5.10 Landscape - Landforms Design

The dunes are the ‘signature’ landforms encountered along the Expressway corridor. In the first instance the route alignment seeks to avoid significant dunes if possible. However, loss or modification of some dunes will be inevitable in places given the confined corridor available and the scale of the Expressway footprint.

It is noted that some of the dunes that still remain today do so because they are located in the existing road designation and thus have been ‘protected’ from modification for residential and other development. Notwithstanding this, integrating the Expressway linear form into the dune landforms is a key design objective.

Several streams or parts of streams will be diverted. Regardless of their current state (many are channelized and/ or weed infested) they will need to be reconstructed to allow indigenous ecology to re-establish. Other important landforms include the Waikanae River, existing wetlands, and distant views to Kāpiti Island.

Design Concept

The dune forms and other natural landform features have been avoided as best they can in the alignment of the Expressway. However, the Expressway will create change to landforms and the approach will be to ‘naturalise’ the changes as far as practicable, to integrate those changes with local topographical patterns.

Design Principles

The following principles will apply to the landform design:

1. Avoid modification of dunes, wetlands, and streams by minimising the construction footprint in sensitive areas.
2. Retain or enhance natural landforms wherever possible, including within both permanent and construction operational areas.
3. Design or modify landforms to acknowledge and reflect the local topographical pattern (scale, orientation, profile [refer Figure 99]).
4. Modify the slope or use retaining walls to reduce the size of cut faces. A standard 1:3 grade has been proposed in the preliminary design (refer Figure 100).
5. Shape (roll off) the tops of cut/ fill faces so the faces integrate with the existing dune profiles as far as practicable and minimise risk of water and wind erosion.
6. Shape visual and noise mitigation bunds to appear as ‘natural’ landforms (refer Figure 99), avoiding engineered appearances unless these forms are a component of a designed ‘land art’ formation.
7. Recognise that the Waikanae River corridor, including, oxbows, river bed and flood plains are a different landform to the dunelands area. The alluvial landform is an important linear feature providing a physical and visual link between the mountains and the coast.
8. Avoid where practicable the realignment of natural stream channels. Ensure that realigned streams are reinstated and designed to allow re-establishment of natural conditions to support indigenous ecology.
9. Recognise the views to the Tararua Ranges and Kāpiti Island as prominent and important landforms and features in the design of east/west local road crossings.
10. Recognise that the sand and peat substrates are likely to need conditioning to provide a good growing substrate for plants. Soils substrate trials will be undertaken to assess the needs and methodology to achieve this.
11. Minimise extent of exposed of sand areas during and post construction to limit erosion from wind and rain events.

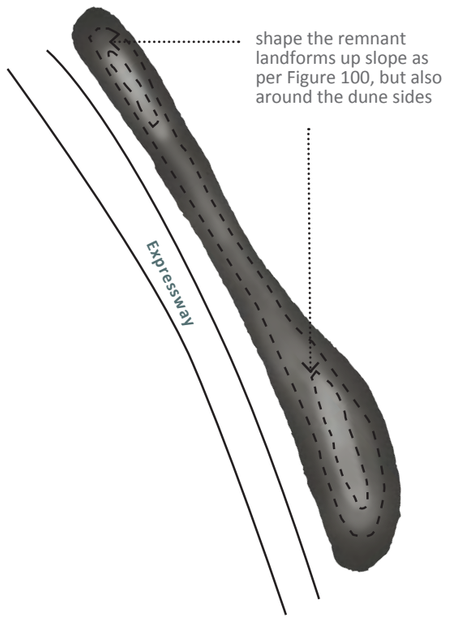
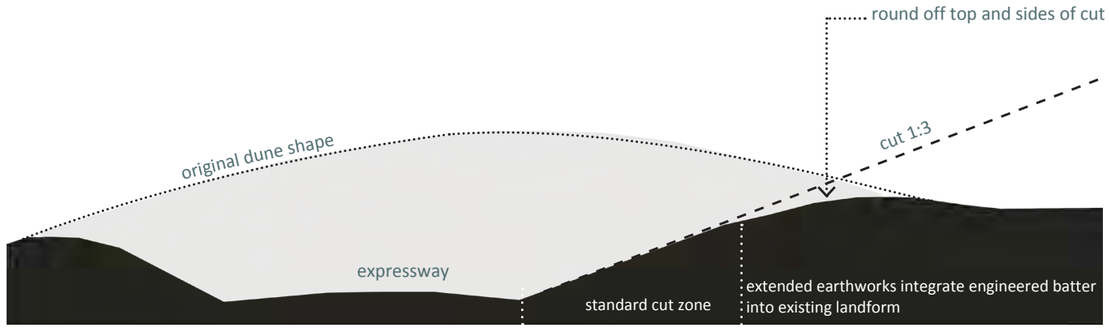
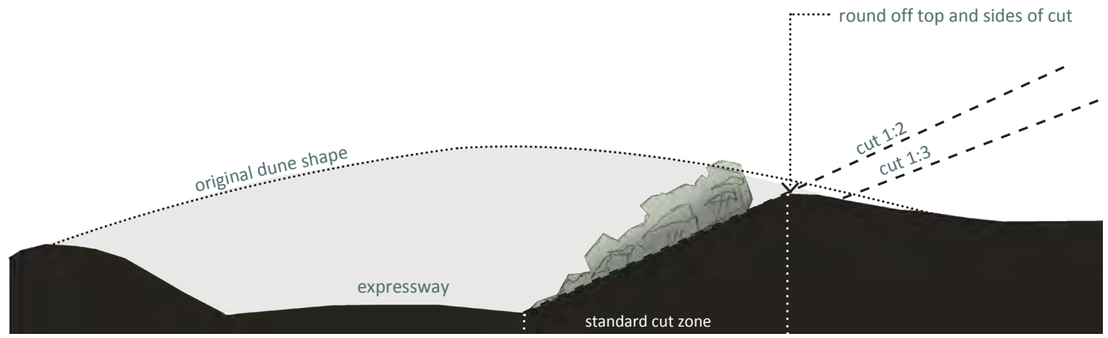


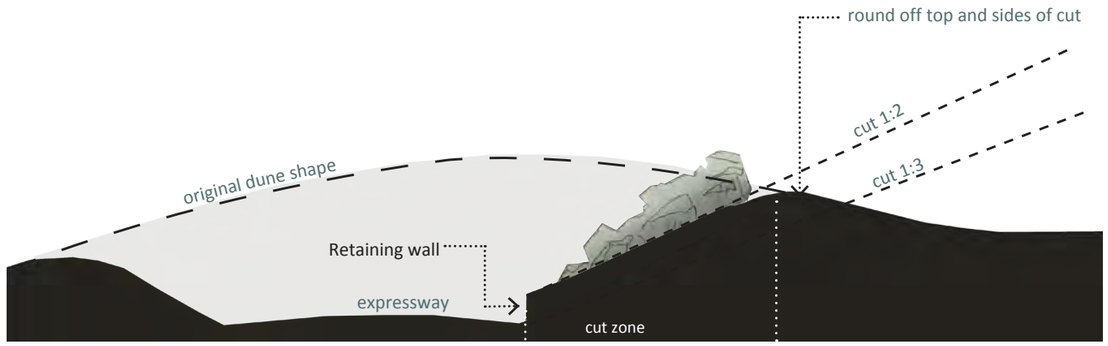
Figure 99 The Expressway has a linear form. Although the dunes are formed in an approximately linear pattern parallel to the coast they are not even and the Expressway cuts across them in places. In plan the remnant dune forms can be shaped to repeat slopes and shapes. The same approach should be used for bunds.



In open rural areas or where the landform will be seen from beyond Expressway consider extending the earthworks beyond standard cut zone to allow rounded dune forms



In areas to be planted consider a steeper cut as this allows more of the ground to be retained and can limit the need for extended earthworks beyond the engineers construction cut zone



Steepening the sides of the wall with retained toe reduces the size of the cut face and retains more of the dune land form. This same approach can be used where it is desireable to minmise the footprint adjacent to wetlands or other features

Figure 100 Expressway integration into the dune landforms can be improved by managing the cut face slopes and their angle at the slope top to wrap to the natural forms

5.11 Landscape - Planting Design

The diverse range of landscape characters through which the Expressway passes necessitates a site specific response to the planting along its length, to ensure new planting is consistent with the existing vegetation structure of specific localities. Figures 101- 107) show the proposed planting typologies along the route. The sector design plans in the ULDF also show how these typologies are applied and further detail is also provided in the Assessment of Landscape and Visual Effects (Technical Report 7, Volume 3).

