Technical Report 27

Ecological Technical Report 1: Terrestrial Vegetation and Habitats (including Wetlands)

NZ TRANSPORT AGENCY
WAKA KOTAHI

1 MacKays to Peka Peka Expressway

Revision History

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002	Matiu Park	Final Draft following VE, NZTA and Legal Review	15 Nov 2011
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Action	Name	Signed	Date
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on behalf of	Boffa Miskell Limited		

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Executive Summary

Introduction

This report presents the results of a survey of the flora, vegetation communities, and associated terrestrial habitats (including wetlands), in the vicinity of the proposed MacKays to Pekapeka Expressway Alignment (Expressway Alignment).

The study has involved a desktop review of literature relevant to the botany of the study area with a focus on sites of indigenous vegetation in, and adjacent to the proposed MacKays to Peka Peka Expressway Designation ("Designations"). This survey has included all sites along the route that have been identified in earlier surveys as having ecological values.

Botanical surveys were undertaken in all habitats in or adjacent to the Designation likely to contain rare species. Additional field investigations were undertaken to map vegetation and confirm the presence or absence of rare plants. More detailed wetland habitat surveys were carried out to better describe those wetlands potentially affected.

The significance of all terrestrial plant communities (including wetlands) along the route was then assessed and the areas potentially affected by construction were quantified.

Resource description / desktop study

Maps of the historical vegetation and current vegetation of the study area were produced from national data sets. A range of rare plants that could potentially be found along the route was compiled from existing references to guide field investigation.

A total of 11 protected (PNA) and 32 unprotected (SNA) areas of significant vegetation or habitats were identified that have historically been recorded, either within the proposed Designation or immediately adjacent to it. Each of these identified sites are listed and described.

Field Survey results

A detailed map of vegetation communities present in close proximity to the proposed Expressway Alignment was prepared as part of the field survey. Several areas of vegetation with ecological value, that have not been previously described, were located and added to the list of sites for assessment. In total between 1.8 and 4.8 ha of wetlands and between 3.8 ha and 8.2 ha of regenerating broadleaved forest and kanuka will be affected by this Project (based on the range of vegetation within the Project Footprint and the Construction Designation). All remaining affected vegetation is predominantly pasture and adventive shrubland (blackberry and gorse), with some gorse and exotic plantings.

Assessment of ecological value

All areas of indigenous vegetation and wetland habitat considered to have ecological value that were identified through the above processes were listed and assessed for their ecological significance. This process identified key plant communities and habitats that will be potentially affected, as well as a number that could be avoided during detailed design.

This report concludes with an assessment of the significance of the various vegetation communities and habitats along the proposed Expressway Alignment. A number of recommendations are then provided to guide the assessment of potential effects and mitigation options.

The key findings of these terrestrial and wetland investigations were that the many wetlands along the proposed Expressway Alignment were of moderate to high value. Most other indigenous vegetation along the proposed Expressway Alignment was considered to have moderate ecological values. The vegetation surveys also confirmed that maintaining existing hydrology, including the seasonal fluctuations in water levels was essential to the long-term sustainability of these values.

While rare plants are present along the length of the proposed Expressway Alignment, they are confined to areas outside of the Construction Designation and are unlikely to be physically affected by habitat loss or other associated effects.

Recommendations

A number of recommendations are provided that relate to the development of a mitigation package, and the identification of particular ecological areas where efforts should be made to avoid effects where practical.

Conclusion

Overall, the proposed Expressway is located within a highly modified landscape dominated by farming, residential and rural lifestyle areas. However, in a number of locations, areas of significant indigenous vegetation or habitat, predominantly wetland vegetation, may be affected resulting in adverse effects that require mitigation. These effects arise either through physical loss of habitat where vegetation is located beneath the Project Footprint, effects associated with construction activities or where these areas are located sufficiently close to the Designation and related activities that there may be potential changes to hydrology.

This report has also confirmed that a number of other areas of ecological value located in close proximity to the Designation will not be affected.

1. Introduction

1.1 Background

This technical report is one of five reports on the various ecological investigations being undertaken as part of the proposed MacKays to Peka Peka Expressway Project (the "Project"). This report has been prepared for the NZ Transport Agency as part of the MacKays Peka Peka Project Team[1].

The primary objective of these ecological investigations is to comprehensively map and describe the values of all ecological systems that occur along this Alignment and to describe the distribution and abundance of native flora and fauna within or in close proximity to the Project Footprint. As a result of these investigations, the potential environmental effects of both the construction and ongoing operation of the proposed Expressway will be assessed in the Ecological Impact Assessment (EcIA – Technical Report 26, Volume 3) report, and measures to mitigate potential or actual adverse effects will be developed.

The proposed Expressway Alignment is approximately 16km in length, running north from Raumati South (by Queen Elizabeth Park, just south of Poplar Avenue) to Peka Peka (just north of Peka Peka Road). The main Alignment and associated interchanges and link roads traverse a wide range of habitats from improved pasture, shrublands to plantation forestry and lifestyle blocks. The Alignment crosses four catchments. A full Project description (Construction & Operation) is outlined within Part D, Chapters 7 and 8, Volume 2 of the Assessment of Environmental Effects (AEE).

The proposed Expressway covers a range of botanical environments, ranging from modified dune wetlands through to large rural-residential lifestyle blocks and areas of pastoral farming. Within these varying vegetation types, there is a wide range of vegetation communities, largely reflecting historical and current land uses. Across the wider study area, historical land clearance and swamp drainage combined with over a century of stock and animal grazing and widespread residential subdivision has had significant effects on the current distribution of indigenous vegetation and species composition within almost all the vegetation communities present.

This report presents the results of the vegetation and habitat investigations (including wetlands) undertaken along the proposed Expressway Alignment from July 2010 to August 2011. This report also considers the habitat value of these plant and wetland communities. Studies of terrestrial fauna that may utilise these habitats are found in technical reports covering herpetofauna (Technical Report 28, Volume 3) and avifauna (Technical Report 29, Volume 3).

[1] This Technical Report refers to the Project team as carrying out works on behalf of and as contracted by the NZTA. The NZTA is the requiring authority and the consent holder.

1.2 Study objectives

The objectives of the terrestrial vegetation assessment were to:

- Describe and map the terrestrial vegetation patterns (including wetlands) and habitats in, immediately adjacent to, or potentially affected by, the proposed Designation;
- Confirm the presence or absence of native flora species and, if present, their distribution in relation to habitat that will be potentially affected by the activities associated with construction and operation of the proposed Expressway;
- Assess the ecological and conservation values of these plant communities and habitats;
- Provide sufficient survey and evaluation information to support the assessment of effects required for a resource consent application; and
- Provide information on plant communities to assist in designing ecological mitigation.

1.3 Report Structure

This report consists of six main parts:

1 A description of the study methodology;

2 A desktop review of the study area including climate, geology, soils, past and current vegetation, rare and threatened plants that may be present, and identification from records of all known sites of significance that could potentially be affected;

3 The results of field investigations, primarily the mapping and description of vegetation communities within the Project Footprint and the results of botanical surveys undertaken at key locations;

4 An assessment of the ecological values and significance of all identified vegetation communities and habitats;

5 Concluding discussions and recommendations; and

6 Appendices containing key reference material, species lists, transect results and site photographs.

The terrestrial vegetation and habitats described in this report also provide the basis of descriptions in the two Technical Reports addressing fauna:

- Techicnal Report 28, Volume 3: Herpetofauna: ecological valuation.
- Technical Report 29, Volume 3: Avifauna: ecological valuation.

1.4 Glossary of Terms

In this assessment:

“Project Footprint” refers to the earthworks extent for the road including both the road surface, associated cuts and fills and permanent stormwater treatment devices, but does not involve temporary works such as site offices, laydown and storage areas and construction sediment treatment devices. The MacKays to Pekapeka Footprint has an area of 164 ha.

“Designation” defines the maximum extent of direct ecological effects within the MacKays to Peka Peka Designation. This is on the understanding that, except where noted, the extent of the Construction Designation has been determined to enclose all necessary construction activities, including the proposed Expressway and all subsidiary work such as sediment treatment and fill disposal. The MacKays to Pekapeka Construction Designation has an area of 316 ha.

“Study Area” refers to all land, water bodies and receiving environments that could be potentially affected by the Project. To provide consistency between this and the other ecology technical reports, the study area includes all catchments that are crossed by the proposed Expressway Alignment, the streams and estuaries downstream of the proposed Expressway Alignment and a number of wetlands that extend outside the Designation. The Study Area has a total area of 10,808 ha.

Ecological District: One of the major levels used for the ecological classification of land. New Zealand has been divided into 85 ecological regions and 269 ecological districts according to geological, topographical, climatic and biological features and processes. This reflects the small-scale variability of New Zealand’s ecological patterns.

An ecological district is an area of land where topographic, climatic, soils and biological features and broad cultural patterns produce a characteristic landscape of biological communities. An ecological region comprises adjacent ecological districts with closely related characteristics; it may only include one ecological district with very distinctive features (McEwen, 1987).

Habitat: The environment in which a particular species or group of species lives. It includes the physical and biotic characteristics that are relevant to the species concerned.

Seral Vegetation: A seral community (or sere) is an intermediate stage found in ecological succession in an ecosystem advancing towards its climax community. In many cases more than one seral stage evolves until climax conditions are attained.

Pioneer Vegetation: A plant or community that occurs early in a vegetation succession. Pioneer species possess characteristics that suit them to this ecological niche, notably rapid growth, the production of copious, small, easily dispersed seed, and the ability to germinate and establish themselves on open sites.

Vegetation/Habitat Type Names:

manuka	over 50% cover of the double underlined species
manuka	between 25-49% cover of the underlined species
manuka	between 5-24% cover of non-underlined species
(manuka)	less than 5% cover. Generally used for emergent species.

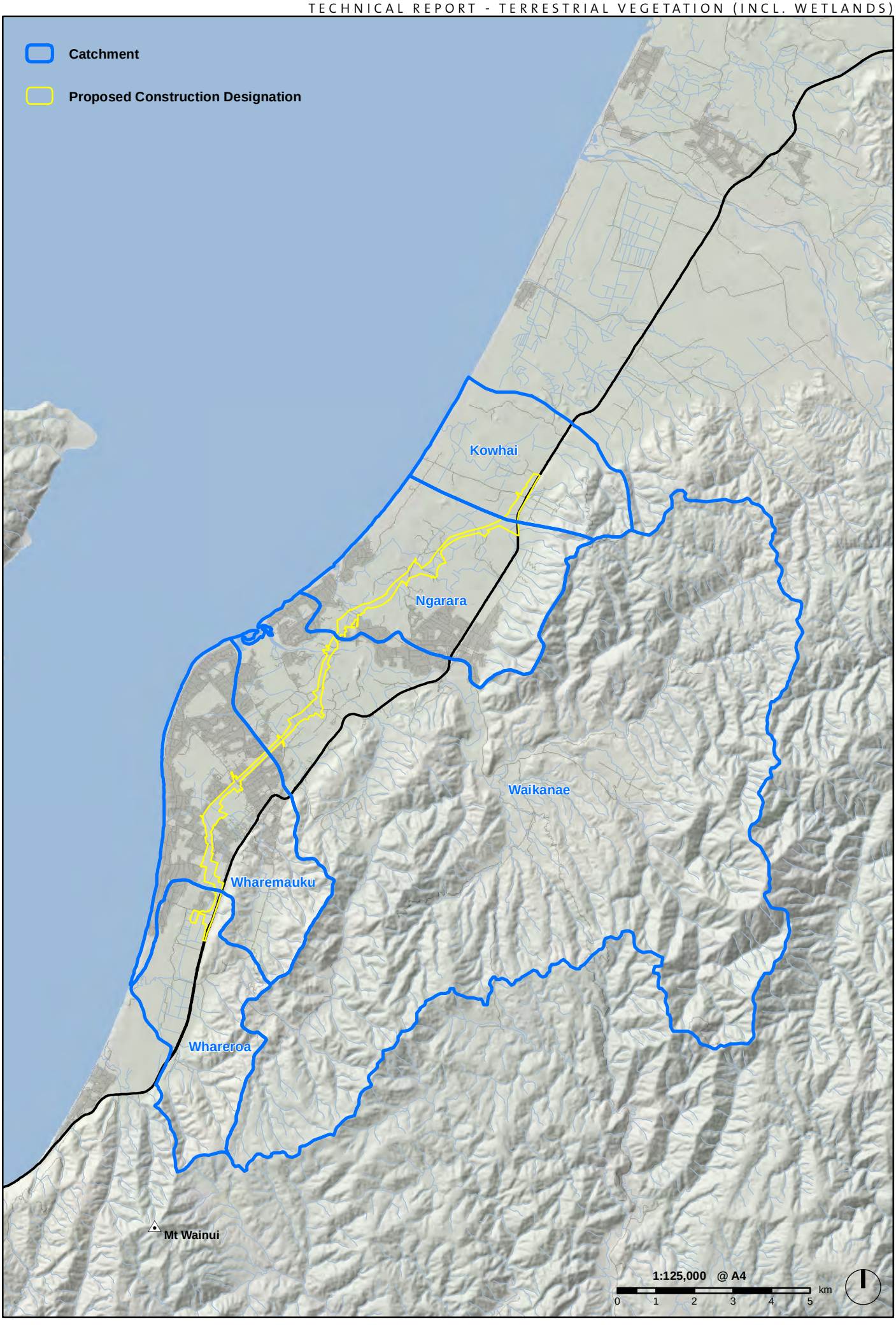
Canopy structure is conveyed using the following approach:

/	Separates various tiers of the vegetation in the community description.
–	links plants in the same tier.

Vegetation structural classes: Are from Atkinson 1985 and Johnson and Gerbeaux 2004 (for wetland classes). Structural classes relevant to this terrestrial ecological assessment are:

- Forest: Woody vegetation in which the cover of trees and shrubs in the canopy is >80% and in which tree cover exceeds that of shrubs. Trees are woody plants >10 cm diameter at breast height (dbh).
- Treeland: Vegetation in which the cover of trees in the canopy is 20-80%, with tree cover exceeding that of any other growth form, and in which the trees form a discontinuous upper canopy above either a lower canopy of predominantly non-woody vegetation or bare ground.
- Scrub: Woody vegetation in which the cover of shrubs and trees in the canopy is >80% and in which shrub cover exceeds that of trees (cf forest). Shrubs are woody plants <10cm dbh.
- Shrubland: Vegetation in which the cover of shrubs in the canopy is 20-80% and in which the shrub cover exceeds that of any other growth form or bare ground. It is sometimes useful to separate tussock-shrublands as a subclass for areas where tussocks are >20% but less than shrubs. (Note: the term scrubland is not used in this classification.)
- Sedgeland: Vegetation in which the cover of sedges in the canopy is 20-100%, and in which the sedge cover exceeds that of any other growth form or bare ground.
- Rushland: Vegetation in which the cover of rushes in the canopy is 20-100% and in which the rush cover exceeds that of any other growth form or bare ground.
- Reedland: Vegetation in which the cover of reeds in the canopy is 20-100%, and in which the reed cover exceeds that of any other growth form or open water. Reeds are herbaceous plants growing in standing or slowly running water that have tall, slender, erect unbranched leaves or culms that are either hollow or have a very spongy pith.
- Fen: A wetland with a predominantly peat substrate that receives inputs of groundwater and nutrients from adjacent mineral soils. The water table is usually close to or just below the peat surface, and relatively constant. Water flow is slow to moderate. Fens have low to moderate acidity and are oligotrophic to mesotrophic.

- Swamp: A wetland that receives a relatively rich supply of nutrients and often also sediment via surface runoff and groundwater from adjacent land. Swamps usually have a combination of mineral and peat substrates. Leads of standing water or surface channels are often present, with gentle permanent or periodic internal flow, and the water table is usually permanently above some of the ground surface, or periodically above much of it.



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NZ TRANSPORT AGENCY WAKA KOTAHI

Mackays to Peka Peka

CORRIDOR & CATCHMENT BOUNDARIES 1

2. Methodology

2.1. Introduction

The following sections provide an overview of the field survey methods and desktop analysis used to describe and evaluate the terrestrial vegetation within the proposed Designation.

2.2. Desktop Ecological Assessment

This study commenced with a review of published and unpublished information on the terrestrial flora of the proposed Alignment including databases provided by the Kāpiti Coast District Council (KCDC), Greater Wellington Regional Council (GWRC), and national data sets produced by Landcare, Department of Conservation (DoC), NIWA and Ministry for the Environment (MfE). The Protected Natural Areas Survey Report for the Foxton Ecological District (Ravine 1992) and plant species lists from a range of sources for the Kāpiti Coast area were also used (from the New Zealand Plant Conservation Network website). References to all these data sets and inventories are provided in the Bibliography.

Information on landforms, soils, and erosion was derived from the New Zealand Land Use Resource Inventory.[2]

Broad vegetation associations, past and present, were identified and described through a combination of Landcover Database II (LCDBII) (MfE) and New Zealand Land Resources Inventory (NZLRI) (Landcare). These databases are an accepted tool adopted primarily regional councils and MfE to understand information on patterns and trends of land use and land cover. The national threat classification of plant species was derived from de Lange et al (2009). The regional status of species was derived from the draft Conservation Management Strategy for the Wellington Conservancy (DoC 2010).

Botanical information was obtained from a large number of unpublished checklists of native vascular plant species undertaken by a number of authors and held by the DoC (Sawyer 2001). Land Environments of New Zealand (LENZ) was used to determine the threat status of various “environments” within the corridor based on comparison of predicted historical vegetation with the known current extent of remaining indigenous vegetation.

Details on the Footprint and Designation were provided by the MacKays to Peka Peka Project team (the CEMP Appendix F, Volume 4) in November 2011. High resolution aerial photographs flown in Autumn 2010 were also provided by the CEMP Appendix F, Volume 4. Aerial oblique photos flown for

the CEMP Appendix F, Volume 4 in 2010 were used as the base maps. GIS information on significant natural areas surveys was provided by KCDC, the Queen Elizabeth II National Trust (QEII) and DoC.

Additional information was incorporated from earlier Boffa Miskell Ecological Assessments for the following Kāpiti Coast District Plan Changes on the Kāpiti Coast: Ngarara Plan Change, Paraparaumu Airport Plan Change, Meadows Trust Plan Change, Tasman Lakes Plan Change and the Waikanae North Plan Change. This assessment also took into account Boffa Miskell ecological reports prepared as part of the existing Western Link Road (WLR) designation and for El Rancho Christian Holiday Park for the restoration of the El Rancho wetlands (refer Bibliography).

All published information about the study area was reviewed and base maps prepared prior to site inspections.

2.3. Fieldwork Timing and Effort

The botanical fieldwork for the plant species lists was undertaken during October 2010, November 2010 and January 2011. Following on from the spring/summer field work, and more detailed refinement of the proposed Expressway Alignment, more detailed field mapping was undertaken during March and April 2011. For the vegetation study the entire proposed Expressway Alignment was either walked or driven to ensure all mapped vegetation was observed. Incidental botanical observations were also added during other ecological investigations.

Further site visits were undertaken during April, May and July 2011 to refine the vegetation mapping and species descriptions and to visit areas where further information was required. Specific wetland condition assessments were undertaken in July 2011 following the final proposed Expressway Alignment and Designation extent being confirmed.

2.3.1. Vegetation Mapping

Vegetation patterns were mapped in the field onto high resolution colour aerial photographs overlaid with proposed Designation boundaries. This work was undertaken through March and April 2011, prior to the final proposed Expressway Alignment being confirmed. To ensure all potentially affected vegetation communities were included within this assessment a corridor extending 100m to either side of the centreline of the Alignment was mapped. Following confirmation of the preferred Designation route, this vegetation was trimmed back to include the Construction Designation. Vegetation shown on maps outside this corridor is based on the LDCBII national dataset.

During the ecological survey particular attention was paid to vegetation communities known to be reduced from their former extent in the Wellington Ecological District (e.g. wetlands, dunes and coastal forest) or vegetation with potentially rare or uncommon species present. Where these sites fell within the Designation or where these sites were considered to be potentially affected through indirect effects (e.g. hydrological changes), they were individually visited to check for presence of rare or threatened plant species (refer discussion below).

The extent of vegetation mapped within this corridor is provided in Figure 9 and discussed in Section f.

2.3.2. Botanical Surveys

Desktop studies and discussions with local botanical experts determined the location of key habitats where rare or uncommon plants, known to occur locally, were most likely to occur within close proximity to the proposed Expressway Alignment. Botanical surveys and lists of vascular plants were compiled for 10 indigenous habitats within these locations. Habitats where these surveys were conducted included manuka-dominated wetlands, sedgeland and rushland wetlands, wet dune depressions in pasture, mature shrublands and areas of advanced regeneration.

To maximise botanical effort during seasonal flowering, botanical surveys were undertaken in key habitats identified as potentially at risk during the initial Project scoping phase (when a number of alternative route options were still being considered). While this approach has meant that some areas surveyed are now not affected by the proposed Expressway Alignment, the botanical information gathered has provided some useful comparative information on species and composition of wetlands in close proximity. For example, the survey included detail on a number of wetland and forest communities now located some distance from the proposed Expressway Alignment (e.g. Poplar Ave Peatlands, Raumati South). Following the final route confirmation (7 July 2011), more detailed wetland condition assessments were undertaken in those immediately affected habitats.

Botanical survey work was undertaken during October 2010, November 2010, January 2011 and July 2011 by Pat Enright and Matiu Park.

The locations of each of these botanical surveys are shown in

and detailed lists of vascular plants at each location are included in Appendix 27.J: Combined plant species list for MacKays to Peka Peka and surrounds.

2.3.3. Wetland Condition Assessments

To support the botanical descriptions of the more ecologically significant wetlands potentially affected by the proposed Expressway Alignment, more detailed wetland condition assessments using vegetation plots and other physical parameters were undertaken following confirmation of the proposed Expressway Alignment and Designation boundaries. In total 8 separate plots were carried out.

The Clarkson et al method (2003)[3] wetland condition assessment methodology was used for these assessments. In addition to canopy composition, information was gathered on understorey, canopy

[3] Refer CLARKSON, B.R, SORRELL, B.K., REEVES, P.N., CHAMPION, P.D., PARTRIDGE, T.R. & CLARKSON, B.D.: 2003. Handbook for Moniotirnig Wetland Condition. A Ministry for the Environment Sustainable Managemetn Fund Project (5105).

height, ecological context, hydrology, catchment characteristics and physical wetland parameters. Wetland condition assessments were undertaken by the author, Pat Enright and Tim Park.

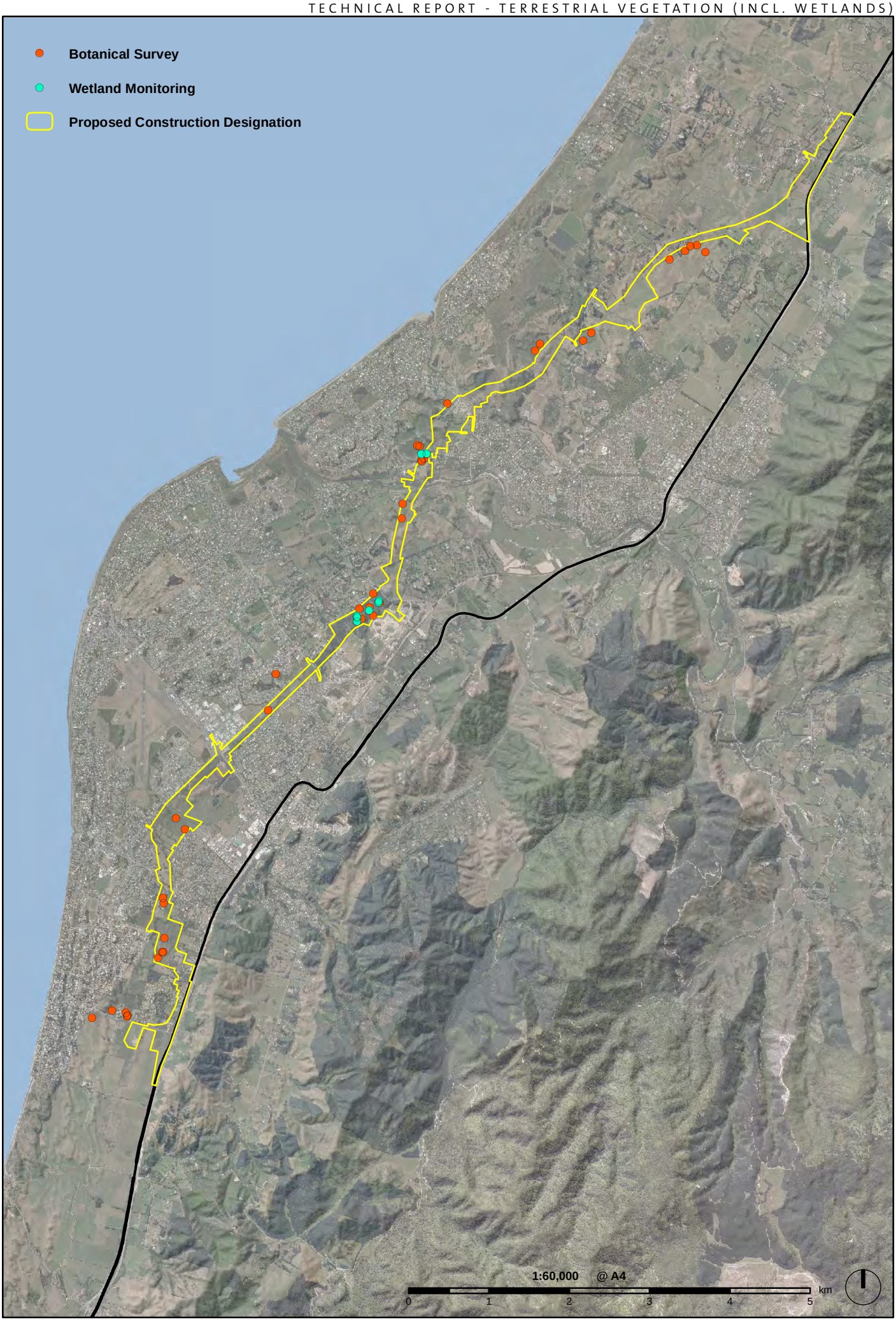
The locations of these wetland condition assessments are shown in
and each wetland plot sheet is attached as Appendix 27.H: Wetland Condition Monitoring Sheets.

2.4. Botanical Survey Constraints

Botanical surveys were carried out at all the sites identified by the desktop ecological review as potentially containing plant communities of concern and habitats where rare plants may occur. This allowed a focused approach to the fieldwork on habitats that are of concern because of their location or threat classification. Given the ephemeral nature of a large number of the wetlands located along or in close proximity to the proposed Alignment, botanical surveys were specifically undertaken during spring, early and late summer to coincide with seasonal flowering species (orchids, rushes etc.) and the botanical changes to these areas associated with drying out of ephemeral habitats.

However, given the length (approximately 16 kms) and the large area of the Designation (316 ha), combined with the large scale of a number of these areas of vegetation (which in many cases comprised of largely inaccessible areas of wetland / blackberry), the botanical surveys may not have detected some species whose identification is limited to seasonal flowering or which are very cryptic. Accordingly, the plant species list may not be entirely complete.

Finally, the wetland condition assessments were undertaken in July 2011, immediately following final confirmation of the proposed Expressway Alignment and Designation. During the site visit, all wetlands were subject to relatively high water tables following recent rain. This visit restricted plant identification to those more readily identifiable species, or those with seed heads.



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2.5. Assessment of Ecological Significance

2.5.1.Introduction

Assessment of ecological significance is a necessary test under section 6(c) of the Resource Management Act 1991 to determine the ecological significance of indigenous vegetation and habitats of indigenous fauna. . Whilea wide range of methods have been developed by different agencies for different purposes, ultimately there is no nationally recognised method for assessing and determining sites of ecological significance.

However, as background to this ecological assessment, the Kāpiti Coast District Plan (District Plan) includes a schedule of sites of ecological significance (Part I; Section E: Heritage Register, Ecological Sites) which were identified by a study conducted in 2003 (Wildland Consultants 2003). This district wide study used a method for assessing significance based on guidelines developed for Environment Waikato (EW 2002). The assessment methodology is provided in Appendix 27.A: KCDC Significance Criteria. In summary, the classification rankings used as part of the District Plan schedule are headed as follows:

- I - International
- N - National
- R - Regional
- L - Local

While the KCDC study by Wildlands (2003) has proven to be a very useful guide as a desk-top based exercise to assessing ecological significance (largely because of the district-wide approach to this inventory), this survey rarely extended to actual botanical surveys of these areas. As a result of our field assessments and botanical surveys, we have additional biological information in a number of locations along the Alignment that we consider sufficient to modify the Wildlands significance listings and these have been taken into account in our assessment. Further, this 2003 ecological inventory did not include a number of areas of indigenous vegetation where these were included within the existing WLR designation. While a number of areas within the existing WLR designation were included (e.g. El Rancho, Osbournes, Te Harakeke wetlands), a number of areas were not included (e.g. 200 Main Road Wetland, the numerous wetlands located within the Otaihanga Landfill).

We note that the Wildlands study (and subsequent review of the KCDC scheduled ecological sites in 2007) identified and described a number of sites which were not considered to have sufficient value at the District Level to be included in the schedule, but which still have local values. We have also considered these sites in the following assessment.

