

8.14 SH 20 under SH1 Link

- Form of underpass represented as a 'gash' through the underlying geology
- Underpass and walls either side to be lined with pre-cast concrete panels that are heavily rusticated at the base and finely textured at the top to reinforce underlying volcanic geology



Bridge location

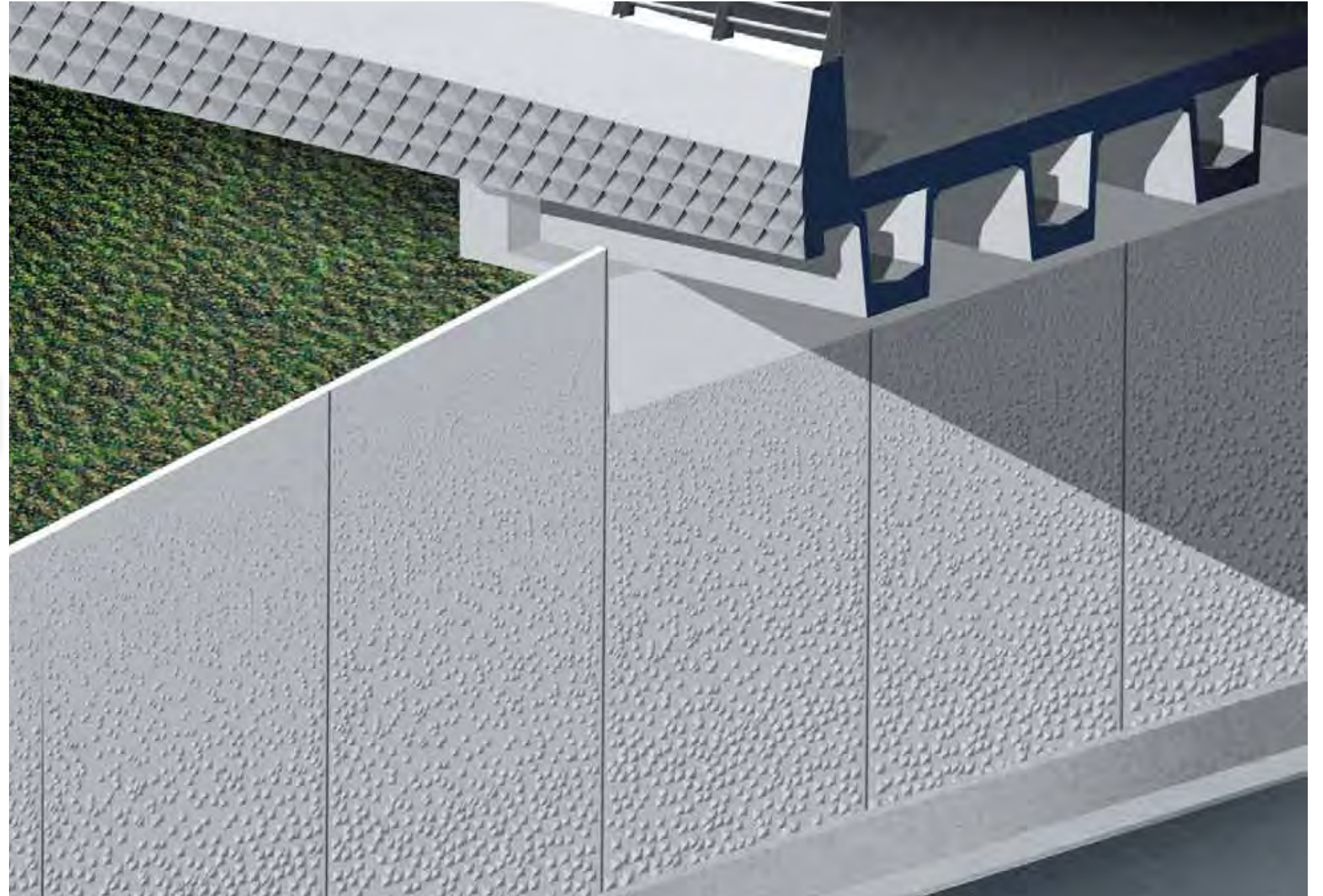


Figure 8.33 - Detail of underpass State Highway 20 under State Highway 1 (Southern Motorway)

09 Softscape Elements



9.0 Plant Materials

Planting and appropriate selection of plant material is a critical design component of the project. Plants will be used to develop the character of the alignment; the spatial volumes, colour, texture and integration with other plantings along SH1 and SH20. Planting will also provide links with past vegetation patterns such as historic lowland forests and reference remnant stands of kahikatea on the nearby Hauraki Plains.

Large scale plantings will add a temporal component to the landscape and a legacy for future generations with transitions from emergent character plants and canopy trees. The geological history of the site forms a defining role for plantings around the lava field.

Plantings also provide a functional role such as soil binding, screening, filtering views and the improvement of ecological values. The Puhinui Stream is a visually and ecologically significant component of the site as are the storm water ponds and associated wetlands.

Appropriate plant selection and positioning will take best advantage of views, visual clues to their locations and the ongoing development of the Manukau urban ecology.

9.1 Planting Vision

The overall vision for the motorway plantings is to:

- Integrate the scale and form of SH20 and the SH1 interchange into the urban grain and amenity of Manukau City residential, civic and industrial character areas;
- Promote a 'sense of place' identity that is driven by the site's natural and cultural history, current cultural identity, natural features, land uses and urban form;
- Improve urban ecology to support target flora and fauna and improve environmental quality;
- Assist the establishment of the Puhinui Stream Walkway and ecological corridor;
- Control views where necessary for mitigation and enhancement;
- Marry in with existing plantings on SH1 and SH20 to ensure continuity;
- Reduce whole of life management and maintenance costs; and
- Ensure the provision of clear sight lines for road users, cyclists and pedestrians.

The vision will be achieved by:

- Plantings of charismatic and recognisable tree species such as kahikatea (*Dacrydium dacrydioides*), kauri (*Agathis australis*) and totara (*Podocarpus totara*) in structural layouts at the SH1/SH20 interchange to integrate the urban form of the motorway and provide dramatic entry sequences;
- Pacifica geometry earthworks and plantings to form and strengthen the cultural and civic component of Manukau City and provide a point of difference to identify this place from others;
- Plantings of pohutukawa (*Metrosideros excelsa*) to emphasise areas with volcanic geology and gaps with lower plantings at critical areas to emphasise views to key volcanic landmarks such as McLaughlins Hill;
- Riparian and wetland plantings along the banks of the Puhinui Stream and at the edges of storm water ponds. Selection of plant species and locations will ensure clear sight lines for safety and enhance ecological values of the area;
- A temporal programme of emerging character plants and flowering canopy tree species to integrate a sense of ongoing change and support bird habitat such as nikau palm (*Rhopalostylis sapida*), kowhai (*Sophora microphylla*) and pohutukawa;
- Integration with Manukau City Council Street Tree Planting strategy and TNZ Guidelines for Highway Plantings;

- Make good any loss of significant or valued vegetation such as the pin oaks in Hayman Park;
- Ensure plantings tie both sides of the motorway alignment together to signal that both sides are still 'intact';
- Marry in with existing SH20 and SH1 plantings to ensure a smooth transition; and
- Planting of species that were once found in the Manukau region but are now rare, endangered or uncommon. These include swamp maire (*Syzygium maire*) in clumps as a wetland signature species or swamp astelia (*Astelia grandis*). In appropriate areas, taraire (*Beischmiedia tarairi*) will be used as an "enrichment" species once the initial planting has established to provide protection.

Areas where exotic tree species will be used are limited to areas with social or historical associations with exotic plant species such as Hayman Park and Manukau City Centre and to align with MCC'S Street Tree Planting Policy.



