assumptions and observer bias (e.g. differences in skill levels). It is possible that interested iwi or Bay of Plenty Birds NZ members could join the Port's observer through prior arrangement and assist with counts.

2.1.7 Survey Equipment

Equipment required for each survey includes maps of survey zones and observation points, binoculars and spotting scope (e.g. sand pile or hard to access sites), data sheets or iPad (or equivalent), plastic thermometer, watch, a method to move between sites (walking or by car), appropriate safety PPE (e.g. Hi-Viz vest). Trail or surveillance cameras can be used to monitor areas as an additional method. Assessments of kororā/penguin burrows should be undertaken by looking for visual signs (faecal matter and feathers around burrow entrances) and periodically using a burrowscope at varying times during the year. Footage can be used to identify fledgling and egg loss by predators, e.g. cats, rats, hedgehogs, and southern black-backed gulls.

2.1.8 Data Storage

Data should be stored electronically, and entering the data directly into an iPad or similar device will reduce handling time and minimise potential for data entry errors. Data should be collated, copied, and stored on a second hard drive for backup security. If data storage is designed well at the start, this will make analysis and interpretation much easier. Ensure that the data is checked for missing information and errors before storing the data. Appropriate file formats include .xls and .csv. All data should be updated into eBird so that it is available to all interested parties.

2.1.9 Incidental Records

A repository of incidental records should be established, which should include:

- Notable different species (e.g. reef heron).
- Bird deaths that can be attributed to port operations.

2.1.10 Data analysis

As data is collected, a biannual assessment should be undertaken to evaluate nesting success and population trends at regularly used sites within the Port. These sites should include the sand pile, tarāpunga/red-billed gull colony and kororā/penguins nesting boxes (once established), at a minimum. This information will help us make informed decisions about future Port management options. Annual reports should summaries the main findings and identify any trends or changes over time. These reports will be provided to the Department of Conservation and should be made available to other interested parties and made available on the Port of Tauranga's website.

3.0 Management of pest plants and animals

Predator control should be implemented at key sites at the Port to target rats, cats, and hedgehogs, to minimise the possibility of birds being killed and eggs destroyed.

The sand storage site should be cleared of weeds during the non-breeding season. Minor maintenance could be undertaken at low tide if incubating birds are not disturbed, e.g. around the edges of the sand storage area.

Acknowledgments

Rowan Johnstone of Port of Tauranga provided useful background information and also useful discussion and guidance during a site visit in December 2021.

References

Bycroft C. and Shaw W.B. 2021: Sixteen years of monthly bird monitoring at the western end of Lake Rotoiti, Rotorua. Relevance of breeding and implications of one-off surveys. Paper presented at the New Zealand Ecological Society Conference, December 2021.

Edney A.J., Hart T., Jessopp M.J., Banks A., Clarke L.E., Cugnière L., Elliot K.H., Juarez Martinez I., Kilcoyne A., Murphy M., Nager R.G., Ratcliffe N., Thompson D.L., Ward R.M., and Wood M.J. 2023: *Best practices for using drones in seabird monitoring and research. Marine Ornithology 51*: 265–280.

Gutherie K. 2020: Drone technology offers low impact method for seabird census. Predator Free NZ Trust. https://predatorfreenz.org/research/drone-technology-census/

Smith D., Bycroft C., McLellan R., Gillies R., and Shaw W. 2015: Analysis of the impacts of a water channel diversion wall on waterbirds inhabiting the western end of Lake Rotoiti, Bay of Plenty, New Zealand.

Wildland Consultants (2014) *Bird monitoring in the vicinity of the proposed Ōhau Channel diversion structure at Lake Rotoiti 2014 progress report*. Wildland Consultants Ltd Contract Report No. 2711d. Prepared for Bay of Plenty Regional Council. 31 pp.

