Appendix Q Ecology

Technical Memorandum

Subject:	ARL Transition Project Ecology Assessment	**Reference No:**	67602
Authors:	Chris Wedding, Treffery Barnett, Michael Anderson	**Date:**	13 November 2025

1 Introduction

Bioresearches and Habitat NZ has been engaged by WM New Zealand (WMNZ) to provide technical assessments to understand the ecological effects from a proposal to reconsent Redvale Landfill, north of Auckland.

Redvale Landfill is currently scheduled to cease accepting waste in December 2028 and due to a delay in the authorisation and establishment of the replacement Auckland Regional Landfill (ARL) a transition plan is required. The proposal is to continue sending the current residual waste (around 600,000 tonnes per year) to Redvale Landfill, beyond the existing consent limit of December 2028. This would require new resource consents at Redvale Landfill.

To accommodate the on-going placement of waste at Redvale Landfill beyond 2028, the proposed works will involve the following:

- **Revised final surface profile of the existing landfill:** The current final design landfill ground profile varies but is less than 1V:3H across the footprint. That ground profile will be steepened up to a maximum grade of 1V:3H, to allow placement of additional waste within the existing landfill footprint. Bunds, varying in height between 2 and 6 m, will be constructed along the eastern and southern boundaries to accommodate the required additional waste volumes.
- **Class 2 extension:** The landfill is proposed to be extended to the south-west of the current landfill boundary, within the area currently occupied by the now decommissioned Managed Fill and Pond 6. The extension will comprise the excavation and lining of a new landfill cell, allowing the acceptance of waste that meets the proposed Class 2 waste acceptance criteria, which will be constructed in a manner similar to the already constructed cells within the current landfill.
- **Relocation of ancillary activities:** the relocation of ancillary activities to allow for the placement of waste.
- **Sediment Retention Ponds:** The removal and filling in of Sediment Retention Pond 6 and the Office Pond while enlarging Pond 1 to capture and treat the stormwater from these catchments.

This memo provides an outline of the initial findings of the Freshwater Ecology, Terrestrial Ecology and Wildlife Hazard Assessments and have been prepared for inclusion in an application for Ministerial referral of the project under the Fast-track Approvals Act 2024. Specifically, this technical memorandum responds to the requirements under section 3.4 of the Fast-track Approvals Referral Application Form. A full description of the draft proposal is included in the accompanying information attached to the application form for the referral.

2 Site and project context

A general description of the site and surrounding locality is included in the accompanying information as part of the referral application. The following elements of the site and project are key to the ecological assessment:

- **Pond decommissioning and drainage realignment** associated with the Class 2 extension, resulting in the removal of two artificial ponds (including Pond 6) and realignment of minor overland flow paths.
- **Vegetation clearance** of approximately 2.8 ha of mixed exotic and planted native vegetation within the existing operational envelope.
- **Disturbance of fauna habitat**, including potential effects on native lizards (*Oligosoma aeneum*) and locally breeding waterbirds such as dabchick (*Poliocephalus rufopectus*).
- **Continuation of landfill operations within approximately 2 km of North Shore Aerodrome**, requiring ongoing wildlife-hazard management to ensure bird-strike risk remains controlled.
- **Maintenance of existing leachate and stormwater systems**, ensuring compliance with applicable discharge consents and protection of downstream freshwater quality in the Rangitopuni Stream. It is understood that it is proposed that any replacement consent will be the same as the existing consent limits on site.

These project components define the scope of ecological assessment for freshwater, terrestrial, and wildlife-hazard values considered in this technical memorandum.

3 Summary of findings

This technical memorandum summarises the initial findings of three specialist ecological assessments done to date by Bioresearches and Habitat NZ. These assessments have evaluated the existing ecological values, potential impacts and potential wildlife hazards (i.e. a bird strike risk assessment for landfill birds to North Shore Airport).

Each discipline has been assessed in accordance with the *EIANZ Ecological Impact Assessment Guidelines (2018)* for New Zealand, and relevant national policy statements, *NPS-FM 2020 (amended 2024)* and *NPS-IB 2023*.

The Project Figures attached to the referral application illustrate the spatial extent of the works, including stormwater realignment, fill areas, and ecological management zones.

4 Freshwater Ecology

4.1 Introduction / Context

Freshwater habitats within the Redvale Landfill footprint comprise a network of artificial ponds and short intermittent flow paths associated with stormwater management infrastructure. These features include six constructed ponds, none of which meet the NPS-FM (2020) or Auckland Unitary Plan – Operative in Part (AUP) definitions of a natural lake or wetland, and a single intermittent tributary of the Rangitopuni Stream along the site's south-western margin. No intermittent or permanent streams were observed within the operational area of the WMNZ site. No natural inland wetlands were identified within or adjacent to the operational footprint during detailed field investigations.

The proposed landfill extension and re-profiling works will require the infilling of two constructed ponds (Pond 6 and the Office Pond located to its east) and localised diversion of stormwater drainage. Because these features support limited aquatic communities and hydrological connectivity to the Rangitopuni Stream, an initial focused preliminary freshwater ecological assessment has been undertaken to evaluate existing ecological values and to guide potential mitigation, including fish-salvage and relocation measures, in accordance with national and regional policy requirements.

