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1 Introduction

1.1 Background

The January 2023 floods, followed closely by Cyclone Gabrielle, marked a period of unprecedented weather challenges for Auckland. Auckland Council is carrying out flood resilience projects with the aim of mitigating flood risk to property through a series of blue-green networks, addressing critical flood-prone areas with sustainable stormwater solutions. The Harania catchment was one of the worst affect areas of Auckland following the January 2023 floods. Healthy Waters identified significant flooding, causing risk to life, and widespread flood damage to homes. This occurred due to poor flood conveyance at the location of the current Tennessee Avenue embankment dam (Figure 1.1).

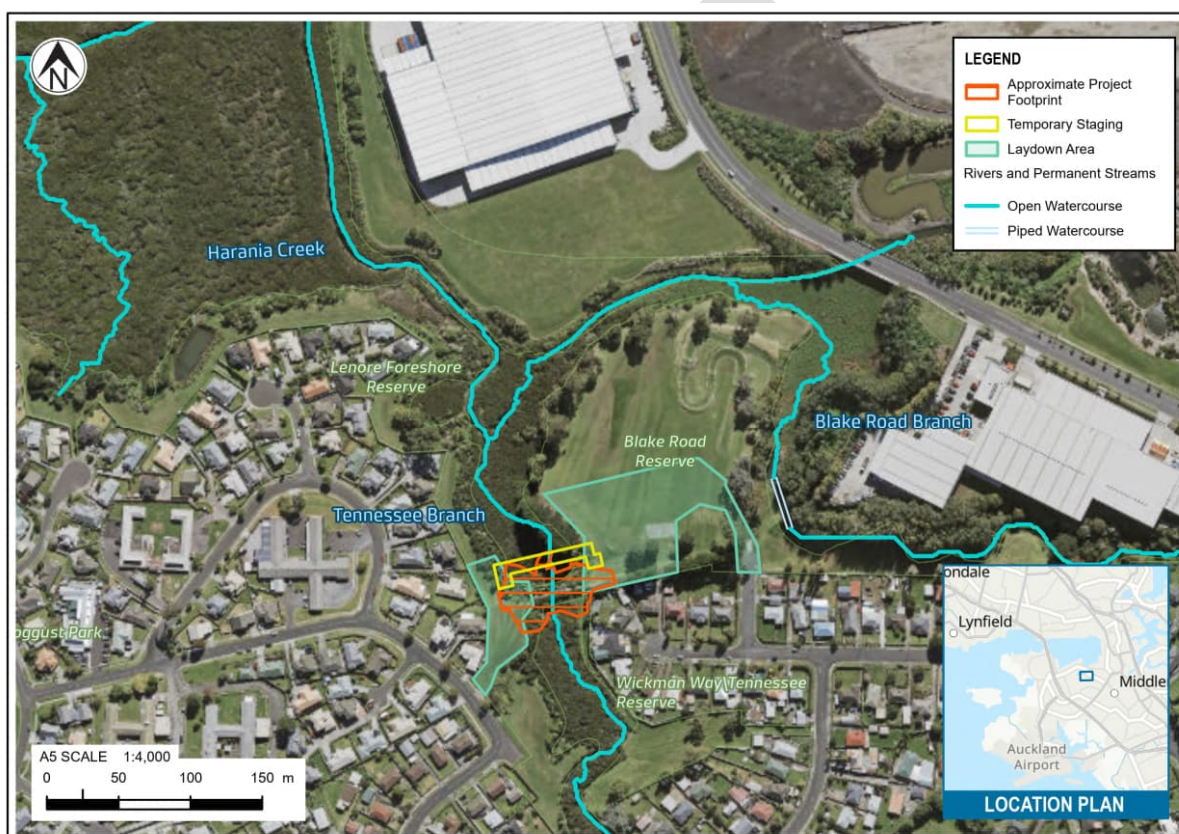


Figure 1.1: Site location and surrounding area

1.2 Project description

A detailed description of the full project works can be found in the Assessment of Effects on the Environment (AEE) report¹.

The Tennessee Bridge project involves removing the current embankment which carries the existing Eastern Interceptor (EI), an approximately 2.6 m diameter reinforced concrete wastewater pipe. The replacement will comprise a new pipe and pipe bridge in the coastal marine area (CMA) to open up the waterway capacity to allow increased flood conveyance. Diversion chambers are required at

¹ Harania Flood Resilience Works – Tennessee Bridge Assessment of Effects on the Environment, Beca Limited, November 2024.

either end of the new pipe, connecting it to the existing pipe to facilitate the change over from the old pipe to the new pipe bridge diversion.

1.3 Scope of works

Tonkin & Taylor Ltd (T+T) has been engaged by Auckland Council’s Healthy Waters to prepare an Ecological Management Plan (EMP) to accompany a resource consent application for the proposed Tennessee Bridge upgrade works (the Project) under the Severe Weather Emergency Recovery (Auckland Flood Resilience Works) Order 2024. The EMP is a requirement of resource consent [numberxxxx] and has been developed in accordance with recommendations described in the EcIA. The EMP includes a Fish Management Plan (FMP), Avifauna Management Plan (AMP), Mokomoko Management Plan (MMP) and a Vegetation Management Plan (VMP). It should be read alongside the [draft Landscape Plans] which are also relevant to effects management for the Project.

The proposed works will impact a number of ecological features as identified in the Ecological Impact Assessment (EcIA) prepared for the project (T+T, 2024a). Effects management have been recommended in this EMP to minimise the impacts of the project on ecological features.

1.4 Plan purpose

This EMP has been developed to outline protocols to avoid, minimise and remedy potential adverse effects on the ecological and biodiversity values within the project area associated with the proposed works.

Each of the fauna management plans within this EMP include good practice methods for fauna salvage and relocation that have been developed internally at T+T over time. The methods have been developed using project-based learnings, are in general accordance with New Zealand fauna sampling protocols (where applicable), and where necessary in line with current scientific literature.

1.5 Resource consent conditions

The consent conditions relevant to this EMP are conditions XXX to XXX of consent BUN/LUSxxxxx and are provided in full in Table 1.1.

Table 1.1: Relevant conditions which relate to the management of native fauna and vegetation

#	Condition wording	Relevant section of EMP or reference to related plans and documents

1.6 Proposed activity

A detailed description of the full project works can be found in the Assessment of Effects on the Environment (AEE) report (Beca Limited, November 2024). In brief, and of relevance to this assessment, the project works comprise:

- Vegetation clearance within the Coastal Marine Area and riparian margins.
- Site establishment of the eastern compound on Blake Road Reserve and the western compound on Lenore Foreshore Reserve.

- In-stream works including installation of three coffer dams (requiring sheet piling) around the location of bridge supports and removal of Eastern Interceptor pipe including the underlying embankment and culvert.
- Revegetation of works footprint, including salt marsh and salt meadow alongside mangrove establishment.

1.7 Associated documents

The EMP should be read in conjunction with the EcIA prepared for Harania Flood Resilience Works – Tennessee Bridge (T+T, 2024a). Also of relevance are the Landscape Plans (ref to be added when finalised), Streamworks Plan (ref to be added when finalised) and Erosion and Sediment Control Plan (ref to be added when finalised).

Where required, Wildlife Act Authorities will be held for works that may result in the handling and relocation of native herpetofauna. Those Wildlife Act Authorities will also have certain conditions which must be complied with that maybe different to what is outlined within this EMP.

1.8 Iwi input to EMP implementation

Ongoing engagement with local iwi representatives will occur where requested, to enable the local iwi’s chosen kaitiaki to participate in and oversee the construction and operational phases of the Project. Kaitiaki will be invited to participate in vegetation clearance protocols, mokomoko/lizard salvage, bird nest checks and planting alongside the Project Ecologist(s).

1.9 Responsibilities

Healthy Waters is ultimately responsible for the implementation of this EMP. Delivery of, and compliance with, this EMP will be the responsibility of the Construction Site Manager (i.e. the Contractor’s representative on site). They will coordinate with the Project Ecologist or a suitably qualified ecologist, hereafter referred to as the ecologist, who has been approved by the Project Ecologist and is familiar with this EMP. The Project Ecologist will be suitably qualified and experienced in fish, avifauna, herpetofauna and vegetation management. Further management plan specific requirements are detailed in the respective management plans.

Responsibilities of all parties involved in the implementation of the EMP are included but not limited to those outlined in Table 1.2, with contact details provided in Table 1.3.

Table 1.2: Responsibilities of those implementing the EMP

Title	Name	Responsibility
Project owner (Healthy Waters)		<ul style="list-style-type: none">• Overall manager of the wider project, including overseeing the implementation of the EMP at a high level.
Project Manager		<ul style="list-style-type: none">• Co-ordinates communication between the Contractor and Project Ecologist.• Project Ecologist to provide regular updates on fauna and vegetation management to the Project Manager.
Contractor/Construction Site Manager		<ul style="list-style-type: none">• Delivery of and compliance with this EMP.• Implementation of the EMP including the following:

Title	Name	Responsibility
		<ul style="list-style-type: none"> – Reading and understanding the EMP. – Facilitating a project start-up meeting with the Project Ecologist before construction commences. – Contacting the Project Ecologist and iwi representatives a minimum of three weeks before any potential in-stream or vegetation clearance works are scheduled and confirmation of in-stream works with at least seven days' notice. – Establish with the Project Ecologist the areas scheduled for vegetation clearance during the upcoming earthworks season. – Maintain clear lines of communication with the Project Ecologist regarding changes to the works schedule. – Briefing new personnel about the contractor's responsibilities under this EMP.
Iwi		<ul style="list-style-type: none"> • TBC in consultation with iwi
Project Ecologist(s)		<p>The Project Ecologist(s) is to be engaged by the project owner to provide technical advice to the Construction Site Manager/contractor and assist the project engineer with compliance against this EMP. The Project Ecologist(s) will:</p> <ul style="list-style-type: none"> • Read and understand the EMP. • Ensure any required permits are attained and on hand during survey works. • Assist with vegetation management if more technical advice is required. • Undertake any required fauna management measures (i.e. fish salvage, and relocation works) and lead pre-salvage communication with DOC/MPI ahead of these works in line with permit requirements. • Complete any required reporting.

Table 1.3: Contact details for personnel involved in the implementation of this EMP

Title	Name	Organisation	Phone	Email

1.10 Accidental discovery protocol of At Risk or Threatened species

All personnel working on site are responsible for alerting the Construction Site Manager and the Project Ecologist in the discovery of any 'At Risk' or 'Threatened' flora and fauna not otherwise identified in this EMP on the same working day as the discovery.

The discovery of 'At Risk' or 'Threatened' flora or fauna not otherwise identified in this plan will be notified to the DOC Local Area Manager (Tāmaki Makaurau / Auckland Office: 0800 275 362) on the same day as the discovery. The Construction Site Manager must determine a course of action that is based on the advice of the Project Ecologist. The course of action must consider the outcomes of consultation with iwi representatives and DOC and submitted for certification to DOC and the relevant territorial authority.

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2 Summary of ecological values and effects management

Ecological values present within the project footprint are described in detail in the EclA that has been prepared for the Project (T+T 2024a).

Ecological values at the project footprint ranged from negligible to high and include manawa/mangrove forest, Tennessee subtidal channel, marine benthic habitat, native and exotic vegetation and fauna (terrestrial and coastal birds, mokomoko/ lizards and fish). These ecological values will be affected by the project through elevated sediment and contaminant discharge to aquatic habitats, disturbance, injury or mortality of fish during instream works, disturbance of mangrove and marine benthic habitats, and the potential for fauna disturbance, injury or mortality during vegetation clearance.

Potential and actual impacts addressed within this EMP include:

- Injury and mortality to native aquatic fauna during streamworks.
- Injury or mortality to native avifauna during vegetation clearance.
- Injury or mortality to native herpetofauna during vegetation clearance.
- Temporary loss of native vegetation (1,820 m²).
- Permanent loss of approximately seven exotic specimen trees.
- Permanent loss of exotic shrubland (65 m²).
- Permanent loss of rank grassland (181 m²).
- Remanent loss of mangrove habitat (1,000 m²).