SECTION 4 – ASSESSMENT OF PORT LIGHTING AT THE PORT OF TAURANGA

1.0 Introduction

Port of Tauranga Ltd commissioned Wildland Consultants to provide an assessment of artificial lighting to minimise the potential for adverse effects on avifauna within the Port environment. Tauranga Harbour supports internationally, nationally, and locally significant populations of many shorebird and wetland bird species. As the Port continues to operate and develop over the coming years, appropriate artificial lighting is required for operational health, safety, and productivity, without compromising avifauna.

As lighting technology is changing rapidly, and biological responses to artificial light varies between species, it is not possible to set prescriptive limits on lighting. This report provides the Port of Tauranga with guidelines and suggested prescriptions for lighting limits.

2.0 Lighting management at the Port

The following measures should be implemented for all new and replacement lights:

- All outside high mast floodlights should be fully shielded and mounted horizontally, preventing upward illumination and reducing horizontal light spread (Figure 3).
- Use as low a colour-correlated temperature for LEDs as practicable, preferably as low as 3,000 kelvin (warm light), but no greater than 6,000 kelvin. If up to 6,000 kelvin is used, control of light spread and intensity is imperative.
- All lights must have as little or no short wavelength (380-500 nanometres) violet or blue light as possible.
- Light intensity and the number of lights used should only light the intended object or area.
- Use motion sensor lighting where practicable and appropriate, to reduce unnecessary illumination.
- Use high quality, low glare lighting.

It is also suggested that any new or repainting of storage tanks, buildings, and structures are painted with a non-reflective paint to reduce sky glow.

3.0 Further information

Refer to the assessment of ecological effects.

Appendix 1

Avifauna survey results

The Ornithological Society of New Zealand (OSNZ; also known as Birds New Zealand) has undertaken surveys of waders around Tauranga Harbour since 1994. Survey findings for the Sulphur Point warehouse shed roofs (OSNZ OSNZ Site 17) and the Sulphur Point sand pile (OSNZ Site 18; 2008-2021) are summarised in Table A1-1. Records for Sulphur Point (OSNZ Site 17) related to various sites, including Sulphur Point, Sulphur Point shed roof, Sulphur Point warehouse, Cargo Shed, and shed/ wharf. It is not clear if these descriptors include more than one structure (e.g. Shed 11 and Shed 12). Variation in species numbers and the shed roof usage is related to the decrease in size of the sand pile and also the removal of some sheds.

The warehouse shed roof 12 is discussed first as this was initially used as a high tide roost for various species until the shed was removed in May-June 2017. At this time, wading birds, dotterels, gulls and terns generally relocated to the sand pile site. However, a second warehouse shed (Shed 11) that was situated further inland, was then probably used as a high tide roost by some individuals. This structure was then removed between May and September 2020. Nevertheless, it is unclear whether both roofs were used between 2008 and 2017. The OSNZ surveys does identify that kuaka/eastern-bar tailed godwits (*Limosa lapponica baueri*, At Risk-Declining) did use the Sulphur Point cargo wharf as a roosting site in 2018, after Shed 12 was deconstructed. The OSNZ surveys also continue to identify individuals roosting on a 'cargo roof' during November 2020, June 2021 and November 2021. It is assumed that this roosting structure is the Sulphur Point Cold Store. The OSNZ surveys have recorded the presence of eight wader species, along with gulls and tern species, at the sand pile.

In October 2021, Port of Tauranga commenced weekly surveys during the breeding season (September to February) at the sand pile and bi-weekly surveys during the non-breeding period (March to August), and the survey methodology is outlined in Chapter 3 of this report. Current survey results are outlined in Table A1-2.

Table A1-1 – Bird survey counts at the Sulphur Point warehouse shed roofs (Shed 11 and 12) and the sand pile, 2008-2021, combined (source: Ornithological Society of New Zealand). *Shed 12 was used as roost site between 2008 and May/June 2017. ^Shed 11 was used also as roost site between November 2017 and May/September 2020. [+]Probable roosting on the Cold Store roof. [#]Bar-tailed godwits and other avian species observed roosting on the Cargo wharf after Shed 12 was removed. Winter months (March to August) and summer months (September to February). Common names, species names, and threat classifications are from Robertson *et al.* (2021).