Planting in the Expressway corridor will have multiple purposes of mitigation of visual effects, ecological enhancement, and integration of the Expressway into the wider landscape. It will be essential that the planting is maintained for a successful restoration and enhancement process.

Design Principles

The following principles will apply to the planting design:

1. Respond to the Expressway scale by using appropriate scale plant species to integrate it into the landscape.
2. Reflect the range of local vegetation character along the route with a appropriate plant species, palettes and compositions.
3. Recognise and retain existing trees and shelter belts to assist with landscape integration and mitigation.
4. Use both exotic and native plant species, as appropriate to the local character of the area, but the predominant species should be indigenous and locally sourced if practicable.
5. Develop the planting structure at the Kāpiti and Te Moana interchanges to specifically enhance the visual amenity of the public open space as well as to provide shade and shelter.
6. Maintain the open rural character, where appropriate, by extending pasture/mown grass to the edge of the paved roadway, and using ‘rural’ tree species.
7. Locate vegetation strategically to provide visual screening to the Expressway and associated structures, noise walls, and bunds.
8. Plant stormwater treatment wetlands, flood storage areas and their margins to reflect existing vegetation patterns and provide additional habitat to freshwater fish and bird species.
9. Establish riparian planting along stream corridors and their margins that assist with enhancing the ecology of the stream, including vegetation which will provide shade.
10. Select plant species that will be sustainable to the soil and climatic conditions within the corridor, to ensure successful establishment and growth.
11. Ensure that all indigenous plant species are sourced locally from the Foxton Ecological District.
12. Ensure that a post construction planting maintenance programme is established and appropriately funded to enable planting to be successfully established and self sustaining.

Figure 101 Massed Planting

Mass planting will primarily include native plant species to provide dense vegetated areas, and may consist of a mixture of species or areas of single species.

Species selection will consider the locality and planting substrate and generally include hardy pioneer species suited to the site. Species may include grasses, ground covers, shrubs and trees.

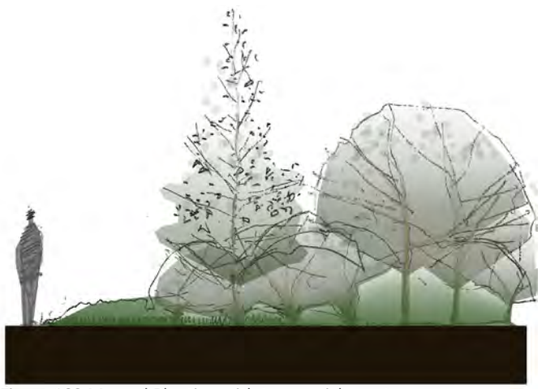


Figure 102 Massed Planting with tree enrichment

Mass planting will primarily include native plant species to provide dense vegetated areas. Enrichment planting of canopy tree species that require a sheltered environment to establish will enrich the biodiversity of the planting and wider area in the long term.

Plant shrubs and small trees at close centres to form a vegetation mass that out competes weeds and other unwanted vegetation for minimal long term maintenance requirements.

Figure 103 Trees under planted with Grass

Single specimen or groups of tall, exotic and native trees established in lawn or pasture to reflect the open character of the local area- to be used in open rural areas and interchanges.

Tree planting in rural areas will reflect existing patterns, such as shelter belts, wood lots and small groups of trees using species such as poplar, willow, pine, eucalypt. Exotic or native amenity trees will be used in civic areas. Avoid the use of willow on streams where practicable and in consultation with GWRC.

Figure 104 Specimen Trees under planted with ground cover

Single specimen or groups of tall, exotic and native specimen trees under planted with massed ground cover species including grasses and low shrubs.

Typically used at interchange or civic areas to provide a low maintenance robust tree structure, shade, screening, and shelter.

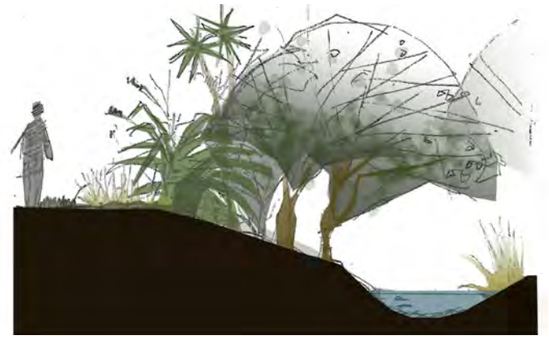


Figure 105 Riparian Planting

Riparian planting will provide transition to adjoining areas and enhance the ecological values of the stream and its margins, providing shade with overhanging vegetation, and stabilising banks.

Figure 106 Wetland/Stormwater Pond Planting

Wetland species consistent with local species including species tolerant of permanent and occasional inundation and drier land on the margins.

Figure 107 Storm water swales

Wetland species consistent with local species including species tolerant of permanent and occasional inundation and drier land on the margins.

Vegetation in swale channel will protect against soil erosion during peak flows.

5.12 Pedestrian, Cycle and Bridleway Design

The provision for walking and cycling as part of the Expressway project reflects the policy commitment from KCDC, NZTA and regional government to provide an integrated movement network that caters for a range and choice of modes.

The context description (refer to section 3) describes the current use of the existing network by walkers, cyclists and horse riders.

Design Concept

The design concept for walking and cycling is the provision of a continuous route which encourages cyclists off the Expressway shoulder and that enables walkers and cyclists improved and safe access to and from local and sub-regional destinations (refer to Figure 113). The new route will work in concert with the existing network and a future network being developed to enhance the walking and cycling activity in the district.

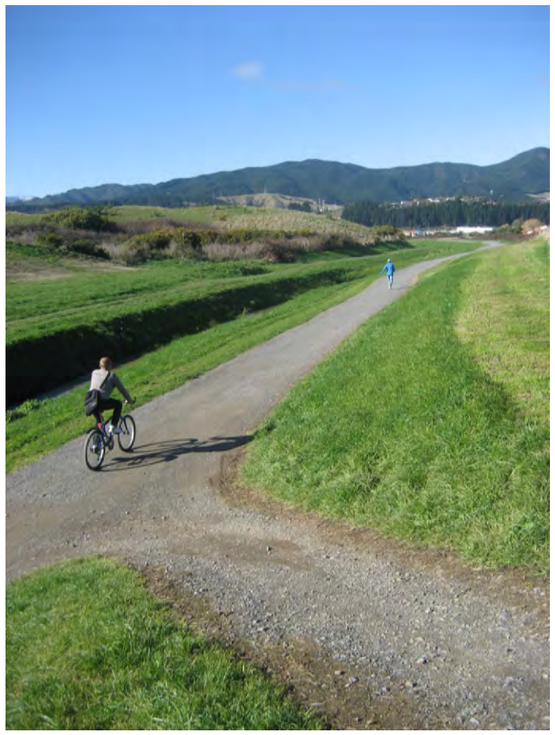
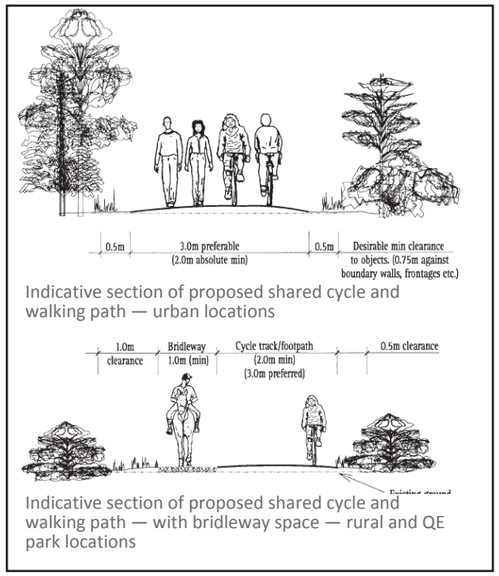


Figure 108 Existing shared cycle and walking path at Wharemauku Stream

Design Principles

1. Provide a safe cycle and walking shared path that is generally parallel to the Expressway route to encourage its use by cyclists and walkers.
2. Recognise and provide for connections to the existing and KCDC planned cycle and walking network as well as to all local roads in the positioning of access links of the cycle and walking path.
3. Ensure that the cycleway is planned in relation to linking with the connections at the Transmission Gully (south) end and the Peka Peka to Otaki (north) end.
4. Provide for slope grades that allow use by a range of users and design for these slopes at the places where the cycleway intersects with the local roads to facilitate cycleable access connections at all of these.
5. Secure with GWRC the provision of a southern section of the route through Queen Elizabeth Park, to link Paekākāriki and Raumati to facilitate commuting use between the community to the south and the services and amenities to the north. It is noted that this will not form part of the designation for the Expressway and will occur by separate agreement.
6. Provide a formed and appropriately surfaced path of 3m width that provides for road cyclists as well as other modes, with a sealed surface in the urban areas and looser surface in rural and Queen Elizabeth Park areas.
7. Identify separate lanes for cycling and walking paths to prevent conflicts in heavu use areas and use directional signage to assist wayfinding.
8. Provide low level lighting at the locations where the path intersects with local roads and integrate lighting with the local road interface design.
9. Consider lighting through the urban areas to provide for evening use of the path.
10. Reflect the context in the design of the walking and cycle path, such as through wetland areas using boardwalks and across waterways expressing the crossing by using bridges rather than culverts.
11. Recognise the opportunities for the integration of the walking and cycle path as a corridor for community art projects.
12. Provide for horse riding alongside the cycle and walking path in the rural and open space sections of the route such as at Waikanae River and Queen Elizabeth Park.

