TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

South Frequent Transit Network Assessment of Ecological Effects

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Version 1.0

WAKA KOTAHI
NZ TRANSPORT AGENCY

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Document Status

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Glossary of Defined Terms and Acronyms

We note that 'Takaanini' (with double vowels is used throughout the Report Acknowledging the ongoing kōrero and guidance from Manawhenua on the cultural landscape. 'Takanini' is used where reference is made to a specific and existing named place (e.g., Takanini Road, Takanini Town Centre etc.). Manawhenua is also used throughout the Report as while gifting the programme name as Te Tupu Ngātahi, Manawhenua confirmed this was an appropriate spelling (capital 'M' and one word). Notwithstanding this, the term is spelled as two words in other fora and the proposed designation conditions – Mana Whenua.

Acronym/Term	Description
Auckland Council	Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010
Ecological Baseline	Means the prevailing ecological state at the time of the assessment
Likely Future Ecological Environment	The likely future environment informed by the Auckland Unitary Plan (AUP)
Ecological Feature	Specific aspects of an ecosystem that are described and evaluated, the term includes components such as species and habitats and related processes and functions, such as habitat buffers and roosting and feeding habitat
Greenfields	Generally rural land identified to be urbanised over time i.e. Future Urban Zoned land
Hydroperiod	Flow and/or soil saturation period of streams or wetlands
Project Area	Area of land that is within the proposed designation boundary
Project Footprint	Area of land that is within the road design
Significant Ecological Area	An overlay within the Auckland Unitary Plan Operative in Part, whereby areas of terrestrial, freshwater or marine habitat of significant indigenous vegetation or significant habitats of indigenous fauna are identified and protected from the adverse effects of subdivision, use or development
Wetland	Defined in the Resource Management Act 1991 as "includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions"
Rapid Habitat Assessment	The RHA provides a standardised protocol for making a quick, qualitative, site-based assessment of physical stream habitat conditions (Clapcott, 2015)
ABM	Automatic Bat Monitors
AEE	Assessment of Effects on the Environment report
ASCV	Area of Significant Conservation Value
AT	Auckland Transport
AUP:OP	Auckland Unitary Plan: Operative in Part

Acronym/Term	Description
BMP	Bat Management Plan
District Plan Tree	Any notable tree, or tree that is greater than 4m in height and/or greater than 400mm in girth located within existing Road reserve and / or Open Space Zone that would require resource consent under the District Plan provisions to be removed (refer to Table E26.4.3.1(A89) and (A92))
DOC	Department of Conservation
EcIA	Ecological Impact Assessment
ED	Ecological District
EIANZ	Ecological Impact Assessment New Zealand: terrestrial and freshwater ecosystems (2018)
LINZ	Land Information New Zealand
LMP	Lizard Management Plan
MDRS	Medium Density Residential Standards
MCA	Multi-Criteria Assessment
N/A	Not Applicable
NIMT	North Island Main Trunk rail line
NIWA	National Institute of Water and Atmospheric Research
NPS	National Policy Statement
NPS-FM	National Policy Statement on Freshwater Management 2022
NPS-UD	National Policy Statement on Urban Development 2020
NoR	Notice of Requirement
NoR 1	Great South Road FTN Upgrade
NoR 2	Great South Road Upgrade (Drury section)
NoR 3	Takaanini FTN – Weymouth Road, Alfriston Road, and Great South Road Upgrades
NoR 4	Takaanini FTN – Porchester Road and Popes Road Upgrades
NZ	New Zealand
NZFFDMS	New Zealand Freshwater Fish Database
The Project	The Four NoRs proposed to authorise transport upgrades along key sections of roads which fall within the South FTN network (subject of this report / application).
RHA	Rapid Habitat Assessment

Acronym/Term	Description
RMA	Resource Management Act 1991
RTC	Rapid Transit corridor
SEA	Significant Ecological Area
SEV	Stream Ecological Valuation
South FTN	South Frequent Transit Network
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth Alliance
TAR	Threatened and At-Risk Species
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
ZoI	Zone of Influence - The Zone of Influence is defined in the EIANZ Guidelines as “the areas/resources that may be affected by the biophysical changes caused by the proposed Project and associated activities.”

Executive Summary

This Ecological Impact Assessment (**EcIA / Report**) has been prepared to inform the Assessment of Effects on the Environment (**AEE**) for four Notices of Requirement (**NoRs / the Project**) being sought by Auckland Transport (**AT**) for the South Frequent Transit Network (**FTN**) under the Resource Management Act 1991 (**RMA**). The NoRs (in the table below) are to designate land for roading upgrades necessary to enable the operation of high-quality bus services along two routes in South Auckland (referred to as the Great South Road FTN and Takaanini FTN) and urbanisation of complementary non-FTN corridors (along Popes Road and the Drury section of Great South Road).

South FTN – Notices of Requirement and Projects

Notice	Project	Requiring Authority
NoR 1	Great South Road FTN Upgrade	Auckland Transport (AT)
NoR 2	Great South Road Upgrade (Drury section)	
NoR 3	Takaanini FTN – Weymouth Road, Alfriston Road and Great South Road Upgrades	
NoR 4	Takaanini FTN - Porchester Road and Popes Road Upgrades	

As the Project relates to proposed designations, this EcIA assesses District Plan matters only. Regional matters (along with Wildlife Act 1953 compliance) will be subject to a future consenting phase along with a supporting EcIA. As such, regional matters have not been formally assessed in this report, however the relevant matters have been considered to inform the designation boundaries and future regional resource consents.

To inform the ecological baseline, ecological features within each NoR boundary were identified, mapped and their value assessed in terms of representativeness, rarity/distinctiveness, diversity/pattern and ecological context. Ecological features included:

- A total of nine vegetation types ranging in value from **Low** to **Very High**;
- Long-tailed bats potentially associated with all NoRs, assessed as having **Very High** value (albeit likely transient visitors to the area);
- A total of 56 avifauna species may be present, of which, 35 are native, 13 have a Threatened or At-Risk (**TAR**) status, and the remainder are exotic;
- A total of two herpetofauna species were likely to occur within the Project Area, which have a TAR status;
- A total of three intermittent streams and seven permanent streams have been assessed and range in value from **Low** to **High**. Streams which are associated with the following main catchments: Papakura Stream, Slippery Creek/Waihaihio Stream, and Hingaia Stream;
- A total of nine native fish of which two have a TAR status have the potential to occur in the Project Area; and
- A total of seven wetlands have delineated, representing two wetland types. Wetlands range in value from **Low** to **High**.

Construction Effects

The District Plan matter ecological effects relevant to construction prior to any mitigation identified are:

- disturbance and displacement to long-tailed bat (*Chalinolobus tuberculatus*) roosts;
- disturbance and displacement to threatened bird nests (existing) due to construction activities (noise, light, dust, vibration etc.); and
- the effect of habitat removal (district plan trees only[1]) on long-tailed bats, birds and lizards, specifically relating to mortality/injury and roost/refugia loss.

The level of effect on bats and birds was considered to be **Low** to **Very Low**, therefore no mitigation was required at this stage in the assessment.

The level of effect for native lizards in relation to district plan tree/vegetation removal (at specific locations) was however assessed to be **Moderate** and therefore mitigation has been developed. Recommended construction effect mitigation measures include the development of a Lizard Management Plan (**LMP**) for all NoRs should consider the following:

- Preconstruction surveys and/or habitat potential surveys to confirm (potential) presence and guide further management;
- Timing of the implementation of the LMP;
- A description of methodology for survey, trapping and relocation of lizards rescued including but not limited to salvage protocols, relocation protocols (including methods used to identify suitable relocation site(s)), nocturnal and diurnal capture protocols, supervised habitat clearance/transfer protocols, artificial cover object protocols, and opportunistic relocation protocols;
- A description of the relocation site(s); including discussion of:
  - provision for additional refugia, if required e.g., depositing salvaged logs, wood or debris for newly released native skinks that have been rescued;
  - any protection mechanisms (if required) to ensure the relocation site is maintained (e.g.) covenants, consent notices etc; and
  - any weed and pest management to ensure the relocation site is maintained as appropriate habitat;
- Monitoring methods, including but not limited to: post-relocation lizard monitoring (subject to triggers identified in the LMP), and pest control monitoring (subject to triggers identified in the LMP);
- A post-vegetation clearance search for remaining lizards;
- A suitably qualified and experienced ecologist/herpetologist approved to oversee the implementation of the LMP shall certify that the lizard related works have been carried out according to the certified LMP within two weeks of completion of the vegetation clearance works; and
- Lizard management should be consistent with any regional consent conditions (and the Wildlife Act) that may be required for regional compliance.

[1] As per the South FTN Assessment of Arboricultural Effects Report, a 'protected tree' is a tree that requires resource consent for alteration (including pruning and works within the root zone) or removal. This includes effects on 'notable trees', effects on trees in Outstanding Natural Feature (**ONF**), High Natural Character (**HNC**), Outstanding Natural Landscape (**ONL**) and Outstanding Natural Character (**ONC**) overlays, effects on trees in roads, except where adjacent to rural zoned in respect of infrastructure projects, and effects on trees in Open Space zones.

The residual (post-mitigation) level of effect for all construction effects are considered **Negligible** to **Low**.

Operational Effects

District matter ecological effects relevant to operation prior to any mitigation identified are disturbance and displacement to long-tailed bat roosts and bird nests, and loss in connectivity due to the presence of the road (including light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat). Potential effects on long-tailed bat roosts and bird nests were considered to be **Low**, therefore no mitigation was required at this stage in the assessment.

Future regional resource consenting

Consideration was also given to future regional resource consenting matters and the range of ecological assessments likely required to inform the regional consenting process. These may include:

- Detailed habitat and fauna surveys to inform the Ecological Impact Assessment which will be used to support future regional resource consent;
- Stream Ecological Valuation (**SEV**) assessments will need to be undertaken to inform the re-evaluation of streams. Opportunities to restore riparian habitat along these features will also need to be taken into consideration. Fish salvage and relocation, sediment control and management of the riparian condition will also be required;
- A detailed wetland assessment, including delineation and functional assessments, will be required. Opportunities for wetland restoration and / or enhancement will also need to be assessed; and
- An additional cumulative ecological effects assessment. The cumulative effect of all the NoRs proposed requires consideration, along with other key drivers of change. A more comprehensive cumulative ecological effects assessment should be undertaken early in the resource consenting process.

1 Introduction

1.1 Purpose and Scope of this Report

This Report has been prepared to inform the Assessment of Effects on the Environment (**AEE**) for Notices of Requirement (**NoRs**) being sought by Auckland Transport (**AT**) for the South Frequent Transit Network (**South FTN**) under the RMA. Four NoR are proposed to authorise transport upgrades along key sections of roads which fall within the South FTN network. The transport upgrades authorised by the NoRs are referred to in this report as the Project.

Specifically, this Report considers the actual and potential effects associated with the construction and operation of the Project on the existing and likely future environment as it relates to ecological effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

This Report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised within the NoR, and the typical construction methodologies that will be used to implement this work. These have been reviewed by the author of this Report and have been considered as part of this assessment of ecological effects. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this Report for clarity.

1.2 Report Structure

In order to provide a clear assessment of the NoRs, this Report follows as appropriate, the structure set out in the AEE. This Report contains an assessment of the actual and potential effects of the Project as a whole (the NoRs). Where appropriate, measures to avoid, remedy or mitigate effects are recommended. The sections of this Report are arranged accordingly.

The Report is structured as follows:

- **Section 2** - Project overview with a summary of the proposed works;
- **Section 3 and Section 4** - Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines
- **Section 5-** Identification and description of the existing (baseline) and likely future ecological environment
- **Section 8** - Assessment of the actual and potential effects (adverse and positive) of construction and operation of the work to be enabled by the NoRs on relevant ecological features. Includes recommended measures to avoid or mitigate potential adverse effects;
- **Section 9** – Design and future Regional Plan/National Environmental Standards/Wildlife Act consenting considerations are discussed in relation to the ecological features; and
- **Section 10** - Overall conclusion of the level of potential adverse ecological effects after recommended measures are implemented.

2 Project Description

2.1 Context – South FTN network

As described further in the AEE, the South FTN is one of the transport works packages proposed for South Auckland between Manukau and Drury as part of Te Tupu Ngātahi Supporting Growth (**Te Tupu Ngātahi**) programme.[2] The South FTN is in turn part of a wider planned multi-modal transport network intended to support growth and enable mode shift in South Auckland.

The South FTN comprises a range of road upgrades including bus priority measures, new and upgraded active mode facilities, and intersection improvements along existing arterial road corridors in South Auckland. In particular, the proposed road upgrades provide for:

- Operation of high-quality FTN[3] bus services along Great South Road between Manukau and Drury (the Great South Road FTN route);
- Operation of high-quality FTN bus services along existing roads between Manurewa, Takaanini, and Papakura (the Takaanini FTN route); and
- Urbanisation of adjoining key connections to FTN routes – Popes Road West, and the Drury section of Great South Road between Waihoehoe Road and State Highway 1 (SH1).

The total extent of the South FTN network is shown in Figure 2-1.

2.2 The NoRs – proposed spatial extent

Of the full South FTN network extent shown in Figure 2-1, only a portion falls within the NoRs/Project (see Figure 2-2). This is because the proposed corridor upgrades do not always require additional land take, can be undertaken within the existing road reserve, and therefore do not require new designations.[4]

Accordingly, this assessment is focussed on the activities proposed to be authorised by the NoRs. The NoRs seek generally to provide for road widening to accommodate bus priority measures, walking, and cycling facilities, key intersection upgrades, replacement of existing bridges and other associated works. These are described in more detail in Table 2-1, and the extents are shown in Figure 2-2.

Further detail on the proposed activities and works in each NoR are provided in the AEE.

[2] The Programme is a collaboration between AT and Waka Kotahi NZ Transport Agency (**Waka Kotahi**) to investigate, plan, and undertake route protection for the strategic transport networks needed to support Auckland's growth over the next 30 years.
[3] FTN services are defined in AT's Regional Public Transport Plan (**RPTP**) as bus routes operating at least every 15 minutes between 7am-7pm, 7 days-a-week, often supported by priority measures such as bus or transit lanes.
[4] Some limited additional third-party land may be required in the future to provide for intersection upgrades between Takaanini and Ōpaheke. The relative cost-benefit assessment of these areas did not favour route protection at this time given the projected time scale for future urban growth in this area.

Table 2-1: Summary of the proposed Project

NoR reference	Project component	Description
NoR 1	Great South Road FTN Upgrade	• Road upgrades and transport upgrades providing for the Great South Road FTN route along Great South Road between Manukau and Drury. • NoR comprises eight separate areas along Great South Road (see Figure 2-2) providing for bus priority measures, walking and cycling facilities, key intersection upgrades, replacement of the existing Otūwairoa / Slippery Creek bridge, and stormwater management devices.
NoR 2	Great South Road Upgrade (Drury section)	• Road upgrades and transport upgrades providing for upgrade of a 520m section of Great South Road in Drury between Waihoehoe Road and the SH1 Drury Interchange. • NoR enables road widening to provide for four lanes, active mode facilities, replacement of the existing Hingaia Stream bridge, and stormwater management devices.
NoR 3	Takaanini FTN – Alfriston Road, Weymouth Road and Great South Road Upgrade	• Road upgrades and transport upgrades providing for the Takaanini FTN route along Weymouth and Alfriston Roads between Selwyn Road and Saralee Drive; and for an adjoining section of the Great South Road FTN route between Halver Road and Myers Road. • NoR enables road widening to accommodate bus priority measures, walking and cycling facilities, key intersection upgrades, replacement of existing bridges along Weymouth Road over the North Island Main Trunk (**NIMT**) and Alfriston Road over SH1, and stormwater management devices.
NoR 4	Takaanini FTN – Porchester Road and Popes Road Upgrade	• Road upgrades and transport upgrades providing for the Takaanini FTN route along Porchester Road generally between Alfriston Road and Walters Road; and for the urbanisation of Popes Road generally between Takanini School Road and Porchester Road. • NoRs provide for urbanisation of both corridors – two traffic lanes, walking and cycling facilities, key intersection upgrades, and stormwater management devices.

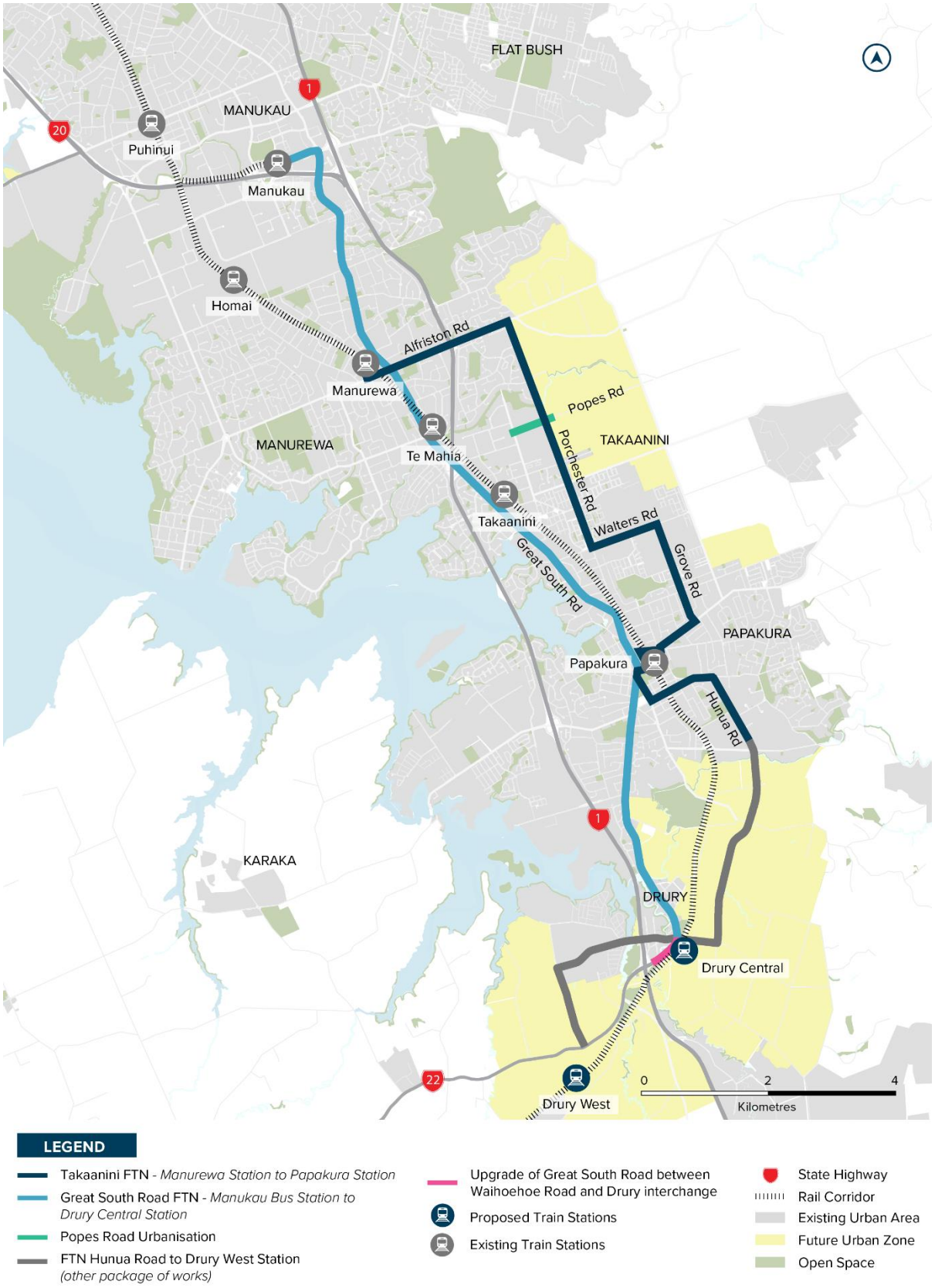

Figure 2-1: South FTN – full network

Figure 2-2: South FTN – NoR extents (the Project)

3 Assessment Approach

3.1 EcIA Assessment

The approach followed in this study is consistent with the approach outlined in the EcIA Guidelines (Roper-Lindsay *et al*., 2018) referred to as the EIANZ Guidelines in this report). The overarching goal of the ecological assessment is to determine the ecological effects of specific Project features or activities and has been considered under two scenarios – 1) the existing ecological baseline and 2) the likely future ecological environment. The requirements for such an assessment are outlined with the EIANZ Guidelines and form the basis of this report. This process is summarised in Figure 3-1 below.

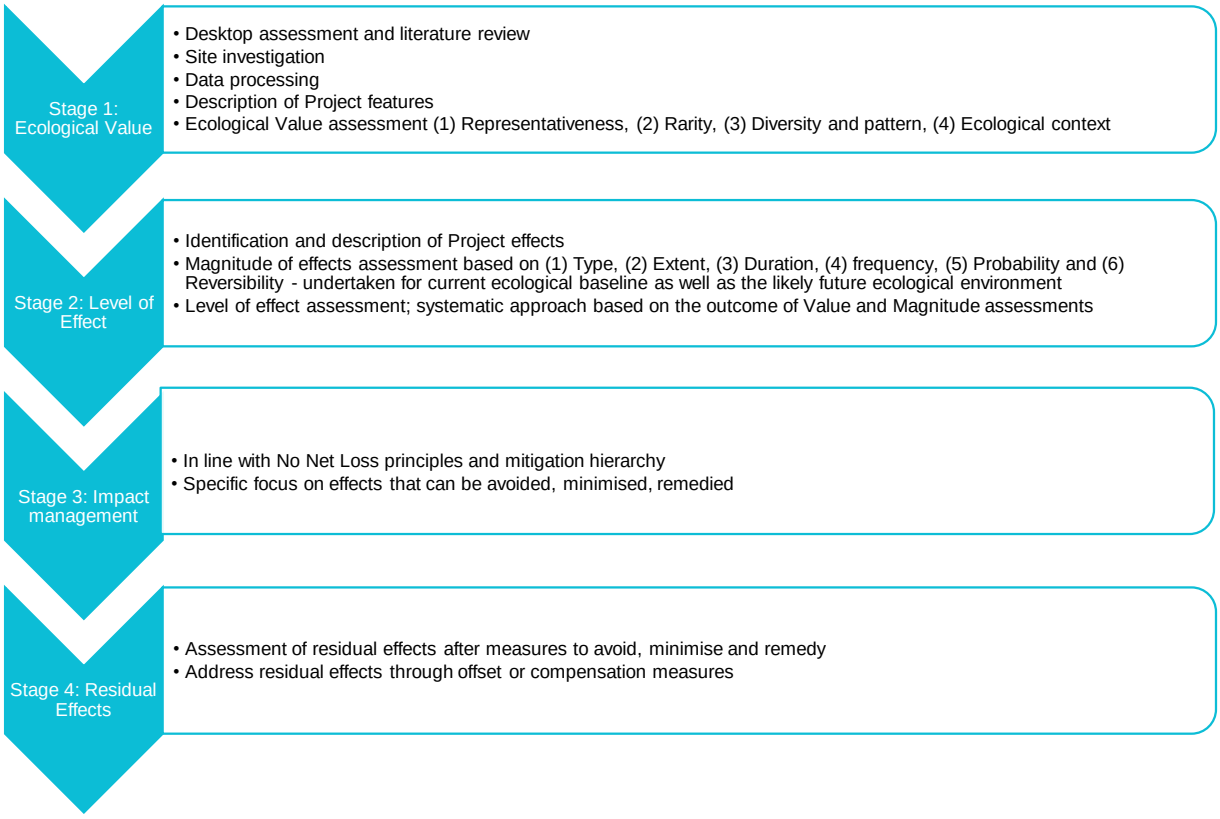

Figure 3-1: Approach process followed for this assessment.

3.2 Manawhenua Values

Māori value indigenous species for a variety of reasons with two key components being whakapapa (or genealogical and ancestral connection) and mahinga kai (food and resource gathering practices). According to the EIANZ Guidelines, Manawhenua values may be considered when making ecological evaluations. Importantly, effects on these values should only be assessed by the appropriate iwi or hapū, or by working in collaboration with Manawhenua.

At the impact management stage, management of impacts on cultural values and on ecological values may involve similar goals and there may be synergies around approaches to achieving those goals (EIANZ Guidelines). Cultural Value Assessments have been undertaken for the project and Huis held with Manawhenua to discuss the ecological values and proposed mitigation for the Project.

No specific changes were requested from Manawhenua in relation to ecology. Please refer to the AEE for more details on the Manawhenua engagement.

3.3 EcIA and the Likely Future Ecological Environment

The EIANZ Guidelines provide guidance to assist with the assessment of the likely future ecological environment in this report. The assessment states:

"The ecologist needs to consider the permitted baseline in order to describe the potential "future ecological environment and to assess effects at that time, and should discuss this with the project planner or legal advisor if in any doubt".

The Planning Team from Te Tupu Ngātahi has advised of the following to inform the assessment of the likely future ecological environment:

- The purpose of the NoRs for the South FTN is to route protect the roading upgrades necessary to enable high-quality FTN bus services and urbanisation of complementary non-FTN corridors (as described above) that will support the existing and anticipated development in South Auckland;
- In addition, the AUP:OP permits activities for infrastructure and development, which will also change the likely future ecological environment. These activities include vegetation clearance and the removal of trees, excluding notable trees and street trees; and
- A summary of the likely future ecological environment is provided in Section 5 and within the AEE.

3.4 Permitted Activities and the Likely Future Environment

The majority of the Project (i.e., works within NoR 1, 2 & 3) are within existing urban areas with live zoning including residential, commercial, and open space zones. NoR 4 largely runs along the outer edge of the live zoned existing urban area and is bound to the east by rural land. The majority of the Popes Road portion of NoR 4 is adjacent to rural land apart from its western most portion which runs through an industrial zoned area and the most southern point (around the Walters Road and Porchester Road intersection) which adjoins residential zoned land. The existing activities within the area are generally reflective of the existing underlying zoning.

3.5 Assessment of District Plan Matters and Approach to Regional Matters

The designation authorises AT, as the relevant requiring authority, to undertake work and activity without the need for land use consent. The designated area is still subject to restrictions on land use under Regional Plan matters in the AUP:OP.

As the Project relate to proposed designations, this EcIA assesses District Plan matters only. Regional Plan matters will be subject to a future consenting phase along with a supporting EcIA. As such Regional Plan matters have not been formally assessed in this report, however the relevant matters have been screened to inform the alternatives assessment, proposed designation boundaries and potential implications for future regional resource consents and are presented in Section 9. Appendix 3 sets out the split between District and Regional Plan matters in the AUP:OP.

The assessment of District Plan matter effects assumed that the value of ecological features, such as wetlands and riparian features, to native fauna will be the same in the future, as these features are protected under the AUP:OP and have been assumed unchanged in a future environment.

3.6 Wildlife Act Matters

The Wildlife Act includes specific provisions for activities that may disturb, injure, or kill native animals. Construction and operational activities that may require consideration under the Wildlife Act are outlined in Appendix 3. The scope of this report pertains to District matters and although not required for NoRs, further consideration has been given to ecological effects under the Wildlife Act in Section 9.

3.7 National Policy Statements

3.7.1 National Policy Statement for Freshwater Management

The overarching concept of the National Policy Statement for Freshwater Management (**NPS-FM**) is Te Mana o te Wai, which refers to the fundamental importance of water, and recognises that protecting the health of freshwater protects the health and well-being of the environment. The NPS-FM seek to ensure that natural and physical resources are managed in a way that prioritises:

- Firstly, the health and well-being of water bodies and freshwater ecosystems;
- Followed by the health needs of people; and
- Then the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

In particular, the NPS-FM seeks to protect natural wetlands, rivers, outstanding waterbodies, and habitats of indigenous freshwater species.

Ecological effects associated with activities that require regional consents and consideration under the NPS-FM were considered to inform design and alignment options for the Project.

3.7.2 National Policy Statement for Indigenous Biodiversity

The National Policy Statement for Indigenous Biodiversity (**NPS-IB**) seeks to maintain indigenous biodiversity across New Zealand so that there is at least no overall loss in indigenous biodiversity. The NPS-IB highlights the need for a cautionary approach to considering effects on indigenous biodiversity both within and beyond Significant Natural Areas (**SNAs**) and including areas supporting highly mobile fauna. Increased indigenous vegetation cover in urban and non-urban environments is promoted, as is information gathering and monitoring of indigenous biodiversity.

At the same time, the NPS-IB sets out a need to recognise and allow for activities which contribute to New Zealand's social, economic, cultural, and environmental wellbeing. The NPS-IB provides a consenting pathway for specified infrastructure which provides significant national or regional public benefit, and which has a functional or operational need to locate in a particular location, when there are no practicable alternatives.

At the date of preparing the report, the NPS-IB had not been given effect to in the AUP:OP. However, many of the policy directions in the NPS-IB are already contained within the AUP:OP and in relation to

large scale infrastructure projects there is not a notable change in policy direction. The assessment of the Project against the NPS-IB is therefore substantively similar to the assessment against the corresponding AUP provisions along with EIANZ 2018.

Relevant policies within the NPS-IB have been considered as part of this assessment, in particular Policy 15 relating to highly mobile fauna such as banded rail and long-tailed bats. We have considered construction and operational effects from the Project on highly mobile fauna in relation to disturbance and habitat fragmentation (refer Table 8.2 and 8.3). This formed part of the options assessment process to inform design and alignment options for the Project. The overall level of effect was assessed as Low for all effects and as such no additional mitigation has been proposed.

3.7.3 New Zealand Coastal Policy Statement

The New Zealand Coastal Policy Statement (**NZCPS**) seeks to promote sustainable management of the coastal environment. Due to its strategic and desirable location, there is significant established development and infrastructure within coastal locations. Continued growing demand for commercial activities in the coastal environment will need to manage inherent vulnerability to natural hazards and manage the effects of ongoing degradation to coastal environments.

The NZCPS sets out a need to recognise and allow for activities which contribute to New Zealand's social, economic, cultural, and environmental wellbeing. When considering a requirement for a designation and any submissions received, a territorial authority must consider the effects on the environment of allowing the requirement, having regard to any relevant provisions of this NZCPS.

Relevant requirements under the NZCPS have been considered as part of this assessment, in particular Policy 1 relating to extent and characteristics of the coastal environment. This recognises that although the Project is not within the Coastal Marine Area (**CMA**), the intertidal zone extends beyond these recognised points and that impacts on tidal estuaries, coastal vegetation and habitats of indigenous coastal species may still be relevant. The report therefore considered the construction and operational effects from the Project on coastal wetland vegetation (Section 9.3) and habitats of indigenous coastal species (Section 8.3). This formed part of the options assessment process to inform design and alignment options for the Project. The overall level of effect was assessed as Low for all effects assessed. Regional matters such as impacts on coastal wetlands have not been formally addressed at this stage, however measures have been made to avoid features (coastal wetlands) where possible and to ensure any future requirements to remedy and mitigate potential impacts are practical and achievable.

4 Assessment Methodology

Desktop and site investigations were undertaken for ecological features within the Zone of Influence (**ZOI**) (refer Section 4.1 for a ZOI description) for all four NoRs. Terrestrial, stream, and wetland features were investigated and mapped to inform the proposed designation boundaries and potential future consenting processes. In addition to the areas included in the ecological mapping, potential habitat for native fauna was also considered.

4.1 Zone of Influence

The ZOI relates to an area occupied by habitats and species that are adjacent to and may go beyond the proposed designation boundaries for the Project. It is defined in the EIANZ Guidelines as "*the areas/resources that may be affected by the biophysical changes caused by the proposed Project and associated activities*." The distance of the ZOI and type of effect from the Project can vary for different species and habitat types and depends on a number of environmental and biological factors. The ZOI is used throughout this report to describe the potential impacts of the Project (construction and operational) on adjacent or connected terrestrial, freshwater, and wetland habitats and associated native species. It should be noted that the desktop assessment includes a potentially larger ZOI area than is assessed for site investigations, which are generally constrained to within the designation boundary. Features included within the initial ZOI desktop assessment are not necessarily always impacted by the Project.