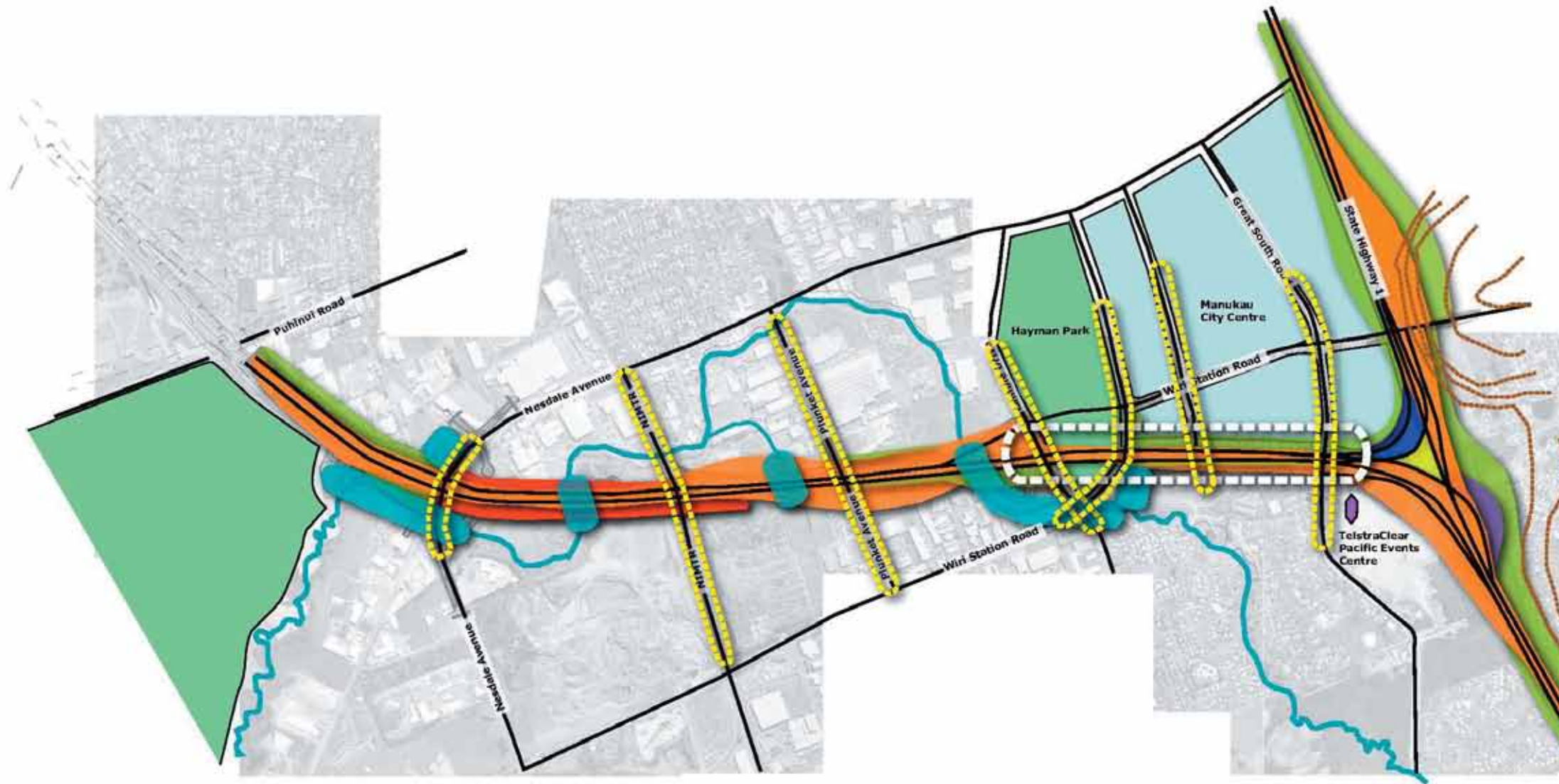
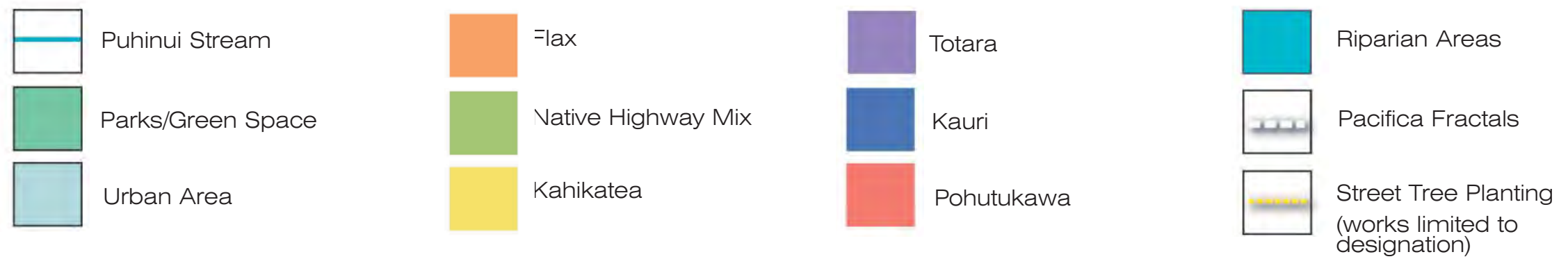


Figure 9.1 - Planting concept.



9.2 Pacifica Fractals:

The Pacifica Fractals are geometrically arranged plantings in the cut between Great South Road and Wiri Station Road Extension in the urban civic character area. The fractals are simple, angled plantings that will comply with the required maximum slope angle of the soils and are based on a repeating geometric form derived from Pacifica motifs. Drainage may be incorporated into the angled landforms. The sloping banks will be planted with mountain flax (*Phormium cookianum*) and cabbage trees (*Cordyline australis*) underplanted with mountain flax to provide comprehensive ground cover. The plantings will provide a strong simple pattern to be read at 100km/hr, strong texture combinations and attractive flowering and scent.



Figure 9.2 - Pacifica Fractals.



Cabbage Tree.



Mountain Flax.



Figure 9.3 - Perspective of Pacifica Fractals.

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Figure 9.2 - Pacifica Fractals.



Cabbage Tree.



Mountain Flax.



Figure 9.3 - Perspective of Pacifica Fractals.

9.3 SH1/SH20 Interchange:

The interchange will be fitted into a wide area of land with significant topographical variation. The Redoubt Flyover, off-ramps and on-ramps, SH1, SH20 and the SH20 under SH1 underpass present a complex array of overlapping horizontal and vertical alignments.

Plantings in the centre provide reference to charismatic plant communities and natural features in the Auckland region including isolated stands of tall kahikatea (*Dacrycarpus dacrydioides*), kauri (*Agathis australis*) and totara (*Podocarpus totara*). Dense planted stands of these trees, amongst native highway plantings for protection, will provide an emergent arrangement of lines that stitch the two motorway systems together.

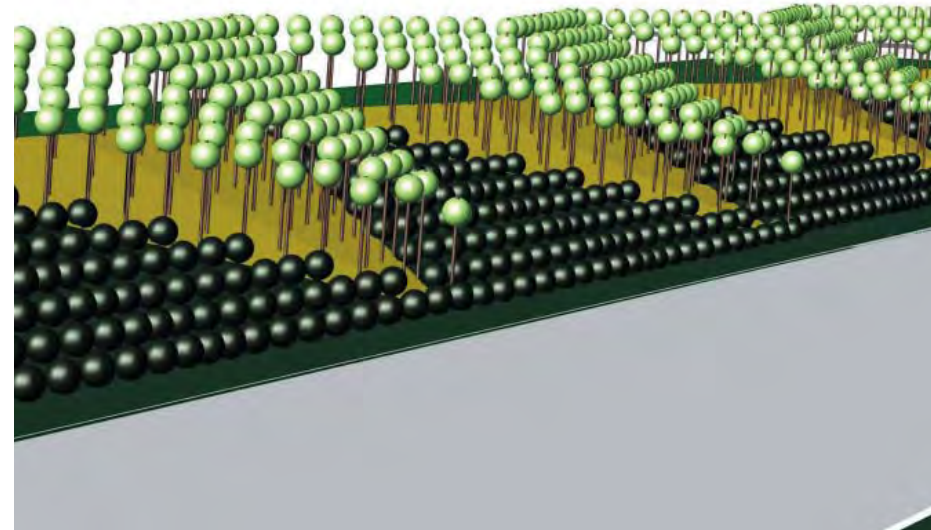


Figure 9.4 - 3D model of Pacifica Fractals planting.