Figure 109 Indicative image of type of proposed shared cycle and walking path - shown as approximately 1m wide pedestrian and 2m wide cycle lanes

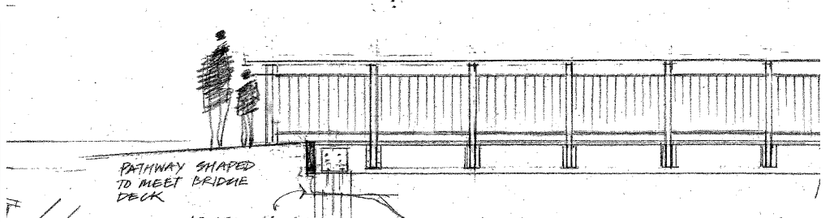


Indicative section of proposed shared cycle and walking path — urban locations

Indicative section of proposed shared cycle and walking path — with bridleway space — rural and QE park locations

Figure 110 Indicative sections (source KCDC)

Figure 111 Simple timber cycle and walking path bridge over watercourses



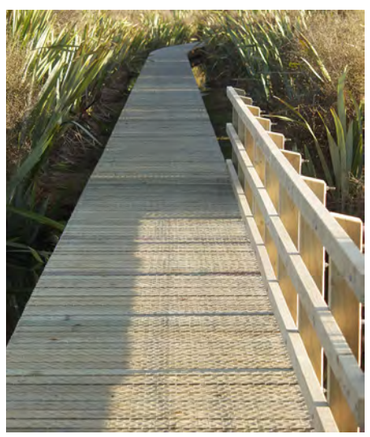


Figure 112 Simple timber cycle and walking path boardwalk over wetland areas — can be with handrail for open water areas

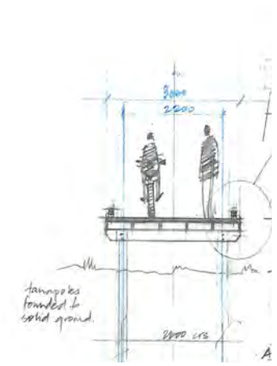


Figure 113 Cycle and walking network - note this shows a combination of the use of existing roads (purple), off road tracks (purple dash) and describes the Expressway connector (orange line). The other local roads that do not form a principal role in the cycle and walking network are shown in white. At each of the places where the Expressway path crosses a local road or another part of the cycle/walking network a connection will be made (circle) that allows cyclists, walkers or horse riders to get on or off the Expressway path to the road or track.

The plan is adapted from the KCDC and Kāpiti Cycling Inc Kāpiti Coast District Coastal Cycleway map. It does not show every small linkage, but shows the principal network.

5.13 Road Furniture Design

Road furniture is the set of elements that are required for the safe functioning of the Expressway. The elements include barriers, lights, signs and messaging systems. These elements need to function to provide the desired safety outcomes but can also be scaled, positioned, and selected to contribute positively to the driver's visual experience and to fit with the local environment.

Design Concept

To integrate all road furniture within the local environment sensitively and to enhance the Expressway driver experience through the Expressway by planning and designing the furniture purposefully from the outset.

Design Principles

Side Barriers

- If possible use runoff areas beyond Expressway shoulders to avoid the need for side barriers.
- Where side barriers are required for safety reasons:
  - > consider the use of ramped up ground as an altrenative to constructed barriers
  - > keep height of all barriers to a minimum to retain views beyond the carriageway
  - > avoid short sections of steel barrier - landform bunds are the preferred option
  - > match barriers on both sides of the carriageway
  - > avoid abrupt and hard ends to barriers, and tie back to bridge barriers with a slip form end
  - > integrate noise mitigation structures and safety barriers where these are required in combinations (refer to noise design)
  - > use concrete side barriers over bridges with the integration to the outward face (refer bridge design)
  - > design the transition of bridge barriers back to the landscape - emphasise the impression of the bridge ending from external view points and do not continue bridge barriers out into the landscape except with earth bunding behind (refer noise design)
  - > avoid surface motif patterns to concrete barriers - texture and natural colours may be used as part of the concrete surface treatment
  - > use steel (w-section and/or thrie-beam) barriers at culverts and minimise their extent

Median Barriers

- Two median widths are proposed - 6m and 4m - which apply to the urban and rural areas respectively. In both cases a wire rope barrier is preferred and the median strip planted on the wider median (refer to landscape planting design)

Lighting Columns

- Keep lighting along the Expressway to a minimum and locate lights at on and off ramps only.
- Use directional lights in the urban areas to minimise the light spill.
- Use steel light standards with a plain galvanised finish and have a defined acute angle between the pole and arm, or attach fitting directly to poles.
- Use consistent heights within each group of light standards (for instance within each interchange).
- Utilise the same pole to attach lights and any other furniture such as CCTV cameras.
- Place light poles and other furniture to avoid the need for additional barrier protection at the base.

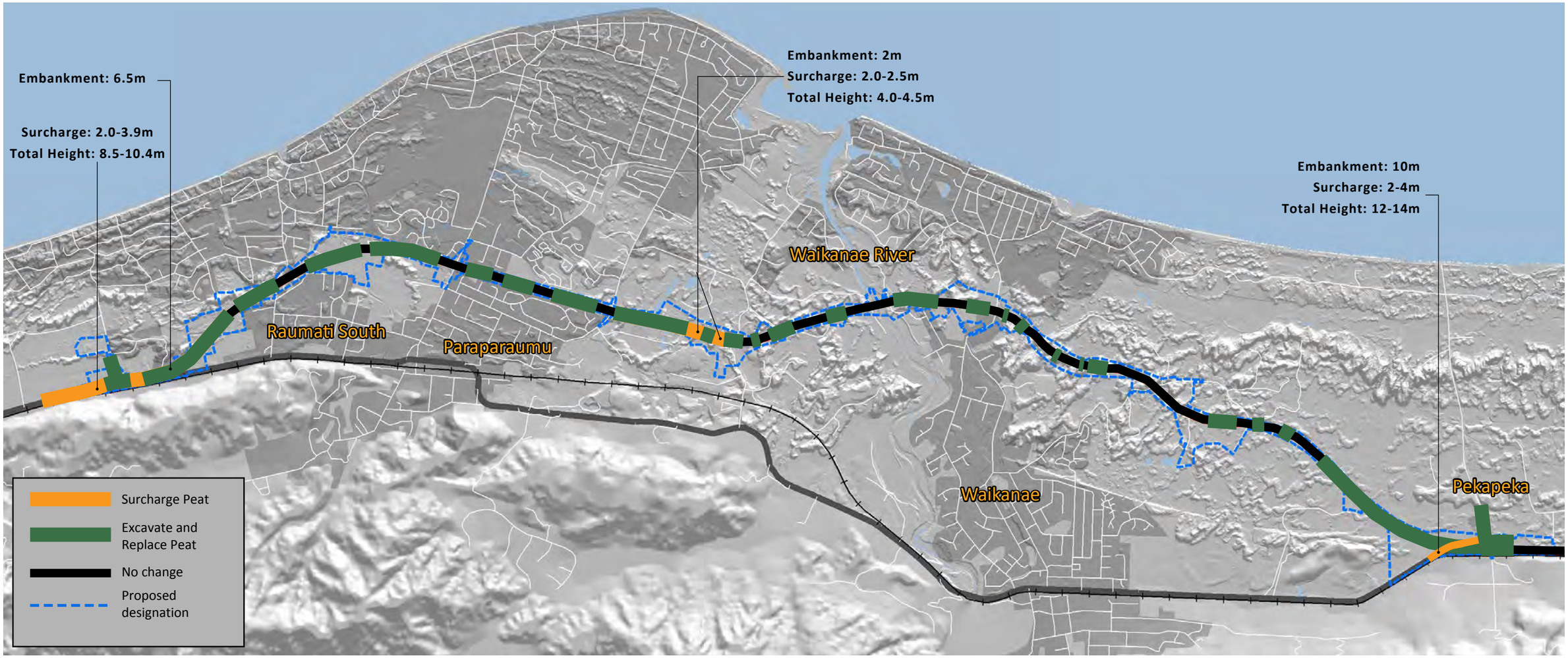
CCTV

- Adopt design for CCTV camera standards that is either combined or consistent with light standards.