The ZOI of the Project on different habitats and/or species differs depending on factors such as connectivity to the Project and how individual species use their environment e.g., mobile species such as long-tailed bats have a larger home range and more diverse habitat requirements compared to lizards which may be restricted to a small area or specific habitat type. This affects how a habitat and/or species could be impacted by the Project, and this was taken into consideration during the desktop review (refer Table 4-1 for detailed breakdown of potential ZOI selected for desktop assessment of habitats and species).

Table 4-1: Zone of Influence for Desktop Assessment – Habitats and Species

Habitat/Species	ZOI – approximate distance	Justification
SEAs	2km	• Larger distance to ensure that these important habitats and any associated, highly mobile fauna species within them or the wider landscape could be considered
Terrestrial habitats (non SEA)	Within the proposed designation	• Vegetation not considered significant and therefore only likely to be relevant at a local scale, limited suitability for highly mobile fauna species. Therefore, only direct impacts on terrestrial habitats within the proposed designation in relation to the impacts of construction and operation are considered.
Wetlands	100m	• The taking, use, damming, diversion, or discharge of water outside of a natural wetland, but within a 100m setback from a natural wetland has the potential to result in the complete or partial drainage of all or part of a natural

Habitat/Species	ZOI – approximate distance	Justification
		wetland. Given the varied sensitivity of wetland habitats to changes in hydrology, 100m ZOI is appropriate for consideration.
Streams	Within or adjacent to the proposed designation	• Given the highly urban nature of the project environment, evaluating streams within or adjacent to the suggested designation considered sufficient to enable assess the project effects of construction and operations
Bats	10km	• Takes into account the highly mobile nature of bats with a vast home range and extensive foraging that can cover up to 13,000 hectares
Birds	2km	• Highly mobile species, with small to large home range during breeding and non-breeding season to include avifuana highly likley occur within the proposed designation areas
Lizards	5km	• Actual ZOI for lizard species is much smaller (their home range is 100-200m^2 depending on habitat conditions). However, the area included in the desktop search is larger to account for the cryptic nature of surveying lizards and often deficient desktop records on species presence and potential distribution within potential suitable habitats.

4.2 Desktop Assessment

A desktop review of existing ecological records was undertaken to gain an understanding of the species and habitats that could be present within the ZOI for each NoR.

The sources of information that were reviewed to determine the likelihood of a species or habitat occurring within or adjacent to each of the NoR included:

- Auckland Council Geomaps;[5]
- Department of Conservation (DOC) Bioweb records;[6]
- Department of Conservation Threat Classification Series;[7]
- Ecological Regions and Districts of New Zealand (McEwen, 1987);
- iNaturalist records[8], records within approximately 2-5 km buffer of the NoRs;
- Indigenous terrestrial and wetland ecosystems of Auckland (Singers et al., 2017);
- National Institute of Water and Atmospheric Research (NIWA) freshwater fish database (NZFFDMS);[9]

[5] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html.
[6] https://www.doc.govt.nz/our-work/monitoring-reporting/request-monitoring-data/.
[7] 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/about-us/science-publications/conservation-publications/nz-threat-classification-system/.
[8] https://www.inaturalist.org/.
[9] https://nzffdms.niwa.co.nz/search.

- New Zealand Bird Atlas eBird database[10]; recorded within 10km2 grid squares. Results from grid squares AD69, AE69, AD69;
- NZ River Name Lines (LINZ Data Service11); and
- Retrolens Historical Aerial Imagery12.

4.3 Site Investigations

Site investigations[13] were undertaken within the designation boundary in order to:

- Prepare an ecological baseline of terrestrial, freshwater, and wetland ecology;
- Inform the assessment for each NoR against the relevant district matters (terrestrial ecology);
- Identify freshwater and wetland ecological criteria which may be considered as part of a future regional resource consent, or under relevant wildlife legislation; and
- Inform the proposed designation footprint.

4.3.1 Site Investigation Limitations

Site investigations were somewhat limited due to a lack of private property access. Where possible, potential ecological features were assessed using roadside observation and/or from adjacent properties where access had been granted, and results were analysed further with an in-depth desktop review.

Where access was limited, a comparative analysis was undertaken between ecological features. This analysis looked for commonality and/or notable patterns between each terrestrial, freshwater/stream, and wetland ecosystems that had been assessed within the field, and then applied these commonalities and/or notable patterns to desktop identified terrestrial, freshwater/stream, and wetland ecosystems in an attempt to provide a high-level ecological value to all features, noting that these features will likely be reassessed (as required) at resource consent stage.

4.3.2 Terrestrial Habitat

Site walkovers were undertaken between June and July 2023 by experienced ecologists; to map and describe the habitats present within the FTN Projects area. Habitats were classified into ecosystem types based on those described in Section 6. The habitats were also assessed as to their potential to support indigenous fauna, including birds, bats, and lizards. For district plan trees a more detailed fauna assessment was undertaken. For bats this included an assessment of bat roost potential (**Low**, **Moderate** or **High**) which took into account tree size (over 15 dbh), the presence of roost features (cracks, splits, hollows, flaking bark) as well as the likelihood of bats utilising that feature i.e. proximity to road, bat activity data, surrounding land use.

Habitat assessment focused on areas of potentially significant value, such as habitat that was identified as an SEA under the AUP:OP, classified as forest habitat on Auckland Council's Geomaps – Ecosystems Current Extent (Singers et al., 2017) or appears to be wetland or forest habitat based

[10] https://ebird.org/atlasnz/home.
[11] https://data.linz.govt.nz/layer/103632-nz-river-name-lines-pilot/.
[12] https://retrolens.co.nz/.
[13] Not all features where subject to a site investigation due to access constraints. Features assessed at desktop level are identified throughout the report.

on aerial photos and during site investigation. Species records from relevant literature and biodiversity databases were used to focus search efforts on certain areas within the Project Areas.

During the site walkovers the vegetation assessment included recording the dominant or characteristic species present and the general quality described (Including: structure, maturity, presence of weeds, and evidence of grazing). Vegetation surveys also included searches for any rare or threatened plant species previously recorded within the Project Areas.

Common plant names are predominantly used within this report. Maps showing the vegetation cover along and adjacent to the proposed designation boundaries are provided in Appendix 4. Terrestrial ecological value assessment methodology is discussed in Appendix 7.

4.3.3 Freshwater Habitat

Where access allowed, streams within the Project Areas identified on the Auckland Council Geomaps ('Named Streams') were ground-truthed and classified as permanent, intermittent, or ephemeral, according to the stream definitions described by (Auckland Regional Council, 2009). Any additional streams observed during site walkovers were also classified. Streams are mapped in Appendix 4.

Freshwater assessments were undertaken by experienced ecologists on all streams identified on site and included stream classification, assessment of the riparian vegetation composition and the implementation of the Rapid Habitat Assessment (**RHA**) protocol. The RHA provides a standardised protocol for making a quick, qualitative, site-based assessment of physical stream habitat conditions (Clapcott, 2015). SEV assessments were not undertaken at this stage but may be completed to support the future regional resource consenting phase as necessary. As such, macroinvertebrate and fish surveys were not undertaken as part of this assessment. However, records from NZFFDMS (Stoffels, 2022) were used to inform the potential ecological value of streams. Freshwater ecological value assessment methodology is discussed in Appendix 8 – Aquatic Value Assessment.

4.3.4 Wetland Habitat

Potential wetland habitat areas were identified by ecologists based on Auckland Council Geomaps contours and the presence of wetland vegetation on aerial maps including a review of historical images. Potential wetlands were mapped and where access permitted, ground-truthed through the use of the rapid technique outlined in the wetland delineation protocol (MfE, 2020). A more conservative approach was adopted where wetland delineation relied on desktop assessment. Ambiguous areas were assumed to be wetlands, where these areas were not accessible Wetland areas along the proposed designation of the NoRs are mapped in Appendix 4.

We note that the scope of the specialist study, for route protection, did not provide for a detailed wetland delineation (i.e. mapping accuracy of <1:10 000). The key focus was to confirm wetland presence and approximate extent. This approach is considered practical for the purposes of route protection, while it is expected that a more detailed wetland assessment will be undertaken during the resource consenting phase, as necessary.

Wetlands were assessed based on the RMA definition of a wetland[14] and classified into ecosystem types based on those described in (Singers et al., 2017). If the habitat present met this RMA definition, it was then further evaluated against the provisions of the NPS-FM for natural wetlands

[14] "Wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions".

(assessed for potential exclusions). Details regarding the wetland value assessment are outlined in Appendix 9 – Wetland Value Assessment.

4.4 Ecological Value Assessment

The ecological value of each visited ecological feature (terrestrial, freshwater and wetland) was assessed using a spreadsheet template by assigning a score of *0* (**None**)*, 1* (**Low**)*, 2* (**Moderate**)*, 3* (**High**)*, or 4* (**Very High**) based on professional judgement (with justification) to attributes associated with each of the four ecological matters recommended within EIANZ (2018): *1) Representativeness; 2) Rarity/distinctiveness; 3) Diversity and pattern; and 4) Ecological context.*

Considerations in relation to the four matters and corresponding aspects for terrestrial, freshwater, and wetland features are detailed below:

Terrestrial Ecology

1. **Representativeness:** Typical structure, species composition, and indigenous representation;
2. **Rarity/distinctiveness:** Species of conservation significance, and distinctive ecological values;
3. **Diversity and pattern:** Habitat diversity, species diversity, and patterns in habitat use; and
4. **Ecological context:** Size, shape and buffering function, sensitivity to change, and ecological networks (i.e., linkages, pathways, migration).

Freshwater Ecology

1. **Representativeness:** RHA score for accessible sites and riparian habitat modification based on desktop stream and catchment assessments;
2. **Rarity/distinctiveness:** Species of conservation significance informed by the potential occurrence of Threatened and At-Risk (TAR) fish species;
3. **Diversity and pattern:** Level of natural diversity informed by the habitat diversity subsection of the RHA. Stream order, slope, and hydroperiod were applied as desktop proxies to judge the likely habitat diversity for streams where access was constraint; and
4. **Ecological context:** Stream order and hydroperiod.

Wetland Ecology

1. **Representativeness:** Hydrological modification based on observations of drains, ponds, and catchment land use. Native vegetation informed by site visits and the review of landcover information;
2. **Rarity/distinctiveness:** Wetland type (rare or distinctive), and distinctive ecological values (ecosystem services) in a larger catchment context;
3. **Diversity and pattern:** Representation of different hydroperiods (permanent, seasonal, or temporary) and the structural complexity of vegetation cover; and
4. **Ecological context:** Flood attenuation, streamflow regulation, sediment trapping, water purification, and connectivity and migration.

The score for each matter was constrained to the highest score for each aspect (e.g., a **High** score allocated to a wetland for flood attenuation will result in a **High** score for the Ecological context matter). The combined ecological value score (ranging from **Very High** to **Negligible**), for the four matters, was determined in accordance with the EIANZ Guidelines.

Where ecological features were not visited during the site investigation, these were assessed using desktop information coupled with the analysis of commonalities and patterns noted of similar ecosystem type to determine a high level assumed ecological value. Detailed ecological value assessment of each ecological feature would be undertaken at the future regional resource consent stage, as relevant.

Notwithstanding the ecological value associated with vegetation/habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EIANZ Guidelines, Table 5):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project; and
- Consideration and adjustment of ecological value may occur dependent on regional threat status and local knowledge (if available). The more conservative of the ecological values should be used.

5 Existing and Likely Future Ecological Environment

5.1 Planning and Land Use Context

The existing and anticipated future environment is further discussed in the accompanying AEE. In summary, the implementation timeframe for the Project has yet to be confirmed but is likely to be in approximately 10-15 years' time subject to funding availability. The assessment considers the effects of the Project at both the existing environment (as it exists today) and the likely future (planned) environment which consider potential urban development and intensification sought under PC78.

The Project will be constructed and will operate in the existing urban environment or planned environment (i.e. what can be built under the existing Auckland Unitary Plan: Operative in Part (AUP:OP) live zones):

a) **Existing environment:** The corridors are situated primarily within existing urban areas with live zoning including residential, commercial, and open space zones. There is some Future Urban Zone land in the wider area to the northeast/east. The existing activities within the area are generally reflective of the existing underlying zoning; and
b) **Planned environment:** The planned environment is anticipated to remain urban and comprised of similar activities as the existing environment. The density of residential development is however anticipated to change and increase in future. In particular, this includes in the residential zones around Te Mahia and Takaanini stations, in line with the implementation of the National Policy Statement on Urban Development (NPS-UD) in the AUP:OP. The remaining residential areas will experience an uplift of density through the implementation of the Medium Density Residential Standards (MDRS) through the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021. Plan Change 78 (notified at the time of assessment) seeks to give effect to the NPS-UD and incorporate the MDRS into residential zoning. It is noted that there are some areas of existing residential zoned land (particularly east of the NIMT) that have recently been intensified (i.e., new builds), as such are unlikely to change in the near future.

The likelihood and magnitude of land use change regarding the land use planning context has been identified in Table 5-1 below. This has been used to inform the assumptions made on the likely future environment.

Table 5-1: South FTN – existing and future environment

Existing Environment	Current AUP:OP Zoning	Likelihood of Change for the environment[15]	Magnitude of potential change	Likely Receiving Environment[16]
Residential[17]	Residential (Mixed Housing Suburban)	Low - Moderate[18]	Low - Moderate	Residential
	Residential (Mixed Housing Urban)	Low - Moderate[19]	Low - Moderate	Residential

[15] Based on AUP:OP zoning/policy direction.
[16] Based on AUP:OP zoning/policy direction.
[17] Based on the NPS-UD and MDRS, these residential areas are likely to experience increased density.
[18] There are areas of existing Residential Zone land that has recently been intensified (i.e. new build developments), as such is unlikely to change in the near future.
[19] There are areas of existing Residential Zone land that has recently been intensified (i.e. new build developments), as such is unlikely to change in the near future.

Existing Environment	Current AUP:OP Zoning	Likelihood of Change for the environment[15]	Magnitude of potential change	Likely Receiving Environment[16]
	Residential (Mixed Housing Suburban and Urban) around train stations	Moderate	Moderate - High	Residential and Commercial/Retail[20]
Business	Business (Heavy Industry)	Low	Low	Business (Industrial)
	Business (Light Industry)	Low	Low	Business (Industrial)
	Business (Neighbourhood Centre)	Low	Low	Business (Neighbourhood Centre)
	Business (Town Centre)	Low	Low	Business (Town Centre)
Open Space	Informal Recreation	Low	Low	Informal Recreation
	Community	Low	Low	Community
Greenfield areas	Future Urban	Low - Moderate	High	Urban

[20] Note that much of the commercial operations between Manuia Road and Taka Street occur on residentially zoned land.

6 Ecological Baseline

6.1 Historical Ecological Context

The Project Area is situated within the Manukau Ecological District (**ED**), which has a warm humid climate and is characterised by poorly drained and gleyed alluvial soils and peats that originating from river flats and swamps (McEwen, 1987). However, due to urban development (Manukau City) and surrounding suburbs, the district has undergone significant modifications and urbanisation.

Once covered in forests and swamps, the ED represents the southernmost extent of the northern North Island lowland forest type, with abundant taraire *(Beilschmiedia tarairi*) and pūriri (*Vitex lucens*) (McEwen, 1987). Now only 1.6% of the land area remains in native vegetation cover in the Manukau ED (Auckland Regional Council, 2013). A reduction to around 20% of its former extent is typically considered significant, and a reduction below 5% is deemed severe (Walker et al., 2008).

6.2 Terrestrial Habitat and Fauna

6.2.1 Significant Ecological Areas

Where natural habitat remains, the AUP:OP has mapped and classified habitats as terrestrial or marine SEAs. A distance of 2km was selected as potential ZOI for adverse effects depending on the potential receiving environment and the habitats and species present within an SEA (refer Figure 6-1). The full list of SEAs which occur within 2km of the Project Area are described in Appendix 5. Upon review, only SEA_T_5248 (directly adjacent) was identified to have the potential to be affected by the Project. A full description is presented in Table 6-1.

Table 6-1: Description of SEA_T_5248 and relevance to the Project Area

SEA	Relevant Project NoR and Distance (km)	SEA Description
SEA_T_5248	NoR 1 GSR near Butterworth Ave junction (1G) 0km (directly adjacent)	Kirks Bush Reserve. This site is a representative of the natural extent within the Eco District, covering >10% of the Puriri forest WF7 (7.03 ha). This area provides habitat for rare plant species, including Yoania (*Danhatchia australis*), Kāpuka (*Griselinia littoralis*) and Carmine rātā (*Metrosideros carminea*).

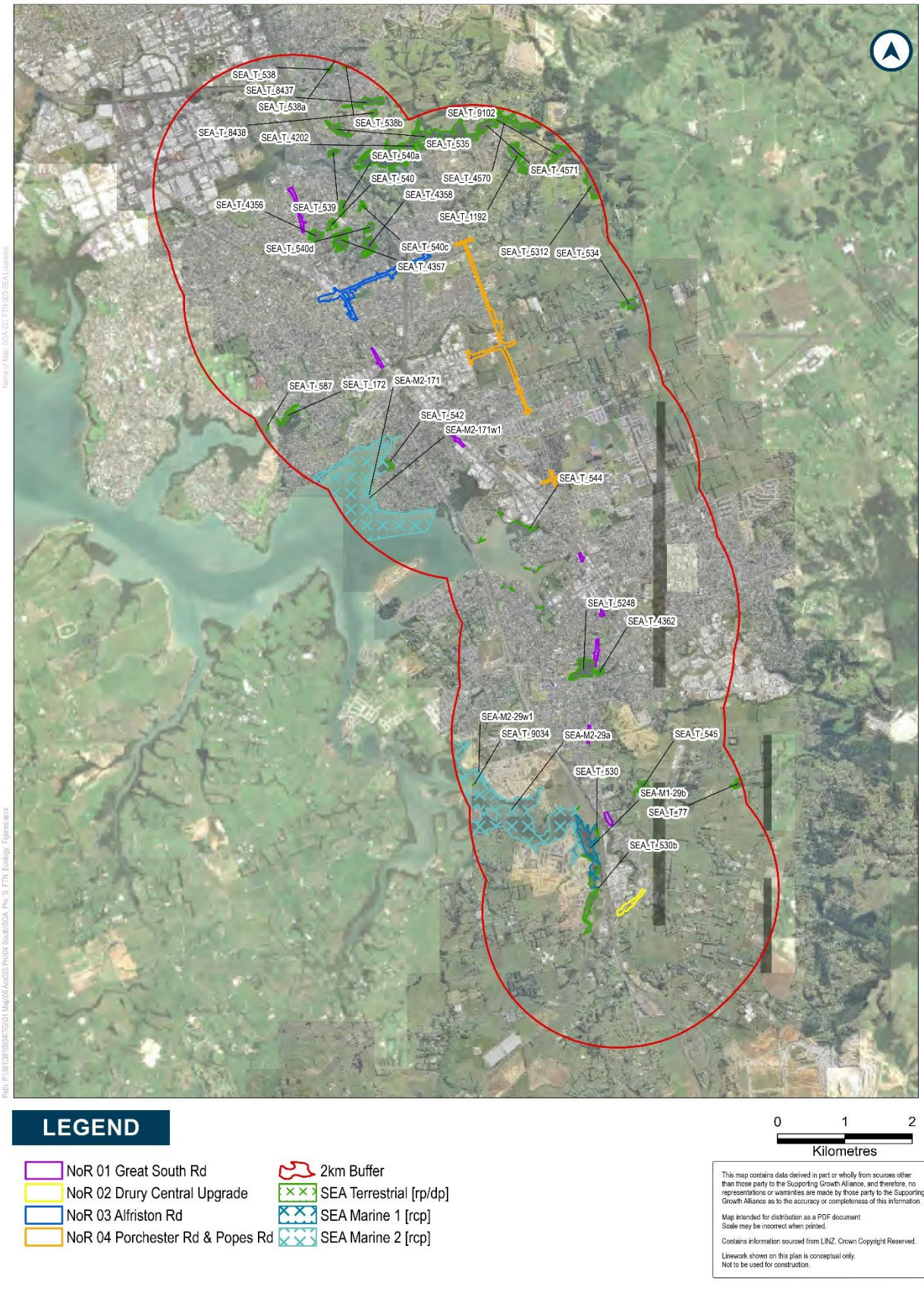

Figure 6-1: SEAs present within 2km of the Project Area.

6.2.2 Terrestrial Habitat

All terrestrial vegetation has been described using a combination of desktop and site investigations. Table 6-2 summarises the terrestrial vegetation types associated with the Project Area. Table 6-3: represents the type and ecological value of the terrestrial vegetation that fall within the proposed designation boundaries of each NoR. Mapping of terrestrial vegetation is presented in Appendix 4, and the detailed ecological values for terrestrial vegetation are presented in Appendix 7.

Table 6-2: Description of the terrestrial vegetation types present within the Project Area. Vegetation type is classified according to (Singers & Rogers, 2014)

Terrestrial Vegetation Type	Abbrev.	Description
Brown Field (includes cropland)	BF	This definition includes industrial hard standing concrete and unmanaged bare ground
Exotic Grassland	EG	Grassland dominated by exotic species
Exotic Scrub	ES	Exotic secondary scrub or shrubland with >50% cover/biomass of exotic species
Planted Vegetation – Native (recent)	PL.1	Native restoration plantings with <50% exotic biomass. Recently planted native scrub and forest <20 years old
Planted Vegetation – Native (mature)	PL.2	Native restoration plantings with <50% exotic biomass. Mature planted native scrub and forest >20 years old
Planted Vegetation – Exotic and / Native (amenity)	PL.3	Amenity plantings. This includes planted exotic and / or mixed native and exotic vegetation within parks, roads, amenity areas and private gardens
Treeland – Native-Dominated	TL.1	Tree canopy cover 20-80%: Native-dominated: >75% native tree cover. For the purposes of mapping this includes planted and wilding native vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms, and amenity areas
Treeland – Mixed Native/Exotic	TL.2	Tree canopy cover 20-80%. Mixed native/exotic: with 25-75% native tree cover. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms, and amenity areas
Treeland – Exotic-Dominated	TL.3	Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms, and amenity areas
Pūriri forest	WF7	Characterised by large emergent rimu and northern rātā, with kahikatea in gullies emerging over a broadleaved canopy of taraire and kohekohe. In the Project Area, it is mostly old remnant forest associated with Kirk's Bush SEA_T_5248

Table 6-3: The terrestrial vegetation types that fall within the proposed designation boundary or directly adjacent to each NoR and their ecological value (see Section 4.4 for assessment methodology)

Terrestrial Vegetation Type	Ecological Value			
	NoR 1	NoR 2	NoR 3	NoR 4
BF – Brown Field	Negligible	Negligible	Negligible	Negligible
EG – Exotic Grassland	Negligible	Negligible	Negligible	Negligible
ES – Exotic Scrub	Low	Low	Low	Low
PL.1 – Planted Vegetation Native (recent)	Moderate	Moderate	Moderate	NA
PL.2 – Planted Vegetation Native (mature)	NA	NA	Moderate	Moderate
PL.3 – Planted Vegetation – Amenity	Low	Low	Low	Low
TL.1 – Treeland – Native-Dominated	Moderate	NA	Moderate	Moderate
TL.2 – Treeland – Mixed Native/Exotic	Moderate	NA	Moderate	NA
TL.3 – Treeland – Exotic-Dominated	Moderate	Moderate	Moderate	Moderate
WF7 – Pūriri Forest	High*	NA	High	NA

Notes: *= associated with SEA_5248;

6.2.2.1 TAR Plant Species

Individual TAR plant / tree species were identified during the site investigations.

The surveys identified the presence of planted kauri (*Agathis australis*), within or immediately adjacent to NoR 1 (Tree Groups 69, 71, 82, 85, 93 and Tree 91, refer further to Arboricultural Assessment). Kauri are listed as 'Threatened – Nationally Vulnerable' because of the spread of kauri dieback (*Phytophthora agathidicida*), which has the potential to significantly impact indigenous forest (De Lange et al., 2013).

Pōhutukawa (*Metrosideros excelsa*) were identified within or immediately adjacent to NoR 1 (Tree Groups 6, 92, 93 and Trees 13, 89, 90, 99), NoR 3 (Tree Groups 43, 53 and Trees 23, 42, 44, 45, 46, 47) and NoR 4 (Tree Group 128 and Trees 132, 133). Manuka (*Leptospermum scoparium*) was identified within small areas of native revegetation within NoR 1 (Group 108, 112 and 113)). Kanuka (*Kunzea robusta*) was also identified within NoR 1 (Group 108) and within NoR 3 (Group 52). These three species are listed as 'Threatened – Nationally Vulnerable' because of the spread of myrtle rust (*Austropuccinia psidii*) within New Zealand and the risk that this poses to indigenous forest (De Lange et al., 2013).

Within the Project context these TAR plants are not considered relevant as they are planted, isolated, and not associated with any native forest areas. However, some of these trees are considered relevant to the ecological effects assessment under the AUP:OP district plan provisions (relevant to the effects assessment in Section 8 of this report and the Arboricultural Assessment).

6.2.3 District Plan Trees

Trees subject to District Plan provisions under the AUP:OP (referred in this assessment as District Plan trees) e.g., street trees, open space trees, notable trees meeting the relevant minimum height and/or girth) have been considered in the Assessment of Arboricultural Effects Report and subsequently as part of this effects assessment. As detailed in Section 2 and Appendix 2, the remainder of terrestrial habitat (and associated fauna) identified is anticipated to be subject to an ecological effects assessment in the future regional consenting phase (including Wildlife Act compliance) as necessary.

Mature native and exotic trees occur throughout the Project Area, these are all street trees or within open space reserves. As such they are all within the existing urban environment and adjacent to existing transport corridors and therefore their ecological value is limited (potential local nesting and foraging potential for non-TAR birds), There value has therefore been assessed from within the Assessment of Arboricultural Effects Report, for amenity value. Ecological effects related to the removal of these trees is considered **Negligible** to **Low** and as such have not been considered any further in this ecological effects assessment.

However, there are some groups of district Plan trees within NoR 1, 2 and 3 that have been highlighted as potentially suitable habitat for native lizards, see Section 8.4. These are:

- NoR 1: Slippery Creek (Tree group 107, 108 and 113);
- NoR 2: Hinagaia Stream (Tree group 115 & 116); and
- NoR 3: State highway one crossing (Tree group 38, 39, 41 & 48).

Additionally, the Wildlife Act provisions would apply for all impacted vegetation, refer to Section 9.1.2.

6.2.4 Long-tailed Bats

Existing desktop records (DOC, 2022a) confirm the presence of long-tailed bats (*Chalinolobus tuberculatus*) within 10km ZOI (home range specific to bat movement and a conservative buffer for assessment) of the Project Area (refer to Figure 6-2). These records include the DOC Bioweb database, which includes previous Automatic Bat Monitors (**ABM**) survey results conducted for various Te Tupu Ngātahi projects. Figure 6-2 shows areas where bat activities have been recorded and also highlights the large number of locations where ABMs have not detected any bat calls. Bat activity is generally absent from the surrounding urban and rural areas, with limited records from intact forest areas or forest corridors in the Clevedon Hill, Hunua Ranges and connected habitat such as Totara Park.

The desktop assessment revealed several stream systems and areas of vegetation with large trees (e.g., areas of TL.1, TL.2, TL.3, WF7) within the Project Area that long-tailed bats have the potential to utilise (albeit they are likely to be absent or to occur only fleetingly (likely only for foraging), based on previous survey data and due to lack of contiguous habitat).

No project specific surveys were undertaken in 2023, as sufficient desktop records (including DOC Bioweb database and Te Tupu Ngātahi 2020 survey records) have confirmed bat activity in the wider ZOI (10km) and highlighted apparent absence or limited activity from the Project Area. The following records have been listed as relevant to the Project Area:

- One record of the presence of long-tailed bats 3.2kms to the northeast of GSR/Browns/Orams Road (NoR 1);

- One record of the long-tailed bats 1.8kms to the west of GSR/ Park Estate Road (NoR 1);
- One record of the long-tailed bats 4.8kms to the east of the Great South Road/ Drury Station (NoR 2);
- One record of the presence of long-tailed bats 2.5kms to the north of Alfriston Road/Porchester Road (NoR 3); and
- One record of the presence of long-tailed bats 2.1kms to the north of Porchester Road (NoR 4).

Table 6-4 presents the ecological value for bats for each NoR based on the results of the desktop assessment, ABM and habitat potential surveys. The conservation status of this species is 'Threatened - Nationally Critical' (O'Donnell et al., 2013), therefore the ecological value of long-tailed bats is **Very High**, albeit they are considered to be transient visitors to the Project Area (see Section 4.4 for assessment methodology of ecological value).

Table 6-4: Results of desktop, ABM, and habitat potential surveys for long-tailed bats within to the ZOI of each NoR

NoR	Desktop Records within 10km Buffer	Potential Bat habitat	Ecological Value
NoR 1	Yes – 3.2km and 1.8km	Kirks Bush Reserve (SEA_T_5248) Otūwairoa Stream / Slippery Creek riparian corridor	Very high
NoR 2	Yes – 4.8km	Hingaia Stream riparian corridor	Very high
NoR 3	Yes – 2.5km	No suitable habitat	N/A
NoR 4	Yes – 2.1km	Papakura Stream riparian corridor and mature trees along Popes Road	Very high

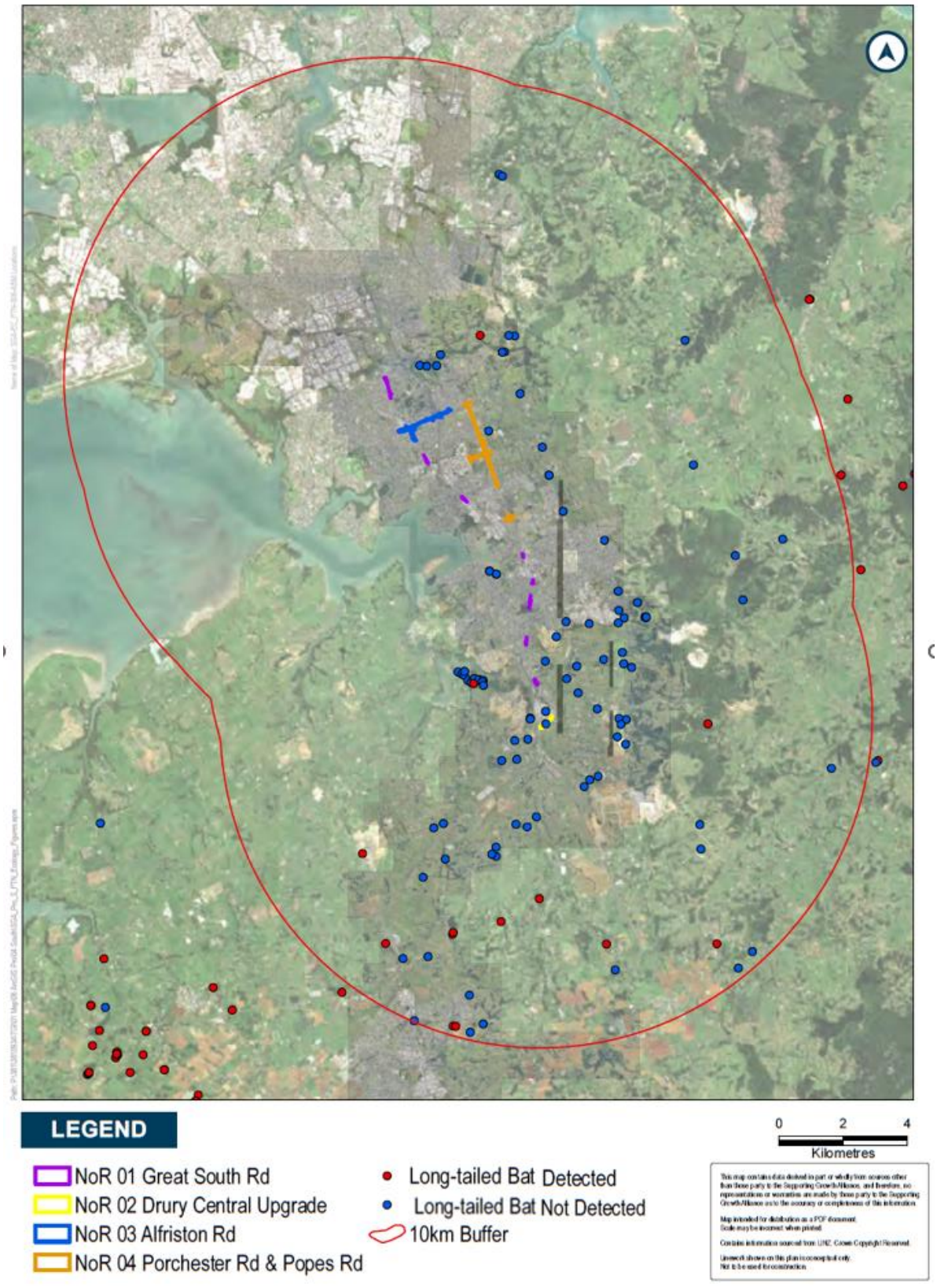

Figure 6-2: Long-tailed bat records within 10 km radius of the Project Area

6.2.5 Avifauna

An area wide desktop review identified the presence of native forest, freshwater, and coastal avifauna (bird) species within a 2 km buffer of the Project Area (eBird, 2022; GBIF.Org User, 2022). No dedicated bird surveys were undertaken for the Project; however, incidental observations of birds were recorded during site visits. A full list of species identified from the desktop review and incidental observations is included in Appendix 6 (including introduced and naturalised species). A total of 56 species were identified, of which, 35 are native, 13 have a TAR status (Table 6-5), and the remainder are exotic (Robertson et al., 2021).

