WINSTONE AGGREGATES

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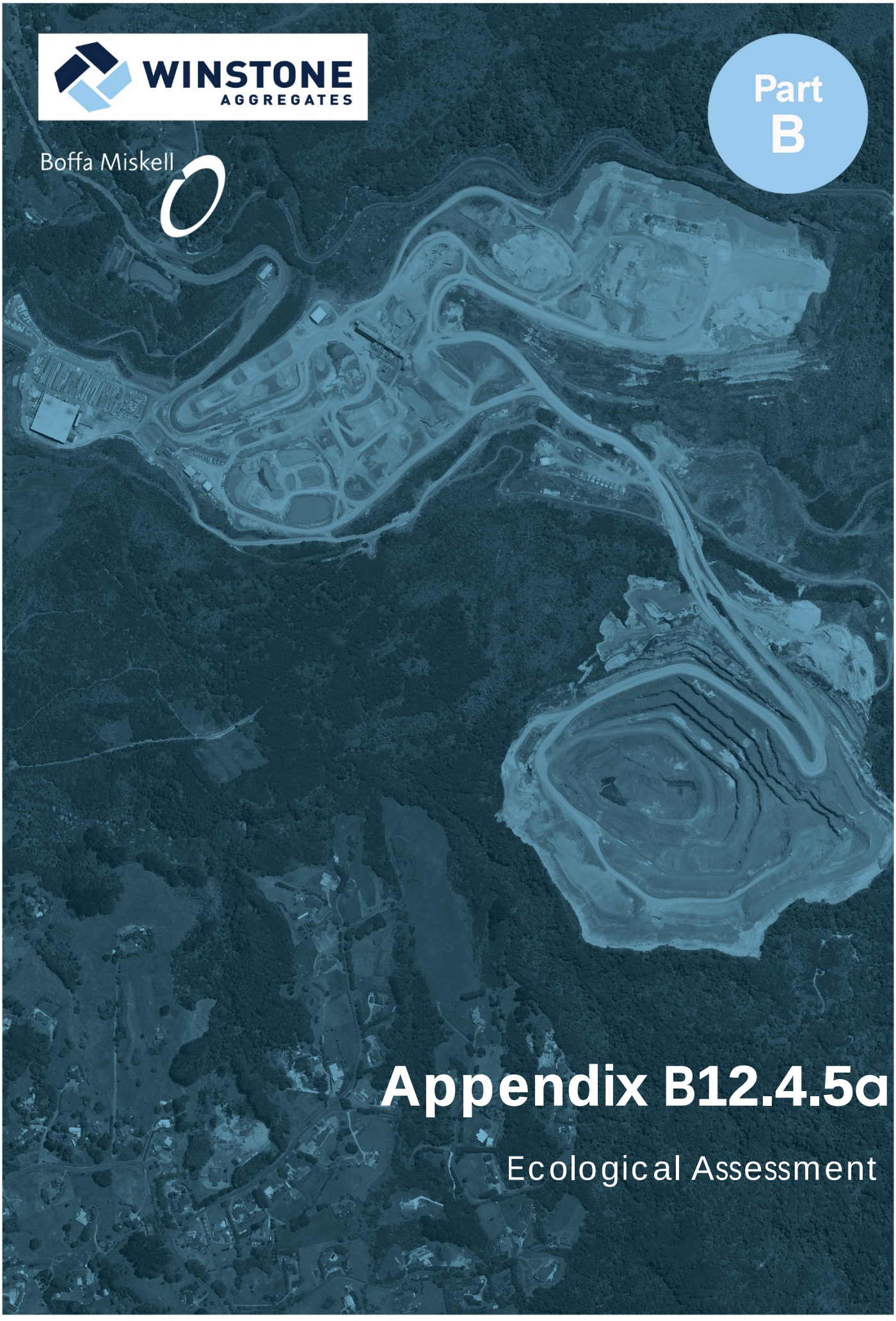
Part B



Appendix B12.4.5a

Ecological Assessment

Boffa Miskell

Hunua Quarry

Assessment of Ecological Effects

Prepared for Winstone Aggregates Limited

28 March 2026

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Approved for issue:

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Release and Reliance

This report has been prepared by Boffa Miskell Limited on the instructions of our Client, in accordance with the agreed scope of work. If it is intended to support an application under the Fast-track Approvals Act 2024, it may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application.

While Boffa Miskell Limited has exercised due care in preparing this report, it does not accept liability for any use of the report beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.

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Executive Summary

Outcome

The ecological outcome from the proposed Hunua Quarry Development is to provide well connected and valuable biodiversity hubs within the neighbouring and local landscape. Each hub or focus area has similar attributes and integrates the offset and compensation actions such that the 'whole is much greater than the component parts'. The location of new indigenous plantings alongside existing mature bush stands creates connections for flora and fauna that builds resilience and refuge for the ecosystem. Each hub includes enhancements to streams and wetlands within headwater catchments, thus improving water quality before it descends its catchment; betterment for water within the catchment at the commencement of the journey to the sea.

The biodiversity hubs are substantially improved by the implementation of landscape-scale pest and weed management. This approach extends across multiple locations with strong border management preventing re-invasions as well as incorporating innovative technological advances in pest management.

The Hunua Quarry site has the potential to become a large, ecologically valuable area of local and regional significance over the long term, established in an industrial and peri-urban landscape, and located a short distance from the Hunua Regional Park. The restored site would form a key connection/corridor between the significant ecological areas surrounding the quarry.

Summary

Winstone Aggregates, a division of Fletcher Concrete and Infrastructure Limited, is seeking approval for the Hunua Quarry Development under the Fast-Track Approvals Act 2024 (FTAA). The Hunua Quarry Development is a Listed Project in Schedule 2 of the FTAA, reflecting its regional and national significance. The proposal is to expand the existing quarry to increase annual quarry production to a peak of approximately 5.4 million tonnes of aggregate, and to enable the continued extraction of aggregate for a further 80 years.

This report provides an assessment of the ecological values of the location and the potential and actual effects of the proposed quarry expansion on these values. Existing consents for the present quarry extent have required Winstone to undertake revegetation, predator control, as well as salvage and relocation of elegant geckos. The quarry, in part, is located within a Significant Ecological Area with high vegetation values. Apart from the known presence of elegant gecko, there were no discoveries of other lizards or frogs and no activity from bats was detected. The avifauna community was largely introduced or native birds with no conservation threat status. Aquatic values were high as a result of their location in the foothills of the Hunua Ranges, but no rare or threatened flora or fauna was recorded.

The location of the aggregate will mean the loss of some 44.4 ha of indigenous vegetation of varied successional status, and the removal of wetlands and watercourses. Key fauna will be salvaged and relocated, and in part the extent and values of the Mangapū Tributary watercourse will be realigned. The remaining residual effects of loss of indigenous vegetation, wetlands and watercourses have been assessed through application of the effects management hierarchy resulting in a package of offset and compensation measures. The outcomes of the application of the effects management hierarchy are set out in the Summary Table below.

Effects management is focused on an integrated offset and compensation outcome over three key Focus Areas with similar attributes. Each of the Focus areas incorporates revegetation of a headwater catchment to improve water quality before it descends its catchment, as well as riparian planting to enhance aquatic values, removal of fish barriers to increase substantially the

extent of upper watercourse available to migratory fish (at two Focus Areas), revegetation of diverse indigenous forest and habitat for indigenous fauna, as well as substantive landscape-scale pest management. These focus areas will become biodiversity hubs in their own right within their respective landscapes.

Some additional areas of enhancement have also been identified.

The proposed Hunua Quarry Development and respective resource consent conditions satisfy the effects management hierarchy in response to the potential and actual ecological effects of the proposed activities, with an overall ecological assessment that there will be an overall net gain for ecological value as a result of the project.

Summary of ecological effects and application of the effects management hierarchy

Effects Management Hierarchy	Loss of indigenous vegetation from quarry expansion	Lizards	Bats – not found at present	Birds	Mangapū Stream tributary realignment	Other Mangapū Stream tributaries	Aquatic Fauna	Wetland areas
Avoid	Avoid loss of vegetation where possible	Avoid fatality through implementation of management plan protocols.	Avoid fatality through implementation of standard tree felling protocols.	Avoid tree felling during bird breeding season (August – February).	Unavoidable loss of 1200 m of intermittent and permanent stream length.	Unavoidable loss of 527 m of intermittent permanent stream length.	Avoid fatalities as far as possible through salvage and relocation.	Avoid loss of wetland areas where possible
Minimise	Minimise vegetation loss as much as is practicable.	Minimise fatality through salvage of geckos and any other native lizards (if detected), via management plan protocols	Check for nests if felling occurs during roosting season - resource consent condition	Check for nests if felling occurs during bird breeding season – resource consent condition	Minimise stream loss as much as is practicable. Maintain passage opportunity for climbing fish	Minimise stream loss as much as is practicable.	Minimise fatality of fish and koura through salvage.	Minimise vegetation loss as much as is practicable.
Remedy		Relocation of geckos to release site with appropriate pest management for protective benefit of the population, via management plan protocols	N/A	N/A	Realignment of 570 m stream length. Flow augmentation to sustain flows as needed.	Augmentation of flows for potential dewatering of Mangapū Stream.	Relocation of fish and koura to release sites downstream.	
RESIDUAL EFFECTS	Unavoidable loss of 44.46 ha of indigenous vegetation [Equates to 96.7 ha of offset planting required]	No	No	No	Unavoidable loss of 630 m intermittent and permanent stream length	Unavoidable loss of 527 m of intermittent & permanent stream length. [Equates to 3,980 m^2 of aquatic ecological values offset required]	No	Unavoidable loss of 0.44 ha [Equates to 2.4 ha offset area required]
Offset	Offset planting of 85.62 ha of new replanted indigenous vegetation areas	N/A	N/A	N/A	Aquatic values enhancement of 1,000 m of current pasture watercourses through riparian planting: Waipokapū Stream tributary and Meremere Quarry Stream Removal of willow, blackberry and other woody weeds, and enhancement of aquatic values to 2,580 m of watercourse: Mangatawhiri River. Total offset for aquatic ecological	N/A	Enhancement and restoration of 0.51 ha of wetlands that are currently farm ponds and flowpaths at Hunua Road and Judge Richardson Road or are existing pasture wetlands at Meremere Quarry. Reinstatement of 2 ha of wetlands on blackberry-infested, low-lying alluvial terraces in Hunua Regional Park	

					values of 3,938 m^2 provided.[#]		
Compensation	Protection of 16.33 ha of existing indigenous bush that is not currently covenanted. Integrated and comprehensive landscape-scale pest management strategy to form Hunua Biodiversity hub	Pest management	Pest management	Pest management	4,000 m of extent of watercourse connected for migratory climbing fish access that is currently denied including to and from downstream RAMSAR-listed Whangamarino Wetland. Improved water quality of two tributary headwater catchments: the Waipokapū Stream tributary and Meremere Quarry Stream	N/A	Integrated and comprehensive landscape-scale pest management strategy to include wetland areas and their margins.

Overall outcome

No residual effects adverse on fauna; net gain in 'net present biodiversity value' for terrestrial vegetation and habitat[1]; no net loss of values or extent of wetlands[2]; no net loss of aquatic values[3].

[#]Assumes average stream width of 1.1 m.

[1] Refer terrestrial BOAM calculations, Appendix 13

[2] Refer Wetland BOAM calculations, Appendix 14

[3] according to SEV/ ECR calculation, Appendix 15

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1.0 Introduction

1.1 Background

Winstone Aggregates (**"Winstone"**), a division of Fletcher Concrete and Infrastructure Limited, has engaged Boffa Miskell Limited to assess the potential ecological effects of the proposed expansion of Hunua Quarry at 489 Hunua Road, Hunua, Auckland.

Winstone is seeking approval to the project under the Fast-Track Approvals Act 2024 (FTAA). The Hunua Quarry Development is a Listed Project in Schedule 2 of the FTAA, reflecting its regional and national significance. The proposal is to expand the existing quarry to increase annual quarry production to a peak of approximately 5.4 million tonnes of aggregate, and to enable the continued extraction of aggregate for a further 80 years (**"the Project"**) or also referred to as the **"quarry development area"**. Through this approval process, Winstone propose to update the consent conditions and quarry management plans applying to the site to incorporate the changes and enable greater operational efficiency.

Information on the preparation of this report and the assessments undertaken is provided in Sections 1.4 and 1.9.

1.2 The Site

The Hunua Quarry is in South Auckland, approximately 5 kilometres (km) southeast of Papakura and 35 km southeast of the Auckland Central Business District (**"CBD"**). The Hunua Quarry has been operating on the site since the 1920's and produces greywacke rock and supplies a significant part of the Auckland region's aggregate requirements, primarily for use in civil infrastructure such as roading and concrete. The Quarry is recognised as one of Auckland's three most strategically important sources of aggregate. The location of the site is illustrated in **Figure 1**.

Currently, material is extracted from the Symonds Hill Pit and processed on-site, with material with no value (referred to as overburden) being deposited on-site in the overburden disposal area (the previous Hunua Pit).

To extend the site's operational life, Winstone proposes a 50 ha expansion and to deepen the existing Symonds Hill Pit to access additional high quality greywacke resource. Initial investigations confirm that the site contains a substantial greywacke resource, sufficient to meet projected demand for up to 80 years, based on current rates of extraction and known site constraints. The project is proposed to be undertaken in 8 stages, as shown in Figure 2 and Table 1.

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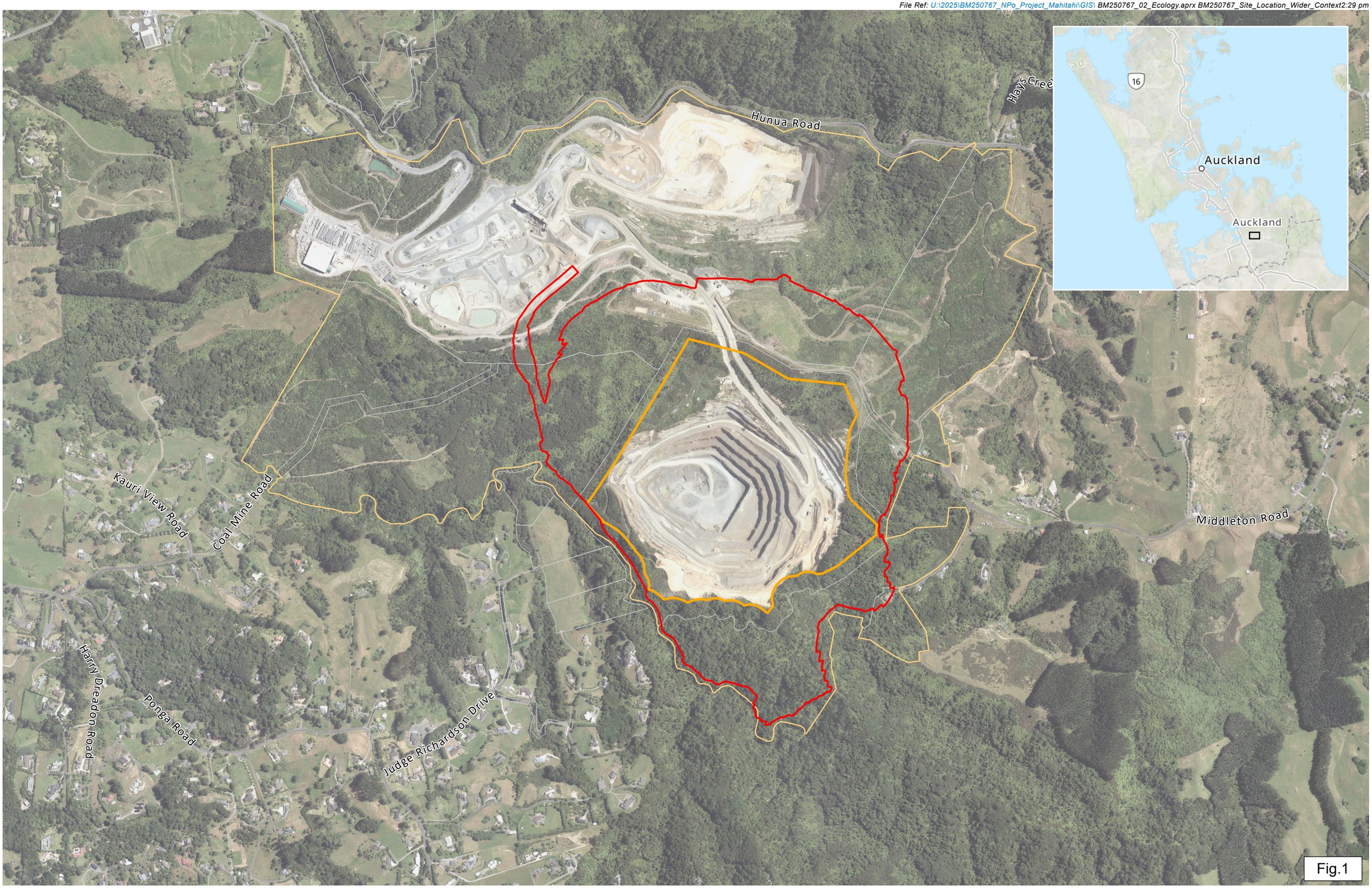

Fig.1

Boffa Miskell

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0 200 400 m

1:10,000 @ A3

Data Sources: LINZ (Aerials 02/2025, Parcels, Roads), Winstone Aggregates, BML

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Quarry Development Area
- Consented Pit Boundary
- The Site
- Other owned land

HUNUA QUARRY DEVELOPMENT

Site Location - Wider Context

Date: 27 March 2026 | Revision: 0

Plan prepared by Boffa Miskell Limited

Project Manager: Nick.Pollard@boffamiskell.co.nz | Drawn: HCo | Checked: SFI

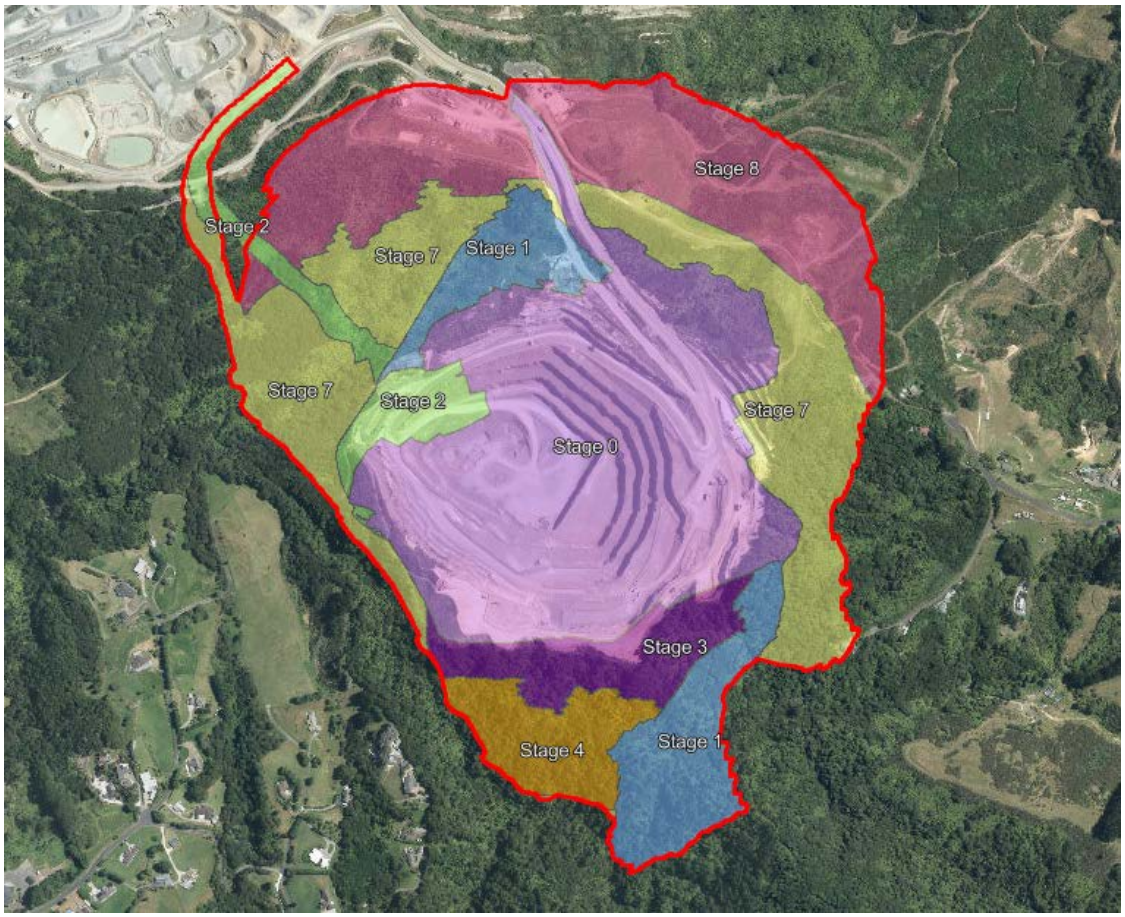

Figure 2: Staging and Indicative Life-of-Quarry Development Plan

Table 1: Stages of development of Symonds Hill Pit, Hunua Quarry Development.

Stage	Activity	Nature of the works	Approximate duration (years)
1	Tributary realignment	Enabling works	4
	Stripping campaign to the northwest - already consented, occurs concurrently with the tributary realignment.	Extraction and processing	1-4
2	Stream realignment completed	Enabling works	1
	NW cut down to 105RL.	Extraction and processing	
	Construct the western haul road.	Enabling works	
3	Incremental stripping campaigns: south from current pit crest towards stream realignment down to 120RL	Extraction and processing	1

Stage	Activity	Nature of the works	Approximate duration (years)
4	Incremental stripping campaigns: southwest of the stream realignment and adjacent to the southern site boundary	Extraction and processing	43-73
5	Incremental stripping campaigns: southern boundary towards the current pit	Extraction and processing	
6	Incremental stripping campaigns: in an anticlockwise direction, extending the pit to the south and northwest and deepening the pit	Extraction and processing	
7	Realign the western haul road, so that it runs, for a short distance, along the southeast extent of the pit. This will enable the pit to extend to the northwest	Enabling works	
	Incremental stripping campaigns: in an anticlockwise direction, extending the pit to the southwest and northwest and deepening the pit	Extraction and processing	
8	Incremental stripping campaigns: in an anticlockwise direction, extending the pit to the northwest and north	Extraction and processing	

Under the provisions of the Auckland Unitary Plan (Operative in Part) the existing quarry is zoned Special Purpose – Quarry Zone (SPQZ) but the proposed pit extent will extend the quarry into the adjoining Rural - Mixed Rural Zone. The quarry development area is also subject to the following overlays:

- Quarry Buffer Area (Chapter D27)
- Outstanding Natural Landscape (ONL) (Area 60 Ponga Road),
- Significant Ecological Areas (SEA) (SEA_T_5323 and SEA_T_7032),
- High Use Stream Management Area (HUSMA) and
- Natural Stream Management Area (NSMA).

The site is also subject to the Council's Proposed Plan Change 120 Housing Intensification and Resilience (PC 120). This proposed plan change includes provisions to better manage development for natural hazards across the region. In the case of the Hunua Quarry, the site and wider area is identified as flood plains. These provisions have immediate legal effect.

1.3 Purpose of report

This technical report has been prepared to accompany the resource consent application under the Fast track Approvals Act 2024 (FTAA). The purpose of this report is to:

- Identify the ecological values present on the site and those which will be impacted by the quarry pit development and associated activities.
- Assess the degree of impact on ecological values and analyse methods of addressing effects by applying the Effects Management Hierarchy.
- Outline the approach to minimising, remedying, offsetting and compensating for impacts on ecological values.

This report should be read together with the other technical assessments prepared in support of the application for substantive approvals.

1.4 Basis of Assessment

Our assessment is based on:

- Desktop review of ecological information.
- Data from previous field surveys and reporting from the Site over a number of years.
- Data from recent field surveys of flora, fauna, wetlands and aquatic ecological values to specifically inform this proposal.
- Operational and design information provided by the project team.
- Standard protocols and guidelines where helpful.
- Application plans and project methodologies.

1.5 Authors and code of conduct statement

This report has been primarily prepared by Dr Ian Boothroyd, a certified (CEnvP) and experienced ecologist who is a Senior Principal ecologist and partner of Boffa Miskell; and Dr Sarah Flynn who is an experienced Senior Principal ecologist at Boffa Miskell. The experience and qualifications of the authors of this report are outlined in **Appendix 1**.

Other contributors to this work include specialists as follows: Victoria Smith (avifauna and bats), Katherine Muchna and Alice Dee (Herpetology and terrestrial fauna), Lauren MacKenzie (botany), Adam Willetts (biosecurity), Katrina McDermott and Ashley Flood (freshwater ecology). The experience and qualifications of these contributors to this report are also outlined in **Appendix 1**.

This report has been prepared and reviewed in accordance with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023. Other than where it is stated that reliance is placed on the advice of another person, the author(s) confirm that the issues addressed in this report are within their area of expertise. The author(s) have not omitted consideration of any material facts known to them that might alter or detract from the opinions expressed.

1.6 Project Description

The Hunua Quarry development seeks to expand and deepen the existing Symonds Hill Pit, enabling sustainable extraction of additional greywacke resource, and the continuation of

quarrying within Winstone's existing site for up to 80 years. The proposed development initially focuses on the southern and northwestern ends of the quarry complex. The new extraction footprint will initially expand the existing Symonds Hill Pit to the south and east, followed by areas to the north and west. These development works will occur entirely within Winstone-owned land and integrate with existing quarry infrastructure.

The quarry will utilise the existing access from Hunua Road, although a right turning lane is proposed to improve the safe operation of the access for turning trucks and other road users. This also reflects the increase in truck volumes accessing the Site as production on the Site increases.

The proposed Symonds Hill Pit expansion will cover an area of approximately 108 hectares, with a maximum depth of approximately – (minus) 50 metres RL and enabling quarrying beyond that in later years to access further resource. Quarry development will use benches ranging from 10 m – 15 m in height and 9 – 20 m in width. The resource comprises Waipapa Group greywacke, with an estimated total volume exceeding 225 million tonnes. Over the life of the quarry, anticipated to be around 80 years, approximately 24 million m^3 of overburden will be removed, supporting a peak production rate of 5.4 million tonnes per annum.

This expansion will necessitate the realignment of a tributary of Mangapū Stream to allow for the pit expansion. This will include clearance of indigenous and exotic vegetation, overburden stripping and earthworks, stream realignment, followed by revegetation within the new stream corridor. Ecological offset planting will also occur within other parts of the landholding, and this will also achieve landscape mitigation and compensation for the removal of an area of the ONL. Additional ecological offset planting and compensation works will also be undertaken in locations beyond the Site.

The proposal will also utilise the current site access, along with the existing processing facilities, staff facilities and bores.

In summary, the key aspects of the proposed quarry development include:

- Diversion and reclamation of approximately 1,200 m length of a tributary to Mangapū Stream to enable the expansion of the extraction footprint. This includes construction of a temporary 7 m wide bridge to enable access for construction of the stream realignment channel.
- Draining and modification of up to 9 identified natural inland wetlands.
- Providing additional overburden capacity within the Site (from Stage 7), primarily by backfilling the Symonds Hill Pit;
- Construction of new sediment retention ponds, haul road, drainage networks, and Mangapū Stream Tributary diversion integrated with the existing quarry systems.
- Increasing average daily traffic movements during both the AM and PM peak hours when the quarry is operating at peak capacity:
    - AM peak hour – 161 truck movements corresponding to approximately 80 entry and 80 exit truck movements; and
    - PM peak hour – 135 truck movements corresponding to approximately 68 entry and 68 exit truck movements.
- Removal of 44.4ha of indigenous vegetation, associated with the stripping of overburden including within an SEA and ONL.

- Constructing the western haul road, including two culverts, to provide a more efficient connection between the pit and the processing yard as part Stage 2. The haul road will then be removed during Stage 7 and a new haul road constructed.
- Amending the consented groundwater takes and discharges to Mangapū Stream.
- Providing for some in-pit crushing to enable a greater volume, and more efficient, processing of aggregate.
- Providing for the placement of a greater volume of overburden within the Site.
- Implementing progressive rehabilitation (where practicable), ecological offsetting, landscape mitigation, compensation and stream enhancement measures throughout quarry development. The expansion necessitating the Mangapū Stream Tributary diversion is the first stage of the project, and the ecological offsetting needed for this will occur in the early phases.
- Enable quarry development below RL-50m as part of the long-term development of the Symonds Hill Pit, recognising that this deeper resource would only be accessed once the earlier stages of the pit have been quarried. The final Life of Quarry Strategy will be confirmed prior to any excavation below RL-50m and will detail further investigations necessary to ensure that adverse environmental effects associated with later-stage extraction and/or rehabilitation are appropriately identified, assessed, and managed (including obtaining any regional consents required).

Winstone is seeking resource consent under the FTAA for both district and regional activities to enable the development of the Symonds Hill Pit. The land use consents (earthworks, vegetation clearance and the disposal of overburden) are being sought in perpetuity (unlimited duration), and a 35-year duration on all water take and use and all discharge permits. Winstone are also seeking a Wildlife Act Authority, an Archaeological Authority and a Complex Freshwater Fisheries Activity Authority.

1.7 Existing Consents and Management Plans

Hunua Quarry has operated for about 100 years and is recognised as one of Auckland's three most strategically important sources of aggregate. The previous expansion of the Symonds Hill Pit was consented in 2009, with the regional consents having a 35 year duration.

The 2009 resource consent provided for vegetation removal within the Symonds Hill quarry footprint, to be mitigated through:

- Revegetation of 39.9 hectares of indigenous forest comprising new and replacement planting, or the enhancement of existing indigenous vegetated area;
- Covenanting of identified areas of revegetated and remnant indigenous vegetation on the land;
- Provision of a weed and pest management plan for the Hunua Quarry landholding that details with details of the scale and type of pest control proposed, including at a minimum:
  - Measures by which native forest birds and reptiles are to be protected from pests;

  - A control programme for mustelids, feral cats, feral goats, deer and rodents (particularly during breeding seasons), including measures for the achievement of 3% possum and rat Residual Trap-Catch (RTC) levels on an annual basis, and measures for the achievement of an average rate tracking tunnel index of 5% as measured over the period of rat control for that year; and
  - Detailed integration with the pest control requirements in the vegetation management plan and the lizard relocation management plan.
- Implement riparian planting in 400m of the Lower Tributary and 400 m of one bank of Symonds Stream, to a width of 20 metres on either side of the Lower Tributary and 20 metres on one bank of Symonds Stream.

It is our understanding that, revegetation of 39.9 ha has largely been implemented in accordance with consent conditions, but conservation covenants have not yet been placed on these areas. As part of this current application, those required covenant areas will be relocated to other parts of the landholding (within the Quarry zone) to achieve equivalent protection of values as what was anticipated as part of that 2009 consent and retain the level of long term protection that was proposed.

Winstone has been carrying out animal control at the site since 2009 in accordance with the conditions of its existing consent. Baseline forest health monitoring was undertaken in December 2008, with subsequent annual monitoring from 2010 to 2024. Weed and pest management work in accordance with the pest management plan developed for the property (Tonkin & Taylor, 2010) has been ongoing. RMA Ecology (2024) reported that the overall trend has been one of increasing abundance of small seedlings and a maintenance of large seedling abundance. Native bird species have remained more abundant than exotic species at all monitoring locations and kereru numbers have trended up.