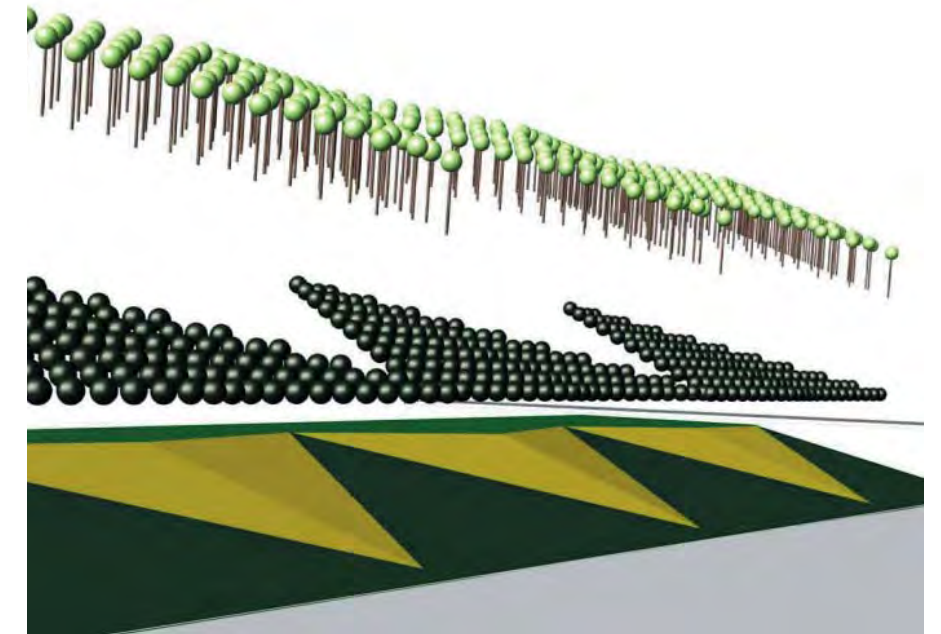


Figure 9.5 - Blow apart model of Pacifica Fractals planting.



Figure 9.6 - Interchange



Kauri.



Kahikatea.



Totara.

9.4 Flaxes:

Large scale plantings of flaxes including the tall, hardy and informal *Phormium tenax* and the low and rigid *Phormium cookianum*, connect with existing SH20 plantings west of the site, and draw them through in an unbroken sequence to SH1. Both species are used where most appropriate to respond to site conditions, level of desired formality, and lines of sight/screening. Flaxes are frangible, low maintenance and weed suppressing. They are also self regenerating, cost effective and are attractive to nectar eating native birds such as Tui.



(*Phormium cookianum*)



(*Phormium tenax*)



9.5 Native Highway Plantings:

The native highway plantings will marry in with existing plantings on SH1 and SH20. They provide textured and attractive multi-layered screening that establishes rapidly and adds continuity into the motorway alignments. Additional value has been added to these with additional plantings of emergent slow growing charismatic plants such as nikau palm (*Rhopalostylis sapida*) and colour and bird habitat such as kowhai (*Sophora microphylla*).



9.6 Waterways and Wetlands:

Puhinui Stream and the storm water wetlands are potential native habitat areas and add to the amenity value of the project. A qualified Ecologist will confirm best practices to ensure habitats are targeted and enhanced. Plantings for the Puhinui Stream that are within the designation will marry with the MCC Puhinui Stream Walkway plantings. These will locate low plantings within the flood prone areas of the stream channel, with taller plantings at the tops of the banks, where visibility into the walkway is not a safety requirement. Plantings around storm water wetlands will be naturalistic swathes of native rushes and reeds, with taller tree and shrub plantings set back to screen safety fences and provide naturalistic backdrops where visibility into the ponds is not a safety requirement.



Figure 9.7 - Stormwater pond

9.7 Mulching

A bark mulch weed suppression system will be adopted over the typical weedmat system due to the following reasons:

Bark Mulch	Weedmat or other similar systems
Allows rhizomatous and stoloniferous plants to spread unimpeded, thus achieving ground cover more rapidly than other more restrictive methods	Impedes the spread of rhizomatous and stoloniferous plants
Fades to a natural colour and texture	Remains highly visible for a long period of time and is unattractive
Allows air exchange in the soil	Restricts the exchange of air in the soil
Restricts water loss from the soil	Ineffective at restricting water loss from the soil
Insulates the soil	Less effective insulation qualities
Simple to apply and re-apply when necessary	Complex and time consuming to apply and repair
Eventually breaks down to form soil	Does not break down, and those that do, tend to fray and become untidy
Is a natural material, from a renewable and sustainable source	Is an unsustainable product that is made from plastic and requires eventual disposal

At the edges of storm water ponds and stream banks, a mechanically secured bio-degradable mulching system is proposed due to the potential for the areas to be inundated with water and washing away loose mulch materials. In these areas, bark mulch will be impractical. By pinning the mat to the ground the plants and the mulch will be secured in place.

9.8 Landscape Mitigation Measures

Mitigation measures include:

- The potential for the greening of the retaining wall in front of Church of Latter Day Saints and the Redoubt Flyover retaining walls with self adhering climbing plants to reduce noise deflection and glare;
- Filtering views from the SH20 alignment to unsightly industrial sites;
- Dense planting between residential areas east of SH1 and SH1 for screening;
- Replacement or relocation of pin oaks in Hayman Park; and
- Replacement street tree plantings in line with Manukau City street tree planting strategy.

9.9 Puhinui Stream Diversion Works

The stream diversion works propose a meander between the base of the SH20 embankment and the neighbouring industrial sites west of Nesdale Avenue.

- A curvilinear walkway on the south side of the stream will provide views of the native planted stream banks. Low planting on the south side of the stream will ensure good passive surveillance from nearby workplaces to the Puhinui Stream Walkway; and
- Native riparian rushes and reeds with taller shrubs and flaxes behind with taller canopy trees on the north banks will provide habitat for native flora and fauna and an attractive backdrop and screen for the motorway.

The stream diversion works provide opportunities to:

- Elevate ecological values of the stream and the planted banks and introduce rare and endangered plant species; and
- Increase amenity and aesthetic values for walkers on the Te Araroa Trail and adjacent industrial sites.



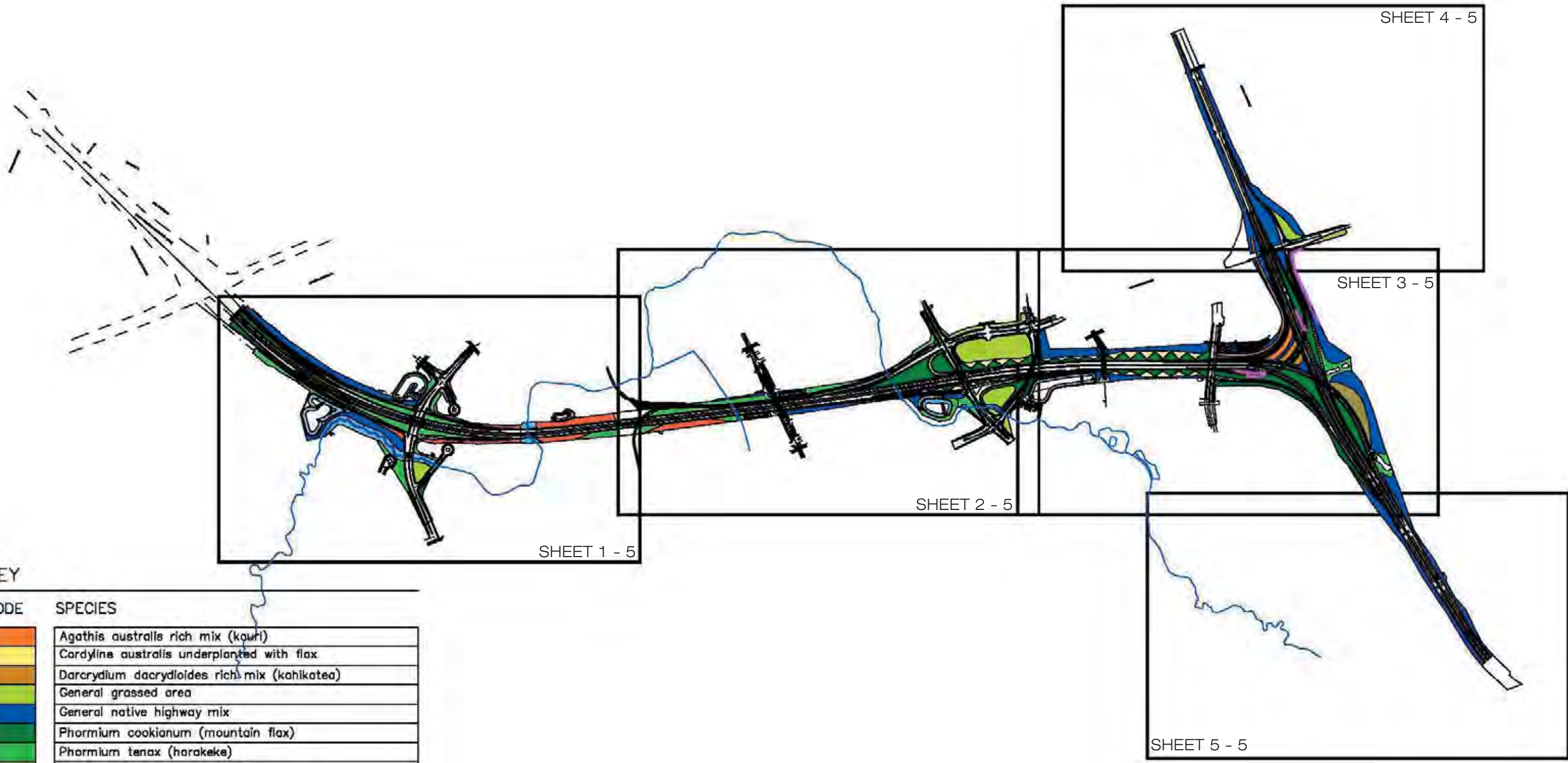
Figure 9.8 - Puhinui Stream diversion and stormwater pond.

