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Terrestrial Ecological Impact Assessment (Waihi Area)

Waihi North Project

for: OCEANAGOLD (NEW ZEALAND) LTD

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Cover Illustration: Rock outcrops at Gladstone Hill

EXECUTIVE SUMMARY

OceanaGold (New Zealand) Ltd (OGNZL) is proposing the Waihi North Project (WNP) to extend the life of its Waihi operation. The project includes:

- Gladstone Open Pit (GOP)
- Northern Rock Stack (NRS)
- Tailings Storage Facility 3 (TSF3)
- Upgrades to the existing Processing Plant and Water Treatment Plant
- Wharekirauponga Underground Mine (WUG) (not addressed in this report)

This report outlines the existing terrestrial ecological values of the proposed project area, identifies how ecological values may be impacted, and recommends mitigation where appropriate.

Ecological Context

This assessment relates to the components of the WNP that occur within a modified rural landscape and comprises property blocks held by OGNZL and other private landowners around the operation. Terrestrial ecology values within the survey area are associated with exotic forestry, regenerating mixed scrub, and a range of native plantings undertaken through time by OGNZL. One Significant Natural Area (SNA) within the Project area, is SNA 166, which comprises two fragments of regenerating native and exotic vegetation.

Effects

The main effects of the WNP are associated with removal of low to moderate value vegetation and habitats, which are predominantly planted (native and plantation). Vegetation removal to construct the WNP is expected to result in loss of common native flora and fauna, increased edge effects, and reduced connectivity between these planted or regenerating habitats.

Threatened and 'At Risk' species expected to be affected by the proposal include kauri trees (*Agathis australis*), 'At Risk' copper skinks are expected to be affected where they occur, including within largely planted habitats at the proposed Gladstone Open Pit (GOP).

Gladstone Open Pit

The expected **low-**level effects of the GOP on ecological values are associated with the permanent removal of 6.5 ha of predominantly rotation harvest pine and native plantings that provide habitat. These effects would include permanent loss of vegetation and habitats, and potential mortality to common native birds

and 'At Risk' copper skinks. Low-level activity of Threatened long-tailed bats was recorded at GOP in late October, however roosting and foraging habitat is highly unlikely to be affected by the project at GOP.

High value 'At Risk' copper skinks at GOP were detected within 10-year-old plantings, pine forest and a rocky outcrop. A moderate magnitude and therefore high level of effect is expected for this species at this location.
Low-level effects on fauna (lizards, birds, bats) as a result of noise and vibration at GOP.

Northern Rock Stack

The expected **low**-level effects of the NRS on ecological values are associated with the permanent removal of approximately 9.1 ha of planted restoration and rotation harvest pine to enable construction. These effects would include permanent loss of vegetation and habitats of common native birds. Some loss of riparian connectivity between the two fragments of SNA 166 would occur, however the terrestrial ecology values are low, given that most of the native plantings are currently 10-20 years old. Similarly, low-level effects on fauna (lizards, birds, bats) as a result of noise and vibration at NRS.

Effects Management of Gladstone Pit and Northern Rock Stack

The potential and expected low to high-level adverse effects associated with GOP and NRS would be managed and mitigated, including:

- Precautionary preclearance bat surveys of any large trees, including pines, would be undertaken to determine the presence of long tailed bats. If present, DOC guidelines will inform careful management;
- Vegetation removal would occur outside the bird breeding season, or be preceded by native nesting bird surveys to ensure native birds or their eggs are not destroyed during vegetation removal;
- Implementation of a lizard management plan will inform capture, habitat enhancement and relocation of any native lizards;
- Offset of vegetation and habitats that could be removed as a permitted baseline (not protected vegetation).
- Significant residual adverse effects are expected following lizard mitigation for copper skinks at GOP, and therefore compensation for copper skink habitat is recommended to support a net gain for this species habitat at this location.

Tailings Storage Facility 3

The ecological values of the areas affected by the proposed TSF3 include 8.3 ha of naturally regenerating native and exotic vegetation (and including some open ground) within SNA 166; and a further 1.8 ha of low value native regenerating and planted vegetation associated with three small fragments (blocks).

The direct effects on moderate value SNA 166 avoid all of the important features that qualify it as an SNA, (namely a kauri stand and moko skink habitat). Low-level indirect effects on fauna (lizards, birds, bats) are anticipated as a result of noise and vibration at TSF3. The vegetation and habitats within the impacted parts of SNA 166 are considered to be of low value, however the WNP is considered to have an overall **moderate** level effect, (due to the moderate overall value and moderate magnitude). Complete loss of low value vegetation blocks outside of SNA 166 are considered to have a **very low** level of effect. Indirect and operational effects are also considered to be **very low**, although it is considered that there may be some overall **positive** indirect effects of the operation of TSF3 on 'At Risk' New Zealand dotterel (*Charadrius obscurus*) and New Zealand pipit (*Anthus novaeseelandiae*). The moderate-low to very low levels of effect of vegetation and habitat removal at TSF3 is proposed to be addressed in accordance with best practice for biodiversity offsetting in New Zealand, so that it demonstrably achieves positive indigenous biodiversity outcomes.

The potential and expected moderate-level adverse effects associated with TSF3 would be managed, mitigated and offset, including:

- Precautionary preclearance bat surveys of large trees, including pines, would be undertaken to determine the presence of long tailed bats. If present, DOC guidelines will inform careful management;
- Vegetation removal would occur outside the bird breeding season, or preceded by native nesting bird surveys to ensure native birds or their eggs are not destroyed during vegetation removal;
- Implementation of a lizard management plan will inform capture, habitat enhancement and relocation of any native lizards;
- Biodiversity Offset via planting and restoration for the loss of 8.3 ha SNA vegetation and 1.2 ha western vegetation block to provide a net gain. Net gains would include protection and enhancement of 'At Risk-relict' moko skink habitat, which occurs beyond the WNP footprint.

Overall Effects

Following mitigation and biodiversity offsetting, the overall level of effect of the project on terrestrial ecological values is expected to be **positive**.

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1 INTRODUCTION

OceanaGold (New Zealand) Ltd (OGNZL) is proposing the Waihi North Project (WNP) to extend the life of its Waihi operation. WNP would comprise the Wharekirauponga Underground Mine (WUG), the Gladstone Open Pit (GOP), the Northern Rock Stack (NRS), Tailings Storage Facility 3 (TSF3) and upgrades to the existing Processing Plant and Water Treatment Plant.

OGNZL commissioned an assessment of the terrestrial ecological values within the footprint of the GOP, NRS and TSF3 components of the WNP and surrounding area, and an associated assessment of the effects of the WNP on those values. An assessment of the terrestrial ecological values associated with the footprint of the WUG component of the WNP and an associated assessment of the effects of the WNP on those values is contained in Boffa Miskell (2025a). Similarly, a freshwater ecological assessment for Waihi North Project has also been undertaken by Boffa Miskell (2025b).

The values described in this report include terrestrial vegetation, frogs, lizards, birds and long-tailed bats (*Chalinolobus tuberculatus*). The reported values (following EIANZ 2018 procedures) are based on desktop and database reviews, on site assessments and targeted surveys. The assessments and survey results reported herein were undertaken (by Bioresearches) between 2011 and 2020, with assessments undertaken in 2011 being revisited in 2017 and expanded over 2018 to 2024.

1.1 Site Overview

The existing environment within which the proposed activities will occur is a modified rural landscape and comprises property blocks held by OGNZL and other private landowners around the operation. There are four distinct “areas” within which the proposed activities will occur (Figure 1) called:

1. Gladstone Open Pit
2. Northern Rock Stack
3. Tailings Storage Facility and
4. Processing Plant Upgrades

Vegetation within the survey area includes pastures, exotic forestry, exotic and native mixed scrub, and a range of native plantings undertaken through time by OGNZL. The Processing Plant upgrades would occur within the existing footprint and replace existing structures, such as water tanks, a pebble crusher, and semi-autogenous grinding mill. Upgrades would not require any vegetation or habitat removal. The Processing Plant and Water Treatment Plant upgrades are therefore considered to have a negligible, if any, effect on terrestrial ecological values, and are not considered further here.

The immediate landscape includes two Significant Natural Areas (SNAs) that are recognised in the Hauraki District Plan (Figure 1. Waihi North Project area, including identified Significant Natural Areas.); SNA 165, (Ngatikoi Domain) and SNA 166 (two separate fragments Northeast of the current tailings storage facilities).

1.2 National Policy Statement for Indigenous Biodiversity (NPSIB)

The NPS-IB provides direction to councils to protect, maintain and restore indigenous biodiversity in the terrestrial environment, requiring at least no further reduction nationally. The objective of the NPS-IB is:

a. to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date; and
b. to achieve this:
    I. through recognising the mana of tangata whenua as kaitiaki of indigenous biodiversity; and
    II. by recognising people and communities, including landowners, as stewards of indigenous biodiversity; and
    III. by protecting and restoring indigenous biodiversity as necessary to achieve the overall maintenance of indigenous biodiversity; and
    IV. while providing for the social, economic, and cultural wellbeing of people and communities now and in the future.

OGNZL recognises the special relationship that iwi have with the indigenous biodiversity, and that this relationship is important to spiritual and cultural wellbeing. Māori cultural values, interests and associations with indigenous biodiversity within the project area, and the potential impacts of the Waihi North Project on these, will be identified through iwi led Cultural Impact Assessments. Ngāti Hako, Ngāti Maru, Ngāti Hei, Ngāti Porou ki Hauraki, Ngāti Puu, Ngāti Tamaterā, Ngāti Rāhiri Tumutumu, Ngāti Tara Tokanui Ngāti / Koi and Ngaati Whanaunga have all communicated to OGNZL that they have cultural interests and associations within the proposed project area.
The indigenous biodiversity within the Project area includes vegetation and potential habitats that are subject to a notified SNA (SNA 166), as well as areas that are not. Areas both within and outside SNAs are addressed in the NPS-IB.

1.2.1 Managing effects outside SNAs

The NPS-IB requires that indigenous biodiversity that is not protected by an SNA:

a. Is managed by applying the effects management hierarchy (avoid, minimise, remedy, offset, compensate), where those effects are significant.
b. Is managed to give effect to its Objective and Policies, where those effects are not significant (clause 3.16 (2)).

1.2.2 Managing effects within SNAs

The NPS-IB requires that adverse effects on indigenous biodiversity within an SNA be avoided, except where specified activities are provided for, including mineral extraction (S3.11(1a(iii))) that provides significant national or regional public benefit that cannot be otherwise achieved using resources within New Zealand. Any adverse effects on an SNA that satisfies the exceptions identified in clause 3.11 (NPS-IB), must be managed by applying the effects management hierarchy.

1.2.3 The Effects Management Hierarchy

The effects management hierarchy is an approach to managing the adverse effects of an activity on indigenous biodiversity that requires that:

a. adverse effects are avoided where practicable; then
b. where adverse effects cannot be avoided, they are minimised where practicable; then
c. where adverse effects cannot be minimised, they are remedied where practicable; then
d. where more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible; then
e. where biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided; then
f. if biodiversity compensation is not appropriate, the activity itself is avoided.

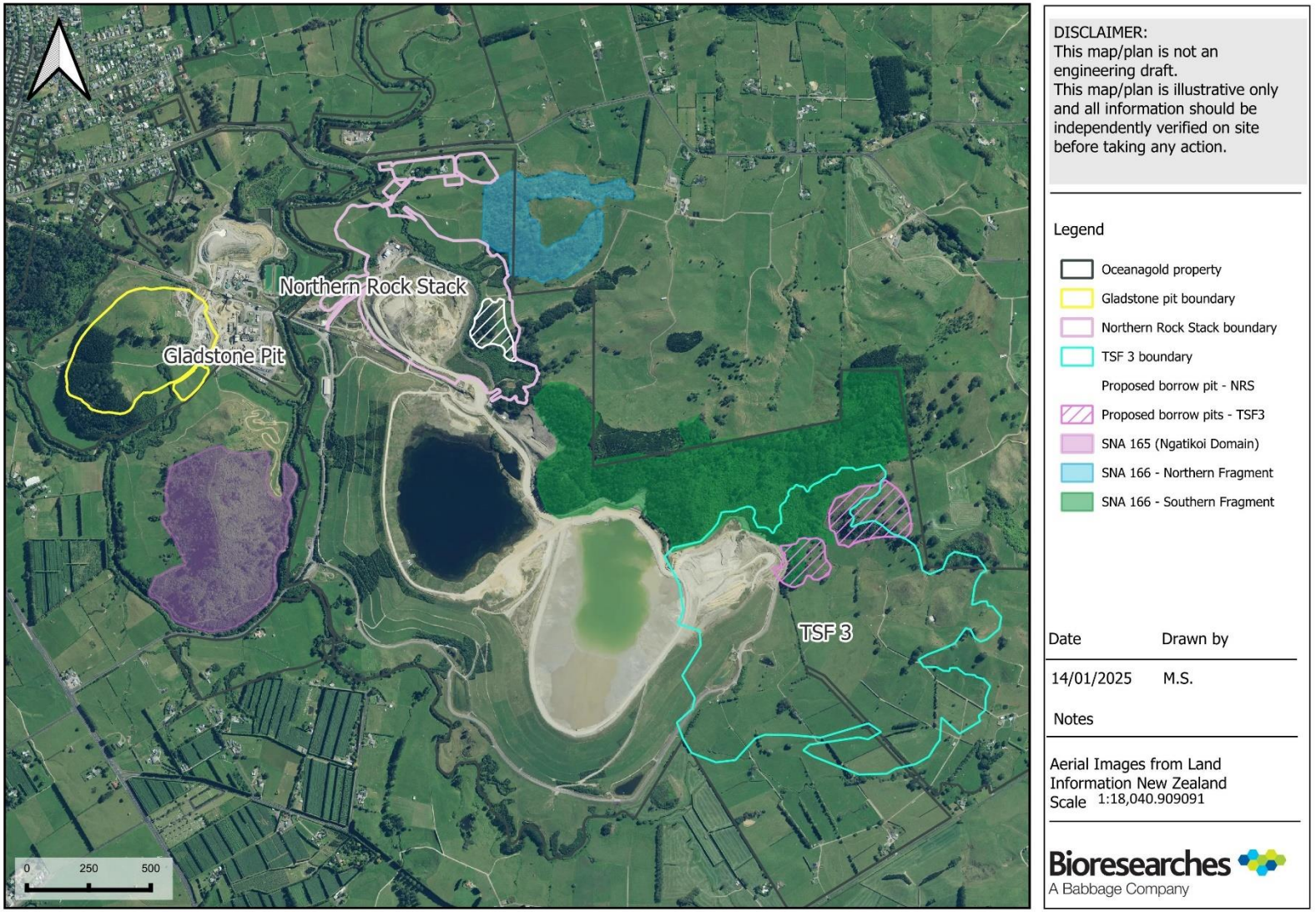

Figure 1. Waihi North Project area, including identified Significant Natural Areas.

2 METHODS

2.1 Methodology

This assessment generally follows the EcIA Guidelines for use in New Zealand, published by the Environmental Institute of Australia and New Zealand (EIANZ) (Roper-Lindsay et al., 2018). The EcIA Guidelines provide a standardised matrix framework that allows analysis of ecological values and effects assessments to be clear, transparent, and consistent. The EcIAG framework is generally used in Ecological Impact Assessments in New Zealand as good practice, and a detailed analysis of this methodology is presented in Appendix A.

The terrestrial vegetation, flora and fauna values within the WNP footprint were informed following desktop reviews, site visits and targeted surveys to expand and update a previous study (Bioresearches 2012). Detailed methods are described in the following sections.

Fauna considered in this report include all those that are protected by the Wildlife Act (1953) including frogs, lizards, birds and long-tailed bats. Particular consideration was given where species with a conservation status of nationally 'At-Risk' or higher have the potential to be present. Survey methods used for lizards (artificial retreats, pitfall traps, systematic searches) were relied upon to detect invertebrates, such as arthropods, peripatus and molluscs (slugs, snails). No 'significant' (At Risk, Threatened) invertebrates have previously been recorded or are expected to occur within the Project Area. For example, known ranges of At Risk and Threatened land snails (Paryphanta, Powelliphanta, Rhytida, Wainuia) or three At Risk peripatus species do not overlap in range with the Waihi project area.

2.2 Desktop Review

A desktop review of literature and online GIS databases was undertaken to determine the extent of ecological protection overlays (e.g., covenants, conservation land, SEAs, 'ecosystem type' classifications, and to visualise historical land-use using historical aerial images. The scheduling of SEAs and classification of ecosystems provides a means for Councils to protect and maintain indigenous biodiversity within Districts and Regions. The desktop review also included a search for local fauna records from various information sources.

Specifically, the following databases and reports were reviewed:

- Department of Conservation Bioweb records for herpetofauna and bats (February 2024)[1];
- Department of Conservation herpetofauna records;

[1] https://www.doc.govt.nz/our-work/monitoring-reporting/request-monitoring-data/

- Global Biodiversity Information Facility (GIBF New Zealand for biodiversity within approximately a 5 km radius from the site[2];
- New Zealand Bird Atlas eBird database[3].
- Department of Conservation Threat Classification Series[4];
- Department of Conservation terrestrial ecosystem classification[5]
- Retrolens historic aerial imagery[6];
- Literature:
- Bioresearches 2012. 'Ecological Assessment of SNA 166 (Bioresearches, 2012). Report for Newmont Waihi Gold;
    - Bioresearches 1996 "Northern New Zealand Dotterel" Report for Waihi Gold Mining Co Ltd

2.3 Vegetation and Flora

A desktop review was initially undertaken to determine the location and extent of vegetation cover within the WNP area and this informed the site assessment.

A 'walk – through' method was used to record and assess all vegetation and flora values, ascertain broad patterns of vegetation types, ages and condition. These assessments were undertaken during site visits in 2012, 2017, 2018 and 2019. A broad vegetation community map was initially produced and has been repeatedly refined through time, including within the SNA areas. Vegetation classes (forest, scrub, treeland etc) were described following Singers and Rogers (2014) and Atkinson (1985).

2.3.1 SNA 166 (southern fragment) Vegetation Plots

In 2019 and 2024, additional data were collected on vegetation and flora within the proposed impact area of the southern fragment of the SNA 166, where TSF3 is proposed. This data was collected using four 20 m x 20 m vegetation plots (Figure 2) representing three types of vegetation within the proposed impact area and wider zone of influence. Within each plot, all plant species and the diameter at breast height (DBH), if over 2.5 cm, were recorded. The Recce method (Hurst & Allen, 2007) was also employed to identify all species present in the plots and against vegetation tiers from the canopy to the forest floor.

[2] https://inaturalist.nz/home
[3] https://ebird.org/atlasnz/block/blkV65
[4] All Department of Conservation Threat Classification Documents are listed in the below webpage. When individual reports are referenced hereafter, they are referenced in-text.
https://www.doc.govt.nz/aboutus/science-publications/conservation-publications/nz-threat-classification-system/
[5] Singers, NJD., Rogers, GM. 2014. A classification of New Zealand's terrestrial ecosystems. Science for Conservation 325. Department of Conservation, Wellington. 87 p.
[6] https://retrolens.co.nz/

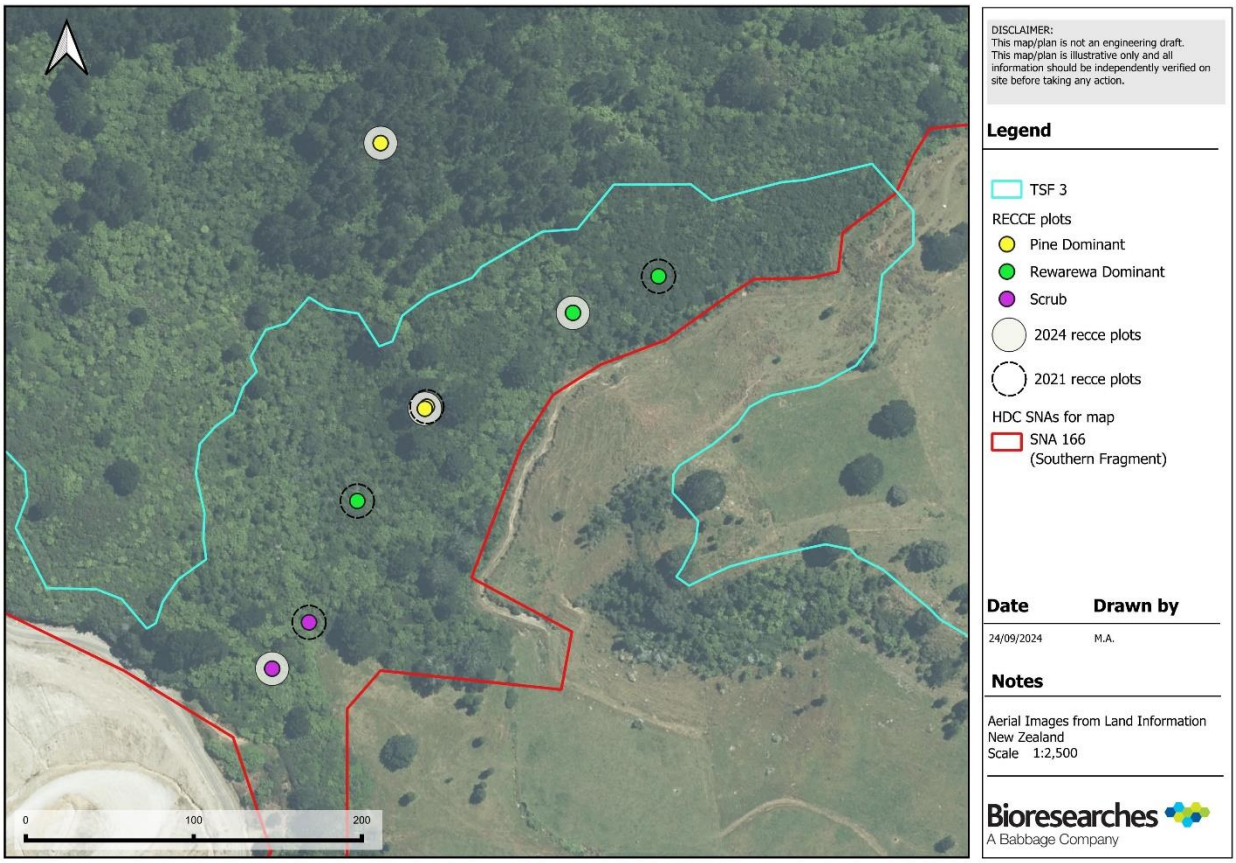

Figure 2. Location of vegetation plots within the southern fragment of SNA 166.

2.4 Fauna

2.4.1 Frogs

Desktop investigations involved a review of the Department of Conservation's *Amphibian and Reptile Distribution Scheme* (ARDS) database (accessed February 2019), as well as an analysis of aerial and topographic imagery for the presence of first and second order streams, where potential habitat for Hochstetter's frog (*Leiopelma hochstetteri*) is most likely.

Hochstetter's frog surveys were undertaken within shaded, hard-bottom or stony streams or cascades. These features can provide suitable habitat for frogs because small, interstitial spaces provided by crevices and rock clusters are free of sediment.

Streams where potential habitat was present were surveyed for frog presence. All frog habitat assessments and searches were undertaken by Chris Wedding, 18 years' herpetological experience (Wildlife Authority 37604-FAU), with a second ecologist.

All footwear and equipment were scrubbed with a stiff brush and sprayed using Trigene prior to survey.

Stream searches of watercourses A and B within the southern SNA fragment (Figure 3) were undertaken on 5 and 6 March 2019, and two stream searches of Watercourses C and D were undertaken in February 2012 and in May 2017, to determine suitability of potential habitat and the presence of frogs.

Four person-search hours was undertaken of each of watercourse A (approximately 200 m) and B (approximately 350 m), and two-person search hours of watercourses C (approximately 100 m) and D (approximately 50 m) during warm and dry weather, when frogs are considered to be more reliably found at close proximity to stream edges within their habitat.

Suitable potential habitat for Hochstetter's frogs was considered to be first and second order stony stream banks under a mature forest canopy, with occasional small pools or waterfalls and a gently sloping bank. Such streams are less prone to flooding than larger streams and have plenty of searchable habitat. Marginal potential habitats were also searched, where they were considered to provide some of the attributes of suitable potential habitat, although searchable areas were patchy.

Searches were undertaken during the day, between 1000 and 1500 hours. Searches involved moving slowly upstream (Figure 3) with a headlamp to increase visibility of search areas. All potential refuges were examined by carefully lifting stones, logs and leaf litter along both stream banks, up to one metre from the water's edge. Overhanging vegetation and rock crevices were also examined under torch light. All lifted substrates were replaced in their original position.

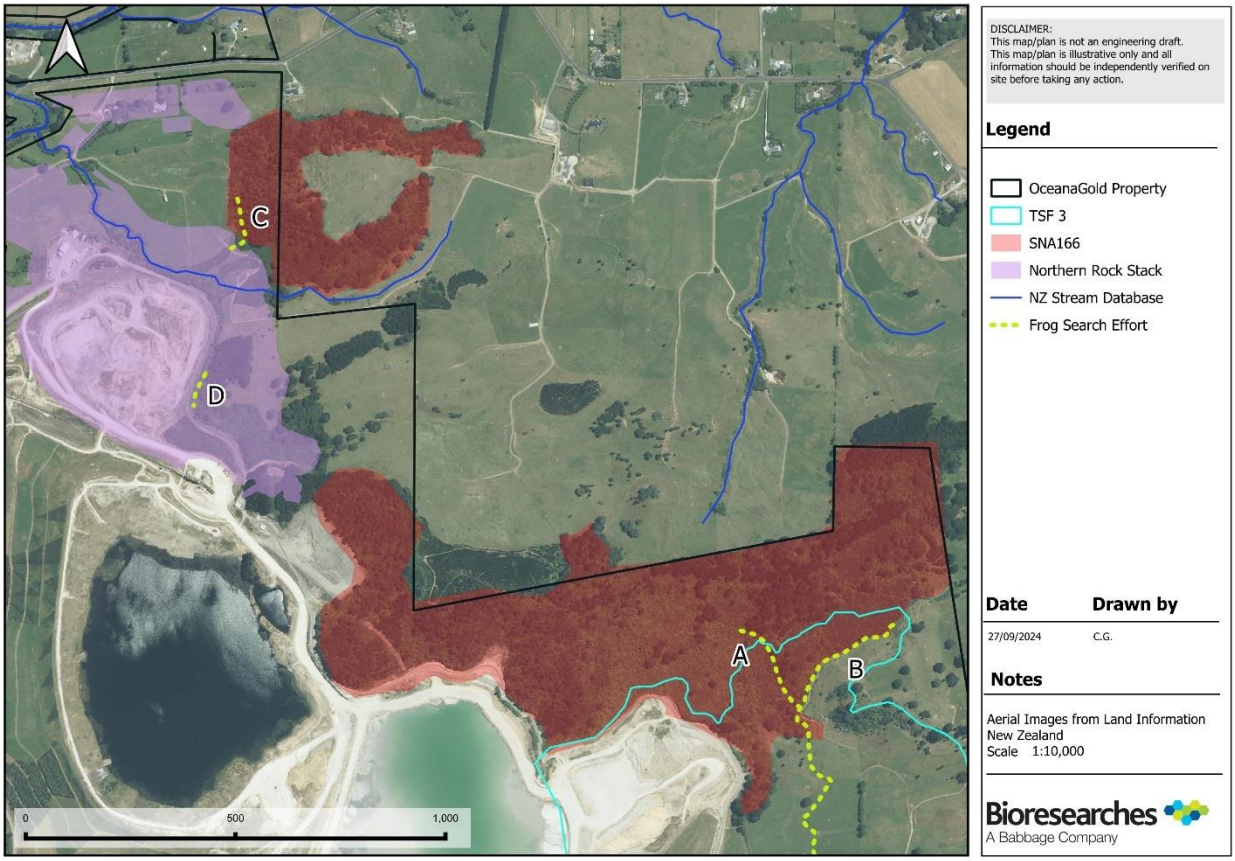

Figure 3. Watercourses A, B, C and D within the southern fragment of SNA 166, were assessed for native frog values.

2.4.2 Lizards

The survey aspect of this assessment was completed by Chris Wedding and Dylan van Winkel, herpetologists acting under Wildlife Act Authority 37604-FAU. All surveys were undertaken between December and May, (2011, 2017, 2019, 2020 and 2022) when native lizards are most active.

The Waihi Ecological District is within the potential distribution of at least eleven lizard species (Hitchmough et al. 2021, Table 1).

Table 1. Threat classification of native lizards from the mainland Waikato Region. Threat category as per Hitchmough et al (2021)

Species	Threat Category	Threat Status
Copper skink (*Oligosoma aeneum*)	At-Risk	Declining
Crenulate skink (Oligosoma robinsoni)	At Risk	Declining
Ornate skink (*Oligosoma ornatum*)	At-Risk	Declining
Moko skink (*Oligosoma moco*)	At-Risk	Relict
Striped skink (*Oligosoma striatum*)	At-Risk	Declining
Shore skink (*Oligosoma smithi*)	At-Risk	Relict
Raukawa gecko (*Woodworthia maculata*)	Not Threatened	N/A
Forest gecko (*Mokopirirakau granulatus*)	At-Risk	Declining
Pacific gecko (*Dactylocnemis pacificus*)	At-Risk	Relict
Elegant gecko (*Naultinus elegans*)	At-Risk	Declining
Northern Striped gecko (*Toropuku* "Coromandel")	Threatened	Nationally Vulnerable

Desktop investigations involved a review of the Department of Conservation's Amphibian and Reptile Distribution Scheme (ARDS) database (accessed December 2018), as well as an analysis of aerial and topographic imagery for the presence of tracks and vegetation cover to plan survey design and spatial coverage.