Overall, biodiversity data indicate that the current pest management approach and programme has been effective, though specific targets (particularly for rats) have not been consistently achieved and monitoring has shown some variability in outcomes. Compliance with the specified target for possum density has been consistent since 2019, while compliance with the target for rat densities has been variable between seasons and years, reflecting the challenges associated with maintaining continued suppression of short-lived, fast-reproducing species.

The proposed quarry expansion overlaps forest areas and revegetation plantings that the existing conditions of consent specified were to be protected by covenants, but where covenanting has not yet occurred. A change of consent conditions to vary the areas to be covenanted as part of existing consent obligations is addressed separately in the AEE report.

1.8 Report Purpose and Scope

This report, which is one of a series of technical assessment reports, provides an assessment of the ecological values of the location and the potential and actual effects of the Project on these values. Where effects are identified the report also sets out how these effects will be avoided, minimised or remedied, including through offsetting and compensation.

The scope of our ecological effects assessment lies within the extent of the Project, plus effects on nearby ecosystems as well as locations for proposed mitigation.

This report should also be read in conjunction with the Landscape Assessment as there is strong interconnection between ecological and landscape values, ecological and landscape areas, proposed ecological management and rehabilitation.

1.9 Assessment Process

Our approach to assessing the environmental effects of the Project on the ecological values falls into three main components:

- Existing ecological values of the Site and surrounds, and their significance.
- Impact of enabling works and operation of the proposed activities on ecological values.
- Recommendations to avoid, minimise, remedy, offset or compensate for adverse effects on ecological values.

In more detail, our approach to the assessment of ecological effects of the proposed expansion has been to undertake:

- A desktop investigation of the known ecological attributes of the location, including the results of previous investigations and monitoring.
- Investigations to understand the ecological values of the Site's ecosystem context.
- Assessment of the direct and indirect effects (including cumulative effects) of the proposed pit expansion and ancillary activities on ecological features and values.
- Application of the 'Effects Management Hierarchy' including offsetting and compensation as required.
- Reference to relevant policy criteria and definitions including the National Policy Statement for Freshwater Management (NPS-FM) and National Environmental Regulations Freshwater (NESF) and Auckland Unitary Plan (AUP(OP).

1.10 Iwi Consultation

Three separate iwi engagement workshops were held in January/February 2026 with Ngāti Tamaoho, Te Āakitai Waiohua and Ngāti Te Ata to discuss the Mangapū Tributary realignment. This consisted of a slide presentation to explain the existing environment, the proposed realignment and the range of effects. Each of the hydrogeology, hydrology, ecology and landscape experts presented information on their relevant technical areas for discussion. During the workshops, methodologies and techniques for realigning the Mangapū Tributary were discussed along with mitigation and management mechanisms for restoration of the new stream corridor and rehabilitation of the landscape and ecology.

Ngāti Tamaoho provided the project team with a cultural induction on 28 January 2026 to support a deeper understanding of Auckland's cultural landscape and its local context. The induction emphasised the importance of recognising historical narratives, cultural associations, and tikanga connected to different places and spaces across the region. Attention was given to waterbodies and the role of mana whenua as kaitiaki (guardians) of the land, reinforcing how these relationships should inform respectful, culturally responsive, and well-considered design outcomes.

2.0 Relevant Policies and Plans

2.1 Overview

The statutory planning provisions relevant to this EcIA are outlined below. Refer to the Assessment of Environmental Effects for a detailed statutory assessment.

2.2 The Fast-track Approvals Act 2024

The approvals for the Hunua Quarry development are being progressed via the FTAA. The purpose of the FTAA is to facilitate the delivery of infrastructure and development projects with significant regional or national benefits.

The FTAA establishes an integrated process for obtaining multiple approvals under various acts - including the Resource Management Act 1991 and the Wildlife Act 1953. With respect to the latter, wildlife approvals provide a lawful authority for an act or omission that would otherwise be an offence under particular sections of the Wildlife Act 1953.

2.3 National Environment Standards for Freshwater

The NES-F (2020) regulates activities that pose risks to the health of freshwater and freshwater ecosystems. The controls mainly relate to farming activities, the protection of natural inland wetlands, and fish passage through waterways. These provisions have been considered in the assessment of ecological effects on wetlands and watercourses with respect to the Project.

2.4 National Policy Statement for Freshwater Management (NPS-FM)

The NPS-FM (2022) provides local authorities with updated direction on how they should manage freshwater, including specific provisions related to natural wetlands and streams, as well as other freshwater-related activities. The NPS-FM applies to all freshwater (including groundwater) and, to the extent they are affected by freshwater, to receiving environments.

2.5 National Policy Statement for Indigenous Biodiversity (NPS-IB)

The NPS-IB (2023) provides local authorities with updated direction on how they should manage indigenous biodiversity under the Resource Management Act 1991 (‘RMA’). These provisions have been considered in the assessment of ecological effects on terrestrial indigenous biodiversity with respect to the Project.

2.6 Auckland Unitary Plan (AUP)

The AUP sets out specific management measures and objectives for indigenous biodiversity and freshwater under the RMA.

2.7 Approvals Sought

This assessment of ecological effects supports the application for approvals and authorisations under the FTAA as follows:

(a) RMA approvals (Schedule 5).

(b) Standard Freshwater Fisheries Activity (Schedule 5).

(c) Complex Freshwater Fisheries Activity (Schedule 9).

(d) Wildlife Permits (Schedule 7).

3.0 Assessment Methods

3.1 Desktop Review

We have drawn our information from several sources including:

- Fauna databases.
- Auckland Unitary Plan GIS layers.
- Previous assessments of ecological effects reports (RMA (Ecology 2018)
- Previous resource consent monitoring (Bioresearches 2007) [refs].
- Forest health monitoring (RMA Ecology 2024).
- Elegant gecko salvage reports (RMA Ecology 2024).
- Bioweb and Auckland Council herpetofauna records within 20 km of the Site.
- Auckland SOE reporting.
- Indigenous terrestrial and wetland ecosystems of Auckland (Singers et al 2017).

3.2 Terrestrial Ecology Surveys

3.2.1 Terrestrial Vegetation

Quantitative and semi-quantitative vegetation surveys were undertaken across the Site, inside and outside the Project area.

Point Centre Quarter (PCQ) sampling involves systematic identification of tree species and measuring the diameter of each tree at breast height (DBH), in directional quarters nearest to 20 m-spaced points across a transect. PCQ sampling was utilised to estimate forest basal area and forest composition. Data was used to describe and map vegetation communities across the Site. 21 transects of 5-6 sample points were deployed across vegetated parts of the Site and wider Landholding, with 11 located inside the Site, and the others within the wider landholding.

Reconnaissance (RECCE) plots (with the addition of DBH measurements) were sampled to inventory vegetation types and general vegetation characteristics across Site and wider Landholding and obtain representative basal area measurements of forest stands. Sample locations were randomly selected within indicatively mapped vegetation types. Sixteen 20x20m RECCE plots and a further 5 unbounded (visually estimated) plots were sampled across the Landholding, 11 of which were located within the Site, and the others within the wider landholding (Figure 3).

Vegetation composition was summarised using the Atkinson descriptor method (Atkinson, 1985) to give informative overviews of vegetation types.

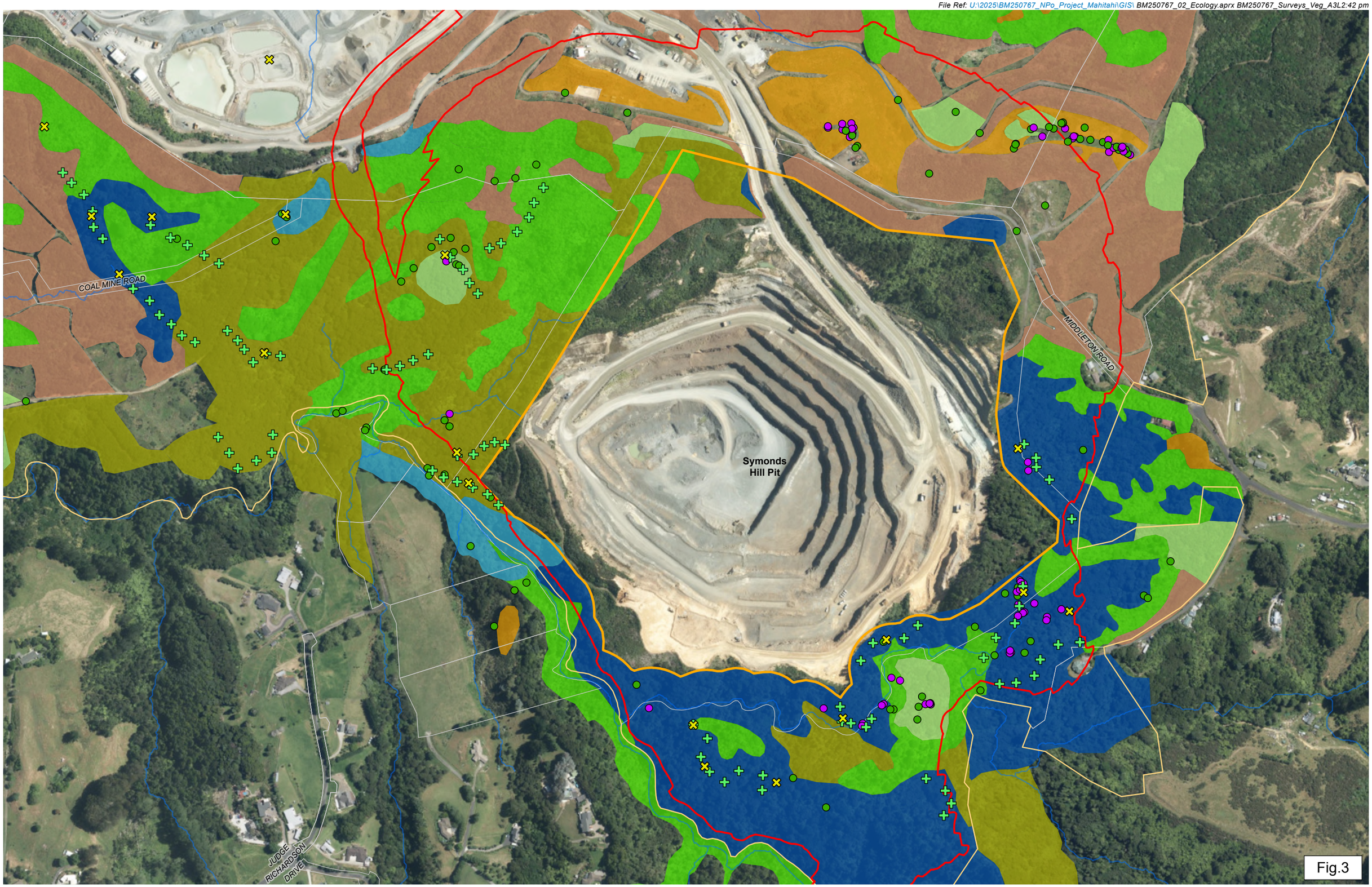

Fig.3

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- RECCE plot
- PCQ plot
- Wetland plots or related observations
- Vegetation observation points

Early successional vegetation
- Tree fernland with nīkau, emergent pūriri and broadleaf scrub (VS5)
- Kānuka forest with emergent broadleaves and podocarps (VS2)
- Kānuka/manuka scrub (VS3)

Late successional vegetation
- Tawa-taraire forest with mature kānuka (WF9)
- Kauri, podocarp, broadleaf forest (WF11)

Disturbed/modified vegetation
- Native planting/weedy scrub mix
- Exotic species (pine, rank grasses, pampas scrub)
- Quarry Development Area
- Consented Pit Boundary
- The Site
- Other owned land

HUNUA QUARRY DEVELOPMENT

Vegetation Surveys

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: LMa

3.2.2 Herpetofauna

3.2.2.1 Herpetofauna records

Information about native lizard and frog taxa present, or potentially present, at the Site are drawn from previous survey work (e.g. RMA Ecology lizard surveys and salvage), Bioweb and Auckland Council fauna records (within 20 km), and published species distribution information (Table 2).

Table 2: Native herpetofauna records within 20 km of the Site and species' habitat preferences. Elegant gecko are the only species confirmed from the Site. Data dates from 2022.

Species	Threat classification[#]	Habitat[*]	Most recent record	Number of records
Elegant gecko (*Naultinus elegans*)	At Risk – Declining Regionally Declining	Gumland, scrubland and forested habitats	2021	5
Forest gecko (*Mokopirirakau granulatus*)	At Risk – Declining Regionally Declining	Forests, scrubland and herbfields across a broad range of elevations.	2018	3
Pacific gecko (*Dactylocnemis pacificus*)	Not Threatened Regionally Declining	Coastal and lowland habitats including boulder beaches, scrubland, flaxland and forest.	>20 yrs	1
Copper skink (*Oligosoma aeneum*)	At Risk – Declining Regionally Declining	Lowland habitats such as coastal vegetation, grassland, scrub and forest. Refuges include leaf litter, rocks, logs, flax and rank grass.	2021	44
Ornate skink (*Oligosoma ornatum*)	At Risk – Declining Regionally Declining	Forests, scrublands and grassland habitats.	>20 yrs	1
Hochstetter's frog (*Leiopelma hochstetteri*) 'Hunua' ESU	At Risk – Declining Regionally Declining	Seepages and small rocky streams and stream margins in heavily forested low light environments	2022	>20

[#]Hitchmough et al., (2025), Melzer et al., 2022).

None of the species identified in Table 2 are classified as 'Threatened' in the New Zealand Threat Classification System.

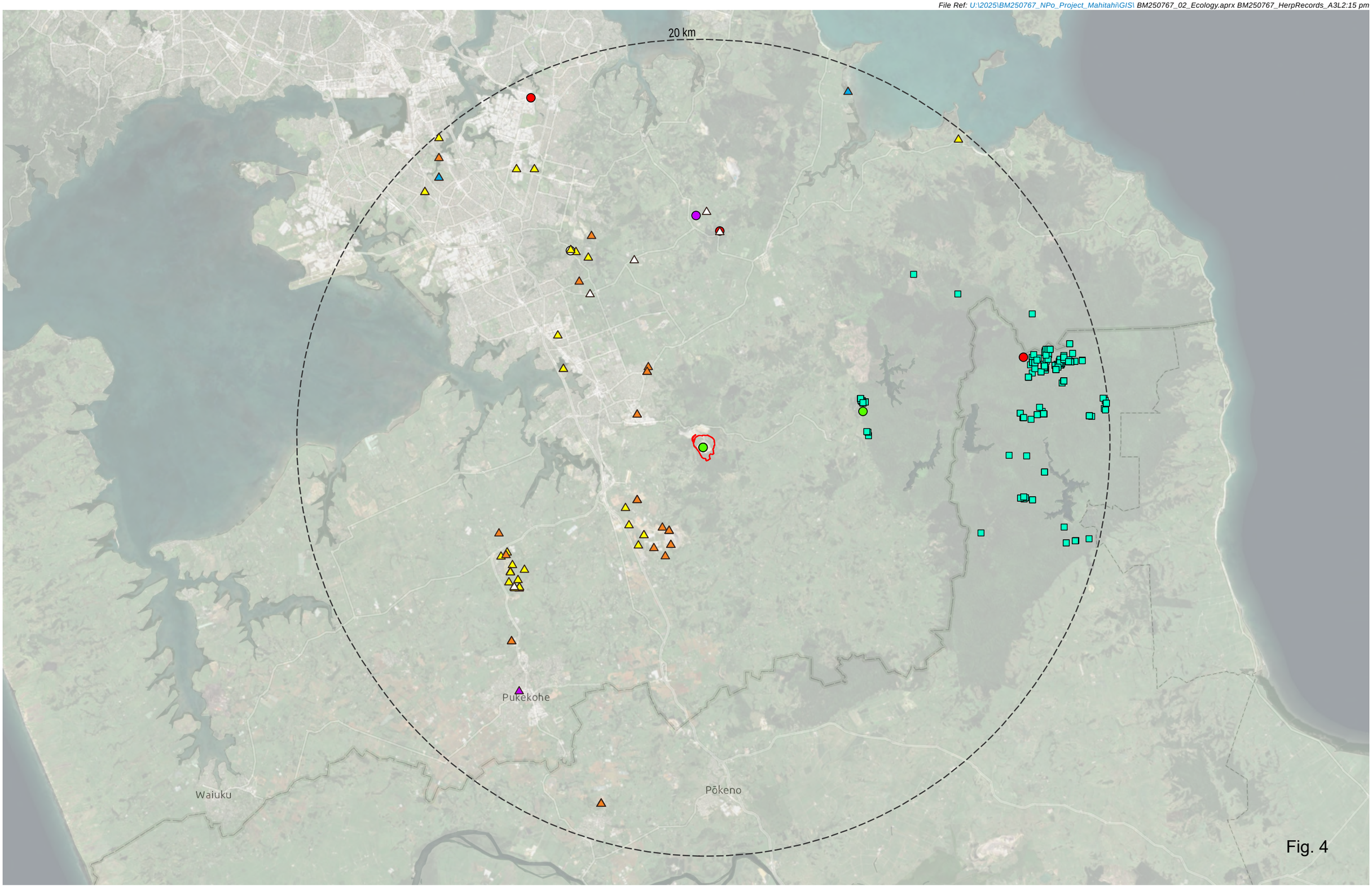

Fig. 4

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Data Sources: Eagle Technology, LINZ, DOC, Auckland Council

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Gecko species
- Forest gecko
- Auckland green gecko
- Pacific gecko
- Undetermined gecko species

Frog species
- Hochstetter's frog

Skink species
- Copper skink
- Ornate skink
- Plague skink
- Shore skink
- Undetermined skink species

Quarry Development Area

HUNUA QUARRY DEVELOPMENT

Herpetofauna Records (DOC and Auckland Council)

Date: 06 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: KMu

Records indicate:

- Elegant gecko (*Naultinus elegans*) are confirmed as present within the Site
- Copper skink (*Oligosoma aeneum*), Ornate skink (*O. ornatum*) forest gecko (*Mokopirirakau granulatus*) and Pacific gecko (*Dactylocnemis pacificus*) may be present based on habitats and distribution records but have not been detected previously.
- Hochstetter's frog (*Leiopelma hochstetteri*) were not found to be present and have not been detected previously.

In addition, the non-native Plague skink (*Lampropholis delicata*) is known from the Site but are classified as an unwanted organism. No management is proposed for plague skinks, and they are not discussed further.

3.2.2.2 Lizard surveys

Lizard surveys were carried out across the Site using a range of methods to target skinks and geckos (Figure 5). Survey methods included:

- Arboreal Artificial Cover Objects (ACOs) were deployed at four locations in transects of 10. The transects were located in four forest types (Transect 1: mature kānuka, Transect 2: mixed kānuka and podocarp, Transect 3: broadleaf, and Transect 4: mature gulley species (pūriri, rimu and kānuka)). This survey was intended to target forest gecko, as elegant gecko do not occupy arboreal ACOs. Refuges were left in-situ for at least eight weeks to allow lizards to become habituated to the covers. These were checked on the 23/02/2026 during warm, sunny weather, and no gecko were detected. Large numbers of Auckland tree weta (Hemideina thoracica) and cave weta (pachyrhamma longipes), banded tunnelweb spider (Hexathele hochstetteri) and cockroaches inhabited the ACOs. Images of the transect locations are provided in **Appendix 2**.
- Ground-based ACOs deployed over five transects comprising 10 ACOs. Ground based ACOs were located in tree fern-dominated regenerating forest; mature kanuka with fern-dominated understory; taraire, tawa, podocarp forest; braken and rank grass; and native early succession broadleaf / weedy scrub mix. This survey method was designed to detect copper and ornate skink. These were checked on 23 February 2026 during warm, sunny weather and no native lizards were detected. Two adult plague skink were observed but not captured.
- Manual searching methods to search for lizards under refugia (logs, artificial materials, sunny track sides) was carried out opportunistically across the Site. During warm sunny weather, three adult and one juvenile skink were seen and not caught. Copper skink and plague skink look similar and share the same habitat. However, based on open sun-basking behaviour and rapid, direct escape manoeuvres paired with anatomical features (long, slim tail) they were likely plague skink. One juvenile plague skink was caught on 23 February 2026 (**Figure 6**).
- Nocturnal visual searches (spotlighting) were carried out over one night to supplement existing arboreal gecko records. No arboreal geckos were recorded.

ACO transect G4
ACO transect G3
ACO transect 4
ACO transect G2
ACO transect 1
COAL MINE ROAD
MIDDLETON ROAD
Symonds Hill Pit
ACO transect 2
ACO transect G1
ACO transect 3
ACO transect G5
JUDGE RICHARDSON DRIVE
PONGA ROAD

Fig. 5

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Data Sources: WSP
Auckland Council: Healthy Waters, Geospatial, Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors
Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Ground ACO
- Arboreal ACO
- Spotlighting
- Habitat search areas
- Hochstetter survey transects
- Quarry Development Area
- The Site
- Consented Pit Boundary
- Other owned land
- Permanant watercourse
- Intermittent watercourse
- Ephemeral watercourse

HUNUA QUARRY DEVELOPMENT

Lizard and Frog Surveys

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: VSm

Figure 6: Juvenile plague skink recovered by opportunistic searching

3.2.2.3 Frogs

High-quality and low-quality frog habitats were surveyed by two separate methods within the Site (**Figure 7**). In high quality habitat frog surveys were carried out using daytime walking transect survey methods to detect whether native frogs were present within Site. Surveys were carried out in dry weather, and only once at each site to minimise stream disturbance. Survey methods broadly followed the DOC guidance[4], i.e. searching by slowly moving upstream from the start point, carefully examining refugia for frogs (underneath rocks, logs and leaves, and inside crevices and tunnels) and returning refugia to the same place carefully after ensuring frogs are not in the way. In low quality habitat, a description and the extent of habitat was recorded and refuges were incidentally searched during the habitat assessment.

High-quality habitat

[4] Hochstetter's frog searching protocol. Frog/pepeketua Recovery Group. June 2024

Low-quality habitat

Figure 7: Images of high and low-quality habitat types searched across the Site.

3.2.3 Avifauna Acoustic Survey and 5MBCs

3.2.3.1 Desktop Assessment

A desktop study was conducted which collated all observations and known distributions of avifauna within the wider landscape and identified the potential habitat and movement corridors available with the Site and wider landscape. The next step was to identify species observed within the wider landscape but unlikely to ever occur within or traverse the Site due to lack of suitable habitat and known habitat preferences and/or movement patterns. Finally, the desktop study determined the key species of concern by looking at the species within the wider landscape and determining which of those species:

- are likely to be resident in the Site – this included identifying the range of potential avifauna habitat within the Site and the wider landscape (e.g. mature forest, open pasture, wetlands); or
- are likely to be frequent of infrequent visitors to the Site to forage or roost.

3.2.3.2 Desktop Data Sources

The primary sources of data were as follows:

- The Ornithological Society of New Zealand's (OSNZ) Atlas of Bird Distribution in New Zealand, grid squares (AE69 and AE70) that encompassed the Site and surrounds (https://ebird.org/atlasnz).
- The New Zealand eBird records of observations within the previous 15 years from within the Site and within a 10 km radius of the Site.
- Kākā GPS distribution (2020 and 2021) - Manaaki Whenua (https://www.landcareresearch.co.nz/publications/kararehe-kino/kararehe-kino-articles/wandering-waikato-kaka).
- The conservation status of avian species was derived from Robertson et al (2021).

3.2.3.3 Desktop Data Limitations

Avifauna presence and distribution recorded in national databases such as eBird often reflect the uneven coverage of past surveys rather than avifauna species true distribution across the landscape. As a result, these datasets provide limited information and do not accurately reflect their actual distribution. This introduces uncertainty when interpreting large-scale distribution patterns using these databases, particularly for species inhabiting remote and under surveyed areas.

eBird is a citizen science platform where users upload bird observations to a public database. While this provides broad geographic coverage, the reliability of the data can vary due to differences in observer experience and survey effort. Cumulative records can still be useful for indicating which species regularly occur in an area, and in some case, an absence of observations may suggest lower abundance. For these reasons, eBird is commonly used in the desktop phase of avifauna assessments; however, the data must be interpreted with caution and is not sufficient on its own. Accordingly, this assessment incorporates 3 months' worth of systematic, site-specific surveys to provide a more thorough understanding of local avifauna.

The New Zealand Bird Atlas is the more reliable avifauna database. It forms part of a nationwide survey run by Birds New Zealand, with the aim of mapping the distribution of all bird species across the country over a five-year period. Observers must register and submit their records in a standardised format, although contributors bird identification ability ranges widely.

3.2.3.4 5-minute Bird Counts (5MBC)

Eight locations were preselected for five-minute bird counts (5MBCs). Locations were selected based on the identified habitat/vegetation types (**Table 3**). Surveys were conducted on one day in each month of October, November and December 2025. At each location, a five-minute stand-down period preceded the count. The 5MBCs followed the standard protocol described by Dawson & Bull (1975) and involved two ecologists positioned at predetermined locations, recording all birds (native and non-native) seen or heard within a five-minute period. Weather conditions were documented at the start of each count using pre-printed data sheets. Observers were equipped with 10 x 42 magnification binoculars. All survey locations were spaced at least 200 m apart. The objective of the 5MBCs was to estimate the relative abundance of bird species utilising the different habitats across the Site.

Table 3: Habitat types at each 5-minute bird count locations.

5MBC ID	Habitat Type
P1	Native planting/weedy scrub mix
P2	Rank grass and manuka
P3	Tree fernland with nikau, emergent puriri and broadlead scrub (VS5)
P4	Tawa-taraire forest with mature kanuka (WF9)
P5	Exotic species (pine, rank grasses, pampas scrub)
P6	Pond
P7	Open pasture
P8	Tawa-taraire forest with mature kanuka (WF9)

3.2.3.5 Acoustic Recorder Surveys

Acoustic Recording Devices (ARDs) provide an effective, non-invasive method for surveying avifauna and can be preprogrammed to record during peak activity periods. Nine ARDs (Song Meter Mini II) were deployed across different vegetation types within the Site (see Map for recorder placement) (Table 4). Each recorder successfully recorded for an average of 25 days between 10 October and 21 November 2025. Technical issues affected four recorders: two recorders functioned for only two days, and two failed to record. Three of these were replaced between 28 November and 18 December 2025 and recorded for an average of 20 days (Map).

ARDs were programmed to operate two hours before and after local sunrise and sunset, with internal clocks automatically adjusting to maintain alignment with daily changes in sunrise and sunset times. These periods were selected to coincide with peak vocal activity around dawn and dusk. ARDs were mounted on trees or fence posts using cable ties, positioned away from heavy machinery corridors and outside the current consented pit to maximise detection potential.

Acoustic data were analysed by an ornithologist using Kaleidoscope Pro (Version 5.8.1). Pre-recorded call files for target species (kākā and koekoeā/ long-tailed cuckoo) were incorporated as “bait files” with each ARDs dataset. A cluster analysis was performed for each target species, and clusters containing bait files were visually assessed using spectrograms. Files resembling the bait files were listened to. All positive identifications were logged with the file name, date and time. In addition to target species detection, other avifauna calls (native and non-native) were identified to complement the 5MBC surveys and incidental observations.

Table 4: Acoustic recording device identification number and its associated vegetation type, Hunua Quarry Development.

ARD ID	Habitat Type
1	Kanuka forest with emergent broadleaves and podocarps (VS2)
2	Kanuka forest with emergent broadleaves and podocarps (VS2)
3	Tawa-taraire forest with mature kanuka (WF9)
4	Kanuka/manuka scrub (VS3)
5	Tawa-taraire forest with mature kanuka (WF9)
6	Tree fernland with nikau, emergent puriri and broadleaf scrub (VS5) AND Tawa-taraire forest with mature kanuka (WF9)
7	Native planting/weedy scrub mix
8	Native planting/weedy scrub mix
9	Tree fernland with nikau, emergent puriri and broadlead scrub (VS5)

3.2.3.6 Incidental Observations

The predetermined 5MBC sites were distributed across the Site in locations that represented different habitat types. The ecologists on site (carrying out 5MBCs and other ecological surveys) travelled across the Site using 4WD vehicles and on foot. Due to the mobile nature of avifauna, supplementary observations were recorded while moving around the Site. Outside of the scheduled 5MBCs, incidental records of native birds were documented, with particular attention to species classified as At Risk and Threatened, as well as species not detected during the 5MBCs. For each observation, the team recorded the species, number of individuals, flight height, direction of movement (if in flight), and GPS coordinates.

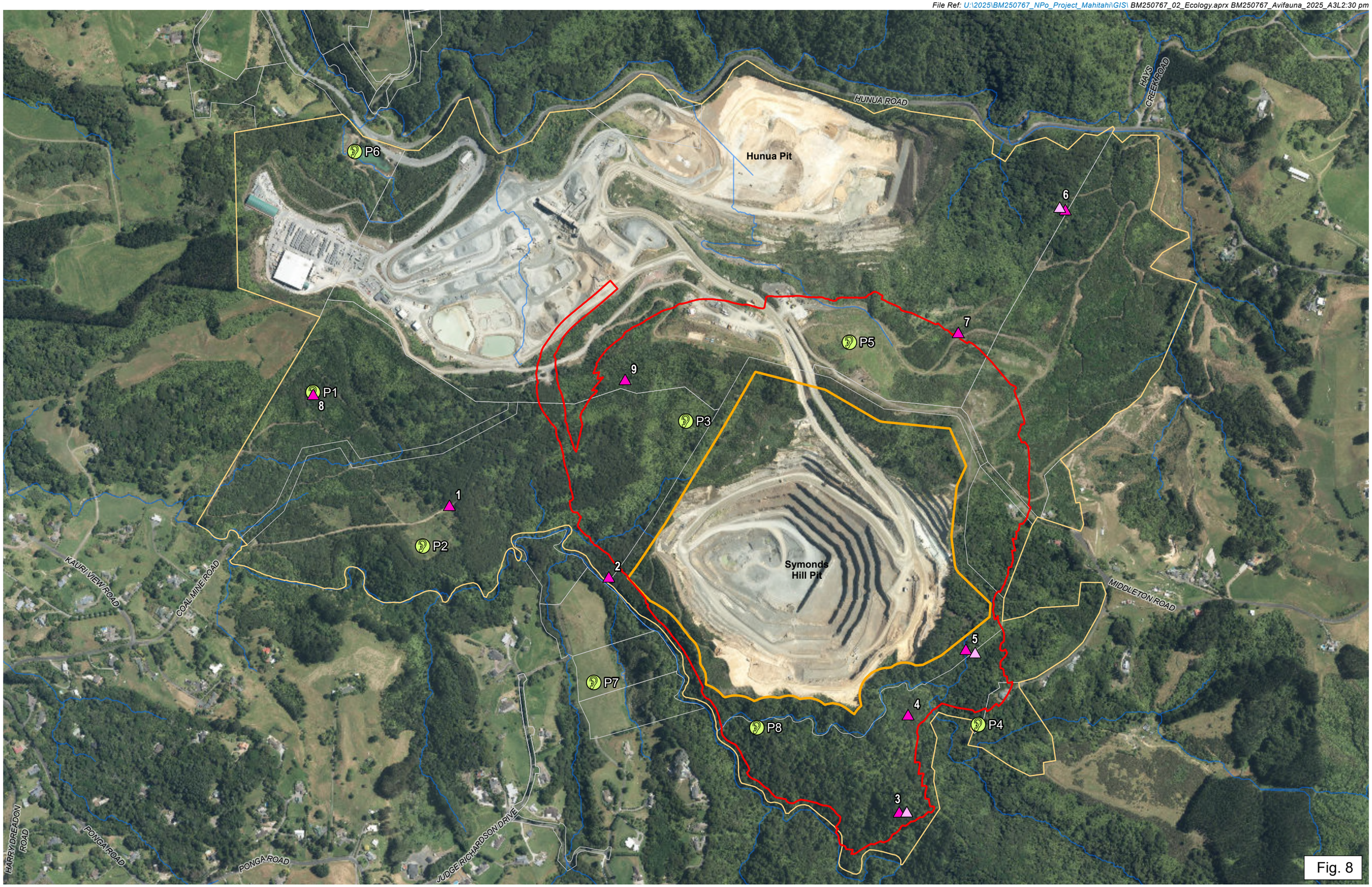

Fig. 8

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Bird Recorder
- Bird Recorder – redeployed
- Five-minute bird count site (5MBC)
- Quarry Development Area
- The Site
- Consented Pit Boundary
- Other owned land

HUNUA QUARRY DEVELOPMENT

Avifauna Surveys 2025

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: VSm

3.2.4 Bat Surveys

A desktop study was conducted to identify potential bat values within the Site and the wider landscape. The desktop study findings and an initial site visit were used to develop a methodology for the Sitebat acoustic surveys. Three acoustic bat recorder deployments (October and November 2025 and February 2026) were undertaken to determine the presence and distribution of bat activity within the Site. Sample locations and details of habitat features assessed in the bat recorder deployments are provided in **Appendix 3**.