PLANT SCHEDULE

SPECIES MIX ID	COMMON NAME	BOTANICAL NAME	GRADE	CENTRES	QUANTITY	NOTES
General Highway Native Plant Mix	Ngaio	Myoporum laetum	Pb3	Average 1m centres		Ngaio, Pittosporum and Coprosma for base colour, texture and rounded form. Flaxes, lancewoods and cabbage trees for striking textural contrast. Flaxes to ground the plantings and provide a textured edge in random locations. Pohutukawa, Taraire and Karaka for rounded overhead canopy, flower, colour and legacy. * Nikau Palm in selected areas for emergent contrasting texture and legacy. * Kowhai in drifts to connect SH1 with SH20 and enhance the ecological corridor and provide textural contrast.
	Cabbage tree	Cordyline australis	Pb3			
	Flax	Phormium tenax	Pb3			
	Karaka	Corynocarpus laevigatus	Pb3			
	Karamu	Coprosma robusta	Pb3			
	Lancewood	Pseudopanax crassifolius	Pb3			
	Kohuhu	Pittosporum tenuifolium	Pb3			
	Tarata	Pittosporum eugenoides	Pb3			
	Taraire	Beilschmiedia tarairi	Pb8			
	Puriri	Vitex lucens	Pb8			
	Pohutukawa	Metrosideros excelsa	Pb8			
Enrichment Planting	* Nikau Palm	Rhopalostylis sapida	Pb8			
	* Kowhai	Sophora microphylla	Pb3			
Kahikatea in Native Plant Mix	Kahikatea	Dacrycarpus dacrydioides	Pb8	3m centres	3,000m2	Close spaced Kahikatea for striking vertical form and height, reference to historic vegetation patterns and remnant populations on Hauraki Plains and for legacy element. Emergent Kahikatea to form volume of space to enhance "Gateway" experience for motorists on the Redoubt Flyover. 2 stage planting amongst mixed native highway plantings to assist establishment.
	Native plant mix (as above)		Pb3	1m centres		
Kauri in Native Plant Mix	Kauri	Agathis australis	Pb8	3m centres	28,000m2	Close spaced Kauri for charismatic sense of place, striking vertical form and legacy. Kauri to form volume of space to enhance "Gateway" experience for north bound motorists. 2 stage planting amongst mixed native highway plantings to assist establishment.
	Native plant mix (as above)		Pb3	1m centres		
Totara in Native Plant Mix	Totara	Podocarpus totara	Pb8	3m centres	10,000m2	Close spaced Totara for local legibility and legacy. Totara to form textured grove to enhance "Gateway" experience for south bound motorists. 2 stage planting amongst mixed native highway plantings to assist establishment.
	Native plant mix (as above)		Pb3	1m centres		
Pohutukawa in Flax	Pohutukawa	Metrosideros excelsa	Pb8	6m centres	25,000m2	Multi-branching Pohutukawa planted on lava flow at staggered spacings. Tall canopy tree for filtered views through trunks and striking summer flower colour. Plant amongst flaxes.
	Flax	Phormium tenax	Pb3	1m centres		
Grassed Areas	Grass mix	Browntop, fescue, clover mix with turf rye grass as nurse		At specified rate/m2	63,000m2	Slow growing grass mix in selected areas.

PLANT SCHEDULE

Pacifica Fractals						
Plant type 1	Cabbage trees	Cordyline australis	Pb3	0.75m centres	17,000m2	On top side of bank and sloping earthworks
Plant type 2	Mountain flax	Phormium cookianum	Pb3	0.75m centres	See below	On sloping bank
Flax Type 1	Mountain Flax	Phormium cookianum	Pb3	0.75m centres	157,000m2	Planted in drifts to interface with rest of SH20 and link into SH1 and as textured mass ground cover in other areas. Different species selected for height, hydrology and formality of area in which they are planted.
Flax Type 2	Flax (Harakeke)	Phormium tenax	Pb3	1m centres	72,000m2	
Riparian Mix						
Stormwater Wetlands	Jointed rush, oi-oi	Apodasmia similis	PB3	Average 500mm centres	37,000m2	Rushes, sedges and grasses on lower stream banks and at edges of wetlands. Drifts of flaxes at tops of banks and to top of maximum flood channels. Small trees and shrubs such as manuka, Coprosma spp., and kowhai in free draining soils at top of bank and away from flood prone areas for low canopy, screening and backdrop. Cabbage trees and lancewoods for striking contrast. Kahikatea for emerging vertical form, height and legacy. * Species selected which occur naturally in the Manukau ecological region but rare or uncommon. * Wheki Ponga to be planted in sheltered areas. * Swamp Maire to be planted in wet areas around ponds and stream. *Swamp Astelia to be planted in groups in wet areas.
Puhinui Stream Banks	Cabbage tree, ti kouka	Cordyline australis	Pb3			
	Flax, Harakeke	Phormium tenax	Pb3			
	Kahikatea	Dacrycarpus dacrydioides	Pb8			
	Karamu	Coprosma robusta	Pb3			
	Kowhai	Sophora microphylla	Pb8			
	Lancewood, horoeka	Pseudopanax crassifolius	Pb3			
	Pukio	Carex secta	Pb3			
	Rush	Juncus pallidus	Pb3			
	Rush	Baumea juncea	Pb3			
	Sedge	Cyperus ustulatus	Pb3			
	Shining karamu	Coprosma repens	Pb3			
Enrichment Planting	* Swamp Maire	Syzygium maire	Pb28			
	* Wheki Ponga	Dicksonia fibrosa	Pb8			
	* Swamp Astelia	Astelia grandis	Pb8			
Hayman Park	Puriri	Vitex lucens	Pb120		20 No's of tree's	Species selected from the Manukau City Council's Draft Tree Policy. Specimen tree planting proposed to signal the presence of isolated section of Hayman Park. Species selection and placement to be carried out in consultation with Manukau City.
	Pin Oak	Quercus palustris	Pb120			
	Liquidambar	Liquidambar styraciflua	Pb120			
Street Trees	Puriri	Vitex lucens	Pb120	10 m centres	63 No's of tree's	For Lambie Drive and Wiri Station Road. To integrate with MCC Draft Tree Policy.
	Kauri	Agathis australis	Pb120	10 m centres		For Great South Road. To integrate with MCC Draft Tree Policy.
	Liquidambar	Liquidambar styraciflua	Pb120	10 m centres		For Plunket Ave. To integrate with MCC Draft Tree Policy.
	Oak	Quercus sp.	Pb120	15m centres		For Nesdale and Puhinui Avenues. To integrate with MCC Draft Tree Policy.
Green Walls	Climbing fig	Ficus pumila	Pb3	1.2m centres	520 No's	For planting at the base of noise walls to produce green, vegetated wall surface.