A desktop assessment identified potential habitat for several TAR species. Table 6-5 details all the observed and potential TAR bird species for each NoR, including the ecological value for each species, based on the availability of potential habitat within the Project Area[21]. The NoR was considered relevant to the species if desktop records indicate presence in that area and if its potential habitat falls within or adjacent to the the FTN Project Area.

Any TAR species that were identified during desktop review but are expected to be absent from the Project Area due to a lack of suitable habitat, were not assessed for ecological value and impact. This includes species that have a strong preference for oceanic or coastal habitats (e.g., petrels, shearwaters, and spoonbills), sandy beaches (e.g., dotterels), rocky shores (e.g., reef herons), and large, open mudflat areas (e.g., godwits).

[21] Non-threatened native bird species are considered to have a **Low** ecological value. The full list of bird species identified via desktop assessment and incidental observations are included in Appendix 6 – Full list of Fauna Records.

Table 6-5: TAR bird species observed or likely to occur within the Project Area based on suitable habitat, as well as their ecological values (see Section 4.4 for assessment methodology)

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Preferred Habitat	Suitable Habitat within FTN Project Area	Ecological Value	Relevant NoR (Location)
Red-billed gull (*Larus novaehollandiae scopulinus)*	At Risk - Declining	eBird and iNaturalist	Found in most coastal areas including urban areas, reserves and sports fields. Breeding habitat, rocky shoreline (Gurr & Kinsky, 1965)	Likely to occur within all NoRs, from the urban to rural areas. Roosting and foraging throughout urban areas riparian margins and grass paddock / reserves. No breeding habitat within the Project Area.	High	All NoRs any open habitat areas grass reserves
Variable Oystercatcher (*Haematopus unicolor*)	At Risk - Recovering	eBird and iNaturalist	Found in most coastal areas, including intertidal mudflats, beaches or rocky shoreline. Breeding habitat along shorelines. Although usually stays close to the coast, occasionally forage in paddocks and nest a short distance inland on mown or grazed grassy areas or bare ground (Dowding, 2014).	Unlikely to occur within urban areas. However, has the potential to occur and utilize coastal / riparian margins and grass paddock / reserves (e.g. Otūwairoa Stream / Slippery Creek) (NoR 1). No breeding habitat within the Project Area.	High	NoR 1 (Otūwairoa Stream / Slippery Creek)
South Island pied oystercatcher (*Haematopus finschi*)	At Risk - Declining	eBird and iNaturalist	Found in most coastal areas, generally foraging in intertidal mudflats around estuaries and harbours. Often also utilises grass reserves, sports pitches and paddocks by the coast for foraging and roosting. Breed inland in the South Island, primarily to the east of the Southern Alps on riverbeds and farmland.	Unlikely to occur within urban areas. However, has the potential to occur and utilize coastal / riparian margins and grass paddock / reserves (e.g. Otūwairoa Stream / Slippery Creek) (NoR 1). No breeding habitat within the Project Area.	High	NoR 1 (Otūwairoa Stream / Slippery creek bridge)
Caspian tern (*Hydroprogne caspia*)	Threatened - Nationally Vulnerable	eBird and iNaturalist	Found in most coastal areas, generally foraging in bays and harbours. Also, large inland lakes and rivers. Breeding habitat along shorelines.	Unlikely to occur within urban areas. However, has the potential to occur and utilize coastal / riparian margins (e.g. Otūwairoa Stream / Slippery Creek) (NoR1)	High	NoR 1 (Otūwairoa Stream / Slippery creek bridge)

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Preferred Habitat	Suitable Habitat within FTN Project Area	Ecological Value	Relevant NoR (Location)
				No breeding habitat within the Project Area.		
Dabchick *(Poliocephalus rufopectus)*	Threatened - Nationally Vulnerable	eBird and iNaturalist	Uncommon but widespread in the Auckland region (Szabo, 2013). Small shallow freshwater lakes and ponds, with dense vegetation around margins. Notably can utilise stormwater ponds for foraging and or breeding, where habitat quality is suitable.	Unlikely to occur within urban areas. Potential to occur fleetingly for foraging. Breeding potential is highly unlikely due lack of suitable breeding habitat and disturbance due to existing roads/urban areas. Potential to use Otūwairoa Stream / Slippery creek bridge (NoR 1) or stormwater ponds adjacent to the Project Area (NoR 3). No breeding habitat within the Project Area.	Very High	NoR 1 (Otūwairoa Stream / Slippery creek bridge). NoR 3 Stormwater wetland near State Highway 1 bridge crossing.
Banded rail (*Gallirallus philippensis assimilis*)	At Risk - Declining	eBird	Restricted to mangroves and saltmarshes in the estuaries of Northland, Auckland, Waikato and Bay of Plenty (O'Donnell et al., 2015a)	Unlikely to occur within urban areas. However, has the potential to occur and utilize coastal / riparian margins (e.g. Otūwairoa Stream / Slippery Creek) (NoR 1). Small area of habitat, Oioi, restiad rushland/reedland (WL10) within the Project Area. However, breeding highly unlikely due to small habitat extent and disturbance due to the existing roads.	High	NoR 1 (Otūwairoa Stream / Slippery creek bridge)
Black Shag (*Phalacrocorax carbo*)	At Risk - Relict	iNaturalist (incl. records in	It is widespread throughout New Zealand, although sparsely so (Powlesland, 2022). Generally coastal, but also occurs in open water wetland, lakes, ponds and	Likely to occur along the major streams which bisect the NoRs. Including Otūwairoa Stream / Slippery Creek (NoR 1), Hingaia	High	NoR 1 (Otūwairoa Stream / Slippery Creek bridge),

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Preferred Habitat	Suitable Habitat within FTN Project Area	Ecological Value	Relevant NoR (Location)
		proximity to NoR 4)	streams. Where there are large, mature trees with overhanging branches these may be used for roosting and breeding.	Stream (NoR 2).and Papakura streams, (NoR 4). No breeding habitat within the Project Area.		NoR 2 (Hingaia Stream), NoR 4 (Papakura Stream)
Little Black Shag *(Phalacrocorax sulcirostris)*	At Risk - Naturally Uncommon	eBird	Common and widespread in the Auckland region (Armitage, 2013). Occur in coastal inlets, lakes, and ponds, including stormwater ponds. Roosting and breeding in overhanging trees.	Likely to occur in open water, and ponds within the Project Area for foraging and nesting. Including Otūwairoa Stream / Slippery Creek (NoR 1), Hingaia Stream (NoR 2).and Papakura streams, (NoR 4). No breeding habitat within the Project Area.	High	NoR 1 (Otūwairoa Stream / Slippery Creek bridge), NoR 2 (Hingaia Stream), NoR 4 (Papakura Stream)
Pied Shag *(Phalacrocorax varius)*	At Risk - Recovering	eBird, iNaturalist	Common and widespread in the Auckland region (Powlesland, 2022). Occur in coastal inlets, lakes and ponds, including stormwater ponds. Roosting and breeding in overhanging trees.	Likely to occur in open water, and ponds within the project area for foraging and nesting. Including Otūwairoa Stream / Slippery Creek (NoR 1), Hingaia Stream (NoR 2) and Papakura streams, (NoR 4). No breeding habitat within the Project Area.	High	NoR 1 (Otūwairoa Stream / Slippery Creek bridge), NoR 2 (Hingaia Stream), NoR 4 (Papakura Stream)
Long-tailed Cuckoo *(Eudynamys taitensis)*	Threatened - Nationally Vulnerable	eBird	Summer migrant to New Zealand, spending winter in tropical Pacific islands. As a parasite nester, their breeding range is restricted to host species whitehead, brown creeper, and yellowhead. Absent as a breeding species from Auckland region (except Te Hauturu-o-Toi, Little Barrier Island) but occurs on migration passage throughout New Zealand (Gill & Huaber, 2013).	Has the potential to occur fleetingly on migration passage across the Project Area. Can occur in native / exotic forest, scrub, farmland, or urban areas on passage to breeding / winter habitat. Only likely to occur fleetingly within Kirks Bush SEA_T_5248 (NoR 1).	Very High	NoR 1 Kirks Bush SEA_T_5248

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Preferred Habitat	Suitable Habitat within FTN Project Area	Ecological Value	Relevant NoR (Location)
				No breeding habitat within the Project Area		
Royal spoonbill (*Platalea regia*)	At Risk – Naturally Uncommon	eBird, iNaturalist	Common and widespread in the Auckland region (Powlesland, 2022). Foraging and breeding around freshwater to saltwater wetlands. Often roosting and breeding in overhanging trees.	Has the potential to occur and utilize coastal / riparian margins (e.g. Otūwairoa Stream / Slippery Creek). No breeding habitat within the Project Area.	High	NoR 1 (e.g., (Otūwairoa Stream / Slippery creek bridge)
North Island Kākā *(Nestor meridionalis)*	At Risk - Recovering	eBird, iNaturalist	Rare but widespread (seasonal migrant) in the Auckland region (Moorhouse, 1997). Kākā are generally restricted to indigenous forest habitat and offshore islands in the Auckland region. However, they make nomadic movements to the Auckland mainland, particularly in winter where they often utilize exotic / native trees in rural and urban areas.	Has the potential to occur fleeting during season winter foraging movements. Only likely to occur fleetingly within Kirks Bush SEA_T_5248 (NoR 1). No breeding habitat within the Project Area.	High	NoR 1 Kirks Bush SEA_T_5248
Red knot (*Calidris canutus rogersi*)	At Risk - Declining	eBird & iNaturalist	Found widely around the large harbours and estuaries of New Zealand (Studds et al., 2017). Foraging in intertidal mudflats and roosting on shell banks and sandspits. Breeds areas are in in Russia.	Unlikely to occur within the Project Area	High	Unlikely to occur
New Zealand pipit (*Anthus novaeseelandiae novaeseelandia*)	At Risk - Declining	eBird	Widespread in rough open habitats (grassland and scrub) from the coastline to alpine, often in coastal habitat in Auckland region (Beauchamp, 2007)	Unlikely to occur within the Project Area. No breeding habitat within the Project Area.	High	Unlikely to occur

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Preferred Habitat	Suitable Habitat within FTN Project Area	Ecological Value	Relevant NoR (Location)
North Island fernbird (*Bowdleria punctata vealeae*)	At Risk - Declining	eBird	Widely but patchily distributed in dense wetland vegetation (M'Lean, 1906; O'Donnell et al., 2015b)	Unlikely to occur within the Project Area	High	Unlikely to occur

6.2.6 Herpetofauna

Existing desktop records (DOC, 2022b; GBIF.Org User, 2022) have identified the presence of native herpetofauna species within 5 km of the Project Area. No dedicated herpetofauna surveys were undertaken for the Project; however opportunistic searches were conducted where possible. Table 6-6 lists the four species identified through desktop records alongside their threat status (Hitchmough et al., 2021; Melzer et al., 2022) and details all the potential native herpetofauna species for each NoR, including the ecological value for each species, based on the availability of potential habitat within the Project Area.[22] The NoR was considered relevant to the species if desktop records indicate presence in that area and if its potential habitat falls within or adjacent to the designation of the NoR.

Auckland Green gecko, and Forest gecko were identified during the desktop review but are expected to be absent from the Project Area due to a lack of indigenous forested habitat within the Project Area (NZ Herpetological Society, 2021). Therefore, they will not be assessed for ecological value and impact.

[22] The full list of herptofauna species identified via desktop assessment and incidental observations are included in Appendix 6 – Full list of Fauna Records.

Table 6-6: Native lizards potentially likely to occur within the proposed designation boundary for the Project, as well as their ecological values (see Section 4.4 for assessment methodology)

Species	Conservation Status (Hitchmough et al., 2021; Melzer et al., 2022)	Record Source	Distribution and Preferred Habitat	Suitable Habitat within the Project Area	Ecological Value	Relevant NoR
Copper Skink *(Oligosoma aeneum)*	At Risk – Declining	DOC Bioweb & iNaturalist	Inhabits areas with good groundcover in open and shaded areas of forests. Also found in urban areas, including thick-rank grass, compost heaps, or under rocks, logs and other debris (NZ Herpetological Society, 2021).	Likely to occur in urban areas. Areas with sufficient understorey relating to vegetation units EG (unmanaged rank grass, not grazed or mown), ES, PL.1, PL.2, PL.3, TL.2, TL.3, WF7, and mature indigenous forest types	High	All NoRs
Ornate skink (*Oligosoma ornatum*)	At Risk – Declining	iNaturalist	Inhabit forested areas, shrubland and heavily vegetated coastlines; they are often found amongst leaf litter, in dense low foliage, thick rank grass and under rocks or logs (Hitchmough et al., 2018)	Unlikely to occur in urban areas. Indigenous forest types and areas contiguous to such habitat with sufficient understorey, such as ES, PL.1, PL.2, TL.2 and TL.3	High	All NoRs
Auckland green gecko *(Naultinus elegans)*	At Risk – Declining	DOC Bioweb	Inhabits forests, including scrubby/regenerating habitat, swamps, scrubland, and mature forest (NZ Herpetological Society, 2021)	Unlikely to occur within urban areas. Requires contiguous indigenous vegetation	High	Unlikely to occur
Forest gecko *(Mokopirirakau granulatus)*	At Risk - Declining	Unconfirmed, likely forest gecko (Boffa Miskel Ltd, 2014)	Inhabits a range of habitats, including scrubland, mature forests (beech, podocarp, and broadleaf), and rock fields. In the North Island, they appear to favor scrubby/regenerating habitats (NZ Herpetological Society, 2021).	Unlikely to occur within urban areas. Requires contiguous indigenous vegetation	High	Unlikely to occur

6.3 Freshwater Habitat and Fauna

6.3.1 Streams

A review of the NZ River Name Lines dataset (LINZ, 2022) indicated that named rivers/streams and their tributaries will be crossed in the Project Area.

All potential streams within the Project Area were mapped (Appendix 4), classified as either permanent or intermittent (ephemeral streams were mapped when possible). Permanent or intermitted streams that were within the NoR areas were numbered and assessed. Additionally, all streams that were accessed during site investigations were surveyed using the RHA, with the detailed RHA results included in Appendix 10. Table 6-7 identifies the streams crossed by each NoR and presents their detailed ecological value.

Table 6-7: Summary of streams identified in the Project Area and their ecological value

Stream ID	Stream Name	Hydroperiod	RHA Category	Ecological Value	Relevant NoR
FTN1_S1	Slippery Creek/ Otūwairoa Stream	Permanent	Moderate	High	NoR 1
FTN1_S2	Papakura Stream	Permanent	Moderate	High	
FTN2_S1	Hingaia Stream	Permanent	Moderate	High	NoR 2
FTN2_S2	Unnamed Hingaia Stream tributary	Permanent	Moderate	Moderate	
FTN3_S1*	Unnamed Papakura Stream tributary	Permanent	Moderate	Moderate	NoR 3
FTN3_S2	Unnamed Papakura Stream tributary	Permanent	Moderate	Moderate	
FTN3_S3	Unnamed Papakura Stream tributary	Intermittent	Moderate	Low	
FTN3_S4	Unnamed Papakura Stream tributary	Intermittent	Moderate	Low	
FTN4_S1	Unnamed Papakura Stream tributary	Intermittent	Poor	Low	NoR 4
FTN4_S2	Papakura Stream	Permanent	Good	High	

Note: * = Ecological feature assessed at a desktop level due to access restrictions.

6.3.2 Roadside drain

Following desktop survey, site investigation and reviewing historical images, the majority (excluding FTN4_S1 and FTN4_S2) of watercourses within NoR 4, were classified as artificial watercourses[23] (drains[24]). These drains run along Porchester and Popes Roads. Despite their original design for subsurface land drainage and stormwater management, these ditches possess ecological value,

[23] Constructed watercourses that contain no natural portions from their confluence with a river or stream to their headwaters. (Auckland Unitary Plan).
[24] Drain means any artificial watercourse, designed, constructed, or used for the drainage of surface or subsurface water, but excludes artificial watercourses used for the conveyance of water for electricity generation, irrigation, or water supply purposes. (RMA).

providing suitable freshwater habitats and supporting local biodiversity (Keßler et al., 2012; Lou et al., 2023). As these features are artificial, they have no formal protection and therefore they have been excluded from aquatic habitat assessment. However, the presence of fish within these features should be considered during regional consenting processes.

6.3.3 Freshwater Fish

The New Zealand Freshwater Fish Database (**NZFFD**) (Stoffels, 2022) was reviewed for native freshwater fish and freshwater invertebrate records within stream catchments associated with the Project Area. Fish surveys were not carried out during site investigations, and no native fish species were incidentally observed onsite.

A full list of species (including introduced and naturalised species) is included in Table 6-8. Of the freshwater fish and invertebrates recorded, nine are native and two have a TAR status (Dunn et al., 2018' Grainger et al., 2018).

Table 6-8: Native freshwater fish species recorded within the catchments associated with the Project Area

Common name	Conservation Status (Dunn et al., 2017)	Catchment and Relevant NoR			
		NoR 1	NoR 2	NoR 3	NoR 4
		Slippery Creek/ Waihoihoi Stream and Papakura Stream	Hingaia Stream	Papakura Stream	Papakura Stream
Shortfin eel	Not threatened	✓	✓	✓	✓
Common bully	Not threatened	✓	✓	✓	✓
Crans bully	Not threatened	✓	NA	✓	✓
Inanga	Not threatened	✓	✓	✓	✓
Red Rock Lobster (Koura)	Not threatened	✓	NA	NA	✓
New Zealand Longfin eel	At Risk: Endangered	✓	NA	✓	✓
Torrentfish	At Risk: Declining	NA	NA	✓	✓
Banded Kokopu	Not threatened	✓	✓	✓	✓
Gambusia (mosquitofish)	Introduced and naturalised	✓	✓	✓	✓
brown bullhead catfish	Introduced and naturalised	✓	✓	✓	✓
Perch	Introduced and naturalised	NA	NA	✓	✓

Common name	Conservation Status (Dunn et al., 2017)	Catchment and Relevant NoR			
		NoR 1	NoR 2	NoR 3	NoR 4
		Slippery Creek/ Waihoihoi Stream and Papakura Stream	Hingaia Stream	Papakura Stream	Papakura Stream
Rudd	Introduced and naturalised	✓	✓	✓	✓
Tench	Introduced and naturalised	✓	✓	✓	✓
Redfin bully	Not Threatened	✓	✓	✓	✓

6.3.4 Wetland Habitat

A desktop review of existing ecological records was undertaken to gain an understanding of the wetland habitat that could be present within the Project Area.

A total of six wetlands within the Project Area were identified and assessed. The different wetland types and their classification are summarised in Table 6-9 (Singers et al., 2017; Singers & Rogers, 2014).

Table 6-9: Description of the wetland types present within the Project Area

Wetland Type	Abbrev.	Description
Exotic Wetland	EW	Wetland ecosystems with >50% exotic plant biomass
Open Water	OW	Open Water (e.g., ornamental ponds, stormwater ponds, stock ponds)
Planted Wetland - Native (recent)	PLW.1	Native restoration plantings with <50% exotic biomass
Oioi restiad rushland/reedland	WL10	Riverine/lacustrine wetlands occurring in freshwater areas of estuaries, coastal stream margins. Dominated by oioi, occasional pūrua grass, kuta and lake clubrush, scattered raupō and harakeke

Details regarding the vegetation cover, potential NPS-FM classification, potential for supporting TAR species, and ecological value for each wetland is presented in Table 6-10. Appendix 8 presents the detailed ecological value for wetlands identified in the Project Area. Refer to Appendix 4 for a map showing the spatial distribution of wetlands.

Table 6-10: Summary of wetlands identified in the Project Area and their ecological value

Wetland ID	Wetland vegetation Type (Singers, 2017)[25]	Wetland Description	NPS-FM Classification	Potential for TAR Species	Ecological Value	Relevant NoR
FTN1_W1	Oioi restiad rushland/reedland (WL10) (occurs on both left and right banks of the Otūwairoa Stream / Slippery Creek) and Planted wetland (PLW.1)	Riverine/ lacustrine upper estuarine zone	Natural inland wetland	Potential inanga (At Risk Declining) spawning habitat. Unlikely to support TAR birds. Banded rail may occur fleetingly for foraging	High	NoR 1
FTN3_W1*	Exotic Wetland (EW)	Valley bottom (with/without channel)	Natural inland wetland	Unlikely to support TAR species	Low	NoR 3
FTN3_W2	Open Water (OW)	Stormwater pond	Artificial wetland	Unlikely to support TAR species	Low	
FTN3_W3	Exotic Wetland (EW)	Valley bottom (with channel)	Natural inland wetland	Unlikely to support TAR species	Low	
FTN4_W1	Exotic Wetland (EW)	Oxbow wetland former disconnected meandering channel	Natural inland wetland	Unlikely to support TAR species	Low	NoR 4
FTN4_W2	Planted wetland (PLW.1)	Stormwater swale	Artificial wetland	Unlikely to support TAR species	Low	

Note: * = Ecological feature assessed at a desktop level due to access restrictions.

6.4 Likely Future Ecological Environment

The assessment of ecological effects should take account of the likely future environment, including the likelihood of change from the existing environment, based on the current AUP:OP zoning, permitted activities for infrastructure, and planned urbanisation and directions within any current National Policy Statements i.e., NPS-FM. Based on these components, the implications of the future environment are not anticipated to differ for all NoRs.

[25] Open water, as an ecological feature, has been included under the wetland section.

7 Assessment of Positive Effects

The following section outlines the positive effects of the proposed alignment for each NoR in relation to specific ecological features (Table 7-1). The statement regarding positive effects assumes that some native planting will occur on the sides of the transport corridors as part of the landscape management.

There is the potential for positive effects which apply to each NoR. These include:

- Improved blue/green infrastructure (stormwater wetlands, swales, raingardens) and associated landscaping (which will be indigenous species); and
- Mass revegetation / landscaping of sloping berms, batters, and embankments to connect with retained vegetation/mature trees.

Table 7-1: Summary of positive effects associated with each NoR

Positive Effect	Ecological Feature	Relevant NoR
The Project landscape planting will tie into stream and riparian corridors. Riparian vegetation will be retained (where practicable) and enhanced (weeds control and indigenous vegetation planted)	All streams and riparian corridors	All NoRs
Existing infrastructure upgrades will include new bridge structures replacing existing undersized structures. This will improve habitat connectivity for freshwater and terrestrial species due to improved fish passage and improved riparian habitat connectivity	Papakura Stream, Slippery Creek and Hingaia Stream	NoR 1, 2 and 4

8 NoR Level Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

This section assesses the ecological effects of activities (construction and operational) which relate to district plan matters under the AUP:OP, as these relate to the designations sought (noting regional consents will be sought later, closer to construction). For each key ecological effect, the assessment details the 'Magnitude of Effect' and subsequent 'Overall level of Effect' (see Appendix 1 for details on assessment methodology) as they relate to the ecological features identified. Impact management and residual effects are presented where the overall level of effect is assessed to be Moderate or higher.

The effects assessment has considered two scenarios – the current ecological baseline and the likely future ecological environment. Refer to Section 5.1 for a discussion regarding the assumptions made for the effects assessment as it relates to permitted activities and likely future environment.

8.1 Overview of Construction and Operational Effects

The Project involves the upgrading and widening of existing roads in existing urban areas.

The potential **construction effects** (direct and indirect) to the terrestrial habitat, bats, birds, and lizards within and adjacent to the Project area (as they relate to district plan matters) include:

- Disturbance and displacement of bats (including roost sites), birds (including nests), and lizards adjacent to construction activities (e.g., noise, light, vibration, and dust from construction activities). It is assumed that this effect will occur after vegetation clearance (subject to regional consent controls) has been implemented and is therefore likely to happen in habitats adjacent to the project footprint/designation or underneath structures such as bridges where vegetation is most likely to occur.

In relation to AUP:OP district plan vegetation[26], the following potential effects have been identified:

- Permanent loss of habitat resulting in fragmentation and edge effects due to the removal of trees during construction;
- Loss of foraging habitat for bats, birds, and lizards due to the removal of trees protected by the AUP:OP district plan;
- Bat roost and bird nest loss through the removal of trees protected by the district plan; and
- Mortality or injury to bats, birds, and/or lizards due to the removal of trees protected by the AUP:OP district plan.

The potential **operational effects** (direct and indirect) to the terrestrial habitat, bats, birds, and lizards within and adjacent to the Project (as they relate to district plan matters) include:

- Disturbance and displacement of bats (including roost sites), birds (including nests), and lizards due to light, noise, and vibration effects from the presence of the road; and

[26] As per the South FTN Assessment of Arboricultural Effects Report, a 'protected tree' is a tree that requires resource consent for alteration (including pruning and works within the root zone) or removal. This includes effects on 'notable trees', effects on trees in ONF, HNC, ONL and ONC overlays, effects on trees in roads, except where adjacent to rural zoned in respect of infrastructure projects, and effects on trees in Open Space zones.

- Loss in connectivity due to permanent habitat loss, and light and noise effects from the road, which leads to fragmentation of terrestrial, wetland and riparian habitat.

8.1.1 Construction effect -Terrestrial vegetation

Vegetation to be removed that is subject to district plan provisions in the AUP:OP, is guided by the findings of the Arboricultural Effects Assessment for the Project.

For a list of trees protected by the district plan provisions (AUP:OP) refer to the Arboricultural Effects Assessment. The removal of the protected trees was taken into consideration for the assessment of:

- The permanent loss of habitat, which may result in fragmentation and edge effects due to the removal of the trees during construction;
- Loss of foraging habitat for bats, birds, and lizards due to the removal of trees protected by the AUP:OP district plan; and
- Bat roost and bird nest loss through the removal of trees protected by the district plan.

The above ecological effects related to the removal of these trees is considered Low and as such have not been considered any further in the ecological effects assessment. As such no impact management is recommended for these effects. However, the effect of the loss of these trees on killing/injuring TAR fauna species is considered separately in Sections 8.2 - 8.4.

These effects assessments considered two scenarios – the current ecological baseline and the 'likely future ecological environment' (i.e., allowing for permitted activities). A precautionary approach was applied considering the level of effect within the likely future ecological environment. The likely future ecological environment was generally assessed as the same as the baseline, unless otherwise specified.

8.2 Long Tailed Bats

8.2.1 Construction effects

During construction of the Project, night works may be required, and site compounds may be lit overnight. Lighting at night has the potential to modify the behaviour of bats if they are foraging within this area or roosting in nearby isolated stands of mature trees. Noise and vibration during construction can also be an issue if bats are roosting in the immediate vicinity of the construction works. This potential impact has been considered in light of the existing transport corridor and therefore existing disturbance, which will significantly reduce the magnitude of effects from the proposed upgrades.

The upgrade of existing transport corridors, within an existing urban area is highly unlikely to cause additional disturbance to habitat potentially utilised by bats. Disturbance such as noise and light are pre-existing and therefore any bat utilising the area will be habituated / deterred from roosting adjacent to the road. Roost sites are highly unlikely to occur within or adjacent to the designation.

The effects of District Plan tree removal on roosting bats and for the provision of roosting habitat has been assessed. With the exception of one location (i.e. a willow that is part of tree group 115 and has **Moderate** bat roost potential), all of the trees identified within the Arboriculture Effects Assessment were identified as having **Low** bat roost potential. This was based upon lack of roosting features and/or proximity to road and surrounding land use. For example tree group 122 was observed to have some roost features, but given the location of these features at eye level and proximity to a busy road

within an urban area, they were considered as **Low** roost potential. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.

The magnitude of effect is assessed as **Negligible** for all effects due to the existing urban environment, very low bat activity, lack of roost habitat (district plan trees only) and scope of project upgrades within an existing road corridor. Therefore, impacts on bats are considered to be highly unlikely. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. The likely Future Ecological Environment assessment was considered to be the same as baseline.

It is expected that any risk associated with the removal of the willow tree (tree group 115) with **Moderate** bat roost potential would be assessed and managed as part of the Wildlife Act compliance process during the resource consent phase of work.

8.2.2 Operational Effects

The loss of connectivity through the presence of the road and associated disturbance such as operational noise, vibration, and light can lead to an overall reduction in size and quality of bat foraging habitat and can impact on bat movement in the broader landscape. Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations. This potential impact has been considered in light of the existing transport corridor and therefore existing disturbance.

The upgrade of an existing transport corridor is highly unlikely to further fragment habitat that might be used by bats. Disturbance such as noise and light are pre-existing and therefore any bat utilising the area will likely be deterred from roosting adjacent to the road. Roost sites are highly unlikely to occur within or adjacent to the designation. In a Likely Future Environment, there is no expected change to baseline as riparian corridors will remain. The magnitude and level of effect are the same as the Baseline.

The magnitude of effect is assessed as **Negligible** for all effects due to the existing urban environment, very low bat activity, lack of roost habitat (district plan trees only) and scope of project upgrades within an existing road corridor. Therefore, impacts on bats are considered to be highly unlikely. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. The likely Future Ecological Environment assessment was considered to be the same as baseline.

8.3 Avifauna

The effect on birds has been considered against the typical behaviours, habitat preference, and the sensitivity of the various TAR species within the Project. Birds have been grouped and effects assessed based upon similar habitat preferences. These groups are as follows:

Freshwater Water / Wetland Birds:

Including the shag species, and dabchick. Typically, these species can be found utilising open water wetlands (ponds), lowland wetlands and large stream systems with plenty of slow moving or still water. Nest behaviour is generally typified by breeding on mature trees with overhanging branches over water or in colonies on cliff sides near water. They are noted as being generally sensitive to disturbance, however there are ample records of shag species and dabchick developing a level of

tolerance to noise and light, with individuals and breeding pairs being noted on stormwater ponds, where suitable breeding habitat is available. They are noted as being relatively mobile outside of the breeding season with frequent habitat relocations. In relation to freshwater/wetland birds, it has been considered that no current habitat within the Project Area presents suitable breeding TAR bird habitat.

Coastal Birds:

Including wading birds, gulls, terns, banded rail. Typically, these are noted as occurring within the coastal and tideline of sandy beaches environment, including harbours, estuaries, riverbeds. These species may occasionally be vagrant with freshwater and open landscapes including rough pasture, wetlands and river margins. In relation to coastal birds, it has been considered that no current habitat within the Project Area presents suitable breeding TAR bird habitat.

Forest Birds:

Including Long-tailed cuckoo and Kaka. Typically, these species are noted as occurring within large areas of indigenous forest. Both species are noted as having a wide home range and both undertaking annual migrations / seasonal movements. Both are affected by the presence of mammalian predators which affect reproductive success. In relation to Forest birds, it considered that no current habitat with the Project Area presents suitable breeding TAR bird habitat.