At the same time as this assessment was being prepared, Boffa Miskell was assisting GWRC with a region-wide review of wetlands using significance assessment criteria outlined in the Proposed Wellington Regional Policy Statement. The goal of this exercise was to re-classify all the known

wetlands in the Wellington Region using these assessment criteria. The criteria from the Proposed Wellington Regional Policy Statement are as follows:

"Policy 22: Identifying indigenous ecosystems and habitats with significant indigenous biodiversity values – district and regional plans

District and regional plans shall identify indigenous ecosystems and habitats with significant indigenous biodiversity values that meet one or more of the following criteria:

(a) Representativeness: high representativeness values are given to particular ecosystems and habitats that were once typical and commonplace in a district or in the region, and:

(i) are no longer commonplace (less than about 30% remaining); or (

ii) are poorly represented in existing protected areas (less than about 20% legally protected).

(h) Rarity: the ecosystem or habitat has biological physical features that are scarce or threatened in a local, regional or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.

(c) Diversity: the ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.

(d) Ecological context of an area: the ecosystem or habitat:

(i) enhances connectivity or otherwise buffers representative, rare or diverse indigenous ecosystems and habitats; or

(ii) provides seasonal or core habitat for protected or threatened indigenous species.

(e) Tangata whenua values: the ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Maori.

While we have taken into account the significance listings of Wildlands for the District Plan Schedule of Indigenous Vegetation and the ecological assessments of OPUS International Consultants Limited (OPUS) as part of the 2001 WLR Designation study, our assessment of significance is based on the Greater Wellington Regional Council Proposed Regional Policy Statement criteria outlined above (Policy 22) and established Environment Court case law to allow a consistent district-wide assessment of ecological value along the mapped corridor. This case law is outlined in more detail below.

2.5.2. Case Law Pertaining to Assessments of Ecological Significance

Many ecological significance assessment criteria used by councils are based on Norton & Roper-Lindsay (2004), although they are often modified. The core criteria are:

- Rarity and distinctiveness;

- Representativeness;
- Ecological context; and
- Sustainability.

These core assessment criteria and the basic considerations that should be assessed when determining ecological significance have been refined by a number of Environment Court decisions, including:

- *Minister of Conservation v Western Bay of Plenty District Council* (A71/2001 at para 20);
- *Royal Forest and Bird Protection Society v The Central Otago District Council* (A128/2004 at para 31 and 32);
- *Director-General of Conservation v The Wairoa District Council* (W 081/2007); and
- *Long Bay-Okura Great Park Society Incorporated v North Shore City Council* (A078/2008).

In summary, discussions within the ecological community over the outcomes of these decisions have centred on:

1) the definition of "representativeness" which has been used to both assess a communities similarity to pre-human examples, and the remaining physical extent; and

2) whether sustainability or viability is a relevant criterion for the assessment of significance.

The most recent Court decision is from *Shearer Swamp Incorporated v West Coast Regional Council* (NZEnvC 345). While this decision relates to Variation 1 of the Proposed West Coast Regional Land and Riverbed Management Plan, Variation 1 provides for the management of West Coast wetlands, it is notable that the experts caucusing on this case have considered physical extent in rarity (historically assessed as part of representativeness) and sustainability has been removed as an assessment criterion. The ecological assessment criteria in *Shearer Swamp* are listed as:

> *[137] A wetland is significant if it triggers any one of the following criteria:*

- ecological context;
- representativeness;
- rarity; and
- distinctiveness.

Under this decision, ecological context relates to the wetland's role in relation to the wider ecological area. Representativeness relates to how closely it resembles pre human communities. Rarity relates to species, communities or habitats as defined through a variety of systems. Distinctiveness relates to special or unique features. The full Shearer Swamp criteria have been included in Appendix 27.B: Assessment of Significance Case Law.

As outlined above, we have considered the Greater Wellington Regional Council Proposed Regional Policy Statement ecological assessment criteria (Policy 22) in our application of these four criteria to all sites identified and assessed in the study, while taking into account the work carried out by other authors for Councils, and the values identified in these other ecological studies. Concurrently, Boffa Miskell has been undertaking a regional assessment of wetlands for GWRC using these criteria and this has provided useful context to the values of the wetlands along the proposed Expressway Alignment. However, given its primary application to assessing the ecological significance of wetlands, the *Shearer Swamp* decision has also informed our assessment of ecological significance.

2.5.3. Other Assessment Considerations

Other tools which assist in assessing significance include the LENZ threat class (Landcare); priorities set in the Wellington Conservancy Conservation Management Strategy (DOC 2010); and the National Priorities for protecting rare and threatened indigenous biodiversity (MfE 2007).

2.5.4. National Priorities for Protecting Rare and Threatened Indigenous Biodiversity

In 2007 the Ministry for the Environment developed a statement of National Priorities for Protecting Rare and Threatened Indigenous Biodiversity on private land (MfE 2007). This lists four national priorities. They are:

National Priority 1: To protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV), that have 20% or less remaining in indigenous cover.

LENZ is a national environment-based classification of ecosystems mapped across New Zealand's landscape (Leathwick et al. 2003). Acutely threatened and chronically threatened level IV LENZ environments have < 20% cover of indigenous vegetation, and these areas have been specifically identified as a national priority (Priority #1) for protecting rare and threatened indigenous biodiversity on private land by the MFE (2007). Any reasonably sized and/or relatively un-modified areas of indigenous vegetation on this land environment should therefore be regarded as ecologically significant.

National Priority 2: To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.

Almost the entire proposed Expressway Alignment is located in sand country - and wetlands are also numerous within the proposed Designation. The ecological significance of any areas of indigenous vegetation associated with sand dunes and wetlands have been assessed accordingly.

National Priority 3: To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.

Seventy-two naturally rare ecosystems have been identified (Williams et al. 2007) defined as ecosystems having a total extent less than 0.5% of New Zealand's total area. Many of these

ecosystems rely on specific rock and soil types which are not found locally. The rare ecosystems that could potentially be found in the vicinity of the proposed Expressway Alignment are:

- Braided riverbeds (raw–recent/sand–boulders/plain/periodically open land;
- Ephemeral wetlands (seasonally high water table / depression. Herbfield);
- Damp sand plains (raw-recent/coastal/sand/depression/plains/permanently high water table. Open land, herbfield);
- Dune slacks (raw-recent/coastal/sand/depression/ permanently or seasonally high water table. Open land, herbfield); ;
- Estuaries (tidal and subtidal); and
- Lagoons coastal/lagoon (open land, sedgeland, rushland, reedland, herbfield, shrubland, scrub).

National Priority 4: To protect habitats of acutely and chronically threatened indigenous species.

2.5.5. Wellington Conservation Management Strategy

Within the Wellington Conservancy the highest priority ecosystems and habitats managed by the Department of Conservation in the Wellington CMS area (DOC 2010) are:

- indigenous forests;
- shrublands;
- freshwater wetlands;
- rivers and lakes;
- estuaries;
- dunes and dune wetlands;
- cliffs;
- herbfields and grasslands;
- islands; and
- marine environment.

2.5.6. National Policy Statement on Indigenous Biodiversity (NPS)

As a proposed NPS, it is appreciated that this has no formal status. However, we have considered each of the policies 1 to 6 in this assessment given the potential for the document to be relevant at a later stage of RMA processes. In addition, we have considered the following principles outlined in the NPS to be applied as providing some guidance when considering a biodiversity offset:

- No net loss
- Additional conservation outcomes
- Adherence to the mitigation hierarchy
- Limits to what can be offset

- Landscape context
- Long-term outcomes
- Transparency.

2.5.7.NZ Transport Agency Environmental Plan (June 2008)

This plan sets out the environmental and social responsibilities and objectives that the NZTA is committed to as an organisation. Part Two of the Environmental Plan is divided into sections by environmental and social impacts and includes an 'ecological resources' section. The Plan then specifies how the NZTA is to address the key social and environmental impacts.

Consistent with NZTA's commitment to promote biodiversity on the SH network and identify and protect significant ecological resources within SH corridors, this report has considered the following objectives for the Ecological Resources Section of NZTA's Environmental Plan:

- E1 Promote biodiversity on the State highway network;
- E2 No net loss of native vegetation, wetlands, critical habitat or endangered species; and
- E3 Limit the spread of plant pests.

3. Desktop Study Results

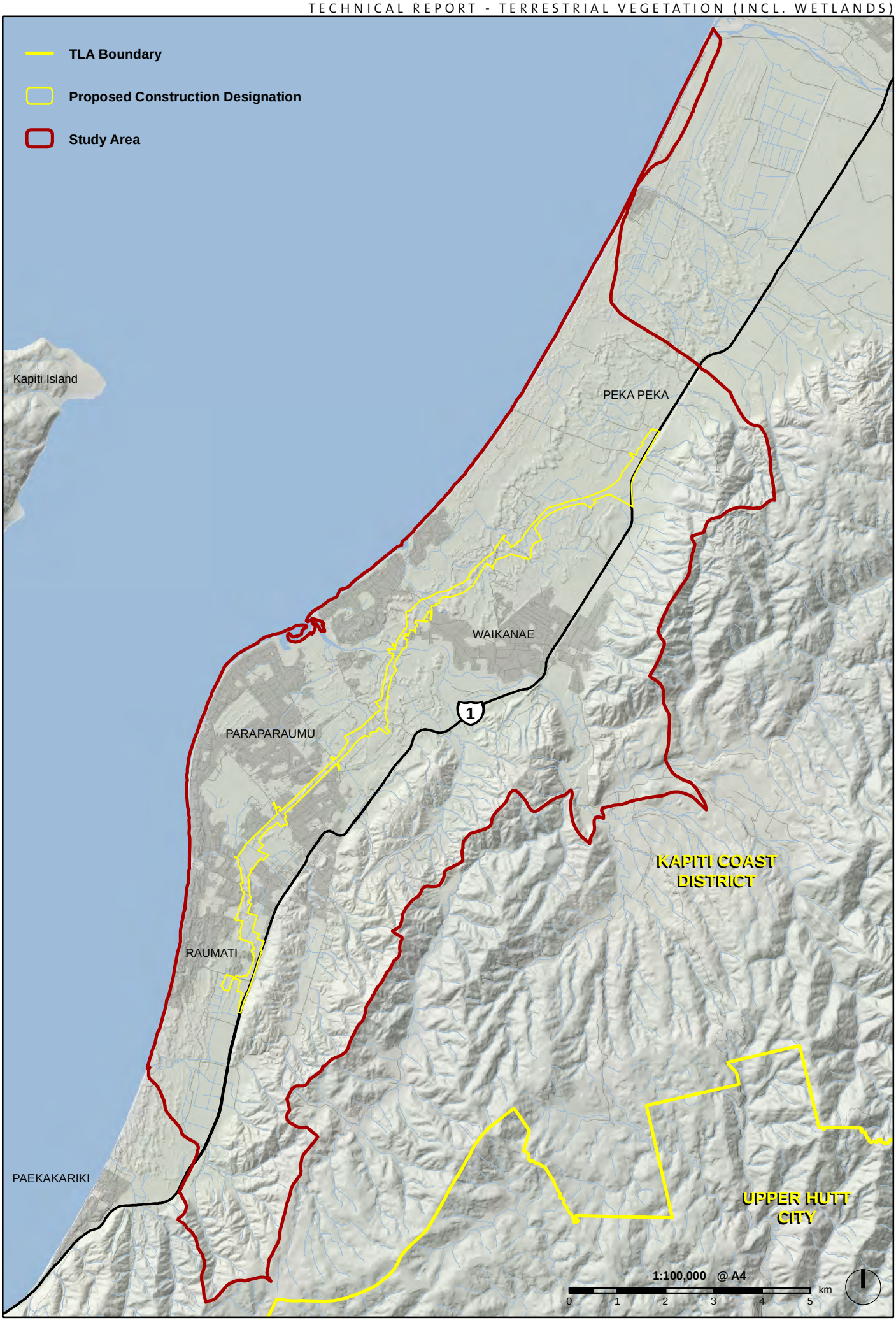
3.1. Ecological Context of the Kāpiti Coast

The study area (refer Figure 4) lies entirely within the Foxton Ecological District, which is predominantly sand country. The Foxton Ecological District contains the largest sand dune system in New Zealand. It is part of the Manawatu Ecological Region. This ecological district is defined by the dune topography and associated vegetation. The long strip of Holocene sand dune country with its several associated wetlands, lagoons and several estuaries form the most extensive sand dune system in New Zealand (McEwen, 1987). The study area in Figure 4 includes all land, water bodies and receiving environments that could be potentially affected by the Project.

Wind is a dominating feature of the climate with north-westerly gales common and affecting the dune landscape, vegetation and land uses. The coastal dunes typically run perpendicular to the prevailing wind. Sand basins and plains form between them. Dune formation often restricted water runoff and shallow dune lakes with wide wetland margins formed in depressions or dune slacks between dunes. In these wetland areas water levels varied up to 1.5 metres seasonally and following heavy rain. Major drainage works for farming have resulted in the loss of most of these natural lakes and wetland systems throughout the area. Dune lakes and peat swamps now account form only a small part of the area (Ravine, 1992). Water levels also vary considerably (up to 1.5m) from season to season and year to year (Ravine, 1992).

The Foxton Ecological District would have been mostly forested, with shrubs and trees dominating inland of the coast. A great part of the Ecological District would have had swamp forest dominated by kahikatea and pukatea with plentiful rimu and swamp maire (Ravine, 1992). There is some evidence that these swamp forests were reduced greatly in extent even before European times by Maori burn-off (Cowie, Fitzgerald and Owens, 1967). These original forests are now reduced to several small remnants.

Because of its mild climate and large range of habitats, the Ecological District would have once supported a very diverse indigenous fauna. The impacts of 1,000 years of people and introduced animals will have caused many changes to this fauna, though, sadly, there is little information on what species would have been lost (Ravine, 1992). According to the Foxton Protected Natural Areas report (Ravine, 1992), less than 5% of the surface area now has predominantly indigenous vegetation (Ravine, 1992) and there were 29 protected natural areas in the district, totalling 2,470ha (or 2.2% of the area of the ecological district).



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Mackays to Peka Peka

STUDY AREA & TERRITORIAL BOUNDARIES

3

3.2. Climate

3.2.1. General

Climate has a major influence on the existing vegetation patterns along the length of the proposed Expressway Alignment, as well as a range of implications for restoration and recovery of vegetation following works associated with the Project.

The climate of the ecological district is mild, with warm summers and moderate winters. Typical summer temperatures range between 18 to 28 degrees and between 8 to 18 degrees in the winter. As noted above, the dominating feature of the climate is the wind. West-north westerly winds predominate, often reaching gale force, and these strong winds have had a major effect on the physical shape of the ecological district (Ravine, 1992). Rainfall is about 1,100 to 1,200 mm per annum, with an increasing gradient in rainfall west to east. The area generally has warm summers and mild winters (McEwen 1987).

The key climatic issues for land use and management associated with the proposed Expressway are expected to be drainage and drought on vegetation and the influence of salt-laden winds on plant growth rates and vegetation recovery.

All plant species selections are going to have to focus on these matters to ensure optimum soil retention and plant establishment. More information on this is outlined in the Landscape and Visual Assessment.

The mild, temperate climate of the Kāpiti Coast also facilitates rapid weed growth, particularly during warm spring and summer conditions with high soil moisture. Weed management and control will need to be considered for all areas of earthworks and for landscape, hydrological and ecological planting areas.

3.3. Geology and topography

The study area where the proposed Expressway Alignment is proposed is part of a long belt of Holocene sand-dune country that extends from Patea to Paekakariki. The dune sands present are derived from material brought to the coast by rivers and moved along the coast by wave action (McFadgen, 1997). The sand has been transported from the beach face, first to the foredune and then further inland. As sand accumulated, the shoreline generally grew seawards, and the foredune increased in height and width.

The Foxton dune phase forms the most extensive and distinctive belt that runs between Paekakariki and the Manawatu River, in some areas the dunes rise to 30m above the surrounding plain (Hawke and McConchie, 2006, McFadgen, 1997, Fleming, 1971). These duneforms are predominantly the landforms that the proposed Expressway Alignment is situated within.

The great majority of the study area lies upon the sand country with strongly rolling to moderately steep sand dunes deposited over the last 6,000 years. The dunes lie parallel to the coast and become progressively older inland. This land class has weakly developed soils with excessive drainage characteristic of the sandy soils (Page, 1995). In large areas of the extensive peat and wetland areas along the proposed Expressway Alignment where the sand dunes have impeded natural drainage, peat is a dominant soil type of the isolated dune depressions of this large belt of sand dunes. These wet dune depressions can have a wide variety of sizes, shapes and altitudes.

These landforms are shown in Table 1 and Figure 4. The New Zealand Land Reserve Inventory (NZLRI) identifies seven distinct geological zones within the study area (not including Town/Urban and Unclassified). These zones are summarised in Table 1 which shows both the total extent within the wider study area and the proportion contained within the Construction Designation. Within these seven zones there is a finer gradation of 28 landforms. These landforms are presented in detail in Appendix 27.C: Landform, Geology & Soils (NZLRI Detail). The zones are:

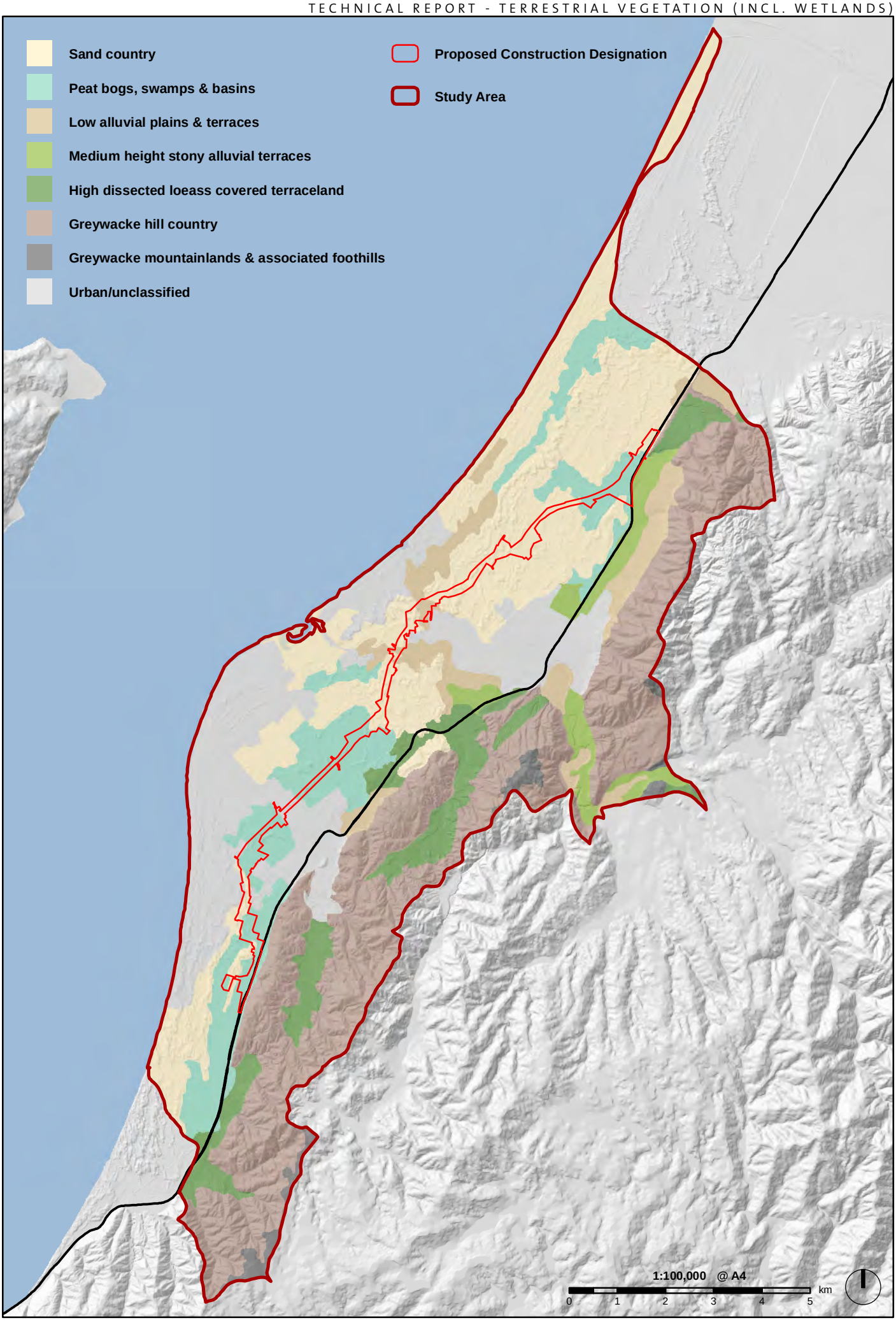
Table 1: Geology of the Study Area (Derived from NZLRI, Page 1995)

Description	Study Area (ha)	% of Study Area	Designation (ha)	% of Total Designation
Sand country	2,677.1	24.8%	68.5	21.7%
Peat bogs, swamps and basins	1,125.7	10.4%	218	69.0%
Low alluvial plains & terraces	530.3	5.0%	15.6	4.9%
Medium height stony alluvial terraces	347	3.2%	2.4	0.8%
High dissected loess covered terraceland	511.9	4.7%	0	0.0%
Greywacke hill country	3,125.5	28.9%	0	0.0%
Greywacke mountainlands and associated foothills	177.3	1.6%	0	0.0%
Town / Urban	1,853.3	17.10%	11.6	3.7%
Unclassified	34.1	0.30%	0	0.0%
TOTALS	10,808	100%	316	100%

In summary, the great majority of the proposed Expressway Designation is located on sand country and associated swamp lands (91% or 286ha). Most of the sand country consists of recent, unconsolidated, excessively drained sand dunes near the coast. In these areas erosion and climate are the two dominant limitations on land use. To stabilise the sand, the maintenance of a complete vegetation cover is recommended and strict management guidelines are recommended for road construction, culvert construction, & scrub clearance, to minimise soil erosion and maintain water quality and reduce impacts on residential properties. The Assessment of Groundwater Effects (Technical Report 21, Volume 3) report discussed the geology of the study area in more detail.

Large areas of the Designation (69% or 218 ha) lie on peat bogs, swamps and basins overlaying sand. These areas are primarily wet dune depressions of varying depth between the more elevated sand dunes. Erosion protection and maintaining vegetation cover in these areas is less essential.

These factors should be considered as part of any future mitigation package.



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Mackays to Peka Peka

GEOMORPHOLOGY
derived from NZLRI

3.4. Waterbodies

The waterbodies located within and downstream of the proposed Expressway Alignment are outlined in more detail in the Freshwater Report (Technical Report 30, Volume 3). However, in summary they consist of the following waterbodies from south to north along the proposed Alignment:

- A small farm drain tributary of the Whareora Stream (within QE Park) Drain 7, a large tributary off the Wharemauku Stream
- Wharemauku Stream
- Mazengarb Stream
- WWTP Drain, a larger tributary off the Mazengarb Stream (fed by the Kāpiti Coast Sewage Treatment Plant)
- Otaihanga Drain
- Muaupoko Stream
- Waikanae River
- Waimeha Stream
- Ngarara Creek
- Kakariki Stream
- Smithfield Drain
- Ngarara Stream
- Paetawa Stream
- Hadfield / Kowhai Stream

Most of the streams and waterbodies traversed by the proposed Expressway Alignment have been highly modified by land clearance and swamp drainage associated with farming and residential development. In most locations where waterbodies are traversed, riparian vegetation consists of grazed pasture or weedlands.

Hydrological information gathered to date indicates that stream levels traversed by the proposed Expressway Alignment are very responsive to localised rainfall in the catchment and appear to return relatively rapidly to a stable baseflow level. More detail on the hydrology of the study area is outlined in the Assessment of Hydrology and Stormwater Effects (Technical Report 22, Volume 3) and Ecological Technical Report 30, Volume 3: Freshwater.

3.5. Wetlands

3.5.1. Introduction

Wetlands are one of the dominant indigenous habitats along the proposed Expressway Alignment, ranging from remnant primary lowland swamp forest dominated by kahikatea, manuka shrublands with *Sphagnum*, purei sedgeland and rushlands through to highly modified wet dune depressions dominated by *Juncus* and exotic wet pasture.

This Report has classified wetlands consistent with Johnson & Gerbeaux (2004) and Williams et al (2007), as areas where the drainage effect results in a permanently to seasonally high water table, or open water, and where plants and animals adapted to the wet conditions are present. This approach is largely consistent with the RMA, which defines wetlands as *'permanently or intermittently wet areas, shallow water or land/water margins that support a natural ecosystem of plants and animals that are adapted to living in wet conditions'*. In terms of consistency with the RMA definition, we note that most of the wetlands within and in close proximity to the proposed Expressway Alignment are modified from their '*natural'* state and, whilst having wetland values, are not original or remnant vegetation.

This ecological assessment has established that the majority of the wetlands along and in close proximity to the proposed Expressway are technically fens and swamps, in that they are wetlands with predominantly peat substrate. Fen wetlands generally receive inputs of groundwater and nutrients from adjacent mineral soils. The water table is usually close to or just below the peat surface, and relatively constant. Fens have low to moderate acidity and are oligotrophic to mesotrophic. In contrast, swamps receive a relatively rich supply of nutrients and often also sediment via surface runoff and groundwater from adjacent land. Swamps usually have a combination of mineral and peat substrates and usually areas of open water and channels.

Table 4 (PNAs) and Table 5 (SNAs) outline each of the potentially affected wetlands along the route. More detailed botanical information on each of the wetlands in close proximity to the proposed Expressway Alignment is included in Appendix 27.I: Site specific species lists.

3.5.2. Wetlands – a national and local context

As a result of historic drainage and alteration for alternative economic uses, mainly agriculture, wetlands are now one of the most nationally threatened and degraded ecosystem types in New Zealand. It is generally accepted that wetlands have been reduced to less than 10% of their former extent across New Zealand (MfE, 1997). Swamps, the predominant wetland type of the Kāpiti Coast, have undergone the largest loss, with only 6% of their historical extent remaining (Aussiel et al, 2008).

Nationally, wetland loss has been greatest in the Auckland, Coromandel, East Cape, Manawatu, Hawkes Bay, Northland and Wellington Regions, with wetlands now largely absent from lowland alluvial flood plains (Aussiel et al 2008). According to GRWC, the Wellington Region has seen an even higher reduction, having lost approximately 97.5% of the wetlands that existed prior to 1840 (based on satellite imagery and the New Zealand Land Resources Inventory). As outlined in **Figure 5** below, the Kāpiti Coast has seen a major reduction in wetland extent.

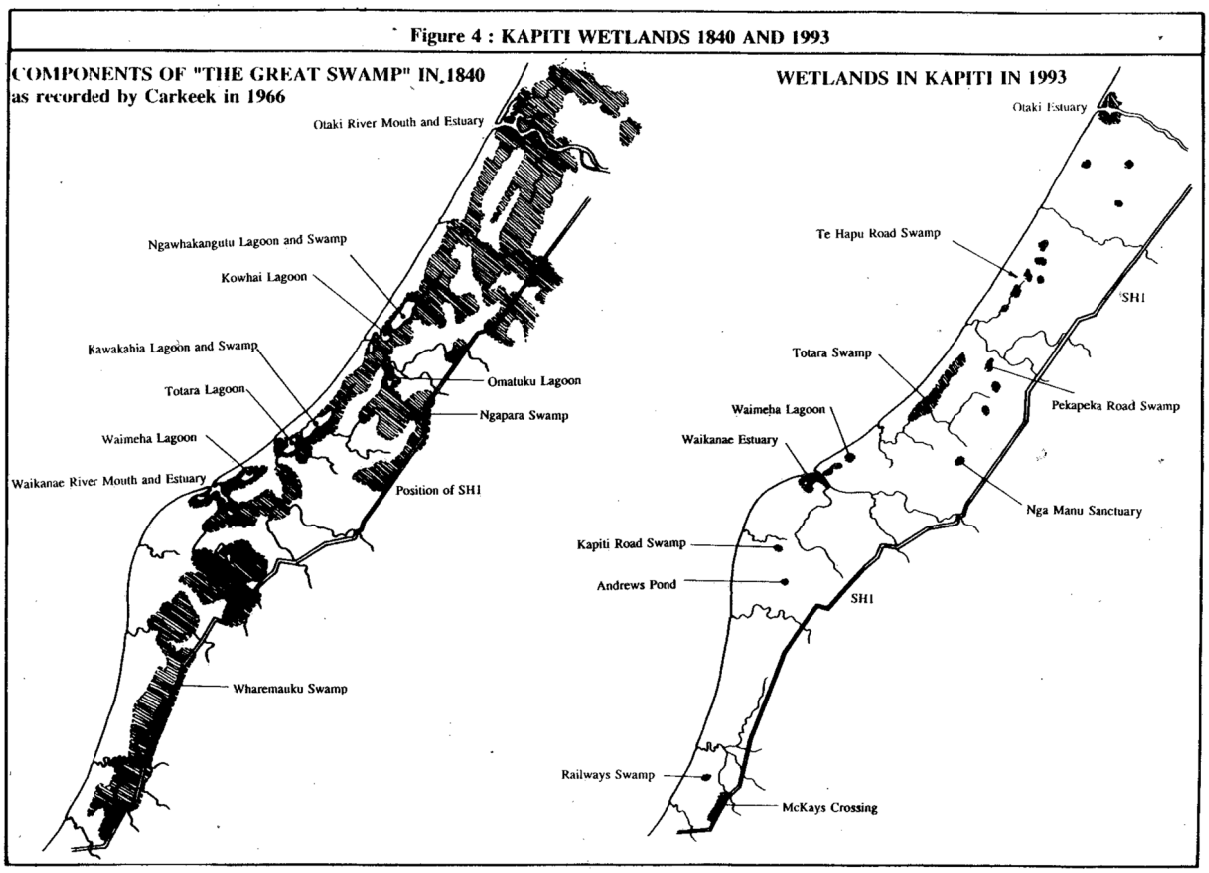


Figure 5: Wetlands of the Kāpiti Coast (reproduced from Fuller, 1993).