3 Fish Management Plan

3.1 Purpose and scope

The purpose of this Fish Management Plan (FMP) is to set out a range of measures to avoid and/or minimise effects to aquatic fauna potentially impacted by the construction activities associated with the project, as discussed in the EclA (T+T, 2024a). Where works in watercourses (streamworks) are required throughout the construction period, these measures will be applied. For clarity, this includes works associated with the intertidal channel, including upstream and downstream of the existing Tennessee Bridge embankment.

This FMP includes good practice methods for fish salvage and relocation that have been developed by T+T over time. The methods have been developed based on project-based learnings, are in general accordance with New Zealand freshwater fauna sampling protocols (where applicable), and where necessary in line with current scientific literature.

3.2 Responsibilities and competencies

Auckland Council Healthy Waters are ultimately responsible for the implementation of the FMP and any requirements of the resource consent conditions.

Delivery of, and compliance with, this FMP will be the responsibility of the Construction Site Manager who will liaise with the Project Ecologist to implement this FMP. The Project Ecologist will be suitably qualified and experienced in aquatic fauna management. The Construction Site Manager and Project Ecologist are yet to be appointed at the time of writing the FMP.

It is important for the Construction Site Manager to read and understand the FMP so that the protocols are adhered to correctly during construction works. The responsibilities of the Construction Site Manager include but are not limited to:

- Reading and understanding the FMP;
- Facilitating a project start-up meeting with the Project Ecologist, before commencement of site work to enable forward planning and avoid delays in the construction schedule;
- Contacting the Project Ecologist and iwi representatives a minimum of three-weeks before any potential stream or and sub-tidal channel areas are scheduled for in-stream works, and confirmation of in-stream works with at least seven days' notice;
- Ensure the opportunity for iwi representatives to participate in and support relocations, and to exercise kaitiakitanga responsibilities, as well as to allow cultural aspects to be addressed;
- Maintaining clear lines of communication with the Project Ecologist regarding changes to the works schedule; and
- Briefing new personnel about the contractor's responsibilities under this FMP.

3.2.1 At Risk or Threatened species discovery framework

All personnel working on site are responsible for alerting the Project Ecologist and Construction Site Manager in the discovery of any 'At-Risk' or 'Threatened' aquatic fauna not otherwise identified in this FMP on the same working day as the discovery. Salvage activities will be undertaken under the supervision of an ecologist who will be able to identify 'At-Risk' or 'Threatened' species. Photographic identification sheets will be developed and made available to non-ecologists working on site to allow them to identify aquatic fauna species known to be present on site. If species are encountered that are not on the identification sheet then an ecologist will be notified immediately to determine if the species is 'At-Risk' or 'Threatened'.

3.2.2 Permits

The FMP must be implemented by suitably qualified and experienced ecologists and in accordance with relevant permits and approvals which will include:

- A Ministry for Primary Industries (MPI) Special Permit to catch fish for the purpose of relocating aquatic life.
- An approval from MPI pursuant to section 26ZM (2) (a) of the Conservation Act 1987 to transfer any aquatic life to a location where they already occur (normally within the same catchment).

3.3 Summary of fish values and effects

3.3.1 Fish ecological values

Based on a review of existing literature, previous surveys and the New Zealand Freshwater Fish Database (NZFFD), the following estuarine and freshwater fish species could be present within the project footprint and may be affected by project works (Table 3.1).

Table 3.1: Freshwater/diadromous¹ and marine² fish identified in the Harania Creek or present within the Māngere Inlet.

Common names	Species name	Regional Threat Status ³	National Threat status ⁴	Value	Recorded in Harania Creek
Anchovy ²	<i>Engraulis australis</i>	-		Low	
Banded kōkopu ¹	<i>Galaxias fasciatus</i>	Regionally Not threatened	Not Threatened	Low	✓
Common bully ¹	<i>Gobiomorphus cotidianus</i>	Regionally Not threatened	Not Threatened	Low	✓
Exquisite goby ²	<i>Favonigobius exquisitus</i>	-	-	Low	
Flounder/pātiki ²	<i>Rhomboselea spp.</i>	-	Not Threatened	Low	
Grey mullet ²	<i>Mugil cephalus</i>	Data Deficient	Not Threatened	Low	
Inanga ¹	<i>Galaxias maculatus</i>	At Risk – Regionally Declining	At Risk – Declining	High	✓
Longfin eel/tuna ¹	<i>Anguilla dieffenbachii</i>	At Risk – Regionally Declining	At Risk – Declining	High	✓
Mottled triplefins ²	<i>Grahamina capito</i>	Data Deficient	Not Threatened	Low	
Mosquitofish ¹	<i>Gambusia affinis</i>	-	Introduced and Naturalised	Negligible	

Common names	Species name	Regional Threat Status ³	National Threat status ⁴	Value	Recorded in Harania Creek
Parore (juvenile) ¹	<i>Girella tircuspidata</i>	-	-	Low	
Shortfin eel/tuna ¹	<i>Anguilla australis</i>	Regionally Not Threatened	Not Threatened	Low	✓
Smelt/pōrohe ¹	<i>Retropinna retropinna</i>	Threatened – Regionally Vulnerable	Not Threatened	High	
Snapper/tāmure ²	<i>Pagrus auratus</i>	-	-	Low	
Speckled sole flounder ²	<i>Peltorhamphus latus</i>	-	-	Low	
Yellow-eyed mullet/kātaha ²	<i>Aldrichetta forsteri</i>	Data Deficient	Not Threatened	Low	

Notes: 1. Freshwater/diadromous species, 2. Marine species, 3. Dunn et al., 2018, 4. Bloxham et al., 2023.

3.3.2 Fish ecological effects and effects management measures

There is potential for direct injury or mortality effects on fish during any instream works including piling works within the subtidal channel, coffer dam installation and culvert removal.

This FMP sets out a range of measures to minimise injury or mortality effects to fish potentially impacted by the construction of the Project.

3.4 Fish salvage and relocation

3.4.1 Salvage timing

The timing of fish salvage work will depend on the construction schedule and weather conditions. The Project Ecologist will consult with the Construction Site Manager to plan the staging and sequence for work area isolation, fish salvage and streamworks. The Construction Site Manager must communicate intended in-stream works at least three weeks in advance and confirm the in-stream works with at least seven (7) days' notice. Due to the tidal nature of the aquatic habitat within the project footprint, works will need to be undertaken during low tide. Works area exclusion and salvage will need to be undertaken immediately prior to works commencing each tidal cycle.

3.4.2 Salvaging footprint

The salvaging footprint will be limited to the immediate areas that are to be subject to instream works which are expected to include piling or coffer dam installation and removal of the existing culverts.

3.4.3 Salvage methods

The implementation of the fish salvage methods described in the following sections will reduce the potential effects of mortality or injury during the construction activities associated with the project. It will not be possible to completely avoid the mortality of all fish, however, the objective of the salvage approach will be to minimise mortality as much as practical and allow the recovery of any fish populations as quickly as possible.

The construction approach is not yet confirmed and is expected to be further refined through further design. This section will be updated as more detail is available following finalisation of the construction methodologies.

Salvaging will follow good practice with reference to the standard survey protocols for New Zealand freshwater fish where appropriate. However, it is recognised that these survey protocols are designed to collect reproducible data rather than maximise the capture of aquatic life and it would therefore not be appropriate to strictly adhere to them during fish salvage operations. Further due to the intertidal nature of the site, standard fish salvage protocols used in freshwater systems are not considered to be appropriate or effective in the intertidal environment.

3.4.3.1 Work area isolation

Before the commencement of any works within the subtidal channel, the affected stream reach will be isolated to enable fish to be removed from the area of works.

Due to the intertidal nature of the site, and the relatively small area of impact, it is recommended that fish are 'chased' from the works area, rather than a trapping approach, as follows.

A temporary fish exclusion screen will be set upstream of the works area prior to works commencing and fish salvage commencing. A drag or seine net will be used, moving downstream from the upstream barrier, effectively 'chasing' fish downstream and out of the works area. Following the first drag net run, an exclusion net will be installed downstream of the works area. For the second and third drag net runs, the downstream exclusion net will be temporarily lifted as the drag net gets closer allowing fish to move past and out of the area. The barrier then gets re-installed. The 'dragging' action will occur three times before the downstream barrier is left at the downstream extent of the works area and works can commence.

The Project Ecologist will remain on site during dewatering to observe the construction and undertake additional salvage with hand nets if required.

The upstream and downstream barriers, once set up following the steps above, will in brief:

- Be temporary and installed prior to fish salvage in accordance with the above protocols.
- Ensure that both upstream and downstream extents of the work area are isolated, minimising the risk of native fish moving into the designated works area.
- Be installed to minimise the ability of fish to swim under, or around the screen, but shall not impede water flow. The exclusion screens will be embedded in the stream bed and banks and firmly secured.
- Extend well above the water surface to allow for increases in water level (not including tidal overtopping).
- Preferably be constructed from fine (4 mm) mesh, although larger mesh (e.g. 8 mm) may be used if there is a risk of the mesh blocking due to instream organic debris. If the mesh used in the construction of the exclusion screen is to be shade cloth the percent shade should range between 50 – 70 %. The mesh material will be supported by wire netting, with construction being similar to a super silt fence.
- Be inspected and, where required, maintained daily by the contractor to ensure the screen's structural integrity is maintained until the fish salvage and stream diversion works in that section are completed.
- If an exclusion screen fails or becomes overtopped with water the methodology outlined within this FMP will need to be repeated.
- Allow the Project Ecologist to capture and relocate any fish from within the area prior to work beginning.

- The locations of the exclusion screens will be agreed upon with the Site Manager and Project Ecologist once an implementation programme is agreed.
- By erecting immediately prior to fish salvage this will reduce the risk of the screens being compromised by high water levels due to tidal flow.

Once fish salvage (from within the exclusion area) is completed and the Project Ecologist is satisfied with the level of capture effort, pile driving and coffer dam installation can begin. The height of the coffer dam will need to be above the high tide mark to prevent flooding as the tide comes in. Once the construction of these works is completed the temporary fish screens can be removed.

If streamworks are not completed within a single tidal cycle, exclusion screens must be removed from the site so as to avoid them washing away and becoming aquatic debris. Any lost nets could become lodged within a culvert or choke point resulting in the obstruction of fish passage or water flow, or the injury or mortality of aquatic fauna.

3.4.3.2 Dewatering and spoil searches

Following the installation of the coffer dam structures, dewatering may need to be undertaken of the area within the dams. Once the Project Ecologist has indicated dewatering can commence, water can be pumped out of the dam footprint. A fish exclusion screen will be installed on all pumps used during dewatering activities. This screen will have a maximum mesh size of 3 mm and will have intake velocities of $< 0.3 \text{ m}^3/\text{s}$ to avoid entrainment of fish. The Project Ecologist will supervise the dewatering of the dam to inspect the substrate for fish that may have been missed. Any fish captured during dewatering will be relocated in accordance with the relocation protocols in Section 3.4.4.

3.4.3.3 Biosecurity and pest fish

All equipment used will be clean, sterilised and/or allowed to dry for no less than one week prior to use ensuring that all plant material (seeds and plant material that is able to regenerate) and fauna (e.g. planktonic larvae) is either removed or dead, reducing the risk of transferring pest plants or animals into the catchment.

Any pest fish caught will be humanely euthanized using clove oil (50 mL per 10 L of water) or benzocaine (3.3% solution in ethanol, 50 mL per 10 L of water). All euthanized pest fish will be buried within the riparian margin of the watercourse in which they were caught.

3.4.4 Relocation protocols

3.4.4.1 Handling, transportation and relocation

It is expected that based on the method above, there will be no need for fish to be handled. Should fish be captured during dewatering or following the placement of barriers, fish will be immediately released either upstream or downstream of the works area. Fish will be handled with wet hands at all times to minimise potential injury. As a general principle, any handling of all fish will be minimised in order to reduce potential stress.