8.3.1 Construction Effects

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace TAR birds and native birds from suitable nesting and foraging habitat within and adjacent to all NoRs. It is considered that no current habitat with the Project Area presents suitable breeding habitat for TAR bird habitat. This potential impact has been considered in light of the existing transport corridor and therefore existing disturbance.

Non-TAR birds may breed throughout the Project Area, within suitable habitat such as planted vegetation and treelands within the NoR. Non-TAR birds may be impacted by the removal of vegetation which is protected by the AUP:OP. The removal of vegetation protected under these district plan provisions may result in mortality or injury to birds within the Project Area.

Table 8-1: and Table 8-2 details the potential magnitude of effect and subsequent level of effect (with justification) on for each NoR. The effects assessment has considered two scenarios – the current ecological baseline and the ‘likely future ecological environment’. The level of effect for the current baseline and the ‘likely future ecological environment’ were the same for both assessments. As such, Table 8-1: Summary of disturbance to native birds and nests, resulting in changes to population dynamics, during constructionand Table 8-2: Summary of the effects due to the removal of district plan trees (AUP:OP) - mortality or injury to birds provides the level of effect for both scenarios.

The magnitude of effect for TAR birds is assessed as **Negligible** due to the existing road in an existing urban environment and low habitat suitability for TAR species. Although TAR birds may occur in the vicinity, they are only likely to use the area fleeting for foraging or roosting. As TAR birds are considered to be non-breeding and highly mobile in the wider landscape disturbance or fragmentation are highly unlikely to impact these birds within the FTN Project Area. The ecological value of TAR birds is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. The likely Future Ecological Environment assessment was considered to be the same as baseline.

The effect of habitat removal on native birds (specifically relating to mortality/injury and nest loss/disturbance) has also been considered for the District Plan trees located in NoR 1 - 4 (refer to Arborist Report). All of these groups of trees have the potential for Non-TAR native bird habitat. Non-TAR native birds have a **Low** ecological value, and the magnitude of effect is considered to be **Low**, with the overall level of effect assessed as **Very Low** prior to mitigation. However, impact management will be required under the Wildlife Act to prevent killing or injuring of native birds and is described in Section 9.1.2.

Table 8-1: Summary of disturbance to native birds and nests, resulting in changes to population dynamics, during construction

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
Freshwater Water / Wetland Birds	Shag species: Black shag, Little black shag, Pied shag	High	NoR 1, 2 & 4	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential for shag species to utilise Otuwairoa Stream / Slippery Creek (NoR 1), Hingaia Stream (NoR 2) and Papakura Stream (NoR 4) corridor. Breeding potential is unlikely due to existing roads and human disturbance. As upgrade to an existing transport corridor, any birds present are expected to be habituated to road disturbance hence disturbance due to construction presence is unlikely. In a Likely Future Environment, there is no expected change to baseline as riparian corridor will remain. The magnitude and level of effect are the same as Baseline.	Negligible	Very Low
	New Zealand Dabchick	Very High	NoR 1 & 3	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential for dabchick to utilise Otuwairoa Stream / Slippery Creek (NoR1), any open water and artificial pond, existing stormwater ponds (NoR 3) fleetingly for foraging. Breeding potential is highly unlikely due lack of suitable breeding habitat and disturbance due to existing roads /urban areas. As upgrade to an existing transport corridor, any birds present are expected to be habituated to road disturbance hence disturbance due to construction presence is unlikely. In a Likely Future Environment, there is no expected change to baseline as riparian corridor and stormwater infrastructure will remain. The magnitude and level of effect are the same as Baseline.	Negligible	Low
Coastal Birds	Wading birds: Variable oystercatcher, South Island pied oystercatcher, Royal spoonbill	High	NoR 1	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential for wading birds to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). Breeding potential is unlikely due to existing roads and human disturbance.	Negligible	Very Low

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
				As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to construction presence is unlikely. In a Likely Future Environment, there is no expected change to baseline as riparian corridor will remain. The magnitude and level of effect are the same as Baseline.		
	Red-bill gulls	High	All NoRs	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential for red-billed gull to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1) and any open maintained grass reserves. Breeding potential is unlikely due to existing roads and human disturbance. As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to construction presence is unlikely. In a Likely Future Environment, there is no expected change to baseline as riparian corridor will remain. The magnitude and level of effect are the same as Baseline.	Negligible	Very Low
	Caspian tern	Very High	NoR 1	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential for Caspian tern to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). Breeding potential is unlikely due to existing roads and human disturbance. As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to construction presence is unlikely. In a Likely Future Environment, there is no expected change to baseline as riparian corridor will remain. The magnitude and level of effect are the same as Baseline.	Negligible	Low
	Banded rail	High	NoR 1	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential for Banded rail to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR	Negligible	Very Low

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
				1). Breeding potential is unlikely due to existing roads and human disturbance. As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to construction presence is unlikely. In a Likely Future Environment, there is no expected change to baseline as riparian corridor will remain. The magnitude and level of effect are the same as Baseline.		
Forest Birds	Kaka	High	NoR 1	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential of kākā to utilise Pūriri Forest (WF7) within adjacent SEA_T_5248 (NoR 1). However only likely to occur fleetingly for seasonal foraging. No breeding habitat. Disturbance due to construction activity is highly unlikely. In a Likely Future Environment, there is no expected change to baseline as SEAs will remain. The magnitude and level of effect are the same as Baseline.	Negligible	Very Low
	Long-tailed cuckoo	Very High	NoR 1	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential of long-tailed cuckoo to utilise Pūriri Forest (WF7) within adjacent SEA_T_5248 (NoR 1). However only likely to occur fleetingly for seasonal on migration. No breeding habitat. Disturbance due to construction activity is highly unlikely. In a Likely Future Environment, there is no expected change to baseline, as SEAs will remain. The magnitude and level of effect are the same as Baseline.	Negligible	Low
Non-TAR birds	Non-TAR native birds	Low	NoR 1, 2, 3 & 4	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor.	Low	Very Low

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
				If birds are present, they are unlikely to be disturbed by construction activities (due to habituation to current conditions). In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline. The most conservative non-TAR species, such as grey warbler, has been used for this assessment.		

Table 8-2: Summary of the effects due to the removal of district plan trees (AUP:OP) - mortality or injury to birds

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
Non-TAR birds	Non-TAR native birds	Low	NoR 1, 2, 3 & 4	**Baseline and Likely Future Environment:** Upgrade of an existing transport corridor. Potential for non-TAR birds to be present and breeding with district Plan vegetation is likely. Although the Magnitude of effect is considered to be low impact management will be required under the Wildlife Act to prevent killing or injuring of native birds. The most conservative non-TAR species, such as grey warbler, has been used for this assessment. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Low	Very Low

8.3.2 Operational Effects

The potential loss of connectivity through the presence of the transport corridors and associated disturbance, such as operational noise/vibration and light, can lead to an overall reduction in size and quality of bird foraging habitat, and has the potential to impact on bird movements in the broader landscape. This potential impact has been considered in light of the existing transport corridor and therefore existing disturbance.

The level of effect on birds due to operational impacts associated with loss or decrease in connectivity has been assessed in the context of habitat suitability, the existing degree of disturbance and fragmentation in the baseline urban setting and the likely future environment. Table 8-3: Summary of habitat fragmentation leading to loss in connectivity to native birds, due to light, noise, and vibration effects from the operation of the road. summarises the level of effect on birds in relation to connectivity.

Noise, vibration, and lighting disturbance caused by the presence of the transport corridors has been assessed in the context of habitat suitability, the existing degree of disturbance and fragmentation in the urban setting and the likely future environment. Table 8-4: Summary of disturbance and displacement to native birds and nests (new and existing) due to light, noise, and vibration effects from the operation of the road.summarises the operational disturbance effects for birds for all NoRs related to disturbance.

The FTN Project area is largely within an urban environment with limited habitat that is unlikely to support TAR birds (some native birds may utilise the remaining habitat within these areas). As such, the upgrading of the road within the FTN Project area is highly unlikely to cause fragmentation or disturbance to birds. A **Very Low** level of effect was determined for all NoRs, for all TAR and native birds).

Table 8-3: Summary of habitat fragmentation leading to loss in connectivity to native birds, due to light, noise, and vibration effects from the operation of the road.

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
Freshwater Water / Wetland Birds	Shag species: Black shag, Little black shag, Pied shag	High	NoR 1 & 2	Potential for shag species to utilise Otuwairoa Stream / Slippery Creek (NoR 1), Hingaia Stream (NoR 2) and Papakura Stream (NoR 4) corridor. As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**
	New Zealand Dabchick	Very High	NoR 1 & 3	Potential for shag species to utilise Otuwairoa Stream / Slippery Creek (NoR 1) and stormwater ponds (NoR 3). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Low**
Coastal/ Open country Birds	Wading birds: Variable oystercatcher, South Island pied oystercatcher, Royal spoonbill, Red knot	High	NoR 1	Potential for Wading birds to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**
	Red-bill gulls	High	All NoR	Potential for gull species to utilise Otuwairoa Stream / Slippery Creek (NoR 1) and any open maintained grassland areas (reserves).	Negligible	**Very Low**

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
				As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.		
	Caspian tern	Very High	NoR 1	Potential for Caspian tern to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Low**
	Banded rail	High	NoR 1	Potential for banded rail to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**
Forest Birds	Kaka	High	NoR 1	Potential of kaka to utilise Pūriri Forest (WF7) within adjacent SEA_T_5248 (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
	Long-tailed cuckoo	Very High	NoR 1	Potential of long-tailed cuckoo to utilise Pūriri Forest (WF7) within adjacent SEA_T_5248 (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Low**
Non-TAR Birds	Non-TAR native birds	Low	NoR 1, 2, 3 & 4	Potential of non-TAR birds to utilise any adjacent habitat, within all NoRs. As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence fragmentation due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Low	**Very Low**

Table 8-4: Summary of disturbance and displacement to native birds and nests (new and existing) due to light, noise, and vibration effects from the operation of the road.

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
Freshwater Water / Wetland Birds	Shag species: Black shag, Little black shag, Pied shag	High	NoR 1, 2 & 4	Potential for shag species to utilise Otuwairoa Stream / Slippery Creek (NoR 1), Hingaia Stream (NoR 2) and Papakura Stream (NoR 4) corridor. As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely.	Negligible	**Very Low**

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
				In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.		
	New Zealand Dabchick	Very High	NoR 1 & 3	Potential for shag species to utilise Otuwairoa Stream / Slippery Creek (NoR 1) and stormwater ponds (NoR 3). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Low**
Coastal/ Open country Birds	Wading birds: Variable oystercatcher, South Island pied oystercatcher, Royal spoonbill, Red knot	High	NoR 1	Potential for Wading birds to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**
	Red-bill gulls	High	All NoR	Potential for gull species to utilise Otuwairoa Stream / Slippery Creek (NoR 1) and any open maintained grassland areas (reserves). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
	Caspian tern	Very High	NoR 1	Potential for Caspian tern to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Low**
	Banded rail	High	NoR 1	Potential for banded rail to utilise Otuwairoa Stream / Slippery Creek Corridor (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**
Forest Birds	Kaka	High	NoR 1	Potential of kaka to utilise Pūriri Forest (WF7) within adjacent SEA_T_5248 (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Negligible	**Very Low**
	Long-tailed cuckoo	Very High	NoR 1, 3 & 4	Potential of long-tailed cuckoo to utilise Pūriri Forest (WF7) within adjacent SEA_T_5248 (NoR 1). As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely.	Negligible	**Low**

Bird Type	Species	Ecological Value	NoR	Effect Justification	Magnitude	Level of Effect (pre-mitigation)
				In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.		
Non-TAR Birds	Non-TAR native birds	Low	NoR 1, 2, 3 & 4	Potential of non-TAR birds to utilise any adjacent habitat, within all NoRs. As upgrade to an existing transport corridor, any bird present is expected to be habituated to road disturbance hence disturbance due to road presence is unlikely. In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.	Low	**Very Low**

8.4 Herpetofauna

The effects on herpetofauna have been considered against the typical behaviours, habitat preference and sensitivity of the various species. Two species are likely to occur within the Project and can be grouped as ground skink species.

Ground skink species

Species included in this group are copper skinks *(Oligosoma aeneum)* and ornate skinks *(Oligosoma ornatum)*. These two species are considered to be habitat generalists relative to other skink species, requiring either overgrown vegetation or organic refuge that maintains a moist environment. Populations typically occur in greater density within forested areas but have been noted to occur in urban and rural areas. In general, they are considered to be relatively resilient to dust and noise disturbance.

8.4.1 Construction Effects

Noise and vibration during construction are not considered to have impacts on native herpetofauna species. Indeed, it is not uncommon within salvage projects to relocate herpetofauna to the immediate habitat (where available) adjacent to any construction site. This potential impact has been considered in light of the existing transport corridor and therefore existing disturbance.

Table 8-5: summarises the magnitude of effects of habitat removal on lizards considered for the removal of District Plan Trees in NoRs 1, 2 & 3 (refer Section 6.2.3). The groups of trees listed in Table 8-5: have the potential for lizard habitat which should be confirmed during pre-construction surveys. Lizards (all potential species identified) are **High** ecological value and the magnitude of effect in relation to kill/injure lizard during vegetation removal is considered to be **Moderate**, with the overall level of effect assessed as **High** prior to mitigation. As such impact management is required and is described in Section 8.4.2 below.

Table 8-5: Summary of effects to herpetofauna through the removal of district plan trees/ vegetation **during construction**

NoR	Effect Description	Effects Justification	Ecological Value	Magnitude	Level of Effect (pre-mitigation)
NoR 1	Kill or injure due to vegetation removal	**Baseline and Likely Future Environment:** Potential for skinks to be present within district plan vegetation (which will be removed). Impact likely to occur, impacting suitable lizard habitat: NoR 1: Slippery Creek (Tree group 107, 108 and 113) NoR 2: Hingaia Stream (Tree group 115 & 116) NoR 3: State highway one crossing (Tree group 38, 39, 41 & 48)	High	Moderate	**High**
NoR 2			High	Moderate	**High**
NoR 3			High	Moderate	**High**

NoR	Effect Description	Effects Justification	Ecological Value	Magnitude	Level of Effect (pre-mitigation)
		In a Likely Future Environment, there is no expected change to baseline. The magnitude and level of effect are the same as Baseline.			

8.4.2 Impact Management and Residual Effects During Construction

NoRs 1, 2 & 3 have construction related effects that might relate in killing/injuring skinks during District Plan vegetation removal that are **Moderate** and as such impact management is required. To address effects, an LMP for each affected NoR should consider the following:

- Preconstruction surveys and/or habitat potential surveys to confirm (potential) presence and guide further management if required;
- Timing of the implementation of the LMP noting that regional consents for earthworks to enable the Project works and Wildlife Permits will also be required;
- A description of methodology for survey, trapping and relocation of lizards rescued including but not limited to: salvage protocols, relocation protocols (including method used to identify suitable relocation site(s)), nocturnal and diurnal capture protocols, supervised habitat clearance/transfer protocols, artificial cover object protocols, and opportunistic relocation protocols;
- A description of the relocation site(s); including discussion of:
    - provision for additional refugia, if required e.g. depositing salvaged logs, wood or debris for newly released native skinks that have been rescued;
    - any protection mechanisms (if required) to ensure the relocation site is maintained (e.g.) covenants, consent notices etc;
    - any weed and pest management to ensure the relocation site is maintained as appropriate habitat;
- Monitoring methods, including but not limited to: post-relocation lizard monitoring (subject to triggers identified in the LMP), and pest control monitoring (subject to triggers identified in the LMP);
- A suitably qualified and experienced ecologist/herpetologist approved to oversee the implementation of the LMP shall certify that the lizard related works have been carried out according to the certified LMP within two weeks of completion of the vegetation clearance works; and
- Lizard management should be consistent with any regional consent conditions (and the Wildlife Act) that may be required for regional compliance. As regional consents will be required to construct the Project works which will take place in advance of vegetation removal, lizard management could also be managed via the regional consenting framework.

The residual impact is assessed as **Low** post mitigation.

8.4.3 Operational Effects

Potential operational effects on herpetofauna in all the NoRs from the construction of upgrading/widening of existing roads include:

- Loss in connectivity due to the extension of the transport corridor (including light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat and a change in population dynamics due to the presence of the infrastructure); and
- Disturbance and displacement of herpetofauna leading to a change in population dynamics due to light, noise, and vibration from the extension of the transport corridor.

Suitable habitat was identified within all NoRs which could potentially support both native skinks. Native skinks require vegetated corridors to facilitate natural dispersal, although they are relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

The loss of connectivity through the presence of the road and associated disturbance such as operational noise, vibration, and light could lead to an overall reduction in size and quality of suitable habitat for TAR herpetofauna within the broader landscape. However, due to existing infrastructure upgrade the overall level of effect due to operational disturbance is assessed as **Negligible** prior to mitigation. The likely future ecological environment was anticipated to be the same as the baseline.

8.5 Cumulative Effects

According to a recent review of international and New Zealand literature (Smith et al., 2017), the RMA does not effectively consider cumulative effects from multiple roads across landscapes. In addition, the delayed nature of effects that occur after initial project completion and/or beyond consenting periods also means such impacts of roads are likely underestimated (Figure 8-1).

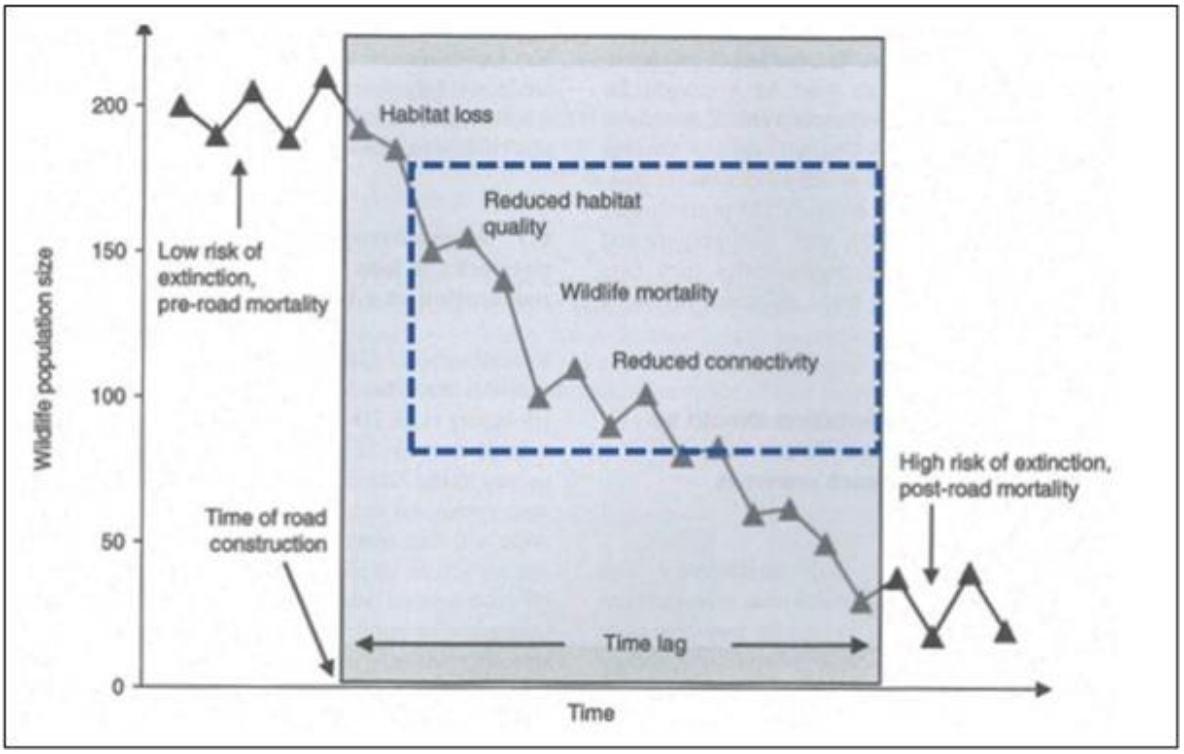

Figure 8-1: Major ecological impacts of roads and traffic on faunal populations and time lag (in the order of decades, shown in grey). The blue dotted line identifies effects due to road edges excluding the footprint at construction (in Simcock, et al., 2022, adapted by van der Ree et al., 2015, from Forman et al., 2003)

As stated in the EIANZ Guidelines, an assessment of ecological effects of a project should consider cumulative impacts on the environment and not just the direct effects of the single Project under review. Upgrading existing roads within the Project Area combined with urban development (external projects), and the consequences of a changing climate, risk a cumulative effect that does not necessarily require mitigation from the perspective of a singular project.

8.5.1 District Cumulative Effects

Mobile native fauna species are expected to use the Project Area and wider landscape. The Project Area is predominantly urban as of present (with exception of NoR 4), and hence existing native fauna are expected to be less sensitive to disturbance. If present they are likely to be habituate to disturbance by noise, light, and vibration as a consequence of transport corridors. However, eventually, gradual incremental changes in habitat caused by surrounding urbanisation could discourage nesting/roosting and reduce viability of native fauna over time.

The potential cumulative impacts of lighting from transport corridors and urban growth on bird movement and distribution in the Auckland region is specifically considered within this section, as the Project does not pose a direct risk in isolation. According to Adams et al. (2021) artificial light is abundant in the built environment with many known or suspected impacts on birds. Birds flying at night are known to aggregate around artificial light and collide with illuminated objects, which may result from attraction and/or disorientation. Birds are known to be repelled by light-based deterrents, and artificial light can also change birds' perceptions of habitat quality, resulting in selection or avoidance of illuminated areas.

All developments should be aware of the vulnerability and resilience of the receiving environment and the cumulative effects which may arise from multiple development activities within the Project Area.

As urban areas expand and transport infrastructure develops, it is important for collaboration between transport providers, consenting authorities (i.e., Auckland Council), and developers to assess the combined effects of lighting and take measures to mitigate these impacts (at a landscape scale). These measures may include the provision of vegetated (including dark) corridors, wildlife-friendly lighting designs, wildlife crossings, and vegetated buffers to protect sensitive habitats and fauna.

8.5.2 Regional Cumulative Effects

The wider area of the Project Area is already largely urban and some areas designated Future Urban Zone. Regardless of whether the transport corridors are developed, or urbanisation occurs first, construction often involves clearing of vegetation which can lead to the loss of habitat for native plant and animal species. The habitat degradation from ongoing cumulative removal of low value vegetation (which does not necessarily require impact management under EIANZ Guidelines) should be considered at a landscape scale by the consenting authorities in the wider regional context to prevent a decline in biodiversity and changes to ecosystem function and services.

To mitigate adverse effects on low value habitat, the use of green infrastructure (at a landscape scale) including riparian setbacks, riparian planting and stormwater management in the context of external development will be important. Implementing these mitigating measures, and others, will also aid in minimising flooding risks and protecting water quality.

9 Design and Future Regional Resource Consent Considerations

Ecological effects associated with activities that require regional consents and consideration under the NPS-FM are briefly discussed in the following sections to inform design and alignment options for each NoR. Wildlife Act Authority permits are also discussed in relation to the potential for killing or injuring of native fauna associated with the Project's activities.

Ecological features relevant to Regional Plan matters (and their approximate values) were considered during the Multi Criteria Assessment (**MCA**) to inform the Alternatives Assessment and proposed designation boundaries (refer to Appendix A of the AEE). This was achieved through a desktop assessment and a proxy-based assessment of ecological value (catchment condition, vegetation type, relationship with other ecological features).

Note that during the future detailed design process (as an additional consideration under the future regional consent process) there is scope within the designation to address (including to avoid) some potential effects/concerns/regional matters through design considerations at the detailed design phase.

9.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the Project Area and is comprised of both native and exotic vegetation which ranges from **Low** to **High** (high value habitat is within unaffected but directly adjacent SEA_T_5248) ecological value (Appendix 7).

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EIANZ Guidelines) which will be used to support future regional resource consents as required (for example, removal of vegetation, with bat roost potential, or within riparian setbacks) and wildlife permit applications (if required).

The potential extents and types of all terrestrial vegetation that could be permanently lost from the Project is presented in Table 9-1. This includes vegetation that will be directly impacted by the footprint of the road and batter slopes. It also includes vegetation that is subject to District and Regional Plan controls, as well as vegetation that can be removed as a permitted activity. Some of these areas are likely to provide habitat to native fauna, and this is discussed in Sections 9.1.1, 9.1.3 and Table 9-1 below.

Table 9-1: Approximate potential area of permanent terrestrial vegetation loss within the road footprint for the FTN Projects Area

Terrestrial Vegetation Feature	Classification*	Approximate Vegetation Loss (m^2)			
		NoR 1	NoR 2	NoR 3	NoR 4
Exotic Grassland*	EG	10175	2134	10794	26317
Exotic Scrub	ES	NA	NA	NA	NA
Planted Vegetation – Native (recent)	PL.1	783	NA	698	36
Planted Vegetation - Native (mature)	PL.2	267	NA	39	878
Planted Vegetation – Amenity	PL.3	2075	NA	2028	4402
Treeland – Native-Dominated	TL.1	1602	NA	1033	53
Treeland – Mixed Native/Exotic	TL.2	5	NA	409	45
Treeland – Exotic-Dominated	TL.3	169	300	647	9593

*Notes: * = Not all degraded / transformed areas were mapped during the assessment.*

9.1.1 Long Tailed Bats

Mature vegetation in suitable habitat areas (as identified in Section 6.2.2) may provide potential habitat for bat roosts and facilitate bat movement in the broader landscape (Smith et al., 2017). The presence of bats and roosts will need to be re-assessed prior to obtaining any regional resource consents for vegetation removal (relevant under regional matters) and to support an application for a wildlife permit.

The presence of bat habitat and bat roosts will require a BMP under regional consents. The objectives of bat management will be to:

- Identify bat habitat that may be affected by the Project;
- Avoid habitat through alignment and design;
- Avoid effects of lighting and noise on bat habitat;
- Avoid injury and/or death of roosting bats during vegetation removal;
- Avoid disturbance through construction management (seasonal restriction on vegetation removal December to April); and
- Outline additional mitigation where avoidance is not feasible including any offset/compensation that may be required.

9.1.2 Avifauna

Native birds as identified in Section 6.2.5 have the potential to be present within the Project Area. The habitats within each NoR that native avifauna may utilise are detailed in Table 6-5. Vegetation clearance required for construction could result in the loss of these habitats and any vegetation

clearance within the bird nesting season (September – February) will need to be managed in accordance with regional consents and the Wildlife Act.

9.1.3 Herpetofauna

Native herpetofauna as identified in Section 6.2.6 have the potential to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native herpetofauna species and result in the removal of their habitat. Any vegetation clearance where native herpetofauna are likely to occur will also need to be managed in accordance with regional consents and the Wildlife Act.

9.1.4 Invertebrates

Impact management may be required under the Wildlife Act to prevent killing or injuring of any native invertebrate species. Therefore, native invertebrates will need to be assessed prior to obtaining any regional resource consents for vegetation removal.

9.2 Freshwater Ecology

The construction of the Project will directly impact 10 streams, ranging from **Low** to **High** ecological value. Approximately 45m of stream reclamation may be required to accommodate the Project works; however, this could change during the detailed design and resource consenting phase which would look to assess and avoid, remedy and mitigate freshwater effects. The predicted permanent and intermittent stream loss for the Project is presented in Table 9-2, based on where the indicative designs require the stream sections to be culverted, piped, or realigned.

These calculations will require re-evaluation as part of the future regional consent process. Stream Ecological Valuation (**SEV**) assessments will need to be undertaken to inform the re-evaluation. All assessed streams have been modified and degraded to varying degrees and there is an opportunity to restore riparian habitat along these features. Where stream loss is likely to be unavoidable, there are opportunities within the designation boundary or within adjacent public land to accommodate potential future compensation requirements.

During the detailed design phase, stream crossing plans (i.e., bridge and culvert design) will be confirmed as well as details regarding fish passage requirements. Under future regional consents for instream works, earthworks and vegetation removal, impact management would also be required for fish salvage and relocation, sediment control and management of the riparian condition.

Table 9-2: Potential stream loss (permanent and intermittent) within the Project Area

Stream ID	Hydroperiod	Ecological Value	Estimate of potential length lost (m)*
NoR 1 – Great South Road Intersections			
FTN1_S1	Permanent	High	NA
FTN1_S2	Permanent	High	NA
Total			**NA**

Stream ID	Hydroperiod	Ecological Value	Estimate of potential length lost (m)*
NoR 2 – Great South Road (Drury Station)			
FTN2_S1	Permanent	High	NA
FTN2_S2	Permanent	Moderate	10
Total			**10**
NoR 3 – Alfriston Road			
FTN3_S1	Permanent	Moderate	NA
FTN3_S2	Permanent	Moderate	10
FTN3_S3	Intermittent	Low	5
FTN3_S4	Intermittent	Low	15
Total			**30**
NoR 4 – Porchester and Popes Roads			
FTN4_S1	Intermittent	Low	4
FTN4_S2	Permanent	High	NA
Total			**5**

*Notes: * = All potential stream loss measurements are indicative. The measurements are based on a potential route option and an approximate measurement of loss.*

9.3 Wetland Ecology

Wetland extent and approximate values were considered during the MCA to inform the Alternatives Assessment and proposed designation boundaries. This was achieved through a desktop wetland delineation for all the NoR options along with a proxy-based assessment of ecological value (catchment condition, vegetation cover, relationship with other ecological features).

The construction of the Project will directly impact three natural inland wetlands, ranging from **Low** to **High** ecological value based on the indicative designs. Approximately 1053m^2 of direct wetland loss is estimated based on the footprint of the corridor widening and batter slopes, additionally 550m^2 are likely to be temporarily impacted during construction (see Table 9-3).

These calculations will require re-evaluation as part of the future regional consent process. Specific requirements of the National Policy for Freshwater Management (2022) will also need to be taken into consideration. Of particular importance will be the need to:

- delineate the wetlands according to acceptable protocols (e.g., Ministry for the Environment, 2022);
- determine wetland functionality (i.e., ecosystem services provided by the wetlands);
- determine wetland condition/health; and

- determine whether any of the wetlands are suitable habitats for TAR species. Specific mitigation is likely to be required, for construction works within potential Inanga breeding habitat FTN1_W1 (WL10& PLW.1) in Otūwairoa Stream / Slippery Creek (NoR 1).

Where permanent wetland loss is likely to be unavoidable, there are opportunities within the designation boundary or within adjacent public land to accommodate potential future compensation requirements.

Table 9-3: Approximate potential permanent and temporary wetland loss within the Project Area

Wetland ID	Wetland / Open Water*	Ecological Value	Potential Permanent Loss (m^2)	Potential Temporary (construction only) Loss (m^2)
NoR 1 – Great South Road Intersections				
FTN1_W1	WL10& PLW.1	High	29	508
Total			**29**	**508**
NoR 3 – Alfriston Road				
FTN3_W1	EW	Low	NA	NA
FTN3_W2	EW	Low	209	50
Total			**209**	**50**
NoR 4 – Porchester and Popes Roads				
FTN4_W1	EW	Low	758	NA
Total			**758**	**NA**

Notes: = Artificial wetlands (i.e., most of the open water bodies) are excluded in the calculation of approximate wetland loss at this stage.

The wetland assessment to inform the future regional consent process should also assess the opportunities for wetland restoration / enhancement, and where required outline additional mitigation where avoidance is not feasible. This may include offsets and/or compensation.

10 Conclusion

This report has considered the actual and potential ecological effects associated with the construction, operation, and maintenance of the Project. The focus was on ecological effects pertaining to district plan matters, and providing recommendation which may be implemented to avoid, remedy, and/or mitigate these likely effects.