Because of this loss the remaining wetlands on the Kāpiti Coast are generally considered ecologically important. A large number of these wetlands have been historically assessed and are scheduled as "Significant Natural Areas" in the District Plan.

3.5.3. Wetlands and the Expressway Alignment

Wetlands have continued to be lost over recent years as a result of increased urbanisation of the Kāpiti Coast. However, intensive land uses have not occurred within the existing WLR designation, and as a consequence a number of the wetlands within the designation have survived and, in many cases, have reverted to an improved state ecologically. A historic comparison of wetlands remaining today with earlier aerial photographs illustrates the rapid natural plant succession within a number of wetlands since the existing WLR designation (e.g. Raumati Wetland).

3.6. Groundwater and hydrology

The majority of the wetlands located close to the proposed Expressway Alignment consist of fen and swamp wetlands with predominantly peat substrates. Based on our ecological investigations, the water table in these wetlands is usually close to or just below the peat surface and is relatively constant for most of the year (with the exception of low water tables in mid-late summer and short-term elevations following heavy winter rains when ground conditions are already saturated). The current wetland plant assemblages within these wetlands have adapted to these conditions, particularly the seasonal fluctuations. In the manuka / sphagnum wetlands near the proposed Expressway Alignment, the manuka are often established on smaller raised hummocks close to or just above the water table, with Carex and other sedges and rushes dominant in the more permanently wet areas.

An earlier study (Phreatos Groundwater Consulting 2002) has suggested that there has been a recession of groundwater levels in the Kāpiti Coast dunesand aquifer in recent years (from groundwater abstraction) which may in part be responsible for the current, modified vegetation assemblages in some of the wetlands near the proposed Expressway.

While our investigations, combined with the results of groundwater modelling undertaken in wetlands within or hydrologically connected to the proposed Expressway Alignment, lead us to believe that the wetlands should be able to tolerate some temporary ponding of water or drying out during the construction phase, we consider that any permanent impediments to groundwater flows could lead to permanent changes in plant communities, potentially on both sides of the proposed Expressway.

As outlined by Landcare (2010) most wetland scientists agree that the single most important factor determining both wetland type and function is hydrology, with changes in hydrology the leading causes of wetland degradation or destruction. Peat substrates in fens and bogs have the ability to expand and contract in response to rising and falling water levels. Peat surface oscillation has the very important property of stabilising water level fluctuations relative to the surface, which may be a critical factor determining where particular plants will grow (Landcare, 2010).

Given the east to west water table flows along the length of the proposed Expressway, we consider the most likely effects of construction would be the drying out of wetlands on the western side and water ponding on the eastern side (see for example the discussion on Andrews Pond in Section 3.9.1). Maintaining current groundwater flows and providing for the continuation of seasonal fluctuations will be critical to ensuring the ongoing health of these wetlands, particularly in areas where wetlands are located within more extensive and connected peatlands. This needs to be factored into the construction methodology accordingly.

More detail on these potential hydrological and groundwater effects, including the results of groundwater 2D and 3D modelling is discussed in the Assessment of Groundwater Effects (Technical Report 21, Volume 3).

3.7. Vegetation of the study area

3.7.1.Pre Human Vegetation of the Kāpiti Coast

The extent of historical (pre-human) vegetation can be defined with varying degrees of accuracy from a number of sources. New Zealand's "Potential Vegetation" has been mapped using the Land Environments of New Zealand (LENZ) model (Leathwick & et.al, 2002). The vegetation communities in Table 2 are sorted from dunelands to forest.

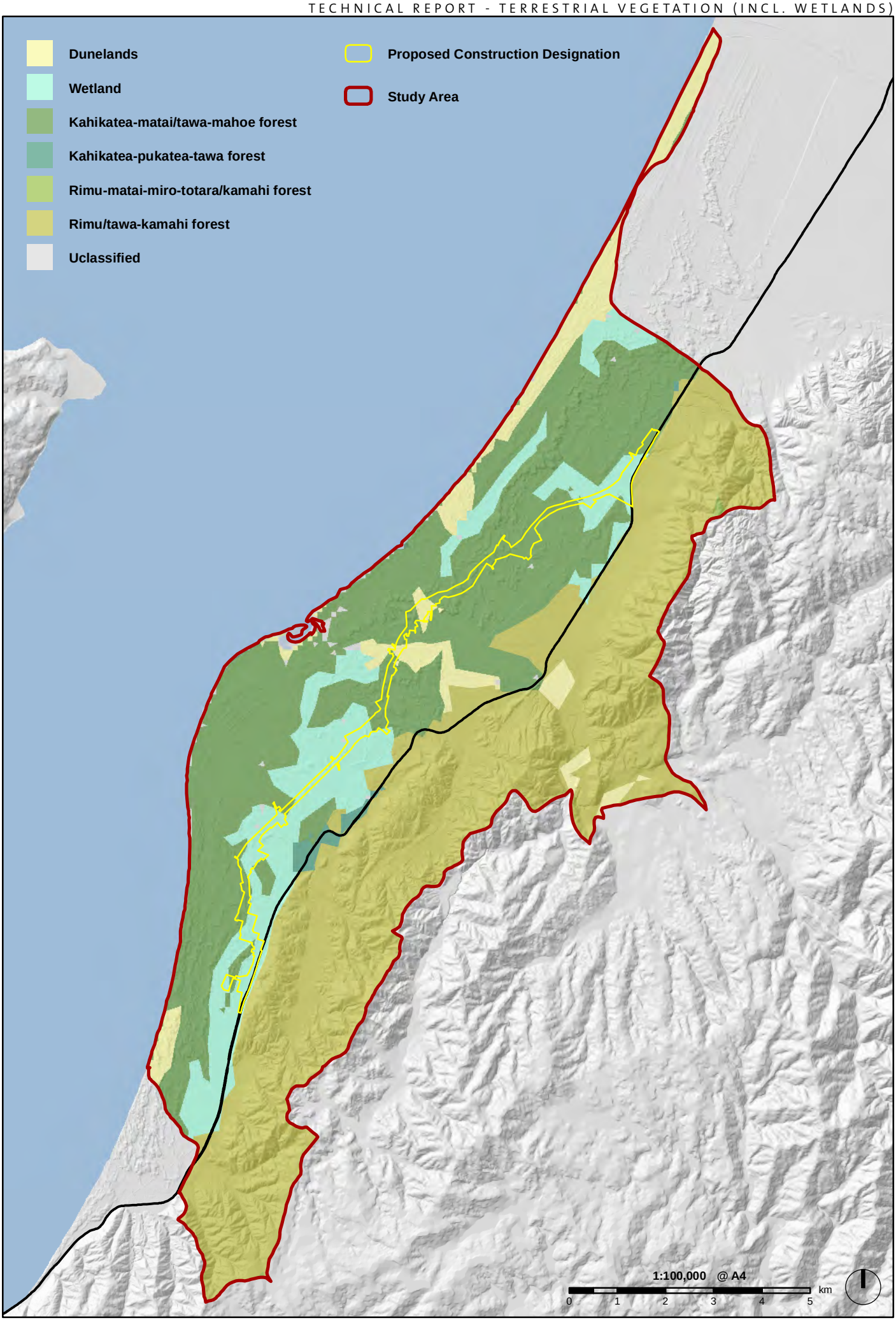
Table 2: Potential Vegetation (Derived from LENZ)

	Description	Study Area ha	% of Study Area	Designation ha	% of Designation
1	Dunelands	660.7	6.1%	16.0	5.1%
2	Wetland	1,335.8	12.4%	146.5	46.4%
3	Coastal shrublands & low coastal forest.	na	na	na	na
4	Kahikatea-associated forest	3,727.4	34.5%	150.6	47.6%
5	Rimu-associated forest	5,008.9	46.3%	2.9	0.9%
6	Unclassified	74.8	0.7%	0.0	0.0%
TOTALS		10,808	100%	316.0	100%

The potential pre-human vegetation predicted across the study area by LENZ is confirmed by a number of authors whom have provided a more accurate picture of pre-human vegetation.

These authors suggest that prior to human occupation, the Kāpiti Coast would have been covered with a highly diverse mix of vegetation types (refer for example Carkeek 1966, Gabites 1993, Esler 1978, Fuller 1993 and Ravine 1992). Predominant among these would have been extensive areas of lowland podocarp forest interspersed with large areas of swamp forest (kahikatea, swamp maire, pukatea, hinau, tawa, titoki and puka) and areas of raupo reedland, flaxland and cabbage tree-coprosma treeland on the large areas of peat and low-lying sand dunes across the District. Other areas, including more recent dune phases and associated wetlands and dune depressions are likely to have been dominated by kanuka and manuka shrubland and rush and sedgeland communities. Most

of these vegetation types have largely disappeared from the Kāpiti coastline today, although there are a number of remnants which attest to the extent and nature of this historical vegetation (e.g. Nga Manu Nature Reserve, Paraparaumu Scenic Reserve etc.).



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Mackays to Peka Peka

POTENTIAL VEGETATION
derived from LENZ

6

3.7.2. Current Vegetation of the Kāpiti Coast

As outlined above, almost the entire Kāpiti Coast has been historically farmed with repeated fires, land clearance and swamp drainage largely removing all the original vegetation cover. Table 3 presents a summary of the current vegetation of the study area based on the Land Cover Data Base (LCDBII). As outlined in Table 3, the current vegetation of the study area is dominated by pasture, regenerating shrub and built-up areas.

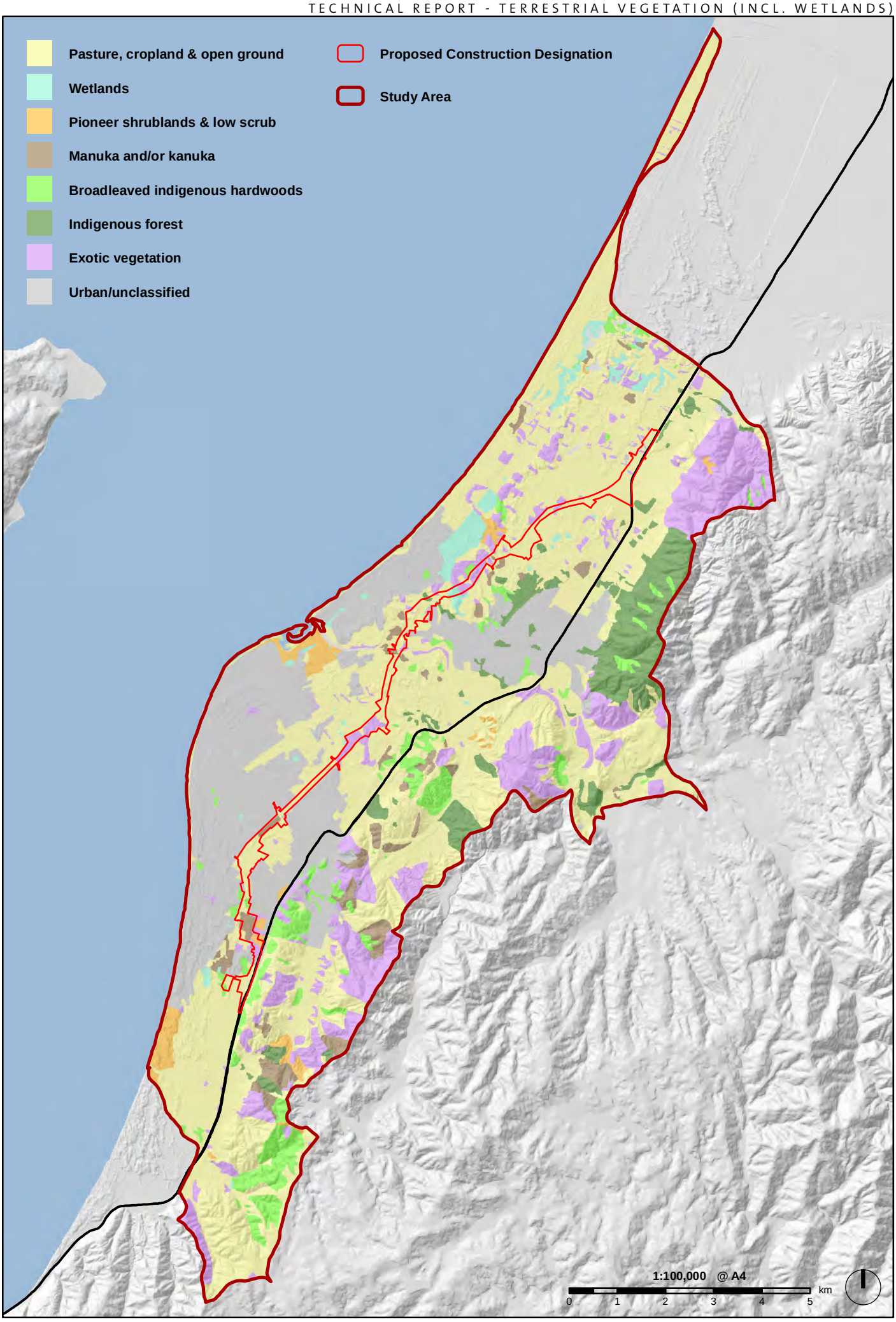
To assist with this assessment, the LCDBII vegetation categories have been aggregated and sorted to match the vegetation types mapped and presented later in this study. The complete LCDBII vegetation breakdown is provided in Appendix 27.D: Land Cover Database (LCDBII) Detail. The LCDBII database is based upon mapping of vegetation on satellite imagery and cannot distinguish between specific vegetation communities but can describe reasonably accurately the difference between different vegetation structure, pasture, shrubland, scrub, plantation forestry, and native forest.

Table 3: Current Vegetation based on Land Cover Database (Derived from LCDBII)

Sort	Description	Study Area ha	% of Study Area	Designation ha	% of Designation
1	Grasslands	5,454.6	50.4%	220.1	69.6%
2	Wetlands and wet depressions	217.6	2.1%	3.7	1.2%
3	Pioneer shrublands, scrub and low forest	974.4	9.0%	27.5	8.7%
4	Indigenous forest	633.6	5.9%	1.3	0.4%
5	Exotic and planted vegetation	1,358	12.6%	50.9	16.1%
6	Built-up area	2,169.4	20.0%	12.5	3.9%
TOTALS:		10,808	100	316	100.0%

Historical land disturbance associated with agricultural and forestry activities are the primary factors determining current vegetation types and distributions. Table 3 indicates that outside of the built-up areas, grasslands cover 50.4% of the study area with pioneer shrublands, scrub and low forest covering 9% of the study area. Wetlands and wet depressions cover 2% of the site. Introduced weed species make up a large component of these pioneer shrublands, with blackberry and gorse particularly dominant through large areas of the existing WLR designation.

In addition to the substantial loss of wetlands described in Section 3.5.2 above (historically making up 1,336 ha, 12 % of the study area, compared with 218 ha or 2% of the study area today), it is notable that only 633ha (5.9% of the study area) remains in indigenous forest today (compared to 8,736 ha or 80% historically). It is also important to note the large areas of grasslands (5,454 ha or 50% of the study area) and pioneer shrublands, scrub and low forest (974 ha or 9% of the study area). These pioneer vegetation communities were almost unrepresented in the LENZ potential historical vegetation, attesting to the scale of historical vegetation loss and modification across the study area.



November 18, 2011 W09181E_TER_CurrentVegetation_A4.mxd

NZ TRANSPORT AGENCY

Mackays to Peka Peka

CURRENT VEGETATION
derived from LCDB2

7

3.8. Rare or threatened plants

Only a small number of site specific species lists and vegetation descriptions exist for sites of indigenous vegetation along and in close proximity to the proposed Expressway Alignment. A list of these references is included in the bibliography. These sources were checked for the presence of rare or threatened plants to provide context for the botanical surveys and vegetation mapping, and to assist in prioritising sites that required more detailed investigation.

From these sources a list of rare, or locally uncommon species was produced that are either known to occur within the Designation, or which may occur in similar habitats within the study area, and so could also be present within the Project Footprint. These species were then considered during field investigations. These are:

i. Species of note in wetlands and associated vegetation potentially found along the proposed Expressway Alignment (classified by threat status[5])

- *Amphibromus fluitans* ephemeral wetland in Queen Elizabeth Park, (Ravine 1992). *Nationally endangered.*
- *Baumea articulata* is very close to the proposed Expressway's southern limit here although it is reportedly found at the Waikanae estuary as well (Ian Cooksley pers. comm.). *Non threatened.*
- *Carex dipsacea* is a sedge that is considered uncommon due to loss of habitat. *Non threatened.*
- *Carex maorica* is a another sedge that is not commonly seen in the conservancy due to loss of suitable habitat. *Non threatened*
- *Crassula manaia* cliff edges at Waverly Beach and Patea. *Nationally Vulnerable*
- *Desmoschoenus spiralis* coastal dunes throughout ED (Ravine 1992). *Relict.*
- *Drymoanthus adversus* uncommon in Wellington. *Non threatened.*
- *Drymoanthus flavus* little spotted moa orchid. *Naturally Uncommon.*
- *Eleocharis neozelandica* (on bare wet sand flats at Tangimoana, Hawken's Lagoon and Waipipi, (Ravine 1992). *Declining.*
- *Gratiola sexdentata*. *Non threatened.*
- *Hypolepis dicksonioides* Giant hypolepis Found in Eastbourne. *Naturally Uncommon.*
- K*orthalsella salicornioides* dwarf mistletoe. *Naturally Uncommon.*

[5] de LANGE, P. J.; NORTON, D. A.; COURTNEY, S.P.; HEENAN, P.B. ; BARKLA, J.W.; CAMERON, E.K.; HITCHMOUGH, R.; TOWNSEND, A.J. 2009: Threatened and uncommon plants of New Zealand (2008 revision). New Zealand Journal of Botany 47: 61-96.

- *Leptinella dioca subsp. monoica* Otaihanga oxbow, Waikanae River Mouth (Ravine 1992). *Non threatened.*
- *Leptinella dispersa subsp. rupestris* cliff faces at several locations near Hawera (Ravine 1992). *Naturally Uncommon.*
- *Libertia peregrinans* (New Zealand iris sandplains at Te Harakeke and Hawken's Lagoon (Ravine 1992). *Nationally Vulnerable*
- *Mazus novae-zelandiae* (on damp sand at Waimahora Swamp and Te Harakeke Swamp (Ravine 1992). *Declining.*
- *Ophioglossum petiolatum* lake edge south of Hokio Beach (Ravine, 1992) and also known historically from El Rancho wetland. *Nationally Critical.*
- *Pimelea arenaria* coastal dunes at Hokio, Himitangi, Tangimoana, Te Harakeke Swamp and Waipipi (Ravine 1992). *Declining.*
- *Potentilla anserinoides* silverweed is uncommon in the Wellington conservancy due to a lack of suitable habitat. *Non threatened.*
- *Ranunculus macropus* Swamp buttercup Gradual decline - is known from the Eastbourne hills. *Data deficient*.
- *Sebaea ovata* – On set sand flats at Te Harakeke, Hawken's Lagoon and Waipipi (Ravine 1992). *Nationally critical.*
- *Viola lyallii* is another plant that is not often seen in the Wellington area because of habitat loss. *Non-threatened.*

Other species of botanical note from the Wellington and Foxton ecological districts are outlined below, along with their national threat classification:

ii. Orchids:

- *Linguella puberula* dwarf greenhood orchid, rarely recorded in Wellington region. *Nationally critical.*
- *Adelopetalum* (*Bulbophyllum*) *tuberculatum* Bulb leaf orchid. Naturally uncommon.
- *Pterostylis cardiostigma* Greenhood. Non threatened.
- *Bulbophyllum pygmaeum* Bulb leaf orchid, rarely recorded in Wellington region. *Non threatened.*

iii. Ferns

- *Adiantum diaphanum* Small maidenhair, locally rare in Wellington. *Non threatened.*
- *Schizaea bifida* Forked comb fern, regionally Critical and found in Eastbourne. *Non threatened.*
- *Botrychium biforme* fine-leaved parsley fern; patotara, susceptible and found in Eastbourne. *Non threatened.*

iv. Other:

- *Nestegis montana* Narrow leaved maire. *Non threatened.*

- *Pittosporum divaricatum* is widespread throughout the Wellington region but never found in abundance. This is classified as Medium priority conservancy status in the Wellington Conservation Management Strategy. *Non threatened.*
- *Mida salicifolia* Willow-leaved Maire. *Non threatened.*
- *Streblus banksii* large-leaved milk-tree. *Relict.*
- *Streblus heterophyllus* small-leaved milk tree. *Non threatened.*

3.9. Significant Natural Areas and Habitats

3.9.1.Protected Natural Areas (PNA's)

1.1 lists 11 sites along the proposed Expressway Alignment that have either been protected for their ecological values or which have been protected for other purposes, but also contain areas of identified ecological value (e.g. Queen Elizabeth Regional Park). These sites are shown generally in Figure 8. More detailed descriptions of each PNA are included in Appendix 27.E: Protected Natural Areas beneath or in close proximity to the MacKays to Peka Peka Expressway Designation.

The protected natural areas listed have been considered in terms of their ecological context or are intersected by the Designation. Of the latter, a number extend beneath the Project Footprint of the proposed Expressway. This report has included a number of areas that are located more than 100m distance where we consider their inclusion is warranted on ecological connectivity grounds (e.g. Nga Manu Nature Reserve, located approximately 400 m away, provides important bird and freshwater fish movements through the area within with the proposed Expressway Alignment is located).

also identifies the relationship of the PNA's to the proposed Expressway Alignment. The categories used are:

- **A** = adjacent to Designation;
- **D** = all or part within Designation;
- **F** = falls beneath Project Footprint;
- **DS** = downstream of Designation; and
- **WT =** outside of Designation, but potentially connected via watertable.

Within the Kāpiti Coast District, RMA-based ecological surveys of significant natural areas have been undertaken and relevant information on protected areas from these surveys is included.

Table 4: Protected Natural Areas beneath or in close proximity to the MacKays to Pekapeka Designation.

Number	Name (listed south to north)	Size (Ha)	Effects	Description
	Terrestrial vegetation			
1	Ngarara Bush	2.59	A	An area of contiguous semi-coastal modified primary kohekohe and kahikatea forest. Protected by QE II covenant, KCDC Ecosite (K133).
	Wetland Vegetation			
2	Queen Elizabeth Regional Park peatlands	N/A	F	A large Regional Park with a range of values, including areas of remnant swamp forest and wetland systems in the south and Poplar Ave wetlands in the north. The actual areas of peatlands have not been determined for this report. Protected by Regional Park, KCDC Ecosite (K184). Refer plant species list attached as Appendix 27.I.
3	Andrews Pond Scientific Reserve.	1.3	A	A small manuka wetland located amongst large areas of pasture. Protected as a Scientific Reserve, RAP, KCDC Ecosite (K093).
4	Sovereign Way / Crown Hill Eco-site	0.6	A	Manuka transitional wetland. Protected by KCDC Recreation Reserve (E183), KCDC Ecosite (E92).
5	Waikanae Estuary Scientific Reserve	68.2	DS	Nationally-significant estuarine wetland and rivermouth protects a natural mosaic of freshwater lakelets, saltwater lagoons and marshes, tidal sand flats and sandy beach at the mouth of the Waikanae River. Protected as a Scientific Reserve, KCDC Ecosite (K081).
6	Waimanu Lagoons	8.0	DS	A large saline lagoon system with linkages to Waikanae Estuary Scientific Reserve. Wetland habitat is nationally under-represented. KCDC Ecosite (K175).
7	Osbournes Swamp	1.0	A	A modified flax/toetoe/raupo wetland with Coprosma propinqua shrubland. Protected by QEII Covenant, KCDC Ecosite (K068).
8	Te Harakeke Swamp / Kawakahia Wetland	58.2	DS	The largest dune swale wetland remaining in a relatively natural state on the coastal plain of the Foxton Ecological District. Protected by QEII Covenants, KCDC Ecosite (K066), RAP (PNAP).
9	Te Kouka Wetland	3.7	D	Regenerating kahikatea wetland, with scattered remnant kahikatea. Protected by QEII Covenant, KCDC Ecosite (K066).
10	Kawakahia Swamp Forest	0.8	DS	A small area of kahikatea-dominated semi-coastal remnant swamp forest. Protected by QEII Covenant, KCDC Ecosite (K066).
11	Nga Manu Nature Reserve	41.0	A	One of the largest and best examples of swamp forest within Foxton Ecological District. Protected by Private Trust, QEII Covenant, KCDC Ecosite (K133).

Only two of these protected natural areas, Te Harakeke / Kawakahia Wetland and Andrews Pond Scientific Reserve, have been identified by DoC in the Protected Natural Areas Programme. Both of these areas are avoided by the proposed Expressway Alignment. Te Harakeke / Kawakahia Wetland remains in excellent condition, and a recent assessment of its ecological significance for GWRC considers this as the sixth most ecologically important wetland system in the Wellington Region.

Andrews Pond, however, has declined considerably since 1992 when it was described by Ravine[6] as the healthiest remaining example of once extensive manuka-sphagnum wetland systems along the Kāpiti Coast. In 1993 Andrews Pond was used as a case study for an assessment of wetlands in the Wellington Region[7].

However, prior to its protection and gazettal as a scientific reserve (the second highest reserve classification in the Conservation Act) around one half to two thirds of the wetland was in-filled. Some years later the Milne Drive subdivision was built and this resulted in significant changes to the hydrology of the wetland. Ongoing stormwater discharges from Milne Drive changed the cycle from seasonal flooding to persistent flooding and this gradually drowned the wetland, killing the sphagnum moss, and caused the ongoing decline of the manuka canopy which persisted for some time but is now almost all dead (Fuller, 2008). Currently there is still a lot of standing dead or nearly dead manuka within the pond which gives an appearance of health, but once the last of the manuka has collapsed the pond will be mostly shallow open water with areas of Carex. While no longer providing habitat for rare plant species, this site is still considered to have ecological values as wetland habitat.

Andrews Pond provides a very useful example of the importance of maintaining hydrological conditions, and the very slow time delay before small changes to wetland hydrology are reflected in modified vegetation assemblages.

Most of the PNAs in

[6] Ravine, D A 1992. Foxton Ecological District. NZ Protected Natural Areas Programme No. 19. Department of Conservation, Wanganui. 264p.

[7] Wetlands in the Wellington Region, 1993. Regional inventory prepared for Wellington Regional Council as part of development of the Regional Policy Statement.

Table 4 are considered to be located sufficient distance from the proposed Expressway Alignment that there will be no adverse effects on terrestrial ecological values, including potential hydrological changes. However, four PNAs of particular concern are located downstream of the proposed Expressway Alignment (Waikanae Estuary Scientific Reserve, Waimanu Lagoons, Kawakahia Wetland and the adjacent Kawakahia Swamp Forest) and the potential indirect effects on these PNAs needs to be factored into the assessment and construction methodology. The Assessement of Ecological Impacts (Technical Report 26, Volume 3) discusses a number of recommendations to avoid or minimise potential adverse effects on these areas.

3.9.2. Unprotected Natural Areas (SNAs)

Table 5 lists 21 sites along the proposed Expressway Alignment that do not have formal protection, but which have been identified through district wide or regional survey as having ecological value. These sites are derived from a number of sources, but primarily the Wildlands Kāpiti Coast District Council Ecological Sites survey (2003) and the Wildlands Kāpiti Coast District Council potential Ecological Sites survey (2007) as well as our own knowledge of the Kāpiti Coast[8]. The evaluation/ranking system for the Wildlands Kāpiti Coast District Council SNA surveys was outlined in Appendix 27.A: KCDC Significance Criteria. Each of these identified ecological sites are shown generally in Figure 8, and in more detail in

[8] Based on ecolgocial assessments prepared for Ngarara Plan Change, Meadows Trust Plan Change, Andrews Pond, Paraparaumu Airport Plan Change, Tasman Lakes Plan Change, El Rancho wetland restoration plan and existing WLR designation.

Figure 12.

The sites listed in Table 5 are either intersected by the Project Footprint or Designation, lie in close proximity to the Designation or have been identified through the ecological assessment as being potentially affected through groundwater or hydrological disturbance or habitat disruption to existing habitat corridors. Table 5 also identifies the relationship of each of the SNA's to the proposed Expressway Alignment. The categories used are the same as for Table 4.

For this terrestrial vegetation assessment, we have separated the SNAs into terrestrial vegetation and wetlands. As outlined earlier in this report, wetlands and associated vegetation form the majority of the SNAs along the proposed Alignment. More detailed plant species lists on a number of these SNAS where they are potentially affected by the proposed Alignment are included as Appendix 27.F: Unprotected sites of ecological value beneath or in close proximity to the MacKays to Peka Peka Expressway Designation.