3.2.4.1 Desktop Assessment

The Bats Observation Map (maintained by the Department of Conservation[5]) was reviewed, to assess the distribution and frequency of bat activity previously recorded in the landscape surrounding the Site and Landholding. This information was used to identify potential habitat and movement corridors within the Site, Landholding and wider landscape.

3.2.4.2 Bat Surveys 2021

A survey for presence and activity of bats was conducted over 16 consecutive nights from 12 to 28 October 2021. During the survey, 10 ABMs were deployed across the Project extent targeting habitat features preferred by long-tailed bats for roosting, commuting, and foraging. The deployments were essentially around the perimeter of the existing quarry (**Figure 9**).

Hourly weather data from the survey period were sourced from the nearest weather station available in New Zealand's National Climate database. Long-tailed bat activity is influenced by overnight weather conditions such as temperature, rainfall, wind speed and moonlight. Suitable conditions are defined for the purpose of this survey report as follows:

- Air temperature does not drop below 10°C from sunset until four hours after sunset;
- Rainfall of no more than 2.5 mm occurs in the first two hours after sunset;
- Mean overnight wind speed does not exceed 20 km/h;
- Overnight wind gusts do not exceed 60 km/h; and
- Nights where there is not a full moon. No monitoring occurs during full moon nights, including one night either side of the full moon[6].

[5] https://www.thebatcolab.co.nz/doc-bat-observations-map

[6] In December 2019, DOC released updated guidelines on weather conditions suitable for automatic bat monitoring (primarily for determining roost occupancy rather than for survey), including nightly temperatures to not exceed 17°C and relative humidity to be above 70%. However, this would render a large proportion of the summer season unsuitable for bat monitoring in the Waikato, Bay of Plenty, Auckland, and Northland regions due to the current prevalence of warmer and drier weather during the summer months. Consequently, for the purpose of this survey we have not considered humidity in the determination of fine weather nights.

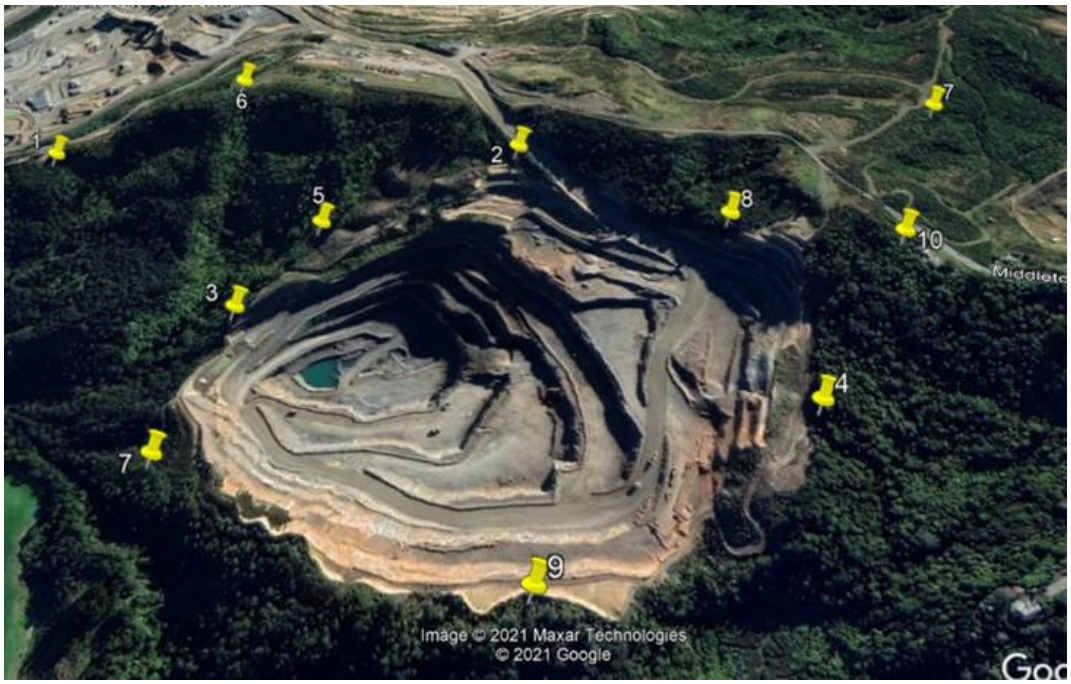

Figure 9: Location of acoustic bat monitors at Hunua Quarry, October 2021

3.2.4.3 Bat Surveys 2025-2026

Acoustic surveys of bat activity were undertaken within the Site over three seasonal survey intervals (October/November 2025 and November/December 2025, and February 2026) (Table 5). Song Meter Mini Bat and Song Meter Mini Bat 2 AA (Wildlife Acoustics) full spectrum recorders were deployed to record bat echolocation calls at 25 locations throughout the Site at any one time (**Figure 9**).

Table 5: Acoustic survey dates, 2025/26.

Survey	Number of detectors	Deployment date	Collection date
October 2025	24	10th October 2025	4th November 2025
November 2025	25	26th November 2025	17th December 2025
February 2026	25	11th February 2026	24th February 2026

Detectors were programmed to monitor from 30 minutes before local sunset to 30 minutes after local sunrise. The detectors were set to record in full spectrum format at a sample rate of 256 kHz. Trigger mode was used to begin recordings. The maximum recording length was set to 12 seconds. The trigger window was set to 3 seconds. This is the amount of time the Song Meter Mini Bat continues to record after the last signal that satisfies the minimum trigger frequency unless the recording reaches maximum recording length first. This avoids recordings ending after each single echolocation pulse. Each spectrogram showing call is recorded as a separate bat pass. A pass is defined as a series of calls, separated from other calls by silence of 3 seconds.

Song Meter Mini Bat and Mini Bat 2 AA recorders are capable of simultaneously recording both long-tailed and short-tailed bat echolocation calls, and the calls of the two species are easily identified by their frequencies of peak energy and call structure (Parsons et al., 1997).

Long-tailed bats have been recorded in the surrounding area, namely to the east in the Hunua Ranges and surrounding landscape and west in Karaka and the surrounding landscape (Department of Conservation Bat Database records). Song Meters frequency was set to 16 kHz to cover the frequency of both bat species, to ensure short-tailed bats would be detected, if present. All data from all nights were analysed using Kaleidoscope Pro (Wildlife Acoustics). Manual identification of subsets of the data was used to verify the accuracy of the automatic filtering used in the Kaleidoscope software.

The objectives of the acoustic surveys were to:

- record and compare absolute and relative activity levels across various habitats within the Site; and
- assess the range of seasonal variations in activity at representative sample locations across the Site.

Detectors were positioned in trees, or on fences where the microphone would be less shielded by dense vegetation. Where possible the same locations were resampled over all the survey intervals. The current consented pit edge in Symonds Hill Pit was avoided as it is actively being blasted.

Survey locations were selected for the following features:

- vegetation edges: favoured for foraging locations;
- gullies, streams and tributaries: used for commuting, sheltering and navigation; and
- open pasture: which can be used for foraging.

Limitations of acoustic surveys:

- Acoustic monitoring of bats can provide evidence of presence, however there is not a direct correlation between the number of calls and the number of bats present. A single bat foraging in a particular area can make multiple passes, creating numerous recordings. A single bat flying through a site could also be recorded on several detectors.
- The detectors have a range of between 30 to 50 m and this can be affected by wind, humidity and surrounding vegetation. Large sites acoustic monitoring provides a snapshot of activity at the detector locations, and it is therefore important to choose representative survey points to enable extrapolation across the Site. The high number of detectors used, across a range of habitat types, is considered sufficient to give a good representation of activity levels on the Site.
- Detectors can be affected by environmental conditions and some detectors failed due to water entry.

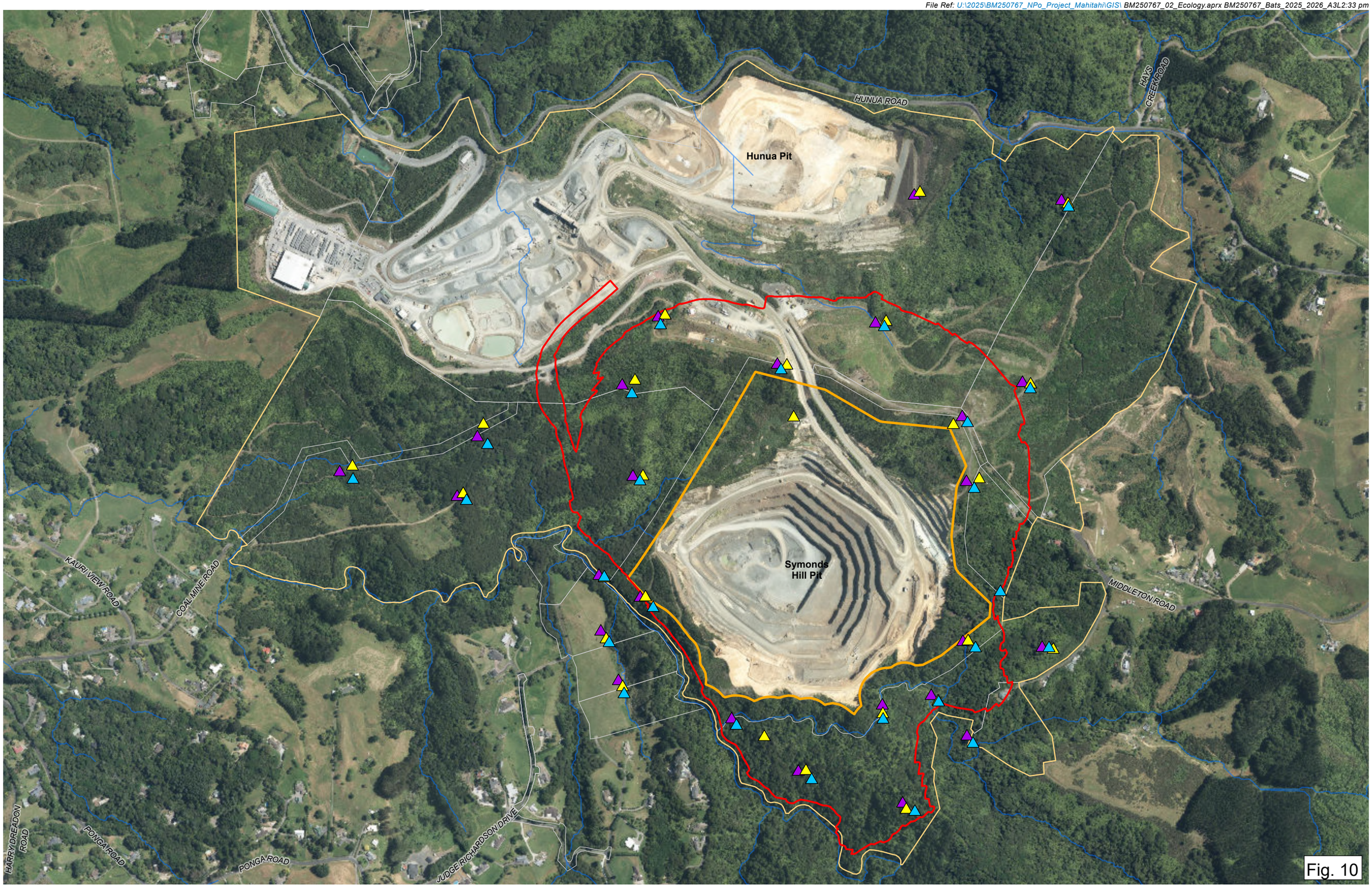

Fig. 10

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Bat recorder deployment 1 (10 Oct - 4th Nov)
- Bat recorder deployment 2 (8th Nov - 18th Dec)
- Bat recorder deployment 3 (11th - 26th Feb)
- Quarry Development Area
- The Site
- Consented Pit Boundary
- Other owned land

HUNUA QUARRY DEVELOPMENT

Bat Recorders 2025 – 2026

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: VSm

3.3 Wetland Delineation

The RMA definition of a wetland is *"permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions".*

The NPS-FM (2020, amended December 2025) defines a "natural inland wetland" as a wetland (defined in the RMA) that is not:

(a) in the coastal marine area; or

(b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or

(c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or

(d) a geothermal wetland; or

(e) a wetland that:

  (i) is within an area of pasture used for grazing; and

  (ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8)); unless

  (iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of the NPS-FM, in which case the exclusion in (e) does not apply.

A desktop review was undertaken to identify prospective wetland features, using recent aerial imagery and topography. Prospective wetland features were indicatively mapped in ArcGIS. Site visits were undertaken to assess prospective wetland features using the national wetland delineation protocols (including features not detected in the desktop analysis).

Wetland investigations were undertaken in December 2025 and January 2026, in accordance with wetland delineation protocols (Ministry for the Environment, 2022b). These protocols comprise a set of vegetation, soil and hydrology tools that are applied in a hierarchical sequence of tests, each requiring an increasing level of detail as shown in the wetland delineation flow chart (**Figure 11**).

The ‘vegetation tool’ in the wetland delineation protocols help to determine whether an area constitutes a natural inland wetland based on the percentage cover of plant species present and their wetland indicator status ratings from (Clarkson et al., 2021). Wetland indicator status ratings for plant species are:

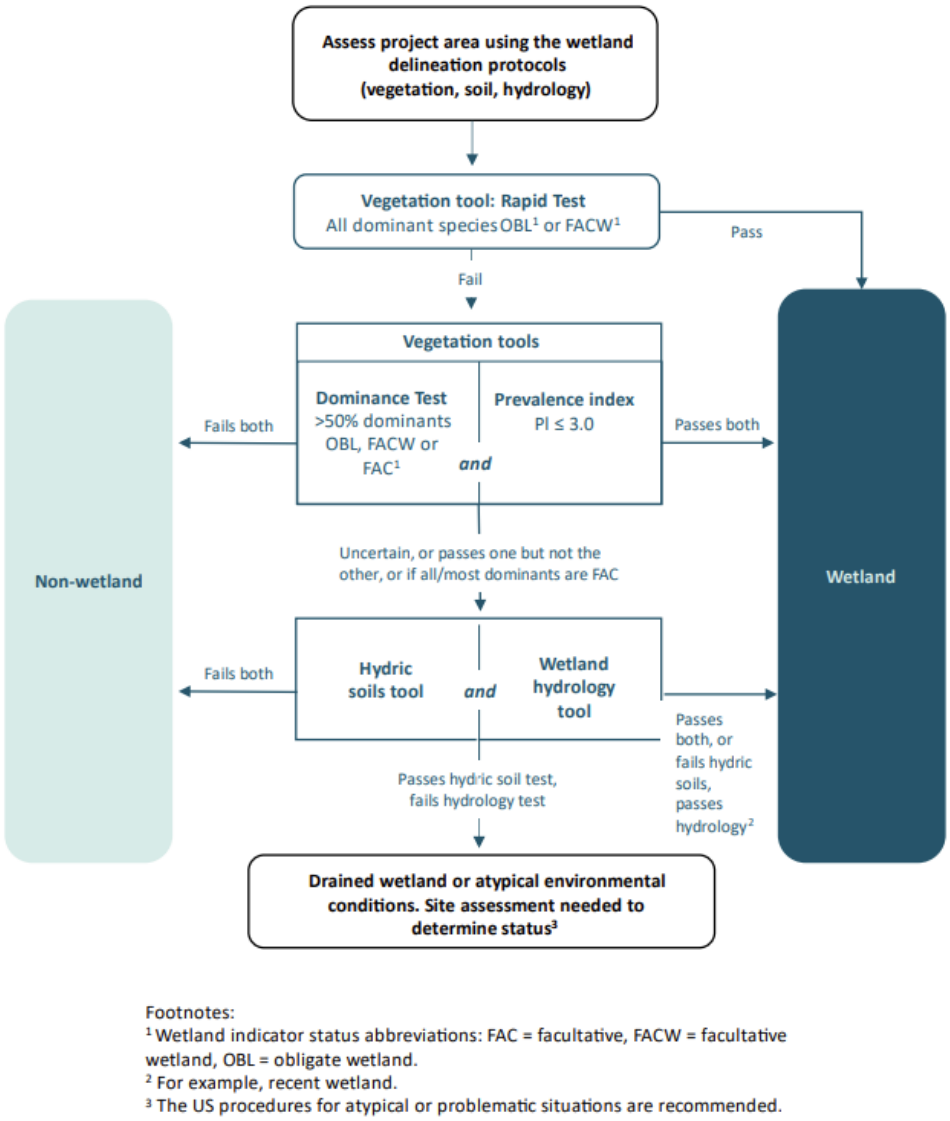
- Obligate (OBL): occurs almost always in wetlands
- Facultative Wetland (FACW): occurs usually in wetlands
- Facultative (FAC): equally likely to occur in wetlands or non-wetlands
- Facultative Upland (FACU): occurs occasionally in wetlands
- Upland (UPL): rarely occurs in wetlands

The ‘Rapid’ (vegetation) test in the wetland delineation protocols (Ministry for the Environment, 2022b) is identified as an appropriate method to identify and delineate wetlands when the characteristics of the feature are obvious (i.e., where the vegetation is dominated by OBL or

FACW species, the area passes the rapid test and is accepted as a natural inland wetland). The ‘Dominance’ and ‘Prevalence Index” (vegetation) tests were applied for less obvious features (Ministry for the Environment, 2022b). If the vegetation tools do not provide a definitive result, the Hydric soils (Fraser et al., 2018) and Wetland hydrology (Ministry for the Environment, 2021) tools were applied.

The spatial extent of confirmed wetland features was mapped in GIS based on a combination of GPS points and further desktop analysis following the site visit and data analysis.

Approximately 270 m of the Mangapū Stream reach was deemed too steep to access (most of the reach between the two waterfalls), so a conservative set of wetland areas were approximated within this reach from a combination of high-definition (2.5m spacing) contour lines, LiDar data of the landforms, and aerial imagery, along with extrapolation from surveys of a representative sample of steep parataniwha-dominated wetland gullies in the area.



Footnotes:
[1] Wetland indicator status abbreviations: FAC = facultative, FACW = facultative wetland, OBL = obligate wetland.
[2] For example, recent wetland.
[3] The US procedures for atypical or problematic situations are recommended.

Figure 11: Key steps in wetland delineation (from NPS-FM Wetland Delineation protocols (Ministry for the Environment, 2022b)

3.3.1 Wetland Condition Evaluation

The NPS-FM 2020 (October 2024) seeks to ensure that natural and physical resources are managed in a way that prioritises the health and well-being of water bodies and freshwater ecosystems. With respect to wetlands and rivers, the NPS-FM defines components of 'value[7]' as:

(i) ecosystem health;
(ii) indigenous biodiversity;
(iii) hydrological functioning;
(iv) Māori freshwater values;
(v) amenity values.

[7] Māori freshwater values and amenity values are beyond the scope of this ecological assessment.

While the NPS-FM does not include specific attributes or quality parameters for assessing wetland ecological values, Appendix 1A specifies the following biophysical components of ecosystem health for water bodies in general:

Water quality: the physical and chemical measures of the water, such as temperature, dissolved oxygen, pH, suspended sediment, nutrients and toxicants.

Water quantity: the extent and variability in the level or flow of water.

Habitat: the physical form, structure, and extent of the water body, its bed, banks and margins; its riparian vegetation; and its connections to the floodplain and to groundwater.

Aquatic life: the abundance and diversity of biota including microbes, invertebrates, plants, fish and birds.

Ecological processes: the interactions among biota and their physical and chemical environment such as primary production, decomposition, nutrient cycling and trophic connectivity.

Clarkson et al. (2004) developed a set of wetland monitoring attributes and a matrix for assigning standardised condition scores for each attribute. Clarkson et al. (2004 and subsequent revisions) includes a broad mix of attributes, some of which are “pressure-state-response” measures more suited to long term state of the environment monitoring, and some of which are specific to peatland (not relevant to this assessment).

This evaluation has adapted the Clarkson (2004) Wetland Condition Index attributes and scoring to enable rapid assessment of the condition of small mineral wetland features, and to incorporate the components of ‘value’ (ecosystem health, indigenous biodiversity and ecosystem functioning) as defined in the NPS-FM. The WCI has been applied at a sub-catchment scale, recognising that the physical functions of superficially discrete wetland features are interconnected.

3.4 Freshwater Surveys

3.4.1 Stream Walks and Habitat Assessments

Stream walks were undertaken along much of the length of permanently flowing sections the Mangapū Stream and its tributaries within and bordering the works footprint. Selected intermittent and ephemeral streams were walked.

Stream walks involved working alongside and / or through the stream and making visual observations. These included observations on attributes such as riparian vegetation, stream shading, stream bed composition, stream flow, areas of potential habitat for native instream fauna and potential fish passage issues. Specific points of interest were recorded via Fieldmaps, while reach scale observations were noted down.

3.4.2 Stream Ecological Valuation (SEV)

Stream Ecological Valuation (SEV) assessments were undertaken at three Sites across the Mangapū Stream and Mangapū Tributary on 15 December 2025 to assess stream

function (**Figure 12**). SEV assessments were also undertaken previously by BML in 2021 at Mangapū Stream Trib 3 and we have relied on the results from that survey. No fish surveys were undertaken at the time of the SEV survey in 2025, with fish communities recorded from eDNA collected at each SEV site.

The SEV is recommended by Auckland Council for providing an ecological valuation of streams. The SEV uses a set of fourteen qualitative and quantitative variables to assess the integrity of stream ecological functions (**Appendix 4**). Field work consists of a comprehensive assessment of the in-stream and riparian environment. This includes a fish survey, aquatic macroinvertebrate sampling and cross-sections of the stream to measure width, depth and substrate, as well as using qualitative parameters for reach-scale attributes.

This data is analysed using a series of formulae in order to produce an SEV score of between 0-1, where a 0 is a stream with no stream function and 1 is a pristine stream with maximum stream function.

3.4.3 Environmental DNA (eDNA)

All living things shed genetic information into their local environment. This is called environmental DNA, or eDNA and refers to all the tiny traces of genetic material that is left behind as living things pass through water or soil. Understanding the eDNA of a waterbody allows for rapid assessment of the biodiversity present. However, it only provides information on the presence of species and does not provide abundance data. Furthermore, the absence of identification through eDNA sampling does not inherently mean a species is not present in the sampled environment. However, although to be treated with some caution, the strength of the eDNA signal (the number of times a unique DNA sequence was detected in a sample) is helpful (although not determinative) in distinguishing relative strength of detections between samples and between locations.

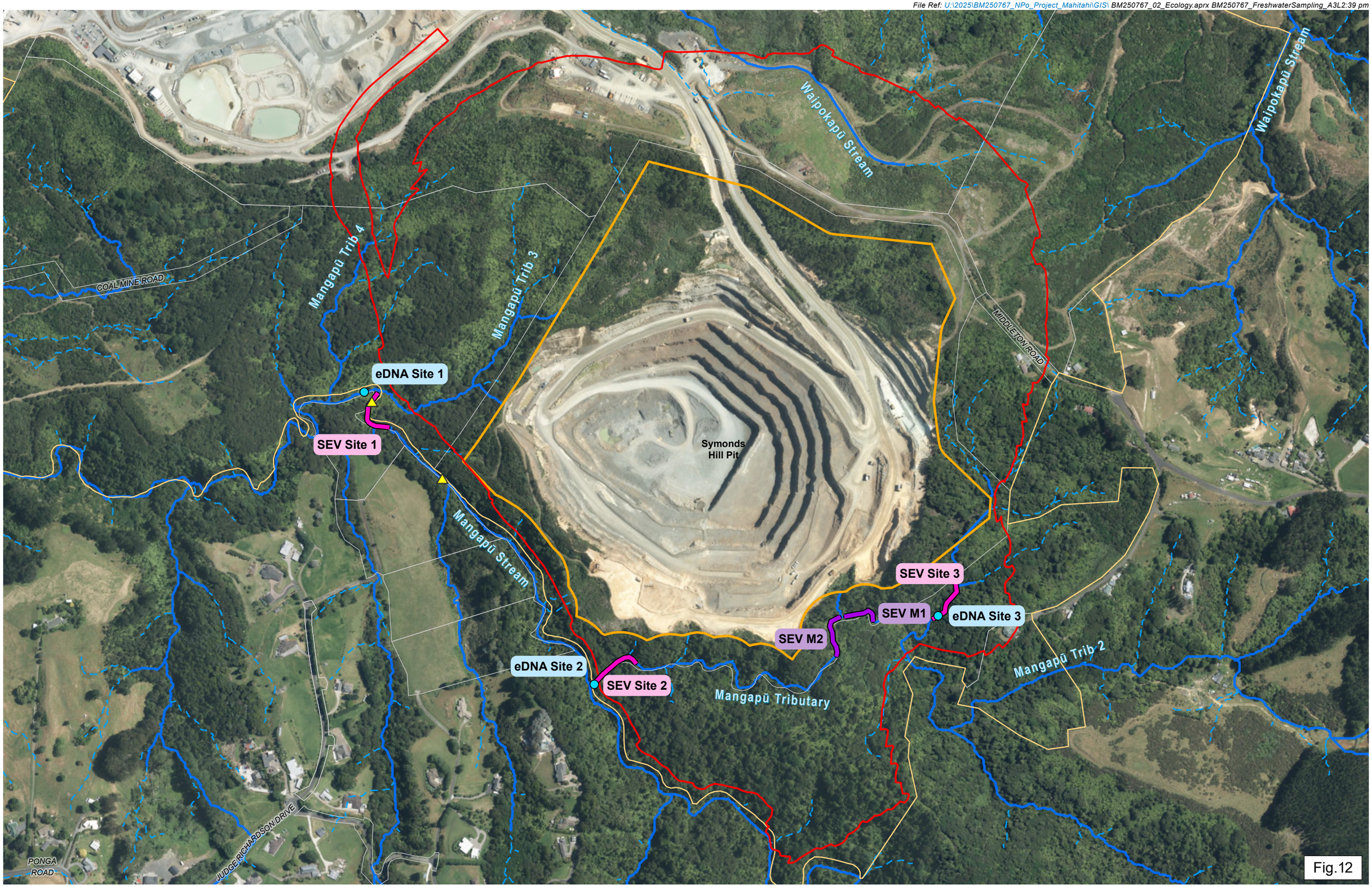


Fig.12

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0 100 m

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Data Sources: WSP
Auckland Council: Healthy Waters, Geospatial, Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- eDNA sample sites 2025
- Groundwater diversion monitoing sites
- SEV sites 2025
- Sediment pond SEV sites

Overland Flow Paths (Auckland Council)

- Permanent
- Intermittent
- Ephemeral

- Quarry Development Area
- Consented Pit Boundary
- The Site
- Other owned land

HUNUA QUARRY DEVELOPMENT

Freshwater Sample Sites

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: IBo

Environmental DNA was collected at the three SEV sites, with sampling progressed from the downstream site to the upstream site to prevent potential contamination of water samples. Samples were collected using Wilderlab NZ Ltd 6-replicate sampling kits (with turbid filters) in accordance with the Wilderlab NZ Ltd eDNA sampling instructions. A 1000 ml sample of stream water was filtered for all replicates. Samples were sent to Wilderlab NZ Ltd for analysis.

3.5 Effects Management Approach

Consistent with the NPS-FM and NPS-IB, we have applied the 'effects management hierarchy' to the impacts of the Project. The effects management hierarchy outlines the order of priority for ecological impact management as:

a. Avoid.

b. Minimise.

c. Remedy.

d. Offset.

e. Compensate.

f. Any supporting actions.

Our approach to providing an environmental outcome for all of the Project components has been one of integrating and aggregating the mitigation and offsets/compensation to maximise environmental outcomes as much as practicable.

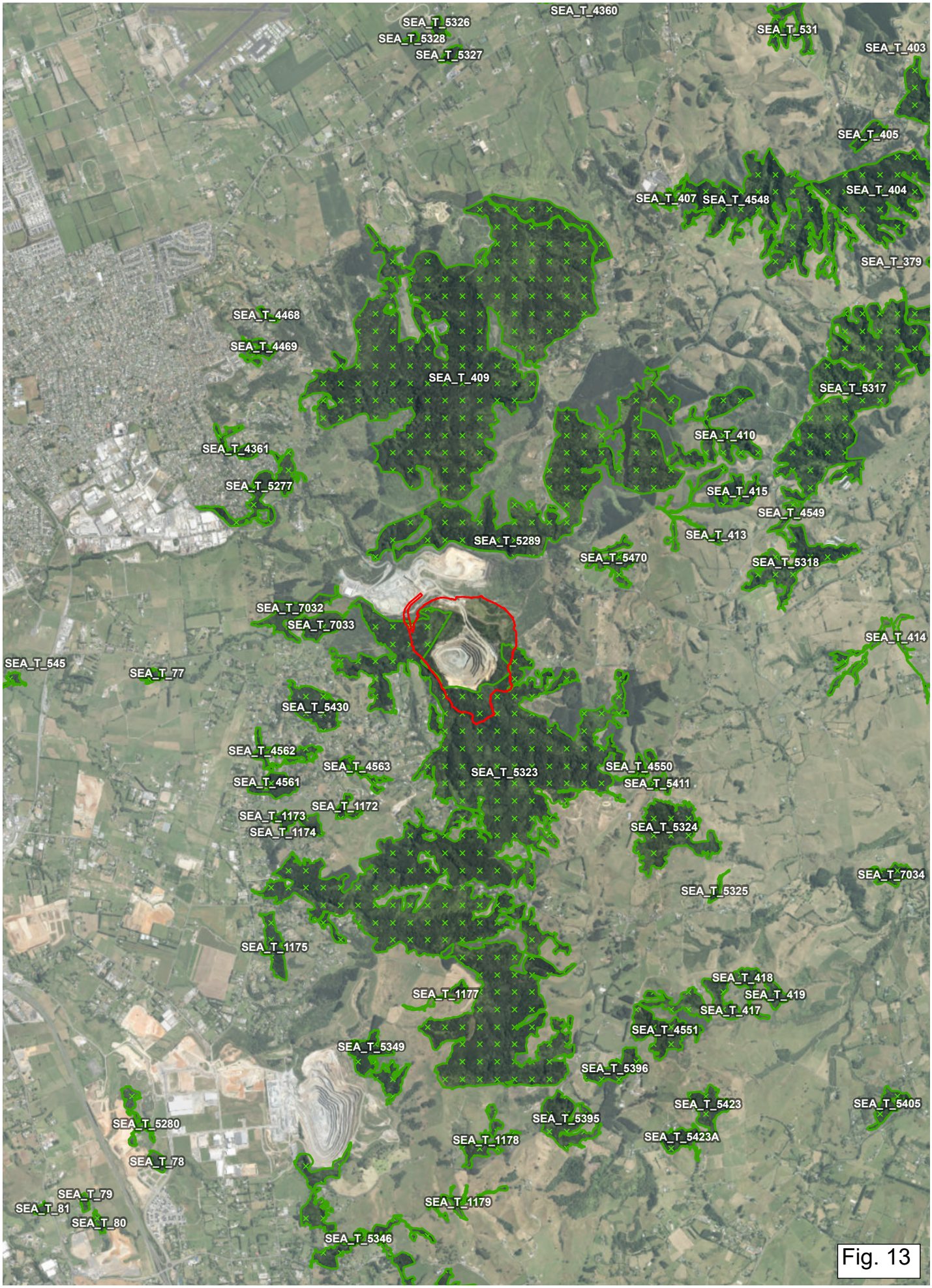
4.0 Site Location and Context

4.1 Ecological District

Hunua Quarry is situated in dissected hill country near the eastern boundary of the Manukau Ecological District within the wider Auckland Ecological Region. The quarry lies within the foothills of the Hunua Ranges east of Papakura, which contain the most extensive areas of native vegetation in the Manukau Ecological District (most of the Manukau ED is pastoral farmland). Further eastward, the forested Hunua Ranges are encompassed within the Hunua Ecological District.