The district matter ecological effects relevant to construction and operation, prior to any mitigation, were assessed. All ecological effects assessed to be Moderate or higher required mitigation. The effects on TAR herpetofauna species due to the removal of district plan trees/vegetation was the only effect which required mitigation. A LMP for NoR 1 – 3 should consider the following:

- Preconstruction surveys and/or habitat potential surveys to confirm (potential) presence and guide further management;
- Timing of the implementation of the LMP;
- A description of methodology for survey, trapping and relocation of lizards rescued including but not limited to: salvage protocols, relocation protocols (including method used to identify suitable relocation site(s)), nocturnal and diurnal capture protocols, supervised habitat clearance/transfer protocols, artificial cover object protocols, and opportunistic relocation protocols;
- A description of the relocation site(s); including discussion of:
    - provision for additional refugia, if required e.g. depositing salvaged logs, wood or debris for newly released native skinks that have been rescued;
    - any protection mechanisms (if required) to ensure the relocation site is maintained (e.g.) covenants, consent notices etc;
    - any weed and pest management to ensure the relocation site is maintained as appropriate habitat;
- Monitoring methods, including but not limited to: post-relocation lizard monitoring (subject to triggers identified in the LMP), and pest control monitoring (subject to triggers identified in the LMP);
- A suitably qualified and experienced ecologist/herpetologist approved to oversee the implementation of the Lizard Management Plan (LMP) shall certify that the lizard related works have been carried out according to the certified LMP within two weeks of completion of the vegetation clearance works; and
- Lizard management should be consistent with any regional consent conditions (and the Wildlife Act) that may be required for regional compliance.

The residual (post-mitigation) level of effect for all construction effects are considered **Negligible** to **Low**.

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1 Appendix 1 – Ecological Impact Assessment Methodology

The standard by which this EcIA was undertaken follows the guidelines published by the Environment Institute of Australia and New Zealand (EIANZ Guidelines) (Roper-Lindsay et al., 2018).

1.1 Assessment of Ecological Value

The first step in the EcIA approach is to assess the value of ecological features in terms of representativeness, rarity, diversity and pattern and ecological context. Details on each matter and its associated considerations are provided in Table 1 for terrestrial ecological value and Table 2 for aquatic ecological value.

Table 1: Matters and considerations for the assessment of terrestrial ecological value

Representativeness
Typical structure and composition
Indigenous representation
Rarity/distinctiveness
Species of conservation significance
Range restricted or endemic species
Distinctive ecological values
Diversity and pattern
Habitat diversity
Species diversity
Patterns in habitat use
Ecological context
Size, shape and buffering
Sensitivity to change
Ecological networks (linkages, pathways, migration)

Table 2: Matters and considerations for the assessment of aquatic ecological value

Representativeness (including SEV, RHA and ecological integrity)
Extent to which site/catchment is typical of characteristic
Instream habitat modification

Representativeness (including SEV, RHA and ecological integrity)
Riparian habitat modification
Hydrological modification
Catchment conditions
Geomorphological modification
Water quality modification
Presence of alien and invasive species
Invertebrate assemblage representation
Fish assemblage representation
Rarity/descriptiveness
Pool characterisation
Species of conservation significance
Range restricted or endemic species
Stream type (rare or distinctive)
Diversity and pattern
Distinctive ecological values
Level of natural diversity
Diversity metrics
Complexity of community
Ecological context (Ecosystem services, importance sensitivity)
Stream order
Catchment size
Hydroperiod
Sensitivity to flow modification
Sensitivity water quality modification
Sensitivity to sedimentation/erosion
Connectivity and migration

1.2 Assessment of Ecological Effects

The ecological effects assessment includes several steps that collectively assess the way the Project will interact with elements of the physical and biological, environment to produce effects to habitat and receptors. The methods for determining the level of effect are outlined in the following sections.

Basic impact characteristic terminology and respective descriptors are in line with the EIANZ Guidelines and are provided in Table 3 below.

Table 3: Magnitude of effect assessment terminology

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect)	Direct
		Indirect
Extent	The “reach” of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.)	Local
		Regional
		National
Duration	The time period over which a resource/receptor is affected	Temporary (days or months)
		Short-term (<5 years)
		Long-term (15-25 years)
		Permanent (>25 years)
Frequency	A measure of the constancy or periodicity the receptor will be affected	Infrequently
		Periodically
		Frequently
		Continuously
Likelihood	The probability of an effect occurring if it is unplanned	Highly Unlikely
		Unlikely
		Likely
		Highly Likely
		Definite
Reversibility	The degree to which the ecological effect can be reversed in a reasonable time scale through natural processes or mitigation	Totally
		Partially
		Irreversible
		Not applicable

Based on the above-mentioned descriptors, the characteristics of each effect are used to assign a magnitude to the specific effect. Magnitude designations are provided in Table 4.

Table 4: Magnitude of effect descriptions

Magnitude	Description
Very High	Total loss of, or 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 very high proportion of the known population or range of the elements/features
High	Major loss or major alteration to key elements/features of the existing baseline 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 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 the existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline conditions will be similar or pre-development circumstances or patterns; and or having a 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

The magnitude of an effect is considered in relation to the ecological value of the habitat or receptor to be impacted on. The ecological value of habitat or receptors are the primary focus of the ecological assessment. The ecological value of habitat or receptors are typically expressed on a local, district, regional or national scale. The ecological value designations are provided in Table 5.

Table 5: Ecological value descriptions

Value	Description
Very high	Area rates High for three or all the four assessment matters. Likely to be of National importance and recognised as such
High	Area rates High for two of the assessment matters, Moderate and Low for the remainder or Area rates High for 1 so the assessment matters, moderate for the remainder. Likely to be regionally important and recognised as such
Moderate	Area rates High for one matter, Moderate and Low Dortha remainder, or Area rates Moderate for 2 or more assessment matters 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 most assessment matters and Moderate for one. Limited ecological value other as local habitat for tolerant species
Negligible	Area rates Very low for three matters and Moderate, Low or Very low for the remainder

Once magnitude of effect and the ecological value of the habitat or receptor have been determined, the level of effect can be assigned for each effect using the matrix shown in Table 6.

Table 6: Ecological effect matrix

		Ecological Values				
		Very High	High	Moderate	Low	Negligible
Magnitude	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	Negligible	Negligible	Negligible	Negligible	Negligible

Note = The ecological effect matrix is not a rigid matrix but rather a guideline to help assign an appropriate effect. Specialist expertise can be used to adjust the ratings when deem appropriate (e.g., when applying a conservative approach, it would be appropriate to score a Moderate ecological effect for a high Value, and low Magnitude).

From Table 6 the level of effect designations are defined below:

- **Negligible**: an effect of negligible consequence is one where habitat or receptors will not be affected in any meaningful way by a Project activity, or the predicted effect is indistinguishable from natural background variations;
- **Low**: an effect of minor consequence is one where habitat or receptors will experience a noticeable effect, but the effect magnitude is sufficiently small (with or without mitigation) and/or the resource/receptor is of low ecological value. In either case, the magnitude should be well within applicable standards;
- **Moderate**: an effect of moderate consequence has an effect magnitude that is within applicable standards but higher than that of a minor effect. The emphasis for moderate effects is to show that the effect has been reduced or minimised in line with the mitigation hierarchy;
- **High**: a high level of effect of is one where an accepted limit or standard may be exceeded, or moderate magnitude of effect will occur to moderate or high value habitat or receptors; and
- **Very High**: a very high level of effect will occur when the magnitude and value of effects are assessed as high or very high. Typically, very high level of effects notably exceeds standard limits.

1.3 Impact Management

Informed by the level of effects suitable impact management measures are provided consistent with the mitigation hierarchy. The priority in mitigation is to first apply mitigation measures to the source of the impact (avoid) and then to address the resultant effects (reduce or minimise) of the impact.

1.4 Residual Impacts

Once mitigation measures are declared, the next step in the effect assessment process was to assign residual impact significance. This is a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional recommended mitigation measures.

1.5 Managing Uncertainty

Biophysical impacts are difficult to predict with certainty, but uncertainty stemming from on-going development of the Project design and implementation is inevitable and the environment is variable over time. If uncertainties are relevant to the effect assessment, they were stated and approached conservatively, to identify a range of likely residual effects and relevant mitigation measures.

1.6 Cumulative Effects

Cumulative impacts and effects are those that arise because of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect. These are termed cumulative impacts and effects. No structed methods were employed to assess cumulative impacts, but where relevant descriptions of potential cumulative effects have been provided.

2 Appendix 2 – Auckland Unitary Plan Activities

Auckland Unitary Plan – E26 Infrastructure

Table E26.4.3.1 below is relevant for considering effects and recommending mitigation in relation to tree removal. Note that, except for Trees in Roads, in Open Space Zones and Notable Trees, trees are not protected under the AUP.

Table E26.4.3.1 Activity table - Network utilities and electricity generation – Trees in roads and open space zones and the Notable Trees Overlay

Activity	Activity Status			Permitted Standards or Matters of Discretion / Control
	Trees in roads [dp]	Open space zones [dp]	Notable trees [dp]	
(A89) Tree removal of Notable Trees	N/A	N/A	Discretionary	N/A
(A90) Tree trimming, alteration or removal on roads adjoining rural zones and on roads adjoining the Future Urban Zone	Permitted	N/A	N/A	N/A
(A91) Tree alteration or removal of any tree less than 4m in height and/or less than 400mm in girth	Permitted	Permitted	Restricted Discretionary	N/A
(A92) Tree alteration or removal of any tree greater than 4m in height and/or greater than 400mm in girth	Restricted Discretionary	Restricted Discretionary	N/A	N/A
(A93) Tree trimming, alteration and removal not otherwise provided for	D	D	D	N/A

Auckland Unitary Plan – E26 Infrastructure

The table below is relevant for considering effects and recommending mitigation in relation to vegetation clearance. Also refer to Table E15.4.1.

Table E26.3.3.1 Activity table – Network utilities and electricity generation and vegetation management

Activity	Activity Status						Permitted Standards
	Rural zones, coastal areas and riparian areas [rp]	SEA [rp]	ONF [dp]	HNC [dp]	ONL [dp]	ONC [dp]	
(A76) Vegetation alteration or removal	P	P	P	P	P	P	Refer to E26.3.5.4. Vegetation alteration or removal for Permitted Activity Standards
(A77) Vegetation alteration or removal that does not comply with Standards E26.3.5.1 to E26.3.5.4	RD	RD	RD	RD	RD	RD	
(A78) Vegetation alteration or removal not otherwise provided for	D	D	D	D	D	D	

Note: Greyed-out boxes relate to Regional Activities which are not considered as part of the NoR and will be relevant for future Regional Resource Consents.

Auckland Unitary Plan – E15 Vegetation management and biodiversity

Table E15.4.1 below is relevant for considering effects of activities over and above those that are permitted and recommending mitigation in relation to vegetation clearance in urban zones, and adjacent to riparian areas.

Table E15.4.1 Activity table - Auckland-wide vegetation and biodiversity management rules

Activity	Activity Status	Permitted Standards
Riparian areas (as described below)		
(A16) Vegetation alteration or removal within 20m of rural streams, other than those in Rural – Rural Production Zone and Rural – Mixed Rural Zone	RD	N/A
(A17) Vegetation alteration or removal within 10m of rural streams in the Rural – Rural Production Zone and Rural – Mixed Rural Zone	RD	N/A

Activity	Activity Status	Permitted Standards
(A18) Vegetation alteration or removal within 20m of a natural inland wetland, in the bed of a river or stream (permanent or intermittent), or lake	RD	N/A
(A19) Vegetation alteration or removal within 10m of urban streams	RD	N/A
All other zones and areas not covered above (i.e. Urban Zones)		
(A22A) Vegetation alteration or removal	P	Refer to E15.6. Vegetation alteration or removal for Permitted Activity Standards
All areas		
(A23) Permitted activities in Table E15.4.1 that do not comply with one or more of the standards in E15.6	RD	N/A

Auckland Unitary Plan – E26 Infrastructure - Earthworks

The table below is relevant for considering effects of activities over and above those that are permitted and recommending mitigation in relation to earthworks.

Table E26.5.3.1 Activity table - Earthworks all zones and roads [dp]

Activity	Activity Status	Permitted Standards
(A95) Earthworks up to 2500m^2 other than for maintenance, repair, renewal, minor infrastructure upgrading	P	Refer to E26.5.5.2. General standards (District)
(A96) Earthworks up to 2500m^3 other than for maintenance, repair, renewal, minor infrastructure upgrading	P	Refer to E26.5.5.2. General standards (District)
(A97) Earthworks greater than 2500m^2 other than for maintenance, repair, renewal, minor infrastructure upgrading	RD	N/A
(A97A) Earthworks greater than 2500m^3 other than for maintenance, repair, renewal, minor infrastructure upgrading	RD	N/A

3 Appendix 3 – Regional Plan, District Plan and Wildlife Act Matters

Ecological effects of road infrastructure construction broken down into AUP:OP Regional and District Plan matters

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act
Construction					
Terrestrial habitat	Vegetation removal (including trees) outside of roads and public spaces in: • a rural zone • riparian margins • coastal areas • SEAs This also includes other terrestrial habitat of value identified in the EcIA	Permanent loss of habitat/ecosystem, fragmentation and edge effects		□	
	Vegetation removal (including trees) in: • Roads • Public spaces • ONFs • ONLs • HNCs • ONCs	Permanent loss of habitat/ecosystem, fragmentation and edge effects	□		
	Earthworks – leading to invasion of bare earth surfaces with weeds and transfer of weeds (seeds and fragments) between earthworks areas	Weed dispersal to previously unaffected areas of indigenous vegetation, reduction in terrestrial biodiversity		□	
Bats	Vegetation removal	Roost loss.		□	□
	Vegetation removal	Kill or injure individual			□
	Vegetation removal	Loss of foraging habitat		□	
	Construction activities (Noise, light, dust etc.)	Disturbance and displacement to roosts and to individuals (existing)	□		□
Birds (native)	Vegetation removal	Nest loss		□	□

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act
	Vegetation removal	Kill or injure individual			✓
	Vegetation removal	Loss of foraging habitat		✓	
	Construction activities (noise, light, dust etc)	Disturbance and displacement of roosts and individuals (existing)	✓		✓
Herpetofauna (native)	Vegetation removal	Lizard habitat loss		✓	
	Vegetation removal	Kill or injure individual			✓
	Construction activities (noise, light, dust etc)	Disturbance and displacement of individuals (existing)	✓		✓
	Reclamation/culvertin g/other structures e.g., bank armouring	Permanent loss/modification of habitat/ecosystem		✓	
Freshwater habitat – wetland or stream (including riparian margins)	Vegetation removal	Permanent loss of habitat/ecosystem, fragmentation and edge effects		✓	
	Construction activities – earthworks (leading to sediment discharge), machinery use and chemical storage (leading to leaks/spills)	Uncontrolled discharge leading to habitat and water quality degradation		✓	
	Diversion, abstraction or bunding of watercourses and water level/flow/ periodicity changes	Detrimental effects on habitats including plant composition and fauna		✓	
Fish (native)	Reclamation/diversion /other structures e.g., bank armouring	Loss of aquatic habitat		✓	
	Reclamation/diversion /culverting/other structures e.g., bank armouring	Kill or injure individual			✓
Operation					
Terrestrial habitat	Presence of the road – use of road edges as dispersal corridors by invasive plant species	Weed dispersal to previously unaffected areas of indigenous vegetation, reduction in terrestrial biodiversity		✓	

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act
	Road maintenance – increased use of herbicides	Increased weed incursion, unintentional spray of indigenous vegetation		✓	
Bats	Vehicle movement	Kill or injure individual			✓
	Presence of the road	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat	✓		✓
	Lighting and noise/vibration	Disturbance and displacement of (new and existing) roosts and individuals	✓		✓
Birds (native)	Vehicle movement	Kill or injure individual	✓		✓
	Presence of the road	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat	✓		✓
	Lighting and noise/vibration	Disturbance and displacement of (new and existing) nests and individuals	✓		✓
Herpetofauna (native)	Vehicle movement	Kill or injure individual			✓
	Presence of the road	Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat	✓		✓
	Lighting	Disturbance of nocturnal lizard behaviour	✓		✓
Freshwater habitat – wetland or stream (including riparian margins)	Vehicle (cartage) movement – risk of spills of potential toxins (oil, milk, chemicals)	Temporary degradation of instream/wetland habitat and water quality		✓	
	Presence of bridge	Shading leading to change in ecosystem structure		✓	
	Gradual change in hydrology from	Effect on downstream habitat (including		✓	

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act
	presence of the road/stormwater, including reclamations	erosion/sediment discharge) due to change in hydrology (increase or decrease)			
	Stormwater discharges – pollutants (such as heavy metals and herbicides)	Permanent degradation of wetland or instream habitat and water quality		✓	
Fish (native)	Presence of culvert	Loss of connectivity due to culvert preventing fish passage up and downstream		✓	

4 Appendix 4 – Ecological Habitat Maps

Terrestrial, Aquatic and Wetland Maps Related to NoR 1


TL.1
TL.3
PL.3
PL.1
EG
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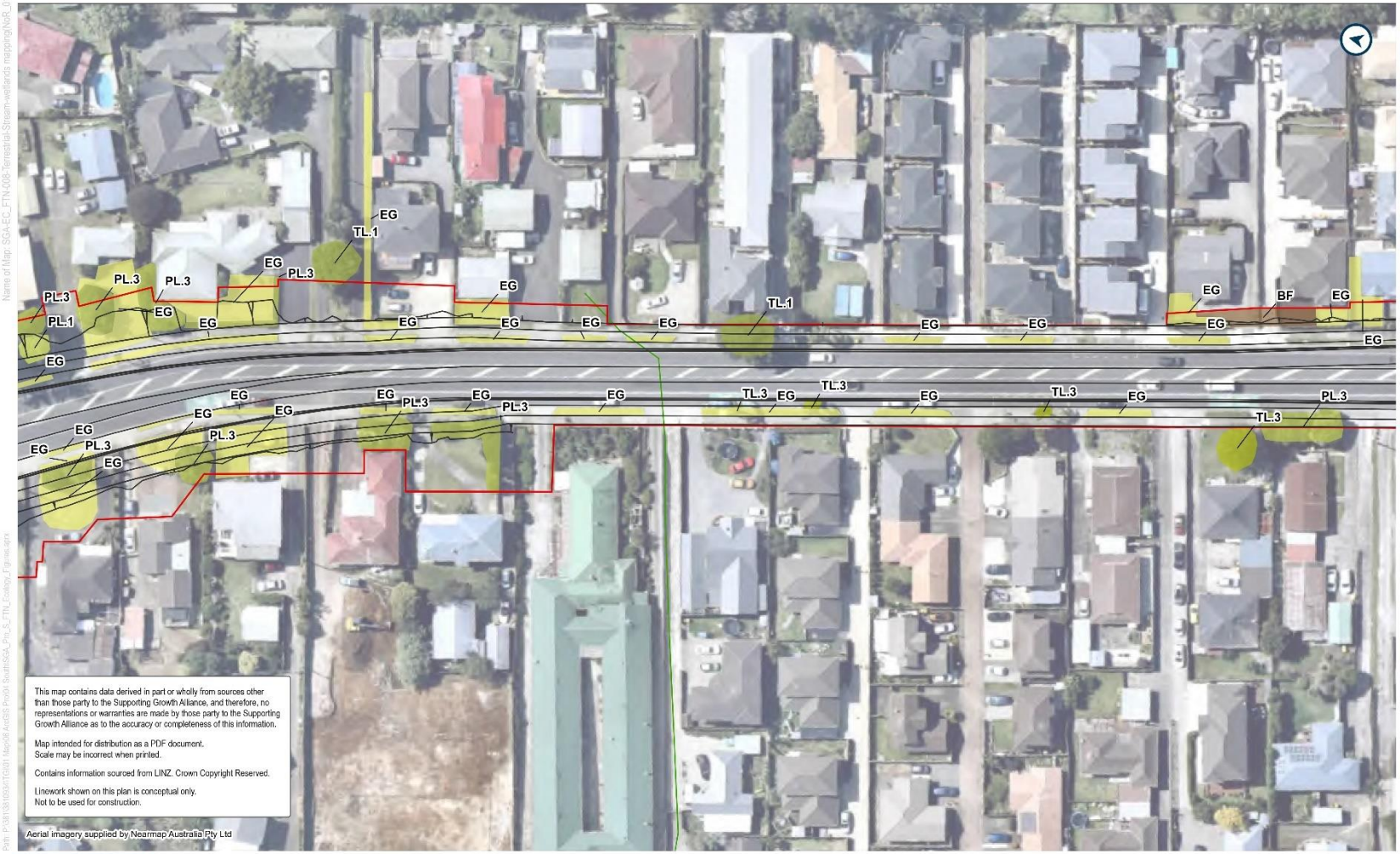
LEGEND
Proposed Designations
EG - Exotic grassland
PL.1 - Planted native (recent)
PL.3 - Planted amenity
TL.1 - Native treeland
TL.3 - Exotic treeland
NoR 1 - Great South Road
AUCK
0 10 20
Metres

Page 1 of 15



LEGEND

- Proposed Designations
- Artificial/Piped/Culvert
- BF - Brownfield
- EG - Exotic grassland
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 1 - Great South Road

0 10 20
Metres

Page 2 of 15


TL.3
PL.3
EG
TL.1
BF
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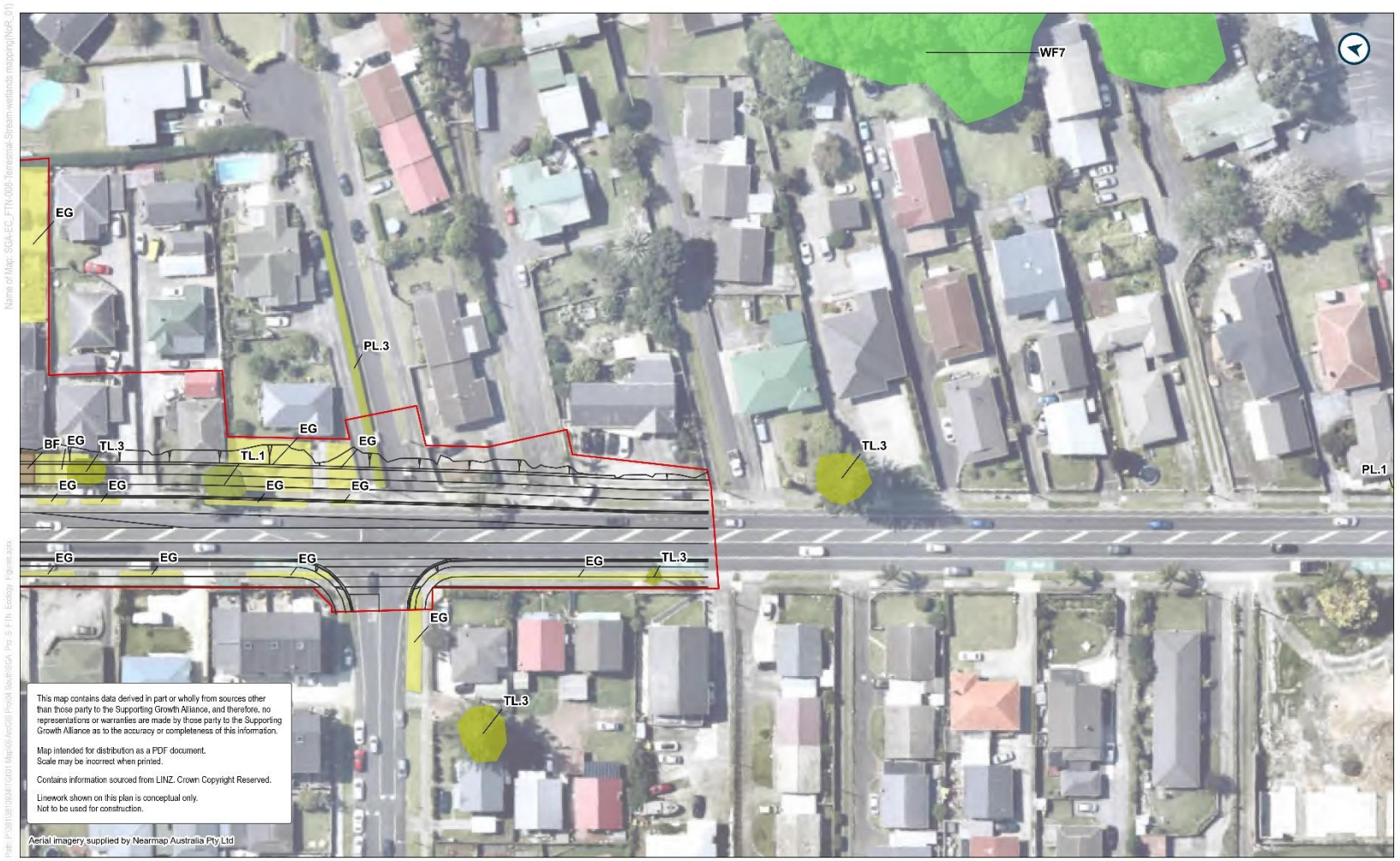
LEGEND
Proposed Designations
BF - Brownfield
EG - Exotic grassland
PL.3 - Planted amenity
TL.1 - Native treeland
TL.3 - Exotic treeland
NoR 1 - Great South Road
AUCK
0 10 20
Metres

Page 3 of 15



LEGEND

- Proposed Designations
- BF - Brownfield
- EG - Exotic grassland
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland
- WF7 - Pūriri Forest

NoR 1 - Great South Road

0 10 20
Metres

Page 4 of 15

LEGEND

Proposed Designations

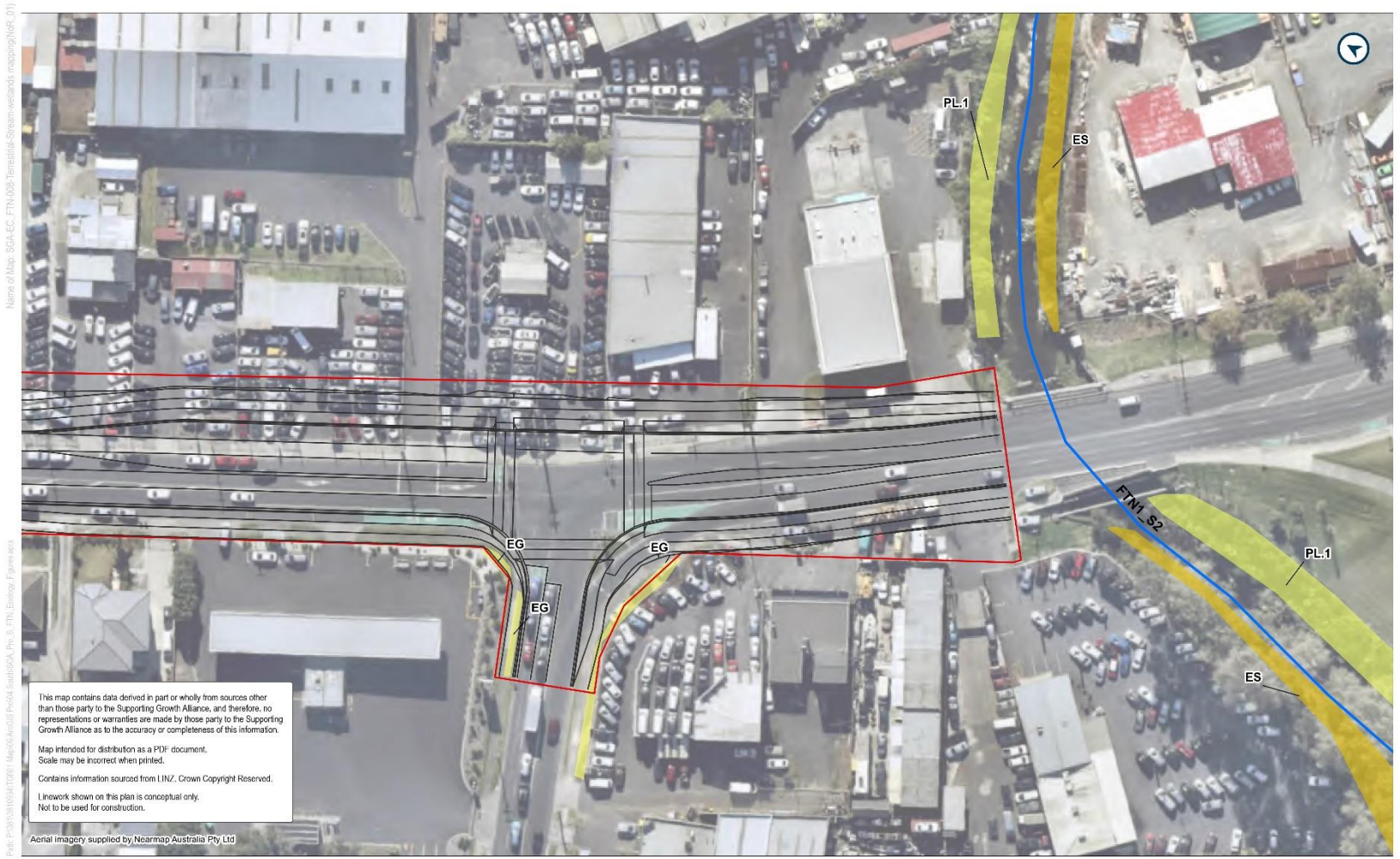
TL.1 - Native treeland

NoR 1 - Great South Road

0 10 20

Metres

Page 5 of 15



LEGEND

Proposed Designations
Permanent
EG - Exotic grassland
ES - Exotic Scrub
PL.1 - Planted native (recent)

NoR 1 - Great South Road

0 10 20
Metres

Page 6 of 15

LEGEND

NoR 1 - Great South Road

- Proposed Designations
- BF - Brownfield
- EG - Exotic grassland
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

0 10 20
Metres

Page 7 of 15

LEGEND

- Proposed Designations
- BF - Brownfield
- EG - Exotic grassland
- PL.3 - Planted amenity

NoR 1 - Great South Road

0 10 20
Metres

LEGEND

Proposed Designations

EG - Exotic grassland

NoR 1 - Great South Road

0 10 20

Metres

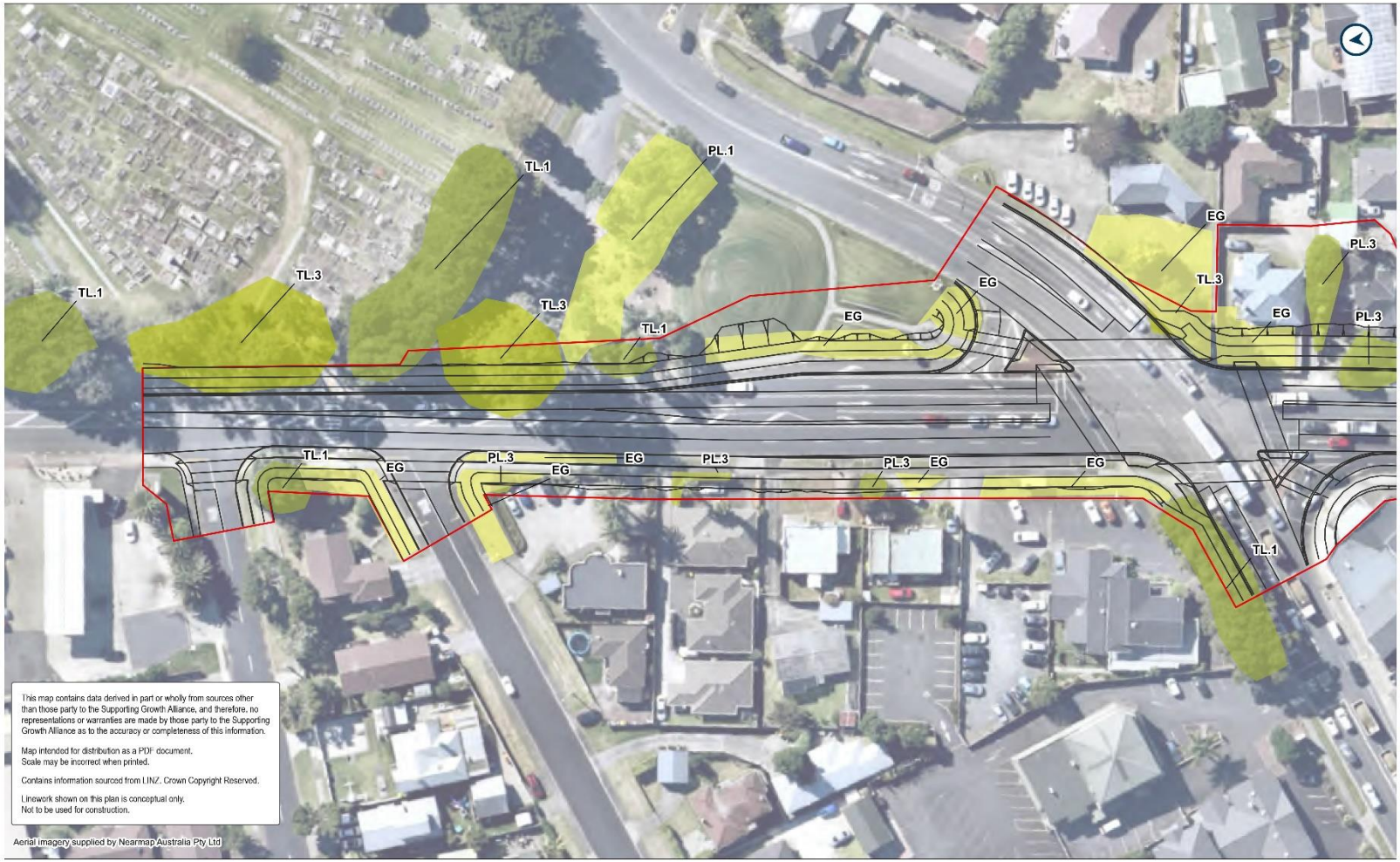
Page 9 of 15

LEGEND

Proposed Designations
PL.3 - Planted amenity
TL.3 - Exotic treeland
EG - Exotic grassland
TL.1 - Native treeland