Table 5: Unprotected sites of ecological value beneath or in close proximity to the MacKays to Peka Peka Designation

Number	Name (listed south to north)	Size (Ha)	Effects	Tenure / Listed	Description
	Terrestrial vegetation				
1	**Raumati Road Kanuka**	**0.4**	**F**	**NZTA**	**A small area of kanuka forest and treeland with scattered mahoe on the raised dunes south of Raumati Road.** **Reference: BML 2011.**
2	**Otaihanga Landfill Mahoe**	**0.1**	**D**	**KCDC**	**Small stand of indigenous bush with remnant matai tree.** **Refer plant species list attached as Appendix 27.I.** **Reference: Wildlands, 2007; BML 2011.**
3	**Otaihanga Landfill Kanuka**	**0.5**	**F**	**KCDC**	**Kanuka forest located on an elevated sand dune.** **Refer plant species list attached as Appendix 27.I.** **Reference: Wildlands, 2007; BML 2011.**
4	**Waikanae River Riparian**	**0.13**	**F**	**GWRC**	**Riparian planting on southern bank of the Waikanae River.** **Reference: Keesing, 2001; BM 2011.**
5	**Tuku Rakau Forest**	**0.9**	**F**	**Private**	**Regenerating mahoe forest with remnant kohekohe tree. Adjacent to a small modified wetland.** **Reference: BML 2011.**
6	**Ngarara Farm Mahoe**	**4.2**	**F**	**Private**	**A large area of advanced mahoe regenerating from gorse on the raised dunes of Ngarara Farm, in close proximity to Ti Kouka wetland.**
	Wetlands				
7	**131 Raumati South Peatlands**	**11.1**	**A**	**NZTA KCDC**	**Large manuka-dominated wetland with a range of other wetland habitat types.**

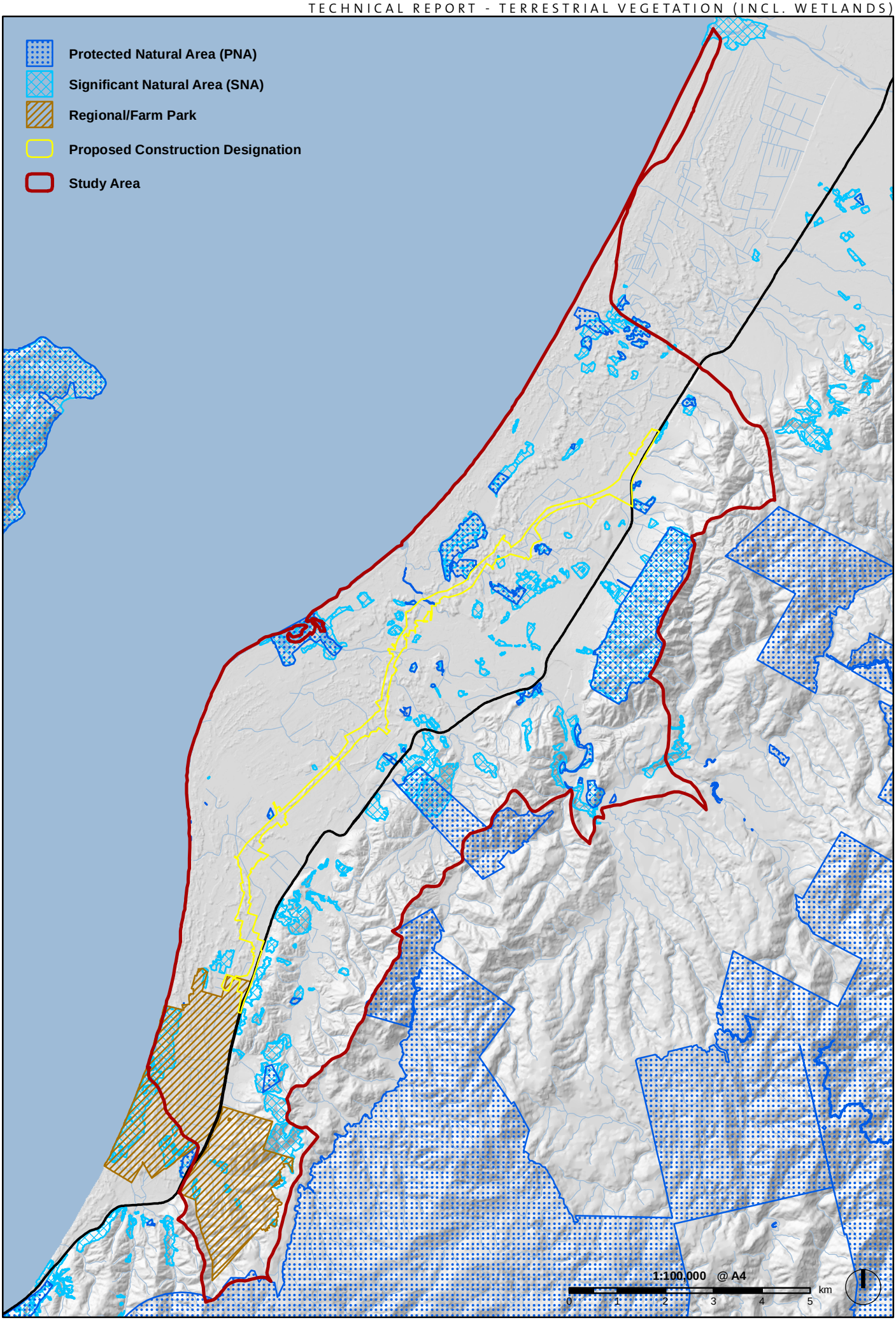
Number	Name (listed south to north)	Size (Ha)	Effects	Tenure / Listed	Description
				Ecosite 131	Refer plant species list attached as Appendix 27.I. Reference: KCDC; Wildlands, 2007; BML 2011.
8	Raumati Manuka Wetland	2.0	D / WT	NZTA	Manuka and Sphagnum wetland, with Carex and Baumea sedge-rushland and open water Refer plant species list attached as Appendix 27.I. Reference: Wildlands, 2007; OPUS 2007; BML 2011.
9	Kiwi Pond	1.8	F	NZTA	A large area of seasonally wet pasture that provides occasional wildlife habitat. Refer plant species list attached as Appendix 27.I. Reference: Wildlands, 2007; OPUS, 2007; BML, 2011.
10	Meadows Trust Carex Wetland	0.2	A	Private	Small area of induced *Juncus* and *Carex* wetland. Reference: Wildlands, 2007; BML, 2008; BML 2011.
11	Southern Otaihanga wetland	1.4	F	KCDC	Large area of purei sedgeland with areas of open water, Baumea rushland and scattered manuka. Refer plant species list attached as Appendix 27.I. Reference: Wildlands, 2007; Opus, 2007; BML 2011.
12	Middle Otaihanga wetland	2.3	F	KCDC	Modified manuka and Carex wetland dominated by weeds. Reference: Wildlands, 2007; BML, 2011.
13	Northern Otaihanga wetland	1.0	F	KCDC	Manuka and Carex wetland with Sphagnum. Refer plant species list attached as Appendix 27.I. Reference: Wildlands, 2007; OPUS, 2007; BML, 2011.
14	Open water and *Juncus* south of Waikanae River.	1.8	A	KCDC	Stock water pond (formed) and large area of *Juncus* and pasture grasses. Reference: Wildlands, 2007; BML 2011.
15	El Rancho Wetland (Weggery)	3.9	F / WT	Private KCDC Ecosite (K170)	A large area of manuka dominated wetland with occasional kahikatea. Southern edge includes Baumea and Carex. Some open water and Sphagnum. Refer plant species list attached as Appendix 27.I. Reference: KCDC, Cameron, 1995; Kessels, 1998; Keesing, 2001; BML, 2006; Wildlands, 2007; OPUS, 2007; BML, 2011.
16	El Rancho Wetland (West)	0.7	WT	KCDC KCDC Ecosite (K170)	Large area of manuka dominated wetland with some open water to the west. Reference: KCDC; Kessels, 1998; Keesing, 2001; Wildlands, 2007; BML, 2006; OPUS, 2007; BML, 2011.
17	El Rancho Wetland (Takamore)	1.8	WT	KCDC KCDC Ecosite (K170)	Large area of manuka dominated wetland with some open water to the north. Reference: KCDC; Kessels, 1998; Keesing, 2001; Wildlands, 2007; BML, 2006; OPUS, 2007; BML, 2011.
18	Tuku Rakau Wetland	0.3	D	Private	A small wetland with scattered manuka, cabbage tree and rushland.
19	Osbournes Swamp West	1.3	A	KCDC KCDC	Large area of manuka dominated wetland with some open water.

Number	Name (listed south to north)	Size (Ha)	Effects	Tenure / Listed	Description
				Ecosite (K170)	**Reference: KCDC; Kessels, 1998; Keesing, 2001; Wildlands, 2007; BML, 2006; OPUS, 2007; BML, 2011.**
20	**Ngarara Wetland**	**2.7**	**A**	**Private** **KCDC Ecosite (K066)**	**A large area of manuka dominated wetland with areas of Carex sedgeland and regenerating kahikatea forest east of Ngarara Road. Contains *Korthalsella salicornoides.*** **Refer plant species list attached as Appendix 27.I.** **Reference: KCDC; Wildlands, 2007; BML, 2008; BML, 2011.**
21	**Ngarara Dune Depressions**	**3.3**	**F**	**Private**	**Three large wet dune depressions dominated by *Juncus* (induced from grazing) in the north of Ngarara Farm.** **Reference: Wildlands, 2007; BML, 2008; BML,2011.**

Of those 21 SNAs outlined above, most are located outside of the Designation and will not be affected. However, parts of five areas of terrestrial vegetation are located within the Project Footprint and there would be some vegetation loss and associated effects.

Of those 15 SNAs identified as wetlands, eight are located within the Designation, six of which are located within the Project Footprint. There will be some vegetation loss and associated effects on these wetlands. The remaining seven SNAs are located outside of the Designation. However, as identified in Table 5, a number of these wetlands outside of the Designation remain a concern in terms of potential hydrological changes associated with the proposed Expressway construction. Most notably, the Raumati Wetland and the El Rancho wetland complex north of the Waikanae River.

Reducing the potential ecological effects on all those SNAs identified in Table 5 needs to be factored into the assessment and construction methodology. The Ecology Assessment discusses a number of recommendations to avoid or minimise potential adverse effects on these areas.



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Survey Results

3.10. Vegetation Mapping

This survey mapped 20 vegetation communities within the proposed Expressway Alignment (Designation). These are summarised in Table 6 with more detailed descriptions provided in

Table 7 and Appendix 27.I: Site specific species lists. Wetland condition assessments (Clarkson et al, 2003) were carried out in four wetland communities that are physically located within the proposed Expressway Designation (see Appendix 27.H: Wetland Condition Monitoring Sheets).

Maps of the vegetation communities along the Alignment are found in Figure 9. Generic photos of each vegetation type are provided at the end of this report.

This analysis presents both vegetation communities within the Designation (an area of 316 ha), and communities beneath the Project Footprint (an area of 164 ha). For the purposes of this terrestrial vegetation report, we have taken a conservative approach by considering all vegetation within the Designation is at risk, even though some areas of vegetation within this area and outside of the Project Footprint will not be affected by construction or operational activities (for example, large areas of the Otaihanga Southern and Northern wetlands). This conservative approach provides a practical estimate of potential effects to be able to calculate a worst-case baseline of vegetation clearance for this report.

While we have assumed that all vegetation beneath the Project Footprint will be lost, in many cases it will be possible to avoid and protect areas of vegetation within the actual Designation. It is noted that in some locations, the extent of the Designation actually serves to ensure these areas of ecological value are protected and enhanced.

Table 6: Summary of vegetation communities within the Designation of the proposed MacKays to Pekapeka Expressway

Description		Project Footprint		Designation	
		Area (ha)	% of Total Project Footprint	Area (ha)	% of Total Designation
Grasslands					
1.01	Improved pasture	64.46	39.3%	128.54	40.7%
1.02	Rank pasture	8.08	4.9%	16.36	5.2%
1.03	Cropland	2.63	1.6%	2.63	0.8%
Wetlands and wet depressions					
2.01	Riparian margins in pasture / rushlands	1.94	1.2%	3.78	1.2%
2.02	Wet pasture with *Juncus*	13.90	8.5%	21.37	6.8%
2.03	Sedge-rushland dominated wetlands	0.78	0.5%	2.04	0.6%
2.04	Cyperus ustulatus dune depressions	0.25	0.2%	0.49	0.2%
2.05	Manuka wetlands	0.76	0.5%	1.30	0.4%
2.06	Manuka wetlands with Sphagnum	0.03	0.0%	1.00	0.3%
2.07	Mature and maturing swamp forest with kahikatea	0.00	0.0%	0.00	0.0%
2.08	Open water / permanent ponds	0.60	0.4%	2.01	0.6%
Pioneer shrublands, scrub and low forest					

Description		Project Footprint		Designation	
		Area (ha)	% of Total Project Footprint	Area (ha)	% of Total Designation
3.01	Blackberry dominated weedlands	16.37	10.0%	30.13	9.5%
3.02	Gorse dominated scrub	10.56	6.4%	21.89	6.9%
3.03	Regenerating kanuka forest	0.83	0.5%	1.72	0.5%
3.04	Regenerating broadleaved scrub and low forest	2.50	1.5%	4.82	1.5%
3.05	Riparian margins in regenerating scrub	0.48	0.3%	1.71	0.5%
Indigenous forest					
4.01	Mature or maturing indigenous forest	0.01	0.0%	0.06	0.0%
Exotic and planted vegetation					
5.01	Plantation pine	12.00	7.3%	22.32	7.1%
5.02	Plantation pine – harvested	5.41	3.3%	7.97	2.5%
5.03	Exotic trees	10.87	6.6%	20.27	6.4%
5.04	Riparian margins with exotic trees	0.27	0.2%	0.72	0.2%
Undefined					
6.01	Built-up area	11.42	7.0%	25.00	7.9%
TOTALS[9]		164.15	100%	316.12	100%

The vegetation communities along the length of the proposed Expressway Alignment are highly varied and range from exotic trees within residential areas, forestry and croplands through to regenerating broadleaved forest and largely unmodified swamp wetlands.

A description of the mapped vegetation communities is set out in Table 7.

[9] Note: in some locations, small areas of the actual Construction Footprint were located outside of the Construction Designation when these figures were developed.

Table 7: Descriptions of vegetation communities within the MacKays to Peka Peka Corridor.

Dry Grasslands: **A range of communities dominated by exotic pastures grasses and crops.**	
1.01	**Improved pasture: Exotic pasture grass species. The dominant plant community within the mapped corridor. See photo 1.**
1.02	**Rank pasture: These are typically less productive pastures or areas of low intensity land use, often as a result of the existing WLR designation. Large areas of exotic pasture grasses with areas of broom, young gorse, blackberry and scattered individual trees.** **See photos 2 and 4.**
1.03	**Cropland: Various crops and market gardening in vicinity of Te Moana Road.**
Wetlands and wet depressions: **Wetlands, rushland and areas of rushes, sedges and herbaceous species in damper soils and dune depressions.**	
2.01	**Riparian margins in pasture / rushlands: Dominated by introduced pasture grasses and *Juncus* rushlands. Usually associated with farm drains. Common species include Yorkshire fog, browntop, water pepper (*Persicaria hydropiper*), Isolepis prolifa, monkey musk (*Mimulus guttatus*).** **Rushland species are both native and exotic. Refer photo 3.**
2.02	**Wet pasture with *Juncus*: Predominantly exotic pasture grasses with grazing-induced *Juncus*. Native Juncus predominantly *Juncus* sarophorus and J. edgariae, with exotic Juncus dominated by J. articulatus and J. effusus. Typically regularly grazed by stock. Refer photos 1, 3 and 5.**
2.03	**Sedge-rushland dominated wetlands: Purei sedgeland wetlands with *Carex secta* and *Carex virgata* predominantly. Includes areas of occasional *Baumea* and *Juncus* (introduced and exotic). This vegetation community often includes areas of open water. *Sphagnum* may be present in some areas. Refer photos 6 and 7.**
2.04	***Cyperus ustulatus* dune depressions: Wet dune depressions in pasture dominated by grazing-induced *Cyperus ustulatus*. Occasional Carex species present and *Juncus* often widespread. Refer photo 8.**
2.05	**Manuka wetlands: Typically dominated by a canopy of manuka over a range of wetland shrub, sedge, rush and fern species. Carex secta and C. virgata often present in sub-canopy or areas of open water. Isolepis prolifa often dominant in wetter areas and Sphagnum occasional. Refer photos 7, 9, 10 and 27.**
2.06	**Manuka wetlands with Sphagnum: As above, but with Sphagnum the dominant understorey species and Isolepis prolifa often common. Refer photos 11, 29 and 30.**
2.07	**Mature and maturing swamp forest with kahikatea: Kahikatea and pukatea dominant, with a wide range of understorey species, including kiekie, mahoe, kawakawa, water bracken, cabbage tree, Carex geminata, Carex virgata, kanuka, Baumea and fern species. Refer photo 13.**
2.08	**Open water / permanent ponds. Typically farm ponds or areas of open water in areas of pasture where water table is exposed, but can include larger open water components of larger wetlands when separately mapped. Refer photo 14.**
Pioneer shrublands, scrub and regenerating native forest on dry sand country: **These plant communities occur where pioneer shrubs (typically blackberry and gorse) have regenerated through pasture to form a closed canopy. Broadleaved shrubs are also present, although typically in low numbers.**	
3.01	**Blackberry dominated weedlands: Blackberry, often monoculture, with some areas of rank pasture and gorse. Some mahoe, bracken and other ferns also present in parts. This vegetation community extends into wetlands in some areas. Refer photos 11, 12, 15 and 17.**
3.02	**Gorse dominated scrub: Gorse, predominantly monoculture, but includes some blackberry and rank pasture. As this community matures broadleaved species (predominantly mahoe) and occasional ferns also occur in low densities. Refer photos 4, 11 and 16.**
3.03	**Kanuka forest: Typically a closed canopy of kanuka with an understorey of exotic grasses. Depending on grazing pressures, other regenerating species may be present, including mahoe, karamu and hangehange. The understorey is typically dominated by grasses, fern species and blackberry or gorse depending on the age of the stand. Refer photos 17 and 18.**
3.04	**Regenerating broadleaved scrub and low forest: Typically a monoculture of mahoe, but with other species**

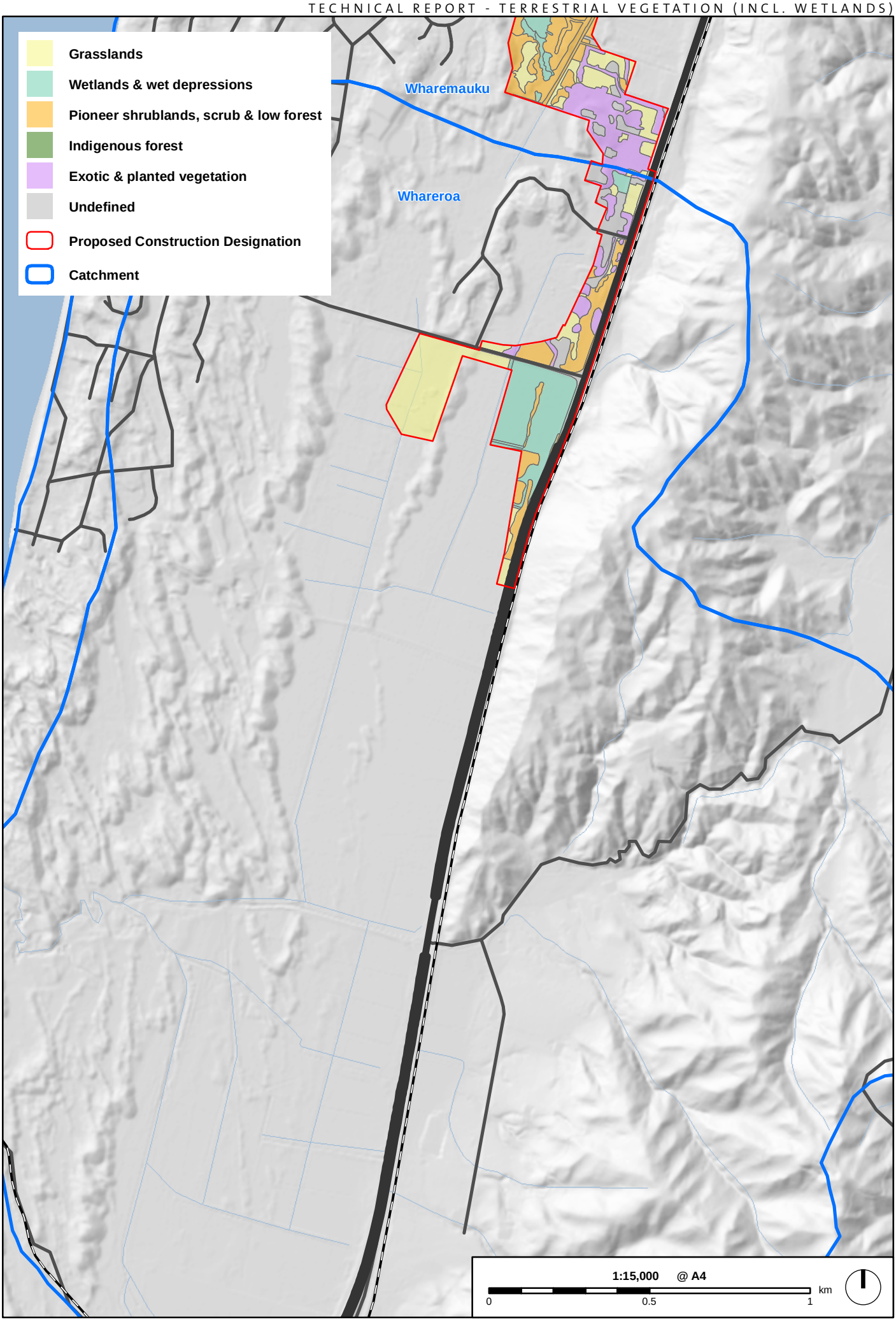
	occasionally present, including hangehange, karamu, kanuka, manuka and mamaku. Understory dominated by open litter and occasional ferns. Mahoe dominates in these landscapes due to its tolerance to grazing, and because it is not reliant on native birds for the distribution of its abundant small seeds. **Note, in some areas this vegetation community also includes areas of native restoration planting. Refer photos 19 and 20.**
3.05	**Riparian margins in regenerating scrub: Riparian margins dominated by regenerating vegetation, ranging from gorse and blackberry dominated shrublands through to more advanced mahoe. Includes areas of native restoration planting. Refer photo 21.**
Mature or maturing indigenous forest on dry sand country: **These forests comprise of a mix of maturing forest that has developed following settlement and land clearance, and small remnant components of predominantly individual or small groups of trees.**	
4.01	**Mature or maturing indigenous forest: Predominantly remnants of coastal broadleaved forest dominated by kohekohe. Titoki, tawa, rewarewa, rimu, pukatea, kahikatea and mahoe may be present.**
Exotic planted vegetation: **A variety of exotic tree-lands, shelterbelts, residential gardens, and pine plantation forests.**	
5.01	**Plantation pine: Radiata pine plantations of various ages. Other exotic *Pinus* species and *Macrocarpa* are also present. Refer photos 6, 7 and 22.**
5.02	**Plantation pine – harvested: Areas of recently harvested pine plantation, now dominated by a variety of plant communities including rank pasture, gorse, blackberry and broom. . Native species include occasional ngaio, mahoe, rangiora, poroporo, karamu and kanuka. Refer photo 24.**
5.03	**Exotic trees: Predominantly old growth exotic trees or plantings, predominantly around residential or lifestyle areas. Includes Macrocarpa, Pinus radiata, *Eucalyptus* sp, oak, willow etc. and areas of exotic landscape and amenity planting. Excludes restoration planting. Refer photos 23 and 25.**
5.04	**Riparian margins with exotic trees: Riparian vegetation under plantation pine or willow canopy or old growth exotic trees. Refer photo 26.**
Built Up Areas – Urban	
6.01	**Built-up area: Residential areas, lifestyle blocks, schools, roading and infrastructure.**

Table 6 presents the vegetation communities of the (areas are rounded up to the nearest ha). Things to note from this table are:

- Improved pasture is the dominant vegetation community, making up 65 ha (36%) of the Project Footprint (or 128 ha (41%) of the Construction Designation).
- Large areas of blackberry dominated weedlands would be lost beneath the Project Footprint (16ha or 10% or 30ha / 10% of the Designation). These areas have low ecological value and, without intervention, are unlikely to regenerate to broadleaved or kanuka forest.
- Large areas of gorse dominated scrub would be lost beneath the Project Footprint (10.6 ha or 6.4%). While an exotic species, gorse has some ecological value, particularly older gorse providing a nurse crop to secondary broadleaved regeneration (typically mahoe).
- Of the wetlands and wet dune depression vegetation communities, wet pasture with *Juncus* (2.02) are a dominant wetland vegetation community along large areas of the proposed Expressway, particularly in the more heavily grazed southern and northern sections. In total, wet pasture with *Juncus* comprises 13.9 ha (8.5%) of the Project Footprint (or 21ha or 6.8% of the Designation). Most of these low dune depressions are likely to have been wetlands historically (given 69% of the Designation occurs in peat and dune depressions), but are unlikely to have same species present

now (with *Juncus* both opportunistic and browse resistant). While these stock-induced *Juncus* wetlands currently have low ecological values as a result of their historical drainage and conversion to pasture, they have good restoration potential and where possible construction-related effects should be minimised.

- The largest area of indigenous wetland physically affected is within the Otaihanga wetland complex where 0.55 ha of the 1.39 ha Southern Otaihanga Wetland and 0.53 ha of the 1.0 ha Northern Otaihanga Wetlands would be lost.
- Approximately 0.38 ha of the southern edge of the 3.9 ha El Rancho Wetland (Weggery) would be lost beneath the Project Footprint.
- Excluding areas of wet pasture and *Juncus*, riparian margins and open water, a total of 1.8 ha (or 1.1%) of indigenous wetland would be lost within the Project Footprint (4.8ha or 1.5% of the Designation).
- The largest area of kanuka forest that would be affected is 0.17 ha of the 0.5 ha Otaihanga Kanuka forest. The total area of kanuka forest located within the Project Footprint is 0.83 ha or 0.5% (1.72 ha or 0.5% of the Designation).
- The largest area of regenerating broadleaved forest that would be affected is 0.86 ha of the 4.2 ha Ngarara Mahoe forest. The total area of regenerating broadleaved forest within the Project Footprint is 3.0 ha or 1.8% (6.5 ha or 2.1% of the Designation).
- The largest area of riparian planting that would be affected is the restoration planting on the southern banks of the Waikanae River In total, 0.29 ha of riparian vegetation (including willows) will be lost on the southern side of the Waikanae River and 0.62 ha of predominantly willow (but with weedlands and some scattered native species) riparian vegetation will be lost on the northern side of the Waikanae River, largely as a result of bridge construction and associated river flood plain widening as part of flood control requirements.
- Large areas of exotic trees are located within the Project Footprint (10.9 ha or 6.8%). These have some value as seasonal habitat for bird movements in the wider Kāpiti area.
- As far as we are aware only a small number of mature or remnant indigenous trees are located within the Designation, including a solitary kohekohe tree and up to half a dozen cabbage trees adjacent to the Tuku Rakau urupa, and a solitary matai, located in regenerating mahoe within the Otaihanga Landfill. Only the cabbage trees are located within the Project Footprint.



