

4 Expansion construction

This section contains the following sections:

- Section 4.1 – Design and Construction
- Section 4.2 – Lining system
- Section 4.3 – Avifauna Management Plan
- Section 4.4 – Lizard Management Plan
- Section 4.5 – Native Fish Capture and Relocation Plan

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4.1 Design and construction

4.1.1 List of structures and construction activities

The principal elements of construction during the life of the landfill include:

- Access road
- Bridge over Rangitopuni Stream
- Fencing and Security
- Main gate
- Weighbridge and gatehouse
- Offices
- Amenities buildings
- Workshop
- Fuel storage
- Buffer zone
- Dams and hydraulic structures
- Drains
- Site roads
- Bulk excavation
- Lining system
- Leachate collection, treatment, storage and disposal system
- Gas collection and treatment system
- Capping system
- Land stabilising installations (structural fills, drainage, retaining walls)
- Perimeter bund (adjacent to the eastern and southern landfill footprint)
- Stockpile 4

4.1.2 Design

The works will generally be in accordance with the design concept included in Section 1 Appendix A. The final landfill design and any more than minor modifications to the design or methodology chosen for operation and construction of the landfill shall require the approval of the Peer Review Panel (PRP) and the AC prior to implementation. The consent holder shall consult with the CLC on any more than minor modifications.

Designs will comply with relevant NZ Standards where applicable as described within the resource consents, although divergence from NZ Standards and work for which there is no NZ Standard (notably geotechnical assessment) are to be explained to the PRP to their satisfaction before obtaining AC approval to proceed. The matters related to the stability of the natural ground surfaces or filled surfaces upon which engineering works are to be constructed will be considered during the design of the structure.

The landfill excavation, batters and haul roads are classified as a Construction Zone and hence fall under the Building Act 2004, in regulatory terms. The Act is administered by the Ministry of Business, Innovation and Employment (MBIE).

Pond design is described in this LMP Section 3.5.

Designs, drawings and specifications will be subject to PRP approval prior to construction.

4.1.2.1 Drawing

Drawings will be prepared to accompany any design for which approval is sought.

4.1.3 Specifications

4.1.4 Construction

4.1.4.1 Project management

The site management of Redvale Landfill will engage project managers to conduct construction work. The project managers may be either independent or directly employed. The project manager will be responsible for arranging resources as required.

4.1.4.2 Construction and Operations Supervision

The activities related to the establishment of the new cell will be under the direct supervision of a professional engineer, experienced in landfill operation. Approval of the person shall be sought from AC. The professional engineer for Redvale Landfill is:

Jonathan David Payne, Environmental Engineer, CPEng (Eng NZ) No. 1011044.

4.1.4.3 Timing of construction

The timing of earthworks and construction shall be restricted to during the dry months as explained in the LMP Section 3.4: Erosion and Sediment Control.

4.1.4.4 Commissioning and hand-over

For each construction project, the construction project management will identify a time and scope of hand-over to the control of operational management. Where appropriate, commissioning records and operational manuals will be included.

4.1.5 Types of materials

4.1.5.1 On site materials

The types of on-site materials which will be encountered and used in the works are summarised below, and geology drawings are included in the LMP section 4.2: Liner. Changes to this system may be warranted if material types change significantly during opening up excavations, and any such changes will be communicated to the Peer Review Panel (PRP). As a guide the following material types are expected at the site:

Material type	Description
Type 1	Mudstones or marly limestones of a nature suitable for high strength, low permeability fills, including liner formations. Type 1 materials will be subdivided and assigned specific compaction requirements for construction purposes
Type 2	Structural fill materials with pre-determined compaction requirements Type 2A is crushed GAP65 limerock, or (if suitably fine grained) ROP limerock. Rocky fill may also be used as Type 2A materials, depending on laboratory test results. It shall be free of any organic material or significant mudstone inclusions and shall be of a marly nature suitable for heavy compaction in designated key fills, structural keys and structure base areas.

Redvale Landfill Management Plan

	Type 2B fill is "quarry fill", comprised predominantly of weathered marly limestone and/or mudstone. It shall be free of any organic material and shall be suitable for compaction in protection zones
Type 3	inorganic clay and clayey silt materials suitable for controlled fill to form high strength, low permeability structural fills. Such materials include Pleistocene clays of suitable water content from both the east and west properties, mudstone and limestone/mudstone mixes of suitable water content, and Waitemata series materials.
Type 4	Weak, softened or wet materials, including Pleistocene clays, silts and silty sands, some mudstone materials of high water content or of a very plastic nature, and Waitemata series materials unsuited to structural filling. This material type covers soils too wet or of a nature unsuited to structural fills
Type 5	Reject fill, comprising very weak or excessively wet materials unsuited to controlled filling even after reasonable drying. These materials shall be cut to stockpile after confirmation by the Landfill Engineer of their unsuitability for use as fill and would be used later for daily cover, once adequately dried
Type 6	Reject fill, comprising organic soils, including peats and organic clays and silts, suitable for excavation and stockpiling for later use by blending or conditioning to form growth medium for use during landfill or bund rehabilitation
Type 7	This material is topsoil.

4.1.5.2 Unsuitable materials

A proportion of the materials on site will be either unsuitable for liner construction or unsuitable for overlaying with structural fill or unsuitable for use as daily cover or temporary roading. These materials will generally be termed "unsuitable materials" (Types 5 and 6) and are expected to comprise two predominant material types:

- softened or excessively wet mudstone or clay;
- organic soils.

Softened, wet or organic materials will be sub-excavated to a depth determined by the designer or certifier in all areas where liner or other structural fill is to be placed. These materials will need to be incorporated within the landfill and to aid in this respect will be placed in a designated stockpile area for conditioning during dry weather and subsequent placement as daily cover or landscaping fill.

Unsuitable materials of an organic nature will be separately stockpiled for mixing with topsoil and later used as growth medium, thereby maximising the usefulness of these soils.

The physical nature of mudstone and limestone materials which will be exposed on the site is such that special care is required to be taken at all times to seal surfaces and maintain the works in a fully drained state. The need for particular care in sealing and diverting water from mudstone slopes and benches is specifically emphasised. The bentonitic mudstones which will be exposed during landfill operation are sensitive to water softening and the stability of slopes could be affected by poor attention to surface water control.

The nature of the site materials is such that changes in phasing of the works and construction approach may be required from time to time to enable the objectives of the project to be met. This may come about due to poor ground conditions in particular areas, poor weather conditions affecting workability of materials or unexpected failures in benches or slopes. A flexible approach is therefore indicated, with careful control of surface water and slope excavation required and subject to close supervision.

Progressive restoration during earthworks is described in the LMP Section 3.4: Erosion and Sediment Control Plan.

4.1.6 Construction monitoring

4.1.6.1 Reporting

Internal reporting

Wherever the technical specifications and drawings prepared by the designers request construction activities or materials to be confirmed as satisfactory before proceeding, the results will be passed to the designer for approval.

During construction, any construction activity monitoring results will routinely be sent to the designer or certifier. The PRP would be notified if the results are relevant to their liner review team inputs, relevant to land stability as described in the land use consent, or relevant to their ongoing involvement after the works have been handed over to operational control (when the designer / certifier is no longer involved).

After construction, any post-construction monitoring results will be sent to the Landfill Engineer who will decide if and when specialist advice is required in response to those results.

Post-construction monitoring results are to be sent routinely to the PRP at least in summary form.

Auckland Council reporting

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4.1.6.2 Record keeping

Record keeping for earthworks and construction will include:

- records for all the types of monitoring indicated above
- daily record of construction and testing
- monthly work summaries
- records of AC inspections if any
- records of approvals
- as-built records of finished surface levels, fill zones, pavements, drains, pipework and other services
- base levels before the placement of refuse

These records are to be maintained up to date and are to be made available for review by Auckland Council – Environment when requested.

4.1.7 Construction Contingency Plan

4.1.7.1 Response

Responses if any that are required by the designer, as expressed in the specification and drawings, will be sought by site management according to those documents.

4.1.7.2 Reporting

The PRP and AC will be notified during construction only of events or findings that the Landfill Engineer judges to be of a serious nature that is likely to either affect landfill integrity (past or future) or be a matter of concern to the community. Otherwise reporting will remain within the group of site management, construction project management, their designers and certifiers until completion and hand-over to operational control.

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4.2 Liner

4.2.1 Liner Design

4.2.1.1 Performance criteria

The lining system will be designed to achieve the following objectives:

- The lining system within the Class 1 footprint will include a continuous “low permeability” liner layer of 900 mm minimum thickness of compacted earth fill whose permeability is less than 1×10^{-9} m/s.
- The lining system within the proposed Class 2 footprint extension south of the Class 1 footprint will be a continuous “low permeability” liner layer of 900 mm minimum thickness of compacted earth fill whose permeability is less than 1×10^{-8} m/s.
- The “low permeability” liner will comprise a material which is suitable for practical earth fill construction, and which has resistance to chemical attack by leachate.
- The liner will be protected to avoid desiccation cracking and erosion before being covered with refuse or drainage aggregate.
- The subgrade is to be adequately stable for long term conditions to avoid detrimental deformation of the liner (minimum long-term factor of safety = 1.5).
- The subgrade and lining system are to be adequately stable for temporary conditions until overlying waste placement has been completed (minimum short-term factor of safety = 1.2 for cuts in natural ground, 1.3 for fills).

4.2.1.2 Liner zones and thicknesses

The landfill will be constructed in two basin-shaped voids (one within the Class 1 footprint, one within the Class 2 footprint extension) excavated below the original natural ground level. The lining system levels and cross falls will be as defined in the Site Development Plans (Section 1, Appendix A). The shaped excavations will be prepared and independently inspected before placing the lining system. The excavations will be deepened below the designated lining system levels or “basegrade” as required to allow for placement of the lining system. Some areas of deeper over-excavation will occur from time to time (e.g. for temporary drainage). These will be backfilled with compacted earth fill before placing the lining system.

The thickness of the low permeability liner, on both the floor and sidewalls, is required to be 900 mm in accordance with consent conditions. This means that, the lining system will comprise the following (from the bottom).

- 900 mm of recompacted mudstone (low permeability liner) and
- a covering of 150 mm of limestone rubble (protective layer) (within the existing landfill footprint) and (within the Class 2 footprint extension), a drainage blanket of 300 mm drainage/tyre derived aggregate layer) to form a foundation for refuse placement at the designated basegrade level. The mudstone and limestone rubble are available within the site.

The liner design is shown on the site development plans in Appendix A to Section 1.

4.2.1.3 Approval of design

Where the design of the liner deviates from the details above, approval by the PRP and AC.

Any identified issues of land stability or potential liner permeability issue would be subject to PRP approval of design for each phase.

Approval of actual construction in progress is dealt with in the liner monitoring section.

4.2.2 Liner Construction

4.2.2.1 Construction supervision

The activities related to the establishment of any new cell will be under the direct supervision of a professional engineer, experienced in landfill operation. The professional engineer for Redvale Landfill is:

Jonathan David Payne, Environmental Engineer, CPEng (Eng NZ) No. 1011044.

4.2.2.2 Floor

Ground conditions

Construction of liner on the floor of the landfill excavation will give consideration to:

- subgrade permeability
- subgrade compressibility and stability
- liner permeability
- liner integrity and durability

It is expected that weak rock will be encountered in the floor of the landfill excavation (e.g. mudstone or limestone, of Northland Allochthon geologic origin), which is unlikely to require undercutting except where permeable zones are suspected and defined during inspections by the independent Liner Review Team.

At some locations sedimentary rock of either relatively high permeability or relatively low strength could be encountered, which it is intended will be treated in a similar manner to the treatment of surficial sediment in sidewalls, including sub-excavation and backfilling.

4.2.2.3 Construction procedure

- (a) excavate to between 0 mm and 900 mm below basegrade level;
- (b) excavate no further than to undisturbed natural ground wherever the ground is already more than 900 mm below basegrade level, for example in Pond 6;
- (c) temporarily cover any areas of over-excavation to protect the subgrade until trimming;
- (d) where subgrade level is below the water table, excavate and install subsoil drains below subgrade level;
- (e) trim the subgrade to expose undisturbed ground, using a straight blade, within the 2 days prior to a scheduled Liner Review Team inspection;
- (f) establish coordinates of the inspection area;
- (g) survey the subgrade floor levels to verify the minimum liner thickness;
- (h) carry out the Liner Review Team inspection;
- (i) determine and record the location of any seepage or particular geologic features noted by the Liner Review Team (measurements will be taken by WM or surveyors instructed by WM);
- (j) complete excavations to the required depths;
- (k) perform any additional preparations required by the Liner Review Team, who will be expected to provide advice at least verbally to WM on the day of the inspection to be followed up in writing as soon as practical, so that WM may immediately instruct the contractor or its own workforce;

Note : Subexcavation below the required subgrade level may be required to:

- remove loose material disturbed either by construction machines or by landslips;
- remove weak, compressible or permeable ground;
- extract limestone to optimise the use of this resource;
- provide a temporary sump for seepage;
- provide for placing the minimum required liner thickness below basegrade levels;
- provide for placing the minimum required liner thickness below a temporary leachate sump.

- (l) scarify the subgrade to a minimum of 75 mm depth e.g. with 3 passes of a compactor;
- (m) place and compact the floor liner fill to the methods and standards specified, to an over-filled level such that trimming back to basegrade level will reveal a tight compacted fill;
- (n) trim and then survey the trimmed liner fill to verify the minimum liner thickness and grade;
- (o) place the leachate drainage layer within 2 days after trimming to prevent erosion and drying of the liner.

4.2.2.4 Side wall

Ground conditions

Construction of liner on the floor of the landfill excavation will give consideration to:

- sidewall subgrade permeability
- sidewall subgrade compressibility
- sidewall temporary excavation stability
- liner permeability
- liner integrity and durability
- seepage where subgrade is below the water table

Liner preparation requirements in the side walls will vary from phase to phase depending on the geologic profile exposed. However, generally the profile will comprise relatively weak surficial soil and sediment (requiring special lining treatment), underlain by Northland Allochthon geologic materials of low permeability (requiring lining treatment similar to that for the floor).

Wherever any weak or permeable ground is encountered in the side wall, this ground will be cut back so that an additional thickness of compacted fill can be placed beneath the liner. This additional fill may be referred to as a buttress or subgrade replacement. The buttress will have strength to improve temporary stability of the side wall slope, low permeability to resist leachate migration (if any), and stiffness to provide a foundation for compaction of liner fill.

Construction procedure

- (a) excavate to the intermediate excavation profile as determined by WM's engineering advisers or designers;
- (b) establish coordinates of the inspection area;
- (c) carry out an initial Liner Review Team inspection. At this stage the Liner Review Team will decide on the final excavation profile and whether 3 (horizontal) : 1 (vertical) is appropriate. A decision will also be reached regarding the requirements for subexcavation and construction of a buttress fill in areas of unstable or otherwise unsuitable material;
- (d) excavate to the final subgrade profile;
Note: Some excavations will need to be delayed until just before liner filling can start. For example:
 - temporary steep cuts in upper materials (non Northland Allochthon) should not be exposed for too long, to reduce the risk of instability. Excavation should be delayed until

just before the final inspection, and then covered as soon as practicable after the final inspection;

- cuts in lower materials (Northland Allochthon) should be protected by leaving a temporary cover of undisturbed ground. Final excavation should be delayed until the contractor will be ready to continue with liner filling immediately after the final excavation and inspection.

- (e) temporarily cover any areas of over-excavation to protect the subgrade, until ready for trimming;
- (f) where subgrade level is below the water table, excavate and install subsoil drains below subgrade level;
- (g) trim the subgrade to expose undisturbed ground, using a straight blade, within the 2 days prior to a scheduled Liner Review Team subgrade inspection;
- (h) survey the side wall subgrade levels to verify the minimum liner thickness;
- (i) carry out the final Liner Review Team inspection;
- (j) determine and record the location of any seepage or particular geologic features noted by the Liner Review Team (measurements will be taken by WM or surveyors instructed by WM);
- (k) perform any additional preparations required by the Liner Review Team, who will be expected to provide advice at least verbally to WM on the day of the inspection to be followed up in writing as soon as practical, so that WM may immediately instruct the contractor or its own workforce.
- (l) place and compact the side wall liner fill to an over-filled level such that trimming back to basegrade level will reveal a tight compacted fill;
- (m) during filling, bench into the side wall subgrade at a maximum of 0.3 m height intervals, and cut out all loose and disturbed subgrade material and either remove it or mix it with liner fill;
- (n) trim and then survey the trimmed liner fill to verify the minimum liner thickness;
- (o) place the leachate drainage layer within 2 days after trimming to prevent erosion and drying of the liner.

4.2.2.5 Earth fill specification

The procedures which will be used to construct the liner will be set out in the earthworks specification prepared by the designer and approved by the Peer Review Panel¹⁵. The specification will address the following aspects:

- (a) general clauses
- (b) erosion and stormwater control
- (c) material types
- (d) fill types
- (e) clearing and stripping
- (f) preparation of subgrade
- (g) subsoil drainage
- (h) inspections
- (i) earth fill placement, conditioning and compaction methods
- (j) earth fill compaction standards and test methods
- (k) Leachate drainage placement

¹⁵ Tonkin & Taylor Ltd, March 2015: Specification, Redvale Landfill, General Construction. Job number 30089.