NoR 1 - Great South Road

0 10 20
Metres



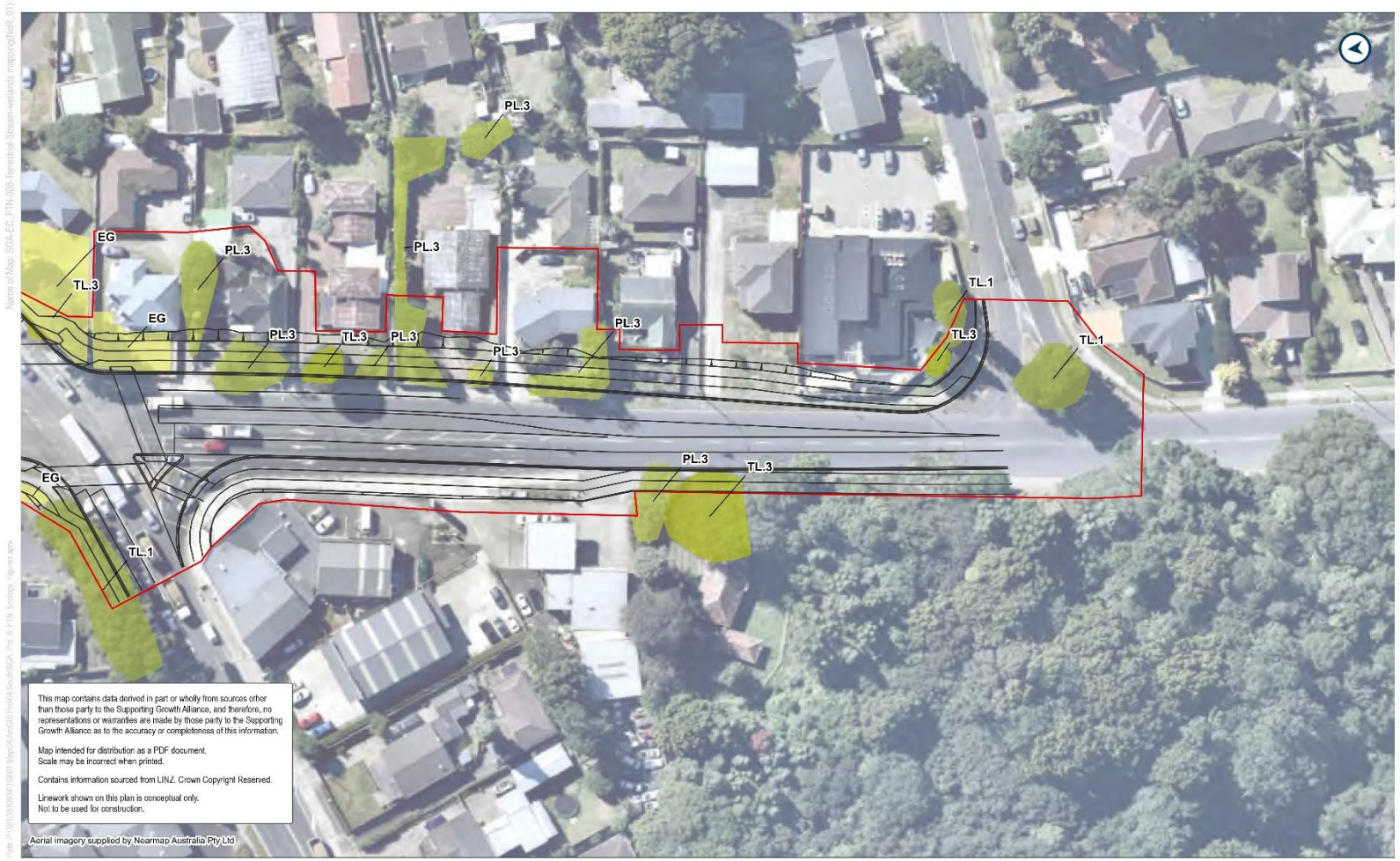
LEGEND

- Proposed Designations
- EG - Exotic grassland
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 1 - Great South Road

0 10 20
Metres

Page 11 of 15



LEGEND

Proposed Designations | PL.3 - Planted amenity | TL.3 - Exotic treeland
EG - Exotic grassland | TL.1 - Native treeland

NoR 1 - Great South Road

0 10 20
Metres

Page 12 of 15

LEGEND

- Proposed Designations
- EG - Exotic grassland
- PL.2 - Planted Vegetation - Native (mature)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 1 - Great South Road

0 10 20
Metres

Page 13 of 15

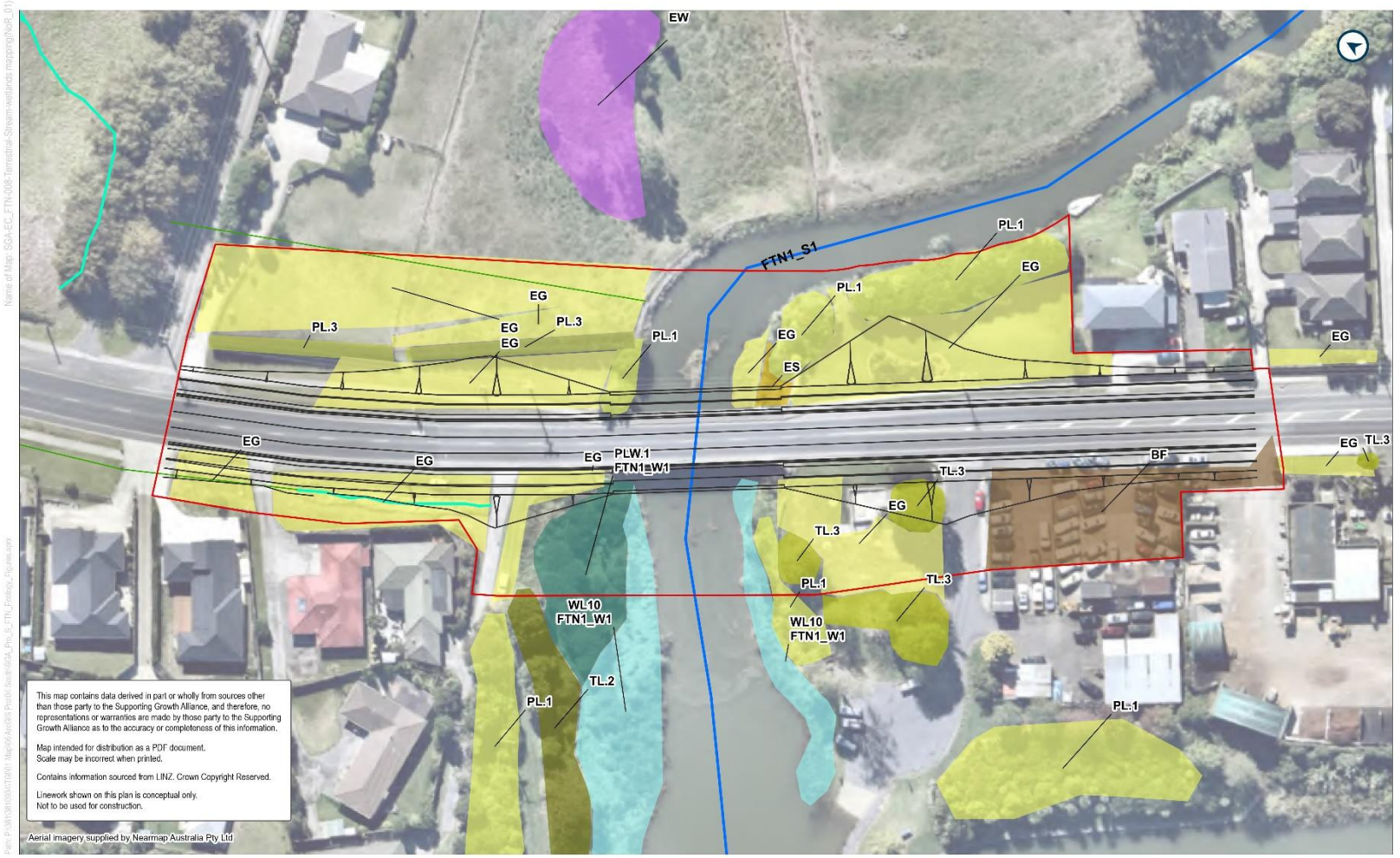
LEGEND

NoR 1 - Great South Road

- Proposed Designations
- Artificial swale/drainage ditch
- Artificial/Piped/Culvert
- Intermittent
- EG - Exotic grassland
- PL.1 - Planted native (recent)
- PL.2 - Planted Vegetation - Native (mature)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

0 10 20
Metres

Page 14 of 15



LEGEND

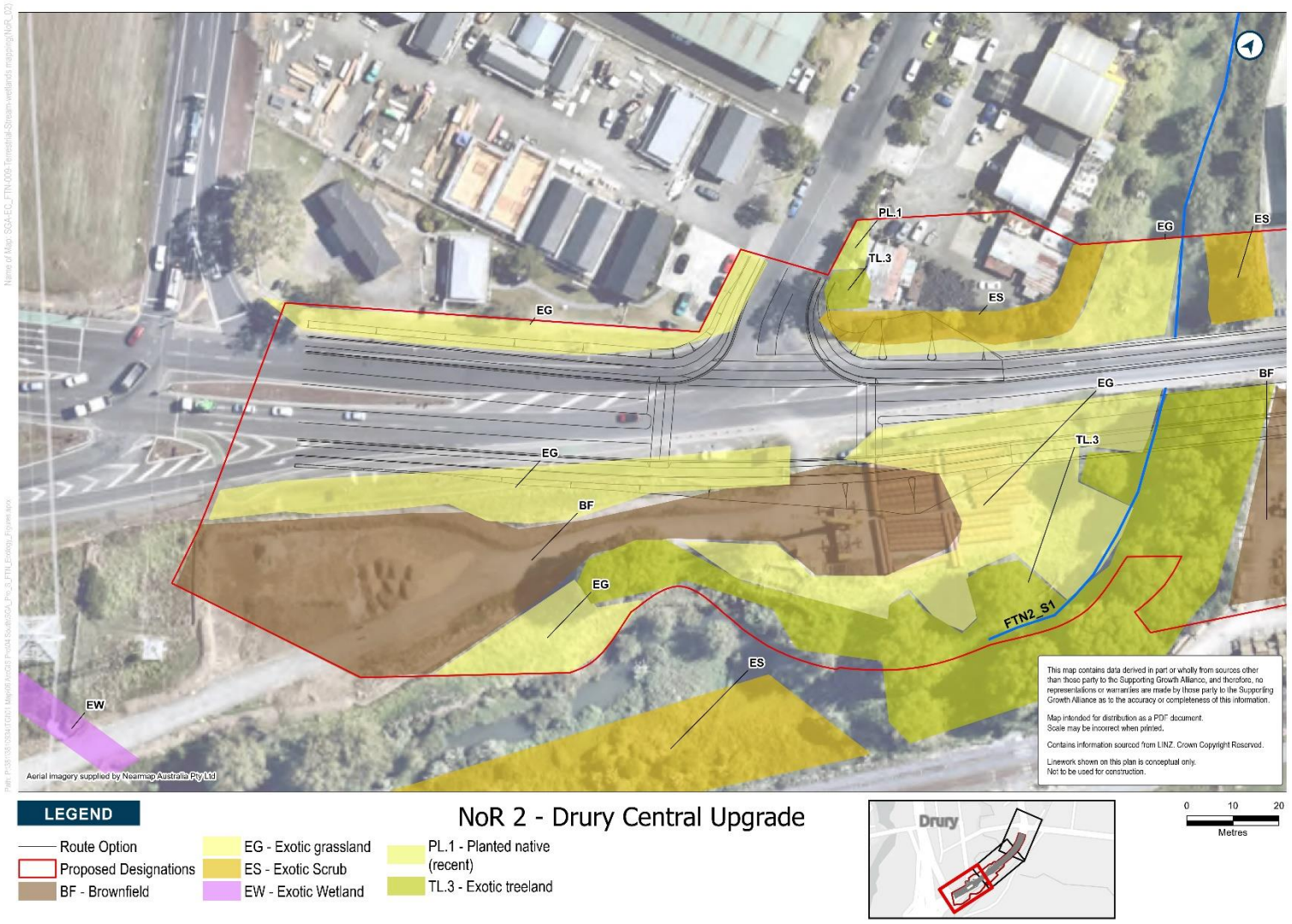
- Proposed Designations
- Artificial swale/drainage ditch
- Artificial/Piped/Culvert
- Permanent
- EW - Exotic Wetland
- PLW.1 - Planted Native Wetland
- WL10 - Oioi, restiad rushland/reedland
- BF - Brownfield
- EG - Exotic grassland
- ES - Exotic Scrub
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.2 - Treeland – Mixed Native/Exotic
- TL.3 - Exotic treeland

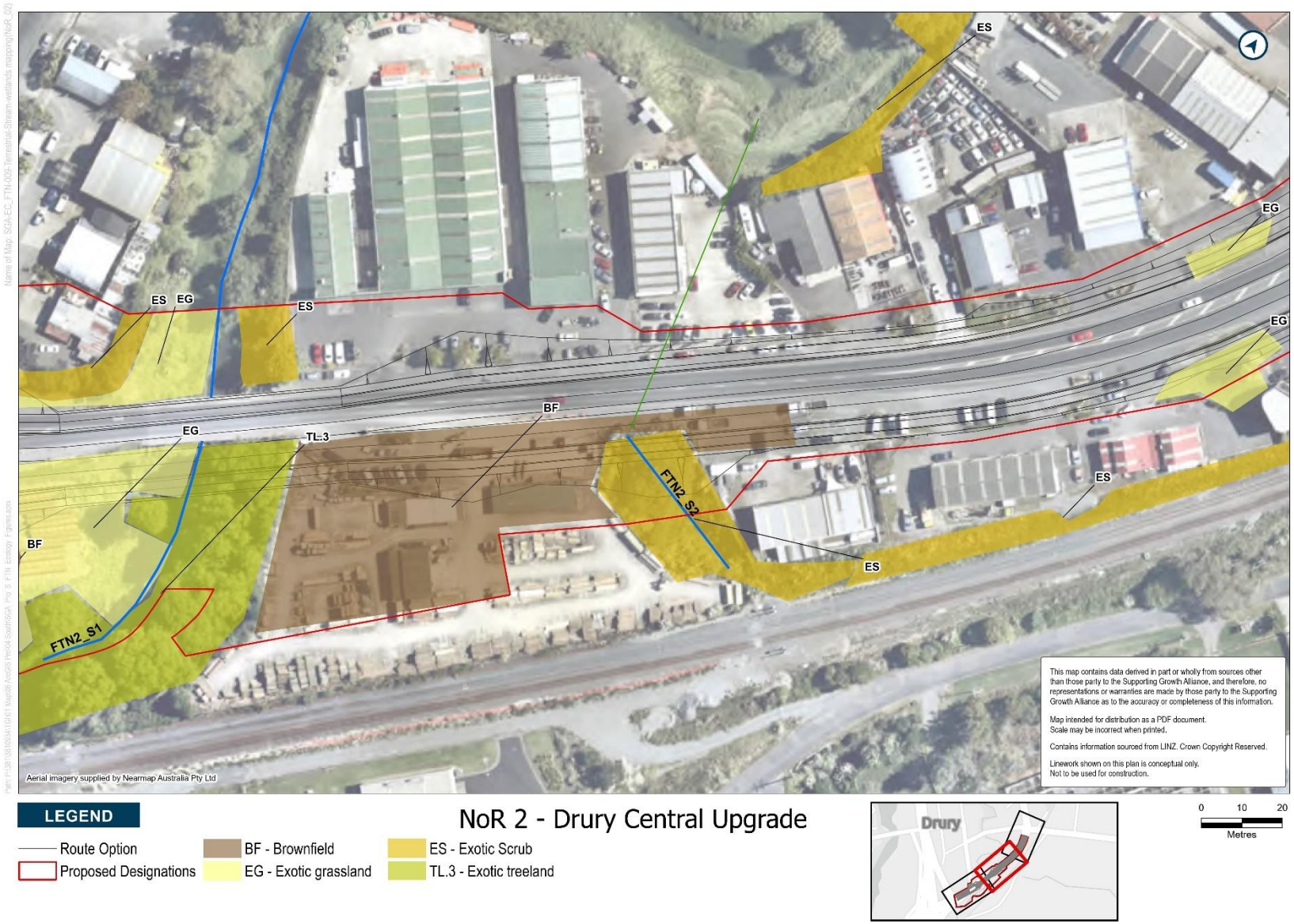
NoR 1 - Great South Road

0 10 20
Metres

Page 15 of 15

Terrestrial, Aquatic and Wetland Maps Related to NoR 2




ES
EG
ES
EG
ES
EG
BF
TL.3
EG
BF
FTN2_S2
ES
ES
FTN2_S1
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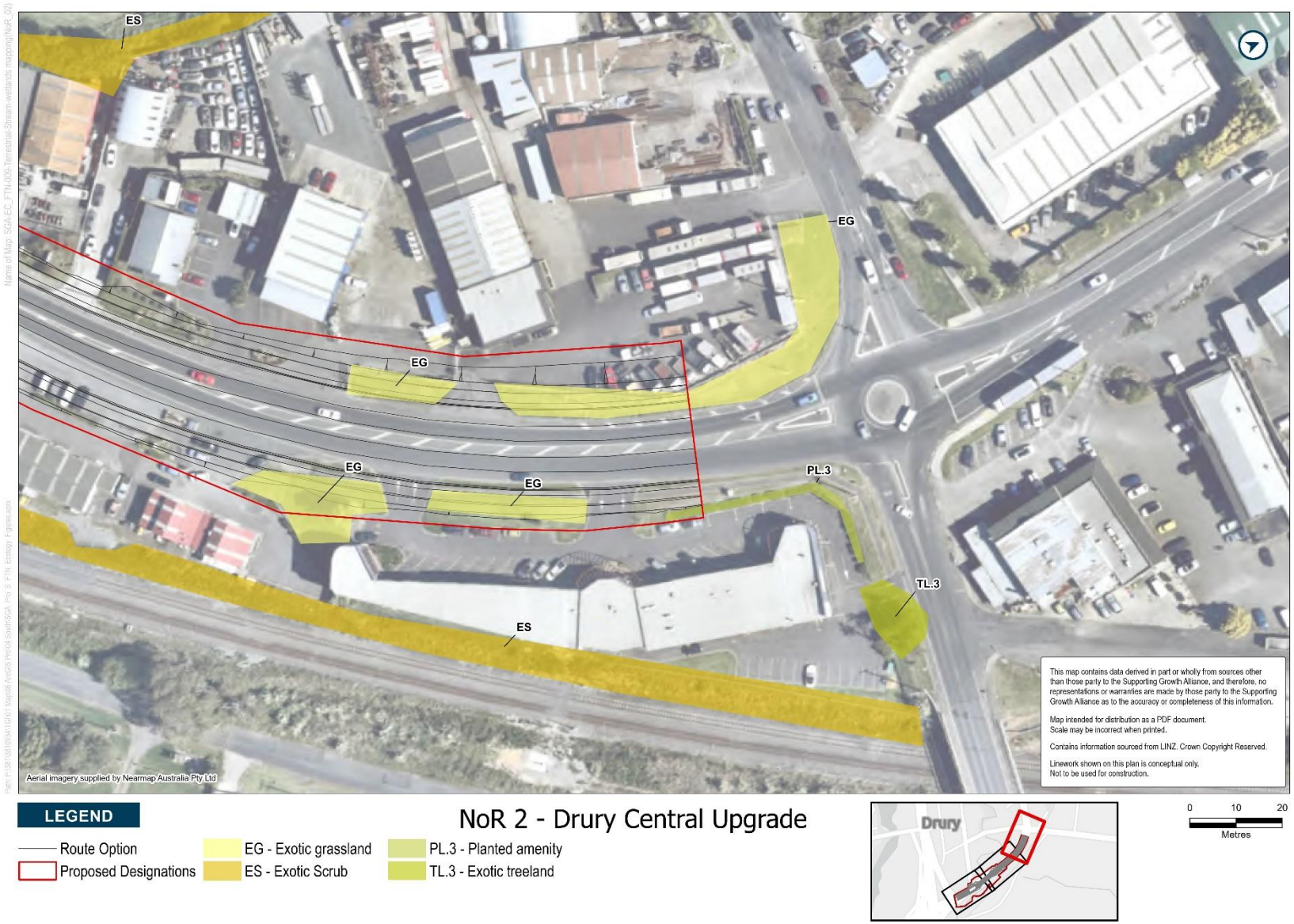
LEGEND
Route Option
Proposed Designations
BF - Brownfield
EG - Exotic grassland
ES - Exotic Scrub
TL.3 - Exotic treeland
NoR 2 - Drury Central Upgrade
Drury
0
10
20
Metres


ES
EG
EG
EG
EG
PL.3
TL.3
ES
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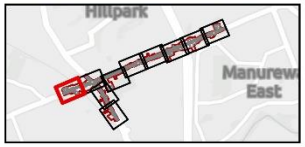
LEGEND
Route Option
Proposed Designations
EG - Exotic grassland
ES - Exotic Scrub
PL.3 - Planted amenity
TL.3 - Exotic treeland
NoR 2 - Drury Central Upgrade
Drury
0
10
20
Metres

Terrestrial, Aquatic and Wetland Maps Related to NoR 3

LEGEND

- Proposed Designations
- Artificial swale/drainage ditch
- BF - Brownfield
- EG - Exotic grassland
- ES - Exotic Scrub
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 3 - Alfriston Road



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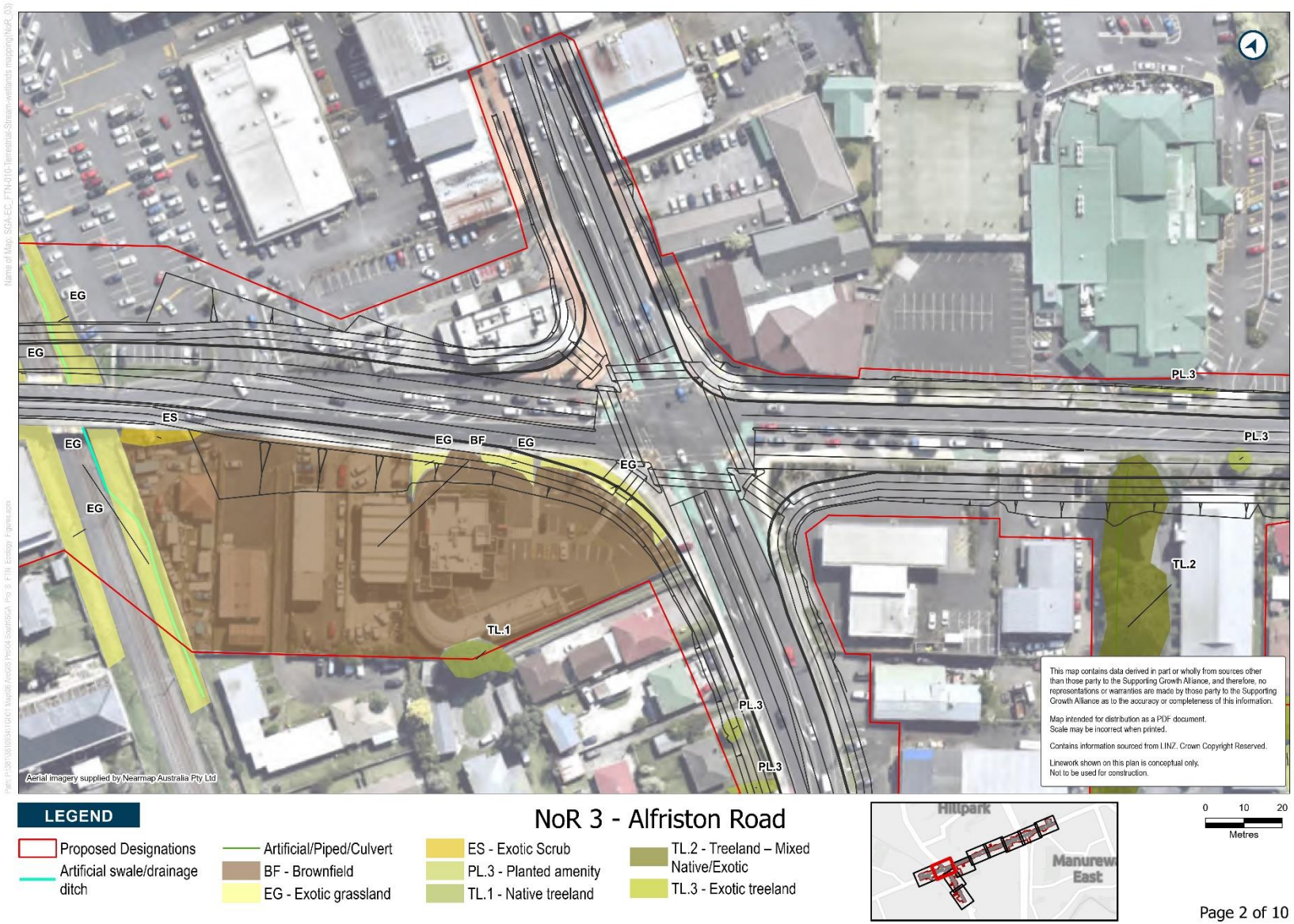
Metres

Page 1 of 10



LEGEND

- Proposed Designations
- Artificial swale/drainage ditch
- Artificial/Piped/Culvert
- BF - Brownfield
- EG - Exotic grassland
- ES - Exotic Scrub
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.2 - Treeland – Mixed Native/Exotic
- TL.3 - Exotic treeland

NoR 3 - Alfriston Road

0 10 20
Metres

Page 2 of 10

LEGEND

- Proposed Designations
- Artificial/Piped/Culvert
- Intermittent
- Permanent
- BF - Brownfield
- EG - Exotic grassland
- EW - Exotic Wetland
- PL.2 - Planted Vegetation - Native (mature)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.2 - Treeland – Mixed Native/Exotic
- TL.3 - Exotic treeland

NoR 3 - Alfriston Road

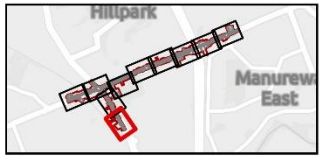
0 10 20
Metres

Page 3 of 10

LEGEND

- Proposed Designations
- Artificial/Piped/Culvert
- Intermittent
- BF - Brownfield
- EG - Exotic grassland
- EW - Exotic Wetland
- PL.3 - Planted amenity
- TL.3 - Exotic treeland

NoR 3 - Alfriston Road



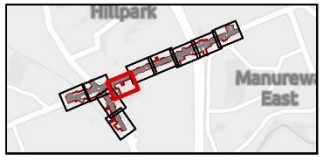
0 10 20
Metres

Page 4 of 10

LEGEND

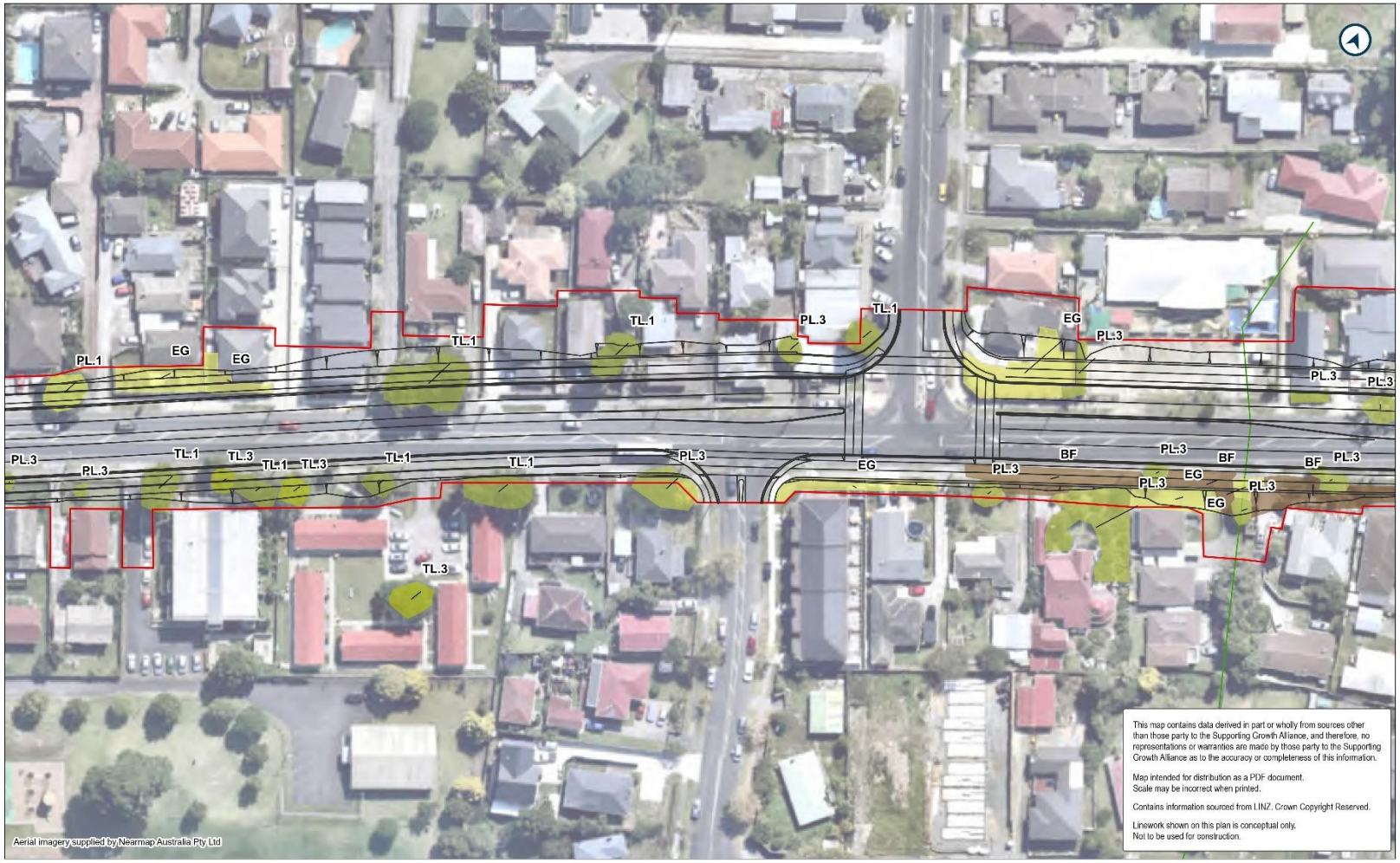
- Proposed Designations
- Artificial/Piped/Culvert
- Permanent
- BF - Brownfield
- EG - Exotic grassland
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.2 - Treeland – Mixed Native/Exotic
- TL.3 - Exotic treeland

