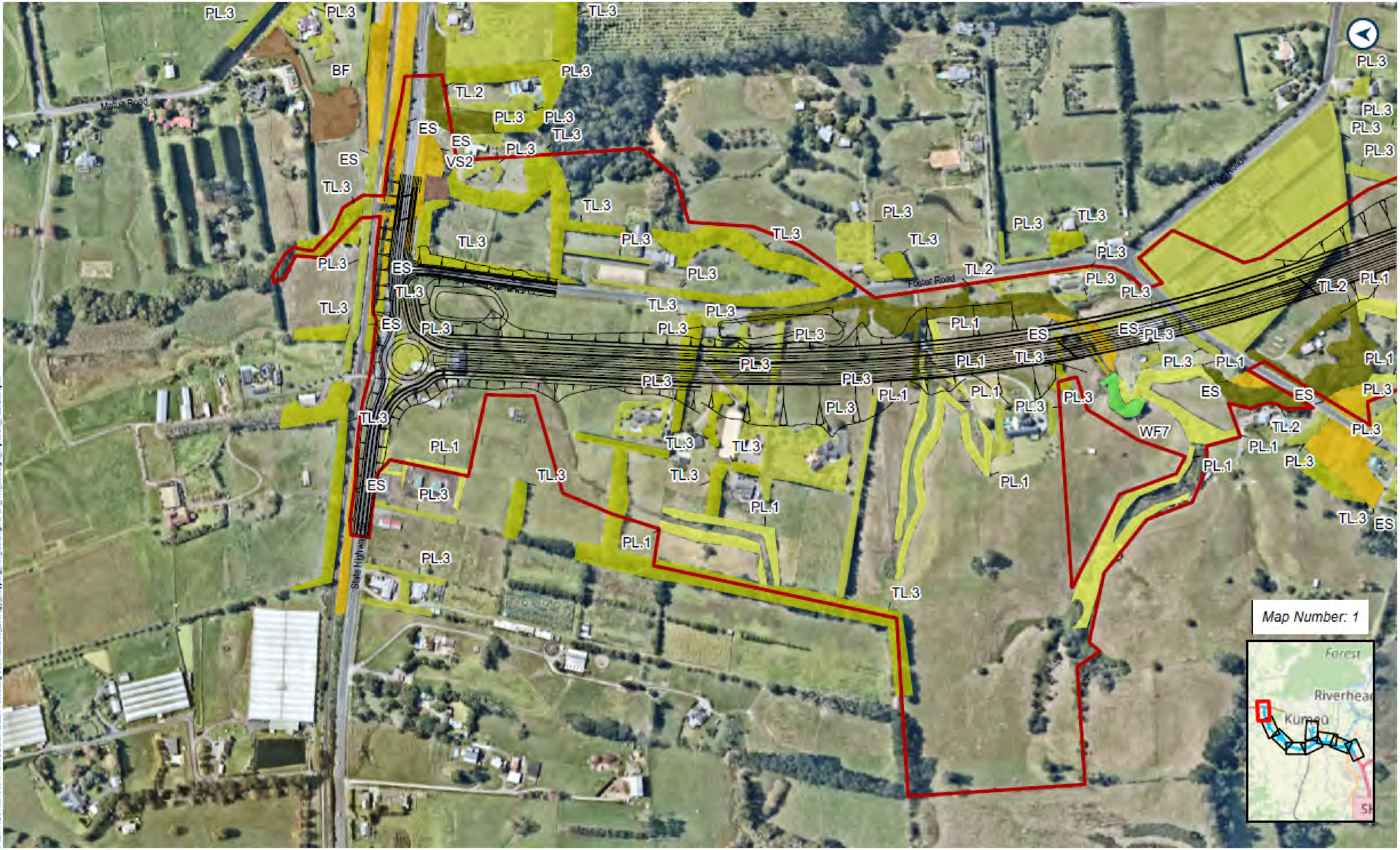
5 Appendix 5 - Strategic Ecological Habitat Maps

5.1 NoR S1: Alternative State Highway, Including Brigham Creek Interchange

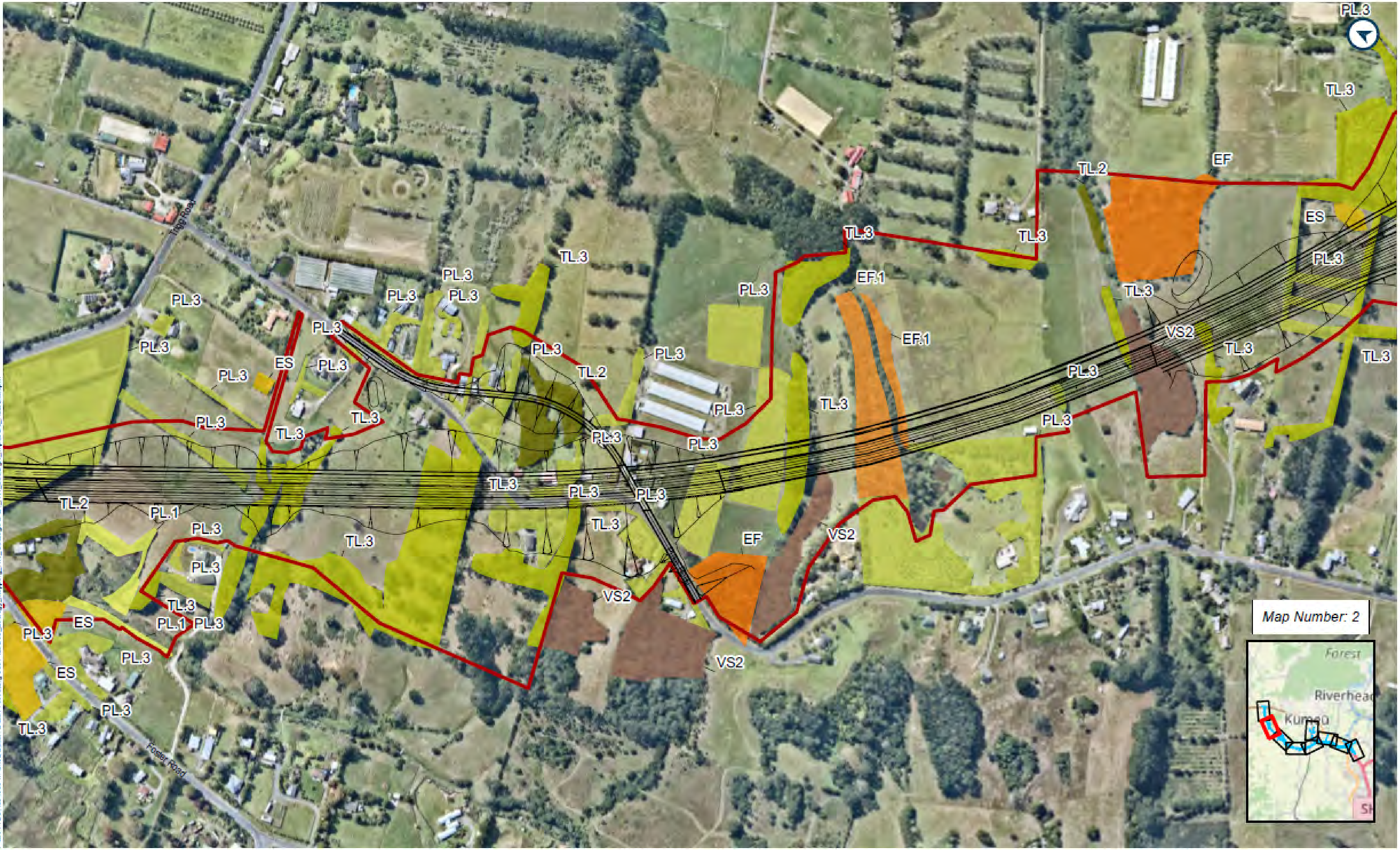
5.1.1 Terrestrial Vegetation



LEGEND

- Route Options
- Designation
- BF-Brownfield (Cropland)
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- VS2-Kanuka Scrub/Forest
- WF7-Puriri Forest

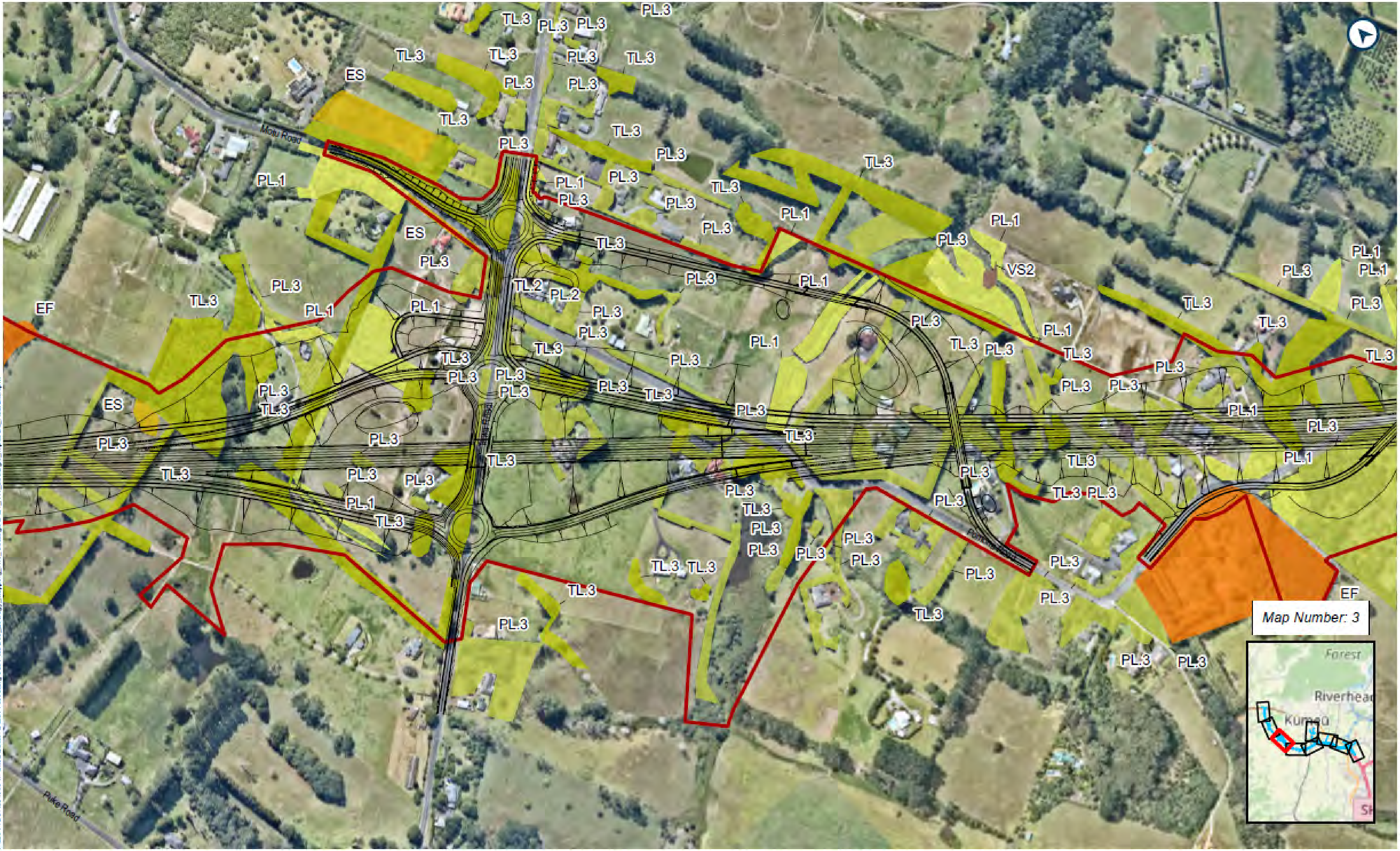
0 100 200
Metres



LEGEND

- Route Options
- Designation
- EF-Exotic Forest
- EF.1-Exotic forest (native understory)
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- VS2-Kanuka Scrub/Forest

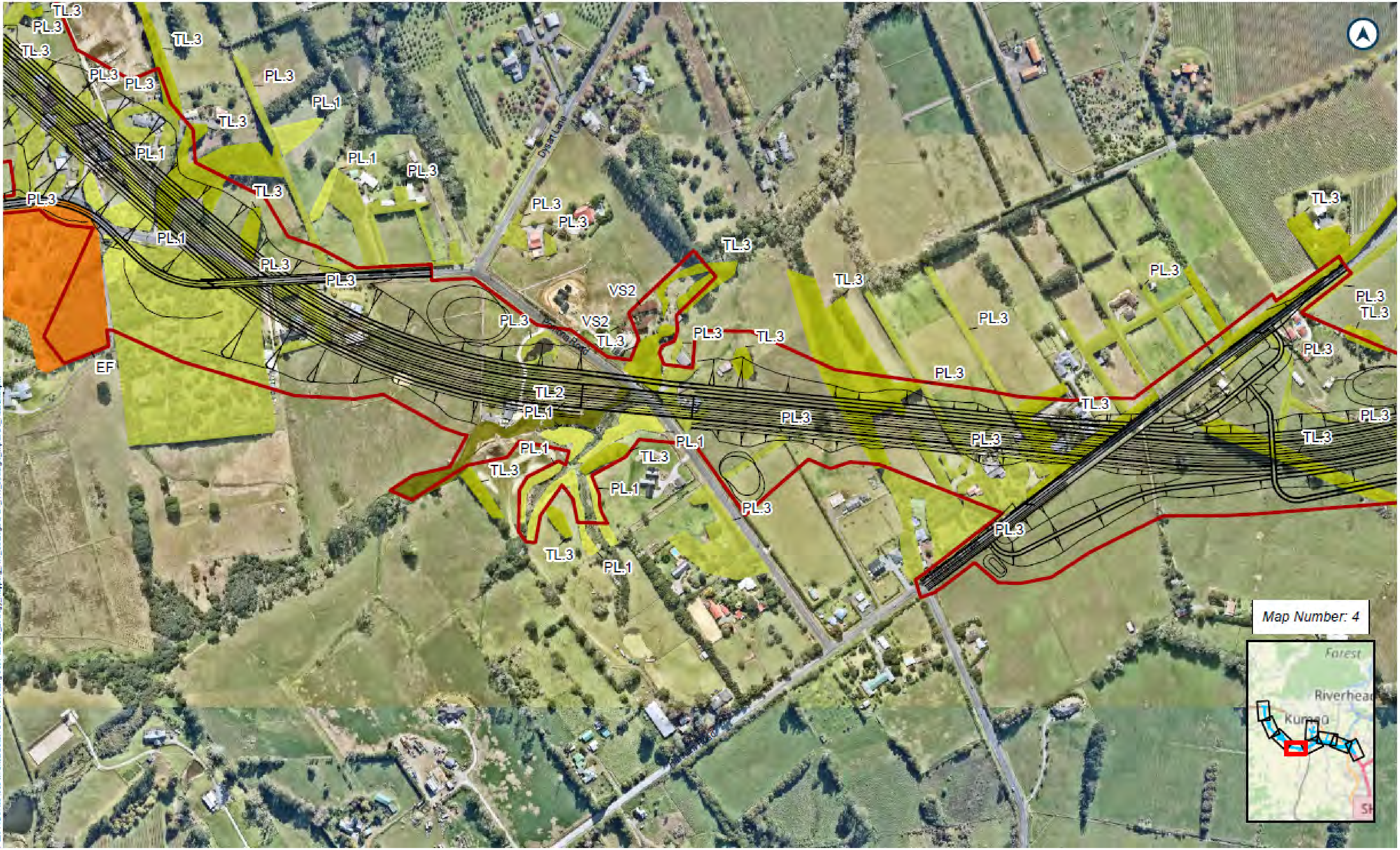
0 100 200
Metres



LEGEND

- Route Options
- Designation
- EF-Exotic Forest
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.2-Planted native (>20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- VS2-Kanuka Scrub/Forest

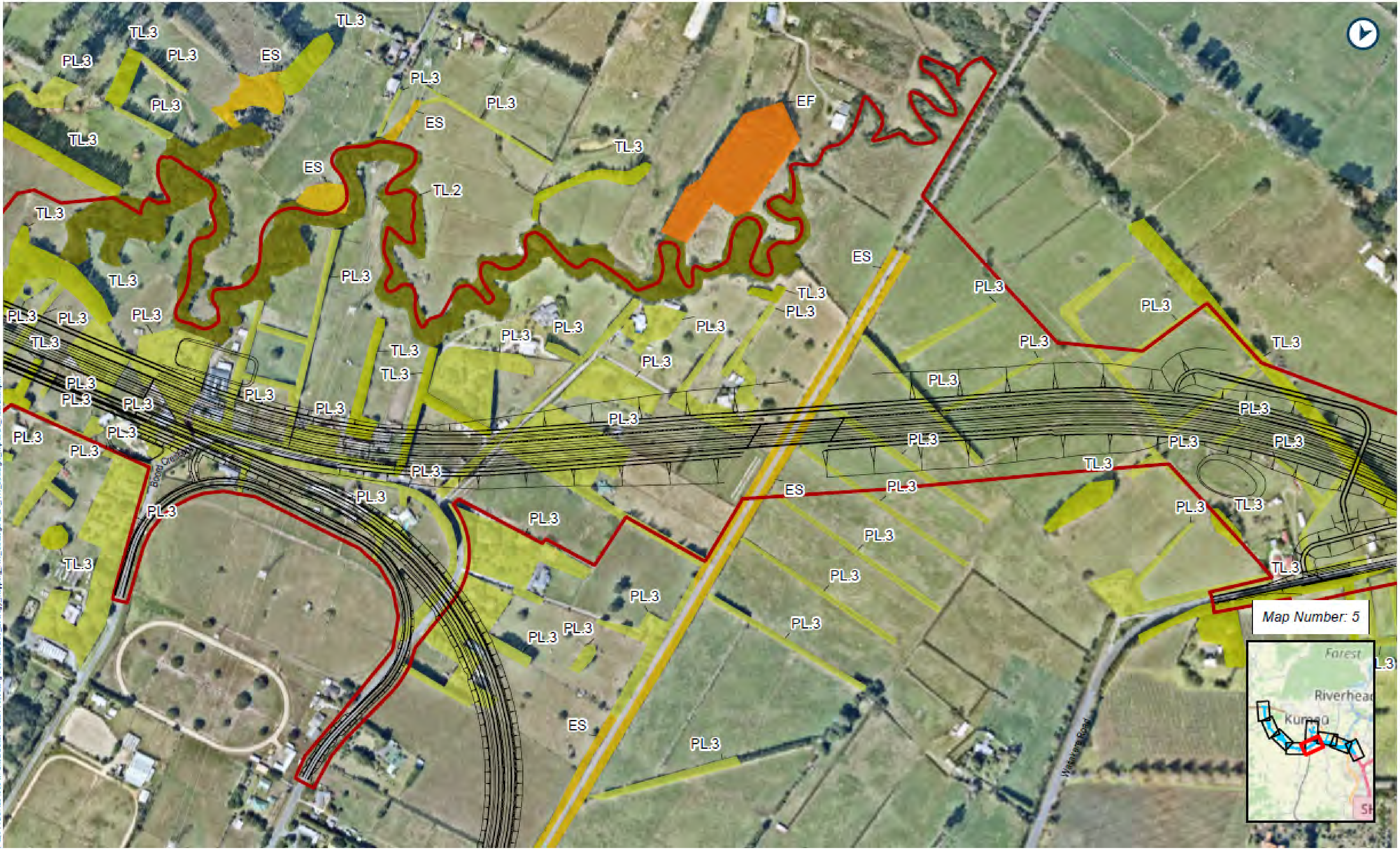
0 100 200
Metres



LEGEND

- Route Options
- Designation
- EF-Exotic Forest
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- VS2-Kanuka Scrub/Forest

0 100 200
Metres

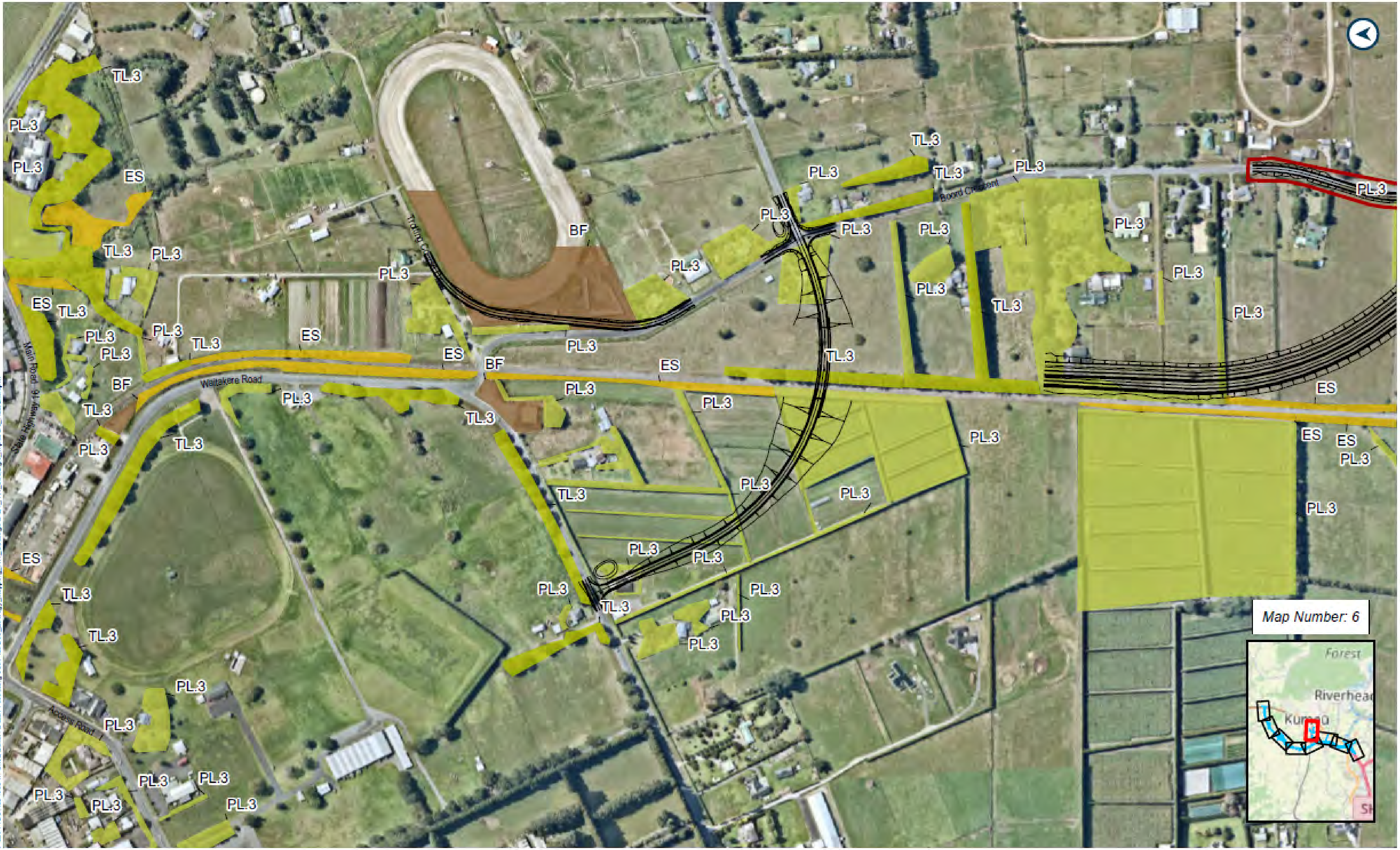


LEGEND

- Route Options
- Designation
- EF-Exotic Forest
- ES-Exotic Scrub
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic

0 100 200

Metres



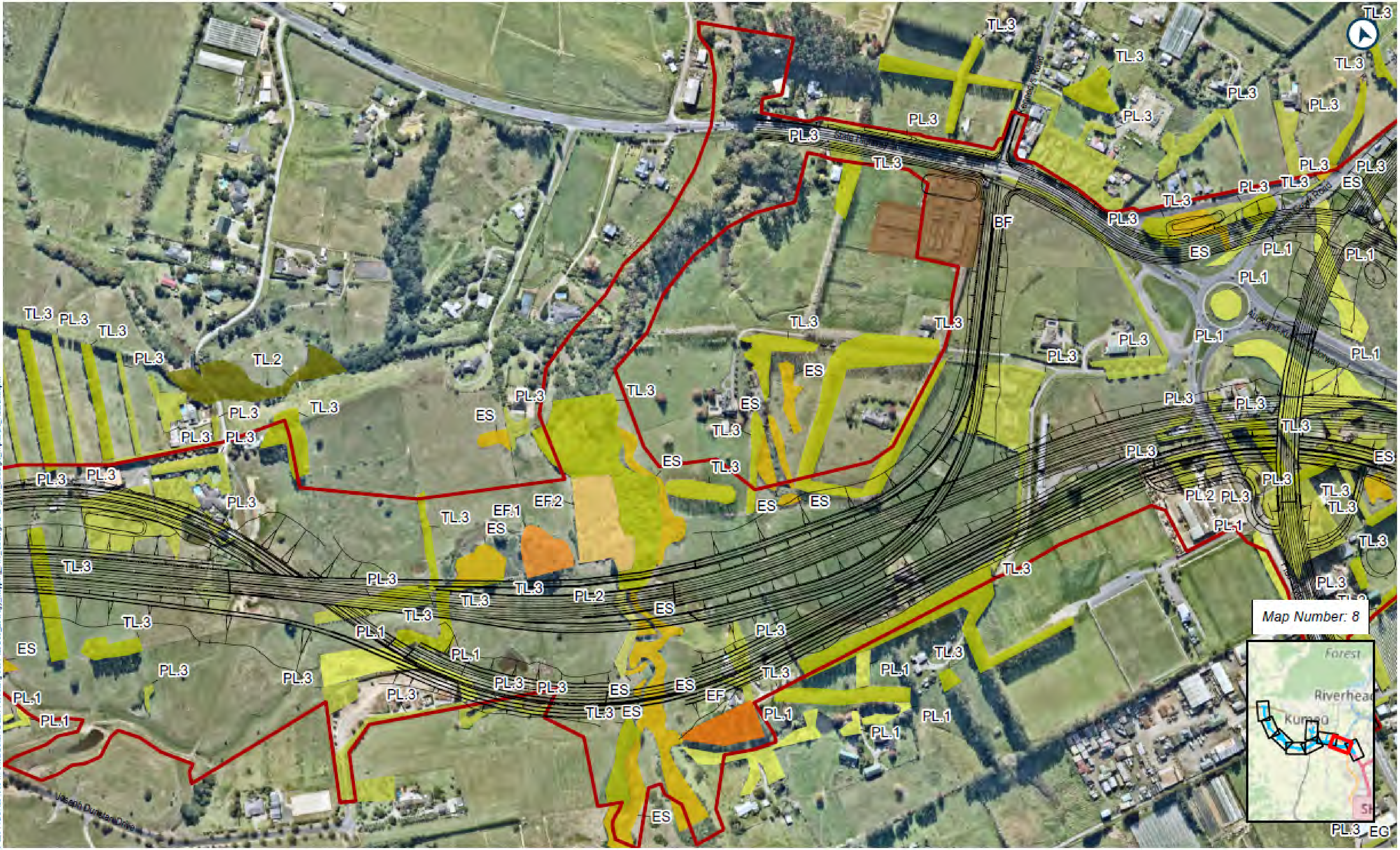
LEGEND

- Route Options
- Designation
- BF-Brownfield (Cropland)
- ES-Exotic Scrub
- PL.3-Amenity planting
- TL.3-Treeland Exotic

LEGEND

- Route Options
- Designation
- EF-Exotic Forest
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- VS2-Kanuka Scrub/Forest

0 100 200
Metres



LEGEND

Route Options	EF.1-Exotic forest (native understory)	PL.1-Planted native (<20 years old)	TL.3-Treeland Exotic
Designation	EF.2 -Exotic forest (exotic understory)	PL.2-Planted native (>20 years old)	
BF-Brownfield (Cropland)	EG-Exotic Grassland	PL.3-Amenity planting	
EF-Exotic Forest	ES-Exotic Scrub	TL.2-Mixed native / exotic treeland	

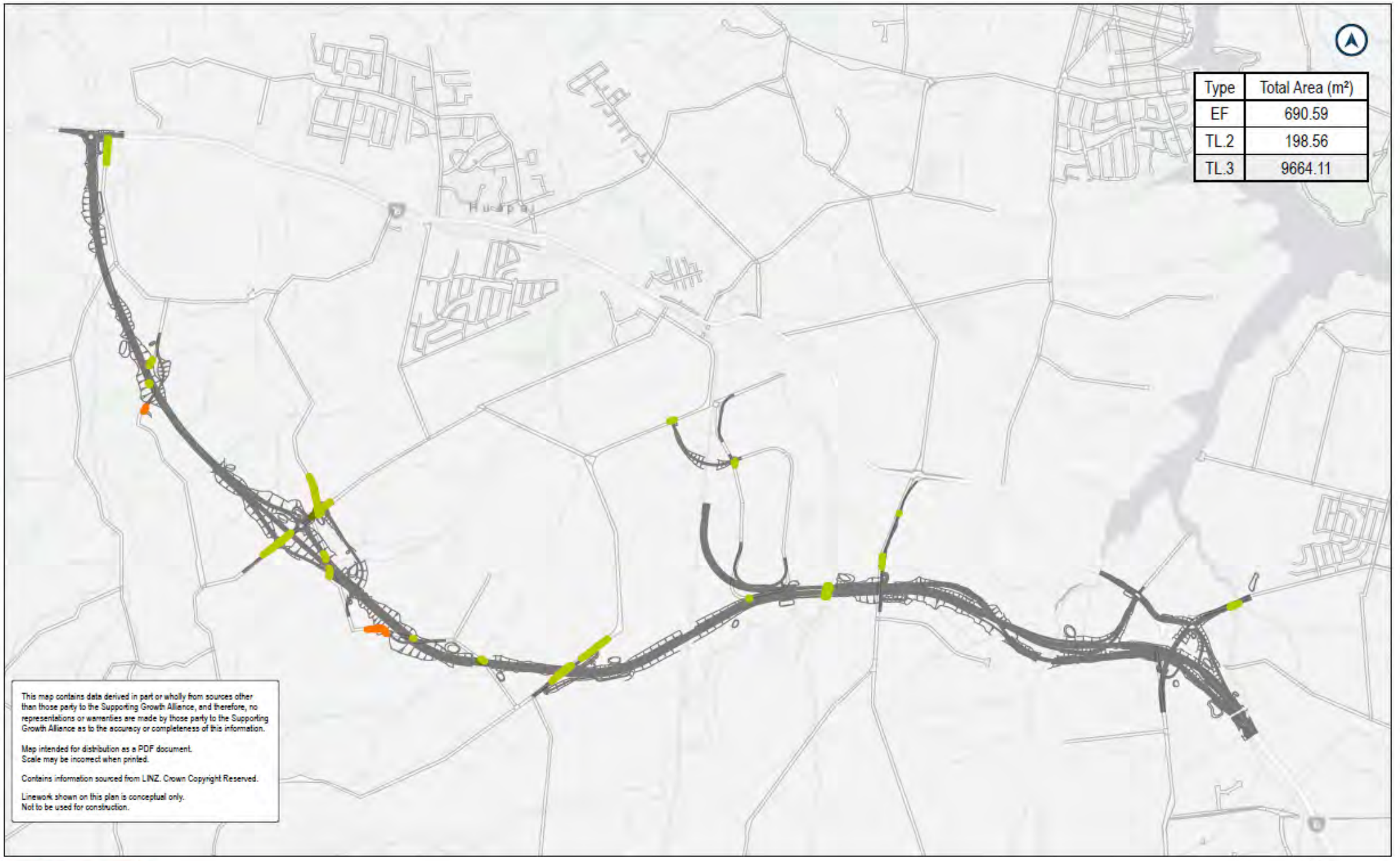
0 100 200
Metres

LEGEND

- Route Options
- Designation
- EG-Exotic Grassland
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.2-Planted native (>20 years old)
- PL.3-Amenity planting
- SA1.2-Mangrove forest and scrub
- TL.3-Treeland Exotic

0 100 200
Metres

5.1.2 District Plan Vegetation


Huapai
Type | Total Area (m²)
EF | 690.59
TL.2 | 198.56
TL.3 | 9664.11
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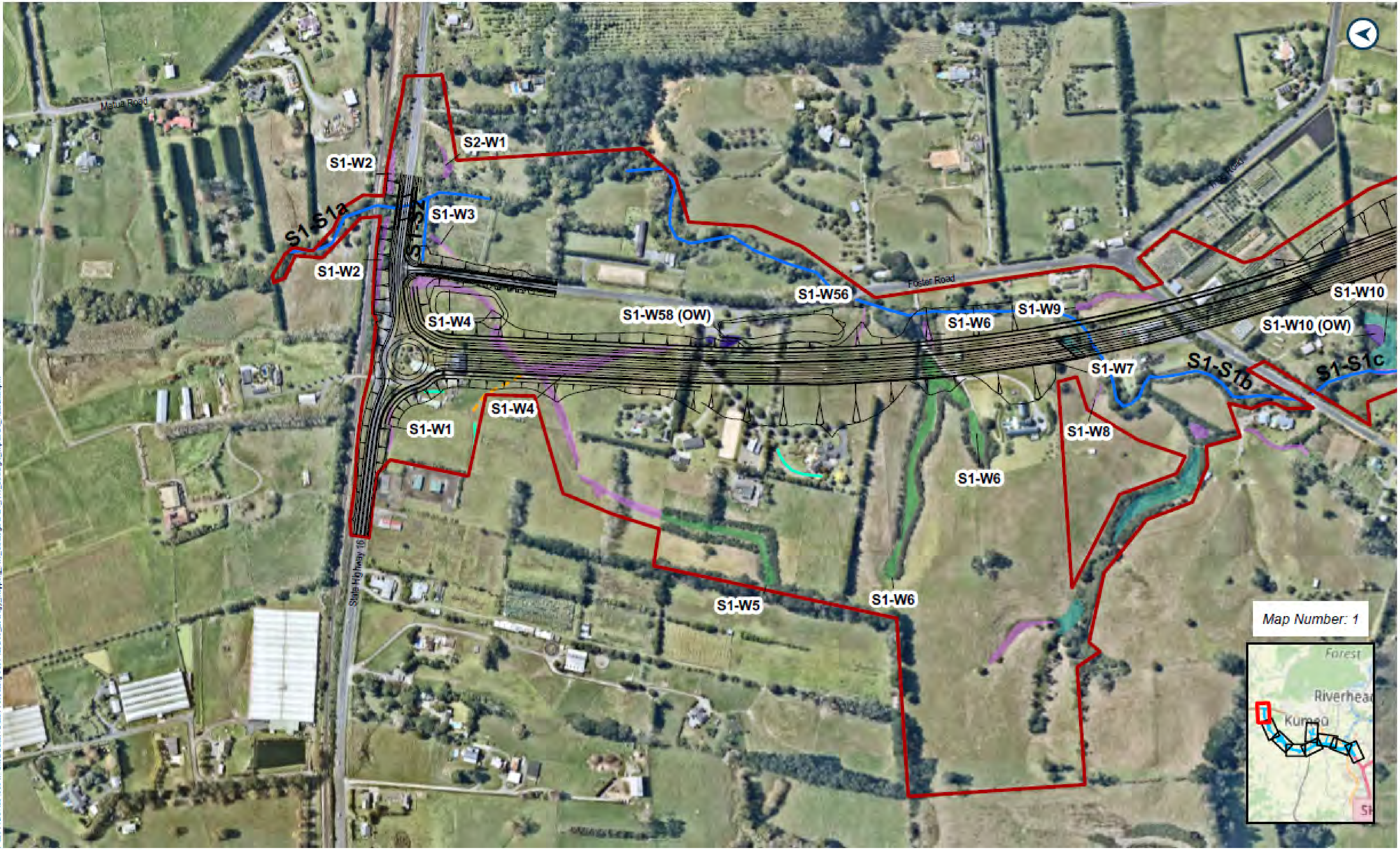
LEGEND
0
0.5
1
Kilometres
Route Option
EF_DPT
TL.2_DPT
TL.3_DPT
Road

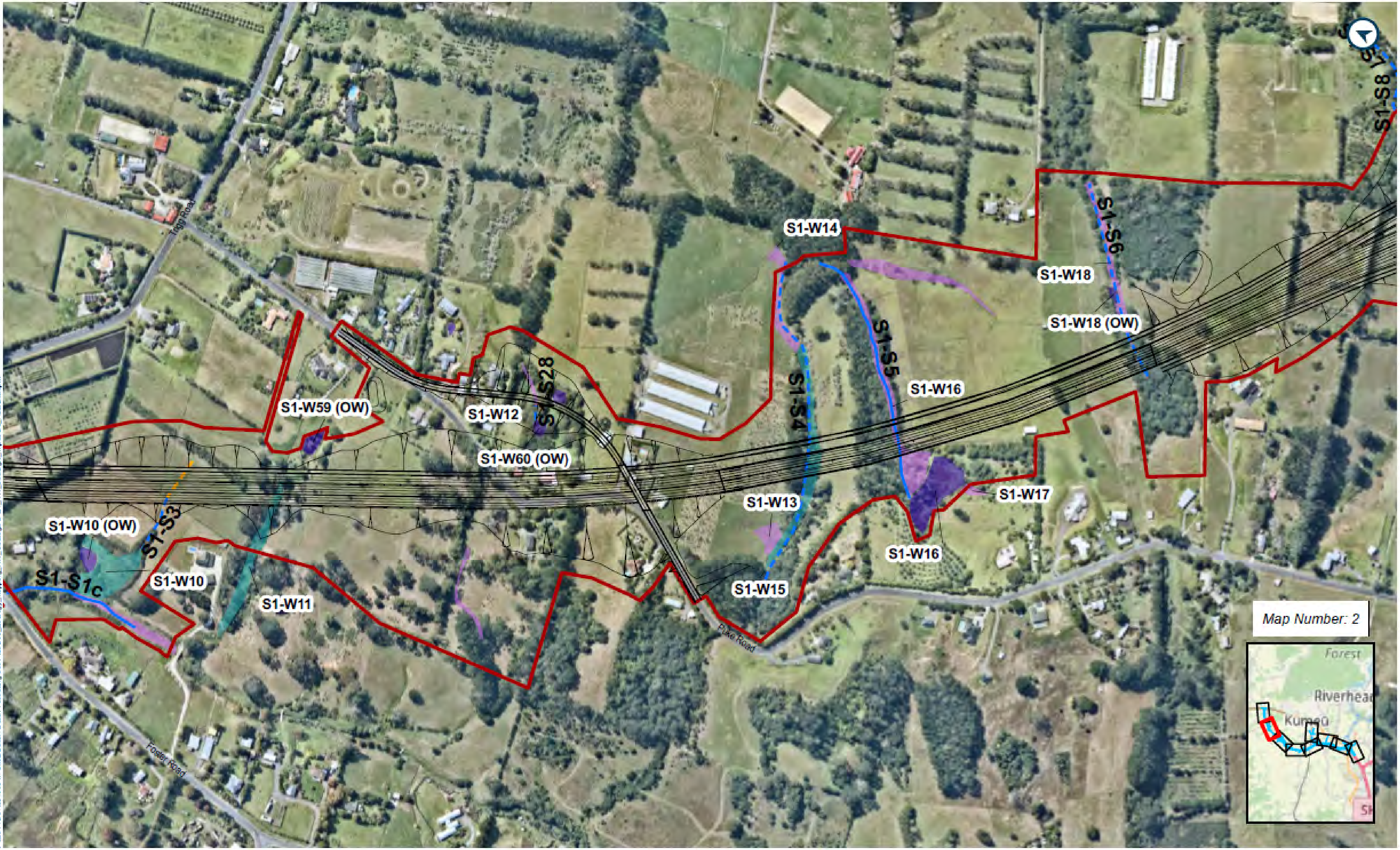
5.1.3 Freshwater Streams and Wetland Habitat