3.4.4.2 Relocation sites

Fish will be relocated either immediately upstream or downstream of the project works area per the approach proposed above.

3.4.4.3 Mortality monitoring

If mortality occurs during the implementation of the salvage and relocation protocols described in Section 3.4.4.1 the salvage and handling protocols will be reviewed and any updates to protect

fauna within the protocols will be made to the FMP (following the adaptive management process outlined in Section 3.5).

Within the vicinity of the relocation site, a minimum of 10-minutes will be spent observing the relocation site once fauna have been released to identify any mortality. This observation period must include walking upstream and downstream of the relocation site.

Any mortality will be recorded, with species identified, length and any physical signs of stress/harm (e.g. reddening of the gills, skin abrasion, loss of/tears in fins) detailed. If during the 10-minute observation period, mortality is observed to be high (i.e. mortality of released fauna > 30 %), any further relocation attempts to that site will be halted, dead fish removed from the site, and the cause of the high mortality investigated (e.g. through collecting relocation site water quality information) and a review of the handling and relocation protocols within the FMP will be completed and if needed any updates to the protocols will be made (following the adaptive management process outlined in Section 3.5). Whilst undertaking the protocols outlined within this FMP, the stress of captured fauna will be monitored and appropriate responses to signs of an increase in stress will be implemented.

Any occurrences of high fish mortality shall be reported to Auckland Council Regulatory with an approach to determining the likelihood of the mortality event and any amendments to the FMP outlined as per the adaptive management process in Section 3.5.

3.5 Adaptive management

To achieve the desired outcome, changes may need to be made to this FMP. Detailed construction programmes and methodologies have not yet been developed and they will determine the most effective salvage methodologies to use. Further information on the presence and abundance of fish may also come to light during the construction phase and this will be incorporated into salvage methodologies.

If changes are required, these will be communicated to the Construction Site Manager and Auckland Council Regulatory prior to implementing any changes. The rationale behind any changes made must be based on best practice management techniques and stay in line with salvage philosophies identified in this plan.

3.6 Reporting

A compliance letter shall be supplied to the Construction Site Manager and Auckland Council Regulatory by the Project Ecologist which documents the outcomes of all salvage and relocation activities. The letter shall be supplied within ten working days of completion of fauna salvage at the final stage of works. The compliance letter will contain a summary of all native fauna captured including:

- Date and time of capture and release.
- Capture method.
- Capture and release locations (including GPS coordinates).
- Number and size of individuals of each species released.
- Detail any observed mortality and the adaptive management methods undertaken to amend the FMP.
- Representative species photographs.

All records of aquatic fauna captured and translocated will also be forwarded to the Ministry of Primary Industries, DOC, and uploaded to the NZFFD in accordance with conditions attached to any permits or authorities.

4 Avifauna Management Plan

4.1 Purpose and scope

This Avifauna Management Plan (AMP) sets out management measures to avoid, remedy and minimise potential adverse effects on avifauna as a result of the Project.

Most native avifauna identified as potentially present within the Project footprint are protected by the Wildlife Act 1953, while the Resource Management Act 1991 (RMA) affords protection to significant habitats for indigenous fauna. Furthermore, several species potentially present on site are classified as 'Threatened' or 'At Risk' under the Department of Conservation (DOC) National Threat Classification System (NZTCS) (Robertson et al., 2021).

This AMP includes the following information:

- Responsibilities and competencies of the staff involved in avifauna management.
- Potential avifauna within the proposed footprint and their ecological values.
- Potential effects to avifauna as a result of construction.
- Management measures to avoid, remedy and minimise effects to avifauna.
- Avifauna bird nest check and salvage protocols.
- Reporting requirements.

4.2 Statutory context

The provision of management to avoid, minimise and remedy adverse effects on native wildlife and associated habitat is a requirement under the Resource Management Act 1991 (RMA) and all native birds are legally protected under the Wildlife Act 1953 (Wildlife Act).

4.3 Responsibilities and competencies

Delivery of, and compliance with this AMP will be the responsibility of the Construction Site Manager who will liaise with the Project Ecologist to implement this AMP. The Project Ecologist will be suitably qualified and experienced in avifauna monitoring. The Construction Site Manager and Project Ecologist are yet to be appointed at the time of writing the AMP.

It will be important for the Construction Site Manager to read and understand the AMP so that the protocols are adhered to correctly during construction works. The responsibilities of the Construction Site Manager include but are not limited to:

- Reading and understanding the AMP.
- Facilitating a project start-up meeting with the Project Ecologist before the works commences to determine habitats scheduled for clearance to enable forward planning and avoid delays in the construction schedule.
- Contacting the Project Ecologist and iwi representatives a minimum of seven days before any potential avifauna habitat areas are scheduled for clearance.
- Ensure the opportunity for iwi representatives to participate in and support relocations, and to exercise kaitiakitanga responsibilities, as well as to ensure cultural aspects are addressed.
- Maintaining clear lines of communication with the Project Ecologist regarding changes to the works schedule.
- Briefing new personnel about the contractor's responsibilities under this AMP.

4.4 At Risk or Threatened species discovery framework

All personnel working on site are responsible for alerting the Construction Site Manager and the Project Ecologist in the discovery of any 'At Risk' or 'Threatened' avifauna nesting on site not otherwise identified in this management plan on the same working day as the discovery.

The discovery of 'At Risk' or 'Threatened' avifauna within the project footprint not otherwise identified in this plan will be notified to the DOC Local Area Manager (Tāmaki Makaurau / Auckland Office: 0800 275 362) and relevant iwi representatives immediately. The Construction Site Manager must determine a course of action that is based on the advice of the Project Ecologist. The course of action must consider the outcomes of consultation with iwi representatives and DOC and be submitted for certification to DOC and the relevant territorial authority.

4.5 Summary of avifauna values and effects

4.5.1 Terrestrial avifauna ecological values

The desktop assessment undertaken as part of the EclA returned records for a total of 18 native terrestrial birds at the site, four of which are classified as nationally At Risk (recovering/relict), with the remaining classified as Not Threatened (Robertson et al. 2021) (Table Appendix A.1).

Nationally At Risk species identified by desktop and site assessments are presented in Table 4.1. Of these, North Island kākā may intermittently forage at the site but are unlikely to nest at the site. Kāruhiruhi (*Phalacrocorax varius*) and kawaupaka (*Microcarbo melanoleucos*) are likely to utilise tall exotic trees for perching and potentially nesting.

Due to their threat classifications, nationally Not Threatened bird species are of low ecological value and North Island kākā, kāruhiruhi and kawaupaka are of moderate ecological value. Tūī (*Prosthemadera novaeseelandiae*) and kererū (*Hemiphaga novaeseelandiae*), despite being nationally Not Threatened are considered of moderate ecological value as key pollinators and seed dispersers.

4.5.2 Coastal avifauna ecological values

The project footprint is in the vicinity of SEA-M2-23a. This designated site is of ecological significance for an array of coastal bird species, providing important foraging and breeding habitat for nationally 'Threatened' and 'At Risk' endemic and migratory species, including the 'At Risk – Declining' species banded rail (*Gallirallus philippensis*).

A bird survey undertaken by Boffa Miskell in 2016 at nearby Norona Park (1.3 km north) identified further species that may utilise the habitats within the project footprint (De Luca et al., 2016; Table Appendix A.1). Species with a national or regional threat classification of 'Threatened' or 'At Risk' that may be utilise the site are presented in Table 4.1 below. Based on their threat classifications, the ecological value of coastal avifauna potentially present at the site ranges from low to very high.

Of the coastal avifauna species identified, three have the potential to nest at the site: white faced heron *Egretta novaehollandiae*, spur winged plover *Vanellus minus* and banded rail.

Further to this, there is the potential for northern New Zealand dotterel (*Charadrius obscurus*) to utilise the land based areas of the project footprint including the Eastern compound at Blake Road Reserve (5,500 m²) and the Western compound at Lenore Foreshore Reserve (1,750 m²). This species has a national threat status of Threatened - Nationally Increasing and a regional threat status of Threatened - Regionally Increasing and an ecological value of high.

Table 4.1: List of native terrestrial and coastal bird species of moderate value or higher that are present or potentially present in or near the project site (data from iNaturalist, eBird, De Luca et al., 2016 and on-site observations).

Common name	Species name	National threat classification (Robertson et al. 2021)	Regional threat classification (Woolly et al. 2024)	Observed on site	Nesting habitat availability	Value
Tūturiwhatu/northern NZ dotterel	<i>Charadrius obscurus</i>	At Risk - Declining	Threatened – Nationally Increasing		*	High
Moho pererū/ banded rail	<i>Gallirallus philippensis</i>	At Risk - Declining	At Risk - declining		*	High
Kererū	<i>Hemiphaga novaeseelandiae</i>	Not Threatened	Not threatened		*	Moderate
Tarāpuka/black-billed gull	<i>Larus bulleri</i>	Threatened - Nationally critical	Threatened - Regionally Endangered			Very High
Kuaka/Bar-tailed godwit	<i>Limosa lapponica</i>	At Risk - Declining	Not Threatened			High
North Island kākā	<i>Nestor meridionalis septentrionalis</i>	At Risk - Recovering	At Risk - Regionally Recovering			Moderate
Kāruhiruhi/pied shag	<i>Phalacrocorax varius</i>	At Risk - Recovering	At Risk - Regionally Recovering		*	Moderate
Kawaupaka/little shag	<i>Phalacrocorax melanoleucos brevirostris</i>	At Risk - Relict	Threatened - Regionally Endangered	*	*	Moderate
Tūi	<i>Prosthemadera novaeseelandiae</i>	Not Threatened	Not Threatened		*	Moderate
Tara/white-fronted tern	<i>Sterna striata</i>	At Risk - Declining	Threatened - Regionally Vulnerable			High

4.5.3 Avifauna ecological effects

Through the proposed removal of vegetation and construction works, potential adverse effects on birds are likely to occur primarily through:

- Temporary loss of habitat, including 1,820 m² of native vegetation, seven exotic specimen trees, 181 m² of rank kikuyu grass, and 65 m² of exotic shrubland.
- Potential disturbance, injury, and/or mortality during breeding season.
- Disturbance from dust, vibration, and noise during project works.

4.6 Avifauna effects management

4.6.1 Approach

Measures to avoid, minimise and remedy potential effects of the project works on native birds are summarised below:

- Provision of maps showing delineation of bird habitat to be cleared.
- Pre-construction and vegetation clearance briefing with Project Ecologist and contractor personnel.
- Seasonal restrictions on the timing of vegetation clearance where practical.
- Pre-vegetation clearance checks for native bird species during the peak breeding/nesting season when vegetation clearance activities are required (and if peak bird breeding season cannot be avoided).
- Incidental discovery and harm protocols. These protocols include best practice methodologies commonly used on construction projects and adapted in this AMP for local site conditions.
- Habitat remediation. Native vegetation removed due to site works will be re-instated following completion of construction works. A minimum of 1,820 m² native remediation planting is proposed.

4.6.2 Seasonal constraints

During the breeding season there is the potential for direct harm to nests, eggs and chicks during vegetation clearance activities. To avoid or minimise effects on native birds, vegetation clearance outside of the peak bird breeding season is recommended.

Where vegetation clearance must be undertaken during the relevant peak bird breeding season in any of the nesting habitats listed in Table 4.2, (i.e. due to critical path) then protocols for vegetation removal (Section 4.6.3) must be adhered to.