All vegetated areas or potential habitat features, such as boulder fields or rock outcrops, that were identified as potentially supporting habitat for indigenous lizards were visited to undertake a qualitative habitat description. Where potential habitats supported logs or other debris that could be lifted, searches of these habitats were undertaken and survey equipment (being artificial lizard retreats (ARs), funnel traps or pitfall traps) was installed. Systematic searches were undertaken through boulder fields and rock outcrops at the NRS and GOP sites. Potential habitat for arboreal geckos was searched by way of nocturnal Visual Encounter Surveys (VES).

The survey coverage extended beyond the footprint of the WNP in some areas as a result of refinements to the project requirements and where opportunities to better understand lizard values in the surrounding landscape allowed. The survey methods are detailed below.

2.4.2.1 Artificial Retreat (AR) Surveys

The AR surveys were undertaken in accordance with the Department of Conservation best practice (Lettink, 2012). ARs are suitable for surveying skinks and geckos that use ground habitats, particularly vegetated edges with sunlight exposure, where ARs can retain heat and enable lizards to maintain elevated body temperatures relative to their surrounding habitats during use (Batson et al. 2015). The locations where ARs were installed were considered to represent the most likely places for native lizard encounters. These areas supported dense leaf litter and edge vegetation that would be suitable potential habitat for terrestrial lizards, especially skinks. ARs were left *in situ* to acclimatise for a minimum four weeks to allow time for resident lizards to habituate to and use them. A minimum of four inspections were undertaken for all ARs between January and May during fine, settled weather.

Lizard surveys were undertaken in 2011 and from 2017 to 2020. Early assessments undertaken in 2011 were revisited and expanded in surveys over 2017 to 2020. See Figure 4 and Table 2 for Lizard survey coverage and effort.

2.4.2.2 Pitfall trap surveys

Pitfall trap surveys were undertaken under canopy cover within SNA 166 at TSF3 (n = 20) and at the edge of the Favona wetland (n = 10) (Figure 4). Survey of Favona wetland was undertaken as part of ecological value assessments of the surrounding environment and is not within the Zone of Influence (ZOI). Pitfall traps are a suitable method for surveying lizards in forest floor habitats where they do not rely on heat retention to attract lizards to them.

Pitfall traps were furnished with grass or native leaf litter, baited with a small piece of banana to maximise chances of capture, and covered with a sheet of Onduline to provide shelter for any lizards confined during capture.

A total of 20 traps were installed within SNA 166 from the forest edge and through the forest interior on 22 January 2018. Following a two-month settling period, the traps were opened on 19th March 2018 and checked on four consecutive days during fine and settled weather.

A total of 10 traps were installed at the Favona wetland from the forest edge and through the forest interior on 22 January 2018. Following a two-month settling period, the traps were opened on 19th March 2018 and checked on four consecutive days during fine and settled weather.

2.4.2.3 Funnel trap surveys

A funnel trap survey was undertaken at Ngatikoi Domain / SNA 165 (March 2018, n = 12). This survey was undertaken as part of ecological value assessments of the surrounding environment and Ngatikoi Domain is not within the ZOI.

Funnel traps are suitable for capturing terrestrial lizards where the traps can be embedded in very dense ground cover vegetation. All funnel traps were furnished with grass and leaf litter and baited with a small piece of banana to maximise capture chance.

Where set, funnel traps were checked on four consecutive days during fine and settled weather.

2.4.2.4 Nocturnal Visual Encounter Surveys

Powerful headlamps, (LED Lenser™ H7), aided by Nikon Monarch™ 8 x 42 binoculars, were used to search for geckos on the ground, on tree branches and in foliage. Arboreal geckos are generally easier to detect at night by slowly scanning potential habitat with a focused light beam, while searching for the lizards' distinctive body shapes and reflective eye-shine (Whitaker, 1994). Searches began after dusk, during settled and dry weather and targeted the edges of SNA 166 within the proposed NRS and TSF3 footprints on 9 and 10 February, 2012 and again on 14 and 15 March 2017.

Table 2. Lizard survey effort (Artificial Retreats, pit traps, funnel traps) within and around WNP

WNP area	Survey time	ARs	Pit traps	Funnel traps	Survey effort (AR checks)	Survey effort (pit trap checks)	Survey effort (funnel trap checks)
Gladstone	May-17	52			208		
Favona*	May-17	28			112		
Favona*	Mar-18		10			40	
NRS / Northern SNA	Feb-12	40			160		
NRS / Northern SNA	May-17	72			288		
NRS / Northern SNA	Mar-18	12			48		
NRS / mid Northern & southern SNA	Oct 22	160			640		
Ngatikoi Domain / SNA 165*	Mar-18			12			48
TSF3	Dec-11	80			320		
TSF3	May-17	141			564		
TSF3	Mar-18	32	20	10	128	80	40
TSF3	Mar-20	100			400		
Total		**717**	**30**	**32**	**2868**	**120**	**128**

*Location beyond the WNP area

Table 3. Survey effort from Nocturnal Visual Encounter Surveys, 2012-2017

Date	Location	Search effort (person search hours)
2012, 9 Feb	Northern fragment, SNA 166	5
2012, 10 Feb	Northern edge & middle track of southern Fragment, SNA 166	5
2017, 14 March	Gladstone Pit pine, plantings and Union Hill, NW of Gladstone	5
2017 15 March	southern Fragment, SNA 166	5

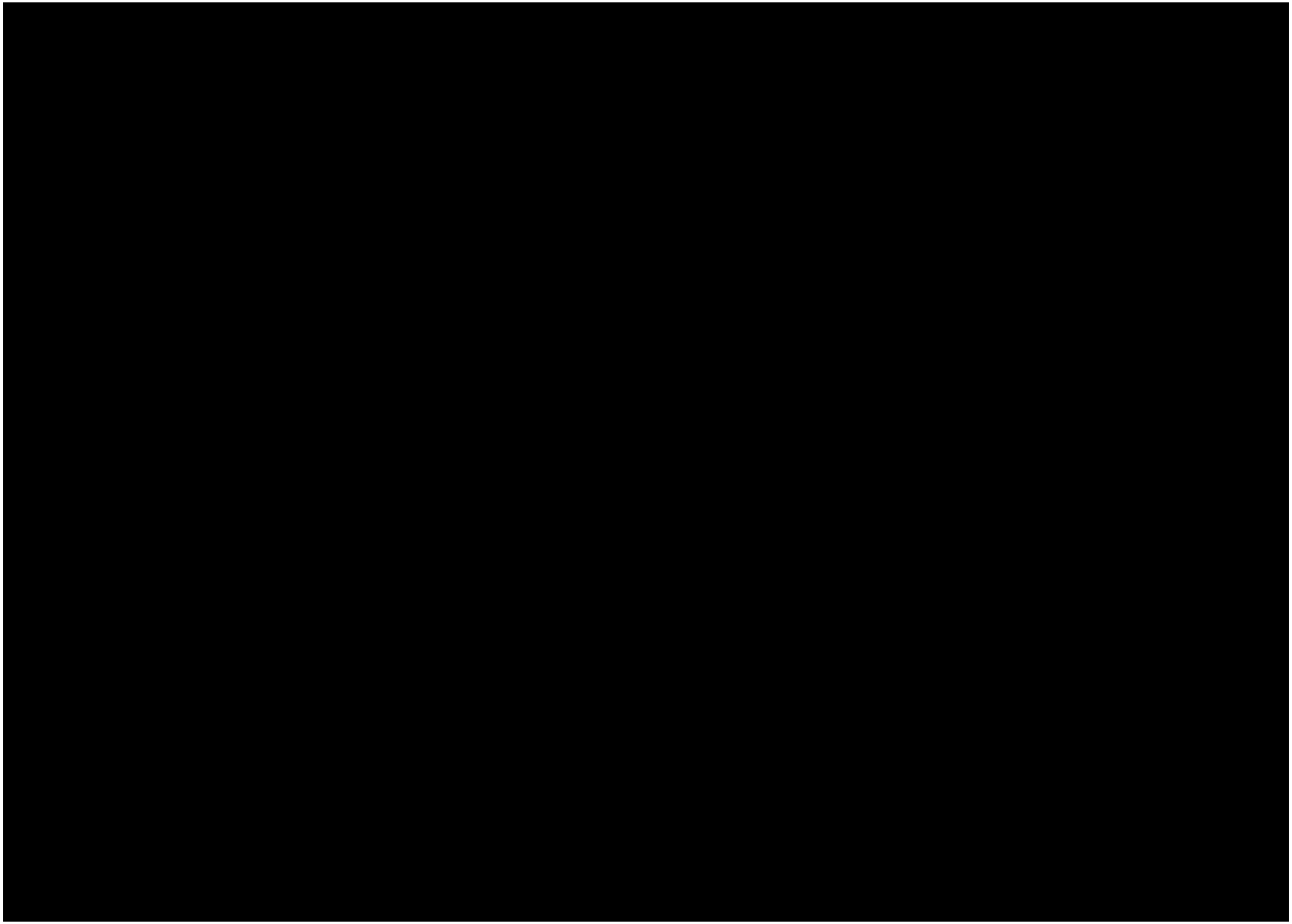

Figure 4. Lizard survey coverage for WNP, Waihi.

2.4.3 Birds

A desktop analysis involved a review of the New Zealand Bird Atlas data, iNaturalist, New Zealand eBird and previous ecological reports for the project area. iNaturalist records for native birds within a 5 km buffer of the site were recorded. For the New Zealand bird atlas data, birds are recorded in 10 km grid squares. For these databases, records of coastal or marine birds (e.g. penguins) were generally discounted, (following consideration to the Project potential habitats) due to a lack of suitable habitat within the site (noting that some species were accepted, such as New Zealand dotterel, which are recorded breeding within the project area).

During vegetation and other fauna surveys, avifauna were recorded opportunistically over the course of 20 field visits to the proposed WNP area and its surrounds in 2011, and through 2017, 2018, 2019, 2020 and 2024.

Standard, replicated, 5-minute bird counts (5MBCs) were undertaken at four stations within the SNA vegetation plots within the southern fragment in March 2019 (Figure 2). The 5MBC stations were located within scrub, pine-dominant and rewarewa-dominant vegetation types. All birds seen and/or heard in a c.150 m – 200 m radius were recorded in the counts. The combination of 5-minute counts and general observations enabled the typical avifauna of the SNA to be characterised.

2.4.3.1 Targeted survey: NZ Pipit

In addition, a targeted survey was completed on 27 March 2019 to record use of the farmland habitat by birds with a specific focus on the northern rough and steeper areas plus the access track which potentially provide habitat for New Zealand pipit (*pihoihoi; Anthus novaeseelandiae).* New Zealand pipit have been recorded using the Tailing Storage Facility (TSF) 1A area (OGNZL records). NZ pipit is considered 'At-Risk' (declining) on a national basis as a result of land-use intensification because they do not prefer heavily grazed pasture (www.nzbirdsonline.org.nz).

Standard replicated, 5-minute counts were undertaken at five stations (Figure 5) in the northern 'hill country'. Those sites also provided observations along the access road which would also potentially attract NZ pipit (G. Don, pers. obs.) and the flat pasture areas of the valley floor. In addition, a total of four hours of habitat observation was undertaken. All birds seen and/or heard in a c.150 m -200 m radius were recorded in the counts. The combination of 5-minute counts and general observation is considered to have (i) enabled the typical avifauna to be characterised; and (ii) would have identified use of the habitat by NZ pipit if it was an area that was important and utilised frequently.

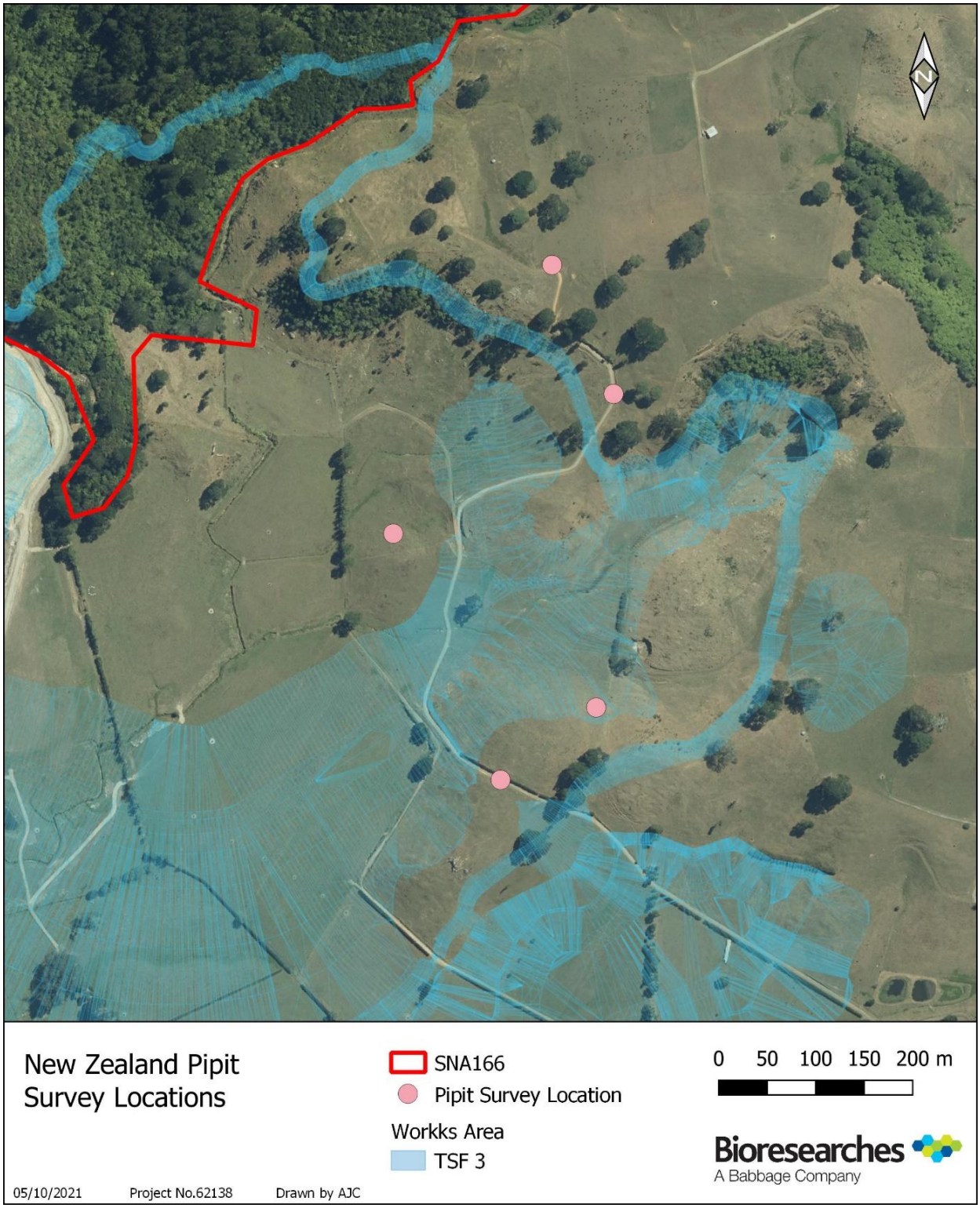

Figure 5. Location of count stations for NZ pipit at TSF3, WNP.

2.4.4 Bats

The survey aspect of this assessment was completed by Chris Wedding, an ecologist certified as competent by the Department of Conservation to undertake bat surveys and associated data analysis. Surveys were undertaken over December and January inclusive (2011, 2017, 2022, 2024), when bats are most active (October 1st to April 30th). The survey period also covered the latter part of Long-tailed bats' breeding period (November to February).

Long tailed bats are classified as 'Nationally Critical' in the North Island (O'Donnell et al., 2023) and are threatened by habitat loss, fragmentation and introduced predators.

Because the species is often difficult to observe in the wild, the paucity of records around the Waihi area may only reflect a lack of survey effort. Long-tailed bats require large trees (including exotic and standing dead trees) with cavities (e.g. deep knot holes), epiphytes and loose bark for roosting; and typically use linear landscape features such as bush edges, gullies and water courses to transit between roosting and feeding sites (Borkin and Parsons 2009; Griffiths 1996). These bats tend to forage in open areas, including clearings (Borkin and Parsons 2009; Griffiths 1996), along forest edges (Alexander 2001; O'Donnell and Sedgeley 1994), over wetlands, open water and along rivers and roadways (Borkin and Parsons 2009; Griffiths 1996).

2.4.4.1 Automatic bat monitors (ABMs)

ABMs are used to record ultrasonic echolocation calls that are produced by bats during their navigation and foraging behaviours. An ABM records the ultrasonic echolocation calls emitted by bats and either converts them to frequencies that are audible to humans or records them as a spectrogram for visual assessment.

An ABM is comprised of two ultrasound sensors and microphones, a sound-activated recording device, a timer to turn the system on and off each day, and a rain-noise detector that turns the system off in the event of heavy, persistent rainfall. ABMs record and store data passively, and have the capacity to record both long-tailed (40 kHz) and lesser short-tailed (28 kHz) bat calls.

Twenty-nine ABMs (Department of Conservation, 'Otterbox' variety in 2011 (n = 5), and later, AR4 in 2017 (n = 4); 2022 (n = 10) and 2024 (n = 10)) were installed at fixed locations within and around the WNP area, including TSF3; GOP and the NRS (Figure 6) where potential bat passes or potential roosting habitat were considered most likely. The ABMs were set to begin recording in line with current advice at the time (1 hour before sunset to 1 hour after sunrise, excepting the 2011 and 2017 surveys which recorded 30 minutes either side) and were left in situ for two to four weeks (Table 5).

2.4.4.2 Bat data analysis

Long-tailed bat activity is influenced by a range of environmental conditions, but current understanding has shifted over the course of the survey period (2011-2024). 'Valid' survey nights were required to meet minimum requirements for rainfall, temperature, moon phase (early surveys) and wind speed (new

criterion) as defined by best practice guidelines issued by DOC (Department of Conservation 2021; 2024). Table 5 identifies bat recorder type and 'old' data has been recalibrated to current valid survey nights against DOC 2021 best practice. Nine nights conservatively disqualified due to potential for rain (all data > 2.5 mm over 24 hours removed, based on cliflo data from Paeroa weather station

AR4 equipment analysis

Surveys in 2017, 2022 and 2024 used the Department of Conservation's AR4 (DOC electronics team) acoustic recorders. Data collected from the 2017 survey were recalibrated to best practice for surveying bats as per Section 4b of DOC bat roost protocol V2 (DOC, 2021) and V4 (DOC, 2024). Data was downloaded and analysed using BatSearch 3.12 – v3.23) software (DOC electronics team). The total number of 'valid nights' was determined using climate data (CliFlo, New Zealand's National Climate Database, NIWA) and recording analyses (e.g. when the recorder log indicated a noise switch pause for a period of more than half the night). Nights were considered 'using the criteria most recently provided by DOC for the survey in question. Each echolocation pass was time (hour/minute/second) and date stamped (year/month/day) providing timing information for activity.

Otterbox equipment analysis

ABM data were downloaded and the waveforms analysed using Bat Box 2.01 software (Department of Conservation, 2008). The total number of 'usable nights' (UNs) was determined using climate data (CliFlo, New Zealand's National Climate Database, NIWA) and recording analyses (e.g. when the recorder log indicated a noise switch pause for a period of more than half the night). Nights were considered 'valid' if the temperature remained above 10°C and overnight rainfall was less than 2.5 mm (recalibrated to DOC 2021 standards). Each echolocation pass was time (hour/minute/second) and date stamped (year/month/day) providing timing information for activity.

While this survey was undertaken prior to DOC survey protocols (DOC 2021), the 'useable nights' from the 2011 survey are generally consistent with current (2022) standards in that:

1. They were undertaken during peak bat activity season, between October 1 and April 30 (survey over December / January).
2. They were undertaken during temperatures at 10°c or greater (threshold was 5°C at the time of the 2011 survey, however Cliflo data relied upon at the time of survey indicated that the minimum temperature experienced during the survey was 9.9 °C on 24/12/2011).
3. Overnight rain or heavy wind reduced the data that were analysed.

2.4.4.3 Handheld bat detectors

Bat detectors were carried opportunistically during all nocturnal VES undertaken for arboreal lizard searches. This survey method was opportunistic because the primary purpose of nocturnal VES was to identify lizards and it is acknowledged that headlight beams may repel bats, however bats have been

recorded at other locations where handheld recorders have been used opportunistically (CW pers. obs.). The hand-held recorders used were the BatBox III model, set to 40 kHz, which represents the peak amplitude of typical long-tailed bat calls. The bat detector's sensitive microphones pick up a bat's echolocation calls and convert them into a series of clicks as a bat flies into range (approximately 50 m). Searches began after dusk, during settled and dry weather and targeted the edges of SNA 166 within the proposed NRS and TSF3 footprints on 9 and 10 February, 2012 and again in March 2017.

Table 4. Date and time spent with handheld bat recorders per location.

Date	Location	Time spent with handheld recorder
2012, 9 Feb	Northern fragment, SNA 166	2.5
2012, 10 Feb	Northern edge & middle track of southern Fragment, SNA 166	2.5
2017, 14 March	Gladstone Pit pine, plantings and Union Hill, NW of Gladstone	2.5
2017 15 March	Southern Fragment, SNA 166	2.5

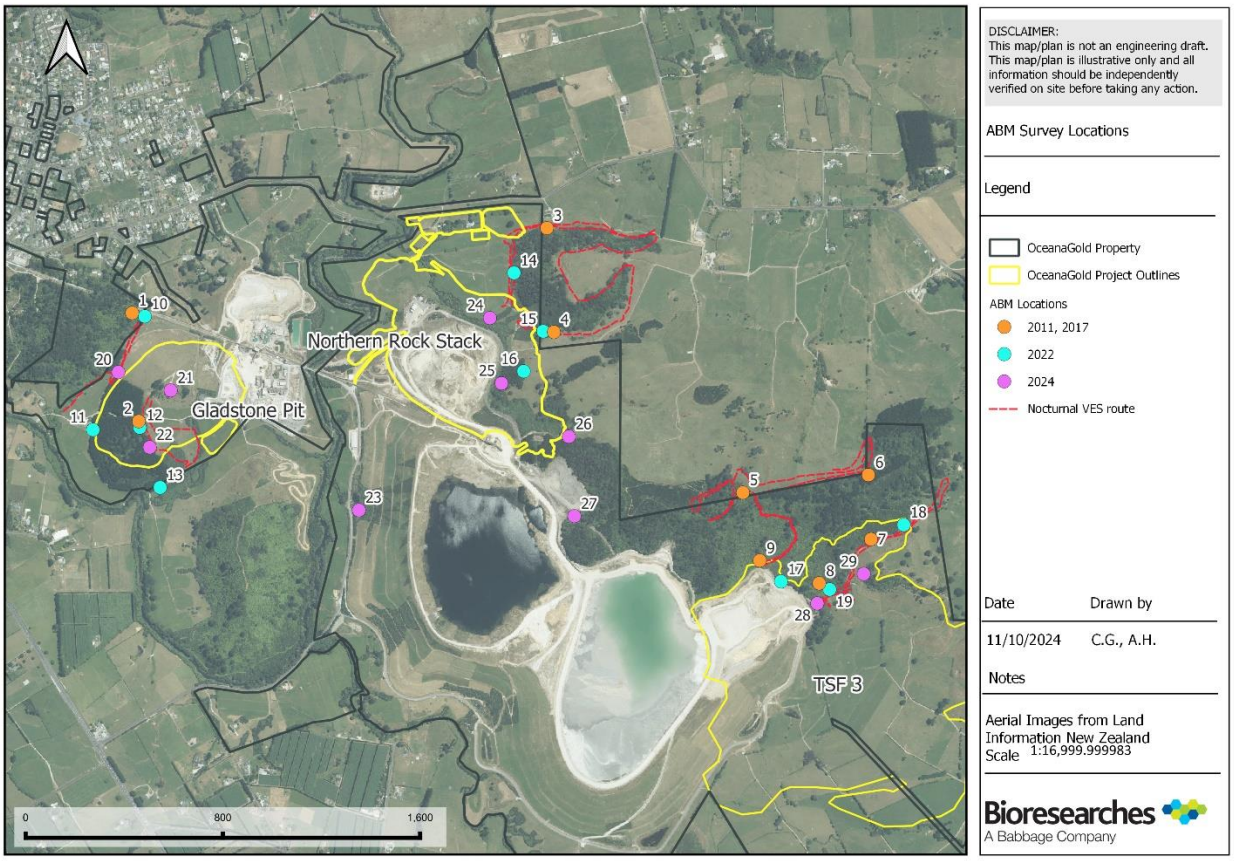

Figure 6. Bat survey coverage for WNP, Waihi.

Table 5. Summary of ABM survey effort for the WNP

ABM number	ABM type	Location	Date set	Valid nights	Bat passes
1	Otterbox	Union Hill	15/12/17	16	0
2	Otterbow	Gladstone Pit	15/12/17	16	0
3	Otterbox	SNA 166 (northern)	21/12/11	23	0
4	Otterbox	Northern Rock Stack	21/12/11	23	0
5	Otterbox	SNA 166 (Southern1)	22/12/11	23	0
6	Otterbox	SNA 166 (Southern2)	22/12/11	23	0
7	Otterbox	TSF3 1	22/12/11	23	0
8	AR4	TSF3 2	15/12/17	16	0
9	AR4	TSF3 3	15/12/17	16	0
10	AR4	Union Hill	27/01/2022	47	0
11	AR4	Gladstone Pit 1	27/01/2022	47	0
12	AR4	Gladstone Pit 2	27/01/2022	47	0
13	AR4	Gladstone Pit 3	27/01/2022	47	0
14	AR4	Northern Rock Stack 1 (SNA 166)	27/01/2022	47	0
15	AR4	Northern Rock Stack 2 (SNA 166)	27/01/2022	47	0
16	AR4	Northern Rock Stack 3	27/01/2022	47	0
17	AR4	TSF3 1	27/01/2022	47	0
18	AR4	TSF3 2	27/01/2022	47	0
19	AR4	TSF3 3	27/01/2022	47	0
20	AR4	Gladstone Pit 20	4/10/2024	0 (failed)	-
21	AR4	Gladstone Pit 21	4/10/2024	13	0
22	AR4	Gladstone Pit 22	4/10/2024	13	**5**
23	AR4	Slope face	4/10/2024	13	0
24	AR4	Northern Rock Stack 1 (SNA 166)	4/10/2024	13	0
25	AR4	Northern Rock Stack 2 (SNA 166)	4/10/2024	13	0
26	AR4	SNA 166 1	4/10/2024	13	0
27	AR4	SNA 166 2	4/10/2024	13	0
28	AR4	TSF3 1	4/10/2024	13	0
29	AR4	TSF3 2	4/10/2024	13	0
		Waihi North Project Totals		**766**	**5**

3 EXISTING ENVIRONMENT – VALUES ASSESSMENT

3.1 Overview of Waihi Ecological District and the WNP Area

The Waihi Ecological District (ED) spans 43,733 ha within the Hauraki District, and is dominated by hilly to steep country reaching to approximately 750 m above sea level. Vegetation in the Waihi ED was formerly dominated by kauri, podocarp, broadleaved forest (type 'WF12', as per Singers & Rogers, 2014) in the central range and hill country, montane podocarp-broadleaved forests (Type MF 25) at higher altitudes particularly around the northern Kaimai and Coromandel Ranges (Singers et al. 2017), and Type WF4 pōhutukawa and pūriri forests near the coast (Kessels et al. 2010).

Much of the vegetation, especially the kauri podocarp forest, has been cleared for agricultural use, which remains the primary land use in the area. WNP sits within the lowlands bioclimatic zones of the Waihi ED, sharing the warm, sub-humid climate classification with much of the upper North Island. Historically, the forests in this area comprised characteristic flora including kauri, miro (*Pectinopitys ferruginea*), rimu (*Dacrydium cupressinum*), toatoa (*Phyllocladus toatoa*), tōtara (*Podocarpus totara*), tānekaha (*Phyllocladus trichomanoides*), northern rātā (*Metrosideros robusta*), tawa (*Beilschmiedia tawa*), taraire (*Beilschmiedia tarairi)*, hīnau (*Elaeocarpus dentatus*), rewarewa (*Knightia excelsa*), pūriri (*Vitex lucens*), and kahikatea (*Dacrycarpus dacrydioides*).

Vegetation (shrub, woody) cover within and around WNP has increased over the last 37 years with restoration plantings (e.g. around the proposed GOP and NRS, Figure 8) and a pine plantation (around the proposed GOP) having been undertaken over that time as well as changes to farming practices and post-harvest land use in the wider landscape.

SNA 166 (68.5 ha) is identified as a significant natural area in the Hauraki District Plan and is comprised of two fragments ('northern fragment, 11.5 ha' and 'southern fragment, 57 ha' (Figure 1)) of vegetation adjacent to the existing tailings storage facilities.

A district-wide desktop analysis was undertaken by Kessels (2010) for the Hauraki District Council to identify areas which should be SNAs, and from this desktop analysis the features identified as present led to the creation of SNA 166. That assessment determined that the site had local significance, was described (Land Cover Data Base 2) as broadleaved indigenous hardwoods, indigenous forest and mānuka and or kānuka or (RIVI) small-leaved scrub (exotic pines /scrub). "Local" significance and the features related to accepting significance were not then described or articulated, but it is acknowledged that an important component was the potential for landscape connectivity functions.

An ecological assessment in 2012 (Bioresearches 2012) described the vegetation within the two SNA 166 fragments as predominantly pine, young scrub and relatively dense rewarewa forest. Moko skink (*Oligosoma moco*) were also identified in two localised areas, being one location on the northern sides of each of the two fragments.

Large areas of the southern fragment of SNA 166 comprised bare ground, pine or scrub in early stages of regeneration some 40 years ago (Figure 7). Restoration plantings, elsewhere within the Project area, are mostly less than 20 years old (Figure 8).