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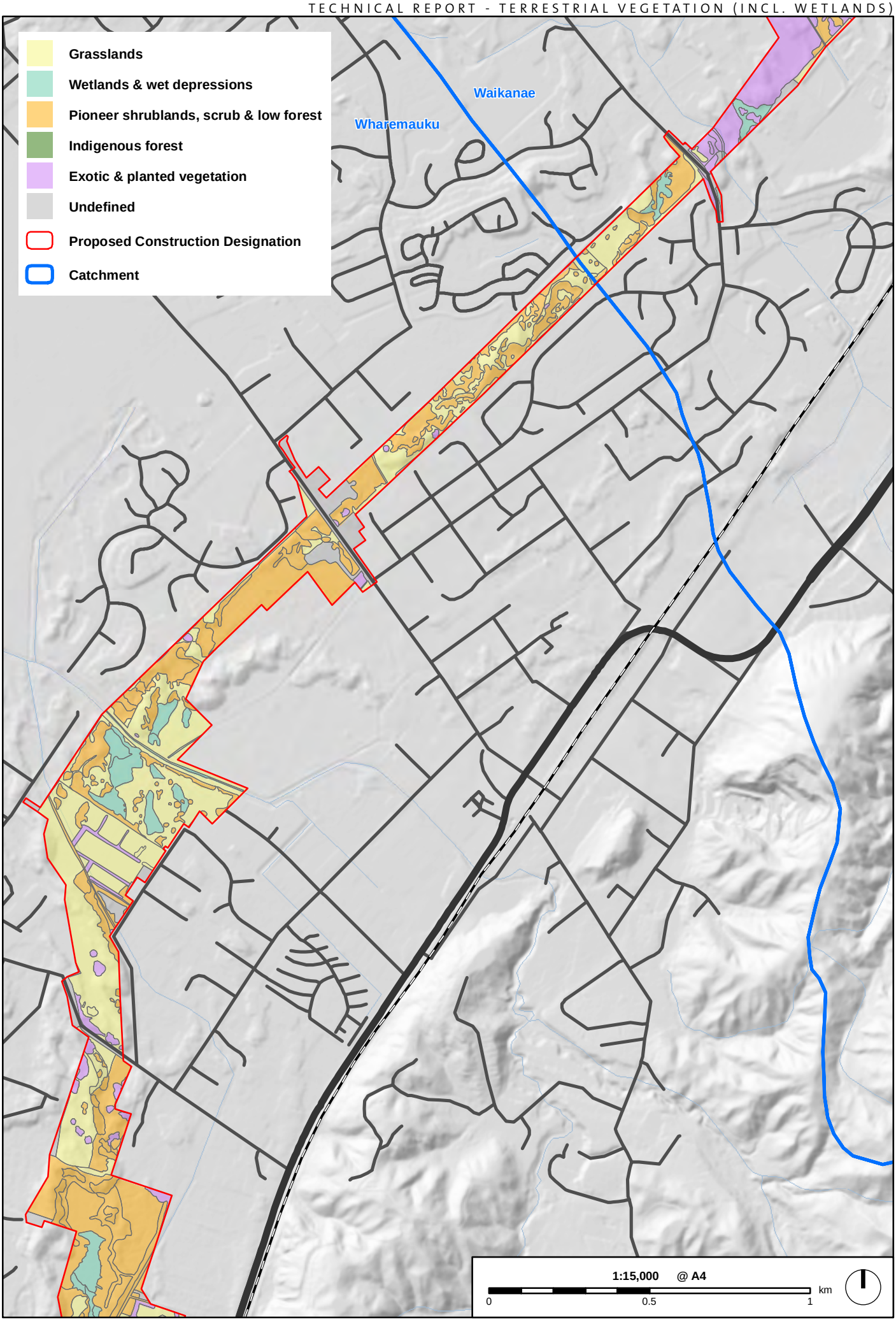

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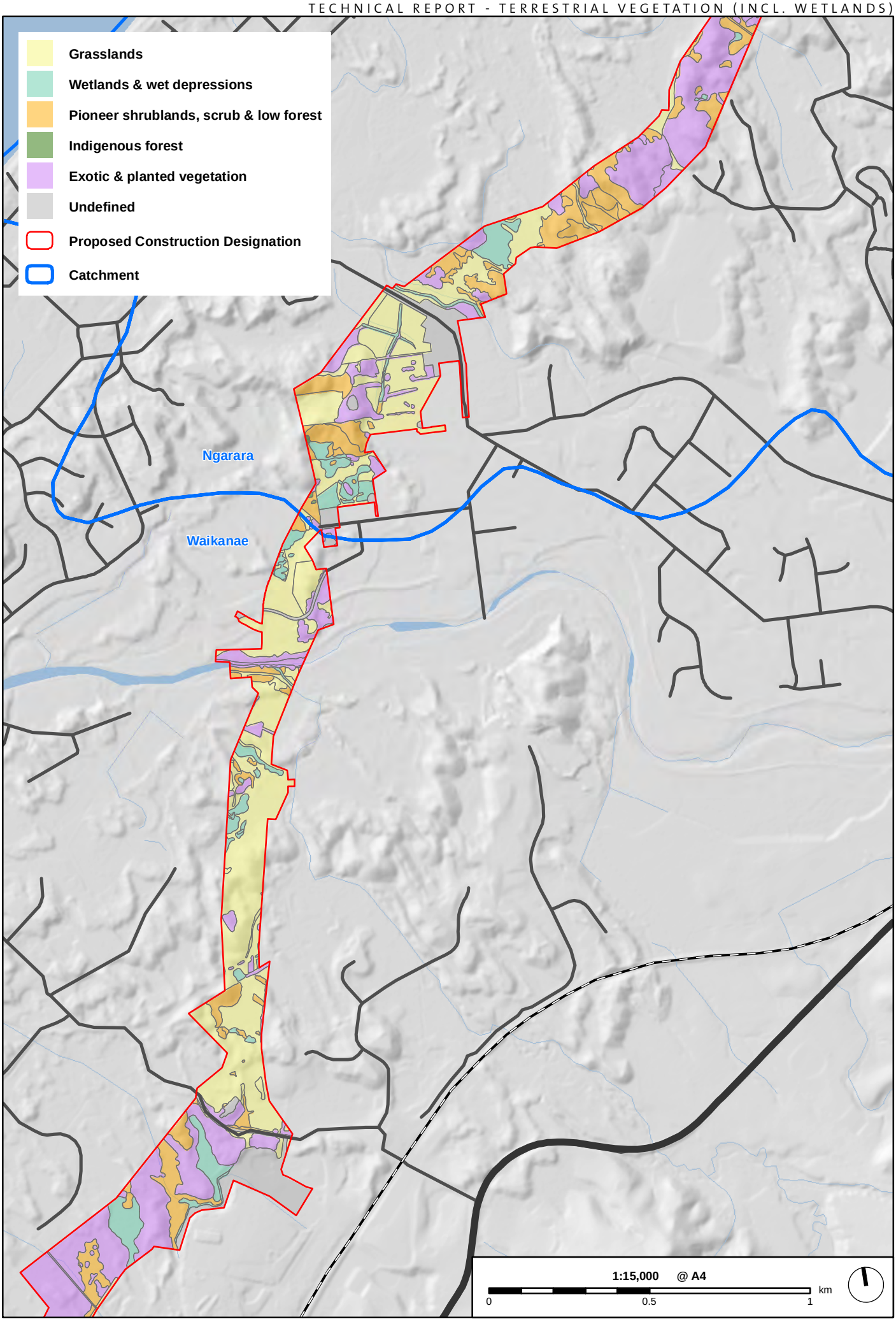

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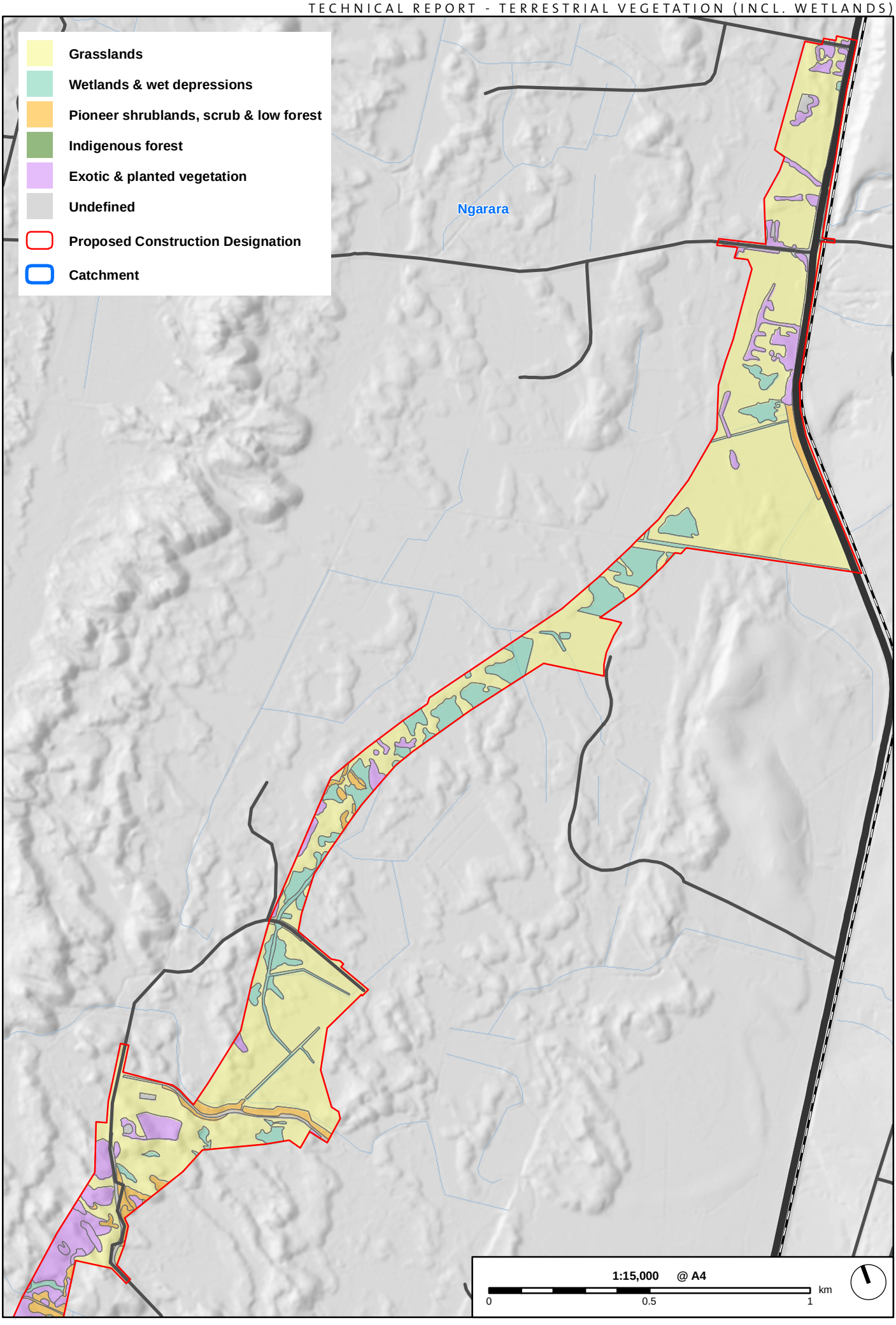

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3.11. Rare plants

The botanical surveys that were carried out investigated 10 distinct plant communities within or immediately adjacent to the mapped corridor which were identified through the desktop study as being the most likely to contain rare or threatened plants. The plant species lists for each of these sites is provided in Appendix 27.I: Site specific species lists. These lists were combined and compared to other historical species lists prepared for areas located within or immediately adjacent to the mapped corridor. A master list was then prepared for the Project corridor Appendix 27.J: Combined plant species list for MacKays to Peka Peka and surrounds.

During this study no species were found within the Designation that have a national threat classification based on de Lange *et al* (2009).

However, a number of species that are considered to be locally uncommon are located within several of the wetlands of the study area, the majority of which are within the manuka wetlands of the Raumati South Peatlands and the El Rancho wetland complex. The presence of these locally uncommon species contributes to our overall assessment of significance of these areas. Key species of note include the following:

At the Raumati South Peatlands, Nertera scapanoides, an uncommon herb in the Wellington Conservancy, is a dominant ground cover in large wet areas. Baumea teretifolia is also present, which is at its southern limit in the Conservancy. Gleichenia dicarpa / G. microphylla hybrid also somewhat uncommon in the Conservancy. This fern's specific designation is being researched by Te Papa as a result of this survey.

At the Raumati Wetland, Nertera scapanoides was found. It is a dominant ground cover in large wet areas, Baumea teretifolia and Gleichinea microphylla were also found at the site.

At the El Rancho Wetland Complex, an earlier site inventory (Cameron 1995) recorded the nationally critical Ophioglossum petiolatum (stalked adder's tongue fern) present in the wetland. Other botanical surveys since, including those undertaken for the Project, have not confirmed this species present.

At the Ngarara Wetland, off Ngarara Road, Korthalsella salicornioides (dwarf or leafless mistletoe) is present in large numbers on manuka in the central area of the wetland. This species is discussed in more detail below.

Of these species, only one species that has a national threat classification, Korthalsella salicornioides (dwarf mistletoe), was found immediately adjacent to the Designation. This species is ranked by de Lange *et al* (2009) as At Risk (4. Naturally Uncommon, with the qualifier of sparse distribution).

According to the New Zealand Plant Conservation Network (NZPCN) website (www.nzpcn.org.nz) Korthalsella salicornioides is endemic to the North, South and Stewart Islands and distributed from Te Paki south. Korthalsella salicornioides is found in coastal to upper montane and subalpine. In terms of habitat, the species is parasitic in forest and shrublands and is most commonly found parasitic on Leptospermum scoparium (manuka) and members of the Kunzea ericoides (kanuka) complex.

Korthalsella salicornioides is a naturally uncommon and biologically sparse species which can on occasion be locally abundant, but is more usually known from large parts of its likely range by only spot or scattered occurrences. The NZPCN website notes that in some parts of its range it is seriously at risk due to the felling of its main host species (Leptospermum and Kunzea) for fire wood and also to clear land for farming or pine plantations. During this study it was located in a large area of manuka-dominated wetland north of Ngarara Road, an area not physically affected by the proposed Alignment.

In summary, along the proposed Expressway Alignment only one nationally listed species of rare plant has been identified with a status of At Risk. The significance assessments take the presence of these rare and uncommon species into account.

4. Assessment of Ecological Value

In this section the ecological value of identified vegetation and habitats are assessed drawing on historical studies and recent national policies and guidelines described earlier, and the findings of this survey. In summary the assessment is informed by the following sources:

- The results of vegetation mapping carried out by this study;
- The results of rare plant surveys, historical and carried out as part of this study;
- Information provided by historical site inventories;
- LENZ threat classes for indigenous vegetation and habitats;
- Priority habitats described in the Wellington Conservancy CMS;
- National Priorities for protecting rare and threatened indigenous biodiversity; and
- Recent Case Law on criteria for assessing Significance.

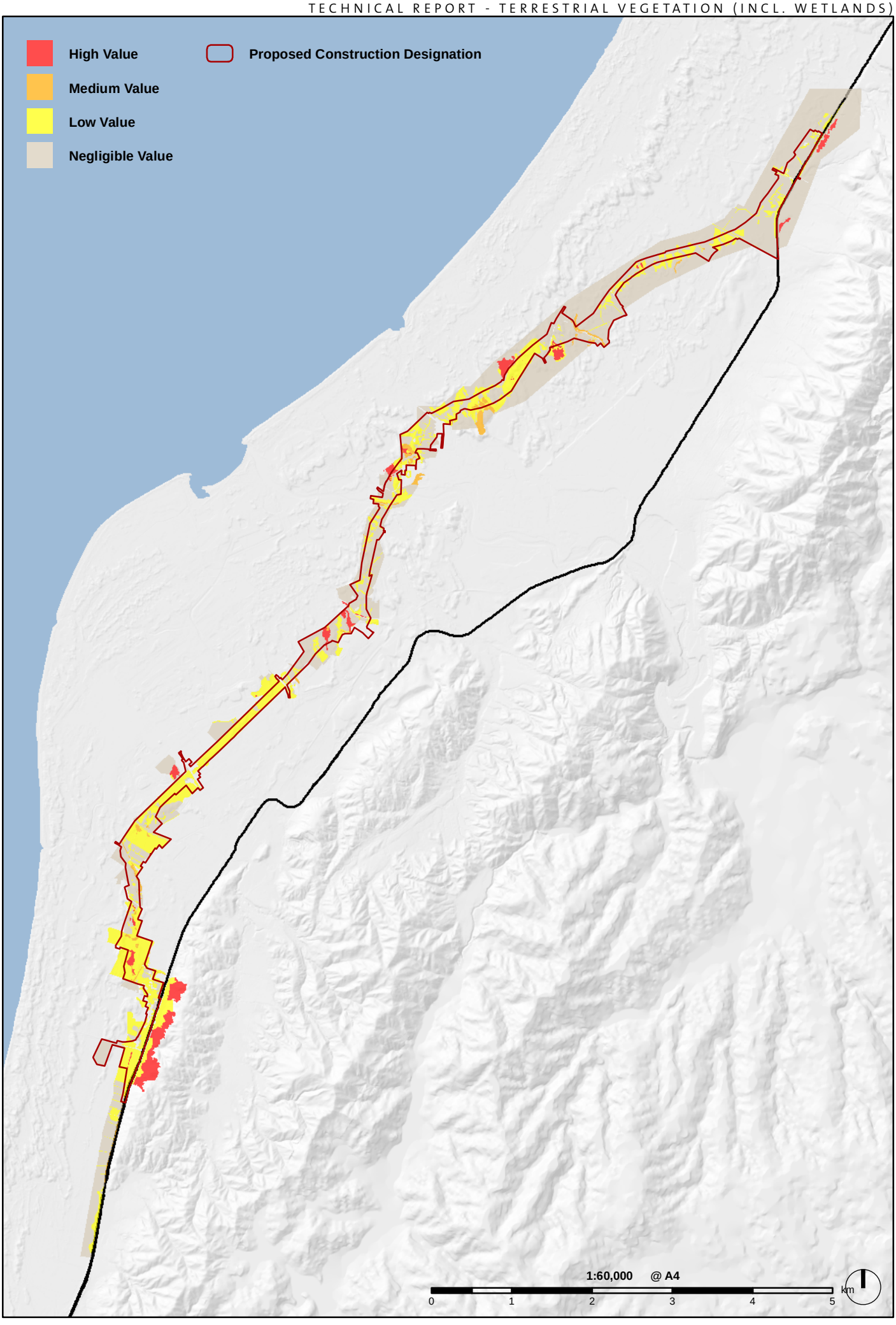
4.1. Vegetation Communities and Habitats

The ecological assessment commenced with the development of a GIS layer that took the mapped vegetation communities and assigned each one a value (high(H), medium(M), low(L), negligible(N)) as follows.

Table 8: Value Classification of Plant Communities.

Grasslands		RANK
1.01	Improved pasture	N
1.02	Rank pasture	L
1.03	Cropland	N
Wetlands and wet depressions		
2.01	Riparian margins in pasture / rushlands	L
2.02	Wet pasture with *Juncus*	L
2.03	Sedge-rushland dominated wetlands	H
2.04	Cyperus ustulatus dune depressions	M
2.05	Manuka wetlands	H
2.06	Manuka wetlands with Sphagnum	H
2.07	Mature and maturing swamp forest with kahikatea	H
2.08	Open water / permanent ponds	M
Pioneer shrublands, scrub and low forest		
3.01	Blackberry dominated weedlands	L
3.02	Gorse dominated scrub	L
3.03	Kanuka forest	H
3.04	Regenerating broadleaved scrub and low forest	M
3.05	Riparian margins in regenerating shrublands	M
Mature indigenous forest		
4.01	Mature indigenous forest	H
Exotic and planted vegetation		
5.01	Plantation pine	N
5.02	Plantation pine – harvested	L
5.03	Exotic trees	L
5.04	Riparian margins with exotic trees	L

These were used to develop a base map, upon which all SNA's and PNA's were added. While field surveys were being undertaken, this base map was used to assist with the route selection process for the proposed Expressway Alignment.



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4.2. Other Ecological Assessment Considerations

4.2.1. National Priorities For Protecting Rare And Threatened Indigenous Biodiversity

National Priority 1: T*o protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV), that have 20% or less remaining in indigenous cover.*

A LENZ level IV analysis was used carried out and provides context to the following assessments. The results of this analysis are presented in Table 9 and

Figure 11 based on the following threat classes.

Table 9: LENZ Threat Classes

Category	1. Acutely threatened	2. Chronically threatened	3. At risk	4. Not at risk	A. Critically under protected	B. Under protected	C. Protected
Criteria	<10% indigenous cover remaining	10–20% indigenous cover remaining	20–30% indigenous cover remaining	>30% indigenous cover remaining	>30% indigenous cover remaining		
					<10% legally protected	10–20%	>20% protected

The LENZ map confirms that within the study area the most threatened environments, and the environments that are critically under protected, are the wetlands and sand country of the Kāpiti Coast. These are the areas that were first settled and which are now the most heavily urbanised and the most intensively farmed and drained.

Almost the entire Foxton Ecological District is considered to be Acutely Threatened because there is less than 10% of indigenous cover remaining within the Land Environments (LENZ) that occur in these Ecological Districts (Leathwick et al. 2003a; Leathwick et al. 2003b).

These threat classes are taken into account in the assessment of significance in Table 10.

National Priority 2: *To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.*

Given the location of the proposed Expressway within remnant sand dunes and wet depressions with indigenous wetland habitat, particular attention was paid to National Priority 2. Given the large scale historical loss and modification of dune and wetland habitats within close proximity to the proposed Expressway, these habitats recognised under National Priority 2 (indigenous vegetation associated with sand dunes and wetlands) duplicate the National Priority 1 habitats outlined earlier (i.e. all indigenous vegetation associated with sand dunes and wetlands are captured under National Priority 1). All dunelands and associated wetlands along the proposed Expressway Alignment are considered in Table 10.

National Priority 3: *To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.*

Seventy two "Naturally rare ecosystems" have been identified (Williams *et al.* 2007) and are defined as "ecosystems having a total extent less than 0.5% of New Zealand's total area". Many of these ecosystems rely on specific rock and soil types which are not found in the Kāpiti Coast District. The only originally rare ecosystems that have been identified within the mapped corridor and could potentially be affected by this Project are:

- **Braided riverbeds** (raw–recent/sand–boulders/plain/periodically open land)

The proposed Expressway Alignment traverses the Waikanae River and associated riparian vegetation. The vegetation in this area consists primarily of willows along the immediate river banks and areas of planted native vegetation south of the river edge.

- **Ephemeral wetlands** (seasonally high water table / depression. Herbfield).

  There are a large number of ephemeral wetlands located within and adjacent to the proposed Alignment. There are also a number of ephemeral wetlands that, while retaining some ecological values in terms of indigenous plants and habitat, are not representative of historical communities and have limited botanical value. Their dominance by exotic grasses and weed species also mean they have limited habitat value. These ephemeral wetlands are therefore not recognised unless another value is present (e.g. recognised habitat values or the present of rare flora or fauna).

- **Damp sand plains** (raw-recent/coastal/sand/depression/plains/permanently high water table. Open land, herbfield)

  There are areas of damp sand plains with manuka and mosses at El Rancho wetland and Ngarara Farm, all of which are historically modified through vegetation clearance and grazing. No original or unmodified sand plains are present.

- **Dune slacks** (raw-recent/coastal/sand/depression/permanently or seasonally high water table. Open land, herbfield)

  There are no dune slacks with the proposed Expressway Alignment.

- **Estuaries**

  There are five estuaries of varying size and condition located downstream of the proposed Expressway Alignment, at the outlets of the Whareroa Stream, Wharemauku Stream, Waikanae River, Waimeha Stream and the Hadfield Drain/Kowhai Stream.

- **Lagoons coastal/lagoon** (open land, sedgeland, rushland, reedland, herbfield, shrubland, scrub)

  There is only one coastal lagoon, the Waimanu Lagoon, located just north of the Waikanae Estuary downstream of the proposed Expressway Alignment, yet outside of potential effects.

National Priority 4: *To protect habitats of acutely and chronically threatened indigenous species.*

This study did not identify any acutely or chronically threatened indigenous plants. However, it identified one plant, Korthalsella salicornioides (dwarf mistletoe), immediately adjacent to the Designation. This species is ranked by de Lange et al (2009) as “At risk (4. Naturally Uncommon”, with the qualifier of “sparse distribution”). The community this is found in is listed in Table 10.

4.2.2.Wellington Conservation Management Strategy

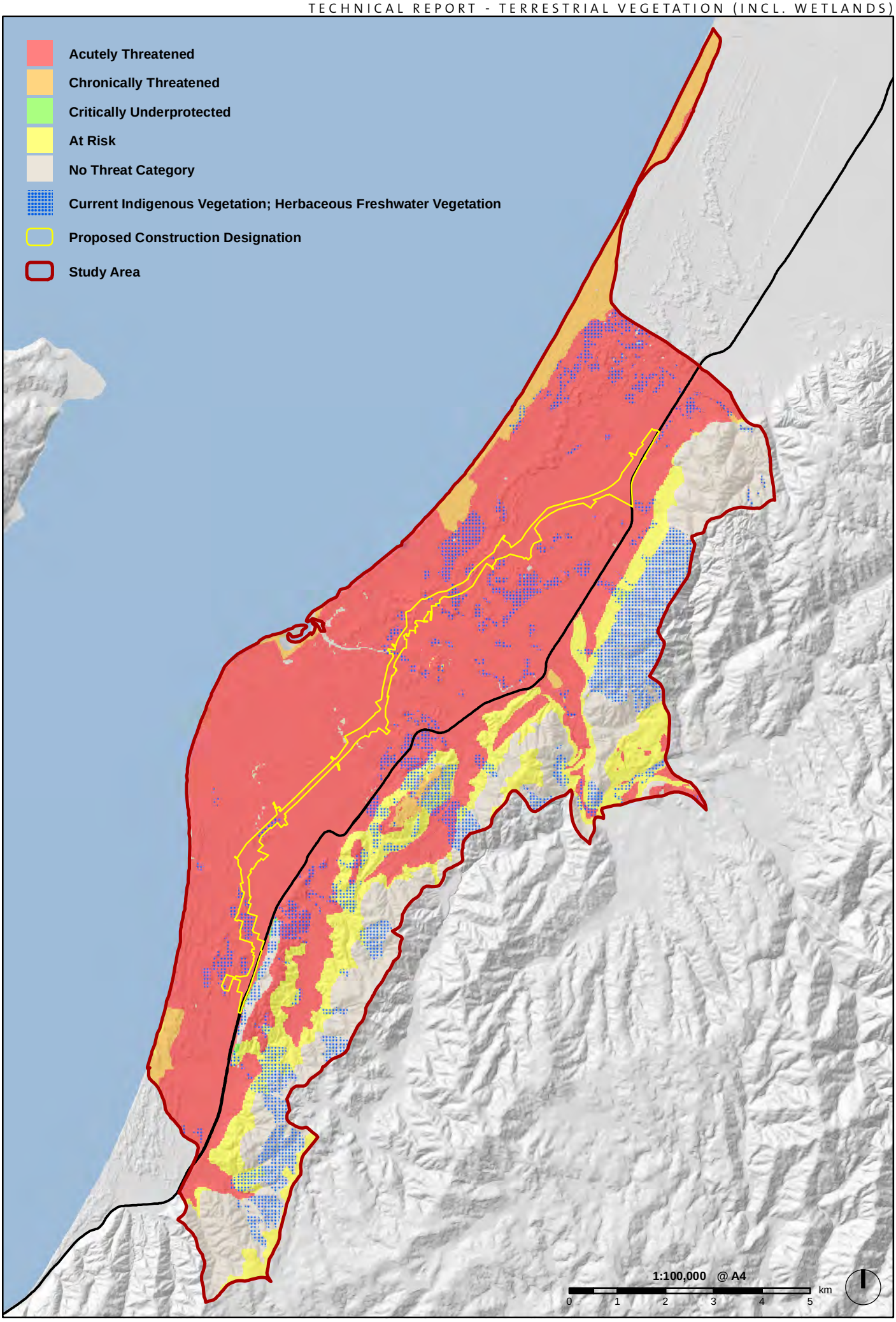
Within the Wellington Conservancy the 10 highest priority ecosystems and habitats managed by the Department in the Wellington CMS area (DOC 2010) are:

- **Indigenous forests:**

  No indigenous forest remnants are present within the Designation or crossed by the Project

Footprint. All forest remnants of the Kāpiti Coast District have been identified and described in earlier PNA surveys and these descriptions have helped to inform the assessment of significance in Table 10.

- **Shrublands:**
  We are satisfied that none of the shrublands contained within the Designation are persistent shrublands representative of historical communities, with the vast majority consisting of blackberry and gorse. They therefore have limited botanical value. However, we have identified areas where regeneration from gorse has advanced to a stage where the shrublands are becoming more valuable as dryland habitat, a habitat type no longer common on the Kāpiti Coast. These are identified in Table 10.
- **Freshwater wetlands:**
  There are a number of freshwater wetlands either located within the Designation, crossed by the Project Footprint or considered to be sufficiently close to the Designation that effects may occur through hydrological connections. These wetlands are identified in Table 10.
- **Rivers and lakes:**
  There are no lakes within the mapped corridor. Listed rivers are identified in Table 10 to the extent that riparian vegetation is relevant to the values of these watercourses.
- **Estuaries:**
  There are five estuaries located downstream of the proposed Expressway Alignment. These are identified in Table 10.
- **Dunes and dune wetlands:**
  All dunelands and associated wetlands are considered in Table 10.
- **Cliffs:**
  No cliff habitat was identified within the mapped corridor.
- **Herbfields and grasslands:**
  We are satisfied that all grasslands and herbfields within the proposed Expressway Alignment are agricultural in origin, are dominated by exotic grasses and weed species and are therefore not representative of historical communities, furthermore they have both limited botanical and habitat value.
- **Islands:**
  Not relevant to this technical report.
- **Marine environment:**
  Not relevant to this technical report.



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LAND ENVIRONMENTS AND THEIR THREAT CLASSIFICATION (derived from LENZ)

4.3. Plant Communities and Terrestrial Habitats of Ecological Value

The previous sections of this report have led to the identification of 32 sites believed to have plant communities or species of ecological value (see Table 10). The list includes a number of sites historically identified, together with a number of other plant communities identified during this study which may not have sufficient value to warrant protection, but which still provide habitat values warranting consideration in an assessment of effects of the proposed Expressway Project.

The table also provides an assessment of each site's ecological significance (High, Moderate, Low, Negligible) based on the GWRC Proposed Regional Policy Statement (Policy 22 – refer Section 2.3.4 of this Report). As discussed in Section 2.3.5 of this Report, we also considered the ecological assessment criteria from Shearer Swamp vs. West Coast Regional Council (refer Appendix 27.B: Assessment of Significance Case Law): ecological context; representativeness; rarity (species, communities, habitats); and

4.4. Distinctiveness.

In determining community and habitat significance, consideration was given to the findings of other studies and the LENZ threat class for each landform upon which the community was located (all of which were either acutely or chronically threatened). Boffa Miskell has recently completed a region-wide assessment of the Wellington Region's wetlands for GWRC and this report, in conjunction with the reference material and biological studies outlined earlier, has influenced the significance assessment of a number of the sites in close proximity to the proposed Expressway Alignment.

4.5. Table 10: Assessment of Ecological Significance

				Significance Assessment				
DESCRIPTION (listed North to South)	Rel[N] to	Site Status	LENZ	Represent-ativeness	Context	Rarity	Distinctive - ness	Overall Score
Wetlands								
Queen Elizabeth Park peatlands10	F	PNA	H	Nil	L	Nil	Nil	L
131 Raumati South Peatlands	A	SNA	H	M	M	H	M	M
Raumati Manuka Wetland	D, WT	NIL	H	M	L	M	L	M

[10] Note: the assessment of QE Park took into account the grazed peatlands adjacent to the existing SH1 and Poplar Ave. Poplar Ave wetlands and other identified ecological areas within the Regional Park were not considered as part of this assessment, although they were the site of botanical surveys.