4.2 Connectivity

Hunua Quarry sits on the western margins of the Hunua Ranges, within a mosaic of remnant forest areas. Auckland Unitary Plan SEA overlay identifies several Significant Ecological Areas (SEAs) in the vicinity (**Figure 13**), including SEA_T_5323 which surrounds the existing Symonds Hill Pit.



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LEGEND

Significant Ecological Area

Quarry Development Area

HUNUA QUARRY DEVELOPMENT

Significant Ecological Areas

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: IBo

5.0 Terrestrial Ecological Values

5.1 Terrestrial Vegetation

5.1.1 Vegetation Types

5.1.1.1 Overview

Vegetation communities are broadly characteristic of the dominant forest cover that occurs throughout the Hunua Ranges. The forest composition within the Site and wider landholding reflect the area's history of forest clearance and disturbance, and the gradients in soil types and drainage formed by the steep, dissected topography.

Much of the understorey of the forested areas show evidence of grazing from possums and possibly ungulates, with broadleaf and podocarp seedlings clearly absent in some areas, and hardier ferns and unpalatable/divaricating shrub species dominating the otherwise-sparse undergrowth.

Vegetation types identified within the Site are shown in **Figure 14**, and a list of all plant species recorded is provided in **Appendix 5**.

5.1.1.2 Tree-fernland with nīkau, emergent pūriri and broadleaved scrub

Tree-fernland and broadleaved scrub covers lowland gullies and sheltered slopes across the Site, occurring on moderately fertile soils with medium to poor drainage. Tree-fernland and broadleaved scrub is an early successional community that has established following recent-historic anthropogenic clearance. Retrolens imagery shows an absence of woody vegetation in parts of these areas until approximately 1988, which is likely when natural regeneration commenced.

Structurally, this vegetation type is best described as a treeland or low forest dominated by tree ferns, low-stature broadleaved species, shrubs, and ferns. Mean canopy height is approximately 4 m, with a range of 3–8 m, and the vegetation typically comprises three strata: a developing canopy of broadleaved species and tree ferns, a subcanopy of juvenile broadleaves and shrubs, and a fern- and herb-dominated groundcover layer. Occasional weed species, including gorse, pampas, and woolly nightshade, are present in areas where indigenous cover is lower, particularly along the northern edge of the current Symonds Hill Pit and adjacent road margins. Indigenous vegetation cover is generally high (>80–90%), with canopy cover typically between 40–70% and dense subcanopy and ground cover in sheltered locations.

Dominant species include ponga (*Cyathea dealbata*), mahoe (*Melicytus ramiflorus*), wheki (*Dicksonia squarrosa*), and mamaku (*Cyathea medullaris*). Frequent associated species include pate (*Schefflera digitata*), hangehange (*Geniostoma ligustrifolium*), pigeonwood (*Hedycarya arborea*), mapou (*Myrsine australis*), putaputawētā (*Carpodetus serratus*), and nīkau (*Rhopalostylis sapida*).

This vegetation best fits the description of the VS5 vegetation type in Singers et al. (2017): Broadleaved species scrub/forest, which has a regional IUCN threat status of Least Concern due to its high prevalence in Auckland and across the country.

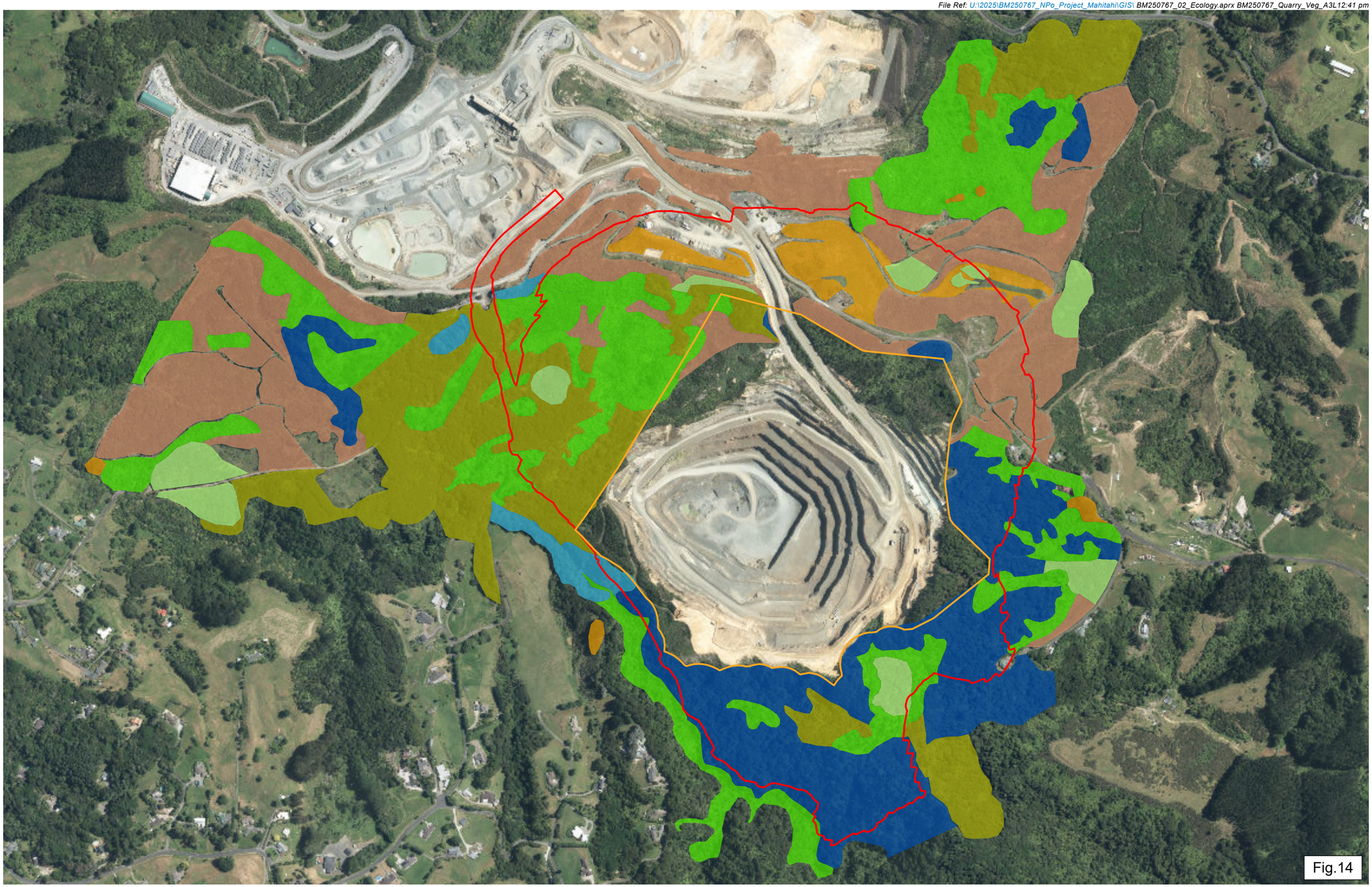

Fig.14

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Early successional vegetation
- Tree fernland with nīkau, emergent pūriri and broadleaf scrub (VS5)
- Kānuka forest with emergent broadleaves and podocarps (VS2)
- Kānuka/manuka scrub (VS3)

Late successional vegetation
- Tawa-taraire forest with mature kānuka (WF9)
- Kauri, podocarp, broadleaf forest (WF11)

Disturbed/modified vegetation
- Native planting/weedy scrub mix
- Exotic species (pine, rank grasses, pampas scrub)
- Consented Pit Boundary
- Quarry Development Area

HUNUA QUARRY DEVELOPMENT

Hunua Quarry Vegetation Types

Date: 27 March 2026 | Revision: 0

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This vegetation is often composed of highly palatable broadleaf species, so its species composition can be altered or threatened by browsing mammalian pests.

5.1.1.3 Kānuka forest with emergent broadleaves & podocarps

Kānuka forest occurs primarily on slopes and ridgelines across the Site, generally on free-draining soils of moderate fertility. This vegetation community is at a mid-successional stage of regeneration following historic land clearance, with no evidence of recent major disturbance. In these areas, natural succession has progressed beyond early scrubland, with the development of a closed forest canopy and increasing broadleaf recruitment.

Kānuka (*Kunzea robusta*) dominates the forest canopy, with a mean height of 5–12 m and occasional individuals reaching up to 15 m. The vegetation typically comprises three strata: a kānuka-dominated canopy, a developing subcanopy of ponga (*Cyathea dealbata*) and broadleaved species including mahoe (*Melicytus ramiflorus*), mapou (*Myrsine australis*), pūriri (*Vitex lucens*), taraire (*Beilschmiedia tarairi*), tawa (*Beilschmiedia tawa*), pigeonwood (*Hedycarya arborea*), tōtara (*Podocarpus totara*), mingimingi (*Leucopogon fasciculatus*), tanekaha (*Phyllocladus trichomanoides*), and kahikatea (*Dacrycarpus dacrydioides*), and a sparse to moderately developed shrub and fern ground layer. Canopy cover typically ranges between 70–90%, with subcanopy density increasing where canopy gaps occur. Indigenous vegetation cover is generally upwards of 95%.

The mix of dominant species under the kānuka canopy was variable and dictated by topography and their associated conditions (i.e. more broadleaves in wetter gullies, more podocarps on drier slopes). The presence of these species indicates ongoing successional transition toward podocarp–broadleaved forest.

This vegetation fits the description of an early successional stage of the WF9 vegetation type: Taraire, tawa, podocarp forest (see below). It is also consistent with the VS2 vegetation type in Singers et al. (2017): Kānuka forest, which has a Regional IUCN threat status of ‘Least Concern’ due to its prevalence resulting colonisation after historic and recent widespread vegetation clearance.

5.1.1.4 Tawa-taraire forest with mature kānuka

Tawa-taraire forest is present within lowland areas of the Site, typically on fertile alluvial or colluvial soils with good moisture availability. Older-growth tawa-taraire forest patches are present in gully heads that were protected from fire (commonly used for forest clearance), but most of this forest type is transitioning from kānuka forest to secondary broadleaved forest following wholesale forest clearance and/ or historic selective harvest of kauri and podocarps approximately 150 – 200 years b.p.

Structurally, this vegetation is a tall forest with a well-developed vertical profile. Canopy height typically ranges from approximately 18–25 m, with four distinct strata evident: an upper canopy dominated by mature trees, a subcanopy of shade-tolerant species, a shrub layer, and a fern-dominated ground layer. Canopy cover is generally high (>90%), creating shaded understory conditions.

Dominant canopy species include taraire (*Beilschmiedia tarairi*), tawa (*Beilschmiedia tawa*), and pukatea (*Laurelia novae-zelandiae*). This species assemblage occurs consistently throughout mature secondary forest areas where the kānuka canopy is mature to senescent. A varied understorey is present, including pūriri (*Vitex lucens*), nīkau (*Rhopalostylis sapida*), ponga, mahoe, pigeonwood, kohekohe (*Dysoxylum spectabile*), rewarewa (K*nightia excelsa*), and kiekie (*Freycinetia banksii*) as a common groundcover. Less commonly, white maire

(*Nestegis lanceolata*), rimu (*Dacrydium cupressinum*), kahikatea (*Dacrycarpus dacrydioides*) and tōtara (*Podocarpus totara*) are present as subcanopy and canopy trees in some slope areas.

This vegetation best fits the description of the WF9 vegetation type in Singers et al. (2017): Taraire, tawa, podocarp forest. This ecosystem type has a regional threat status of "Endangered" under the IUCN ecosystem threat classification (Singers et al., 2017).

5.1.1.5 Native planting/weedy scrub mix

Areas of native plantings are present within the Site and wider landholding, with a varied composition that reflects variations in planting history, disturbance, weed invasion and maintenance resulting in a heterogeneous vegetation mosaic across the Site.

Planted vegetation comprises patches of scrub and shrubland, with vegetation heights between 1–5 m. The vegetation generally comprises two strata: a shrub or low tree canopy and a ground layer dominated by grasses, herbs, and juvenile woody species. Total vegetation cover is variable, ranging from approximately 50–90%, with patchy distribution of indigenous and exotic species.

Species composition varies considerably but typically includes planted indigenous species such as *Coprosma* spp. and *Pittosporum* spp., alongside exotic species including gorse, pampas, inkweed and other ruderal weeds. Indigenous species dominance is variable and reflects planting density, maintenance, and time since disturbance.

This vegetation represents a modified, early successional state and does not directly correspond to a single vegetation type in Singers et al. (2017) and is therefore treated as a locally defined vegetation unit.

5.1.1.6 Kānuka/mānuka scrub

Kānuka- mānuka scrub occurs primarily on moderate-poorly draining, nutrient-poor soils in flat or slumped areas, and represents an early to mid-successional stage following historic clearance. Structurally, this vegetation is a low forest or tall shrubland, typically 2–6 m in height, and generally comprises two strata: a dense shrub canopy and a sparse to moderate ground layer of sedges, ferns and herbs. Canopy cover is typically high, ranging from approximately 70–90%, with some emergent weed species such as woolly nightshade and pampas present (~1-5%).

Kānuka and mānuka (*Leptospermum scoparium*) grow densely, with a limited variety of other woody species including mahoe, hangehange and putaputawētā. Where canopy gaps occur, early successional broadleaved species may establish, indicating ongoing successional development. Wet-tolerant *Carex* species are common as groundcover due to the poorly draining soils.

This vegetation best fits the description of the VS3 vegetation type in Singers et al. (2017): Mānuka / kānuka scrub, which has a Regional IUCN threat status of 'Least Concern' due to its prevalence resulting from colonisation after historic and recent widespread vegetation clearance. Weed species, particularly fire-resistant ones, are the greatest threat to this vegetation type.

5.1.1.7 Kauri, podocarp, broadleaf forest

Remnant stands of kauri, podocarp, broadleaf forest occurs in upland to lowland areas of the Site, typically on acidic, free-draining soils. These areas have experienced limited recent disturbance and support mature indigenous forest.

Structurally, this vegetation is a tall forest with canopy heights typically ranging from 18–25 m. The forest exhibits a well-developed four-tiered structure, comprising emergent kauri and podocarps, a closed canopy of large podocarps, a subcanopy of broadleaved species, and a fern and seedling-dominated ground layer. Some areas comprise fewer podocarps and are more dominated by mature kānuka, likely due to a mosaic of land use and recent disturbance across the Site. Canopy cover is generally high (>80%).

Dominant species include kauri (*Agathis australis*), podocarp species such as tanekaha and rimu, or kahikatea where soils are poorly-draining, with a diverse assemblage of indigenous broadleaved shrubs and trees, particularly kānuka, hangehange, mahoe, pigeonwood, and rewarewa. Species composition reflects advanced successional status and long-term forest continuity.

This vegetation best fits the description of the WF11 vegetation type in Singers et al. (2017): Kauri, podocarp, broadleaved forest (WF11). This ecosystem type has a regional threat status of “Endangered” under the IUCN ecosystem threat classification (Singers et al., 2017).

5.1.1.8 Exotic Weedfield

These areas have likely been cleared recently and/or experience ongoing modification and disturbance, resulting in fast-growing exotic species dominating the groundcover and outcompeting native species. Pampas, pine, and rank grasses dominate these areas.

5.1.2 Vegetation Characteristics by successional stage

Data compiled from RECCE plots and PCQ transects is presented in **Figure 15- Figure 21**. Vegetation types are ordered by successional stage to highlight trends associated with stand age, including increased basal area (a measure of biomass), canopy height, and organic soil accumulation (**Figure 15, Figure 17, Figure 19**). Stem density in natural plant communities shows a peak in early succession, with natural thinning as larger trees outcompete and suppress smaller ones (**Figure 16**).

Numbers of plant species increase through the succession to the mature secondary forest, but decline in old-growth forest remnants (**Figure 20**). This may reflect a temporal ecotone, i.e., mid-successional stages have a mix of both early and later- successional species, while old growth forests are dominated by late-successional specialists and the environment is more homogeneous (the “intermediate disturbance hypothesis”).

Canopy cover (**Figure 18**) and numbers of exotic species (**Figure 21**) did not show any clear trend associated with forest successional development. Planted vegetation had the lowest species richness and highest number of exotic species of all vegetation types assessed.

Examples of vegetation types are shown in **Figure 22.**

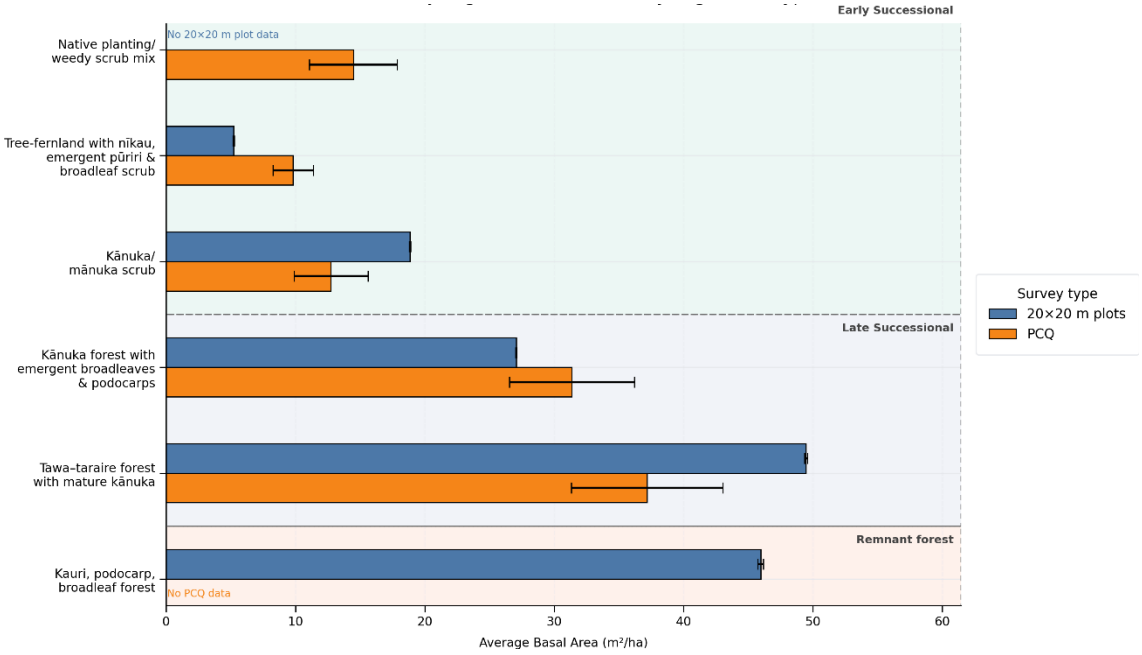

***Figure** 15. Mean basal area by vegetation type, Hunua Quarry Development, October 2025-February 2026.*

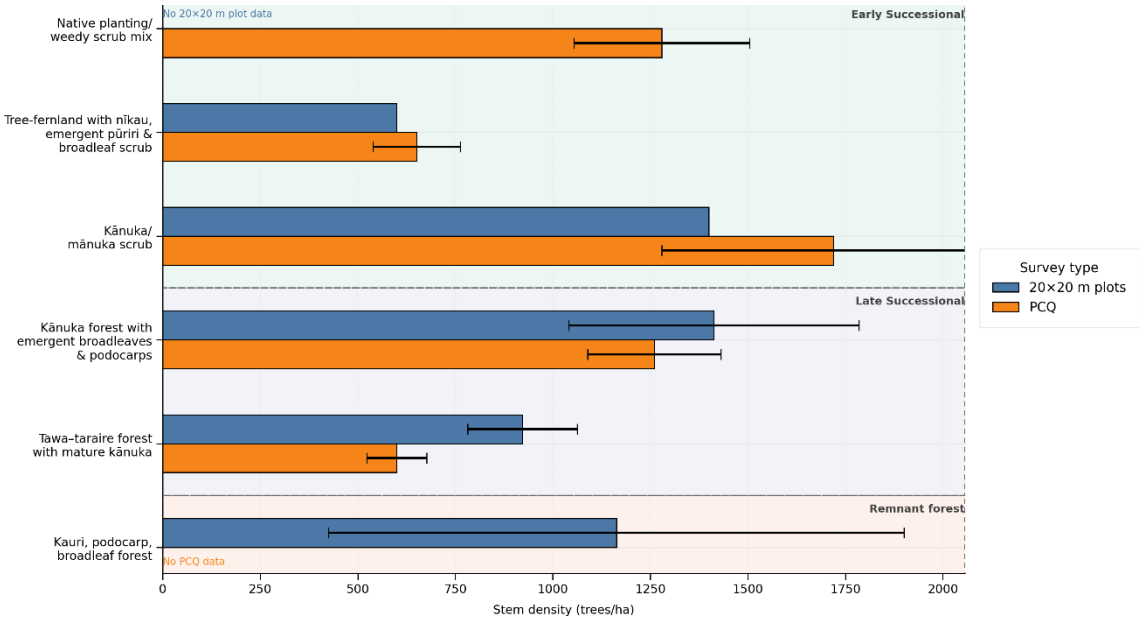

***Figure** 16. Mean stem density by vegetation type, Hunua Quarry Development, October 2025-February 2026.*

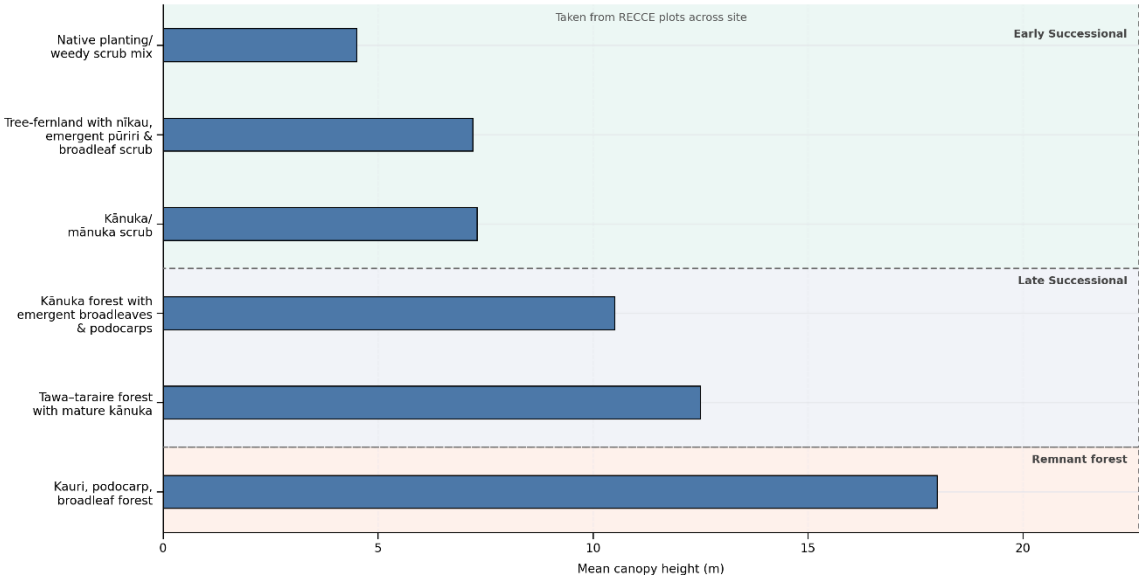

***Figure** 17. Mean canopy height by vegetation type, Hunua Quarry Development, October 2025-February 2026.*

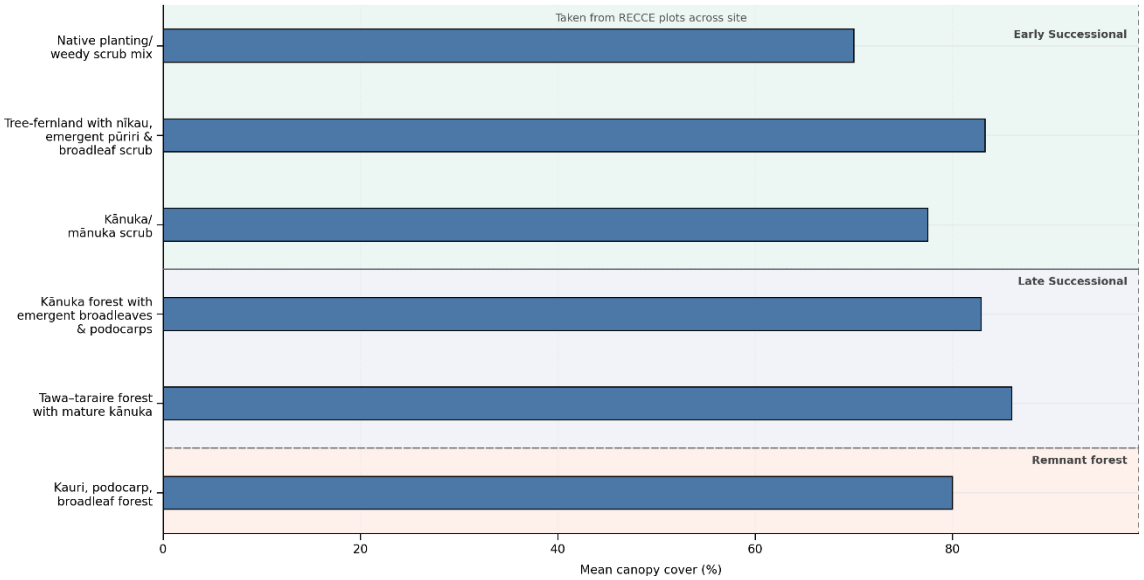

***Figure** 18. Mean canopy cover by vegetation type, Hunua Quarry Development, October 2025-February 2026.*

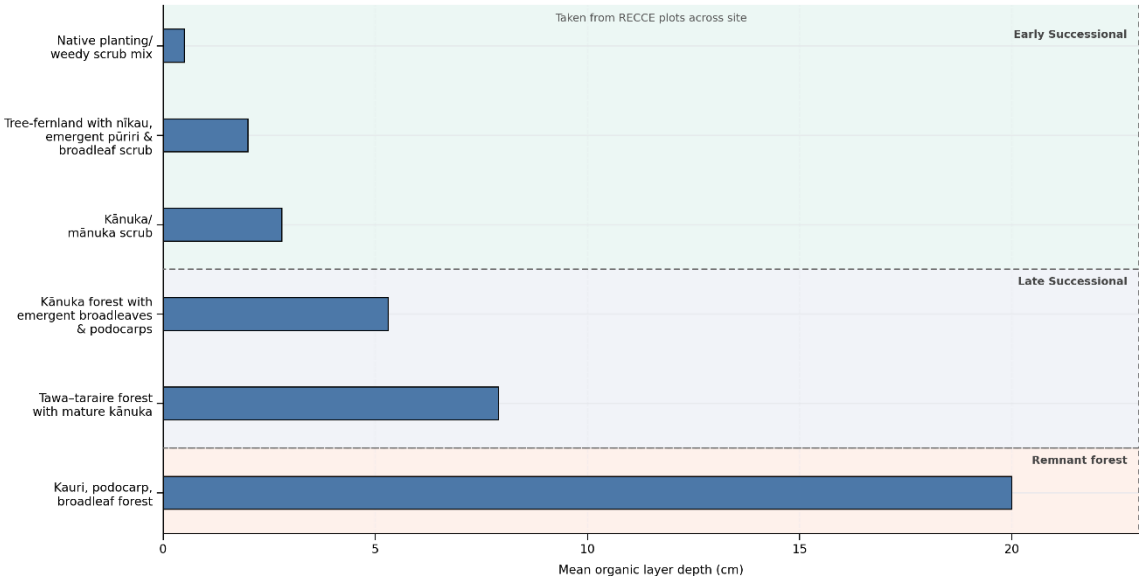

***Figure** 19. Mean organic layer depth by vegetation type, Hunua Quarry Development, October 2025-February 2026.*

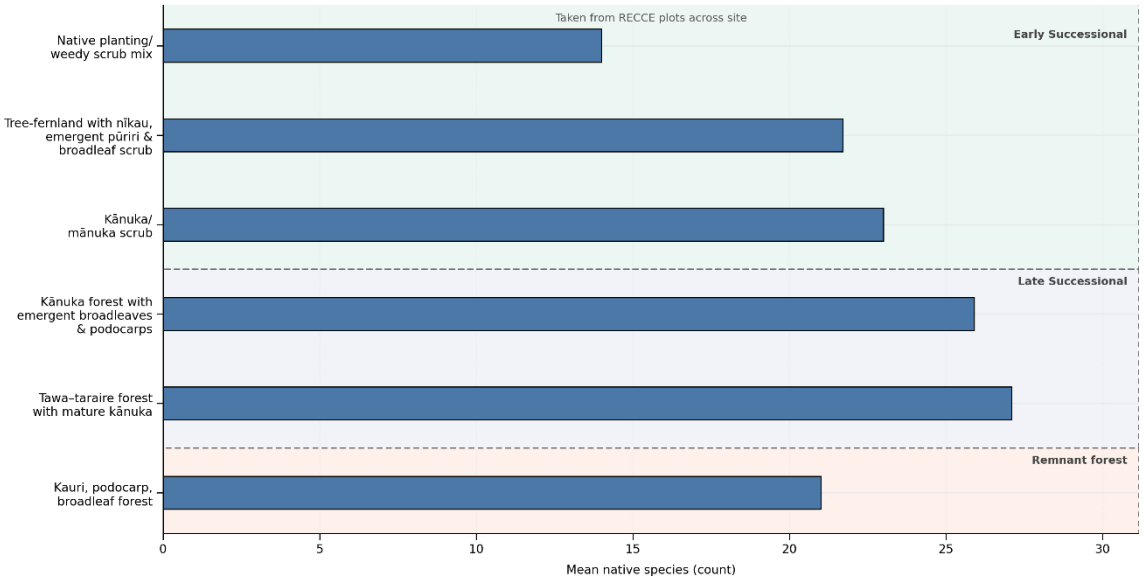

Figure** 20**. Mean native species by vegetation type, Hunua Quarry Development, October 2025-February 2026.