4.2 Assessment Methodology

Preliminary freshwater assessments included desktop review and on-site ecological valuations and classification of aquatic habitats on the WMNZ site (focusing primarily on the expansion location, i.e. south-western site area), complemented by water quality, sediment quality and biological surveys at four (Spring) / five (Autumn) monitoring sites in or near the adjacent Rangitopuni Stream. Stream reaches and ponded areas were classified following AUP (E1.3) definitions for permanent, intermittent, and ephemeral watercourses, and the Ministry for the Environment (2022) Wetland Delineation Protocols. Biological sampling followed nationally recognised methods with:

- macroinvertebrates collected using the soft-bottomed, semi-quantitative C2 protocol of Stark et al. (2001) protocol), with MCI and SQMCI indices calculated to characterise habitat quality;
- macrophytes were surveyed along random transects to estimate percentage cover of submerged and emergent vegetation, and native fish communities were sampled in general accordance with the Joy et al. (2013);
- protocol using a combination of marmite-baited Gee-minnow traps and fine-meshed fyke nets deployed overnight at each site; and
- Spot measurements of basic water quality parameters were taken, and water samples were collected and sent to Hill Laboratories for analysis of a range of parameters that can indicate leachate or contamination, supplementing the comprehensive historic and current water quality sampling programme in and near the Rangitopuni Stream carried out by WMNZ.in and near the Rangitopuni Stream carried out by WMNZ.

4.3 Existing Environment and Ecological Values

This initial ecological values assessment confirms that aquatic habitats within the project site are heavily modified and of generally low natural character. The single intermittent tributary to the Rangitopuni Stream (Site 4), was a combination of intermittent stream and exotic wetland, which exhibited shallow silty substrates, patchy shading, drying to isolated pools over summer, typical of shallow intermittent habitats in Auckland.

Freshwater macroinvertebrate communities at all Rangitopuni Stream sites showed poor diversity, with pollutant-tolerant species such as freshwater snail and damselfly dominating the sites with a relatively low proportion of sensitive EPT[1] taxa.

Netting and trapping for native fish was carried out at four sites in the Rangitopuni Stream, a tributary to the Rangitopuni Stream, and WMNZ Ponds 1, 2, 3, 4 and 6. The native fish population in the ponds was exclusively shortfin eel (*Anguilla australis*). Native fish caught in the Rangitopuni Stream were shortfin and longfin eel, (*Anguilla dieffenbachii*), common bully (*Gobiomorphus cotidianus*), Crans bully (*Gobiomorphus basalis*) and banded kokopu (*Galaxias fasciatus*), all of which were caught immediately downstream of the site.

Overall, freshwater ecological values on the WMNZ site have been initially assessed as *low to moderate* in accordance with EIANZ (2018) criteria.

[1] EPT taxa are Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)

4.4 Assessment of Potential Effects and Mitigation

Potential effects from the landfill extension relate primarily to pond infilling, including the disturbance on aquatic fauna during salvage (where this is undertaken) and the temporary sediment generation, including the potential cumulative degradation of downstream water quality during earth working activities during both construction and landfilling activities.

The loss of aquatic habitat would be confined to the artificial ponds on site, which are proposed to be filled in to enable the expansion of the landfill. Without mitigation, short-term adverse effects could occur through increased turbidity during de-watering or accidental entrainment of fish.

Long-term effects from altered runoff quality or leachate pathways are addressed under existing discharge consents and the landfill's stormwater and leachate management system.

During construction, mitigation measures are proposed to include the implementation of the fish capture and relocation plans, where appropriate, primarily to reduce adverse effects on the shortfin eels during the construction activities at the ponds (inclusive of infilling of the office pond and Pond 6 and the expansion of Pond 1). These protocols will include details on methods such as trapping, netting, and relocation to the Rangitopuni Stream, in an area which provides shaded pools, woody debris, and flow diversity. Pumps used for de-watering will be screened with 3 mm mesh, and pond draw-down will proceed gradually under ecological supervision.

Dabchick-specific protocols are proposed, including requiring works in Pond 6 to occur outside the dabchick breeding season (June–March) unless an ornithologist confirms the absence of nesting birds immediately prior to de-watering; and at other times an ornithologist should assess the ponds within 24 hours prior to commencement of the fish recovery to ensure no dabchicks are present.

To manage impacts from sedimentation during construction and landfilling activities, adaptive water-quality monitoring and sediment-control measures will operate under the landfill's existing Landfill Management Plan, ensuring compliance with the discharge limits which are proposed to remain consistent with the existing landfill consents.

4.5 Conclusions

Freshwater habitats within the Redvale Landfill project footprint are largely artificial, isolated, and support low ecological values. The only native fish recorded are shortfin eel, which are tolerant of disturbance. With implementation of fish salvage and relocation procedures, timing of works to avoid dabchicks, and continued application of established leachate and stormwater controls, residual adverse effects on aquatic ecology and downstream water quality are currently assessed as **Low** and **Very Low**.

5 Terrestrial Ecology

5.1 Introduction / Context

Preliminary terrestrial ecology investigations at the Redvale Landfill have been undertaken to determine baseline ecological values, evaluate potential effects of the proposed landfill extension.. These studies covered vegetation, avifauna (including wetland birds), herpetofauna, and bats across the existing landfill footprint, surrounding buffer land, and the proposed construction areas. The terrestrial environment at Redvale Landfill is typical of a highly modified landscape with long-established management practices in the Auckland region. It consists predominantly of exotic and young (≤10 years old) planted native vegetation, particularly maintained and rough grasses, some pine and constructed settling ponds.

5.2 Assessment Methodology

Desk-top reviews drew upon eBird, iNaturalist, and the Department of Conservation's (DOC) BioWeb Herpetofauna databases and DOC national Bat databases to confirm regional species distributions and inform potential presence of indigenous species.