Permeability

The fill compaction standards will be based firstly on achieving low permeability. Prior to placing the first liner, laboratory tests were performed which demonstrated that the required low permeability would be achieved by compacting mudstone until its air voids content was less than 7%¹⁶. The test methods and frequency of testing will be specified by the designer and approved by the Peer Review Panel for each phase of work, usually annually. The permeability test procedure that Redvale follows is outlined in Appendix A.

4.2.2.6 Joining of liner

Wherever joins are made to the edge of a completed section of liner, special care will be taken to avoid formation of a discontinuity which could result in a seepage path. In floor areas the join will be made by cutting the edge of the existing liner at a slope of no steeper than 4H : 1V^{Error!} Reference source not found.. The exposed liner will then be scarified, conditioned and compacted as necessary to achieve a surface which is equivalent to that achieved immediately before placement of a subsequent fill lift. Liner fill will then be placed and compacted as specified.

In side wall areas the liner joining method will be the same as for the floor except, where restricted by the steeper slope of the existing liner, the join will be made by cutting the edge of the existing liner at a slope of no steeper than 1H : 1V.

To contain leachate and refuse behind the edge of the completed section of liner, and to identify the location of the edge of liner during future excavations, the following steps may be followed:

- (a) construction of a temporary mudstone bund along the edge of the new section of liner;
- (b) placement of a strip of cloth on the liner which will act as an indicator flag for future excavation.
- (c) To minimise the possibility of refuse being placed on an area yet to be lined the following steps will be followed:
 - (a) the edge of each new section of liner will be kept straight without irregularities wherever practical;
 - (b) where refuse is placed against the side wall it will be battered back away from the edge of completed liner towards the refuse;
 - (c) the edge of each section of liner will be clearly marked using posts, drums or stakes which will remain in place during adjacent refuse filling until the next section of liner is to be constructed. Care will be taken to ensure that any liner penetrations caused by stakes are either removed or repaired during construction of the new liner.

4.2.3 Liner monitoring

4.2.3.1 Consent requirements

[Condition XX]

4.2.3.2 Liner review team

An independent Liner Review Team is formed comprising:

- An appropriate representative of WM's engineering advisers ;
- An appropriate representative of the PRP.

The members of the Liner Review Team will be suitably qualified persons who are approved by WM.

¹⁶ Tonkin & Taylor 14 April 1993 : letter Ref: 11541 regarding "Phase 1A Liner, Redvale Landfill."

The Liner Review Team is responsible for independently:

- (a) inspecting and recording of natural ground exposed over the entire basegrade including floor and sidewalls ;
- (b) specifying basegrade preparation requirements;
- (c) observing basegrade preparation including liner construction;
- (d) obtaining and reviewing test results;
- (e) reporting to the AC in regard to all basegrade preparation requirements and quality assurance;
- (f) reporting to the AC in regard to sidewall preparation requirements.

4.2.3.3 Subgrade inspection

All exposures of natural ground in the floor and sidewalls of the landfill basin will be inspected and recorded by the Liner Review Team. Northland Allochthon rock and all overlying soils are to be included in the inspections.

The Liner Review Team is responsible for setting up its own recording system. Inspection is required before permanent coverage of any subgrade with fill.

WM will provide the approximate coordinates of the areas presented for inspection. These coordinates will be determined to an accuracy of ± 2 m by tape measurements from stakes established by appropriately qualified surveyors or any better survey system such as GPS. WM will additionally instruct surveys in response to reasonable requests from the Liner Review Team and wherever greater accuracy is needed.

WM will notify the Liner Review Team of appropriate inspection times. It is noted that due to the diversity of operations in progress and other factors such as weather, advance notice may be as little as 24 hours on some occasions. The Liner Review Team may make any additional inspections as it sees fit.

4.2.3.4 Liner testing

Filed testing of the liner will be carried out by an independent testing agency. This field testing will be in accordance with their Quality Plan for the Redvale Landfill and the site policy on fill control testing.

4.2.3.5 Test methods

The liner test methods and standards to be achieved will be set out in the general construction specification document¹⁷. It is expected that the nature of the materials and compaction standards to be achieved may vary from phase to phase. Variations will be identified by investigations, inspections and progressive field and laboratory tests.

4.2.3.6 Record keeping

Record of all the monitoring and inspections carried out will be kept on site. Such records will be forwarded to the PRP on monthly basis.

4.2.3.7 Results and reporting

The liner test results will be made available by either the independent testing organisation or the Company:

¹⁷ Tonkin & Taylor Ltd, March 2015: Specification, Redvale Landfill, General Construction. Job number 30089.

Redvale Landfill Management Plan

Independent liner test results available to	Status	How	When
WM and contractor	preliminary	verbal	upon completion of test
LRT and PRP	preliminary	verbal	upon request
WM and contractor	preliminary	written daily report	daily
LRT and PRP	preliminary	written daily reports or summaries	weekly during liner construction
WM and contractor	final unchecked	verbal	one day after test
LRT and PRP	final unchecked	verbal	upon request
WM and contractor	final checked	written	six-monthly unless requested sooner
LRT and PRP	final checked	written	six-monthly unless requested sooner
LRT and PRP	all	written	upon request direct to the independent testing organisation

The results of inspections of the Liner Review Team will be advised:

LRT's inspection results available to	Status	How	When
WM and contractor	preliminary	verbal	upon completion of inspection
WM and contractor	final	written	within 3 days after inspection and subsequent submission of survey data by WM
AC	final	written, copy to WM	prior to refuse filling

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Appendix A Permeability test procedure

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4.3 Ecology Management Plans

4.3.1 Avifauna Management Plan

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Waste Management - Redvale
Avifauna Management Plan
for: WMNZ Ltd.



DOCUMENT CONTROL AND REVISION RECORD

Document title	Avifauna Management Plan
Prepared for	WMNZ Ltd.

Author(s)	Michaela Scarrott Ecologist	
Reviewer(s)	Michael Anderson Senior Ecologist	

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Reference: Bioresearches (2026). Avifauna Management Plan. Report for WMNZ Ltd. pp 26.

Cover Illustration: New Zealand Dabchick (*Poliocephalus rufopectus*) with her young chick nestled in amongst her feathers. Photo by: Rosa Stewart <https://commons.wikimedia.org/>

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1 INTRODUCTION

This Avifauna Management Plan (AMP) has been prepared for WM New Zealand (WMNZ) to mitigate potential adverse effects on New Zealand dabchick (*Poliocephalus rufopectus* – Regionally Threatened - Critical), and species of Not-Threatened native avifauna, during the proposed expansion of Redvale Landfill in Dairy Flat, Auckland (Site) as part of the Auckland Regional Landfill – Transition Project (Project) (Figure 1).

An Ecological Impact Assessment (Bioresearches, 2025) (EclA) has recommended avifauna management be implemented during the Project as New Zealand dabchicks were recorded using several ponds on the Site for breeding (Bioresearches, 2025), and suitable nesting habitat exists for ‘Not Threatened’ terrestrial avifauna within suitable habitats on the Site.

1.1 Project Works

To facilitate the Project (as pertaining to ecology), the following works (hereby referred to within the report as the ‘Project Works’) are required to be undertaken:

- Vegetation removal
 - o 0.8 ha of planted native vegetation; and
 - o 0.8 ha mixed (native and exotic) vegetation.
- Reclamation of two freshwater ponds
 - o Pond six (~3325m²); and
 - o Pond eight / office pond (~878m²).

Vegetation removal and reclamation of the ponds may disturb breeding avifauna, including dabchick utilising the aquatic habitats and riparian vegetation, which, if left unmanaged, may result in harm, mortality or disturbance. Adult birds are likely able to relocate themselves during works; however, chicks and eggs are at risk of injury or death during vegetation removal activities, as they are not able to relocate themselves.

The protocols and methodologies outlined in this AMP have been developed specifically for the Site and Project Works, drawing on current best-practice ecological management approaches. The primary objective is to avoid, minimise, and appropriately manage adverse effects on protected native avifauna and their habitats, while reducing disturbance to breeding, nesting, and foraging birds throughout the duration of the Project Works.

Figure 1. Project Works on Site outlining the extent of vegetation and pond removal (below)

Redvale Landfill

Proposed extension works,
vegetation and pond
removal

20/03/2026

Legend

 WMNZ properties

Proposed Works

 Ponds Proposed
for Removal

 Class2_LandfillExtension

Vegetation

 Planted Native Vegetation

 Mixed Native Exotic
Vegetation

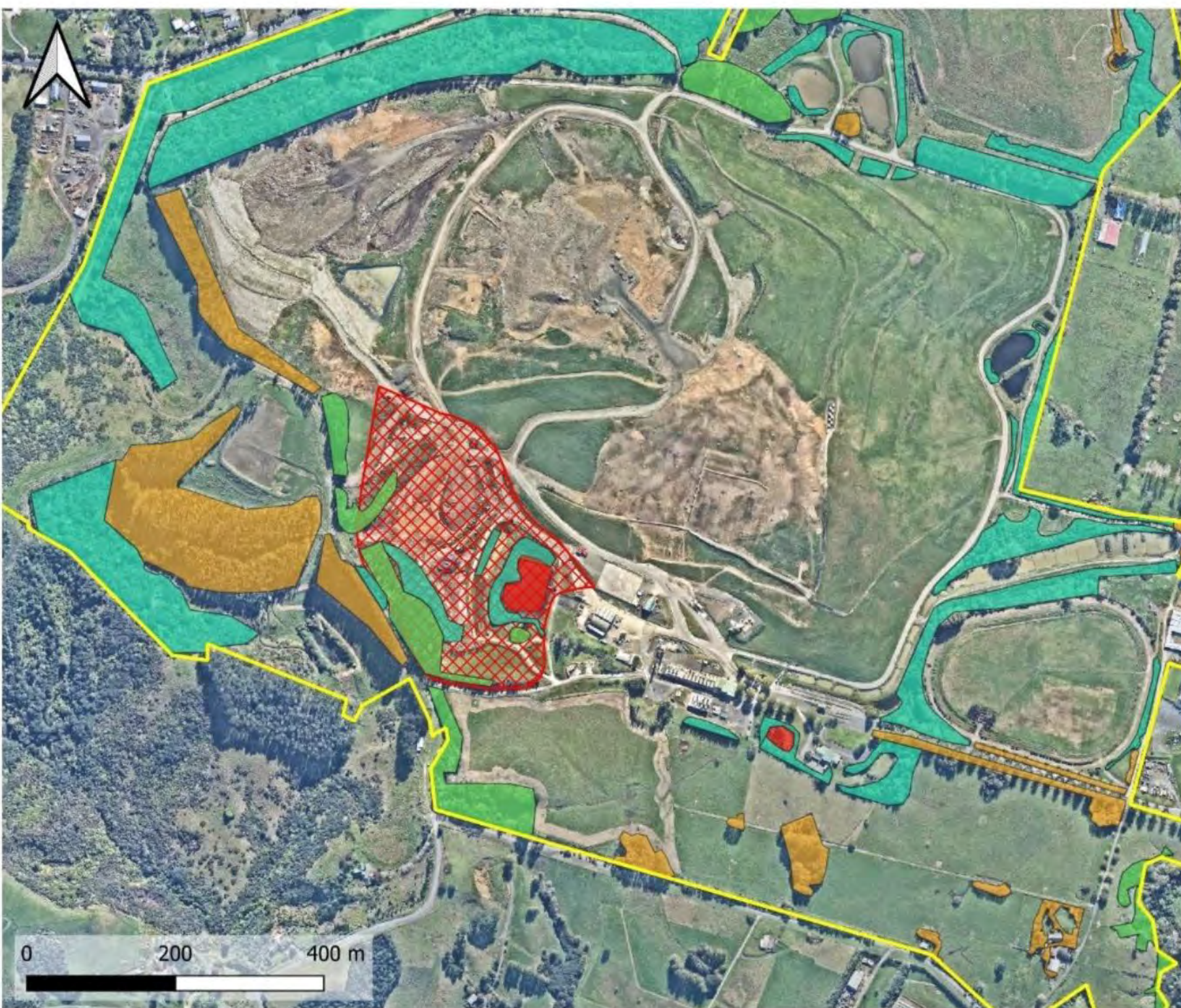
 Exotic Vegetation

SOURCES
NearMap

MAP PROJECTION
NZGD2000 / New
Zealand Transverse
Mercator 2000

Drawn by: MS

**MAP
NO.** 67602



1.1.1 Key Details of Avifauna Management

As such, to avoid adverse impacts on New Zealand dabchick, the following management protocols are to be implemented:

- Pond works and removal of riparian vegetation should be undertaken during the months of 1 April and 31 May (outside of the dabchick breeding season (June - March inclusive)), except where a suitably qualified ecologist has confirmed that the pond and/or riparian vegetation is clear of any dabchick, eggs, or chicks.
- This should be confirmed within 24 hours of any proposed pond drainage or riparian vegetation removal.
- Should an active nest be found, a 20m exclusion zone must be demarcated from the pond margin, and works must remain outside of this zone until the chicks have hatched and naturally fledged the natal site, or the nest has naturally failed.

To avoid adverse impacts on other native avifauna, the following management protocols are to be implemented:

- Vegetation removal and removal of man-made structures (i.e., culverts and buildings) must be undertaken outside the bird breeding season (see Table 3 for timings and species) within a suitable habitat, except where a suitably qualified ecologist has confirmed that the vegetation and/or man-made structures are clear of any native nesting birds, eggs, or chicks.
- This should be done within 24 hours of the Project Works.
- Should an active nest be found, a 10 m exclusion zone must be demarcated, and works must remain outside of this zone until the chicks have fully fledged, or the nest has naturally failed.

Where possible, works can continue if they are determined not to have an impact on breeding birds as determined by the Project Ornithologist and/or approved ecologist (Project Ornithologist) (Table 2). This includes impacts on their nesting activity (e.g. incubation, brooding), their chicks once they are mobile, and avoiding inducing stress responses (e.g. disturbance flight initiation, alarm calling) and disruption to other natural behaviours (e.g. foraging). These protocols are discussed further in Section 3.

1.1.2 Summary of Activities

A summary of the proposed AMP activities has been provided as a checklist in Table 1. For details on each of these elements, refer to the appropriate section within the AMP body text.

Table 1. Avifauna Management Plan Checklist

Project start-up	Required of:	Relevant section of AMP	Completed
Avifauna Management Plan	WMNZ and Auckland Council		
Timing of the implementation of the AMP	Ornithologist, WMNZ & Auckland Council		
Summary of affected habitats and species	Ornithologist	Section 2.1	
Pre-work survey for the presence of birds and breeding status/nest presence.	Ornithologist	Section 3.1.2	
Pond dewatering protocols on-site	Ornithologist, WMNZ	Section 3.1.2	
Vegetation clearance protocols on-site	Ornithologist, WMNZ	Section 3.2	
Protocols for eggs detected on-site	Ornithologist, WMNZ	Section 3.1.4	
Protocols for chicks detected on-site	Ornithologist, WMNZ	Section 3.1.4	
Ongoing monitoring	Ornithologist, WMNZ	Section 5	
Demarcating active nests with a 20 m boundary (e.g. tape and posts) and a 20 m no-go-zone for New Zealand dabchick.	Ornithologist, WMNZ	Section 3.1	
Demarcating active nests with a 10 m boundary (e.g. tape and posts) and a 20 m no go zone for not-threatened avifauna.	Ornithologist, WMNZ	Section 3.2	
Completion report	Ornithologist	Section 5	

1.2 Contact Details

The credentials and contact details of the Project Ecologists/Ornithologists are provided in Table 2.

Table 2. *Details of Project Ornithologist/Ecologist*

Credentials and Contact Details of Project Ornithologist	
Project Ecologists/Ornithologists	Dr. Michael Anderson, PhD.
	Michaela Scarrott, B.Sc.
Contact details	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]

1.3 Objectives

The objective of this AMP is to avoid mortality, injury and disturbance to nesting native birds from the Project Works. The AMP seeks to avoid potential direct and indirect effects by way of disturbance. This objective will be achieved by:

- Using current best practice (or new advances identified during Project Works) to survey for breeding activity and monitor active nests during incubation, and chicks during their dependent stage prior to fledging (avoid and minimise mortality of wildlife protected by the Wildlife Act 1953);
- Setting out standard surveying and monitoring protocols that are to be followed; and
- Meeting requirements of the Wildlife Act 1953.

This AMP addresses the following:

- A summary of the affected habitat and species covered by the plan;
- Avifauna survey and monitoring procedures;
- A summary of the recommended bird breeding management actions; and
- Monitoring and reporting protocols.

1.4 Statutory Context

As the majority of native avifauna are protected under the Wildlife Act 1953 (and subsequent amendments), and habitats that support indigenous bird species are recognised and provided for under the Resource Management Act 1991, the management of native birds and their habitats where they may be affected by land disturbance, vegetation clearance, or development activities is a statutory requirement.

1.5 Tangata Whenua

The New Zealand Policy Statement for Indigenous Biodiversity (NPS-IB) recognises tangata whenua as kaitiaki of indigenous biodiversity and partners in its management¹. In accordance with these principles, engagement with relevant tangata whenua will be undertaken to identify and understand cultural values associated with the Site, including any taonga species, that may be affected by the Project Works.