Sign Gantries and Signage Posts

- Design gantries so that beams and pillars join at right angles. Preference is for square box section, I beams and flat steel components.
- Design pillars to prevent unauthorised access without the need for such secondary fittings such as barbed wire.
- Use simple steel posts for smaller signs installed adjacent to the Expressway such as 'welcome' signs.
- Paint gantries a metallic colour that complements weathered galvanised steel.
- Where possible, signage should be visually contained within the depth of the spanning girder, through integrated design of girders and signage panels
- Signage should not be mounted on bridges as they are to be retained as clean sculptural shapes
- Signage on local roads directing users to the Expressway should be minimised and integrated with other furniture to both minimise visual clutter and minimise the number of support posts at ground level.
- Support posts for signs on local road should be located off footpaths and in places where they do not obstruct the passage of walkers, cyclists and horseriders.
- Avoid the use of overhead gantries on the local road to support signs or traffic lights.

Attachment 7: Ground Improvements, Pre-loading



NOTE:

Surcharge Peat: These areas will be pre-loaded. This involves building up the earthworks with fill materials to levels higher than the final road level to compact the road surface to allow a firm base for road construction. This material will need to remain in place for between 6-24 months depending on the location. The height of the pre-loading will vary from 2.0-3.9m as shown on the map above.

Excavate and Replace Peat: These are areas where the peat is particularly deep and so it will be excavated and replaced with imported fill material in order to create a firm base for road construction.

Attachment 8: Planting Plans (including areas of vegetation to be retained)

The Site Specific Ecological Mitigation Planting (SSEMP) site maps in the Ecological Management Plan (EMP) that outline the indicative areas of ecological mitigation to be undertaken in each SSEMP area will be designed by the Project Ecologist with input from the Project Landscape Architect to ensure that these areas meet the ecological requirements specified and will have priority over the Planting Plan Maps included in this attachment. The final locations and extent of ecological and landscape and visual mitigation planting within each SSEMP site will be refined through the Site Specific Management Plans prepared for each area.

The SSEMP site maps that outline the indicative areas of ecological mitigation to be undertaken in each SSEMP area; often these areas are part of a larger planted area that fulfil both landscape and visual mitigation and for offset flood storage. However, where this occurs the planting proposed for the SSEMP areas identified have priority over the Planting Plan Maps included in Attachment 8 of the LMP. These maps and the final locations of ecological and landscape and visual mitigation planting within each SSEMP site will be refined through the Site Specific Management Plans prepared for each area.

The following series of maps are from Appendix A Landscape and Visual Effects Assessment (Technical Report 7). They summarise the information from 35 sheets of aerial photographs that cover the route, and record 'Vegetation to be Retained' and 'Proposed Mitigation Planting.'

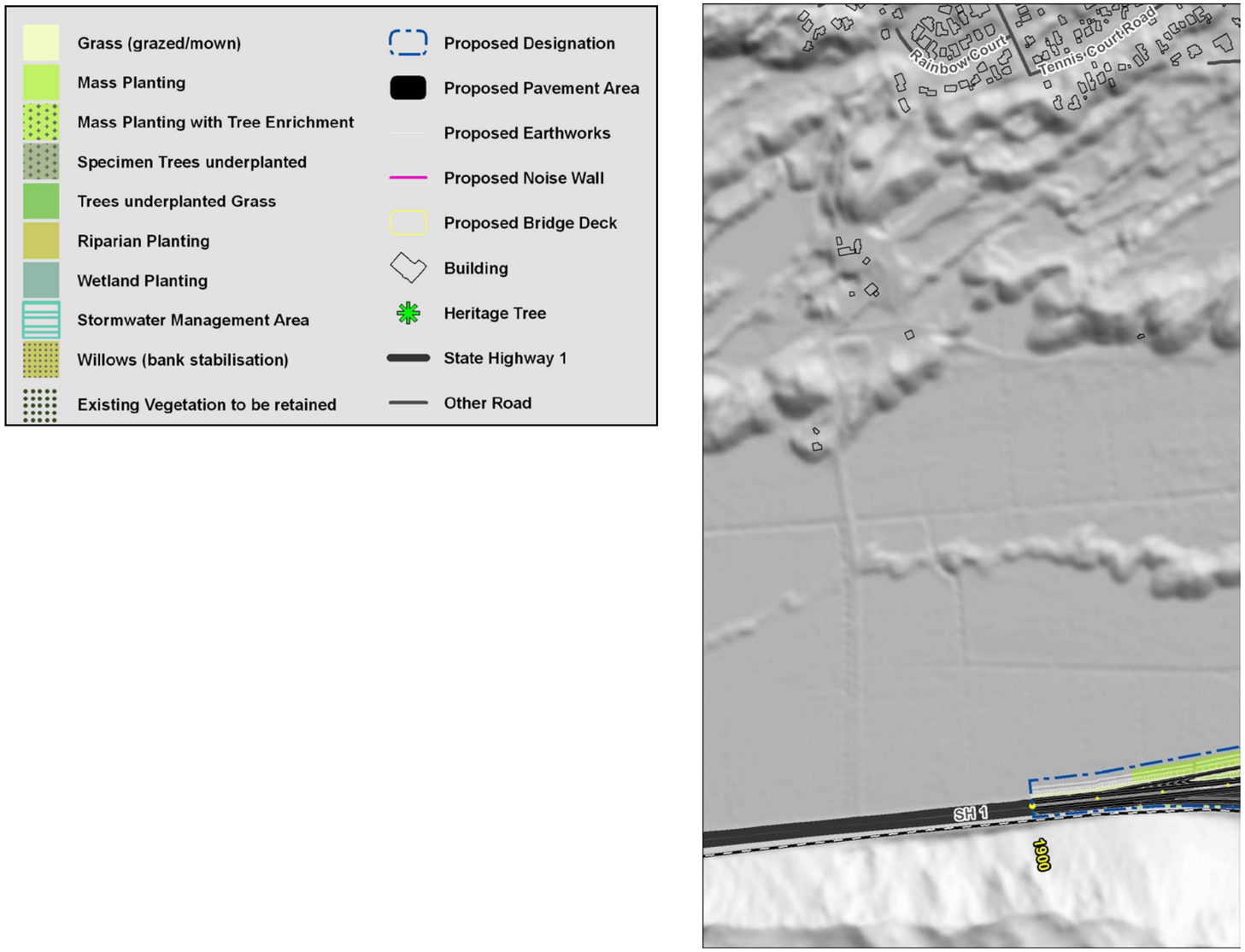
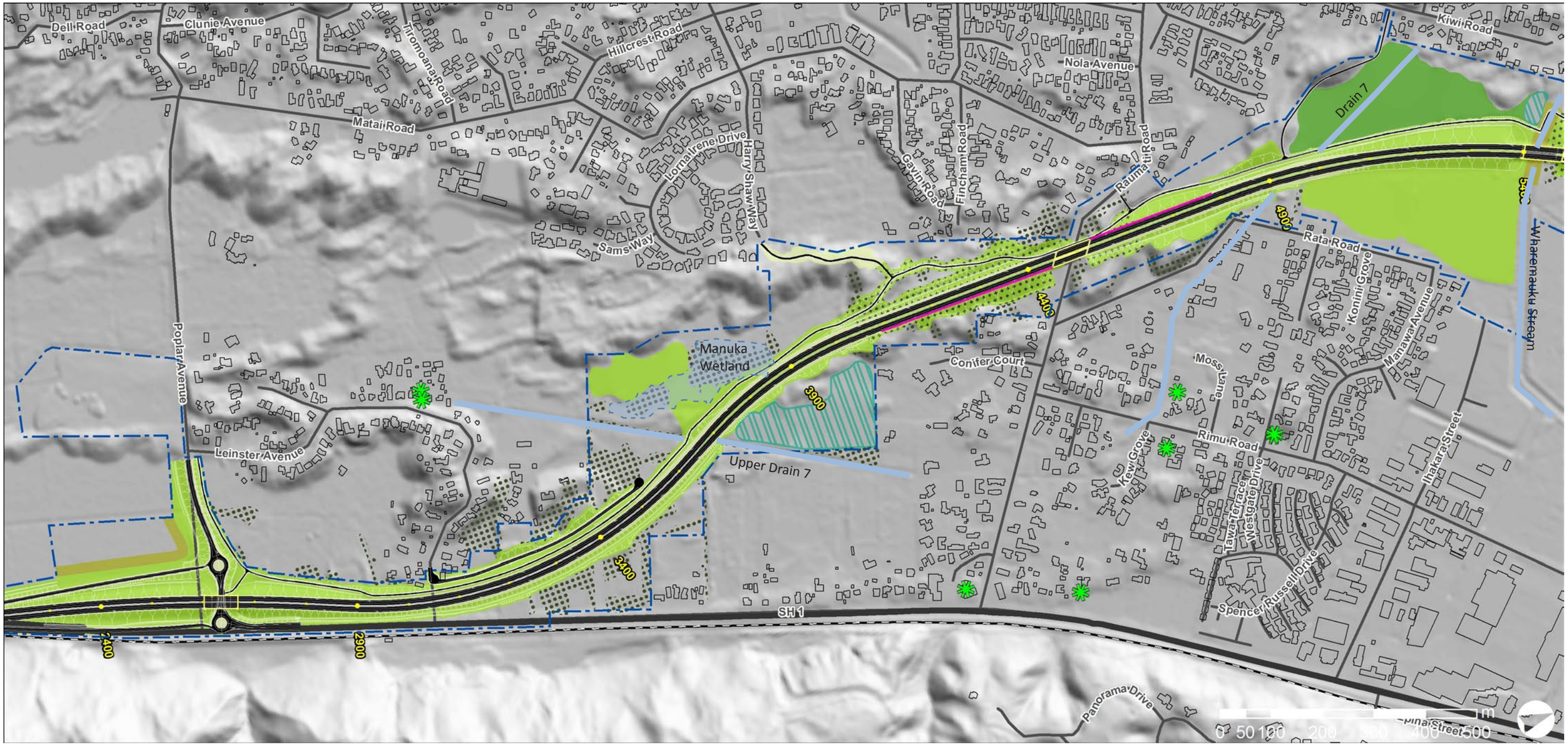