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Ephemeral
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- WL11
- WL19

0 100 200
Metres



LEGEND

Route Options
Designation
Ephemeral
Intermittent
Permanent
EW-Exotic Wetland
OW-Open Water
WL11

0 100 200
Metres

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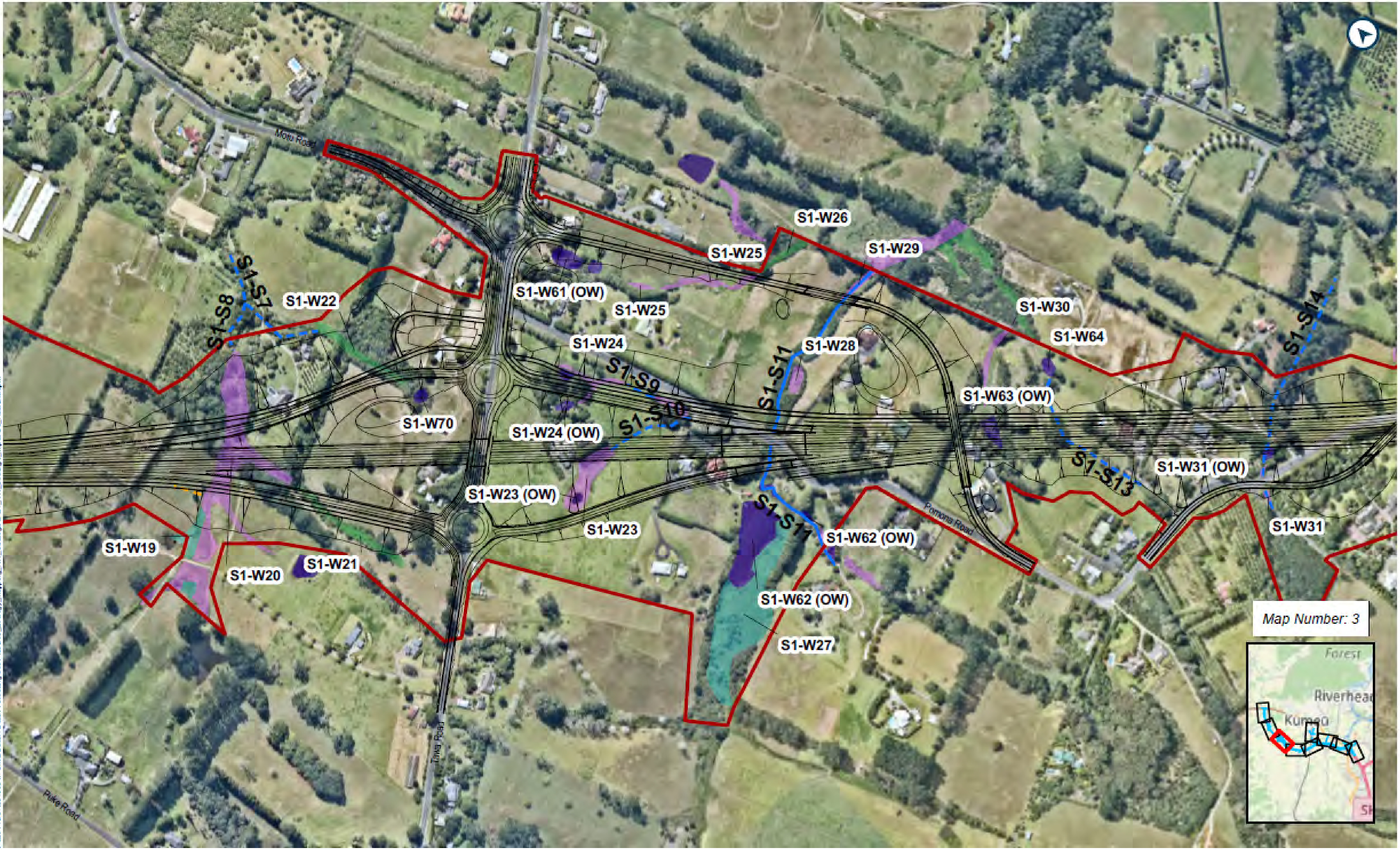

LEGEND

- Route Options
- Designation
- Ephemeral
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- WL11

0 100 200

Metres

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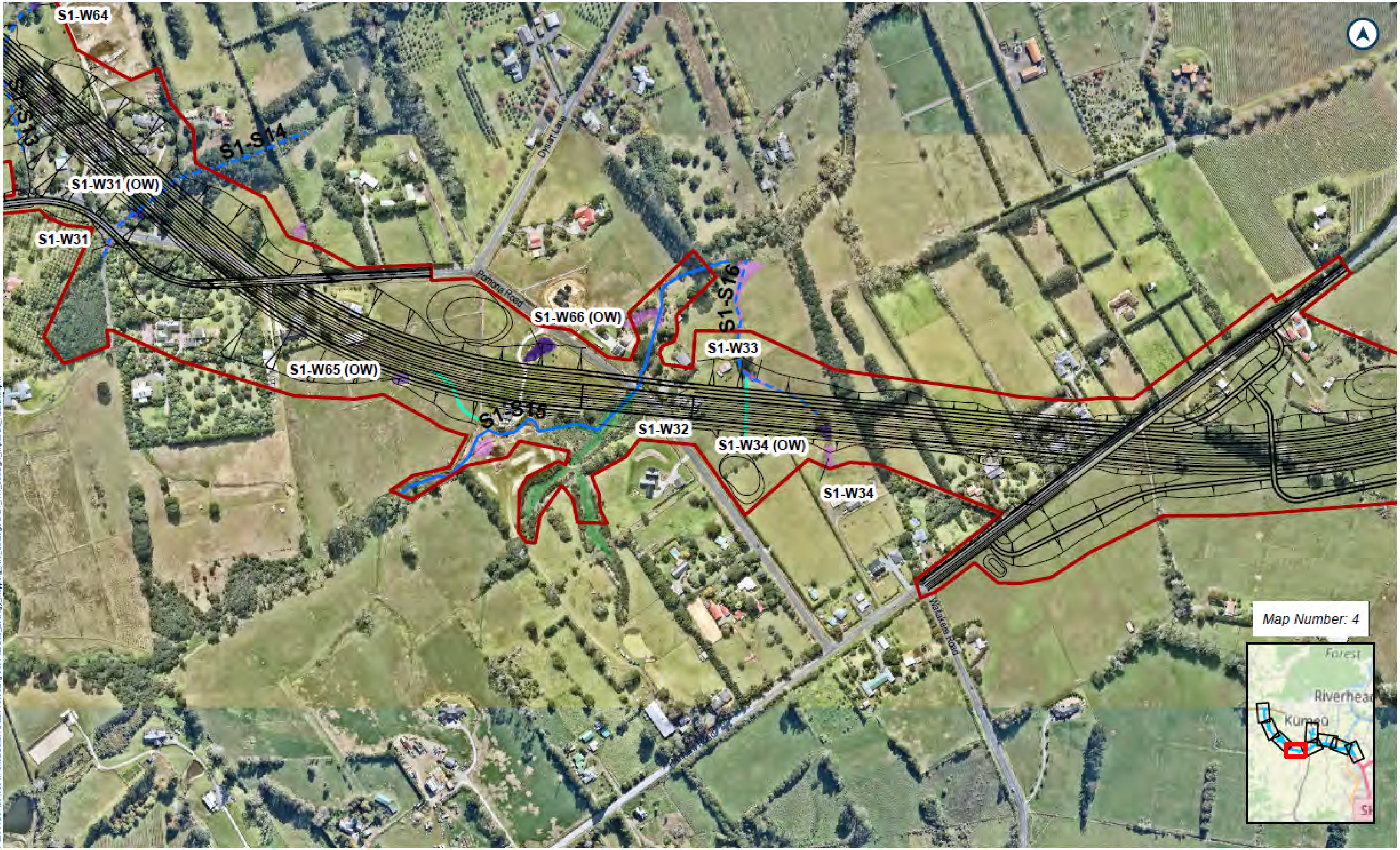
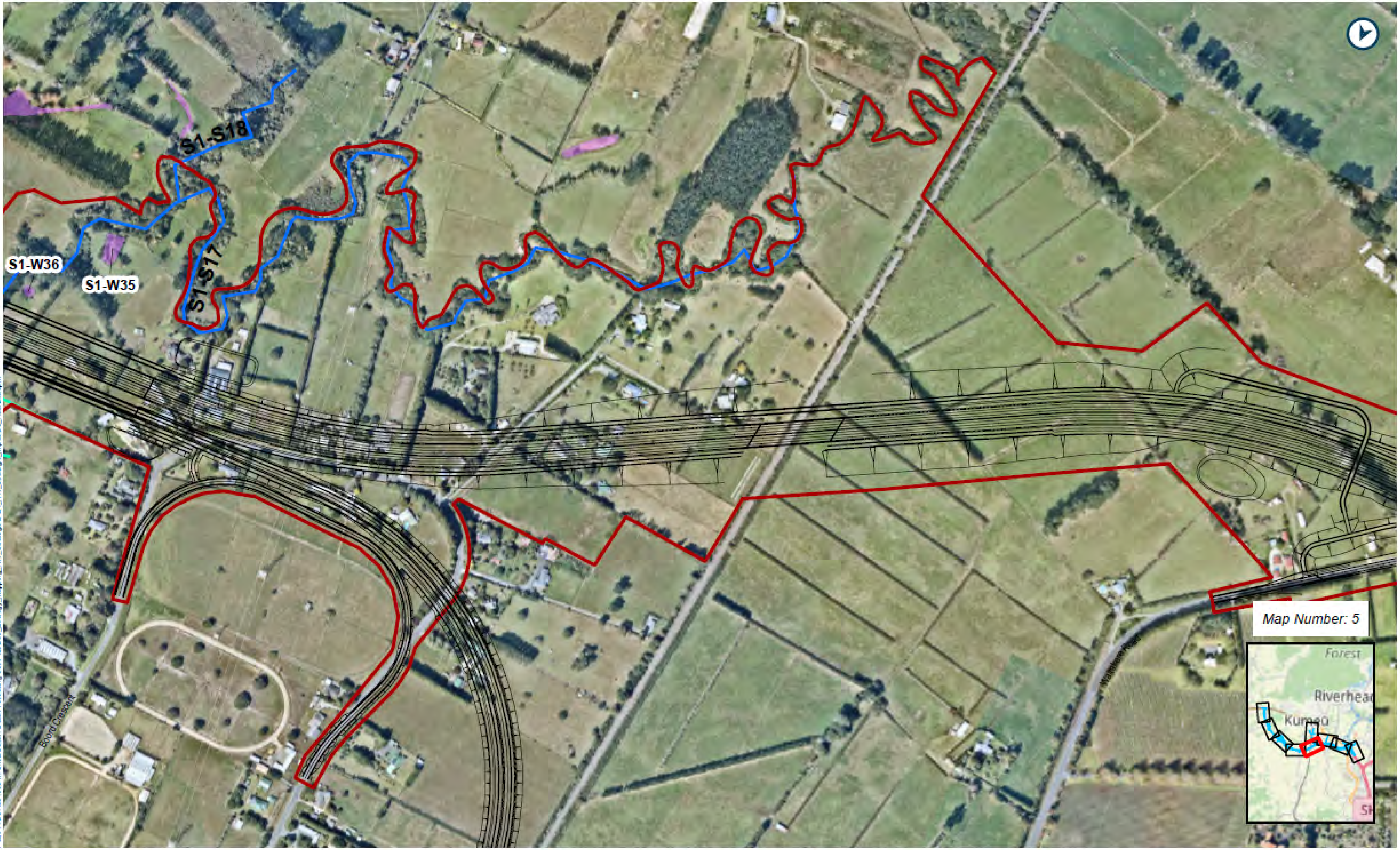


LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)

0 100 200

Metres



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Permanent
- EW-Exotic Wetland

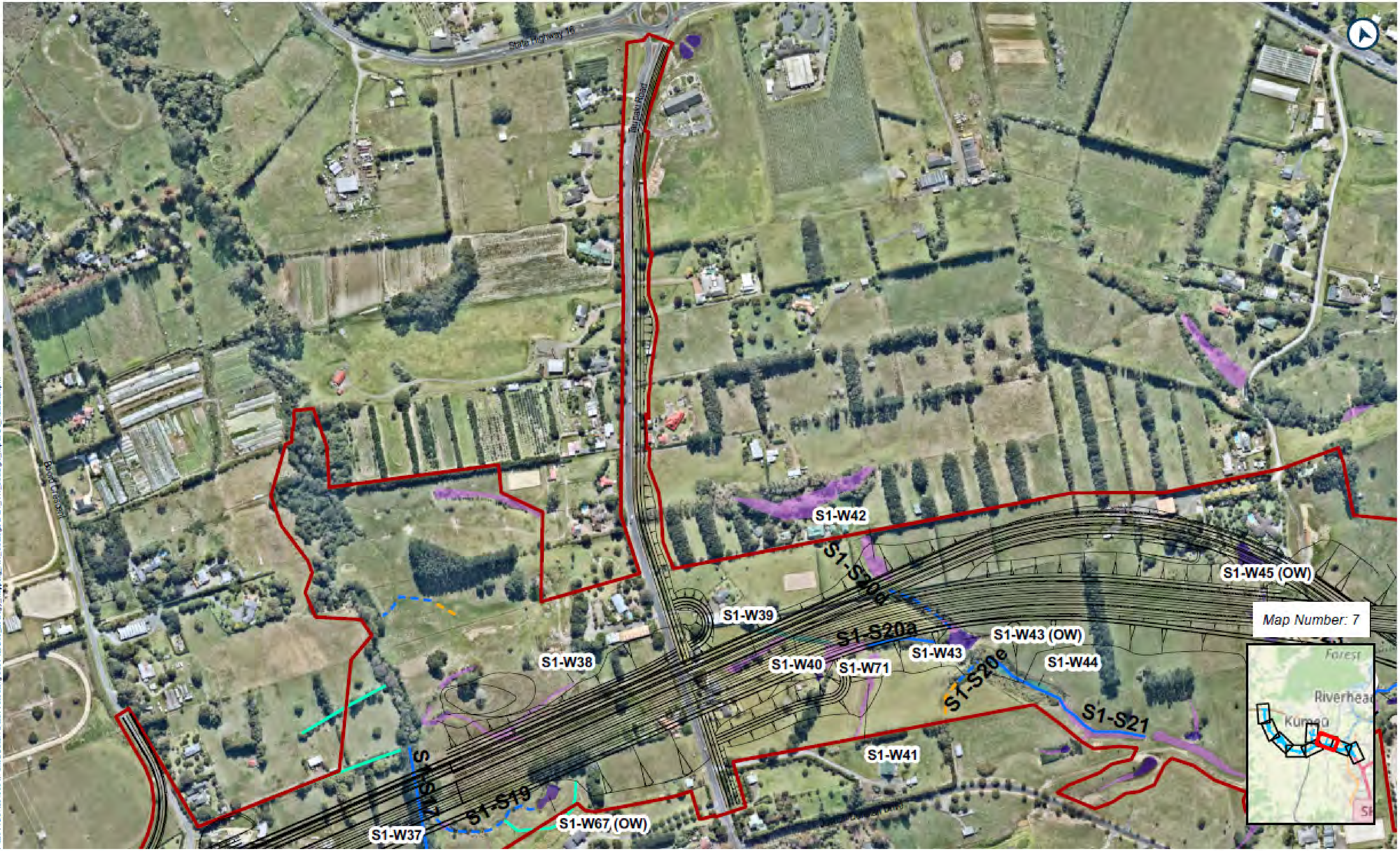
0 100 200
Metres

LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Permanent
- EW-Exotic Wetland
- WL19

0 100 200

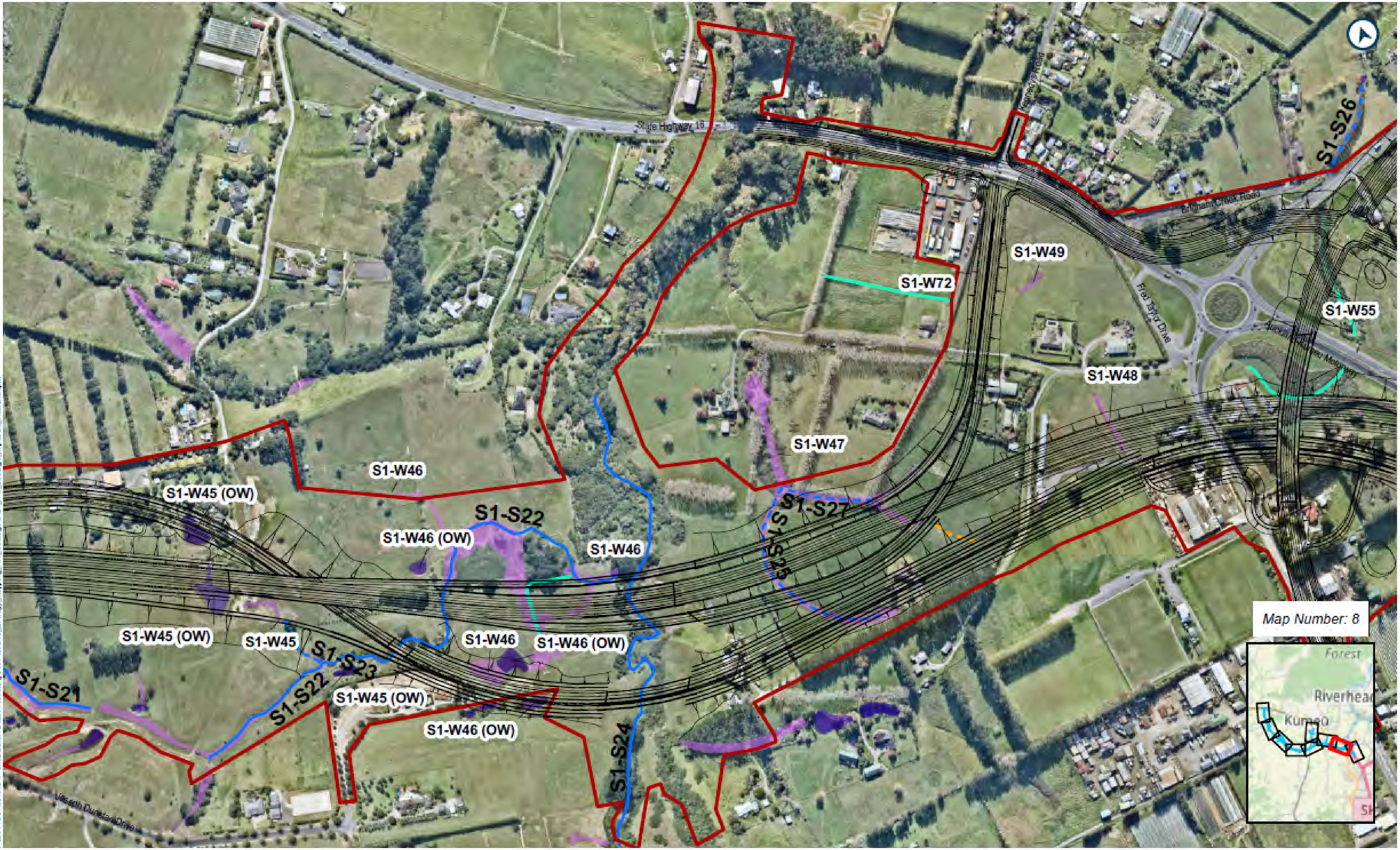
Metres



LEGEND

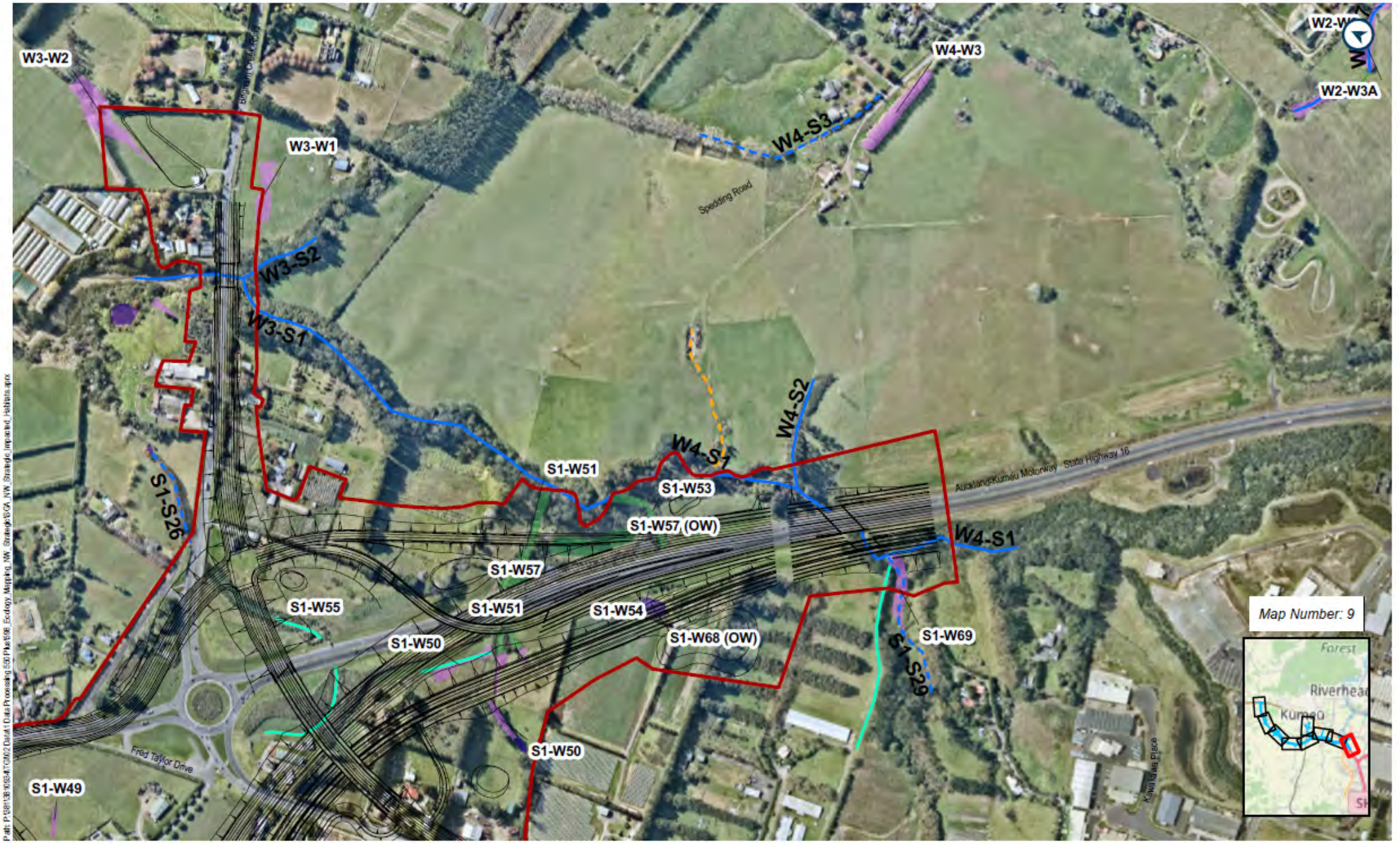
- Route Options
- Designation
- Artificial swale/drainage ditch
- Ephemeral
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- WL11

0 100 200
Metres



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Ephemeral
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW.1



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Artificial/Piped/Culvert
- Ephemeral
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- PLW.1

0 100 200
Metres

5.2 NoR S2: SH16 Main Road Upgrade

5.2.1 Terrestrial Vegetation

LEGEND

Route Options	PL.3-Amenity planting
Designation	TL.2-Mixed native / exotic treeland
BF-Brownfield (Cropland)	TL.3-Treeland Exotic
EF-Exotic Forest	
ES-Exotic Scrub	
PL.1-Planted native (<20 years old)	

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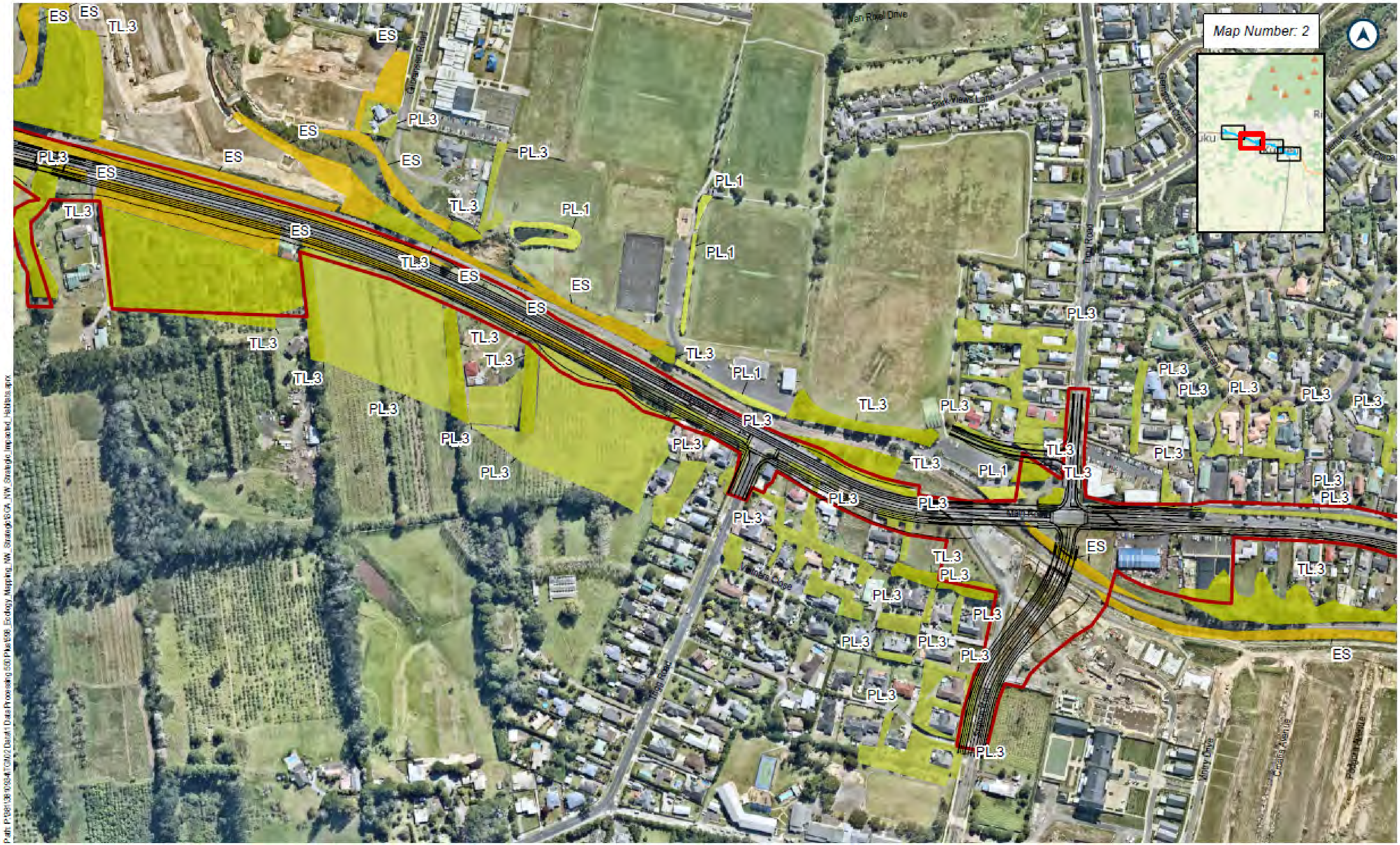
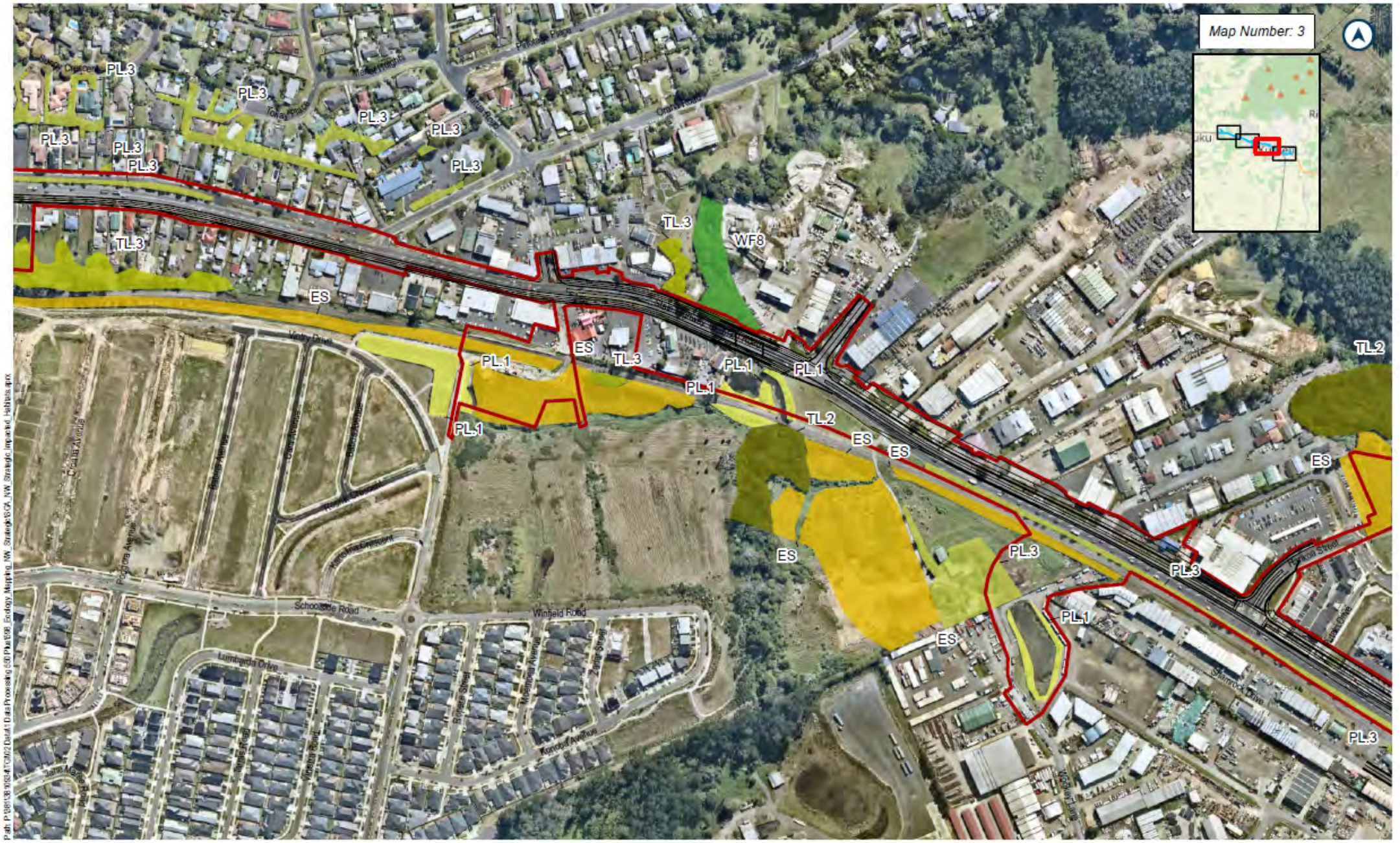


LEGEND

- Route Options
- Designation
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.3-Treeland Exotic

0 100 200
Metres

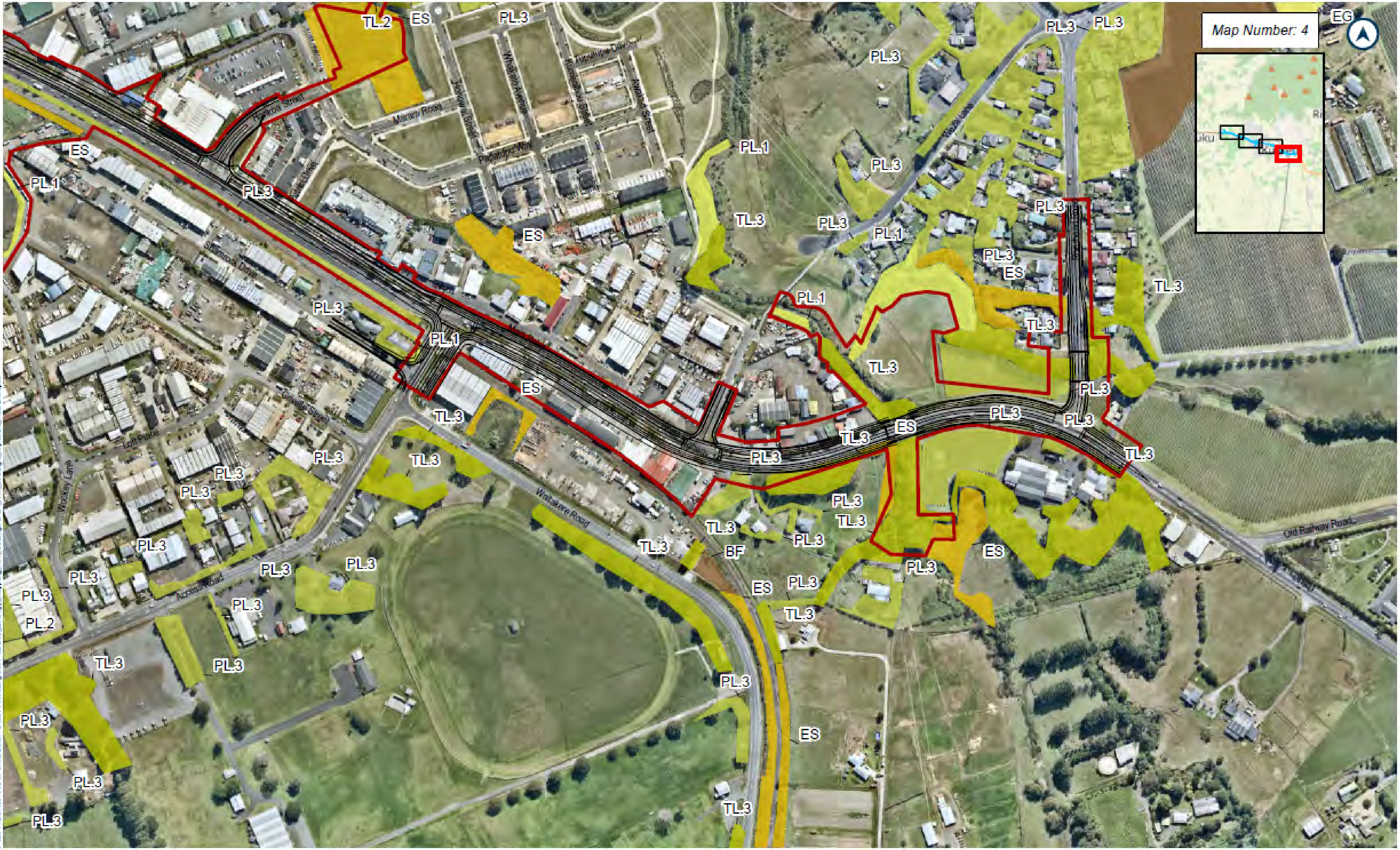


LEGEND

- Route Options
- Designation
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- WF8-Kahikatea, Pukatea Forest

0 100 200

Metres



LEGEND

- Route Options
- Designation
- BF-Brownfield (Cropland)
- EG-Exotic Grassland
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.2-Planted native (>20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic

0 100 200
Metres

5.2.2 District Plan Vegetation

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Type	Total Area (m²)
TL.3	214.24
WF8	99.48