Where appropriate, opportunities will be explored to incorporate mātauranga Māori, cultural indicators, and kaitiakitanga-based approaches into biodiversity management frameworks, with the objective of supporting tangata whenua participation and contributing to the long-term protection and enhancement of indigenous biodiversity values.

¹ NPS-IB, Policy 2

2 AVIFAUNA ECOLOGY

2.1 Breeding Seasons and Nest Habitats

As part of the Ecological Assessment (Bioresearches, 2025), on-site surveys and desktop analysis were undertaken to determine the species present or potentially present on site. These findings are summarised in Table 3, with nesting seasons and habitats specific to each species provided in Table 3.

Spring and summer are generally recognised as the primary breeding season for native terrestrial avifauna, typically extending from September to February. However, species-specific nesting periods, provided for in Table 3, indicates that this timeframe may not adequately capture the full nesting period for all species potentially present on the Site (e.g., kereru, *Hemiphaga novaeseelandiae*). Consequently, if avifauna management measures are limited to the generalised breeding season, active nests may be overlooked, and nesting birds and their offspring could be adversely affected.

It is therefore recommended that habitat clearance (i.e., vegetation clearance, building removal) should be avoided during key parts of their breeding season (as indicated by Table 3) where possible. If habitat clearance is required within the bird nesting season, a suitably qualified ecologist and/or ornithologist must check habitats for nests before clearance. See Section 3 for details on pre-work clearance check requirements.

Although many of the species listed in Table 3 have not been historically recorded breeding on site, they are included as a precautionary management approach. This acknowledges the presence of suitable breeding and nesting habitat within the Site, which has the potential to support breeding individuals should they establish during the Project period.

Table 3. Nesting habitats and breeding seasons of native birds recorded during the site survey that have the potential to breed on site. Indicative breeding months (in light blue), main egg laying periods are indicated in dark blue. Information sourced from New Zealand Birds online (nzbirdsonline.org.nz).

Common name	Nesting Habitat							Nest Height (m)	Breeding Season											
	Ground	Long grass	Shrubs	Trees	Wetlands	Ponds	Buildings		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Australasian coot								0												
<i>Australasian harrier</i>								0-15												
<i>Australasian shoveler</i>								0												
<i>Black swan</i>								0												
Dabchick								0				*								
Fantail								1.5-5												
<i>Grey duck</i>																				
Grey teal								<4m												
Grey warbler								<8.5												
Kereru								1.8-20												
Kingfisher								<3.6												
<i>Mallard</i>								0												
Morepork								<12												
<i>Paradise shelduck</i>								<20												
<i>Pūkeko</i>								<0.8												
Shining cuckoo								<8.5												
Silvereye								<14												
Tūī								<30												
Welcome swallow								0.5-13												
White-faced heron								<22												

Note: Several species found on site are partially protected under the Wildlife Act 1953, listed as game-birds² or 'partially protected wildlife'³. These species are italicised. Species in bold have a conservation status of Threatened or At-Risk. Breeding dabchick were not recorded at WMNZ during on-site surveys in June and July, and are therefore more likely to lay eggs from August onwards. *= dabchick moult.

² Schedule 1 of the Wildlife Act 1953, <https://www.legislation.govt.nz/act/public/1953/0031/4.0/DLM278547.html>

³ Schedule 2 of the Wildlife Act 1953, <https://www.legislation.govt.nz/act/public/1953/0031/4.0/DLM278553.html>

2.2 Dabchick

Identification and Behaviour

Dabchick are a small to medium-sized aquatic diving bird, approximately half the size of a duck, identified by their brown-black body, relatively long neck, small yellow eyes, and rich rufous-red chest during the breeding season (Szabo, 2013) (Photo 1). Dabchicks can be recognised from afar as they frequently dive underwater foraging for freshwater invertebrates, and often exhibit paranoid, flighty behaviours, hastily hiding within emergent vegetation or diving underwater when approached. Dabchicks are clumsy on land as their feet are set far back on their bodies, but can only run for short periods, falling over frequently.



Photo 1. Dabchick, photo by Rosa Stewart, <https://commons.wikimedia.org/>

Habitat

Dabchicks are aquatic diving birds and are confined to the freshwater pond habitats, both during the breeding and non-breeding seasons.

Moult

Dabchicks moult their flight feathers simultaneously, rendering them flightless for a period of approximately 3 weeks⁴. Moult usually occurs post-breeding season, but can also occur pre-breeding season, or between broods of chicks in some species of grebe. The timing and duration of moult in New Zealand dabchick populations have not been well studied, and consequently, there is limited information available regarding exactly when individuals undertake moult. This has been included as April (post breeding season) in Table 3.

Population and Conservation Status

Dabchick populations are estimated at 1900-2000 individuals and have a conservation status within the Auckland Region of 'Threatened – Critical' and a national status of 'Threatened – Nationally Increasing' (Woolly, 2024).

Breeding

Dabchick pairs are seasonally monogamous, solitary and territorial. They nest on freshwater lakes and pools, or within small caves, by anchoring a floating nest platform made of a loose pile of water-logged vegetation to emergent vegetation or substrate (Photo 2).

⁴ https://www.nzbirdsonline.org.nz/assets/95597/1691725054-036_new-20zealand-20dabchick.pdf

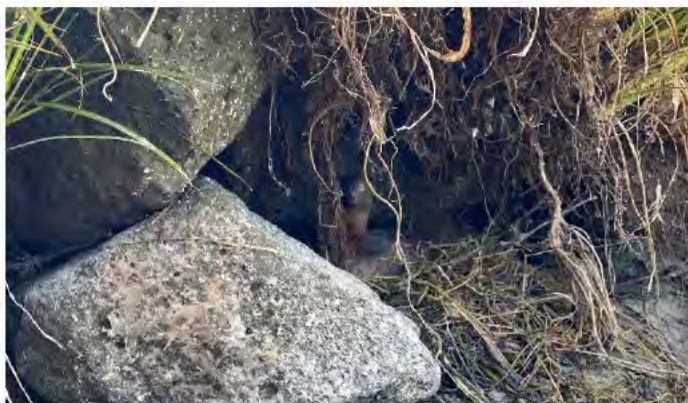


Photo 2. (Left) dabchick adult sitting on a nest; (Right) dabchick egg, photos by Bioresearches⁵

Territories are generally established between June and July, with the main egg laying between August and February. The clutch size is between two and three eggs, which are initially coloured bluish, transitioning to brown in the nest. Incubation is performed by both adults for approximately 3 weeks, and chick rearing takes ~70 days in total. Chicks are raised on the backs of the parents for two to four weeks until they are too big to be carried, but continue to be fed by the parents until they are approximately 70 days old. Dabchicks can re-nest within a breeding season if a nest succeeds or fails, producing up to two successful broods. Table 4 describes key breeding behaviour activities of the dabchick and their typical timing and duration.

Table 4. Key breeding behaviour activities of the New Zealand dabchick and their typical timing and duration.

Activity	Start Date	End Date	Typical duration / Comments
Establish Breeding Territory	June	August	Pairs not recorded at WMNZ during June–July surveys
Main breeding period	June	March	Ten months
Egg laying dates	August	February	Interval between eggs in a clutch 1-2 days
Incubation period	August	February	Between 22-23 days
Fledgling period	September	onwards	Fledge at ~5 weeks old, independent and disperse at ~10-14 weeks ⁶

2.3 Non-Threatened Native species

Sixteen 'non-threatened' native species were recorded during the site-surveys and within 10km of the Site, and may utilise suitable habitat on the site for breeding. Under the Wildlife Act 1953, direct harm to these species, their nests, eggs, and nestlings, must be avoided. Table 3 summarises these species, their typical nesting habitats and nest types to inform management protocols required during the breeding season.

⁵ Photos taken during dabchick breeding season at an Auckland construction site, managed by Bioresearches (2022)

⁶ Dabchick chicks took 102 days to naturally leave natal pond at a dabchick breeding site managed by Bioresearches (2022), whereas literature suggests the average is 70 (Szabo, 2013) or 81 days (Marchant *et al*, 1990).

3 AVIFAUNA MANAGEMENT

This section outlines potential management actions to avoid the adverse effects of the proposed Project Works on potentially breeding dabchick and other protected native avifauna on the Site. These are aimed at avoiding the potential for either direct or indirect effects, including disturbance of the birds in the first instance, and where avoidance is not possible, by minimising potential adverse effects through mitigation management strategies. These options are only intended to be used during the Project Works process and are not long-term management measures.

3.1 Dabchick

Dabchicks are highly likely to breed within the freshwater ponds on the Site during the breeding season. Specifically, breeding birds are likely to be present on Pond 6 (Photo 3), where they successfully fledged chicks during the 2024-2025 season, which is proposed for removal. The Office Pond (Photo 3) is also proposed for removal and is suitable dabchick habitat, but dabchicks had not been observed there at the time of writing this AMP.

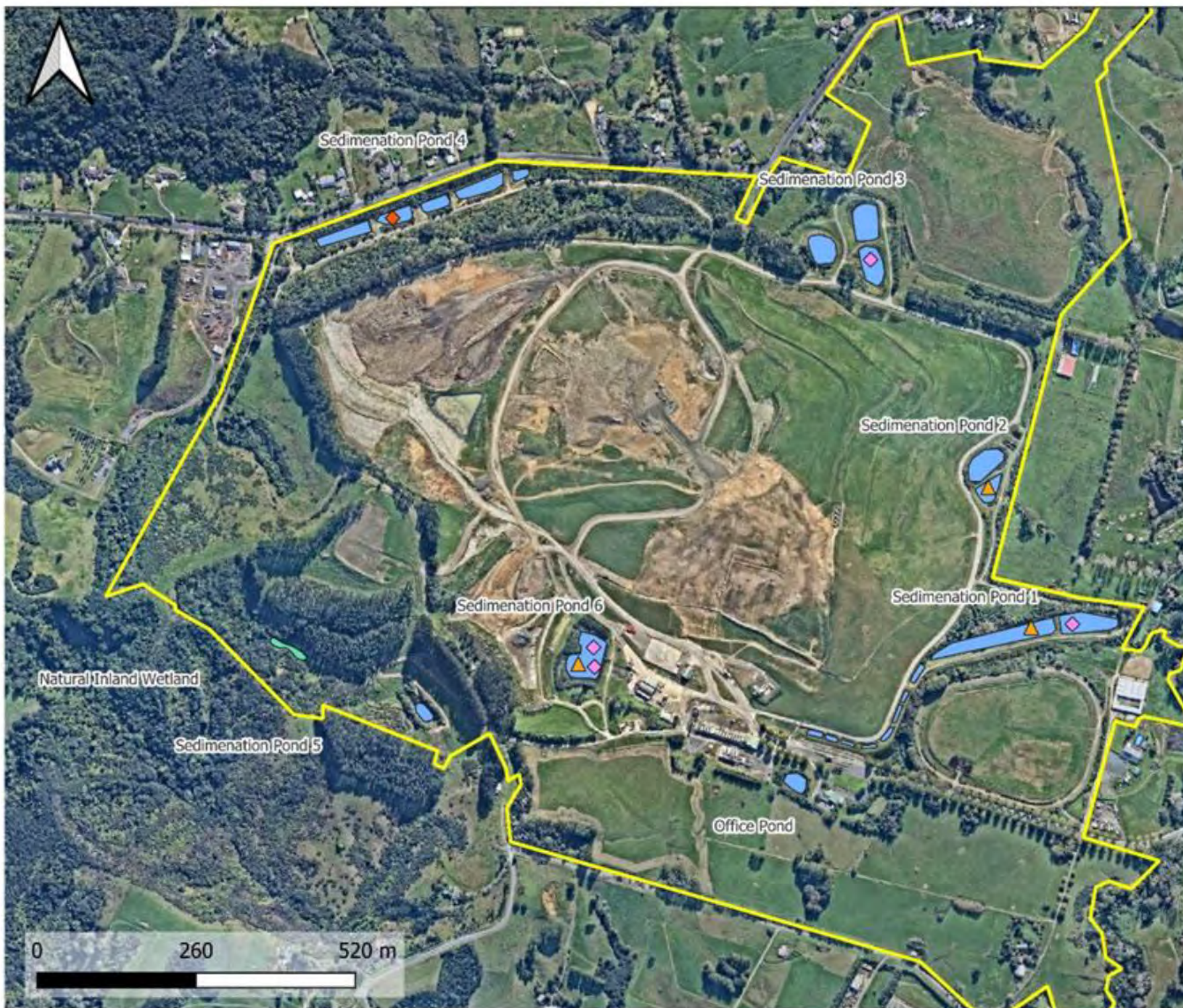
The following protocols therefore specifically apply to Pond 6 and Office Pond, and the riparian vegetation within the Project Works area (Figure 1) to avoid injury and mortality and minimise disturbance to dabchicks.

This AMP has been developed in accordance with current best-practice ecological management principles and draws on previous experiences and management approaches that have been successfully implemented for New Zealand dabchick on comparable projects (Bioresearches, 2022).



Photo 3. Ponds proposed for removal: (left) Pond 6, where Dabchicks have been recorded breeding; (right) Office Pond, where Dabchicks have not been recorded at the time of this report.

Figure 2. (Below) Locations of the ponds on WMNZ property and records of dabchicks. Note: Only Pond 6 and the Office Pond are proposed for removal



Redvale Landfill

Threatened and At Risk
bird species recorded on
site

Legend

-  WMNZ properties
-  Dabchick Pair
-  Dabchick Chick
or Juvenile
-  Little Black Shag
-  Freshwater Features
-  Natural inland wetland

SOURCES
NearMap

MAP PROJECTION
NZGD2000 / New
Zealand Transverse
Mercator 2000

Drawn by: MS

**MAP
NO.** 67602

3.1.1 Recommended deterrence

The only permanent deterrence for dabchick is to convert all suitable nesting habitat to unsuitable by dewatering the ponds. It is recommended to dewater the ponds and establish the works on Site **between the 1 April to 31 May** to avoid disturbance to potentially breeding birds and reduce the likelihood of pairs establishing territories within the Project Works area. This is effective as dabchicks require freshwater pond habitats to construct nests.

Where works cannot be undertaken outside of the breeding season, protocols described in Section 3.1 will be implemented within the Project Works area.

3.1.1.1 Dabchick moult

If a dabchick is present on the freshwater pond, the Project ornithologist/ ecologist must be present during the dewatering phase to observe for signs of flight moult in the dabchick. Flight moult renders dabchick flightless for ~3 weeks⁷ and is an energy-demanding and stressful time for dabchicks. It would limit the ability for individuals to disperse to other freshwater ponds, may expose them to predation, and increase the risk of harm. Moult is indicated by the following in birds:

- Feather loss on the wings (remiges),
- The appearance of new pin feathers, and
- Increased itchiness.

Should signs of moult be observed in the dabchick, Project Works must be delayed until the pin feathers have fully grown, indicating the individual's ability to fly, and therefore relocate themselves during Project Works.

3.1.2 Dabchick breeding survey

Dabchick breeding surveys should be undertaken within the Project Works area by an experienced ecologist or ornithologist, within 24 hours prior to any riparian vegetation clearance and/or dewatering of the freshwater ponds during the dabchick breeding season (Table 3). The Dabchick Breeding Survey will involve visual inspection of the works area using scopes (including thermal) and/or binoculars to identify if dabchicks are breeding during the breeding season. Indicative signs of dabchick breeding include the following:

- Nest building behaviours;
- Courtship (Figure 3); and
- Mating/copulation.

Nesting behaviours include the following:

- Periodic absence of 1 adult (incubating)
 - During nesting, regular movements to/from the nest are expected with minimal time spent away from the nest.

If both adult dabchicks were observed foraging, preening, resting for >30 minutes mid-pond, this should be indicative that there is no currently active nest. If dabchicks are not found to be breeding (i.e. present with an active nest on Site, and/or with fledglings), dewatering/vegetation removal can commence with approval from the Project ornithologist/ecologist.

⁷ https://www.nzbirdsonline.org.nz/assets/95597/1691725054-036_new-20zealand-20dabchick.pdf

Should birds be present, but not have nests, it is recommended that regular (i.e. no more than weekly) inspections are conducted during Project Works to monitor for the presence of dabchick pairs, breeding territories and potential new nests.