NoR 3 - Alfriston Road



0 10 20
Metres

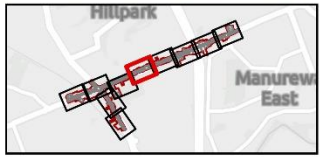
Page 5 of 10



LEGEND

- Proposed Designations
- Artificial/Piped/Culvert
- BF - Brownfield
- EG - Exotic grassland
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 3 - Alfriston Road



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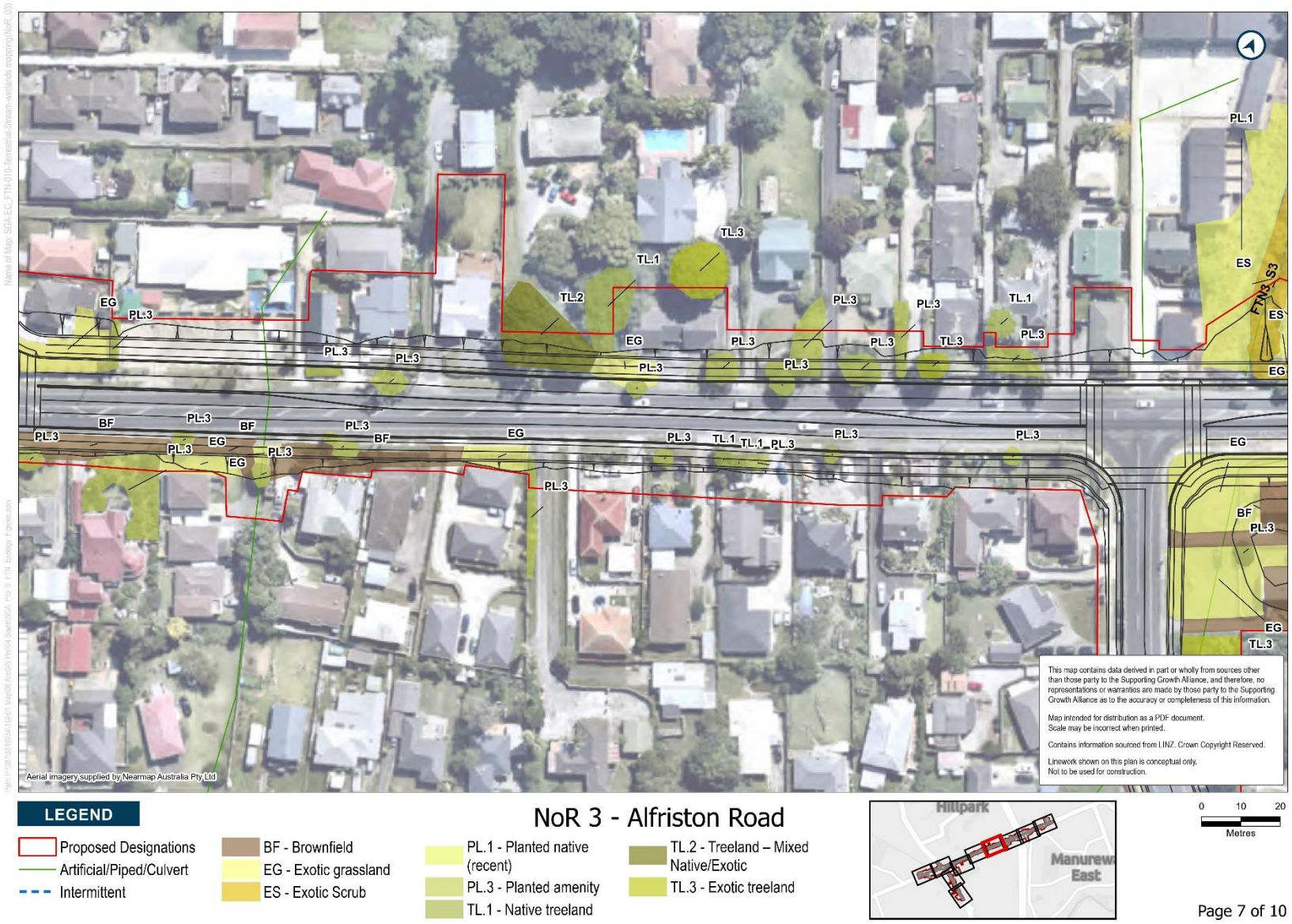
Metres


PL.1
TL.3
TL.1
TL.2
ES
FTN3_S3
EG
PL.3
BF
TL.1
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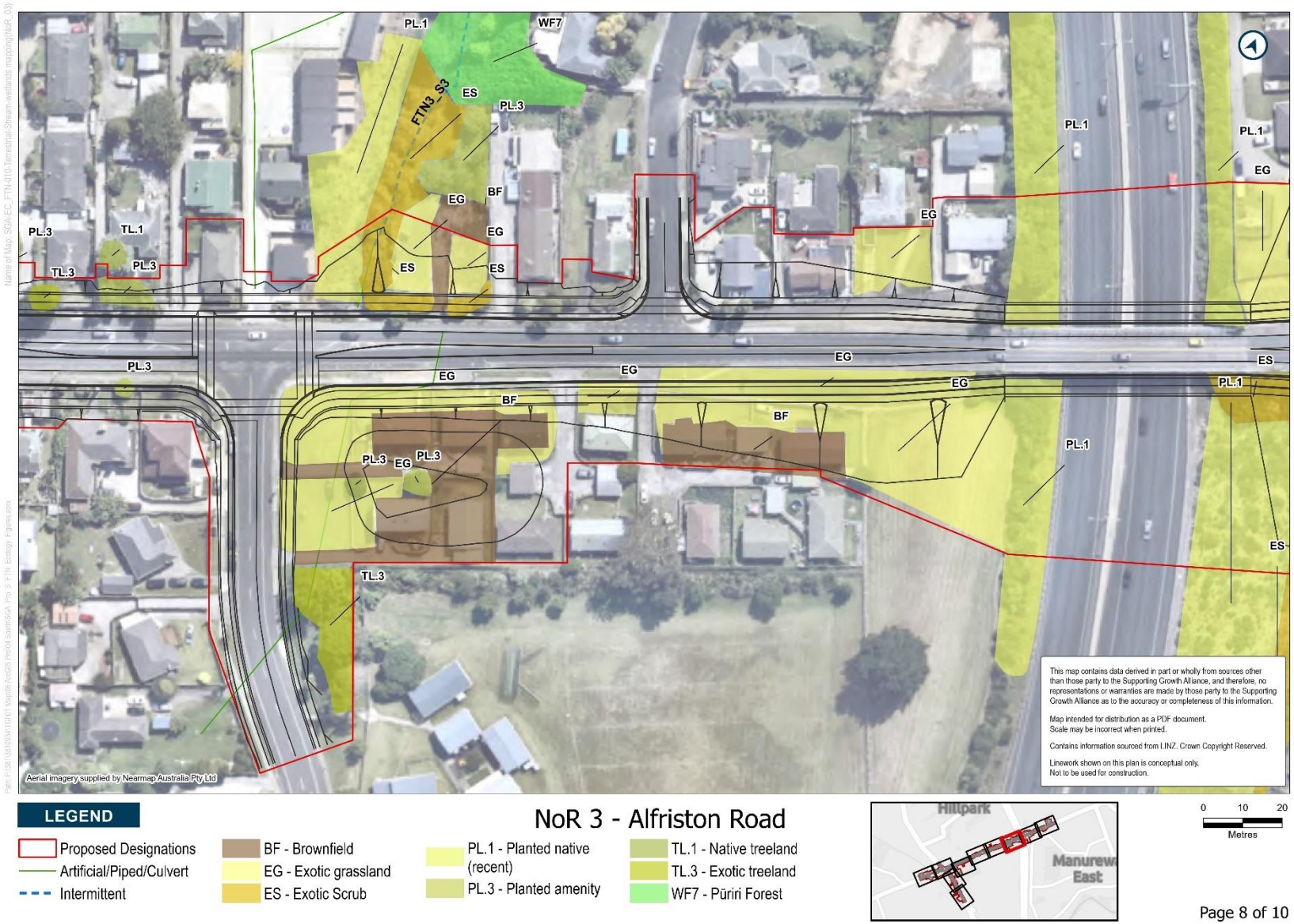
LEGEND
Proposed Designations
Artificial/Piped/Culvert
Intermittent
BF - Brownfield
EG - Exotic grassland
ES - Exotic Scrub
PL.1 - Planted native (recent)
PL.3 - Planted amenity
TL.1 - Native treeland
TL.2 - Treeland – Mixed Native/Exotic
TL.3 - Exotic treeland
NoR 3 - Alfriston Road
Hillpark
Manurewa East
0
10
20
Metres


PL.1
WF7
FTN3_S3
ES
PL.3
EG
BF
TL.1
TL.3
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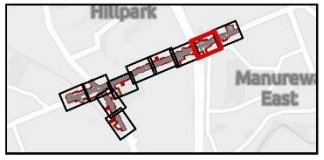
LEGEND
Proposed Designations
Artificial/Piped/Culvert
Intermittent
BF - Brownfield
EG - Exotic grassland
ES - Exotic Scrub
PL.1 - Planted native (recent)
PL.3 - Planted amenity
TL.1 - Native treeland
TL.3 - Exotic treeland
WF7 - Pūriri Forest
NoR 3 - Alfriston Road
Hillpark
Manurewa East
0 10 20
Metres

LEGEND

- Proposed Designations
- Artificial/Piped/Culvert
- Intermittent
- EG - Exotic grassland
- ES - Exotic Scrub
- EW - Exotic Wetland
- OW - Open Water
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland
- WF7 - Pūriri Forest

NoR 3 - Alfriston Road

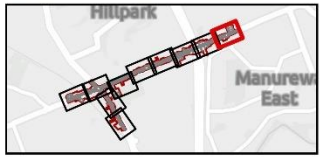


0 10 20
Metres

LEGEND

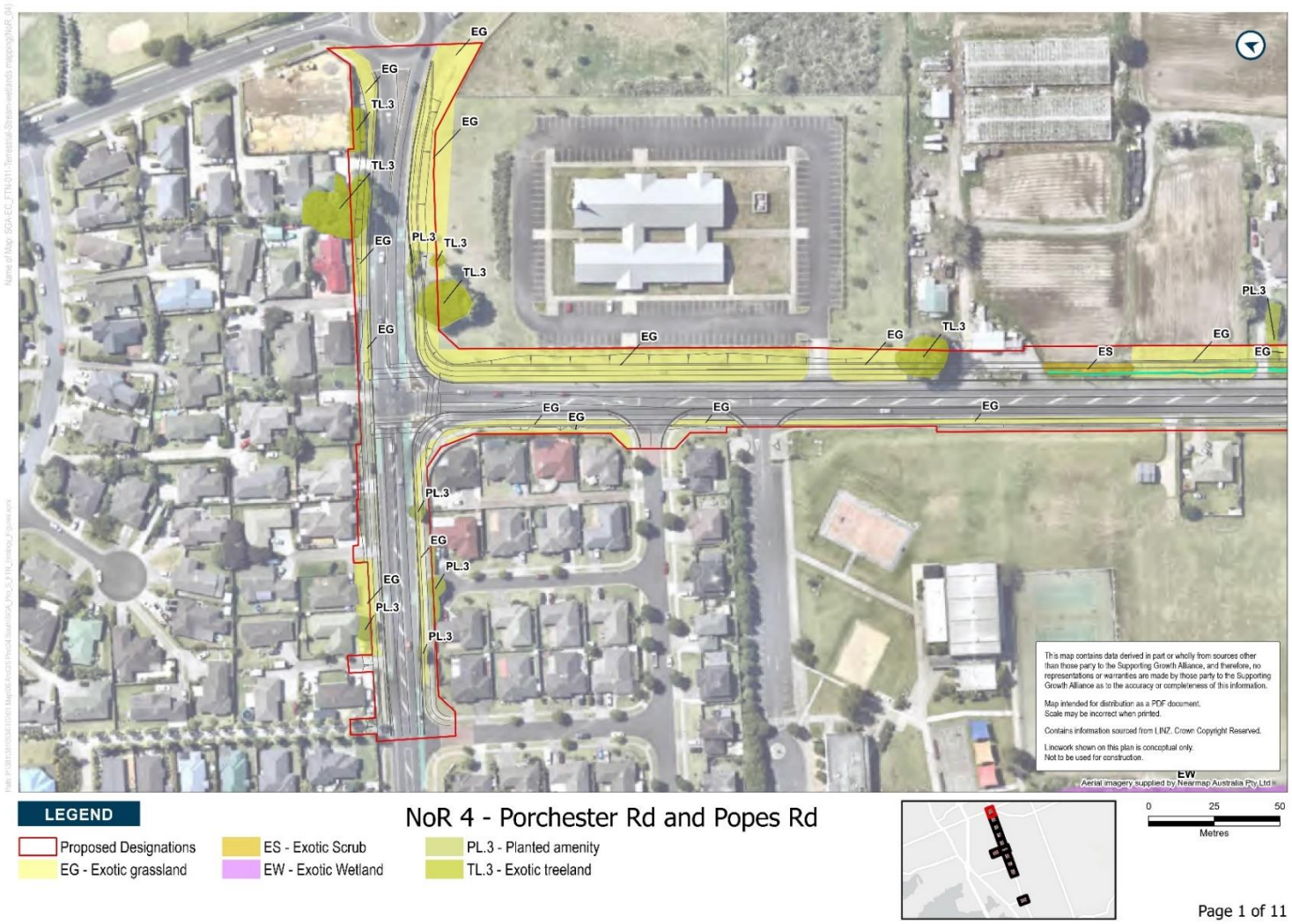
- Proposed Designations
- Artificial/Piped/Culvert
- EG - Exotic grassland
- PL.3 - Planted amenity

NoR 3 - Alfriston Road



0 10 20
Metres

Terrestrial, Aquatic and Wetland Maps Related to NoR 4



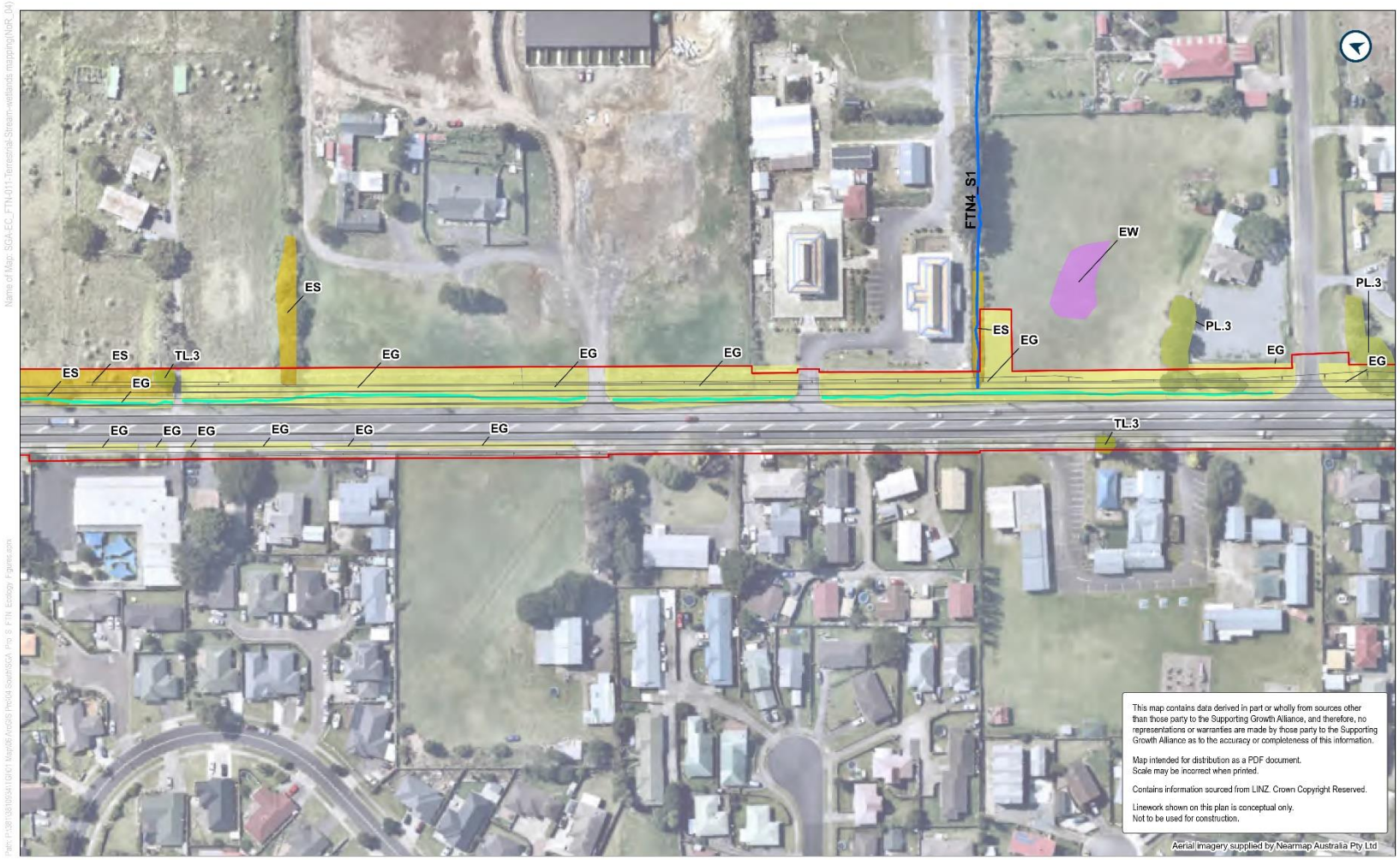
Page 1 of 11

LEGEND

- Proposed Designations
- EG - Exotic grassland
- ES - Exotic Scrub
- EW - Exotic Wetland
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 25 50
Metres

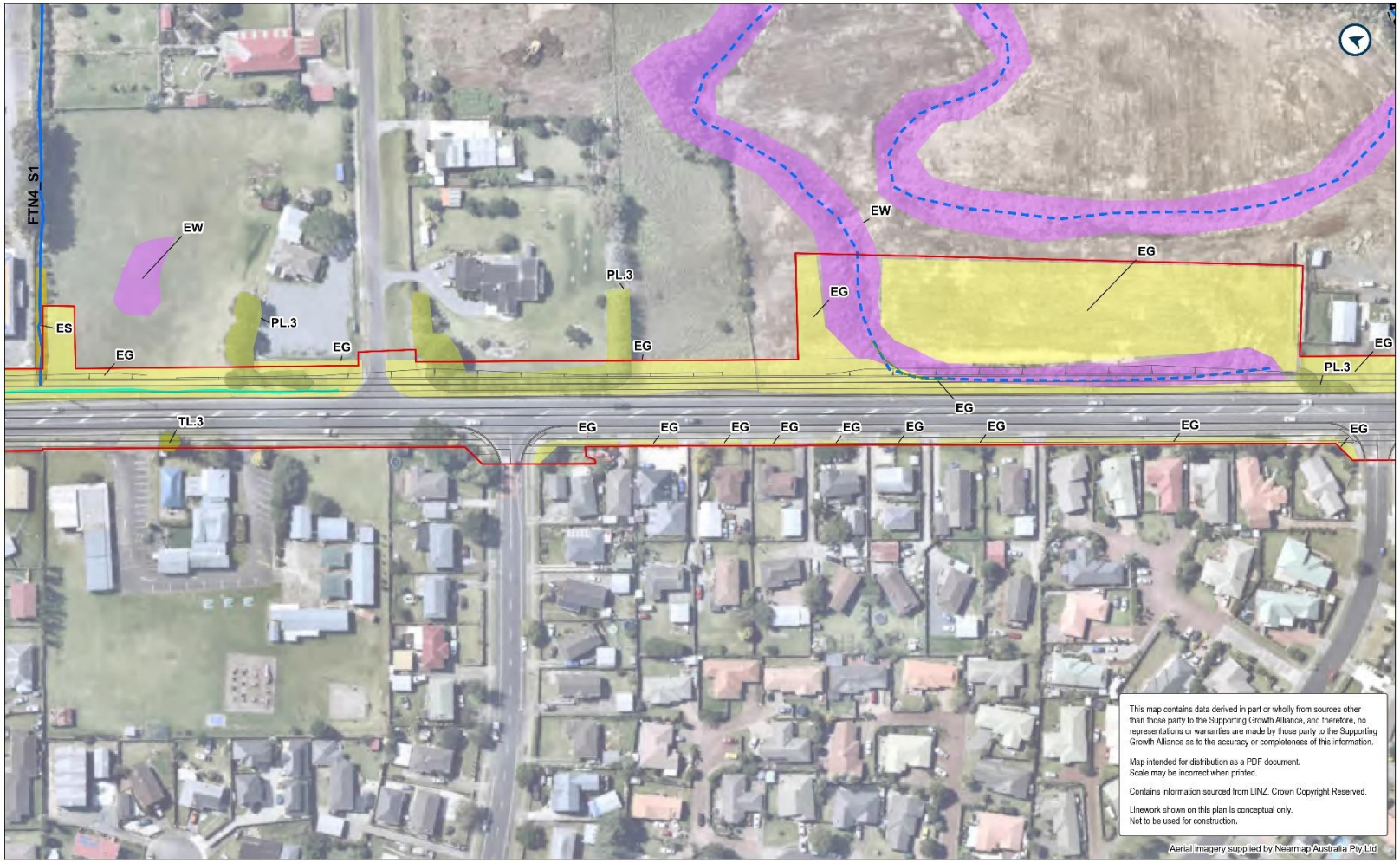


LEGEND

- Proposed Designations
- EG - Exotic grassland
- ES - Exotic Scrub
- EW - Exotic Wetland
- PL.3 - Planted amenity
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 25 50
Metres



LEGEND

- Proposed Designations
- EG - Exotic grassland
- ES - Exotic Scrub
- EW - Exotic Wetland
- PL.3 - Planted amenity
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 25 50
Metres

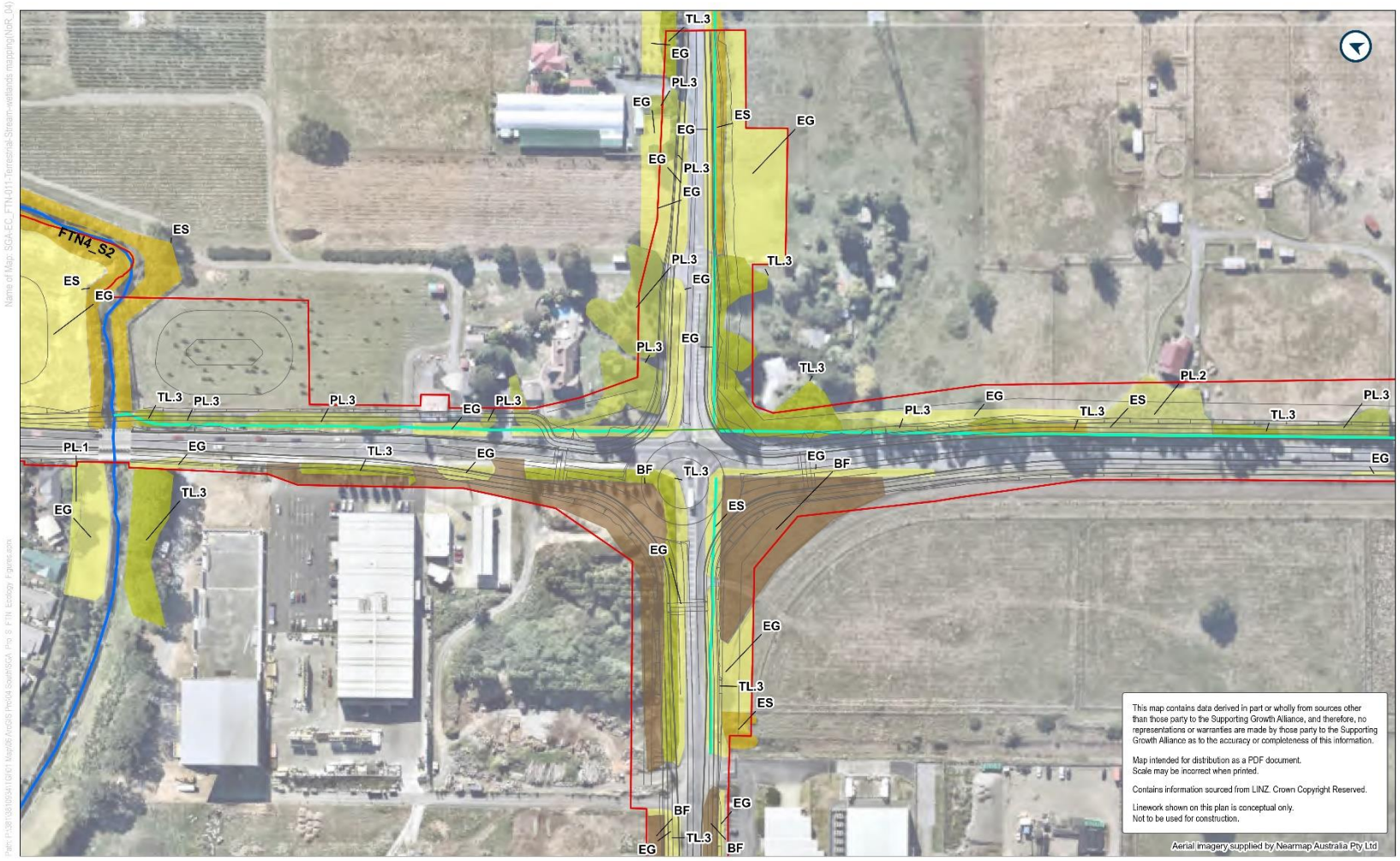
LEGEND

- Proposed Designations
- BF - Brownfield
- EG - Exotic grassland
- ES - Exotic Scrub
- EW - Exotic Wetland
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 25 50
Metres

Page 5 of 11



LEGEND

- Proposed Designations
- BF - Brownfield
- EG - Exotic grassland
- ES - Exotic Scrub
- PL.1 - Planted native (recent)
- PL.2 - Planted Vegetation - Native (mature)
- PL.3 - Planted amenity
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 30 60
Metres

Page 6 of 11

LEGEND

- Proposed Designations
- BF - Brownfield
- EG - Exotic grassland
- ES - Exotic Scrub
- PL.3 - Planted amenity
- PLW.1 - Planted native wetland
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

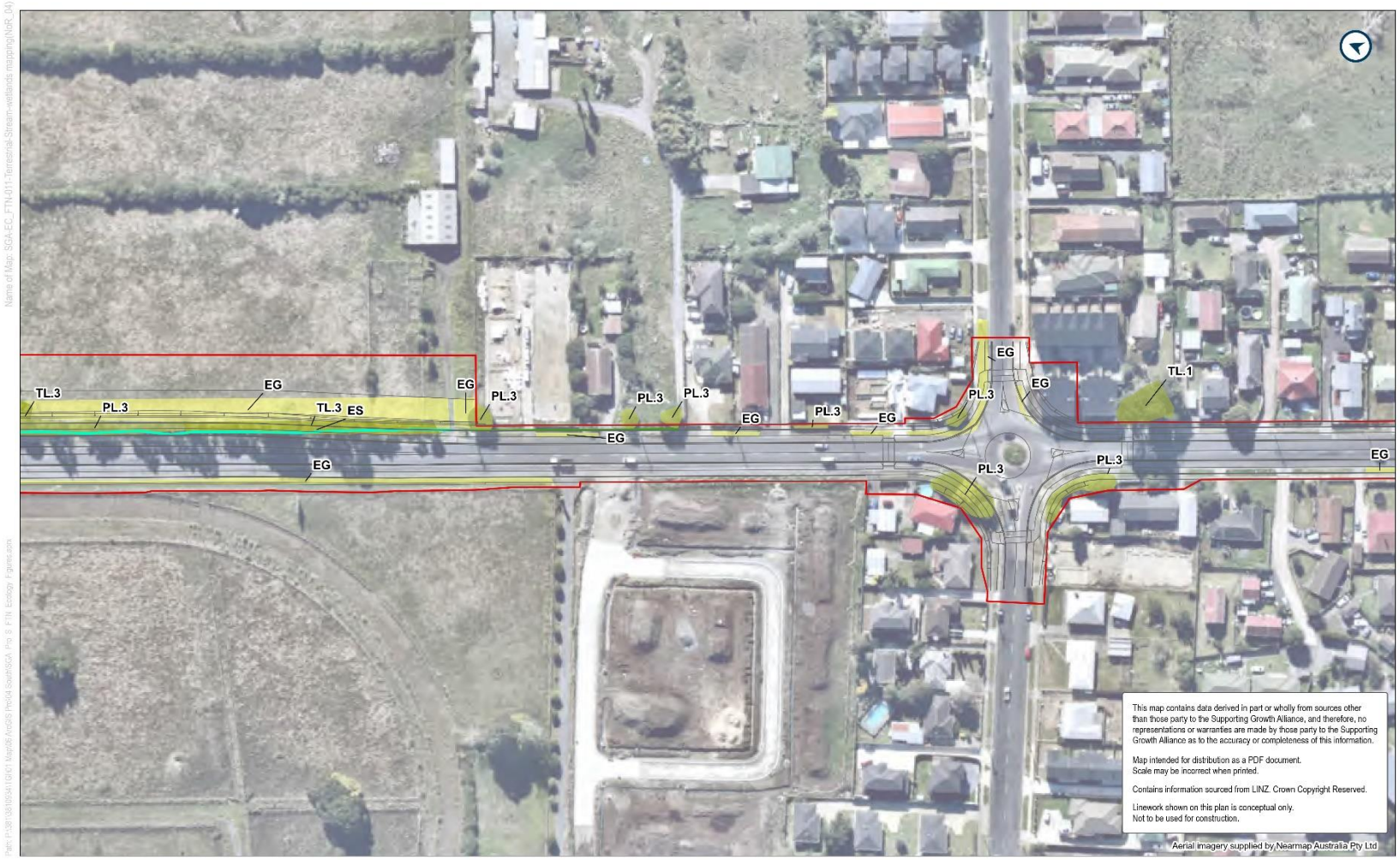
0 30 60
Metres

LEGEND

- Proposed Designations
- BF - Brownfield
- EG - Exotic grassland
- ES - Exotic Scrub
- PL.2 - Planted Vegetation - Native (mature)
- PL.3 - Planted amenity
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 25 50
Metres



LEGEND

- Proposed Designations
- EG - Exotic grassland
- ES - Exotic Scrub
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 25 50
Metres

LEGEND

- Proposed Designations
- EG - Exotic grassland
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 25 50
Metres

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LEGEND

- Proposed Designations
- EG - Exotic grassland
- PL.1 - Planted native (recent)
- PL.3 - Planted amenity
- TL.1 - Native treeland
- TL.2 - Treeland – Mixed Native/Exotic
- TL.3 - Exotic treeland

NoR 4 - Porchester Rd and Popes Rd

0 30 60
Metres

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5 Appendix 5 – Significant Ecological Areas