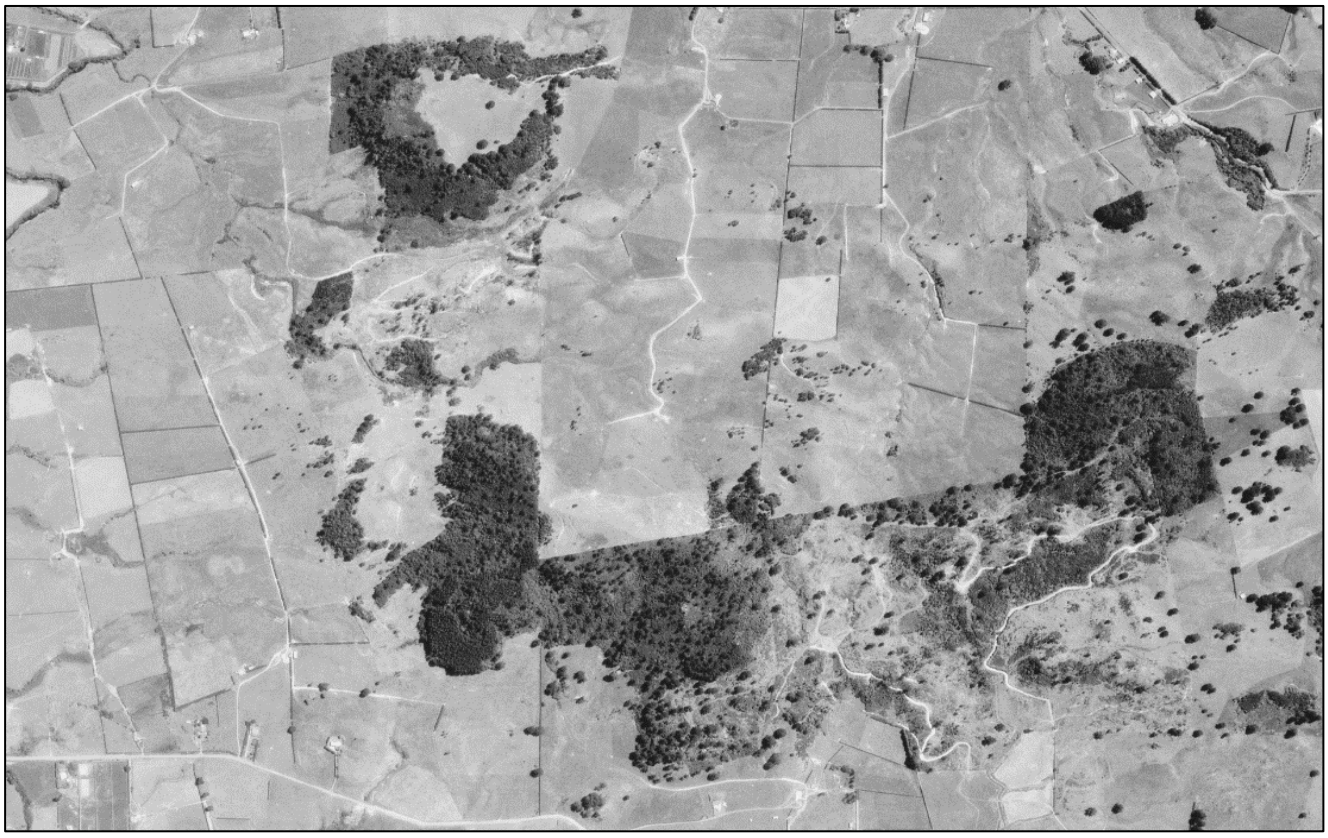

Figure 7. Large parts of the southern block of SNA 166 were pine, bare or early seral in 1982. (Image courtesy Retrolens.nz).

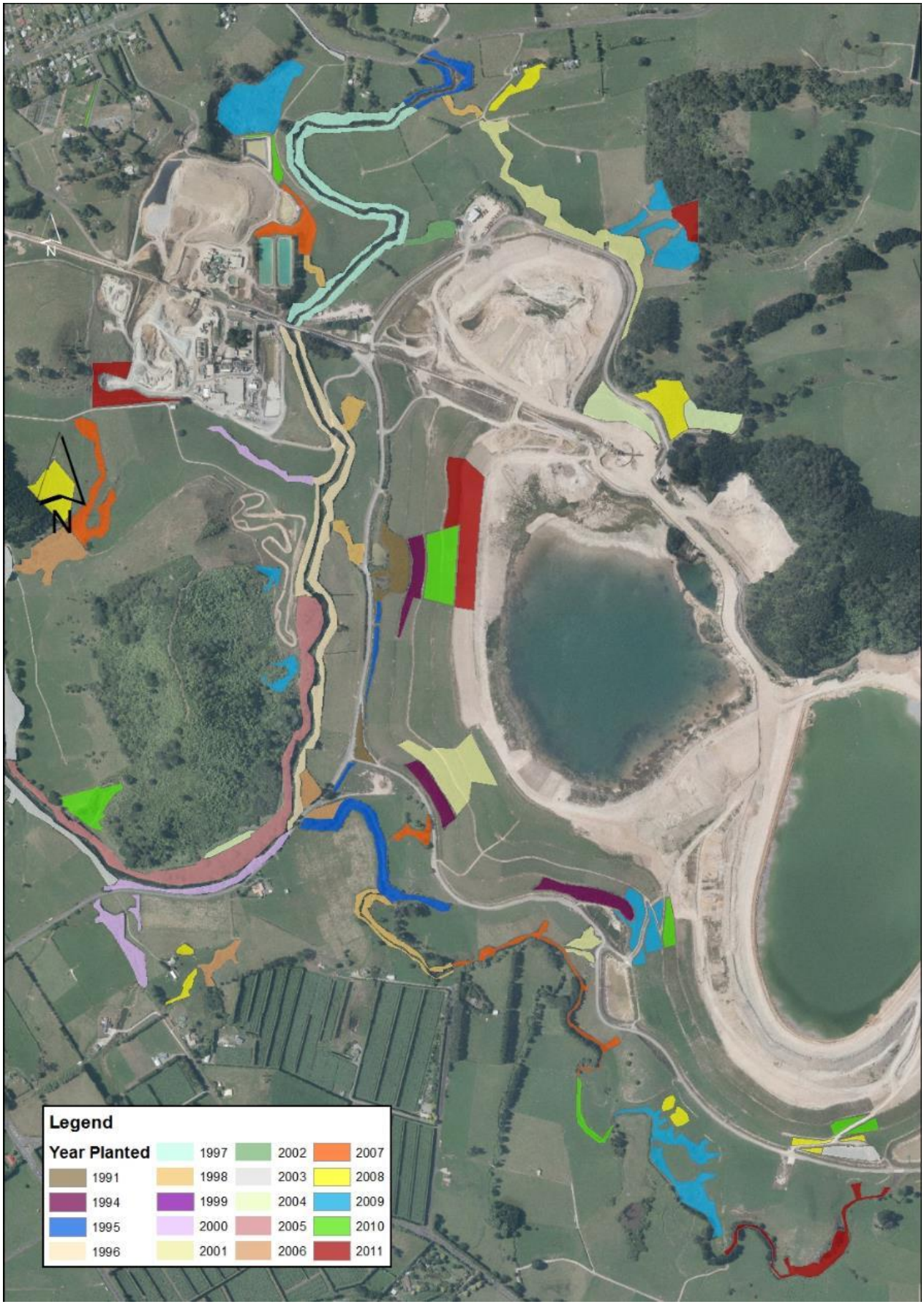

Figure 8. Year planted for revegetated areas around the WNP

Today even small and damaged indigenous systems are more valued than in the past, but typically only where they are in very depleted landscapes (i.e. under represented). Under the Threatened Environment Classification system (TEC, Walker et al. 2007), SNA 166 represents vegetation within the lowest threat category, being that more than 30% is remaining and more than 20 % is protected (Figure 9). Therefore, the SNA feature does not sit in an underrepresented landscape.

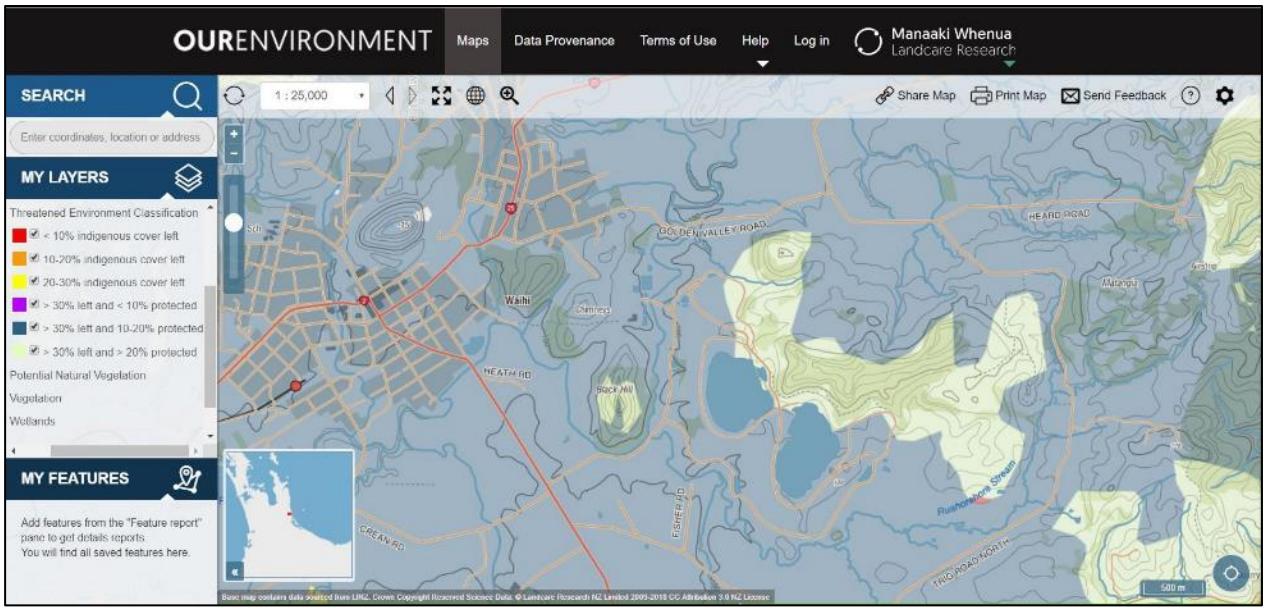

Figure 9. Threatened Environment Classification for vegetation cover within SNA 166 is within category 6, whereby >30% is left and >20% is protected. Screenshot of Manaaki Whenua Landcare Research https://ourenvironment.scinfo.org.nz/app# accessed 8 September 2021.

3.2 Overview of lizards recorded throughout Waihi Ecological District and the WNP Area

A review of lizard records in the Waihi ED (ARDS bioweb, accessed May, 2020) indicates that copper skink, shore skink, forest gecko and green gecko all occur within 5 km of SNA 166. Orokawa Scenic Reserve holds records for forest gecko (2019) and green gecko (2006). Shore skink are strictly a coastal species and have been recorded at Waihi Beach (2012).

Lizard species recorded from within and around the WNP area (**Error! Reference source not found.**) include 'At Risk- declining' copper skink and 'At-Risk – relict' moko skink (Hitchmough et al. 2021).

During the surveys which informed this assessment, copper skinks were recorded from the proposed Gladstone Pit area, Union Hill and Favona wetland. Moko skinks were recorded from north-facing vegetation edges of both fragments of SNA 166 and a pine block east of the NRS (between the two fragments of SNA 166). The early record of Moko skink within the boundaries of the SNA 166 southern fragment, were found in open track edge habitat and not under canopy within the "forest cover". The presence of copper skink lends "high" value rating to the specific habitat it uses, and the presence of Moko

skink lends a “Moderate” value rating. Copper skink was reclassified as “At Risk- declining” (previously “Not Threatened”) in October 2021.

Figure 10. Locations of native lizards recorded from the Waihi lizard surveys (2012 & 2017, 2018, 2019).

3.3 Overview of birds recorded throughout Waihi Ecological District and the WNP Area

A review of various databases (DOC fauna, inaturalist, New Zealand eBird, accessed 7 May 2020) indicates the presence of a suite of common native birds throughout the Waihi ED. Coastal areas to the east support several 'At-Risk' coastal bird species which are not expected to use vegetation within SNA 166. However other 'At-Risk' bird species recorded within the Waihi ED include New Zealand dotterel (*Charadrius obscurus*), which has nested successfully on bare ground around the existing two tailings storage facilities with pest control assistance, and New Zealand pipit (*Anthus novaeseelandiae*), which inhabit rough, open habitats, including farmland. North Island kaka (*Nestor meridionalis*) have been recorded at Orokawa Scenic Reserve (2.5 km east) and this species is also resident within the Coromandel and Kaimai Ranges and has been recorded widely in the surrounding area (e.g. Primrose Hill Domain, Paeroa, 2018).

The bird species recorded using habitats during field visits throughout the WNP include 9 native (3 endemic) and 16 introduced species (**Error! Reference source not found.**). No 'Threatened' or 'At-Risk' species were recorded (beyond those associated with the existing tailings facility). The avifauna was dominated (in terms of abundance and frequency of presence) by introduced species. No species of conservation concern were recorded and the only such species that could be anticipated on a regular basis, based on the habitat types present, are New Zealand dotterel (which nest on bare ground at the existing TSF and not in the SNA vegetation) and New Zealand pipit, which have been recorded near the current TSF1A (OGNZL records) in pasture.

Common species that were expected to be recorded but were not, from 17 field visits, include kereru (*Hemiphaga novaeseelandiae*) and bellbird (*Anthornis melanura*). Both species have been recorded in the surrounding landscape- e.g. bellbird were recorded at Gilmore Reserve in Waihi in March 2019 (New Zealand eBird). Kereru is wide-ranging and occurs throughout the Coromandel and Kaimai Ranges, and probably also Orokawa Scenic Reserve (no database records for this species there) but it is suggestive of a lack of suitable resources in SNA 166 that kereru do not regularly visit the vegetation there.

Overall, the avifauna community at the wider site, and in the planted and SNA 166 vegetation in particular, are common and largely exotic species whose "Value" can be considered between Negligible and Low.

Table 6. Bird species recorded throughout the WNP area (2017 - 2020)

Common name	Species name	9/05/2017	10/05/2017	25/05/2017	26/05/2017	22/01/2018	26/03/2018	27/03/2018	28/03/2018	29/03/2018	5/03/2019	6/03/2019	27/08/2019	28/08/2019	17/03/2020	18/03/2020	19/03/2020	20/03/2020	Total
Blackbird	*Turdus merula*	✓	✓	✓	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	14
California quail	*Callipepia californica*	✓	✓		✓	✓	✓			✓	✓		✓	✓					9
Chaffinch	*Fringilla coelebs*	✓	✓			✓	✓	✓	✓						✓				7
Eastern rosella	*Platycercus eximius*	✓	✓		✓	✓	✓		✓	✓		✓	✓	✓					10
Fantail	*Rhipidura fulginosa*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	15
Feral turkey	*Meleagris gallopavo*					✓	✓												2
Goldfinch	*Carduelis carduelis*		✓		✓										✓				3
Greenfinch	*Carduelis chloris*		✓	✓	✓			✓											4
Grey warbler	*Gerygone igata*	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	14
House sparrow	*Passer domesticus*	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓					11
Magpie	*Gymnorhina tibicen*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	17
Morepork	*Ninox novaeseelandiae*			✓															1
Myna	*Acridotheres tristis*	✓	✓	✓		✓	✓		✓	✓			✓	✓			✓	✓	11
NZ kingfisher	*Todiramphus sanctus*	✓	✓		✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	13
Pheasant	*Phasianus colchicus*	✓				✓	✓	✓	✓	✓	✓		✓	✓	✓				10
Pukeko	*Porphyrio melanotus*	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	13
Rock pigeon	*Columba livia*								✓							✓			2
Shining cuckoo	*Chrysococcyx lucidus*					✓	✓		✓	✓									4
Silvereye	*Zosterops lateralis*	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓	13
Skylark	*Alauda arvensis*					✓	✓	✓	✓										4
Song thrush	*Turdus philomelos*	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓					10
Starling	*Sturnus vulgaris*	✓	✓	✓		✓	✓		✓	✓			✓	✓					9
Swamp harrier	*Circus approximans*	✓	✓	✓				✓		✓				✓					6
Tui	*Prosthemadera novaeseelandiae*		✓			✓		✓			✓						✓		5
Welcome swallow	*Hirundo neoxena*			✓		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	12
Yellowhammer	*Emberiza citrinella*		✓	✓		✓	✓	✓	✓				✓	✓			✓		9

3.4 Overview of bats recorded

In 2024, one of the AR4s at Gladstone Pit recorded five long-tailed bat passes throughout the 3-week survey (13 valid nights using DOC 2024 criteria, although note that one of the five bat passes was recorded on a night considered invalid due to 12.5 mm of rain in the first 4 hours after dusk).

While Gladstone Pit had been surveyed multiple times previously with no detections, long-tailed bat activity and habitat use can shift across years and throughout seasons. This was the first early-season survey that had been conducted at the Site and coincides with the start of the breeding season when females may be pregnant.

Details of the recorded passes are presented in Table 7. All passes were typical 'search phase' passes which did not include feeding buzzes or social calls. The ABM which detected bats was positioned on the eastern edge of the block, at the edge of the pines. Of the other two ABMs in the Gladstone Pit area, one failed and one had no passes recorded.

Table 7. Summary of bat detections at the WNP area

ABM number	Date	Location	Valid night	Long-tailed bat passes	Time
22	5/10/2024	Gladstone Pit 3	Yes	2	00.48; 4.00
22	6/10/2024	Gladstone Pit 3	No (rain)	1	00.41
22	7/10/2024	Gladstone Pit 3	Yes	1	23.26
22	11/10/2024	Gladstone Pit 3	Yes	1	1.59

4 PROJECT AREA: VALUES ASSESSMENTS

The following part of the assessment steps through each major component of the Project and describes the areas and then the ecological values within the zone of influence.

4.1 Gladstone Open Pit

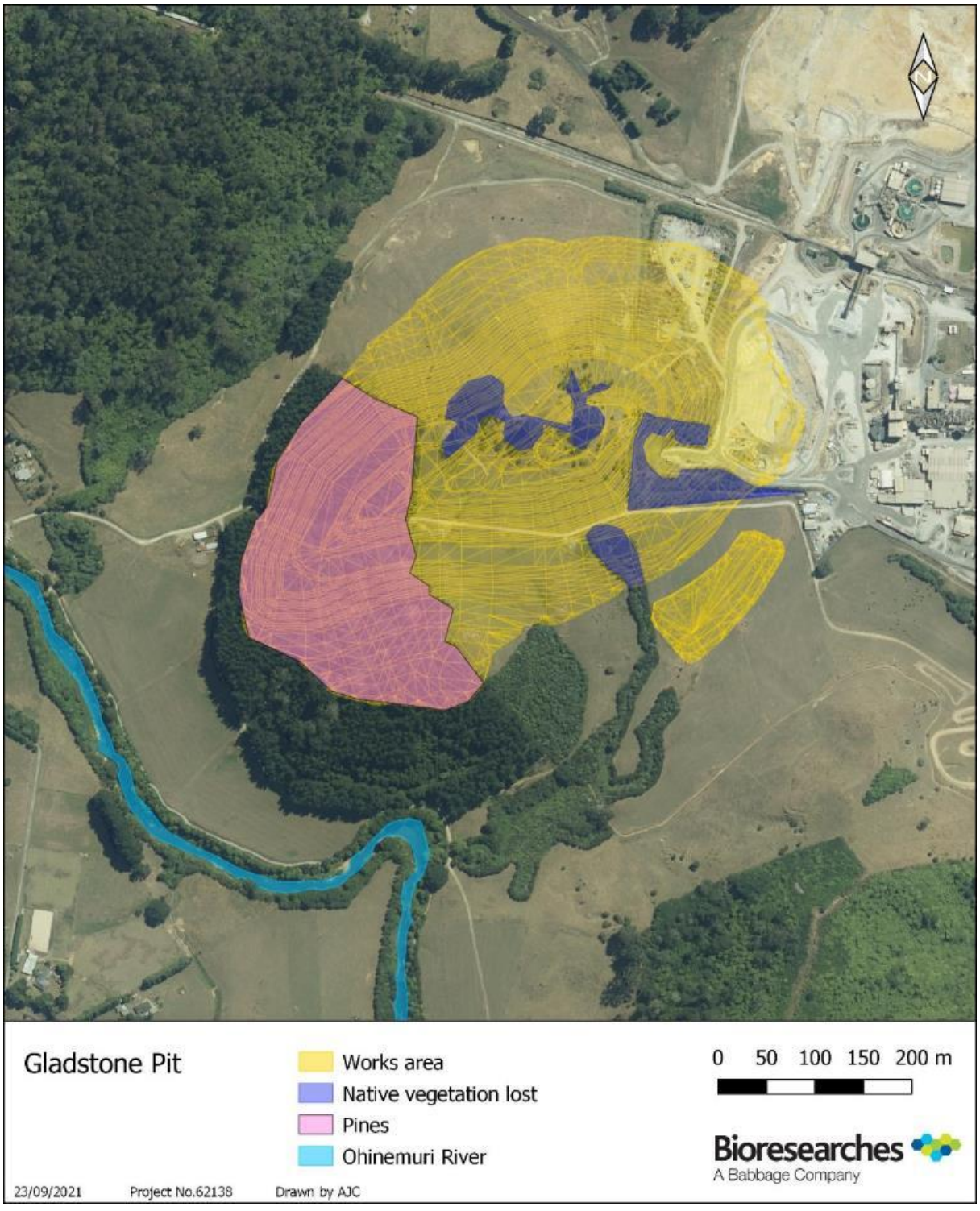

Figure 11. Gladstone Pit surface elements.

4.1.1 Vegetation and Flora

The proposed Gladstone Pit area is primarily pasture, with a rock outcrop to the northeast of a pine (*Pinus radiata*) plantation and two areas of young (c. 15 years) plantings adjoining the southeast of the plantation. Further east of these features is the mining operation's Processing Plant.

The rock outcrop sits beneath a large pine tree and a small number of other exotic trees where the centre of proposed Gladstone Pit would be. It has a number of native species growing on and around the boulders including a coastal Astelia (*Astelia banksii*), and several *Asplenium* ferns (*Asplenium flaccidum*, *A. polyodon*, and *A. oblongifolium*). The epiphytic ferns hound's tongue (*Zealandia pustulata*) and *Pyrrosia eleagnifolia* are also abundant. There are a small number of native tōtara (*Podocarpus totara* var. *totara*) and mingimingi (*Leucopogon fasciculatus*) saplings, and a juvenile māhoe (*Melicytus ramiflorus*) growing in the area immediately surrounding the boulders. These species, particularly the ferns, are generally considered to be associated with shaded environments, which in the current case is likely to be attributable to the overhead pine and the south-facing aspect of the outcrop.

Approximately 0.75 ha of native plantings at Gladstone Pit (planted in 2008, Figure 12) adjoin a restored wetland to the south (see Boffa Miskell 2022b) and are adjacent to a similar area of planting (composition and age) that projects from an adjacent pine plantation. The plantings have been undertaken voluntarily and have not been required by a Resource Consent. They are over five metres in height, appear to be in good health, and have become self-sustaining as evidenced by some of the planted species present in seedlings. The canopy is comprised of kānuka (*Kunzea robusta*), mānuka (*Leptospermum scoparium*), karo (*Pittosporum crassifolium*) and tōwai (*Weinmannia silvicola*). Beneath these, an assemblage of akeake (*Dodonaea viscosa*), miro (*Prumnopitys ferruginea*), māpou (*Myrsine australis*), karamu (*Coprosma robusta*), and harakeke (*Phormium tenax*) is thriving. Being a planted composition, some of the expected future canopy species, typical of a naturally regenerating ecosystem, are missing, such as tōtara, kahikatea, rimu and puriri.

The planted block forms a protective buffer around the headwaters of a watercourse (watercourse addressed in Boffa Miskell 2022b). The vegetation here is more mature, and includes large mamaku (*Cyathea medullaris*) and dense *Carex* stands within the flowing water. The riparian vegetation provides buffer function to support the water quality and aquatic habitat (Figure 11 & 15).

A further area of planted vegetation east of the rock outcrop (approximately 0.6 ha) is much younger (planted 2011), isolated from other ecological features including other plantings, and generally provides amenity value to the existing processing area.

The pine plantation has a dense understory of Chinese privet (*Ligustrum sinense*), with areas of blackberry (*Rubus fruticosus* agg.), Japanese honeysuckle and small stands of Japanese cherry (*Prunus serrulata*). There is very little native heterogeneity, although some common native plant species are regenerating around the pine edges, and several *Asplenium* ferns are present beneath the canopy.

Several sapling tōtara trees and occasional rock outcrops occur through the middle of the pine plantation. An area of mixed age tōtara occurs to the south of, and beyond the pit boundary.

Figure 12. Planted vegetation adjacent to pine block at proposed Gladstone Pit site. Vegetated rock outcrop in the background on the right side of the image.

4.1.2 Fauna

4.1.2.1 Frogs

The Gladstone Open Pit area does not support potential habitat for native frogs.

4.1.2.2 Lizards

The AR survey recorded ten 'At Risk' copper skinks (Figure 13) around the edges of the pine plantation, restoration plantings and the rock outcrop near where the centre of the proposed pit would be.

Six copper skinks were recorded at the rock outcrop and four from 9-year old restoration plantings and pine plantation edge.

Planted areas provide some understory grass vegetation that provides suitable cover for native lizards in addition to occasional rock deposits (including some within the pine forest) that may have supported small, relict populations of lizards to persist prior to the development of the current vegetation cover. Overall, the vegetation and isolated rock outcrops provide habitat for native copper skinks, which appear to be relatively widespread where habitats provide cover in the Gladstone Pit area. Copper skinks are 'At Risk' (Hitchmough et al. 2021), and are of 'high' ecological value (Roper-Lindsay et al. 2018).

No geckos were recorded from nocturnal VES.

Figure 13. Copper skink from proposed Gladstone Pit survey area.

4.1.2.3 Bats

Bat surveys (2011-2024) at Gladstone Open Pit recorded five long-tailed bat passes over four nights from a single recorder location, during October 2024. No other bat activity has been recorded through-out the wider project area, including from 766 valid survey nights over 2011, 2017, 2022 and 2024. This level of activity is considered low.

While Gladstone Pit had been surveyed multiple times previously with no detections, long-tailed bats are highly mobile and their activity and habitat use can shift across years and throughout seasons, and as demonstrated by these most recent results.

All passes were typical 'search phase', which did not include feeding buzzes or social calls. The single ABM which detected activity was positioned on the eastern edge of the block, at the edge of the pine plantation.

The restoration plantings that would be affected by the Gladstone Open Pit are not mature enough to provide cavities, loose bark and other features that could provide roost habitat for bats (considered to be when growth reaches ≥15 cm DBH (Diameter at Breast Height)). However, the pine trees may have some capacity to support roosts at the time of harvesting (a permitted activity). Given the absence of bat activity from previous surveys and throughout the surrounding area, the GOP area is considered to supports low-level, intermittent activity.

Long-tailed bats are a threatened species and are of 'very high' ecological value (Roper-Lindsay et al. 2018).

4.1.3 Ecological Value at Gladstone Open Pit

Representativeness.

The non-pasture vegetation and habitats at Gladstone Pit are young, highly modified and are planted compositions, apart from a few naturally occurring native plants at the rock outcrop (this includes the small wetland). While indigenous species generally dominate those compositions (non-pine plantings), and are relatively typical of young, regenerating ecosystems, plant and fauna diversity is low and some expected species of flora and fauna are not present (e.g. kahikatea, swamp Coprosma, rimu, puriri, kereru, bellbird), although these are likely to colonise as indigenous plantings mature. It is notable, however, that the vegetation and habitats at Gladstone Pit do support indigenous vegetation, avifauna, reptiles (at least one 'At Risk' species), and long-tailed bats (at least intermittently). Therefore, given that the native dominated vegetation supports common indigenous species assemblages that are representative of seral flora, reptiles and bird communities, the Gladstone Pit native vegetation and habitats are considered to have **moderate** ecological representativeness. This is good evidence of the success of the OGNZL revegetation programme (none of which has been required by Resource Consents) as the majority of this feature has been developed from pasture.

Rarity and distinctiveness

GOP supports the occurrences of high value copper skink ('At Risk- declining'), which are resident, and very high value bats, which have been recorded intermittently at low-level activity. Survey results suggest that copper skinks have a stronger association with GOP than other sites, because they have not been detected at NRS or TSF3. This species is, however, generally widespread, particularly in the upper North Island, and has a very large national population. Therefore, with consideration of the occurrence of one resident high value species, and intermittent, low-level use by a very high value threatened species, the rarity and distinctiveness aspect is considered to be **high**.

Diversity and Pattern

Being mostly a selected composition of planted plants, the vegetation and habitats at the proposed Gladstone Pit site are generally of low diversity and pattern. There is no obvious pattern complex related to a range of environmental gradients (not taking account of the lower wetland). There is a riparian / wetland vegetation pattern at a small scale and a rock outcrop area, these create some pattern and complexity. However, while indigenous diversity at GOP is not high at species level (there is a range of flora and fauna species that could be expected to be present for a naturally regenerating ecosystem in the Waihi ED that are not currently present), it is relatively high at a basal taxonomic level, with representatives of flora, and fauna, particularly representatives of indigenous invertebrates, a reptile, birds, and a mammal. Overall, this criterion is considered to be **moderate**.

Ecological Context.