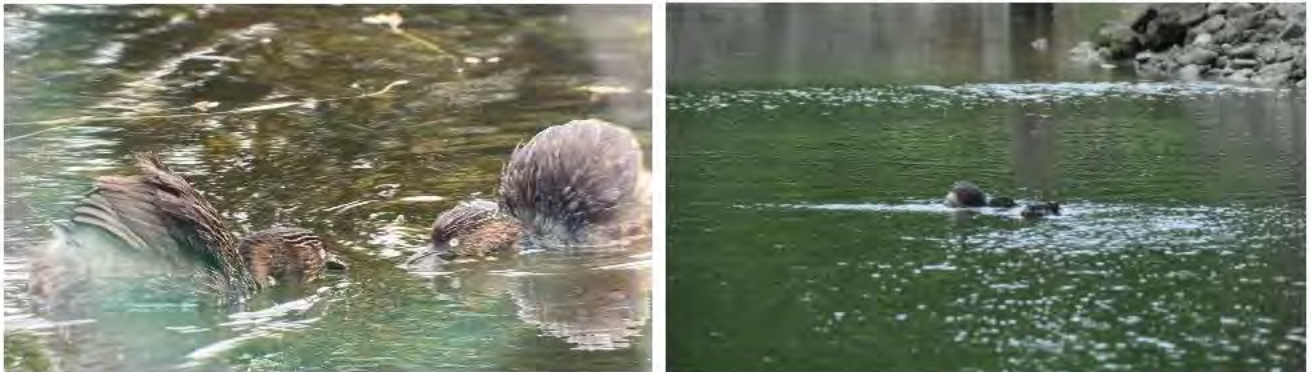


Figure 3. Examples of dabchick courtship behaviour: synchronised head bobbing, often followed by synchronised diving. photos by Bioresearches⁸

3.1.3 Dabchick nest check

Where dabchick nesting behaviours are observed (as described in the above section), the Project ecologist/ornithologist can check the location to confirm the nest. This will include a physical inspection of the riparian vegetation by systematically lifting vegetation carefully and checking for the nest.

It is necessary to limit the time that the dabchicks are disturbed to 30 minutes in normal conditions, and to 10 minutes at the most in cold and hot conditions. Rain is particularly dangerous to eggs. If it is raining, postpone the nest check until conditions are more suitable.

3.1.4 Eggs and/or chicks detected within Project Works area

If eggs or chicks are found on site within the Project Works area, the following protocols will apply:

- All activities within 20 metres of the nest should stop immediately, and people are to leave the area. A 20 m exclusion zone around the outer margin of the pond should be implemented within 24 hours;
- Do not directly mark the nest location. If needed, a marker can be placed at least 10 metres from the nest as an indicator, or two markers on either side >10 m from the nest;
- Notify the Project Ornithologist (refer Table 2);
- If the nest is in an area that will not be affected by Project Works, then the area can be cordoned off using tape and markers. The area should measure 20 m from the nest. Make it clear that no person or machine is to enter the marked-out site. No work is to occur within 20 m of the nest;
- Monitoring equipment (i.e., trail camera) will be positioned at each dabchick nest site within the works area to monitor for any potential adverse effects, and to ensure compliance with the above requirements. This footage will be reviewed by the Project Ornithologist/ecologist weekly whilst the nest is active, and the chicks are present;
- This exclusion zone should remain in-situ until either;
- The chicks have fledged, and are independent (i.e., not reliant on parents) (10-14 weeks for dabchicks);

⁸ Photos taken during dabchick breeding season at an Auckland construction site, managed by Bioresearches (2022)

- The chicks have naturally fledged the natal site (10-14 weeks for dabchicks);
- Or have not been seen on the site for 48 hours (as confirmed by the Project Ornithologist), indicating fledging has failed.

After chick fledging, it is recommended to implement the deterrence measures described in Section 3.1.5, as dabchicks can re-nest multiple times in a season, raising up to two successful broods.

3.1.5 Temporary deterrence measures

Deterrence measures can be used to minimise the likelihood of dabchick nesting within the Project Works area, however, these methods are less effective compared to permanent deterrence (i.e., works outside of the breeding season), which is recommended in the first instance (Bioresearches, 2022).

Where works cannot be undertaken outside of the breeding season, and dabchick pairs are present within the Project Works area, with the potential to nest; and/or have nested already but the nest has confirmed to have failed; and/or have nested already with successfully fledged chicks, then the following methods may be utilised to deter dabchick nesting or re-nesting on Site:

- Cutting back of overhanging vegetation that could be used to anchor a floating nest;
- Moving rocks to block any cavity entrances on the riparian edge;
- Lowering water level (dabchick health and behaviour monitored);
- Closing potential nest cavities with rocks;
- Close behavioural monitoring to assess courtship, mating, breeding behaviour;
- Human presence around pond edges to discourage nesting;
- Trimming overhanging branches from water (using a kayak, where safe and appropriate); and
- Removal of some overhanging vegetation seen as potential nest sites.

Signs of dabchick distress must be monitored by the Project Ornithologist/ecologist when undertaking the above deterrence measures when dabchicks are present on Site, and confirmed to not have an active nest or chicks. These signs may be noticeably attributed to or stimulated by human presence or activity, and should be monitored for such. Signs of distress in Dabchicks include the following, for prolonged, sustained periods of time (~30 minutes):

- Absence of regular foraging;
- Reduced frequency of foraging;
- Reduced time spent preening and resting;
- Hypervigilance;
- Moving away from 'threat'; and
- Increased aggression.

If dabchicks exhibit signs of distress for 30 minutes or more, the activity should be postponed, and an exclusion zone should be implemented for at least one hour, or until no noticeable, sustained periods of distress are shown.

3.1.6 Summary of Protocols

- **Timing of Works:** Undertake pond dewatering and riparian vegetation removal outside the breeding season (1st April – 31st May) to prevent disturbance.
- **Nest Surveys:** Conduct dabchick nest checks within 24 hours of proposed works during the breeding season (1st June – 31st March).
- **If Dabchicks Are Present:**
 - Monitor for signs of **moult** (which renders birds flightless); delay works if moult is observed.
 - Conduct **weekly surveys** for breeding behaviour if no nests are present.
- **If Active Nest Detected:**
 - Establish a 20 m exclusion zone from the pond margin.
 - Install **monitoring equipment** (e.g., trail cameras) and review footage weekly.
 - Delay works until chicks have fledged (approx. 10–14 weeks) or are no longer present.
- **If Chicks Are Found Without a Nest:**
 - Implement the same 20 m exclusion zone and monitoring regime.
 - Continue deterrence after fledging, as dabchicks can re-nest in the same season.
- **Deterrence Measures:** If nests are not active, apply temporary deterrents (e.g., vegetation trimming, human presence) to prevent re-nesting, while monitoring for signs of distress.

3.2 Non-Threatened Native Birds

To avoid potential delays to the proposed works, vegetation clearance and tree felling are recommended to be undertaken outside of the native avifauna nesting season (as identified in Table 3). Project Works such as vegetation clearance and the removal of man-made structures (i.e., culverts, buildings) during the bird breeding season (Table 3) should be preceded by a nest check by a suitably qualified and experienced ecologist or ornithologist.

If works are required during the breeding season within that particular habitat, the following nest-check protocol should be adhered to:

- Nest searches undertaken no more than 24 hours prior to Project Works (e.g. morning before, or morning of).
- Preferably undertaken in the morning when birds are most active, however can be undertaken at other times of the day;
- Include both the branches, foliage and cavities of standing trees, as well as the ground and any ground-cover/rank grass habitat, and man-made structures such as culverts, and buildings for welcome swallow;

Where a nesting bird and/or eggs are detected, the following procedure should be adhered to:

- All operations will cease within 10 m of that nest until the Project Ornithologist has confirmed that the nest has either failed or the chicks have fledged;
- The nest location should be visibly marked by the Project Ornithologist (e.g. spray paint on a nearby tree or flagging tape), and a map/GPS location provided to the Site Manager to be available to all contractors. The 10 m radius should also be marked, either on a map or ideally with spray paint.
- The nest would be monitored until the chicks have fully fledged (i.e., can leave the nest of their own accord) and are capable of dispersing the site independently, or confirmed failed. Vegetation clearance or felling can occur once the nest is determined to be inactive, and the parents have not re-nested;
- If a nest is discovered outside of the nest check, the Project Ornithologist should be contacted immediately, and works must cease within the 10 m radius of the nest. Photos should be provided where possible, as well as the location; and
- The Project Ornithologist will notify the Site Manager and Contractor responsible for vegetation clearance upon completion of the survey and advise on the location of any nesting native birds.

Nest checks are not required within a particular habitat if Project Works occur outside of the breeding season for the species that have been identified as using that habitat (Table 3).

4 ADAPTIVE MANAGEMENT

Adaptive management will be employed throughout the duration of the Project Works to ensure that the protection of avifauna remains responsive to ecological uncertainties and changing site conditions. This approach allows for the real-time adjustment of management protocols in response to new information, unexpected bird behaviours, or unforeseen adverse effects on native avifauna, particularly during the breeding season. If monitoring identifies signs of distress, disturbance, or nesting activity that fall outside of the expected patterns detailed in this Plan, the Project Ornithologist will reassess the mitigation measures in place and implement necessary modifications to avoid or minimise impacts. Adaptive responses may include, but are not limited to:

- Establishing or expanding exclusion zones,
- Amending the timing or sequencing of works,
- Applying additional deterrence measures, or
- Increasing monitoring frequency.

These decisions will be made in consultation with WMNZ and Auckland Council as required and based on up-to-date field observations, technical expertise, and ecological principles. All adaptive measures will be documented and reported in the completion report to support continuous improvement and accountability, in line with the Ecological Impact Assessment (Bioresearches, 2025) and EIANZ Code of Ethics and Professional Conduct (2023).

5 MONITORING AND REPORTING

Ongoing monitoring is required to ensure compliance with the above conditions is met, and the outcomes are achieved as set out in Section 1.3.

Should Project Works be found or suspected to adversely affect breeding avifauna on site, the Project Ornithologist may implement additional mitigation and/or monitoring strategies at their discretion, to ensure there is no impact on the breeding success of avifauna by the proposed activities. This will be discussed with the client prior to and only implemented where necessary.

Weekly monitoring of the works area during the dabchick breeding season

Weekly monitoring of the Project Works area should be undertaken to provide early warning to management if breeding pairs are prospecting territories within the Project Works area and implement deterrence methods to minimise nest attempts or the possibility of chicks within the Project Works area. See Section 3.1.1 for recommended methods.

Weekly monitoring of nesting birds

If birds are found nesting on site, ongoing site visits and surveys will be required to ensure there is no impact on the breeding success of avifauna by the proposed activities. This will include the following monitoring provisions:

- Weekly monitoring inspections of any nest and/or chicks on site by a suitably qualified and experienced person (SQEP), such as an ornithologist and/or ecologist, until the completion of nesting and fledging. Where inspections are not undertaken by a SQEP from Bioresearches, a SQEP should be approved by the Project Ornithologist. Monitoring will include:
 - Positioning monitoring equipment (i.e., trail camera) at each nest site within the works area. This footage will be provided to Bioresearches by WMNZ and reviewed by the project ornithologist/ecologist weekly. The monitoring equipment (including trail cameras and SD memory cards will be provided by Bioresearches); and
 - Weekly site visits by a person appointed by the Project Ornithologist, monitoring the nests with binoculars more than 50m away. If undertaken by an appointed person, the inspection reports should outline the weekly inspection findings to the Project Ornithologist within 24 hours of inspection, or an alternative reduced frequency when birds are not found to be present on site, as approved by the Project Ornithologist.

Reporting

A completion report will be provided by the Project Ornithologist to WMNZ at the end of the breeding season, or on completion of the Project Works. Reporting should include information about the activities undertaken for monitoring of birds and present on site, as well as the outcome for any nests/chicks that were found to be present.

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APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

This report has been prepared solely for the benefit of WMNZ Ltd. as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

Legal Interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions. Where opinions or judgements are to be relied on, they should be independently verified with appropriate legal advice.

Maps and Images

All maps, plans, and figures included in this report are indicative only and are not to be used or interpreted as engineering drafts. Do not scale any of the maps, plans or figures in this report. Any information shown here on maps, plans and figures should be independently verified on site before taking any action. Sources for map and plan compositions include LINZ Data and Map Services and local council GIS services. For further details regarding any maps, plans or figures in this report, please contact Bioresearches.

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4.3.2 Lizard Management Plan

DRAFT

Redvale Landfill Extension

Lizard Management Plan

for: WM New Zealand



DOCUMENT APPROVAL AND REVISION HISTORY

Document title	Lizard Management Plan
Prepared for	WM New Zealand

Author(s)	Liam Ireland Ecologist
	Michaela Scarrott Ecologist
Reviewer(s)	Chris Wedding Senior Ecologist

Version	Date	Author(s)	Reviewer
V1	9 July 2025	LI	MA
V2	22 July 2026	LI, MS	CW

Job number	67602
Filename	67602 Lizard Management Plan – WMNZ Redvale V2

Reference: Babbage Consultants Ltd (2026). Lizard Management Plan. Report for WM New Zealand pp 25

Cover Photo: *Copper skink (Oligosoma aeneum)*, photo by: Dylan van Winkel

Table 1. Lizard Management Plan Checklist and key information

Project Component	Notes	Required of:	Completed
Lizard Management Plan		Auckland Council	
Pre Works: Must be undertaken between 1 October and 30 April			
Pre-works salvage	<i>Must be prepared 4 weeks prior to planned clearance commencing</i>	Herpetologist	
During Works: Must be undertaken between 1 October and 30 April			
Machine-assisted salvage	<i>Contractor must provide a toothed digger bucket for this portion of vegetation clearance.</i>	Herpetologist, clearance contractor	
Post-clearance manual searches		Herpetologist	
Post Works: Must be undertaken between 1 October and 30 April			
Works completion report	To be completed within 1 month of completion of all vegetation removal	Herpetologist, Client, Auckland Council	
Amphibian Reptile Distribution Scheme (ARDS) card		Herpetologist, Auckland Council, DOC	

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1 INTRODUCTION

This Lizard Management Plan (LMP) has been prepared for the proposed WM New Zealand (WMNZ) in relation to the proposed expansion of Redvale Landfill located in the suburb of Dairy Flat, Auckland (Site) as part of the Auckland Regional Landfill – Transition Project (Project) (Figure 1). The purpose of this LMP is to minimise potential effects on native lizards before and during the removal of potential lizard habitats associated with the ARL-TP.

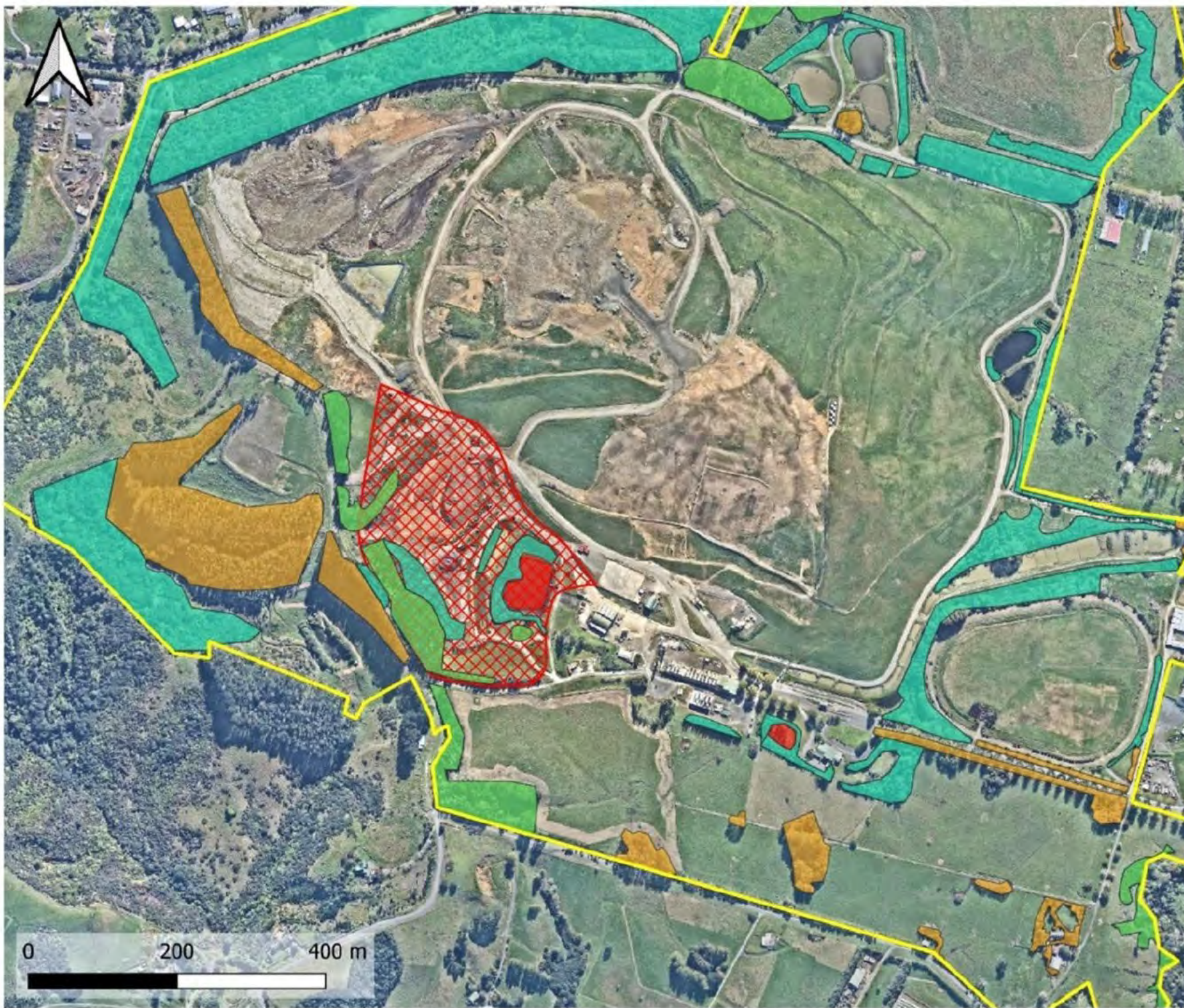
This LMP should be read in conjunction with the Ecological Impact Assessment (EclA, Bioresearches, 2026). A survey conducted by Bioresearches (2026) recorded two native lizards (both copper skinks, *Oligosoma aeneum* – ‘At Risk – Declining’) at the Site, but not within the Project footprint. This LMP therefore adopts a conservative approach towards capture and salvage of potentially present native lizards within similar vegetation and potential habitat features where they occur within the Project footprint.