				Significance Assessment				
DESCRIPTION (listed North to South)	Rel[N] to	Site Status	LENZ	Represent-ativeness	Context	Rarity	Distinctive - ness	Overall Score
Kiwi Pond	F	NIL	H	Nil	L	Nil	Nil	L
Andrews Pond Scientific Reserve	A	PNA, SNA	H	L	Nil	Nil	Nil	L
Sovereign Way / Crown Hill Eco-site	A	SNA	H	M	L	M	L	M
Meadows Trust Carex Wetland	A	NIL	H	Nil	L	L	Nil	L
Southern Otaihanga Wetland	F	NIL	H	L	M	M	M	M
Middle Otaihanga Wetland	F	NIL	H	L	M	L	Nil	L
Northern Otaihanga Wetland	F	NIL	H	M	M	M	M	M
Open water and Juncus south of Waikanae River.	A	NIL	H	Nil	L	Nil	Nil	L
Waikanae Estuary Scientific Reserve	DS	PNA, SNA	H	H	H	H	H	H
Waimanu Lagoons	DS	PNA, SNA	H	M	H	M	L	M
El Rancho Wetland (Weggery)	F, WT	SNA	H	M	M	H	M	M
El Rancho Wetland (West)	WT	SNA	H	M	M	M	L	M
El Rancho Wetland (Takamore)	WT	SNA	H	M	M	M	L	M
Tuku Rakau Wetland	D	NIL	H	L	M	L	L	L
Osbournes Swamp West	A	SNA	H	M	M	L	L	M
Osbournes Swamp	A	QEII, SNA	H	M	L	L	Nil	L
Te Harakeke / Kawakahia Wetland	DS	QEII, SNA	H	H	H	H	H	H
Kawakahia Swamp Forest	DS	QEII, SNA	H	H	H	H	H	H
Te Kouka Wetland	D	NIL	H	M	H	L	L	M

DESCRIPTION (listed North to South)	Rel[N] to	Site Status	LENZ	Significance Assessment				
				Represent-ativeness	Context	Rarity	Distinctive - ness	Overall Score
Ngarara Wetland	A	PNA, SNA	H	L	M	H	Nil	M
Nga Manu Nature Reserve	A	PNA, SNA	H	H	H	H	H	H
Ngarara Dune Depressions	F	NIL	H	Nil	L	Nil	Nil	L
Pioneer shrublands, scrub and low forest								
Raumati Road Kanuka	F	NIL	H	M	L	M	Nil	M
Otaihanga Landfill Mahoe	D	NIL	H	L	M	M	Nil	M
Otaihanga Landfill Kanuka	F	NIL	H	M	L	M	L	M
Waikanae River Riparian	F	NIL	H	L	M	Nil	Nil	L
Tuku Rakau Forest	F	NIL	H	L	L	M	Nil	L
Ngarara Farm Mahoe	F	NIL	H	L	M	M	Nil	M
Indigenous forest								
Ngarara Bush	A	PNA, QEII	H	H	M	M	M	H

In summary, of the 32 areas of identified ecological value outlined in Table 10 located in close proximity of within the proposed Expressway Designation, 5 sites are considered to have high ecological significance, 16 sites are considered to have moderate ecological significance. The remaining 11 sites are considered to have low ecological significance.

Table 11 quantifies the extent of each identified site that lies within the Designation, or beneath the Project Footprint, as a percentage of the total area of that vegetation community within the catchment. This table is intended to inform the assessment of effects.

In addition, Table 11 also takes into account potential indirect effects associated with construction and operation of the proposed Expressway on wetland vegetation and habitat associated with hydrological linkages (i.e. those wetlands that are considered sufficiently close to or linked to the proposed Expressway via larger areas of contiguous peat substrate). These areas are not taken into account in the calculation of affected areas, but are discussed in more detail following the summary.

4.6. Table 11: Magnitude of Risk to Each Site

DESCRIPTION (listed North to South)	Rel[N] to Alignment	Site Status	Significance Score	Area (ha) Designation	Area (ha)Footprint
Wetlands					
Queen Elizabeth Park peatlands11	F	PNA	L	7.63	4.26
131 Raumati South Peatlands	A	SNA	M	0	0
Raumati Manuka Wetland	F	NIL	M	1.54	0.03
Kiwi Pond	F	NIL	L	0.46	0.23
Andrews Pond Scientific Reserve	A	PNA, SNA	L	0	0
Sovereign Way / Crown Hill Eco-site	A	SNA	M	0	0
Meadows Trust Carex Wetland	A	NIL	L	0	0
Southern Otaihanga Wetland	F	NIL	M	1.28	0.55
Middle Otaihanga Wetland	F	NIL	L	1.64	0.46
Northern Otaihanga Wetland	F	NIL	M	1.0	0.53
Open water and Juncus south of Waikanae River.	A	NIL	L	0.87	0.16
Waikanae Estuary Scientific Reserve	DS	PNA, SNA	H	0	0
Waimanu Lagoons	DS	PNA, SNA	M	0	0
El Rancho Wetland (Weggery)	F / WT	SNA	M	0.45	0.38
El Rancho Wetland (West)	WT	SNA	M	0	0
El Rancho Wetland (Takamore)	WT	SNA	M	0	0
Tuku Rakau Wetland	D	NIL	L	0.32	0.04

[11] Note: the assessment of QE Park took into account the grazed peatlands adjacent to the existing SH1 and Poplar Ave. Poplar Ave wetlands and other identified ecological areas within the Regional Park were not considered as part of this assessment, although they were the site of botanical surveys.

DESCRIPTION (listed North to South)	Rel[N] to Alignment	Site Status	Significance Score	Area (ha) Designation	Area (ha)Footprint
Osbournes Swamp West	A	SNA	M	0	0
Osbournes Swamp	A	QEII, SNA	L	0	0
Te Harakeke / Kawakahia Swamp	DS	QEII, SNA	H	0	0
Kawakahia Swamp Forest	DS	QEII, SNA	H	0	0
Te Kouka Wetland	A	NIL	M	0	0
Ngarara Wetland	A	PNA, SNA	M	0	0
Nga Manu Nature Reserve	A	PNA, SNA	H	0	0
Ngarara Dune Depressions	F	NIL	L	1.49	1.03
Pioneer shrublands, scrub and low forest					
Raumati Road Kanuka	F	NIL	M	0.35	0.35
Otaihanga Landfill Mahoe	D	NIL	M	0.11	0
Otaihanga Landfill Kanuka	F	NIL	M	0.46	0.17
Waikanae River Riparian (includes willow)	F	NIL	L	1.26	0.2
Tuku Rakau Forest	F	NIL	L	0.91	0.25
Ngarara Farm Mahoe	F	NIL	M	1.29	0.86
Mature or maturing indigenous forest					
Ngarara Bush	A	PNA, QEII	H	0	0

4.7. Summary

Table 10 and Table 11 establish that of the 32 areas of identified ecological value in close proximity to the Designation, portions of 15 areas are located beneath the Designation, of which 13 sites include

portions of vegetation within the Project Footprint. From south to north, the following section outlines in more detail each of the ecological areas affected:

4.7.1 High ecological value

Of the five sites considered to have high ecological value, all are located outside of the Designation and will not be physically affected by habitat loss. The five high value sites are as follows:

- The Waikanae River Mouth (including salt marsh and estuary - KCDC K081) and Waimanu Lagoons (KCDC K075) are located approximately 1.6km downstream of the Designation. Any effects will be indirect and relate to potential contamination of streams that flow through them, either via sediment discharge during earthworks, or stormwater discharge during Expressway operation. Refer to Technical Report 31, Volume 3 for more details on the Waikanae Estuary.
- Te Harakeke / Kawakahia Wetland (KCDC K066) is located approximately 170 metres downstream of the Project Footprint. There will be no loss of habitat of this large nationally recognised wetland area. Any effects will be indirect and relate to potential contamination of streams that flow into this wetland, either via sediment discharge during earthworks, or stormwater discharge during Expressway operation.
- Kawakahia Swamp Forest (KCDC K066) is located approximately 370 metres from the Designation. There will be no loss of habitat in this wetland.
- Nga Manu Nature Reserve (Kāpiti Coast District Council K133) is located 400 m from the proposed Expressway Alignment, and approximately 150m from the new Smithfield Road realignment. There will be no loss of habitat from this protected area of wetland and swamp forest.
- Ngarara Bush (KCDC K133) is located 250 m from the proposed Expressway Alignment, and 90 m from the new Smithfield Road realignment. There will be no loss of habitat from this protected area of forest.

4.7.2 Moderate ecological value

Fifteen sites are considered to have moderate ecological value. Of these fifteen sites, seven are located either in part or all within the Designation as follows (south to north):

- Approximately 0.03 ha of the eastern edge of the Raumati Manuka Wetland will be lost within the Project Footprint.
- Approximately 0.35 ha of regenerating kanuka south of Raumati Road will be lost beneath the Project Footprint.
- The southern and northern wetlands within the Otaihanga wetland complex are bisected by the proposed Expressway Alignment and there will be some loss of wetland habitat within each of these three wetlands. In the 1.39 ha Southern Otaihanga wetland, approximately 0.55 ha of purei sedgeland and Baumea rushland will be lost beneath the Project Footprint. In the 1.0 ha Northern

Otaihanga wetland, approximately 0.53 ha of manuka wetland with purei and Sphagnum will be lost beneath the Project Footprint.

- Approximately 0.17 ha of the eastern section of the 0.5 ha Otaihanga Kanuka Forest within the Otaihanga Landfill will be lost beneath the Project footprint.
- Approximately 0.38 ha of the El Rancho Wetland (Weggery) (KCDC K170) will be lost beneath the Project Footprint.
- Approximately 0.86 ha of a larger area of regenerating mahoe on Ngarara Farm will be lost within the Project Footprint.

The remainder moderate value sites are adjacent to but not affected by the proposed Expressway Alignment:

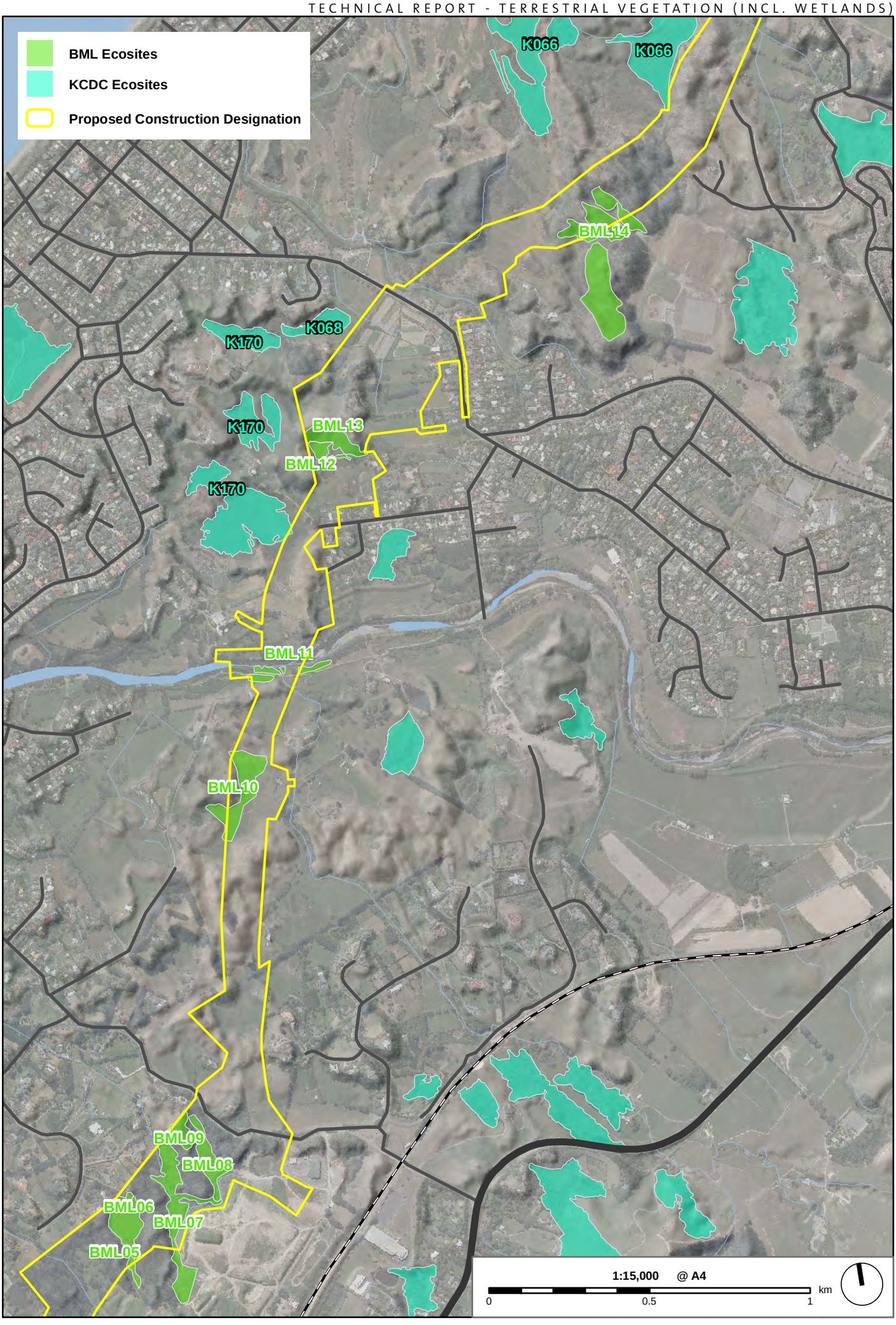
- The Raumati South Peatlands (KCDC K131) are located 500 and 800 metres respectively from the Designation. There will be no loss of habitat.
- The Crown Hill Reserve (KCDC K183) is approximately 120m from the Designation, and is physically separated from the proposed Expressway by a small residential area. There will be no loss of habitat and the wetland is located sufficient distance that there will not be hydrological effects.
- Two of the El Rancho Wetlands (West and Takamore - KCDC K170) are located approximately 250 metres and 180 metres respectively from the Designation and there will be no loss of wetland vegetation.
- The QEII covenanted Osbournes Swamp (KCDC K068) and Osbournes Swamp West (KCDC K170) are located 150m and 400m respectively from the Designation and there will be no habitat loss.
- The Ti Kouka Wetland, west of Ngarara Road (KCDC K066), is located outside of the Designation and there will be no habitat loss.
- The Ngarara Wetland (KCDC K066) is located approximately 35m from the Designation. However, a small portion of the dryland vegetation (consisting of approximately five trees) buffering this wetland, east of Ngarara Road will be lost beneath the Project Footprint.
- The small area of regenerating mahoe within the Otaihanga Landfill is located approximately 15 metres from the Project Footprint and will not be physically affected.

4.7.3 Low ecological value

Fourteen sites or areas of vegetation are considered to have low ecological values but still provide some ecological benefits. These sites are predominantly wet dune depressions in pasture with *Juncus*, ponds or areas of open water, highly modified wetlands or areas of pioneer scrub and shrublands. This also includes the area of planted riparian vegetation at the Waikanae River (north and south).

Based upon the information contained with the SNA and PNA surveys, the value of each community was reviewed and the status of some were elevated or reduced from this base map. In addition, the presence of rare or locally uncommon indigenous plants was considered as part of this assessment. The results of this analysis are shown in

Figure 12 and summarised in Table 10.



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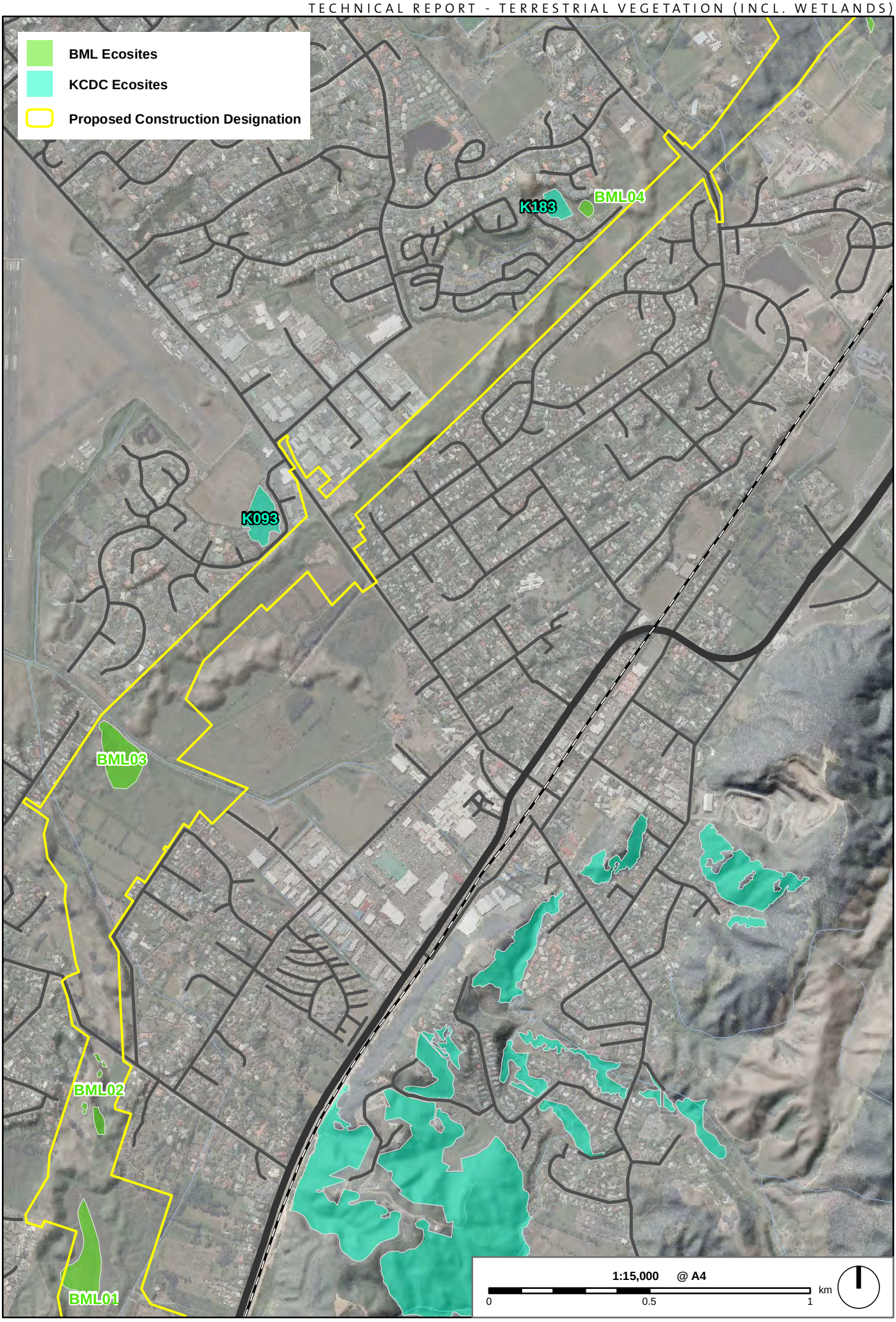

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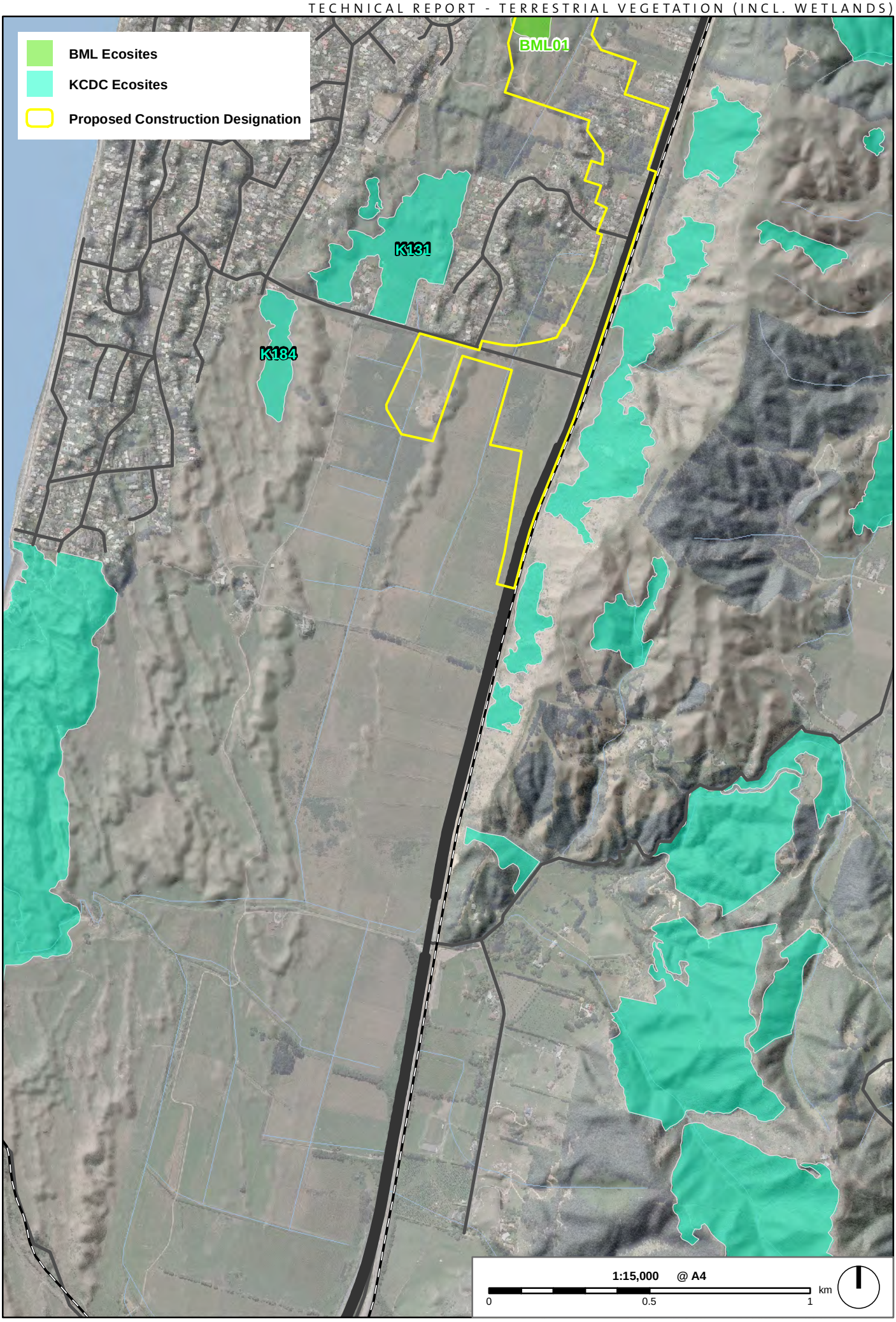

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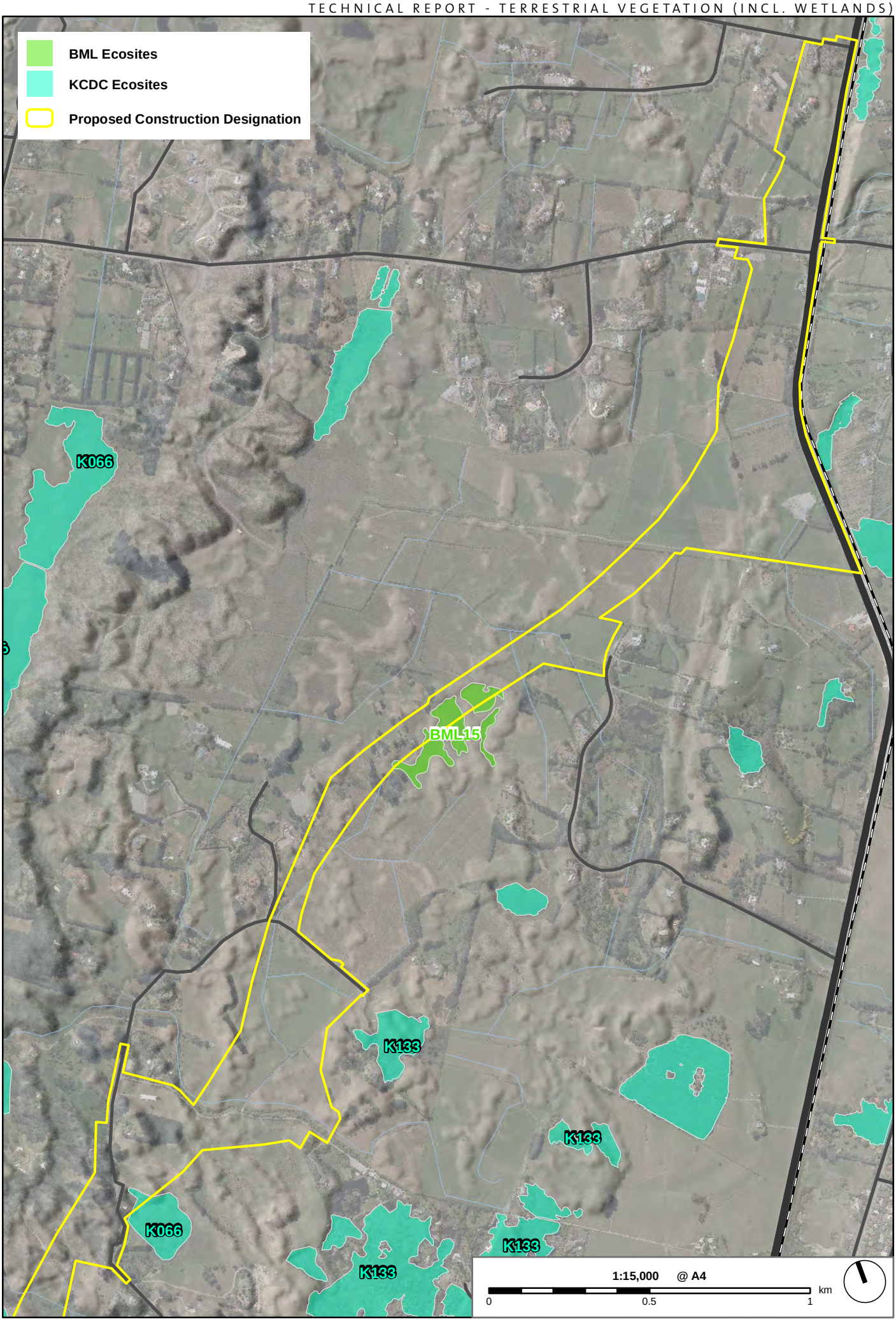

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5. Discussion

This terrestrial ecological assessment has examined mapped and described the vegetation within the proposed Designation running along the approximately 16 km length of the Alignment and associated interchanges (a total mapped area of 316 ha). More detailed botanical surveys of ten key habitats were carried out over a number of occasions during core flowering periods to identify any rare species. Wetland condition assessments were carried out in a number of wetlands to better describe several indigenous plant communities that are potentially affected by the Alignment.

The results show that the great majority (88%, or 279 ha) of the proposed Expressway Designation lies in a highly modified pastoral landscape including pasture, exotic weedlands (predominantly blackberry), wet pasture with *Juncus*, croplands, forestry, exotic trees or is classed as urban. These communities have no botanical value and typically have low habitat value.

6.9% (21.9 ha) of the vegetation within the Designation is in pioneer scrub and shrublands dominated by gorse. These vegetation communities have low botanical value and minimal habitat value other than as a nurse crop for natural regeneration. We do not propose that mitigation is required for the loss of any of these vegetation communities.

2.1% (6.5 ha) of the vegetation within the Designation is in seral scrub and forest dominated by either kanuka or mahoe). These communities are now poorly represented within the sand country of the Kāpiti Coast and Foxton Ecological District and have a range of botanical and habitat values and mitigation will need to be considered for their loss.

0.5% (1.7 ha) of the vegetation within the Designation is riparian margins in regenerating shrubland. A further 0.2% (0.7 ha) of the Designation is riparian margins in exotic trees. These areas range between willow-dominated flood protection plantings on the north and southern banks of the Waikanae River through to more advanced riparian planting.

1.5% (4.8 ha) of the vegetation within the Designation is wetlands (1.8 ha within the Project Footprint), excluding areas of wet pasture dominated by *Juncus*, riparian margins in pasture and open water. Wetland vegetation ranges between 0.03 ha of manuka wetland at the Raumati Manuka Wetland through to 2 ha of sedge-rushland dominated wetlands at the Southern Otaihanga Wetland. These wetland vegetation communities are significantly reduced in the Foxton Ecological District and have a range of botanical and habitat values. Mitigation will need to be considered for their loss.

With the exception of two cabbage trees adjacent to the Tuku Rakau urupa, no mature indigenous forest will be affected.

Rare, threatened or locally uncommon plant species of the Kāpiti Coast were identified from a range of sources and all key habitats within the Designation that were considered likely to contain any of these plants were identified. Following detailed botanical surveys in these key habitats, only one rare plant was found, *Korthalsella salicornioides* (dwarf mistletoe), located in a regenerating manuka

wetland off Ngarara Road. A number of locally uncommon wetland plants were also identified within a number of the wetlands near the proposed Expressway Alignment.

This terrestrial survey report has also undertaken a significance assessment of the vegetation communities potentially affected by proposed Expressway Alignment. This assessment has taken into account a range of factors, including historical surveys and biological inventories, rare and threatened species, communities and habitats, and recent case law. As a result, this assessment has identified five sites of high ecological value; none of which are located within Designation or will suffer vegetation loss. However, four sites of high ecological value lie downstream and could be indirectly affected by sediment and stormwater (Waikanae Estuary Scientific Reserve, Waimanu Lagoon, Te Harakeke / Kawakahia Wetland and the adjacent Kawakahia Swamp Forest).