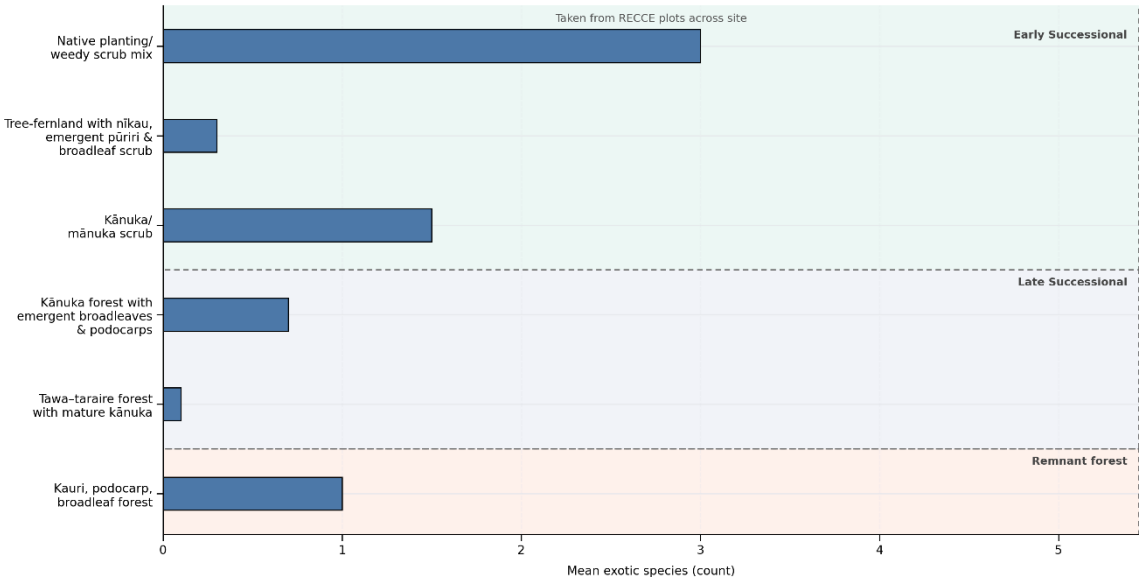

Figure** 21**. Mean exotic species by vegetation type, Hunua Quarry Development, October 2025-February 2026.

a) Typical kānuka canopy over ponga and mingimingi

b) Large taraire typical of remnant taraire-tawa-pukatea forest

c) Regenerating podocarps (kauri, tanekaha) and mature kānuka in thick ricker stands

d) Remnant mature kauri forest with tree fern subcanopy

Figure 22(a-d). Mature and regenerating vegetation within proposed Symonds Hill Pit expansion area.

Figure** 23. **Parataniwha-dominated stream terrace, Hunua Quarry, 2026.

Figure** 24. **Exotic-dominated scrub and weedfield, Hunua Quarry, 2025.

5.1.3 Threatened and At-Risk Flora

Appendix 5 lists all plants recorded in vegetation surveys. Nomenclature follows the online Flora of New Zealand (Breitwieser et al., 2023), accessed 13/03/2026. Records from the Site and wider landholding included 11 regionally threatened or at risk species (Simkin et al., 2025;) and three species with a national threat status (de Lange et al., 2024). The location and distribution of these plants within the Site is shown in **Figure 25**. All threatened and at risk flora observations comprised single specimens or a small number of individuals.

Carex sinclairii (data deficient) was recorded on the margin of a wetland feature dominated by wet-tolerant exotic grasses *(Glyceria,* Mercer grass, Yorkshire fog, kikuyu). The fertile specimens located had immature spikes, and it is possible that these specimens are *Carex subdola* (nationally not threatened, regionally vulnerable). Auckland is the northern extent of the range of *C. sinclairii*, while *C. subdola* is distributed throughout the northern North Island. Both occur commonly in fertile to mid-fertile littoral and riparian wetlands in semi-shade.

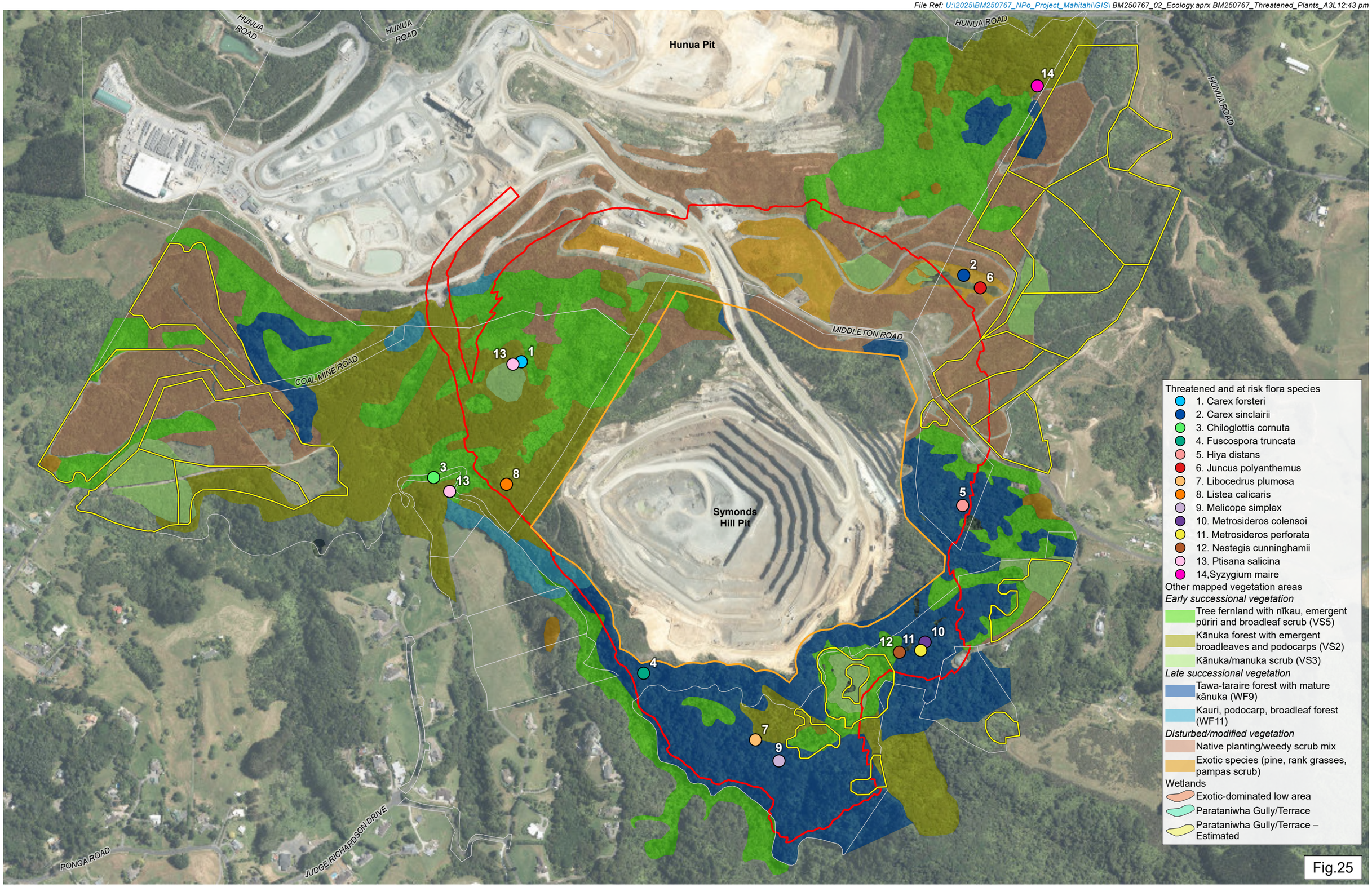

Fig.25

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

Consented Pit Boundary
Quarry Development Area
Covenant planting areas

HUNUA QUARRY DEVELOPMENT

Regionally and Nationally Threatened and At Risk Flora

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: VSm

Also present in this wetland was *Juncus polyanthemus*, a rush species regarded as a recent (since 1950) introduction to the region from elsewhere in New Zealand.

Members of the Myrtaceae family are impacted to a varied degree by myrtle rust disease caused by the invasive exotic rust *Austropuccinia psidii. Metrosideros perforata)* is listed as regionally at risk primarily due to the uncertainty of impacts associated with this disease.

Metrosideros colensoi was noted as an incidental observation but is unverified as the plant was growing epiphytically on a tall tree. No photo or sample was collected, and no flowers were observed. Auckland is the northern extent of the range of *Metrosideros colensoi.*

Maire tāwake is in serious decline throughout much of its range due to browsing pests and has proved extremely susceptible to myrtle rust. Specimens recorded during surveys were healthy (possibly planted) specimens on the margin of a small waterbody within an area of naturally established kānuka forest, located well away from impacted vegetation in the northeast of the wider landholding.

Most plants of conservation interest were found in mature secondary tawa-taraire forest. Plants of conservation interest found in early successional vegetation included herbaceous species (*Chiloglottis cornuta,* king fern and *Carex forsteri*) characteristic of damp gullies and moist, semi-shaded situations such as stream margins, along with a young mangeao specimen (likely seeded from an area of mature broadleaved forest).

5.2 Terrestrial Fauna

5.2.1 Overview

Observations and translocations of indigenous fauna have been undertaken across Hunua Quarry since 2005 as part of the Symonds Hill ecological assessments, and more recently through bird counts, lizard salvage and fauna observations. Here we summarise the findings of these surveys, and bat surveys undertaken as part of previous and current assessments.

5.2.2 Herpetology

5.2.2.1 Gecko Salvage 2011 to 2025

A population of elegant gecko (*Naultinus elegans)* was discovered at the Hunua Quarry Stage 5 expansion footprint in 2007. Subsequent capture and relocation (“salvage”) of geckos was described in a Lizard Relocation Plan (Tonkin & Taylor, 2011), and between 2011 and 2025, 152 geckos were salvaged. Initially, lizards were translocated to a release site within the wider quarry area in the south-east corner of the Friedman Block paddock and an area to the north of the Hay Paddock. We understand that later translocations moved lizards to a release site on Tiritiri Matangi Island. Translocation data is provided in **Appendix 6**, of particular note is that the number of geckos captured in each salvage event declined markedly between 2011 and 2025. For that reason, early salvage results (2011-2016) may not be a reliable indicator of current population size.

Geckos have previously been observed within and salvaged from kānuka shrubland / forest in the Symonds Hill area. Geckos were observed at heights between 7 m and 10 m (i.e., mature kānuka). Geckos have not been observed in mature and sapling mānuka or other native species in the surrounding area.

5.2.2.2 Herpetofauna Values 2025-2026

No native lizards or Hochstetter's frogs were detected on the Site during the 2025-26 surveys, despite the presence of potential habitat.

It is likely that elegant gecko are present within the development footprint, but are difficult to detect because of the complexity and height of the habitat they occupy. It is possible other lizard species are present but not detected because of low densities and / or habitat complexity.

A regionally significant sub population of Hochstetter's frogs is known to be established in the Hūnua Ranges Regional Park and is thought to benefit from possum, stoat and rat control in the Kōkako Management Area. The population is classified as a 'Relict' and an Ecological Significant Unit (ESU). The Hūnua population is spatially separated from the Site by a minimum distance of 8.3 km, and it is not possible for frogs to disperse into the Site from Hūnua Ranges Regional Park.

Hochstetter's frogs have not been detected on the Site previously, or in the present survey. Elevation at the Site ranges between 100-200 m a.s.l and potential habitat was assessed as sub-optimal in many areas as crevices are armoured by silt. It is unlikely, based on the lack of current and previous records that Hochstetter's frogs are present within the Site, and they will not be considered further.

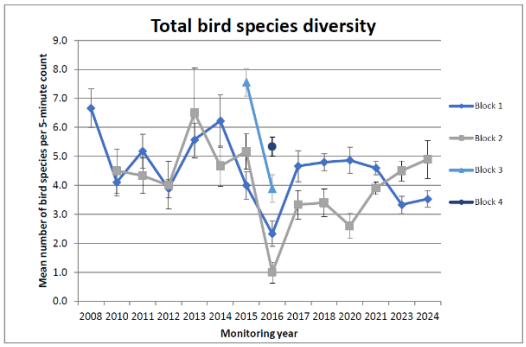
5.2.3 Avifauna

5.2.3.1 Avifauna Monitoring 2008-2024

Results of desktop information on bird species is provided in **Appendix 7**. Avifauna surveys (five-minute bird counts) have been undertaken since 2008 as part of annual forest health monitoring. The monitoring is undertaken at five fixed plots in two forest blocks (**Appendix 8**), and the most recent (2025) monitoring recorded a predominance of native birds. Native bird species were more abundant than exotic species at all monitoring plots, continuing the pattern seen over the past fourteen years of monitoring.

RMA Ecology (2024) reports the long-term average for bird species diversity (mean number of bird species per plot) from 2008-2023 as relatively stable, at 4.63 and 4.8 (within the two monitoring blocks respectively). The key exception was in 2016 which recorded a sharp decline in bird diversity and abundance of indicator species in 2016, followed by a subsequent recovery in species richness an abundance (Figure **26**).

a)



b)

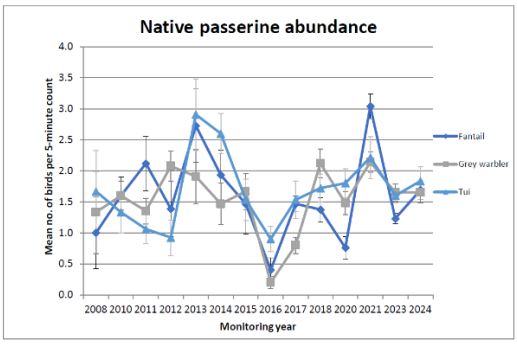


Figure 26. a) Mean total bird species diversity 2008-2024; b) Mean native passerine abundance 2008-2024. Mean +/- Standard Error. From RMA Ecology (2024).

5.2.3.2 2025 Desktop Assessment Overview

Appendix 9 contains a summary of bird species recorded within the Site and wider landholding, including all site observations (5MBCs, acoustic surveys and incidental observations), records within 10 km of the Site (eBird and OSNZ atlas), survey observations from BioResearches 5MBCs report (from 2007) threat classifications (Roberston et al., 2021) and habitat associations (Heather & Robertson, 2005).

No records from within the Site are present on eBird and Bird Atlas. OSNZ Atlas and eBird records include eleven Threatened species and eighteen At Risk species (**Appendix 9**), though several of these are coastal species, while the 10 km radius around the Site includes part of the Hunua Regional Parkland which receives intensive predator control. Twenty-two species are classified as Not Threatened, twenty-seven are Introduced species, as well as a few coastal vagrants.

5-minute bird counts (5MBC) 2025

A total of 440 detections of native and non-native avifauna were made during surveys undertaken for this assessment between October and December 2025 (222 native and 218 non-native individuals). Five-minute bird counts recorded 13 native species (Table 6), two of which have a threat classification of At Risk – Naturally Uncommon, namely māpunga / black shag and pihoihoi / NZ pipit (Robertson et al., 2021). The māpunga was observed once at the entrance to the silt ponds (Site 6) and the pihoihoi on the track at Site 5. Fifteen non-native birds were also recorded (**Table 7**).

The native avifauna assemblage within the Site is dominated by non-threatened native species; 99% of all 5MBC native species detections were non-threatened native avifauna species. Four species (tūi, riroriro, warou and silvereye) make up the majority of all 5MBC detections (72%). This assemblage is similar to that recorded by RMA Ecology between 2008 and 2024 (Section 2.3.1.3). A small percentage of detections were of At Risk species (0.01%) (Table 6) being one each of the māpunga / black shag and pihoihoi / NZ pipit.

An average of 1,800 hours of acoustic data from ARDs deployed across the Site was recorded and analysed. No vocalisations of kākā and koekoeā were detected.

Table 6: Total number of individual native birds seen or heard during the 5MBC surveys within the Site, Hunua Quarry, October to December 2025

Species	Threat Status (Robertson et al., 2021)	Total Seen & Heard	% of total observations
Māpunga / black shag	**At Risk - Naturally Uncommon**	1	0.5
Pīwakawaka / fantail	Not Threatened	14	6.3
Riroriro / grey warbler	Not Threatened	34	**15.3**
Kāhu / swamp harrier	Not Threatened	10	4.5
Kererū / NZ pigeon	Not Threatened	5	2.3
Kōtare / sacred kingfisher	Not Threatened	15	6.8
Pīhoihoi / NZ pipit	**At Risk - Naturally Uncommon**	1	0.5
Pūkeko / pukeko	Not Threatened	10	4.5
Pīpīwharaura / shining cuckoo	Not Threatened	4	1.8
Tauhou / silvereye	Not Threatened	29	**13.1**
Spur-winged plover	Not Threatened	2	0.9
Tūi / tui	Not Threatened	65	**29.3**
Warou / welcome swallow	Not Threatened	32	**14.4**
Total		222	100.00

Table 7: Total number of individual non-native birds seen or heard during the 5MBC surveys within the Site Hunua Quarry, October to December 2025.

Species	Threat Status (Robertson et al., 2021)	Total Seen & Heard	% of total observation
Manu pango / blackbird	Introduced and naturalised	13	5.96
Tikaokao / California quail	Introduced and naturalised	10	4.59
Pahirini / chaffinch	Introduced and naturalised	13	5.96
Kōurarini / goldfinch	Introduced and naturalised	24	**11.01**
European greenfinch	Introduced and naturalised	22	**10.09**
Rakiraki / mallard	Introduced and naturalised	35	**16.06**
Maina / common myna	Introduced and naturalised	15	6.88
Common pheasant	Introduced and naturalised	16	7.34
Kākā uhi whero / eastern rosella	Introduced and naturalised	22	**10.09**
Kairaka / Eurasian skylark	Introduced and naturalised	6	2.75
Manu-kai-hua-rakau / song thrush	Introduced and naturalised	7	3.21
Tiu / house sparrow	Introduced and naturalised	10	4.59
Spotted dove	Introduced and naturalised	2	0.92
Tāringi / common starling	Introduced and naturalised	6	2.75
Hurukōwhai / yellowhammer	Introduced and naturalised	17	7.80
Total		218	100

5.2.3.3 Acoustic Surveys

Approximately 1,488 hours of acoustic data from eight ARDs deployed across the Site was recorded and analysed.

Kākā and koekoeā were the two species of interest identified in the desktop surveys (Section 2.3.3.3) as species that may inhabit this site during the spring and summer season. No vocalisations of kākā and koekoeā were detected using acoustic surveys, and none were observed during 5MBCs or through incidental observations.

However, 27 species were incidentally detected across eight acoustic survey locations (

Table 8). ARD at Location 4 failed, and no acoustic recordings were available for analysis (Section 2.3.6.3).

Incidental Observations

Incidental observations of five native species were recorded across the Site. Three of the six species are classified as At Risk or Threatened (weweia, pīhoihoi and kawaupaka) and were recorded by ecologists when moving around the Site between October and February 2026 (**Table 9**). Pīhoihoi were always observed individually and always along the edge habitat of Symonds Hill Pit. Weweia was observed only once in a silt pond in close proximity to the Site Office. Kawaupaka was observed once flying over the silt ponds heading in a southeast direction.

Poaka were observed on two occasions. Once in October 2025 on a recent earth worked area, next to a haul road and then a single poaka was seen in December 2025 in a drained silt pond in the main processing area of the Site; and one matuku moana was seen with the poaka in the drained silt pond. A male tomtit was observed along a track edge, near P4.

Further information on the species recorded and their threat status is provided in **Appendix 9**.

Table 8: *Birds heard at each ARD location, Hunua Quarry, October to December 2025.*

Species	Threat Status (Roberston et al., 2021)	Location 1	2	3	4	5	6	7	8	9
Kahu / swamp harrier	Not Threatened	■								
Kererū / NZ pigeon	Not Threatened			■						
Kōtare / sacred kingfisher	Not Threatened	■	■	■	■	■	■		■	■
Miromiro / tomtit	Not Threatened				■					
Pīpīwharaura / shining cuckoo	Not Threatened		■		■	■	■			■
Pīwakawaka / fantail	Not Threatened	■	■	■	■	■	■		■	■
Pūkeko / pukeko	Not Threatened	■						■	■	
Riroriro / grey warbler	Not Threatened		■	■	■	■	■	■		■
Ruru / morepork	Not Threatened			■	■	■	■		■	
Spur-winged plover	Not Threatened		■	■		■		■		
Tauhou / silvereye	Not Threatened	■	■		■		■		■	■
Tūi / tui	Not Threatened	■	■	■	■	■	■	■	■	■
Common pheasant	Introduced and naturalised	■	■			■		■	■	
Domestic chicken	Introduced and naturalised	■		■	■					
European greenfinch	Introduced and naturalised	■	■		■		■	■		■
Hurukōwhai / Yellowhammer	Introduced and naturalised								■	
Kākā uhi whero / eastern rosella	Introduced and naturalised	■	■				■			
Kōurarini / goldfinch	Introduced and naturalised						■			
Maina / common myna	Introduced and naturalised					■				■
Makipai / Australian magpie	Introduced and naturalised		■					■		■
Manu pango / blackbird	Introduced and naturalised	■	■		■		■	■	■	
Manu-kai-hua-rakau / song thrush	Introduced and naturalised	■	■	■	■	■	■	■	■	■
Pahirini / chaffinch	Introduced and naturalised		■		■	■	■		■	
Rakiraki / mallard	Introduced and naturalised								■	
Spotted dove	Introduced and naturalised								■	
Tikaokao / California quail	Introduced and naturalised	■	■	■	■	■	■	■	■	
Tiu / house sparrow	Introduced and naturalised						■		■	■

Table 9: Incidental observations of native species within the Site.

Species	Threat Status (Robertson et al., 2021)	Count	Nearest Survey Location
Weweia / NZ dabchick	**Threatened - Nationally Increasing**	1	P1
Pīhoihoi / NZ pipit	**At Risk - Naturally Uncommon**	3	edge of Symonds pit
Kawaupaka / Little shag	**At Risk - Relict**	1	silt pond
Poaka / pied stilt	Not Threatened	3	P1 & P3
Matuku moana / white-faced heron	Not Threatened	1	P1
Miromiro / tomtit	Not Threatened	1	P4

5.2.3.4 Summary of avifauna values

The vegetation across the Site provides habitat for roosting, foraging and nesting for a variety of Not Threatened and Introduced avifauna species commonly found in the Auckland region and across the country. Few At Risk species have been observed within the Site, with the majority being observed outside the Project footprint.

5.2.4 Bats

5.2.4.1 Background

Long-tailed bats have a threat status of Threatened – Nationally Critical. Long-tailed bats have large home ranges, often moving kilometres between day roost sites and various foraging grounds, and individual bats tend to space themselves in different parts of the landscape to reduce competition (O'Donnell 2001; Dekrout 2009). Long-tailed bats are very selective in their choice of maternity roost trees and usually utilise a limited number of the oldest trees in the landscape for breeding (O'Donnell 2018).

The desktop review of bat observations compiled from surveys undertaken by DOC, regional councils, contractors and private individuals identified that long-tailed bats have been recorded

throughout the Hunua Ranges, eastward of the Site, and occasionally in forest remnants and open pasture to the north-east and south. Long-tailed bats are also detected frequently around Pukekohe, Patumahoe and Waiuku to the southwest. However, there are few confirmed bat detections in forest or pastureland contiguous with Hunua Quarry (or Drury Quarry to the south), notwithstanding a reasonable search effort.

5.2.4.2 Bat Survey 2021

Surveys for bats in old-growth forest within the area of Symonds Hill Pit in 2021 (refer Figure **9**), including ABMs deployed over 14 fine weather detector-nights, found no presence or sign of native bats. Kānuka vegetation is not favoured roosting or nesting habitat for bats but we note that older growth WF9 forest at Symonds Hill does support trees of an age and type used by bats elsewhere.

5.2.4.3 Bat Survey 2025-2026

Current surveys over three x one month-long sample intervals (October 2025, November 2025 and February 2026) detected no bat activity within the Site or wider Landholding. Details of bat acoustic recorders and habitat are provided in **Appendix 10**.

5.2.4.4 Bat Values

While no bat activity was recorded at Hunua Quarry, the Site and Landholding contains suitable bat habitat, including some mature trees with potential roost characteristics. Given the long-term nature of the Hunua Quarry Development, there is potential that bats may return to the location, especially after implementation of the effects management provisions (see Section 10).

The Site contains a mosaic of open pasture, indigenous forest, recent native plantings, streams and tributaries that provide potential roosting, foraging and commuting habitat for bats. Potential roost features are present in mature trees, especially forest to the south of Symonds Hill Pit.

Long-tailed bats tend to roost in multiple trees within their populations roosting area and occasionally day roost or night roost further away from their main territory. They can travel in excess of 20 km from their roosts in a night, making their dispersal from the Hunua Ranges to the Site a distinct possibility. While the habitat has high value for roosting, foraging and commuting it does not appear to be a key habitat for bats in the wider landscape.

5.2.4.5 Summary of bat values

No bat activity has been detected over successive recent surveys within the Site and wider landholding, though long-tailed bats are known to be present in wider landscape, with hotspots of activity in the Hunua Ranges to the east and Waiuku / Patumahoe to the west. The lack of activity signifies the absence of favoured roost trees (including maternity roosts) within the Site or Landholding. However, long-tailed bats are wide-ranging, and individuals may occasionally utilise the Project location for foraging and/or solitary roosts.

5.3 Summary of Terrestrial Ecological Values

Mature forest remnants (WF9 and mature kanuka) within the proposed pit expansion area score highly for at least three of the four assessment matters (representativeness, rarity / distinctiveness, ecological context) that are set out in Schedule 3 of the AUP. Accordingly, we

have assigned an overall ecological value of high to the ecological values associated with these mature forest remnants.

A number of regionally threatened or at risk plant species (and three that are nationally threatened / at risk) were encountered during vegetation surveys, including species that are likely to be rare as a result of historic forest clearance, habitat loss and pest browse, as well as species that are naturally uncommon, and / or at the edge of their distributional range. Most flora of conservation interest were found within forest habitats, but a few were in more recently modified habitats (e.g., king fern in an area of manuka-kanuka scrub), while one regionally threatened / at risk sedge was found within an area of degraded, exotic grass-dominated swamp. In general, the varied flora assemblage of the Site reflects the relative intactness of the forest ecosystem, notwithstanding historic forest clearance and / or harvest that occurred across the landscape as a whole during the 19th and early 20th centuries.

Fauna habitat values are assessed as moderate, as while the habitat is of good quality in terms of structural complexity and connectivity, no native lizards, frogs or bats were detected within the Site or wider landholding despite extensive survey effort.

While a roughly equal number of indigenous and introduced species were detected, native birds made up the bulk of observations. However, the assemblage of indigenous birds observed within the forested parts of the Site was moderate in terms of species richness or abundance (ie, composed of ubiquitous native species found throughout the region and nationally). The depleted state of indigenous fauna assemblages is likely to be the result of chronic predation pressure by invasive mammalian pests, notwithstanding implementation of site-wide pest control over the past 16 years.

5.4 Wetlands

5.4.1 Wetland Extent in the Quarry Development Area

Site investigations identified a series of broken (gullied and slumped) and dissected terrain in the southeastern corner of the proposed pit expansion area, intersected by ephemeral and intermittent watercourses as identified in Section 7. Nine small wetland features were delineated in gullies and terraces with poorly draining soils on the eastern side of the Site. A total of 0.44 ha of wetlands were mapped within the Site and wider landholding that will be affected by the proposal. All wetland features meet the definition of a natural inland wetland (refer Section 3.3). A map of identified wetland features is shown in Figure **27.**

5.4.2 Wetland Types

5.4.2.1 Forest Seepages

Localised areas of saturated and strongly hydric soils with a compact, non-porous structure were identified in forested areas to the east of the existing Symonds Hill Pit. These seepage areas are possibly associated with historic slips, as they occur on parts of the site with more gently relief below steep hillslopes, in gullies and adjacent to stream terraces. A dense groundcover of parataniwha (*Elatostema rugosum*) is characteristic of these features, beneath a patchy understorey of wheki, nikau and kiekie with occasional putaputaweta and pate. overhanging kanuka and ponga form the surrounding canopy, with occasional kahikatea and pukatea. *Carex geminata* was noted in some features but was not abundant. The surrounding

hillslopes are vegetated in tawa-taraire secondary forest. African clubmoss and buttercup replaced parataniwha as dominant vegetation in two features where prior disturbance appears to have occurred.

Parataniwha is not identified as a hydrophilic species and most other commonly co-occurring species (nikau, pate, putaputaweta, kiekie) are FACU, therefore these features do not key out as wetlands using the NPS-FM wetland delineation protocols (features where African clubmoss and buttercup dominate the ground cover marginally qualify). Nonetheless, areas that were found to be persistently wet during dry conditions and had strongly hydric soils are mapped as wetlands. A total of 7 forest seepage features were delineated (Figure **27**), comprising a total of 2,124 m^2 of forest seepage wetland either wholly or partly within the Site.

Extensive growths of parataniwha also frequently occur in and around intermittent watercourses, in gullies and on lower slopes surrounding watercourses, in areas with moist (but not saturated) soils. In these situations, parataniwha is not treated as indicative of wetland conditions and is regarded as riparian vegetation.

5.4.2.2 Exotic Grass Dominated Swamp

Two patches of exotic grass - dominated swamp were delineated in the northeast of the Site and adjacent landholding (one wholly and one partly within the Site), in recently disturbed/cleared areas with poor drainage, primarily dominated by hydric clay with some gravel found underneath. Wet-tolerant exotic grasses including *Glyceria maxima*, Mercer grass, kikuyu and Yorkshire fog dominate both features, with pampas, aristea and gorse common on margins. Patches of indigenous rushes and sedges (*Juncus edgariae, J. polyanthemus, Carex flaviformis* and C. *sinclairii/ subdola*) are interspersed throughout the wetland feature, but are generally overgrown with exotic grasses. The total area of exotic grass-dominated wetlands is 2,366 m^2.

5.4.3 Summary of Wetland Ecological Values

Nine small wetland features are identified within (or partly within) the Site, seven of which are forested gully or toeslope seepages within the SEA, and two of which are exotic grass dominated swamps on terraces in the northern part of the Site. Wetland features within the forest are of moderate or high quality (notwithstanding some localised historic disturbance), with predominantly indigenous vegetation, intact hydrological functions, and good buffering and connectivity with the wider hydrosystem. The exotic grass-dominated swamps are degraded features that are poorly buffered, with poor hydrological connection as a result of previous quarrying activity

LEGEND

Wetlands

- Forest seepages
- Exotic grass dominated swamp
- Quarry Development Area
- 100m from expansion boundary
- The Site
- Consented Pit Boundary
- Other owned land

Overland Flow Paths (Auckland Council)

- Permanent
- Intermittent
- Ephemeral

Fig.27

Boffa Miskell

www.boffamiskell.co.nz

0 100 m

1:5,500 @ A3

Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors, Auckland Council, Boffa Miskell Limited

Projection: NZGD 2000 New Zealand Transverse Mercator

HUNUA QUARRY DEVELOPMENT

Wetlands

Date: 27 March 2026 | Revision: 1

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: LMa

6.0 Ecological Significance

The Hunua Quarry landholding encompasses 60.18 ha of SEA_T_5323. This SEA is broadly characterised as an example of the 'taraire, tawa, podocarp forest' (WF9) ecosystem described in Singers et al. (2017). This vegetation type occurs throughout the Auckland Region, while some of the best examples occur in the Hunua Ranges where the steep topography was unsuitable for conversion to farmland. The total extent of SEA_T_5323 is 616 ha.

Singers et al. (2017) notes that a variant of this ecosystem type (termed WF9.3) occurs in the Hunua Ranges where taraire is less abundant and kohekohe, rewarewa, pūriri, tawa and hinau are comparatively more common. However, we note that taraire is co-dominant with kohekohe in SEA_T_5323. According to Singers et al. (2017), the WF9 forest ecosystem has a Regional IUCN threat status of "Endangered". The forest type has been substantially reduced by clearance for agriculture and is vulnerable to browsing, notably by possums and goats.