This LMP details the management measures required to protect potentially present native lizards both prior to, and while vegetation clearance is undertaken as part of the Project. The objectives of the LMP are to maintain or enhance the population of native lizards present on the Site at which vegetation clearance is to occur, and to ensure that the habitat(s) that lizards are transferred to will support viable populations for all species present pre-clearance.

The LMP includes three phases:

1. Pre-works management;
2. During-works management; and
3. Post-works search of the cleared area and release.

Figure 1. (Below) Extent and location of vegetation removal



Redvale Landfill

Proposed extension works,
vegetation and pond
removal

20/03/2026

Legend

 WMNZ properties

Proposed Works

 Ponds Proposed
for Removal

 Class2_LandfillExtension

Vegetation

 Planted Native Vegetation

 Mixed Native Exotic
Vegetation

 Exotic Vegetation

SOURCES

NearMap

MAP PROJECTION
NZGD2000 / New
Zealand Transverse
Mercator 2000

Drawn by: MS

MAP
NO. 67602

1.1 Objectives

The objectives of the LMP are to minimise adverse effects on native lizards within the construction footprint by capturing and relocating individuals before and during vegetation removal and providing habitat enhancement and pest control where appropriate. Addressing and reducing adverse effects is discussed in further detail in Section 1.1.1. The LMP also aims to maintain or enhance native skink populations at the site through relocation to appropriate alternative sites, such that the release site supports a viable population(s).

These objectives will be achieved by:

- a. Using current best practice to capture native lizards from vegetation in the footprint prior to and during vegetation clearance and relocating any captured individuals to safe and suitable habitats;
- b. Applying recognised surveying and monitoring protocols following the Department of Conservation's (DOC) Natural Heritage Management System's Herpetofauna Inventory & Monitoring Toolbox, supplemented by new advances in tools and techniques not yet incorporated into the toolbox;
- c. Meeting requirements of the Wildlife Act 1953 and Resource Management Act 1991.

This LMP addresses the following:

- A summary of the affected habitat and species covered by the LMP;
- Capture and relocation procedures;
- A summary of the recommended release sites; and
- Post-works management and monitoring (where required).

1.1.1 Addressing and reducing adverse effects

The National Policy Statement for Indigenous Biodiversity (NPSIB) requires that any significant adverse effects on indigenous biodiversity (outside a Significant Natural Area (SNA)) be managed by applying the effects management hierarchy. The effects management hierarchy requires that adverse effects be avoided first, where practicable, followed by actions to minimise and remedy. The following approach will be implemented for lizard salvage and relocation in accordance with these requirements:

Avoid

There is no alternative to salvaging and relocating lizards within the Project area. This is due to:

- The majority of vegetation within the Project footprint is being fragmented and isolated, eliminating the possibility of employing methods where lizards (potentially inhabiting the Site) could be encouraged to leave the Site naturally (i.e., through habitat degradation); and
- An unavoidable need for the landfill expansion to occur in these locations, which are already highly modified by historic activities.

Minimise and mitigate

A lizard salvage and relocation programme will be implemented to minimise adverse effects (i.e., harm, mortality) on individual lizards and local lizard populations arising from vegetation clearance within the Project footprint.

Lizards will be captured prior to, and during, vegetation clearance activities and relocated to an appropriate release site, as discussed in Section 3. The release site will be enhanced through the installation of ecostacks to support the successful establishment of relocated lizards.

Additional management measures and post-release monitoring requirements will be implemented where more than 10 lizards are salvaged, or more than two lizard species are salvaged, as outlined in Table 5.

1.2 Statutory context

Native reptiles are legally protected under the Wildlife Act 1953, and their habitats are recognised under the Resource Management Act 1991. The purpose of this LMP is to detail appropriate measures to be undertaken in accordance with a current Wildlife Act Authority (e.g. WA98006-FAU) and conditions to the resource consents for the Project to ensure that native lizards (as captured from trapping and destructive searches), are appropriately managed to minimise adverse effects on these high-value species in association with vegetation/habitat clearance. This includes maintaining or enhancing the population of each species of native lizard present on the site at which habitat clearance is to occur and ensuring that the habitat(s) that lizards are transferred to will support viable populations for all species present pre-clearance.

This LMP may only be implemented under a valid Wildlife Authority, issued by the Department of Conservation (DOC).

1.3 Key Contact

This LMP would be actioned by the Project Herpetologist (Chris Wedding) under Wildlife Act Authority WA 98006-FAU issued by the DOC¹ or another approved herpetologist acting under an appropriate Wildlife Authority.

The Project Herpetologist may be aided by suitably qualified and experienced herpetologists/ecologists, who would assist with aspects of the salvage/relocation. The credentials of the proposed Project Herpetologist are provided in Table 2.

Table 2. Details of Project Herpetologist

Credentials and Contact Details of Project Herpetologist	
Project Ecologist / Herpetologist	Chris Wedding
Credentials	M.Sc.; 20 years of herpetological experience

¹

Wildlife Authority	WA 98006-FAU (Valid to 2028)
--------------------	------------------------------

1.4 Key Principles for Lizard Salvage and Transfer

DOC's *Key principles for lizard salvage and transfer in New Zealand* guidelines require consideration of the following nine guidelines when selecting a release site (Table 3). These matters are addressed below, with reference to the Ecological Values Assessment (Bioresearches, 2026a), the Ecological Impacts Assessment (Bioresearches, 2026b) and/or this LMP (as relevant), as set out in the table below.

Table 3. Nine principles for lizard salvage and transfer in New Zealand

Principle #	Principle	Location of information
1	Lizard species' values and site significance must be assessed at both the impact (development) and release sites.	Section 2 of this LMP (Impact Site) Section 3.6 of Values Assessment ² Section 4.1 of this LMP (Release Site)
2	Actual and potential development-related effects and their significance must be assessed.	Section 2.2.4 of the Effects Assessment ³
3	Alternatives to moving lizards must be considered.	Section 1.1.1 of this LMP
4	Threatened lizard species require more careful consideration than less-threatened species.	Section 2 of this LMP
5	Lizard salvage, transfer and release must use the best available methodology.	Sections 3 and 4 of this LMP
6	Release sites and their carrying capacities must be suitable in the long term.	Section 4.1 of this LMP
7	Monitoring is required to evaluate the salvage operation.	Section 4.2 of this LMP
8	Reporting is required to communicate outcomes of salvage operations and facilitate process improvements.	Section 5 of this LMP
9	Contingency actions are required when lizard salvage and transfer activities fail.	Section 3.5 of this LMP

² Bioresearches, 2026a

³ Bioresearches, 2026b

2 LIZARD SPECIES COVERED BY LMP

A review of the Amphibian and Reptile Distribution Scheme (ARDS) database and databases, such as iNaturalist, identified records of 8 herpetofauna species within 5km of the Site, five of which are indigenous and are legally protected under the Wildlife Act 1953 (Table 4). Exotic (i.e., 'Introduced and naturalised') species are not protected and are not considered further in this LMP.

Bioresearches (2025) recorded two native copper skinks (*Oligosoma aeneum*) at the Site, although none were found within the Project footprint. The presence of a gravid female indicates a resident population likely extends into adjacent suitable habitats, including areas within the Project footprint.

Copper skinks and other indigenous skinks, such as ornate skinks (*Oligosoma ornatum*), are generally found in dense ground cover and around vegetated edge habitats, especially areas of rank grass, contiguous native and non-native vegetation, such as those that occur within the Project footprint. Copper skinks are also capable of recolonising heavily modified and degraded environments. Within such areas, they commonly utilise anthropogenic materials (e.g. timber, corrugated iron) as refuge sites, provided that adequate habitat complexity is present through such features, such as rank grasses, ground cover vegetation, and shrubland.

Table 4. Terrestrial indigenous herpetofauna covered by this plan

Common name	Scientific name	National threat status	Regional threat status	Habitat on Site	Records within 5km of the Site ⁴
Copper skink	<i>Oligosoma aeneum</i>	At Risk - Declining	At Risk - Declining	Rank grassland where additional habitat complexity exists (i.e., pampas, rubbish, logs), and forest edge habitats.	Two found on Site during 2024/2025 survey
Ornate skink	<i>Oligosoma ornatum</i>	At Risk - Declining	At Risk - Declining	Rank grassland where additional habitat complexity exists (i.e., pampas, rubbish, logs), and forest edge habitats.	Nine records within 5 km
Forest gecko	<i>Mokopirirakau granulatus</i>	At Risk - Declining	At Risk - Declining	Native forest vegetation.	Five records within 5km
Elegant Gecko	<i>Naultinus elegans</i>	At Risk – Declining	At Risk - Declining	Native forest vegetation.	One record within 5km
Pacific gecko	<i>Dactylocnemis pacificus</i>	Not Threatened	At Risk - Declining	Native forest vegetation.	One record within 5km

Note: Regional threat status sourced from Melzer et al.(2022), National threat status from Hitchmough et al. (2021) and Burns et al. (2024).

⁴ Records obtained using: Amphibian and Reptile Distribution Scheme (ARDS) database, iNaturalist, and Department of Conservation records, and on-site survey (undertaken 2024-2025).

2.1 Potential habitats

The majority of potential habitats within the Project footprint are comprised of rough, exotic grassland, typically supporting various compositions of planted vegetation, including planted native vegetation (0.8 ha), mixed native and exotic vegetation (0.3 ha), exotic vegetation (0.6 ha), and unmanaged scrub (1.3 ha) (Figure 1). Older vegetation supports more abundant ground cover through leaf litter accumulation and occasionally, coarse woody debris. Combined, these areas provide potential lizard habitat through leaf litter, logs and debris, herbaceous vegetation, and unmanaged rank grass (Figure 2).



Figure 2. Examples of vegetation types and habitats within the WM property that are proposed for clearance where native lizards can inhabit. (top left) unmanaged scrub habitat; (top right, bottom left) mixed native and exotic vegetation; (bottom right) an area of native plantings.

3 LIZARD SALVAGE AND RELOCATION PROTOCOLS

To minimise adverse effects on any native lizards within the works footprint, management activities will include (prior to removal) systematic searches⁵ and trapping, and (during removal) destructive searches. Release site habitat enhancement and triggers for release site monitoring are detailed in Section 4.1.1 and Table 5.

This LMP requires habitat searches undertaken or supervised by the Project Herpetologist, prior to and during vegetation removal. All relocated native lizards shall be released into habitats that are enhanced, in accordance with this LMP. To increase the carrying capacity of the release site, shelter/refuge provision will be provided with all lizards relocated.

3.1 Timing of the Salvage and Relocation

All lizard capture and release shall be undertaken:

- Immediately prior to (e.g. during the week prior) vegetation removal; and
- Within the accepted North Island 'lizard salvage season' (October to April, inclusive).

This timing covers both lizard trapping / searches and any associated habitat removal. The specific timing of the lizard salvage will depend on the timing of the proposed habitat clearance works.

3.2 Pre-Works Management

3.2.1 Demarcation of works footprint

Prior to any vegetation clearance or habitat disturbance on-site, all works areas will be clearly demarcated to ensure that works do not encroach into peripheral undisturbed or protected habitat areas.

3.2.2 Pre-Vegetation Clearance

Prior to the commencement of any vegetation clearance or earthworks, a herpetologist(s), or ecologist under the Project Herpetologist's supervision, will carry out a search-and-salvage operation. The operation will involve active searches for lizards in all identified habitats within the clearance footprint, with the use of artificial retreats (AR) (Figure 3) and hand searching methods, described in further detail below.

Methods

A minimum five-day trapping period using ARs would be undertaken within suitable habitat, within the identified vegetation clearance areas, as shown in Figure 1. Trapping will follow the protocols below:

- All traps are embedded into surrounding vegetation;
- ARs shall be installed at least two weeks prior to a 5-day trapping period; and

⁵ <https://www.doc.govt.nz/documents/science-and-technical/inventory-monitoring/im-toolbox-herpetofauna-sytematic-searches.pdf>

- During AR checks, the Project Herpetologist shall hand search all vegetation, logs, and debris throughout the extent of the clearance footprint to capture lizards and to identify important areas that should be targeted for machine searching. Diurnal searching is a proven technique for detecting diurnal lizards in New Zealand (Lettink and Hare, 2016⁶).



Figure 3. Examples of Artificial Retreats (ARs) placed within suitable skink habitat

3.3 During works management

Machine-assisted destructive searches require the vegetation removal contractor to work with the Project Herpetologist to search through vegetation as it is removed. This involves scraping back of surface vegetation using a toothed bucket or root rake attachment (Figure 4) as well as lifting heavy objects (e.g., large logs) so that lizards hiding beneath can be captured (Figure 5). Recoverable habitats, such as logs, will be collected and transferred to the lizard relocation site(s) where practicable (Figure 5). Some material transfer may require machine assistance.

Key Points:

- An excavator with a toothed bucket or root-rake attachment will be required for this work (see Figure 4); and
- Recoverable leaf litter substrate, woody debris, potential shelter structures (e.g., logs, rocks) and invertebrate food sources will be collected and transferred to the lizard relocation site(s) (Figure 5).

⁶ Lettink, M. and Hare, K.M., (2016). Sampling techniques for New Zealand lizards. In *New Zealand Lizards* (pp. 269-291). Springer, Cham.



Figure 4: Machine-assisted lizard searches. Herpetologist supervising the scraping of terrestrial vegetation.



Figure 5. (left) Copper skink caught during a machine assisted habitat search; (right) an example of recoverable debris salvaged during a vegetation clearance, used to enhance the release site and provide additional habitat for lizards.

3.3.1 Capture and release methodology

Native lizards will be captured and handled by a DOC-authorised herpetologist (under Wildlife Authority 98006-FAU), or by an ecologist under their supervision. Key points during the lizard salvage are provided below:

- All native lizards captured prior to and during vegetation clearance operations will be placed immediately into containment boxes with vegetation and refugia for lizards to hide in and held temporarily for release.
- As the areas of vegetation clearance are not directly adjacent to the release site (as described in Section 3), the risk of lizards moving back to the Site is low. Therefore, lizards should be released as soon as practicable, and within the same day of capture into the release site.
- Retaining lizards in captivity for periods exceeding 24 hours will be avoided wherever possible to minimise stress and ensure lizard welfare is prioritised.
- Every lizard will be measured, sexed, and photographed before release, and released into supplementary eco-stacks, created within the release site.

3.3.2 Incidental discovery of species not listed in this LMP

In the unlikely event that a native lizard is found in the footprint that is not listed in Table 4 of this LMP, the species will be retained in temporary captive management, and DOC will be notified. Note that incidental discoveries would be considered notable because those not listed in Table 4 are likely to include species outside their known range, and/or are Threatened species and potentially not covered under the Wildlife Authority.

3.3.2.1 Temporary captive management

Temporary captivity of salvaged lizards should be managed in accordance with the methodologies outlined in the *Guide to Keeping New Zealand Lizards in Captivity* (DOC, n.d.). Where advances in lizard husbandry have occurred since publication of the guide, alternative methodologies may be adopted, provided they are supported by current best practice and demonstrably improve animal welfare outcomes during captivity.

3.4 Post-works habitat searches

Post-clearance activities will involve searching for and recovering any remaining lizards by the Project Herpetologist or an ecologist under their supervision after vegetation clearance. Searches will be completed until the Project Herpetologist is satisfied that no habitats remain within the Project footprint or that all affected areas have been thoroughly searched.

3.5 Adaptive Management

Adaptive management will be applied throughout the implementation of the lizard salvage and relocation programme to respond to any unforeseen outcomes and incorporate lessons learned. This approach will allow management practices to be modified where necessary to improve capture success, animal welfare, post-release outcomes, and the overall effectiveness of the mitigation measures. Any adaptive management approaches and outcomes will be reported within the final report (as discussed in Section 5).

4 RELEASE SITE

The selection of an appropriate lizard relocation site is crucial to ensuring the best possible outcome for lizard salvage-relocation programmes. The release site has been selected using the DOCs key principles for lizard salvage and transfer guidelines (DOC, 2019) and as per the guidelines, the following key parameters have been considered to guide in selecting an appropriate relocation site:

- The site must be ecologically appropriate and have long-term security;
- The habitat at the site must be suitable for the salvaged species;
- The site must provide protection from predators; and
- The site must be protected from future human disturbance.

4.1 Release Site Description

Based on the above considerations, an area of vegetation along the northern end of the property, adjacent to Pond 4, has been identified as the most appropriate release site (see Figure 7).

This site supports native skink inhabitation with a mosaic of planted native vegetation with occasional rough grass clearings throughout, providing basking sites along the edges of clearings, refugia within the groundcovers and organic substrates, and habitat complexity (Figure 6). The release site also supported a copper skink recorded during surveys undertaken by Bioresearches (Bioresearches, 2026a), indicating the likely presence of a low-density resident population of skinks. This provides opportunities for integration of relocated individuals into an existing population, while also demonstrating that the habitat is capable of supporting native lizards.