Vegetation was mapped using a walk-through survey to delineate plant communities and search for any potentially present Threatened or At Risk (TAR) species as listed under Simpkins et al. (2022) and de Lange et al. (2023). Ecosystem classification followed Singers & Rogers (2017) for indigenous terrestrial and wetland ecosystems of Auckland.

Avifauna surveys were undertaken over multiple stages, using a combination of five-minute bird counts (5MBC) at ten fixed stations, playback lures targeting cryptic wetland birds, and ten-minute pond observations for dabchick and other freshwater species. Acoustic recorders targeting Australasian bittern were deployed at three locations for up to 23 days, consistent with O'Donnell & Williams (2015).

Lizards were surveyed using 116 Artificial Cover Objects (ACOs) following Lettink (2012) and nocturnal Visual Encounter Surveys (VES) along native forest and scrub margins.

Native bat surveys were conducted at the site and in the surrounding area using acoustic recorders at various times throughout the 2024-2025 year.

5.3 Existing Environment and Ecological Values

The landfill and its margins are dominated by exotic vegetation, mixed with planted native shelterbelts and small patches of regenerating shrubland. Vegetation communities were categorised as *planted native vegetation, mixed native–exotic scrub, exotic pine*, and *exotic grassland*; together these occupy the entire operational area. Most native vegetation consists of young plantings (≤10 years old) of common species such as *Coprosma*, *cabbage tree*, and *harakeke*, intermixed with invasive pasture grasses and weeds. Fourteen *TAR* plant species were recorded, including *kānuka (Kunzea robusta)*, *mānuka (Leptospermum scoparium)*, *kāpuka (Griselinia littoralis)*, *kauri (Agathis australis)*, *ngaio (Myoporum laetum)* and *kumarahou (Pomaderris kumeraho)*. Many are planted individuals rather than self-sown, and several are assessed as *At Risk – Declining* at the regional level but *Not Threatened* nationally. Several 'native' species are cultivar varieties and / or do not occur naturally within the Auckland Region. Consequently, the overall botanical value of the site is *low to negligible (Table 1)*.

Avifaunal surveys detected thirty-three species within 10 km of the site, of which nineteen may breed locally. Four *TAR* species were recorded on site during field surveys: the endemic dabchick (*Poliocephalus rufopectus*), black shag (*Phalacrocorax carbo*), little black shag (*P. sulcirostris*), and red-billed gull (*Chroicocephalus novaehollandiae)*. Dabchicks bred successfully on Ponds 1 and 6 during 2024–2025, with adults and chicks observed. Other native birds such as pūkeko, tūī, fantail, and kingfisher were common in low numbers, while exotic species, particularly mallard, Canada goose, and sparrow, dominated freshwater and grassland habitats.

Herpetofaunal surveys recorded three At Risk *copper skinks (Oligosoma aeneum)*, including a gravid female, within vegetation around the edges of the site. No geckos were detected from 9.7 person-hours of nocturnal search effort.

Bat detectors recorded no bat activity on site.

Given the site's modified nature and limited native ecosystem connectivity, the overall terrestrial ecological values are considered *low to moderate*. A summary of TAR species is provided in Table 2.

Table 1. A summary of the vegetation values on Site

Vegetation category	Category description	Value
Planted native vegetation	Native plantings appear along the margin of Pond 6 in the southwest corner of the site, and on the hill slopes. Several TAR species are found here, including kauri, mānuka and ngaio; and common native species such as harakeke, cabbage tree and Coprosma sp. The plantings are young (~10 years old), patchily distributed, and occur in narrow strips with weedy vegetation growing within the understory.	**Low**
Mixed native and exotic vegetation	This vegetation type consists of areas of pine forest with an understory of naturally regenerated native shrubs, ferns, or young trees interspersed throughout (e.g., mānuka, kānuka, māhoe, red mapou), and weedy species such as Chinese privet, blackberry, Japanese honeysuckle, pampas) throughout the edges and understory.	**Low**
Exotic vegetation	Pine sp. is the dominant species within this vegetation type, which exists in a large area SW of the Site, outside of the proposed works area, and narrow rows alongside several roads.	**Negligible**
Exotic grassland	Occurs where historic vegetation clearance and subsequent reseeding of grass has occurred; the majority of which is along the hillslopes of the landfill surrounding the landfill. The majority of grass on the landfill hill slope is managed, and comprises exotic grasses with weedy pasture species throughout.	**Negligible**

Table 2. A summary of the TAR species found on site during the survey period

Taxa	Common name	Regional Conservation status[2]	National Conservation Status[3]	EIANZ Value
Plants	Kānuka	At Risk - Declining*	Not Threatened	High
	Mānuka	Threatened - Vulnerable*	Not Threatened	Very High
Avifauna	Dabchick	Threatened - Critical	Threatened - Increasing	Very high
	Black shag	Threatened - Critical	At Risk – Relict	Very High
	Little black shag	At Risk - Naturally Uncommon	At Risk Naturally Uncommon	Moderate
Lizards	Copper skink	At Risk – Declining	At Risk – Declining	High

5.4 Assessment of Potential Effects and Mitigation

To support the project, the proposal requires infill and reclamation of two constructed ponds, clearance of approximately 0.8ha of low-value planted native vegetation, approximately 0.8ha of

[2] Simpkins et al, (2025); Melzer et al, (2022); Woolly et al, (2024).
[3] deLange et al, (2023); Robertson et al, (2021); Hitchmough et al, (2021).

low-value mixed native and exotic vegetation, and negligible value exotic managed grassland (Figure 3).