LEGEND

Route Option

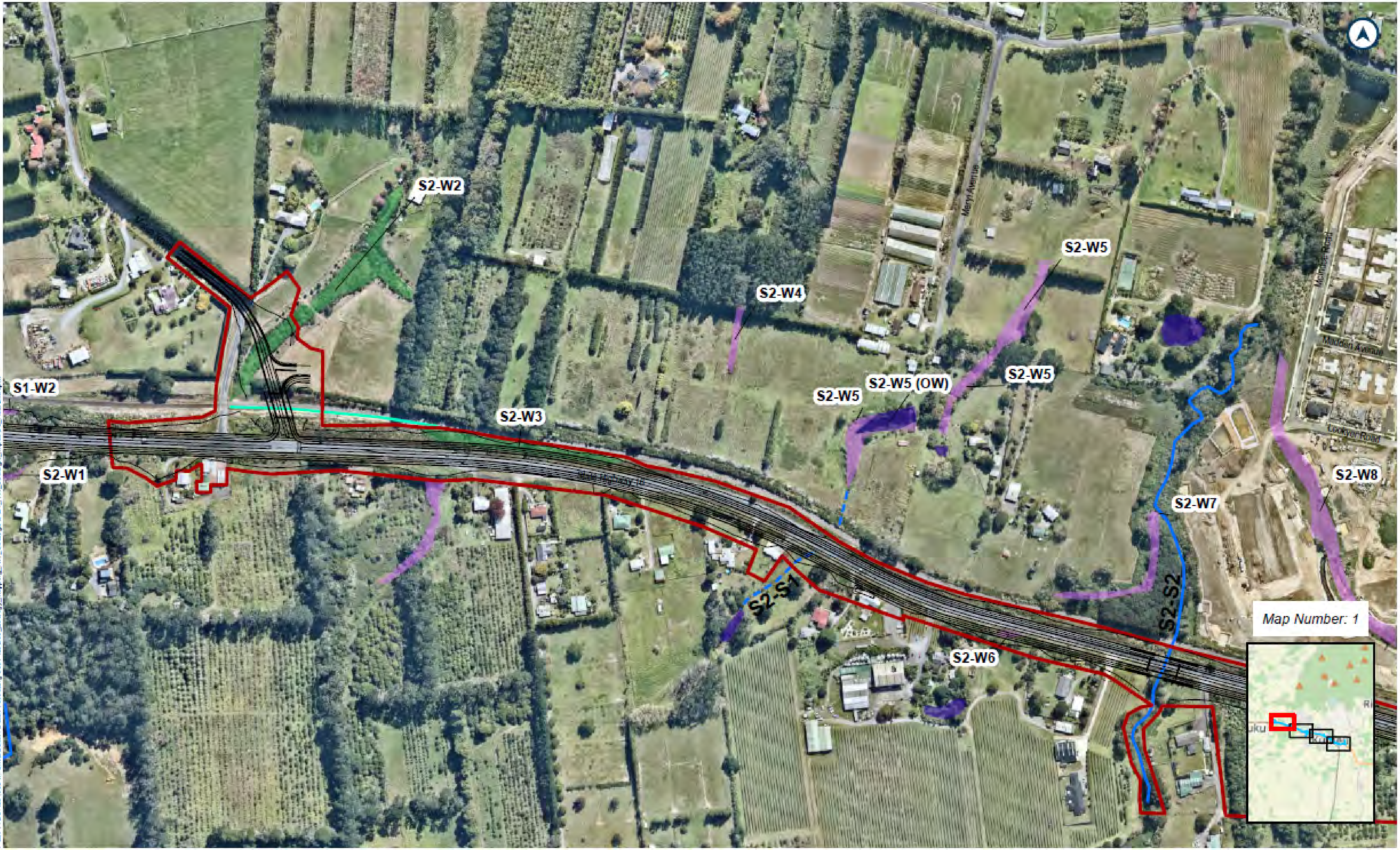
TL.3_DPT

WF8_DPT

Road

0 0.2 0.4
Kilometres

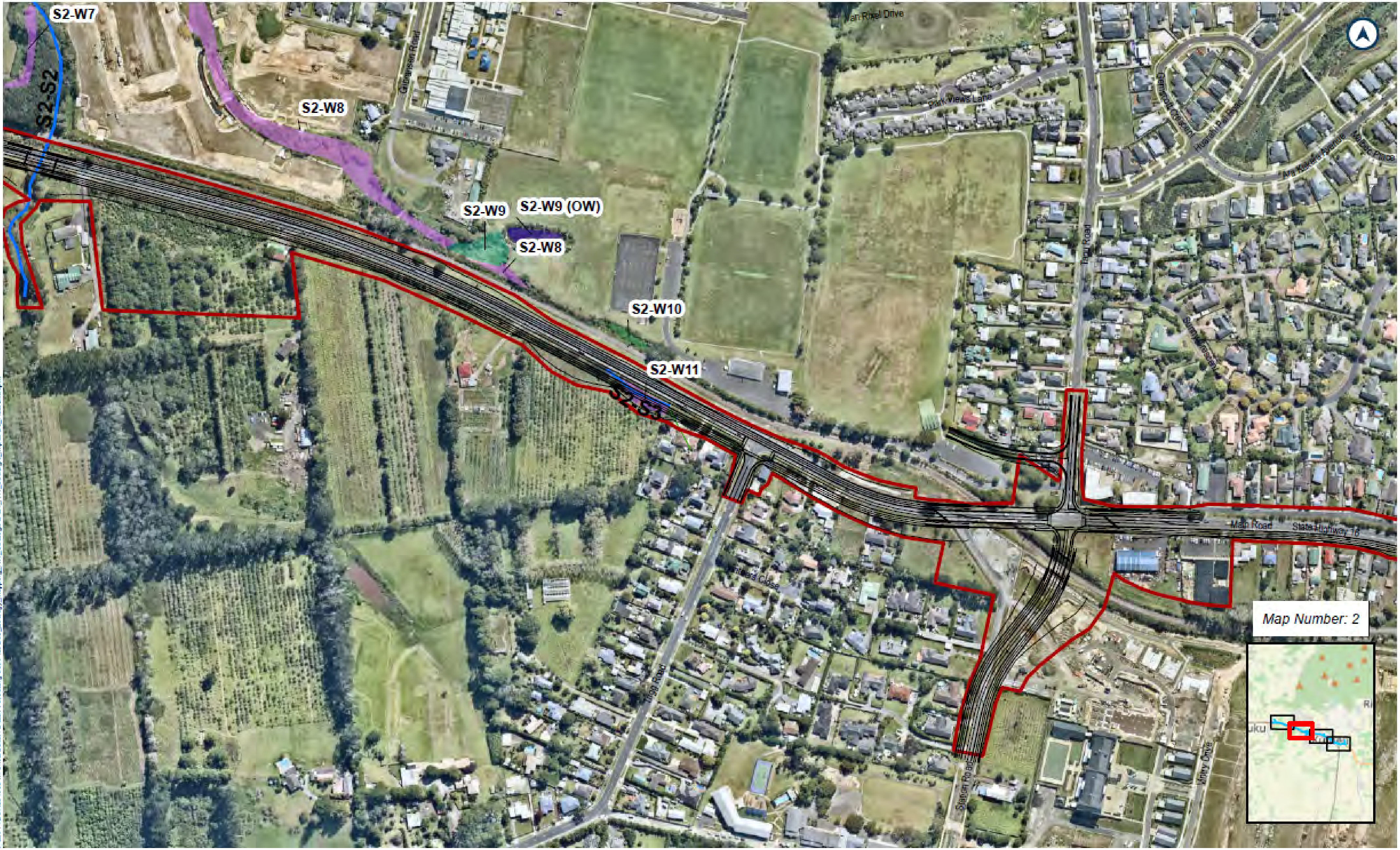
5.2.3 Freshwater Streams and Wetland Habitat



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)

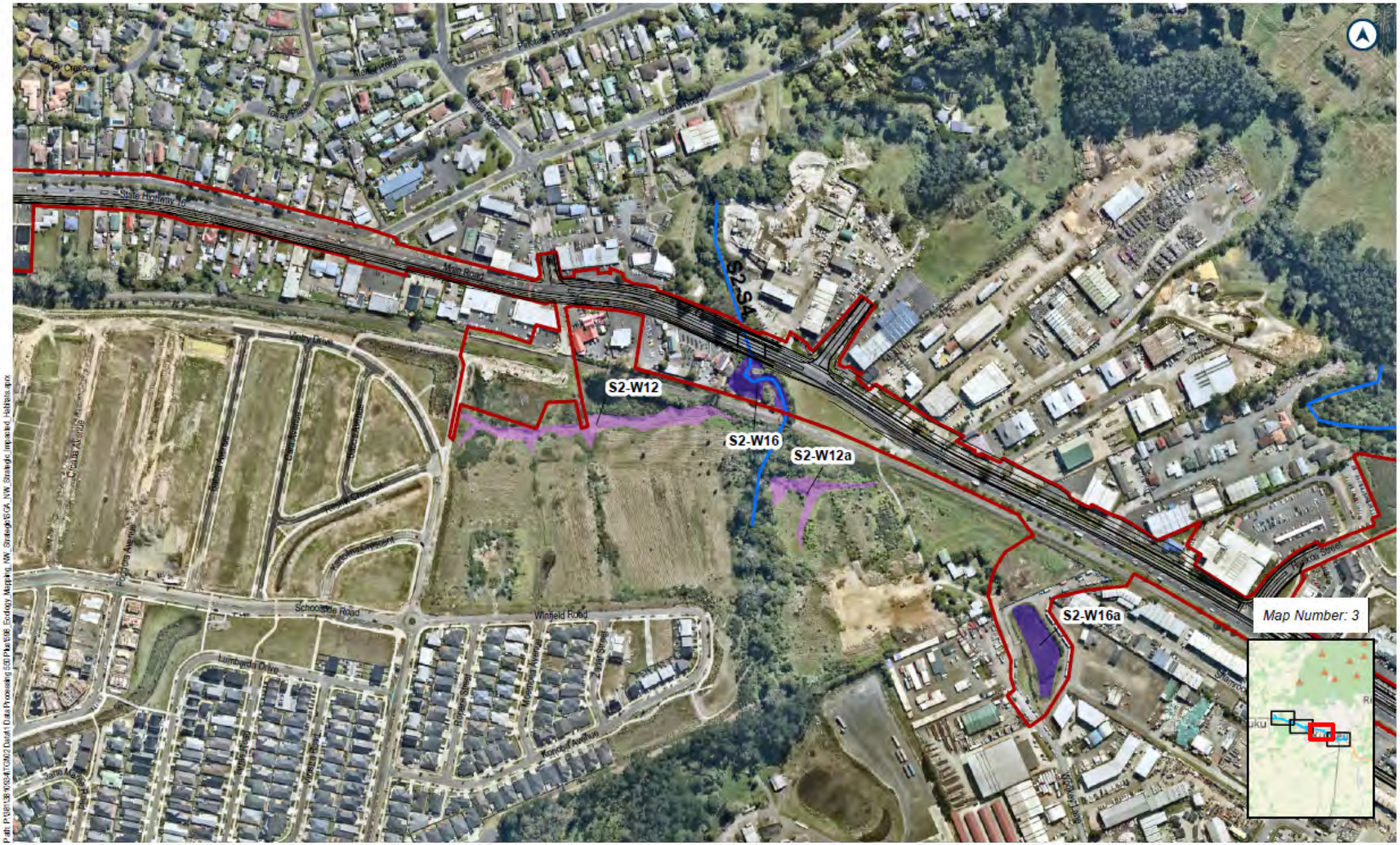
0 100 200
Metres



LEGEND

- Route Options
- Designation
- Artificial/Piped/Culvert
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- WL19

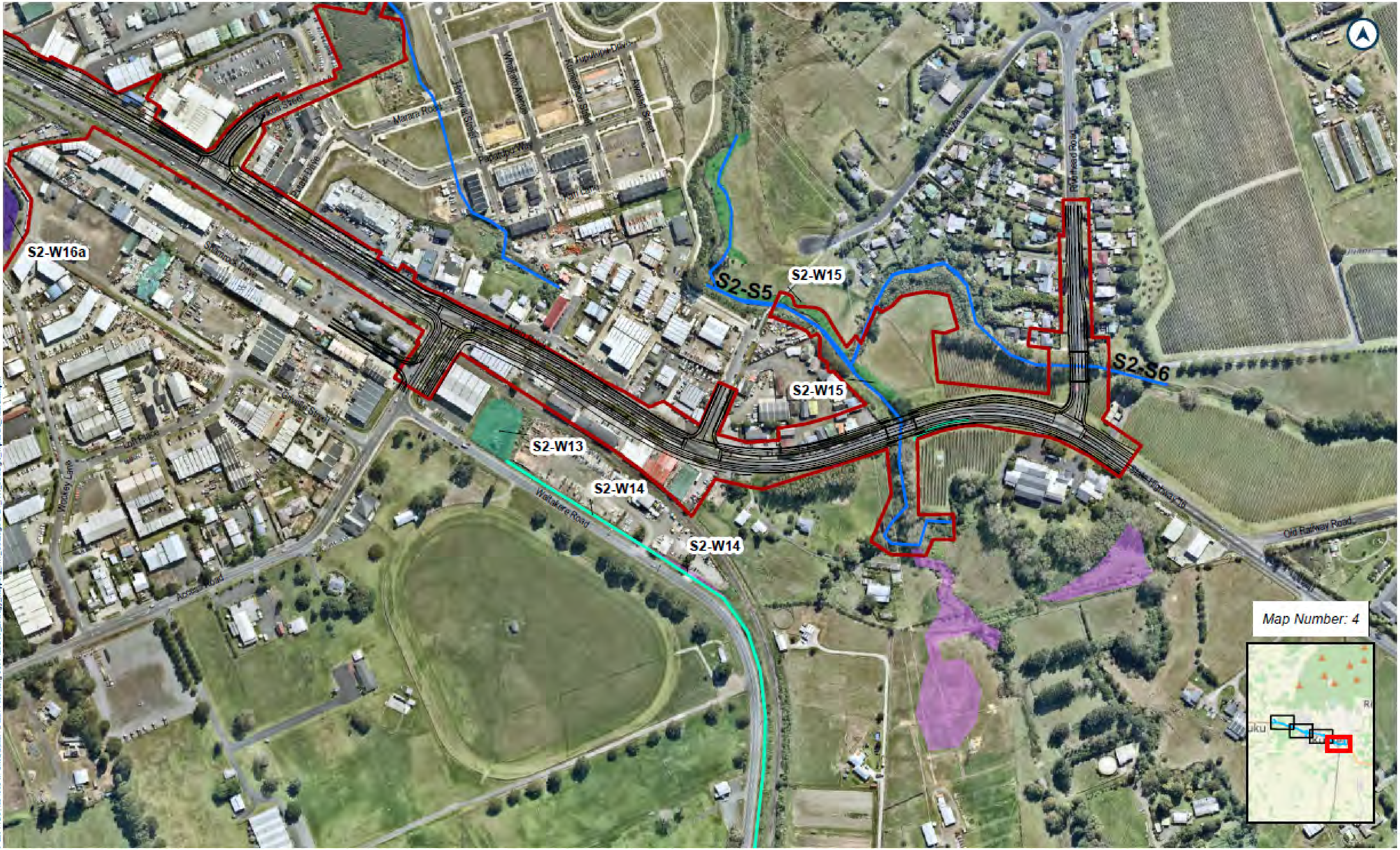
0 100 200
Metres



LEGEND

Route Options
Designation
Permanent
EW-Exotic Wetland
OW-Open Water

0 100 200
Metres

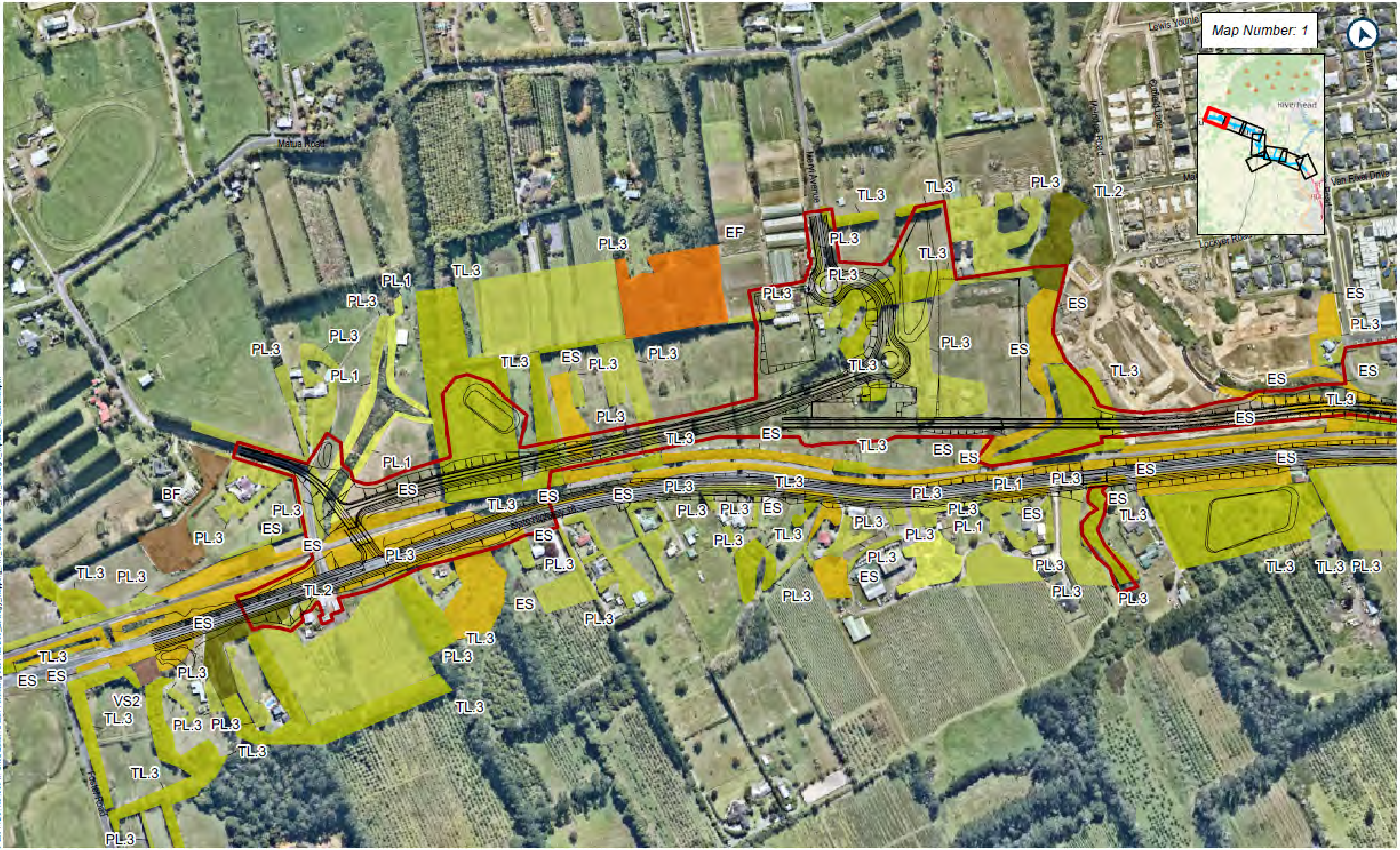


LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- WL19

5.3 NoR S3: Rapid Transit Corridor and Regional Active Mode Corridor

5.3.1 Terrestrial Vegetation



LEGEND

Route Options	ES-Exotic Scrub
Designation	PL.1-Planted native (<20 years old)
BF-Brownfield (Cropland)	PL.3-Amenity planting
EF-Exotic Forest	TL.2-Mixed native / exotic treeland
TL.3-Treeland Exotic	VS2-Kanuka Scrub/Forest

0 100 200

Metres

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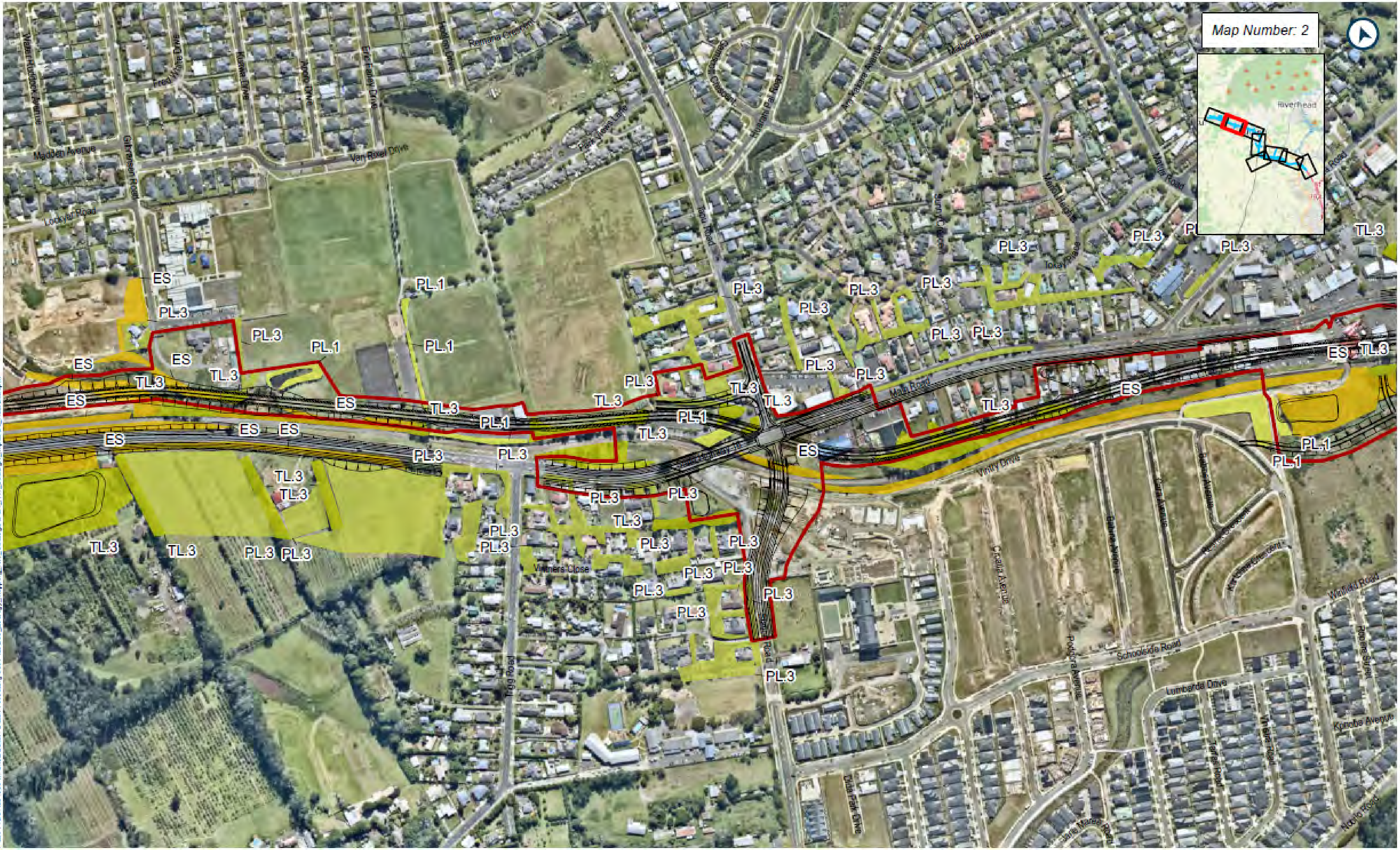
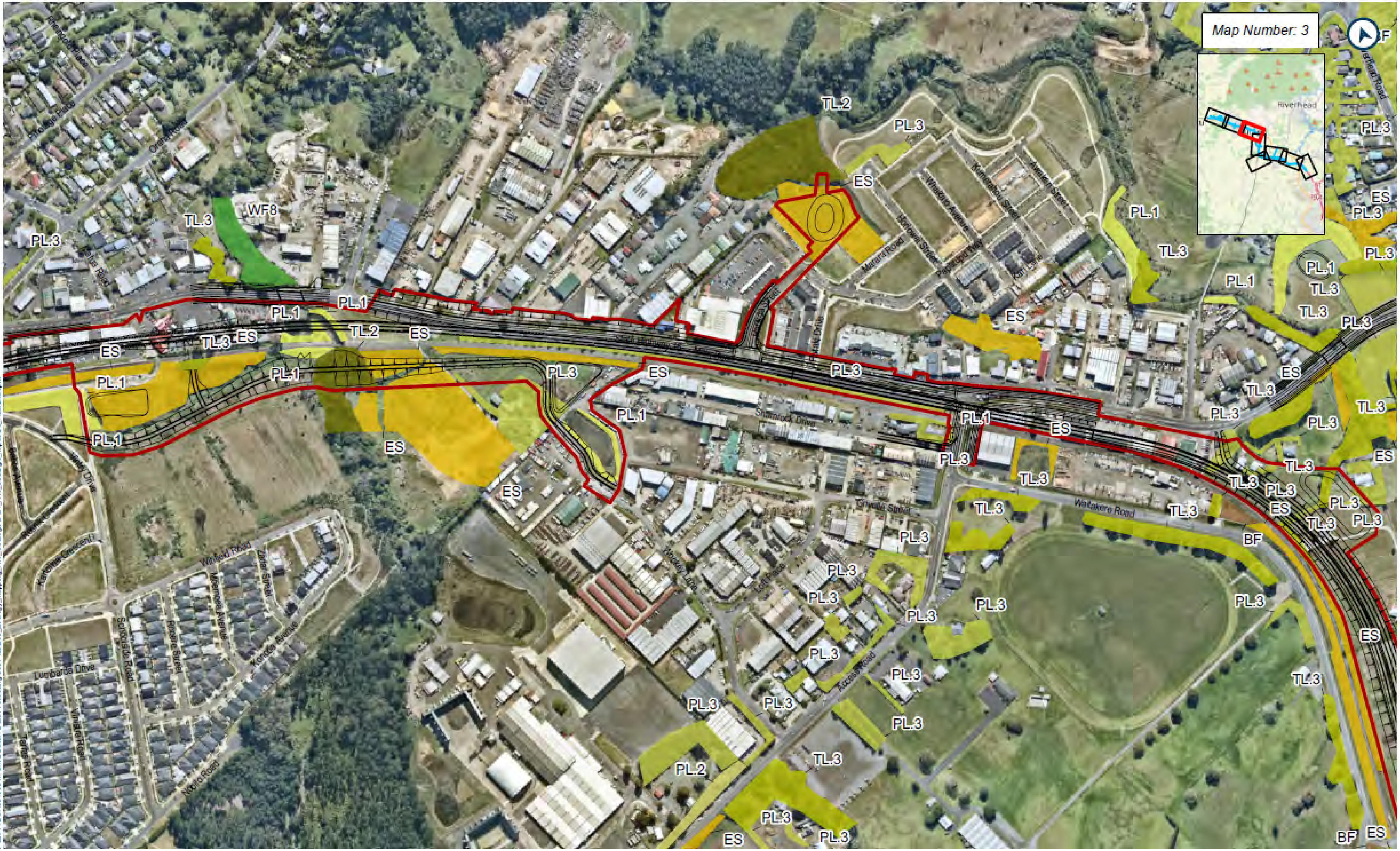


LEGEND

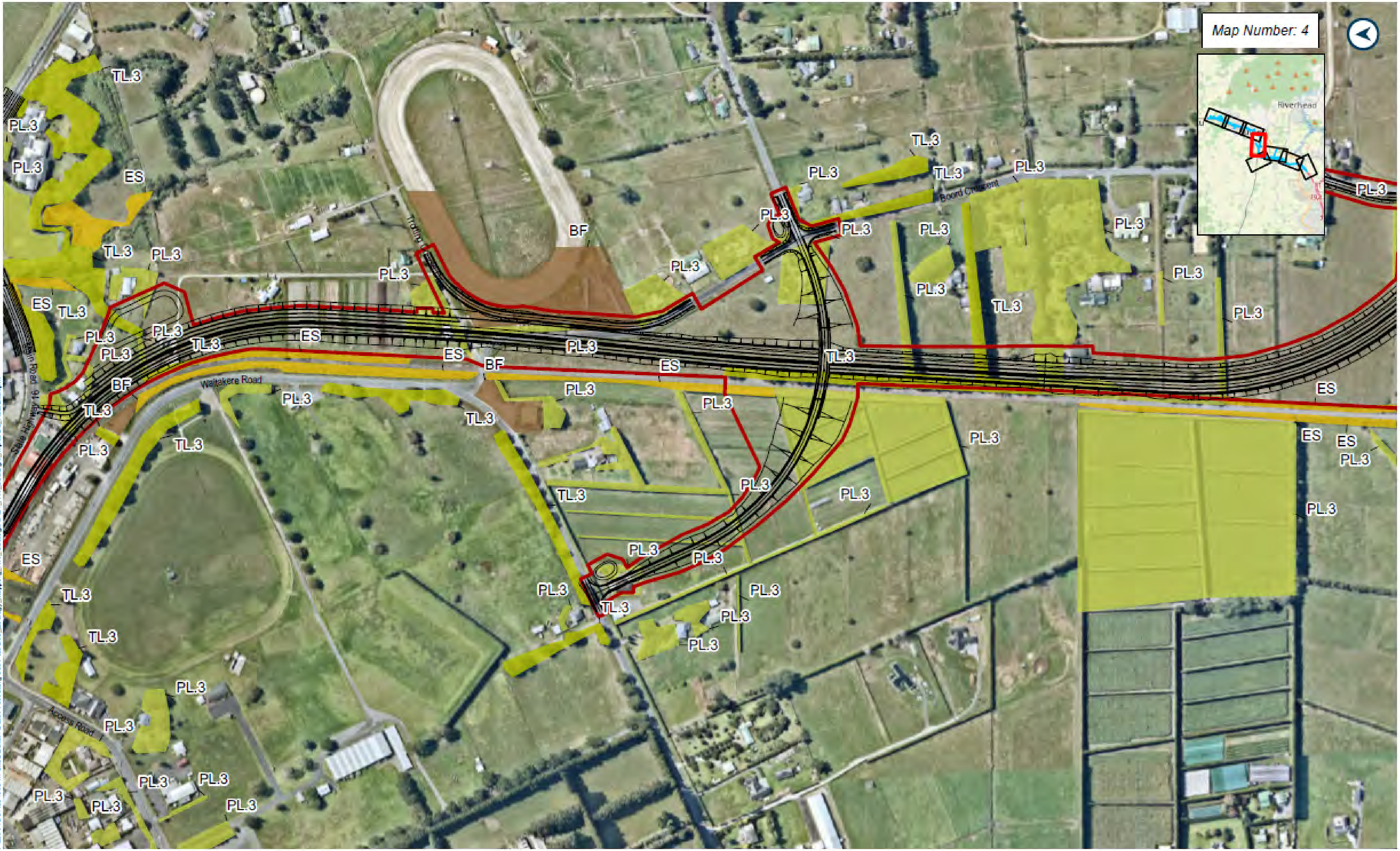
- Route Options
- Designation
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.3-Treeland Exotic



LEGEND

Route Options	PL.1-Planted native (<20 years old)
Designation	PL.2-Planted native (>20 years old)
BF-Brownfield (Cropland)	PL.3-Amenity planting
ES-Exotic Scrub	TL.2-Mixed native / exotic treeland
TL.3-Treeland Exotic	WF8-Kahikatea, Pukatea Forest

0 100 200
Metres



LEGEND

Route Options
Designation
BF-Brownfield (Cropland)
ES-Exotic Scrub
PL.3-Amenity planting
TL.3-Treeland Exotic

LEGEND

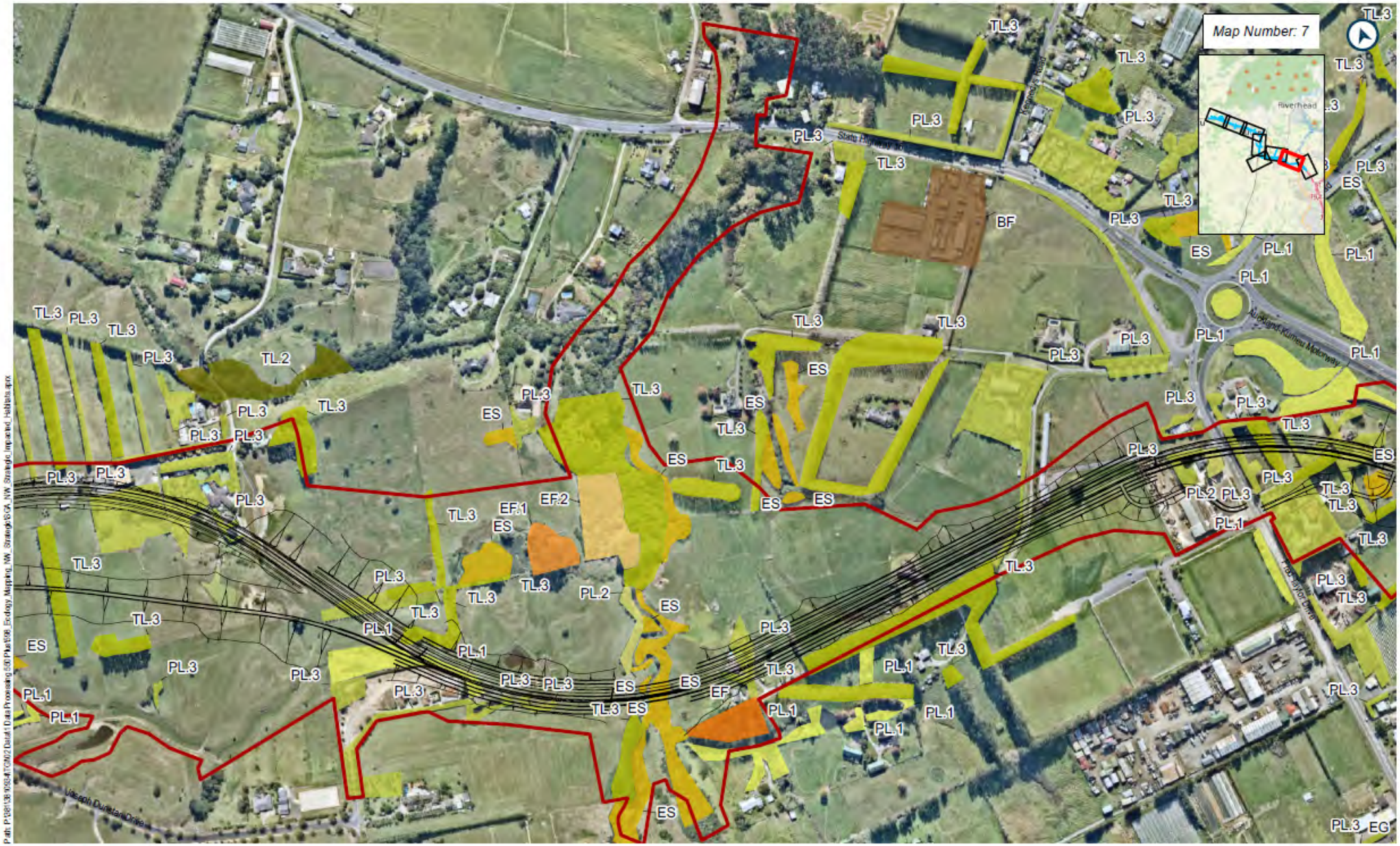
- Route Options
- Designation
- EF-Exotic Forest
- ES-Exotic Scrub
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic

0 100 200
Metres

LEGEND

- Route Options
- Designation
- EF-Exotic Forest
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- VS2-Kanuka Scrub/Forest

0 100 200
Metres



LEGEND

- Route Options
- Designation
- BF-Brownfield (Cropland)
- EF-Exotic Forest
- EF.1-Exotic forest (native understory)
- EF.2 -Exotic forest (exotic understory)
- EG-Exotic Grassland
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.2-Planted native (>20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic

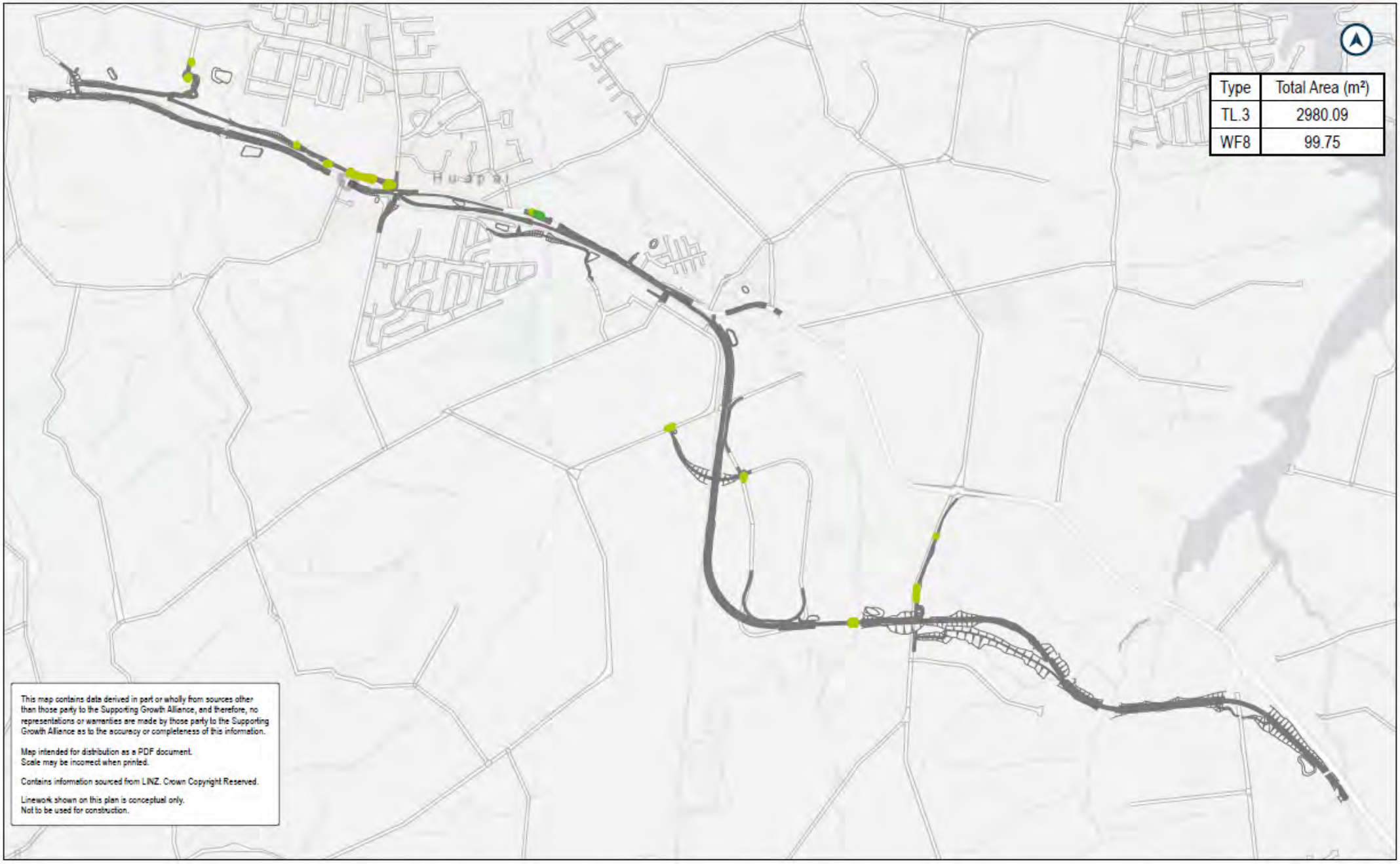
0 100 200
Metres

LEGEND

- Route Options
- Designation
- EG-Exotic Grassland
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.2-Planted native (>20 years old)
- PL.3-Amenity planting
- SA1.2-Mangrove forest and scrub
- TL.3-Treeland Exotic