Species	Threat Classification	Season	Site	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Waders																	
Banded dotterel/ pohowera	At Risk - Declining	Winter	Shed														
			Sand pile			100											
		Summer	Shed														
			Sand pile														
Eastern bar-tailed godwit/kuaka	At Risk - Declining	Winter	Shed						132*	43*	5*	115*					
			Sand pile			22							50				
		Summer	Shed						200*	1,000*	1,500*	2,000*		1,200[#]			
			Sand pile	1,000	3,500	860	3,000	2,200	2,000				1,500		2,000	2,000	2,000
Northern New Zealand dotterel/ tuturiwhatu	Threatened - Nationally Increasing	Winter	Shed				11*										
			Sand pile			20		10	1	6	3		2	3		4	4
		Summer	Shed														
			Sand pile	6	10	9	2	2	2	5	2	3	1	2	4	2	2
Pied stilt/poaka	Not Threatened	Winter	Shed														
			Sand pile				2										
		Summer	Shed														
			Sand pile							2							
South Island pied oystercatcher/ tōrea	At Risk - Declining	Winter	Shed			400*		700*	750*	492*	600*	292*	500*	211^		200^	550[+]
			Sand pile				338										
		Summer	Shed	20*	85*	107*	35*	120*	220*	95*	110*	138*	110^	100^	170^	95[+]	
			Sand pile		2												
Spur-winged plover	Not Threatened	Winter	Shed														
			Sand pile			2											
		Summer	Shed														
			Sand pile	2													
Variable oystercatcher/	At Risk - Recovering	Winter	Shed				3*				12*						
			Sand pile			10		6	2				5	3		2	4

Species	Threat Classification	Season	Site	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
tōrea pango		Summer	Shed	25*	25*	4*	16*		13*	10*	35*	5*	10^	2^	4#	4	
			Sand pile	6	2	2		3		6	4	3	1	3	2		2
Wrybill/ ngutuparore	Threatened - Increasing	Winter	Shed														
			Sand pile			71		52	48								
		Summer	Shed														
			Sand pile					8									
Gulls																	
Black-backed gull/karoro	Not Threatened	Winter	Shed						14*	14*	14*	20*		1^		1^	1+
			Sand pile			2		46	20				2	2		4	2
		Summer	Shed			62*	12*					41*	2^	165^	42^	48+	
			Sand pile				20	12	7		1	2	1		3	2	2
Black-billed gull/ tarāpuka	At Risk - Declining	Winter	Shed														
			Sand pile														
		Summer	Shed	15*													
			Sand pile	210						1	4	12	5				
Red-billed gull/ tarāpunga	At Risk - Declining	Winter	Shed				8*				1*						5+
			Sand pile										6	1			
		Summer	Shed											16#			
			Sand pile	400	800			30	4	8	90	200	20	400		14	120
Terns																	
Caspian tern/ taranui	Threatened - Nationally Vulnerable	Winter	Shed														
			Sand pile			16		26	28								2
		Summer	Shed		1*												
			Sand pile				1	3	3				2				
New Zealand fairy tern/tara	Threatened - Nationally Critical	Winter	Shed														
			Sand pile														
		Summer	Shed														
			Sand pile				2										
White-fronted tern/tara	At Risk - Declining	Winter	Shed				1*										5+
			Sand pile														
		Summer	Shed				2*										
			Sand pile	250	150			300	100	5	120	200	35	200	240	400	100

Table A1-2 – Sand pile bird survey counts, 2021-2024 (source: Port of Tauranga Ltd). Average monthly counts and range (minimum and maximum). Winter months (March to August) and summer months (September to February). Common names, species names, and threat classifications are from Robertson *et al.* (2021). No sand removal or additions occurred during this time.