Schedule 3 of the AUP lists SEA_T_5323 as meeting 4 of the 5 factors used for determining ecological significance (listed in full in **Appendix 11**):

- Representativeness.
- Threat status and rarity.
- Diversity.
- Stepping-stones, migration pathways and buffers.

The SEA_T_5323 overlay covers 28.03ha of indigenous vegetation within the Site (surrounding the existing Symonds Hill Pit boundary to the west, south and east). As described in Section 5.1, this includes areas of mature secondary tawa-taraire forest and patches of kauri, podocarp, broadleaf forest vegetation to the east and south of the existing pit (both of which are endangered ecosystem types according to Singers et al., 2017), while vegetation in the SEA westward of the existing pit contains small patches of mature forest remnants and scattered individual broadleaved and podocarp trees within a matrix of early – successional indigenous forest and scrub.

All indigenous vegetation within the Site covered by the SEA_T_5323 meets at least the "stepping-stones, migration pathways and buffers" factor for determining ecological significance, and the "representativeness" factor to a varying degree. The threat status and rarity criterion is met due to the presence of nationally threatened and regionally endangered plants (albeit in small, sparse populations). The presence of regionally at risk species do not qualify features as ecologically significant under the "threat status and rarity" criterion, but this contributes to the "diversity" factor, as the vegetation is an indigenous habitat type that supports a typical species richness or species assemblage for its type.

Accordingly, all areas of indigenous vegetation within the Site and wider landholding (including patch of indigenous scrub and mature secondary forest eastward of the Hunua Quarry Pit that is not encompassed within the SEA overlay) meet at least one of the AUP significance criteria and are ecologically significant.

The northern portion of the Site and the wider landholding is outside the SEA overlay and encompasses areas of early-successional indigenous plantings and weedy exotic scrub, which are of relatively low ecological value. Early successional plantings, weedy exotic scrub and exotic grass – dominated swamp do not qualify as ecologically significant.

7.0 Freshwater Ecological Values

7.1 Overview

In this section we summarise existing information on the water quality and ecological values of the Mangapū Stream, based on previous surveys and monitoring, and the results of more recent surveys and observations of the stream. Our purpose is to background the conditions and characteristics of the upper Mangapū Stream catchment, before detailing the characteristics of the Mangapū Stream tributary (Mangapū Tributary) to be diverted. The freshwater streams and catchments in the vicinity of the Hunua Quarry are shown in Figure **28**.

7.2 Mangapū Stream Catchment

The Mangapū Stream forms part of the Slippery Creek catchment (along with Slippery Creek, Hays/Waipokapū Stream and Waihoihoi Stream). These discharge via Slippery Creek to the upper Pāhurehure Inlet of the Manukau Harbour beneath the Southern Motorway over bridge.

Auckland Council (2015) report that, some 50% of the Slippery Creek catchment is pastoral land, over 25% of the catchment is dominated by indigenous forest and a further 5% in exotic forestry blocks. Less than 15% of the total catchment is currently built up, however under the AUP, this may double to 30% of the total catchment area.

Auckland Council (2015) surveyed a total of 20 km of Mangapū Stream including 2.6 km of intermittent to ephemeral stream. The catchment was classified into three main stream types:

- Low land agricultural.
- High land native forest.
- High Land agricultural.

Auckland Council (2015) describe the high land native forest streams (upper 7 km of the main channel of Mangapū Stream), as typically 2.5 to 3 m wide but up to 5 m wide in places with an average depth of approximately 0.4 m except for parts of the mainstem which averaged 0.7 m deep with pools up to 1.3 m deep. Banks averaged 0.4 to 2 m high with less than 20% erosion. The three highest scoring SEV sites (SC1, SC9, SC10) were within the High Value Indigenous Forest Management Zone, with all three sites scoring higher than 0.83. (i.e., high quality stream function).

Auckland Council (2015) recommended the following goals and objectives for the High Value Indigenous Forest Management Zone:

- Protect high value natural streams and gullies within significant ecological areas to maintain reference conditions.
- Protect shortjaw kokopu habitat.
- Improve fish passage downstream to enable access to high quality habitat.
- Support Kauri dieback disease control programmes.

- Control feral goat and deer populations to reduce damage to watercourses and riparian vegetation within existing covenant areas.

7.3 Mangapū Stream

7.3.1 Water Quality

7.3.1.1 Previous Monitoring

Selected water quality parameters have been measured in some capacity since 2011 on the Mangapū Stream mainstem, downstream of the Mangapū Tributary, including for augmentation flow monitoring and the Mangapū Stream summer monitoring (Figure **29**).

The Mangapū Stream summer monitoring is located to the west of the Symonds Hill Pit, next to a small tributary draining from the pit area. Water quality measurements are taken upstream and downstream of the unnamed tributary draining the Symonds Hill Pit.

The augmentation flow monitoring site is located on the Mangapū Stream, downstream of the Symonds Hill Pit area, near the end of Coal Mine Road. Water quality measurements are undertaken at the augmentation flow monitoring site and immediately upstream and downstream.

Additional instream monitoring of fine sediment deposition, bank erosion and aquatic macroinvertebrates is carried out in the mid-Mangapū Tributary that forms baseline surveys for a currently consented discharge from a proposed sediment treatment pond.

7.3.1.2 Mangapū Stream Summer Monitoring

Monitoring of instream water quality of the upper reaches of Mangapū Stream has been undertaken during January-March since 2011. Temperature, dissolved oxygen and turbidity have been measured upstream and downstream of the tributary draining Symonds Hill Pit ((Figure **29**). The result from the sampling indicates there are no negative impacts on the measured parameters downstream of the Symonds Hill Pit drainage discharge.

Mean temperatures ranged between 14.6-15.5°C, and temperature ranges were generally considered to be excellent and suitable for most invertebrate and periphyton species (NIWA, 2019). Mean dissolved oxygen (%) levels were high at 95.1-101.5%. Turbidity (NTU) had large variability across sampling occasions with median values similar at both upstream and downstream sampling locations. Mean values, both upstream and downstream were above the default guideline values (80th percentile) of 5.2 for turbidity (ANZG 2018).

7.3.1.3 Mangapū Stream Augmentation Flow Monitoring

Monitoring of Mangapū Stream immediately upstream and downstream of the augmentation flow discharge point has been undertaken during December – April since 2015. Two parameters are measured: water temperature and dissolved oxygen.

Mean dissolved oxygen (DO, mg/L) and temperature were consistent within the Mangapū Stream (range for DO 8.8-9.6 mg/L; temperature 16.1-16.9°C). Temperatures over 20 °C are regarded as moderately high and may become stressful for some invertebrates and fish, particularly if for prolonged periods. The augmentation flow input does not appear to influence the downstream water temperature.

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0 100 m

1:5,500 @ A3

Data Sources: WSP
Auckland Council: Healthy Waters, Geospatial, Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Overland Flow Paths (Auckland Council)
- Permanent
- Intermittent
- Ephemeral

- Quarry Development Area
- The Site
- Consented Pit Boundary
- Other owned land

HUNUA QUARRY DEVELOPMENT

Freshwater Catchments

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: BMc | Checked: IBo

Waipokapū Stream
(formerly Hays Stream)

Hunua
Pit

Downstream
of Pipe

Augmentation
Pipe

Upstream
of Pipe

DO

DO at TRIB

Mangapū Stream
(formerly Symonds Stream)

Symonds Hill
Pit

Fig.29

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0 250 m

1:8,000 @ A3

Data Sources: Tonkin + Taylor, Auckland Council, LINZ

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Hunua Quarry
- Stream
- Water Quality Sampling Location
- Proposed Discharge Point
- SEV

HUNUA QUARRY DEVELOPMENT

Freshwater Monitoring 2009

Date: 05 June 2020 | Revision: 0

Plan prepared by Boffa Miskell Limited

Project Manager: Catherine.Clarke@boffamiskell.co.nz | Drawn: ATy | Checked: KMc

7.3.1.4 Water quality – 2021 and 2025

Single samples of water quality were obtained from Mangapū Stream and Mangapū Tributary in October 2021 and in December 2025 (**Table 10**). With the exception of Site Upstream 3 in Mangapū Stream in 2025, for nutrients measured the water quality met the NOF Attribute Band A. Site Upstream 3 bordered on Bands B and C for DRP.

PDP (2026b) comment that there is little to no variation between sampling sites that are upstream of the quarry discharge and the downstream sampling points, even where guideline levels are exceeded (i.e., aluminium, copper and iron) (**Table 10**). Of these, aluminium has the greatest exceedance margin noting that the highest value occurs upstream. As provided in our report below, there is no evidence that any exceedance of the DGV values is affecting the aquatic values of the Mangapū Stream.

Table 10: Water quality, Mangapū Stream and Mangapū Tributary, December 2025. Units g/m3 unless otherwise stated. Figures in bold = NOF Band B; Figure in red = exceedance of guideline limits.

Stream	**Mangapū Tributary**		**Mangapū Stream**			**NOF**	**DGV**
Location	**Upstream 1**	**Upstream 2 (Trib)**	**Upstream 3**	**Downstream**	**Upstream 3**		**95% ecosystem protection**
Year	**2025**				**2021**		
Nitrite-N	0.004	<0.002	<0.002	0.007	0.0012		
Nitrate-N	0.39	0.39	0.27	0.28	0.323	A	1.1
Total Ammoniacal-N	<0.010	0.011	<0.010	<0.010	0.006	A	0.9
Total Kjeldahl Nitrogen (TKN)	0.28	0.32	0.26	0.24	0.22		
Dissolved Reactive Phosphorus (DRP)	0.005	0.005	**0.01**	<0.004	0.002	A/**B**	
E. coli (MPN/100 ml)	>2,420	>2,420	>2,420	>2,420	490		
Sulphate	4.9	5.7	4.6	5.2	14.4		
Total Aluminium	**0.4**	**0.57**	**0.65**	**0.59**	n/a		0.055
Total Arsenic	<0.0011	<0.0011	<0.0011	<0.0011	<00050		0.024
Total Boron	< 0.053	< 0.053	< 0.053	< 0.053	0.032		0.94
Total Cadmium	0.000181	<0.000053	<0.000053	<0.000053	<0.000020		0.0002
Total Copper	**0.00144**	**0.00143**	**0.0014**	**0.00167**	0.00063		0.0014
Total Iron	**1.01**	**1.16**	**0.91**	**0.99**	n/a		0.28
Total Lead	0.00048	0.00063	0.00055	0.0006	<0.000050		0.0034
Total Nickel	0.00081	0.00078	0.00067	0.00072	0.00081		0.011
Total Zinc	0.0025	0.0028	0.0021	0.0023	<0.0010		0.008

7.3.2 Habitat and biotic communities

7.3.2.1 Stream Habitat

Mangapū Stream downstream of the Mangapū Tributary is a predominantly hard-bottomed stream dominated by cobbles, boulders and bedrock, with small amount of silt/sand present (RMA Ecology, 2020).

In the mid-reaches of the Mangapū Stream, the channel is some 1.5 – 5.5 m wide, with depths ranging from 0.41 - 0.49 m. Hydrological heterogeneity is high along the reach with a mix of riffles, runs and deep and shallow pools present. Riparian vegetation is well established with a well-developed canopy and abundant understory. This vegetation provides shade to approximately 75 - 85% of the water's surface, with some areas of open sunlight. The riparian community consists of abundant nīkau and ponga and abundant smaller ferns along the stream margin. Wood debris and undercut banks are present within the reach.

7.3.2.2 Macroinvertebrate Communities

Macroinvertebrate communities of the downstream Mangapū Stream sampled in 2019 were diverse with up to 34 taxa recorded. Sampled macroinvertebrate communities were dominated by the single-gill mayfly *Deleatidium*, the snail *Potamopyrgus* and the chironomid midge *Polypedilum. Deleatidium* was the most abundant, with its presence indicative of a good habitat and water quality conditions. Both *Potamopyrgus* and *Polypedilum* can be found in a range of habitats from pristine to polluted.

Macroinvertebrate communities sampled in 2019 encompassed a range of sensitive EPT taxa, containing 47% (%EPT taxa) at both upstream and downstream habitats. This is representative of a stream with good water quality.

MCI scores in 2019 ranged from 105 to 118, These scores are representative of good quality water (Stark & Maxted 2007). When comparing the results above to regional reference site data, which has a mean MCI of 128 (n=6) for reference streams, Mangapū Stream values are below reference conditions.

MCI scores from previous sampling show variability across sampling years (Figure **30**). Scores at both Upstream and Downstream sites are generally trending downwards, with scores equal in 2020. MCI scores have typically been slightly higher at the downstream site.

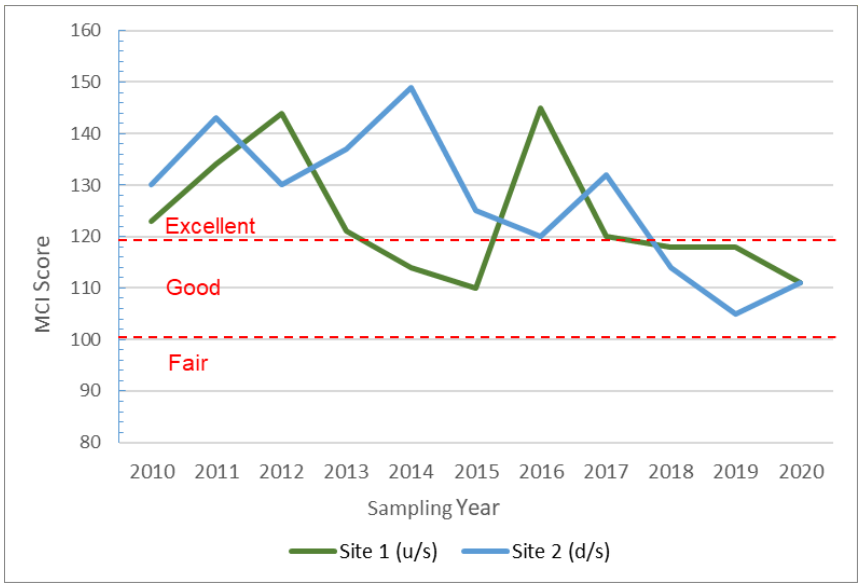


Figure 30: Macroinvertebrate Community Index (MCI) scores from the Mangapū Stream sampling sites between 2010-2020. Sample locations are shown on Figure 28.

7.3.2.3 Stream Ecological Valuation

The SEV scores within the Mangapū Stream are representative of a high-quality in-stream habitat with high ecological function. Monitoring of sediment discharge from 2010 – 2020 show that SEV scores have been highly similar over that timeframe (**Table 11**).

Table 11: Downstream Mangapū Stream ecological monitoring SEV scores, 2010-2020. SEV sites are shown on Figure 28.

Year	Years of Operation of Discharge	SEV Score	
		Upstream	Downstream
2010	-	0.78	0.79
2011	-	0.73	0.77
2012	-	0.78	0.76
2013	-	0.80	0.78
2014	0	0.80	0.80
2015	1	0.78	0.79
2016	2	0.81	0.79
2017	3	0.79	0.80
2018	4	0.82	0.84
2019	5	0.81	0.81
2020	6	0.81	0.81

7.4 Mangapū Tributary

7.4.1 Background

The Mangapū Tributary to be realigned flows around the south of the pit, in an east-west direction, with a further headwater tributary to the east of the pit (Trib 2). These stream sections are all located within an area of native forest (SEA_T_5323). The Mangapū Stream Tributary mainstem is classified as a permanent under the AUP stream classification criteria (**Appendix 12**).

In November 2025, aquatic ecological assessments of the habitat and biota (macroinvertebrates) of the stream were undertaken at three sites (**Figure 11**). These surveys build upon the information collected previously.

7.4.2 Stream Habitat

7.4.2.1 Lower reaches (Site 2)

In the lower reaches of the Mangapū Tributary (Site 2), the stream channel ranges from 0.9 – 5.7 m wide, with depths ranging from 0.02 - 0.90 m. Hydrological heterogeneity is high along the reach with a mix of runs, riffles and deep and shallow pools present. Large boulders and bedrock are abundant, with cobbles and gravels common. Small streamside gravel bars are present. Stream banks are highly variable, from 0.2 m in some locations to >2m high near vertical in other areas. Riparian vegetation is well established with a thick canopy and abundant understorey, providing shade to over 90% of the stream surface. The riparian community consists of abundant nikau and ponga and abundant parataniwha (*Elatostema rugosum*) along the stream banks. Bryophytes are abundant on large boulders and bedrock banks.

7.4.2.2 Mid-reaches (Site 3)

In the mid-reaches of the Mangapū Tributary (upper reaches of the stream to be realigned, Site 3), the channel is some 1.5 – 5.5 m wide, with depths ranging from 0.41 - 0.49 m. Hydrological heterogeneity is high along the reach with a mix of riffles, runs and deep and shallow pools present. The stream substrate is dominated by a strong mix of cobbles, gravel, bedrock and silt /sand with fewer large boulders than the lower reaches. Riparian vegetation is well established with a well-developed canopy and abundant understory. This vegetation provides shade to approximately 75 - 85% of the water surface, with some areas of open sunlight. The riparian community consists of abundant nikau and ponga and abundant smaller ferns along the stream margin. Wood debris and undercut banks are present within the mid-reaches.

7.4.3 Headwater gullies

Although not subject to the realignment we briefly describe the nature of the headwaters which will remain unchanged and connected to the proposed realigned section of the tributary. Sampling and observations of the headwater gullies was undertaken in 2021 as part of earlier proposals for a pit expansion that did not progress at that time.

The headwater streams occur in an area of varied topography including a series of gullies running generally north to south through the SEA_T_5323. Most headwater watercourses were classified as ephemeral, with some intermittent reaches also identified (Figure 31). Our classification was based on the overland flow path GIS layer, observations and sampling on site. The headwaters of the gully features were formed with a mix of broad and narrow gullies with mostly no evidence of stream channels or banks. Our classification of intermittent streams commenced where incised stream channel were apparent and/or shallow pools were evident in accordance with AUP stream classification criteria.

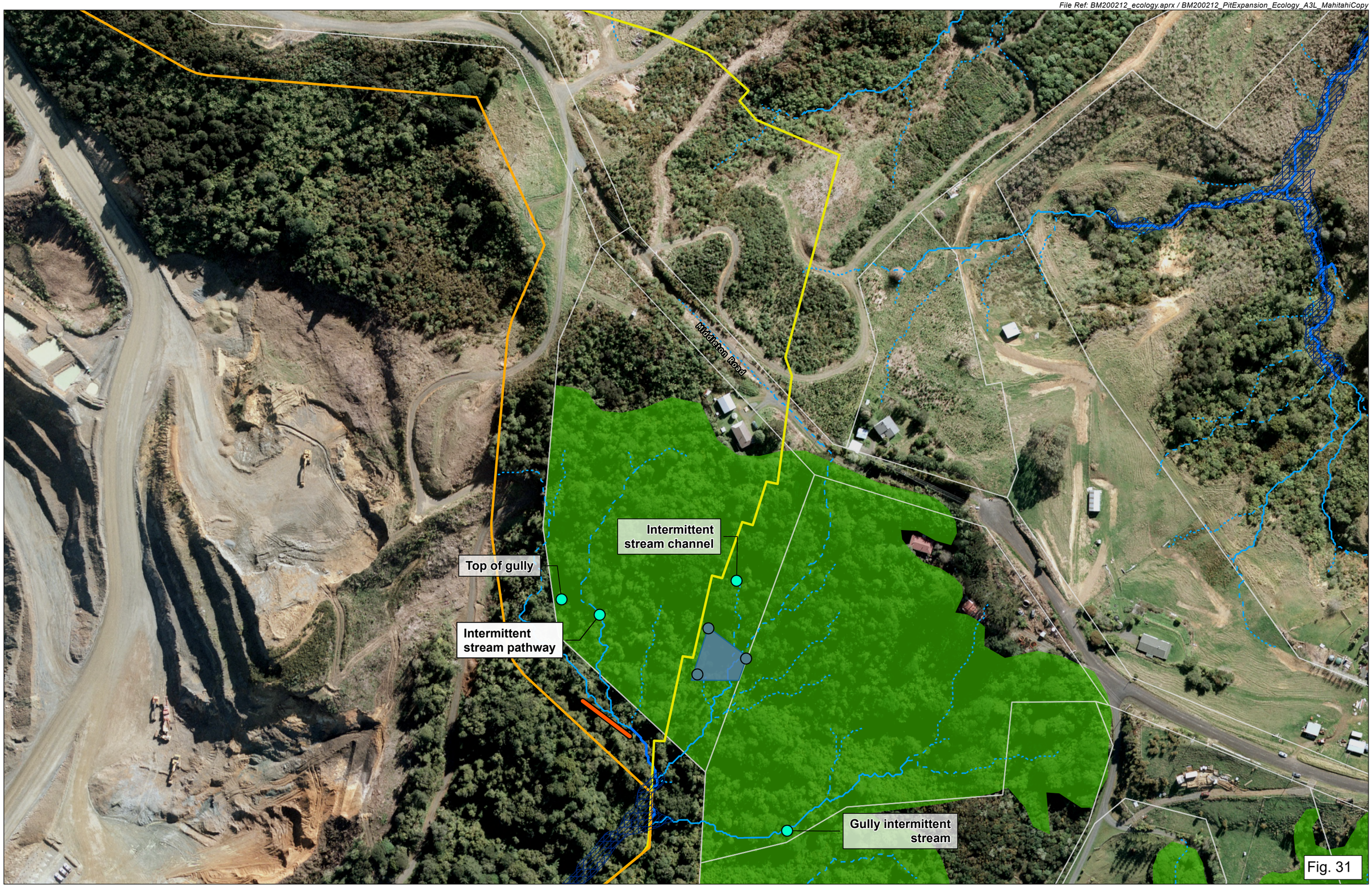
Where intermittent streams were evident, the channel was typically shallow, with a streambed that was predominantly silt/sand with areas of small gravels and woody debris. The stream channel was narrow, with low immediate channel banks within the wider gully. Stream shade

was relatively high, with some open patches in the lower reaches. Further visits to the site revealed no change to the ecological characteristics of the location.

7.4.4 Environmental DNA: biological communities

The eDNA results confirmed the presence of climbing fish species (eels and banded kokopu), including longfin eel (At Risk - Declining) and the absence of swimming species (Table 12). Detection strength of eels was greatest in the lower-mid-reaches of the tributary, and the reverse for banded kokopu. Nevertheless, the tributary provides passage for these climbing fish throughout its extent.

The eDNA also confirmed the presence of two mayfly species *Zephlebia pirongia* and *Z. aff. tuberculata sp.1* both of which are classified as Naturally Uncommon.



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0 40 m

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Data Sources: public, Auckland Council, Auckland Council – Environmental Strategy and Policy – Natural Heritage (2013)

Projection: NZGD 2000 Mount Eden Circuit

LEGEND

- Proposed Pit Boundary
- Current Consented Pit Boundary
- Property Parcels
- Flood Prone Areas
- Significant Ecological Areas
- Possible wetland
- Stream
- Wetland
- SEV Survey

Overland Flow Paths

- 3ha to 100ha
- 1ha to 3ha
- 4000m2 to 1ha
- 2000m2 to 4000m2

HUNUA QUARRY DEVELOPMENT

Headwater Freshwater Environments of the Mangapū Tributary

Date: 08 December 2021 | Revision: 1

Plan prepared by Boffa Miskell Limited

Project Manager: catherine.clark@boffamiskell.co.nz | Drawn: HCo | Checked: IBo

Table 12: Summary of threatened and selected freshwater macrofauna detected from eDNA sampling from Mangapū Tributary, November 2025. Single tick = DNA detected, multiple ticks = stronger relative eDNA signal. Sample sites are provided in Figure 30.

Common name	Scientific name	Māori Name	Threat status	Site 1 Downstream of Mangapū Tributary	Site 2 Mangapū Tributary	Site 3 Mangapū Tributary
Fish						
Longfin eel	*Anguilla dieffenbachii*	Tuna	At Risk – Declining	✓✓✓	✓✓	✓
Shortfin eel	*Anguilla australis*	Tuna	Not threatened	✓✓	✓	✓
Banded kōkopu	*Galaxias fasciatus*	Kōkopu	Not threatened	✓	✓	✓✓
Crustacea						
Freshwater crayfish	*Paranephrops planifrons*	Kōura	Not threatened	✓	✓	
Mollusca						
Mud snail	*Potamopyrgus antipodarum*		Not threatened	✓✓	✓	✓
Freshwater limpet	*Latia*		Not threatened / data deficient	✓		
Insecta						
Single gill mayfly	*Deleatidium lilli*		Not threatened	✓✓	✓	
Double gill mayfly	*Zephlebia pirongia*		Naturally uncommon	✓	✓	✓
Double gill mayfly	*Zephlebia aff. tuberculata sp.1*		Naturally uncommon	✓	✓	✓
Double gill mayfly	*Zephlebia borealis*		Not threatened	✓✓	✓✓	✓

7.4.5 Macroinvertebrates

Macroinvertebrate communities at Site 2 were indicative of high-quality habitat and water quality with MCI and QMCI scores both considered excellent at, 125 and 6.65, respectively. There was a high proportion of pollution-sensitive EPT taxa with %EPT 69% and %EPT taxa 55%. The most abundant taxon was the common freshwater snail *Potamopyrgus*, which can

be abundant in both polluted and pristine waters. The next most abundant taxa were the spiny gilled mayfly *Coloburiscus,* and the single gill mayfly *Deleatidium.* common in stony, well-aerated streams and are indicative of good habitat and water quality.

At Site 3, the macroinvertebrate communities were indicative of high-quality habitat and water quality with MCI and QMCI scores both considered excellent at 115 and 6.81, respectively. There was a high proportion of pollution-sensitive EPT taxa with %EPT 81% and %EPT taxa 44%. The most abundant taxa were the double gill mayflies *Tepakia* and *Zephlebia,* both of which are common in bush covered streams in the North Island and indicative of good habitat and water quality.

Macroinvertebrate communities in the headwaters (Figure 31) had low diversity (15 taxa) and were dominated by the mud snail *Potamopyrgus* (42%), followed by Diptera (21%). The EPT taxa mayflies accounted for 7.3% and caddisflies 2.1% of the community. The MCI sub score of 113 is considered 'good' (Stark and Maxted, 2007). The eDNA sampling did not detect koura from our uppermost sampling point (Site 3).

7.4.6 Fish Communities

No specific fish sampling was carried out in the Mangapū Tributary. Rather, we relied on the results of the eDNA sampling, as set out above. The eDNA results confirmed the presence of climbing fish species (eels and banded kokopu), including longfin eel (At Risk declining) but also confirmed the absence of swimming species. There are a number of significant waterfalls located within the Mangapū Tributary that are likely to restrict upstream fish passage to all species except those with good climbing ability (i.e., eels and kokopu).

Detection strength of eels was greatest in the lower-mid-reaches of the Tributary (Sites 2 and 3), and detection strength for banded kokopu was greatest in the upper reaches (Site 3). No introduced or pest fish were detected in the Tributary. The ecological values of the Mangapū Tributary for native fish are high.

7.4.7 Riparian Vegetation

The vegetation surrounding the streams within the Project area were observed throughout both the stream and vegetation surveys. The immediate riparian species, those generally of low stature and providing direct stream shade and inputs, include parataniwha (*Elatostema rugosum*), kiokio (*Parablechnum novae-zelandiae*), hangehange (*Geniostoma ligustrifolium*), kanono (*Coprosma grandifolia*), wheki / rough tree fern (*Dicksonia squarrosa*), and kiekie (*Freycinetia banksii*). Vegetation within the riparian margin up to approximately 5m away from the water's edge included some small shrubs and trees of larger stature. These included ponga / silver fern (*Alsophila dealbata*), nīkau (*Rhopalostylis sapida*), pāte (*Schefflera digitata*), heketara (*Olearia rani*), māhoe / whiteywood (*Melicytus ramiflorus*), mamaku / black tree fern (*Sphaeropteris medullaris*), tawa (*Beilschmiedia tawa*), and taraire (*Beilschmiedia taraire*).

7.4.8 Stream Ecological Valuation

Stream Ecological Valuation (SEV) surveys were undertaken at three locations in 2025 (Figure 12), and from the headwater stream in 2021. SEV scores are provided in **Table 13**.

Table 13: Mean SEV functional categories for Mangapū Stream (Site 1) and Mangapū Tributary (Sites 2, 3 and headwaters).

Function category	Site 1	Site 2	Site 3	Headwaters
Hydrological	1	1	0.98	0.98
Biogeochemical	0.85	0.93	0.86	0.86
Habitat Provision	0.81	0.88	0.60	0.64
Biodiversity	0.87	0.77	0.76	0.58
Overall SEV score	0.89	0.91	0.83	0.80

All SEV scores are indicative of a high-functioning stream. The survey reach scored very highly for hydraulic and biodiversity functions. Biogeochemical function was high, with a lack of stream shade reducing functionality, whilst habitat provision score was variable, decreasing at the uppermost site (Site 3).

The mean for native forest reference sites reported by Storey et al. (2011) was 0.92 for native forest sites, 0.80 for exotic forest sites and 0.61 for rural sites. The SEVs for Mangapū Tributary and mainstem were within the expected range for native forested stream.

7.4.8.1 Fish Communities

Fish communities were surveyed through the collection of eDNA. The eDNA detected longfin and shortfin eel. A large waterfall is located downstream on the main Mangapū Stream, likely restricting the passage of banded kōkopu that were detected downstream at the Mangapū Stream Site 3.

7.5 Haul Road – Mangapū Stream Tributaries 3 and 4

7.5.1 Background

As for the headwaters of the Mangapū Stream described above, the condition and characteristics of the tributaries (Mangapū Stream Tributary 3) affected by the proposed haul road were assessed as part of an earlier proposal. The proposal did not progress, but we have drawn on the data and observations gathered at that time to inform our assessment of the Project. No assessment was made of Mangapū Stream Tributary 4 at the time, and the condition and values are assumed to be similar to Mangapū Stream Tributary 3. Nothing has changed since the assessment was undertaken in 2019.

7.5.2 Stream Classification

The proposed haul road alignment crosses two tributaries of Mangapū Stream, a smaller one to the north and a larger to the south. The northern watercourse was classified as intermittent (becoming ephemeral on the eastern side of the alignment). It had a small defined channel with occasional shallow pools but did not have continual flow. The larger stream in the southern sub catchment had continual flow and was classified as permanent (**Figure 32**).

7.5.3 Habitats

The larger permanent stream was shallow and rocky with areas of silt). The stream banks were vertical and heavily eroded, with projecting tree roots, indicating substantial scouring flows. Upstream of the SEV section the stream becomes very steep with bedrock cascades and waterfalls. Riparian vegetation consists of mature native vegetation, which together with the steep terrain provided very high shade. Water quality was good, with moderate water temperature and high dissolved oxygen and clarityTable **14**). An SEV assessment was undertaken in the larger (permanent) stream (**Figure 32**).

Table 14: Habitat and water quality parameters of Tributary 3

Instream habitat	
Average wetted width (m)	0.59
Average channel width (m)	1.27
Average Depth (m)	0.04
Max depth (m)	0.18
Average Velocity (m/s)	<0.01
Substrate	silt/sand 0.37, gravel/cobble/boulder 0.46, bedrock 0.17
Fish habitat	rocky substrate, shallow pools
Riparian	
Proportion shade at water surface*	very high>90% shade
Riparian vegetation type	Native forest
Proportion tree cover in riparian zone	100% wider than 20m each side
Water quality**	
Temperature (°C)	12.6
Dissolved Oxygen (%)	94
Dissolved Oxygen (µg/l)	9.97
Specific conductivity (µs/cm)	441
Conductivity (µs/cm)	337
Clarity (m)	0.68

* Value taken from Vshade in SEV calculation spreadsheet

** Measured on a YSI Pro DSS water quality meter

Figure 32: Images of Tributary 3 watercourse, Hunua Quarry 2025.