0 100 200
Metres

5.3.2 District Plan Vegetation


Type
Total Area (m²)
TL.3
2980.09
WF8
99.75
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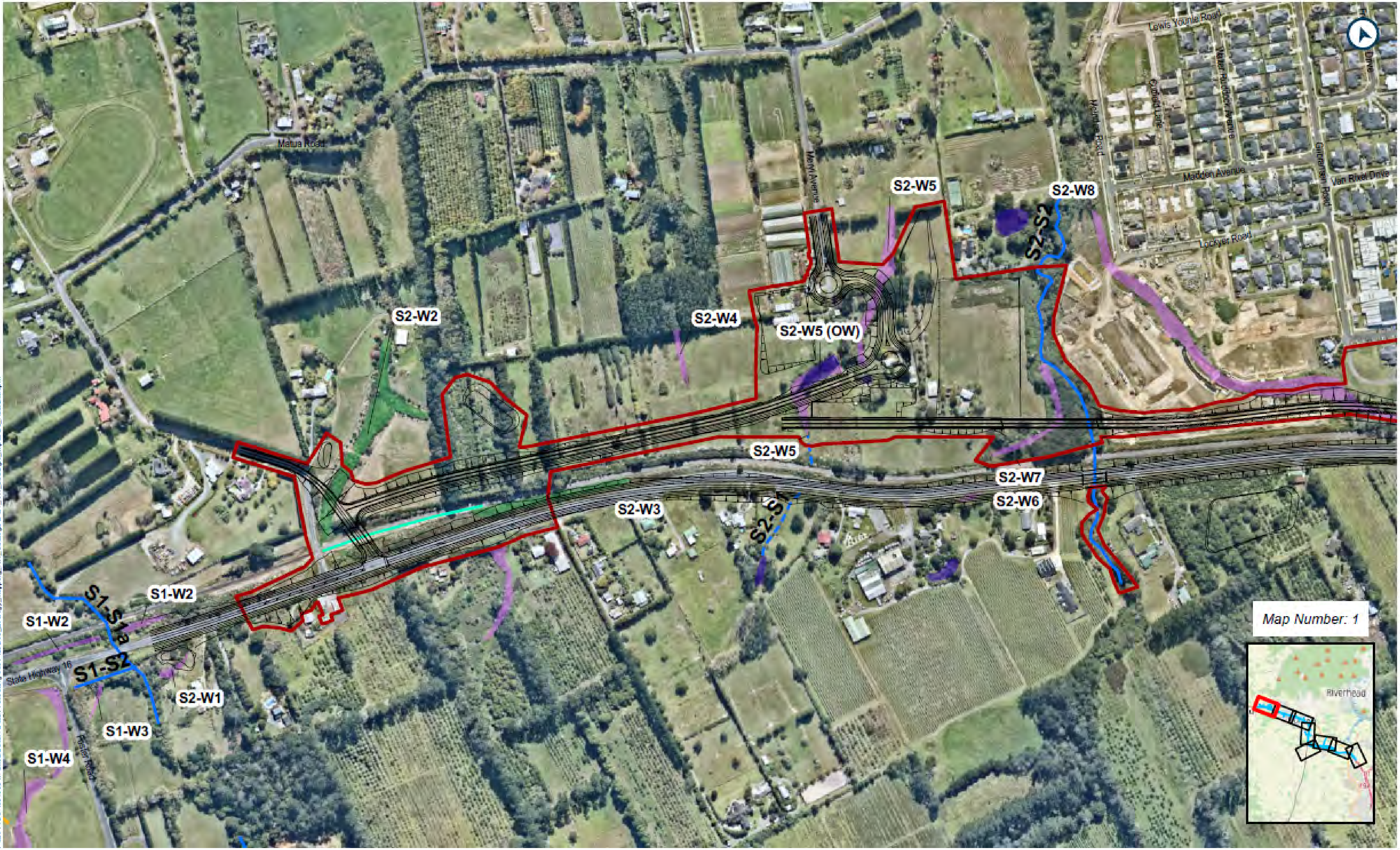
LEGEND
Route Option
TL.3_DPT
WF8_DPT
Road
0
0.5
1
Kilometres

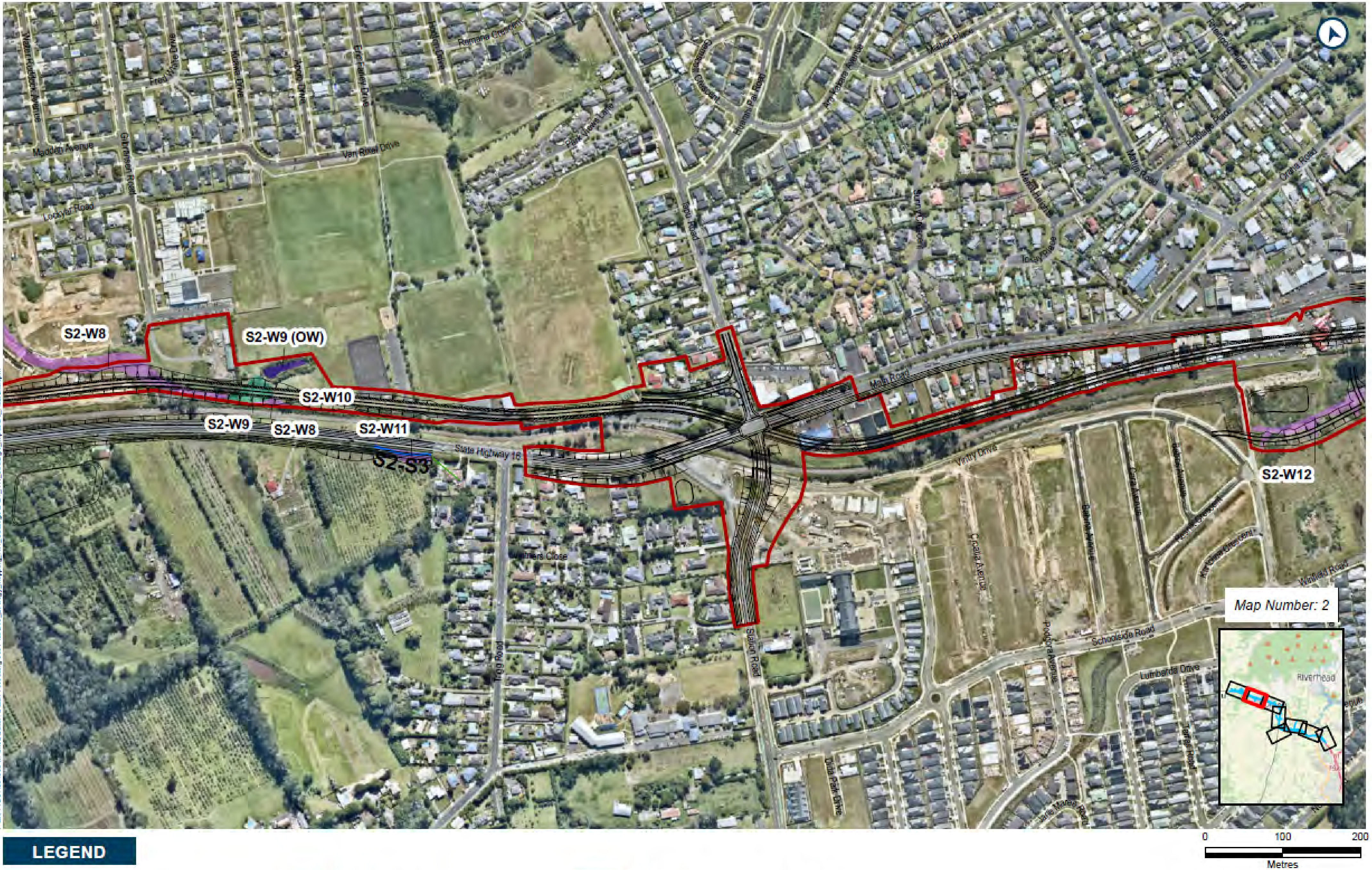
5.3.3 Freshwater Streams and Wetland Habitat



LEGEND

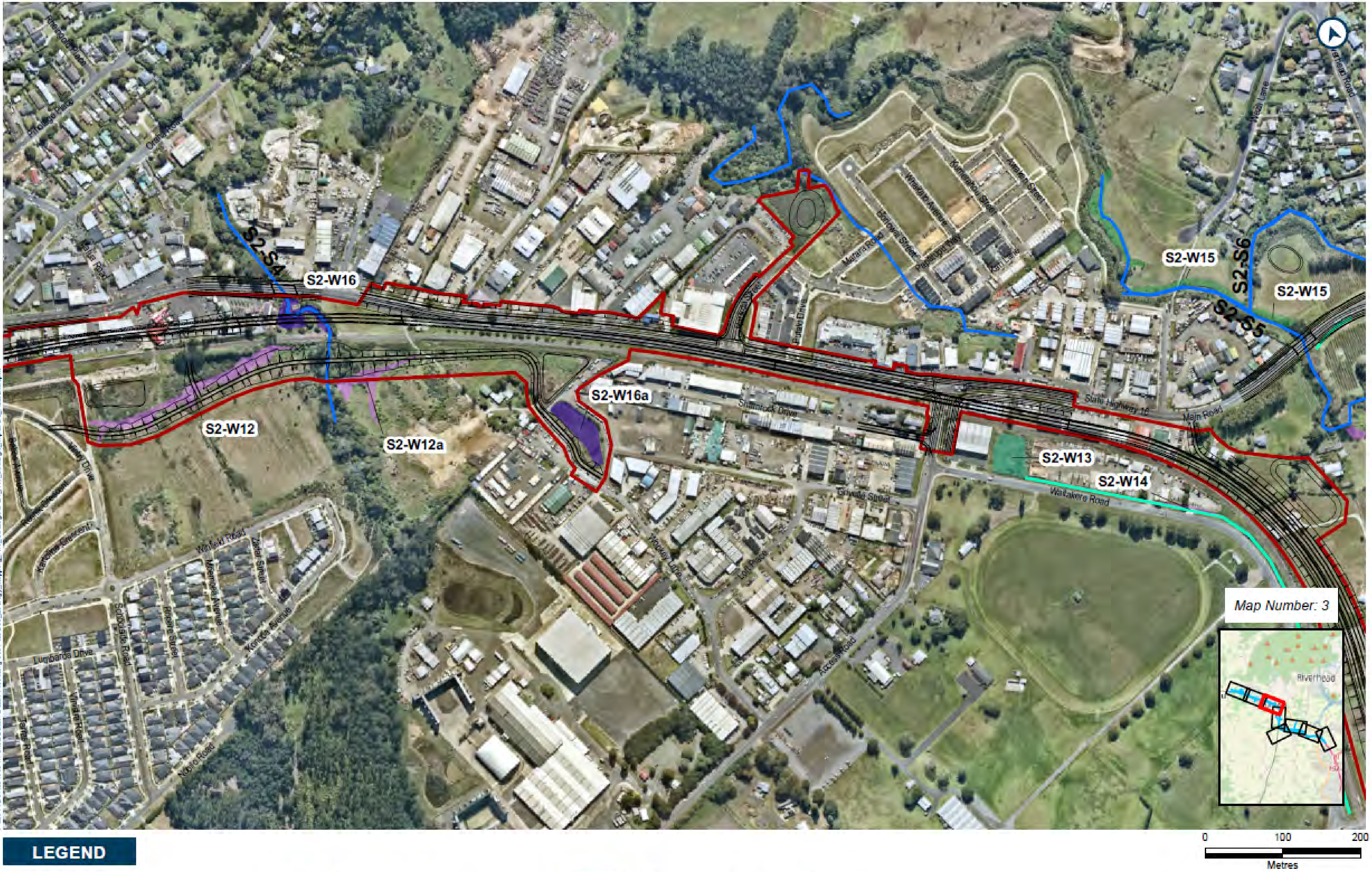
- Route Options
- Designation
- Artificial swale/drainage ditch
- Ephemeral
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)

0 100 200
Metres



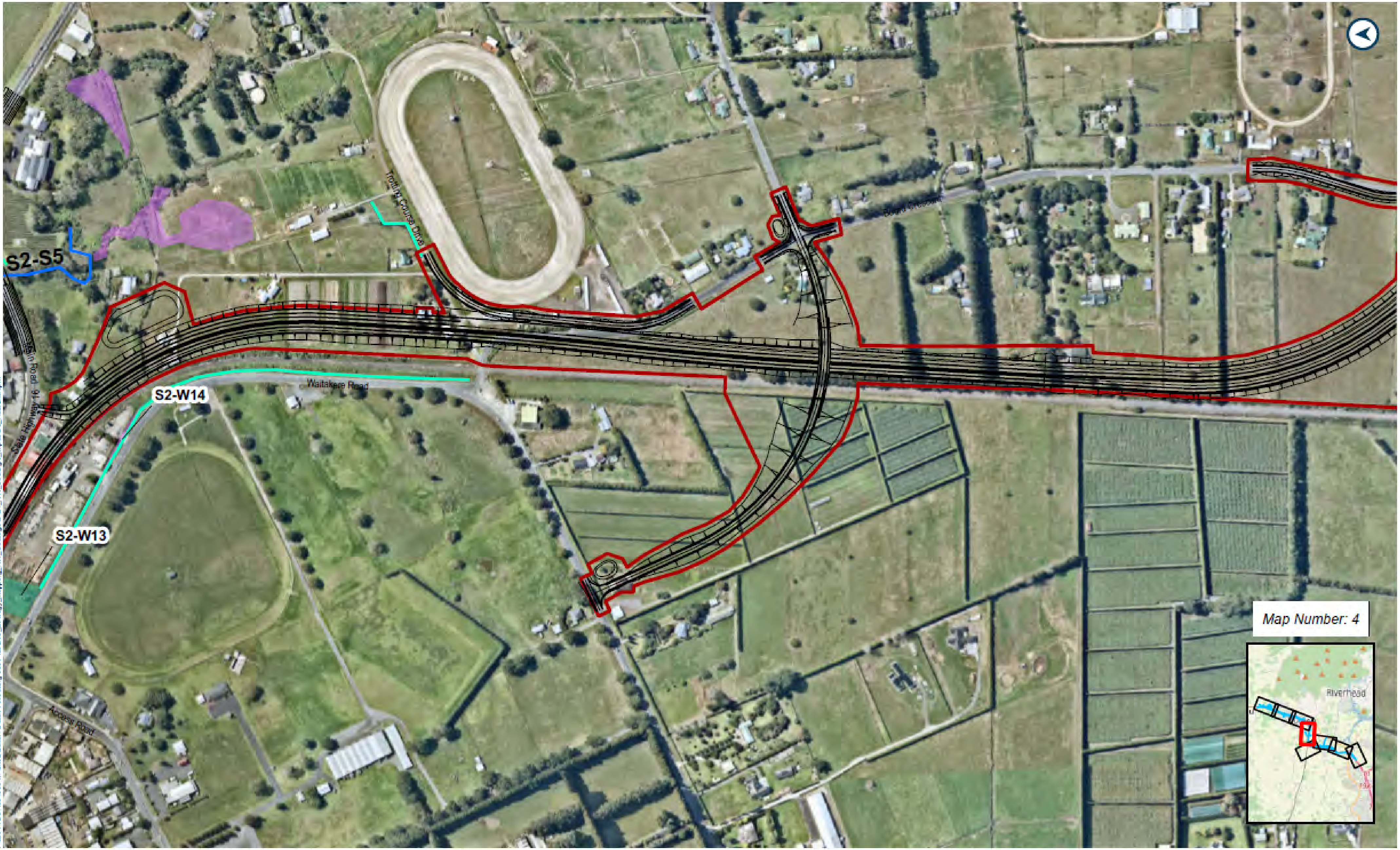
LEGEND

- Route Options
- Designation
- Artificial/Piped/Culvert
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- WL19



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- WL19



LEGEND

Route Options
Designation
Artificial swale/drainage ditch
Permanent
EW-Exotic Wetland
WL19

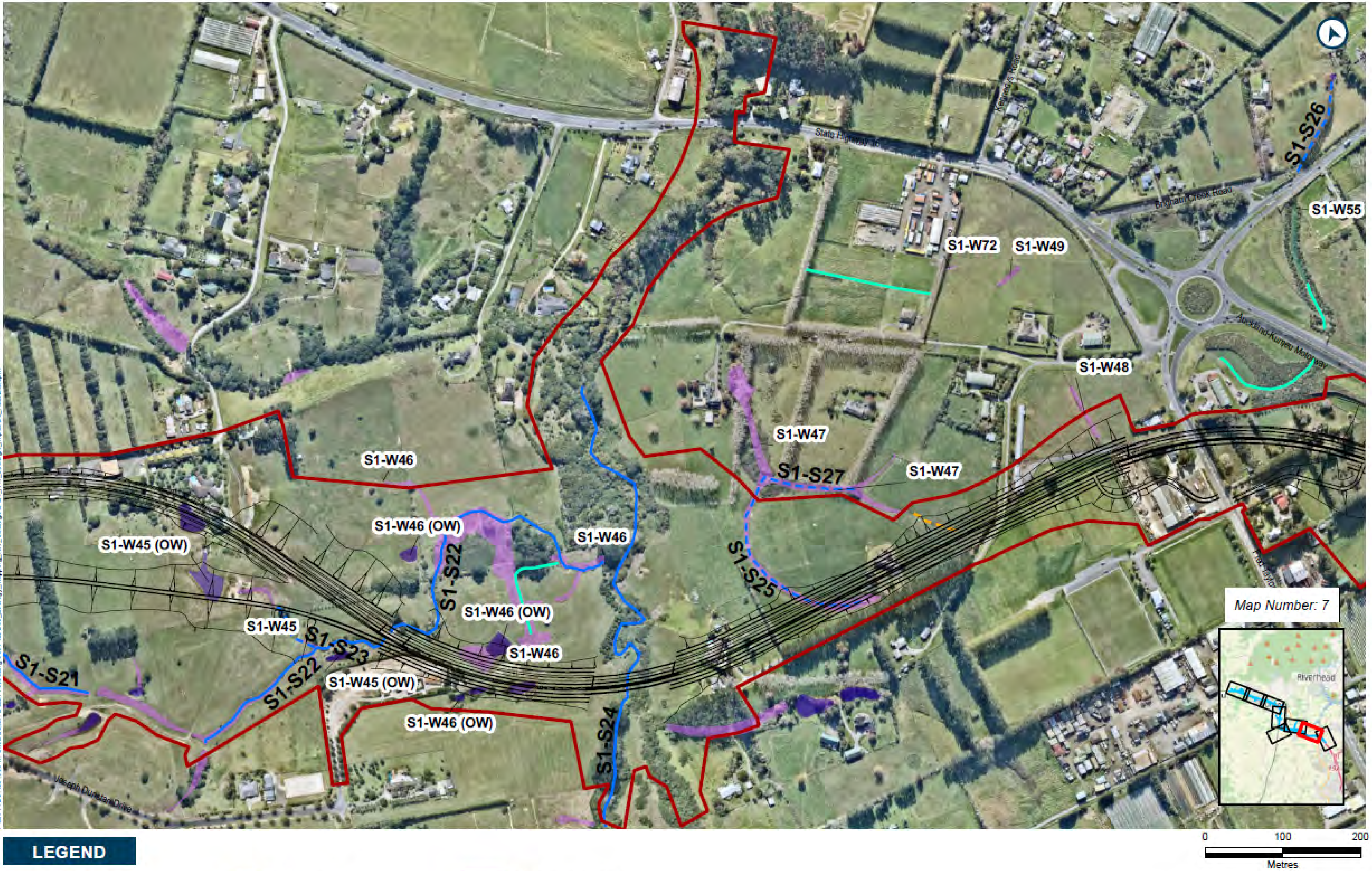
0 100 200
Metres

LEGEND

Route Options
Designation
Artificial swale/drainage ditch
Permanent
EW-Exotic Wetland

LEGEND

Route Options	Ephemeral	EW-Exotic Wetland
Designation	Intermittent	OW-Open Water
Artificial swale/drainage ditch	Permanent	WL11



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Ephemeral
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW.1

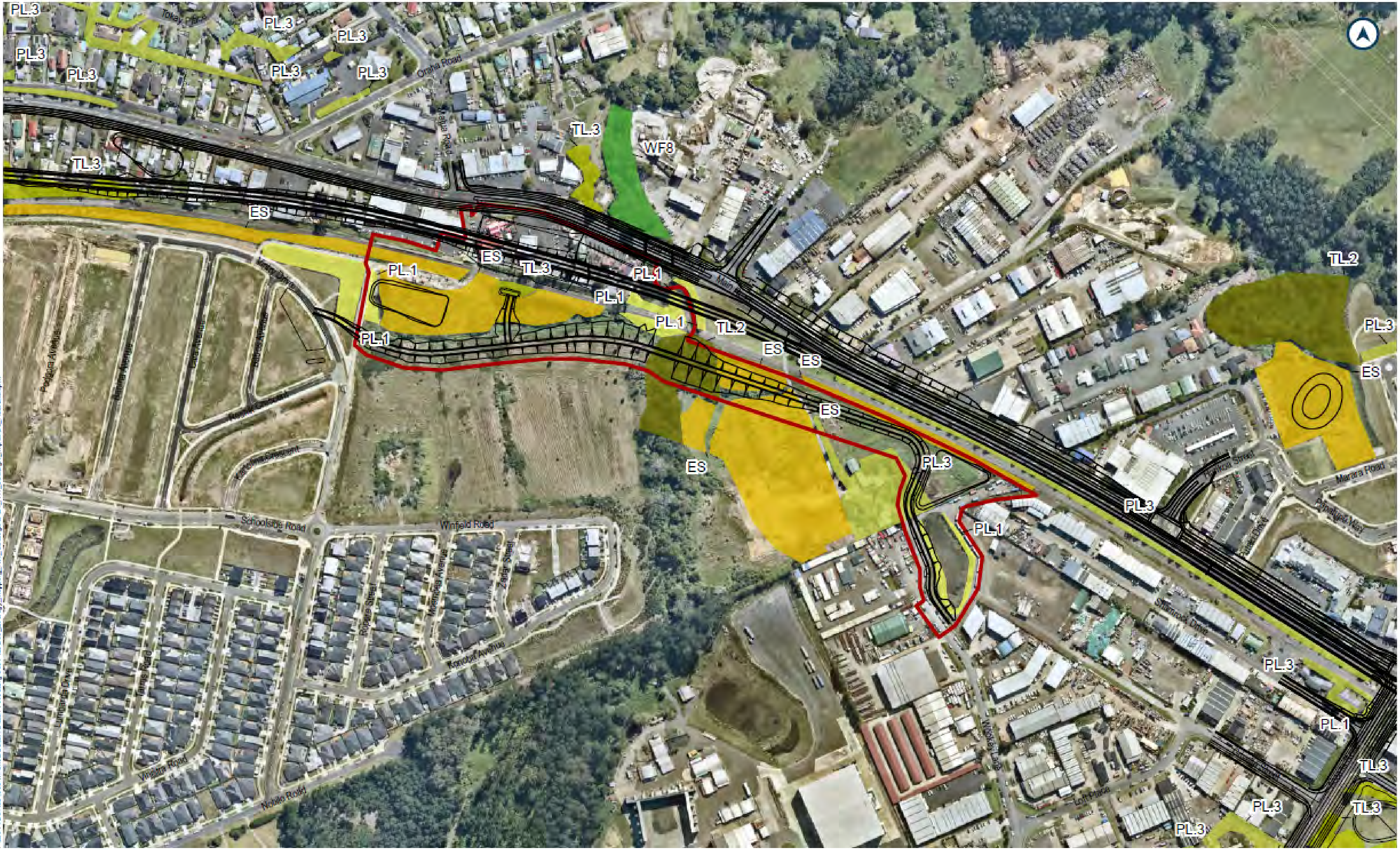
0 100 200
Metres

LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Artificial/Piped/Culvert
- Ephemeral
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)
- PLW.1

5.4 NoR KS: Kumeū Rapid Transit Station

5.4.1 Terrestrial Vegetation



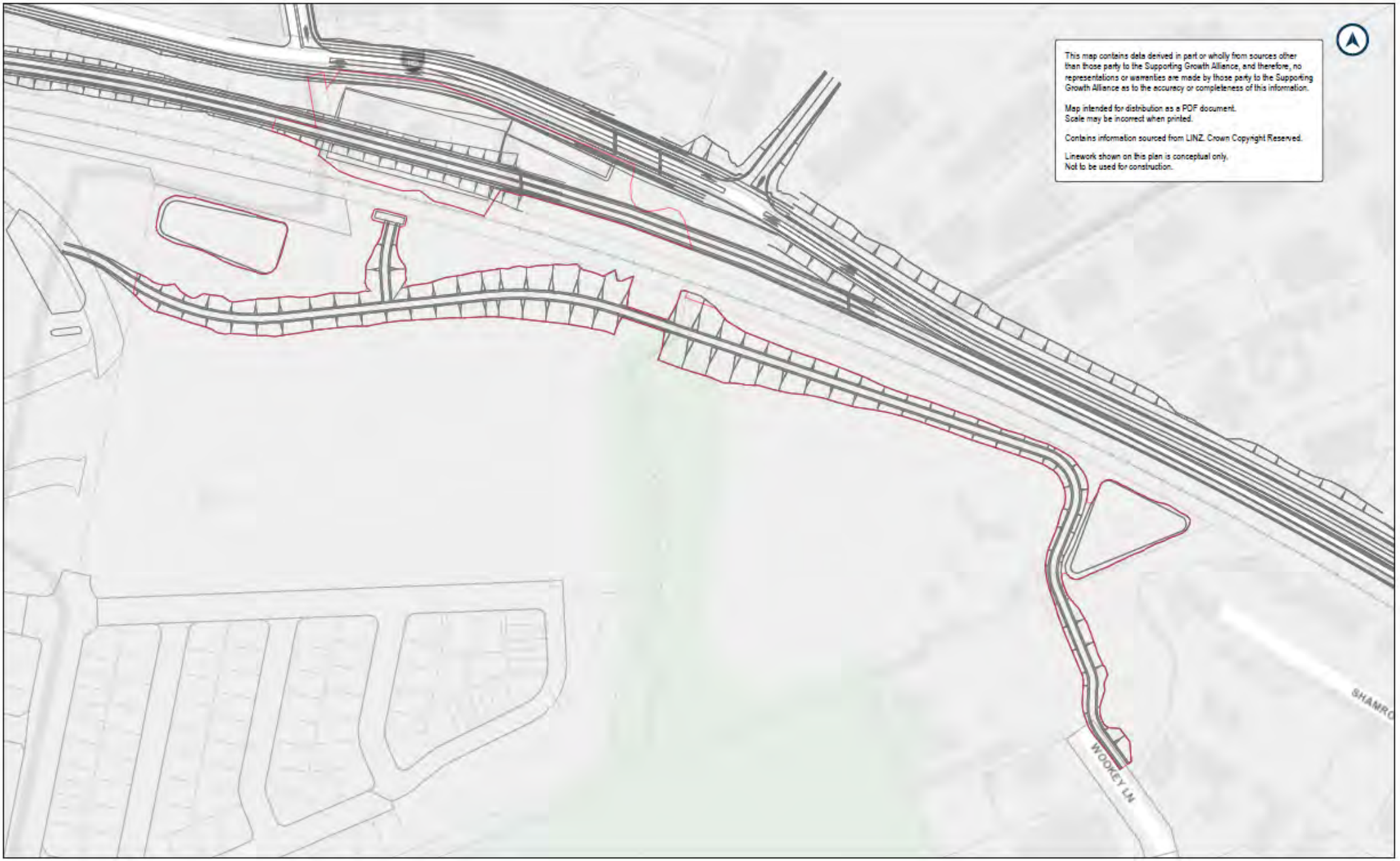
LEGEND

- Route Options
- Designation
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic
- WF8-Kahikatea, Pukatea Forest

0 100 200

Metres

5.4.2 District Plan Vegetation



LEGEND

Route Option

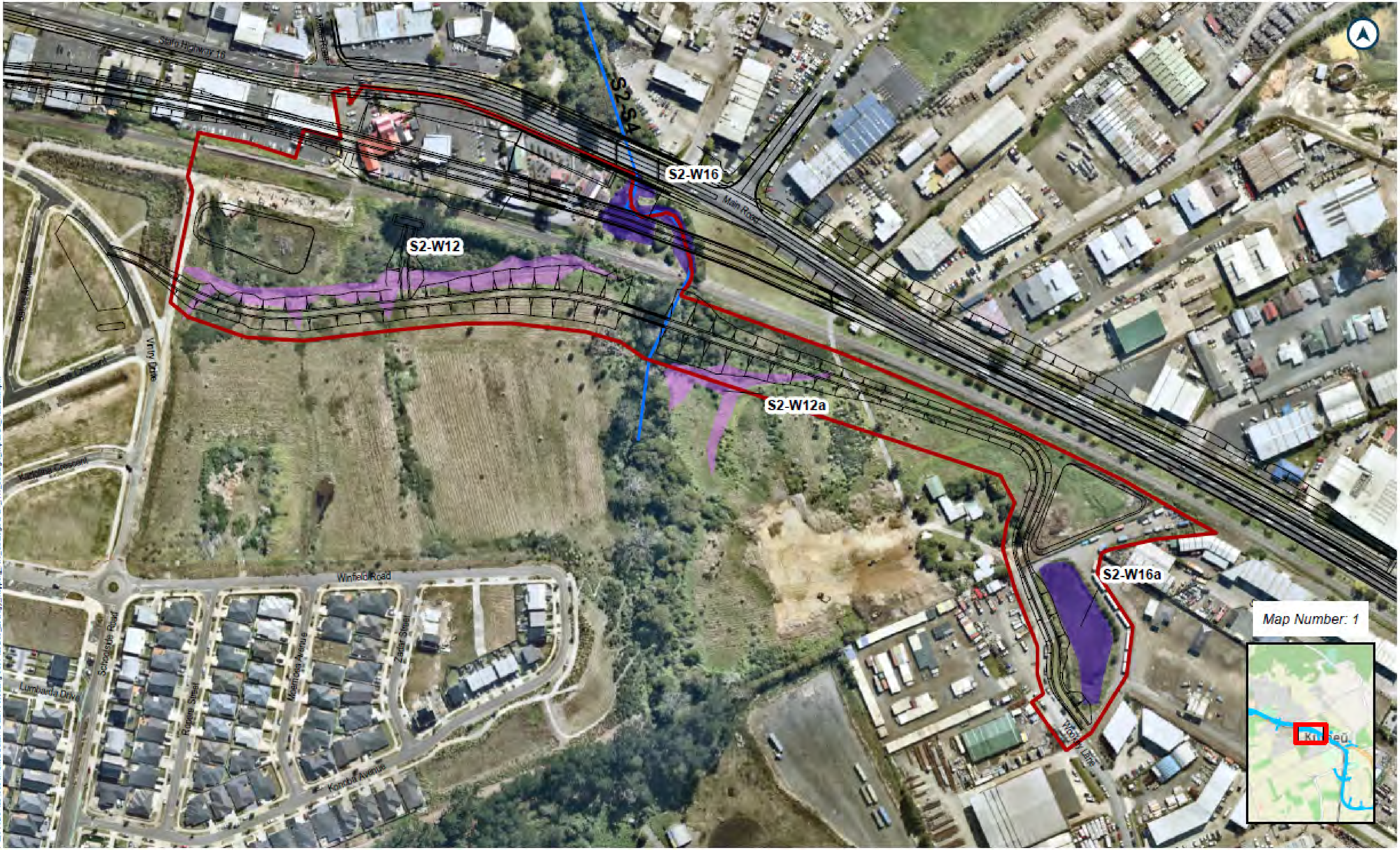
Kumeu Station Boundary

Road

0 0.1 0.2

Kilometers

5.4.3 Freshwater Streams and Wetland Habitat



LEGEND

- Route Options
- Designation
- Permanent
- EW-Exotic Wetland
- OW-Open Water

0 100 200

Metres

5.5 NoR HS: Huapai Rapid Transit Station

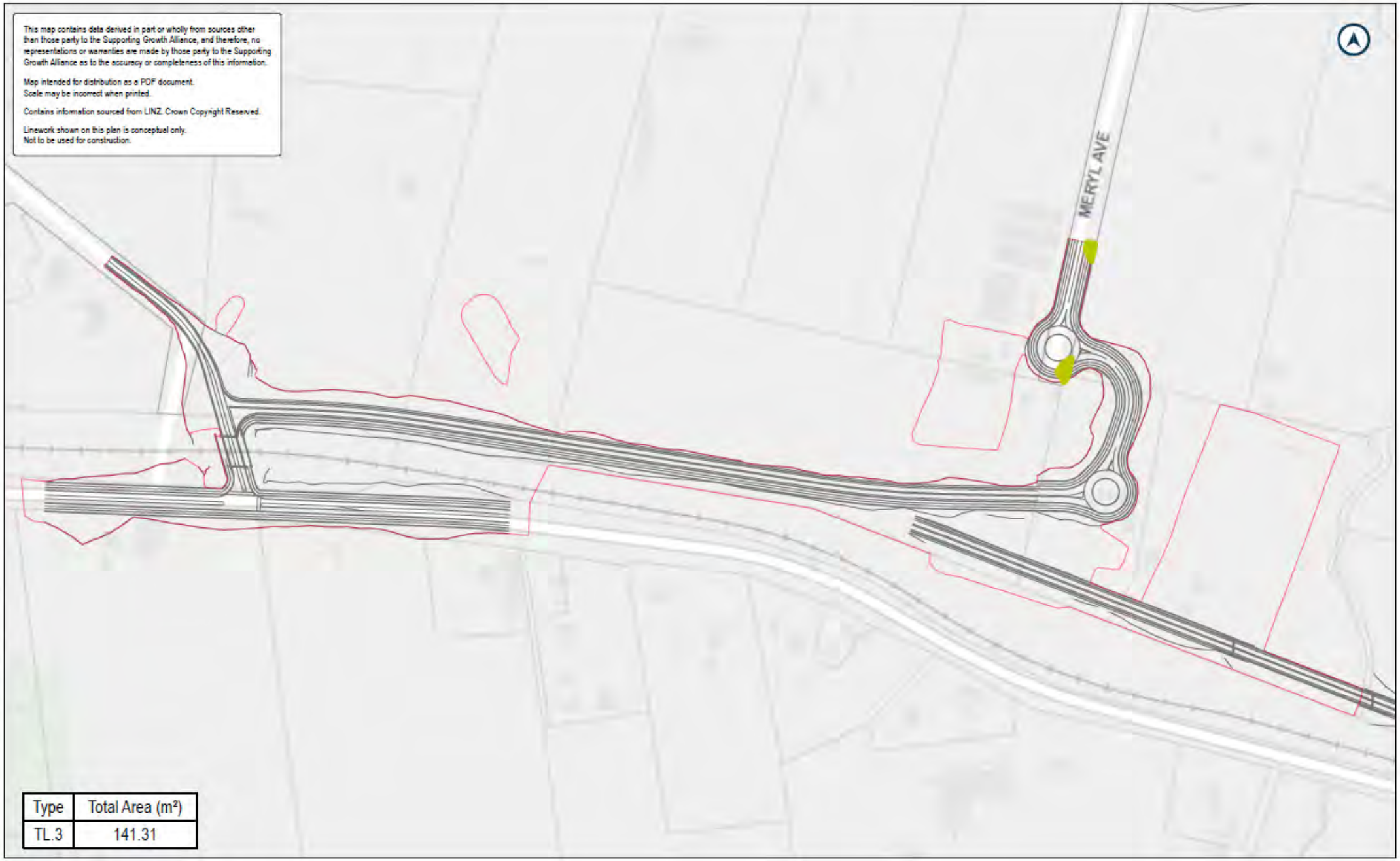
5.5.1 Terrestrial Vegetation

LEGEND

- Route Options
- Designation
- BF-Brownfield (Cropland)
- EF-Exotic Forest
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.2-Mixed native / exotic treeland
- TL.3-Treeland Exotic

0 100 200
Metres

5.5.2 District Plan Vegetation


This map contains data derived in part or wholly from sources other than those party to the Supporting Growth Alliance, and therefore, no representations or warranties are made by those party to the Supporting Growth Alliance as to the accuracy or completeness of this information.
Map intended for distribution as a PDF document.
Scale may be incorrect when printed.
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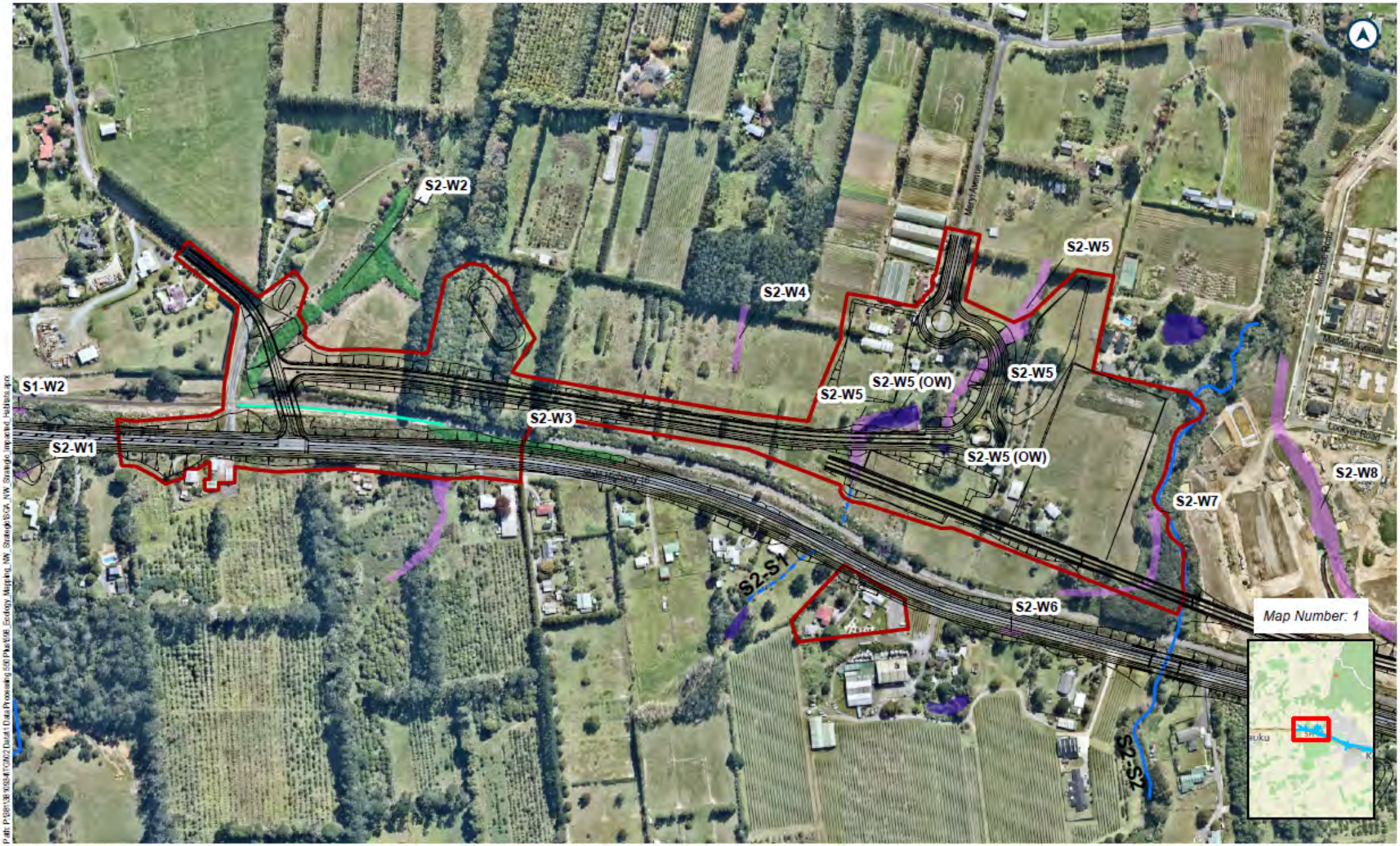
Linework shown on this plan is conceptual only.
Not to be used for construction.
MERYL AVE
Type
Total Area (m²)
TL.3
141.31
LEGEND
Route Option
TL.3_DPT
Huapai Station Boundary
0
0.1
0.2
Kilometres