The size and shape of the planted blocks may provide some resilience in terms of ecosystem integrity although the thin riparian corridor will have existing edge influence on terrestrial values. This integrity, however, is partly provided by current connectivity to the pine plantation which provides some habitat to native fauna (e.g. copper skinks, birds) and reduces some edge effects on the plantings (e.g. light, wind exposure). However, these pines are either temporary or will eventually reduce biodiversity integrity to the plantings in the long term whereby their potential spread into indigenous vegetation would suppress regeneration and natural vegetation diversity. The native plantings also provide riparian functions and wetland buffering (beyond the GOP area). It is unlikely the plantings offer any particular valuable avian food resource or nesting area or connection role, and although it contributes to part of the wider Ohinemuri River riparian vegetation, it is not in a significant way. Some common native species will utilise the planting as it progresses (e.g. silvereye, grey warbler etc).

For long-tailed bats, the intermittent use of GOP habitats is not considered to be associated with any potentially limited resources, such as communal roosts or foraging areas. Overall, this area is predominantly planted pine and native plantings, and is considered to have a **moderate** contextual value.

Conclusion

The native plantings at Gladstone Open Pit are a more developed restoration area than other examples in the surrounding landscape (e.g. Martha Pit and Favona Wetland). This area is nevertheless still young, small and simple. Overall, the areas of planted native vegetation and the rock outcrop rate as low for two assessment matters and moderate for two. It is assessed as being of **moderate** ecological value, largely due to the presence of At Risk (high value) copper skinks.

The pine plantation supports a few common native shrubs and ferns in the understory, and given its condition, future potential (felled or otherwise persistent pine canopy) it is considered to be of negligible botanic value and limited (low) ecological value other than the potential for 'High Value' copper skinks to be present. The pine plantation is subject to rotation harvest and is considered to be of **low** ecological value.

4.1.4 Significance

In accordance with the Waikato RPS and criterion 3 (vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: classed as threatened or At-Risk, or endemic to the Waikato region, or at the limit of their natural range) and 11A, this vegetation is significant in terms of Section 6(c) of the RMA and the Waikato RPS because of the presence of copper skink (recently listed as At Risk (Hitchmough et al. 2021)).

4.2 Northern Rock Stack

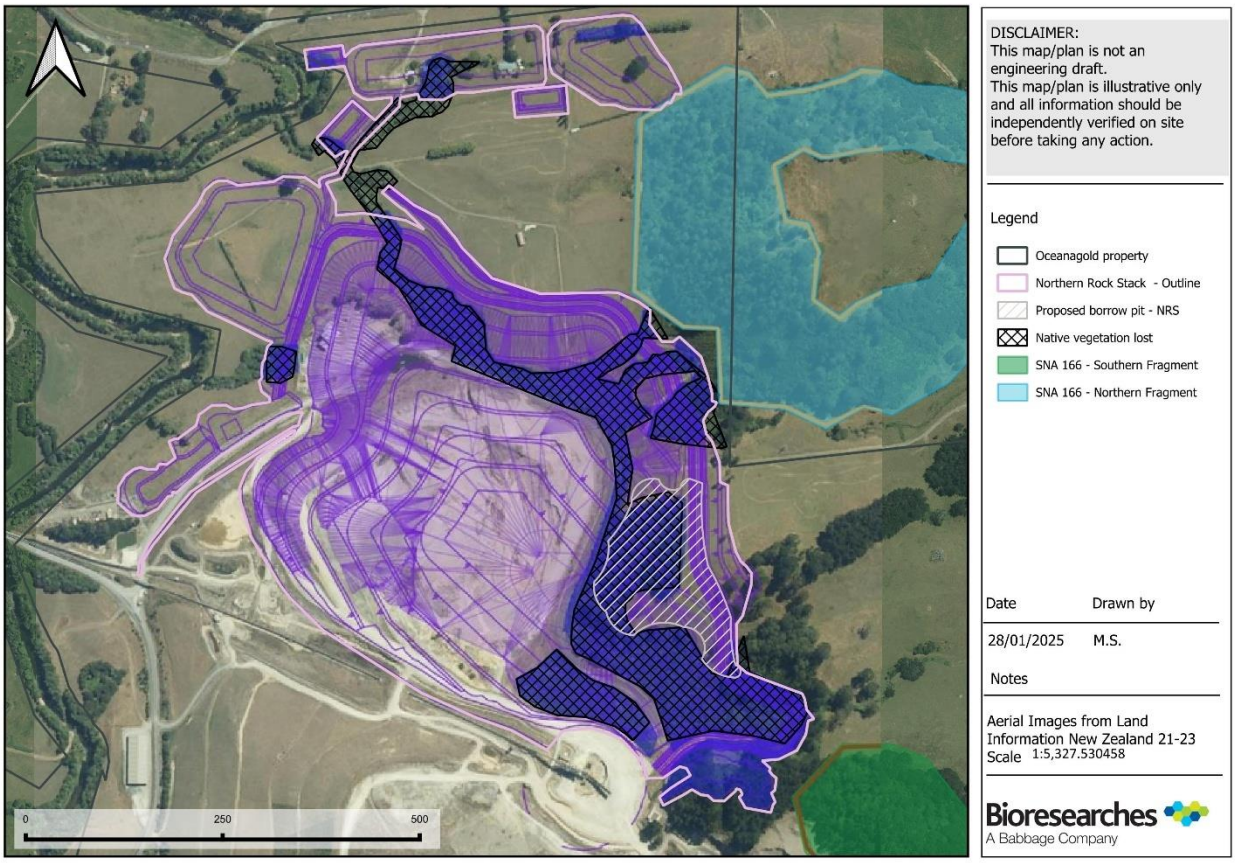

Figure 14. NRS surface elements.

4.2.1 Vegetation and Flora

The vegetation within the NRS is comprised almost entirely of voluntary plantings, which are largely contiguous with the northern fragment of SNA 166. The plantings are not associated with any consent requirements, and have been planted voluntarily over the last 11-21 years (Figure 8). The plantings include kānuka, karo, cabbage tree, kauri, māhoe, hoheria, tōtara, ribbonwood (*Plagianthus regius*), flax, makomako, koromiko, karamū (*Coprosma lucida* and *C. robusta*), and māpou. Most of these species are also naturally regenerating in the understorey across various plantings, where they were recorded as seedling in 2022. Other species not part of the original plant schedule have naturally colonised, including various native fern species (*Doodia media, Histiopteris incisa, Alsophila tricolor, Sphaeropteris medullaris, Parablechnum novae-zealandiae*), shrubs (*Leucopogon fasciculatus, Geniostoma ligustrifolium*) and exotic weeds (*Ligustrum* spp. *Lonicera japonica*).

Figure 15. Natural regeneration of ferns occurring within the understorey of the NRS planted areas (plantings 2007: 17 years old at time of photo).

To the east is an approximately 1 ha mature pine stand which includes some common native seedlings and ground cover species, but is nevertheless a simple pine stand.

These plantings are healthy and provide a riparian buffer to a tributary of the Ohinemuri River and vegetation connection to SNA 166 fragment (northern fragment, Figure 16) as well as low-level (fragmented pine stands) connectivity between the northern and southern fragments of SNA 166 (Figure 14).

Figure 16. 2009 Plantings alongside SNA 166 (northern fragment, at 2017: 8 years old at time of photo).

4.2.2 Fauna

4.2.2.1 Frogs

None of the identified watercourses within the NRS area support native frog habitat.

4.2.2.2 Lizards

Potential lizard habitats within and around the NRS area include managed farmland with restoration planting, native forest (SNA 166) and exotic pine. Although the restoration plantings are relatively young (approximately 15-21 years old), they do have capacity to support habitat for skinks or arboreal lizards, despite none being recorded from survey of plantings or more established vegetation associated with SNA 166. In the surrounding landscape, copper skinks were readily detected from survey at GOP in young plantings, and at Favona Wetland (**Error! Reference source not found.**) in rough grass adjacent to a planted area approximately 7 years old.

The lizard surveys did not record any native lizards within the NRS area. However, where survey coverage included potential habitats around 400 m - 500 m east of, and beyond the NRS footprint, moko skinks

(*Oligosoma moco,* Figure 17) were recorded along the north-facing aspects of the northern fragment of SNA 166 (n = 2 – habitat searching stony substrate) and the edge of a pine block that extends to the east of the rock stack (n = 3, **Error! Reference source not found.**, habitat searching stony substrate). Moko skinks have a conservation status of 'Nationally At-Risk- relict' (Hitchmough et al. 2021) and have moderate value (Roper-Lindsay et al., 2018). Their known habitats within the Waihi area are all north-facing and are associated with boulder deposits and / or vegetated edges that have remained relatively stable over the last decade- that is, moko skinks have not been detected within vegetation that has been planted. While these habitats are contiguous with plantings within the NRS footprint, moko skinks were not recorded within the NRS footprint.

No other lizards were recorded from the survey, including nocturnal VES. Overall, the lizard values within the proposed NRS are **low**.

Figure 17. Moko skink near SNA 166.

Figure 18. Moko skink habitat, within boulder deposits and low scrub under pine canopy- east of the NRS area.

4.2.2.3 Bats

The restoration plantings at the NRS do not provide sufficient cover for roosting bats. The bat surveys at adjacent, higher quality potential habitats to the west, alongside the northern fragment of SNA 166 and pine plantations, did not record any bats. Given their absence from these and other surveys throughout the surrounding area, bats are not considered likely to be present within the WNP area, even on an intermittent basis.

4.2.3 Existing Tailings Dams TSF1a and TSF2

Two existing tailings dams are located immediately to the south of the Northern Rock Stack (immediately to the west of SNA 166). While they are artificial structures and are outside the footprint of the NRS, they are known to support indigenous biodiversity and are described here, following a visit (11 September 2024), with consideration to their proximity to the Project activities. The newest (currently active) of the two tailings dams, TSF1a is the largest and does not support any indigenous vegetation. There is a small (~10m^2) area of grass at the southern end. Water level fluctuations expose areas of silt /mud at the southern end of the dam. TSF1a is surrounded by an elevated dam wall with a dirt road running around the periphery. TSF2 is the older and smaller of the tailings dams. The inner banks of this dam are vegetated with pasture grasses and small flax bushes (*Phormium cookianum*), which appear to have naturally established (Figure 20, Figure 21). Aquatic reeds, sedges and raupō (*Typha orientalis*) fringe the shallow margins of the dam and are most extensive at the northern end, and are understood to have naturally colonised.

4.2.3.1 Birds on TSF1a

TSF1a supports a breeding colony of approximately 100 black-backed gulls (*Larus dominicanus*), which occupy bare ground (waste rock embankment) alongside the tailings dam. Other birds species include Canada geese (*Branta canadensis*), spur-wing plovers (*Vanellus miles*), pied stilts (*Himantopus himantopus*) and three New Zealand dotterels (*Charadrius obscurus*), including a breeding pair. The dotterels have been recorded breeding at the tailings facility previously, including since at least 1995 (Figure 19).

Figure 19. New Zealand dotterel at existing Waihi tailings embankment area

4.2.3.2 Birds on TSF2

Thirteen bird species were recorded (11 September 2024) on or around TSF2, including swamp harrier (*Circus approximans*), skylarks (*Alauda arvensis*), Canada geese, welcome swallows (*Hirundo neoxena*), black swan (*Cygnus atratus*), pukeko (*Porphyrio melanotus*), spur wing plover, Australian coot (*Fulica atra*), mallard ducks (*Anas platyrhynchos*) and a flock of 171 pāpango / scaup (*Aythya novaseelandiea*). At Risk and Threatened species observed include one pipit (At Risk declining), Australian coot (At Risk- naturally uncommon), Māpunga / black shag (*Phalacrocorax carbo*) and ten pairs of weweia / dabchicks (*Poliocephalus rufopectus*) (Threatened- nationally increasing), including two chicks and three non-paired adults.

Figure 20. TSF2, showing naturally regenerating vegetation around the edges.

Figure 21. Edge wetland vegetation at TSF2

4.2.4 Ecological Value at the Northern Rock Stack

The vegetation within the NRS is comprised almost entirely of voluntary plantings, which are largely contiguous with the northern fragment of SNA 166. The plantings are not associated with any consent requirements, and have been planted voluntarily over the last 11-21 years (Figure 8). The plantings include kānuka, karo, cabbage tree, kauri, māhoe, hoheria, tōtara, ribbonwood (*Plagianthus regius*), flax, makomako, koromiko, karamū (*Coprosma lucida* and *C. robusta*), and māpou. Most of these species are also naturally regenerating in the understorey across various plantings, where they were recorded as seedlings in 2022. Other species not part of the original plant schedule have naturally colonised, including various native fern species (*Doodia media, Histiopteris incisa, Alsophila tricolor, Sphaeropteris medullaris,*

Parablechnum novae-zealandiae), shrubs (*Leucopogon fasciculatus, Geniostoma ligustrifolium*) and exotic weeds (*Ligustrum* spp. *Lonicera japonica*).

Representativeness.

The vegetation and habitats at the NRS are generally well established (2001-2011), planted compositions, or are mature pine. The plantings support a higher diversity of indigenous species than what has been planted, particularly ferns and shrubs, in addition to some of the planted species now self-regenerating as seedlings.

In general, the canopy of the replanted areas is established (5-7 m high) and species within this tier are maturing. However, while the understorey supported self-seeded species, it is relatively sparse, perhaps reflective of the recently established planted areas.

Indigenous species generally dominate the planted compositions, and are relatively typical of young, regenerating ecosystems. The closed canopy (5-7 m tall) is likely to support nesting habitat for common indigenous species, recorded from the surrounding environment. As a predominantly planted community (15-20 years old), this vegetation is of **moderate** representativeness.

Rarity and distinctiveness

Though it is recognised that the Kauri ('At Risk – Declining') at NRS are not naturally occurring (i.e. planted) and immature, their presence triggers the rarity and distinctiveness criteria; "habitat supporting nationally threatened or At-Risk species". This criterion is therefore considered to be **moderate**.

Diversity and Pattern

Being mostly a selected composition of planted plants, and some additional colonisers, the vegetation and habitats at the NRS site support a moderate diversity. Much of the planted areas are narrow fragments, some of which form projections from SNA 166, although it is noted that the fragments do form a mosaic of semi-connected habitats for flora and fauna. There is no obvious vegetation pattern complex other than there being a riparian element to the planting. Overall this criterion is considered to be **moderate**.

Ecological Context.

The size and shape of the planted blocks is not a cohesive solid block, but being riparian they are generally long thin elements 15 m – 50 m wide over approximately 5.5 ha. The most "intact" component is roughly 100 m wide and 200 m long. Most of the feature is considered to be "edge". The plantings do have a riparian function, and being linear, and now generally established with natural regeneration occurring, there also is likely to be some corridor / movement facilitation function, for both aquatic and terrestrial flighted invertebrates and also common native birds (e.g. fantail, grey warbler, silvereye). The contextual value is considered **moderate**.

Conclusion

As with the Gladstone Pit assessment, the NRS is a well planted developing restoration area that supports natural regeneration, 'At Risk' species and probably supports fauna movement locally. Overall, the areas of planted native vegetation and the pine forest can be concluded to be of **moderate ecological value**.

4.2.5 Significance

The treatment of this area is the same as the Gladstone Pit, in terms of disease-elevated conservation status species whereby the planted kauri technically (Criterion 3, 11A, RPS) would cause the feature to be considered significant.

4.3 Tailings Storage Facility

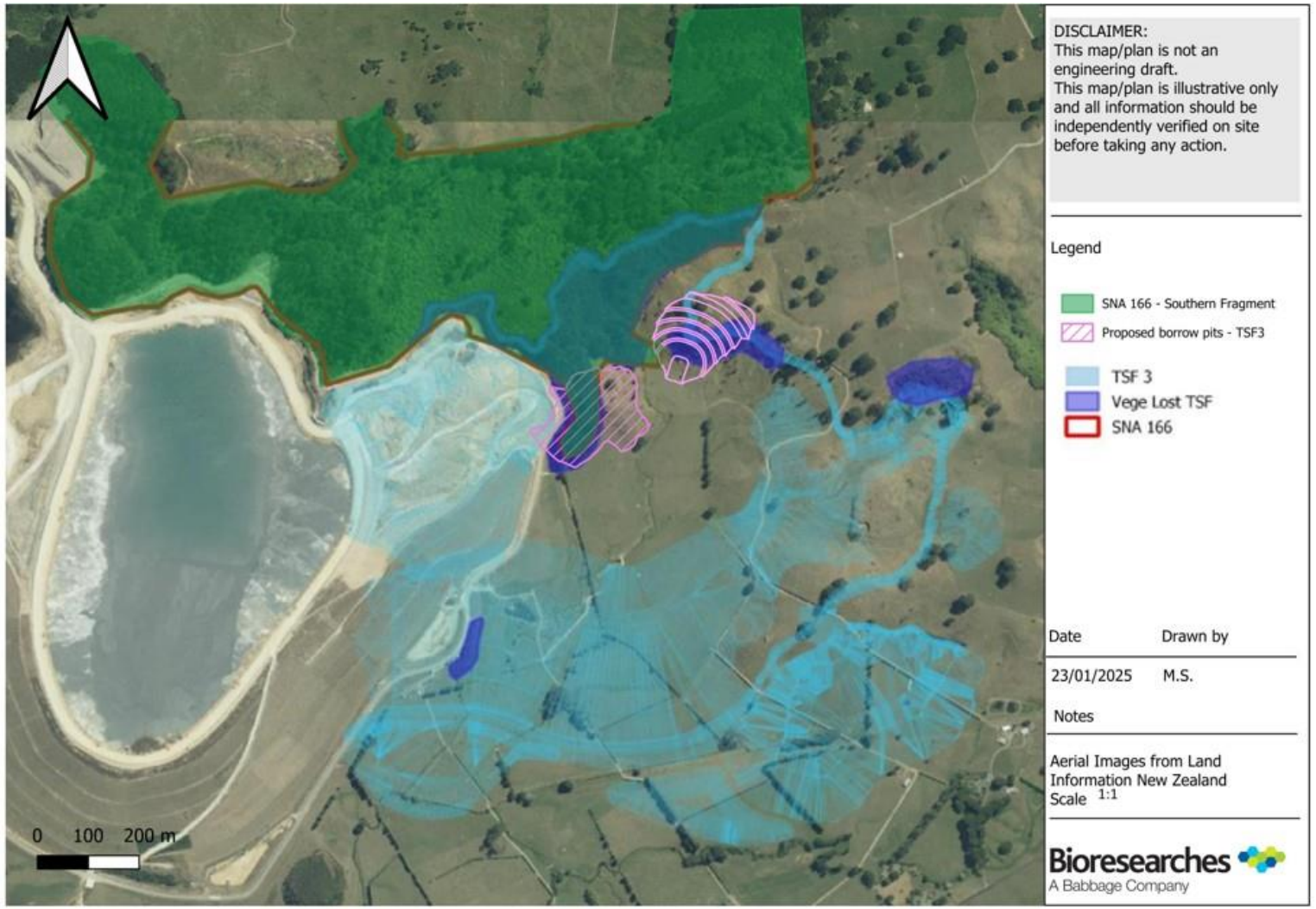

Figure 19 Tailings Storage Facility Surface elements (TSF3)

4.3.1 SNA 166

4.3.1.1 Vegetation and Flora

The southern fragment of SNA 166 is an east-west elongated block, approximately 1.5 km long and 57 ha in area. It is situated adjacent to the north of the current Tailings Storage Facilities, to the northeast. The vegetation type was historically kauri, podocarp, broadleaved forest (WF11, Singers and Rogers 2014), however, most of the components of this ecosystem type are now absent due to historic clearance.

The SNA is best described as broadleaved species scrub (VS5, Singers and Rogers 2014).

The fragment has four recognised vegetation communities (Figure 23. Vegetation types of SNA 166, including ecological features identified from flora and fauna surveys 2012 and 2017-2020.):

- a small kauri dominant stand (Not within the zone of influence);
- tree fern scrub;
- pine-dominant (with rewarewa); and
- rewarewa-dominant (with pine) scrub.

The current vegetation has been regenerating from pasture over the past ~50 years. The composition of vegetation communities indicates the varied ages of retirement from pasture and the presence of pest plants (namely pines). Whilst the SNA is composed of four vegetation communities (defined by canopy species), rewarewa and tōwai are present in high proportions in the canopy or subcanopy throughout. It is likely that with pine removal and time for younger areas to mature, the entire SNA would be characterised as broadleaved species scrub/forest (VS5, Singers and Rogers 2014), with a rewarewa and tōwai dominant canopy.

The four vegetation communities currently present in SNA 166 are described below.

4.3.1.1.1 Tree-fern scrub

Scrub vegetation accounts for approximately 17.3 ha of the SNA 166 southern fragment and is comprised predominantly of tree ferns, with mamaku being the tallest dominant native species along with occasional emergent rewarewa (*Knightia excelsa*). Barberry (*Berberis glaucocarpa*), hangehange, patē, wheki-ponga (*Dicksonia squarrosa*), mamaku, and silver fern (*Alsophila tricolor)* are also present in the canopy and subcanopy, while the understorey is comprised of hangehange, patē (*Schefflera digitata*) and kiokio (*Parablechnum novae-zealandiae*). Gorse (*Ulex europaeus*), Japanese honeysuckle (*Lonicera japonica*) and multi-stemmed barberry are present throughout these areas.

The scrub vegetation around the southern edge of the SNA 166 southern fragment, alongside TSF1A, which borders the tailings access road and the pasture, is primarily a mix of young, short stature native and exotic species comprised of barberry, gorse, mamaku, silver fern and young broadleaved species such as rangiora (*Brachyglottis repanda*), kumarahou (*Pomaderris kumeraho*) and māhoe (e.g. Figure 22).

Figure 22. Young, short stature treefern scrub along the southern SNA 166 boundary.

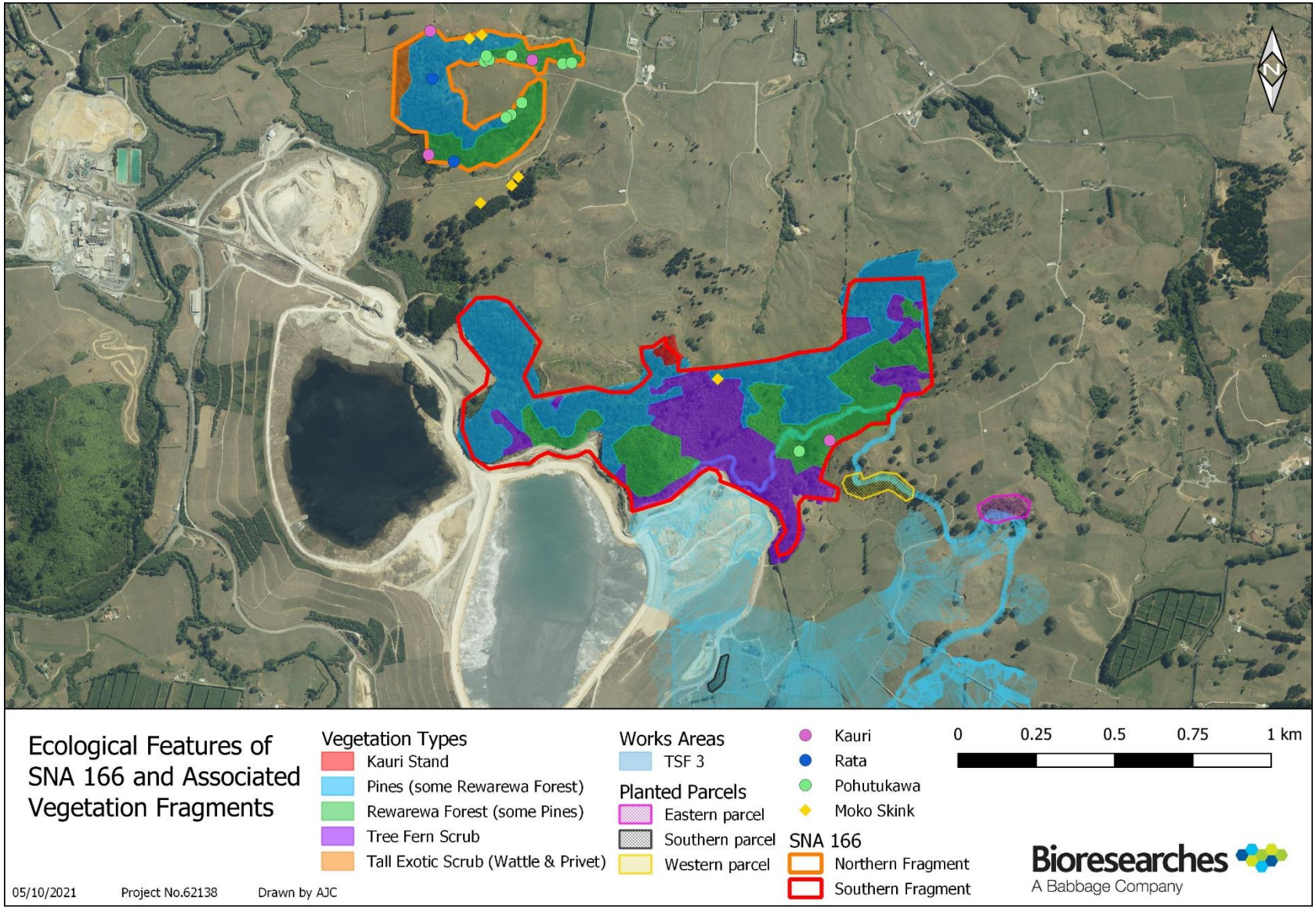

Figure 23. Vegetation types of SNA 166, including ecological features identified from flora and fauna surveys 2012 and 2017-2020.

4.3.1.1.2 Pine forest (with rewarewa)

Mature radiata pine (*Pinus radiata*) are scattered throughout the southern fragment of SNA 166 but comprise more dominant stands (and canopy cover) in the north of this fragment. This vegetation type accounts for 25 ha of the southern fragment (e.g. Figure 23, Figure 25). In these areas, pine is emergent over a canopy that comprises a mixture of pine (up to 25%), spindly (<10 cm DBH) rewarewa (up to 25%) and tōwai (up to 25%), with some mamaku (up to 10%). Understorey species include hangehange, silver fern, mamaku and rewarewa, and indigenous vegetation accounts for approximately 90% cover, with exotic species such as barberry and Japanese honeysuckle having a lesser presence. Other native species present in the understorey include mingimingi (*Leucopogon fasciculatus*), prickly mingimingi (*Leptecophylla juniperina* subsp. *juniperina*), karamu (*Coprosma lucida*), pigeonwood (*Hedycarya arborea*), kānuka, and māpou. The ground cover here has a greater species diversity than the rewarewa scrub, probably as a result of higher light levels through the more open canopy created by the emergent pines. Seedling regeneration from the species present in the other tiers was visible, however, the native grass (*Oplismeus hirtellus subsp. hirtellus*) was most prolific.

4.3.1.1.3 Rewarewa forest (with pine)

Rewarewa forest (as defined by the Atkinson 1985 method) makes up around 18 ha of the SNA 166 southern fragment and is comprised primarily of rewarewa, tōwai and mamaku. From two plots, the average Diameter at Breast Height (DBH) measurements for rewarewa was 7.14 and 8.5 cm, indicating most of these trees are relatively young, roughly 10 years old (Bergin et al. 2012) although environmental factors (e.g soil fertility, exposure) may have slowed growth (some vegetation cover is visible from 1982 aerial image, refer Figure 7). Excepting the pine, only the outermost edges of this area are infested with weedy species and the interior is native-dominated. Weeds include pampas (*Cortaderia selloana*), gorse, blackberry, woolly nightshade (*Solanum mauritianum*), barberry and Japanese honeysuckle (*Lonicera japonica*).

In addition to the rewarewa, tōwai and mamaku, silver fern, basket grass (*Oplismenus hirtellus* subsp. *imbecillis*), hound's tongue fern, hangehange, drooping spleenwort (*Asplenium flaccidum*), karamu (*Coprosma robusta*), and māhoe are present. None of these species are threatened or rare and they are indicative of a naturally regenerating ecological system.

The canopy and sub-canopy are generally represented by dense, regenerating rewarewa and tōwai of similar age and size (Figure 26), the understorey is generally sparse to open, particularly where pine needles are abundant. However, some seedling establishment around the outer edges of the SNA 166 southern fragment and within rewarewa-dominant vegetation indicates that some natural regeneration is occurring, though rewarewa and tōwai are dominant at this level as well. In some previously disturbed

areas, the ground fern *Deparia petersenii* subsp. *congrua* has formed a low but dense ground cover. This fern has a creeping rhizome habit, which can increase soil stability.

A single kauri (Figure 23, Figure 27) was recorded toward the south-eastern edge of the SNA 166 southern fragment. This tree is mature and substantially older than the rewarewa and other mixed vegetation around it, indicating that it would have previously been an isolated specimen. Kauri is an 'At Risk' species (de Lange et al. 2024), and is present in other parts of the SNA 166, including a stand at the northern edge of the southern fragment (described in 4.3.1.1.4, below) and through the southern fragment (Bioresearches 2012).

4.3.1.1.4 Kauri stand

Of note, is a stand of 40-50 kauri trees with some rewarewa trees, on a north facing projection of the northern ridge of the SNA 166 southern fragment. These trees appear to be healthy (no sign of kauri dieback was observed), however the stand is grazed underneath by cattle (i.e. there is no lower tier ground cover typical of a kauri forest). It is therefore a "treeland" of kauri and rewarewa.

Figure 24. Stand of kauri trees with some rewarewa.

4.3.1.1.5 Summary values within SNA 166 (Southern Fragment)

Overall, the vegetation within the SNA 166 southern fragment has a low diversity (species richness), although it is a relatively large area. Its future in the absence of management is uncertain, due to the prominent areas of pine and its ability to more rapidly colonise and spread through the early seral communities, and the occasional stock breaches (fence failures) throughout. This will propagate a future

pine dominant forest (in all but the currently most dense rewarewa regeneration area), which while containing more natives than a production pine forest will not represent a native (significant) indigenous vegetation type or habitat. Continued presence of livestock will reduce natural regeneration and indigenous species diversity in the parts of the SNA where livestock continue to have access.