Table 4.2: Bird groups with potential to nest on site, their peak breeding season, and nesting habitats

Bird group	Nesting habitats	Peak bird breeding season
Forest birds	Native vegetation Exotic specimen trees	September to January inclusive
Moho pererū/banded rail	Mangrove forest Native vegetation or rank grass immediately adjacent to mangrove forest	September to March inclusive

Bird group	Nesting habitats	Peak bird breeding season
Kāruhiruhi/pied shag and kawaupaka/little shag	Exotic specimen trees	September to March inclusive
New Zealand dotterel	Construction areas	July to March inclusive (refer to Section 4.6.4 for more detail)

4.6.3 Protocols for vegetation removal

To enable programme delivery, vegetation clearance may need to be undertaken during bird breeding season for species potentially on site. However, to avoid the loss of native bird nests, eggs and chicks associated with this clearance, the following protocols will be followed:

- Constructor to notify the Project Ecologist at least three weeks prior to any bird habitat clearance during the peak bird breeding seasons.
- Project Ecologist to notify iwi of any upcoming bird nest checks. Iwi will be invited to assist and attend any bird nest check works.
- Pre-construction briefing with Project Ecologist and contractor personnel.
- Prior to bird nest surveys, a surveyor will mark out the required area of vegetation clearance.
- The Project Ecologist or suitably qualified ecologist will undertake the following to identify breeding birds, nests and eggs prior to vegetation clearance:
 - Bird behaviour will be observed from a distance to determine bird nest presence.
 - Careful and thorough transect walks will be undertaken within potential bird nesting habitat areas within the project area (and 10 m buffer to the boundary) searching for breeding birds, nests, and eggs.
 - If no active nests are found, vegetation clearance in the searched area may proceed (within three days, otherwise an additional nest check is required).
 - Where active nests are found, then individual trees and/or immediate surrounding habitat (within 10 m for nationally 'Not Threatened' species and 30 m for nationally 'At Risk' or 'Threatened' species) are to be left in situ, clearly marked, and cordoned off from any works or machinery until nesting birds have fledged or nests are naturally abandoned. Following confirmation that the area is free of active nests by the Project Ecologist, vegetation clearance or works may occur within three days of the area being checked.
- Climbing arborists may be required to assist with bird nest surveys where trees are too tall or dense to effectively assess from the ground.
- Where work ceases for more than three consecutive days, the site must be re-inspected for bird breeding and nesting activity.

4.6.4 Dotterel management

Dotterels may establish breeding territories and nests within construction yards established at the beginning of works. Dotterels are known to continue to opportunistically nest throughout their breeding season (July to March inclusive). The choice of nest sites may be influenced by physical nest site parameters, including distance to the nearest potential cover (e.g. woody weeds used by predators such as cats, rats and mustelids). Dotterels can set up breeding territories before the earthworks season begins. The earlier a bird is detected, the more options there are and less chance of delay to work or harm to dotterels.

Nesting deterrents (e.g. silt fences or similar, allowing grass to grow long, walking a dog on a leash through the site) can be used to block the birds' line of sight and disturb mature prospecting

dotterels². Deterrents must be applied prior to and at the beginning of the breeding season. Dotterel survey methods should be employed to allow early detection of dotterel presence, beginning July and continuing intermittently through to the end of February.

The following protocols shall be implemented during the breeding season for dotterels (July to March inclusive). Protocols are as follows:

- Prior to the breeding season (July to March inclusive), the Project Ecologist shall check for suitable dotterel nesting habitat or dotterel presence within the construction yards, or otherwise modified areas on site. Suitable nesting habitat would comprise large areas of open space, with little to no vegetation, buildings or machinery compromising line of sight.
- If no prospecting birds are observed and/or no suitable habitat is present on the site, the Project Ecologist will make the determination that no further actions are required, other than accidental discovery protocols (refer to Section 4.6.5) if applicable.
- If present, dotterels should be observed from a distance using binoculars, with a survey period of two hours.
- If nesting birds are detected:
 - A 20 m buffer / exclusion zone should be erected around the nest (the nest shall be in the centre of the zone), and works shall not be conducted in the area until the nesting activities are completed. No person or machine is to enter the exclusion zone.
 - The nest shall be monitored weekly from a distance of at least 20 m and utilisation of this area will only commence once a suitably qualified ecologist confirms the chicks have fledged, or the nest has failed.
 - If the status of the nest cannot be determined from 20 m, then the ecologist shall slowly move closer to the nest until they can successfully determine its status (e.g. active, failed, fledged).
- Where no nests have been found but the Project Ecologist considers the construction yards or site to provide potentially suitable habitat, deterrents shall be deployed, including:
 - Silt fences – shaded cloth will be erected to knee height and placed 10 m apart. The constructor will be responsible for the upkeep of the fencing to ensure it efficiently blocks line of sight.
 - Further deterrents can be undertaken in accordance with Project Ecologist recommendations and the NZTA guidance document.
- Following the placement of nesting deterrents, whilst construction is underway during the months of July to March inclusive, the Project Ecologist will undertake monthly surveys to identify if dotterel have established a nest in construction yards or on site. If a nest is identified, construction activities can continue if an exclusion zone is implemented (as described above) and the Project Ecologist confirms that the works will not contribute to nest failure.
- Toolbox meetings to inform the construction crew of dotterel and resources such as posters will be supplied to the construction team prior to the beginning of the nesting season so that they may be aware of the potential for dotterel at their site and methods that should be employed if an accidental discovery occurs.

² Detailed methods can be found in the Waka Kotahi – NZ Transport Agency guidance document (Guidance in relation to New Zealand dotterels on NZTA land, 2012).

4.6.5 Accidental discovery protocols

If a bird nest, eggs and/or chicks are discovered during vegetation clearance by site contractors, the following protocols will be followed:

- The contractor will contact the Project Ecologist immediately.
- If a nest is found and deemed to be active, then individual trees and immediate surrounding habitat (within 10 m for nationally 'Not Threatened' species and 30 m for nationally 'At Risk' species) are to be left in situ, clearly marked, and cordoned off from any works and machinery until nesting birds have fledged or nests naturally abandoned.
- No works or personnel are to enter within the exclusion zone until chicks have fledged or the nest has been naturally abandoned, as confirmed by the Project Ecologist.
- Climbing arborists may be required to assist with bird nest checks where vegetation is too tall or dense to properly assess.
- Once the area is deemed free of active nests by the Project Ecologist, vegetation clearance or works may continue.

4.6.6 Accidental bird injury and mortality during construction

In the event of finding a dead or injured native bird during vegetation clearance or construction works, the following procedures will be implemented:

- Injured native birds will be placed in a cool, dark, material-lined box or bag by or under the direction of the Project Ecologist to ensure any birds are handled appropriately.
- Any accidental bird injuries and/or mortality will be reported to the Project Ecologist no longer than two hours after the injured or dead bird is found.
- The local DOC office or DOC hotline (if after hours) will be contacted no more than two hours after the injured or dead bird is found. The DOC hotline is 0800 DOCHOTLINE (0800 362 468).

DOC and veterinary advice shall be sought in conjunction with the Project Ecologist when considering the rehabilitation requirements of any injured native birds (for example, legislative requirements will need to be considered). If the bird is dead or euthanised by the vet, it must be taken to the local DOC office as soon as practicable if requested by the local DOC office.

4.7 Adaptive management

To achieve the desired outcome (managing effects on avifauna), changes may need to be made to this AMP. The rationale behind any changes must be based on best practice management techniques to manage adverse effects on avifauna. If any changes are required, Auckland Council Regulatory as the consenting authority will be notified in writing (email or letter) prior to implementing any changes.

4.8 Reporting

Reporting will be completed within three months of all construction site works being completed (does not include revegetation works). The project report will contain a summary of the following:

- The name and qualifications of the person carrying out the pre-construction bird nest checks.
- Dates of any bird nest checks.
- The location, species and outcome of any observed bird-breeding and nests.
- The number and species of any accidental bird injury and/or mortality that occurred during construction.

- Measures taken to avoid, minimise or mitigate adverse effects on any bird breeding or nesting sites.
- Photographs of any bird management measures, including photographs of any active native bird nesting.

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5 Mokomoko Management Plan

See Appendix B for the Mokomoko (Lizard) Management Plan (MMP) which was prepared separately to this EMP and provided to the DOC alongside a supporting Wildlife Act Authority Application. The MMP includes measures for two sites within Harania Creek, including the Tennessee Bridge works.

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6 Vegetation Management Plan

6.1 Introduction

This section outlines the management processes to avoid, remedy, minimise or remedy adverse effects on vegetation and habitat values during the construction phase of the project. The design proposals will result in:

- Temporary loss of 1,820 m² of native vegetation.
- Permanent loss of approximately seven exotic specimen trees.
- Permanent loss of 181 m² of rank kikuyu grassland.
- Permanent loss of 65 m² of exotic shrubland.
- Permanent loss of 'At-Risk' and 'Threatened' plant species that are present within the development footprint.
- Permanent loss of 1,000 m² of mangrove habitat.

Management actions recommended in order to avoid, remedy and minimise effects on vegetation include design measures, vegetation mapping, vegetation clearance protocols, and vegetation salvage. All proposed management actions outlined in this report shall take into account the outcomes of consultations with DOC and the iwi partners.

6.2 Responsibilities and competencies

Delivery of, and compliance with, the Vegetation Management Plan (VMP) will be the responsibility of the Construction Site Manager who will liaise with the Project Ecologist and specialist ecologists as required.

It will be important for the construction contractor to read and understand this section so that the protocols are adhered to correctly during construction works. The responsibilities of the construction contractor include, but are not limited to:

- Reading and understanding the VMP
- Facilitating a project start-up meeting with the Project Ecologist and the Construction Site Manager before vegetation clearance commences for each stage of the Project.
- Ensure the opportunity for iwi partners to participate in and support any vegetation or habitat salvaging and relocation as deemed necessary, to ensure appropriate exercise of kaitiakitanga responsibilities and to ensure that cultural concerns are addressed
- Maintaining clear lines of communication with the Project Ecologist regarding changes in the works schedule
- Ensuring reporting requirements under the VMP are met
- Briefing new personnel about the contractor's responsibilities under this plan

6.3 At risk or Threatened species discovery framework

All personnel working on site are responsible for alerting the Project Ecologist and the Construction Site Manager in the event of the discovery of any 'At-Risk' or 'Threatened' flora and fauna not otherwise identified in this management plan on the same working day as the discovery.

The discovery of 'At Risk' or 'Threatened' flora within the project footprint not otherwise identified in this plan will be notified to the DOC Local Area Manager (Tāmaki Makaurau / Auckland Office: 0800 275 362) and relevant iwi representatives immediately.

The Construction Site Manager must determine a course of action that is based on the advice of the Project Ecologist. The course of action must consider the outcomes of consultation with iwi representatives, DOC and Auckland Council Regulatory (as appropriate).

6.4 Summary of vegetation values and effects

6.4.1 Vegetation values

Vegetation types present in the project footprint include native vegetation, exotic specimen trees and rank grass. Native vegetation was dominated by typical native revegetation species including kānuka (*Kunzea robusta*), mānuka (*Leptospermum scoparium*), harakeke (*Phormium tenax*), lemonwood (*Pittosporum eugenoides*), karamu (*Coprosma robusta*), ngaio (*Myoporum laetum*) and ti kōuka/cabbage tree (*Cordyline australis*). The canopy was approximately five to six meters tall. The understory was mostly bare but occasional native ferns including rasp fern (*Doodia australis*) and exotic annuals were present. Pest plant species included Chinese privet (*Ligustrum sinense*) and Sydney golden wattle (*Acacia longifolia*). Exotic specimen trees in the vicinity of the project footprint included Monterey cypress (*Hesperocyparis macrocarpa*), *Sequoia* and *Eucalyptus* species. Hedgerows of exotic monkey apple (*Syzigium smithii*) were recorded to the east of the project footprint on the periphery of residential housing. To the south side of the Eastern Interceptor and within the project footprint, an area of approximately 150 m² of rank exotic kikuyu grass (*Cenchrus clandestinus*) occurred.

Of the species present, kānuka is classified as Nationally Not Threatened but regionally At Risk – Declining while mānuka is classified as Nationally Not Threatened but Regionally Endangered due to the potential threat of myrtle rust (*Austropuccinia psidii*) (de Lange et al. 2024; Simpkins et al. 2022). They are otherwise common in the local and wider environment. All other species are classified as Not Threatened or exotic.