Based on the results of our ecological surveys and knowledge of the hydrological processes of the Kāpiti Coast District, we consider that the wetlands in close proximity to the proposed Expressway Alignment should be able to tolerate some temporary ponding of water or drying out during the construction phase. However, we consider that there is a risk that permanent impediments to groundwater flows or modifications to water tables (as a result of the hydrological changes associated with stormwater treatment or flood storage ponds) could lead to permanent changes in plant communities, potentially on both sides of the proposed Expressway, with drying out on the western side and water ponding on the eastern side. Ensuring current groundwater flows are maintained and providing for the continuation of seasonal fluctuations will be critical to ensuring the ongoing health of these wetlands. This needs to be factored into the construction methodology.

We have considered a range of other site influences including climate, geology, soils, and slope and identified a number of major site limitations which require consideration when developing mitigation and revegetation packages. We have also described the likely historical vegetation of the site which can guide any revegetation and landscape mitigation that is undertaken

Overall, taking these matters into account, we consider the key issues for land use and management associated with the proposed Expressway are drainage and drought on vegetation and the influence of salt-laden winds on plant growth rates and vegetation recovery. The warm spring and summer conditions of the Kāpiti Coast also facilitate rapid weed growth. All plant species selections and associated weed management and control will need to be considered for all areas of earthworks and for landscape, hydrological and ecological planting areas to ensure optimum soil retention and plant establishment. More information on this is outlined in the Assessment of Landscape and Visual Effects (Technical Report 7, Volume 3).

6. Recommendations

We have identified a number of sites of ecological value within the vicinity of the proposed Expressway Alignment and outlined a number of issues that require consideration within the Assessment of Ecological Affects. Overall, we consider that:

- As far as practicable, consistent with the aim of NZTA's Environmental Plan, every effort has been made during the Project design phase to select route options that avoid significant ecological resources and maintain the ecological function of the study area.. While a small number of areas of indigenous wetland cannot be avoided due to a combination of property and geotechnical constraints etc., most of the ecologically significant wetlands have been avoided by the Designation, including almost all wetlands recognised by earlier site inventories and scheduled in the District Plan. However, there are some exceptions where vegetation cannot be avoided. In these situations every effort should be made to minimise effects on any indigenous wetland located within the Designation.
- Based on the results of groundwater modelling there are a number of wetlands in close proximity to the Designation that may be adversely affected as a result of proposed Expressway construction and associated stormwater treatment wetlands. While there is some information from historical bores and more recent water bores and piezometers, consideration needs to be given to potential adverse effects of 'de-watering' or impeding water flows during both the construction phase and through the operational life of the proposed Expressway.
- While a number of the wetlands along the proposed Expressway Alignment have been demonstrated by the groundwater modelling (refer Assessment of Groundwater Effects – Technical Report 21, Volume 3) to be able to withstand relatively large seasonal variations in water tables, the scale of the construction activities and unknown effects of peat compaction and construction may lead to permanent adverse effects on some of these wetland systems, including:

    1. Raumati Manuka Wetland
    2. The residual areas of the Otaihanga wetland complex west of the Designation (Otaihanaga Southern and Otaihanga Northern wetlands)
    3. El Rancho wetlands (West and Weggery).
- Taking into account the relevant literature and best practice examples to date where there have been potential effects on wetlands associated with major infrastructure projects in New Zealand, we consider an adaptive management framework should be implemented for each of these identified wetlands. Implementation of such a programme should ensure that an acceptable hydrological and ecological baseline is developed prior to construction and that any potential effects can be determined and avoided, remedied or mitigated in sufficient time consistent with their inherent ecological values. This adaptive management approach is outlined in the Assessment of Ecological Impacts (Technical Report 26, Volume 3).

- In addition to this adaptive management framework, and as part of the mitigation for the loss of wetland habitat within the Project Footprint, we have also recommended the restoration of a number of wetlands that are located close to the proposed Expressway Alignment. These wetlands include:

    1. The Raumati Manuka Wetland, inland of 200 Main Road.
    2. Approximately 1.2 ha of lowlying weedland south of the Southern and Northern Otaihanga wetlands, including restoration of an adjacent low-lying dune depression (using indigenous wetland species transplanted from the Southern and Northern Otaihanga wetlands).
    3. Approximatley 5.4 ha of the former Waikanae Oxidation Ponds, part of the Pharazan Reserve and part of the former extent of the Te Harakeke / Kawakahia Wetland.

7. Conclusion

This report provides a background to all the vegetation communities and terrestrial habitats (including wetlands) of ecological value that are potentially affected by the proposed MacKays to Peka Peka Expressway Designation. The ecological values of these areas have been determined by fieldwork and the application of accepted ecological assessment criteria. The actual assessment of effects on these identified areas of terrestrial vegetation and habitats is covered in the Ecological Impact Assessment.

Extensive desktop literature reviews of biological inventories have been undertaken. Field work and botanical surveys undertaken have involved experienced botanists and wetland specialists using best practice methodologies and current documentation on threatened species. The field work for this report has been extensive and has included detailed vegetation mapping and plant community descriptions and the use of wetland condition monitoring assessments.

The fieldwork has identified a number of additional sites that have not been picked up by earlier significant natural area ecological surveys carried out for district and regional councils. Each of these sites has been assessed and incorporated in this report accordingly.

Coordination with other technical disciplines has also been an important component of this report, including engineering and structural design, landscape architecture, stormwater and hydrology, geotechnical and groundwater, contaminated sites, construction, water quality and planning teams.

KCDC, GWRC and DoC staff have been consulted during the development of this report. Consultation has included a number of meetings and discussions on terrestrial habitat values and options for mitigation.

Overall, we believe the information presented in this report is a comprehensive account of the terrestrial vegetation and wetland habitats in the vicinity of the proposed Expressway Alignment.

8. Acknowledgements

- Botanical Survey and Species Lists prepared by Pat Enright and Matiu Park.
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- Assessments of Ecological Significance undertaken with the assistance of Stephen Fuller.
- GIS mapping and analysis by Martin Pecher.
- Ecological peer review by Stephen Fuller.

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Appendix 27.A

KCDC Significance Criteria

Appendices

Appendix 27.A: KCDC Significance Criteria

The following has been reproduced from (Wildland Consultants, 2003).

Table 2: Ranking of Ecological Sites
(Adapted from the Environment Waikato Guide for Applying Significance Criteria.)

Criterion (See Table 1)	**INTERNATIONALLY SIGNIFICANT**	**RESPONSE**	**NOTES**
	Internationally significant natural areas have usually been identified in previous assessments. These sites are so important that some of them are already protected by international conventions. Other natural areas may be internationally significant if they contain high quality vegetation or habitat that is unique in the world (e.g. Fiordland National Park). Internationally significant sites attract the interest of scientists and tourists from other countries**.**		
?	Has it been recognised under international legislation or convention as an internationally significant area (e.g. as a World Heritage Site or a RAMSAR site)?	Y / N / NS	
1	Has it been recommended for protection as a World Heritage Site or Wetland of International Importance (RAMSAR site) by QEII or NWH, or NHF?	Y / N / NS	
2	Is it currently habitat for an indigenous species which is threatened with extinction (in the categories Nationally Critical, or Nationally Endangered or Nationally Vulnerable) and endemic to the Wellington Region?	Y / N / NS	
?	Is it a key habitat for the completion of the life cycle of species that migrate internationally and that would be threatened if these habitats weren't sustained?	Y / N / NS	
3,7	Is the site the best or only remaining large representative example in New Zealand of a suite of relatively intact indigenous ecosystems and ecological sequences (wetlands may be included).	Y / N / NS	

Criterion (See Table 1)	NATIONALLY SIGNIFICANT	RESPONSE	NOTES
	Nationally significant natural areas include sites that contain healthy populations of threatened species or are very good examples of nationally rare habitat or vegetation (e.g. Lake Wairarapa) They also include sites that are the only location where certain species occur (e.g. Chatham Islands) Nationally significant sites tend to attract the interest of scientists, technical specialists, and eco-tourists from other parts of New Zealand. The site is **at least** Nationally Significant if the answer to any of the following criteria is 'Yes'.		
	Is it protected, or recommended for protection, under the Conservation Act 1987 (Ecological Area, Forest Sanctuary), National Parks Act 1980, Marine Reserves Act 1971, or Reserves Act 1977 (Nature Reserve, Scientific Reserve).	Y / N / NS	
	Is it habitat for an indigenous species which is under serious threat in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, Serious Decline, or Gradual Decline?	Y / N / NS	
	Is it indigenous vegetation or habitat for indigenous species that is under-represented nationally (10% or less remains), or nationally uncommon (including wetland) that is a good quality example that is representative of its type? ***Good quality examples would receive mostly highs or mediums for Criterion 7 in Table 1 (taking into account size, presence of plant and animal pests, stock damage, other damaging effects).*** ***For the definition of vegetation types refer to Criterion 4 in Table 1 above - Column B, Definitions and Further Information.***	Y / N / NS	List no. of responses to criterion 7 in Table 1: H _____ M _____ L _____

Criterion (See Table 1)	REGIONALLY SIGNIFICANT	RESPONSE	NOTES
	Regionally significant natural areas include the best examples in the Wellington Region of habitats that may be common elsewhere in New Zealand - for example, our best dune systems, or the large areas of more common vegetation types. They may also include examples of nationally rare features that are not in good condition. The site is **at least** Regionally Significant if you can respond 'Yes' to any of the following criteria.		
1	Is it protected under the Reserves Act 1977, as a Wildlife Management Reserve, Wildlife Refuge, Scenic Reserve, Nga Whenua Rahui Kawenata, or for any conservation purpose under the Conservation Act such as a Conservation Area or Conservation Park, with significant fauna and/or flora values.	Y / N / NS Status: _____ Recommended Status: _____	
1	Is it protected under the Queen Elizabeth the Second National Trust Act 1977 as an Open Space Covenant?	Y / N / NS	
1	Is it a site that has been recommended for protection by NHF, NWR, or QEII?	Y / N / NS	
2	Is it currently habitat for an indigenous species that is threatened, in the categories Sparse or Range Restricted, or endemic to the Wellington Region?	Y / N / NS Species: _____ Threat Status: _____	
3, 7	Is it indigenous vegetation or habitat for indigenous species that is under-represented regionally (i.e. within relevant ecological regions and districts) and which is a good quality example that is representative of its type (taking into account size, plant and animal pests, stock damage, other damaging effects)? ***Good quality examples would receive highs or mediums for***	List no. of responses to question 7 in Table 1: H _____ M _____ L _____	

Criterion (See Table 1)	REGIONALLY SIGNIFICANT	RESPONSE	NOTES
	Criterion 7 in Table 1. ***Assessment must be justified by a well qualified and experienced ecologist.***	Y / N / NS	
3	Is it a relatively large example of indigenous vegetation or habitat for indigenous species that is under-represented nationally, or nationally uncommon (including wetlands), but which is degraded in quality (taking into account presence of plant and animal pests, stock damage, other damaging effects)? ***Assessment must be justified by a well qualified and experienced ecologist. Use the results from Criterion 7 in Table 1 to determine the relative quality of the site.***	Y / N / NS	
3	Is it the Regions' only remaining representative example (irrespective of its size) of a particular indigenous vegetation type or indigenous species habitat that is degraded in quality? ***Representative areas are the best examples of indigenous vegetation and habitats that comprise a network covering the full range of landforms, soil sequences, vegetation and fauna communities within an ecological district (c.f. Shaw 1994). The reality for many landscapes, particularly throughout much of Wellington, is that a 'representative example' will be the largest and most diverse remaining examples of indigenous vegetation and habitats.*** ***Degraded sites would receive mostly Low scores for the factors listed in Criterion 7.***	List no. of responses to question 7 in Table 1: H _____ M _____ L _____ Y / N / NS	
6, 7	Is it one of the best representative examples in the Wellington Region of indigenous vegetation or habitat for indigenous fauna or an ecological sequence? ***Assessment must be justified by a well qualified and***	Y / N / NS	

Criterion (See Table 1)	**REGIONALLY SIGNIFICANT**	**RESPONSE**	**NOTES**
	experienced ecologist.		
4, 7	Is it a good quality example of indigenous vegetation or habitat for indigenous species representative of the ecological character typical of the Wellington Region? ***This may include examples of indigenous vegetation that are large or moderately large relative to other similar habitats in the region or within the relevant ecological district. They should be relatively intact and retain the main elements of their original composition structure. Examples would include relatively large tracts of indigenous forest and habitats on the ??.***	Y / N / NS	
8	Is it a buffer (or a key part of a buffer) to a site that is of international or national significance? ***The site buffered must have first been shown to be of national or international significance using relevant sections above in Table 2.***	Y / N / NS	

LOCALLY SIGNIFICANT	RESPONSE	NOTES
Locally significant natural areas are healthy examples of relatively common vegetation and habitat types. They are often small areas, but large enough to enable key ecological processes to occur, such as regeneration of seedlings or reproduction of indigenous fauna. These sites may not be particularly significant in their own right, but nevertheless play an important part in a network of natural areas. For example, a locally significant site might be important as a seasonal feeding or breeding area. It might also act as a stepping stone between other natural areas, allowing indigenous fauna to move in search of food or mates. Such sites are likely to provide representative examples of common or typical vegetation types or habitat for common indigenous species. They will not be among the best examples in the Region but will meet criterion 7 as healthy, functioning, and ecologically viable sites.		
Did the site receive a 'Yes' response to **any** of the criteria in the plan?	Y / N / NS	

RELATIVE ECOLOGICAL RANK? Circle the highest level for which you allocated at least one 'Yes' response in Table 2. This indicates the rank of the site.	INTERNATIONAL, NATIONAL, REGIONAL, LOCAL

Appendix 27.B

Assessment of Significance Case Law

Appendix 27.B: Assessment of Significance Case Law

Interim Decision of The Environment Court in *Friends Of Shearer Swamp Incorporated v West Coast Regional Council* ([2010]NZEnvC 345). This decision resulted in the inclusion of criteria in the West Coast Proposed Regional Land and Riverbed Management Plan as an appendix. The appeals related to Variation 1 which provided for the management of wetlands on the West Coast. As it was an interim decision leave was reserved to any party to comment on the wording of Appendix 27.H. The criteria are:

1. Ecological context

[1]The **ecological context** *of the wetland has one or more of the following functions and or attributes:*

a.a role in protecting adjacent ecological values, including adjacent and downstream ecological and hydrological processes, indigenous vegetation, habitats or species populations; or

b.is a habitat for critical life history stages of indigenous fauna including breeding/spawning, roosting, nesting, resting, feeding, moulting, refugia, migration staging points (as used seasonally, temporarily or permanently); or

c.it contributes to ecological networks (such as connectivity and corridors for movement of indigenous fauna); or

d.it contributes to the ecological functions and processes within the wetland.

2. Representative Wetlands

[2]A **representative wetland** *is one that contains indigenous wetland vegetation types or indigenous fauna assemblages that were typical for, and has the attributes of, the relevant class of wetland as it would have existed prior to 1840.*

[3]This criterion will be satisfied if the wetland (not including pakahi wetlands) contains **indigenous wetland vegetation types** *that have the following attributes:*

Either (a):

i.The indigenous wetland vegetation types that are typical In plant species composition and structure; and

ii.The condition of the wetland is what would have existed prior to 1840 in that:

indigenous species dominate; and

most of the expected species and tiers of the wetland vegetation type(s) are present for the relevant class of wetland.

Or (b):

i.The wetland contains indigenous fauna assemblages *that:*

are typical of the wetland class; and

indigenous species are present in most of the guilds expected for the wetland habitat type.

[4]A pakihi wetland is a representative wetland where:

a.it is greater than 40 hectares in area; and

b.is dominated by a mixture of sedges, ferns, restiads, rushes, mosses and manuka (Leptospermum scoparium) of which Baumea spp, Sphagnum spp, Gleichenia dicarpa, and Empodisma minus are the main species.

[5]The representative wetland criterion applies to the whole or part of the wetland irrespective of land tenure.

[6]Each wetland is to be assessed at the ecological district and freshwater bio-geographic unit scale.

3. Rarity

[7]The wetland satisfies this criterion if:

a. nationally threatened species13 are present14; or

b.rationally at risk species or uncommon communities or habitats are present and the population at this site has an important contribution to the national population and distribution of a species or number of at risk species or distribution and extent of threatened or uncommon communities or habitats.

c.regionally uncommon species are present; or

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[13] The Threatened and At Risk categories are defined in the current version of the New Zealand threat classification system (Townsend et al 2008). Species are reassessed according to these categories approximately every three years.

[14] For mobile species such as kotuku this requires some assessment of the importance of the site for the species i.e. the intention is not to include areas such as wet pasture where these birds may be foraging.

d.is a member of a wetland class that is now less than 30% of its original extent as assessed at the ecological district and the freshwater bio-geographic unit scales; or

e.excluding pakihi, it contains wetland ecosystems that are identified as historically rare by Williams et al (2007).

4. Distinctiveness

[8]The wetland satisfies the **distinctiveness criterion** *if it has special ecological features of importance at the international, national, freshwater biogeographic unit or ecological district scale including:*

a.intact ecological sequences such as estuarine wetland systems adjoining tall forest species distribution limit; or

b.an unusual characteristic (for example an unusual combination of species, wetland classes, wetland structural forms, or wetland landforms).

Explanation

[9]The **wetland classes** *may be determined in a number of ways including the classification index of Johnson and Gerbeaux (2004).*

*[10]***Wetland indigenous vegetation types** *are identified with reference to the dominant plants species that are present, the structural class, wetland class and hydrosystem (See for example Johnson and Gerbeaux (2005)) or similar method.*

[11]The three **freshwater bio-geographic units** *in the West Coast region are the Northwest Nelson-Paparoa, Buller-Grey and Westland units (Leathwick et al 2000).*

*[12]***Ecological districts** *are described and mapped in McEwen (1987). The maps of the ecological districts on the West Coast region have been refined by David Norton and Fred Ovemars for use at the 1:50,000 scale and are available from the Department of Conservation (West Coast Conservancy).*

In *Long Bay-Okura Great Park Society Incorporated v North Shore City Council* (A078/2008). The Court essentially accepted the following criteria which were based on an article by Drs Norton and Roper-Lindsay. The criteria are listed as:

(a) Rarity and distinctiveness, i.e. the site supports a species that is

(i)Known to be threatened, or

(ii)At its national distributional limit, or

(iii)Endemic to the area, or

(iv)Locally uncommon.

(b) Representativeness, i.e. the site supports an ecosystem that is:

(i)Less than c.1 0% of its former extent in the ecological district, or

(ii)A high-quality example of its type, where less than c. 20% of its ecosystem remains in the ecological district c.f. its former extent.

(c) Ecological context, i.e the site:

(i)Enhances connectivity between patches, or

(ii)Buffers or similarly enhances the ecological values of a specific site of value, or

(iii)Provides seasonal or "core" habitat for specific indigenous species.

(d) Sustainability, ie, a site is considered sustainable if:

(i)Key ecological processes remain viable or still influence the site, and

(ii)Key ecosystems within the site are known to be or are likely to be resilient to existing or potential threats under some realistic level of management activity, and

(iii) Existing or potential land and water uses in the area around the site could be feasibly modified to protect ecological values.

Our assessment of significance for these sites uses past assessments, predominantly Wildlands 2003, for context and then applies Norton e*t al* to provide a consistent assessment across all districts crossed by the proposed MacKays to Peka Peka Expressway Alignment.

Appendix 27.C

Landform, Geology & Soils (Detail)

Appendix 27.C: Landform, Geology & Soils (NZLRI Detail)

Code	Description	Study Area (ha)	%	Designation (ha)	%
Sand country					
8e 1	Undulating to strongly rolling (4-20) rolling coastal foredunes.	149	1.4%	0	0.0%
7e 3	Rolling to moderately steep (8-25), recent, unconsolidated sand dunes near the coast.	293	2.7%	0	0.0%
6e 5	Strongly rolling to moderately steep (16-25) consolidated sand dunes inland of the recent unconsolidated dunes.	937	8.7%	64	19.5%
6s 5	Rolling to strongly rolling (8-20) low, stable sand dunes.	1,262	11.7%	68	20.7%
6s 2	Strongly rolling to moderately steep (16-25) low stable hills of slightly consolidated Aeolian sands occurring near the coast.	35	0.3%	0	0.0%
Peat bogs, swamps and basins					
3w 2	Flat (0-3°), poorly to very poorly drained peaty depressions and swamp margins associated with sand country.	1,031	9.5%	169	51.2%
4w3 + 6s 5	Interdune peat swamps and lake margins with poorly to very poorly drained organic soils.	95	0.9%	0	0.0%
Low alluvial plains & terraces					
1w 1	Deep fertile, free-draining soils occurring on plains and river terraces that are not subject to flooding or erosion.	43	0.4%	0	0.0%
2c 1	Flat to undulating, fertlile well-drained soils.	37	0.3%	0	0.0%
4s 1	Flat (0-3) low river terraces, with shallow sandy to stony soils.	50	0.5%	0	0.0%
2w 1 & 2s 1	Flat to gently undulating. (0-3°°), low river terraces with fine textured alluvial soils.	151	1.4%	15	4.5%
6s 3 & 6s 4	Very stony terraces or fans with thin soils and susceptibility to drought.	226	2.1%	0	0.0%
3w 1	Flat (0-3°), narrow, alluvial valley floors with imperfectly to poorly drained soils developed from fine grained alluvium.	61	0.6%	0	0.0%
6w 1	Flat narrow river valleys, lake margins and plains of alluvium and peat with very high water tables.	60	0.6%	0	0.0%
Medium height stony alluvial terraces					
3s 2	Flat to gently undulating (0-3°), medium-height alluvial terraces with somewhat excessively drained soils developed from stony alluvium.	218	2.0%	0	0.0%
4s 2	Flat (0-3) medium-height alluvial terraces, with shallow stony soils not subject to flooding.	129	1.2%	2	0.7%
High dissected loess covered terraceland					
3e 1	Undulating to gentrly rolling slopes near sea level with free draining fertile yellow-brown loams.	88	0.8%	0	0.0%
3e 2	Rolling downlands with yellow-brown loams.	147	1.4%	0	0.0%
3s 3	Undulating to rolling (4-15°), slightly dissected, high terraces and fans, with a mantle of loess of consolidated gravels.	267	2.5%	0	0.0%
4e 1	Strongly rolling and rolling (8-20°) terraces and low hills	231	2.1%	0	0.0%

	formed from consolidated weathered gravels.				
6s 1	Strongly rolling to moderately steep, terraces and low, stable hills with a mantle of loess over gravels and consolidated gravels.	14	0.1%	0	0.0%
Greywacke hill country					
6c 2	Rolling to strongly rolling (80 - 200) exposed greywacke ridgetops and hill country. The ridges typically occur above 400m a.s.l.	155	1.4%	0	0.0%
6e 3 + 6e 1	Moderately steep to strongly rolling, (E, E+D; 160 - 250), coastal greywacke hill country including rounded ridges and hill slopes.	672	6.2%	0	0.0%
6e 6	Moderately steep, to steep (210 - 350) greywacke hill country in areas of moderate rainfall (1140-1270mm p.a.) with seasonal moisture deficits.	378	3.5%	0	0.0%
6s 6	Strongly rolling to moderately steep (16-20°) low hills with a mantle of loess over greywacke.	125	1.2%	0	0.0%
7e 1	Steep to very steep (260 - 350), greywacke hill country in areas of moderate rainfall (1140 - 1270mm) with seasonal soil moisture deficiencies. Occurs between 50 and 400 m a.s.l.	1,740	16.1%	0	0.0%
7e 4	Steep to very steep (26->35) coastal greywacke hill country exposed to strong salt-laden winds. And subject to seasonal soil moisture deficits. 0-500m altitude range.	55	0.5%	0	0.0%
6c 2	Rolling to strongly rolling (80 - 200) exposed greywacke ridgetops and hill country. The ridges typically occur above 400m a.s.l.	155	1.4%	0	0.0%
Greywacke mountainlands and associated foothills					
6c 1	Rolling to strongly rolling (80 - 200) greywacke hill country, exposed broad ridgetops between 300 and 500 m a.s.l. with a mantle of loess over greywacke.	123	1.1%	0	0.0%
6e 8	Moderately steep to steep (21-35) greywacke hill country between 200-500m a.s.l., comprising the foothills of the mountain ranges. in areas of high rainfall (1270-1780 mm pa).	24	0.2%	0	0.0%
7e 2	Steep to very steep (260 - 350) greywacke hill country in the foothills of mountain ranges. Occurs in areas of high rainfall.	30	0.3%	0	0.0%
OTHER					
999	Town / Urban	1,853	17%	11	3.4%
999	Unclassified	34	0.3%	0	0.0%
TOTAL		10,807	100	330	100

Appendix 27.D

Land Cover Database (LCDBII) Detail

Appendix 27.D: Land Cover Database (LCDBII) Detail

Code	Description	Study Area (ha)	% of Study Area	Designation (ha)	% of Total Designation
Grassland					
10	Coastal Sand and Gravel	85.2	0.8%	0.0	0.0%
40	High Producing Exotic Grassland	5025.6	46.5%	234.8	71.3%
41	Low Producing Grassland	313.5	2.9%	0.0	0.0%
32	Orchard and Other Perennial Crops	15.4	0.1%	2.9	0.9%
31	Vineyard	14.9	0.1%	0.0	0.0%
Wetlands					
20	Lake and Pond	34.4	0.3%	0.0	0.0%
22	Estuarine Open Water	1.3	0.0%	0.0	0.0%
45	Herbaceous Freshwater Vegetation	157.7	1.5%	3.7	1.1%
47	Flaxland	17.7	0.2%	0.0	0.0%
21	River	6.5	0.1%	0.0	0.0%
Pioneer shrublands and low scrub					
51	Gorse and Broom	181.0	1.7%	3.8	1.1%
56	Mixed Exotic Shrubland	0.9	0.0%	0.0	0.0%
57	Grey Scrub	3.2	0.0%	0.0	0.0%
Regenerating kanuka scrub & forest					
52	Manuka and or Kanuka	271.5	2.5%	17.8	5.4%
Regenerating broadleaved scrub & forest					
54	Broadleaved Indigenous Hardwoods	517.8	4.8%	3.8	1.1%
Mature or maturing indigenous forest					
69	Indigenous Forest	633.6	5.9%	1.2	0.4%
Exotic vegetation					
65	Pine Forest - Open Canopy	164.6	1.5%	0.0	0.0%
66	Pine Forest - Closed Canopy	624.3	5.8%	40.6	12.3%
62	Afforestation (not imaged)	284.8	2.6%	0.0	0.0%
63	Afforestation (imaged, post LCDB 1)	40.3	0.4%	0.0	0.0%
64	Forest Harvested	105.9	1.0%	0.0	0.0%
61	Major Shelterbelts	33.4	0.3%	1.4	0.4%
67	Other Exotic Forest	50.0	0.5%	1.7	0.5%
68	Deciduous Hardwoods	54.7	0.5%	5.5	1.7%
Undefined					
0	Unclassified	27.8	0.3%	0.0	0.0%
1	Built-up Area	1722.8	15.9%	10.8	3.3%
2	Urban Parkland/ Open Space	389.7	3.6%	0.0	0.0%
3	Surface Mine	15.6	0.1%	0.0	0.0%
5	Transport Infrastructure	13.5	0.1%	1.5	0.5%
TOTALS		10807.6	100.0%	329.5	100.0%

Appendix 27.E

Protected Natural Areas benea or in close proximity to the MacKays to Peka Peka Expressway Designation

Appendix 27.E: Protected Natural Areas beneath or in close proximity to the MacKays to Peka Peka Expressway Designation.