KEY

CODE	SPECIES
	Agathis australis rich mix (kauri)
	Cardyline australis underplanted with flax
	Dacrydium dacryloides rich mix (kahikatea)
	General grassed area
	General native highway mix
	Phormium cookianum (mountain flax)
	Phormium tenax (harakeke)
	Podocarpus totara rich mix (totara)
	Metrosideros excelsa rich mix (pohutukawa)
	Riparian and pond mixes
	Areas in Meters square
	Street trees
	Puhinui walkway
	Retaining walls

Notes: Refer plant schedules for species make-up of mixes



SH20 Manukau Motorway Extension



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SH20 MANUKAU EXTENSION

CONCEPTUAL DESIGN

PLANTING SCHEMATIC - KEY PLAN



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BUILDING CONSENT	
SCHEDULING	
TRUCKS	

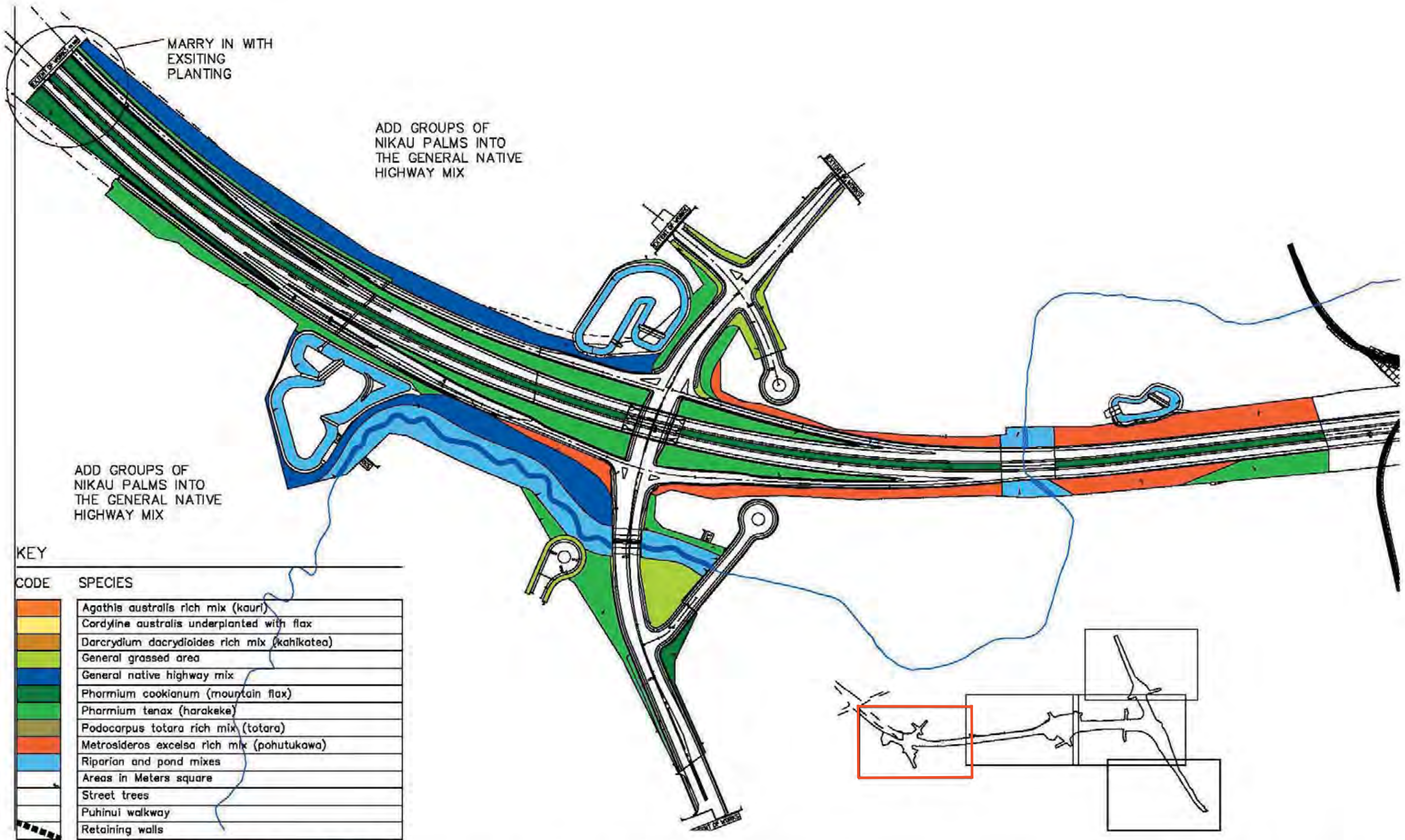
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SH20 MANUKAU EXTENSION

CONCEPTUAL DESIGN

PLANTING SCHEMATIC - SHEET 1 OF 5



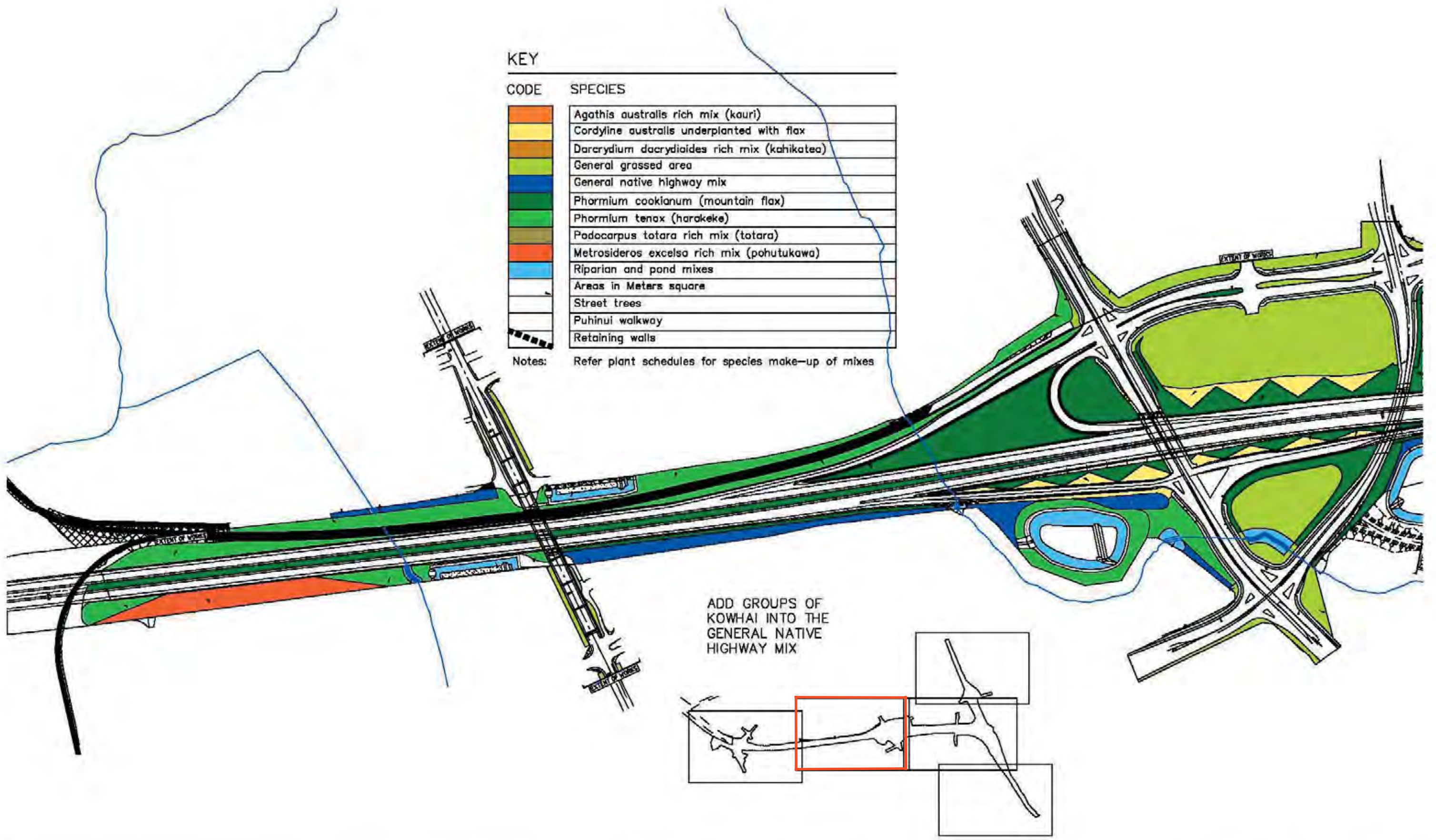
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 APPROVED MT