While copper skinks were not recorded within any areas of vegetation removal, there is some potential for this species to be present within those low to negligible value areas of impacted vegetation. Management for lizards, including developing appropriate protocols, would ensure that any effects on lizards within these potential habitats are **Low.**

Similarly, the habitat for terrestrial avifauna on-site is generally of low value because the (low value) native species using vegetation within the Site are likely to only use it on an intermittent basis for foraging and for limited breeding opportunities. Management in accordance with (and where applicable) appropriate Avifauna Protocols, or pre-clearance nesting surveys, would ensure any effects on birds within these potential habitats are **Low.**

One of the two potentially impacted ponds was used for breeding, and the other was assessed as having potential to be used. Other ponds within the WMNZ landholding were used for breeding or had the potential to be used. Loss of breeding habitat was assessed as low magnitude, and because dabchicks were not present at the site through winter, the ponds could be safely dewatered prior to breeding season without directly impacting any birds. This should be managed in accordance with (and where applicable) appropriate Protocols and would result in a **Low** overall level of effect.

Other TAR avifauna were not recorded using any of the vegetation or ponds within the project footprint, and potential effects on these species are considered **Negligible**.

These assessments are summarised in Table 3. The proposed landfill works are proposed to be carried out in stages from 2029 to 2036.

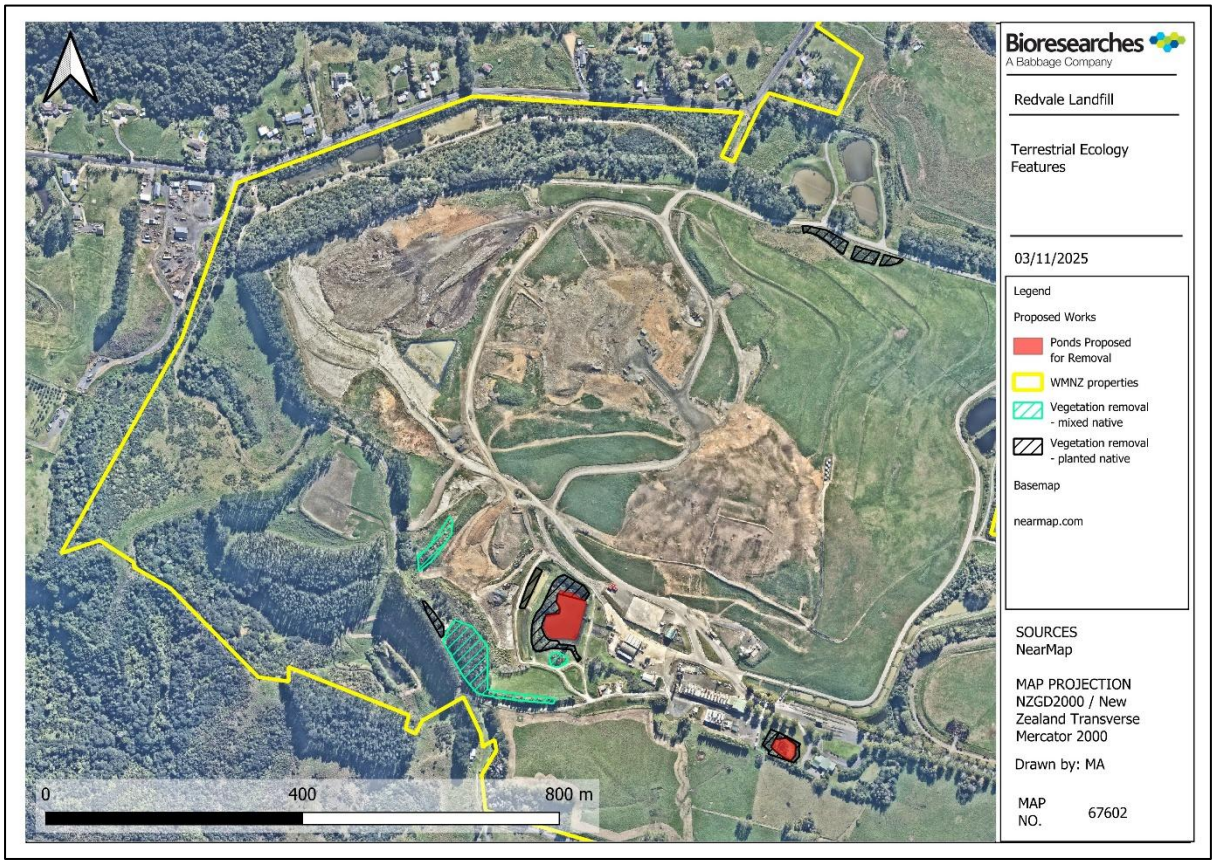

Figure 1. Proposed works on Site outlining the extent of vegetation and pond removal, based on the works design

Table 3. Magnitude and level of effect based on the design of the preliminary design for proposed works to terrestrial and freshwater habitats and fauna – without effects management.

Habitat or species	Ecological value	Magnitude of effect	Level of effect
Planted native vegetation	Low	Low	**Very low**
Mixed native and exotic vegetation	Low	Low	**Very low**
Exotic vegetation	Negligible	NIL	**NIL**
Exotic managed grassland	Negligible	NIL	**NIL**
Dabchick	Very High	Low	**Low**
Little Black Shag	Moderate	Negligible	**Very Low**
Terrestrial Avifauna	Low	Low	**Very Low**
Lizards	High	Low	**Low**
Native fish	Low	Moderate	**Low**

5.5 Conclusions

The terrestrial habitats within and surrounding the Redvale Landfill are highly modified, comprising mainly exotic grassland, young native plantings, and small shrub patches that collectively provide **Low to Negligible** ecological values. With implementation of management plans and/or protocols, pest and weed-control programmes, and reinstatement planting for any required vegetation clearance, potential adverse effects on native species or habitats will be reduced to **Very Low to Low**. Further investigation will be undertaken on the required mitigation measures.