Figure 6. Representative photos of vegetation within the proposed release site (refer to Figure 7)

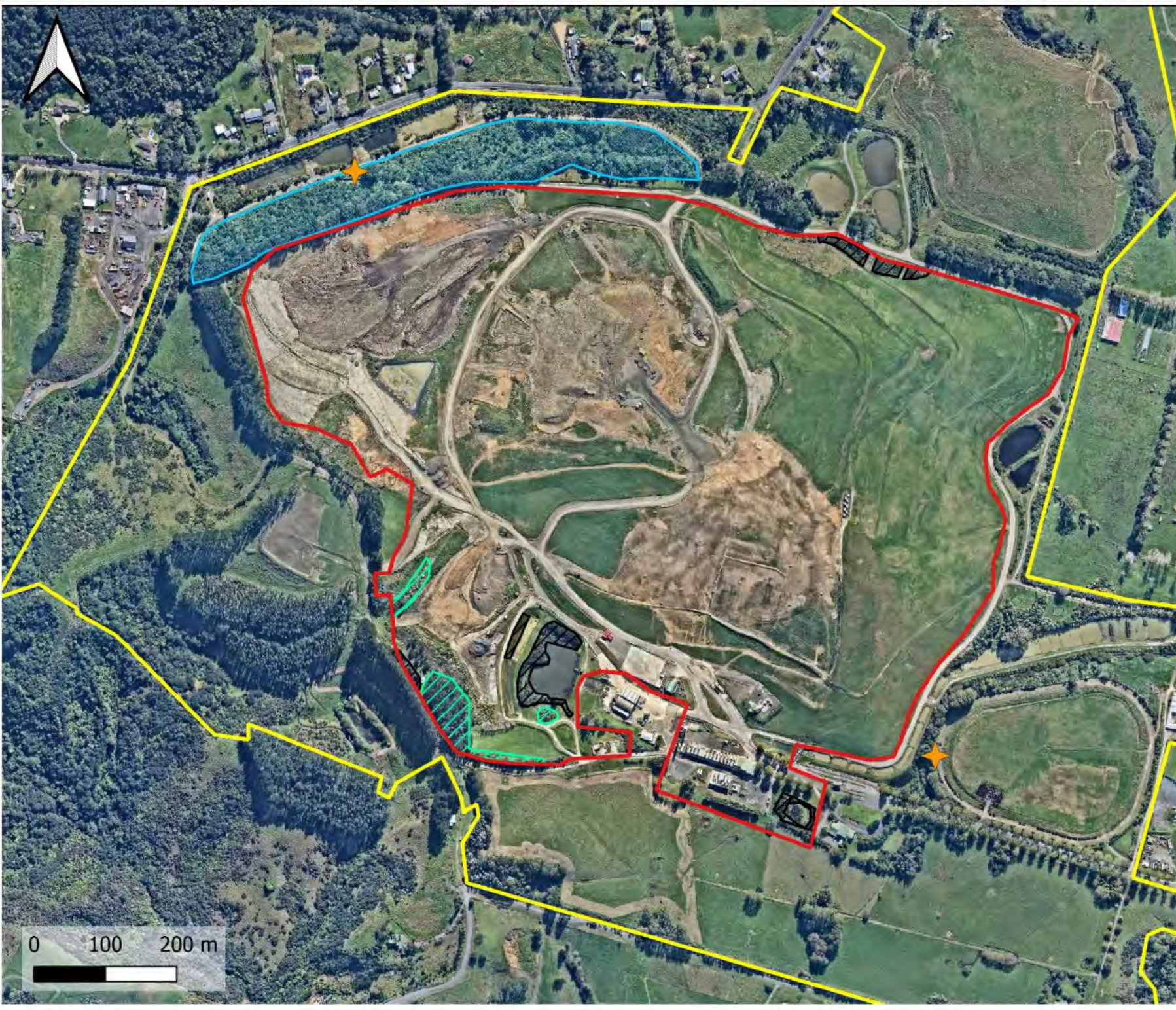
Geckos were not detected during site surveys undertaken by Bioresearches (2026a), and given the highly modified nature of the habitat proposed for clearance, and its limited connectivity to the surrounding

landscape, the presence of geckos within the Project footprint is considered unlikely. Consequently, the likelihood of geckos being encountered during lizard salvage operations is expected to be low.

Notwithstanding this, should a gecko be encountered during lizard management activities, the proposed release site would also be suitable for native geckos. Mature trees across the site create a contiguous canopy and provide some structural complexity through the presence of natural hollows, crevices, loose bark, and branch cavities, which provide suitable refuge, shelter, and arboreal habitat for native geckos.

The selection of this release site would provide additional ecological benefits beyond those associated with lizard relocation. Specifically, any predator control measures implemented within the release site (where triggered by the thresholds and management responses outlined in Table 5) would also be expected to benefit New Zealand dabchicks (*Poliiocephalus rufopectus*) that may utilise Pond 4 for nesting.

Figure 7. (Below) Release site for indigenous lizards relocated from the project footprint



Redvale Landfill

Lizard Relocation Site

15/06/26

Legend

- Relocation Site 1
- Copper skink found
- Proposed Works Area
- Vegetation removal mixed native
- Vegetation removal planted native
- WMNZ properties

SOURCES
NearMap

MAP PROJECTION
NZGD2000 / New
Zealand Transverse
Mercator 2000

Drawn by: MA

MAP
NO. 67602

4.1.1 Release Site Enhancement: Additional Retreats

The release site will be enhanced through the installation of additional refugia (ecostacks) to increase habitat complexity, refuge availability, and the long-term carrying capacity of the site for relocated lizards. Enhancement measures will include the strategic placement of organic materials within the release location. Key requirements for release site enhancement are outlined below:

- Any natural retreat items (logs, etc.) shall be transferred to the release site area from the vegetation clearance site;
- All lizards would be released with a small pile of wood (1 pile per individual (examples shown in Figure 8), obtained from the Project footprint, or surrounding areas within the release site where they are not already providing habitat to lizards; and
- Specific release locations will be set back from road and pond side by at least 4 m to avoid potential water level rise during heavy rainfall events or with poor runoff.



Figure 8. Example of stacked branches, logs, punga trunks, and leaf litter to create supplementary refuges for relocated lizards.

4.1.2 Release Site Enhancement: Pest Control

This LMP acknowledges that displaced animals have a higher probability of risk of predation, and a rapid increase in lizard numbers in a given area is likely to result in a corresponding increase in predators. Therefore, this LMP requires **pest control to be triggered** where lizard values are high, as determined by greater than 10 lizards, or where two or greater species are relocated (Table 5).

Table 5. Triggers for management and post-release monitoring provisions.

	Trigger	Management provision	Duration of management
A	< 10 native lizards	• Immediate relocation • Provision of habitat cover per lizard	N/A
B	≥ 10 native lizards Or ≥ 2 species	• Immediate relocation • Provision of habitat cover per lizard • Pest management required	5 years
C	≥ 20 native lizards	• Immediate relocation • Provision of habitat cover per lizard • Pest management required • Success Monitoring	5 years

4.1.2.1 Pest control Protocols

Pest control shall be initiated at the release site where ≥ 10 native lizards or where ≥ 2 species are released. Pest control shall be operational for at least five years from the date of final salvage and relocation. Where more than 20 lizards are relocated, success monitoring, comprising 5 x annual surveys at release locations, would be undertaken (Table 5) Pest control would be monitored via bait take (bait stations) or kill counter.

- Pest control shall be operational within ten working days of the threshold for pest control (above) being triggered.
- Pest control would be achieved over four pulses each year. Each pulse would consist of a four-week period, in August, November, January and April.
- Pest control shall involve maintained rodent bait stations at 50 x 50 m spacing or humane, self-resetting instant kill traps with a counter, deployed throughout the entire release area with a 50m buffer outside the outermost release points.
- Pest control will be overseen by a suitably qualified and experienced pest management professional and follow best-practice methodology for rodents consistent with the Pest animal control guidelines for the Auckland region (Auckland Council 2025)
- While it is acknowledged that reinvasion of pest mammals will be constant over the period of pest management, pest suppression over the period of lizard establishment would reduce predation pressure on relocated and resident lizards.

4.1.2.2 Pest Control Monitoring

An annual report on pest control programme effectiveness will be created, documenting bait take/replacement and trap captures for Auckland Council and the Project Herpetologist.

4.2 Monitoring

4.2.1 Relocation Success Monitoring

Success monitoring will be triggered if ≥ 20 native lizards are found and relocated from the project site. Where required, success monitoring will be undertaken at release site locations, targeting ecostacks, where lizards are relocated. The purpose of the monitoring is to determine success by measuring/identifying:

1. Occupancy by lizards of ecostacks, as provided for habitat replacement.
2. Identifying any relocated lizards, where photograph ID is used.
3. Recording any trends in numbers and species encountered within the pest managed area.
4. Presence of gravid females or juveniles.

4.2.2 Pitfall trapping

Monitoring using pitfall traps will consist of a trapping period, undertaken at approximately the same time each year (spring, summer or autumn) as per the following:

- A five-day trapping period would be undertaken during each monitoring period;
- A minimum of 10 monitoring stations, each comprising four traps, will be established within the release site.
- Monitoring effort will be scaled relative to the number of lizards released, with one additional four-trap station installed for every two lizards relocated (i.e. a minimum monitoring density of one station per two released lizards).
- Traps should be situated in suitable areas of skink habitat (i.e., with ground-cover, leaf litter, adjacent to shrubby vegetation), and within proximity to eco stacks (Section 4.1.1);
- All traps shall be embedded in, furnished with vegetation and covered to protect any captured lizards from heat and exposure during confinement;
- Pitfall traps shall be baited with banana pear or a suitable lizard attractant;
- When not in use, all pitfall traps shall be neutralised, such that they are sealed closed (so that no lizards can be captured), or fully furnished to the upper rim so that lizards may escape; and
- All traps shall be checked no more than every 24 hours while active.

Pitfall traps would exist in the environment for the entirety of the five-year monitoring period. Pitfall traps will be installed at least three weeks prior to the initial monitoring period, and neutralised following completion of each monitoring period. Neutralised Pitfall traps may be left in situ between survey years, however, they will be covered either an impenetrable cover, or filled to ensure any lizards can climb out.

5 Reporting

A works-completion report would be prepared by the Project Herpetologist within 1 month of completion of all vegetation removal, per indicative stage. The report would detail:

- The number of lizards and species captured and transferred.
- The number and location of any ecostacks created.
- Whether monitoring is triggered by the relocation.
- All information as required of an ARDS report (Amphibian Reptile Distribution Scheme, DOC).

The works completion report would be submitted to Auckland Council's Ecological Advice Team, Natural Environment Design and Environmental Services.

REFERENCES

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APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

This report has been prepared solely for the benefit of WM New Zealand as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

Legal Interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

Maps and Images

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4.3.3 Native Fish Capture and Relocation Plan

DRAFT

Waste Management - Redvale

Native Fish Capture and Relocation Plan

for: WM New Zealand



Consulting Biologists – Established 1972

P.O. Box 2027, Auckland 1140. New Zealand

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DOCUMENT CONTROL AND REVISION RECORD

Document title	Native Fish Capture and Relocation Plan
Prepared for	WM New Zealand

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Version	Date	Author(s)	Reviewer
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Job number	67602
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Reference: Bioresearches (2026). Native Fish Capture and Relocation Plan. Report for WM New Zealand pp 18.

Cover Illustration: Longfin eel (*Anguilla dieffenbachii*)

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Figure 1: Map of the impacted ponds. Captured fish will be relocated into the Rangitopuni Stream, to the east of the site. 3

1 INTRODUCTION

Bioresearches were engaged by Waste Management New Zealand (WMNZ) to prepare a Native Fish Capture and Relocation Plan (FMP) for works in ponds proposed at Redvale Landfill in Dairy Flat, Auckland (hereafter “the Site”). The works involve the expansion of Pond 1, and the infilling of two ponds on the Site; Pond 6 spanning approximately 3,247 m² and the Office Pond approximately 878 m². All ponds will require dewatering to complete these works which puts native fish at risk of injury or mortality if left unmanaged. As shortfin eels (*Anguilla australis*) were recorded in Pond 1 and Pond 6 in previous surveys undertaken by Bioresearches (2025), and habitat exists within the Office Pond, native fish management is required to be undertaken prior to, and during the works to minimise adverse effects to native fish.

A map of the ponds requiring works, alongside the proposed relocation site, is depicted below in Figure 1. Recovered native fish will be relocated into the Rangitopuni Stream, between Richards Road and Landfill Access Road, to the east of the Site.



Figure 1: Map of the impacted ponds. Captured fish will be relocated into the Rangitopuni Stream, to the east of the site.

This document provides the FMP with the methodology for the native fish recovery and relocation, which includes:

- Requirements for the commencement of the FMP;
- Trapping, dewatering, and excavation methodologies;

- Location and description of the relocation site;
- The procedure to humanely euthanise pest fish; and
- The name, experience and qualifications of those involved in undertaking the fish relocations.

2 METHODOLOGY

The New Zealand Freshwater Fish Sampling Protocols (Joy et al. 2013) will be followed unless specified within this plan. Setting of Gee-minnow traps will also be in general accordance with A Revised Methodology to Survey and Monitor New Zealand Mudfish Species (Ling et al. 2009).

The ponds on site are soft-bottomed, stagnant, and deep, rendering them unsuitable for electric fishing. Instead, the fishing effort for the ponds will be restricted to a combination of netting/trapping (Pond 6 and Office Pond only) and supervision of the dewatering and excavation phase (all ponds).

As the ponds are offline (i.e. not connected to any natural watercourse), no fish exclusion structures are required for works to proceed.

2.1 Timing of Works

To avoid adverse effects to native aquatic avifauna (specifically New Zealand dabchick, *Poliocephalus rufopectus*), works (i.e., dewatering) within the ponds on the Site will be undertaken in accordance with timings and protocols outlined in the Avifauna Management Plan (AMP) (Bioresearches, 2026).

The protocols and timings within the AMP are briefly outlined here for cohesion with freshwater works required on site:

1. Dewatering of the ponds and establishment of works is preferably to be undertaken **between 1st April to 31st May** (outside of the Dabchick breeding season).
2. Where pond dewatering cannot be undertaken during 1st April to 31st May, the procedures and management measures set out in the AMP shall be implemented prior to, and during, any works undertaken within the affected ponds.

Fish capture and relocation will be undertaken prior to the commencement of works within the ponds.

2.1.1 Netting/Trapping

Due to the depth of the water and the presence of thick sludge of unknown depth in Pond 1, netting and trapping are considered unsuitable and potentially unsafe. As a result, these methods will not be used in Pond 1. Netting and trapping will instead be undertaken only within Pond 6 and the Office Pond.

Trap Types

Fine meshed fykes with a separator grill will be used. All nets and traps will be set with an airspace to provide trapped fish access to atmospheric oxygen utilising appropriately sized buoys placed within the fyke nets to ensure airspace is provided. Fyke nets will be set in general accordance with the New Zealand Freshwater Fish Sampling Protocols (Joy et al. 2013).

Trap Methodologies

Given the depth of the ponds, baited Gee's-minnow traps and fyke nets will be placed at intervals near the margins of the ponds and left in place overnight. The number of traps deployed will be determined based on site-specific conditions, including the extent of accessible habitat and the availability of suitable habitat (e.g., appropriate water depths). Trap density will be maximised where practicable to ensure comprehensive

coverage of suitable habitat and maximise the capture of fish within the site. The traps will be checked the following morning, prior to 9 am, with any captured fish recovered.

As a minimum performance for trapping, if more than ten native fish are caught during a single trapping effort (measured as one night of trapping) within the ponds, trapping will continue until numbers are depleted to the satisfaction of the project ecologist (using an 80% removal rate as a target, based on the Hayne's (1949) regression method). Although this is not anticipated, given that previous surveys within the ponds are restricted to records of shortfin eels (*Anguilla australis* – Not threatened) - if any At-Risk or Threatened native fish species are captured, target removal rates will be adjusted to 95%.

Duration of Trapping

It is anticipated that the netting/trapping phase will take up to a week to complete.

2.1.2 Dewatering and excavation

Pre-excavation phase

A sump pond is to be installed for the dewatering effort within each of the ponds proposed for works - within Pond 6 this should ideally be in proximity to the jetty to ensure accessibility. The wider pond depth within Pond 6 and Office Pond should be reduced to around 30 cm to allow for nets and traps to be set in the deeper sump in accordance with the methodology outlined in Section 2.1.1. This will occur in the days prior to the excavation of the ponds in which remaining fish not captured in the initial netting/trapping phase will move to the sump ponds and encounter re-set nets. Due to the water level and sludge within Pond 1, these works will not occur there unless safe, flat access to the pond base and sump can be created.

Dewatering phase

An ecologist will be on-site with hand nets to supervise the dewatering and excavation phase. Any native fish observed during this period will be captured, and relocated accordingly, with visual and tactile searches undertaken throughout the dewatering and excavation phase.