5.5.3 Freshwater Streams and Wetland Habitat



LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Intermittent
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- PLW-Planted Wetland Native (Recent)

0 100 200

Metres

5.6 NoR S4: Access Road Upgrade

5.6.1 Terrestrial Vegetation

LEGEND

- Route Options
- Designation
- EF-Exotic Forest
- ES-Exotic Scrub
- PL.1-Planted native (<20 years old)
- PL.3-Amenity planting
- TL.3-Treeland Exotic

0 100 200
Metres

LEGEND

Route Options
Designation
ES-Exotic Scrub
PL.1-Planted native (<20 years old)
PL.2-Planted native (>20 years old)
PL.3-Amenity planting
TL.3-Treeland Exotic

0 100 200
Metres

5.6.2 District Plan Vegetation

LEGEND

0 0.1 0.2
Kilometres

Route Option

TL.3_DPT

Road

5.6.3 Freshwater Streams and Wetland Habitat

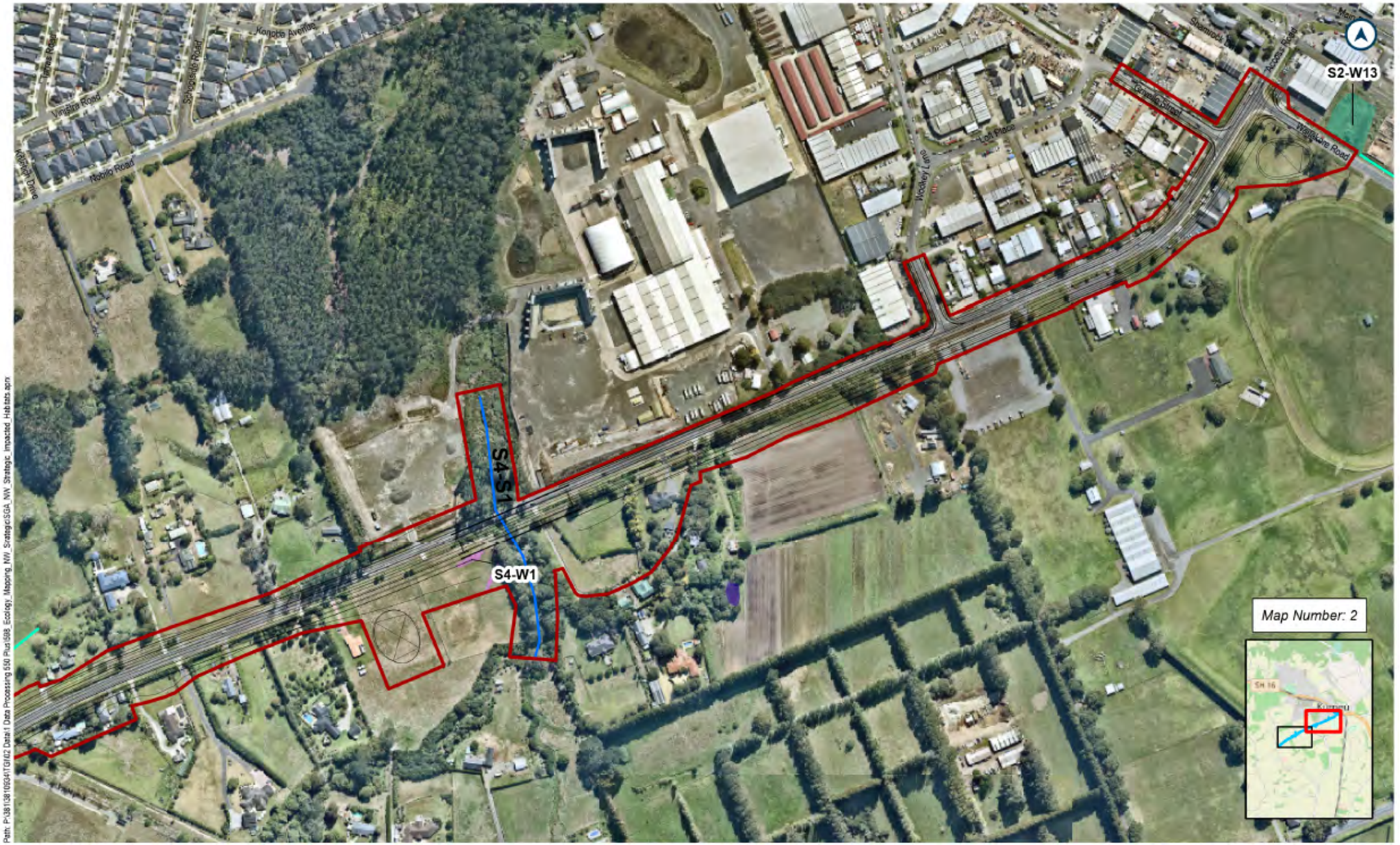
Path: P:\381\381109341\GIS\02 Data\1 Data Processing\50 Plus\598_Ecology_Mapping_NW_Strategic\SGA_NW_Strategic_Impacted_Habitats.aprx

LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- OW-Open Water
- EW-Exotic Wetland

0 100 200

Metres



Path: P:\38\13810\93417\GIS\2 Data\1 Data Processing\50 Plus\598_Ecology_Mapping_NW_Strategic\SGA_NW_Strategic_Impacted_Habitats.aprx

LEGEND

- Route Options
- Designation
- Artificial swale/drainage ditch
- Permanent
- EW-Exotic Wetland
- OW-Open Water
- WL19

0 100 200

Metres

6 Appendix 6 – Terrestrial Value Assessment

6.1 NoR S1: Alternative State Highway, Including Brigham Creek Interchange

Table 13-9 Assessment of ecological value for terrestrial ecology features for NoR S1 (1 of 2)

Attributes to be considered	S1-BF	S1-EF	S1-EF.1	S1-EF.2	S1-EG	S1-ES	S1-PL.1	S1-PL.2	S1-PL.3	Justification
Representativeness	**1**	**2**	**3**	**2**	**1**	**2**	**4**	**4**	**2**	
Typical structure and composition	1	1	2	1	1	1	2	2	1	BF, EG, ES, EF, EF.2, PL.3: Habitats have been significantly altered by human activities (exotic dominated). PL.1, PL.2, EF.1: Habitat and species have been affected by human activities.
Indigenous representation	1	2	3	2	1	2	4	4	2	BF, EG: <10% of the species are indigenous. EF, EF.2, ES, PL.3: 10-50% of the species are indigenous. EF.1: 50-90% of the species are indigenous. PL.1, PL.2: >90% of the species are indigenous.
Rarity/distinctiveness	**0**	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**3**	
Species of conservation significance	-	4	4	4	3	3	3	3	3	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (EF, EF.1, EF.2). TAR bird species expected to be reliant on ecological features associated with the Project Area, seasonal use by kākā would score 3 (EF, EF.1, EF.2, PL.2). Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (EF, EF.1, EF.2, EG, ES, PL.1, PL.3)
Distinctive ecological values	-	2	2	2	1	1	2	2	1	BF: Habitat not playing an important role in provisional or regulatory ecosystem services at any scale

Attributes to be considered	S1-BF	S1-EF	S1-EF.1	S1-EF.2	S1-EG	S1-ES	S1-PL.1	S1-PL.2	S1-PL.3	Justification
										EG, ES PL.3: Habitat playing an important role in provisional or regulatory ecosystem services typically on local scale EF, EF.1, EF.2, PL.1, PL.2: Habitat playing an important role in provisional or regulatory ecosystem services typically on Catchment scale
Diversity and pattern	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**3**	**1**	
Habitat diversity	-	1	2	1	1	1	1	2	1	Increased habitat diversity in areas with indigenous species present: EF.1, PL.1, PL.2 Increased habitat diversity in areas with late succession: EF, EF.1, EF.2, PL.2
Species diversity	1	1	2	1	1	1	2	2	1	Increased species diversity in areas with indigenous species present: EF.1, PL.1, PL.2. Increased species diversity in areas with late succession: EF, EF.1, EF.2, PL.2.
Patterns in habitat use	1	3	3	3	1	1	1	3	1	EF, EF.1, EF.2, PL.2 rated high due to potential seasonal utilisation by long-tailed bat and kākā. All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale.
Ecological context	**0**	**3**	**3**	**3**	**0**	**1**	**1**	**4**	**1**	
Size, shape and buffering	-	1	1	1	-	-	1	1	-	EF, EF.1, EF.2, PL.1 PL.2 are represented by small, patches of habitat but provide buffering to adjacent areas.
Sensitivity to change	-	-	-	-	-	-	-	4	-	PL.2: Intact habitat and late succession. All other habitats are generally modified with no residual sensitive receptors.

Attributes to be considered	S1-BF	S1-EF	S1-EF.1	S1-EF.2	S1-EG	S1-ES	S1-PL.1	S1-PL.2	S1-PL.3	Justification
Ecological networks (linkages, pathways, migration)	-	3	3	3	-	1	1	3	1	Habitat is locally an important breeding and feeding link in terms of connectivity for the survival of species (e.g. native birds): ES, PL.1, PL.3. Habitat is regionally an important breeding and feeding link in terms of connectivity for the survival of species: woody structure EF, EF.1, EF.2, PL.2.
Combined value	**N**	**M**	**H**	**M**	**L**	**L**	**M**	**H**	**L**	

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

Table 13-10 Assessment of ecological value for terrestrial ecology features for NoR S1 (2 of 2)

Attributes to be considered	S1-TL.2	S1-TL.3	S1-VS2	S1-WF7	S1-Bat	S1-Non-TAR Bird	S1-Lizard	Justification
Representativeness	**3**	**2**	**4**	**4**	**0**	**0**	**0**	
Typical structure and composition	3	1	3	4	-	-	-	TL.3: Habitat has been affected by human activities (exotic-dominated treeland). TL.2 VS2: Habitat has been insignificantly affected by human activities. WF7: Habitat is unchanged from baseline conditions.
Indigenous representation	3	2	4	4	-	-	-	TL.3: 10-50% of the species are indigenous. TL.2: 50-90% of the species are indigenous. VS2, WF7: >90% of the species are indigenous.
Rarity/distinctiveness	**4**	**4**	**4**	**4**	**4**	**2**	**3**	
Species of conservation significance (fauna only)	-	-	-	-	4	2	3	Long-tailed bat (Threatened – Nationally Critical) = value score of 4. Kākā (At Risk - Recovering) and copper skink (At Risk - Declining) = value score of 3. Nationally and locally common native species = value score of 2.

Attributes to be considered	S1-TL.2	S1-TL.3	S1-VS2	S1-WF7	S1-Bat	S1-Non-TAR Bird	S1-Lizard	Justification
Species of conservation significance	4	4	4	4	-	-	-	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (TL.2, TL.3, VS2, WF7). TAR bird species expected to be reliant on ecological features associated with the Project Area, seasonal use by kākā would score 3 (TL.2, TL.3, VS2, WF7). Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (TL.2, TL.3, VS2, WF7). Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (TL.2, TL.3, VS2, WF7)
Distinctive ecological values	3	1	3	3	-	-	-	TL.3: Habitat playing an important role in provisional or regulatory ecosystem services typically on Local scale. TL.2, VS2, WF7: Habitat playing an important role in provisional or regulatory ecosystem services typically on Regional scale.
Diversity and pattern	**3**	**3**	**3**	**4**	**0**	**2**	**0**	
Habitat diversity	3	1	3	4	-	-	-	Increased habitat diversity in areas with indigenous species present: TL.2, VS2, WF7. Increased habitat diversity in areas with late succession: TL.2, TL.3, VS2, WF7.
Species diversity	3	1	3	3	-	2	-	Increased species diversity in areas with indigenous species present: TL.2, VS2, WF7. Increased species diversity in areas with late succession: TL.2, TL.3, VS2, WF7. VS2 and WF7 rated higher due to higher % indigenous species.
Patterns in habitat use	3	3	3	3	-	-	-	All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale. (TL.2, TL.3, WF7 rated high due to potential utilisation by long-tailed bat and kākā).
Ecological context	**4**	**3**	**4**	**4**	**0**	**2**	**0**	

Attributes to be considered	S1-TL.2	S1-TL.3	S1-VS2	S1-WF7	S1-Bat	S1-Non-TAR Bird	S1-Lizard	Justification
Size, shape and buffering	2	-	2	2	-	2	-	WF7 is represented by a very small area located along Ahukuramu Stream at 116 Foster Road. VS2 is represented by several patches, approximately 300m2 in size, located on both sides of Puke Road. TL.2 is represented largely by riparian vegetation, part of wider catchment. TL.3 located throughout the NoR.
Sensitivity to change	4	-	4	4	-	-	-	VS2, TL.2, WF7: Intact habitat and late succession. WF7 IUCN Threat Status: Critically Endangered. TL.3: Habitat generally modified with no residual receptors sensitive to change.
Ecological networks (linkages, pathways, migration)	3	3	3	3	-	-	-	Aged woody structure (TL.2, TL.3, VS2 and WF7) increase steppingstone value (connecting other areas of ecological value). TL.2 and TL.3 along Kumeu River (S1-S17) and Pakinui Stream (S1-S18) important ecological network for long-tailed bats (bats confirmed at ABM2) and along Ahukuramu Stream. VS2 is represented by several patches on both sides of Puke Road within close proximity to each other (ranging from approximately 15 - 450 metres). WF7 scored lower due to limited extent, but provides linkage between area of natural wetland, PL.1 and ES/TL.2 along Ahukuramu Stream.
Combined value	**H**	**M**	**H**	**VH**	**VH**	**L**	**H**	

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

Table 13-11 Assessment of ecological value for terrestrial ecology features for NoR S1 (TAR birds)

Attributes to be considered	S1-TAR Bird (Terrestrial - Moderate Value)	S1-TAR Bird (Terrestrial - High Value)	S1-TAR Bird (Terrestrial - Very High Value)	S1-TAR Bird (Wetland - Moderate Value)	S1-TAR Bird (Wetland - High Value)	S1-TAR Bird (Wetland - Very High Value)	Justification
Representativeness	**3***	**0**	**0**	**3***	**0**	**0**	
Typical structure and composition	3*	-	-	3*	-	-	-
Indigenous representation	-	-	-	-	-	-	-
Rarity/distinctiveness	**0**	**3**	**3**	**0**	**3**	**3**	
Species of conservation significance (fauna only)	-	3	4	-	3	4	Terrestrial (Moderate): North Island kākā Terrestrial (High): New Zealand pipit Terrestrial (Very High): long-tailed cuckoo Wetland (Moderate): little black shag, pied shag Wetland (High): banded rail, North Island fernbird, spotless crake Wetland (Very High): brown teal, dabchick
Species of conservation significance	-	-	-	-	-	-	-
Distinctive ecological values	-	-	-	-	-	-	-
Diversity and pattern	**3***	**0**	**0**	**3***	**0**	**0**	
Habitat diversity	3*	-	-	3*	-	-	-

Attributes to be considered	S1-TAR Bird (Terrestrial - Moderate Value)	S1-TAR Bird (Terrestrial - High Value)	S1-TAR Bird (Terrestrial - Very High Value)	S1-TAR Bird (Wetland - Moderate Value)	S1-TAR Bird (Wetland - High Value)	S1-TAR Bird (Wetland - Very High Value)	Justification
Species diversity	-	-	-	-	-	-	-
Patterns in habitat use	-	-	-	-	-	-	-
Ecological context	**3***	**0**	**0**	**3***	**0**	**0**	
Size, shape and buffering	3*	-	-	3*	-	-	
Sensitivity to change	-	-	-	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-	-	-	-
Combined value	**M**	**H**	**VH**	**M**	**H**	**VH**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Moderate' combined value.

Table 13-12 Assessment of ecological value for terrestrial ecology features for NoR S1 (District Plan vegetation)

Attributes to be considered	S1-EF (District Plan)	S1-TL.2 (District Plan)	S1-TL.3 (District Plan)	Justification
Representativeness	**2**	**3**	**2**	
Typical structure and composition	2	3	2	EF, TL.3: Habitat has been affected by human activities (exotic-dominated treeland). TL.2: Habitat has been insignificantly affected by human activities.
Indigenous representation	2	3	2	EF, TL.3: 10-50% of the species are indigenous. TL.2: 50-90% of the species are indigenous.

Attributes to be considered	S1-EF (District Plan)	S1-TL.2 (District Plan)	S1-TL.3 (District Plan)	Justification
Rarity/distinctiveness	**4**	**4**	**4**	
Species of conservation significance	4	4	4	Some areas of District Plan EF, TL.2, TL.3 are located on the edges of larger habitat areas (EF, TL.2, TL.3) within the vicinity of confirmed bat presence (results of the April 2022 survey). Other areas of EF, TL.2, TL.3 in NoR S1 are isolated and not connected to any significant ecological pathways.
Distinctive ecological values	-	-	-	-
Diversity and pattern	**2**	**3**	**2**	
Habitat diversity	2	3	2	Increased habitat diversity in areas with indigenous species present: TL.2 Increased habitat diversity in areas with late succession: EF, TL.2, TL.3
Species diversity	2	3	2	Increased species diversity in areas with indigenous species present: TL.2 Increased species diversity in areas with late succession: EF, TL.2, TL.3
Patterns in habitat use	2	2	2	EF, TL.2, TL.3: habitat important for lifecycle completion or periodic habitat utilisation by native animal species on a Local scale (EF rated high due to potential utilisation by long-tailed bat and kākā).
Ecological context	2	2	2	
Size, shape and buffering	2	1	2	Some areas of District Plan EF, TL.2, TL.3 are located on the edges of larger habitat areas (EF, TL.2, TL.3), however the extent of District Plan TL.2 vegetation is small in the context of the NoR.
Sensitivity to change	-	2	-	TL.2: Late succession ecosystem. All other habitats are generally modified with no residual sensitive receptors.

Attributes to be considered	S1-EF (District Plan)	S1-TL.2 (District Plan)	S1-TL.3 (District Plan)	Justification
Ecological networks (linkages, pathways, migration)	2	2	2	EF, TL.2, and TL.3 are likely utilised by long-tailed bats.
Combined value	**M**	**M**	**M**	

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

6.2 NoR S2: SH16 Main Road Upgrade

Table 13-13 Assessment of ecological value for terrestrial ecology features for NoR S2

Attributes to be considered	S2-BF	S2-EG	S2-ES	S2-PL.1	S2-PL.3	S2-TL.2	S2-TL.3	S2-WF8	Justification
Representativeness	**1**	**1**	**2**	**4**	**2**	**3**	**2**	**4**	
Typical structure and composition	1	1	1	2	1	3	2	4	BF, EG, ES, PL.3: Habitats have been significantly altered by human activities (exotic dominated). TL.3: Habitat has been affected by human activities (exotic-dominated treeland). PL.1, TL.2: Habitat has been insignificantly affected by human activities. WF8: Habitat is unchanged from baseline conditions.
Indigenous representation	1	1	2	4	2	3	2	4	BF, EG: <10% of the species are indigenous. ES, PL.3, TL.3: 10-50% of the species are indigenous. TL.2: 50-90% of the species are indigenous. PL.1: >90% of the species are indigenous WF8: >90% of the species are indigenous.
Rarity/distinctiveness	**0**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	

Attributes to be considered	S2-BF	S2-EG	S2-ES	S2-PL.1	S2-PL.3	S2-TL.2	S2-TL.3	S2-WF8	Justification
Species of conservation significance	-	3	3	3	3	4	4	4	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (TL.2, TL.3, WF8). TAR bird species expected to be reliant on ecological features associated with the Project Area, seasonal use by kākā would score 3 (TL.2, TL.3, WF8). Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (EG, ES, PL.1, PL.3, TL.2, TL.3, WF8). Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (EG, ES, PL.1, PL.3, TL.2, TL.3, WF8).
Distinctive ecological values	-	1	1	2	1	3	1	3	BF: Habitat not playing an important role in provisional or regulatory ecosystem services at any scale EG, ES PL.3: Habitat playing an important role in provisional or regulatory ecosystem services typically on local scale PL.1, TL.2, TL.3: Habitat playing an important role in provisional or regulatory ecosystem services typically on Catchment scale TL.2, WF8: Habitat playing an important role in provisional or regulatory ecosystem services typically on a Regional scale.
Diversity and pattern	**1**	**1**	**1**	**2**	**1**	**3**	**3**	**4**	
Habitat diversity	-	1	1	1	1	3	1	4	Increased habitat diversity in areas with indigenous species present: PL.1, TL.2, WF8. Increased habitat diversity in areas with late succession: TL.2, TL.3, VS2, WF8.
Species diversity	1	1	1	2	1	3	1	3	Increased species diversity in areas with indigenous species present: PL.1, TL.2, WF8 Increased species diversity in areas with late succession: TL.2, TL.3, WF8. WF8 rated higher due to higher % indigenous species.

Attributes to be considered	S2-BF	S2-EG	S2-ES	S2-PL.1	S2-PL.3	S2-TL.2	S2-TL.3	S2-WF8	Justification
Patterns in habitat use	1	1	1	1	1	3	3	3	All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale. TL.2, TL.3, WF8 rated high due to potential utilisation by long-tailed bat and kākā).
Ecological context	**0**	**0**	**1**	**1**	**1**	**4**	**3**	**4**	
Size, shape and buffering	-	-	-	1	-	2	1	2	TL.2 is represented by an approximately 450m^2 shelterbelt along southern side of SH16. WF8 is represented by an approximately 700m^2 area that provides riparian buffering for stream S2-S4 in a highly urbanised area.
Sensitivity to change	-	-	-	-	-	4	-	4	WF8: Very high species diversity and delayed succession. TL.2: Late succession ecosystem. All other habitats are generally modified with no residual sensitive receptors.
Ecological networks (linkages, pathways, migration)	-	-	1	1	1	3	3	3	Woody structure (PL.1 and PL.3) and aged woody structure (TL.2, TL.3, WF8) increase steppingstone value (connecting other areas of ecological value).
Combined value	**N**	**L**	**L**	**M**	**L**	**H**	**M**	**VH**	

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

Table 13-14 Assessment of ecological value for terrestrial ecology features for NoR S2 (fauna)

Attributes to be considered	S2-Bat	S2-Non-TAR Bird	S2-Lizard	Justification
Representativeness	**0**	**2***	**0**	

Attributes to be considered	S2-Bat	S2-Non-TAR Bird	S2-Lizard	Justification
Typical structure and composition	-	-	-	-
Indigenous representation	-	2*	-	-
Rarity/distinctiveness	**4**	**2**	**3**	
Species of conservation significance (fauna only)	4	2	3	-
Species of conservation significance	-	-	-	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (TL.2, TL.3, WF8). Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (EG, ES, PL.1, PL.3, TL.2, TL.3, WF8). Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (EG, ES, PL.1, PL.3, TL.2, TL.3, WF8).
Distinctive ecological values	-	-	-	-
Diversity and pattern	**0**	**0**	**0**	
Habitat diversity	-	-	-	-
Species diversity	-	-	-	-
Patterns in habitat use	-	-	-	-
Ecological context	**0**	**2***	**0**	

Attributes to be considered	S2-Bat	S2-Non-TAR Bird	S2-Lizard	Justification
Size, shape and buffering	-	2*	-	-
Sensitivity to change	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-
Combined value	**VH**	**L**	**H**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Moderate' combined value.

Table 13-15 Assessment of ecological value for terrestrial ecology features for NoR S2 (TAR birds)

Attributes to be considered	S2-TAR Bird (Terrestrial - Moderate Value)	S2-TAR Bird (Terrestrial - High Value)	S2-TAR Bird (Terrestrial - Very High Value)	S2-TAR Bird (Wetland - Moderate Value)	S2-TAR Bird (Wetland - High Value)	S2-TAR Bird (Wetland - Very High Value)	Justification
Representativeness	**3***	**0**	**0**	**3***	**0**	**0**	
Typical structure and composition	3*	-	-	3*	-	-	-
Indigenous representation	-	-	-	-	-	-	-
Rarity/distinctiveness	**0**	**3**	**3**	**0**	**3**	**3**	
Species of conservation	-	3	4	-	3	4	Terrestrial (Moderate): North Island kākā Terrestrial (High): New Zealand pipit

Attributes to be considered	S2-TAR Bird (Terrestrial - Moderate Value)	S2-TAR Bird (Terrestrial - High Value)	S2-TAR Bird (Terrestrial - Very High Value)	S2-TAR Bird (Wetland - Moderate Value)	S2-TAR Bird (Wetland - High Value)	S2-TAR Bird (Wetland - Very High Value)	Justification
significance (fauna only)							Terrestrial (Very High): long-tailed cuckoo Wetland (Moderate): little black shag, pied shag Wetland (High): banded rail, North Island fernbird, spotless crake Wetland (Very High): brown teal, dabchick
Species of conservation significance	-	-	-	-	-	-	-
Distinctive ecological values	-	-	-	-	-	-	-
Diversity and pattern	**3***	**0**	**0**	**3***	**0**	**0**	
Habitat diversity	3*	-	-	3*	-	-	-
Species diversity	-	-	-	-	-	-	-
Patterns in habitat use	-	-	-	-	-	-	-
Ecological context	**3***	**0**	**0**	**3***	**0**	**0**	
Size, shape and buffering	3*	-	-	3*	-	-	
Sensitivity to change	-	-	-	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-	-	-	-

Attributes to be considered	S2-TAR Bird (Terrestrial - Moderate Value)	S2-TAR Bird (Terrestrial - High Value)	S2-TAR Bird (Terrestrial - Very High Value)	S2-TAR Bird (Wetland - Moderate Value)	S2-TAR Bird (Wetland - High Value)	S2-TAR Bird (Wetland - Very High Value)	Justification
Combined value	**M**	**H**	**VH**	**M**	**H**	**VH**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Moderate' combined value.

Table 13-16 Assessment of ecological value for terrestrial ecology features for NoR S2 (District Plan vegetation)

Attributes to be considered	S2-TL.3 (District Plan)	S2-WF8 (District Plan)	S2-Notable Tree	Justification
Representativeness	**2**	**3**	**1**	
Typical structure and composition	2	2	1	-
Indigenous representation	1	3	1	-
Rarity/distinctiveness	**1**	**2**	**0**	
Species of conservation significance	1	2	-	Areas of TL.3 are small, isolated and in suburban areas. One patch of TL.3 is riparian vegetation along a stream (S2-S6) on Riverhead Road, located adjacent to a main road (SH16) and an urban area, therefore unlikely to be utilised by bats. Area of WF8 loss is very small in extent, however it is associated with permanent stream S2-S4 (high ecological value stream). Located

Attributes to be considered	S2-TL.3 (District Plan)	S2-WF8 (District Plan)	S2-Notable Tree	Justification
				adjacent to a main road (SH16) and an urban area, therefore unlikely to be utilised by bats. The current conservation status of kahikatea is 'Not Threatened'.
Distinctive ecological values	1	1	-	-
Diversity and pattern	**1**	**2**	**0**	
Habitat diversity	1	1	-	-
Species diversity	1	2	-	-
Patterns in habitat use	1	2	-	-
Ecological context	**1**	**1**	**0**	
Size, shape and buffering		1	-	-
Sensitivity to change	-	1	-	-
Ecological networks (linkages, pathways, migration)	1	1		-
Combined value	**L**	**L**	**N**	

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

6.3 NoR S3: Rapid Transit Corridor and Regional Active Mode Corridor

Table 13-17 Assessment of ecological value for terrestrial ecology features for NoR S3

Attributes to be considered	S3-BF	S3-EF.1	S3-EF.2	S3-EG	S3-ES	S3-PL.1	S3-PL.3	S3-TL.2	S3-TL.3	S3-WF8	Justification
Representativeness	1	3	2	1	2	4	2	3	2	4	
Typical structure and composition	1	2	1	1	1	2	1	3	2	4	BF, EF.2, EG, ES, PL.3: Habitats have been significantly altered by human activities (exotic dominated). EF.1, TL.3: Habitat has been affected by human activities (exotic-dominated treeland). PL.1, TL.2: Habitat has been insignificantly affected by human activities. WF8: Habitat is unchanged from baseline conditions.
Indigenous representation	1	3	2	1	2	4	2	3	2	4	BF, EG: <10% of the species are indigenous. EF.2, ES, PL.3, TL.3: 10-50% of the species are indigenous. EF.1, TL.2: 50-90% of the species are indigenous. PL.1, WF8: >90% of the species are indigenous.
Rarity/distinctiveness	**0**	**4**	**4**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	
Species of conservation significance	-	4	4	3	3	3	3	4	4	4	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (EF.1, EF.2, TL.2, TL.3, WF8). Pied shag (At Risk - Recovering) observed at 14 Brigham Creek Road, adjacent to Totara Creek (W3-S1), likely reliant on mangrove system adjacent to Totara Creek (W3-S1) which is outside of designation boundary, rather than reliant on ES. Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (EF.1, EF.2, EG, ES, PL.1, PL.3, TL.2, TL.3, WF8).

Attributes to be considered	S3-BF	S3-EF.1	S3-EF.2	S3-EG	S3-ES	S3-PL.1	S3-PL.3	S3-TL.2	S3-TL.3	S3-WF8	Justification
											Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (EF1, EF.2, EG, ES, PL.1, PL.3, TL.2, TL.3, WF8)
Distinctive ecological values	-	2	2	1	1	2	1	3	1	3	Scoring reflects value for native animal species (excluding TAR species).
Diversity and pattern	**1**	**3**	**3**	**1**	**1**	**2**	**1**	**3**	**3**	**4**	
Habitat diversity	-	2	2	1	1	1	1	3	1	4	Increased habitat diversity in areas with indigenous species present: EF.1, PL.1, TL.2, WF8. Increased habitat diversity in areas with late succession: EF.1, EF.2, TL.2, TL.3, WF8.
Species diversity	1	2	1	1	1	2	1	3	1	3	Increased species diversity in areas with indigenous species present: EF.1, PL.1, TL.2, WF8. Increased species diversity in areas with late succession: EF.1, EF.2, TL.2, TL.3, WF8. WF8 rated higher due to higher % indigenous species.
Patterns in habitat use	1	3	3	1	1	1	1	3	3	3	TL.2, TL.3, WF8: habitat important for lifecycle completion or periodic habitat utilisation by native animal species on a Local scale (EF.1 and EF.2 rated high due to potential utilisation by long-tailed bat and kākā). All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale.
Ecological context	**0**	**3**	**3**	**0**	**1**	**1**	**1**	**4**	**3**	**4**	
Size, shape and buffering	-	1	1	-	-	1	1	2	1	2	TL.2 is represented by an approximately 450m^2 shelterbelt along southern side of SH16. WF8 is represented by an approximately 700m^2 area that provides riparian buffering for stream S2-S4 in a highly urbanised area.

Attributes to be considered	S3-BF	S3-EF.1	S3-EF.2	S3-EG	S3-ES	S3-PL.1	S3-PL.3	S3-TL.2	S3-TL.3	S3-WF8	Justification
Sensitivity to change	-	-	-	-	-	-	-	4	-	4	WF8: Very high species diversity and delayed succession. TL.2: Late succession ecosystem. All other habitats are generally modified with no residual sensitive receptors.
Ecological networks (linkages, pathways, migration)	-	3	3	-	1	1	1	3	3	3	Woody structure (PL.1 and PL.3) and aged woody structure (EF.1, EF.2, TL.2, TL.3, WF8) increase stepping stone value (connecting other areas of ecological value). TL.2 and TL.3 along Kumeu River (S1-S17) and Pakinui Stream (S1-S18) important ecological network for long-tailed bats (bats confirmed at ABM2).
Combined value	**N**	**H**	**M**	**L**	**L**	**M**	**L**	**H**	**M**	**VH**	

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

Table 13-18 Assessment of ecological value for terrestrial ecology features for NoR S3 (fauna)

Attributes to be considered	S3-Bat	S3-Non-TAR Bird	S3-Lizard	Justification
Representativeness	**0**	**2***	**0**	
Typical structure and composition	-	-	-	-
Indigenous representation	-	2*	-	-
Rarity/distinctiveness	**4**	**2**	**3**	

Attributes to be considered	S3-Bat	S3-Non-TAR Bird	S3-Lizard	Justification
Species of conservation significance (fauna only)	4	2	3	-
Species of conservation significance	-	-	-	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (EF.1, EF.2, TL.2, TL.3, WF8). Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (EF.1, EF.2, EG, ES, PL.1, PL.3, TL.2, TL.3, WF8). Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (EF.1, EF.2, EG, ES, PL.1, PL.3, TL.2, TL.3, WF8)
Distinctive ecological values	-	-	-	-
Diversity and pattern	**0**	**0**	**0**	
Habitat diversity	-	-	-	-
Species diversity	-	-	-	-
Patterns in habitat use	-	-	-	-
Ecological context	**0**	**2***	**0**	
Size, shape and buffering	-	2*	-	-
Sensitivity to change	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-

Attributes to be considered	S3-Bat	S3-Non-TAR Bird	S3-Lizard	Justification
Combined value	**VH**	**L**	**H**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Moderate' combined value.

Table 13-19 Assessment of ecological value for terrestrial ecology features for NoR S3 (TAR birds)

Attributes to be considered	S3-TAR Bird (Terrestrial - Moderate Value)	S3-TAR Bird (Terrestrial - High Value)	S3-TAR Bird (Terrestrial - Very High Value)	S3-TAR Bird (Wetland - Moderate Value)	S3-TAR Bird (Wetland - High Value)	S3-TAR Bird (Wetland - Very High Value)	Justification
Representativeness	**3***	**0**	**0**	**3***	**0**	**0**	
Typical structure and composition	3*	-	-	3*	-	-	-
Indigenous representation	-	-	-	-	-	-	-
Rarity/distinctiveness	**0**	**3**	**3**	**0**	**3**	**3**	
Species of conservation significance (fauna only)	-	3	4	-	3	4	Terrestrial (Moderate): North Island kākā Terrestrial (High): New Zealand pipit Terrestrial (Very High): long-tailed cuckoo Wetland (Moderate): little black shag, pied shag Wetland (High): banded rail, North Island fernbird, spotless crake Wetland (Very High): brown teal, dabchick

Attributes to be considered	S3-TAR Bird (Terrestrial - Moderate Value)	S3-TAR Bird (Terrestrial - High Value)	S3-TAR Bird (Terrestrial - Very High Value)	S3-TAR Bird (Wetland - Moderate Value)	S3-TAR Bird (Wetland - High Value)	S3-TAR Bird (Wetland - Very High Value)	Justification
Species of conservation significance	-	-	-	-	-	-	-
Distinctive ecological values	-	-	-	-	-	-	-
Diversity and pattern	**3***	**0**	**0**	**3***	**0**	**0**	
Habitat diversity	3*	-	-	3*	-	-	-
Species diversity	-	-	-	-	-	-	-
Patterns in habitat use	-	-	-	-	-	-	-
Ecological context	**3***	**0**	**0**	**3***	**0**	**0**	
Size, shape and buffering	3*	-	-	3*	-	-	
Sensitivity to change	-	-	-	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-	-	-	-
Combined value	**M**	**H**	**VH**	**M**	**H**	**VH**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce ‘Moderate’ combined value.