6 Wildlife Hazard Assessment

6.1 Introduction / Context

Redvale Landfill lies approximately 2 kilometres west of the North Shore Aerodrome and therefore sits within the zone of potential influence for aircraft–wildlife interactions. Large flocks of gulls, plovers, and waterfowl can be associated with landfills can increase the likelihood of bird-strike incidents, so a preliminary Wildlife Hazard Assessment (WHA) has been undertaken to evaluate the potential risk posed by the proposed landfill extension to aviation safety.

The assessment followed Civil Aviation Authority (CAA) and International Civil Aviation Organisation (ICAO) guidance for landfills within 13 km of an aerodrome and used both on-site vantage-point

surveys and five years of CAA bird-strike data (2019–2025). The purpose of the WHA was to characterise species composition, abundance, and flight behaviour over the landfill and aerodrome, determine strike probability using established risk models, and identify potential management measures to ensure that residual risk remains as low as reasonably practicable (ALARP).

6.2 Assessment Methodology

The WHA combined desktop and field-based approaches. A targeted desktop review compiled bird records from GBIF, iNaturalist and eBird within a 13 km radius of the aerodrome, identifying 115 species, including southern black-backed gulls (*Larus dominicanus*), red-billed gulls (*Chroicocephalus novaehollandiae*), spur-winged plovers (*Vanellus miles*), mynas, and mallards, as the principal landfill-associated or high-risk species.

The total number of birds were estimated using structured vantage-point surveys that were repeated twice, using three landfill observation points and one at the aerodrome (Figure 2). Each location was surveyed morning, midday, and in the afternoon to capture diurnal patterns. Observers recorded species identity, abundance, flock size, flight height, direction, and behaviour (foraging, soaring, commuting). Flight altitudes were grouped into low (0–20 m), medium (20–60 m), and high (> 60 m) bands, and movement data were analysed to identify dominant flight corridors. Statistical risk modelling applied two internationally recognised frameworks: the Allan (2006; probability × severity matrix) and the Paton (2010; probability × consequence model). Each framework integrates species traits (body mass, flocking behaviour, flight pattern) with empirical strike and abundance data.

Historical bird-strike data for the North Shore Aerodrome were standardised by month and species and analysed using cross-correlation and generalised linear mixed-effects models to test whether landfill bird-culling activity influenced strike frequency. Together, these datasets provided a robust, evidence-based basis for risk evaluation and management planning.

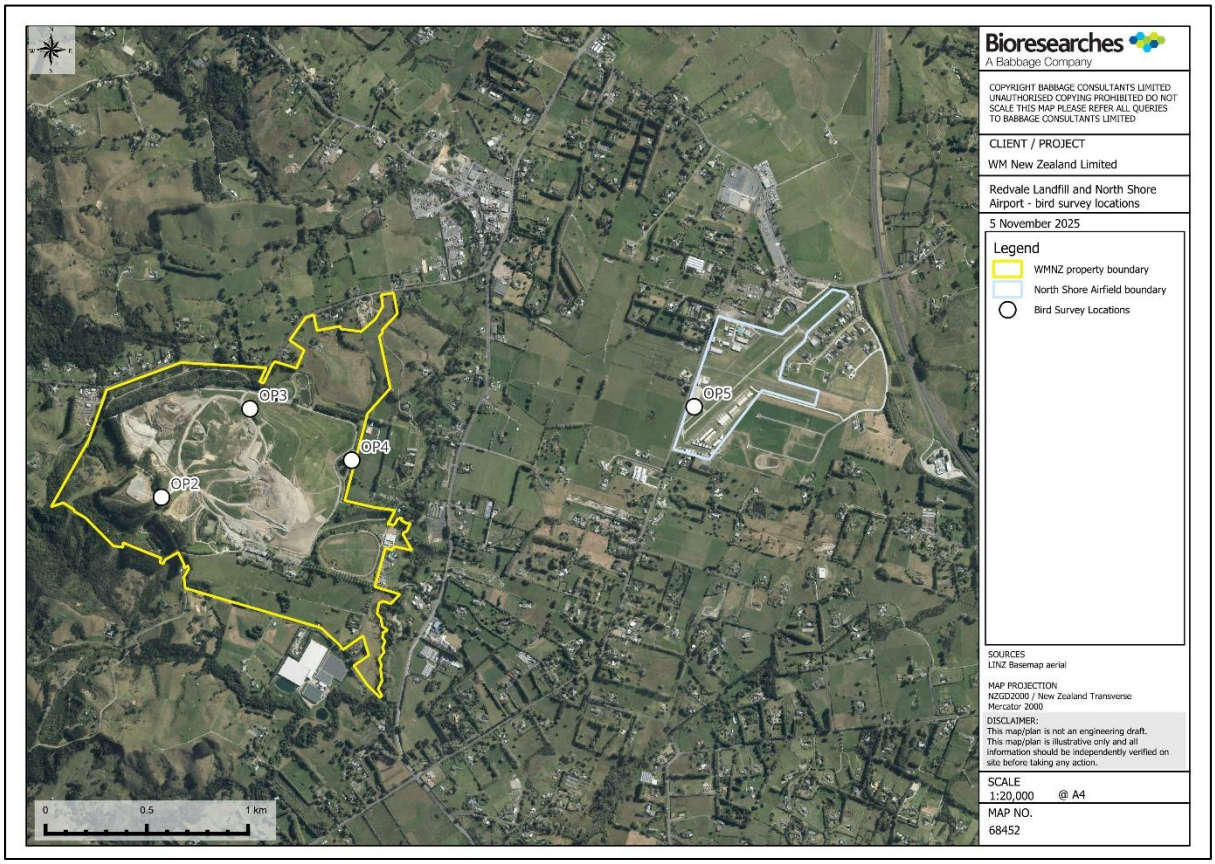

Figure 2. Locations of bird survey points used at Redvale Landfill and North Shore Airport.