7.5.4 Fish

As identified above, the NZFFDB has eight records for the Mangapū Stream in the vicinity of the Project area. Species recorded were longfin and shortfin eel and Cran's bully. In our electrofishing survey of Trib 3, shortfin eel, banded kokopu and koura were recorded in the vicinity of the proposed haul road crossing. Neither of these species are classified as threatened. Although diversity was low, the Fish IBI score of 40 was Good, above the 70th percentile for Auckland sites but with some signs of stress.

7.5.5 Macroinvertebrates

Macroinvertebrate communities had a moderate abundance (260 individuals in the sample), and high metric values in the good or excellent range (Table 15). About 54% of the sample comprised mayflies, 28% caddisflies, 10% true flies, and 8% others including beetles, snails, worms and crustaceans.

Compared to regional reference site data, Taxa Richness (24) and MCI (106) values were below the average for hard-bottomed exotic or native forest sites (mean Richness 28 to 33, MCI 126 to 127) and similar to the rural site values (mean Richness 26, mean MCI 100).

This suggests that while values are high and fauna are dominated by mayflies and other species typical of forest sites, values are suboptimal from this site. The most probable cause based on our observations are periodic high flows and associated natural channel erosion and sediment deposition.

Table 15: Macroinvertebrate metrics, Mangapū Stream Tributary 3, 2021.

Metric	Value	Interpretation
Taxonomic Richness	24	Excellent
EPT Richness	7	Good
%EPT abundance	82	Excellent
MCI	106	Good
QMCI	7.05	Excellent

7.5.6 Stream Ecological Functions

Tributary 3 was unmodified but had an incised channel with poor connectivity to the floodplain and natural cascades likely to impede fish passage to some extent, resulting in a Hydraulic function score of 0.63 (Table 16). The Biogeochemical function scores was high due to native riparian forest and rocky streambed substrate (score of 0.94). Habitat provision score was 0.74, with good instream habitat but suboptimal galaxiid spawning due to the incised channel. Biodiversity function scores were fair bur suboptimal for both fish and invertebrates, with a score of 0.65. The overall SEV score was 0.76, toward the upper end of the "Good" range. The mean for native forest reference sites reported by Storey et al. (2011) was 0.92 for native forest sites, 0.80 for exotic forest sites and 0.61 for rural sites. These results indicate functions are good but sub-optimal for a native forest stream.

Table 16: SEV Function Scores for Mangapū Stream Tributary 3

Function category	Mean score
Hydrological	0.63
Biogeochemical	0.94
Habitat Provision	0.74
Biodiversity	0.65
Overall SEV score	0.76

7.6 Summary Freshwater Ecological Values

The freshwater ecological value of the Mangapū Tributary is assessed as High, due to the high habitat quality and diversity with a natural channel and 100% of the catchment in native vegetation, moderate shading, a reasonably diverse macroinvertebrate community with MCI scores ranging from 113 and SEV scores of 0.8.

8.0 Ecological Effects of Pit Expansion

8.1 Description of Proposed Works

Effects on biodiversity and ecological features arise from direct impacts (loss or disturbance of features within the Site) and indirectly from activities associated with quarry operations resulting in disturbance, discharges, or changes to hydrological functions.

Components of the Project that will have direct actual or potential adverse effects on terrestrial and freshwater ecosystems include the following:

- Forest clearance and removal of overburden.
- Construction of a haul road.
- Stream realignment.
- Diversion of groundwater.
- Discharges to streams.

Components of the Project that will have indirect / potential adverse effects on terrestrial and freshwater ecosystems include the following:

- Blasting.
- Truck movements.

8.2 Vegetation Clearance

8.2.1 Loss of Indigenous Vegetation

Vegetation removal activities broadly involve the use of crews of workers and machinery creating tracks into vegetated areas followed by tree felling, and/or the mulching and chipping of vegetation in situ. The mulching is typically carried out by small hydraulic excavators fitted with a grinding attachment. In situ mulching is suitable for vegetation typically up to 200 mm in diameter but can include large fern. Large woody debris (> 200 mm in diameter) is cut down to size. Vegetation removal generally takes place well in advance of scheduled overburden removal, allowing time for decomposition of the vegetative material. Alternatively, mulch is collected for composting elsewhere. Composted mulch is incorporated into topsoil which is recovered and stockpiled for rehabilitation activities.

A total of 44.46 ha of terrestrial indigenous vegetation communities will be cleared over the life of the Project, along with 4.15 ha of exotic scrub (Table 17). Vegetation to be removed amounts to 4.55% of the total SEA_T_5323 area, on the northern and northwestern periphery of the SEA

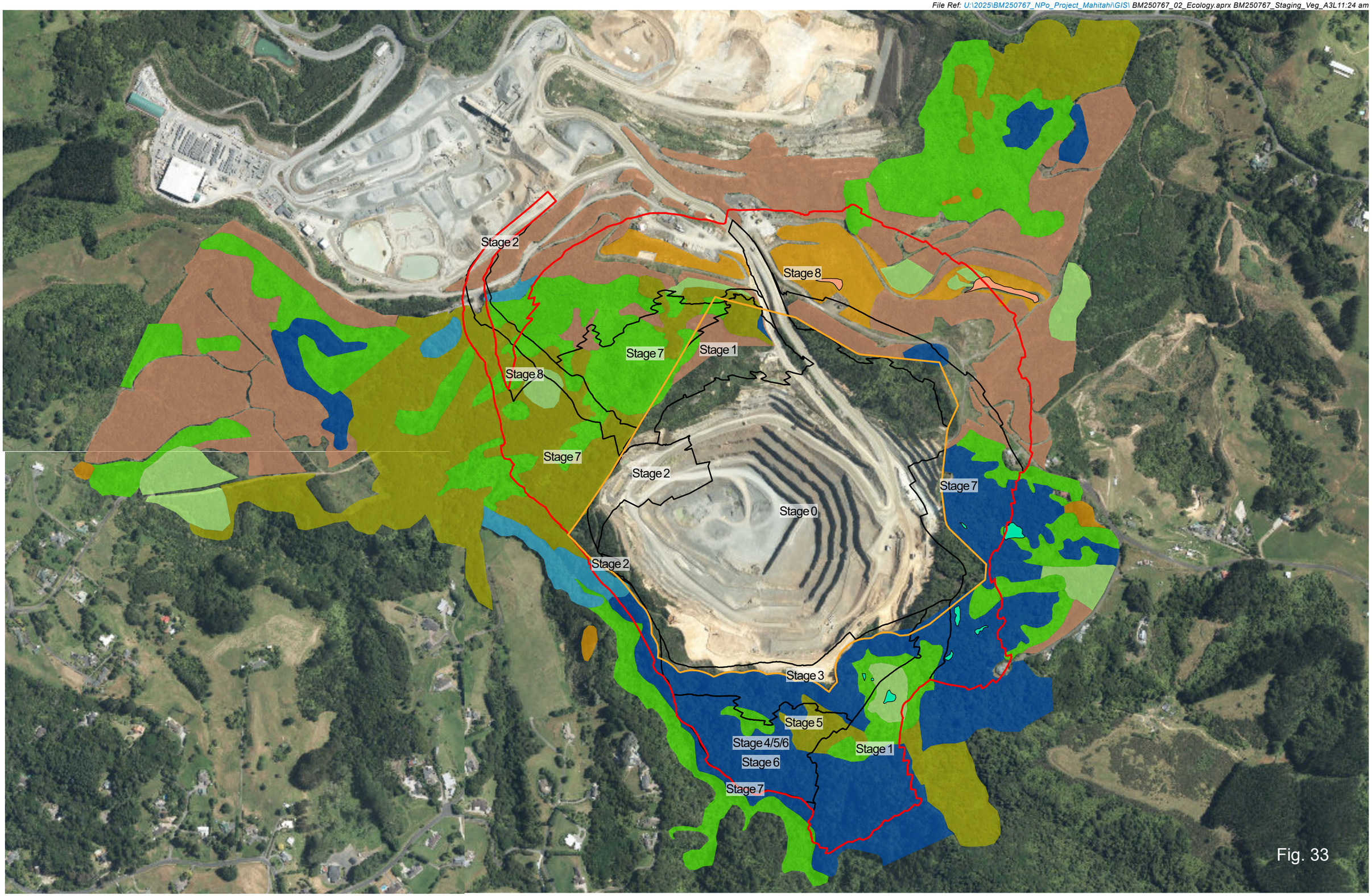

Fig. 33

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Wetlands
  - Forest seepages
  - Exotic grass dominated swamp
- *Early successional vegetation*
  - Tree fernland with nīkau, emergent pūriri and broadleaf scrub (VS5)
  - Kānuka forest with emergent broadleaves and podocarps (VS2)
  - Kānuka/manuka scrub (VS3)
- *Late successional vegetation*
  - Tawa-taraire forest with mature kānuka (WF9)
  - Kauri, podocarp, broadleaf forest (WF11)
- *Disturbed/modified vegetation*
  - Native planting/weedy scrub mix
  - Exotic species (pine, rank grasses, pampas scrub)
  - Expansion stages
  - Consented Pit Boundary
  - Quarry Development Area

HUNUA QUARRY DEVELOPMENT

Staging and Vegetation Removal

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: LMa

Table 17: Total extent of terrestrial vegetation types within Project footprint.

Vegetation type	Area (ha)
Tree-fernland with nīkau, emergent pūriri and broadleaf scrub	10.14
Kānuka forest with emergent broadleaves & podocarps	8.38
Tawa-taraire forest with mature kānuka	14.93
Native planting/weedy scrub mix	8.71
Kānuka/manuka scrub	2.04
Kauri, podocarp, broadleaf forest	0.26
Subtotal – significant vegetation	44.46
Native planting/weedy scrub mix	8.71
Exotic scrub	4.15
Total	48.61

The amount and type of vegetation clearance anticipated at each stage of the Project is set out in Table 18. Stages 1-3 include development of the stream realignment and haul road and result in removal of 12.82 ha of ecologically significant vegetation.

Table 18: Vegetation clearance at each stage of the Project[8].

Stage	Vegetation type							TOTAL (ha)
	Tree-fernland with nīkau, emergent pūriri & broadleaf scrub	Kānuka forest with emergent broadleaves & podocarps	Tawa-taraire forest with mature kānuka	Native planting / weedy scrub mix	Kānuka / manuka scrub	Kauri, podocarp, broadleaf forest	Exotic scrub	
Stage 1	1.46	0.79	3.73	0.66	0.58	0.00	0.00	**7.22**
Stage 2	0.54	0.95	0.00	0.25	0.07	0.02	0.00	**1.83**
Stage 3	0.50	0.06	3.06	0.00	0.15	0.00	0.00	**3.77**
Stage 4	0.23	0.67	3.35	0.00	0.00	0.00	0.00	**4.25**
Stage 5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Stage 6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**

[8] For offset, Veg 2 and 3 combined – mature secondary forest Broadleaf; Veg 1, 4 and 5 combined – early succession, Veg 6 old remnant podocarp) including any areas earmarked under existing consents.

Stage 7	4.60	5.19	4.73	1.85	0.38	0.24	0.15	**17.14**
Stage 8	2.81	0.72	0.06	5.95	0.86	0.00	4.00	**14.40**
Total (ha)	**10.14**	**8.38**	**14.93**	**8.71**	**2.04**	**0.26**	**4.15**	**48.61**

8.2.2 Effects on Connectivity and Buffering and Edge Effects

In the context of effects arising from forest clearance, “edge effect” is a collective term for changes that occur in a forest habitat as a consequence of removing part of a forest stand and thereby creating a new edge. Patch size is a key factor determining the potential resilience of the remaining forest, with size, as small or irregularly-shaped remnants may not form a sufficient buffer develop a forest interior microclimate (Murcia, 1995; Norton, 2002).

The proposed quarry expansion results in the loss of 4.55% of the total SEA_T_5323 extent. The removal largely impacts the northern margin of SEA_T_5323, and expands the gap between SEA_T_5323 and SEA_T_5289 made by the existing quarry site.

Approximately 6 ha of forest within the SEA overlay that adjoins the eastern margin of the Site will be isolated from the otherwise contiguous forest area as a result of the proposed quarry expansion. The roadway to 165 Middleton Road, will separate this fragment of SEA forest and the main body of the SEA to the south.

The forest edge is an ecotone where the forest community meets and integrates with an adjoining non-forest habitat. Depending on the abruptness of this transition, forest edge environments may be characterised by a mix of species variously adapted to both habitats, arranged along a gradient that reflects their habitat tolerances and competitive ability. Depending on site characteristics, forest edges are typically warmer, drier and windier than the forest interior environment.

New Zealand research indicates that while direct microclimatic effects are often most pronounced within approximately 20 m of a forest edge, associated vegetation responses can extend substantially further. Changing microclimatic conditions along the forest margin typically include increased light exposure, wind penetration, temperature variability, and reduced humidity (Chen et al., 1995; Norton, 2002). Over time, changes in canopy condition, subcanopy structure, and understorey composition near a newly created forest edge, and declines in moisture-dependent groups such as ferns and bryophytes, have been recorded up to 70 m into forest interiors depending on the direction the edge faces, with effects most prevalent in the first 30 m from the edge (Norton, 2002). Recently created, open edges such as those associated with quarrying are likely to exhibit the strongest effects, particularly where edge regeneration is limited (Didham & Lawton, 1999).

Forest edges can function as focal points for weed invasion and pest incursions, particularly where ongoing disturbance, vehicle access, and elevated light levels occur (Murcia, 1995; Norton, 2002).

The approximate extent of the forest edge where the existing pit adjoins SEA is currently 2,042 m. At completion, the length of the forest edge at the quarry margin adjoining SEA_T_5323 will be 2,528 m (i.e., an increase of 428 m; Figure **34**). The Project will result in a 24% increase in the exposed edge of the contiguous forest area currently present around Symonds Hill Pit but does not result in fragmentation of the remaining forest in that location

LEGEND

- Existing forest edge - consented pit
- Post-development forest edge
- Quarry Development Area

vegetation mapping 20261122

Early successional vegetation

- Tree fernland with nīkau, emergent pūriri and broadleaf scrub (VS5)
- Kānuka forest with emergent broadleaves and podocarps (VS2)
- Kānuka/manuka scrub (VS3)

Late successional vegetation

- Tawa-taraire forest with mature kānuka (WF9)
- Kauri, podocarp, broadleaf forest (WF11)

Disturbed/modified vegetation

- Native planting/weedy scrub mix
- Exotic species (pine, rank grasses, pampas scrub)

Fig. 34

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors, Auckland Council, Boffa Miskell Limited

Projection: NZGD 2000 New Zealand Transverse Mercator

HUNUA QUARRY DEVELOPMENT

Forest Edge

Date: 27 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: LMa

The quarry pit will move outwards and into the existing forest in stages, as has occurred over the past 15 years with the progressive expansion of the Symonds Hill Pit.

Forest surrounding the existing quarry pit already experiences some edge effects. Transmission of quarry works noise is likely to intrude into the forest interior closest to the pit edge, potentially affecting fauna sensitive to noise disturbance. Dust generated by quarry operations deposited along exposed forest margins may reduce the habitat quality of the forest margin ecotone which is otherwise favourable for a variety of species.

The rate of expansion of the existing pit has allowed a resilient indigenous shrubby community to establish around the pit margin. Vegetation survey plots sampled around the eastern perimeter of the quarry pit showed increased cover of treeferns and shrub density in the subcanopy and understorey (Figure **35**). The dense growth of treeferns and shrubs forms an effective buffer to the forest interior, mediating the intrusion of noise, dust and humidity effects, and suppressing weed incursions. Accordingly, no active measures to mitigate edge effects around the quarry pit are proposed.

Figure 35: Abundant treefern and shrub cover in RECCE plot on eastern margin of existing quarry pit.

8.3 Effects on Terrestrial Fauna

8.3.1 Skink and gecko populations and habitat

In the absence of mitigation and specific fauna management, forest clearance will result in the likely mortality of lizards and the loss / modification of habitat, particularly of elegant gecko. Mature kānuka (8.38 ha), tawa-taraire forest with mature kānuka (14.93 ha), and

kānuka/manuka scrub (2.04 ha) are classified here (conservatively) as “key elegant gecko habitats”. A further 19.11 ha of lower quality potential lizard habitat will also be cleared. Lizard mortality will be minimised through implementation of survey and salvage protocols prior to and during vegetation clearance works (Section 9.4.1). Loss of habitat is a residual effect that will be offset / compensated by revegetation to reinstate forest habitat over the medium to long term, and pest control to improve the viability of existing lizard populations in remnant forest areas, and over time, in adjoining revegetation sites (Section 10.0).

Potential sub-lethal effects include ongoing disturbance from elevated noise, dust, light and vibration levels which may impact animal health and breeding success, although there are no known studies of these effects on native lizards, so such effects are theoretical. The most significant indirect effect of habitat clearance is increased exposure to predators as new forest edges are created. Intensification of pest management effort is proposed to address this effect (Section 9.4.2).

8.3.2 Frog populations and habitat

No Hochstetter’s frogs were recorded during the surveys of the Mangapū Tributary, and habitat was observed as sub-optimal. Accordingly, the effects of the Project on frogs are assessed as negligible, and no effects management is required or recommended.

8.3.3 Bird populations and habitat

A variety of Not Threatened indigenous bird species and Introduced bird species were recorded across the Site. The assemblage of native birds inhabiting the proposed Project footprint was characteristic of secondary indigenous forest and scrub habitat (kereru, fantail, tui, silvereye grey warbler, etc). Loss of habitat for roosting, foraging and nesting are the main effects on native bird species, notwithstanding that extensive similar or better quality habitat is present in the adjoining SEA and surrounding forest and scrubland patches.

Tawa-taraire forest is assessed as high quality habitat for native forest birds, while kānuka and kānuka/manuka dominated forest and scrub vegetation types and recent plantings are of moderate habitat quality for native birds.

Fauna management protocols to minimise effects on nesting birds will be employed during vegetation clearance (Section 9.4.1.3) to minimise mortality risk. As for lizards, the most significant indirect effect of habitat clearance on birds is increased exposure to predators as new forest edges are created. Intensification of pest management effort is proposed to address this effect (Section 9.4.2).

Loss of habitat is a residual effect that will be offset / compensated by revegetation to reinstate forest habitat over the medium to long term, and pest control to improve the viability of existing bird populations in remnant forest areas and over time, in adjoining revegetation sites (Section 10.0).

8.3.4 Bat population and habitat

Long-tailed bats are known to be present in the wider Hunua Ranges, but no bat activity was recorded at Hunua Quarry, which suggests that the location is not favoured for maternity and nocturnal roost trees and is not a preferred foraging area. No adverse effects on any bat

colonies present in the Hunua Ranges are anticipated as a result of the Project, and no effects management is required or recommended.

8.4 Wetland Drainage and Removal Effects

The Project will result in the direct removal of 0.22 ha of wetland features, including 0.12 ha of ecologically significant forest seepage, and 0.1 ha of degraded exotic grass-dominated swamp.

In addition, works will result in the likely drainage of a further 0.22 ha of wetland extent (0.09 ha of forest seepage, 0.14 ha of exotic grass-dominated swamp) within 100m of the Site as a result of partial removal. No other wetlands are identified within 100m of the Site.

An anticipated 0.44 ha loss of wetland extent in total cannot be avoided or mitigated within the Site or wider landholding, and is therefore a residual effect to be managed through offsetting and compensation (Section 10.0).

8.5 Effects on Freshwater Ecology

8.5.1 Removal of Watercourses

The Project will result in the permanent removal and loss of intermittent and permanent streams. The location, stage and extent of stream modification is set out in Table 19. In summary a total of 527 m of intermittent and permanent stream length will be removed from tributaries 3 and 4, and a length of 1,200 m from the Mangapū Tributary.

Although included for completeness as a line item in Table 19, the effects of the realignment of Mangapū Tributary are not addressed in this section but are contained in section 11 below.

The removal of the headwater streams of the Mangapū Tributary anticipated in Stage 7 is not included in our assessment as this activity will occur outside of the 35 year consent period for regional earthworks and stream works matters. These will be addressed in future applications, as further investigations and analysis are undertaken.

Table 19: Estimated infrastructure, realignments and removal of watercourses resulting from the Project.

Watercourse	Stage Quarry development	Purpose of stream modification / removal	Estimated length of stream modification / removal
Mangapū Tributary	Stage 2	Bridge	No loss
Mangapū Tributary	Stage 2	Stream realignment	1200 m
Mangapū Stream trib 3	Stage 7 (offset in Tranche 1 Stages 1-4)	Haul road culverts and quarry expansion	475 m
Mangapū Stream trib 4	Stage 7 (offset in Tranche 1 Stages 1-4)	Haul road culverts and quarry expansion	40 m

Although quarrying of streams is not strictly from an ecological perspective stream reclamation,[9] the watercourses and their channels no longer remain. The loss of watercourses results in the permanent removal of aquatic habitats, loss of biodiversity and habitat for biodiversity, and a decline in ecosystem services. Notably with quarry expansions, once the watercourses are removed, they cannot be replaced, and the effect is permanent.

The loss of the watercourses (before mitigation) is a significant adverse effect.

8.5.2 Haul Road Culverts

The development of a new haul road is proposed as part of the Project. The new haul road proposed as part of the early stages of the quarry development (Stage 2) will cross the Mangapū Stream tributaries 3 and 4 respectively (**Figures 2 and 10**).

Two new culverts are proposed to convey steep natural catchments beneath the haul road formation extending some 75 m and 40 m of Mangapū Stream tributaries 3 and 4 respectively. The NESF sets mandatory requirements for new instream structures, including culverts. The key requirements include:

- culvert velocity not exceeding that of adjacent reaches;
- constructed bed width at least 1.3 times the natural bed width for streams ≤3 m wide;
- closed-bottom culverts embedded at least 25% of diameter or open-bottom design; and
- substrate stability through the culvert; and continuity of geomorphic processes (sediment and debris).

Because the natural bed width is approximately 1.0 m, the internal bed width inside any culvert must be at least 1.3 m. This requirement governs culvert sizing, not hydraulic capacity.

The loss of stream habitat from the installation of culverts, is an adverse effect on aquatic values through the loss of a length of stream habitat. The installation of culverts that provide for fish passage (of climbing fish) is not possible in this steep environment.

However, as set out below, the loss of the entire catchments of tributaries 3 and 4 anticipated for Stage 7 of the Hunua Quarry Development, is incorporated into the early offset and compensation for removal of watercourses, and thus the residual effect of the loss of habitat from both the culverts (Stage 2) and quarry expansion (Stage 7) is managed at the outset. Whilst every attempt has been made to try and provide for fish passage through the culverts, this will not be achieved due to the gradient and water velocities. Effectively the gains for the impact on tributaries 3 and 4 and the change to fish passage will be realised long before the removal of the watercourses occurs (by some decades).

[9] Per regs 56A and 57 of the NESF. As the proposed quarrying activity results in the removal of streambed, rather than its infilling or covering. The definition of reclamation in the NESF, which cross-refers to the National Planning Standards, means (relevantly) the manmade formation of permanent dry land by the positioning of material into or onto any part of a waterbody, bed of a lake or river or the coastal marine area. From an ecological perspective, reclamation is accepted as a significant environmental loss, rather than a restoration activity.

8.5.3 Erosion and Sediment Control

Control protocols and devices are proposed to reduce the potential for erosion of bare soils to occur (erosion control) and to employ treatment devices to treat sediment laden water prior to discharging runoff from the Site (sediment controls). An Erosion and Sediment Control Plan (ESCP) is proposed incorporating the 10 basic principles taken from GD05 (PDP2026c):

- Minimise disturbance: only work areas required for construction to take place.
- Stage construction: carefully plan works to minimise the area of disturbance at any one time.
- Protect steep slopes: where steep slopes existing within the works area, ensure that these are protected as steep slopes are prone to erosion.
- Protect watercourses: Map all water bodies before works commence.
- Stabilise exposed areas rapidly by sowing new seed or mulch cover, or as appropriate to achieve stabilisation where possible.
- Install perimeter controls: divert clean water away from areas of disturbance and divert runoff from areas disturbed to sediment control devices.
- Employ detention devices: treat runoff by methods that allow sediment to settle out.
- Use trained and experienced operators and ensure site staff are aware of the requirements of the ESCP and the relevant resource consent conditions.
- Make sure the ESCP evolves as construction progresses and the nature of land disturbing activities change, the ESCP needs to be modified to reflect the changing conditions on the Site.
- Assess and adjust, inspect, monitor and maintain control measures.

Implementation of these principles and design and operation of associated devices are set out in the ESCP (PDP 2026c). The ESCP also sets out the expected maintenance and monitoring requirements to ensure that the controls are functional and fit for purpose.

The proposed monitoring condition as set out in PDP (2026c) focuses on total suspended solids (TSS) and turbidity (nephelometric turbidity units, NTU) with sampling aimed at rainfall events such that instream sampling must be collected as soon as practicable after a 25 mm or more rainfall event having occurred. Threshold values where discharges from the quarry have increased the instream TSS (or NTU equivalent) as measured from a point 10 m upstream of the most upstream quarry discharge point and 30 downstream of the most downstream quarry discharge point into the Mangapū Stream are recommended by PDP (2026c), where there is a 20% or more change in TSS or NTU between above and below discharge points, quarry operations must be modified and/or water quality control measures implemented.

We have noted above that mean values for turbidity, both upstream and downstream were above the default guideline values (80th percentile) of 5.2 for turbidity (ANZG 2018), meaning that turbidity levels in the Mangapū Stream can be high at times. We recommend that baseline turbidity monitoring is also carried out as set out in Section 10.6.

Where GD05 principles are implemented, we do not expect that excess sediment resulting from the quarry operations will result in adverse effects on the aquatic ecological values, and conditions of consent relating to water quality will be met. We address potential erosion and sediment effects from the construction of the stream realignment in Section 11 below.

8.5.4 Stream Works

In addition to stream loss or realignment, works in or around streams may directly impact aquatic habitat through disturbance and through sediment and temperature-related effects. Care is therefore required for works in and around watercourses to minimise potential effects as much as possible. The ESCP sets out the plans for works around streams to avoid and minimise sedimentation to streams, including for the installation of culverts within watercourses and structures adjacent to watercourses (e.g., bridge abutments).

8.6 Effects of Dewatering

8.6.1 Loss of surface flows

PDP (2026b) conclude that the proposed dewatering at Symonds Hill Pit may potentially affect the stream low flows below RL 60 m and also cause a reduction in the regional groundwater contribution to the streams east of the fault as some of this upwelling groundwater flow could be diverted to the pit instead. Streams potentially affected east of the pit include: Taitaia Stream, Waipokāpū Stream, Mangapū Stream, Waihoihoi Stream, sub-catchments of Hingaia Stream and small portion of Papakura Stream sub-catchment, west of Taitata.

The results of conceptual modelling suggest that based on the current total pumping rate estimated as being up to 1,280 m^3/d (from HUN18/1 and Symonds Hill Pit), the estimated baseflow losses for the Mangapū Stream and Waipokapū Stream equate to up to 655 m^3/d and 555 m^3/d respectively (Table 20) once the full pit depth is reached. For the dewatering levels at RL –50 m, the estimated loss of base flow for Mangapū and Waipokapū Streams is predicted to be 946 m^3/d (i.e. reduction in baseflow of 34%) and 2,290 m^3/d (reduction in baseflow of 35%) respectively. This amounts to an improvement in flow of some 10.2% compared to the existing consent condition for Mangapū Stream, but a further 9.1% flow loss in the Waipokapū Stream. Additional flow losses in some smaller catchments appear relatively high, but these correspond to modest absolute increases of loss (e.g., 13 m^3/d in the Papakura Stream and 238 m^3/d in the Taitaia Stream.

Table 20: Changes in flow loss compared with existing consent at Hunua Quarry (from PDP 2026b) 10

Catchment	Predicted reduction in baseflow for existing consent (m^3/d)	Predicted reduction in baseflow for proposed development (m^3/d)	Change (m^3/d)	Percentage increase in flow loss (%)
Taitaia Stream	311	549	238	76.5
Waipokapū Stream	2099	2290	191	9.1
Mangapū Stream	1053	946	-107	-10.2
Waihoihoi Stream	564	610	46	8.2

[10] PDP (2026b) go on to note that as a result of the complex nature of the groundwater flow through the greywacke, the calculated reductions are only indicative and in practice the actual effects are likely to be less due to intervening flow barrier faults.

Hingaia Sub-Catchment	76	89	13	17.1
Papakura Sub-Catchment	23	36	13	56.5
Total	**4127**	**4520**	**394**	**9.5**

8.6.2 Effects of loss of surface flows

Habitat availability

Sufficient habitat for animals and plants to live, feed and reproduce is important for the viability of aquatic ecosystems. In waterways, this can be expressed as the wetted area, or the amount (width and depth) of substrate covered by water. The greater the area available, the more space there is for animals and plants to live.

Except for the most entrenched waterways, a reduction in flow typically causes a contraction of the running water channel, exposing stream margins, and resulting in less bed habitat available, and less space for living organisms. A contraction of the flow channel also has other implications for temperature, dissolved oxygen, and other components of the water column. This occurs because typically a contracted flow would be shallower, light penetration is greater, and there may be a concentration of nutrients and other contaminants.

Available area will vary between habitats, with pool areas becoming shallower, and the water flows in the wider, shallower reaches becoming narrower.

Temperature

Water temperature is important for a wide range of aquatic ecological functions, and alterations to temperature can have a range of different effects. Effects ranging from short to long periods of time are also important to consider. Many species have specific thresholds for different stages of their life cycles and are adapted to temperature regimes. In addition, changes to temperature can result in modified biotic (e.g., competition/predation with introduced species) and food-web interactions (ARC 2012).

A range of methods and approaches have been used to assess the thermal tolerance of aquatic organisms, ranging from knowledge of field distribution of species, particularly at temperature extremes to controlled laboratory experiments which provide the most defensible estimates of the thermal tolerance of aquatic species.

ARC (2012) outline acute and chronic temperature thresholds for native fish and aquatic macroinvertebrates, including critical maximum temperatures, temperature preferences, and upper limits of behavioural and development effects. Based on the criteria, the ARC (2012) assessment of temperature thresholds concludes that:

- Maximum temperatures in upland streams that are less than 20℃ should protect even the most sensitive native taxa.
- The most sensitive native taxa in lowland streams should be protected as long as maximum temperatures are less than 25℃.

No modelling has been undertaken to assess the potential for temperature changes but the effects of reductions in flows on water temperature will be influenced by several key factors including (but not limited to):

- The extent of reduction in wetted area and depth of the receiving watercourse.

- The extent of shading available to the surface waters of the watercourse.
- The temperature of the source of water for the environmental flows.

Dissolved oxygen, pH and conductivity

Sufficient dissolved oxygen is essential for sustaining the life supporting capacity of aquatic ecosystems. Many organisms are adapted for high oxygen levels, or in some cases can tolerate low oxygen levels. Oxygen levels are sustained by a number of factors including (but not limited to):

- The temperature of the receiving watercourses.
- The gradient and nature of the receiving watercourses.
- The extent of shading available to the surface waters of the watercourse.
- The temperature and oxygen levels of the source of water for the environmental flows.
- The extent of algal and plant growth in the receiving watercourses.