The pumps utilised during the dewatering phase are required to have a 3 mm mesh screen around the water intake to prevent fish from entering the pump. To prevent any remaining fish from being entrained to the pump head, this screened intake should then be placed inside a submerged bucket or drum.

Excavation phase

Once dewatering is completed, an excavator fitted with a toothed rock bucket will be used to carefully scrape out the top layer of sediment within the ponds. This sediment will be hand checked by the freshwater ecologist, with native fish, such as eels (*Anguilla* spp.) known to burrow into silt substrates when they are disturbed or as water levels decrease.

2.2 Fish Handling and Relocation

Fish handling will be in accordance with the New Zealand Freshwater Fish Sampling Protocols (Joy et al. 2013) and appropriate, project-specific permits.

All native fish captured will be relocated within 2 hours of capture to the suitable release habitat as described below, and shown in Figure 1. Following capture, fish will be transferred into lidded containers of an appropriate volume for the number of fish caught and kept cool. Battery powered oxygen bubblers will be placed within each of the transfer bins to provide high dissolved oxygen into the water. To reduce further stress, a water

conditioner (such as API Stress Coat) will be added at a concentration of 2.5 mL per 19 L of water, or otherwise in accordance with the manufacturer's instructions.

Whilst contained, fish will be monitored and water will be changed after one hour of capture. If any individual captured fish shows signs of stress (loss of righting response, exuding excessive mucus, gulping air, and/or mouth gaping) the water will be changed to provide more oxygen, or the fish will be moved to the relocation site immediately.

Large eels (> 500 mm) will be contained individually to avoid injury to other smaller captured fish.

2.3 Relocation Site

The relocation site is within the Rangitopuni Stream to the east of the site, in the reach between Richards Road and Landfill Access Road, as indicated within Figure 1. The area is well shaded, accessible, and contains fish habitat in the form of woody debris, root mats, and pools. The site is considered to be superior to the current habitat of the ponds, which are heavily degraded and man-made.

If large numbers of fish are captured, they will be distributed across multiple release points in the stream, extending upstream and downstream of Richards Road and Landfill Access Road if necessary, to avoid short term overstocking and predation risks, particularly considering that smaller fish including banded kokopu (*Galaxias fasciatus*), common bully (*Gobiomorphus cotidianus*), and Crans bully (*Gobiomorphus basalis*) are known to be present within the general area of the relocation site (Bioresearches, 2025).



Photo 1: Photo taken at the Rangitopuni Stream relocation site adjacent to Landfill Access Road.

2.4 Biosecurity and animal welfare

All equipment will be thoroughly cleaned and dried prior to use. Equipment includes but is not limited to waders, fyke nets, Gee's minnow traps, transfer buckets and bubblers.

Fish will be visually examined for general health (visual skin lesions or heavy fungal burdens) and if considered unhealthy by an appropriately qualified freshwater ecologist, they will be humanely euthanised in accordance with Section 29 of the MPI Special Permit (872), by submerging fish within a high dosage of clove oil followed by blunt force trauma.

Any pest fish caught will be humanely euthanized and all euthanized pest fish will be disposed of in a bio secure manner to land, in accordance with Project specific permits.

2.5 Personnel

The Suitably Qualified and Experienced Person (SQEP) shall have demonstrated experience in freshwater fish surveys and relocations, hold all necessary authorisations and permits (including a current electrofishing licence where electrofishing is proposed), and possess extensive knowledge of freshwater fish ecology, identification, handling, and relocation techniques. At least one SQEP shall be present on site during all fish salvage and relocation activities and shall be responsible for overseeing and directing the implementation of this FMP, including ensuring that all relocation, handling, monitoring, and reporting requirements are carried out in accordance with best-practice standards.

3 PROJECT MANAGEMENT

3.1 Adaptive Management

Due to the inherent variability of fish recovery and relocation activities, this FMP may be modified by an appropriately qualified freshwater ecologist to ensure fish are recovered in a safe and professional manner, as well as in accordance with the New Zealand Freshwater Fish Sampling Protocols (Joy *et al.*, 2013).

3.2 Reporting

Following the relocation, a short report will be prepared detailing the fish captured (species and number of fish) during the recovery, their status (i.e. recovered, accidentally injured or killed) as well as details on the relocation site. Auckland Council shall be provided with a copy of the report within 15 days of completion of dewatering.

Fish records will also be sent to Earth Sciences New Zealand (previously NIWA) to be included in the New Zealand Freshwater Fish Database.

3.3 Permits

Bioresearches holds a permit that allows persons or agencies to take aquatic life and relocate it to a suitable habitat where this is necessary or required to mitigate adverse effects of habitat modification to the aquatic life. The National Fish Translocation permit is provided in Appendix A of this FMP.

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Methodology to survey and monitor New Zealand mudfish species. CBER Contract Report 104. Department of Conservation and University of Waikato, Hamilton. 60pp

Appendix A: NFT Permit

**Fisheries New Zealand**

Tini a Tangaroa

File Ref: NFT 422

Bioresearches Group Limited
PO Box 2027
AUCKLAND 1140

AUTHORISATION pursuant to section 26ZM(2)(a) of the Conservation Act 1987 is given to:

Bioresearches Group Limited

Species to be transferred:	Any native freshwater aquatic life.
To capture/transfer from:	Any freshwater waterbody (as defined in the <i>Conservation Act 1987</i>) in New Zealand.
To release to:	Appropriate freshwater waterbodies in the same catchment ¹ as the capture/transfer site.

This authorisation is valid from the date of signature to 8 August 2028, subject to the following conditions:

Inclusions and limitations

1. This generic authorisation is limited to projects/transfers for the purposes of;
 - a) investigative research and monitoring of environmental effects;
 - b) mitigating the environmental effects of habitat modification; and
 - c) addressing the effects of structures impeding the passage of aquatic life.
2. This generic authorisation is limited to use for any project involving relocation of aquatic life where the aquatic life is caught using non-destructive methods and is transferred as soon as practicable within the same waterbody, catchment¹ or flood plain.

Capture and release sites

3. The capture and release sites must be as close as possible while ensuring the transferred aquatic life is removed from potential harm.
4. The release sites must be connected to and exchange water with, or be in the same waterbody, catchment¹ or flood plain as the capture site.
5. There must be no permanent barriers to the passage of aquatic life that would

¹ Catchments defined in the map series published by the Ministry for the Environment in 2010 from the New Zealand River Environment Classification (Snelder *et al.*, 2004).

preclude the target aquatic life from moving between the capture and release sites (this provision does not apply where the capture site does not continue to be a water body, e.g., reclamations).

6. The release site must have appropriate habitat for the aquatic life to be transferred to as determined by a suitably qualified ecologist.

Husbandry and fishing methods

7. All aquatic life must be released in appropriate numbers to ensure the best ecological outcomes for the release site. For instance, numbers must be such that they reduce the likelihood of predation of existing native populations at the release site, and that they are within the system's carrying capacity (e.g., there is adequate food supply).
8. The handling, holding, breeding, euthanasia and transport of aquatic life must meet the obligations set out in the *Animal Welfare Act 1999* and relevant provisions of codes of welfare including the code of welfare for transport. The aquatic life must have access to sufficient food and must not be overcrowded to the point that their welfare is compromised.
9. Non-destructive capture methods (e.g., netting, trapping or electric fishing) appropriate to the site and situation that minimise stress and harm to aquatic life must be used.

Biosecurity measures

10. The health of all fish must be visually assessed during capture to ensure no pest species or aquatic plants are transported with the fish.
11. Where necessary to mitigate stress on fish, water in transport tanks may be from the capture site. In which case, fish are to be removed from the transporter tanks using a dip net, placed into a holding tank at the release site and the water and fish inspected for any unwanted plant, zooplankton or other animal material alien to the receiving environment prior to release.
12. In all instances, water in holding containers prior to release of the fish must be from the receiving environment, town supply water (dechlorinated if necessary), bore water or collected rain water. The water must not be from a source potentially contaminated with plant, zooplankton or other animal material alien to the receiving environment and must be clear enough to easily view the fish.
13. Water and other material in the holding containers, transport vessels and observation tanks shall be disposed of through an approved wastewater system, or to land where there is no runoff to any waterbody, or be returned to the waterbody of the collection site.
14. Directly prior to release, fish to be transferred must be inspected for obvious signs of disease (e.g., lesions) whilst in holding tanks/containers. Fish that are affected by disease, obviously in stress, and unlikely to survive must be humanely

euthanised.

15. Notwithstanding the above conditions, the authorisation holder must notify the Ministry for Primary Industries (MPI) exotic pest and disease hotline 0800 80 99 66 (request an Aquatic Incursion Investigator) should significant mortality (i.e., more than 5%) or abnormally high numbers of distressed, diseased, or moribund fish occur. In that instance, the authorisation holder must retain and chill the affected fish for MPI investigation unless otherwise advised by MPI. The remaining fish and water must be retained and disposed of as instructed by MPI.
16. All appropriate measures must be taken to reduce the risk of transferring notifiable, unwanted or pest organisms² between capture and release sites including:
 - a) where possible, releasing aquatic life downstream of the capture site;
 - b) if releasing between water bodies or releasing upstream, taking additional measures to prevent the release of pest material at the release site;
 - c) visually assessing the aquatic life during capture to ensure no pest species or aquatic plants are transported;
 - d) humanely euthanising any aquatic life that is a recognised pest within the region in which the relocation is occurring;
 - e) paying special attention to ensure didymo is not transferred to locations where it is currently not present (i.e., no relocation of aquatic life from a site known to have *didymo* to one known not to have *didymo*) and applying the Check, Clean, Dry protocol (available at <https://www.mpi.govt.nz/travel-and-recreation/outdoor-activities/check-clean-dry/>);
 - f) To mitigate the possibility of plant, zooplankton or other animal material from a release site being transferred to other locations, all equipment used in the transport, holding and release of aquatic life should be treated, as outlined below, before being used again:
 - i. all non-fibrous (metal and plastic) smooth surfaced equipment is to be thoroughly cleaned using freshwater (chlorinated town supply water, bore water or collected rain water);
 - ii. any non-fibrous smooth surfaced equipment that can retain water such as under seals and hollows within handles, etc., must be dismantled in such a way that all surfaces can be thoroughly cleaned using freshwater (chlorinated town supply water, bore water or collected rain water);

² Unwanted means "Unwanted aquatic life" as defined in the *Fisheries Act 1996*. Pest organisms means those listed in the regional pest management strategy of the region the biota relocation is within, or those listed in the National Pest Plant Accord in the aquatic plant category.

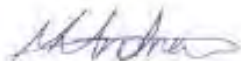
iii. all other equipment must be:

- immersed for a minimum of 30 seconds, in a water bath heated to at least 50° C; or
- immersed in water, for a minimum of five minutes containing at least 35 g of sodium chloride per litre.

General conditions

17. The transfer and release of aquatic life must be conducted by a suitably qualified ecologist operating under a valid special permit for the purpose of relocating aquatic life (section 97(1)(c) of the *Fisheries Act 1996*).
18. The authority to take aquatic life under this authorisation does not preclude the authorisation holder from obtaining any other approvals for the taking, possession, transfer or retention of any aquatic life under any legislation or regulations administered by other authorities.
19. The permit holder must supply a brief annual report to Fisheries New Zealand giving the date, capture and release locations, reason for transfer, and estimated number of fish by species transferred, sent to specialpermits@mpi.govt.nz. This information can be aligned and included within the appropriate special permit annual report.
20. Fisheries New Zealand may at any time amend, add or revoke any conditions to this transfer authorisation, or revoke this transfer authorisation, by notice in writing (including email) to the authorisation holder.

In exercise of powers delegated to me pursuant to the *Public Service Act 2020*.



Monique Andrew

Director Verification and Operations

Dated at Wellington on 4 August 2023

APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

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5 Closure

5.1 Post Closure Management Plan

5.1.1 General

This section outlines the procedures for closing the landfill, and aftercare following the closure of landfill which is normally for 30 years. This also covers the requirements of the Post Closure Management Plan (PCMP) as required by [Condition XX]. The PCMP will be updated regularly as required, and will seek AC approval prior to implementation.

The plan covers each aspect of post-closure care and is intended to demonstrate what is envisaged in terms of post-closure care at the time of facility opening. It is expected that as operation of the landfill progresses and further experience is gained with site conditions, that requirements in respect of some aspects of post-closure care may change. Furthermore, as the local community becomes involved with the facility through the Community Liaison Committee, then further options for the specifics of the site's end use may be identified and may lead to some modifications to the final planting and landscaping arrangements, provided these are to the approval of the regulatory authorities and the Company.

Some of the consents will expire during the aftercare period and will have to be renewed. This will be the responsibility of the aftercare manager.

5.1.1.1 Objectives

The objectives of Post Closure Plan are, to:

- To provide the waste pile with a proper clay cap which will minimise long term infiltration of rainfall into the landfill (and hence leachate generation) and which will minimise fugitive gas emissions;
- To provide the waste pile with a gas extraction and disposal system which will operate for the duration of the post closure period (also referred to as the 'aftercare period').
- Ensure the final landfill surface remains in a stable, vegetated condition, in accordance with the planting plan shown in Section 5.1 Appendix A.
- Minimise long term infiltration into the landfill and hence leachate generation.
- Minimise gas migration through provision of a low permeability compacted earth cap and continued gas extraction and disposal, for the duration of the post closure period.
- To provide a framework of maintenance, monitoring and reporting activities which will ensure proper engineering and environmental performance of the facility following the completion of landfilling and closing off of the final cover layer.

The objectives of documentation are:

- To provide records for safe future land management.
- To provide records for future as-yet unknown use of the waste pile.

5.1.1.2 End Use

It is intended that the site's end use be one of passive recreation. Local community input will be sought during the life of the facility, through the Community Liaison Committee, to ensure that the final development plan optimises the potential for recreational uses desired by the local community, provided that the technical and safety considerations associated with the landfill's operation and post-closure care are not compromised.

At the time of the initial consents being granted, possible recreational activities which could be catered for at the site following closure include:

- bridle trails
- fitness and jogging trails
- cycling tracks
- open parkland

5.1.2 Closure

5.1.2.1 Bond

The bond was established on 30 April 1993.

Periodically during the life of the landfill, and at the time of landfill closure, the site management may seek to revise the amount of the bond according to the revised amount of work required to close the landfill and to continue with post-closure care. Also, the AC may instigate a revision. It is expected that the bond will finally be cancelled at the time of 'hand-over' at the end of the aftercare period.

During 2026 the bond was reviewed, to determine if it was appropriate when allowing for the continued operation and expansion of the landfill. The associated report¹⁸ concluded that the current bond is appropriate (conservatively high). WMNZ will continue to re-assess the status of the residual risk of Redvale Landfill including, if required, calculating a new bond amount.

5.1.2.2 Closure checklist

Documentation will be assembled at the beginning of the Closure period as follows.

#	Topic	
	Closure documentation • <i>Collation of records of environmental monitoring and audits</i> • <i>Report on status of leachate, gas, surface water and site infrastructure</i> • <i>Cell construction records to be archived</i> • <i>Waste records to be archived</i> • <i>Final cap records to be archived</i> • <i>Risk assessment</i>	
	Closure Management Plan • <i>Intended future use</i> • <i>Management structure</i> • <i>Projected aftercare period</i> • <i>Site ownership</i> • <i>Consent status and renewal schedule</i> • <i>Restoration programme and controls</i> • <i>Maintenance programme</i> • <i>Monitoring programme</i> • <i>Inspection programme</i>	

¹⁸ Tonkin & Taylor Ltd (2026), Bond Assessment Report. *Redvale Landfill Expansion*

Redvale Landfill Management Plan

	• <i>Communications lines - owner / manager / contractors / Council / community / Mana Whenua</i> • <i>Complaints procedures</i> • <i>Emergency management</i> • <i>WorkSafe requirements</i> • <i>Record keeping</i> • <i>Reporting programme</i>	
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5.1.2.3 Final Contour

The Site Development Plans (Section 1, Appendix A) shows post-settlement contours for the waste pile. The overall refuse mass will be shaped to match the specified final contours, except for an allowance for future settlement as described in Section 3.3 Cover of this LMP.

The final slope on the surface of the landfill post-settlement is to be an average of not steeper than 1(vertical): 3(horizontal).

5.1.2.4 Final Cover

Final cover will be placed over the entire waste pile in accordance with Section 3.3 (Cover) of this LMP. The pertinent issues at the time of closing the landfill will include:

- objectives
- settlement
- erosion resistance
- gas
- vegetation
- timing
- thickness
- compaction standard
- cap drainage

5.1.2.5 Buffer Zone

The strip of land between the footprint and the boundary will remain essentially at contours and levels that existed prior to development, except where otherwise indicated in the Site Development Plans.

The most significant alteration to original ground levels will be where permanent sedimentation ponds have been formed.

5.1.2.6 Buildings

At the time of closing the landfill and beginning the aftercare period, a number of buildings are expected to remain, including:

- flare site
- main office
- workshop
- dams and dam structures
- climate station
- roads
- site water supply installations

A number of buildings will eventually become obsolete (but may be retained for alternative purposes to be determined nearer the time), including:

- amenities building for landfill operators
- wheel wash

5.1.2.7 Fencing

The permanent dog-proof security fence around the perimeter of the site has been maintained as at 2016.