6.3 Existing Environment and Ecological Values

The landfill and surrounding landscape support a diverse avifauna assemblage shaped by the interaction of anthropogenic habitats, active tip face, capped slopes, settling ponds, and rural pasture. At the landfill, the most numerous species were common myna (*Acridotheres tristis*) and red-billed gull, with morning peaks exceeding 1,000 and 275 birds, respectively. Southern black-backed gulls were frequent but less abundant, while house sparrows, feral pigeons, and pūkeko were common secondary species. At the aerodrome, the dominant and most consistently observed species was the spur-winged plover, which was recorded breeding on runway margins and adjacent grassed areas. These plovers accounted for most of the identified bird-strike events in the CAA dataset[4] and represent the primary on-airfield hazard. Gulls, although abundant at Redvale, were rarely recorded at the aerodrome itself, suggesting that foraging flights are typically confined to the landfill and do not overlap substantially with low-level approach airspace.

Flight-height analyses showed clear guild-specific patterns: most gull movements occurred in the medium (20–60 m) or high (> 60 m) bands over the landfill, while passerines and pigeons flew almost exclusively low. Plovers and waterfowl occupied the low band around the aerodrome, directly within aircraft operating altitude. Spatial mapping of flight directions indicated that gulls predominantly departed the landfill north-east in the morning and north-west in the afternoon, movements likely linked to commuting between the landfill and coastal roosts at Orewa Estuary.

[4] CAA dataset is from 2019-2025.

Culling records at the landfill from 2019–2025 show 13,842 birds removed, mostly mynas and black-backed gulls, with culling intensity increasing since 2022. Seventy-four percent of recorded bird-strikes incidents (near strikes and strikes) associated with North Shore Aerodrome were “unidentified” species. However, among those species that were identified, spur-winged plovers dominated (7 of 9 known incidents), which are resident at the airfield and do not commute to the landfill. This evidence confirms that a small suite of abundant, behaviourally adaptable species accounts for nearly all aviation risk.

6.4 Assessment of Potential Effects and Mitigation

The proposed landfill extension is a continuation of an existing activity, and therefore is **not** likely to result in an increase of bird activity from current operations. However, the site will continue to attract species that present a potential bird-strike risk, particularly gulls, mynas and large waterfowl. The key drivers of this hazard are food availability at the active tip face. If unmanaged, landfill activities could maintain or slightly increase local bird abundance, sustaining a moderate level of baseline strike risk at the aerodrome.

Results from the Allan (2006) and Paton (2010) bird-strike risk models indicate that a small group of species account for the majority of operational risk. Under the Allan model (Figure 3), spur-winged plovers ranked highest for strike likelihood due to their abundance and frequent use of the airfield, while southern black-backed gulls and red-billed gulls were assessed as high-consequence species because of their large body mass and flocking behaviour. The Paton model (Figure 4) produced similar outcomes, classifying gulls and waterfowl within the high to very-high risk categories and passerines such as mynas and starlings within moderate risk categories. Together, both models confirmed that overall strike risk is dominated by a small number of abundant, mobile species. The bird-strike risk posed by those species whose activity is strongly influenced by landfill operations (e.g. gulls and mynas) is not in the highest risk categories, as bird strike records for these species are rare and they are not abundant at the airfield.

Mitigation and management rely on a multi-layered approach already embedded within WMNZ’s Landfill Bird, Vermin & Insect Control Plan and refined through WHA recommendations. A Pest Bird Management Plan has also been adopted, which will provide fortnightly pest bird number surveys combined with close monitoring of culling numbers and effort. This will help to carefully track pest bird numbers and maintain them below pre-determined thresholds (400 mynas, 20 black-backed gulls), further reducing bird-strike risk. I

Measures for management which are already implemented by WMNZ and will continue to be with the proposed expansion, which include rigorous daily cover and minimisation of exposed waste to reduce food resources; active deterrence of gulls and mynas; and habitat management to remove roost trees and design stormwater ponds unattractive to waterfowl. Coordination with North Shore Aerodrome will continue through regular liaison meetings and data sharing on bird activity and strike occurrences. Adaptive monitoring thresholds will trigger additional management actions if specified bird counts are exceeded.

These measures collectively ensure compliance with CAA and ICAO guidelines requiring that refuse facilities within 13 km of an aerodrome operate under active wildlife-control programmes that demonstrably maintain risk ALARP.