Upstream and downstream of the Tennessee embankment is dominated by established mangrove (manawa/*Avicennia marina*) forests. There is a recently cleared patch of mangroves extending an area of approximately 600 m² downstream of the Tennessee embankment. Mangrove forest provides protection, foraging and breeding and nursery habitat for fish, including species that are classified as At Risk (Robertson et al., 2021).

6.4.2 Effects on vegetation

Potential adverse effects on terrestrial vegetation include:

- Removal of native vegetation (1,820 m²).
- Removal of exotic specimen trees (approximately seven).
- Removal of 181 m² of rank kikuyu grassland
- Removal of 65 m² of exotic shrubland.

Adverse effects to mangroves include:

- Removal of approximately 1,000 m² of mangroves within the coastal area

6.5 Effects management

A range of measures will be implemented during construction to avoid and minimise adverse effects on vegetation, including on 'Threatened' and 'At-Risk' species and ecosystems. These include:

- Vegetation clearance protocols (Section 6.5.1).
- Remediation planting including the replacement of 'Threatened' and 'At-Risk' plant species (Section 6.5.2).

Removal of vegetation can expose soil, making it more prone to erosion, resulting in increased sedimentation into streams. In addition, the accumulation or storage of sawdust, chip or mulch near or over waterways can leach dissolved organic matter that can promote heterotrophic growths or deplete dissolved oxygen in stream water.

Prior to vegetation clearance, sediment control measures will be undertaken to avoid or minimise effects on Harania Creek and aquatic fauna due to effects on water quality. Procedures for minimising the area and duration of soil exposure from vegetation clearance are outlined in the Erosion and Sediment Control Plan (ESCP) (reference to be updated once finalised).

Any adverse effects arising from vegetation clearance will be minimised by following procedures for:

- Minimising the area and duration of soil exposure from vegetation clearance.
- Minimising the volume of vegetation to be mulched.
- Locating wood residue piles with an appropriate separation distance from Harania creek.

Vegetation clearance will only commence after all pre-clearance management measures have been undertaken or are in place and these measures have been confirmed by the Project Ecologist and iwi.

During vegetation clearance activities, construction methodology refinements, maintenance of physical delineation barriers and erosion and sediment control measures, as described within this VMP, will be ongoing.

6.5.1 Vegetation clearance protocols

6.5.1.1 Appropriately experienced arborists

Vegetation removal will be undertaken by suitably experienced arborists to reduce tree damage and to accommodate construction.

6.5.1.2 Demarcation of clearance extent

To ensure native vegetation outside of the areas marked in the vegetation clearance plans are not mistakenly removed or damaged, the extent of vegetation clearance will be clearly physically delineated. The boundaries will be delineated by the Construction Site Manager using temporary fencing. The Contractors/Construction Site Manager will ensure no vegetation will be removed outside of this boundary. Furthermore, no construction materials or waste will be deposited into vegetation outside of the fencing.

Project arborists and construction contractors will, where practicable, ensure that vegetation is felled into the Project footprint to minimise impacts on the remaining vegetation.

6.5.1.3 Seasonal restrictions on vegetation clearance

Vegetation clearance should be undertaken during the earthworks season (1 October – 1 May) due to seasonal constraints for salvaging and relocating lizards.

Vegetation clearance should also be undertaken where practicable:

- Outside of peak bird breeding season to avoid and minimise potential direct mortality or injury to eggs, nesting chicks and fledglings.
- In the event that some vegetation clearance is required during peak bird breeding season, refer to Section 4: Avifauna Management Plan for further additional management actions that will need to be implemented.

Additional to the bird breeding constraints, clearance of certain habitat types will also be limited to suitable weather as defined in the Mokomoko (Lizard) Management Plan (Section 5) when lizards are likely to be more active (and therefore more likely to be detected if present).

6.5.1.4 Minimising impacts on adjacent vegetation

In addition to the above, the methodology to further reduce effects during vegetation clearance for the removal and pruning of vegetation includes:

Where practicable vegetation will be directionally felled away from the physically marked boundary (refer to Section 6.5.1.2) to prevent vegetation damage to the vegetation immediately adjacent to the Project footprint, unless deemed to be unsafe and hazardous. Methods for undertaking vegetation removal will be site specific and commonly will include use of an excavator, grapple and chainsaw on suitable land, and directionally felling trees using experienced arborists.

An excavator will be required to assist with lizard management. An excavator will be required to scrape ground covers and lift large rocks and/or logs which native lizards use for cover. An ecologist will be on site to direct any machine-assisted lizard salvage (refer to Section 5 MMP).

6.5.2 Remediation planting

Following construction, remediation planting will be undertaken to reinstate vegetation that will be cleared. Remediation planting includes (Boffa Miskell, 2024). The total area of planting will include in the order of 900 m² of saltmarsh/meadow planting and 1,100 m² of riparian planting (to nearest 100 m).

The planting also includes 100 *Muehlenbeckia complexa* plants to be established in canopy gaps in the lizard relocation site. The planting schedule closely resembles the species composition of the existing native vegetation, including regionally 'At Risk – Declining' kānuka, ngaio and taupata and 'Regionally Endangered' mānuka. The planting has been undertaken in accordance with Ngāa Hau o Maangere Ngāhere Planting Guide (Maahe, 2023).

6.6 Mangrove removal

Auckland Council shall engage contractors to undertake mangrove removal as is required during the construction timeline, subject to seasonal restrictions (i.e. preference to clear mangroves outside of bird breeding season (outside the period September to March inclusive)). Approximately 1,000 m² of mangrove clearance will be undertaken as part of the works surrounding the Tennessee embankment. This will be done by way of an excavator with a selector grab tool within the coastal area. Mangroves will be fully de-rooted, removed from the coastal area and taken off site. The area of mangroves to be removed will be demarcated to allow for any appropriate nests checks within the area and ensure no excess mangrove cover is removed.

When undertaking mangrove removal, the following methods will be adhered to:

- As few points of access as possible to the coastal area to minimise disturbance. Access of the excavator will be via the Blake Road Reserve.
- Machinery will occupy the coastal area only on the gravel pads or on the temporary stage access.
- All mangroves will be removed at the root, bundled and removed from the coastal area to be transferred off-site to green waste. They will not be incorporated back into the site as vegetative material will smother sediments, cause anoxia and is associated with the release of hydrogen sulphide gas.

- The contractor (or Project Ecologist if present) will capture mangrove removal processes via photographic and/or video recordings to inform ecologists of the practicalities and effectiveness of the proposed mangrove removal methods.
- All refuelling or cleaning of equipment to take place on land.
- All mangrove clearance to be undertaken outside the period September to March inclusive to avoid peak bird moho pererū breeding season. If mangrove clearance cannot be undertaken within this period, a suitably qualified ecologist shall determine whether any Threatened or At-Risk nesting birds are likely to be displaced by the removal of mangroves at that time and in that location in accordance with the processes in the AMP.

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7 Applicability

This report has been prepared for the exclusive use of our client Auckland Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and that Auckland Council Regulatory as the consenting authority will use this report for the purpose of assessing that application.

We understand and agree that this report will be used by Auckland Council (Regulatory) in undertaking its regulatory functions in connection with the consent.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants
Report prepared by:

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Ross Oliver
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Authorised for Tonkin & Taylor Ltd by:

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Chris Bauld
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Appendix A Avifauna species list

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Table Appendix A.1 : List of native terrestrial¹ and coastal² bird species present or potentially present in or near the project site (data from iNaturalist, eBird, De Luca et al., 2016 and on-site observations).

Common name	Species name	National conservation status (Robertson et al. 2021)	Regional conservation status (Woolly et al. 2024)	Observed on site	Ecological value (EIANZ criteria; Roper-Lindsay et al. 2018)
Australian magpie ¹	<i>Gymnorhina tibicen</i>	Introduced	Introduced		Negligible
Banded rail / moho pererū ²	<i>Gallirallus philippensis</i>	At Risk - Declining	Threatened - Regionally Vulnerable	*	Very High
Bar-tailed godwit / kuaka ²	<i>Limosa lapponica</i>	At Risk - Declining	Not Threatened		High
Black-billed gull / tarāpuka ^{1,2}	<i>Larus bulleri</i>	Threatened – Nationally critical	Threatened – Regionally Endangered		Very High
Chaffinch ¹	<i>Fringilla coelebs</i>	Introduced	Introduced		Negligible
Common myna ¹	<i>Acridotheres tristis</i>	Introduced	Introduced		Negligible
Common starling ¹	<i>Sturnus vulgaris</i>	Introduced	Introduced		Negligible
Eastern rosella ¹	<i>Platycercus eximius</i>	Introduced	Introduced		Negligible
Eurasian blackbird ¹	<i>Turdus merula</i>	Introduced	Introduced		Negligible
European goldfinch ¹	<i>Carduelis carduelis</i>	Introduced	Introduced		Negligible
European greenfinch ¹	<i>Chloris chloris</i>	Introduced	Introduced		Negligible
Grey warbler / riroriro ¹	<i>Gerygone igata</i>	Not Threatened	Not Threatened	*	Low
House sparrow ¹	<i>Passer domesticus</i>	Introduced	Introduced	*	Negligible
Kererū ¹	<i>Hemiphaga novaeseelandiae</i>	Not Threatened	Not Threatened		Moderate
Little shag / kawaupaka ²	<i>Phalacrocorax melanoleucos brevirostris</i>	At Risk - Relict	Threatened – Regionally Endangered	*	Moderate
Mallard / rakiraki	<i>Anas platyrhynchos</i>	Introduced	Introduced		Negligible
Morepork / ruru ¹	<i>Ninox novaeseelandiae</i>	Not Threatened	Not Threatened		Low
North Island kākā ¹	<i>Nestor meridionalis septentrionalis</i>	At Risk - Recovering	At Risk – Regionally Recovering		Moderate

Common name	Species name	National conservation status (Robertson et al. 2021)	Regional conservation status (Woolly et al. 2024)	Observed on site	Ecological value (EIANZ criteria; Roper-Lindsay et al. 2018)
North Island fantail / pīwakawaka ¹	<i>Rhipidura fuliginosa placabilis</i>	Not Threatened	Not Threatened	*	Low
Pied shag / kāruhiruhi ²	<i>Phalacrocorax varius</i>	At Risk - Recovering	At Risk – Regionally Recovering		Moderate
Pied stilt / poaka ²	<i>Himantopus Himantopus</i>	Not Threatened	Not Threatened		Low
Pūkeko ²	<i>Porphyrio melanotus</i>	Not Threatened	Not Threatened		Low
Red-billed gull / tarāpunga ^{1,2}	<i>Chroicocephalus novaehollandiae</i>	At Risk - Declining	Threatened – Regionally Vulnerable		High
Rock pigeon ¹	<i>Columba livia</i>	Introduced	Introduced		Negligible
Sacred kingfisher / kōtare ²	<i>Todiramphus sanctus vagans</i>	Not Threatened	Not Threatened		Low
Shining cuckoo / pīpīwharau ¹	<i>Chrysococcyx lucidus</i>	Not Threatened	Not Threatened		Low
Silvereye / tauhou ¹	<i>Zosterops lateralis</i>	Not Threatened	Not Threatened	*	Low
Song thrush ¹	<i>Turdus philomelos</i>	Introduced	Introduced		Negligible
South Island pied oystercatcher / tōrea pango ²	<i>Haematopus finschi</i>	At Risk - Declining	At Risk – Regionally Declining		High
Southern black-backed gull / karoro ^{1,2}	<i>Larus dominicanus</i>	Not Threatened	Not Threatened		Low
Spotted dove ¹	<i>Spilopelia chinensis</i>	Introduced	Introduced		Negligible
Spur-winged plover ²	<i>Vanellus miles</i>	Not Threatened	Not Threatened		Low
Tūi ¹	<i>Prosthemadera novaeseelandiae</i>	Not Threatened	Not Threatened		Moderate
Welcome swallow / warou ¹	<i>Hirundo nexoena</i>	Not Threatened	Not Threatened		Low
White-faced heron / matuku moana ²	<i>Egrett novaehollandiae</i>	Not Threatened	Not Threatened	*	Low
White-fronted tern / tara ²	<i>Sterna striata</i>	At Risk - Declining	Threatened – Regionally Vulnerable		High