FIGURE 3 SECTOR ONE MITIGATION PLANTING



SECTOR ONE MITIGATION PLANTING FIGURE 3

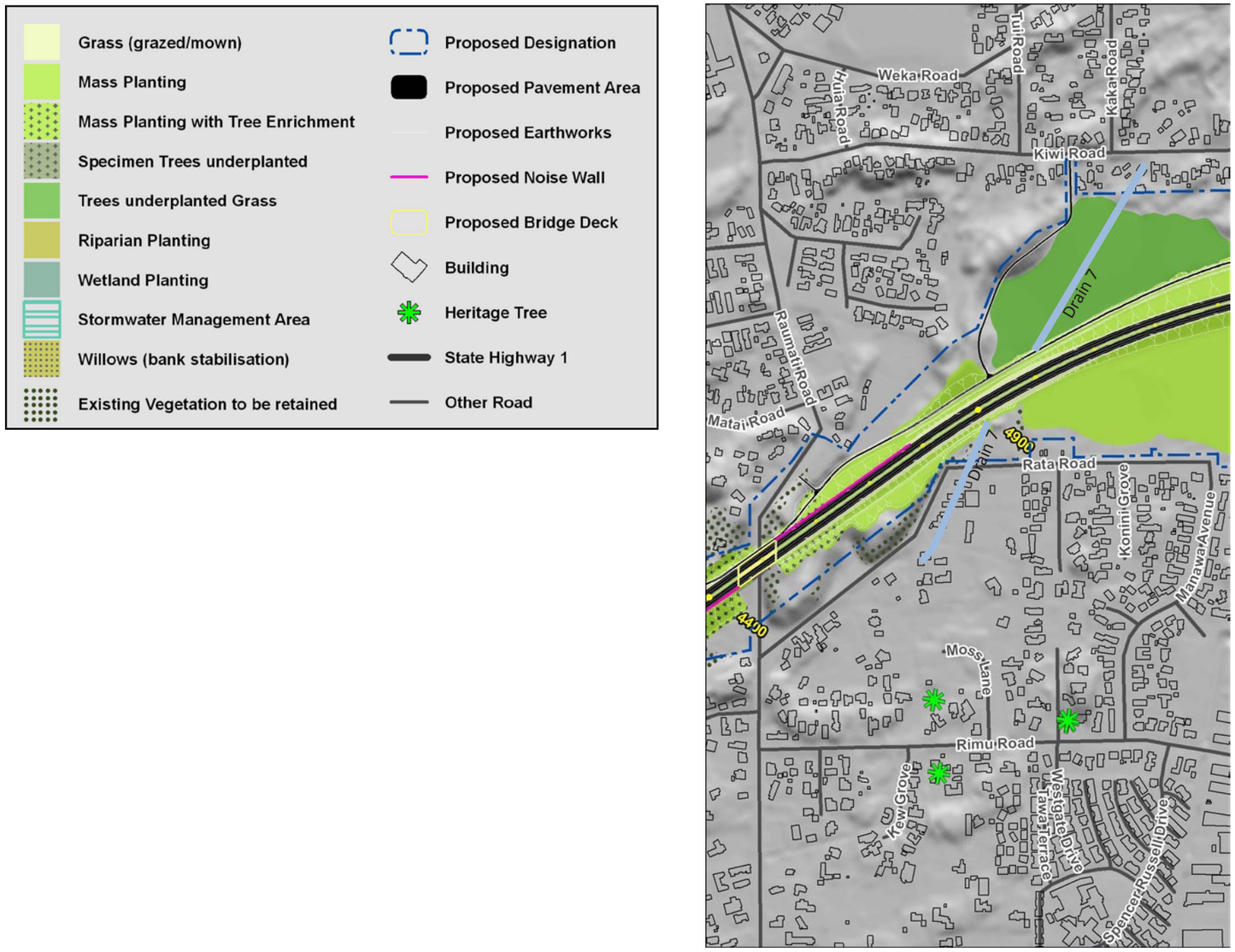
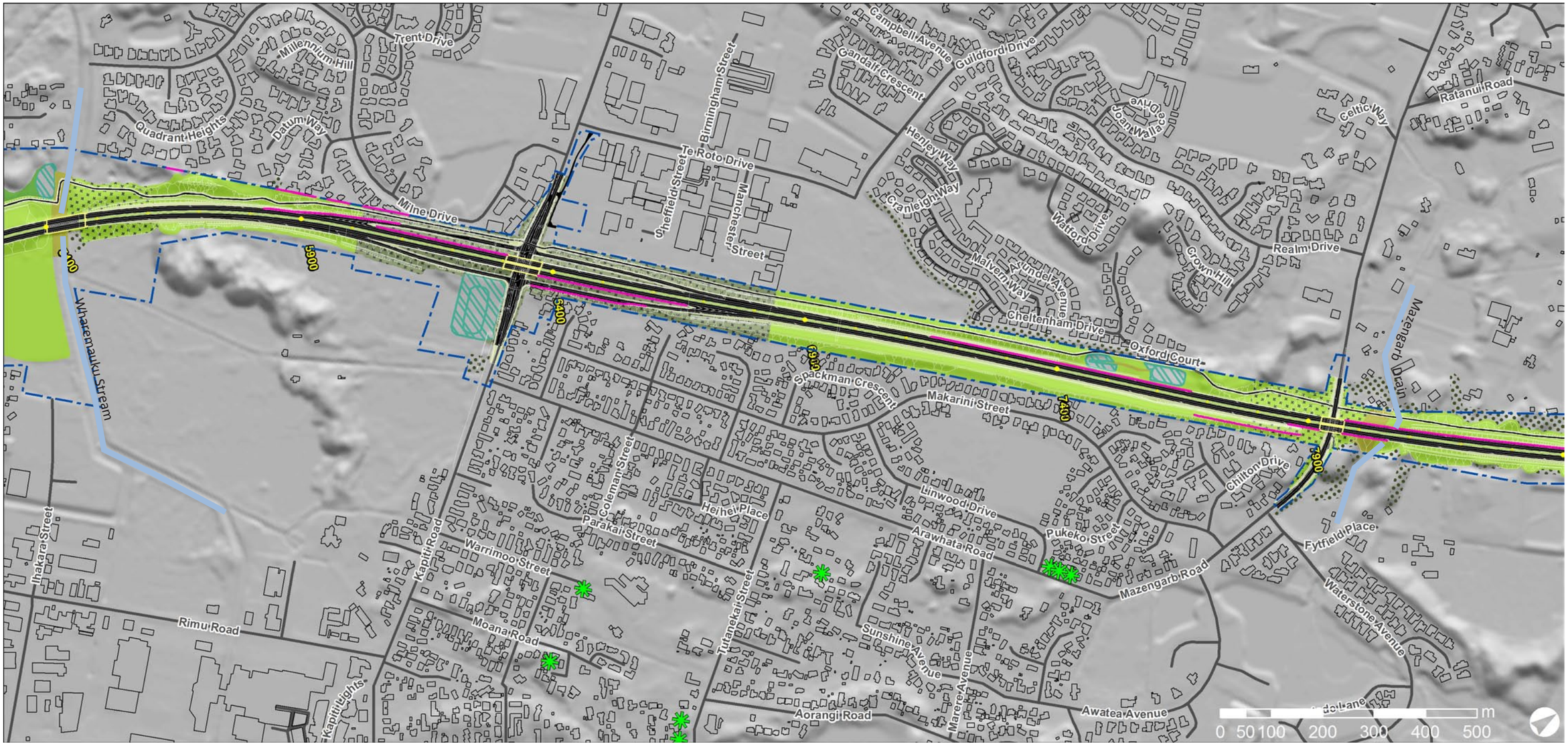
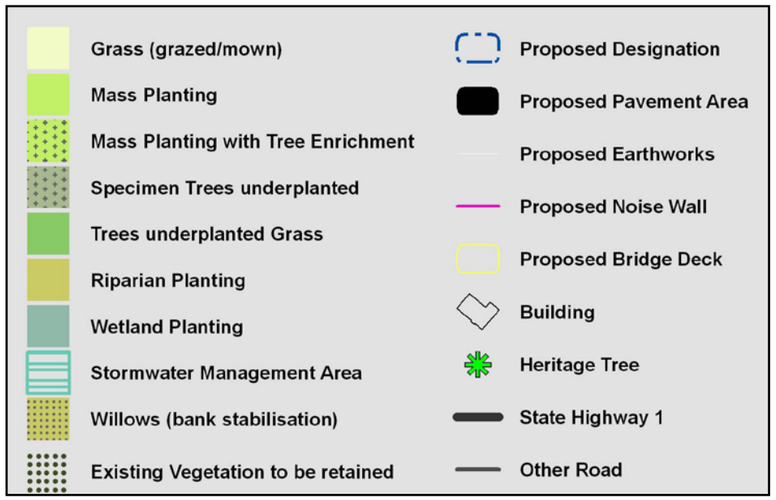