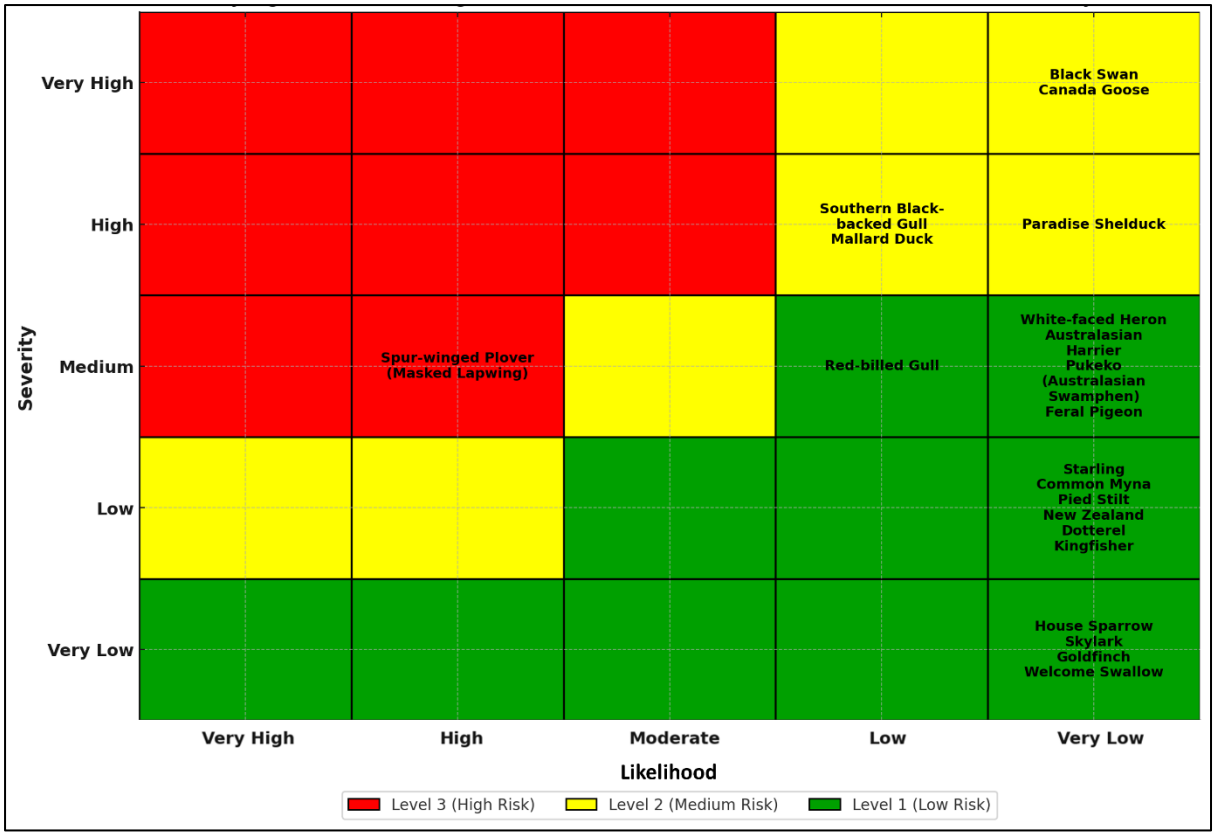

Figure 3. Summary matrix of bird strike risk using the Allan (2006) model. Colours indicate overall risk class.