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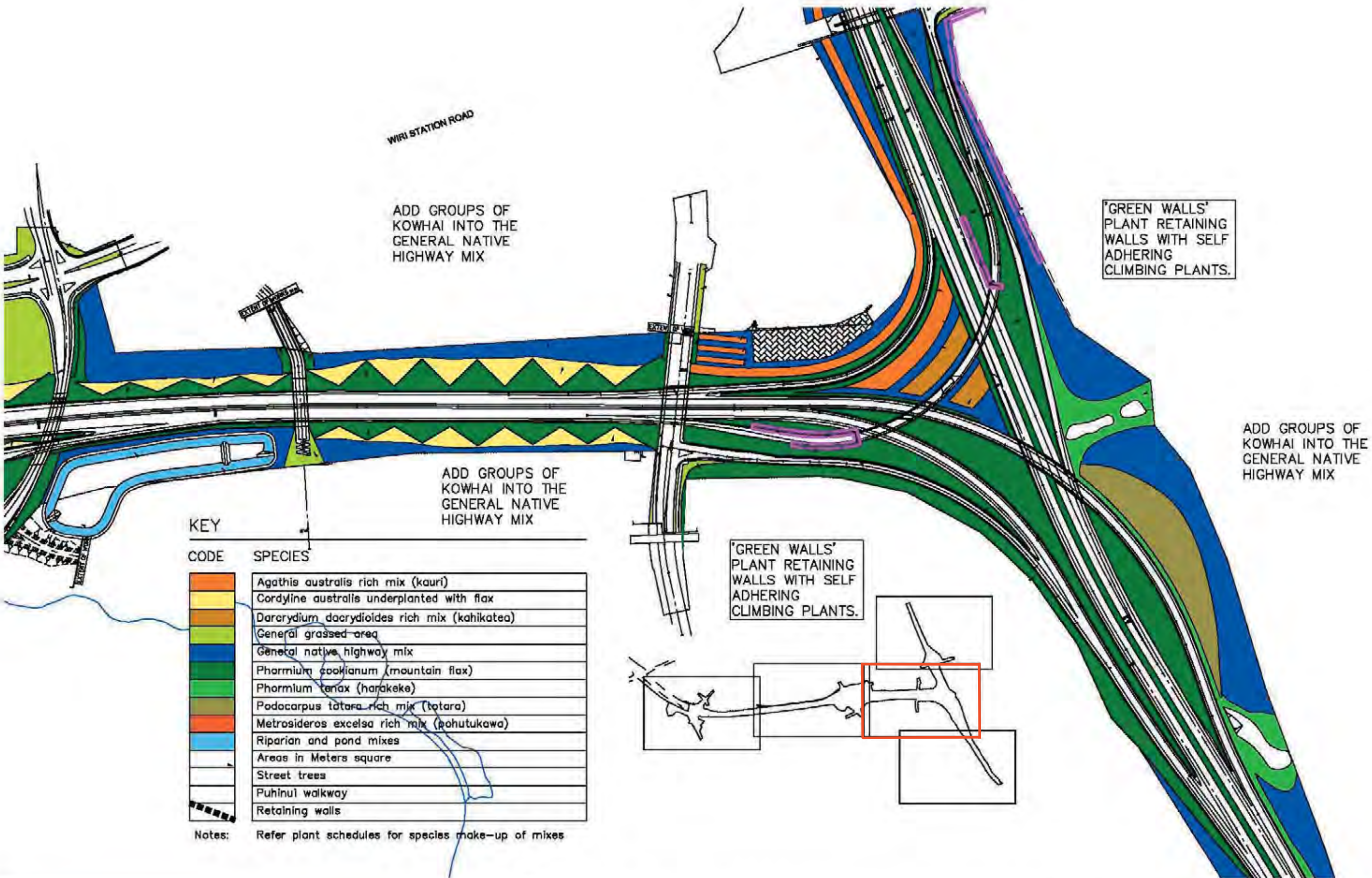


SH20 MANUKAU EXTENSION
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 DRAWN NLM/AM
 CHECKED MT
 APPROVED MT

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BUILDING CONCEPT	
SCHEMATIC DESIGN	
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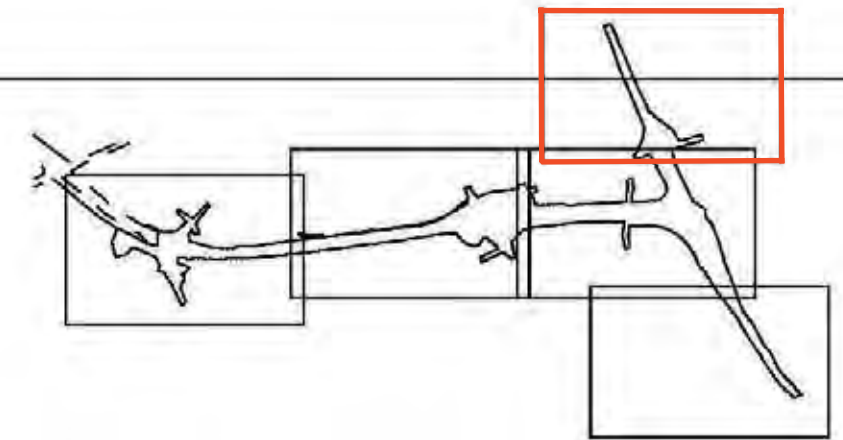
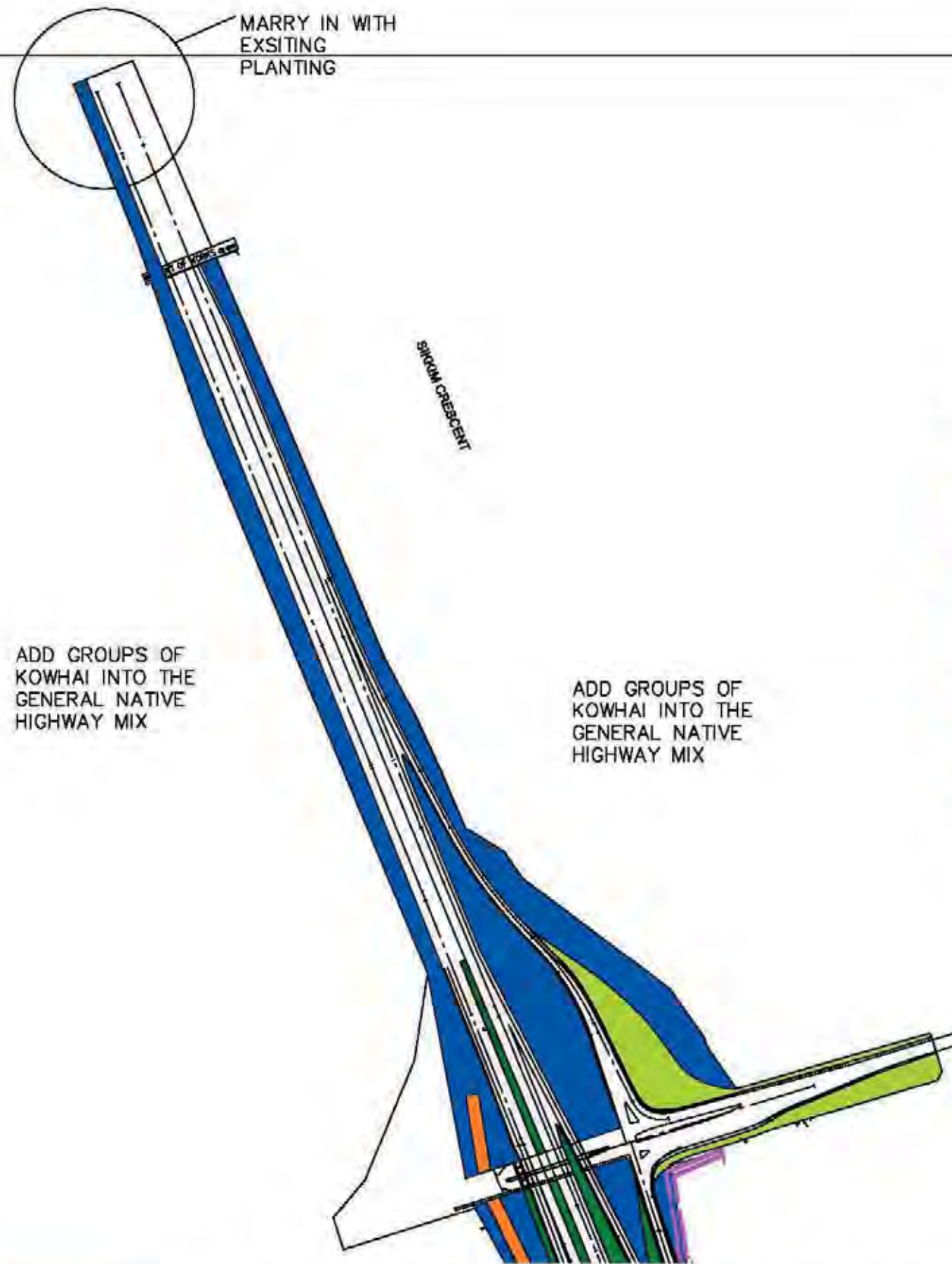