FIGURE 4 SECTOR TWO MITIGATION PLANTING



SECTOR TWO MITIGATION PLANTING FIGURE 4



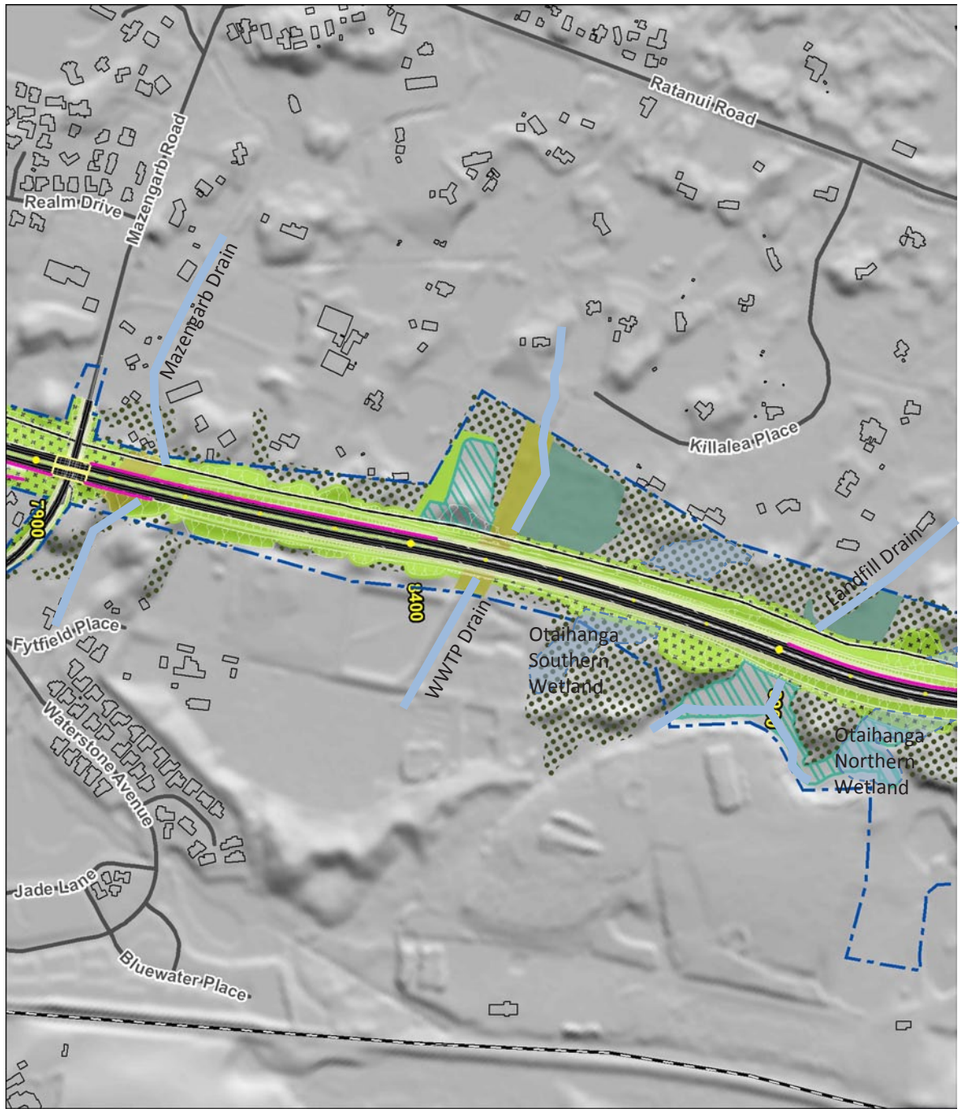
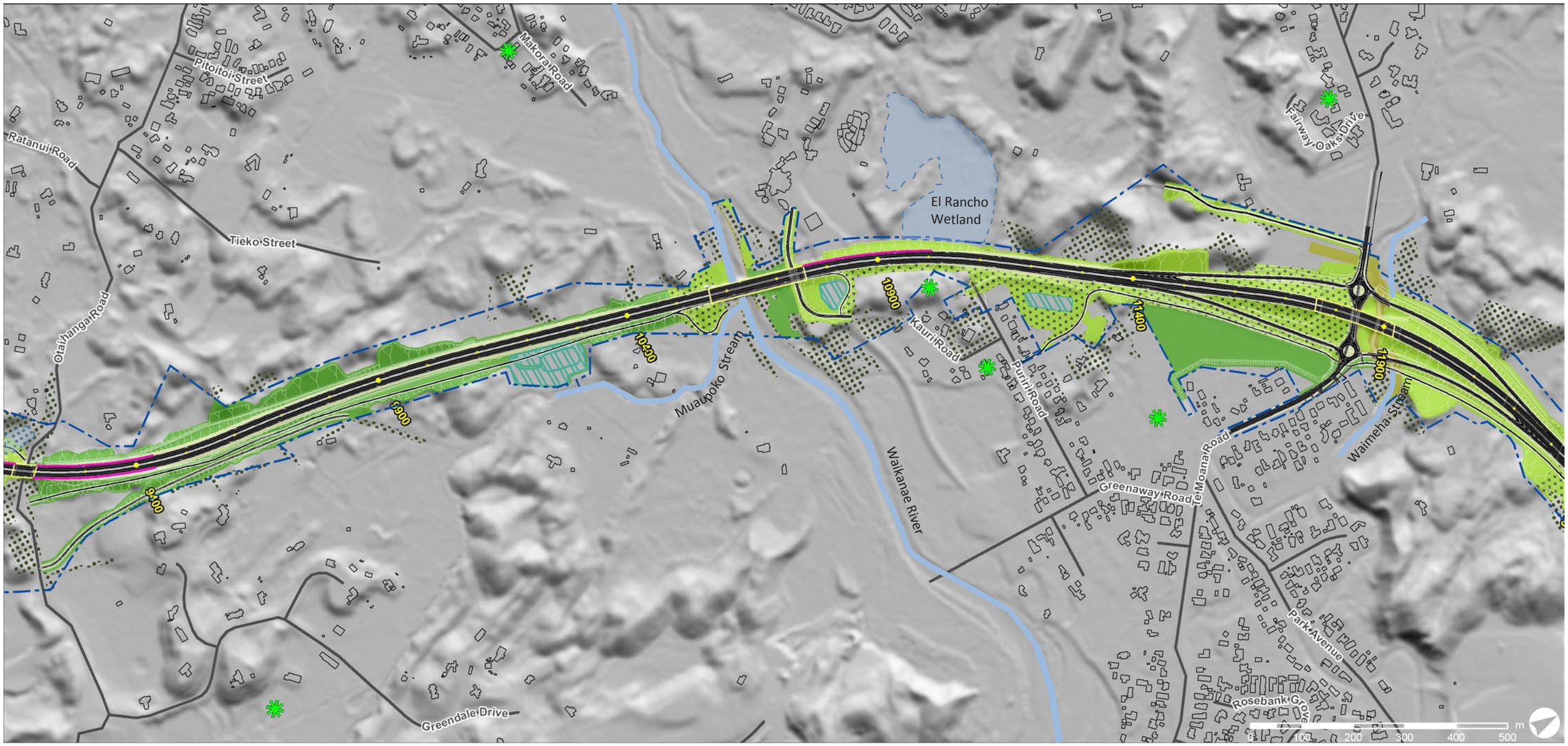