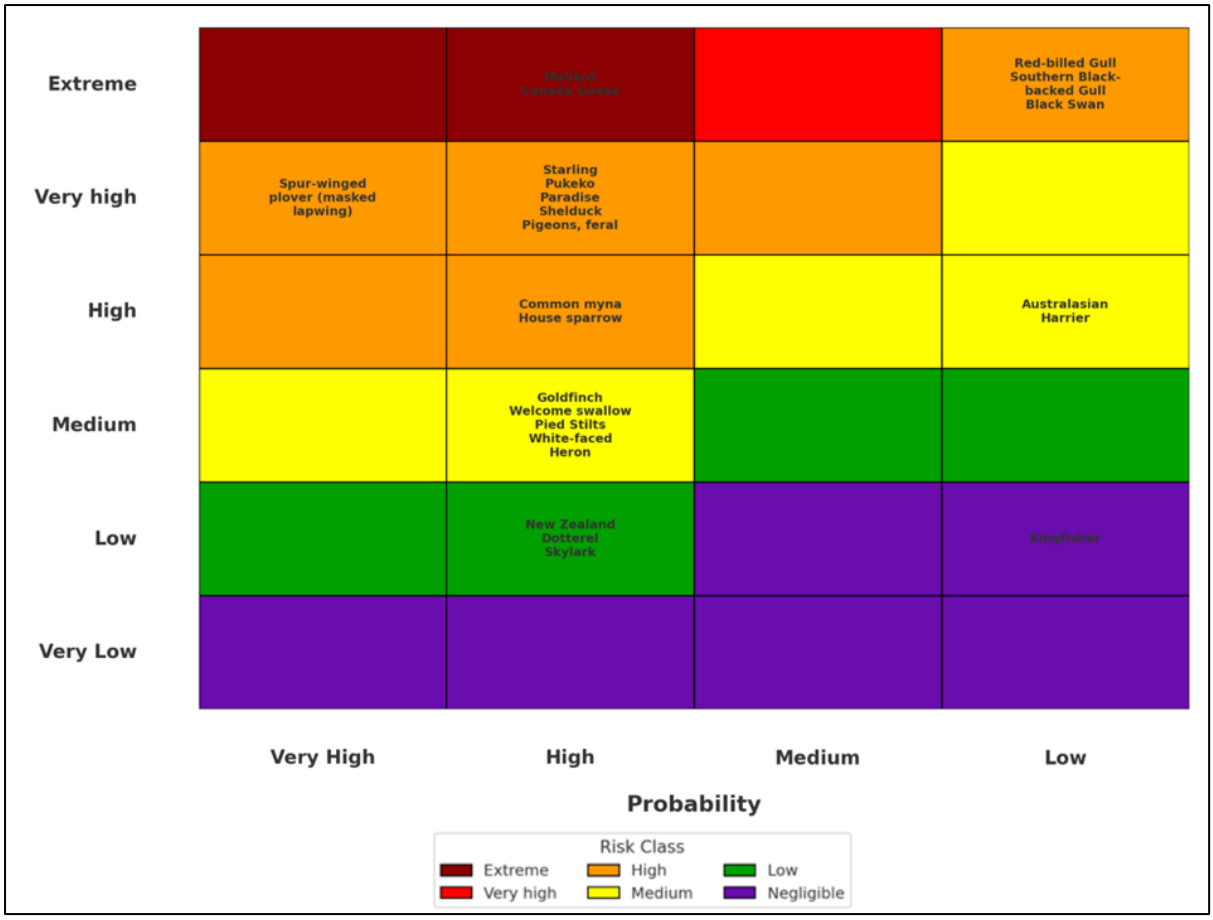

Figure 4. Summary matrix of bird strike risk using the Paton (2010) model. Colours indicate overall Paton risk class.

7 Conclusions

The Redvale Landfill remains a managed bird-attractant site situated within a sensitive aviation landscape. Although high-risk species such as gulls and mynas are present, ongoing monitoring and control programmes have proven effective in limiting bird abundance and reducing strike potential. Risk modelling under both the Allan (2006) and Paton (2010) frameworks indicates that gulls, plovers, and large waterfowl represent the upper-tier hazard species, but no significant increase in aviation wildlife risk is expected from the proposed landfill extension, provided management continues as is proposed.. With strict application of daily cover, deterrence protocols, and coordinated liaison with the aerodrome, bird-strike risk will remain controlled and consistent with CAA and ICAO best-practice standards. Residual effects are therefore expected to be negligible to minor in magnitude, and the project can proceed without adverse implications for aviation safety.

8 Overall Conclusions

The preliminary ecological assessments undertaken for the Auckland Regional Landfill Transition Project demonstrate that the site and its surrounds are highly modified as a result of decades of landfill operation and associated land-use activities. Potential adverse effects arising from the proposed extension and re-profiling works have been carefully assessed, and each discipline has developed

tailored and integrated mitigation and management measures to ensure that any effects are appropriately avoided, minimised, or remedied.

From a **freshwater ecology** perspective, the only aquatic habitats likely to be affected are artificial ponds and short intermittent flow paths of limited ecological function. Field surveys recorded only shortfin eel on the site. With the implementation of the *Native Fish Capture and Relocation Plan*, including supervised de-watering, screened pumps, and relocation of all native fish to the Rangitopuni Stream, residual effects on aquatic fauna and water quality are assessed as **Low** or **Very Low**.

Baseline surveys of the Rangitopuni Stream and its tributaries which flow within close proximity to the site show no discernible effects occurring as a result of the fill operations. Sites upstream of the managed fill (i.e. upstream of all of the stormwater pond discharges) have similar characteristics in regard to water and sediment quality, fish and macroinvertebrate communities, and macrophyte and periphyton growth.

In relation to **terrestrial ecology**, vegetation is dominated by exotic grassland and planted native shrublands, with scattered *At Risk* plant species present primarily as planted individuals. The small resident population of copper skink (*Oligosoma aeneum*, At Risk – Declining) and locally breeding dabchicks (*Poliocephalus rufopectus*, At Risk – Recovering) represent the key native fauna of interest. Through the implementation of appropriate protocols and associated pest- and weed-control, terrestrial ecological effects will be effectively mitigated to low or very low level effects. No significant residual effects are expected following application of mitigation components (avoid, minimise, remedy) of the effects-management hierarchy outlined in the NPS-IB (2023).

The **wildlife hazard assessment** confirms that, although the landfill remains a managed attractant to gulls, mynas, and other common species, the proposed works will not introduce new airspace hazards or materially alter the current risk environment for the North Shore Aerodrome. Risk modelling under the Allan (2006) and Paton (2010) frameworks shows that with ongoing application of daily waste cover, active deterrence, habitat management, and continued coordination with aerodrome operators, bird-strike risk will remain controlled and as low as reasonably practicable in accordance with CAA/ICAO guidance.

Taken together, the findings of the three preliminary assessments demonstrate that ecological effects associated with the Auckland Regional Landfill Transition Project are manageable, minor, and consistent with national and regional environmental policy. The proposal upholds the integrated management principles of the Resource Management Act 1991, NPS-FM (2020), and NPS-IB (2023), ensuring protection of indigenous biodiversity and the maintenance of freshwater ecosystem health. With the mitigation measures described in this initial assessment (and to be developed at subsequent stages of the process if the referral application is accepted), the project can proceed without significant residual ecological effects, and all disciplines support the conclusion that the proposal is environmentally acceptable within the context of the Fast-track Approvals Act 2024.

9 Applicability

This technical memorandum has been prepared by Bioresearches (Babbage Consultants Limited) for the exclusive use of our client WMNZ, with respect to the particular brief given to us, and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement. It summarises the findings of the specialist assessments referenced herein and should be read in conjunction with those detailed reports. Bioresearches accepts no responsibility for the use of this technical memorandum by any party other than WMNZ or for any purpose other than that for which it was prepared.

We understand and agree that WMNZ will submit this report to the Environmental Protection Authority in support of a referral application under the Fast-track Approvals Act 2024 for the works described herein, and that the Environmental Protection Authority will rely on this report for the purpose of assessing that application.

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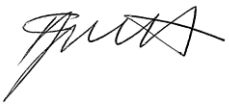

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