Appendix B Mokomoko (Lizard) Management Plan

DRAFT



Mokomoko Management Plan

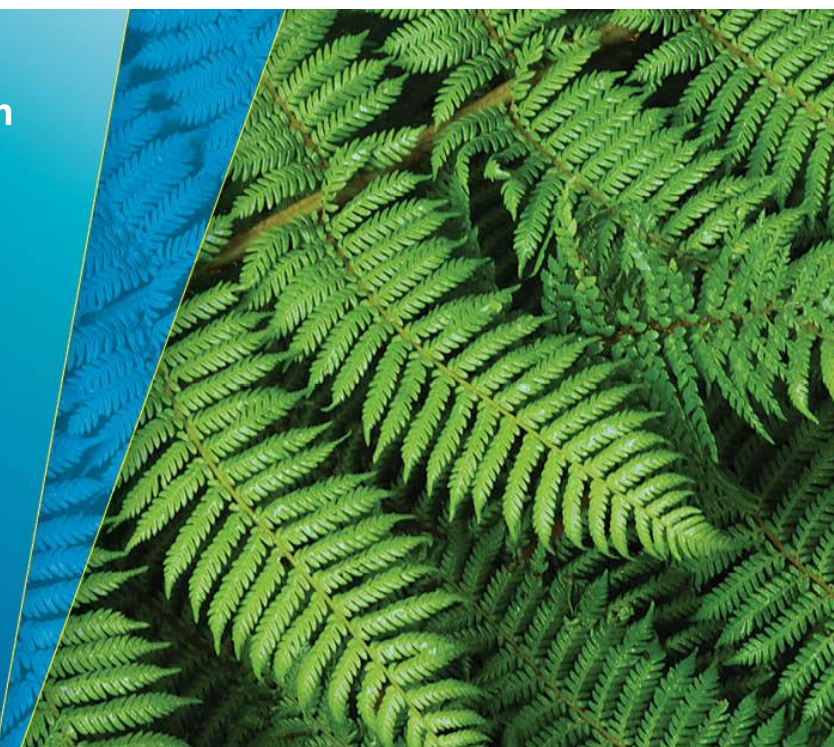
Blue Green Network: Harania

Prepared for
Auckland Council

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5 August 2024	1.1	Draft Mokomoko Management Plan for client review	S Heggie-Gracie	R Behrens J Quinn	C Bauld
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1 PDF copy
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1 Introduction

Auckland Council (AC) is proposing the implementation of flood resilience works across a number of sites across Tāmaki Makaurau / Auckland. These works comprise part of the Blue Green Network upgrades in response to significant storm events and associated flooding across Tāmaki Makaurau in 2023. In general, these works involve the upgrading of instream structures for higher flow capacities, floodplain management and associated enabling works. The projects may be consented through an 'Orders in Council' – a number of laws changed to help communities continue to recover from severe weather events during early 2023. However, they may also be consented through the usual consenting process.

One of the target sites is works associated with the Eastern Interceptor located at Harania Creek, located to the west and east of Blake Road Reserve, Māngere East (see Figure 1, Appendix A). The Eastern Interceptor is a wastewater pipe and is a critical piece of infrastructure for Auckland. It is situated within an embankment perpendicular to Harania Creek and is supported by a number of culverts. The proposed works include an upgrade to the existing interceptor, removal of culverts and construction of a pipe bridge. This will require the removal of planted native and exotic vegetation, which may provide habitat for native mokomoko / skinks (Photograph 1.1 through Photograph 1.6).

The works are likely to take place across two distinct areas of Blake Road Reserve, named Tennessee Culvert and Blake Road upgrades (see Figure 1, Appendix A). Both areas contain potential habitat for native mokomoko / skinks.

Native mokomoko are protected by the Wildlife Act 1953. This Mokomoko Management Plan (MMP) has been prepared to outline measures to avoid, remedy and mitigate impacts to native mokomoko and to support a Wildlife Act Authority (WAA) application to the Department of Conservation (DOC).

This MMP has been prepared in accordance with our Statement of Work (SoW) dated 14 June 2024¹.

¹ T+T (2024). Statement of Work (SoW). Harania Stage 2: Design. Stream works. Contract number CW218693. Auckland Council.



Photograph 1.1: Tennessee Culvert showing Eastern Interceptor with native planted vegetation on the peripheries suitable for native skinks. (18 June 2024).



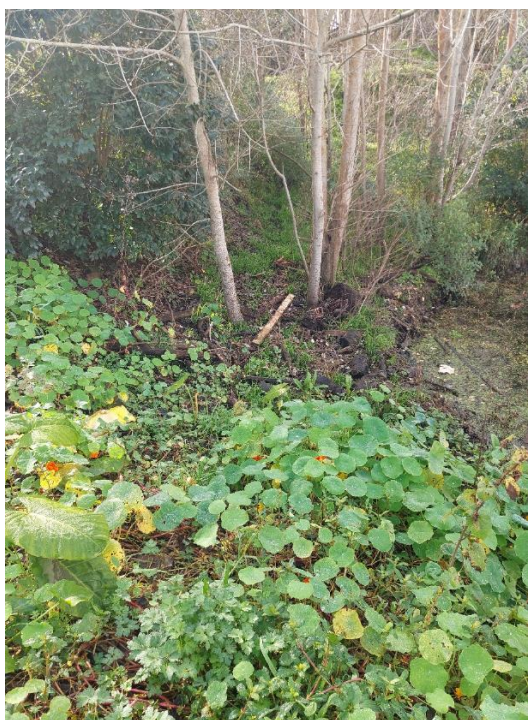
Photograph 1.2: Tennessee Culvert area with rank grassland with large harakeke (Phormium tenax) suitable for native skinks. (18 June 2024).



Photograph 1.3: Blake Road area with dense cluster of wild ginger. Skinks can use the roots of wild ginger as effective micro-habitat (18 July 2024).



Photograph 1.4: Blake Road area with sparse understory dominated by exotic ground-covers. Rocks and exotic ground covers provide potential skink habitat. (18 July 2024).



Photograph 1.5: Blake Road area with exotic ground cover looking south from the top of the Eastern Interceptor. (18 July 2024).



Photograph 1.6: Blake Road area with exotic grasses and ground covers dominating the southern bank of the Eastern Interceptor.

1.1 Scope

The scope of this MMP is to provide the mokomoko ecological values, potential effects and effects management measures to avoid, remedy and mitigate potential impacts to native mokomoko. This MMP includes the following:

- Responsibilities of personnel involved in mokomoko management.
- Summary of mokomoko ecological values, effects and effects management.
- Salvaging protocols for mokomoko.
- Mokomoko relocation protocols including relocation site description.
- Adaptive management protocols.
- Reporting requirements.
- A figure showing descriptions of potential mokomoko habitats and relocation site.
- Key principles for mokomoko salvage.

Note, that at this time, the design and construction approach for the project is still being finalised. An ecological impact assessment report (EclA) will be prepared and lodged with the resource consent application. This MMP will be submitted with the application as a draft, with the intention that it can be updated in response to queries from Auckland Council and any clarification that may come from DOC. The MMP has been prepared based on information available at this time and is considered to be an accurate indication of the extent of impact expected from the project works.

1.2 Responsibilities

Responsibilities of all parties involved in implementing the MMP are outlined in Table 1.1.

Table 1.1: Responsibilities of those implementing the MMP

Title	Responsibility
Project owner (Auckland Council – Healthy Waters)	<ul style="list-style-type: none"> Overall manager of the wider project, including overseeing the implementation of the MMP at a high level.
Project Manager	<ul style="list-style-type: none"> Co-ordinates communication between the Contractor and Project Ecologist.
Contractor / construction site manager	<ul style="list-style-type: none"> Delivery of and compliance with this MMP. Implementation of the MMP including the following: <ul style="list-style-type: none"> Reading and understanding the MMP. Facilitating a project start-up meeting with the Project Ecologist before construction commences. Contacting the Project Ecologist and Project Iwi a minimum of one month before any potential mokomoko habitat areas are scheduled for clearance. Maintaining clear lines of communication with the Project Ecologist regarding changes to the works schedule. Briefing new personnel about the contractor's responsibilities under this MMP.
Project Ecologist	<p>The Project Ecologist is to be engaged by the project owner to provide technical advice to the construction site manager / contractor and assist the Project Manager with compliance against this MMP.</p> <p>The Project Ecologist will:</p> <ul style="list-style-type: none"> Read and understand the MMP. Ensure any required permits are attained and on hand during survey, salvage and relocation works. Co-ordinate with Project Iwi to ensure mokomoko salvage to allow iwi involvement and provide opportunity for tikanga to be followed. Undertake any required mokomoko salvage and relocation works and lead pre-application meeting with DOC ahead of these works to confirm permit requirements and the relocation site. Project Ecologist to provide regular updates on mokomoko management to the Project Manager. Complete any required reporting.
Project Iwi	<p>Project iwi have been engaged for this project. The Project Iwi will:</p> <ul style="list-style-type: none"> Communicate with the Project Ecologist. Read and understand the MMP. Input to proposed mokomoko management measures. Lead and implement any tikanga required for mokomoko management measures. <p>Project Iwi will be invited to assist in any mokomoko survey and / or salvage works.</p>

2 Summary of mokomoko values, effects and effects management

2.1 Mokomoko ecological values

Based on a desktop assessment, copper (*Oligosoma aeneum*) and ornate skinks (*O. ornatum*) were considered potentially present at site².

A site visit was undertaken on 18 June 2024 to assess the Tennessee Culvert and Blake Road proposed works footprints. The habitat assessment confirmed potential skink habitat, comprising native vegetation (previously planted), rank grass, rocks, exotic ground covers and occasional debris.

At the Tennessee Culvert (see Figure 1, Appendix A) vegetation was dominated by native vegetation. Native vegetation comprised typical restoration species including harakeke (*Phormium tenax*), kānuka (*Kunzea robusta*), mānuka (*Leptospermum scoparium*) and karamu (*Coprosma robusta*). An area of rank kikuyu grass (*Cenchrus clandestinus*) was also present in this area.

Vegetation at the Blake Road area (see Figure 1, Appendix A) was dominated by exotic forest and shrubland. The canopy was dominated by exotic poplars (*Populus spp.*) with an understory dominated by exotic pest plants. These included tradescantia (*Tradescantia fluminensis*), wild ginger (*Hedychium gardnerianum*), nasturtium (*Tropaeolum majus*), bear's baches (*Acanthus mollis*), Chinese privet, tree privet (*Ligustrum lucidum*), brush wattle (*Paraserianthes lophantha*), blackberry (*Rubus fruticosus agg.*), creeping buttercup (*Ranunculus repens*), fennel (*Foeniculum vulgare*), onion weed (*Allium triquetrum*), montbretia (*Crocsmia x crocosmiiflora*), elephant ear (*Alocasia brisbanensis*), moth plant (*Araujia sericifera*) and exotic grasses.

The native vegetation at Tennessee Culvert was approximately 4 - 5 m tall and potentially 10 years in age, separate from any mature native vegetation and any known gecko populations. In addition, Blake Road was dominated by exotic vegetation not typically utilised by native geckos. As a result, no geckos are expected to be present based on the desktop assessment and site assessment of marginal habitat quality.

One copper skink was incidentally observed under a piece of debris approximately 200 m from the site. ACOs were established during the week of 29 July 2024 in the project footprint and relocation site (30 at the Tennessee Culvert, 30 at Blake Road and 30 at the relocation site). ACOs will be established for a minimum of six weeks and checked during warmer months. This MMP can be updated once results from the survey are available. ACO checks were undertaken on 23 September and 2 October 2024 of both footprint and relocation site ACOs. One copper skink was identified under an ACO within the Tennessee Culvert footprint on the 23 September. Two copper skinks were identified under a log within the Blake Road footprint.