Table 13-20 Assessment of ecological value for terrestrial ecology features for NoR S3 (District Plan vegetation)

Attributes to be considered	S3-TL.3 (District Plan)	S3-WF8 (District Plan)	S3-Notable Tree (District Plan)	S3-Huapai Domain Trees (District Plan)	Justification
Representativeness	**2**	**3**	**1**	**1**	
Typical structure and composition	2	2	1	1	TL.3: Habitat has been affected by human activities (exotic-dominated treeland).
Indigenous representation	2	3	1	1	TL.3: 10-50% of the species are indigenous.
Rarity/distinctiveness	**3**	**2**	**0**	**3**	
Species of conservation significance	3	2	-	3	TL.3 (District Plan), area of TL.3 located at the southern end of Meryl Avenue part of larger area of TL.3 surrounding an exotic wetland/stream complex (S2-S1). Also located approximately 250 metres west of S2-S2 and associated TL.2 habitat. Long-tailed bats were not detected in this area during ABM survey. Non-TAR birds expected to utilise this area, TAR birds are expected to utilise this area but not be reliant. Other areas of TL.3 are small, isolated and located near roads or pasture. Area of WF8 loss is very small in extent, however it is associated with permanent stream S2-S4 (high ecological value stream). Located adjacent to a main road (SH16) and an urban area, therefore unlikely to be utilised by bats. The current conservation status of kahikatea is 'Not Threatened'. Notable tree is one mature exotic tree (eucalyptus) that is isolated and located on a main road. Huapai Domain trees are TL.3, isolated and along the northern side of the railway. Non-TAR birds are expected to utilise this area.
Distinctive ecological values	-	1	-	-	-
Diversity and pattern	**2**	**2**	**1**	**1**	

Attributes to be considered	S3-TL.3 (District Plan)	S3-WF8 (District Plan)	S3-Notable Tree (District Plan)	S3-Huapai Domain Trees (District Plan)	Justification
Habitat diversity	2	1	1	1	TL.3: Increased habitat diversity in areas with late succession.
Species diversity	2	2	1	1	TL3: Increased species diversity in areas with late succession.
Patterns in habitat use	2	2	1	1	TL.3: Habitat important for lifecycle completion or periodic habitat utilisation by native animal species on a Local scale.
Ecological context	**1**	**1**	**0**	**0**	
Size, shape and buffering	1	1	-	-	-
Sensitivity to change	-	1	-	-	Habitats are generally modified with no residual sensitive receptors.
Ecological networks (linkages, pathways, migration)	1	1	-	-	TL.3 likely utilised by TAR and Non-TAR bird species.
Combined value	**L**	**L**	**N**	**L**	

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

6.4 NoR KS: Kumeū Rapid Transit Station

Table 13-21 Assessment of ecological value for terrestrial ecology features for NoR KS

Attributes to be considered	KS-BF	KS-EG	KS-ES	KS-PL.1	KS-TL.2	KS-TL.3	Justification
Representativeness	**1**	**1**	**2**	**4**	**3**	**2**	
Typical structure and composition	1	1	1	2	2	2	BF, EG, ES: Habitats have been significantly altered by human activities (exotic dominated). TL.3: Habitat has been affected by human activities (exotic-dominated treeland). PL.1, TL.2: Habitat has been insignificantly affected by human activities.
Indigenous representation	1	1	2	4	3	2	BF, EG: <10% of the species are indigenous. ES, TL.3: 10-50% of the species are indigenous. TL.2: 50-90% of the species are indigenous. PL.1: >90% of the species are indigenous.
Rarity/distinctiveness	**0**	**3**	**3**	**3**	**4**	**2**	
Species of conservation significance	-	3	3	3	4	2	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (TL.2). Long-tailed bats unlikely to use TL.3 in the context of NoR KS. Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (EG, ES, PL.1, TL.2, TL.3). Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (EG, ES, PL.1, TL.2, TL.3).
Distinctive ecological values	-	1	1	2	3	1	Scoring reflects value for native species (excluding TAR species).
Diversity and pattern	**1**	**1**	**1**	**2**	**3**	**2**	

Attributes to be considered	KS-BF	KS-EG	KS-ES	KS-PL.1	KS-TL.2	KS-TL.3	Justification
Habitat diversity	-	1	1	1	2	2	Increased habitat diversity in areas with indigenous species present: PL.1 Increased habitat diversity in areas with late succession: TL.2, TL.3
Species diversity	1	1	1	2	2	1	Increased species diversity in areas with indigenous species present: PL.1, TL.2 Increased species diversity in areas with late succession: TL.3
Patterns in habitat use	1	1	1	1	3	2	TL.2, TL.3: habitat important for lifecycle completion or periodic habitat utilisation by native animal species on a Local scale. TL.3 in the context of NoR KS is small and isolated. All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale.
Ecological context	**0**	**0**	**0**	**1**	**4**	**0**	
Size, shape and buffering	-	-	-	-	-	-	Habitat areas small in size within NoR boundary.
Sensitivity to change	-	-	-	-	4	-	TL.2: Late succession ecosystem. All other habitats are generally modified with no residual sensitive receptors.
Ecological networks (linkages, pathways, migration)	-	-	-	1	2	-	Woody structure (PL.1) and aged woody structure (TL.2, TL.3) increase steppingstone value (connecting other areas of ecological value). TL.3 in the context of NoR KS is small and isolated from ecological networks. TL.2 serves as riparian vegetation around S2-S4.
Combined value	**N**	**L**	**L**	**M**	**H**	**L**	

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

Table 13-22 Assessment of ecological value for terrestrial ecology features for NoR KS (fauna)

Attributes to be considered	KS-Bat	KS-Non-TAR Bird	KS-Lizard	KS-TAR Bird (Terrestrial – Very High Value)	KS-TAR Bird (Terrestrial - High Value)	KS-TAR Bird (Terrestrial - Moderate Value)	KS-TAR Bird (Wetland – Very High Value)	KS-TAR Bird (Wetland - High Value)	KS-TAR Bird (Wetland - Moderate Value)	Justification
Representativeness	**0**	**2***	**0**	**0**	**0**	**3***	**0**	**0**	**3***	
Typical structure and composition	-	-	-	-	-	3*	-	-	3*	-
Indigenous representation	-	2*	-	-	-	-	-	-	-	-
Rarity/ distinctiveness	**4**	**2**	**3**	**4**	**3**	**0**	**4**	**3**	**0**	
Species of conservation significance (fauna only)	4	2	3	4	3	-	4	3	-	-
Species of conservation significance	-	-	-	-	-	-	-	-	-	-
Distinctive ecological values	-	-	-	-	-	-	-	-	-	-
Diversity and pattern	**0**	**2***	**0**	**0**	**0**	**3***	**0**	**0**	**3***	
Habitat diversity	-	2*	-	-	-	3*	-	-	3*	-
Species diversity	-	-	-	-	-	-	-	-	-	-

Attributes to be considered	KS-Bat	KS-Non-TAR Bird	KS-Lizard	KS-TAR Bird (Terrestrial – Very High Value)	KS-TAR Bird (Terrestrial - High Value)	KS-TAR Bird (Terrestrial - Moderate Value)	KS-TAR Bird (Wetland – Very High Value)	KS-TAR Bird (Wetland - High Value)	KS-TAR Bird (Wetland - Moderate Value)	Justification
Patterns in habitat use	-	-	-	-	-	-	-	-	-	-
Ecological context	**0**	**0**	**0**	**0**	**0**	**3***	**0**	**0**	**3***	
Size, shape and buffering	-	-	-	-	-	3*	-	-	3*	-
Sensitivity to change	-	-	-	-	-	-	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-	-	-	-	-	-	-
Combined value	**VH**	**L**	**H**	**VH**	**H**	**M**	**VH**	**H**	**M**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Low' or 'Moderate' combined value.

6.5 NoR HS: Huapai Rapid Transit Station

Table 13-23 Assessment of ecological value for terrestrial ecology features for NoR HS

Attributes to be considered	HS-BF	HS-EG	HS-ES	HS-PL.1	HS-PL.3	HS-TL.2	HS-TL.3	Justification
Representativeness	**1**	**1**	**2**	**4**	**2**	**3**	**2**	
Typical structure and composition	1	1	1	2	1	2	2	BF, EG, ES, PL.3: Habitats have been significantly altered by human activities (exotic dominated). TL.3: Habitat has been affected by human activities (exotic-dominated treeland). PL.1, TL.2: Habitat has been insignificantly affected by human activities.
Indigenous representation	1	1	2	4	2	3	2	BF, EG: <10% of the species are indigenous. ES, PL.3, TL.3: 10-50% of the species are indigenous. TL.2: 50-90% of the species are indigenous. PL.1: >90% of the species are indigenous.
Rarity/distinctiveness	**0**	**3**	**3**	**3**	**3**	**4**	**4**	
Species of conservation significance	-	3	3	3	3	4	4	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (TL.2, TL.3). Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (EG, ES, PL.1, PL.3, TL.2, TL.3). Copper skink (At Risk - Declining, value score 3) likely to utilise ecological features within the Project Area (EG, ES, PL.1, PL.3, TL.2, TL.3).
Distinctive ecological values	-	1	1	2	1	3	1	Scoring reflects value for native species (excluding TAR species).
Diversity and pattern	**1**	**1**	**1**	**2**	**1**	**3**	**3**	

Attributes to be considered	HS-BF	HS-EG	HS-ES	HS-PL.1	HS-PL.3	HS-TL.2	HS-TL.3	Justification
Habitat diversity	-	1	1	1	1	2	2	Increased habitat diversity in areas with indigenous species present: PL.1 Increased habitat diversity in areas with late succession: TL.2, TL.3
Species diversity	1	1	1	2	1	2	1	Increased species diversity in areas with indigenous species present: PL.1, TL.2 Increased species diversity in areas with late succession: TL.3
Patterns in habitat use	1	1	1	1	1	3	3	TL.2, TL.3: habitat important for lifecycle completion or periodic habitat utilisation by native animal species on a Local scale. All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale.
Ecological context	**0**	**0**	**0**	**1**	**1**	**4**	**2**	
Size, shape and buffering	-	-	-	-	-	-	-	Habitat areas small in size within NoR boundary.
Sensitivity to change	-	-	-	-	-	4	-	TL.2: Late succession ecosystem. All other habitats are generally modified with no residual sensitive receptors.
Ecological networks (linkages, pathways, migration)	-	-	-	1	1	2	2	Woody structure (PL.1 and PL.3) and aged woody structure (TL.2, TL.3) increase steppingstone value (connecting other areas of ecological value).
Combined value	**N**	**L**	**L**	**M**	**L**	**H**	**M**	

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

Table 13-24 Assessment of ecological value for terrestrial ecology features for NoR HS (fauna)

Attributes to be considered	HS-Bat	HS-Non-TAR Bird	HS-Lizard	HS-TAR Bird (Terrestrial – Very High Value)	HS-TAR Bird (Terrestrial - High Value)	HS-TAR Bird (Terrestrial - Moderate Value)	HS-TAR Bird (Wetland – Very High Value)	HS-TAR Bird (Wetland - High Value)	HS-TAR Bird (Wetland - Moderate Value)	Justification
Representativeness	**0**	**2***	**0**	**0**	**0**	**3***	**0**	**0**	**3***	
Typical structure and composition	-	-	-	-	-	3*	-	-	3*	-
Indigenous representation	-	2*	-	-	-	-	-	-	-	-
Rarity/distinctiveness	**4**	**2**	**3**	**4**	**3**	**0**	**4**	**3**	**0**	
Species of conservation significance (fauna only)	4	2	3	4	3	-	4	3	-	-
Species of conservation significance	-	-	-	-	-	-	-	-	-	-
Distinctive ecological values	-	-	-	-	-	-	-	-	-	-
Diversity and pattern	**0**	**2***	**0**	**0**	**0**	**3***	**0**	**0**	**3***	
Habitat diversity	-	2*	-	-	-	3*	-	-	3*	-
Species diversity	-	-	-	-	-	-	-	-	-	-
Patterns in habitat use	-	-	-	-	-	-	-	-	-	-
Ecological context	**0**	**0**	**0**	**0**	**0**	**3***	**0**	**0**	**3***	

Attributes to be considered	HS-Bat	HS-Non-TAR Bird	HS-Lizard	HS-TAR Bird (Terrestrial – Very High Value)	HS-TAR Bird (Terrestrial - High Value)	HS-TAR Bird (Terrestrial - Moderate Value)	HS-TAR Bird (Wetland – Very High Value)	HS-TAR Bird (Wetland - High Value)	HS-TAR Bird (Wetland - Moderate Value)	Justification
Size, shape and buffering	-	-	-	-	-	3*	-	-	3*	-
Sensitivity to change	-	-	-	-	-	-	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-	-	-	-	-	-	-
Combined value	**VH**	**L**	**H**	**VH**	**H**	**M**	**VH**	**H**	**M**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Low' or 'Moderate' combined value.

Table 13-25 Assessment of ecological value for terrestrial ecology features for NoR HS (District Plan vegetation)

Attributes to be considered	HS-TL.3 (District Plan)	Justification
Representativeness	**2**	
Typical structure and composition	2	TL.3: Habitat has been affected by human activities (exotic-dominated treeland).
Indigenous representation	2	TL.3: 10-50% of the species are indigenous.
Rarity/distinctiveness	**2**	

Attributes to be considered	HS-TL.3 (District Plan)	Justification
Species of conservation significance		
Species of conservation significance	2	TL.3 (District Plan), area of TL.3 located at the southern end of Meryl Avenue part of larger area of TL.3 surrounding an exotic wetland/stream complex (S2-S1). Also located approximately 250 metres west of S2-S2 and associated TL.2 habitat. Long-tailed bats were not detected in this area during ABM survey. Non-TAR birds expected to utilise this area. Potential for TAR birds to visit the area, but not frequently.
Distinctive ecological values		
Diversity and pattern	**2**	
Habitat diversity	2	TL.3: Increased habitat diversity in areas with late succession.
Species diversity	2	TL3: Increased species diversity in areas with late succession.
Patterns in habitat use	2	TL.3: Habitat important for lifecycle completion or periodic habitat utilisation by native animal species on a Local scale.
Ecological context	**1**	
Size, shape and buffering	1	
Sensitivity to change	1	Habitats are generally modified with no residual sensitive receptors.
Ecological networks (linkages, pathways, migration)	1	TL.3 likely utilised by TAR and Non-TAR bird species.
Combined value	**L**	

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

6.6 NoR S4: Access Road Upgrade

Table 13-26 Assessment of ecological value for terrestrial ecology features for NoR S4

Attributes to be considered	S4-BF	S4-EG	S4-ES	S4-PL.1	S4-PL.2	S4-PL.3	S4-TL.3	S4-Bat	S4-Non-TAR Bird	S4-Lizard	Justification
Representativeness	**1**	**1**	**2**	**4**	**4**	**2**	**2**	**0**	**2**	**0**	
Typical structure and composition	1	1	1	2	2	1	1	-	2	-	BF, EG, ES, PL.3, TL3: 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	1	2	4	4	2	2	-	-	-	BF, EG: <10% of the species are indigenous. ES, PL.3, TL.3: 10-50% of the species are indigenous. PL.1, PL.2: >90% of the species are indigenous.
Rarity/distinctiveness	**0**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**2**	**3**	
Species of conservation significance (fauna only)	-	-	-	-	-	-	-	4	2	3	-
Species of conservation significance	-	3	3	3	3	3	4	-	-	-	Long-tailed bat (Threatened – Nationally Critical, value score of 4) present and potentially using ecological features associated with the Project Area (TL.3). TAR bird species expected to be reliant on ecological features associated with the Project Area, seasonal use by kākā would score 3 (PL.2 and TL.3). Not Threatened native birds (value score of 2) likely to utilise ecological features within the Project Area (EG, ES, PL.1, PL.2, PL.3, TL.3). Copper skink (At Risk - Declining, value score 3) likely to

Attributes to be considered	S4-BF	S4-EG	S4-ES	S4-PL.1	S4-PL.2	S4-PL.3	S4-TL.3	S4-Bat	S4-Non-TAR Bird	S4-Lizard	Justification
											utilise ecological features within the Project Area (EG, ES, PL.1, PL.2, PL.3, TL.3).
Distinctive ecological values	-	1	1	2	2	1	2	-	-	-	BF: Habitat not playing an important role in provisional or regulatory ecosystem services at any scale EG, ES PL.3: Habitat playing an important role in provisional or regulatory ecosystem services typically on local scale TL.3, PL.1, PL.2: Habitat playing an important role in provisional or regulatory ecosystem services typically on Catchment scale
Diversity and pattern	**1**	**1**	**1**	**2**	**2**	**1**	**2**	**0**	**0**	**0**	
Habitat diversity	-	1	1	1	2	1	2	-	-	-	Increased habitat diversity in areas with indigenous species present: PL.1, PL.2. Increased habitat diversity in areas with late succession: PL.2, TL.3.
Species diversity	-	1	1	2	2	1	2	-	-	-	Increased species diversity in areas with indigenous species present: PL.1, PL.2. Increased species diversity in areas with late succession: PL.2, TL.3.
Patterns in habitat use	1	1	1	1	2	1	2	-	-	-	PL.2, TL.3: habitat important for lifecycle completion or periodic habitat utilisation by native animal species on a Local scale. All other habitats are not important for lifecycle completion or periodic habitat utilisation on any scale.
Ecological context	**0**	**0**	**1**	**1**	**4**	**1**	**3**	**0**	**2**	**0**	
Size, shape and buffering	-	-	-	1	1	-	1	-	2	-	PL.2 is represented by a small shelterbelt located at 116 Access Road, approximately 350m^2.

Attributes to be considered	S4-BF	S4-EG	S4-ES	S4-PL.1	S4-PL.2	S4-PL.3	S4-TL.3	S4-Bat	S4-Non-TAR Bird	S4-Lizard	Justification
											Large area of TL.3 located at 116 Access Road which also provides riparian buffering for stream S4-S1.
Sensitivity to change	-	-	-	-	4	-	-	-	-	-	PL.2: High species diversity and late succession. All other habitats are generally modified with no residual sensitive receptors.
Ecological networks (linkages, pathways, migration)	-	-	1	1	3	1	3	-	-	-	Habitat is locally an important breeding and feeding link in terms of connectivity for the survival of species (e.g. native birds) ES, PL.1, PL.3 Habitat is regionally an important breeding and feeding link in terms of connectivity for the survival of species (woody structure (EF, EF.1, EF.2, PL.2) increase stepping stone value (connecting other areas of ecological value) Large area of TL.3 located at 116 Access Road and provides riparian buffering for stream S4-S1.
Combined value	**N**	**L**	**L**	**M**	**H**	**L**	**M**	**VH**	**L**	**H**	

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

Table 13-27 Assessment of ecological value for terrestrial ecology features for NoR S4 (TAR birds)

Attributes to be considered	S4-TAR Bird (Terrestrial - Moderate Value)	S4-TAR Bird (Terrestrial - High Value)	S4-TAR Bird (Terrestrial - Very High Value)	Justification
Representativeness	**3***	**0**	**0**	
Typical structure and composition	3*	-	-	-

Attributes to be considered	S4-TAR Bird (Terrestrial - Moderate Value)	S4-TAR Bird (Terrestrial - High Value)	S4-TAR Bird (Terrestrial - Very High Value)	Justification
Indigenous representation	-	-	-	-
Rarity/distinctiveness	**0**	**3**	**3**	
Species of conservation significance (fauna only)	-	3	4	Terrestrial (Moderate): North Island kākā Terrestrial (High): New Zealand pipit Terrestrial (Very High): long-tailed cuckoo Wetland (Moderate): little black shag, pied shag Wetland (High): banded rail, North Island fernbird, spotless crake Wetland (Very High): brown teal, dabchick
Species of conservation significance	-	-	-	-
Distinctive ecological values	-	-	-	-
Diversity and pattern	**3***	**0**	**0**	
Habitat diversity	3*	-	-	-
Species diversity	-	-	-	-
Patterns in habitat use	-	-	-	-
Ecological context	**3***	**0**	**0**	
Size, shape and buffering	3*	-	-	

Attributes to be considered	S4-TAR Bird (Terrestrial - Moderate Value)	S4-TAR Bird (Terrestrial - High Value)	S4-TAR Bird (Terrestrial - Very High Value)	Justification
Sensitivity to change	-	-	-	-
Ecological networks (linkages, pathways, migration)	-	-	-	-
Combined value	**M**	**H**	**VH**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Moderate' combined value.

Table 13-28 Assessment of ecological value for terrestrial ecology features for NoR S4 (District Plan vegetation)

Attributes to be considered	S4-TL.3 (District Plan)	Justification
Representativeness	**1**	
Typical structure and composition	1	-
Indigenous representation	1	-
Rarity/distinctiveness	**2**	
Species of conservation significance	2	TL.3 to be removed from edges of approximately 0.15km2 area of treelands that is known to be utilised by long-tailed bat (calls recorded at this location during the April 2022 ABM survey) and also provides hopover connection to S4-S1. However, large amount of trees have recently already been cleared in this area by private landowners (refer image on

Attributes to be considered	S4-TL.3 (District Plan)	Justification
		right), therefore unlikely that bats will be directly killed or injured by tree removal. Other areas of TL.3 in NoR S4 are isolated and not connected to any significant ecological pathways.
Distinctive ecological values	1	-
Diversity and pattern	**1**	
Habitat diversity	1	-
Species diversity	1	-
Patterns in habitat use	1	-
Ecological context	**1**	
Size, shape and buffering	-	-
Sensitivity to change	-	-
Ecological networks (linkages, pathways, migration)	1	-
Combined value	**L**	

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

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Table 13-29 Assessment of ecological value for aquatic ecology features (S1-S1 to S1-S8)

Attributes to be considered	S1-S1a	S1-S1b	S1-S1c	S1-S2	S1-S3	S1-S4	S1-S5	S1-S6	S1-S7	S1-S8	Justification
Representativeness	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	
Riparian habitat modification	2	2	2	1	1	1	2	1	1	1	S1-S1 (Ahukuramu Stream) RHA total score is 40-70% relative to reference. S1-S2 and S1-S3 RHA total scores are <40%. S1-S4, S1-S6, S1-S7 and S1-S8 riparian features have been significantly altered by agricultural/horticultural activities (desktop assessment). S1-S5 riparian features have been affected by agricultural/horticultural activities (desktop assessment).
Rarity/distinctiveness	**3**	**3**	**3**	**3**	**1**	**1**	**3**	**1**	**1**	**1**	
Species of conservation significance	3	3	3	3	1	1	3	1	1	1	Torrentfish (At Risk - Declining) (via desktop) and Īnanga (At Risk - Declining) and unidentified eels (onsite observations) identified in S1-S1 (Ahukuramu Stream). Longfin eel (At Risk - Declining) were identified via desktop in wider catchment and there is a high likelihood that this species utilises permanent streams (S1-S2 and S1-S5) in the area. Common native species were identified via desktop in wider catchment.
Diversity and pattern	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	
Level of natural diversity	2	2	2	1	1	1	2	1	1	2	S1-S1a instream RHA score = 23 S1-S1b instream RHA score = 22 S1-S1c instream RHA score = 17

Attributes to be considered	S1-S1a	S1-S1b	S1-S1c	S1-S2	S1-S3	S1-S4	S1-S5	S1-S6	S1-S7	S1-S8	Justification
											S1-S5 instream desktop proxy = SS, P, LO1, LG, perm S1-S8 instream desktop proxy = SS, P, LO1, MG, intermit Zero Order streams have low natural diversity.
Ecological context	**4**	**4**	**4**	**4**	**3**	**3**	**4**	**3**	**3**	**3**	
Stream order	3	3	3	1	1	1	2	1	1	2	S1-S1 (Ahukuramu Stream) is an Order 3 stream. S1-S5 & S1-S8 are Order 1 streams, all others are Zero Order streams.
Hydroperiod	4	4	4	4	3	3	4	3	3	3	S1-S1 (Ahukuramu Stream), S1-S2 and S1-S5 are permanent streams, all others are intermittent streams.
Combined value	**M**	**(M) H***	**M**	**M**	**L**	**L**	**M**	**L**	**L**	**L**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Combined ecological value has been increased irrespective of initial value scores due to the ecological context in relation to buffer function, connectivity to SEAs, and are considered to be important ecological corridors.

Table 13-30 Assessment of ecological value for aquatic ecology features (S1-S9 to S1-S18)

Attributes to be considered	S1-S9	S1-S10	S1-S11	S1-S13	S1-S14	S1-S15	S1-S16	S1-S17	S1-S18	Justification
Representativeness	**1**	**1**	**2**	**1**	**1**	**2**	**1**	**2**	**2**	
Riparian habitat modification	1	1	2	1	1	2	1	2	2	S1-S11 and S1-S17 (Kumeu River) RHA total scores are 40-70% relative to reference. S1-S9, S1-S10, S1-S12 and S1-S14 RHA total scores are <40% relative to reference.

Attributes to be considered	S1-S9	S1-S10	S1-S11	S1-S13	S1-S14	S1-S15	S1-S16	S1-S17	S1-S18	Justification
										S1-S13 and S1-S16 riparian features have been significantly altered by agricultural/horticultural activities (desktop assessment). S1-S15 and S1-S18 (Pakinui Stream) riparian features have been affected by agricultural/horticultural activities (including culverting at S1-S15) (desktop assessment).
Rarity/distinctiveness	**1**	**1**	**3**	**1**	**1**	**3**	**1**	**3**	**3**	
Species of conservation significance	1	1	3	1	1	3	1	3	3	Īnanga (At Risk - Declining), Longfin eel (At Risk - Declining) (via desktop), Echyridella menziesii (At Risk - Declining) (onsite observation) identified at S1-S17 (Kumeu River). Longfin eel (At Risk - Declining) were identified via desktop in wider catchment and there is a high likelihood that this species utilises permanent streams in the area - S1-S11, S1-S15, S1-S17 (Kumeu River) and S1-S18 (Pakinui Stream). Common native species were identified via desktop in wider catchment.
Diversity and pattern	**1**	**1**	**3**	**1**	**1**	**2**	**1**	**3**	**2**	
Level of natural diversity	1	1	3	1	1	2	1	3	2	S1-S11 instream RHA score = 26 S1-S15 instream desktop proxy = SS, P, MO2, LG, permanent S1-17 (Kumeu River) instream RHA score = 33 S1-S18 (Pakinui Stream) instream desktop proxy = SS, P, M02, LG, permanent Zero Order streams have low natural diversity.
Ecological context	**3**	**3**	**4**	**3**	**3**	**4**	**3**	**4**	**4**	
Stream order	1	1	2	1	1	3	1	4	3	S1-S17 (Kumeu River) is an Order 4 stream. S1-S18 (Pakinui Stream) is an Order 3 stream. S1-S15 is an Order 2 stream.

Attributes to be considered	S1-S9	S1-S10	S1-S11	S1-S13	S1-S14	S1-S15	S1-S16	S1-S17	S1-S18	Justification
										S1-S11 is an Order 1 stream. All others are Zero Order streams.
Hydroperiod	3	3	4	3	3	4	3	4	4	S1-S11, S1-S15, S1-S17 (Kumeu River) and S1-S18 (Pakinui Stream) are permanent streams, all others are intermittent streams.
Combined value	**L**	**L**	**M**	**L**	**L**	**M**	**L**	**(M) H***	**M**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Combined ecological value has been increased irrespective of initial value scores due to the ecological context in relation to buffer function, connectivity to SEAs, and are considered to be important ecological corridors.

Table 13-31 Assessment of ecological value for aquatic ecology features (S1-S19 to S1-S24)

Attributes to be considered	S1-S19	S1-S20a	S1-S20d	S1-S20e	S1-S21	S1-S22	S1-S23	S1-S24	Justification
Representativeness	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	
Riparian habitat modification	1	2	2	2	2	2	1	1	S1-S20a, S1-S20d, S1-S20e, S1-S21 and S1-S22 (Karure Stream) RHA scores are 40-70% relative to reference. S1-S19, S1-S23 and S1-S24 (Ngongetepara Stream) RHA total scores are <40% relative to reference.
Rarity/distinctiveness	**1**	**3**	**1**	**1**	**3**	**3**	**1**	**3**	

Attributes to be considered	S1-S19	S1-S20a	S1-S20d	S1-S20e	S1-S21	S1-S22	S1-S23	S1-S24	Justification
Species of conservation significance	1	3	1	1	3	3	1	3	Longfin eel (At Risk - Declining) (via desktop) identified at S1-S24 (Ngongetepara Stream). Longfin eel (At Risk - Declining) were identified via desktop in wider catchment and there is a high likelihood that this species utilises permanent streams in the area - S1-S20a, S1-S21, S1-S22 (Karure Stream) and S1-S24 (Ngongetepara Stream). Common native species were identified via desktop in wider catchment.
Diversity and pattern	**1**	**1**	**1**	**1**	**2**	**4**	**1**	**2**	
Level of natural diversity	1	1	1	1	2	4	1	2	S1-S20d instream RHA score = 12 S1-S21 instream RHA score = 15 S1-S22 (Karure Stream) instream RHA score = 38 S1-S24 (Ngongetepara Stream) instream RHA score = 16 Zero Order streams have low natural diversity.
Ecological context	**3**	**4**	**3**	**3**	**4**	**4**	**3**	**4**	
Stream order	1	1	2	1	2	2	1	3	S1-S24 (Ngongetepara Stream is an Order 3 stream. S1-S20d, S1-S21 and S1-S22 (Karure Stream) are Order 1 streams. All other streams are Zero Order.
Hydroperiod	3	4	3	3	4	4	3	4	S1-S20a, S1-S21, S1-S22 (Karure Stream) and S1-S24 (Ngongetepara Stream) are permanent streams, all others are intermittent streams.
Combined value	**L**	**M**	**L**	**L**	**M**	**H**	**L**	**(M) H***	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Combined ecological value has been increased irrespective of initial value scores due to the ecological context in relation to buffer function, connectivity to SEAs, and are considered to be important ecological corridors.

Table 13-32 Assessment of ecological value for aquatic ecology features (S1-S25 to S2-S6)

Attributes to be considered	S1-S25	S1-S26	S1-S27	S1-S28	S1-S29	S2-S1	S2-S2	S2-S3	S2-S4	S2-S5	S2-S6	Justification
Representativeness	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	
Riparian habitat modification	1	1	1	1	2	1	2	1	1	2	2	S2-S2, S2-S5 (Kumeu River) and S2-S6 RHA scores are 40-70% relative to reference. S1-S26, S1-S28, S2-S1, S2-S3 and S2-S4 RHA total scores <40% relative to reference. S1-S25 and S1-S27 riparian features have been significantly altered by agricultural/horticultural activities (desktop assessment). S1-S29: riparian features have been altered by human activities (desktop assessment).
Rarity/distinctiveness	**1**	**1**	**1**	**1**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	
Species of conservation significance	1	1	1	1	3	1	3	3	3	3	3	Īnanga (At Risk - Declining) and Longfin eel (At Risk - Declining) identified at S2-S5 (Kumeu River). Longfin eel (At Risk - Declining) were identified via desktop in wider catchment and there is a high likelihood that this species utilises permanent streams in the area - S2-S2 to S2-S6. S1-S29: Īnanga (At Risk - Declining) and Longfin eel (At Risk - Declining) (via desktop) identified upstream (Totara Creek). Common native species were identified via desktop in wider catchment.
Diversity and pattern	**2**	**1**	**1**	**1**	**2**	**1**	**3**	**1**	**2**	**2**	**2**	

Attributes to be considered	S1-S25	S1-S26	S1-S27	S1-S28	S1-S29	S2-S1	S2-S2	S2-S3	S2-S4	S2-S5	S2-S6	Justification
Level of natural diversity	2	1	1	1	2	1	3	1	2	2	2	S1-S25 instream desktop proxy = SS, P, LO1, LG, intermittent S1-S29 instream desktop proxy = SS, P, LO1, LG, intermittent. S2-S1 instream RHA score = 9 S2-S2 instream RHA score = 28 S2-S4 instream RHA score = 14 S2-S5 (Kumeu River) instream RHA score = 19 S2-S6 instream RHA score = 14 Zero Order streams have low natural diversity.
Ecological context	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	
Stream order	2	1	1	1	2	2	3	1	3	4	3	S2-S5 (Kumeu River) is an Order 4 stream. S2-S4 is an Order 3 stream. S2-S2 and S2-S6 are Order 2 streams. S1-S25, S1-S29, and S2-S1 are Order 1 streams. All other streams are Zero Order streams.
Hydroperiod	3	3	3	3	3	3	4	4	4	4	4	S2-S2 to S2-S6 are permanent streams, all others are intermittent streams.
Combined value	**L**	**L**	**L**	**L**	**M**	**L**	**M**	**M**	**H***	**H***	**M**	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Combined ecological value has been increased irrespective of initial value scores due to the ecological context in relation to buffer function, connectivity to SEAs, and are considered to be important ecological corridors. Additionally, S2-S4 is considered to be of high cultural value.

Table 13-33 Assessment of ecological value for aquatic ecology features for (S4-S1, W3-S1, and W4-S1)

Attributes to be considered	S4-S1	W3-S1	W4-S1	Justification
Representativeness	**2**	**2**	**3**	
Riparian habitat modification	2	2	3	S4-S1 RHA score is 40-70% relative to reference. W3-S1 RHA score is 40-70% relative to reference. Riparian features of streams W4-S1 have been insignificantly affected by human activities.
Rarity/distinctiveness	**3**	**3**	**3**	
Species of conservation significance	3	3	3	Longfin eel (At Risk - Declining) was identified via desktop in wider catchment and there is a high likelihood that this species utilises S4-S1 in the area. Īnanga (At Risk - Declining) and Longfin eel (At Risk - Declining) (via desktop) identified at W3-S1 and W4-S1. Common native species were identified via desktop in wider catchment.
Diversity and pattern	**2**	**2**	**2**	
Level of natural diversity	2	2	2	S4-S1 instream RHA score = 21 W3-S1 instream RHA score = 24

Attributes to be considered	S4-S1	W3-S1	W4-S1	Justification
				W4-S1 is an Order 3 stream.
Ecological context	**4**	**4**	**4**	
Stream order	3	3	3	S4-S1 is an Order 3 stream. W3-S1 (Totara Creek) is an Order 3 stream. W4-S1 is an Order 3 stream.
Hydroperiod	4	4	4	S4-S1 is a permanent stream. W3-S1 (Totara Creek) and W4-S1 are permanent streams.
Combined value	**M**	**(M) H***	**(M) H***	

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Combined ecological value has been increased irrespective of initial value scores due to the ecological context in relation to buffer function, connectivity to SEAs, and are considered to be important ecological corridors.

8 Appendix 8 – Wetland Value Assessment

Table 13-34 Assessment of ecological value for wetland ecology features (S1-W1 to S1-W10)

Attributes to be considered	S1-W1	S1-W2	S1-W3	S1-W4	S1-W5	S1-W6	S1-W7	S1-W8	S1-W9	S1-W10	Justification
Representativeness	**1**	**1**	**1**	**1**	**4**	**4**	**4**	**1**	**1**	**4**	
Hydrological modification	1	1	1	1	4	4	4	1	1	4	-
Rarity/distinctiveness	**1**	**1**	**1**	**1**	**2**	**2**	**4**	**1**	**1**	**4**	
Species of conservation significance	1	1	1	1	2	2	2	1	1	2	S1-W5, S1-W6, S1-W7: potential spotless crake habitat.
Vegetation type of conservation significance	-	-	-	-	1	1	4	-	-	4	S1-W5, S1-W6: planted natives. S1-W7, S1-W10: WL11 (critically endangered *machaerina* sedgeland).
Diversity and pattern	**1**	**2**	**1**	**4**	**4**	**4**	**2**	**1**	**2**	**4**	
Diversity of habitat types	1	2	1	4	4	4	2	1	2	4	-
Ecological context	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2**	**4**	
Flood attenuation	1	2	1	2	2	2	1	1	1	2	-
Streamflow augmentation	1	2	1	2	2	2	2	1	1	4	-
Sediment trapping	1	2	1	2	2	2	1	1	1	2	-

Attributes to be considered	S1-W1	S1-W2	S1-W3	S1-W4	S1-W5	S1-W6	S1-W7	S1-W8	S1-W9	S1-W10	Justification
Water purification	2	2	2	3	3	3	1	2	2	3	-
Combined value	**L**	**L**	**L**	**M**	**H**	**H**	**M**	**L**	**L**	**VH**	

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

Table 13-35 Assessment of ecological value for wetland ecology features (S1-W11 to S1-W20)

Attributes to be considered	S1-W11	S1-W12	S1-W13	S1-W14	S1-W15	S1-W16	S1-W17	S1-W18	S1-W19	S1-W20	Justification
Representativeness	**4**	**1**	**1**	**1**	**4**	**1**	**1**	**1**	**4**	**1**	
Hydrological modification	4	1	1	1	4	1	1	1	4	1	-
Rarity/distinctiveness	**4**	**1**	**1**	**1**	**4**	**2**	**1**	**1**	**4**	**1**	
Species of conservation significance	2	1	1	1	2	2	1	1	2	1	-
Vegetation type of conservation significance	4	-	-	-	4	-	-	-	4	-	S1-W11, S1-W15, S1-W19: WL11 (critically endangered *machaerina* sedgeland).
Diversity and pattern	**4**	**2**	**3**	**3**	**4**	**4**	**2**	**4**	**4**	**4**	
Diversity of habitat types	4	2	3	3	4	4	2	4	4	4	-

Attributes to be considered	S1-W11	S1-W12	S1-W13	S1-W14	S1-W15	S1-W16	S1-W17	S1-W18	S1-W19	S1-W20	Justification
Ecological context	**3**	**3**	**3**	**3**	**3**	**4**	**2**	**3**	**3**	**4**	
Flood attenuation	2	1	1	1	2	3	1	2	3	3	-
Streamflow augmentation	3	3	2	2	3	4	2	3	3	3	-
Sediment trapping	2	1	3	3	2	2	2	2	3	3	-
Water purification	3	2	2	2	3	2	2	3	3	4	-
Combined value	**H**	**L**	**L**	**L**	**H**	**M**	**L**	**M**	**H**	**M**	

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

Table 13-36 Assessment of ecological value for wetland ecology features (S1-W31 to S1-W40)

Attributes to be considered	S1-W31	S1-W32	S1-W33	S1-W34	S1-W36	S1-W37	S1-W38	S1-W39	S1-W40	Justification
Representativeness	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**4**	
Hydrological modification	1	1	1	1	1	1	1	1	4	-
Rarity/distinctiveness	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**4**	
Species of conservation significance	1	1	1	1	1	1	1	1	2	-

Attributes to be considered	S1-W31	S1-W32	S1-W33	S1-W34	S1-W36	S1-W37	S1-W38	S1-W39	S1-W40	Justification
Vegetation type of conservation significance	-	-	-	-	-	-	-	-	4	S1-W40: WL11 (critically endangered *machaerina* sedgeland).
Diversity and pattern	**1**	**4**	**2**	**2**	**1**	**1**	**3**	**3**	**3**	
Diversity of habitat types	1	4	2	2	1	1	3	3	3	-
Ecological context	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	
Flood attenuation	1	3	1	1	1	1	2	2	2	-
Streamflow augmentation	2	3	2	1	1	2	1	2	2	-
Sediment trapping	1	1	2	2	1	1	3	2	2	-
Water purification	2	3	2	2	2	2	2	2	2	-
Combined value	**L**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**H**	

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

Table 13-37 Assessment of ecological value for wetland ecology features (S1-W41 to S1-W50)

Attributes to be considered	S1-W41	S1-W42	S1-W43	S1-W44	S1-W45	S1-W46	S1-W47	S1-W48	S1-W49	S1-W50	Justification
Representativeness	**1**	**1**	**1**	**4**	**1**	**1**	**1**	**1**	**1**	**1**	
Hydrological modification	1	1	1	4	1	1	1	1	1	1	-
Rarity/distinctiveness	**1**	**1**	**2**	**4**	**2**	**2**	**1**	**1**	**1**	**1**	
Species of conservation significance	1	1	2	1	2	2	1	1	1	1	S1-W43, S1-W45, S1-W46: Potential for spotless crake and dabchick.
Vegetation type of conservation significance	-	-	-	4	-	-	-	-	-	-	S1-W44: WL11 (critically endangered *machaerina* sedgeland).
Diversity and pattern	**4**	**3**	**2**	**2**	**1**	**4**	**3**	**1**	**1**	**3**	
Diversity of habitat types	4	3	2	2	1	4	3	1	1	3	-
Ecological context	**3**	**2**	**2**	**2**	**2**	**4**	**3**	**1**	**1**	**2**	
Flood attenuation	2	2	1	1	1	4	2	1	1	2	-
Streamflow augmentation	3	1	2	2	2	4	3	1	1	2	-
Sediment trapping	3	2	2	2	2	3	3	1	1	2	-
Water purification	3	2	2	2	2	3	2	1	1	2	-

Attributes to be considered	S1-W41	S1-W42	S1-W43	S1-W44	S1-W45	S1-W46	S1-W47	S1-W48	S1-W49	S1-W50	Justification
Combined value	**M**	**L**	**L**	**M**	**L**	**M**	**L**	**N**	**N**	**L**	

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

Table 13-38 Assessment of ecological value for wetland ecology features (S1-W51 to S1-W60)

Attributes to be considered	S1-W51	S1-W53	S1-W54	S1-W55	S1-W56	S1-W57	S1-W58	S1-W59	S1-W60	Justification
Representativeness	**4**	**4**	**4**	**4**	**1**	**2**	**2**	**2**	**2**	
Hydrological modification	4	4	4	4	1	2	2	2	2	-
Rarity/distinctiveness	**2**	**2**	**2**	**2**	**1**	**3**	**2**	**3**	**2**	
Species of conservation significance	2	2	2	2	1	3	2	3	2	S1-W57: likely dabchick and spotless crake.
Vegetation type of conservation significance	2	2	2	2	1	2	1	1	1	S1-W51 to S1-W55: planted natives.
Diversity and pattern	**2**	**4**	**2**	**3**	**1**	**3**	**1**	**1**	**1**	
Diversity of habitat types	2	4	2	3	1	3	1	1	1	-

Attributes to be considered	S1-W51	S1-W53	S1-W54	S1-W55	S1-W56	S1-W57	S1-W58	S1-W59	S1-W60	Justification
Ecological context	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	
Flood attenuation	2	3	2	2	1	3	2	2	2	-
Streamflow augmentation	3	3	2	2	2	3	2	2	2	-
Sediment trapping	2	2	2	2	1	2	2	2	2	-
Water purification	2	2	2	2	1	2	2	2	2	-
Combined value	**M**	**H**	**M**	**M**	**L**	**M**	**L**	**L**	**L**	

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

Table 13-39 Assessment of ecological value for wetland ecology features (S1-W61 to S1-W69)

Attributes to be considered	S1-W61	S1-W62	S1-W63	S1-W64	S1-W65	S1-W66	S1-W67	S1-W68	S1-W69	Justification
Representativeness	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**4**	
Hydrological modification	2	2	2	2	2	1	1	1	4	-
Rarity/distinctiveness	**3**	**3**	**3**	**3**	**1**	**3**	**1**	**1**	**1**	
Species of conservation significance	3	3	3	3	1	3	1	1	1	S1-W67: likely to support dabchick.