FIGURE 5 SECTOR THREE MITIGATION PLANTING



SECTOR THREE MITIGATION PLANTING FIGURE 5

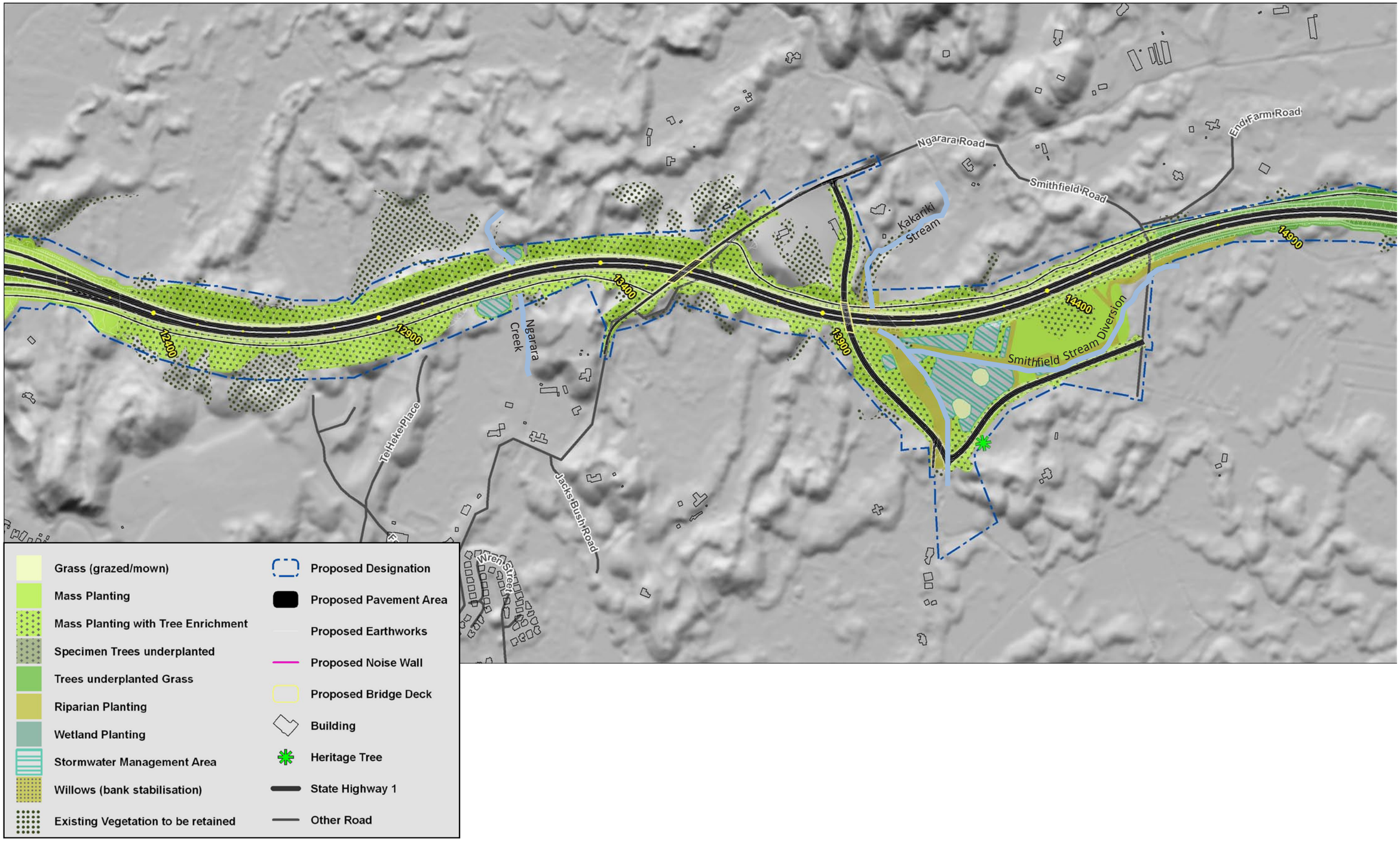


FIGURE 6 SECTOR FOUR MITIGATION PLANTING

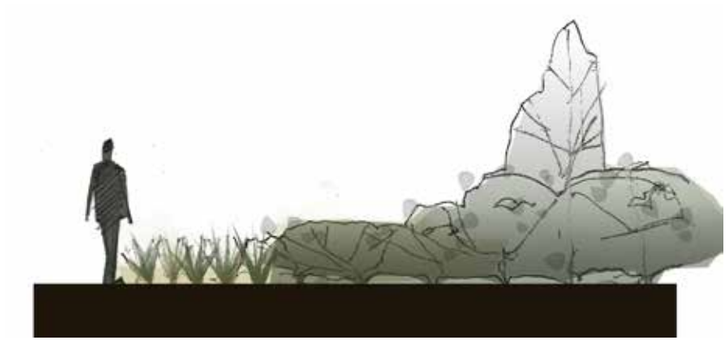
SECTOR FOUR MITIGATION PLANTING FIGURE 6

Attachment 9: Planting Types

Eight different planting types will be used along the Expressway:

- Massed Planting
- Massed Planting with Tree Enrichment
- Trees Underplanted with Grass
- Riparian Planting
- Specimen Trees Underplanted with Ground Cover
- Road Median Planting
- Wetland/Stormwater Pond Planting
- Stormwater Swale Planting.

These are from Appendix A, Landscape and Visual Effects Assessment, (Technical Report 7) submitted as part of the AEE.



MASSED PLANTING

Mass planting will primarily include native plant species to provide dense vegetated areas, and may consist of a mixture of species or areas of single species.

Species selection will consider the locality and planting substrate and generally include hardy pioneer species suited to the site. Species may include grasses, ground covers, shrubs and trees.

Indicative species:

Grasses:

- *Festuca novae-zelandiae* (Fescue tussock)
- *Chionochloa flavicans* (Miniature toetoe)
- *Poa cita* (Silver tussock)
- *Chionochloa testacea*
- *Carex inversa* (Knob sedge)

Ground cover:

- *Muehlenbeckia complexa* (Pohuehue)
- *Hebe elliptica*
- *Pimelea prostrata*
- *Dichondra repens*
- *Coprosma cultivars*

Small Trees:

- *Rhopalostylis sapida* (Nikau)
- *Coprosma repens* (Taupata)
- *Macropiper excelsa* (Kawakawa)
- *Myrsine australis* (Mapou)
- *Kunzea ericoides* (Kanuka)
- *Myoporum laetum* (Ngaio)
- *Cordyline astralis* (Cabbage tree)

Shrubs

- *Dodonaea viscosa* (Akeake)
- *Coprosma propinqua* (Mingimingi)
- *Coprosma acerosa* (Sand coprosma)
- *Coprosma robusta* (Karamu)
- *Phormium tenax* (New Zealand flax)
- *Griselinia lucida* (Puka)

MASSED PLANTING WITH TREE ENRICHMENT

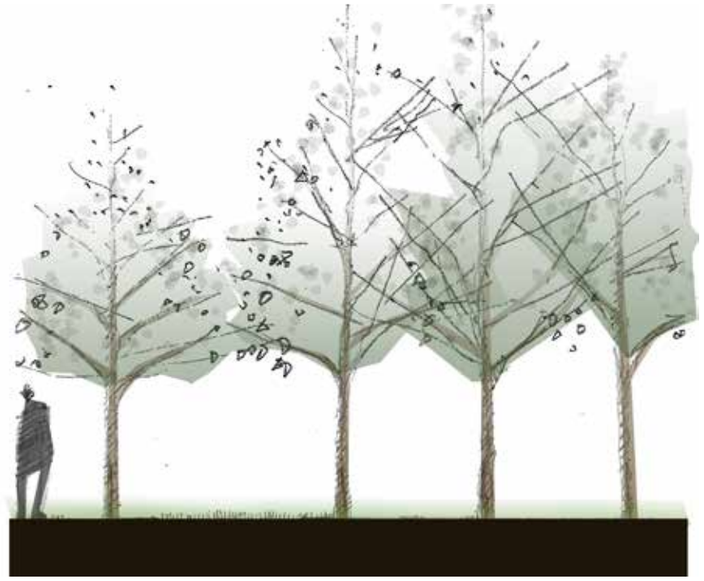
Mass planting will primarily include native plant species to provide dense vegetated areas. Enrichment planting of canopy tree species, that require a sheltered environment to establish will enrich the biodiversity of the planting and wider area in the long term. Enrichment planting of canopy species will occur over 2 years following the initial mass planting.