Terrestrial SEAs which are present within 2 km of the Project Area

SEA	Criteria met for SEA Classification	SEA Description	Relevant NoR
SEA_M2_171	NA	This area is comprised of mangroves on the outer coastline of Pahurehure Inlet, adjoining wading bird habitat (171w) to the west of the motorway causeway	NoR 1
SEA_M2_29a	NA	This area is comprised of a variety of intertidal habitats ranging from sandy mud intertidal flats to current-exposed rocky reefs and a variety of saline vegetation. Drury Creek is comprised of a variety of intertidal habitats ranging from sandy mud intertidal flats to current-exposed rocky reefs and a variety of saline vegetation. Wading bird roosting area, including important area for pied stilt	NoR 1 and 2
SEA_M2_29b	NA	Within the upper tidal reaches of Drury Creek there are a variety of marshes, grading from mangroves through to extensive areas of jointed rush-dominated saltmarsh, to freshwater vegetation in response to salinity changes. This same area is a migration pathway between marine and freshwater habitats for a number of different species of native freshwater fishes	NoR 1
SEA_T_1192	3,4	This area supports a diversity of habitat type that inhabitant typical species richness and also acts as migration pathway	NoR 1, 3 and 4
SEA_T_4202	1,2,3,4	This area encompassess <10% natural Taraire-tawa-podocarp forest WF9 (0.08 ha), WF12 (0.29 ha). This area is vital for supporting a threatened ecosystem, including Kahikatea forest MF4 (2.3 ha), as well as several TAR species such as NZ longfin eel (*Anguilla dieffenbachii), Swamp astelia (Astelia grandis), Redfin bully (Gobiomorphus* huttoni), Black maire (*Nestegis cunninghamii*), Koura (*Paranephrops*), Poporo (*Solanum aviculare* var. *aviculare*). Within this SEA, there are also some rare species present, including Kaikomako (*Pennantia corymbosa*), Kowhai (*Sophora microphylla*). The diversity of habitats inside this SEA is WF12, WF9, MF4. This area also acts as buffer around a protected area.	NoR 1
SEA_T_4356	1,2	This area is a representation of the natural extent within the Eco District, comprising less than 10% of the Taraire-tawa-podocarp forest, specifically WF9 (2.28 ha). Notably, this habitat supports threatened species, including the Kaka (*Nestor meridionalis septentrionalis*)	NoR 1 and 3
SEA_T_4357	1,2,4	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Pūriri forest WF7 (4.28 ha)	NoR 1 and 3
SEA_T_4358	1,2	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Pūriri forest WF7 (3.35 ha)	NoR 1 and 3
SEA_T_4362	1,2	This site is a representative of the natural extent within the Eco District, covering >10% of the Puriri forest, particularly WF7 (0.53 ha). Also, this area is home to rare species, including the Danhatchia Orchid (*Danhatchia australis*)	NoR 1
SEA_T_5248	1,2	This site is a representative of the natural extent within the Eco District, covering >10% of the Puriri forest WF7 (0.53 ha)	NoR 1

SEA	Criteria met for SEA Classification	SEA Description	Relevant NoR
SEA_T_530	2,4	This area is characterized by the presence of threatened species, including Mingmingi (*Coprosma propinqua* var. *propinqua*), Inanga (*Galaxias maculatus*), and Hawkweed (*Picris burbidgeae*). Additionally, it is home to several rare species, such as Korokio (Corokia cotoneaster), Kaikomako (*Pennantia corymbosa*), and Kowhai (*Sophora microphylla*). This area serves as a buffer for both a Protected Area and a Significant Ecological Area (SEA)	NoR 1
SEA_T_5312	2,3,4	This area provides habitats to threatened species, including the King fern (*Ptisana salicina*), Strap fern (*Grammitis billardierei*). This area exhibits habitat diversity, encompassing WF9 and VS5 and acts as a protective buffer for both a designated Protected Area and a SEA	NoR 4
SEA_T_535	1,2	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Pūriri forest WF7 (4.37 ha)	NoR 1
SEA_T_539	1,2	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Pūriri forest WF7 (1.25 ha). It provides habitat for a rare species, including Kaikomako (*Pennantia corymbosa*)	NoR 1
SEA_T_540	1	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Taraire-tawa-podocarp forest WF9 (1.31 ha)	NoR 1 and 3
SEA_T_540a	1	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Taraire-tawa-podocarp forest WF9 (1.4 ha)	NoR 1 and 3
SEA_T_540c	1	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Taraire-tawa-podocarp forest WF9 (0.68 ha)	NoR 1 and 3
SEA_T_540d	2	This area contains threatened ecosystem, including Totara-kanuka-broadleaved forest, which includes both dune forest & scrub habitats, WF5(1.6ha)	NoR 1 and 3
SEA_T_545	1,2	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Pūriri forest WF7 (2.03 ha)	NoR 1 and 2
SEA_T_5421b	4	This area serves as migration pathway for TAR species	NoR 4
SEA_T_4359	1,4	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Taraire-tawa-podocarp forest WF9 (4.09 ha). This SEA act as a buffer around a protected area	NoR 4
SEA_T_534	1,2,3	This area serves as a representative of the natural extent within the Eco District, constituting >10% of the Pūriri forest WF7 (0.45 ha) and Kahikatea Forest MF4 (1.5 ha)	NoR 4
SEA_T_530b	2	This area provides habitats for TAR species, including South Island Pied Oyestercatcher (*Haematopus finschi*) and Caspian tern (*Sterna caspia*).	NoR 2

6 Appendix 6 – Full List of Avifauna Records

List of bird species recorded within 2 km of the Project Area based on the eBird and iNaturalist databases, as well as incidental observations onsite (mark with *)

Common Name	Māori Name	Scientific Name	Conservation Status (Robertson et al., 2021)	Record Source	Relevant NoR
New Zealand pigeon*	Kereru	*Hemiphaga novaeseelandiae*	Not Threatened	iNaturalist and eBird	All NoRs
Mallard*	Rakiraki	*Anas platyrhynchos*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Silvereye*	Tauhou	*Zosterops lateralis*	Not Threatened	iNaturalist and eBird	All NoRs
Ring-necked pheasant	NA	*Phasianus colchicus*	Introduced and Naturalised	iNaturalist and eBird	NoR 4
Red-billed gull*	Tarāpunga	*Larus novaehollandiae scopulinus*	At Risk: declining	iNaturalist and eBird	NoR 1 and NoR 2
Wild turkey	NA	*Meleagris gallopavo*	Introduced and Naturalised	iNaturalist and eBird	NoR 4
Grey Warbler*	Riroriro	*Gerygone igata*	Not Threatened	iNaturalist and eBird	All NoRs
Tui*	NA	*Prosthemadera novaeseelandiae*	Not Threatened	iNaturalist and eBird	All NoRs
Fantail*	Pīwakawaka	*Rhipidura fuliginosa*	Not Threatened	iNaturalist and eBird	All NoRs
Greenfinch*	NA	*Chloris chloris*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Pukeko*	NA	*Porphyrio melanotus*	Not Threatened	iNaturalist and eBird	All NoRs
Welcome swallow*	Warou	*Hirundo neoxena neoxena*	Not Threatened	iNaturalist and eBird	All NoRs
White-faced heron*	Matuku moana	*Egretta novaehollandiae*	Not Threatened	iNaturalist and eBird	All NoRs
Spur-winged plover*	NA	*Vanellus miles*	Not Threatened	iNaturalist and eBird	All NoRs
Dabchick	Weweia	*Poliocephalus rufopectus*	Threatened: Nationally Vulnerable	iNaturalist and eBird	NoR 3 and 4
House sparrow*	Tiu	*Passer domesticus*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Common Indian Myna*	Maina	*Acridotheres tristis*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Australasian Harrier*	Kāhu	*Circus approximans*	Not Threatened	iNaturalist and eBird	All NoRs
Song thrush*	Manu-kai-hua-rakau	*Turdus philomelos*	Introduced and Naturalised	iNaturalist and eBird	All NoRs

Common Name	Māori Name	Scientific Name	Conservation Status (Robertson et al., 2021)	Record Source	Relevant NoR
Blackbird*	Manu pango	*Turdus merula*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Variable Oystercatcher	Tōrea pango	*Haematopus unicolor*	At Risk: Recovering	iNaturalist and eBird	NoR 1
Sacred kingfisher*	Kōtare	*Todiramphus sanctus*	Not Threatened	iNaturalist and eBird	All NoRs
Eastern Rosella*	Kākā uhi whero	*Platycercus eximius*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Eurasian Skylark	Kairaka	*Alauda arvensis*	Introduced and Naturalised	iNaturalist and eBird	NoR 4
Little Black shag	Kawau tūī	*Phalacrocorax sulcirostris*	At Risk: Naturally Uncommon	iNaturalist and eBird	NoR 1
Little shag	Kawaupaka	*Phalacrocorax melanoleucos brevirostris*	At Risk: Relict	iNaturalist and eBird	NoR 1
Shinning cuckoo	Pīpīwharauroa	*Chrysococcyx lucidus*	Not Threatened	iNaturalist and eBird	NoR 3
New Zealand pied shag*	Kāruhiruhi	*Phalacrocorax varius varius*	At Risk: Recovering	iNaturalist and eBird	NoR 1
South Island pied oystercatcher	Tōrea	*Haematopus finschi*	At Risk: Declining	iNaturalist and eBird	NoR 1
Canada Goose	Kuihi	*Branta canadensis*	Introduced and Naturalised	iNaturalist and eBird	NoR 1 and 4
African Collared Dove*	NA	*Streptopelia roseogrisea*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Spotted Dove*	NA	*Streptopelia chinensis*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
European Greenfinch*	NA	*Chloris chloris*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
California Quail	NA	*Callipepla californica*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
European Starling*	Tāringi	*Sturnus vulgaris*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
European Goldfinch*	Kōurarini	*Carduelis carduelis*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Paradise Shelduck*	Pūtangitangi	*Tadorna variegata*	Not Threatened	iNaturalist and eBird	All NoRs
Morepork	Ruru	*Ninox novaeseelandiae*	Not Threatened	iNaturalist and eBird	All NoRs
Yellowhammer	Hurukōwhai	*Emberiza citrinella*	Introduced and Naturalised	iNaturalist and eBird	All NoRs

Common Name	Māori Name	Scientific Name	Conservation Status (Robertson et al., 2021)	Record Source	Relevant NoR
Australian Magpie*	Makipai	*Gymnorhina tibicen*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
White-fronted tern	Tara	*Sterna striata*	At Risk: declining	iNaturalist and eBird	NoR 1
Domestic Muscovy Duck	NA	*Cairina moschata*	Introduced, not established	iNaturalist and eBird	All NoRs
Chaffinch*	Pahirini	*Fringilla coelebs*	Introduced and Naturalised	iNaturalist and eBird	All NoRs
Southern black-backed gull*	Karoro	*Larus dominicanus*	Not Threatened	iNaturalist and eBird	NoR 1
Caspian tern	Taranui	*Hydroprogne caspia*	Theatened: Nationally Vulnerable	iNaturalist and eBird	NoR 1
Royal Spoonbill	Kōtuku ngutupapa	*Platalea regia*	At Risk: Naturally Uncommon	iNaturalist and eBird	NoR 1
Red Knot	Huahou	*Calidris canutus rogersi*	At Risk: Declining	eBird	NoR 1
Australian shoveler	Kuruwhengi	*Spatula rhynchotis*	Not Threatened	iNaturalist and eBird	NoR 1
Black Swan	Kakīānau	*Cygnus atratus*	Not Threatened	iNaturalist and eBird	NoR 1
Greylag goose	Kuihi	*Anser anser*	Introduced and Naturalised	iNaturalist and eBird	NoR 1
Banded rail	Moho pererū	Gallirallus philippensis	At Risk: declining	iNaturalist and eBird	NoR 1
Australasian Gannet	Tākapu	*Morus serrator*	Not Threatened	iNaturalist and eBird	NoR 1
New Zealand pipit	Pīhoihoi	*Anthus novaeseelandiae novaeseelandiae*	At Risk: Declining	eBird	NoR 4
New Zealand fernbird	Mātātā	*Poodytes punctatus*	At Risk: Declining	eBird	NoR 1 and 4
Black-tailed Godwit	NA	*Limosa limosa*	Non-Resident: Vagrant	iNaturalist and eBird	NoR 1
Pied stilt	Poaka	*Himantopus himantopus* leucocephalus	Not Threatened	eBird	NoR 1
North Island kaka	Kaka	*Nestor meridionalis septentrionalis*	At Risk: Recovering	iNaturalist and eBird	NoR 1 and NoR 4
Grey teal	Tētē-moroiti	*Anas gracilis*	Not Threatened	iNaturalist and eBird	NoR 1

7 Appendix 7 – Terrestrial Value Assessment

NoR 1: Great South Road FTN Upgrade

Assessment of ecological value for Terrestrial ecology features for NoR 1

Attributes to be considered	EG	ES	PL.1	PL.3	TL.1	TL.2	TL.3	WF7	Justification
Representativeness	**1**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	Associated with SEA-5248 – WF7
Typical structure and composition	1	2	2	2	2	2	2	3	ES, PL.3, TL.3: Habitats have been significantly altered by human activities (exotic dominated). PL.1, PL.2: Habitat and species have been affected by human activities.
Indigenous representation	1	2	3	2	3	3	2	3	ES: <10% of the species are indigenous. PL.3, TL.3: 10-50% of the species are indigenous. TL.2: 50-90% of the species are indigenous. WF7, PL.1, PL.2, TL.1, TL.2: >90% of the species are indigenous.
Rarity/distinctiveness	**1**	**2**	**3**	**1**	**3**	**3**	**3**	**3**	
Species conservation significance	-	-	-	-	-	-	-	3	WF7 provides high value habitat for native species
Species (habitat) of conservation significance	1	2	3	1	3	3	3	3	PL.1, and WF7 have the potential to support native skink. TL.1, TL.2, TL.3 and WF7 have the potential to support native birds and bats
Distinctive ecological values	-	-	-	-	-	-	-	3	WF7: Habitat playing an important role in provisional or regulatory ecosystem services typically on Regional scale (native forest cover). All other habitats not playing an important role in provisional or regulatory ecosystem services at any scale.
Diversity and pattern	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	

Attributes to be considered	EG	ES	PL.1	PL.3	TL.1	TL.2	TL.3	WF7	Justification
Habitat diversity	1	1	2	1	2	1	1	3	Indigenous terrestrial forests value score 3 PL.1 and TL.1 value score 2 Mixed native/exotic plantings value score 1
Patterns in habitat use	1	2	2	2	2	2	2	2	PL.3, PL.1, TL.1, TL.3, TL.2, ES supports a diverse range of invertebrates, amphibians, reptiles, birds and bats at a local scale.
Ecological context	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**4**	
Size, shape and buffering	1	1	2	1	1	1	1	4	TL.1, TL.2 and PL.1 represent <5% of original habitat type value score 1. WF7 very high representation original habitat type (>20%)
Ecological networks (linkages, pathways, migration)	--	2	2	-	2	2	2	3	All habitats (excluding BF) are locally an important breeding and feeding link in terms of connectivity for the survival of species (e.g. native birds). Planted shrubs and aged woody structure (PL.1 and TL.1 TL.3 TL.2) increase stepping stone value (connecting other areas of ecological value) for long-tailed bats, lizards and TAR bird species such as Kaka
Combined value	**N**	**L**	**M**	**L**	**M**	**M**	**M**	**H**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 2: Great South Road Uprgade (Drury section)

Assessment of ecological value for Terrestrial ecology features for NoR 2

Attributes to be considered	EG	ES	PL.1	PL.3	TL.3	Justification
Representativeness	**1**	**2**	**3**	**2**	**2**	
Typical structure and composition	1	2	3	2	2	BF, EG, ES, PL.3, TL.3: Habitats have been significantly modified by human activities. It's grouped as Urban.
Indigenous representation	1	2	3	2	2	EG: <10% of the species are indigenous. ES, PL.3, TL.3: 10-50% of the species are indigenous. PL.1>50% of the species are indigenous.
Rarity/distinctiveness	**0**	**0**	**3**	**2**	**2**	
Species (habitat) of conservation significance	-	-	3	2	2	PL.1, TL.2 and TL.1 contain totara, matipo, kanuka, cabbage tree
Diversity and pattern	**1**	**2**	**2**	**2**	**2**	
Habitat diversity	1	1	2	2	1	PL.1 and TL.1 value score 2 Mixed native/exotic plantings value score 1
Patterns in habitat use	1	2	2	2	2	PL.3, PL.1, TL.3, ES supports a diverse range of invertebrates, amphibians, reptiles, birds and bats.
Ecological context	**1**	**2**	**3**	**2**	**3**	
Size, shape and buffering	1	1	2	2	1	PL.1 represent <10% of original habitat type value score 2
Ecological networks (linkages, pathways, migration)	-	2	3	2	3	All habitats (excluding BF) are locally an important breeding and feeding link in terms of connectivity for the survival of species (e.g. native birds). Planted shrubs and aged woody structure (PL.3 , PL.1 , TL.3) increase stepping stone value (connecting other areas of ecological value) for

Attributes to be considered	EG	ES	PL.1	PL.3	TL.3	Justification
						long-tailed bats and TAR bird species such as Dabchick, little black shag.
Combined value	**N**	**L**	**M**	**L**	**M**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 3: Takaanini FTN - Weymouth Road, Alfriston Road and Great South Road Upgrades

Assessment of ecological value for Terrestrial ecology features for NoR 3

Attributes to be considered	EG	ES	PL.1	PL.3	TL.1	TL.2	TL.3	WF7	Justification
Representativeness	**1**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	
Typical structure and composition	1	1	2	1	2	2	2	3	EG, ES, PL.3, TL.3: Habitats have been significantly modified by human activities.
Indigenous representation	1	2	3	2	3	2	2	3	EG: <10% of the species are indigenous. ES, PL.3, TL.3: 10-50% of the species are indigenous. PL.1, PL.2, TL.2, TL.1, WF7 >50% of the species are indigenous.
Rarity/distinctiveness	**1**	**2**	**3**	**1**	**3**	**3**	**3**	**3**	
Species of conservation significance	-	-	-	-	-	-	-	3	Kaka and long-tailed cuckoo to be foraged and present
Species (habitat) of conservation significance	1	2	3	1	3	3	3	3	PL.1, TL.2 and TL.1, WF7 contain totara, matipo, kanuka, cabbage tree
Diversity and pattern	**1**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	
Habitat diversity	1	1	2	1	2	1	1	3	PL.1 and TL.1 value score 2 Mixed native/exotic plantings value score 1
Species diversity	-	-	-	-	-	-	-	3	Provide high value habitat for native species
Patterns in habitat use	1	2	2	2	3	3	2	2	PL.3, PL.1, TL.3, ES supports a diverse range of invertebrates, amphibians, reptiles, birds and bats.
Ecological context	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	

Attributes to be considered	EG	ES	PL.1	PL.3	TL.1	TL.2	TL.3	WF7	Justification
Size, shape and buffering	1	1	2	1	1	1	1	3	WF7 represent >10% of original habitat type value scoring 3 PL.1 represent <10% of original habitat type value score 2
Ecological networks (linkages, pathways, migration)	1	2	2	2	2	2	2	3	All habitats (excluding BF) are locally an important breeding and feeding link in terms of connectivity for the survival of species (e.g. native birds). Planted shrubs and aged woody structure (PL.3, PL.1 , TL.1, TL.2, TL.3, WF7) increase stepping stone value (connecting other areas of ecological value) for native bird species such as kereru, tui, kingfisher, silvereye, fantail and TAR species Kaka
Combined value	**N**	**L**	**M**	**L**	**M**	**M**	**M**	**H**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 4: Takaanini FTN – Porchester Road and Popes Road Upgrades

Assessment of ecological value for Terrestrial ecology features for NoR 4

Attributes to be considered	EG	ES	PL.2	PL.3	TL.1	TL.3	Justification
Representativeness	**1**	**2**	**3**	**2**	**3**	**3**	
Typical structure and composition	1	1	2	1	2	2	BF, EG, ES, PL.3, TL.3: Habitats have been significantly modified by human activities. It's grouped as Rural.
Indigenous representation	1	2	3	1	3	2	ES: <10% of the species are indigenous. PL.3, TL.3: 10-50% of the species are indigenous. PL.2, TL.1 >50% of the species are indigenous.
Rarity/distinctiveness	**1**	**2**	**2**	**2**	**2**	**2**	
Species (habitat) of conservation significance	1	1	2	1	2	1	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using suitable habitat (TL.3, TL.1) Kākā (At Risk – Recovering, value 3) and long-tailed cuckoo (Threatened – Nationally Vulnerable, value score of 4) may use established forests (PL.2, TL.3, TL.2) Herpetofauna (At Risk - Declining, value score of 3) likely to utilise all forest types that have appropriate understorey.
Diversity and pattern	**1**	**1**	**2**	**2**	**2**	**2**	
Habitat diversity	1	1	2	1	2	1	PL.1 and TL.1 value score 2 Mixed native/exotic plantings value score 1
Patterns in habitat use	1	1	2	1	2	2	TL.3, TL.1 rated high due to potential seasonal utilisation by long-tailed bat, North Island kākā, and long-tailed cuckoo. All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale.
Ecological context	**1**	**2**	**3**	**1**	**3**	**3**	

Attributes to be considered	EG	ES	PL.2	PL.3	TL.1	TL.3	Justification
Size, shape and buffering	1	1	2	1	2	1	TL.1 and PL.2 represent <10% of original habitat type value score 2
Ecological networks (linkages, pathways, migration)	1	2	2	1	3	3	All habitats (excluding BF) are locally an important breeding and feeding link in terms of connectivity for the survival of species (e.g. native birds). TL.1 and TL.3 increase stepping stone value (connecting other areas of ecological value) for long-tailed bats and TAR bird species such as Kaka
Combined value	**N**	**L**	**M**	**L**	**M**	**M**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

8 Appendix 8 – Aquatic Value Assessment

NoR 1: Great South Road FTN Upgrade

Assessment of ecological value for aquatic ecology features for NoR 1

Attributes to be considered	FTN1_S1	FTN1_S2	Justification
Representativeness	**2**	**2**	**(Including SEV, RHA and ecological integrity)**
Instream habitat modification	2	3	Instream habitat features have been altered by human activities.
Riparian habitat modification	2	2	Riparian features have been significantly altered by human activities
RHA scores relative to potential score	2	2	Instream RHA scores: FTN1_S1: 59 FTN1_S2: 52
Rarity/distinctiveness	**2**	**2**	
Species of conservation significance	4	4	Torrenfish (At Risk - Declining) and longfin eel (At Risk – Endangered) has been recorded in the wider catchment. There is a high likelihood that these species utilise permanent streams.
Diversity and pattern	**2**	**2**	
Level of natural diversity	2	2	Instream habitat diversity proxy FTN1_S2: SS, S, LO, LG, Permanent FTN1_S3: SS, S, LO, LG, Permanent
Ecological context	4	4	
Stream order	4	4	FTN1_S2 stream order = 4 FTN1_S3 stream order = 4

Attributes to be considered	FTN1_S1	FTN1_S2	Justification
Hydroperiod	4	4	Both streams are permanent
Connectivity and migration	2	2	Connectivity and migration scores based on stream order (proxy).
Combined value	**H**	**H**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 2 : Great South Road Upgrade (Drury section)

Assessment of ecological value for aquatic ecology features for NoR 2

Attributes to be considered	FTN2_S1	FTN2_S2	Justification
Representativeness	**2**	**2**	**(Including SEV, RHA and ecological integrity)**
Instream habitat modification	2	2	Instream habitat features have been significantly altered by human activities.
Riparian habitat modification	2	2	Riparian features have been significantly altered by human activities
RHA scores relative to potential score	2	2	Instream RHA scores: FTN2_S1: 48 FTN2_S2: 44
Rarity/distinctiveness	**2**	**2**	
Species of conservation significance	4	2	Torrenshish (At Risk - Declining) and longfin eel (Threatened) have been recorded in the wider catchment associated with NoR2 (Hingaia Stream). There is a high likelihood that these species utilise permanent streams.
Diversity and pattern	**2**	**2**	
Level of natural diversity	2	2	Instream habitat diversity proxy FTN2_S1 & 2: SS, S, LO, LG, Permanent
Species diversity	3	2	Stream S1 Rated on a Regional scale, S2 at a local scale
Ecological context	4	4	
Stream order	4	3	FTN2_S1 stream order = 4 FTN2_S2 Stream order = 2
Hydroperiod	4	4	Both streams are permanent

Attributes to be considered	FTN2_S1	FTN2_S2	Justification
Connectivity and migration	2	2	Connectivity and migration scores based on stream order (proxy).
Protected status	1	-	FTN2_S1 Floodplains protected within local reserves.
Combined value	**H**	**M**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 3: Takaanini FTN – Weymouth Road, Alfriston Road, and Great South Road Upgrades

Assessment of ecological value for aquatic ecology features for NoR 3 (FTN3_S1 has been evaluated though desktop assessment due to access restriction)

Attributes to be considered	FTN3_S1	FTN3_S2	FTN3_S3	FTN3_S4	Justification
Representativeness	**2**	**2**	**2**	**2**	**(Including SEV, RHA and ecological integrity)**
Instream habitat modification	2	2	2	2	Instream habitat features have been significantly altered by human activities.
Riparian habitat modification	-	2	2	2	Riparian features have been significantly altered by human activities
RHA scores relative to potential score	-	2	2	2	Instream RHA scores: FTN3_S1: Not assessed. FTN3_S2: 50 FTN3_S3: 49 FTN3_S4: 62
Rarity/distinctiveness	**1**	**1**	**1**	**1**	
Species of conservation significance	1	1	1	1	these streams flow through highly urbanised landscapes and connected to mainstream by pipes and covered by culverts. The fish passage assessment tool shows no fish passage within NoR 3.
Diversity and pattern		**2**	**2**	**2**	
Level of natural diversity	-	2	2	2	Instream habitat diversity proxy FTN3_S1 & FTN3_S2: SS, S, LO, LG, Permanent FTN3_S1 $ FTN3_S4: SS, S, LO, LG, intermittent
Ecological context	**3**	**4**	**3**	**3**	
Stream order	2	-	-	2	Stream order: FTN3_S1: 1 FTN3_S2: 2 FTN3_S3: 1

Attributes to be considered	FTN3_S1	FTN3_S2	FTN3_S3	FTN3_S4	Justification
					FTN3_S4: 2
Hydroperiod	3	4	3	3	FTN3_S1: Intermittent FTN3_S2: Permanent FTN3_S3: Intermittent FTN3_S4: Intermittent
Connectivity and migration	2	2	2	2	local scale ecological connectivity in the wider landscape
Combined value	**L**	**M**	**L**	**L**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 4: Takaanini FTN - Porchester Road and Popes Road Upgrades

Assessment of ecological value for aquatic ecology features for NoR 4

Attributes to be considered	FTN4_S1	FTN4_S2	Justification
Representativeness	**2**	**3**	**(Including SEV, RHA and ecological integrity)**
Instream habitat modification	1	3	Instream habitat features have been significantly altered by human activities.
Riparian habitat modification	2	2	Riparian features have been significantly altered by human activities
RHA scores relative to potential score	1	2	Instream RHA scores: FTN4_S1: 20 FTN4_S2: 67
Rarity/distinctiveness	**1**	**3**	
Species of conservation significance	1	4	longfin eel (At Risk – Declining) has been recorded in the wider catchment. There is a high likelihood that these species utilise permanent streams.
Diversity and pattern	**2**	**2**	
Level of natural diversity	2	2	Instream habitat diversity proxy FTN4_S1: SS, S, LO, LG, Permanent FTN4_S2: SS, S, LO, LG, intermittent
Species diversity	2	3	S1 at a local scale, S2 Rated on a Regional scale
Ecological context	**2**	**3**	
Stream order	2	4	Stream order: FTN4_S1: 1 FTN4_S2: 4

Attributes to be considered	FTN4_S1	FTN4_S2	Justification
Hydroperiod	2	4	FTN4_S1: Intermittent FTN4_S2: Permanent
Connectivity and migration	2	4	Connectivity and migration scores based on stream order
Combined value	**L**	**H**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

9 Appendix 9 – Wetland Value Assessment

NoR 1: Great South Road FTN Upgrade

Assessment of ecological value for wetland (open water) ecology features for NoR 1

Attributes to be considered	FTN1_W1	Justification
Representativeness	**3**	**(Wetland condition assessment)**
Hydrological modification	3	Largely intact wetland, with mostly indigenous vegetation (some areas of planted native vegetation). Score provided for representativeness in general. Transformed catchments - largely rural.
Rarity/distinctiveness	**4**	
Species of conservation significance	4	Potential inanga spawn habitat
Wetland type (rare or distinctive)	3	Rushland/reedland wetland score value 3
Diversity and pattern	**3**	
Diversity of habitat types	2	Moderate diversity of vegetation and geomorphological structure and Moderate patchiness/interspersion
Species diversity	3	Rated on a Regional scale
Ecological context	**4**	**(Ecosystem services, importance and sensitivity)**
Sensitivity to change in floods	3	Perennial, and tidally influenced.
Streamflow augmentation	2	Aquatic habitat of a particular size (often "larger") and with habitat types supported by large infrequent floods (< annual) less easily affected by anthropogenic changes.

Attributes to be considered	FTN1_W1	Justification
Connectivity and migration	4	
Combined value	**H**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 3: Weymouth Road, Alfriston Road and Great South Road Upgrades

Assessment of ecological value for wetland (open water) ecology features for NoR 3

Attributes to be considered	FTN1_W1	FTN1_W2	Justification
Representativeness	**2**	**2**	**(Wetland condition assessment)**
Hydrological modification	2	2	Significantly modified. Score provided for representativeness in general. Transformed catchments - largely urban development.
Rarity/distinctiveness	**1**	**1**	
Species of conservation significance	1	1	Nationally and locally common indigenous species
Wetland type	1	1	Wetland type common at any scale
Diversity and pattern	**1**	**2**	
Diversity of habitat types	1	2	Moderate diversity of vegetation and geomorphological structure and Moderate patchiness/interspersion
Species diversity	1	1	Not significant at any scale
Ecological context	**3**	**3**	**(Ecosystem services, importance and sensitivity)**
Sensitivity to change in floods	3	3	Intermittent (>6 months Moderate)
Connectivity and migration	1	2	Habitat is locally an important breeding and feeding link in terms of connectivity for the survival of species
Combined value	**L**	**L**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

NoR 4: Porchester Road and Popes Road Upgrades

Assessment of ecological value for wetland (open water) ecology features for NoR 4

Attributes to be considered	FTN4_W1	FTN4_W2	Justification
Representativeness	**1**		**(Wetland condition assessment)**
Hydrological modification	1		Wetland significantly modified. Score provided for representativeness in general. Transformed catchments - largely agricultural and rural developments. Wetland physically modified through dredging, drainage and stormwater.
Rarity/distinctiveness	**3**		
Species of conservation significance	1		Nationally and locally common indigenous species
Wetland type (rare and distinctive)	3		Oxbow lake formation. Within the district (wetlands type is rare distinctive within the Region)
Diversity and pattern	**1**		
Diversity of habitat types	1		Moderate diversity of vegetation and geomorphological structure and Moderate patchiness/interspersion
Species diversity	1		Not significant at any scale
Ecological context	**1**		**(Ecosystem services, importance and sensitivity)**
Sensitivity to change in floods			Aquatic habitat of a particular size (often "larger") and with habitat types supported by large infrequent floods (< annual) less easily affected by anthropogenic changes. Only pollution tolerant taxa present
Connectivity and migration	1		Habitat is locally an important breeding and feeding link in terms of connectivity for the survival of species
Combined value	**L**		

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

10 Appendix 10 – Rapid Habitat Assessment

The result of RHA for all streams related to the Project Area

Stream ID	Deposited Sediment	Invertebrate habitat diversity	Invertebrate habitat abundance	Fish cover diversity	Fish cover abundance	Hydraulic heterogeneity	Bank erosion	Bank vegetation	Riparian width	Riparian shade	RHA Habitat Quality Score	Corresponding Habitat Value*
FTN1_S1	2	10	6	10	7	9	7	6	6	2	59	M
FTN1_S2	2	9	5	8	3	9	4	4	5	3	52	M
FTN2_S1	2	9	1	7	7	6	3	4	8	4	48	M
FTN2_S2	3	8	1	5	4	6	2	4	9	4	44	M
FTN3_S1*												
FTN3_S2	2	9	5	8	3	9	4	4	5	3	50	M
FTN3_S3	6	9	1	7	9	1	7	5	2	9	49	M
FTN3_S4	7	10	3	6	10	6	7	7	3	10	62	G
FTN4_S1	2	4	1	2	1	1	4	2	2	5	20	P
FTN4_S2	5	8	7	10	8	10	9	7	7	5	65	G

Notes - Corresponding habitat values for each habitat quality score:

P = Poor (Score 10-40)

M = Moderate (Score 41-60)

G = Good (Score 61-80)

E = Excellent (Score 81+)

Light blue shading = Permanent stream; No shading = Intermittent stream

*Not assessed due to property access

11 Appendix 11 – Impact Assessment

See separate document attached