Figure 25. View of southern fragment of SNA 166 from outside of the south-eastern corner. Pines are dominant to the left and background; with rewarewa and tree fern present in the canopy to right and foreground.

Figure 26. Spindly vegetation in the rewarewa dominated areas of SNA 166 southern fragment

Figure 27. Kauri tree emergent above rewarewa / towai scrub within the southern fragment of SNA 166.

4.3.1.2 Fauna

4.3.1.2.1 Frogs

A small, cascading waterfall within Watercourse A (Figure 26) provided small pools and standing water that could provide suitable potential habitat (Figure 27) for native frogs, however no native frogs were identified from searches of potential first order watercourses within the southern fragment of SNA 166 (Figure 3). One possible reason for this, is that 40 years ago much of the surrounding vegetation was grazed pasture and little to no canopy cover was present. Due to the historic non-forested land use and isolation of this fragment from known frog habitats, native frogs are not considered to be present in the southern SNA fragment. There is no connection to habitat where they are known to be present and they would not have been able to persist in waterways in predominantly grazed paddocks, as was present 40 years ago. Native frogs are not present and do not contribute to values associated with SNA 166.

Figure 28. Small waterfall within watercourse A, within SNA 166, TSF3 at WNP, Waihi 06/03/19.

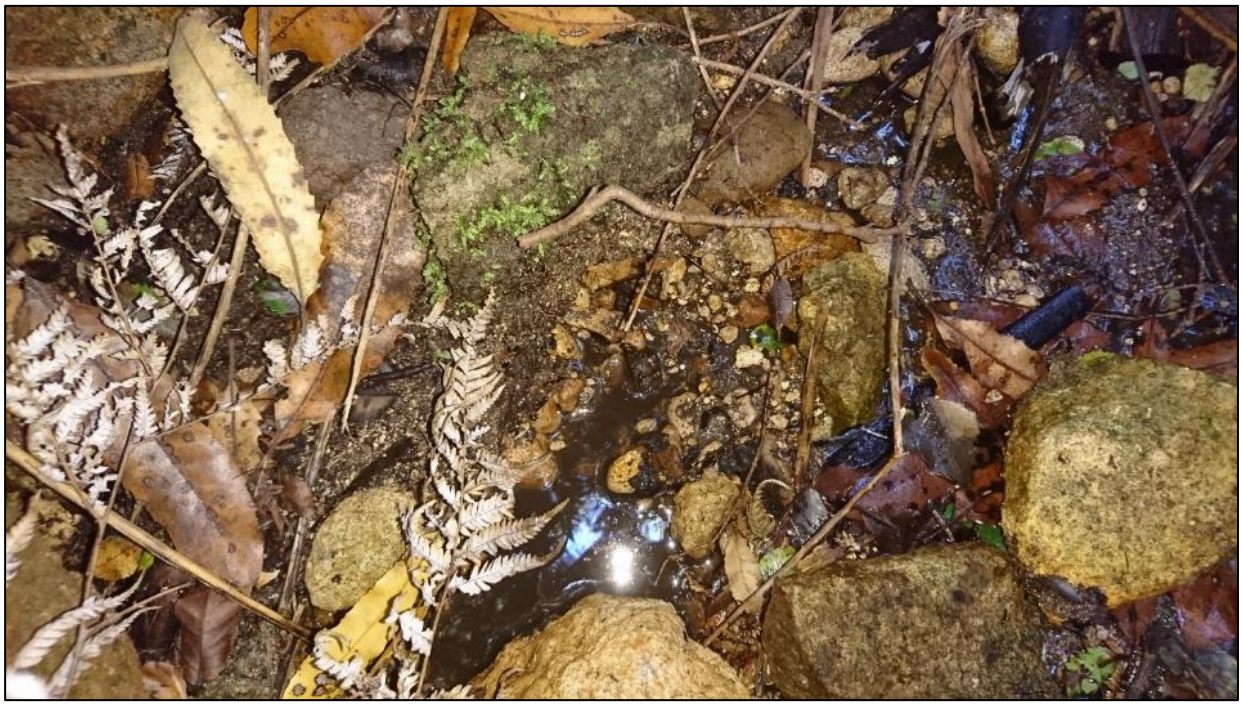

Figure 29. Example of stony instream potential Hochstetter's frog habitat within watercourse A, Waihi, 06/03/19.

4.3.1.2.2 Lizards

Potential lizard habitats within the overlap of the TSF3 footprint into the southern fragment of SNA 166 are associated with non-grazed areas within SNA 166 and three small (> 1 ha) non-SNA fragments of vegetation (Figure 23. Vegetation types of SNA 166, including ecological features identified from flora and fauna surveys 2012 and 2017-2020.). Rough grass around the edges of SNA 166 provides some ground cover for skinks as well as dense leaf litter further under canopy where light levels are lower. The structural complexity of potential lizard habitats below the canopy in SNA 166 is low, particularly the southern edges of the southern fragment, including within the proposed TSF3 footprint where stock breaches have compacted the ground below the canopy. Throughout, there are very few lying logs that typically provide retreats and an invertebrate food source, and this is likely a result of the young age of the vegetation.

The lizard surveys (ARs, pitfall traps, funnel traps) did not locate any native lizards within vegetation or ground cover within the proposed TSF3 footprint area. It is notable, however, that moko skinks were previously recorded (Bioresearches 2012) within the northern and southern fragments of SNA 166 in grass clearings. All four specimens identified in the 2012 surveys were recorded on the north-facing sides of both fragments, beyond the WNP area.

Moko skinks are considered to be open habitat specialists, occurring in grassland and vineland habitat. They are not forest dwelling species and this may explain why, despite a considerable sampling effort, the

only specimens recorded have been in open grassland at the northern boundaries of the two SNA 166 fragments or in a small rocky hillock pine / pasture edge area between the fragments.

Moko skink have a conservation status of 'At-Risk – Relict' (Hitchmough et al. 2021) and are therefore a moderate value species (Roper-Lindsay et al. 2018).

No lizard species were recorded within any forest interiors or at the south-facing southern edges of either of the two fragments of SNA 166, where the habitat quality was poor for these species.

Of note, the more widespread native lizard, copper skink, was not recorded in SNA 166 despite a high survey effort (Figure 4). This species would have been expected to be present within SNA 166, as it inhabits a wide range of habitats with dense ground cover from open scrub to shaded forest areas and was recorded in the wider landscape (Gladstone, Favona areas, **Error! Reference source not found.**). This species is also often sympatric with moko skink.

The tree fern dominated parts of SNA 166, within the area affected by proposed TSF3, may provide some habitat for arboreal geckos, such as forest gecko and pacific gecko, particularly where dense skirts provide good retreats. However, beyond these trees and with the exception of scattered pines, the habitat quality for arboreal lizards is poor due to the homogenous nature of the young rewarewa forest, which was typically small stature and spindly (Figure 23, Figure 26). The young canopy trees supported few epiphytes that could support refugia for arboreal species and the subcanopy was very sparse. This lack of structure provides little cover for arboreal lizards, such as geckos. Overall, the habitat quality within the proposed TSF3 footprint in SNA 166 is considered **low**.

No other lizards were recorded from the survey, including nocturnal VES. Overall, the values of the vegetation and potential habitats for native lizards within the proposed TSF3 area are **low**.

4.3.1.2.3 SNA 166 five-minute bird counts and targeted NZ pipit survey

The results and weather conditions for the 5MBC and NZ pipit surveys are summarised Appendix III.

Within the 5MBC plots, the avifauna consisted of 12 species, five native (three endemic) birds and seven introduced species were recorded. However, despite a greater diversity of introduced species, three of the most abundant species were native, being fantail, grey warbler and silvereye.

Species recorded during the targeted NZ pipit survey and the average number recorded from five-minute counts (n=3) are shown in Table 24 (E = endemic species; N = native species; the remainder are introduced). A total of 16 species was recorded – one endemic (grey warbler), five native and 10 introduced.

The avifauna was dominated by introduced species; those most abundant species were, in decreasing order, Australian magpie, starling, chaffinch and goldfinch, followed by eastern rosella. The average number of endemic/native species was 2.20 per count compared with 5.60 introduced species per count (chi-squared = 1.5; not significant) however a significantly higher average number of introduced

individuals (12.27 per count) were recorded compared with endemic/native individuals (1.26 per count); chi-squared = 8.9 : p<0.01; a significant difference.

No species of conservation concern were recorded, and only NZ pipit could potentially be present on a regular basis because of their recorded presence at the nearby TSF1A area. NZ pipit (and At-Risk NZ dotterel) can also be expected to utilise the proposed TSF3 at future stages of its development and operation. Pipits are considered likely to have benefitted from forest clearance for pasture, however, have subsequently declined with land-use intensification (Beauchamp, 2013). Under historic forest cover, this species would not have occurred within the Project area, as it would not have supported their open habitat requirements. It is known that pipits are present at lower frequencies in areas of heavily grazed pasture (such as what is present within the site) than in areas of rough pasture (Beauchamp, 2013), and consequently, much of the site would be considered to be of relatively low value for pipit, although they are known to utilise wetlands and have been recorded at the adjacent tailings storage facilities, which support other rare avifauna.

Following retirement of the WNP, TSF3 is likely to benefit native bird species, including NZ pipit and NZ dotterel, which are present at TSF1a and TSF2, and also other threatened and At-Risk bird species, such as NZ dabchick (threatened) and Australian coot (At Risk), which are resident and breeding at TSF2. Ongoing maturation of wetland vegetation may also support habitat for other rare species, including spotless crake (At Risk) and Australasian bittern (threatened- critical).

4.3.1.2.4 Bats

Large pine trees, pōhutukawa and tree ferns with dense skirts within the TSF3 footprint within the SNA 166 southern fragment may provide roost opportunities for long-tailed bats. However, surveys (December and January 2011, 2017, 2022, October 2024) at TSF3 have not recorded any long-tailed bats. Several recent passes at Gladstone pit (October 2024) have confirmed this species is present in the wider landscape, at least intermittently, and therefore their future presence around TSF3 cannot be discounted.

4.3.1.3 Ecological Value of SNA 166

The Hauraki District Plan and the supporting report (Kessels 2010) do not state which criteria were relied on to determine the significance classification of SNA 166. There is some speculation that it was related to an ecological contextual aspect, namely a network / stepping stone function, supporting species moving west-east from the DOC forests west of the site to the coastal forests east and not a representative, rarity or diversity aspect (Moko skink was not known at the site at that time). Other than its identification by Kessels (2010) as part of a desktop analysis, no ecological values assessment had previously been published on SNA 166.

Here, each of the four vegetation assemblage elements are assessed individually and then the combined feature is valued as a whole. This approach is considered appropriate as the proposed activity does not

affect the whole or even a large proportion of the SNA, nor every vegetation assemblage found within the SNA.

In terms of representativeness, the feature is compared with species lists of Druce (1974-1990) of the Kauaeranga valley (Thames) and of Boase and Beadel (1988) at Mount Te Aroha. These references provide a guide to good regenerating forest types over a range of landforms in the general area and are the only such lists identified in the literature for this review (Plant conservation network). Those references suggest that quality forest complexes have between 400 and 500 taxa, comprised of between 10 and 15 gymnosperms, 66 Dicotyledon trees, 5 monocot trees, 80-90 Dicotyledon shrubs, 60-90 ferns, 20-30 Orchids, 50 grasses, 40 composite and monocot herbs, and around 70 dicot herbs. These lists are extensive and produced by numerous experts and dedicated botanical society groups over time. A typical point in time assessment will not record these numbers of species but a good survey will approximate at least these numbers in the larger tree and shrub and fern taxa.

Each of: Treefern scrub, pine forest with rewarewa, rewarewa forest and kauri treeland are assessed against the EIANZ (2018) values guidance criteria: representativeness, rarity and distinctiveness, diversity and pattern and context.

4.3.1.3.1 Treefern scrub - approximately 15ha (26% of the southern fragment of SNA 166), generally central to the SNA but with a few patches east and west.

Representativeness.

The vegetation and habitats of this youngest regenerating seral community are depauperate of many of the typical seral community species expected of a natural regeneration process. As a result, a lower species richness is noticeable in part due to the fragment's isolation, but also the limited time since it was cleared and the encroachment of weeds. Structural elements are missing (no canopy species and few emergents); there is limited appropriate ground cover, limited epiphytes, and the current canopy is not intact. Despite being an early seral regeneration stage with limited diversity and structure, it is not dissimilar to nearby treefern-dominant seral systems, notably Ngatikoi Domain (SNA 165), which is a similarly isolated, seral fragment. However, given the array of species and structures expected, This area is assessed as of **low** representative value and note that it remains prone to dominance by encroaching pine into the future (without management).

Rarity and distinctiveness

No threatened, naturally uncommon or rare plant or bird species were recorded.

In 2012 two moko skink were identified at one location "within" this vegetation unit (in open grassland near the northern edge (Bioresearches 2012)). Because this species is an open environment, high sunlight, habitat specialist, its use of this vegetation type is restricted to such environments. Therefore, as the vegetation matures, it is possible that this species could be lost to the system, or become confined to the

outer edge of the SNA (possibly with management, because high survey effort did not record them there). Moko skink are a unique species, given that their populations, throughout their range are largely confined to islands along the northeast of the North Island. Because of this, their presence, within this vegetation type, is significant. Therefore, treefern scrub rates as **moderate** on the basis of this species being recorded (being an "At-Risk-relict" classification).

Diversity and Pattern

Being a simple early seral community in a modified landscape with restricted seed propagule potential, the diversity of species is limited. Also, the diversity of environmental gradients (hydrology, soils, slopes, etc) is relatively uniform and there do not appear to be any mosaics, patterns, or sub-units representing nuances in assemblages related to environmental gradients. The diversity and pattern is assessed as **low** value.

Ecological Context.

The size and shape of the central block of treefern scrub in the SNA 166 southern fragment is relatively large at nearly 20 ha and is more or less a solid shape. It has potential, if not for the young age and still evident tracks, to have a core habitat less affected by edge effects sometime in the future if it were to develop sufficiently well. That development is however in doubt with the current weed (including pine and Japanese honeysuckle) elements present and the lack of canopy species such as podocarps. Given its young age it has little resource or other functional role other than to support common native insectivorous avifauna (fantail, grey warbler, silvereye and to a much lesser degree, tui). Its primary value lies in the fact that it is central to the wider SNA 166 southern fragment and provides connectivity between the two rewarewa dominated vegetation, and generally the western and eastern ends of the SNA 166 southern fragment. Overall, the ecological context of the treefern scrub is conservatively considered to be **low**.

Conclusion

The area is large and of solid shape and has potential to be of greater value than it has currently, were it to continue to develop and gain a greater diversity of representative indigenous species, especially final canopy and further seral stage species. However, in the absence of management (pine and stock encroachment), it is unlikely to do so and therefore the various components of ecological value have been assessed as **moderate**, with two moderate ratings and the remainder low (moko skink having a rarity / distinctiveness ranking of moderate).

4.3.1.3.2 Kauri – dominant treeland – approximately 1 ha (0.02 % of the SNA).

This feature within SNA 166 is beyond the zone of influence and occurs entirely on private property.

Representativeness

This treeland has no ground tier (being grazed under), little middle tier, no lower canopy and limited epiphytic components. It is largely a small grove of kauri with some rewarewa on a northern hill slope and has around 10% of the expected species of a typical kauri forest. Its representativeness value is **low**.

Rarity and distinctiveness.

A kauri (High value species) dominated canopy in this landscape is a distinctive feature, although the species remains relatively common in the surrounding landscape, including naturally occurring specimens and in plantings. The Kauri dominant treeland is assessed as **High** for rarity and distinctiveness.

Diversity and pattern

In the absence of the supporting lower tiers and in general other indigenous species the kauri stand is of **low** value in terms of this criterion.

Ecological context.

This 1 ha, small adjunct to the larger SNA 166 southern fragment, is grazed underneath and this is likely to reduce its ability to influence succession within the SNA, as the stock fence line disconnects its dripline from the wider SNA. No kauri seedlings or saplings were recorded around kauri trees, or in adjacent, fenced areas of the SNA. Therefore, this small (40-50 trees) edge apparently has limited connectivity or wider networking function. With appropriate management, it has potential to be an important locally representative example of the historic condition. Its contextual value is currently **low**.

Conclusion

With one high ranking and the rest low or lower, the ecological value of the kauri-dominant treeland unit within the southern fragment of SNA 166 is considered to be **moderate** and is not affected by the project.

4.3.1.3.3 Pine forest with rewarewa - approximately 25 ha (44% of the SNA 166 southern fragment)

This remnant of a plantation pine forest includes areas which have not been harvested and areas where wilding pine has become the dominant canopy. Pine is variably dominant within the canopy and generally dominates in the west and eastern portions and across the northern half of the southern SNA 166 fragment.

Representativeness.

Even where there is some rewarewa scrub, the pine is dominant and typically the only emergent and canopy species. The rewarewa / tōwai remains in scrub form. Under the denser pine, pine needles dominate the

ground and as a result a diminished array of native plant species persist. The ground tier, middle tier, lower canopy and canopy do not represent an indigenous forest or even a seral stage to such a forest. The representativeness is potentially what could be expected of this age of scrub, regenerating from pasture and under pine influence. Representativeness is considered to be **low**.

Rarity and distinctiveness

There are no rare species or distinguishing features of this unit. It is considered to be of **very low** ecological value.

Diversity and pattern

The pine areas are generally on the drier tops and ridge lines and upper slopes and there is little in the way of environmental gradation or other pattern causing aspects. The species diversity is very limited compared to an expected native forest. The ranking for this element is considered **very low.**

Ecological context

Similar to the treefern unit the principal value of the pine unit is its size and the fact that it stretches across the rewarewa units and provides a vegetated connection between them, improving faunal species movement throughout the wider SNA 166 southern fragment. The pine forest itself may provide some resource elements required by the local fauna, such as cavity or other roosting, however such trees are abundant throughout the landscape and indigenous cavity roosting fauna are limited (ruru, kingfisher). The contextual value is considered **low** and accounts for its connectivity function.

Conclusion

The sum of the values results in a **negligible** value outcome which is reasonable especially given that this community also restricts the future indigenous recovery of the SNA 166 southern fragment.

4.3.1.3.4 Rewarewa forest – 17.5 ha (31% of the SNA 166 southern fragment)

This is the most indigenous dominant community of the SNA 166 southern fragment. There are two main areas and a third smaller area. The three areas are separated by pine forest or by the treefern scrub. The largest area is in a north-east - north-west running gully on the south-east edge of the SNA fragment, and the other two smaller units are in the south and western end.

Representativeness.

The plot data (Appendix 2) suggests that this pole rewarewa/ tōwai forest can be considered an early seral indigenous community as it progresses towards having a broadleaf canopy (rewarewa). There is no

evidence of indigenous podocarp regeneration or of the diversity of broadleaf species to be expected in a natural regeneration of this age and advancement at this site (e.g. tītoki, tawa, hīnau, pōkākā (*Elaeocarpus hookerianus*)). It has a limited array of shrubs, ferns, grasses and herbs and very little in the way of epiphytic flora. It represents the recovery from a highly modified largely pasture vegetation type with limited sources of limited indigenous early seral species. As such and given it is somewhat typical of similar examples of limited farmland regeneration (and not overly similar to a natural process of seral community in a forest disturbance site). This community is conservatively as of **moderate** representativeness.

Rarity and distinctiveness

No rare species have been recorded and no distinctive species or features have been recorded. Again, the single pōhutukawa tree, or the kānuka present are not considered to trigger the "Threatened" threshold. The single kauri tree (very high value), as with the pōhutukawa, would have been lone specimens prior to the regeneration of indigenous species around it (as these species occur throughout the wider landscape). This vegetation type is assessed as **low** with respect to this criterion.

Diversity and pattern

Species richness is low relative to an expected regenerating broadleaf forest, indeed in total 35 taxa were recorded where it is reasonable to expect over 100. The faunal component also appears to be limited, with no lizards or frogs recorded, and the bird (and likely invertebrate) communities are restricted to common simple habitat species. There are no notable ecological patterns related to environmental gradients, other than the ridge and foot of the hillside, and indeed the vegetation community is relatively homogenous. This vegetation type is assessed as **low** for this criterion.

Ecological context

The rewarewa forest unit is somewhat fragmented, but the larger area is buffered by the topography of a gully system, although it remains somewhat narrow (200 m). Alone it has only minimal connectivity and network functioning and has no special resources or habitat quality important to fauna, migratory or resident species. At flowering the rewarewa flowers may be a temporary locally important seasonal resource for tūī and perhaps bellbird (although none were detected). Tūī appeared to be uncommon on site (few recorded from survey or observed from visits) and there are much greater nectar resources in the surrounding landscape. The integrity of this habitat is still low, with weeds and a poor resilience to future disturbance and pine invasion. The community is buffered to the north and generally buffered to the east and west, but open to the south to farming effects and edge effects. The contribution to the wider landscape is minimal. The contextual value of the rewarewa/tōwai units is assessed as **low**.

Conclusion

With one moderate ranking and the rest low or lower the overall ecological value of the rewarewa units is **low**.

4.3.1.4 Summary of unit ecological values assessment for SNA 166 (southern fragment)

In summary, the ecological values of the components of SNA 166 (southern fragment) are generally low to negligible, with an exception being a projection of kauri on the northern side of the fragment, beyond the zone of influence (Table 10).

4.3.1.5 The SNA 166 southern fragment as a whole

SNA 166 is a mosaic of three main vegetation types (excluding a northern projection of predominantly, grazed-under, kauri trees). The three vegetation types are rewarewa dominant (31%), treefern dominant (26%) and pine dominant (44%). These vegetation types are described as components in Section 4.3.1.3 and their overall ecological value (sum of parts) is summarised and assessed in Section 4.3.1.4 and Table 10 (revised below). Note that the SNA 166 is assessed as moderate value overall, as the sum of parts, including its mosaic of three regenerating broadleaved vegetation types and overall size, are greater than any individual component.

Representativeness

The recorded flora and fauna diversity (four vegetation plots and walk-throughs) comprised predominantly common species that are typical of regenerating systems. Most major flora groups are present that would be expected (gymnosperms, angiosperms, grasses, orchids, epiphytes, shrubs, herbs), and fauna assemblages (invertebrates, reptiles, birds). Most of the expected indigenous avifauna feeding guilds are present (nectivores, insectivores, frugivores, predators), although frugivory is largely represented by silvereye (*Zosterops lateralis*) only, which while more a generalist consumer than a frugivore, does play a role in dispersal of seeds of very small fruits such as small shrubs and conifers. However, a range of typical and expected fauna and flora species (which would be expected to be detected given the survey effort) were not recorded, including kererū, bellbird, copper skink, kōwhai, tōtara.

Dominance of indigenous species is patchy throughout. Nearly 50% of the vegetation cover is pine dominant, and where other components are mostly indigenous in composition (tree fern, rewarewa), pine is emerging through these areas as well. Similarly, exotic gorse and barberry are present throughout all vegetation types, weed species that are relics of the rough pasture from which this seral vegetation regenerated.

Typical structural tiers are generally limited, with canopy and subcanopy generally represented by a single vegetated cover of treeferns, rewarewa, tōwai and / or pine- although this may be a factor of the vegetation being still relatively young. **Representativeness is considered moderate overall.**

Rarity / distinctiveness

Rare and distinctive species within SNA 166 (southern fragment) are represented by the kauri stand, which sits on a northern projection on private land, and At Risk (relict) moko skink. The conservation of these features should be considered a priority and their presence raises the value of the site.

Moko skinks (moderate value, Roper-Lindsay et al. 2018) are a particularly unique feature in the Waihi landscape, in that populations of this species are almost entirely confined to islands off the north-east coast of the North Island. Therefore, populations on the mainland, within their natural range, are rare. This species was recorded from two observations at one location on the northern side of the southern fragment- consistent with other north facing habitats where they have been identified in the wider landscape.

The presence of kānuka and mānuka are not considered to trigger rarity or distinctiveness values, and similarly neither is the relict pōhutukawa tree. The projection of kauri trees (very High value species) on the northern side of the southern fragment is a distinctive feature, although the species remains relatively common in the surrounding landscape, including both naturally occurring specimens and throughout plantings. While neither of these features is considered to occur within the zone of influence, their presence raises the **rarity / distinctiveness of the SNA to High**.

Diversity and Pattern

In terms of diversity, the SNA flora is compared with species lists of Druce (1974-1990) of the Kauaeronga valley (Thames) and of Boase and Beadel (1988) at Mount Te Aroha. These references provide the guide to good regenerating forest types over a range of landforms in the general area and are the only such lists located in the literature (Plant conservation network). Those references suggest that quality forest complexes have between 400 and 500 taxa, comprised of between 10 and 15 gymnosperms, 71 angiosperm trees, 80-90 Dicotyledon shrubs, 60-90 ferns, 20-30 Orchids, 50 grasses, 40 composite and monocot herbs, and around 70 dicot herbs.

Among the native vascular plant species assemblages recorded within SNA 166 (southern fragment), two gymnosperms, nine angiosperms, eight shrubs and 13 ferns were recorded from four vegetation plots and walk-throughs. While the species observed are typical of regenerating systems, they represent substantially lower diversity than other regenerating broadleaved systems in the Hauraki- Coromandel area.

Being a simple, early seral community in a modified landscape with restricted seed propagule potential, the low diversity of species (flora and fauna) is influenced by its young age and relative isolation from other larger or more diverse forest fragments. For example, forest bird species, including tomtit (*Petroica macrocephala*), whitehead (*Mohoua albicilla*) and North Island robin (*Petroica longipes*) could be expected to be present here if the forest fragment was larger, or better connected to larger areas of forest, where these species have been recorded to the north, west and south of SNA 166. Other species that are expected but were not recorded, include kererū and bellbird, both of which may be habitat-limited by food availability, underpinned by a limited diversity of mature flora.

The dominant existing indigenous mature flora (rewarewa, tōwai and treefern) are all wind-dispersed seed producers and the flowering resource of these species to nectivores (bellbird and tūī) are limited to spring and summer. Apparently absent (but probably infrequent visitors) kererū, are an important seed disperser via frugivory and such food resources within SNA 166 (southern fragment), including the foliage on which kererū consume (e.g. kōwhai) are particularly limited or also absent. **Diversity and Pattern is considered low.**

Ecological Context

The southern fragment is a relatively large area of mixed native and exotic vegetation within the surrounding landscape, within which it probably provides some connectivity for common native flora and fauna. While its size and isolation are likely to be limiting its current diversity to some extent (e.g avifauna and flora diversity are low), it is likely to play an important role in maintaining biodiversity within the wider landscape, at least as a stepping stone for common species within a network of other nearby natural areas (SNA 166 northern fragment, Union Hill, Ngatoki Domain). At present, the fragment is unmanaged, subject to frequent stock breaches, and supports a refuge for wilding pines, which dominate nearly half of the fragment. These pines compromise the ecological integrity of the fragment, where their value is largely in providing a vegetated habitat connection, for common avifauna, between otherwise disconnect areas of indigenous treefern and rewarewa. These 'wildling conifers' are likely to continue to spread throughout SNA 166, and potentially into unmanaged areas of the surrounding landscape, if the SNA remains as is. Wildling pines are recognised as a pest by the Department of Conservation, as they reduce biodiversity, can cause acidification of soils and consume more water (Department of Conservation website). As a result, overall **ecological context is considered moderate**.

Table 8. Summary ecological value of vegetation and habitat components of SNA 166 as being of moderate overall value (Southern Fragment).

Assessment matters	Tree fern scrub (26%)	Kauri treeland (0.02%)	Pine forest (44%)	Rewarewa forest (31%)	Overall value
Representativeness	Low	Low	Very Low	Moderate	**Moderate**
Rarity / Distinctiveness	Moderate	High	Very Low	Low	**High**
Diversity & Pattern	Low	Low	Very Low	Low	**Low**
Ecological Context	Low	Low	Low	Low	**Moderate**
Overall value	**Low**	**Moderate**	**Negligible**	**Low**	**Moderate**

4.3.2 Other non-SNA vegetation

Three fragments of vegetation occur to the south of (beyond) the SNA 166 southern fragment (east of the existing TSF). These are described as the 'western block', the 'eastern block' and the 'southern block' (Figure 22) and are described below.

4.3.2.1 Western Fragment

The western block (Figure 25) is approximately 1.2 ha in size, and lies around 50 m west of SNA 166 (southern fragment). It is unfenced and parts (where not too steep) are grazed by stock.

The canopy is often discontinuous, dominated by rewarewa and tall pole *Alsophila cunninghamii*, however pōhutukawa are a distinctive feature of this fragment, and are present throughout, and include some large, mature trees. The pōhutukawa were checked for signs of myrtle rust, and none were found at the time of assessment.

The subcanopy includes silver fern and mamaku. The understory comprises rangiora, prickly mingimingi, several *Coprosma* species (*C. robusta, C. areolata, C. rhamnoides*), mapou and an abundance of tōwai. In steep rocky areas, epiphytic-associated ferns (*Asplenium flaccidum*, *A. polyodon, Microsorum scandens, Zealandia. pustulata*) and the coastally-associated *Astelia banksii* are dominant.

Barberry, Japanese honeysuckle, and gorse are present, particularly around the edges.

As with SNA 166, the flora and fauna diversity comprise predominantly common species that are typical of regenerating systems. Most major flora groups are present that would be expected (angiosperms, grasses, orchids, epiphytes, shrubs, herbs, where stock access is restricted), and fauna assemblages are consistent with SNA166 (nectivores, insectivores, frugivores, predators), with few tūī, and bellbird, kererū not being recorded.

As with SNA 166, the vegetation within the western block would have historically been WF12 kauri, podocarp, broadleaved forest (Singers & Rogers, 2014, (there are a few isolated, relict kauri trees beyond this fragment in the surrounding farmland landscape)) however it is lacking many characteristic flora of this forest type (tōtara, rimu, kauri), and there is no evidence of any podocarps regenerating within this small fragment.