Plant shrubs and small trees at close centres to form a vegetation mass that out competes weeds and other unwanted vegetation for minimal long term maintenance requirements.

Indicative species:

Canopy Trees:

- *Alectryon excelsus* (Titoki)
- *Podocarpus totara* (Totara)
- *Dysoxylum spectabile* (Kohekohe)
- *Prumnopitys taxifolia* (Matai)
- *Knightia excelsa* (Rewarewa)



TREES UNDER PLANTED WITH GRASS

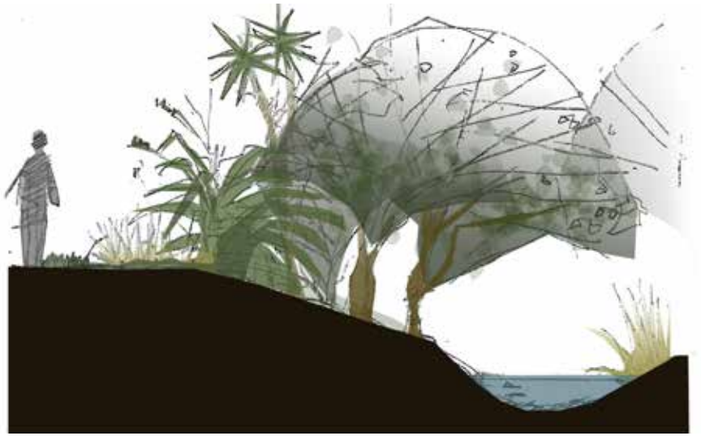
Single specimen or groups of tall, exotic and native trees established in lawn or pasture to reflect the open character of the local area- to be used in open rural areas and interchanges.

Tree planting in rural areas will reflect existing patterns, such as shelter belts,wood lots and small groups of trees using species such as poplar, willow, pine, eucalypt. Exotic or native amenity trees will be used in civic areas such as interchanges.

Indicative species:

- *Eucalyptus* spp.
- *Populus* spp.
- *Quercus palustris* (Pin oak)
- *Metrosideros excelsa* (Pōhutukawa)
- *Alnus cordata* (Italian Alder)
- *Myoporum laetum* (Ngaio)
- *Podocarpus totara* (Totara)
- *Metrosideros robusta* (Northern Rata)
- *Knightia excelsa* (Rewarewa)

FIGURE 2 MITIGATION PLANTING TYPES



RIPARIAN PLANTING

Riparian planting will provide transition to adjoining areas and enhance the ecological values of the stream and its margins, providing shade with overhanging vegetation, and stabilising banks.

Indicative species:

Riparian:

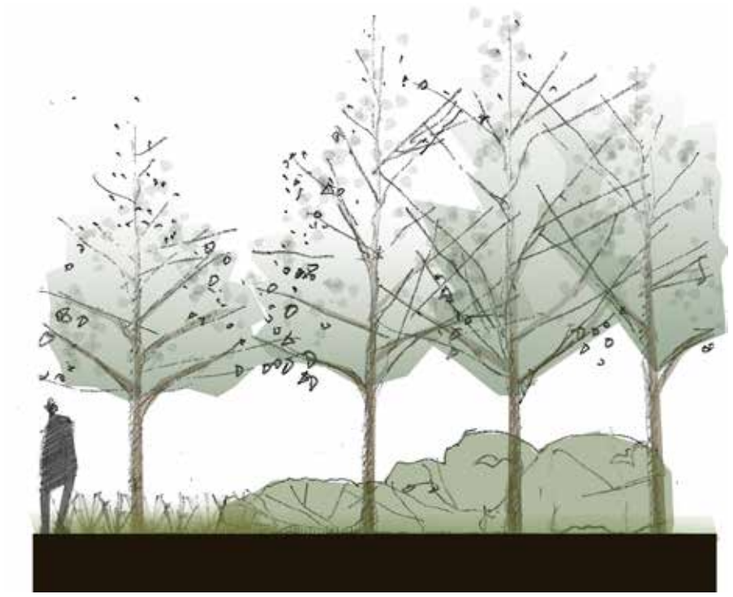
- *Phormium tenax* (New Zealand Flax)
- *Carex secta* (Makuru)
- *Carex lessoniana* (Swamp Sedge)
- *Cordyline australis* (Cabbage Tree)
- *Plagianthus regius* (Ribbonwood)
- *Austroderia fulvida* (Toetoe)
- *Pseudopanax arboreus* (Fivefinger)

ROAD MEDIAN

Planting at the 6m wide median would consist of hardy indigenous species that will require low level of maintenance once established.

Indicative species:

- *Muehlenbeckia australis* (Pohuehue)
- *Libertia ixioides* (Mikoiko)
- *Libertia peregrinans*
- *Carex spp.*
- *Chionochloa flavicans*
- *Coprosma cultivars*
- *Lomandra spp.*



SPECIMEN TREES UNDER PLANTED WITH GROUND COVER

Single specimen or groups of tall, exotic and native specimen trees underplanted with massed ground cover species including grasses and low shrubs.

Typically used at interchange or civic areas to provide a low maintenance robust tree structure, shade, screening, and shelter.

Indicative species:

Ground Cover:

- *Muehlenbeckia complexa* (Pohuehue)
- *Corokia cotoneaster* (Korokio)
- *Coprosma* spp.
- *Carex solandri* (New Zealand Bush Sedge)
- *Hebe spp.*

Specimen Trees:

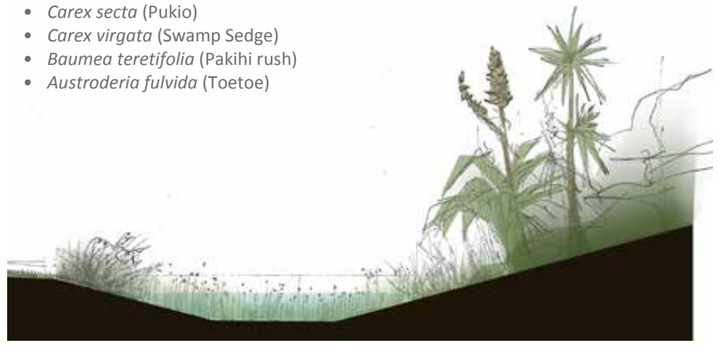
- *Quercus palustris* (Pin Oak)
- *Metrosideros excelsa* (Põhutukawa)
- *Alnus cordata* (Italian Alder)
- *Liquidambar styraciflua* (Liquidambar)
- *Vitex lucens* (Puriri)
- *Knightia excelsa* (Rewarewa)
- *Alectryon excelsus* (Titoki)

WETLAND/STORMWATER POND PLANTING

Wetland species consistent with local species including species tolerant of permanent and occasional inundation and drier land on the margins.

Indicative species

- *Phormium tenax* (New Zealand Flax)
- *Leptospermum scoparium* (Manuka)
- *Carex secta* (Pukio)
- *Carex virgata* (Swamp Sedge)
- *Baumea teretifolia* (Pakihi rush)
- *Austroderia fulvida* (Toetoe)



STORM WATER SWALES

Wetland species consistent with local species including species tolerant of permanent and occasional inundation and drier land on the margins.

Vegetation in swale channel will protect against soil erosion during peak flows.

Indicative species:

Wet swales:

- *Baumea rubiginosa* (Orange nut sedge)
- *Baumea teretifolia* (Pakihi rush)
- *Baumea tenax* (Bumblebee nut sedge)
- *Austroderia fulvida* (Toetoe)
- *Phormium tenax* (New Zealand Flax)
- *Cordyline australis* (Cabbage Tree)
- *Carex virgata* (Swamp Sedge)

Dry swales:

- *Mown grass*