The fence details during the aftercare period may remain undefined until then.

5.1.2.8 Security

Fencing arrangements and the controlled single point of access will remain in effect up to the point of closure.

5.1.2.9 Final inspection and Report

Following closure of the landfill for refuse disposal, there will be a short period of completing final cap and restoration. The landfill would then be declared fully “closed” and the aftercare period would commence. At this time i.e. ‘closure’, site management will review:

- Historic environmental monitoring, and proposed aftercare monitoring
- Status of leachate, has and surface water provisions.
- whole of life operational records to be retained
- end use
- status of consents
- risk

The risk assessment may follow the guidelines provided by MfE¹⁹.

The final closure report will contain information for aftercare management including

- Inspection programme
- Monitoring programme
- Maintenance programme
- Consent and legal compliance obligations

5.1.2.10 Aftercare Commencement

The aftercare period will begin when the landfill ceases disposing refuse. Placement of final cover and miscellaneous closure activities may continue to take place during the first months of the aftercare period before hand-over to the aftercare manager.

The aftercare period will be for at least 30 years.

¹⁹ Ministry for the Environment, May 2001: A Guide for the Management of Closing and Closed Landfills in New Zealand.

5.1.3 Aftercare

5.1.3.1 Overview

It is proposed to extend the landfill operating life to the end of 2036. The post closure aftercare period will be for a minimum of 30 years.

The overall scenario at the time of closure is one of a mature site, with the bulk of the landscaping, final cover and planting well established and self-sustaining. Leachate, gas and monitoring systems for the bulk of the site will be in routine operating mode.

In the final area of landfilling, the final cover, and gas and leachate collection systems will be recently installed and will need to be subject to a higher level of maintenance for a few years immediately following closure.

5.1.3.2 Final Closure Checklist

#	Topic	
	Final Closure documentation • Collation of records of environmental monitoring and audits • Report on status of leachate, gas, surface water and site infrastructure • Verification of records that were archived at Interim Closure re cell construction and waste • Final cap records to be archived • Risk assessment	
	Final Closure Management Plan (updated) • Agreed future use • Management structure • Projected aftercare period • Site ownership • Consent status and renewal schedule • Maintenance programme • Monitoring programme • Inspection programme • Communications lines - owner / manager / contractors / Council / community / Mana Whenua • Complaints procedures • Emergency management • WorkSafe requirements • Record keeping • Reporting programme	
	Independent review	
	Archive of records - where and how	
	Rationalisation of land ownership	
	Definition of liabilities	
	Insurance	

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	Decommissioning of stormwater ponds	
	Low-care installations for passive gas and leachate treatment.	
	Aftercare maintenance programme, responsibilities & contract • <i>Gas infrastructure</i> • <i>Leachate infrastructure</i> • <i>Stormwater system</i> • <i>Vermin control</i> • <i>Planting</i> • <i>Fencing</i> • <i>Paths</i> • <i>Roads</i>	
	Aftercare monitoring programme, responsibilities & contract • <i>Gas</i> • <i>Leachate</i> • <i>Groundwater</i> • <i>Surfacewater</i>	
	Emergency provisions	
	Future communication channels for all interests	
	Access control arrangements	

5.1.3.3 Responsibilities

The site owner (Waste Management) will be responsible for full care and environmental maintenance of the facility, for a minimum of 30 years following closure. During landfill operation many of the activities which will need to be continued during the post-closure period will be being implemented as part of the routine operational procedures (e.g. landfill gas and leachate management).

Prior to the final closure of the facility, the Company will identify a Maintenance Supervisor (MS), for the facility's post-closure period. This Supervisor is to be appropriately qualified. The MS will be actively involved in post-closure care operations and maintenance of the leachate, gas collection and monitoring systems at the site for at least one year and will be thoroughly trained in all safety and contingency aspects of the facility's operation.

Duties of the Maintenance Supervisor:

- to report at regular intervals (to be determined) to the Landfill Manager prior to landfill closure and to WMNZ's designated manager responsible for the facility in the post-closure stage, in relation to maintenance and monitoring activities
- to ensure that routine environmental monitoring is undertaken to AC requirements and that the records and reporting procedures associated with the monitoring are regularly and properly implemented
- to regularly inspect the site in accordance with a defined programme, covering all permanent structures, environmental monitoring systems and landscaping/planting areas
- to liaise with AC as appropriate in relation to the environmental monitoring programme and to report any anomalous test results or findings promptly to the relevant authorities
- to implement the programmes of routine site care and facility maintenance and to review these regularly with the AC.
- to record any complaints received from local residents following facility closure and report these immediately to WMNZ
- to prepare regular reports and data summaries.

- to arrange and administer all maintenance contracts associated with site maintenance, leachate and gas disposal
- to conduct any other duties which the Company may require from time to time.

Maintenance activities related to maintaining the facility grounds and surrounds will be well established by the time final closure occurs. Generally, these activities will be subject to maintenance contracts, although following closure, some activities may be undertaken by the MS.

The following sections summarise regular maintenance activities and requirements, with specific requirements for the final Phase area (which will be in an immediate post-closure state) identified as appropriate. It is expected that the following requirements will be refined as a result of facility operation over its design life and that a matrix of maintenance activities will be developed, for integration with the Compass programme for environmental management.

5.1.3.4 Landscape and Planting

All the matters related to landscaping and mitigation planting are discussed separately in Section 3.11 Landscape Mitigation and Restoration Plan.

5.1.3.5 Gas

Maintenance requirements for the gas collection system are set out in Section 5.1 Appendix C.

Maintenance activities in relation to the gas collection system will be summarised in the annual maintenance report.

Gas generation from the landfill will develop progressively during filling. Gas generation rates are expected to peak approximately 1 year after the completion of refuse filling, and gas flows will continue for several years, halving after about 10 years.

The specifics of this monitoring programme will be confirmed with Auckland Council prior to landfill closure, based on gas monitoring experience gained at the site during the operational phase.

5.1.3.6 Leachate

Maintenance requirements for the leachate collection system are set out in Section 5.1 Appendix D.

Maintenance activities in relation to the leachate collection system will be summarised in the annual maintenance report.

During the aftercare period leachate management actions will be subject to approval of the PRP and Auckland Council. Leachate pumping is expected to continue as follows:

- Leachate will be pumped for the first five years of the aftercare period (years 1 to 5) to maintain leachate levels at less than either 11 m head on the liner or 51 mRL in the south eastern corner of the landfill. This criterion will aim to keep leachate levels below the surrounding regional ground water level and to allow the leachate strength to abate with time.
- Leachate will be pumped for the remaining aftercare period (years 6 to 30) only as required to maintain leachate levels at less than either 11 m head on the liner or 51 mRL in the south eastern corner of the landfill. This criterion will aim to keep leachate levels below the surrounding regional ground water level i.e. to maintain inward hydraulic gradient of ground water, and to provide a significant margin before any leachate breakout from full waste pile saturation in the very long term.
- Leachate pumping may cease altogether at the end of the aftercare period.
- A contingency method of disposal will be available for any leachate in excess of that specified in resource consent condition through off-site treatment.

Leachate pumping may cease altogether at the end of the aftercare period.

5.1.3.7 Groundwater

Groundwater monitoring provides a key long-term overview of the landfill's performance as a containment cell, and hence it is anticipated that groundwater monitoring will run for the full term of the post-closure care (aftercare) period, at a monitoring frequency to be determined as a result of performance and groundwater response during the operational phase.

5.1.3.8 Surface Water, Drains and Ponds

Maintenance requirements for the site drainage system are set out in Section 5.1 Appendix D.

Maintenance activities in relation to the drainage system will be summarised in the annual maintenance report.

Surface water monitoring relates predominantly to the operational and immediate post-closure phases, when the greatest potential exists for surface water impacts as a result of siltation or leachate-related contamination from the operational and site facility areas. However, while it is envisaged that surface water monitoring frequencies may gradually be able to be reduced following final closure of the landfill and completion of cover rehabilitation, ongoing surface water monitoring will be required in watercourses or at sedimentation pond outlets until the ponds are decommissioned to:

- mitigate against the possibility of localised or undetected leachate breakout from final cover
- ensure that the cover layer has a stabilised growth layer that is resistant to erosion
- provide assurance that any ongoing activities and water management are not adversely affecting local watercourses.

The five main sedimentation ponds may remain in place permanently. If they are to be decommissioned, a separate study into the effects and method of decommissioning will be undertaken. Consents would be either renewed or surrendered.

5.1.3.9 Waste Pile

At the time of final closure, the bulk of the expected landfill settlement and resulting cover maintenance requirements will have been completed. A significant amount of settlement and cover maintenance work will also have been completed in the final Phase area.

A regular cover inspection and maintenance programme will be implemented as set out in Section 5.1 [Appendix D](#)

The frequency of inspections and maintenance may vary according to the age of the cover and maturity of the planting on it.

Given the expected low permeability of the cap materials, gas penetration is likely to be low. However, any hotspots showing evidence of gas penetration up through the cover will need to be repaired.

Cap drainage will be carefully monitored and drainage swales maintained to mitigate the effects of:

- Uneven settlement (requiring adjustment of swale gradient/surface).
- Localised erosion (due to uneven grass strike for example).
- Cracking (due to settlement or desiccation).

In areas of drainage swale construction, final cap thickness will be increased to a minimum of 1.0 m to mitigate the effects of settlement induced cracking. In areas where experience shows drainage

swales may be prone to erosion or de-vegetation, appropriate additional protection measures will be implemented (e.g. riprap, matting or close turfing).

5.1.3.10 Access Road and Bridge

The access road and Rangitopuni Stream Bridge will be inspected on an annual basis and remedial works programmed to address any defects which may develop, with particular attention to be paid to:

- maintenance of the seal surface on the access road
- maintenance of roadside drains and culverts
- the condition of the bridge structure and railings
- signage at the Dairy Flat Highway intersection

Maintenance requirements for the site perimeter and main access roads and associated crossings are set out in Appendix D.

Maintenance activities in relation to the site roading system will be summarised in the annual maintenance report.

5.1.3.11 Safety and Security

Access to sensitive areas of the site like gas and leachate installations will be controlled by fences and gates.

Benign parts of the site may eventually have public access provided that installations like gas well heads and high dam structures are fenced so as to have only controlled access.

All fences will be maintained in good, secure condition, for as long as is required by AC into the post-closure care (aftercare) period. The full length of the perimeter fence and culverts beneath will be inspected annually.

5.1.3.12 Community Liaison

The consent conditions do not specify the life of the Community Liaison Committee. The site management will support the committee for the aftercare period.

5.1.3.13 Handover to Local Authorities

At the end of the aftercare period and following any reviews and extensions, a hand-over plan will be agreed between the parties involved in site ownership. The hand-over plan would be expected to cover assignment of responsibility for the facility to the relevant authority, and in particular:

- Transfer of land titles
- Transfer of performance records and archive data
- Transfer of insurances and applicable bond balances (if any)
- Refunding of any bond balances to the company (if applicable)
- Confirmation of ongoing monitoring and maintenance requirements

5.1.3.14 Surrender of Consents

Consents will be held either until expiry or until they are no longer required for the forecast operations.

5.1.3.15 Ongoing Monitoring Programme

At the time of closure, the database of monitoring data will have grown from its current size, so this LMP will not try to pre-empt any future findings and recommendations for aftercare monitoring regimes.

At this stage, the Closure Management Plan (including aftercare) will aim only to identify the principles of ongoing monitoring. The detail of the actual aftercare monitoring programmes will be agreed with Auckland Council at the time of landfill closure, and at subsequent times when appropriate and agreed.

5.1.3.16 Local Authority Liaison

An appropriate level of ongoing local authority liaison will be required during the post-closure period to supplement the monitoring data and reporting procedures. Responsibility for maintaining ongoing dialogue with the relevant authorities will lie with the Maintenance Supervisor.

Exact requirements for ongoing liaison will need to be determined closer to landfill closure, with the frequency of contact, requirements for regular meetings etc, likely to be largely determined by the environmental performance of the facility during the operating phase.

5.1.3.17 Reporting

Routine reporting of observations, monitoring results and maintenance activities will be required during the post-closure care period. Final procedures for reporting will need to be agreed by the authorities and site management prior to landfill closure.

An annual maintenance report will be prepared for distribution to AC, and to any other authorities that may have jurisdiction over particular activities.

Topics for the annual maintenance report will include:

- Summary of inspections
- Summary of monitoring
- Summary of maintenance

The attached schedules describe the types of activities for each of the above three categories.

5.1.3.18 Record Keeping

A selection of operating records will be held for the full aftercare period. They will be identified at the time of closure.

5.1.3.19 Final Report

At the end of post-closure aftercare period, WMNZ will produce a report to demonstrate that the landfill no longer presents any undue or unacceptable risk to the environment to the satisfaction of AC and/or any other appropriate regulatory authority. The aftercare period may extend longer if the report finds that the landfill is still may pose a significant risk to the surrounding environment.

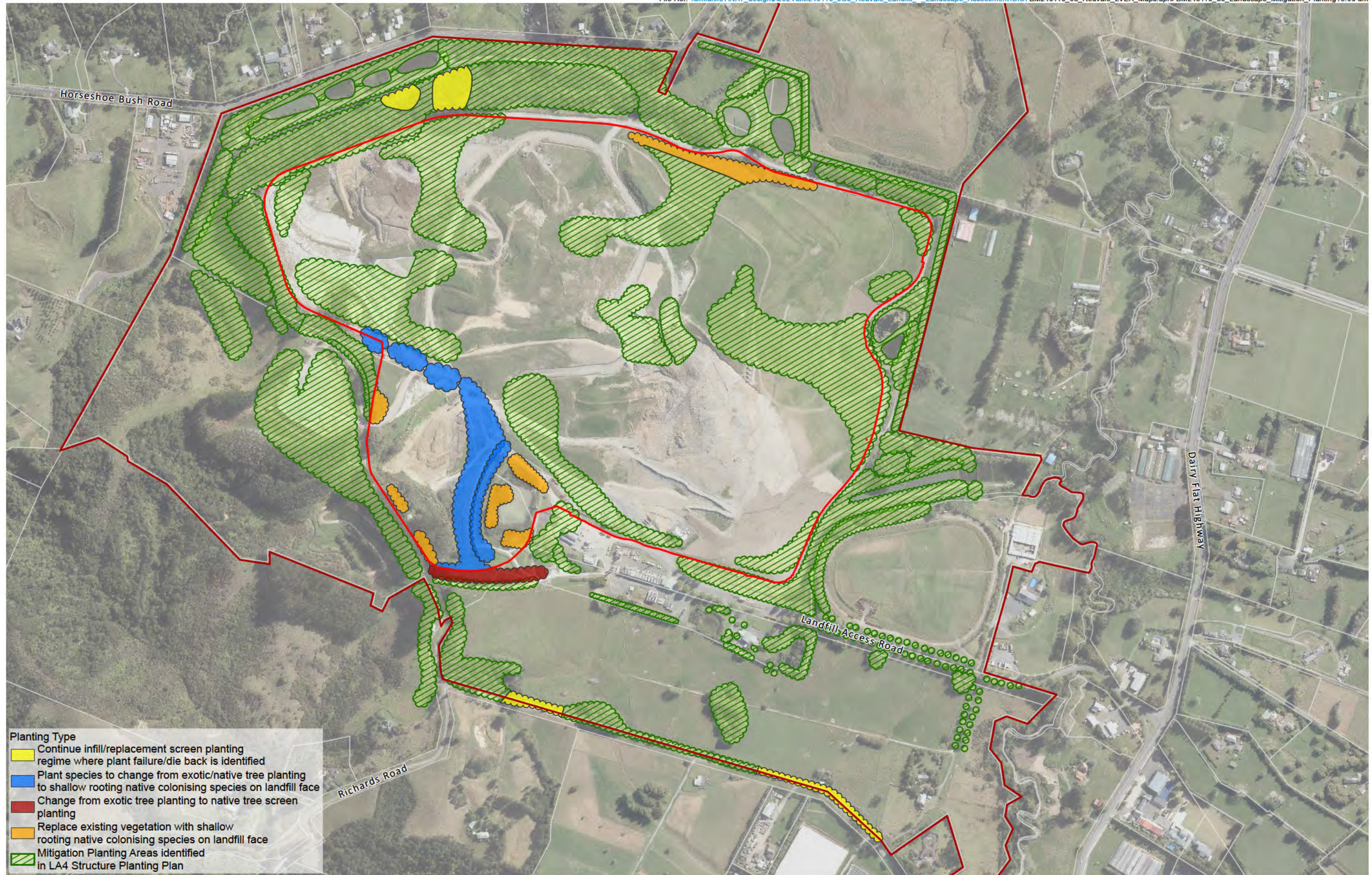
5.1.4 Contingency

Response limits and contingency action plans will continue to follow the provisions of the relevant Sections in this LMP.

The Site Emergency Management Plan will continue to provide guidance on how to respond to emergencies and provisions for emergency preparedness.

Appendix A Structure Planting Plan

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Appendix B 2026 Bond Assessment Report

[Attached to application]

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Appendix C Closure Checklist

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Waste Management

Figure: 5.2.8.4

Fig 5.2.8.4 closure checklist

Appendix D Aftercare Checklist

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**Waste
Management**

Figure: 5.2.8.5