Copper and ornate skinks are classified as nationally (Hitchmough et al. 2021) and regionally (Meltzer et al. 2022) At Risk – Declining. Due to their threat classification, they are considered of high ecological value.

2.2 Effects on mokomoko

Potential effects on native copper and ornate skinks includes the following:

- Temporary habitat loss of native vegetation (estimated 2,872 m²) and rank grass (estimated 150 m²) at Tennessee Culvert.
- Temporary loss of exotic forest and shrubland (estimated 1,500 m²) at Blake Road.
- Injury or mortality during habitat clearance.

² DOC Herpetofauna Database. Copper skink ID 647297 (700 m from site, observation date 1972). Ornate skink ID 715994 (1 km from site, observation date 1978).

Skink density estimates can vary widely depending on habitat quality. For instance, Bell et al. (2018) estimated copper skink densities between 1.96 (garden habitat) and 20.48 (rank grassland) per 100 m² in a garden in Wellington.

Given the proposed habitat clearance area of 4,372 m² is most similar to 'garden habitat' (native vegetation and exotic forest and shrubland) and there is a further 150 m² of rank grassland to clear, it could be expected that, if present, up to 100 skinks could be affected by the proposed works. Please note this is a rough estimate and actual population densities will depend on pest mammal density, micro-habitats, food resources and previous site modifications.

2.3 Effects management for mokomoko

To manage potential adverse effects on mokomoko the following is proposed (and described in detail further in this MMP):

- Mokomoko salvage before habitat clearance as per the protocols in this MMP.
- Mokomoko relocation site habitat enhancement measures comprising logs and / or rocks.
- Mokomoko relocation site habitat enhancement through pest animal management if certain thresholds of mokomoko salvage are met.
- Habitat remediation across the project footprint, including provision and reconstruction of mokomoko habitat including rocks and plant species that support native mokomoko.
- Mokomoko monitoring if certain thresholds of mokomoko salvage are met, both at the relocation site and the project footprint / remediation site (following mokomoko habitat reconstruction).

In accordance with EIANZ guidelines for Ecological Impact Assessments (Roper-Lindsay et al. 2018), and as per the EcIA prepared for this project (still in preparation³) (T+T, 2024), a **high** ecological value combined with a **low** magnitude of effect (following the above efforts to avoid, remedy and mitigate impacts), results in an overall **low** level of effect on native mokomoko.

3 Salvaging protocols

3.1 Iwi engagement

Project Iwi form part of the project team and have expressed interest in being involved in mokomoko surveys. Iwi will be engaged to support and provide tikanga for any mokomoko surveys. Iwi shall be contacted a minimum of two weeks before surveys commence. The Project Ecologist has attended the site with Project Iwi. Project Iwi have assisted in the deployment of ACOs for the mokomoko survey and reviewed the relocation site.

3.2 Salvaging timing and weather conditions

Mokomoko salvaging will be undertaken between 1 October and 30 April inclusive, when mokomoko are active and more likely to be detected during salvage operations. Mokomoko salvage will only be undertaken during suitable weather conditions as defined below.

For the purpose of this management plan, suitable weather is defined as minimum average daytime temperatures of 12°C, with no more than light winds and <5 mm rain per day.

³ See Section 1.1

3.3 Salvaging footprint

The salvaging footprint will be clearly delineated prior to mokomoko salvage. Efforts will be made to minimise the loss of potential mokomoko habitat through reducing the footprint to the extent practicable.

3.4 Artificial cover objects

Artificial Cover Objects (ACO) shall be deployed in accordance with standard ACO deployment protocols (Department of Conservation, 2012a). ACOs shall be deployed in suitable microhabitats targeting ground-dwelling mokomoko. Each ACO will consist of a corrugated Onduline sheet measuring approximately 400 mm x 330 mm. A total of 30 ACOs were deployed a minimum of six weeks prior to vegetation removal in each area of suitable mokomoko habitat.

3.4.1 Level of effort

A total of 30 ACOs were installed across the 0.2 ha Tennessee Culvert footprint and 30 across the 0.15 ha Blake Road footprint in a grid of approximately 10 x 10 m targeting potential micro-habitats. Checking of ACOs will commence two weeks prior to habitat clearance and will be checked a minimum of three times with at least one day in between checks.

Where mokomoko are found during the last check, an additional ACO check will be required (ensuring at least one day between checks).

3.5 Line-trimming of rank grass

Prior to manual habitat salvaging commencing in the rank grass area, the grass habitat shall be reduced through the use of a line-trimmer. Following habitat reduction, manual salvaging can commence in this area. An ecologist shall be on-site to check the rank grass immediately following reduction. There is no specific level of effort required for this salvage method. Line trimming shall be undertaken until all rank grass has been reduced and skinks can naturally disperse from this area.

3.6 Manual habitat salvaging

Manual habitat searches will be undertaken before and after habitat clearance and will include:

- Turning over or pulling apart cover objects (such as the rocks present in the footprint).
- Raking of litter or ground cover (e.g. rank grass, fern skirts, harakeke).
- Habitat searches (harakeke mounds).
- Lifting human refuse (e.g. wooden fenceposts, rubbish).

Manual searching will be undertaken in coordination with ACO checks prior to habitat clearance. As a result, manual searching will be undertaken over a minimum of three separate days prior to clearance, as well as on the day of clearance.

3.6.1 Level of effort

A minimum of two person-hours of manual searching will be undertaken per 200 m² across the entire footprint within two weeks prior to habitat clearance. Where native mokomoko are found, an additional two person-hours of manual searching per 200 m² will be undertaken across the footprint. Searching will continue until no native mokomoko are found after continuous two person-hours of manual searching per 200 m².

3.7 Machine-assisted salvage

Machine-assisted salvage will be undertaken once the ACOs and manual search efforts are complete. Machine-assisted salvage will comprise the use of an excavator with a toothed-bucket. Following machine-assisted removal of ground cover, an ecologist will be on site to check for any remaining native mokomoko. Machine-assisted salvage will be undertaken until all potential dense mokomoko ground cover has been removed.

Machine-assisted salvage can increase the risk of injury or mortality to native mokomoko. The machine-operator will co-ordinate with the Project Ecologist and any other site ecologists to ensure machine-assisted salvage is undertaken with best-practice methods to reduce mokomoko injury and mortality to the extent possible.

3.8 Data collection

Each individual mokomoko found will be assigned an ID and the following information will be recorded. Data collected is consistent with DOCs Amphibian and Reptile Scheme Database (ARDs) requirements:

- Date and time of capture.
- General weather conditions.
- Capture methodology.
- Capture location and relocation location (GPS co-ordinates).
- Macro and micro habitat types at capture location and at recipient site.
- Species, reproductive status for females, age class, tail status (regenerating / lost / original), overall health and condition, Snout to Vent Length (SVL).
- A minimum of one photograph of each captured mokomoko, including at least one photograph of the dorsal surface and one side-profile of the mokomoko head.
- Note: SVL and / or photographs will not be measured if an individual appears stressed (i.e. highly lethargic, eyes closed or shutting). Stressed individuals will be immediately released to the relocation site.

3.9 Capture, handling and transport

The following steps will be overseen by at least one of the personnel listed on the Wildlife Act Authority. Capture, handling and transport of mokomoko will be undertaken in accordance with the following methodologies:

- All field equipment that native mokomoko may come into contact with (e.g. plastic enclosures, collection bags, scales, etc.) will be sterilised prior to and between uses.
- Hand sterilisation will be undertaken between handling individuals.
- Salvaged mokomoko will either be placed in cloth bags (only during salvage, not during transportation), or in suitable ventilated plastic containers:
 - Vegetation / leaf litter will be added to plastic containers to shelter and protect mokomoko during transportation.
 - Cloth bags will be kept in the shade to ensure a constant ambient temperature is maintained for the mokomoko.
- Where practical, native mokomoko will be placed into ventilated two litre or larger plastic containers for no longer than four hours for transportation and relocation:

- Larger individuals will not be placed in the same container as smaller individuals to prevent aggressive interactions or predation.
- Any injured mokomoko will be kept separate to other mokomoko.
- Different species will be kept separately.
- Salvaged mokomoko will be released into appropriately prepared and protected habitat suitable for the species being relocated (refer to Section 4).

3.10 Accidental injury and / or mortality of native mokomoko

The following steps will be implemented if any injured or dead native mokomoko (not applicable to introduced plague skinks) are found during mokomoko work:

- The Project Ecologist will notify the local DOC office and project iwi at the earliest opportunity within 24 hours after an injured or dead mokomoko found. If the local DOC office is not available, the DOC emergency hotline will be contacted instead (0800 DOC HOT / 0800 362 468).
- Any mokomoko mortality of nationally Threatened, At Risk, or Data Deficient species shall be sent to Massey University Wildlife Post-mortem Service for necropsy if requested by DOC (or alternative address if provided by DOC). The body is to be chilled if it can be delivered within 24 hours, frozen if longer than 24 hours to deliver.
- Injured mokomoko found during salvage will be taken by an ecologist to a suitably qualified vet as soon as possible for assessment and treatment. Injured mokomoko will be kept in an appropriate portable enclosure (i.e., a clean, well-ventilated plastic container) under the direction of the Project Ecologist to ensure the animal is handled appropriately until the mokomoko(s) can be assessed and treated.
 - The veterinary clinic “Pet Doctors St Lukes & Exotic Centre” undertake reptile rehabilitation. The clinic is located at 5 Wagener Place, Mount Albert, Auckland 1025. Injured mokomoko can be taken there in the first instance.
- Mokomoko assessed by the vet or alternative specialist as uninjured, or otherwise in suitable condition for release, will be transported to the mokomoko relocation site and released into habitat suitable for the species being relocated.
- Euthanasia of an injured mokomoko shall only be undertaken under direction from DOC or as advised by the vet.
- The reasons behind the injury or mortality will be assessed by the Project Ecologist. The Project Ecologist will adapt management measures where possible to reduce further injury or mortality.

4 Mokomoko relocation protocols

4.1 Relocation site description

The proposed relocation site is located at Blake Road Reserve (see Figure 1, Appendix A). The relocation site is 150 m away from the project footprint. A total of 30 ACOs have been deployed at the relocation site to assess existing mokomoko populations. Project Iwi have been consulted and support this area being used as a relocation site.

Key aspects of the relocation site include:

- The habitat is similar to that of the project footprint comprising native-dominated scrubland (Photograph 4.7; Photograph 4.8).
- There are opportunities to place logs and rocks in the shrubland and along shrubland edges.

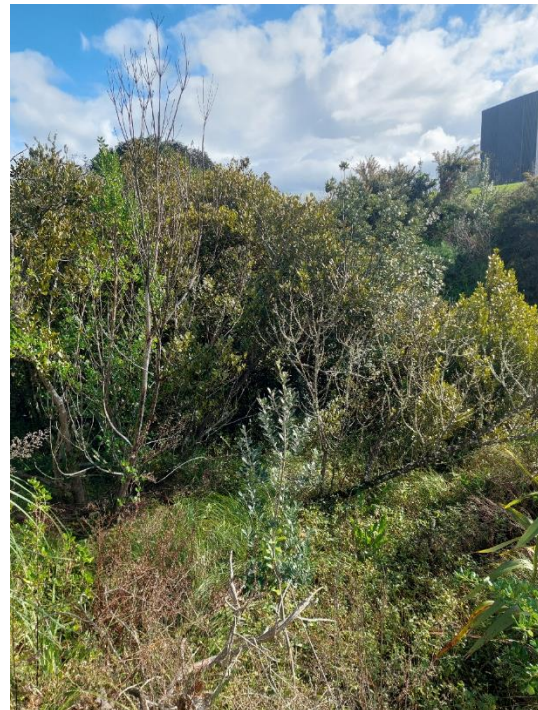
- Existing micro-habitat availability includes logs and dense shrubland. The micro-habitats will be supplemented with rocks and logs during any salvage.
- Micro-habitat availability includes variable humidity, with the site being adjacent to coastal wetlands.
- The relocation site is contiguous with the project footprint allowing for natural re-colonisation of adjacent habitats following construction completion.
- There are ample basking locations for native skinks.
- ME Family Services (www.mefsc.org.nz) undertake existing hedgehog and rat control along the Harania Creek riparian margin (predatorfreenz.org national map) which includes some of the relocation site.
- The relocation is located adjacent to an approximately 0.16 ha area of native revegetation (Photograph 4.9; Photograph 4.10).