Suspended solids and turbidity

As discussed above, sediment and fine particle intrusions into waterways are a natural occurrence, resulting from natural bank erosion, runoff from floodplains, and the re-mobilisation of stream bed materials. For the Mangapū Stream, median suspended solids and turbidity values were very low, but increased marginally as the river travelled downstream.

Periphyton

Periphyton (benthic algal growth) is an important component of stream biodiversity, acting as an important source of productivity and food for macroinvertebrates (which in turn form the food of fish). Periphyton development is depending on a variety of factors including substrate type and mobility, water flows and velocity, water temperature, water depth, water quality and clarity, and shade. Excessive growths of periphyton can have important effects on freshwater ecology and can result in a smothering of the stream bed. This can result in a shift in the macroinvertebrate communities and a less favourable habitat for fish species. Reduced flows may result in favourable conditions for increased algal growth.

Macroinvertebrates

A reduction in habitat availability reduces the living space for benthic macroinvertebrates, and if occurring with changes in water temperature and/or dissolved oxygen levels, can result in the modifications to the macroinvertebrate communities. We note that no significant changes have occurred in the macroinvertebrate metrics resulting from the existing operations. Reduced flows may result in a change in abundance of individuals, but we expect the macroinvertebrate communities to stay much the same, perhaps with different proportions of community composition. Any short-term perturbations in community structure are rapidly recoverable. Most at risk are some members of the EPT group of macroinvertebrates, whose temperature thresholds are typically lower (cf. the 20℃ temperature threshold is mostly derived from this group of aquatic organisms). The portion of EPT in the benthic macroinvertebrate communities may change if temperatures are markedly elevated.

Fish

The Mangapū and Waipokapū Stream have diverse fish faunas, with a large number of native fish recorded within the Slippery Creek catchment. In the Mangapū Tributary, the presence of the Waitakere Falls presents a significant barrier to the migration of non-climbing fish, and eels and banded kokopu are known to occur in the stream.

Cumulative long-term effects

Longer term effects of continuing lower baseline flows in aquatic ecosystems are not well understood, but the available evidence points to no single consistent response in waterways. Different effects occur in different river types and depend on a range of hydrological and local factors (Moss 1998).

Life-history characteristics and ecological characteristics (traits) of organisms play an important role in determining how individual taxa respond to flow regime change in rivers and streams. Also important is the ability for systems to recover from longer-term perturbations.

Summary of effects of dewatering

In the absence of effects management, the effects of dewatering of Mangapū Stream and other local watercourses is a significant adverse effect.

8.7 Summary of Effects of Hunua Quarry Development

The ecological effects of the Hunua Quarry Development are set out in Table 21. The following section sets out how the effects management hierarchy is applied to each of these.

Table 21: Summary of ecological effects of the Hunua Quarry Development.

Ecological attribute	Ecological value	Effect	Adverse effect to be managed	Residual effect
Vegetation	Taraire/Tawa Forest: High Mature kanuka: High Other vegetation: Low to moderate	Unavoidable loss of 44.46 ha of indigenous vegetation	Yes – Residual effect – loss of vegetation	Yes – loss of vegetation and habitat
Lizards	Fauna: High Habitat: Low-Moderate	Potential fatalities Loss of habitat	Yes – potential incidental fatalities during quarry expansion	No
Birds	Fauna: Moderate – no threatened species Habitat: Low - Moderate	Potential fatalities Loss of habitat	Yes – potential fatalities and disturbance to nests during quarry expansion	No
Bats	Fauna: Negligible – no bats recorded Habitat: Low - moderate	Potential for future: Potential fatalities Loss of habitat	No – no bats present	No
Wetlands	Fauna: Negligible Habitat: Low - moderate	Unavoidable loss of 0.44 ha of wetland	Yes – residual effect	Yes – loss of ecological values and extent
Watercourses				
Mangapū Stream	Very high	Unavoidable loss of 1,200 m of intermittent and	Yes – realignment for ecological	Yes – loss of ecological values and extent

tributary realignment		permanent stream length.	values and extent (in part) Residual effect of remaining values and extent	
Other Mangapū Stream tributaries	High	Unavoidable loss of 527 m of intermittent permanent stream length	Yes – residual effect	Yes – loss of ecological values and extent
Aquatic Fauna	Moderate-High	Potential fatalities even with salvage and relocation Loss of habitat	Yes – loss of habitat	No
Reduction in surface flows		Reduction in habitat Increase in temperature Changes in water quality Potential excessive periphyton growth	Yes – remedy loss of flows	No

9.0 Effects Management Approach

9.1 Effects Management Hierarchy

As outlined in Section 0, this assessment has applied the effects management hierarchy (EMH) set out in National Policy Statements for Freshwater Management (NPS-FM) and Indigenous Biodiversity (NPS-IB), relevant sections of the AUP, Biodiversity offsetting under the RMA (Biodiversity Working Group 2018). The EMH set out in these policies is generally consistent with AUP policies concerning effects on SEAs (Policy D9.3), vegetation management and biodiversity (Chapter E.15) and aquatic environments (Chapter E.3).

The effects management hierarchy prioritises avoidance of adverse effects, and requires that effects are otherwise minimised or remedied, before considering the appropriateness of offsetting or compensating residual adverse effects.

In the case of the Project, the proposed quarrying activity is constrained by the location of the aggregate resource, i.e. aggregate extraction can only occur where sufficient geological resource exists and it is accessible (i.e. the land has not been sterilised as a result of other land uses such as urban development). A critical element of functional need is not only the presence of the resource, but the ability to access it in a practical and economically viable manner with favourable strip ratios (generally at or below breakeven strip ratio) across substantial portions of the pit, particularly in southern and eastern areas where tertiary cover is minimal, and thus enabling earlier access to resource rock, reduced non-productive overburden handling, and more efficient sequencing of extraction relative to alternative or deeper resources (Winstone Aggregates (2026)). There is a functional need for the stream diversion and to quarry in this location, and an operational need for the new haul road in its intended location to provide for that quarrying activity such that alternative options for quarry expansion are unavailable and the anticipated loss and disturbance of indigenous vegetation, streams, wetlands and associated fauna habitats is unavoidable in the context of this site and the existing Quarry Zone (Winstone Aggregates (2026).

Our assessment uses the following definitions, as set out in the NPS-IB and NPS-FM.[11]:

Avoidance: To modify a project proposal to prevent any environmental damage or loss of an ecological or environmental feature or function.

Minimise: To reduce the extent, intensity, or duration of unavoidable adverse effects.

Remedy: Actions taken to repair, restore or reinstate adverse effects that have occurred or damaged environments.

Biodiversity Offset: A measurable conservation outcome resulting from actions designed to compensate for residual, adverse biodiversity effects arising from activities after appropriate avoidance, remediation, and mitigation measures have been applied. The goal of a biodiversity offset is to achieve no-net-loss, and preferably a net-gain, of indigenous biodiversity values.

Environmental Compensation: Non-quantified biodiversity benefits are offered to compensate for biodiversity losses. The compensation actions may benefit different biodiversity to that lost (out-of-kind compensation), including biodiversity of lesser

[11] New Zealand Government, 2014.

conservation concern than that lost. Compensation is not quantified or balanced with losses and may involve subjective decision-making subject to socio-political influences.

No-Net-Loss: A no-net-loss offset aims to return biodiversity values to the point they would be anyway, that is, without the impact or the offset.

Net gain: Actions that generate biodiversity values that are greater than they would be anyway (without the impact or the offset).

Management of residual effects is in accordance with NPS-IB and NPS-FM Principles of Biodiversity Offsetting and Biodiversity Compensation (refer Section 10.3), which are generally consistent with AUP offsetting principles (**Appendix 11**).

9.2 Components of Effects Management Package

Actions to address the ecological effects of the Hunua Quarry Development project fall into broad components, listed below and described in the following sections:

- Salvage and relocation actions for both aquatic fauna and terrestrial fauna (Section 9.3.2).
- Revegetation of large areas to offset for removal of indigenous vegetation, wetland and fauna habitats (Section 9.8).
- Pest management to offset and compensate the removal of indigenous vegetation, wetland and fauna habitats (Section 9.8.4.3).
- Wetland rehabilitation (Section 9.9).
- Riparian restoration (including weed clearance) to offset and compensate the loss of stream length as a result of quarrying (Section 9.10.5).
- Realignment of the Mangapū Tributary to remedy the removal of some of the existing channel (Section 10).

Additional methods of effects management include:

- Flow augmentation to remedy effects on local watercourses (Section 9.4.3).
- Improvements to existing barriers to freshwater fish migration and opening a substantial extent of upstream habitat for fish and other migratory species.

9.3 Avoid Adverse Effects (where practicable)

9.3.1 Overview

Avoidance of adverse effects, as far as is practicable for an extractive project, has been factored into design, staging and management. Avoidance of impact on indigenous vegetation, riparian areas and streams, and wetlands is provided to some extent through project design.

Key aspects of avoidance in relation to fauna include:

- Aquatic fauna salvage and relocation.

- Lizard salvage and relocation.
- Avoidance of tree felling during nesting season of birds.
- Avoidance of tree felling of bat roost trees.

9.3.2 Fauna survey and Salvage

9.3.2.1 Aquatic Fauna

Salvage and relocation of aquatic fauna is proposed as part of the realignment of the current Mangapū Tributary, and prior to removal of any small watercourses within the Site in the course of the quarry expansion. The purpose of the salvage and relocation is to minimise harm to the individuals and population of specific species of the aquatic community. Salvage and relocation will focus on native fish (long fin and short fin eels, and banded kokopu) as well as koura (freshwater crayfish).

Salvage of aquatic fauna will be challenging within the channel morphology and location of the Mangapū Tributary, and efficiency and timing will be essential as flows are reduced during livening of the realigned channel.

Typically, prior to any disturbance within a stream bed, the salvage and relocation of native fish will be required. The fish capture and relocation component of any stream removal are timed to occur prior to and during the dewatering of the watercourses. Upstream inflows and downstream outflows should be dammed at each watercourse. Details of the approach to be undertaken are provided in the Aquatic Fauna Salvage and Relocation Plan.

9.3.2.2 Herpetofauna

Based on the history of the Site, where gecko salvage has occurred for over 20 years, we consider that capture and relocation of lizards to a suitable, protected release site is an appropriate and effective tool to minimise the likelihood of injury and/or mortality. This also aligns with existing Wildlife Act Authorities, as will be further required to undertake this work on an ongoing basis.

Lizard salvage will include:

- Prepare lizard release area/s. Release site requirements are described in the Lizard Management Plan and account for the habitat requirements of different species.
- Targeted pre-works surveys and salvage of key habitats to align with staged vegetation clearance.
- Post-clearance salvage will be undertaken following procedures described in the Lizard Management Plan. Briefly, these include heaping vegetation into piles and searching the piles for emerged lizards' multiple times over a minimum of three weeks in suitable weather conditions.

Native lizards are seasonally active, which constrains any surveying or mitigation activities. Therefore, any surveys or salvage of lizards may only be carried out between the months of September – April (inclusive), with weekly overnight average temperatures of at least 12 degrees.

Lizard management will follow the key principles for lizard salvage and translocation in New Zealand (DOC, 2019). Preclearance salvage and translocation is the preferred option where

significant lizard populations may be present and avoidance is not possible, as is the case for this Project. Mitigating effects on lizard populations in the wider area by reducing predation and/or increasing carrying capacity is also a management option.

The purpose of the proposed lizard management is to **minimise** incidental fatalities (salvage) and provides a **remedy** for the protective benefit of the lizard populations (relocation). We acknowledge that lizard fatalities may occur despite best efforts, and it is not possible to avoid all lizard mortality. The Lizard Management Plan will apply to the proposed vegetation clearance for the pit expansion and access roads, and will also ensure compliance with the Wildlife Act Authority.

With implementation of the Lizard Management Plan, and the demonstration of successful salvage and relocation to date, no residual adverse effects remain and no further effects management is required.

9.3.2.3 Birds

Native birds observed on the Site are all species that nest in native and exotic vegetation and have a nesting season that can extend from August to March (inclusive). The most sensitive time of the year (in regard to disturbance or mortality risk) for native birds is the nesting season.

Where practicable, vegetation clearance will be undertaken outside of the bird breeding season. Otherwise, prior to vegetation clearance scheduled during the breeding season (August to March inclusive) surveys will be undertaken for native bush birds to ensure that any nest sites are avoided to minimise mortality or injury to native birds. This approach can be ensured through conditions of consent.

With implementation of bird management protocols to avoid adverse effects, no residual adverse effects should remain and no further effects management is required.

9.3.2.4 Bats

The lack of recorded bat activity within the Site and the vicinity of the Hunua Quarry indicates an absence of favoured maternity and nocturnal roost trees and a lack of preferred foraging areas. However, as individual long tailed bats may occasionally utilise the Site for foraging and/or solitary roosts, pre-clearance bat monitoring is recommended.

Potential bat roosting areas present within the footprint are characterised as:

- Stands of mature native conifer and broadleaved forest trees that contain trees and tree ferns ≥ 15 cm diameter at breast height (dbh);
- Stands of mature exotic trees (not pine) that contain trees ≥ 15 cm dbh; and
- Standing dead trees ≥ 15 cm dbh.

Trees / tree ferns within the above ‘potential bat roosting areas’ offering potential bat roost habitat have one of more of the following features:

- Crack, crevices, cavities and / or fractured limbs large enough to support roosting bat(s);
- Sections of loose flaking bark large enough to support roosting bat(s);
- A hollow trunk, stem or branches;

- Deadwood in canopy or stem of sufficient size to support roost cavities or hollows; or
- Bat droppings, grease marks and / or urine staining around cavities.

Pre-clearance bat monitoring will ensure possible roost trees are not occupied at the time of clearance, avoiding injury or mortality of bats. Prior to vegetation clearance commencing, potential bat roosting areas will need to be visually assessed by the Bat Specialist. If trees are identified in these areas that provide potential bat roost features (i.e., cavities, deadwood, loose bark and epiphytes), then further acoustic surveys will be required to confirm the presence/absence of bats immediately prior to felling. This approach can be ensured through conditions of consent.

Notwithstanding the absence of bats on the Site, with implementation of bat management protocols to avoid adverse effects, no residual adverse effects should remain and no further effects management is required.

9.4 Minimise and Remedy Adverse Effects

9.4.1 Fauna survey and Salvage

9.4.1.1 Aquatic Fauna

Salvage and relocation is proposed initially as a method of avoiding adverse effects on aquatic fauna. With thorough methodology applied to remove aquatic fauna from harm's way prior to works commencing, limited minimisation or remedy of effects is anticipated to be required. Ongoing management of stream works and oversight by ecologists will further minimise impacts and relocation is also considered to be a form of remedy for impacts on fauna by providing a suitable new habitat.

9.4.1.2 Herpetofauna

Salvage and relocation of lizards is proposed as initial avoidance of fatalities wherever possible (while recognising that not all lizards present within the habitat to be remove are likely to be detected and salvaged). Relocation is also a form of remediation of effects where lizards that are removed from project areas are released into appropriate, pest-managed habitat (as detailed in the lizard management plan, refer section 9.3.2.2). With avoidance, minimisation and remedy through salvage and relocation there is no residual adverse effect on the local lizard fauna population to be managed. Loss of lizard habitat is compensated through revegetation and pest control and is anticipated to achieve and positive outcome for lizards that outweighs adverse effects within the term of the consent.

9.4.2 Vertebrate Pest Management

As noted in section 1.7, Winstone has been carrying out pest and weed management for some time. The expansion of the Symonds Hill Pit at Hunua Quarry presents an opportunity to update the existing pest management programme with modern tools, best practice techniques and protocols, and integrate it with new enhancement areas to improve the value of both the effects management package and ecological outcomes for the wider Project.

Pest management is a means of mitigating edge effects and associated risk of pest incursion into existing bush areas and replanting areas. Further benefits of pest management are discussed in terms of compensation below in section 9.9.4.2.

9.4.3 Flow augmentation

PDP (2026b) provide a remedy for the potential reduction in flows in watercourses resulting from the dewatering proposed as part of the Hunua Quarry Development. The remedy involves augmentation of flows to maintain the existing MALF established and applied at the respective gauging stations. The proposed monitoring and augmentation proposed by PDP (2026b) is based on the existing dewatering response for development of Symonds Hill Pit down to RL-5 m (with some modifications) and proposes as follows:

- Two additional low flow gauging stations (Waipokapū Stream and the realigned Mangapū Tributary respectively).
- Re-located monitoring bores.
- Trigger levels for regional and shallow groundwater.
- Proposed augmentation to maintain MALF.

The augmentation of flows to MALF is a suitable remedy for any potential effects of dewatering on aquatic ecological values.

9.5 Offset and Compensation for Residual Effects

9.5.1 Integrated approach

Having provided for avoidance, minimisation or remedy of adverse ecological effects (as set out above) residual effects have then been considered.

In accordance with offsetting and compensation principles (see Section 9.6), the over-arching objective of the proposed ecological enhancement package is to ensure benefits to indigenous biodiversity outweigh adverse effects of the Hunua Quarry development, and where possible to demonstrate “no net loss” (and preferably a net gain) of indigenous biodiversity values.

An integrated approach to adverse residual ecological effects is a key aspect of the proposal, in order to:

- Restore and enhance resilient ecosystems.
- Form a cohesive and integrated package of ecological enhancement that links with and connects existing ecosystems across the landscape.
- Consider the wider environmental context i.e. Ki Uta Ki Tai (from mountain to sea) by contributing to headwater catchment and water quality improvements in the Slippery Creek and Waikato River catchments.

9.5.2 Focus Areas

The proposed enhancement locations selected comprise three key “focus areas” (Figure 36) with identified opportunities to expand and improve the condition of existing ecological features, including indigenous forest, streams and wetlands. The focus areas are as follows:

Focus Area 1: Hunua Quarry OBDA and adjacent properties (**Figure 35**).

Focus Area 2: Meremere Quarry site (**Figure 36**).

Focus Area 3: Hunua Ranges Regional Park (**Figure 37**).

A brief description of each of the Focus Areas and additional areas, and the ecological enhancement and management proposed for each of these areas, is provided in the following sections.

In order to account for the various residual effects identified (i.e., loss of terrestrial vegetation and habitat, loss of stream length, and loss of wetland extent and values), component areas and activities proposed for revegetation and enhancement within the Focus Areas have been allocated to specific, quantified residual effects (**Table 22**).

Specific details of the proposed ecological enhancement and management for each of the Focus Areas is provided in the Ecological Management Plan (Boffa Miskell 2026a) and the Pest Management Plan (Boffa Miskell 2026b).

Airfield Rd
ARDMORE
AKURA
RED HILL
Hunua Rd
Hunua Quarry
ŌPAHEKE
HŪNUA
Hunua Rd
DRURY
NCIMAN
Focus Area 1
Hunua Quarry o f set sites
Kiripaka Wildlife Reserve
Kohukohunui
MOUMOUKAI
Mangatangi Reservoir
Moumoukai Rd
Vining Reserve
MARAMA
Auckland Southern Mtwy
ARARIMU
PAPARIMU
HAPPY VALLEY
PAPARĀTĀ
Paparata Rd
Focus Area 3
Hunua Ranges/Auckland Parks
o f set sites
BOMBAY
KEKOHE EAST
State Highway 2
MANGATĀWHIRI
MANGATANGI
RRISVILLE
PŌKENO
Koheroa Rd
KAU
WHANGARATA
KELLYVILLE
MARAMARUA
KOPUKU
Waikato River
MERCER
Whangamarino Wetland Management Reserve
Focus Area 2
Meremere Quarry o f set site
ISLAND BLOCK
MEREMERE
PUKEKAWA
Waikato River
Whangamarino Wetland Management

Fig. 36

Boffa Miskell
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0 2 km
1:100,000 @ A3

Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors, Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors.

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND
Potential Offset Sites
Meremere Quarry
Hunua Quarry
Hunua Ranges
Hunua quarry proposed expansion boundary

HUNUA QUARRY DEVELOPMENT

Offset / Compensation Site Locations

Date: 13 March 2026 | Revision: 0

Plan prepared for Winstone Aggregates by Boffa Miskell Limited

Project Manager: Ian.Boothroyd@boffamiskell.co.nz | Drawn: HCo | Checked: IBo

Table 22: Offset and compensation measures proposed for identified residual effects.

		Terrestrial Vegetation and Habitat Loss				Stream loss	Wetland loss		
Focus Area	**Site/s**	**Revegetation planting (offset)**	**Enhancement of existing bush (compensation**	**Formal legal protection [12](compensation)**	**Weed & pest management (compensation)**	**Riparian restoration (offset)**	**Wetland reinstatement (offset)**	**Wetland enhancement (offset & compensation)**	**Landscape-scale benefits (compensation)**
1. Hunua Quarry and surrounding landscape	Hunua Quarry pit	25.8 ha		25.8 ha	25.8 ha weed and pest control for consent term.				• Improved water quality in stream through protection of tributary's upper catchment; • Improved connectivity in streams with the removal of farm ponds
	Judge Richardson Drive	3.7 ha	1.3 ha	5 ha (including wetland)	5 ha weed and pest control for consent term.		0.13 ha wetland reinstatement 0.02 ha wetland enhancement		
	Hunua Road properties (484, 397 and 411 Hunua Road)	15 ha	7.5 ha	23.7 ha (including wetland and stream enhancement)	23.7 ha weed and pest control for consent term (including 1.8 ha of woody exotic weed infestations replaced with native planting)	1 ha planting along 600 m stream length	0.2 ha wetland reinstatement 0.01 ha wetland enhancement		
2. Meremere Quarry	Meremere Quarry site	21.12 ha	7.53 ha	29.4 ha (including wetland and stream enhancement)	29.4 ha weed and pest control for consent term.	0.6 ha planting along 400 m stream length		0.15 ha	• Contributes a "stepping stone" forest patch in a relatively depleted landscape. • Adds aquatic connectivity to and from Whangamarino wetland • Improved water quality in stream through protection of

[12] Formal legal protection will be provided through covenants to be placed on all areas subject to replanting / offset sites.

								portion of tributary's upper catchment
3. Hunua Ranges	Hunua Ranges / Auckland Parks land	> 20 ha available for revegetation		*Already protected as part of Regional Park*	Extensive weed infestations over >15 ha to be removed for revegetation.		2 ha wetland reinstatement and enhancement through removal of blackberry infestation and wetland revegetation on low-lying alluvial terraces	• Improved connectivity and buffering from infill of canopy gaps. • Removal of willow, blackberry and other woody weeds allows development of riparian cover on stream terraces suitable for wetland birds and waterfowl potentially present.
	Mangatawhiri River					Planting along 2,580 m of stream length		• Improved aquatic habitat as riparian cover develops and shades watercourse
TOTAL		**85.62 ha**	**16.33 ha**	**83.9 ha**	**> 100 ha weed and/ or pest control**	**3,580 m (stream length)**	**2.51 ha**	

9.5.3 Focus Area 1: Hunua Quarry and adjacent properties

9.5.3.1 Site Description

Focus Area 1 includes large portions of five separate properties, including 4 rural residential properties (484, 397 and 411 Hunua Road and 118 Judge Richardson Drive), all owned by the applicant, along with the Hunua Quarry Pit within the landholding that contains the proposed quarry expansion.

Vegetation communities present within the Judge Richardson Drive and Hunua Road properties contain a mix of well-maintained and rough grazed pasture used for stock grazing, exotic scrub dominated by gorse and woolly nightshade, exotic tree privet forest, treefern – dominated scrub (interspersed with woody weeds), regenerating kanuka scrub, and mature secondary kanuka forest. The area proposed for restoration in the Judge Richardson Drive property adjoins the area of mature secondary kauri, podocarp forest within SEA_T_5323 where hard beech (a regionally at risk species) was found. The Hunua Road properties do not directly adjoin SEAs but are contiguous with areas of regenerating and mature indigenous scrub and forest that connect SEA_T_409, 5289 and 5277 to the north and northwest of the Hunua Quarry landholding.

The Hunua Quarry Pit has been decommissioned for extraction and now receives overburden from the Symonds Hill Pit operation. The Hunua Quarry Pit is adjacent to SEA_T_5289, though separated from it by Hunua Road. Within the Landholding, the eastern margin of the pit abuts naturally regenerating and mature indigenous scrub and forest (young specimens of maire tāwake, a nationally vulnerable species, were recorded in a pond within this bush area). The revegetated “hay paddock” extends the area of bush cover to the eastern boundary of the Landholding.

9.5.3.2 Offsetting and compensation proposed

Indigenous revegetation and ecological enhancement is proposed over a total of 15 ha within the 4 rural residential properties and 25.8 ha within the Hunua Quarry Pit. A further 7.5 ha of indigenous forest and scrub within these properties will be retired from grazing and managed to remove extensive weed infestations, with infill planting undertaken to infill canopy gaps where weed infestations are likely to impede regeneration of indigenous forest species. The 484 Hunua Road and Judge Richardson Drive site includes 2.5 ha of pine plantation that will be felled and revegetated.

Tree privet infestations are widespread within regenerating forest and scrub, and is a dominant or co-dominant canopy species in areas of treefern and kanuka scrubland, impeding the succession to indigenous forest. Removal of tree privet and other woody weeds from within these areas of existing indigenous vegetation will promote a successional trajectory to indigenous forest dominance.

Stock ponds (7 in total) have been formed within natural watercourses in all four of the rural residential properties. These features will be retired from use for stock watering, and rehabilitated to form indigenous wetlands, ensuring stream connectivity is restored where suitable native fish habitat is available upstream of the features (reinstating fish passage to approximately 150 m of stream length). Connecting flowpaths and surrounding areas of low relief that are intermittently wet will be incorporated into the wetland features with planting of appropriate wet-tolerant vegetation. A total area of ~0.18 ha of indigenous wetland will be

created and / or enhanced with indigenous vegetation, all of which will be surrounded and buffered by revegetated native forest.

10 m riparian buffers either side of 600 m of permanent and intermittent stream length within the Hunua Road properties is set aside to offset loss of stream length (a total of 1 ha).

The proposed terrestrial revegetation surrounds all wetland and riparian areas to be restored, and appropriate ecotonal gradients will be incorporated into the planting design and specifications.

The Hunua Quarry Pit is currently an active overburden disposal area. Once filled (an estimated 30 years' timeframe), the surface of the overburden disposal area will be revegetated with native forest species forming an extension to forest within the adjacent SEA_T_5289 and maturing bush to the east.

Planting in accordance with the proposed restoration plan (Boffa Miskell 2026c) will reduce fragmentation and edge effects in the surrounding vegetation and will enhance connectivity across the surrounding SEAs. The proposed planting will introduce a more varied mix of secondary forest species into areas of low-complexity scrubland, facilitating the development of a more diverse secondary forest community over the medium to long term.

Comprehensive weed and pest management is proposed throughout all five of the Focus Area 1 properties, incorporating and updating the existing pest management undertaken within the Hunua Quarry Landholding.

9.5.4 Focus Area 2: Meremere Quarry

9.5.4.1 Site Description

The Meremere Quarry site is 29.4 ha of pastoral land with scattered forest and scrub remnants to the north of Meremere Quarry, also owned by the applicant, of which 21.12 ha of this area has been identified for replanting). Pine forest adjoins the proposed revegetation site to the north and east, while 7.5 ha of secondary podocarp forest remnant (kahikatea, rimu, totara, miro and rewarewa) and patches of dense kanuka scrub in a gully head are located within the north-eastern corner of the Meremere Quarry revegetation site. Several similar indigenous forest patches of varying size are present on surrounding properties.

The area proposed for planting pastoral farmland on steep hillslopes. A number of totara trees (approximately 4 – 6 m tall) have naturally regenerated on the hillslope, and patches of secondary kanuka – broadleaved scrub are present in gullies, along with a planted woodlot (to be felled and revegetated). A stream and wetland (approximately 0.15 ha) containing a mixed assemblage of native and exotic species is present in the bottom of the gully in the eastern quarter of the Meremere Quarry revegetation site. Feral pigs were seen and evidence of pig rooting was noted in the forest remnant and wetland.

There is remnant kahikatea (along with eucalypts & conifers etc) around the stream that flows from pine forest in the neighbouring property and patches of raupo wetland. A shallow channel containing macrophytes is located in the upper reaches of the stream although it is likely that there are fish barriers for climbing fish in a couple of places along the lower reaches of the stream. The raupo wetland near entrance by weigh bridge may have been used for stormwater detention.

9.5.4.2 Offsetting and compensation proposed

The approach to offsetting and compensation within this focus area includes revegetation planting over 21.12 ha of steep, south-facing slopes northward of the quarry pit, incorporating and buffering 7.53 ha of existing mature and regenerating indigenous forest.

Riparian planting along 400 m of stream and enhancement planting over 0.15 ha of wetland is also proposed within Focus Area 2. Removal of fish passage impediments will create access to greater than 1,900 m extent of stream length for climbing fish, and enhance aquatic connectivity between the upper reaches of Meremere Quarry stream and the downstream RMASAR-listed Whangamarino Wetland. Exclusion of stock and re-vegetation will improve water quality prior to entering downstream.

Weed and vertebrate pest management of existing and revegetated areas (a total of 29.2 ha) will be undertaken for the life of the consent, and will be legally protected.

9.5.5 Focus Area 3: Hunua Ranges

9.5.5.1 Site Description

Winstone Aggregates have entered into a formal confirmation of landowner support for proposed offset planting and associated ecological management measures with Auckland Parks within the Hunua Regional Park (letter dated 18 March 2026). The Hunua Regional Park has reserve status which provides long term protection of these areas.

Auckland Council's Parks team indicatively identified areas (at least 30.6 ha) where revegetation and management will be of ecological benefit. The identified areas are canopy gaps between 0.3 ha and 12 ha in size, amongst an extensive tract of indigenous forest and scrub. The largest patch surrounds a 2.6 km section of Mangatawhiri River (Figure 39).

These offset works are not works planned or funded by Auckland Council, and would not occur without the offset proposed.

Dense swards of blackberry form the dominant vegetation cover across a large portion of the features, particularly on low-lying, wide alluvial terraces that are evidently subject to periodic flooding. Infestations of tree privet, pampas and Japanese honeysuckle are also common and locally abundant. Crack and grey willow, blackberry and other woody weeds dominate sections of riparian cover along the riparian margins of Mangatawhiri River.

Stands of kanuka forest, podocarp-broadleaved forest, manuka-kanuka scrub, and naturally regenerating kanuka, treefern and broadleaved scrub dominate the surrounding hillslopes, and are interspersed throughout the areas identified for revegetation and management.

This is all within Regional Park land so subject to existing legal protection.

9.5.5.2 Offsetting and compensation proposed

Proposed ecological enhancement works include removal of weed infestations and revegetation of a minimum 20 ha of regional parkland, infilling gaps in areas of established indigenous scrub and forest.

Weed removal and riparian planting (average 10 m width) is proposed along a 2.58 km length of the Mangatawhiri River within Hunua Regional Park.

9.5.6 Total area of enhancement

The total area of ecological enhancement for the three Focus Areas amounts to:

- 85.62 ha of new plantings and 16.33 ha of protected mature forest vegetation, to a total of 101.95 ha of combined indigenous vegetation areas.
- Enhancements to 3,580 m of stream length (including removal of 2.5 km of riparian weed infestations).
- Improved fish passage and connectivity with over 2,500 m of stream extent currently fully or partially denied.
- Re-establishing and/ or enhancing 2.51 ha of wetlands in Focus Areas.
- Integrated and comprehensive landscape-scale pest management strategy.
- Improved water quality in headwater catchments through stock exclusion and revegetation.