Aerial imagery from 1982 (Figure 7) indicates that the vegetation within the western block is at least as old as the most mature parts of SNA 166.

Regenerating scrub on the western and eastern blocks (Figure 22) to the southeast of SNA 166 support some boulder deposits which enhance habitat complexity and potential habitat values for ground dwelling lizards. The north-facing edges of these blocks may provide greater basking opportunities where there are higher light levels and boulder deposits. No surveys were undertaken to sample for lizards.

4.3.2.1.1 Ecological value and significance of vegetation within Western Fragment

<u>Representativeness</u>

The vegetation within the Western Fragment has low species richness and is generally a relatively young, regenerating area of native and exotic vegetation that supports some older trees, around which the younger vegetation is regenerating (Figure 28). The ground cover is grazed where it is not too steep for cattle, and canopy varies between a few sprawling pōhutukawa, some rewarewa and tree ferns. As with

SNA 166, this fragment has been degraded by grazing and edge effects, and has low species richness. The representativeness of the fragment is assessed as **low**.

Rarity and distinctiveness

No rare species were recorded and (as with other areas) the myrtle-elevated species (pōhutukawa, kānuka, mānuka). The pōhutukawa are a distinctive feature of this fragment, with respect to the adjacent SNA166, and comprise some sprawling, mature specimens. Pōhutukawa remain common throughout its range, however, therefore this assessment concludes a **low** score for rarity and distinctiveness.

Diversity and pattern

As noted above, there is a low species richness and a low diversity in general of species and structures. There are some small gradients related to slope and hydrology but little evidence of vegetation assemblage responses to those gradients and therefore minimal evidence of patterns in the fragment. By and large the level of modification, ecological simplicity, age and high weed incursion result in the diversity and pattern of the fragment to be **low**.

Ecological Context

The feature is small (1 ha) and rather elongated (220 m long and 50 m wide and is largely all edge habitat). While it is close to the southern edge of the southern fragment of SNA 166 it does not facilitate species movement between good habitats or hold any important habitat resource not present in the larger SNA 166. The contextual value is assessed as **low**.

Conclusion

In the absence of values greater than low associated with representativeness, diversity and pattern, ecological context, distinctiveness or rarity, the western fragment is considered to be of **low** value and not ecologically significant.

Figure 30. 'Western Fragment'

4.3.2.2 Eastern Fragment

The Eastern Fragment is approximately 0.9 ha and is unfenced. It comprises early regenerating ponga gully-type vegetation. The canopy is low (c. 2 m – 3 m) and is almost entirely a *S. medullaris* monoculture in the central region, excepting isolated māhoe and pockets of kānuka around the outer edges. Gorse is moderately common around the perimeter, but is replaced by common native understorey plants such as mingimingi and *Coprosma rhamnoides* and patches of the fern *Histiopteris incisa*. This fragment is grazed underneath.

The ecosystem best fits the classification of a tree fern variant of '*VS5 – Broadleaved species scrub/forest*' (Singers & Rogers, 2014). This ecosystem is driven primarily by large scale historic disturbance, and as such is an abundant ecosystem type within the Waihi ED.

4.3.2.2.1 Ecological value and significance

The Eastern Fragment is considered to have low value. It is smaller than the Western Fragment, has a very simple species assemblage and lacks large tree species typical of a future forest type. This fragment has very low representativeness, and lacks the flora and fauna expected of a natural early seral system. Without any other "special" value, it is judged to have no more than **low** ecological value and is not a significant area of vegetation of habitat of indigenous fauna.

4.3.2.3 Southern Planted Fragment

A small (0.3 ha) elongated (100 m) strip of planted vegetation is fenced and lies south of the SNA 166 southern fragment, at the foot of TSF1A. It will be within the TSF3 footprint. This fragment is planted (Figure 31) with karo, kōhūhū, tōtara, karamu, kānuka, and a border of flax around the edges.

The plants are very healthy and weed prevalence is low. The fragment is small and isolated, and the planted species are a very small sample of those found within a naturally occurring, regenerating ecosystem. For these reasons this small planted fragment has not been formally assessed in detail botanically (note that lizard surveys have been conducted within it), however the feature is not considered to have more than a **low** value (currently) and is not "significant" in terms of section 6(c) of the RMA.

Figure 31. Southern Planted Fragment within TSF3 footprint (2017).

5 ASSESSMENT OF ECOLOGICAL EFFECTS

At each of the three proposed works areas, a range of surface feature clearance and earthworks are required which will remove all surface vegetation / habitat in the ZOI and may include other indirect potential effects related to disturbance, including dust, noise, vibration and edge creation. This assessment provides for a site-specific assessment of direct effects of vegetation and potential habitat removal. A general description of noise and vibration effects is provided with regard to lizard, birds and bat habitat values, with further site specific discussion for each location also provided.

A total of 25.7 ha of low to moderate value vegetation and habitats would be removed to provide for Gladstone Open Pit (6.5 ha vegetation and habitats), Northern Rock Stack (9.1 ha vegetation and habitats) and Tailings Storage Facility 3 (10.1 ha vegetation and habitats). Of this, 10.2 ha is naturally occurring mixed native and exotic vegetation, 9.4 ha is indigenous plantings and 6.1 ha is exotic plantation (pine).

A total of 8.3 ha of this vegetation and habitat (which includes 0.1 ha of open ground) is formally protected where it occurs within SNA 166 at TSF3. The remaining areas of vegetation are predominantly planted (native and exotic) and have no formal protection.

5.1 Noise and Vibration

Noise and vibration activities will be generated from regular truck movements within and around the new pit, rocks stack and tailings facility construction areas. In addition, intermittent blasting associated with two borrow areas (at NRS and TSF3), and GOP is expected to consist of a maximum of three blast events over a two-week period is anticipated, when blasting is required, with no more than two blasts in one week. A single blast is expected to last a few seconds, during daylight hours (between the hours of 10am and 3pm). Blasting and associated vibrations at the proposed borrow pits will be consistent with those at the proposed GOP. Descriptions of the potential effects of these activities on fauna in adjacent habitats is described further here.

Bats

Bat activity was recorded at GOP only, and the low-level activity recorded indicates that bats fly through the area intermittently. Bats are nocturnal, and are generally active outside mine operation hours, therefore any potential effects on bats would be expected to arise where bats are roosting in an adjacent area during the day, when the mine is operational. It is uncertain whether blasting or other similar noise or associated vibration would harm or cause bats to abandon a roost during the day and no research could be found that would suggest this would occur. However, survey results do not indicate that there is any roost habitat within WNP and it is expected that the small pine plantation associated with bat activity in 2024 would be harvested prior to construction of the pit. Further, bats are a highly mobile

species and will move from their day roosts every 1-2 days, potentially travelling several km to new roosts over very large home ranges. Therefore, it is considered that any such disturbance as a result of blasting, in the event that a bat(s) is roosting nearby at the time a blast occurs, would be a highly unlikely occurrence. Therefore, while a low-level magnitude could be expected on a very high value species or resource, such an event is considered highly unlikely. It is acknowledged that a low-level effect on a very high value results in a moderate magnitude (Table 10 of Roper-Lindsay 2018), this assessment considers that an overall level of effect of noise from traffic and blasting would be **low** (if at all).

Avifauna

Noise and vibration effects on avifauna in habitats adjacent to the WNP (GOP, NRS and TSF3) would involve intermittent blasting (three blasts per fortnight, maximum two blasts per week, each blast a few seconds duration), increased vehicle movements, and localised to active areas of the WNP. These effects have not been well studied in relation to New Zealand avifauna, however birds are highly vocal and noise associated with traffic and blasting is likely to be disruptive to communication and potentially also their ability to detect prey. International studies indicate that birds do soon habituate to regular disturbance, particularly continuous, steady noise (Harbrow et al., 2011). Within the WNP area, avifauna diversity includes nine common native and 16 introduced species, and all are typically present within highly modified urban and rural landscapes within continuous noise environments such as along as alongside motorways, active quarry sites and other similar human-modified environments. No 'Threatened' or 'At-Risk' species were recorded (beyond those associated with the existing tailings facility, and which are exposed to existing baseline traffic noises). Potential effects of noise and vibration on native birds in adjacent habitats of GOP, NRS and TSF3 area may result in some indirect effects to avifauna, which is expected to be of a relatively low, but potentially moderate magnitude within the surrounding landscape. An overall **low** level of effect is anticipated as a result of low-moderate magnitude of effect on low value avifauna.

Lizards

Impacts on lizards from noise and vibration are uncertain, however geckos and skinks occur in habitat edges of other active quarry sites, (e.g. Brookby, Hunua and Drury quarries) and alongside high traffic-volume traffic areas of Auckland State Highway 1. Lizards are considered likely to habituate to regular noise, and are often recorded in edge habitat alongside high vehicle traffic and other continuous anthropogenic noise environments, including parks, reserves in urban environments. An overall **low** level of effect on native lizards within habitats adjacent to GOP, NRS and TSF3 is expected from an overall low magnitude of effect on high value native lizards.

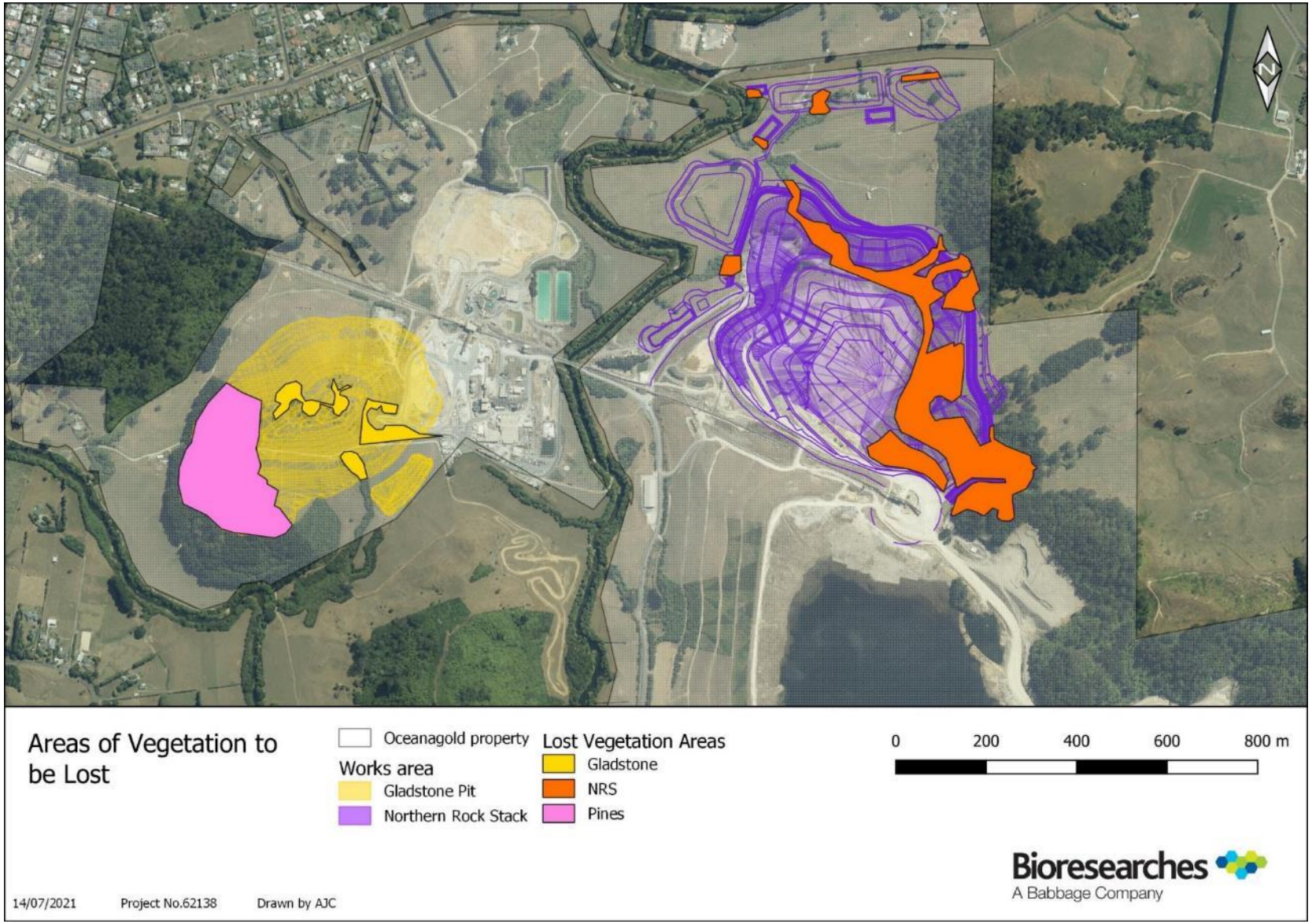

Figure 32. Areas of vegetation that would be removed within the WNP: GOP and NRS.

5.2 Gladstone Open Pit

The GOP and associated stockpile are situated over an area that currently comprises a processing area, farmland and pine plantation in between two large (22 + ha) areas of indigenous vegetation at Union Hill (adjacent, north) and Ngatikoi Domain (200 m south). The stockpile avoids a watercourse and associated planted riparian vegetation. Approximately 0.65 ha of the corner of a planted block would be removed for a stockpile, and these activities avoid potentially higher value vegetation and habitats associated with a wetland immediately south. The larger area of naturally occurring vegetation and habitats at Union Hill (25 ha, supports copper skink) are also avoided. A small area of the rocky hilltop will be affected which has a small number of native species and some lizard habitat (0.5 ha).

5.2.1 Direct effects

The construction of GOP and stockpile would involve permanent removal of approximately 1.4 ha of moderate value planted and remnant (rocky hilltop) indigenous vegetation and habitat (including for 'At Risk' copper skink), and 5.1 ha of low value pine plantation (Figure 11). This equates to less than 5% of the available local regenerating native vegetation and habitats within the Waihi ED and removes only a small part of the previously voluntarily revegetated area. In terms of the EIANZ guidance, this represents a minor shift from baseline character and quantum, and a low overall magnitude of effect. A low magnitude effect to a moderate value resource results in a **low** level of adverse effect. Such levels of effect do not typically require any mitigation or offset, although mitigation for 'At Risk' copper skinks by way of capture, relocation and associated habitat enhancement via a lizard management plan is recommended as a minimum, and would be required under the Wildlife Act (1953).

The pine plantation currently forms part of a rotational harvest pattern and would ultimately be felled once it reaches harvestable age. Under normal patterns, this area would then be replanted with pines for future harvest, however under WNP, the ecological value of the pine block (**negligible**) is expected to be permanently lost.

Threatened fauna, including bats and native frogs have either not been detected within the proposed footprint and are not considered to be present (frogs), or present on any regular basis (bats at GOP). However, despite some 246 valid survey nights at the Gladstone Pit and nearby Union Hill area over 2017, 2022 and 2024 (and a further 766 survey nights across the surrounding Waihi North Project area over the same period of time), only five (recent) bat passes have been recorded and their future presence within the GOP (or wider) project area cannot be discounted because bat flight paths may change over time. Because long-tailed bats are a threatened species, the removal of vegetation that supports an active roost would be a significant (high to very high level) adverse effect, depending on whether the vegetation supports single or multiple individuals. The very low likelihood of this occurrence would be reduced to minor by way of undertaking preclearance surveys for bats from October 1 to April 31, as per DOC guidelines, and employing tree-felling protocols for bats where 'high risk' trees are identified by a suitably

qualified bat expert. Where loss of a bat roost is confirmed, a bat management plan, prepared by a suitably qualified bat expert, would additionally detail measures to compensate for any loss with provision and placement of artificial roost boxes, as per DOC artificial bat roost advisory note (DOC-6734955).

A suite of common native birds would be expected to lose a low magnitude of nesting, roosting and foraging habitat, as well as the eggs and unfledged chicks of common native birds, which have a lower likelihood of escape during vegetation removal. Non-volant eggs and chicks would likely be destroyed if unmanaged. Given their protection under the Wildlife Act 1953, mitigation actions to minimise death or injury should be included in the management of the vegetation clearance. Such management could include avoidance of vegetation removal during the main bird breeding season (where practicable) or that vegetation removal be preceded by nesting surveys to confirm that any nesting native birds have fledged.

Effects on Native lizards (At Risk species)

'High Value' copper skinks occur within native plantings, pine forest edges and the rocky outcrop at the proposed Gladstone Pit. This species is still relatively common throughout its range in the upper North Island and was relatively easy to detect from plantings, the rocky outcrop, pine edge, the eastern end of Union Hill and at the Favona wetland. However, it was not recorded elsewhere within and surrounding the Project area, and lizards are not as mobile as flighted birds. Therefore, the loss of known habitats of this species is likely to represent a higher magnitude of effect than when compared to potential habitats in the surrounding landscape, or other fauna.

Table 9 identifies the extent of identified copper skink habitat within the proposed Gladstone Pit. Overall, some 6.5 ha of copper skink habitat would be removed, from approximately 38.7 ha. For copper skink, a species of high ecological value, the level of effect is considered **high**.

Table 9. Expected effect of direct loss of known habitat of copper skink at Gladstone Pit (value of habitat: high).

Habitat type	Permanent habitat removal	Identified habitat extent at Gladstone and surrounds	Proportion habitat lost within Gladstone	Magnitude	Level
Indigenous (incl planting)	1.4	29.4*	5%	Low	Low
Pine plantation	5.1	9.3	55%	High	Very High
Total	**6.5**	**38.7**	**17%**	**Moderate**	**High**

* area includes 25 ha of mixed vegetation at Union Hill, within which copper skinks were detected.

Lizard management typically comprises capture and relocation to suitable habitat, however with some uncertainty as to the success of such actions on individual lizards, management should additionally involve restoration and enhancement and protection of habitat for the species. Given that this species readily inhabits rough grass, and the detection of this species at the distal end of planted vegetation less than 10 years old, a high level of confidence in successful establishment of habitat for this species is expected.

5.2.2 Indirect effects

Potential indirect effects associated with degradation of surrounding vegetation and habitats by way of noise (traffic and blasting), dust and vibration disturbance are minor on the basis that such vegetation and habitats are relatively young plantings that generally support low value (common native birds) or disturbance-tolerant (copper skinks) fauna. Copper skinks are typically common in northern North Island urban environments, including roadside grasses and scrub (and refer Section 5.1 for a fuller discussion).

Some reduction in habitat availability to local, common native fauna that currently use the vegetation for foraging, roosting or potentially nesting, causing some level of displacement into surrounding habitats may occur but given the scale relative to the remaining resource in the immediate vicinity (Union Hill, Ngatikoi Domain) this effect is considered to be minor. Given the generally poor habitat quality and low value fauna that may use these habitats, a negligible magnitude of effect of such displacement is considered (with the low value) to result in a **very low** level of adverse effect.

Potential construction and operations related noise and vibrations or dust effects on adjacent vegetation and habitats are considered to be low level effects, given the variously low value vegetation and planted terrestrial habitats.

5.2.3 Recommendations

In regard to the pine trees, given that long-tailed bats have very large home ranges, have been recorded less than 10 km from WNP, and have a conservation status of 'Nationally Critical' (O'Donnell et al. 2023), bat surveys should be repeated prior to removal of pine trees over 15 cm DBH. While repeated surveys through the WNP area have not recorded bats and they are unlikely to be using the area currently, their flight paths may change over time and therefore preclearance surveys for bats should be undertaken from October 1 to April 31, as per DOC guidelines, and as a precautionary management measure, where vegetation removal involves large trees, including pines. If bats are detected, DOC guidelines will inform the pathway forward.

The affected fauna comprises both common species with low ecological value, as well as High value 'At Risk' copper skinks' (Roper-Lindsay et al. 2018). Despite the fact that felling of the pine forest as part of commercial forestry operations is a permitted activity in the Rural Zone under the District Plan, such species have legal protection under the Wildlife Act 1953 and therefore measures should be undertaken to avoid and minimise adverse effects on them. Such measures should include careful timing of vegetation removal to avoid the main bird breeding season, and implementation of a lizard management plan that details capture, habitat enhancement and relocation of potentially present native lizards.

5.3 Northern Rock Stack

The NRS will provide for the expansion of an area that currently provides rock storage to the immediate north of the existing TSFs. The area of expansion encompasses an area of young (> 20 years) planted

vegetation to the north of the TSFs. The NRS avoids higher value SNA 166 vegetation further east and has also deliberately avoided occupying a valley immediately south of the northern fragment, where 'At-Risk' moko skink habitat may be affected alongside a block of pine dominated vegetation (Figure 18).

5.3.1 Direct effects

The proposed NRS would require removal of approximately 8.1 ha of moderate value planted native vegetation and approximately 1 ha of negligible value pine-dominated vegetation (Figure 12). The total area of the NRS development is approximately 28 ha meaning vegetation to be removed occupies approximately one third of the total NRS footprint. The 8-9 ha of planted vegetation represents around 10% of the local habitat present (the two SNA 166 fragments and various small riparian and pine forest patches). This is considered to be a low magnitude effect (given not only the size but the age and diversity of the plantings) – a noticeable shift from the pre-development base but one that will not have a more than minor effect on faunal populations. This magnitude of effect is best described as low. A low magnitude on a moderate value ecological resource results in **a low** level of adverse effect.

The most prominent effect is the reduction in partial connectivity between the northern and southern fragments of SNA 166. This area, while not continuous, does provide some level of connection between the two SNA 166 fragments. There is no evidence to support the need for this vegetation connection for species movement between the fragments, and given the suite of common bird species present and surrounding vegetation corridors and stepping stones, the maintenance of this connection is not a requirement and its loss will not affect the movements of any local bird populations.

Common native fauna that may be within the vegetation at the time of removal would be affected by injury or mortality. Affected fauna may include the eggs and unfledged chicks of common native birds, which have a lower likelihood of escape during vegetation removal and would likely be destroyed if unmanaged.

As with Gladstone Open Pit, threatened fauna, including bats and native frogs have not been detected within the proposed footprint and are not considered to be present, even on an intermittent basis. However, despite some 199 valid survey nights at the Northern Rock Stack and adjacent SNA 166 (northern fragment) over 2011, 2017 and 2022 (and a further 626 survey nights across the surrounding Waihi North Project area over the same period of time), the vegetation and habitats (potentially pine area) are within 10 km of long-tailed bat records and therefore the future presence of bats cannot be discounted, given that bat flight paths may change over time. Because long-tailed bats are a threatened species, the removal of vegetation that supports an active roost would be a significant (high to very high level) adverse effect, depending on whether the vegetation supports single or multiple individuals. The very low likelihood of this occurrence would be reduced to minor by way of undertaking preclearance surveys for bats from October 1 to April 31, as per DOC guidelines (DOC, 2024), and employing tree-felling protocols for bats where 'high risk' trees are identified by a suitably qualified bat expert. Where loss of a bat roost is confirmed, a bat management plan, prepared by a suitably qualified bat expert, would

additionally detail measures to compensate for any loss with provision and placement of artificial roost boxes, as per DOC artificial bat roost advisory note (DOC-6734955).

Effects on native lizards (At Risk species)

While not recorded from 640 artificial lizard retreat inspections within NRS vegetation, native lizards (copper and / or moko skinks) still have potential to be present within NRS plantings. Native and established plantings within NRS are contiguous with identified moko skink habitat on the northern side of the northern fragment of SNA 166, and copper skink may also be present in pine or plantings at less than detectable, very low abundance. However, targeted surveys within potential habitats of NRS have not recorded either species, despite their being recorded from similar (or less) survey effort in the surrounding landscape. Therefore, the value of the vegetation and potential habitats to native lizards is considered **low**.

Table 10 identifies the extent of potential, low value habitat within the proposed NRS. Overall, some 9.1 ha of mostly planted native vegetation would be removed, from approximately 71.1 ha of contiguous vegetation and available habitats in the immediate area, including both the northern fragment and 48.7 ha of the southern fragment of SNA 166. The lizard values within the proposed NRS footprint are currently assessed as low, and moderate magnitude of effect would be anticipated, being that the post development character (planted vegetation that partially connects and buffers SNA 166) would be partially changed. The overall level of this effect on low-value lizard habitat is considered **low**. This effect would be minimised however, through precautionary lizard survey and relocation prior to and during removal of potential habitats, and in accordance with a lizard management plan that details a suitable enhance relocation area with provision for habitat restoration where necessary.

Table 10. Expected effect of direct loss of known habitat of native lizards at NRS (value of habitat: low)

Habitat type	Permanent potential habitat removal	Identified potential habitat extent at NRS and surrounds	Proportion habitat lost within NRS	Magnitude	Level
Indigenous (incl planting)	8.1	71.1*	11.4.%	Moderate	Low
Pine plantation	1	2.55	39%	Moderate	Low
Total	**9.1**	**73.65**	**12.4%**	**Moderate**	**Low**

* area includes northern fragment, SNA166 and 48.7 ha of southern fragment, SNA 166 within which moko skink were detected.

5.3.2 Indirect effects

Potential indirect effects associated with degradation of surrounding terrestrial vegetation and habitats are minor on the basis that such vegetation and habitats are relatively young plantings that support low

value fauna (common native birds). The western side of SNA 166 would retain areas of plantings where they occur against SNA vegetation.

5.3.2.1 Noise, and vibration

A general discussion of noise and vibration on fauna is presented in Section 5.1. This discussion addresses higher value avifauna present at TSF1a and TSF2, which support habitats adjacent to the NRS and are approximately 300 m to 1 km south of the proposed borrow site, noting that the far side of TSF2 is approximately 900 m. Avifauna using the naturalised environments at the existing TSF2 include aquatic species, which predominantly occur on the water (Threatened weweia / New Zealand dabchick and pāpango / New Zealand scaup) and species that occupy terrestrial environments around the water edges (Threatened northern New Zealand dotterel, and At-Risk New Zealand pipit, Australian coot). A single At Risk black shag was observed foraging at TSF2. This species nests in colonies and the tailings facility is not considered to support breeding habitat for this species.

Large numbers of both weweia and pāpango occupy the TSF2 waterbody. Both are specialist diving species and have been observed diving in response to fright or predator avoidance (e.g. harrier hawks flying over). These species would be expected to respond similarly to infrequent but regular blasting. Dabchicks are highly territorial, and would not be expected to abandon breeding territories. New Zealand dotterel and pipit have generally been observed occupying terrestrial habitats alongside the tailing's facilities over 1 km away from the NRS borrow area and are not expected to be significantly disturbed by infrequent blasting. Further NZ dotterel frequently breed at highly modified and disturbed environments, such as alongside motorways and airport runways. Similarly, the closest habitats at TSF2 are over 1 km away from TSF3 borrow areas and therefore blasting or traffic noise is not considered likely to have a significant adverse effect on these species.

Overall, while the avifauna values at the existing tailings facilities are high to very high, the level of effect on these species is considered to be low to very low, on the basis that blasting would be infrequent, and generally at distances of between 300- 1000 m from occupied habitats.

Table 11. Summary of Avifauna values at TSF2 and TSF1a, and indirect effects of noise

Species	Value	Magnitude of effect and explanation	Level of effect
NZ Dabchick	Very High	Negligible - disturbance response well understood, highly territorial to breeding ponds and abandonment highly unlikely, as evidenced from other monitoring studies of their use of artificial ponds (e.g. Bioresearches 2023a & 2023b).	Low
NZ scaup	Low	Low - magnitude less understood than dabchicks, but less territorial, similar disturbance response.	Very Low

Black shag	High	Low- one individual observed, highly mobile, no breeding habitat within WNP.	Low
NZ dotterel	Very High	Negligible- > 900 m from blasting, will breed in highly disturbed environments	Low
NZ pipit	High	Negligible- > 900 m from blasting, will breed in highly disturbed environments, very large area of surrounding open habitats available	Very Low
Overall level of effect			**Low-Very Low**

5.3.2.2 Fragmentation

Some low-level habitat fragmentation and isolation may occur for lizards (if present) and birds as a result of loss and reduction of available habitat (8.1 ha planted native, 1 ha pine) and by reducing the ability for common fauna to disperse across the landscape for food, shelter, and breeding purposes. Some of this vegetation currently provides partial connectivity between the northern and southern fragments of SNA 166, however it currently provides limited connectivity value for highly mobile fauna such as birds and the open areas (cattle grazed) already present a barrier for lizard dispersal.

Some reduction in habitat availability to local, common native fauna that currently use the vegetation for foraging, roosting or potentially nesting, could cause some level of displacement into surrounding habitats. Given the availability of similar adjacent habitat and the generally poor habitat quality and low value fauna that may use the affected areas of planted vegetation, the effect of such displacement is considered minor. Potential construction and operations related noise and vibrations or dust effects on adjacent vegetation and habitats are considered to be low level effects, given the variously low value vegetation and planted terrestrial habitats and highly mobile nature of the common native and exotic bird species which occur throughout the surrounding landscape.

5.3.3 Recommendations

Threatened or At-Risk fauna, including bats and native frogs are not considered to be present, even on an intermittent basis, at present. However, given that long-tailed bats have very large home ranges, and while repeated surveys throughout the WNP area have not recorded bats and they are unlikely to be using the area currently, their flight paths may change over time and therefore preclearance surveys for bats from October 1 to April 31, as per DOC guidelines, should be undertaken as a precautionary management

measure, where the mature pine vegetation is removed. If bats are detected, DOC guidelines will inform the pathway forward (monitoring by a competent bat professional until bats leave the roost).

While the potentially affected fauna are nationally and locally common species with low ecological value (Roper-Lindsay et al. 2018), such species have legal protection under the Wildlife Act 1953 and measures should be undertaken to avoid and minimise adverse effects on them. Such measures should include careful timing of vegetation removal to avoid the main bird breeding season, and implementation of a lizard management plan that details capture, habitat enhancement and relocation of potentially present native lizards.

While the loss of this vegetation is a **very low** level of effect, and does not require mitigation, the effect could further be reduced to temporary if a similar amount is replanted, attached to the planting nearby. The speed of succession in the remaining revegetation could also be enhanced by enrichment planting of final canopy species.