Species	Threat Classification	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24
Waders																																
Banded dotterel/ pohowera	At Risk – Declining																															
Eastern bar-tailed godwit/ kuaka	At Risk – Declining	643 (140-1,200)	963 (900-1,000)	733 (400-900)	1,100 (1,000-1,200)	62 (35-100)			1	1			20	377 (330-400)	1000	590 (500-700)	434 (1-800)	200 (100-300)								850 (600-1,200)	1,133 (1,000-1,200)	550 (400-700)	567 (500-700)				
Northern New Zealand dotterel/ tuturiwhatu	Threatened – Nationally Increasing	6	4 (2-4)	5	6	1		2	4 (2-6)	6	6	5 (4-6)	5 (4-6)	4 (2-6)	4 (2-6)	5 (4-6)	4	2 (2-6)		6 (5-7)	2	3 (2-4)	4	6	6	5 (4-6)	5 (4-6)	3	2 (1-3)		5	2 (1-2)	2
Pied stilt/ poaka	Not Threatened																															
South Island pied oystercatcher/ torea	At Risk – Declining																															
Spur-winged plover	Not Threatened																	2	2												2	
Variable oystercatcher/ tōrea pango	At Risk – Recovering	2 (1-2)	3 (2-4)	2	1	2 (1-2)	2 (1-2)	2	2	4	2	2	2	2	3 (2-4)	3 (2-4)	4	6 (4-8)	3 (2-4)	4	2	3 (2-4)	4	3 (2-4)	4	4	5 (4-6)	3 (2-4)	4 (2-5)	4 (2-6)	3 (2-4)	2	2
Wrybill/ ngutuparore	Threatened – Nationally Increasing																															
Gulls																																
Black-backed gull/karoro	Not Threatened	2 (1-3)	1	2 (2-3)	2	2 (1-3)	1		2	4	8	5	5 (3-6)	7 (4-10)	6 (3-10)	6 (3-8)	3				1	5		4 (2-6)	6 (1-15)	2 (1-3)	3 (2-3)	7 (2-16)	5 (3-6)	4 (2-5)	2 (1-3)	1
Black-billed gull/tarāpuka	At Risk – Declining	2																						3 (1-4)		5	14 (5-20)	18 (15-20)	12 (10-15)	10			
Red-billed gull/tarāpunga	At Risk – Declining	4 (1-10)	35 (20-50)	30 (20-40)	62 (30-100)	38 (15-65)	4		8			34 (8-60)	21 (10-35)	41 (15-50)	130 (100-150)	152 (120-200)	200	63 (8-150)		1		1		23 (15-30	160 (30-300)	400 (300-500)	538 (250-800)	350 (300-400)	163 (100-250)	13 (1-30)	3 (2-3)		
Terns																																
Caspian tern/ taranui	Threatened – Nationally Vulnerable	1																														
New Zealand fairy tern/tara	Threatened – Nationally Critical																															
White-fronted tern/tara	At Risk – Declining	190 (20-400)	98 (40-200)	33 (20-50)	43 (20-65)		1							52 (20-110)	50	34 (20-60)	50									175 (150-200)	188 (100-300)	225 (200-250)	108 (30-200)				

OSNZ summer counts averaged 1,854 kuaka (range 860-3,500) in Tauranga over 13 years. However, these data include sightings of birds roosting on the former warehouse roof. Interestingly, in 2018 kuaka/eastern-bar tailed godwits were observed roosting on the Sulphur Point cargo wharf. The recent sand pile survey undertaken by Port of Tauranga staff for the 2023-2024 summer months averaged 800 (range 400-1,200) birds. Only one individual has been observed during the winter months of 2022 (Table A1-3).

Table A1-3 – Sand pile bird survey data, 2021-2024 (source: Port of Tauranga Ltd). Average survey counts and range (minimum and maximum) for summer (September to February) and winter months (March to August).