Attributes to be considered	S1-W61	S1-W62	S1-W63	S1-W64	S1-W65	S1-W66	S1-W67	S1-W68	S1-W69	Justification
Vegetation type of conservation significance	1	1	1	1	1	1	-	-	1	-
Diversity and pattern	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	
Diversity of habitat types	1	1	1	1	1	1	1	1	2	-
Ecological context	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	
Flood attenuation	2	2	2	2	2	2	1	1	2	-
Streamflow augmentation	2	2	2	2	2	2	2	2	2	-
Sediment trapping	2	2	2	2	2	2	2	2	2	-
Water purification	2	2	2	2	2	2	2	2	2	-
Combined value	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	

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

Table 13-40 Assessment of ecological value for wetland ecology features (S1-W70 to S1-W72)

Attributes to be considered	S1-W70	S1-W71	S1-W72	Justification
Representativeness	**1**	**1**	**1**	

Attributes to be considered	S1-W70	S1-W71	S1-W72	Justification
Hydrological modification	1	1	1	-
Rarity/distinctiveness	**1**	**1**	**0**	
Species of conservation significance	2	1	-	S1-W70 may support TAR birds.
Vegetation type of conservation significance	-	-	-	-
Diversity and pattern	**2**	**1**	**1**	
Diversity of habitat types	2	1	1	-
Ecological context	**1**	**1**	**1**	
Flood attenuation	1	1	1	-
Streamflow augmentation	1	1	1	-
Sediment trapping	1	1	1	-
Water purification	1	1	1	-
Combined value	**N**	**N**	**N**	

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

Table 13-41 Assessment of ecological value for wetland ecology features (S2-W1 to S2-W10)

Attributes to be considered	S2-W1	S2-W2	S2-W3	S2-W4	S2-W5	S2-W6	S2-W7	S2-W8	S2-W9	S2-W10	Justification
Representativeness	**1**	**4**	**3**	**1**	**1**	**1**	**2**	**2**	**4**	**2**	
Hydrological modification	1	4	3	1	1	1	2	2	4	2	-
Rarity/distinctiveness	**1**	**2**	**1**	**1**	**2**	**1**	**1**	**2**	**4**	**1**	
Species of conservation significance	1	2	1	1	2	1	1	2	2	1	S2-W2, S2-W5, S2-W8, S2-W9: potential for TAR birds.
Vegetation type of conservation significance	-	1	1	-	-	-	-	-	4	-	S2-W2, S2-W3, S2-W10: planted natives. S2-W9: WL19 - Raupō reedland (endangered).
Diversity and pattern	**2**	**4**	**3**	**1**	**3**	**1**	**2**	**3**	**3**	**1**	
Diversity of habitat types	2	4	3	1	3	1	2	3	3	1	-
Ecological context	**2**	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	
Flood attenuation	1	3	3	1	2	1	2	3	2	2	-
Streamflow augmentation	2	2	2	1	2	1	3	2	2	1	-
Sediment trapping	1	2	2	1	2	1	2	2	2	2	-
Water purification	2	3	2	2	2	2	2	2	2	2	-

Attributes to be considered	S2-W1	S2-W2	S2-W3	S2-W4	S2-W5	S2-W6	S2-W7	S2-W8	S2-W9	S2-W10	Justification
Combined value	**L**	**H**	**M**	**L**	**L**	**L**	**L**	**M**	**H**	**L**	

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

Table 13-42 Assessment of ecological value for wetland ecology features (S2-W11 to S2-W16)

Attributes to be considered	S2-W11	S2-W12	S2-W12a	S2-W13	S2-W14	S2-W15	S2-W16	S2-W16a	Justification
Representativeness	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	-
Hydrological modification	1	2	2	2	1	2	2	1	-
Rarity/distinctiveness	**1**	**2**	**2**	**4**	**1**	**2**	**2**	**0**	-
Species of conservation significance	1	2	2	2	1	1	2	-	S2-W12, S2-W12a, S2-W13, S2-W16: potential for TAR wetland birds. S2-16a: artificial pond surrounded by urban area.
Vegetation type of conservation significance	-	-	-	4	-	2	-	-	S2-W15: planted natives. S2-W13: WL19 - Raupō reedland (endangered).
Diversity and pattern	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	-
Diversity of habitat types	2	3	1	2	1	2	1	1	-

Attributes to be considered	S2-W11	S2-W12	S2-W12a	S2-W13	S2-W14	S2-W15	S2-W16	S2-W16a	Justification
Ecological context	**2**	**3**	**4**	**2**	**1**	**2**	**2**	**1**	-
Flood attenuation	2	3	4	2	1	2	2	1	-
Streamflow augmentation	2	1	4	1	1	2	1	1	-
Sediment trapping	2	2	2	2	1	2	2	1	-
Water purification	2	2	2	2	1	2	2	1	-
Combined value	**L**	**M**	**M**	**M**	**N**	**L**	**L**	**N**	-

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

Table 13-43 Assessment of ecological value for wetland ecology features (S4-W1)

Attributes to be considered	S4-W1	Justification
Representativeness	**1**	
Hydrological modification	1	-
Rarity/distinctiveness	**1**	
Species of conservation significance	1	-
Vegetation type of conservation significance	-	-
Diversity and pattern	**1**	

Attributes to be considered	S4-W1	Justification
Diversity of habitat types	1	-
Ecological context	**2**	
Flood attenuation	1	-
Streamflow augmentation	1	-
Sediment trapping	1	-
Water purification	2	-
Combined value	**L**	

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

9 Appendix 9 – Impact Assessment

NoR S1													
Phase	Project Activity	Resource	Ecological Value	Main Effect Description	Detailed Effect Description	Type	Extent (ZOI)	Duration	Frequency	Likelihood	Reversibility	Magnitude (pre-mitigation)	Level of Effect (pre-mitigation)
Construction	Lighting and noise	S1-Bat	Very High	Construction- Bats	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Short-term (<5 years)	Frequently	Highly Likely	Totally	Low	Moderate
Operation	Presence of the road	S1-Bat	Very High	Operation- Bats	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	High	Very High
Operation	Lighting and noise	S1-Bat	Very High	Operation- Bats	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	Moderate	High
Construction	Lighting and noise	S1-Non-TAR Bird	Low	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Definite	Totally	Moderate	Low
Operation	Presence of the road	S1-Non-TAR Bird	Low	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Definite	Irreversible	High	Low
Operation	Lighting and noise	S1-Non-TAR Bird	Low	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Definite	Irreversible	High	Low
Construction	Lighting and noise	S1-Lizard	High	Construction- Herpetofauna	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Highly Likely	Totally	Low	Low
Operation	Presence of the road	S1-Lizard	High	Operation- Herpetofauna	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 due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Likely	Irreversible	Low	Low
Operation	Lighting and noise	S1-Lizard	High	Operation- Herpetofauna	Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use	Indirect	Local	Permanent (>25 years)	Continuously	Likely	Irreversible	Low	Low
Construction	Lighting and noise	S1-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S1-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S1-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Unlikely		Negligible	Low
Construction	Lighting and noise	S1-TAR Bird (Wetland - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S1-TAR Bird (Wetland - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Low
Construction	Lighting and noise	S1-TAR Bird (Wetland - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Likely		Low	Moderate
Operation	Presence of the road	S1-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		Low	Low
Operation	Presence of the road	S1-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		Low	Low
Operation	Presence of the road	S1-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		Low	Moderate
Operation	Presence of the road	S1-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Likely		Low	Low
Operation	Presence of the road	S1-TAR Bird (Wetland - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Likely		Low	Low
Operation	Presence of the road	S1-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Likely		Low	Moderate
Operation	Presence of the road	S1-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S1-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S1-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	S1-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S1-TAR Bird (Wetland - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Likely		Low	Low
Operation	Presence of the road	S1-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Likely		Low	Moderate
Construction	Vegetation removal	S1-EF (District Plan)	Moderate	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-TL.2 (District Plan)	Moderate	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Likely		Low	Low
Construction	Vegetation removal	S1-TL.3 (District Plan)	Moderate	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Likely		Low	Low
Construction	Vegetation removal	S1-Bat	Very High	Construction- Bats	Kill or injure individual bats due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Likely		Low	Moderate
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-Non-TAR Bird	Low	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S1-Bat	Very High	Construction- Bats	Roost loss through vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-Non-TAR Bird	Low	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S1-Bat	Very High	Construction- Bats	Roost loss through vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-Non-TAR Bird	Low	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S1-Bat	Very High	Construction- Bats	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S1-Non-TAR Bird	Low	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low

NoR S2													
Phase	Project Activity	Resource	Ecological Value	Main Effect Description	Detailed Effect Description	Type	Extent (ZOI)	Duration	Frequency	Likelihood	Reversibility	Magnitude (pre-mitigation)	Level of Effect (pre-mitigation)
Construction	Lighting and noise	S2-Bat	Very High	Construction- Bats	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely	Totally	Negligible	Low
Operation	Presence of the road	S2-Bat	Very High	Operation- Bats	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Moderate
Operation	Lighting and noise	S2-Bat	Very High	Operation- Bats	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Infrequently	Unlikely	Totally	Negligible	Low
Construction	Lighting and noise	S2-Non-TAR Bird	Low	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Highly Likely	Totally	Moderate	Low
Operation	Presence of the road	S2-Non-TAR Bird	Low	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Likely	Totally	Low	Very Low
Operation	Lighting and noise	S2-Non-TAR Bird	Low	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Likely	Irreversible	Low	Very Low
Construction	Lighting and noise	S2-Lizard	High	Construction- Herpetofauna	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely	Totally	Negligible	Very Low
Operation	Presence of the road	S2-Lizard	High	Operation- Herpetofauna	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 due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Operation	Lighting and noise	S2-Lizard	High	Operation- Herpetofauna	Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use	Indirect	Local	Permanent (>25 years)	Continuously	Likely	Totally	Low	Low
Construction	Lighting and noise	S2-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S2-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S2-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Low
Construction	Lighting and noise	S2-TAR Bird (Wetland - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S2-TAR Bird (Wetland - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Low
Construction	Lighting and noise	S2-TAR Bird (Wetland - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Moderate
Operation	Presence of the road	S2-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	S2-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Wetland - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	S2-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	S2-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Wetland - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S2-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S2-TL.3 (District Plan)	Low	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-WF8 (District Plan)	Low	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-Bat	Very High	Construction- Bats	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S2-Bat	Very High	Construction- Bats	Kill or injure individual bats due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S2-Non-TAR Bird	Low	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Likely		Low	Very Low
Construction	Vegetation removal	S2-Non-TAR Bird	Low	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S2-Non-TAR Bird	Low	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-Notable Tree	Negligible	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S2-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low

NoR S3													
Phase	Project Activity	Resource	Ecological Value	Main Effect Description	Detailed Effect Description	Type	Extent (ZOI)	Duration	Frequency	Likelihood	Reversibility	Magnitude (pre-mitigation)	Level of Effect (pre-mitigation)
Construction	Lighting and noise	S3-Bat	Very High	Construction- Bats	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Short-term (<5 years)	Frequently	Highly Likely	Totally	Low	Moderate
Operation	Presence of the road	S3-Bat	Very High	Operation- Bats	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	Moderate	High
Operation	Lighting and noise	S3-Bat	Very High	Operation- Bats	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	Moderate	High
Construction	Lighting and noise	S3-Non-TAR Bird	Low	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Highly Likely	Totally	Moderate	Low
Operation	Presence of the road	S3-Non-TAR Bird	Low	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Likely	Irreversible	Low	Very Low
Operation	Lighting and noise	S3-Non-TAR Bird	Low	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Likely	Irreversible	Low	Very Low
Construction	Lighting and noise	S3-Lizard	High	Construction- Herpetofauna	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely	Totally	Negligible	Very Low
Operation	Presence of the road	S3-Lizard	High	Operation- Herpetofauna	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 due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Operation	Lighting and noise	S3-Lizard	High	Operation- Herpetofauna	Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Construction	Lighting and noise	S3-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S3-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S3-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Low
Construction	Lighting and noise	S3-TAR Bird (Wetland - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Construction	Lighting and noise	S3-TAR Bird (Wetland - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Low
Construction	Lighting and noise	S3-TAR Bird (Wetland - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Moderate
Operation	Presence of the road	S3-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		Low	Low
Operation	Presence of the road	S3-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		Low	Low
Operation	Presence of the road	S3-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		Low	Moderate
Operation	Presence of the road	S3-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Likely		Low	Low
Operation	Presence of the road	S3-TAR Bird (Wetland - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Likely		Low	Low
Operation	Presence of the road	S3-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Likely		Low	Moderate
Operation	Presence of the road	S3-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S3-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S3-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	S3-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Operation	Presence of the road	S3-TAR Bird (Wetland - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Likely		Low	Low
Operation	Presence of the road	S3-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Likely		Low	Moderate
Construction	Vegetation removal	S3-TL.3 (District Plan)	Low	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-WF8 (District Plan)	Low	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-Notable Tree (District Plan)	Negligible	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-Huapai Domain Trees (District Plan)	Low	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-Bat	Very High	Construction- Bats	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S3-Bat	Very High	Construction- Bats	Kill or injure individual bats due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S3-Non-TAR Bird	Low	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Likely		Low	Very Low
Construction	Vegetation removal	S3-Non-TAR Bird	Low	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S3-Non-TAR Bird	Low	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S3-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low

NoR HS													
Phase	Project Activity	Resource	Ecological Value	Main Effect Description	Detailed Effect Description	Type	Extent (ZOI)	Duration	Frequency	Likelihood	Reversibility	Magnitude (pre-mitigation)	Level of Effect (pre-mitigation)
Construction	Lighting and noise	HS-Bat	Very High	Construction- Bats	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Short-term (<5 years)	Continuously	Likely	Totally	Low	Moderate
Operation	Presence of the road	HS-Bat	Very High	Operation- Bats	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely	Irreversible	Low	Moderate
Operation	Lighting and noise	HS-Bat	Very High	Operation- Bats	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Moderate
Construction	Lighting and noise	HS-Non-TAR Bird	Low	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Definite	Totally	Moderate	Low
Operation	Presence of the road	HS-Non-TAR Bird	Low	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	Moderate	Low
Operation	Lighting and noise	HS-Non-TAR Bird	Low	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	Moderate	Low
Construction	Lighting and noise	HS-Lizard	High	Construction- Herpetofauna	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Short-term (<5 years)	Frequently	Unlikely	Totally	Negligible	Very Low
Operation	Presence of the road	HS-Lizard	High	Operation- Herpetofauna	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 due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Operation	Lighting and noise	HS-Lizard	High	Operation- Herpetofauna	Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Construction	Lighting and noise	HS-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Operation	Presence of the road	HS-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Operation	Presence of the road	HS-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Construction	Lighting and noise	HS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Operation	Presence of the road	HS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Operation	Presence of the road	HS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Construction	Lighting and noise	HS-TAR Bird (Wetland - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	HS-TAR Bird (Wetland - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	HS-TAR Bird (Wetland - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Construction	Lighting and noise	HS-TAR Bird (Wetland - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	HS-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	HS-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	HS-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Very Low
Operation	Presence of the road	HS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Very Low
Operation	Presence of the road	HS-TAR Bird (Wetland - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Very Low
Operation	Presence of the road	HS-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Very Low
Construction	Lighting and noise	HS-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Infrequently	Likely		Negligible	Low
Construction	Lighting and noise	HS-TAR Bird (Wetland - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Likely		Low	Moderate
Operation	Presence of the road	HS-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Low
Operation	Presence of the road	HS-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	HS-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Likely		Low	Moderate
Operation	Presence of the road	HS-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	HS-TL.3 (District Plan)	Low	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	HS-Bat	Very High	Construction- Bats	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	HS-Bat	Very High	Construction- Bats	Kill or injure individual bats due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	HS -Non-TAR Bird	Low	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Likely		Low	Very Low
Construction	Vegetation removal	HS -Non-TAR Bird	Low	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	HS -Non-TAR Bird	Low	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	HS -TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low

NoR KS													
Phase	Project Activity	Resource	Ecological Value	Main Effect Description	Detailed Effect Description	Type	Extent (ZOI)	Duration	Frequency	Likelihood	Reversibility	Magnitude (pre-mitigation)	Level of Effect (pre-mitigation)
Construction	Lighting and noise	KS-Bat	Very High	Construction- Bats	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Short-term (<5 years)	Frequently	Likely	Totally	Low	Moderate
Operation	Presence of the road	KS-Bat	Very High	Operation- Bats	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely	Irreversible	Low	Moderate
Operation	Lighting and noise	KS-Bat	Very High	Operation- Bats	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Moderate
Construction	Lighting and noise	KS-Non-TAR Bird	Low	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Highly Likely	Totally	Moderate	Low
Operation	Presence of the road	KS-Non-TAR Bird	Low	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	Moderate	Low
Operation	Lighting and noise	KS-Non-TAR Bird	Low	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Highly Likely	Irreversible	Moderate	Low
Construction	Lighting and noise	KS-Lizard	High	Construction- Herpetofauna	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely	Totally	Negligible	Very Low
Operation	Presence of the road	KS-Lizard	High	Operation- Herpetofauna	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 due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Operation	Lighting and noise	KS-Lizard	High	Operation- Herpetofauna	Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Construction	Lighting and noise	KS-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Operation	Presence of the road	KS-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Operation	Presence of the road	KS-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Construction	Lighting and noise	KS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		Negligible	Very Low
Operation	Presence of the road	KS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Operation	Presence of the road	KS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely		Low	Low
Construction	Lighting and noise	KS-TAR Bird (Wetland - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Construction	Lighting and noise	KS-TAR Bird (Wetland - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Likely		Low	Low
Operation	Presence of the road	KS-Non-TAR Bird	Low	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Very Low
Operation	Presence of the road	KS-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Very Low
Operation	Presence of the road	KS-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Unlikely		Negligible	Very Low
Operation	Presence of the road	KS-TAR Bird (Wetland - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Likely		Low	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Likely		Low	Low
Construction	Lighting and noise	KS-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)		Unlikely		Negligible	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)	Infrequently	Likely		Low	Low
Construction	Lighting and noise	KS-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)		Unlikely		Negligible	Low
Construction	Lighting and noise	KS-TAR Bird (Wetland - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Frequently	Likely		Low	Moderate
Operation	Presence of the road	KS-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	KS-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Operation	Presence of the road	KS-TAR Bird (Wetland - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low

NoR S4													
Phase	Project Activity	Resource	Ecological Value	Main Effect Description	Detailed Effect Description	Type	Extent (ZOI)	Duration	Frequency	Likelihood	Reversibility	Magnitude (pre-mitigation)	Level of Effect (pre-mitigation)
Construction	Lighting and noise	S4-Bat	Very High	Construction- Bats	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely	Totally	Negligible	Low
Operation	Presence of the road	S4-Bat	Very High	Operation- Bats	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Moderate
Operation	Lighting and noise	S4-Bat	Very High	Operation- Bats	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Moderate
Construction	Lighting and noise	S4-Lizard	High	Construction- Herpetofauna	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely	Totally	Negligible	Very Low
Operation	Presence of the road	S4-Lizard	High	Operation- Herpetofauna	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 due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Irreversible	Low	Low
Operation	Lighting and noise	S4-Lizard	High	Operation- Herpetofauna	Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use	Indirect	Local	Permanent (>25 years)	Continuously	Unlikely	Totally	Low	Low
Construction	Lighting and noise	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		#REF!	
Construction	Lighting and noise	S4-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		#REF!	
Construction	Lighting and noise	S4-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Unlikely		#REF!	
Construction	Lighting and noise	S4-Non-TAR Bird	Low	Construction- Birds	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Indirect	Local	Short-term (<5 years)	Continuously	Highly Likely		#REF!	
Operation	Presence of the road	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		#REF!	
Operation	Presence of the road	S4-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Regional	Permanent (>25 years)		Unlikely		#REF!	
Operation	Presence of the road	S4-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Unlikely		#REF!	
Operation	Presence of the road	S4-Non-TAR Bird	Low	Operation- Birds	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	Indirect	Local	Permanent (>25 years)		Likely		#REF!	
Operation	Presence of the road	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		#REF!	
Operation	Presence of the road	S4-TAR Bird (Terrestrial - High Value)	High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		#REF!	
Operation	Presence of the road	S4-TAR Bird (Terrestrial - Very High Value)	Very High	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Unlikely		#REF!	
Operation	Presence of the road	S4-Non-TAR Bird	Low	Operation- Birds	Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration	Indirect	Local	Permanent (>25 years)		Likely		#REF!	
Construction	Vegetation removal	S4-TL.3 (District Plan)	Low	Construction- Terrestrial habitat	Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S4-Bat	Very High	Construction- Bats	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S4-Bat	Very High	Construction- Bats	Kill or injure individual bats due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S4-Non-TAR Bird	Low	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Likely		Low	Very Low
Construction	Vegetation removal	S4-Non-TAR Bird	Low	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S4-Non-TAR Bird	Low	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Highly Likely		Moderate	Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Moderate Value)	Moderate	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - High Value)	High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Very Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Loss of foraging habitat due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Nest loss due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low
Construction	Vegetation removal	S4-TAR Bird (Terrestrial - Very High Value)	Very High	Construction- Birds	Kill or injure individual due to vegetation removal. District Plan vegetation only.	Direct	Local	Permanent (>25 years)		Unlikely		Negligible	Low

10 Appendix 10 - Rapid Habitat Assessment Results

Table 13-44 Summary of RHA values

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*
S1-S1a	1	5	5	4	4	5	2	4	8	5	43	M
S1-S2	1	2	2	2	3	3	1	3	6	9	32	P
S1-S1b	3	5	2	5	6	4	3	5	7	7	47	M
S1-S1c	4	3	2	3	4	5	7	8	8	8	52	M
S1-S3	1	2	1	2	3	1	4	3	3	2	22	P
S1-S4												
S1-S5												
S1-S6												
S1-S7												
S1-S8												
S1-S9	1	2	1	1	2	1	1	1	1	1	12	P
S1-S10	1	3	1	2	3	4	1	2	1	3	21	P
S1-S11	1	7	4	6	5	4	2	6	6	10	51	M
S1-S13												
S1-S14	1	2	1	2	3	3	1	6	8	10	37	P
S1-S15												
S1-S16												
S1-S17	1	7	2	8	8	8	5	6	5	8	58	M
S1-S18												
S1-S19	1	2	2	2	3	3	4	2	3	3	25	P
S1-S20a	4	2	1	2	3	3	7	8	7	6	41	M

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*
S1-S20d	5	2	1	2	3	4	7	5	7	5	41	M
S1-S20e	5	4	2	4	5	4	7	6	6	8	51	M
S1-S21	5	3	2	3	3	4	7	5	8	4	44	M
S1-S22	5	8	6	8	8	8	4	2	2	5	56	M
S1-S23	1	2	1	1	2	2	1	1	1	2	14	P
S1-S24	3	3	2	3	4	4	3	4	4	5	35	P
S1-S25												
S1-S26	1	2	2	2	4	2	4	5	4	8	34	P
S1-S27												
S1-S28	1	3	1	3	4	4	4	6	6	7	39	P
S2-S1	1	1	1	2	4	1	1	3	2	9	25	P
S2-S2	2	6	4	6	6	6	7	6	6	9	58	M
S2-S3	1	5	1	4	3	2	2	3	3	8	31	P
S2-S4	1	3	1	3	5	2	5	4	2	1	27	P
S2-S5	4	4	3	5	5	2	4	6	7	3	43	M
S2-S6	4	3	2	3	4	2	4	6	6	6	40	P
S4-S1	4	5	4	4	4	4	4	8	9	10	56	M
W3-S1	3	5	4	4	6	5	7	8	9	8	59	M

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

11 Appendix 11 – Long-Tailed Bat Acoustic Monitoring Report (2021-2022)

TE TUPU NGĀTAHI
SUPPORTING GROWTH

North West Long-Tailed Bat Acoustic Monitoring Report 2021-2022

July 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY

New Zealand Government

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1 Executive Summary

As part of the Supporting Growth Programme, Te Tupu Ngātahi Supporting Growth (SG) is preparing Notices of Requirement (NoRs), on behalf of Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT), to designate land, under the Resource Management Act 1991 (RMA), for the purpose of constructing, operating and maintaining a proposed strategic and local arterial transport network in the North West (NW) of Auckland, hereinafter referred to as the 'Project'.

Long-tailed bats (pekapeka) (*Chalinolobus tuberculatus*) are considered 'Threatened – Nationally Critical' (O'Donnell et al., 2018) and are known to be present within the Northwest of Auckland. Although desktop records confirm their presence within a 10 km radius of the Project area, the understanding of how bats use the wider landscape is limited. To gain an understanding of the habitat features that are of value to long-tailed bats it is necessary to monitor the landscape in a manner that reflects how they use it. Therefore, to establish an ecological baseline and identify if there are vegetated corridors that bats are using frequently to move through the landscape, acoustic monitoring for bats was undertaken at an areawide level.

Automatic Bat Monitors (ABM)s were deployed across the Project area in two separate survey sessions. The first (December 2021) was completed within the bat maternity period (December - February) and the second (April 2022) within the bat mating season (March - May). ABMs were placed in a network within habitats that would be affected by the Project and would provide suitable habitat for bat roosting, foraging, and commuting. Specifically, pre-determined survey locations were selected based on the current understanding of habitats that are favoured by bats.

During the December 2021 survey, seven of the 32 ABM sites (December sites #2, #11, #17, #21, #23, #25, and #27) detected bat activity. The site with the greatest number of bat passes was December site #27. No foraging calls or social calls were recorded, and no bat passes were recorded within 30 minutes of sunset or sunrise.

During the April 2022 survey, 16 of the 21 ABM sites (April sites #1, #2, #4, #5, #6, #7, #8, #9, #10, #11, #13, #14, #15, #16, #17, and #20) detected bat activity. The site with the greatest number of bat passes was April site #17 with 1370 bat passes recorded during the survey. Foraging calls were recorded at 10 of the ABM sites, with the greatest number recorded at April site #17. No social calls were recorded, and no bat passes were recorded within 30 minutes of sunset or sunrise.

The results suggest that bats are active in the North West Project area. Specifically, the results suggests that bats are active in both the Local Arterials Package area (Whenuapai Arterials, Redhills Arterials, and Riverhead Arterials), and the Strategic Projects and Kumeū Huapai Local Arterials Package area, with the highest bat activity recorded in the Alternative State Highway (ASH) NoR.

2 Introduction

2.1 Background

As part of the Supporting Growth Programme, Te Tupu Ngātahi Supporting Growth (SG) is preparing Notices of Requirement (NoRs), on behalf of Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT), to designate land, under the Resource Management Act 1991 (RMA), for the purpose of constructing, operating and maintaining a proposed strategic and local arterial transport network in the North West (NW) of Auckland, hereinafter referred to as the 'Project'.

SG is preparing the NoRs for the individual projects within the NW and the projects have been split into two lodgement packages:

- **Lodgement Package 1** is the **Local Arterial Package** and consists of three area-based assessment volumes (Whenuapai, Redhills and Riverhead) (Table 2-1).
- **Lodgement Package 2** is the **Strategic and Kumeū-Huapai Package**. The assessments have been grouped based upon their strategic role, or in the case of Access and Station Road the relationship with the strategic projects (Table 2-2).

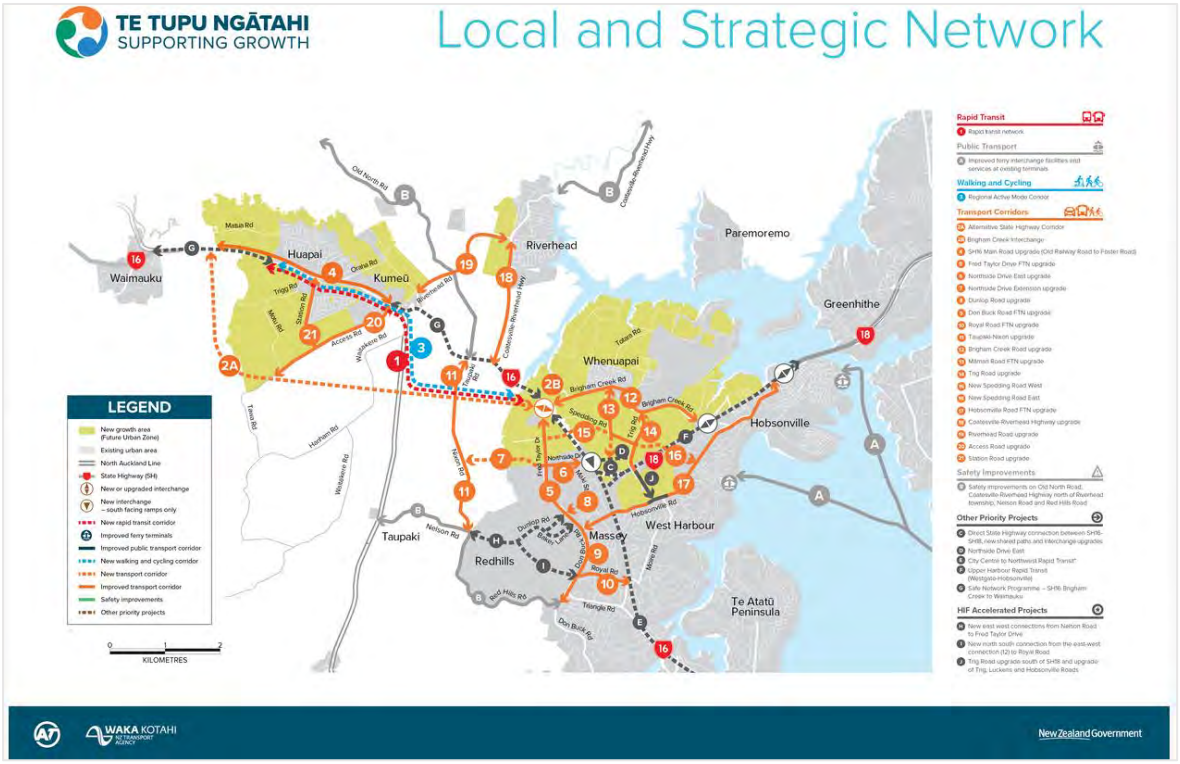

Figure 2-1 North West Growth Area Local and Strategic Network

Table 2-1 Local Arterial Package

Package	Assessment Volume	Proposed NoRs
Local Arterial Package	**Whenuapai Arterials**	Proposed NoRs: • Brigham Creek Road upgrade • Māmari Road FTN upgrade

Package	Assessment Volume	Proposed NoRs
		• Trig Road North upgrade • Spedding Road East and West
		Proposed alternations to existing designations: • Hobsonville Road FTN upgrade
	Redhills Arterials	Proposed NoRs: • Northside Drive East extension • Don Buck Road FTN upgrade • Royal Road FTN upgrade
		Proposed alternations to existing designations: • Fred Taylor Drive Frequent Transport Network (FTN) upgrade
	Riverhead Arterials	• Coatesville – Riverhead Highway Upgrade • Riverhead Road Upgrade

Table 2-2 Strategic Package

Package	Proposed NoRs
Strategic Projects and Kumeū Huapai Local Arterials	Proposed NoRs: • Rapid Transit Corridor (RTC), including Regional Active Mode Corridor (RAMC) • Alternative State Highway (ASH), including Brigham Creek Interchange • Access Road upgrade • Station Road upgrade
	Proposed alternations to existing designations: • SH16 Main Road upgrade

2.2 Acoustic Monitoring

Long-tailed bats (pekapeka) (*Chalinolobus tuberculatus*) are considered 'Threatened – Nationally Critical' (O'Donnell *et al.,* 2018) and are known to be present within the Northwest of Auckland (Waitakere Ranges, Riverhead Forest etc) (DOC, 2022). Although desktop records confirm their presence within a 10 km radius of the NoRs, the understanding of how bats use the wider landscape is limited.

To gain an understanding of the habitat features that are of value to long-tailed bats it is necessary to monitor the landscape in a manner that reflects how they use it. Therefore, to establish an ecological baseline and identify if there are vegetated corridors that bats are using frequently to move through the landscape, acoustic monitoring for bats was undertaken at an areawide level.

3 Methodology

3.1 Acoustic Monitoring

Automatic Bat Monitors (ABM)s (Song Meter SM4BAT-FS Ultrasonic Bat Detectors with SMM-U2 microphones) were deployed across the Project area. ABMs were deployed in two separate survey sessions. The first (December 2021) was completed within the bat maternity period (December - February) and the second (April 2022) within the bat mating season (March - May). The intent of surveying in two sessions was to cover any potential changes in bat activity patterns between the maternity and mating seasons.

Once deployed, ABMs were pre-set to start recording 60 minutes before sunset, and cease recording 60 minutes after sunrise (a 'night'). Each ABM was left *in-situ* for at-least 14 nights with suitable weather conditions (O'Donnell & Sedgeley, 2001). For the purposes of this report suitable weather conditions have been defined as:

- Air temperatures dropped below 10°C in the first four hours after sunset.
- Mean overnight wind speed was considered 'strong breeze' on the Beaufort Scale (39-49 km/h) (Royal Meteorological Society, 2021).
- Maximum overnight wind gust exceeded 60 km/h; and/or
- Persistent heavy rain in the first two hours after sunset (heavy rain is described as >4 mm/h) (United States Geological Survey, 2016).

3.1.1 December 2021 Survey

ABMs were placed in a network within habitats that would be affected by the Project and would provide suitable habitat for bat roosting, foraging, and commuting. Specifically, pre-determined survey locations were selected based on the current understanding of habitats that are favoured by bats, drawing information from recent radio tracking that AECOM has completed on the urban fringe of the Waitakere Ranges, existing bat records (Department of Conservation and Auckland Council), and a heat map produced by Auckland Council (Crewther, 2016).

32 ABMs were left in-situ at various times during the period 17 November 2021 until 23 December 2021. The locations of the December 2021 survey sites are detailed in Table 3-1 and presented in Figure 3-1.