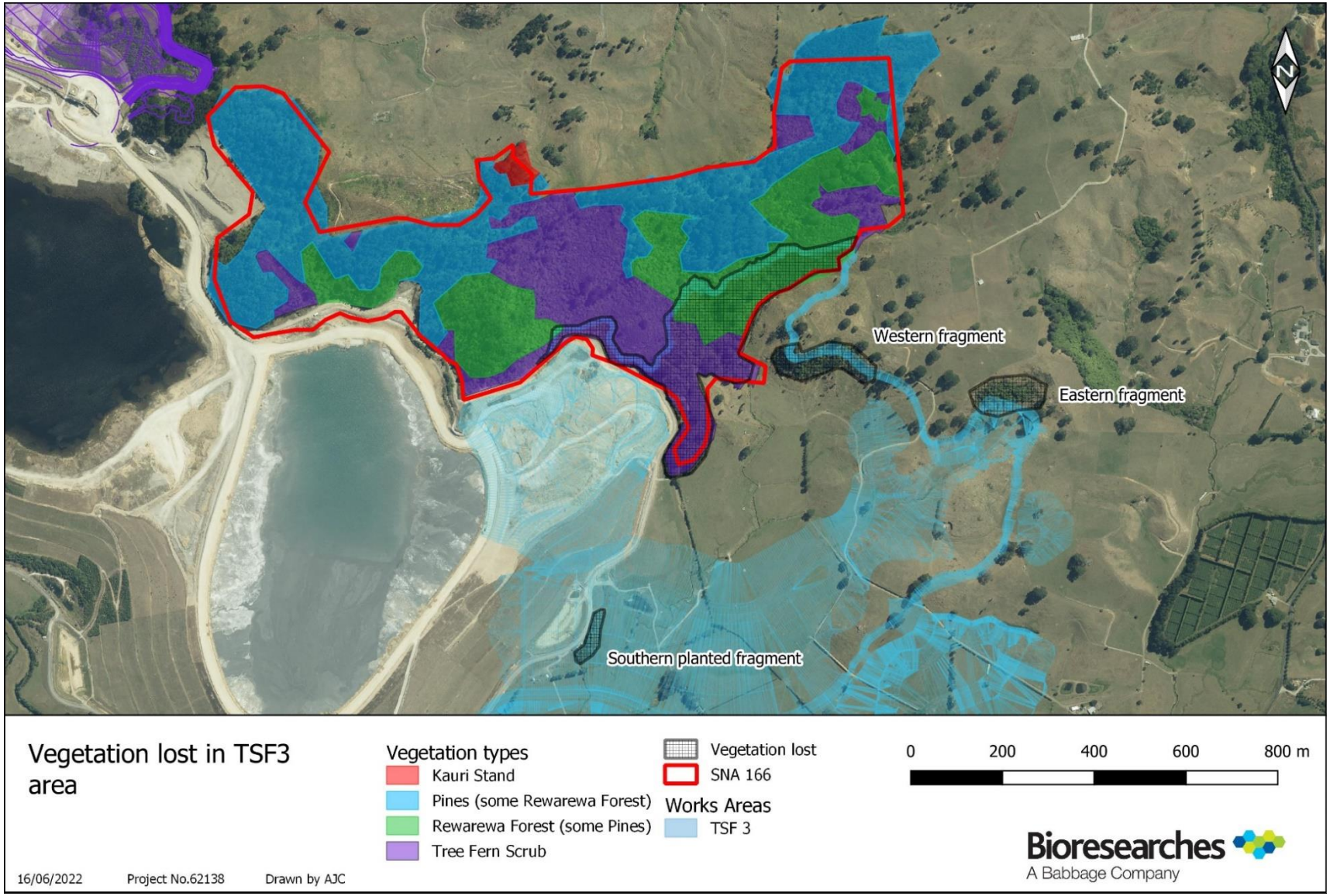

Figure 33. Areas of vegetation that would be removed within WNP: TSF3

5.4 Tailings Storage Facility 3

The establishment of TSF3 would permanently remove an 8.3 ha area of **moderate** value rewarewa / treefern forest within the southern SNA 166 fragment. This represents 14.5% of the southern fragment, including approximately 30 % (4.6 ha) of the treefern and 21% (3.6 ha) of the rewarewa forest within the fragment. Beyond the SNA, some 1.8 ha of **low** value vegetation / habitat from three smaller fragments would also be permanently removed. Low to very low-level indirect effects on fauna are expected as a result of noise and vibration effects (5.1 and 5.3.2.1).

5.4.1 Direct Effects

The affected area avoids the main key elements of the SNA including moko skink habitat and a kauri stand, both on the northern side of the southern fragment. Approximately 3.6 ha of SNA rewarewa forest, and 4.6 ha of SNA treefern scrub (both low value regenerating vegetation), 1.2 ha of low value mixed scrub and pōhutukawa (non-SNA western fragment), 0.4 ha of low value treefern scrub (non-SNA Eastern Fragment) and 0.3 ha low value non-SNA planted vegetation would be removed for construction of the proposed TSF3.

There is around 15 ha of treefern scrub and 17 ha of rewarewa scrub in the southern SNA 166 fragment. At a local level this equates to a **moderate** magnitude of effect to the rewarewa scrub (a loss of a moderate proportion of the unit, but little difference in composition or character with the loss of the most developed of this unit type in the SNA) and a **moderate** magnitude of effect for the treefern scrub with a loss of a fair proportion of the unit, but little difference in composition, character, or attributes of the unit.

Accepting the overall moderate value of SNA 166 as a whole (despite the effect avoiding the features that qualify its significant status), a moderate magnitude of effect results in an overall **moderate** level of effect, being the permanent removal of 8.3 ha of low value vegetation and habitats (includes 0.1 ha of bare ground) from the 57 ha southern fragment.

The proposed removal comprises predominantly edge components of the southern side, including approximately 3 ha (36%) of which include a narrow projection to the south, thus ensuring the overall rectangular shape is maintained post works.

These adverse effects should be managed in accordance with the effects management hierarchy, as set out in the NPSIB. This process requires that more than minor adverse effects that cannot be avoided, minimised or remedied, be offset or compensated for. The explanation and requirements of a biodiversity offset are detailed in the Ecology and Landscape Management Plan.

Tthe complete loss of the western, eastern and southern fragments adjacent to the SNA is assessed as a low magnitude given their character and attributes remain well represented by the remaining SNA 166 features and the wider landscape, although the small fragments themselves are totally removed. In all cases this results in a **very low** level of effect.

Common native fauna that may be within the vegetation at the time of removal would be affected by injury or mortality. Affected fauna may include the eggs and unfledged chicks of common native birds, which have a lower likelihood of escape during vegetation removal and would likely be destroyed if unmanaged. While not recorded, native copper skinks may be present because they are locally common in the surrounding landscape.

NZ pipit (and At-Risk NZ dotterel, Figure 34) could also be expected to utilise the proposed TSF3 at various stages of its development. If anything, the outcome of the establishment of TSF3 could be positive for these 'At-Risk' bird species.

Figure 34. New Zealand dotterel at existing Waihi tailings area

Effects on native lizards (At Risk species)

The affected vegetation and potential habitat feature within SNA 166 are contiguous with a moko skink record on the northern side of the fragment, beyond the project footprint. Moko skink typically inhabit high light-level edge scrub and open environments, and are less likely to be present beneath a vegetated canopy, between the record and the proposed TSF3. This species is present on the northern side of SNA 166, and other north-facing vegetated edges beyond the project. There is some low potential for this species, or copper skink, which similarly inhabit dense ground cover edge habitats, to be present, however substantial survey effort within the southern and central parts of the southern fragment (SNA 166) and nearby fragments have not recorded them.

Table 13 identifies the extent of potential, low value habitat within the proposed TSF3. Overall, some 10.1 ha of native vegetation would be removed, from approximately 58.8 ha of low value potential habitats in the immediate area, and within which native lizards have not been recorded. Overall, a moderate

magnitude of effect would be anticipated, being that a moderate proportion of the available potential habitats would be removed, and therefore the overall level of effect is expected to be **low**.

This **low level effect** would be minimised however, through precautionary lizard survey and relocation prior to and during removal of potential habitats, and in accordance with a lizard management plan that details a suitable enhance relocation area with provision for habitat restoration where necessary.

Table 11. Expected effect of direct loss of known habitat of native lizards at TSF3 (value of habitat: low). * area covers SNA166 southern fragment only.

Habitat type	Permanent potential habitat removal	Identified potential habitat extent at TSF3 and surrounds	Proportion habitat lost within TSF3	Magnitude	Level
SNA 166	8.3	57*	14.5	Moderate	Low
Isolated fragments	1.8	1.8	100%	Very High	Moderate
Total	**10.1**	**58.8**	**17.2%**	**Moderate**	**Low**

5.4.2 Indirect Effects

Potential indirect effects are associated with degradation of surrounding vegetation and habitats. These effects would generally be minor beyond SNA 166 where vegetation values are generally much lower (and refer Section 5.1 for a fuller discussion).

Some reduction in habitat availability to local, common native fauna that currently use the vegetation for foraging, roosting or potentially nesting, could cause some low-level of displacement into surrounding habitats.

5.4.2.1 Edge effects

Approximately 1.15 km of new edge, some 100 m inside of the existing edge, would be created along the retained area of the SNA at TSF3 as a result of removal of the affected vegetation. At least half of this new edge would be where existing seral mamaku-dominant vegetation occurs, and half is through young rewarewa dominant vegetation. All of these areas are currently or were recently subject to high light levels and weed presence. For example, weed species, such as barberry, gorse and pampas are still present through mamaku-dominant (treefern scrub) areas, and evidence of barberry being shaded out within areas of rewarewa forest is present in both rewarewa plots.

In addition, large blocks of pine north of the TSF3 footprint and above the TSF1A footprint are inhibiting natural regeneration and limiting rewarewa-dominant forest at the western and north-eastern end of the TSF3 footprints. This pine reduces the potential value of the native forest in these areas. These factors lead to a consideration of the magnitude of the effect of the new edges to be no more than low. Therefore, the potential edge effects on vegetation values of a low magnitude edge effect (where values are low in the rewarewa and low in the native scrub) are **very low**.

5.4.2.2 Noise, dust and blasting

The Project will involve noise generated from vehicle movements and blasting at borrow sites. A Borrow area is indicated at the eastern side of TSF3, within its existing footprint. Noise generated by intermittent blasting and more regular truck movements within and around the TSF3, may have a low to very low level degradation effect on the habitats of birds and may cause some disturbance to avifauna that use adjacent habitats (refer sections 5.1 and 5.3.2.1). Such adjacent habitats include the retained, southern fragment of SNA 166, and common native birds that forage, roost and potentially, nest there.

The avifauna present at TSF1A generally use bare ground habitats on the embankment, and include breeding black backed gulls and New Zealand dotterel.

Once construction of TSF3 has been completed, noise is expected to be negligible, and high value habitats that have established at TSF2, which support a diversity of indigenous wetland birds, including threatened and At-Risk species, are expected to expand to TSF1A and, later, TSF3.

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5.4.3 Summary

The permanent removal of 8.3 ha of seral tree fern, rewarewa-dominant vegetation and bare ground from the 57 ha southern fragment of SNA 166, including, one kauri, would reduce the SNA 166 southern fragment to 82% of the current extent. The removal would not result in the loss of the key elements of botanical or known fauna value of the wider SNA 166. Rather, it would represent a minor shift away from current conditions given that all of these species occur elsewhere in SNA 166, and two of the species that would be affected are represented by relic individuals. It would not exacerbate the edge effects by producing a narrower area, although it would relocate any edge effects to the newly located edge. The newly created edge would likely become more susceptible to weed invasion, however this could easily be managed through buffer planting and weed management. No effects would be anticipated on the current pine wilding spread. The new edges are not a significant issue (and can be mitigated) given the early seral nature of most of the feature.

Therefore, considered as a whole, the proposed construction of TSF3 would represent a moderate magnitude effect on moderate value SNA, and results in an overall **moderate** level of effect. This level of effect considers that the fauna protected by the Wildlife Act 1953 is managed such that mortality and harm is avoided through time of works / clearance and salvage.

5.4.4 Recommendations

While the potentially affected fauna are nationally and locally common species with low ecological value (Roper-Lindsay et al. 2018), such species have legal protection under the Wildlife Act 1953 and measures should be undertaken to avoid and minimise adverse effects on them. Such measures should include careful timing of vegetation removal to avoid the main bird breeding season, and implementation of a

lizard management plan that details capture, habitat enhancement and relocation of native lizards that are potentially present.

The loss of 8.3 ha of vegetation is a moderate level of effect and under the EIANZ (2018) guidance requires mitigation (Roper-Lindsay et al. 2018). The SNA would be reduced in size and the vegetation removal would represent a net biodiversity loss to an area identified as significant. OGNZL have indicated their desire to ensure there is a net biodiversity gain as a result of loss of significant (greater than low) level effects of the project and therefore, it is recommended that such losses be offset, over and above other mitigation actions (fauna, edge buffer planting). As a minimum, offset calculations should be based on the 8.3 ha of SNA 166 proposed for removal for the TSF3 component of the project.

5.5 Air Quality Effects on Flora and Fauna

Potential discharges to air from the WNP include dust from surface sources, by-products of combustion from vehicles, and dust from excavation and the ongoing operation of the mine. Full details of activities and predicted air discharges are provided in the Assessment of Effects of Discharges to Air report ('Air Assessment', Beca, 2025. The main area of concern for ecological values is the generation of dust from both construction activities and the ongoing mine operation. Excessive dust can interfere with plant photosynthesis, affecting both growth and food sources for fauna, and may affect fauna habitat, if present in high enough quantities.

The Air Assessment concludes that there is a short-term moderate to high risk of dust, adversely affecting properties within approximately 100m of the works during dry, windy conditions. Based on this, there is a moderate to high risk of dust affecting vegetation and habitats within 100m of works areas. The risk for the remainder of the area is considered to be low.

The magnitude of effect of dust on flora and fauna is considered to be negligible, providing mitigation measures set out in the Air Assessment are followed. To date, no damage to adjacent vegetation has been reported from existing mine activities as a result of air quality concerns. Dust generation is not expected to increase as a result of the WNP operation, however locations of generation will change as the development proceeds. The ecological values of areas within 100m of works range from negligible to moderate, therefore the overall level of effect from dust generation is considered to be **low**.

6 ASSESSMENT OF EFFECTS SUMMARY

A summary of the effects of the WNP is set out in Table 15. Overall, the components of the WNP assessed here would require the removal of approximately 25.7 ha of vegetation and habitats, of which 9.4 ha is voluntarily planted natives and 6.1 ha is pine plantation. Naturally occurring native vegetation includes 8.3 ha (including some open ground) of SNA 166 and 2 ha of smaller, unprotected fragments.

Terrestrial ecological values within the footprint of the WNP components assessed here are generally no higher than low, and are associated with young (15-20 years old), planted or natural but low-diversity regenerating vegetation.

Some areas of planted vegetation provide buffer and connectivity functions, and habitat for planted kauri trees, localised copper skinks (At Risk, Hitchmough et al. 2021) and common native birds.

Naturally occurring vegetation at the TSF3 site is of low value where it comprises part of the southern fragment of moderate value SNA 166. The SNA represents a large fragment of young, predominantly native vegetation that supports 'At Risk' kauri, albeit represented by a single individual within the affected area. Smaller fragments to the east of SNA 166, within TSF3 are naturally regenerating and have low value, although the western block also supports pōhutukawa trees.

The main values of planted areas associated with the proposed GOP and NRS are determined in part by ecological context whereby some of those areas provide buffer services to other ecological values, such as freshwater systems, or where they support 'High Value' copper skinks. The planted mixtures at GOP and NRS are selected species compositions and it is noted that kauri trees, which typically occur on dry ridges, have also been planted into Favona wetland, north of GOP where all are either in very poor health, or have died. This indicates that the plant mixtures are not all representative of natural patterns of diversity or ecosystem types.

Under an overall net gain approach, such as that proposed by OGNZL for effects greater than low level, efforts to address moderate to low-level adverse effects are considered necessary, irrespective of the habitats and species values and the generally low levels of effects as a result of the Project. While removal of planted vegetation within WNP at GOP and NRS is considered both a permitted activity and generally a low level of effect, OGNZL has indicated its intention to mitigate for the loss of this, and other non-SNA and not-protected vegetation through replacement. Other actions that would be undertaken to manage and mitigate the loss of biodiversity include buffer and offset planting, fauna management and habitat enhancement, and are detailed in an Ecology and Landscape Management Plan (Bioresearches 2025). Therefore, the loss of all naturally occurring vegetation within the WNP, whether it is protected (SNA) or not, would be balanced by actions (including revegetation, pest and weed control) implemented in accordance with a biodiversity offset that achieves a Net Biodiversity Gain, where those effects are moderate or greater. These actions are consistent with the RPS, towards achieving no net loss of indigenous biodiversity, re-creation and restoration of habitats and habitat connectivity throughout the surrounding landscape.

Indigenous biodiversity losses would be mitigated and offset (Bioresearches, 2025, so that the full suite of ecosystem types and their extents, and life supporting capacity will either be maintained or enhanced by the WNP, as per Policy 11.1 of the RPS, and Objective 2 Section 6.2.3 and Objective 5.2.2 of the Hauraki District Plan. The values that prescribe SNA 166 as significant will be enhanced by the mitigation works through revegetation, pest and weed control as per Policy 11.2 and Method 11.2.2 of the RPS. Effects on ambient air quality present a very low threat to the health of flora and fauna as per Objective 3 (section 6.1) of the Waikato Regional Plan.

7 SIGNIFICANCE ASSESSMENT AGAINST WAIKATO REGIONAL POLICY STATEMENT

An assessment of the significance of naturally occurring and planted vegetation and habitats within the Waihi North Project (GOP, NRS, TSF3) are provided here, against the Waikato Regional Policy Statement (RPS) criteria for determining significance of indigenous biodiversity (Part B, Chapter 11A). Overall, the significance of these areas of vegetation and habitats is mostly determined by the presence of 'At Risk' or 'Threatened' lizard and plant species.

7.1 Gladstone Open Pit

The vegetation and habitats at Gladstone Open Pit (the planted vegetation, pine plantation and 14-year old restoration area, and an isolated rocky outcrop) trigger significant habitat status on the basis of criterion 3, whereby they support copper skink which has recently been classified as 'At Risk' (Hitchmough et al. 2021).

Table 12. Assessment of Gladstone Pit vegetation and habitats against RPS (Part B, Chapter 11A)

	Regional Policy Statement Criteria (Chapter 11A, Table 11-1)	Assessment
1	It is indigenous vegetation or habitat for indigenous fauna that is currently, or is recommended to be, set aside by statute or covenant or by the Nature Heritage Fund, or Ngā Whenua Rāhui committees, or the Queen Elizabeth the Second National Trust Board of Directors, specifically for the protection of biodiversity, and meets at least one of criteria 3-11.	**Not significant**- Not currently or recommended to be set aside by statute or covenant specifically for the protection of biodiversity.
2	In the Coastal Marine Area, it is indigenous vegetation or habitat for indigenous fauna that has reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened.	**Not significant**- Not in the Coastal Marine Area.
3	It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • classed as threatened or at risk, or • endemic to the Waikato region, or • at the limit of their natural range.	**Significant** •Planted and naturally occurring vegetation supports 'At Risk' copper skinks.
4	It is indigenous vegetation, habitat or ecosystem type that is under-represented (20% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	**Not significant**- Not significant. Vegetation is largely planted and / or exotic.
5	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, chenier plain, or karst ecosystems, hydrothermal vents or cold seeps.	**Not significant**- ecosystem types are exotic and / or planted, or regenerating
6	It is wetland habitat for indigenous plant communities and/or indigenous fauna communities (excluding exotic rush/pasture communities) that has not been created and subsequently maintained for or in connection with: • waste treatment; • wastewater renovation; • hydro-electric power lakes (excluding Lake Taupō);	**Not significant**- Not wetland habitat.

	• water storage for irrigation; or • water supply storage; unless in those instances they meet the criteria in Whaley et al. (1995).	
7	It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type. Note this criterion is not intended to select the largest example only in the Waikato region of any habitat type.	**Not significant**- - ecosystem types are small areas of exotic and / or planted, or regenerating vegetation
8	It is aquatic habitat (excluding artificial water bodies, except for those created for the maintenance and enhancement of biodiversity or as mitigation as part of a consented activity) that is within a stream, river, lake, groundwater system, wetland, intertidal mudflat or estuary, or any other part of the coastal marine area and their margins, that is critical to the self-sustainability of an indigenous species within a catchment of the Waikato region, or within the coastal marine area. In this context "critical" means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas and migratory and dispersal pathways of an indigenous species. This includes areas that maintain connectivity between habitats.	**Not significant**- areas concern terrestrial vegetation
9	It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because: • Its structure, composition, and ecological processes are largely intact; and • If protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment disturbance), can maintain its ecological sustainability over time.	**Not significant**- vegetation is comprised of plantings or modified seral scrub with very low diversity throughout- it is not an exceptional, representative example of any recognised ecosystem type.
10	It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato region or an ecological district, or is an exceptional, representative example of its type.	**Not significant**- plantings do not provide or support any uncommon sequences or are exceptional, representative examples.
11	It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under criteria 1-10 from external adverse effects.	**Not significant**- plantings are not naturally occurring and have not been required as mitigation.

7.2 Northern Rock Stack

The vegetation and habitat at NRS (the planted vegetation) trigger significant habitat status on the basis of criterion 3, whereby they contain Kauri trees, classified as 'At Risk - Declining' (de Lange et al, 2024).

Table 13. Assessment of NRS vegetation and habitats against RPS (Part B, Chapter 11A)

	Regional Policy Statement Criteria (Chapter 11A, Table 11-1)	Assessment
1	It is indigenous vegetation or habitat for indigenous fauna that is currently, or is recommended to be, set aside by statute or covenant or by the Nature Heritage Fund, or Ngā Whenua Rāhui committees, or the Queen Elizabeth the Second National Trust Board of Directors, specifically for the protection of biodiversity, and meets at least one of criteria 3-11.	**Not significant-** Not currently or recommended to be set aside by statute or covenant specifically for the protection of biodiversity.
2	In the Coastal Marine Area, it is indigenous vegetation or habitat for indigenous fauna that has reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened.	**Not significant**- Not in the Coastal Marine Area.
3	It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • classed as threatened or at risk, or • endemic to the Waikato region, or • at the limit of their natural range.	**Significant** – Planted kauri trees present within are classified as 'At Risk - Declining' (de Lange et al, 2024).
4	It is indigenous vegetation, habitat or ecosystem type that is under-represented (20% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	**Not significant**- Not significant. Vegetation is planted and / or exotic.
5	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, chenier plain, or karst ecosystems, hydrothermal vents or cold seeps.	**Not significant**- ecosystem types are exotic and / or planted.
6	It is wetland habitat for indigenous plant communities and/or indigenous fauna communities (excluding exotic rush/pasture communities) that has not been created and subsequently maintained for or in connection with: • waste treatment; • wastewater renovation; • hydro-electric power lakes (excluding Lake Taupō); • water storage for irrigation; or • water supply storage; unless in those instances they meet the criteria in Whaley et al. (1995).	**Not significant**- Not wetland habitat.
7	It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type. Note this criterion is not intended to select the largest example only in the Waikato region of any habitat type.	**Not significant**- - ecosystem types are small areas of exotic and / or planted, or regenerating vegetation
8	It is aquatic habitat (excluding artificial water bodies, except for those created for the maintenance and enhancement of biodiversity or as mitigation as part of a consented activity) that is within a stream, river, lake, groundwater system, wetland, intertidal mudflat or estuary, or any other part of the coastal marine area and their margins, that is critical to the self-sustainability of an indigenous species within a catchment of the Waikato region, or within the coastal marine area. In this context "critical" means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas and migratory and dispersal pathways of an indigenous species. This includes areas that maintain connectivity between habitats.	**Not significant**- areas concern terrestrial vegetation (Refer Boffa Miskell 2022)

9	It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because: • Its structure, composition, and ecological processes are largely intact; and • If protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment disturbance), can maintain its ecological sustainability over time.	**Not significant**- vegetation is comprised of plantings with very low diversity throughout- it is not an exceptional, representative example of any recognised ecosystem type.
10	It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato region or an ecological district, or is an exceptional, representative example of its type.	**Not significant-** plantings do not provide or support any uncommon sequences or are exceptional, representative examples.
11	It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under criteria 1-10 from external adverse effects.	**Not significant**- plantings are not naturally occurring and have not been required as mitigation.

7.3 Tailings Storage Facility

7.3.1 SNA 166

The 'At-Risk' species within SNA 166 are moko skink (*Oligosoma moco*) and kauri trees (*Agathis australis*).

Moko skinks were recorded from north-facing, localised edges of SNA 166 and a location between the two fragments that comprise this SNA. Moko skink have not been recorded within TSF3. A single kauri tree was recorded within TSF3 at SNA166.

Table 14. Assessment of SNA 166 against criteria for determining significance of indigenous biodiversity in accordance with the Waikato Regional Policy Statement (criteria 1-11, Chapter 11A (table 11-1)).

	Regional Policy Statement Criteria (Chapter 11A, Table 11-1)	Assessment
1	It is indigenous vegetation or habitat for indigenous fauna that is currently, or is recommended to be, set aside by statute or covenant or by the Nature Heritage Fund, or Ngā Whenua Rāhui committees, or the Queen Elizabeth the Second National Trust Board of Directors, specifically for the protection of biodiversity, and meets at least one of criteria 3-11.	**Not significant**- Not currently or recommended to be set aside by statute or covenant specifically for the protection of biodiversity.
2	In the Coastal Marine Area, it is indigenous vegetation or habitat for indigenous fauna that has reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened.	**Not significant**- Not in the Coastal Marine Area.
3	It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • classed as threatened or at risk, or • endemic to the Waikato region, or • at the limit of their natural range.	**Significant** •SNA supports 'At Risk' moko skinks, localised at two edge sites, rather than within the SNA as a whole. •A stand of kauri ('At Risk' – Declining) occurs on a projection of the northern side of the southern fragment. Entirely grazed beneath this. All significant values are outside the footprint
4	It is indigenous vegetation, habitat or ecosystem type that is under-represented (20% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	**Not significant**- Threatened Environment Classification for vegetation cover is categorised as >30% left, >20% protected.
5	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, chenier plain, or karst ecosystems, hydrothermal vents or cold seeps.	**Not significant**- ecosystem type is common, regenerating with very low indigenous biodiversity
6	It is wetland habitat for indigenous plant communities and/or indigenous fauna communities (excluding exotic rush/pasture communities) that has not been created and subsequently maintained for or in connection with: • waste treatment; • wastewater renovation; • hydro-electric power lakes (excluding Lake Taupō); • water storage for irrigation; or • water supply storage; unless in those instances they meet the criteria in Whaley et al. (1995).	**Not significant**- Not wetland habitat.
7	It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type. Note this criterion is not intended to select the largest example only in the Waikato region of any habitat type.	**Not significant**- Area of vegetation is not large with respect to other indigenous vegetation in the Waikato Region. Potentially large in the Waihi ED (although not compared to the southern portion of the Coromandel Forest Park within the ED) but does not contain almost all indigenous species typical of that habitat type.
8	It is aquatic habitat (excluding artificial water bodies, except for those created for the maintenance and enhancement of biodiversity or as mitigation as part of a consented activity) that is within a stream, river, lake, groundwater system, wetland, intertidal mudflat or estuary, or any other part of the coastal marine area and their margins, that is critical to the self-sustainability of an indigenous species within a catchment of the Waikato region, or within the coastal marine area. In this context "critical" means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas and migratory and dispersal pathways of an indigenous species. This includes areas that maintain connectivity between habitats.	**Not significant**- The SNA is listed in the relevant statutory planning documents as a terrestrial ecosystem, as opposed to being an aquatic habitat.
9	It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because: • Its structure, composition, and ecological processes are largely intact; and • If protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment disturbance), can maintain its ecological sustainability over time.	**Not significant** • Vegetation is modified seral scrub with very low diversity throughout- it is not an exceptional, representative example of regenerating broadleaved scrub or kauri podocarp forest, which would have historically occurred at the site. •The plant and fauna diversity is low compared to other naturally regenerating ecosystems (though a localised stand of kauri and two location records of moko skink are distinctive features). •Forest lacks some structural components (forest tiers) due to young age (30-40 years old) and very low diversity. Most notably, while there are trees present at canopy, sub-canopy, understorey and seedling levels, these are generally all dominated by rewarewa, towai and tree ferns and a distinct 'canopy' and 'subcanopy' are not distinguishable. An emergent tree layer is represented by pines throughout. The understorey is generally sparse to open with high light levels throughout, particularly where pine trees are present. •Most of the SNA is fenced from stock, with some breaches on the southern side. Natural regeneration is occurring as evidenced by seedlings throughout and is therefore likely to be ecologically sustainable in the long term. However, given the low diversity and isolation, this fragment would probably rely on external seed source, such as via bird dispersal, for biodiversity to increase.
10	It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato region or an ecological district, or is an exceptional, representative example of its type.	**Not significant**- Vegetation is young and regenerating and represents seral scrub with very low diversity throughout- therefore there is no ecological sequence. Vegetation is not an exceptional, representative example of regenerating broadleaved scrub or kauri podocarp forest
11	It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under criteria 1-10 from external adverse effects.	**Not significant**- While identified as 'locally significant', suggesting that SNA 166 may have potential value as part of a network of natural areas within a landscape, the value of SNA 166 as a buffer, linkage or corridor to other ecologically significant areas is low. Major existing ecological linkages in the surrounding landscape provide greater connectivity between regionally and nationally significant ecological areas in coastal forest north of Waihi Beach (Orokawa Scenic Reserve), Coromandel Forest park and Kaimai-Mamaku Forest Park, all of which have significantly higher ecological value with respect to connectivity than SNA166.