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SH20 MANUKAU EXTENSION
 CONCEPTUAL DESIGN
 PLANTING SCHEMATIC - SHEET 3 OF 5



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FIRST DESIGN	2008-10-31
PERMITS/CONSENT	
BUILDING CONSENT	
GENERAL PLAN	
TENDERS	
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KEY

CODE	SPECIES
	Agathis australis rich mix (kauri)
	Cordyline australis underplanted with flax
	Dacrydium dacrydioides rich mix (kahikatea)
	General grassed area
	General native highway mix
	Phormium cookianum (mountain flax)
	Phormium tenax (harakeke)
	Podocarpus totara rich mix (totara)
	Metrosideros excelsa rich mix (pohutukawa)
	Riparian and pond mixes
	Areas in Meters square
	Street trees
	Puhinui walkway
	Retaining walls

Notes: Refer plant schedules for species make-up of mixes



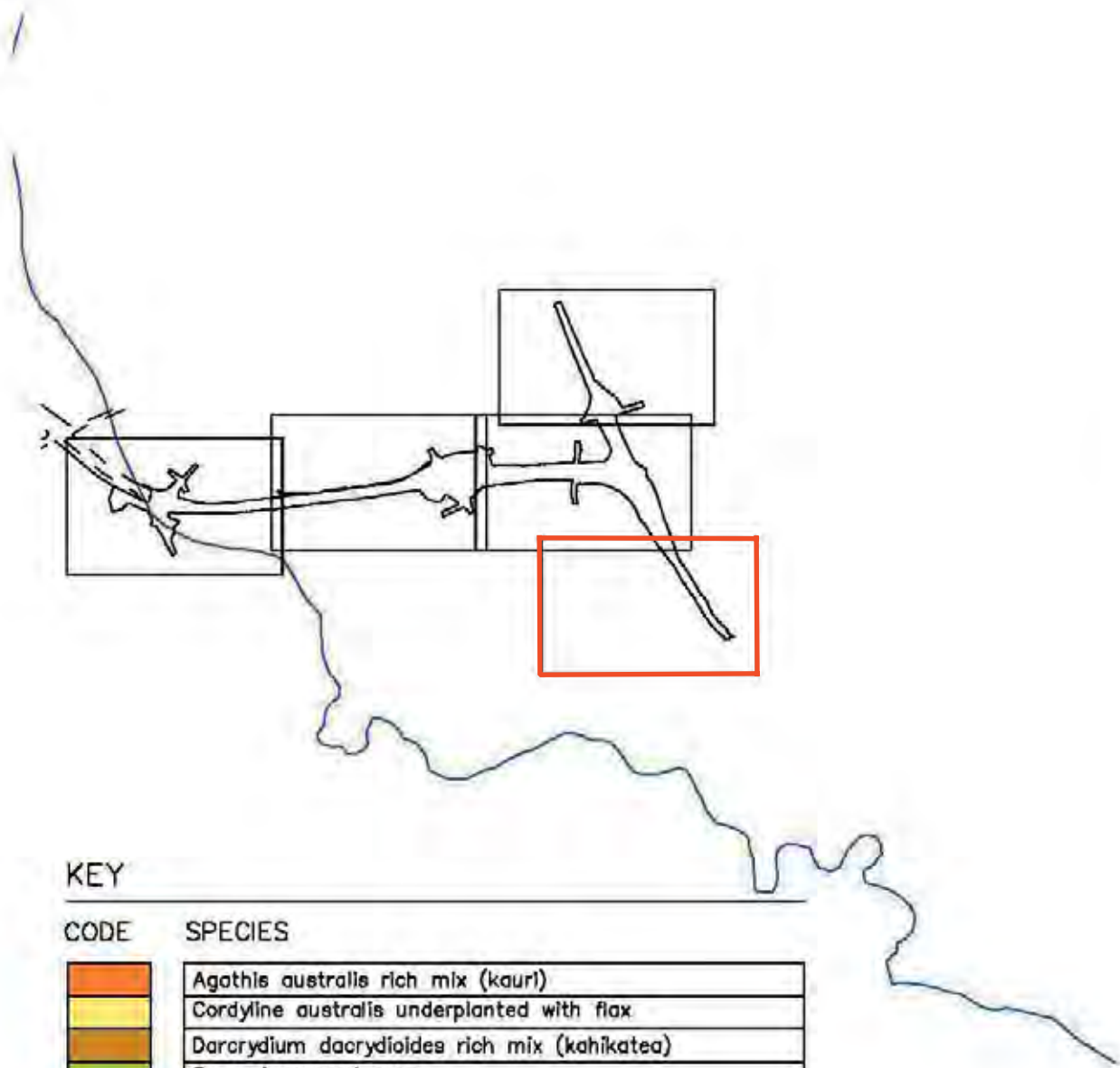
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SH20 MANUKAU EXTENSION
 CONCEPTUAL DESIGN
 PLANTING SCHEMATIC - SHEET 4 OF 5



DESIGN	MT
DRAWN	MT/MT
CHECKED	MT
APPROVED	MT

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ADD GROUPS OF KOWHAI INTO THE GENERAL NATIVE HIGHWAY MIX

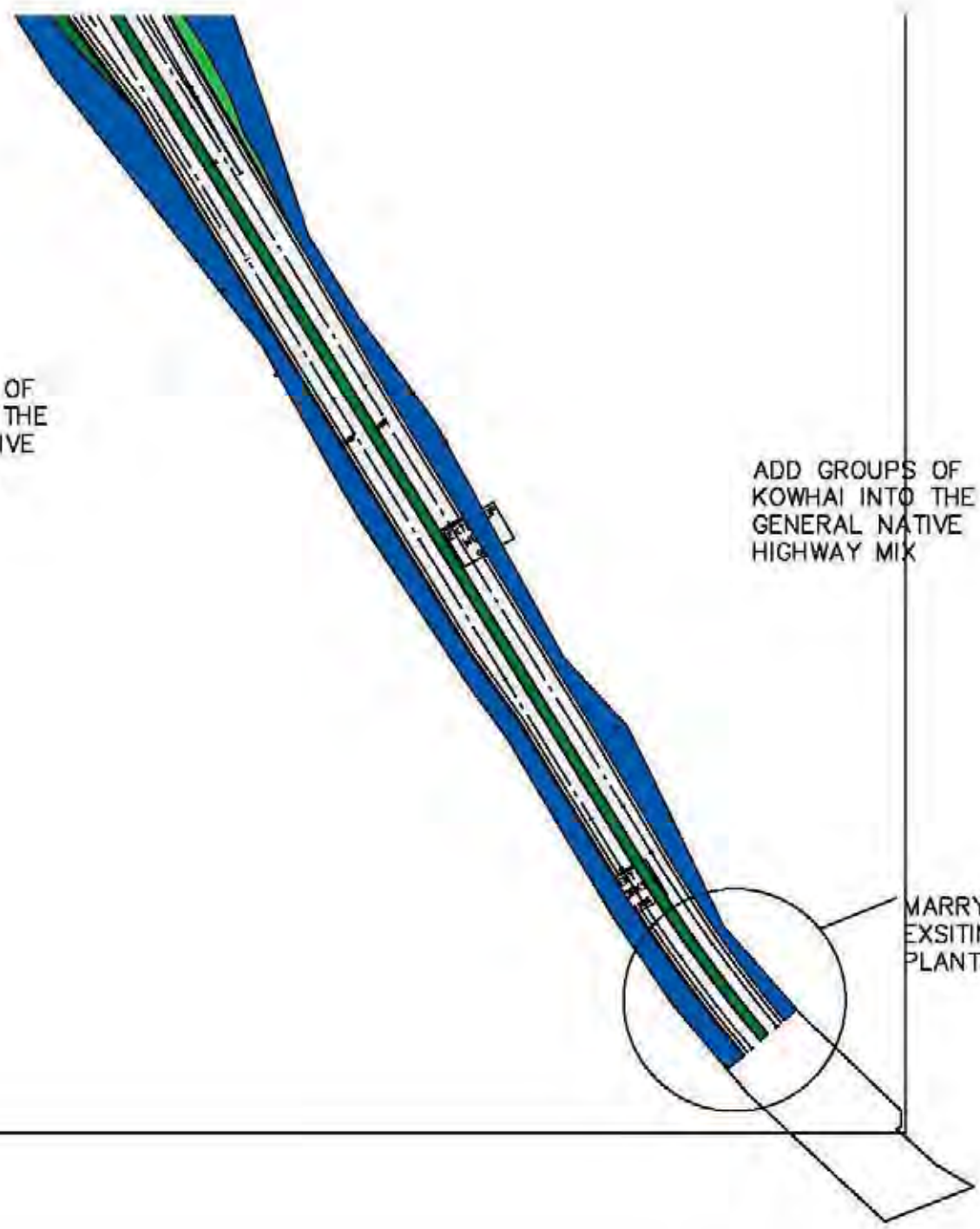
ADD GROUPS OF KOWHAI INTO THE GENERAL NATIVE HIGHWAY MIX