Table 3-1 December 2021 ABM survey locations

Site	NZTM Easting (X)	NZTM Northing (Y)
#1-Dec	1739214	5926273
#2-Dec	1740072	5926623
#3-Dec	1735355	5928284
#4-Dec	1733209	5929146
#5-Dec	1736714	5929643
#6-Dec	1734977	5929358

Site	NZTM Easting (X)	NZTM Northing (Y)
#7-Dec	1742885	5926156
#8-Dec	1738312	5927722
#9-Dec	1745935	5926209
#10A-Dec	1738213	5928889
#10B-Dec	1738211	5928832
#11-Dec	1741815	5924338
#12A-Dec	1736983	5926448
#12B-Dec	1736912	5926867
#13-Dec	1742972	5926641
#14-Dec	1741756	5931165
#15-Dec	1736431	5930302
#16-Dec	1738242	5929512
#17-Dec	1741693	5922045
#18-Dec	1735617	5930473
#19-Dec	1739393	5928689
#20-Dec	1738140	5930302
#21-Dec	1741241	5921934
#22-Dec	1741983	5926912
#23-Dec	1740244	5920178
#24-Dec	1741618	5926346
#25-Dec	1738270	5923934
#26-Dec	1738146	5928249
#27-Dec	1735631	5926833
#28-Dec	1738928	5929152
#29-Dec	1736737	5930863
#30-Dec	1734194	5928226

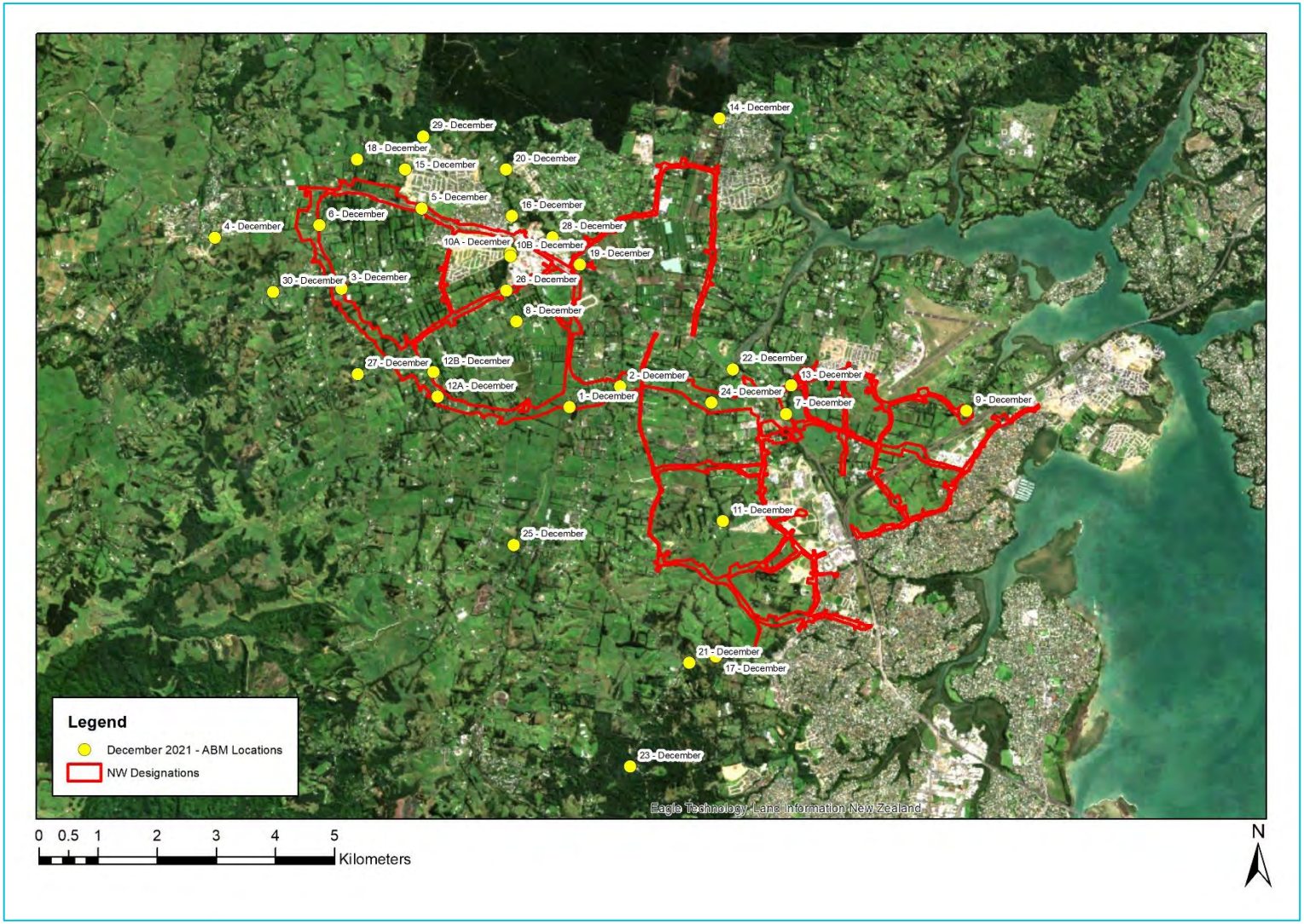

Figure 3-1 ABM locations (December 2021 survey).

3.1.2 April 2022 Survey

Based on the results of the first survey, ABMs locations were specific to the stream and river corridors associated with the proposed Strategic alignment and specifically the Alternative State Highway (ASH).

A total of 21 ABMs were left *in-situ* from 6-7 April 2022 until 3 May 2022. The locations of the April 2022 survey sites are detailed in Table 3-2 and presented in Figure 3-2.

Table 3-2 April 2022 ABM survey locations

Site	NZTM Easting (X)	NZTM Northing (Y)
#1-Apr	1741497	5926010
#2-Apr	1741627	5926348
#3-Apr	1738298	5927729
#4-Apr	1740062	5926649
#5-Apr	1739242	5926255
#6-Apr	1736563	5925866
#7-Apr	1737764	5926415
#8-Apr	1737011	5926448
#9-Apr	1738151	5928249
#10-Apr	1735633	5926835
#11-Apr	1737116	5926987
#12-Apr	1736235	5926691
#13-Apr	1736074	5927368
#14-Apr	1735449	5927854
#15-Apr	1737326	5926729
#16-Apr	1735364	5928281
#17-Apr	1735701	5928158
#18-Apr	1734931	5928655
#19-Apr	1734952	5929326
#20-Apr	1739706	5926337
#21-Apr	1739953	5926092

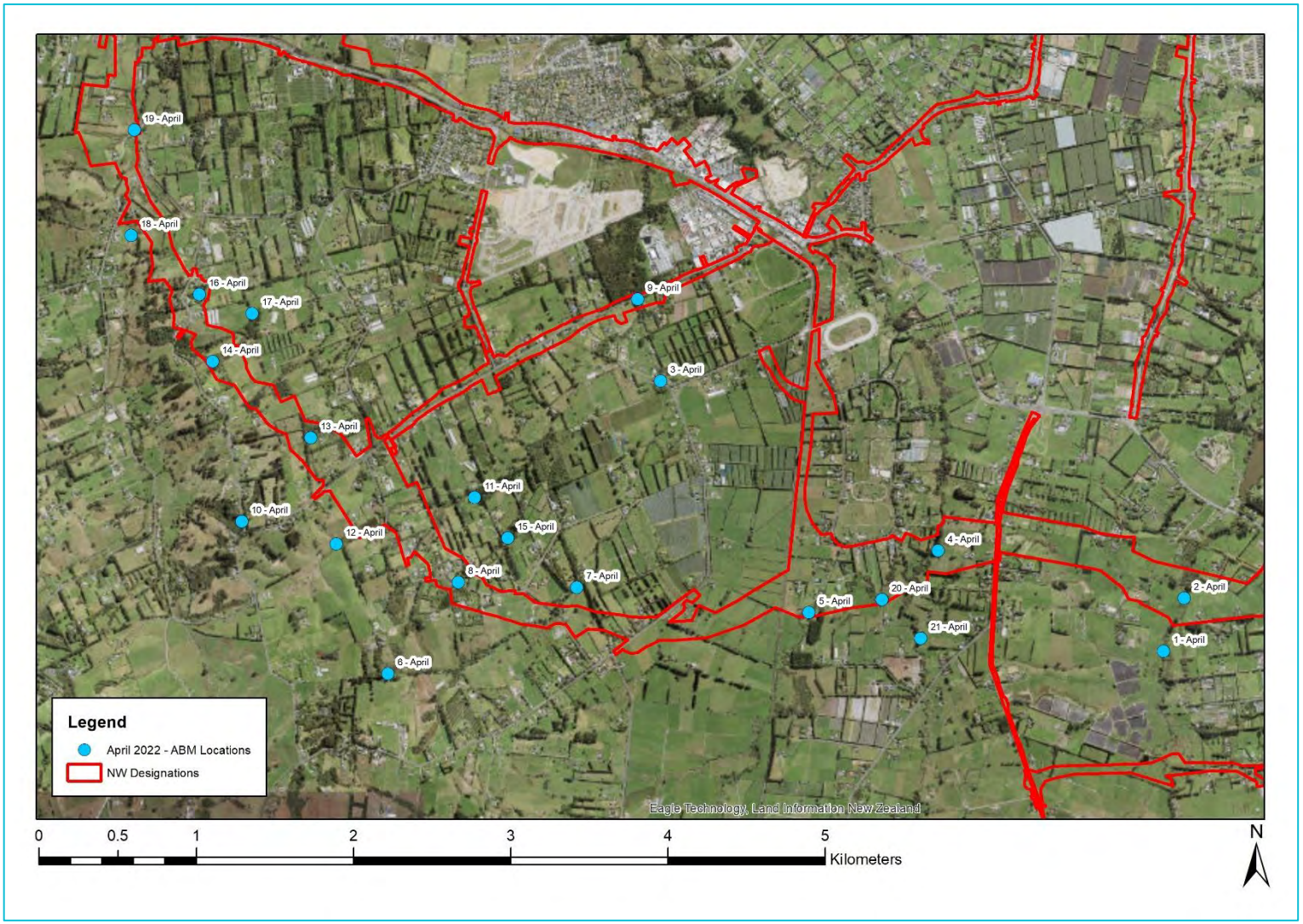

Figure 3-2 ABM locations (April 2022 survey)

3.2 Data Analysis

3.2.1 Long-tailed bat detection and behaviour

The ABM recordings were analysed by an experienced ecologist using Kaleidoscope Pro Analysis[1] software. Confirmed bat recordings (several bat echolocation calls recorded in a sound file) were further classified into:

- Echolocation calls i.e. regularly-spaced calls;
- Echolocation calls with foraging calls (feeding buzzes); and
- Echolocation calls with social calls.

The ABM data was removed from the analysis of trends if there was instrument error or weather conditions overnight were suboptimal for bat activity. Weather data for the survey period was provided by the nearest NIWA CliFlo weather station with relevant data available (North Shore Albany Ews, Agent 37852)[2] and the weather conditions during this period are included in Appendix 1.

3.2.2 First and Last Bat Pass

A review of the ABM data was undertaken to determine when the first and last bat pass was detected in comparison with sunset or sunrise time (data collected from the Time and Date website[3]). The purpose of this analysis was to gain an understanding as to whether bats could potentially be roosting in close proximity to an ABM site. Griffiths (2007) found that long-tailed bats emerged on average 30.1 ± 1.5 minutes after sunset and between January – February bats returned to their roost just before sunrise. However, by March bats were observed to be returning earlier to their roosts and by the end of May they returned as early as 40 minutes after emerging.

The following information was reviewed:

- Percentage of nights at each site where first/last bat pass is recorded within 30 minutes of sunset/sunrise;
- First and last bat pass recorded at each site during the survey period; and
- Minimum time difference between sunset/sunrise and the first/last bat pass.

[1] https://www.wildlifeacoustics.com/download/kaleidoscope-software.
[2] https://cliflo.niwa.co.nz/
[3] https://www.timeanddate.com

4 Results

4.1 December 2021

Table 4-1 and Figure 2-1 present the overall results of the bat surveys completed for the North West during the December 2021 survey. Raw survey data is included in Appendix 2.

Seven of the 32 ABM sites (December sites #2, #11, #17, #21, #23, #25, and #27) detected bat activity during the survey period. The site with the greatest number of bat passes was December site #27, all other sites had similarly low numbers of bat passes (Figure 4-2). No foraging calls or social calls were recorded during the survey.

No bat passes were recorded within 30 minutes of sunset or sunrise (Appendix 3). The site with the lowest minimum time difference between sunset and first bat pass was at December site #17, with a time of one hour 37 minutes. The site with the lowest minimum time difference between sunrise and last bat pass was at December site #25, with a time of 3 hours 9 minutes.

Table 4-1 December 2021 survey results of sites with bat activity

Site	Total Number of Echolocation Calls	Total Number of Foraging Calls	Total Number of Social Calls
#2-Dec	1	0	0
#11-Dec	3	0	0
#17-Dec	2	0	0
#21-Dec	1	0	0
#23-Dec	1	0	0
#25-Dec	3	0	0
#27-Dec	42	0	0

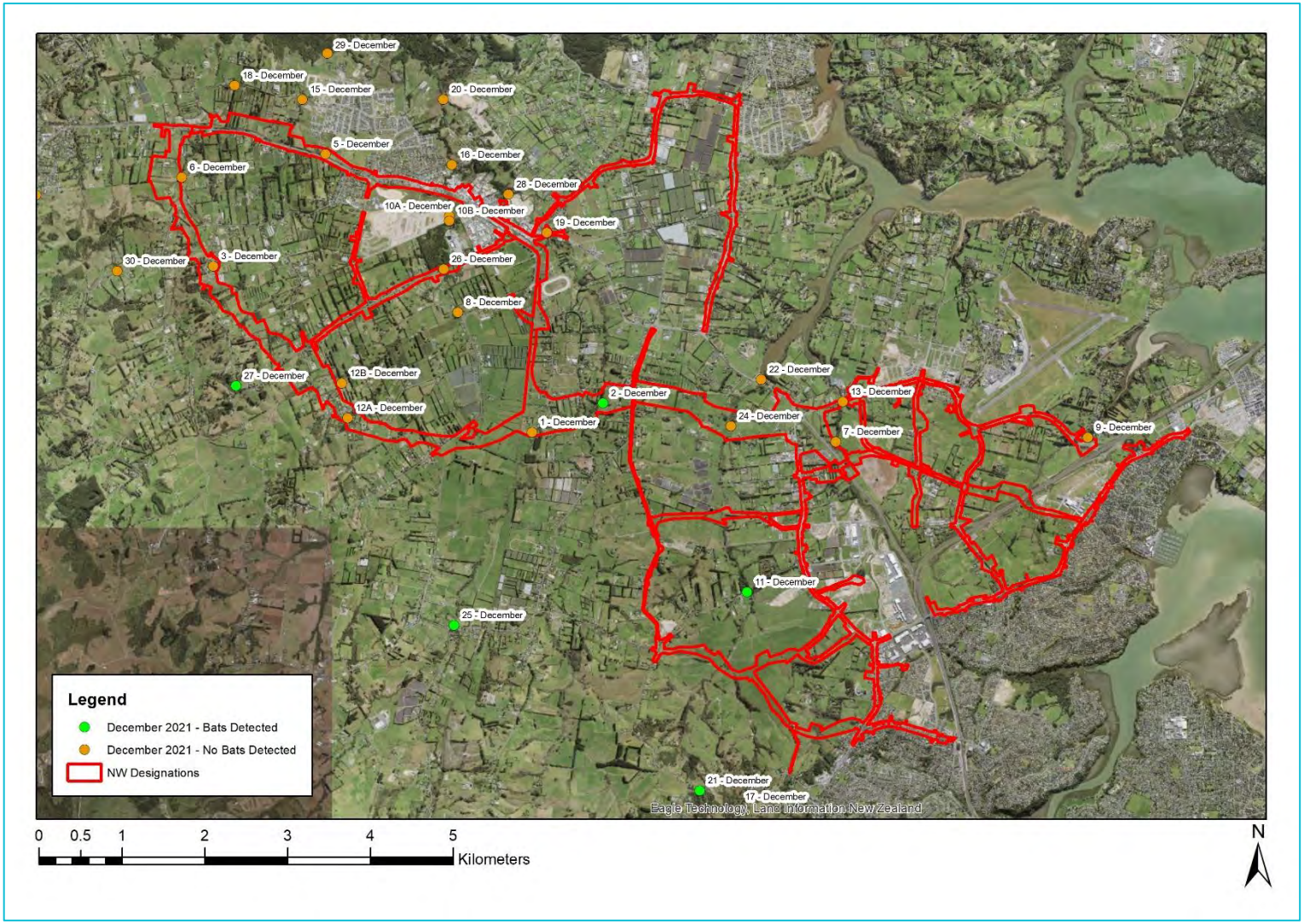

Figure 4-1 Long-tailed bat presence/absence (December 2021 survey)

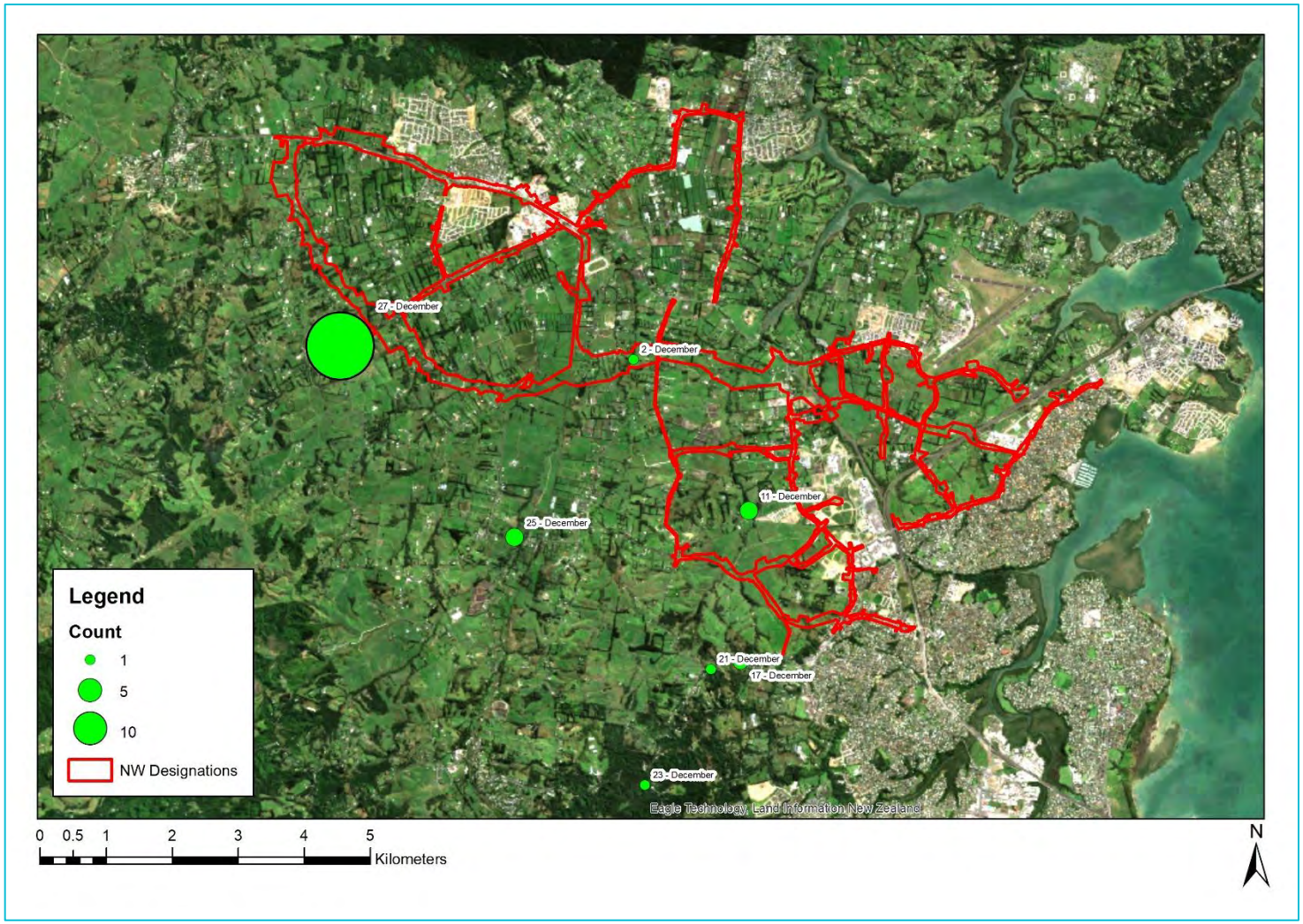

Figure 4-2 Sites with confirmed long-tailed bat presence (December 2021 survey). Proportional symbology indicates the relative proportion of bat passes in relation to the site with the highest number of bat passes (#27-December).

4.2 April 2022

Table 4-2 and Figure 4-3 present the overall results of the bat surveys completed for the North West during the April 2022 survey. Raw survey data is included in Appendix 2.

A total of 16 of the 21 ABM sites detected bat activity during the survey period (April sites #1, #2, #4, #5, #6, #7, #8, #9, #10, #11, #13, #14, #15, #16, #17, and #20). The site with the greatest number of bat passes was April site #17 with 1370 bat passes recorded during the survey (Figure 4-4). Foraging calls were recorded at 10 of the ABM sites, with the greatest number recorded at April site #17, and no social calls were recorded during the survey.

No bat passes were recorded within 30 minutes of sunset or sunrise (Appendix 3). The site with the lowest minimum time difference between sunset and first bat pass was at April site #11, with a time of 46 minutes. The site with the lowest minimum time difference between sunrise and last bat pass was at April site #17, with a time of 1 hour 2 minutes.

Table 4-2 April 2022 survey results of sites with bat activity

Site	Total Number of Echolocation Calls	Total Number of Foraging Calls	Total Number of Social Calls
#1-Apr	1	0	0
#2-Apr	2	0	0
#4-Apr	29	4	0
#5-Apr	21	2	0
#6-Apr	346	15	0
#7-Apr	103	14	0
#8-Apr	35	3	0
#9-Apr	2	0	0
#10-Apr	231	5	0
#11-Apr	162	15	0
#13-Apr	37	1	0
#14-Apr	21	1	0
#15-Apri	18	0	0
#16-Apr	5	0	0
#17-Apr	1370	265	0
#20-Apr	1	0	0

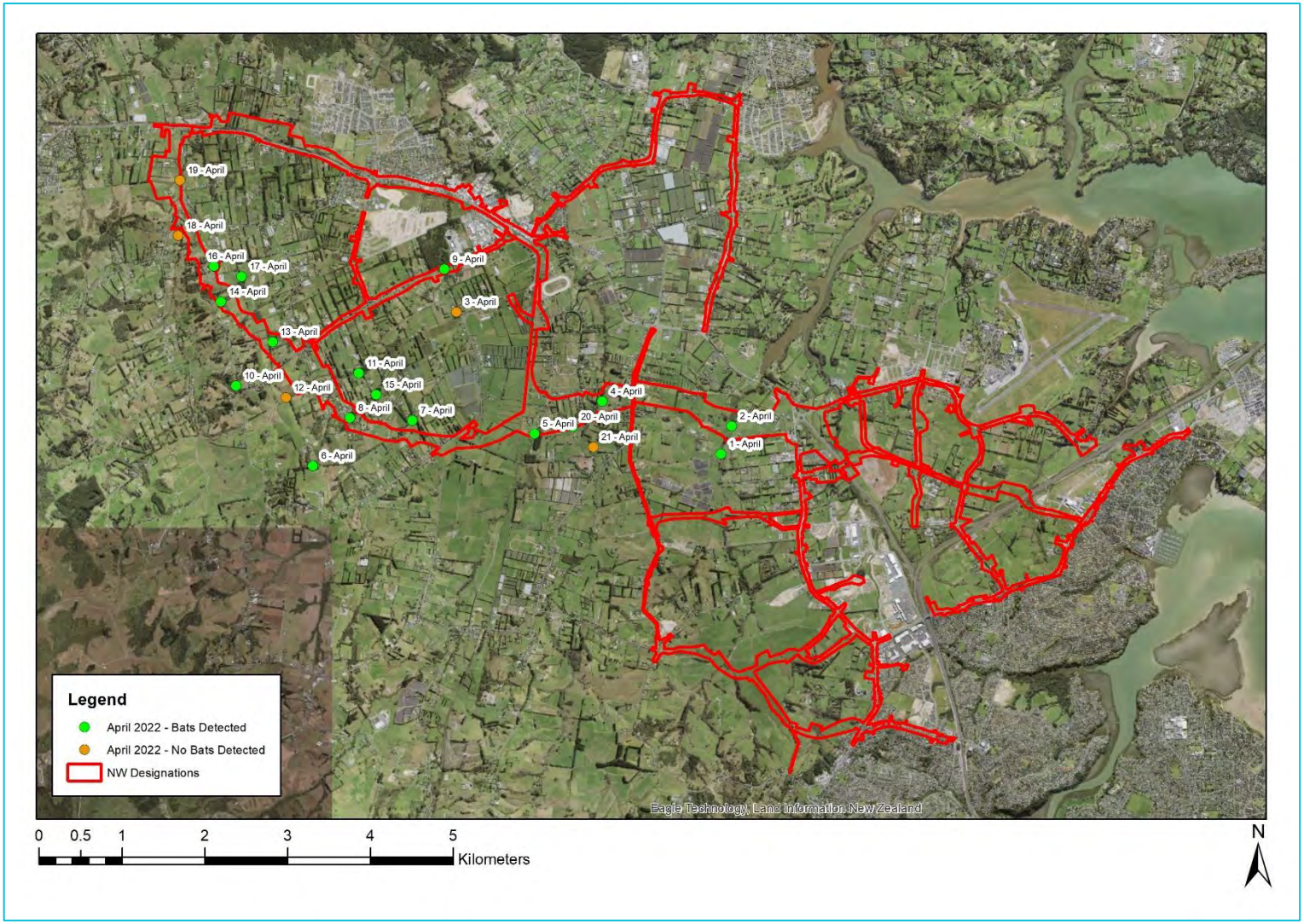

Figure 4-3 Long-tailed bat presence/absence (April 2022 survey)

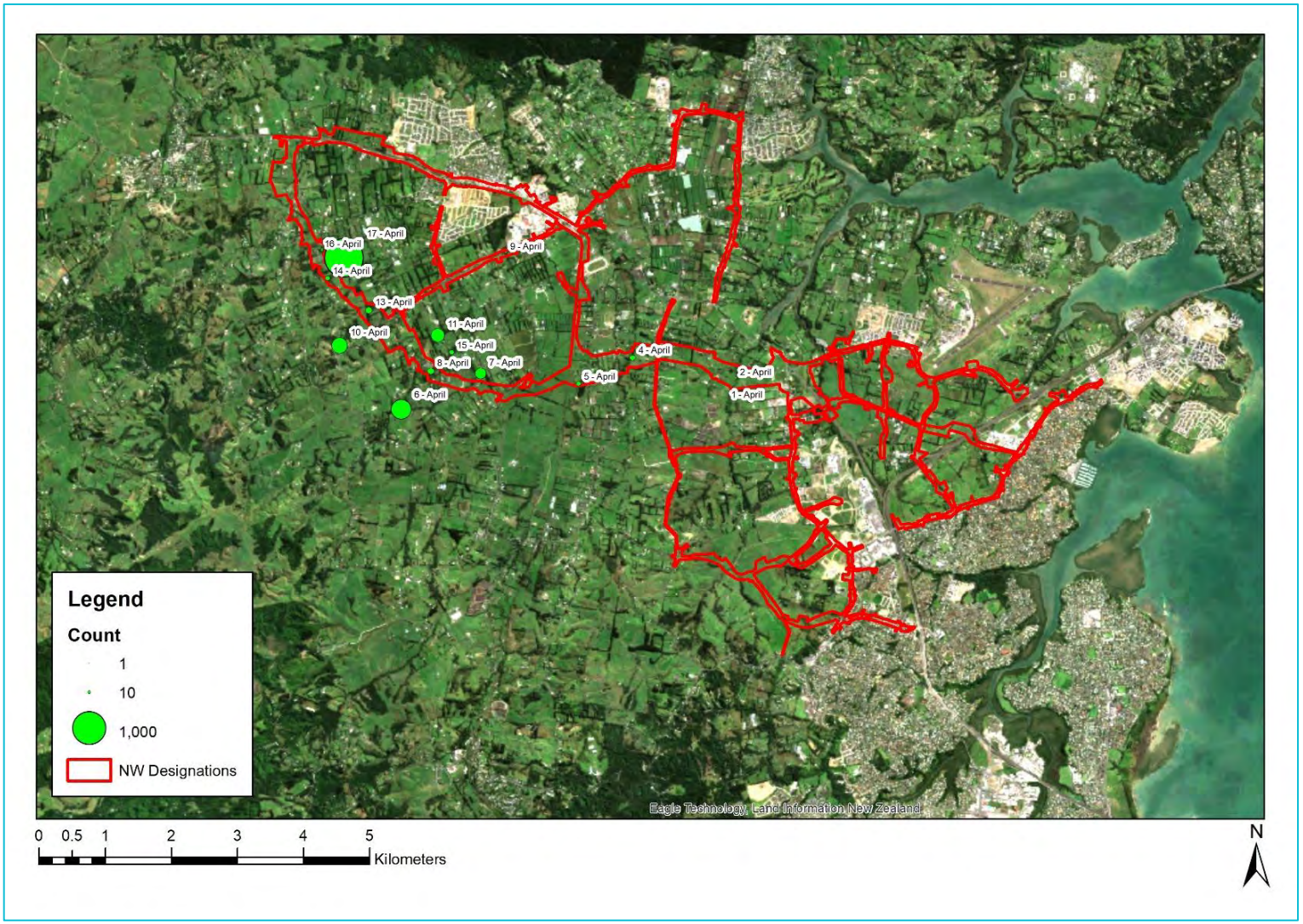

Figure 4-4 Sites with confirmed long-tailed bat presence (April 2022 survey). Proportional symbology indicates the relative proportion of bat passes in relation to the site with the highest number of bat passes (#17-April).

4.3 Survey Limitations

Some survey locations were limited by access to private property. If access was not available for a pre-determined survey location, then an alternative survey location as close as possible to the original survey site was used.

Instrument error was recorded during both the December 2021 and April 2022 surveys. An overview of when and where instrument error occurred is included in Appendix 2.

5 Conclusion

Both the December 2021 and April 2022 surveys found evidence of long-tailed bat activity in the Project area. Bats were observed to be most active during the April 2022 survey (bat mating season) with the highest mean number of 53 nightly bat passes recorded at April site #17. During the December 2021 survey, the highest mean number of bat passes was 1 nightly bat pass at December site #27.

Foraging calls were recorded during the April 2022 survey, with the highest number of foraging calls recorded at April site #17, with a total of 265 calls (19% of the total calls recorded at this site). Foraging calls were not recorded during the December 2021 survey, and social calls were not recorded during either survey.

Analysis of the first and last bat pass suggests that there are no bat roosts within the immediate vicinity of each ABM location. It is possible that bats may be roosting in the vicinity of April sites #6, #8, #11, #15, and #17 with first bat passes recorded within an hour of sunset.

Using the information obtained from the surveys, the results suggest that bats are active in the North West Project area. Specifically, the results suggests that bats are active in both the Local Arterials Package area (Whenuapai Arterials, Redhills Arterials, and Riverhead Arterials), and the Strategic Projects and Kumeū Huapai Local Arterials Package area, with the highest bat activity recorded in the Alternative State Highway (ASH) NoR.

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1 Appendix 1 - Weather Conditions

Analysis of the nightly weather against the criteria described in Section 3 led to the exclusion of data whilst the ABMs were in situ during the 2021-2022 surveys. The dates that met weather criteria and were selected for data analysis are presented in Table 1 and Table 2.

Table 1 Weather conditions during the December 2021 survey

Date	Maximum overnight wind gust (km/h)	Average Nightly Windspeed (km/h)	Minimum temperature in first four hours after sunset (°C)	Total rainfall in first two hours after sunset (mm)	Suitable Weather Conditions?
17 Nov 2021	13.7	2.62	13.0	0.0	✓
18 Nov 2021	15.8	2.57	11.1	0.0	✓
19 Nov 2021	15.5	3.08	13.2	0.0	✓
20 Nov 2021	26.3	10.3	17.4	0.0	✓
21 Nov 2021	23.4	5.92	18.9	0.0	✓
22 Nov 2021	21.6	7.01	16.6	0.0	✓
23 Nov 2021	28.4	7.76	17.0	0.0	✓
24 Nov 2021	11.9	2.88	15.0	0.0	✓
25 Nov 2021	13.0	2.58	14.4	0.0	✓
26 Nov 2021	9.4	1.66	13.2	0.0	✓
27 Nov 2021	17.3	2.77	17.0	0.0	✓
28 Nov 2021	10.8	2.03	17.3	0.0	✓
29 Nov 2021	16.6	2.23	15.4	0.0	✓
30 Nov 2021	11.2	1.80	16.4	0.0	✓
1 Dec 2021	20.2	4.09	18.7	0.3	✓
2 Dec 2021	32.8	14.56	18.9	0.0	✓
3 Dec 2021	40.0	16.56	19.6	0.0	✓
4 Dec 2021	33.1	14.81	19.2	0.3	✓
5 Dec 2021	36.4	15.45	19.7	0.0	✓
6 Dec 2021	31.7	12.96	20.3	0.0	✓
7 Dec 2021	20.2	5.37	19.8	0.0	✓
8 Dec 2021	16.2	2.53	18.6	0.0	✓

Date	Maximum overnight wind gust (km/h)	Average Nightly Windspeed (km/h)	Minimum temperature in first four hours after sunset (°C)	Total rainfall in first two hours after sunset (mm)	Suitable Weather Conditions?
9 Dec 2021	12.2	2.42	19.1	0.0	✓
10 Dec 2021	19.8	5.22	18.8	0.0	✓
11 Dec 2021	17.3	4.82	19.8	0.4	✓
12 Dec 2021	20.9	5.67	19.3	0.4	✓
13 Dec 2021	38.9	16.14	19.2	2	✓
14 Dec 2021	65.5	21.11	18.8	4.5 (did not exceed >4mm/hr)	X
15 Dec 2021	26.3	7.37	17.7	0.0	✓
16 Dec 2021	33.8	6.08	17.3	0.2	✓
17 Dec 2021	32.0	4.22	14.6	0.0	✓
18 Dec 2021	26.3	3.71	15.2	0.0	✓
19 Dec 2021	19.4	2.85	13.8	0.0	✓
20 Dec 2021	14.8	2.62	17.0	0.0	✓
21 Dec 2021	17.3	4.30	19.0	0.0	✓
22 Dec 2021	28.1	7.89	18.2	0.0	✓
23 Dec 2021	28.1	8.74	19.5	0.0	✓

Table 2 Weather conditions during the April 2022 survey

Date	Maximum overnight wind gust (km/h)	Average Nightly Windspeed (km/h)	Minimum temperature in first four hours after sunset (°C)	Total rainfall in first two hours after sunset (mm)	Suitable Weather Conditions?
6 Apr 2022	28.4	6.56	19.0	0.0	✓
7 Apr 2022	28.1	6.20	15.8	0.0	✓
8 Apr 2022	18.4	3.56	13.9	0.0	✓
9 Apr 2022	22.0	7.02	18.7	0.0	✓
10 Apr 2022	14.8	2.26	15.0	0.0	✓

Date	Maximum overnight wind gust (km/h)	Average Nightly Windspeed (km/h)	Minimum temperature in first four hours after sunset (°C)	Total rainfall in first two hours after sunset (mm)	Suitable Weather Conditions?
11 Apr 2022	31.7	12.99	19.1	0.0	✓
12 Apr 2022	32.4	11.85	18.4	0.0	✓
13 Apr 2022	31.7	8.29	17.9	0.0	✓
14 Apr 2022	28.8	4.02	12.7	0.0	✓
15 Apr 2022	14.0	2.48	14.2	0.0	✓
16 Apr 2022	16.6	4.69	16.6	0.0	✓
17 Apr 2022	54.7	24.78	19.1	0.0	✓
18 Apr 2022	55.1	26.12	17.5	0.8	✓
19 Apr 2022	41.8	15.4	19.4	4 (did not exceed >4mm/hr)	✓
20 Apr 2022	36.4	13.86	19.6	0.0	✓
21 Apr 2022	31.7	9.81	19.9	0.0	✓
22 Apr 2022	43.9	12.42	15.8	0.0	✓
23 Apr 2022	27.7	3.71	12.1	0.0	✓
24 Apr 2022	39.6	4.94	14.5	1.5	✓
25 Apr 2022	23.0	2.54	12.5	0.0	✓
26 Apr 2022	22.7	3.11	15.7	0.0	✓
27 Apr 2022	32.8	6.06	14.5	0.0	✓
28 Apr 2022	19.1	8.16	17.5	0.0	✓
29 Apr 2022	27.4	8.14	16.3	0.0	✓
30 Apr 2022	29.2	10.32	15.8	0.0	✓
1 May 2022	22.3	4.01	15.7	0.0	✓
2 May 2022	19.8	2.36	14.7	0.0	✓
3 May 2022	12.6	1.91	15.0	0.0	✓

2 Appendix 2 - Survey Results

2.1 December 2021

Date	Site																													
	#1-Dec	#2-Dec	#3-Dec	#4-Dec	#5-Dec	#6-Dec	#7-Dec	#8-Dec	#9-Dec	#10A - Dec	#10B - Dec	#11-Dec	#12A - Dec	#12B - Dec	#13-Dec	#14-Dec	#15-Dec	#16-Dec	#17-Dec	#18-Dec	#19-Dec	#20-Dec	#21-Dec	#22-Dec	#23-Dec	#24-Dec	#25-Dec	#26-Dec	#27-Dec	#28-Dec	#29-Dec	#30-Dec
17-Nov-21	N/A	N/A	N/A	0	0	0	0	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	N/A	N/A	0	0	N/A	N/A	N/A	E	1	0	0	N/A	0	0
18-Nov-21	N/A	N/A	N/A	0	0	0	0	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	N/A	N/A	0	0	N/A	N/A	N/A	E	0	0	0	N/A	0	0
19-Nov-21	N/A	N/A	N/A	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
20-Nov-21	N/A	N/A	N/A	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
21-Nov-21	N/A	N/A	N/A	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
22-Nov-21	N/A	N/A	N/A	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
23-Nov-21	0	N/A	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
24-Nov-21	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
25-Nov-21	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
26-Nov-21	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	E	0	0
27-Nov-21	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	1	0	3	E	0	0
28-Nov-21	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	7	E	0	0
29-Nov-21	0	1	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0	13	E	0	0
30-Nov-21	0	0	0	0	0	0	0	0	0	0	N/A	1	0	0	0	0	0	0	0	0	0	0	1	0	0	E	0	0	10	E	0	0
1-Dec-21	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	E	0	0
2-Dec-21	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	E	0	0
3-Dec-21	0	0	0	0	0	0	0	0	0	0	N/A	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
4-Dec-21	0	0	0	0	0	0	0	E	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
5-Dec-21	0	0	0	0	0	0	0	E	E	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Dec-21	0	0	0	0	0	0	0	E	E	0	N/A	0	0	0	E	0	0	0	0	0	0	0	0	0	0	0	E	0	0	0	0	0
7-Dec-21	0	0	0	0	0	0	0	0	E	N/A	0	0	0	0	E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Dec-21	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Dec-21	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Dec-21	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Dec-21	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Dec-21	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0