7.3.2 Other Fragments

The planted vegetation and fragments (Western, Eastern, planted) within TSF3 are not considered to trigger significance under the RPS or meet Section 6(c) of the RMA (i.e. they are not significant).

Table 15. Assessment of TSF3 fragments of vegetation and habitats against RPS (Part B, Chapter 11A)

	Regional Policy Statement Criteria (Chapter 11A, Table 11-1)	Assessment
1	It is indigenous vegetation or habitat for indigenous fauna that is currently, or is recommended to be, set aside by statute or covenant or by the Nature Heritage Fund, or Ngā Whenua Rāhui committees, or the Queen Elizabeth the Second National Trust Board of Directors, specifically for the protection of biodiversity, and meets at least one of criteria 3-11.	**Not significant**- None of the three fragments are currently or recommended to be set aside by statute or covenant specifically for the protection of biodiversity.
2	In the Coastal Marine Area, it is indigenous vegetation or habitat for indigenous fauna that has reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened.	**Not significant**- Not in the Coastal Marine Area.
3	It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • classed as threatened or at risk, or • endemic to the Waikato region, or • at the limit of their natural range.	**Not significant**- No At Risk or Threatened species present, or species at the natural extent of their range.
4	It is indigenous vegetation, habitat or ecosystem type that is under-represented (20% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	**Not significant**- Not significant. Vegetation is planted and / or exotic.
5	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, chenier plain, or karst ecosystems, hydrothermal vents or cold seeps.	**Not significant-** ecosystem types are exotic and / or planted.
6	It is wetland habitat for indigenous plant communities and/or indigenous fauna communities (excluding exotic rush/pasture communities) that has not been created and subsequently maintained for or in connection with: • waste treatment; • wastewater renovation; • hydro-electric power lakes (excluding Lake Taupō); • water storage for irrigation; or • water supply storage; unless in those instances they meet the criteria in Whaley et al. (1995).	**Not significant**- Not wetland habitat.
7	It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type. Note this criterion is not intended to select the largest example only in the Waikato region of any habitat type.	**Not significant**- - ecosystem types are small areas of exotic and / or planted, or regenerating vegetation
8	It is aquatic habitat (excluding artificial water bodies, except for those created for the maintenance and enhancement of biodiversity or as mitigation as part of a consented activity) that is within a stream, river, lake, groundwater system, wetland, intertidal mudflat or estuary, or any other part of the coastal	**Not significant**- areas concern terrestrial vegetation (Refer to Boffa Miskell 2022 for aquatic habitats)

	marine area and their margins, that is critical to the self-sustainability of an indigenous species within a catchment of the Waikato region, or within the coastal marine area. In this context "critical" means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas and migratory and dispersal pathways of an indigenous species. This includes areas that maintain connectivity between habitats.	
9	It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because: • Its structure, composition, and ecological processes are largely intact; and • If protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment disturbance), can maintain its ecological sustainability over time.	**Not significant**- vegetation is comprised of plantings with very low diversity throughout- it is not a representative example of any recognised ecosystem type.
10	It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato region or an ecological district, or is an exceptional, representative example of its type.	**Not significant**- vegetation fragments do not provide or support any uncommon sequences or are exceptional, representative examples.
11	It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under criteria 1-10 from external adverse effects.	**Not significant**- vegetation fragments do not provide or support any significant ecological buffer, stepping stone or linkage corridor.

8 EFFECTS MANAGEMENT HIERARCHY (NPS-IB)

The effects management hierarchy (NPSIB) is an approach to managing the adverse effects of an activity on indigenous biodiversity that requires that:

g. adverse effects are avoided where practicable; then
h. where adverse effects cannot be avoided, they are minimised where practicable; then
i. where adverse effects cannot be minimised, they are remedied where practicable; then
j. where more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible; then
k. where biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided; then
l. if biodiversity compensation is not appropriate, the activity itself is avoided.

8.1 Waihi North Project (Waihi Area) Approach to Managing Effects on Indigenous Biodiversity outside SNAs

Most of the vegetation and habitats within the WNP are not protected, and are not subject to any notified SNA, with the exception of SNA 166 at TSF3.
The NPS-IB requires that indigenous biodiversity that is not protected by an SNA:

a. Is managed by applying the effects management hierarchy (avoid, minimise, remedy, offset, compensate), where those effects are significant.
b. Is managed to give effect to its Objective and Policies, where those effects are not significant (Section 3.16 (2)).

The permanent loss of non-SNA vegetation within the WNP at GOP, NRS and TSF3 areas are all assessed as low to very low-level effects (Table 20) and their removal is considered a permitted activity under the Hauraki District Plan. However, while these effects are not significant, OGNZL intends to provide for replacement of the values associated with such removal as far as practicable, including those areas of pines, with an equal or greater area of higher value native vegetation.

OGNZL also proposes to minimise harm and adverse effects to all fauna within those habitats through management actions prior to, and at the time of vegetation / habitat removal. This approach is precautionary for some species (bats) and at some locations (lizards) and includes salvage, resurvey for the presence of special taxa, and timing of vegetation removal, as well as procedures for the removal and

use of felled material. Details for methods and triggers for habitat enhancement or compensation, where necessary, would be provided in fauna management plans.

A net positive outcome is expected for the loss of copper skink habitat through compensation actions at GOP, including revegetation and pest control on OGNZL landholdings contiguous with known copper skink habitat.

8.2 Waihi North Project (Waihi Area) Approach to Managing Effects on Indigenous Biodiversity within SNAs

Moderate value SNA vegetation, proposed to be removed at TSF3, is required to be managed in accordance with the effects management hierarchy (NPS-IB). The WNP provide for this approach as detailed here.

8.2.1 Adverse effects that are avoided, where practicable

While pit locations are designed for mineral extraction and have limited scope for design adjustments, early phase optioneering adjustments have resulted in NRS avoiding known moko skink habitat between the northern and southern fragments of SNA166.

Targeted nesting bird and roosting bat surveys will be undertaken prior to all tree and other vegetation removal, to avoid nesting birds and roosting bats.

Measures to avoid unnecessary vegetation and habitat loss through onsite management. This will include avoidance of unnecessary vegetation clearance through the physical delineation of the footprint boundary.

While not necessarily through design, it is acknowledged that TSF3 avoids the main key elements of SNA 166, including known moko skink habitat and a kauri stand, both on the northern side of the southern fragment.

8.2.2 Adverse effects that are minimised, where practicable

Species-specific adverse effects, particularly mortality to indigenous fauna, would be minimised as far as practicable, through implementation of fauna management plans that detail methodologies such as capture-relocation and accompanied with habitat enhancement (lizards), and pre-vegetation removal surveys to avoid nesting birds and roosting bats.

All newly created edges at the abutment of TSF3 and SNA 166, will additionally be buffered with dense plantings of indigenous shrubs to minimise edge effects, such as weed incursion, light, wind exposure and desiccation effects on habitats at exposed edges.

8.2.3 Adverse effects that are remediated, where practicable

No adverse effects are proposed to be remediated, as all vegetation and habitat values that are proposed to be removed, would be within the proposed pit and associated structures.

8.2.4 Residual adverse effects that are offset

Offset planting and enhancement actions would be undertaken to achieve an overall Net Gain Project outcome. To achieve this, all native plantings, naturally occurring vegetation and pine throughout the Project are proposed to be offset, including where the losses are part of the permitted baseline and assessed as low-level effects. This approach is consistent with the objective of the NPS-IB to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity.

The biodiversity offset would be modelled using the Department of Conservation's Biodiversity Offset Accounting Model (BOAM, Maseyk et al. 2015) to provide a detailed and transparent analysis of biodiversity components that would be lost, against measurable, like-for-like gains that provide for short term (habitat enhancement actions) and longer term (revegetation) outcomes.

8.2.5 Residual adverse effects that are compensated

At Gladstone Pit: Revegetation and pest control will be modelled to ensure that the high level of effect expected as a result of copper skink habitat loss will be compensated. The quantum of revegetation and pest control should be guided by a biodiversity compensation model and resulting actions be contiguous with existing copper skink habitat.

8.2.6 Waihi North Project (Waihi Area) Ecological Package

The WNP gives effect to the NPS-IB through ensuring that biodiversity is maintained across the Project area, and that adverse effects are managed in accordance with the effect's management hierarchy. Maintaining indigenous biodiversity requires (NPS-IB):

a. the maintenance and at least no overall reduction of all the following:
    i. the size of populations of indigenous species:
    ii. indigenous species occupancy across their natural range:
    iii. the properties and function of ecosystems and habitats used or occupied by indigenous biodiversity:
    iv. the full range and extent of ecosystems and habitats used or occupied by indigenous biodiversity:
    v. connectivity between, and buffering around, ecosystems used or occupied by indigenous biodiversity:
    vi. the resilience and adaptability of ecosystems; and

b. where necessary, the restoration and enhancement of ecosystems and habitats

As part of the overall ecological management package, which provides for measures to avoid and minimise effects in the first instance, OGNZL proposes a suite of restoration and enhancement actions to assist SNA 166 to progress ecologically, removing the ongoing threat of pine encroachment, and revegetate / restore areas to provide for:

- Overall increases in available habitats for indigenous biodiversity, including lizards (copper and moko skinks), birds and (where identified) bats
- Buffers: edge protection for SNA 166
- Connections: connecting areas of existing habitats and facilitating access through terrestrial and aquatic environments for mobile species
- Building sequences: reconnecting pathways across ecological gradients and ecosystems
- Like-for-like biodiversity values, in terms of habitats and ecosystem type.

Further, a unique opportunity to maximise biodiversity gains occurs in the immediate landscape, where the rare moko skink occurs within OGNZL landholdings. This species has few remaining populations on mainland New Zealand. Therefore, it is recommended that a broad ecological management and offset package provides for opportunities to connect fragmented values as well as protect and enhance high value features, including moko skink.

Table 16. Summary of vegetation removal, values and effects within the WNP. Values and effects assessments are as described in report, and as per EIANZ guidelines (Roper-Lindsay 2018).

Location	Vegetation type	Ecological Value	Level of effect (without mitigation)	Estimated area of removal (ha)	Proposed mitigation or offset	Level of Effect (with mitigation or offset)
Gladstone Open Pit	Planted native	Moderate	Low	1.0	1. Replacement planting. 2. Timing of vegetation removal to avoid the main bird breeding season (or preclearance nesting surveys). 3. Implementation of a lizard management plan. 4. Adoption of bat tree-felling protocol.	Temporary
	Naturally occurring native	Moderate	Low	0.4		Temporary
	Pine	Very Low	Very low	5.1		Temporary
Total proposed vegetation removal at GOP				**6.5**		
Northern Rock Stack	Planted native	Moderate	Low	8.1	1. Replacement planting. 2. Timing of vegetation removal to avoid the main bird breeding season (or preclearance nesting surveys). 3. Implementation of a lizard management plan. 4. Adoption of bat tree-felling protocol.	Temporary
	Pine	Low	Very Low	1		Temporary
Total proposed vegetation removal at NRS				**9.1**		
Tailings Storage Facility 3	Naturally occurring native (SNA)	Moderate	Moderate	8.3	1. Mitigation / offset planting. 2. SNA enhancement of restoration of pine areas. 3. Timing of vegetation removal to avoid the main bird breeding season (or preclearance nesting surveys). 4. Implementation of a lizard management plan.	**Net Gain (Biodiversity Offset)**
	Naturally occurring native (non-SNA western fragment)	Low	Very Low	1.2		**Net Gain (Biodiversity Offset)**
	Naturally occurring native (non-SNA eastern fragment)	Low	Very low	0.3	1. Replacement planting. 2. Timing of vegetation removal to avoid the main bird breeding season (or preclearance nesting surveys). 3. Implementation of a lizard management plan.	Temporary
	Southern planted fragment	Low	Very Low	0.3		Temporary
Total proposed vegetation removal at TSF3				**10.1**		

9 RECOMMENDATIONS

The loss of 25.7 ha of native and exotic (planted and naturally occurring) vegetation proposed within the components of the WNP assessed here would result in moderate to very low levels of effects. In many of the areas this effect would be reduced to temporary (Roper-Lyndsey 2018) because it is proposed that vegetation removed be replaced with plantings. Those plantings would enhance ecological values in the surrounding landscape by providing buffer, connectivity and improved diversity which is more representative of the historical vegetation cover. It is also recommended that additional habitat enhancement (long-term pest control and 'tailored' habitat plantings) be undertaken to improve habitat values for moko skink, which represent an important ecological feature within the immediate landscape, but would not be directly affected by the components of the WNP.

Such planting should be undertaken within the WNP area, where it could provide ecological buffers and connectivity, or reduce edge effects for other ecological values. Restoration and enhancement actions should include weed control and animal pest control (particularly targeting native lizard habitats), fencing and enrichment plantings to improve the SNA (166).

The following recommendations would ensure that the terrestrial ecological effects of the assessed components of the WNP would be effectively managed to achieve a net ecological benefit for the local area:

1. Measures to avoid or minimise vegetation and habitat loss through onsite management. This would include avoidance of unnecessary vegetation clearance through the physical delineation of the footprint boundary.

2. Avoidance of large-scale removal of native vegetation during peak bird breeding season (September to December inclusive) or to be preceded by a native bird nesting survey and avoidance of any identified active native bird nests until fledging confirmed;

3. Adoption of tree-felling protocols to protect bats at pine areas within GOP, NRS and TSF3 to avoid or minimise the potential for direct harm to potentially roosting bats;

4. A vegetation replacement, enhancement and offset plan should be prepared using best practice methods for the establishment and enhancement of ecological vegetation and systems. The plan should cover the following:
    a. Within SNA 166: Pine removal and revegetation, long-term pest animal and weed control as calculated using a biodiversity offset accounting system, for the loss of 8.3

ha of SNA and 1.2 ha of Western Fragment. The resulting revegetation and enhancement should:

i. Be contiguous with SNA166 where possible, or within the within the immediate landscape where it enhances ecological integrity through buffering and connecting existing biodiversity values;
ii. Where practicable, enhance significant values of SNA, such as kauri trees and moko skink.

b. At Gladstone Pit: Revegetation and pest control to compensate for the high level of effect expected as a result of loss of habitat for high value copper skinks. The quantum of revegetation and pest control should be guided by a biodiversity compensation model and resulting actions be contiguous with existing copper skink habitat.
c. Replacement planting: Replacement of 16.2 ha of unprotected planted and other low to moderate value vegetation that would be removed. Planting should be undertaken within the immediate landscape where it enhances ecological integrity through buffering and connecting existing biodiversity values.
d. Buffer planting in and adjacent to SNA 166 to minimise newly created edge effects along the southern edge of SNA 166 (Southern Fragment).
e. Legal protection of all replanted areas

- A Lizard Management Plan (LMP) should be prepared in accordance with Department of Conservation best practice guidelines prior to vegetation removal at GOP, NRS and TSF3. All lizard works should be undertaken in accordance with a Wildlife Act Authority. The LMP should be prepared by a suitably qualified herpetologist with a Department of Conservation (DOC) Wildlife Authority and provide (but not be limited to):
    f. details of search methods and effort to be implemented for capturing arboreal and ground-dwelling lizards prior to any construction activities within the project footprint, including type of search, and search effort;
    g. appropriate mechanisms for re-establishing lizard habitat including suitable shrubland or rock pile habitat;
    h. locations and land-ownership approvals (if required) for the potential release of lizards, including provision of a detailed pest control programme to be initiated before the release of lizards;

5. A Bat Management Plan (BMP) should be prepared prior to any vegetation removal (including exotic pines) at GOP, NRS and TSF3. The BMP should be prepared by a suitably experienced

and qualified ecologist, and detail a survey methodology for determining presence or absence of bat roosting within affected vegetation, and protocols for ensuring that no vegetation is removed that supports an active bat roost. Where bats are detected during that survey, the BMP shall detail the steps to be undertaken to protect bats including tree felling protocols, bat capture and release, and habitat enhancement measures for suitably mitigating loss of roost habitat, as appropriate.

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Appendix A Ecological Impact Assessment Methodology

The analysis of ecological values and effects in this report generally follows the Ecological Impact Assessment Guidelines (EcIAG), published by EIANZ[7] (Roper-Lindsay et al. 2018). It follows a stepwise process to determine ecological values, and assess the magnitude of the actual and potential effects on those values. This analysis leads to an evaluation of the overall level of adverse effects.

This three-step process is summarised as follows:

Step 1: Assess the value of the area, taking into consideration species (Table 17) and other attributes of importance for vegetation or habitats (Table 18) to assign an overall ecological value (Table 19).

Step 2: Determine the magnitude of effect (Table 20). This step also includes consideration of the timescale and permanence of the effect.

Step 3: Evaluate the severity of ecological effect using a matrix (Table 21) of the ecological value and magnitude of effect.

That analysis can then lead to an effects management regime commensurate with the level of adverse ecological effect, using the management hierarchy, to end with a global outcome for terrestrial ecology that, ensures the maintenance of indigenous biodiversity.

Table 17. Factors to be considered in assigning value to species (Roper-Lindsay et al. 2018).

Determining factors	
Nationally threatened species, found in the ZOI[8] either permanently or seasonally	Very High
Species listed as 'At-Risk' – declining, found in the ZOI, either permanently or seasonally	High
Species listed as any other category of 'At-Risk' found in the ZOI either permanently or seasonally	Moderate
Locally (Ecological District) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Negligible

All naturally occurring (non-planted) habitats and vegetation were assessed for significance against relevant policies and guidelines in Section 6, including the Waikato Regional Policy Statement criteria

[7] Environment Institute of Australia and New Zealand

[8] ZOI (Zone of Influence) is Roper-Lindsay et al. (2018) define the Zone of Influence (as "*the areas/resources that may be affected by the biophysical changes caused by the proposed project and associated activities.*"

to test ecological significance (where not already an SNA) (RPS, criteria 1-11, Chapter 11A, table 11-1), and the Hauraki District Plan.

Table 18. Attributes to be considered when assigning ecological value or importance to a site or area of vegetation / habitat / community (as per Table 4 of Roper-Lindsay et al. 2018).

Matters	Attributes to be considered
Representativeness	*Criteria for representative vegetation and habitats:* • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified.
Rarity/distinctiveness	*Criteria for rare/distinctive vegetation and habitats:* • Naturally uncommon or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National Priority for Protection *Criteria for rare/distinctive species of species assemblages:* • Habitat supporting nationally threatened or At-Risk species, or locally uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and Pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations - pattern, complexity • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history and local environment conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystems integrity, form, functioning and resilience (from 'intrinsic value' as defined in RMA) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning - high level, key species identification, habitat as proxy

Table 19. Assigning value to areas (Roper-Lindsay et al. 2018)

Value	Determining Factors
Very High	Area rates 'High' for at least three of the assessment matters of Representativeness, Rarity/distinctiveness, Diversity and Pattern, and Ecological Context. Likely to be nationally important and recognised as such.
High	Area rates 'High' for two of the assessment matters, and 'Moderate' and 'Low' for the remainder OR area rates 'High' for one of the assessment matters and 'Moderate' for the remainder. Likely to be regionally significant and recognised as such.
Moderate	Area rates 'High' for one of the assessment matters, 'Moderate' or 'Low' for the remainder OR area rates as 'Moderate' for at least two of the assessment matters and 'Low' or 'Very Low' for the remainder. Likely to be important at the level of the Ecological District.
Low	Area rates 'Low' or 'Very Low' for majority of assessment matters, and 'Moderate' for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates 'Very Low' for three assessment matters and 'Moderate', 'Low' or 'Very Low' for the remainder.

Table 20. Criteria for describing magnitude of effect (Roper-Lindsay et al. 2018)

Magnitude	Description
Very High	Total loss of, or a very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances and patterns; AND/OR Having minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Table 21. Criteria for describing the level of effect (Roper-Lindsay et al. 2018)

Magnitude of Effect	Ecological Value				
	Very High	High	Moderate	Low	Negligible
Very High	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very Low
Moderate	High	High	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

Appendix B Native flora species list for SNA 166 (Northern & Southern fragments).

Botanical Name	Common Name
Agathis australis	Kauri
Asplenium flaccidum	Drooping spleenwort
Asplenium oblongifolium	Shining spleenwort
Asplenium polyodon	Sickle spleenwort
Brachyglottis repanda	Rangiora
Blechnum filiforme	
Blechnum novaezelandiae	
Coprosma lucida	Shining karamu
Coprosma robusta	Karamu
Cyathea cunninghamii	Gully tree fern
Cyathea dealbata	Silver fern
Cyathea medullaris	Mamaku
Cyathea smithii	Kātote
Dacrydium cupressinum	Rimu
Dicksonia squarrosa	Wheki-ponga
Doodia australis	Rasp fern
Dysoxulum spectabile	Kohekohe
Earina mucronata	Bamboo orchid
Geniostoma ligustrifolium subsp. ligustrifolium	Hangehange
Hedycarya arborea	Pigeonwood
Icarus filiformis	Thread fern
Knightia excelsa	Rewarewa
Leptecophylla juniperina subsp. juniperina	Prickly mingimingi
Leucopogon fasciculatus	Mingimingi
Melicytus ramiflorus	Māhoe
Metrosideros excelsa	Pōhutukawa
Metrosideros robusta	Northern rāta
Microlaena stipoides	Meadow rice grass
Microsorum pustulatum	Hound's tongue
Myrsine australis	Māpou
Oplismenus hirtellus subsp. hirtellus	
Paesia scaberula	Lace fern
Parablechnum novae-zealandiae	Kiokio
Parablechnum procerum	Small kiokio
Parapolystichum glabellum	Smooth shield fern
Piper excelsum subsp. excelsum	Kawakawa
Podocarpus totara	totara
Pneumatopteris pennigera	Gully fern
Pseudopanax arboreus	Five-finger
Pseudopanax crassifolius	Lancewood
Ripogonum scandens	Supplejack
Schefflera digitata	Patē
Weinmannia silvicola	Tōwai

Exotic species list for SNA 166

Botanical Name	Common Name
Acacia mearnsii	Black wattle
Ligustrum sinense	Chinese privet
Lonicera japonica	Japanese honeysuckle
Ulex europaeus	Gorse

Pinus radiata	Radiata pine
Cortederia selloana	Pampas
Berberis glaucocarpa	Barberry

Appendix C Detailed description of vegetation plots within SNA 166 at TSF3.

PLOT1: Treefern dominant vegetation

The vegetation within close proximity to the tailings storage area is seral vegetation with mamaku being the tallest dominant native species. Barberry (*Berberis glaucocarpa*), hangehange, patē, wheki-ponga (*Dicksonia squarrosa*), mamaku, and silver fern formed the canopy and subcanopy, while the understorey was comprised of hangehange, patē and kiokio (*Parablechnum novae-zealandiae*). Areas of gorse (*Ulex europaeus*) and multi-stemmed barberry were the main weed species within this area.

PLOT2: Pine dominant area

SNA 166, northeast of the tailings storage was predominantly comprised of regenerating broadleaf forest. Mature radiata pine (*Pinus radiata*) were scattered in the southern reaches of the SNA but increased in abundance north of the TSF3 project area. The canopy and subcanopy of the southern emergent pine area was dominated by rewarewa, tōwai and mamaku and the key understorey species included hangehange, silver fern, mamaku and rewarewa. Less common understorey species present included mingimingi (*Leucopogon fasciculatus*), prickly mingimingi (*Leptecophylla juniperina* subsp. juniperina), karamu (*Coprosma lucida*), pigeonwood (*Hedycarya arborea*), kānuka, māpou and Japanese honeysuckle. The ground cover of the pine plot had the greatest species richness due to the higher light levels through the open canopy created by the emergent pines. Seedling regeneration from the species present in the other tiers was visible, however, the native grass (*Oplismeus hirtellus subsp. hirtellus*) was the most prolific species.

PLOT3: Rewarewa-dominant 1

Rewarewa and towai were the canopy and subcanopy trees within this vegetation type, however, the largest diameters were recorded at only 24 cm and 25.8 cm, respectively, and their heights approximately 12m to 15 m. The average DBH for rewarewa within this plot was 8.5 cm making this stand roughly 10 years old (Bergin et al. 2012) though other environmental factors may have slowed growth. Rewarewa comprised over half the canopy with mamaku the next dominant species. The subcanopy included māhoe, hangehange, silver fern, rewarewa and barberry and the understorey hosted a broader range of specimens that not only included the aforementioned species but also lace fern (*Paesia scaberula*), māpou, kiokio, pigeonwood, shining spleenwort (*Asplenium oblongifolium*) and rangiora (*Brachyglottis repanda*). Thread fern (*Icarus filiformis*) had a noticeable presence as not only

a ground cover but as an epiphyte. The rewarewa plots were the only plots to have epiphytes and other species included drooping spleenwort (*Asplenium flaccidum*) and supplejack (*Ripogonum scandens*).

PLOT4: Rewarewa-dominant 2

Rewarewa 2 had a similar species diversity and age class to the Rewarewa 1 plot. The dominant trees within the plot were rewarewa and towai and the largest DBH's for the respective tree species were recorded at 21.5 cm and 28.2 cm. The average DBH for rewarewa was 7.14 cm and towai had an average DBH of 15.14 cm. Only five species within the plot had diameters over 2.5 cm, however, out of the four plots, rewarewa 2 had the lowest genetic diversity. Like the rewarewa and pine plots, canopy species were limited to towai, mamaku and rewarewa and gully tree fern (*Cyathea cunninghamii*), hangehange (*Geniostoma ligustrifolium* var. *ligustrilfolium*) and wheki-ponga were additional species in the subcanopy. Silver fern was the dominant species in the understorey, however māpou, māhoe and kohekohe (*Dysoxylum spectabile*) were also additionally present. Seedling regeneration was limited and thread fern and (less so) small kiokio (*Parablechnum procerum*) were the primary ground cover species.

Appendix D Five-minute bird counts within SNA 166

Table 22. Five minute bird counts in SNA 166 (southern fragment) vegetation plots- 27 March 2019

		Plot 1		Plot 2		Plot 3		Plot 4		
Common name	Scientific name	Count 1	Count 2	Count 1	Count 2	Count 1	Count 2	Count 1	Count 2	Total
Blackbird	*Turdus merula*					1	1			2
California quail	*Callipepia californica*			6			2			2
Eastern rosella	*Platycercus eximius*					2	2			4
Fantail	*Rhipidura fulginosa*	5	3	2	2	3	2	3	3	23
Grey warbler	*Gerygone igata*	1	2	2	1	1		2	2	11
Magpie	*Gymnorhina tibicen*	1		1		2	1			5
Myna	*Acridotheres tristis*						2			2
NZ kingfisher	*Todiramphus sanctus*					2	1	2	1	6
Pheasant	*Phasianus colchicus*	1								1
Silvereye	*Zosterops lateralis*			3	2		2	2	2	11
Song thrush	*Turdus philomelos*						1			1
Tui	*Prosthemagera novaeseelandiae*	1						1		1

Table 23. Weather conditions during bird survey – 27 March 2019

Station	Time (hrs)	Air Temperature (°C)	Barometric pressure (hPa)	Wind (knots)	General Weather
1	0855	19.6	1001	SW<1	dry, sunny, scattered cloud
2	0920	19.6	1001	nil	dry, sunny, scattered cloud
3	0950	21.6	1005	NE to 5	dry, sunny, scattered cloud
4	1020	23.7	1005	NE to 5	dry, sunny, scattered cloud
5	1055	24.5	1004	NE to S	dry, sunny, scattered cloud

Table 24. Results of five minute bird counts for pipit survey (Averages of 3 replicate counts)

Species	Station					Average	SD
	1	2	3	4	5		
Australian magpie	6.00	1.67	6.67	5.33	1.00	4.13	2.61
Blackbird	0.33	-	-	-	-	0.07	0.15
California quail	-	0.33	0.67	-	-	0.20	0.29
Chaffinch	3.00	1.33	1.00	2.33	1.00	1.73	0.89
Eastern rosella	2.33	-	1.00	-	0.33	0.73	0.98
Fantail (N)	0.33	1.00	-	0.33	0.33	0.39	0.37
Goldfinch	1.33	-	3.67	1.00	-	1.20	1.50
Grey warbler (E)	0.67	-	-	-	-	0.13	0.29
House sparrow	-	1.67	-	-	-	0.33	0.75
Kingfisher (N)	-	-	-	0.33	-	0.07	0.15
Pheasant	0.67	-	0.33	-	-	0.20	0.29
Silvereye (N)	1.67	-	0.33	-	0.33	0.47	0.69
Starling	1.00	9.00	3.67	2.67	2.00	3.67	3.14
Swamp harrier (N)	-	-	0.67	-	-	0.13	0.29
Welcome swallow (N)	-	0.33	-	-	-	0.07	0.15
Yellowhammer	-	-	-	-	0.67	0.13	0.29
Total Native Species	3	2	2	2	2	2.20	0.45
Total Native Individuals	2.67	1.33	1.00	0.66	0.66	1.26	0.83
Total Introduced Species	7	5	7	4	5	5.60	1.34
Total Introduced Individuals	13.66	14.00	17.34	11.33	5.00	12.27	4.59

APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

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

Legal Interpretation

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

Maps and Images

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

Reliability of Investigation

Babbage / Bioresearches has performed the services for this project in accordance with the standard agreement for consulting services and current professional standards for environmental site assessment. No guarantees are either expressed or implied.

Recommendations and opinions in this report are based on discrete sampling data. The nature and continuity of matrix sampled away from the sampling points are inferred and it must be appreciated that actual conditions could vary from the assumed model.

There is no investigation that is thorough enough to preclude the presence of materials at the site that presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable may in the future become subject to different regulatory standards, which cause them to become unacceptable and require further remediation for this site to be suitable for the existing or proposed land use activities.

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