MARRY IN WITH EXISTING PLANTING

KEY

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	Cordyline australis underplanted with flax
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	Riparian and pond mixes
	Areas in Meters square
	Street trees
	Puhinui walkway
	Retaining walls

Notes: Refer plant schedules for species make-up of mixes



SH20 MANUKAU EXTENSION
CONCEPTUAL DESIGN
PLANTING SCHEMATIC - SHEET 5 OF 5



DESIGN: MT
DRAWN: HJW/MT
CHECKED: MT
APPROVED: MT

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GENERAL HIGHWAY MIX



Karaka (*Corynocarpus laevigatus*)



Lancewood (*Pseudopanax crassifolius*)



Pittosporum (*Pittosporum eugenioides*)

PACIFICA FRACTALS



Cabbage Tree (*Cordyline australis*)



Mountain Flax (*Phormium cookianum*)



ICONIC ENRICHMENT PLANTS



Kahikatea (*Dacrycarpus dacrydioides*)



Kauri (*Agathis australis*)



Totara (*Podocarpus totara*)



Pohutukawa (*Metrosideros excelsa*)





Ponga (*Dicksonia fibrosa*)



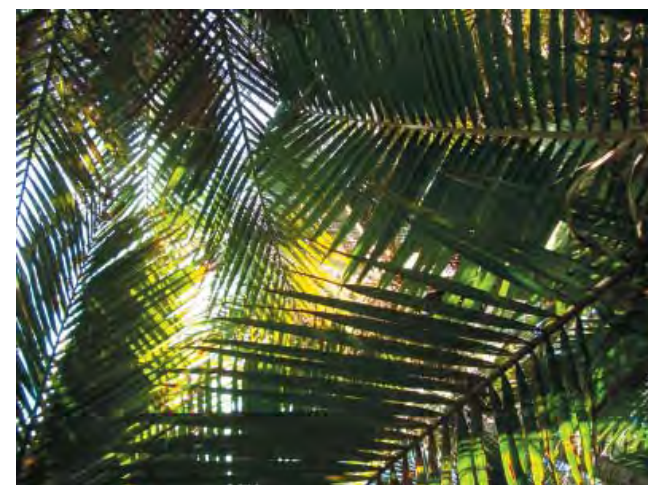
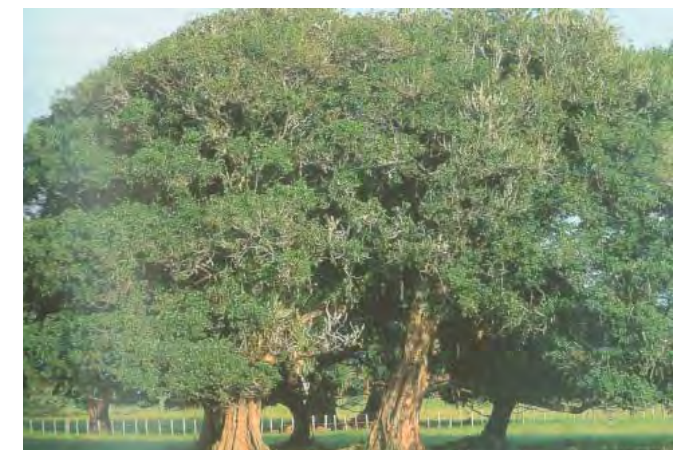
Kowhai (*Sophora microphylla*)



Nikau Palm (*Rhopalostylis sapida*)



Puriri (*Vitex lucens*)



WETLAND AND WATERWAY PLANTS



Carex secta



Carex sp



Carex virgata



Juncus pallidus



Juncus pallidus

PARK TREES



Puriri (*Vitex lucens*)



Plane Tree (*Platanus orientalis*)



American Sweetgum (*Liquidambar styraciflua*)



Plane Tree (*Platanus orientalis*)



Pin Oak (*Quercus palustris*)

STREET TREES



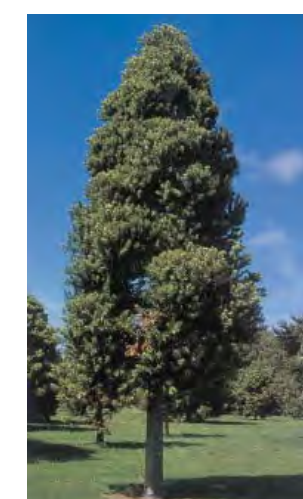
English Oak (*Quercus robur*)



Pohutukawa (*Metrosideros excelsa*)



American Sweetgum (*Liquidambar styraciflua*)



Kauri (*Agathis australis*)



Puriri (*Vitex lucens*)



Climbing Fig (*Ficus pumila*)

10.1 Landscape and Urban Design Masterplan

10.1 Landscape Plan Description

The following is a description with accompanying plans of the Landscape Plan for the Motorway Link. It is generally consistent with the approach of The Landscape Management Plan prepared by Boffa Miskell for Transit New Zealand, is cognisant of the Manukau City Centre Tree Planting Strategy and TNZ Guidelines for Highway Planting and the conditions of the Consent Notice. The concept expands upon the themes established in the above noted work, and as described in the preceding report, is more place specific, deriving themes and forms from the physical and cultural landscape of Manukau City.

The strong planting and grading patterns expressed in the Urban/Civic character areas uses fractal geometry to convey, in a contemporary manner, a geometric interpretation of Maori and Pacifica cultural motifs.

Fractal geometry is described as any of various extremely irregular curves or shapes for which any chosen part is similar in shape to a given larger or smaller part when magnified or reduced to the same size.

This allows the patterning to be “read” at a global or aerial whole of project level and at the most detailed level in patterning of elements such as barriers and abutments.

From east to west the Landscape Plan is described and illustrated on the following pages:

10.1 SH1/REDOUBT ROAD TO GREAT SOUTH ROAD – “THE INTERCHANGE”

The intent of the design is to ensure a continuous experience through the established SH1 upon which is “grafted” the landscape theme of SH20 as it transitions from the Manukau City theme to this interchange area.

The landscape concept for the interchange employs the following to highlight the sense of arrival and departure:

- References to Manukau City cultural identity on structures, earthworks, retaining walls and plantings;
- References to underlying geology on retaining walls and spill-through abutments;
- Reference to historic vegetation patterns;
- Structural plantings to control views and provide confined volumes of space in selected arrival/departure areas;
- Retain the established planting theme along SH1 north and south of the interchange to merge with existing plantings;
- Theme noise walls with references to historic naming of Manukau; and
- Maintain and frame views to the TelstraClear Pacific Arena.

Structures

- The existing Redoubt Road bridge is maintained;
- Church of Latter Day Saints retaining wall planted with self adhering climbing plants to form green vegetated wall. Same treatment proposed for retaining walls on Redoubt Flyover;
- The Redoubt Flyover – SH1 to SH20 westbound over SH1 fitted with folded steel mesh cladding on barriers to tie in with Pacifica theme and incorporate a repeating decorative element; and
- SH20 under SH1 southbound underpass lined with rusticated panels.

Planting

- An overstorey of tall kahikatea, kauri and totara are dominant features of the interchange to provide structural form and arrival and departure experience;
- Screen planting between highway and residential areas to the east with interplanting of kowhai for colour and habitat for Tui; and
- Swathes of flax plantings to connect SH20 and SH1 and retain sight lines.



Figure 10.1 - Interchange Area.



Figure 10.2 - Perspective sketch from SH1 looking north to Redoubt Flyover.