A silt fence shall be established to prevent skinks from homing back into the project footprint during construction. For the Tennessee Culvert area, the fence can be established beneath macrocarpa trees near the relocation site where ground cover is bare (and no mokomoko habitat would be disturbed) (Photograph 4.11). Similarly, for Blake Road, there are suitably open areas where the silt fence can be established with minimal disturbance to existing vegetation.

Attention should be given on how the silt fence is secured on the ground. U-nails or similar may be needed to close gaps in the fence.



Photograph 4.7: Edge habitat with basking zones suitable for rock and log placement. (18 June 2024).



Photograph 4.8: Native-dominated shrubland at the proposed relocation site. (18 June 2024).



Photograph 4.9: Extensive native plantings adjacent to the proposed relocation site. Native plantings will provide effective skink cover in the short-medium term. (18 June 2024).



Photograph 4.10: Revegetation plantings and scrubland suitable for native skinks. (18 June 2024).



Photograph 4.11: Open understory under macrocarpas. A silt fence can be established to deter native skinks homing into the project footprint. (18 June 2024).

4.2 Habitat enhancement measures

The relocation site will be enhanced through the deployment of a minimum of five rocks (at least 30 cm diameter) for each native mokomoko salvaged.

In addition, a number of large (50 cm diameter) exotic trees are likely to be felled as part of the proposed works. The Project Ecologist will identify and mark suitable trees prior to felling to be set aside for habitat enhancement purposes. Logs will be cut into approximately 0.5 m sections and at least two metres of log will be relocated for each mokomoko relocated where available. The Project Ecologist will liaise with arborists to confirm appropriate sizes for logs and ensure logs are suitable for relocation (i.e. will not pose a biosecurity risk).

4.3 Post-relocation monitoring and pest mammal control

Mokomoko monitoring and pest mammal control will be undertaken if any of the following thresholds are met (thresholds are in general accordance with Wildlands, 2019):

- **20 or more** nationally 'Not Threatened' or 'At Risk' native mokomoko are relocated.
- **Any number** of nationally 'Threatened' or 'Data Deficient' native mokomoko are relocated. The identification of 'Threatened' or 'Data Deficient' species will trigger further discussions with DOC on the best method for mokomoko management.

Based on the size of the project footprint, it is considered unlikely the above monitoring and pest mammal control thresholds will be met.

However, if thresholds are met, a Post Relocation Plan (PRP) will be prepared and implemented. The PRP will include mokomoko monitoring methods and pest mammal control requirements. The PRP will be sent to AC (as the consenting authority) and DOC. A summary of recommended PRP methods are provided below.

4.3.1 Mokomoko monitoring

Monitoring of mokomoko is challenging due to their cryptic nature and difficulty in re-identifying released individuals. However, if thresholds outlined in Section 4.3 are met, the following monitoring is proposed and will be outlined in further detail in the PRP.

The following two aims are proposed for the purposes of monitoring:

- Are native mokomoko present at the relocation site from one to five years post-relocation, (presence / absence survey)?
- Are native mokomoko utilising enhancement objects (rock piles) following relocation?

Morphometrics such as size, sex, weight, reproductive and tail status will be recorded to provide inference on population trends and mokomoko health (but are not the main focus of the monitoring).

- Annual monitoring using ACOs in a 10 x 10 m grid format across the relocation site:
 - ACOs will be deployed for at least six weeks before the first check for mokomoko.
 - Three checks of ACOs will be undertaken during November, with at least one day between checks.
 - A total of 25% of the provisioned enhancement objects (i.e. rock piles) will be searched for use by mokomoko.
 - Two person-hours of manual searching will be undertaken during each monitoring period.

- Monitoring will be undertaken for five years.
- Annual reporting will be required including:
 - Summary of survey methods.
 - Weather data during the monitoring period.
 - Summary of results.
 - Any recommendations following the survey.

4.3.2 Pest mammal management

Pest mammal management will commence within six months of the thresholds outlined in Section 4.3. The PRP will outline the pest mammal protocols which will include the following:

- Pest mammal control (mustelids, possum, rats, hedgehogs and mice) of at least one hectare across the relocation site area for five years.
- Pest mammal control must include the control of mice. Mouse control (bait or trap) stations will be deployed in a grid format of 25 x 25 m.
- Annual audit of bait station or trap performance by chew card or other suitable method.
- Opportunities for the local community to contribute to pest mammal control. ME Family Services (www.mefsc.org.nz) undertake existing hedgehog and rat control along the Harania Creek riparian margin (predatorfreenz.org national map). Additional pest mammal management will augment existing community pest mammal management.
- At least two pulses of pest mammal control will occur annually.
- No specific trap indices (such as Chew Card Index, Residual Trap Catch Index) have been provided due to the likelihood of pest mammal incursion from surrounding urban areas.
- Pest mammal control will be undertaken at the relocation site and at the project footprint (once the site has been rehabilitated).
- Summary of pest animal control undertaken, including catch data and maintenance schedules provided from the pest control contractor.

5 Adaptive management measures

In order to achieve the best outcomes for native mokomoko, changes may need to be made to this MMP. The rationale behind any changes must be based on robust management techniques and only following confirmation from the Project Ecologist in liaison with DOC.

6 Reporting

6.1 Compliance reporting

A compliance report will be prepared and submitted to DOC and AC (as the consenting authority), within 30 working days from the clearance of all potential mokomoko habitat.

The report shall include the following:

- Confirmation that mokomoko management was undertaken in accordance with the MMP.
- Salvage and relocation results.
- Representative photographs of the salvage methodologies and mokomoko captures.
- Any other additional reporting requirements stipulated in the relevant Wildlife Act Authority.

Where thresholds outlined in Section 4.3 are met, and a PRP is developed, further compliance reporting will be required. Compliance reporting associated with the PRP will be undertaken annually for the five years of monitoring and include:

- Confirmation that mokomoko monitoring was undertaken in accordance with the PRP.
- Monitoring results.
- Representative photographs of the monitoring methodologies and mokomoko captures.
- Any other additional reporting requirements stipulated in the relevant Wildlife Act Authority.
- Pest mammal trap results.

An Amphibian and Reptile Distribution Scheme (ARDS) card will be completed and sent to DOC and AC (as the consenting authority) where any native mokomoko are recorded.

6.2 Incident monitoring and reporting

Where mokomoko habitat is removed without adhering to the protocols outlined in this MMP, the following actions will be undertaken under direction of the Project Ecologist:

- The area affected is to be quantified and described through a field investigation. The habitat description shall include an assessment of the suitability of the habitat for mokomoko and likely species present.
- A report will be prepared outlining:
 - A description of the incident, including the date, and reasons for the incident occurring.
 - An assessment of whether offset or compensation is required. The quantum of offset or compensation will be determined through a standard ecological impact framework, such as the EIANZ guidelines (Roper-Lindsay et al. 2018). If required, measures to offset or compensate for the loss of any mokomoko (for instance, habitat enrichment or pest mammal control).
 - Photographs of the affected habitat.
 - Recommendations to ensure further protected fauna habitat removal does not occur.
- Incident report to be delivered to DOC and AC (as the consenting authority) within 30 working days of the incident.

7 MMP Implementation programme

The contractor and Project Manager will communicate the habitat clearance programme with the Project Ecologist. This will allow the project team to plan the implementation of the MMP. The contractor and Project Manager will inform the Project Ecologist at least one month prior to habitat clearance and prior to any excavation works that provide habitat for native mokomoko species.

Table 7.1: Mokomoko management implementation schedule

Deliverables	Timeframe	Personnel	Completed
Project Start			
Relocation site	Prior to works commencing.	AC, DOC	
WAA approval	Prior to works commencing.	DOC	
Deploy ACOs			
Deploy Artificial Cover Objects (ACOs)	At least six weeks prior to habitat clearance.	Project ecologist, iwi	✓ (completed week 29 July 2024)
Pre-clearance management (Inclusive 1 October – 30 April)			
ACO checks of established ACOs and manual habitat searches	Within two weeks prior to any habitat clearance.	Project ecologist, iwi	
Habitat clearance management (Inclusive 1 October – 30 April)			
Habitat clearance supervision	During habitat clearance.	Project ecologist, iwi	
Relocation site enhancement			
Pest mammal control	When trigger thresholds outlined in Section 4 are met. Control undertaken for five years.	Contractors	
Deployment of logs / rocks / habitat enhancement items	During mokomoko salvage.	Contractors and Project ecologist and iwi.	
Monitoring			
Prepare monitoring plan	When trigger thresholds outlined in Section 4 are met.	Project ecologist, AC, DOC, iwi	
Implement monitoring plan	Annual for five years following salvage completion.	Project ecologist, AC, DOC, iwi	
Reporting			
Incident reporting (if required)	Completed within five working days following salvaging incident.	Project ecologist	
Compliance reporting	Completed within 30 working days following salvaging completion.	Project ecologist	

Reporting			
WAA reporting	Dependant on WAA requirements.	Permit holder	
Amphibian and Reptile Distribution Scheme (ARDS) Card	Completed within 30 working days following salvaging completion.	Project ecologist	
Annual monitoring reporting (if triggered)	Completed annually for five consecutive years following salvaging.	Project ecologist	

8 References

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- Wildlands (2019). *Guidance on methods to improve lizard protection and management during land use and development in the Wellington Region*. Prepared for Greater Wellington Regional Council.

9 Applicability

This report has been prepared for the exclusive use of our client Auckland Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and Wildlife Act Authority application and that Auckland Council as the consenting authority will use this report for the purpose of assessing that application.

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Appendix A Figures



Appendix B Key principles for mokomoko salvage and transfer

Appendix B Table 1: Key principles for mokomoko salvage and transfer (from Department of Conservation Lizard Technical Advisory Group, 2019)

Principle	Assessment
Mokomoko species' values and site significance must be assessed at both the development and receiving sites	Copper and ornate skinks have been assessed as potentially present at the development site. The development site and receiving sites are undergoing mokomoko surveys currently to assess species presence and estimate relative density.
Actual and potential development-related effects and their significance must be assessed	A summary of effects assessment has been provided in this MMP. A full Ecological Impact Assessment (EcIA) is being developed for this project concurrently.
Alternatives to moving mokomoko must be considered	It is not feasible to avoid some habitat clearance due to the pipe upgrades at Harania.
Threatened mokomoko species require more careful consideration than less-threatened species	Copper and ornate skinks are classified as At Risk – Declining. Where a considerable number of individuals are salvaged (more than 20), pest mammal management (including mice control) will be implemented to mitigate impacts to the population.
Mokomoko salvage, transfer and release must use the best available methodology	Salvage methods proposed are based on standard guidelines.
Receiving sites and their carrying capacity must be suitable in the long term	Habitat items will be transferred with each captured mokomoko to provide additional micro-habitat availability at the relocation site. Pest mammal management (if triggered) will likely increase carrying capacity by increasing the number of invertebrates (i.e. food resource) and reduce predation pressure.
Monitoring is required to evaluate the salvage operation	Monitoring has been proposed following the triggers outlined in Section 4.3.
Reporting is required to communicate outcomes of salvage operations and encourage process improvements	Reporting is required as outlined in Section 0.
Contingency actions are required when mokomoko salvage and transfer activities fail	Based on the relatively small project footprint, the low number of mokomoko expected, and cryptic nature of native skinks, post-relocation monitoring is unlikely to definitively conclude the success of the relocation (i.e. an absence of mokomoko during monitoring may be an indication of low detectability rather than a relocation failure). Hence, no contingency actions are proposed.

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