Species	Threat Classification	Summer			Winter		
		Oct-21 - Feb-22	Sep-22 - Feb-23	Sep-23 - Feb-24	Mar-22 - Aug-22	Mar-23 - Aug-23	Mar-24 - May-24
Waders							
Banded dotterel/pohowera	At Risk – Declining						
Eastern bar-tailed godwit/kuaka	At Risk – Declining	688 (35-1,200)	517 (1-1,000)	800 (400-1,200)	1		
Northern New Zealand dotterel/tuturiwhatu/	Threatened – Nationally Increasing	4 (1-6)	4 (2-6)	5 (1-6)	4	1	
Pied stilt/poaka	Not Threatened						
South Island pied oystercatcher/torea	At Risk – Declining						
Spur-winged plover	Not Threatened		2			2	2
Variable oystercatcher/ tōrea pango	At Risk – Recovering	2 (1-4)	3 (2-8)	4 (2-6)	2 (1-4)	3 (2-4)	2 (2-4)
Wrybill/ngutuparore	Threatened – Nationally Increasing						
Gulls							
Black-backed gull/karoro	Not Threatened	2 (1-3)	5 (3-10)	4 (1-16)	4 (1-8)	3 (1-5)	2 (1-5)
Black-billed gull/tarāpuka	At Risk – Declining	2		12 (5-20)			
Red-billed gull/ tarāpunga	At Risk – Declining	34 (1-100)	96 (8-200)	268 (1-800)	20 (4-60)	12 (1-30)	3 (2-3)
Terns							
Caspian tern/taranui	Threatened – Nationally Vulnerable	1					
New Zealand fairy tern/tara	Threatened – Nationally Critical						
White-fronted tern/tara	At Risk – Declining	95 (20-400)	44 (20-110)	165 (30-300)	1		1

Appendix 2

Proposed nesting box colony configuration

Appendix 3

Example of a field count data sheet

Observer _____ **Date** _____

Time			
Location			
Tide			
Time (24-h)			
Temp (1-6)			
Wind direction			
Wind (0-3)			
Other Noise (0-2)			
Cloud Cover (%)			
Precipitation Type (N,M,R,H,S)			
Precipitation Value (0-5)			
Photo No.			

Species	Adult	Juv	Egg	Heard	Behaviour	Adult	Juv	Egg	Heard	Behaviour	Adult	Juv	Egg	Heard	Behaviour

Cloud cover: percentage of sky cover
Time: 24 h clock at the beginning of each count

Seen & Heard: Birds that are first heard should be entered under **Heard** (even if they are later seen); birds that are first seen should be entered under **Adult or Juv**. Add columns to get the total number of birds observed.

Unbounded: Counts are unbounded

Temperature
1 Freezing <0 °C
2 Cold 0-5 °C
3 Cool 6-10 °C
4 Mild 11-15 °C
5 Warm 16-22 °C
6 Hot >22 °C

Wind scale: The average for each 5-min count
0 Leaves still or move without noise
1 Leaves rustle
2 Leavesand branches in constant motion
3 Branches or trees sway

Other Noise:
Other than wind, the ave for 5-mins
0 Not important
1 Moderate
2 Loud

Precipitation Type:
Average for each count
N None
M Mist
R Rain
H Hail
S Snow

Precipitation Value:
0 None
1 Drip of structure
2 Drizzle
3 Light
4 Moderate
5 Heavy

Call Free 0508 WILDNZ
Ph +64 7 343 9017
Fax +64 7 349018
ecology@wildlands.co.nz

99 Sala Street
PO Box 7137, Te Ngae
Rotorua 3042, New Zealand

Regional Offices located in Auckland; Christchurch;
Dunedin; Hamilton; Invercargill; Queenstown; Tauranga;
Wānaka; Wellington; Whakatāne; Whangārei.

wildlands.co.nz

Wildlands