Name (listed south to north)	Size (Ha)	Effects	Description
Terrestrial vegetation			
Ngarara Bush	**2.59**	**A**	**An area of contiguous semi-coastal modified primary kohekohe and kahikatea forest on residual hillslope and wetland swamp. Formally protected by the PH Smith Covenant (#5/07/241).**
Wetland Vegetation			
Queen Elizabeth Regional Park peatlands	**N/A**	**F**	**The Queen Elizabeth Regional Park is predominantly grazed pasture and a working farm. However, the Regional Park includes a number of important wetlands and remnants of swamp forest. Most notably, in the northern section are the Poplar Avenue wetlands. These wetlands consist of two larger manuka scrub wetlands dominated by manuka, Isolepis prolifer and rushland. The wider area consists of two peat "bog" areas of manuka shrubland, separated by a drier hummock but connected by a stand of manuka/kanuka treeland along a dune ridge on the western side. Substantial restoration planting has been undertaken around the perimeter of the wetlands and they form part of a joint community, GWRC, DOC, and KCDC restoration programme as well as the site of a monitoring system of National Wetland Monitoring Programme (Clarkson etc.). Identified as KCDC Ecosite K184.**
Andrews Pond Scientific Reserve.	**1.3**	**A**	**Historically this area was a small manuka wetland located amongst large areas of pasture. Andrews Pond was thought to be one of only two such habitats remaining within the ecological district, with kapungawha and a rare orchid. However, changed hydrological conditions associated with the recent Milne Drive Subdivision have reduced ecological significance as a result of drowning originally listed ecological values. Today the area consists of a highly modified wetland dominated by open water and Carex secta (Fuller, 2008). Listed as KCDC Ecosite (K093), DOC RAP and DOC PNAP (Ravine, 1992).**
Sovereign Way / Crown Hill Eco-site	**0.6**	**A**	**This Kāpiti Coast District Council-owned Recreation Reserve consists of a small, but good example of a manuka transitional wetland. The reserve is set within a small peat dune depression and contains good manuka habitat with a number of older kahikatea and rimu trees. There has been substantial restoration undertaken around the perimeter of the reserve, with plantings of rimu and kahikatea. Identified as KCDC Ecological Site E92, KCDC Recreation Reserve E183.**
Waikanae Estuary Scientific Reserve	**68.2**	**DS**	**Estuarine wetland, rivermouth. Nationally under-represented habitat types. Good sequences between salt marsh, fresh water wetlands, dune lakes and dune systems (although degraded and modified). Linkages to Kāpiti Island via Kāpiti Marine Reserve. Provides habitat for numerous fauna species including Australasian bittern, Caspian tern and rare visits from reef and white heron. Carex litorosa, Pimelea aff. arenaria, Coprosma acerosa, Spinifex sericeus, and Leptinella dioica ssp. monoica present (Department of Conservation 1996). Also habitat for kapungawha and Baumea articulata. This nationally significant reserve protects a natural mosaic of freshwater lakelets, saltwater lagoons and marshes, tidal sand flats and sandy beach at the mouth of the Waikanae River. According to the Department of Conservation, more species of coastal and aquatic birds visit Waikanae Estuary than any other site on the Wellington coast. Waikanae Estuary Scientific Reserve, Kāpiti Marine Reserve and Kāpiti Island Nature Reserve are recognised as part of a rare sequence of protection for animals, which move between river, sea and land habitats. The Department of Conservation is embarking on an ecological restoration project for the estuary, complemented by the restoration work being undertaken by Waikanae Estuary Care Group, within the scientific reserve and on the adjacent Kāpiti Coast District Council administered land.**

			National significance (Wildlands, 2003). **Ravine, 1992, KCDC Ecosite K081.** **KCDC areas assessed for ecological values.** **Protected as a Scientific Reserve.**
Waimanu Lagoons	**8**	**DS**	**Wetland habitat is nationally under-represented.** **Highly modified, with artificial assemblage of species and some inappropriate enhancement plantings. However, this site has linkages to Waikanae River Mouth and provides continuation of open water habitat. High use by water bird species.** **District significance. KCDC Ecosite (K175).**
Osbournes Swamp	**1.0**	**A**	**KCDC owned. KCDC Ecosite (K068), QEII Covenant, Wetlands September 2003. A small area of flax/toetoe/raupo wetland with Coprosma propinqua shrubland adjoining a constructed pond which covers approximately half of the area. Protected under QEII Covenant. The wetland and pond complex has been the site of substantial planting, with a number of kahikatea and other native and exotic specimen trees planted around the perimeter. Large areas of blackberry and other invasive weeds present within and surrounding the wetland.** **Historical information suggested the possible presence of stalked adder's tongue fern (Ophioglossum petiolatum) (Opus, 2007).** **Identified as regionally significant (Wildlands, 2003).** **Refer plant species list attached as Appendix 27.I.**
Te Harakeke / Kawakahia Wetland	**58.2**	**DS**	**KCDC Ecosite (K066), QEII Covenants, DOC RAP (PNAP), Wetlands September 2003. Consists of the largest dune swale wetland remaining in a relatively natural state on the coastal plain of the Foxton Ecological District (McEwen 1987). Recognised by the Wellington Regional Council as of particular significance under the Key Native Ecosystems Programme. The majority of this wetland has been formally protected as part of a larger 43.7ha QE II covenant (the southern part extends on to the neighbouring golf course and is not formally protected). There is also a natural area of open dune lake called Totara Lagoon within this wetland system.** **Kawakahia wetland is identified by the Department of Conservation as a Wetland of Ecological and Representative Importance (ranking of 3) and as a moderate-high Site of Special Wildlife Importance.** **Regional Wetland habitat is nationally under-represented. A moderately sized area of harakeke flaxland and raupo reedland - the second largest of its type in the Kāpiti District. An important representation of habitat formally common in the area.**
Kawakahia swamp forest	**0.8**	**DS**	**KCDC Ecosite (K066), QEII Covenants, DOC RAP (PNAP). A small area of kahikatea-dominated semi-coastal remnant swamp forest. One of very few remnants of swamp forest left in the Kāpiti Coast District and largely weed free. Forms part of a 20.8ha QEII Covenant (the Ngarara Covenant 5/07/240B).** **Refer plant species list attached as Appendix 27.I.**
Te Kouka Wetland	**3.7**	**D**	**Private land. KCDC Ecosite (K066), QEII Covenant. A large area of regenerating kahikatea wetland, with scattered remnant kahikatea surrounded by regenerating secondary broadleaved vegetation dominated by mahoe. One swamp maire tree present. Wetland and forest margins have been enhanced through restoration planting. Large areas of blackberry with gorse dominate the northern component of the wetland. Aside from the blackberry and gorse, this area is relatively weed-free.** **Refer plant species list attached as Appendix 27.I.**
Nga Manu Nature Reserve	**41**	**A**	**KCDC (K133), QEII covenant, DOC, The larger unit of Nga Manu Nature Reserve (including a series of smaller associated areas of remnant swamp and kohekohe forest and/or wetlands within residential Waikanae) comprises one of largest and best examples of swamp forest within Foxton Ecological District. The main Nga Manu Nature Reserve is approximately 15ha in area and is the largest remnant of original lowland coastal swamp forest in the Foxton Ecological District. A large and diverse area consisting of wetland, swamp forest, kohekohe forest and tawa forest.** **The larger Nga Manu Nature Reserve complex provides a good example of sequences between wetland, swamp forest and dry forest. Provides habitat for brown mudfish and kereru. Nga Manu Nature Reserve protected under Private Trust.** **Wetland habitat is nationally under-represented. Regionally significant (Wildlands) Ravine, 1992.**

Appendix 27.F

Unprotected sites of ecological value beneath or in close proximity to the MacKays to Peka Peka Expressway Designation

Appendix 27.F: Unprotected sites of ecological value beneath or in close proximity to the MacKays to Peka Peka Expressway Designation

Name (listed south to north)	Size (Ha)	Effects	Tenure / Listed	Description
Terrestrial vegetation				
Raumati Road Kanuka	**0.4**	**F**	**NZTA**	**A small area of kanuka forest and treeland with scattered mahoe on the raised dunes south of Raumati Road.** **Reference: BML 2011.**
Otaihanga Landfill Mahoe	**0.1**	**D**	**KCDC land.** **Not listed in District Plan.** **KCDC areas assessed for ecological values.**	**This area consists of a small stand of indigenous bush dominated by one large remnant matai tree surrounded by regenerating mahoe and the northern Otaihanga Wetland.** **Not specifically identified in OPUS report, but noted it was a small stand of indigenous bush also occurred to the west of the alignment.** **Refer plant species list attached as Appendix 27.I.** **Reference: Wildlands, 2007; BML 2011.**
Otaihanga Landfill Kanuka	**0.5**	**F**	**KCDC land.** **Not listed in District Plan.** **KCDC areas assessed for ecological values.**	**This site consists of an area of kanuka forest located on top of an elevated sand dune. While the kanuka forest canopy remains largely intact, the under storey has been highly modified by introduced pasture grasses and there only limited indigenous flora present. Mountain bike tracks and associated structures traverse this small remnant.** **Refer plant species list attached as Appendix 27.I. Reference: Wildlands, 2007; BML 2011.**
Waikanae River Riparian	**0.5**	**F**	**Private, Greater Wellington Regional Council Flood Protection**	**The riparian vegetation in this section of the Waikanae River consists of a thin strip of willow on the immediate river edge with large areas of indigenous restoration plantings on the southern side. There are also large areas of wetland plantings, in the flood-prone flood channels on the flood plain on the southern side. On the northern side, almost all the vegetation is willow, with areas of weedland and occaisional native regeneration.** **Reference: Keesing, 2001; BML 2011.**
Tuku Rakau Forest	**0.9**	**F**	**Private land**	**A small area of advanced regenerating mahoe forest with one remnant kohekohe tree. Adjacent to a small wetland with scattered manuka, cabbage trees, Baumea and *Juncus* species.** **Reference: BML 2011.**
Ngarara Farm Mahoe	**4.2**	**F**	**Private**	**A large area of advanced mahoe regenerating from gorse on the raised dunes of Ngarara Farm, in close proximity to Ti Kouka wetland.** **Reference: BML 2008, BML 2011.**
Wetlands				
131 Raumati South Peatlands	**11.1**	**A**	**NZTA owned.** **KCDC Ecosite 131**	**A large area of manuka-dominated wetland with Baumea rushland and fernland. This KCDC ecosite consists of relatively large and intact area of nationally under-represented habitat type. Large areas of gorse and blackberry throughout and**

				surrounding north, east and western extent. Fragmented by the Te Ra school and associated activity. **Identified as locally significant by Wildlands, 2003.** **Refer plant species list attached as Appendix 27.I.** **Reference: KCDC; Wildlands, 2007; BML 2011.**
Raumati Manuka Wetland	**2.0**	**D, WT**	**NZTA owned** **Not listed in District Plan.**	**The main and northern extent consists of a manuka scrub and Sphagnum wetland with large areas of open water and Isolepis. To the south, predominantly open water with Carex and areas of Baumea rushland around the wetland margins. Seasonally wet dune depression with 0.5m of water during winter months, drying out over summer months. Wetland interior relatively weed free, but surrounded by a large buffer of gorse and blackberry.** **Not included in earlier inventories, including Wildlands, 2003, and previous OPUS route selections and WLR ecology.** **Refer plant species list attached as Appendix 27.I.** **Reference: Wildlands, 2007; OPUS 2007; BML 2011.**
Kiwi Pond	**1.8**	**F**	**NZTA owned** **Not listed in District Plan, but included in KCDC Areas assessed for ecological values.**	**A large area of seasonally wet pasture that provides occasional wildlife habitat. A survey by OPUS in 2007 noted that during spring, the area supported a good diversity and numbers of waterfowl and wading birds, with mallard, royal spoonbill, pied stilt and grey teal identified.** **However, when it is dry it has no special ecological merit since it supports no significant indigenous vegetation. The pond is considered to be induced as part of the embankments associated with the Wharemauku Stream.** **Refer plant species list attached as Appendix 27.I.** **Reference: Wildlands, 2007; OPUS, 2007; BML, 2011.**
Meadows Trust Carex Wetland	**0.2**	**A**	**Private land.** **Not listed in District Plan.** **KCDC areas assessed for ecological values.**	**A relatively small area of induced *Juncus* and *Carex* wetland adjacent to manuka transitional wetland outlined above.** **Reference: Wildlands, 2007; BML, 2008; BML 2011.**
Southern Otaihanga Wetland	**1.4**	**F**	**KCDC land.** **Not listed in District Plan.** **KCDC areas assessed for ecological values.**	**A large purei sedgeland (Carex secta and Carex virgata) with large areas of open water, Baumea rushland and scattered manuka (mostly dead or dying) Northern extent of this wetland adjoins a small remnant of dry vegetation with a large matai (described in dry land vegetation above). Standing water through winter and spring dries out over summer months.** **Identified by Opus 2007 as locally significant.** **Refer plant species list attached as Appendix 27.I.** **Reference: Wildlands, 2007; Opus, 2007; BML 2011.**
Middle Otaihanga Wetland	**2.3**	**F**	**KCDC land.** **Not listed in District Plan.** **KCDC areas assessed for ecological values.**	**A heavily weed infested modified manuka and Carex wetland. Presumed eutrophication associated with Otaihanga Landfill has modified the original wetland and the current vegetation is dominated by blackberry and other invasive weeds, with only occasional Carex and manuka surviving. This wetland is the primary waterbody for water runoff from the Otaihanga Landfill site and is presumed to be contaminated.** **Reference: Wildlands, 2007; BML, 2011.**

Northern Otaihanga Wetland	**1.0**	**F**	**KCDC land.** **Not listed in District Plan.** **KCDC areas assessed for ecological values.**	**A moderately sized manuka and Carex wetland situated between two high sand dunes. Due to surrounding pine plantation and associated low light conditions, this wetland remains relatively weed free. Seasonally wet, with standing water of approximately 0.5m deep disappearing during summer months. A road has separated the two wetland components and impeded drainage, modifying the vegetation from historical extent.** **Refer plant species list attached as Appendix 27.I.** **OPUS Area 6 Locally significant (OPUS, 2007).** **Reference: Wildlands, 2007; OPUS, 2007; BML, 2011.**
Open water and *Juncus* south of Waikanae River	**1.8**	**A**	**KCDC**	**Stock water pond (formed) and large area of *Juncus* and pasture grasses.** **Reference: Wildlands, 2007; BML 2011.**
El Rancho Wetland (Weggery)	**3.9**	**F, WT**	**Private land.** **KCDC Ecosite (K170)** **KCDC areas assessed for ecological values.**	**A large area of manuka dominated wetland with some open water. A number of remnant kahikatea present and showing a high biodiversity of wetland species present. While buffered by considerable infestation of gorse and blackberry, the wetland interior remains relatively intact and weed free. Drainage in recent years has modified historical Sphagnum wetland values to some extent. Presumed to provide habitat for Amphibromus.** **Part of KCDC Ecosite K170 (El Rancho Wetland Complex).** **Regionally significant (Wildlands, 2003).** **Considered by DoC (J. Sawyer, pers. comm. Ex Kessels 1998), to represent a habitat type under-represented (i.e. wetlands) and so significant within the ecological region. This may be in part associated with the recorded presence of the nationally vulnerable (Cameron 199515) fern Ophiglossum petiolatum (stalk adders tongue fern), which while recorded in 1981, has not been found in the area since, despite additional specific searches (DoC under took a further search in 1998 (Richard Gill pers comm.) (Keesing, 2001).** **Takamore wetland vegetation areas, as a whole, were described as having an SSBI (Site of Significant Biological Interest) ranking of "moderate-high" (Kessels) and of district conservation significance, this ranking rising to "high" if the presence of the stalk adders tongue fern was confirmed. (Keesing, 2001).** **The Takamore wetlands as a whole, due to their history of modification, the general age and condition of the remaining vegetation communities and the lack of representativeness or other extraordinary ecological feature, should be considered as a successionally young modified system adaptive to change (Keesing, 2001).** **BML, 2006.** **Refer plant species list attached as Appendix 27.I.** **Reference: KCDC, Cameron, 1995; Kessels, 1998; Keesing, 2001;**

[15] Cameron, EK, de Lange, P.J., Given, D.R, Johnson, O.N., Ogle, C.C. 1995. Threatened and Local Plants List (1995 Revision). NZ Botanical Society Newsletter, No. 39.

				BML, 2006; Wildlands, 2007; OPUS, 2007; BML, 2011.
El Rancho Wetland (West)	**0.7**	**WT**	**KCDC owned.** **KCDC Ecosite (K170)** **KCDC areas assessed for ecological values.**	**Large area of manuka dominated wetland with some open water. Buffered by considerable infestation of gorse and blackberry.** **Part of KCDC Ecosite K170 (El Rancho Wetland Complex).** **Regionally significant (Wildlands, 2003).** **Reference: KCDC; Kessels, 1998; Keesing, 2001; Wildlands, 2007; BML, 2006; OPUS, 2007; BML, 2011.**
El Rancho Wetland (Takamore)	**1.8**	**WT**	**KCDC owned.** **KCDC Ecosite (K170)** **KCDC areas assessed for ecological values.**	**Large area of manuka dominated wetland with some open water. Buffered by considerable infestation of gorse and blackberry.** **Part of KCDC Ecosite K170 (El Rancho Wetland Complex).** **Regionally significant (Wildlands, 2003).** **Reference: KCDC; Kessels, 1998; Keesing, 2001; Wildlands, 2007; BML, 2006; OPUS, 2007; BML, 2011.**
Tuku Rakau Wetland	**0.3**	**D**	**Private land**	**A small wetland with scattered manuka, cabbage trees, Baumea and *Juncus* species. Forms part of a larger successional area of vegetation from wetlands through to dryland (mahoe with one remnant kohekohe tree).** **Reference: BML, 2011.**
Osbournes Swamp West	**1.3**	**A**	**KCDC owned.** **KCDC Ecosite (K170)** **Regionally significant (Wildlands, 2003).**	**Large area of manuka dominated wetland with some open water. Buffered by considerable infestation of gorse and blackberry. Considered to be part of KCDC Ecosite K170 (El Rancho Wetland Complex).** **Reference: KCDC; Kessels, 1998; Keesing, 2001; Wildlands, 2007; BML, 2006; OPUS, 2007; BML, 2011.**
Ngarara Wetland	**2.7**	**A**	**Private land** **KCDC Ecosite (K066) Combined, QEII Covenant**	**A large area of manuka dominated wetland with areas of Carex sedgeland and regenerating kahikatea forest east of Ngarara Road. One of the few wetlands on the Kāpiti Coast that still contains the naturally uncommon mistletoe *Korthalsella salicornioides* . Wetland margins surrounding the wetland core are dominated by blackberry.** **Refer plant species list attached as Appendix 27.I.** **Reference: KCDC; Wildlands, 2007; BML, 2008; BML, 2011.**
Ngarara Dune Depressions	**3.3**	**F**	**Private**	**Three large wet dune depressions dominated by *Juncus* (induced from grazing) in the north of Ngarara Farm.** **Reference: Wildlands, 2007; BML, 2008; BML,2011.**

Appendix 27.G

Threatened Plants in the Wellington Conservancy

Appendix 27.G: Threatened Plants in the Wellington Conservancy

Derived from Appendix 1, *Preliminary Draft Conservation Management Strategy for the Wellington Region, January 2010*

Scientific name	Common name	2008 Threat Category	Qualifier	Distribution	Key Habitat
Amphibromus fluitans Kirk	Water brome	Nationally Endangered	EF, TO	Lake Wairarapa and Kāpiti Coast	Wetland
Anogramma leptophylla (L.) Link	Jersey fern	Nationally Vulnerable	EF, RR, SO, Sp	Wairarapa hill country	Forest
Atriplex cinerea Poir.	Grey saltbush	Nationally Critical	SO	Palliser Bay (now locally extinct)	Coastal
Atriplex hollowayi de Lange et D.A.Norton	Holloway's crystalwort	Nationally Vulnerable	CD, EF, Inc, OL	Wellington (now locally extinct)	Coastal
Carex cirrhosa Berggr.	Curly Sedge	Nationally Vulnerable		Lake Wairarapa	Wetland
Crassula multicaulis (Petrie) A.P.Druce et Given	None known	Nationally Critical	DP, EF	Unknown	Wetland
Crassula peduncularis (Sm.) F.Meigen	None known	Nationally Critical	EF, SO	Turakirae and Wairarapa coast	Wetland
Dactylanthus taylorii Hook.f.	Wood rose, Pua o te Reinga	Nationally Vulnerable	CD, PD, RF, Sp	Northern Wairarapa	Forest
Daucus glochidiatus (Labill.) Fisch., C.A.Mey. et Avé-Lall.	Native carrot	Nationally Critical	DP, SO	Eastern Wairarapa, Castlepoint, Kāpiti and Mana Islands	Cliff & Grassland
Dichelachne micrantha (Cav.) Domin	Purple plume grass	Nationally Vulnerable	DP, SO, Sp	Unknown	Cliff & grassland
Eleocharis pusilla R.Br.	None known	Data Deficient	SO	Unknown	Wetland
Epilobium hirtigerum A.Cunn.	Hairy willowherb	Nationally Critical	DP, EF, SO	Hutt Valley (now locally extinct)	Wetland
Geranium retrorsum	Turnip-rooted geranium	Nationally Vulnerable	DP, SO	Unknown	Grassland
Gratiola concinna Colenso	None known	Nationally Vulnerable	De	Northern Wairarapa	Wetland
Isolepis basilaris Hook.f.	Pygmy clubrush	Nationally Endangered	De	Wairarapa and Horowhenua coast	Wetland
Isolepis fluitans (L.) R.Br. var. fluitans	None known	Nationally Vulnerable	DP, SO	Unknown	Wetland
Juncus holoschoenus var. holoschoenus R.Br.	None known	Nationally Critical	CD, DP, EF, OL, SO	Wairarapa (now locally extinct)	Wetland
Lepidium flexicaule Kirk	Coastal cress	Nationally Vulnerable	CD, EF	Whitireia (now locally extinct)	Coastal
Lepidium oleraceum	Cook's	Nationally	CD,	Kāpiti Island (formerly	Coastal

Sparrm.	scurvy grass	Vulnerable	EF, RR, Sp	around the Wellington coast)	
Leptinella maniototo (Petrie) D.G.Lloyd et C.J.Webb	Maniototo, button daisy	Data Deficient		Lake Wairarapa (locally extinct)	Wetland
Leptinella nana (D.G.Lloyd) D.G.Lloyd et C.J.Webb	Pygmy button daisy	Nationally Endangered	CD, EF, Sp	Whitireia Park	Coastal
Libertia peregrinans Cockayne et Allan	New Zealand iris, mikoikoi	Nationally Vulnerable	DP	Horowhenua coast	Coastal
Linguella puberula (Hook.f.) D.L.Jones, M.A.Clem. et Molloy	Dwarf greenhood	Nationally Critical	EF, Sp	Eastbourne and Hutt Valley	Shrubland
Lobelia carens Heenan	None known	Nationally Endangered	DP	Unknown	Wetland
Mazus novaezeelandiae subsp. impolitus Heenan f. impolitus	Dwarf musk	Nationally Vulnerable	DP	Horowhenua dunes	Coastal
Muehlenbeckia astonii Petrie	Shrubby tororaro	Nationally Endangered	CD, RF	South Wellington, Turakirae and Wairarapa coast	Shrubland
Myosotis pygmaea var. minutiflora G.Simpson et J.S.Thomson	None known	Nationally Endangered	DP, EF	Kāpiti Island and south of Makara (now believed to be extinct)	Shingle
Myosurus minimus subsp. novae-zelandiae (W.R.B.Oliv.) Garn.-Jones	New Zealand mousetail	Nationally Critical	EF, Sp	Cape Palliser and Aorangi Coast (formerly known from Wellington)	Wetland
Myrsine umbricola Heenan et de Lange	Tararua matipo	Nationally Critical	DP, RF, RR	Tararua FP	Forest
Nematoceras papillosum (Colenso) D.L.Jones et M.A.Clem.	Spider Orchid	Data Deficient		Unknown	Forest
Nematoceras rivulare (A.Cunn.) Hook.f.	Spider Orchid	Data Deficient		Unknown	Forest
Olearia gardneri Heads	Gardner's tree daisy	Nationally Critical	CD, RF	Wairarapa	Forest
Ophioglossum petiolatum Hook.	Stalked adder's tongue fern	Nationally Critical	RF, SO, Sp	Horowhenua	Wetland
Pimelea aff. arenaria (AK 216133; Southern New Zealand)	Sand daphne	Nationally Vulnerable	DP	Wairarapa and Horowhenua Coast	Coastal
Pimelea aff. aridula (b) (AK 230900; Cook Strait)	None known	Nationally Endangered	DP, OL	Makara Coast	Coastal
Pimelea longifolia Sol. ex Wickstr.	Long-leaved pimelea	Data Deficient		Aorangi FP	Forest
Pimelea tomentosa (J.R.Forst. et G.Forst.) Druce	None known	Nationally Vulnerable	PD	Wairarapa hill country	Forest
Plumatochilos tasmanicum (D.L.Jones) Szlachetko	Bearded greenhood	Nationally Endangered	EF, PD, SO	Souther Tararua Forest Park and Eastebourne Hills	Shrubland
Polygonum plebeium R.Br.	Small knotweed	Data Deficient	SO	Ruamahanga River	Wetland
Pterostylis micromega	Swamp	Nationally	CD,	Lake Wairarapa	Wetland

Hook.f.	**greenhood**	**Critical**	**DP, EF**		
Ranunculus macropus Hook.f.	**Swamp buttercup**	**Data Deficient**		**Kāpiti & Horowhenua coast, Cape Palliser, Eastbourne, Lake Wairarapa and Wellington**	**Wetland**
Rytidosperma merum Connor et Edgar	**Slender bristle grass**	**Data Deficient**		**Unknown**	**Grassland**
Sebaea ovata (Labill.) R.Br.	**Sebaea**	**Nationally Critical**	**CD, EF, SO**	**Horowhenua (now locally extinct)**	**Coastal**
Simplicia laxa Kirk	**Simplicia**	**Nationally Critical**	**CD, Sp**	**Northern Aorangi**	**Limestone**
Spiranthes novae-zelandiae Hook.f.	**Ladies' tresses**	**Nationally Vulnerable**	**DP, Sp**	**Kāpiti Coast**	**Wetland**
Stenostachys gracilis (Hook.f.) Connor	**None known**	**Data Deficient**		**Unknown**	**Wetland**
Utricularia australis R.Br.	**Yellow bladderwort**	**Nationally Endangered**	**RR, SO**	**Kāpiti Coast**	**Wetland**

Appendix 27.H

Wetland Condition Monitoring Sheets

Appendix 27.H: Wetland Condition Monitoring Sheets

Photo 1: Improved pasture (1.01) with wet pasture with Juncus (2.02). Beneath Project Footprint in Sector Four.

Photo 2: Rank pasture (1.02) in the vicinity of Kiwi Pond (distance). Beneath Project Footprint in Sector 2.

Photo 3: Riparian margins in pasture/rushlands (2.01) forming Smithfield Drain in Sector 4. Wet pasture with Juncus (2.02) surrounds.

Photo 4: Looking across the Wharemauku Stream to rank pasture (1.02) and open water (2.08). Gorse (3.02) within improved pasture in the foreground. Project Footprint in Sector 2.

Photo 5: Wet pasture with Juncus (2.02) under the Project Footprint in Sector 4 surrounded by improved pasture (1.01).

Photo 6: Sedge-rushland dominated wetlands (2.03) surrounded by plantation pine (5.01) under Project Footprint in Southern Otaihanga Wetland.

Photo 7: Sedge-rushland dominated wetlands (2.03) with scattered manuka (2.05) surrounded by plantation pine (5.01) in the Southern Otaihanga Wetland. Expressway Alignment to the upper left of photo.

Photo 8: Cyperus ustulatus dune depressions (2.04) surrounded by improved pature (1.01) and scattered kanuka (3.03) in Sector 4. Expressway Alignment to the right of photo.

Photo 9: Manuka wetlands (2.05) of Sovereign Way/Crown Hill Ecosite surrounded by rank pasture (1.02) and built-up area (6.01). Expressway Alignment between houses in upper portion of photo.

Photo 10: Manuka wetlands (2.05) at El Rancho Wetland (Weggery). Rank pasture (1.02) and lizard habitat in foreground. Expressway Alignment located on dunes in centre of photo.

Photo 11: Manuka wetlands with Sphagnum (2.06) at Raumati Manuka Wetland. Surrounded by blackberry dominated weedlands (3.01) and gorse dominated scrub (3.02). Expressway Alignment by houses to the left of photo.

Photo 12: Mature and maturing swamp forest with kahikatea (2.07) at the Ti Kouka Wetland. Blackberry dominated weedlands (3.01) in the foreground and plantation pine harvested (5.02) on the dunes at the rear of photo.

Photo 13: Detail of mature and maturing swamp forest (2.07) at the QEII covenanted Kawakahia Swamp Forest.

Photo 14: Open water / permanent ponds (2.08) of Kiwi Pond. Wharemauku Stream in Sector 2 to rear of photo. Located in Project Footprint.

Photo 15: Blackberry dominated weedlands (3.01) surrounded by improved pasture (1.01) and rank pasture (1.02) in Sector 1. Raumati Road visible in background in location of Expressway Alignment.

Photo 16: Gorse dominated scrub (3.02) in foreground and large areas of blackberry dominated weedlands (3.01) and rank pasture (1.02) in the Expressway Alignment in Sector 2 north of Kapiti Road.

Photo 17: Blackberry dominated weedlands (3.01) in foreground intermixing with bracken and kanuka forest (3.03) on the raised dunes above Raumati South Peatlands outside of the Expressway Alignment.

Photo 18: Interior of kanuka forest (3.03) on the raised dunes of the Otaihanga Landfill Kanuka. Shared walk/cycleway component of Expresway Alignment to the left of this image.

Photo 19: Interior of regenerating broadleaved scrub and low forest (3.04) on Ngarara Farm in Sector 4. Located adjacent to Expressway Alignment.

Photo 20: Regenerating broadleaved scrub and low forest (3.04) of Tuku Rakau Forest. Scattered cabbage trees surrounding Tuku Rakau wetland visible in foreground. Expressway Alignment through centre of this photo.

Photo 21: Riparian margins in regenerating scrub (3.05) associated with the Kakariki Stream. Blackberry dominated weedlands in actual stream.

Photo 22: Plantation pine (5.01) in vicinity of Otaihanga Mountainbike Area.

Photo 23: Areas of exotic trees (5.03) and plantation pine (5.01) surrounded by improved pasture (1.01) and riparin margins in pasture/rushlands (2.01) north of Smithfield Road under the Expressway Alignment in Sector 4.

Photo 24: Plantation pine harvested (5.02) with gorse dominated scrub (3.02) on Ngarara Farm on the raised dunes of the Expressway Alignment. Sector 4.

Photo 25: Interior of exotic trees (5.03) and plantation pine (5.01) on Ngarara Farm adjacent to the Expressway Alignment in Sector 4.

Photo 26: Riparian margins with exotic trees (5.04) and weedlands. Mazengarb Stream in centre of Expressway Alignment.

Photo 27: Built-up area (6.01) surrounding Expressway Alignment south of Mazengarb Road in Sector 2. Manuka wetlands (2.05) in foreground.

Photo 28: Baumea rushland on disturbed areas of the edge of the Raumati Manuka Wetland surrounded by gorse (3.02). Remnant kohekohe coastal forest on the coastal escarpment in background. Expressway Alignment to the right of this image.

Photo 29. Close-up of proposed location of Expressway Alignment on the southern edge of the El Rancho Wetland (Weggery) in Sector 3. Scattered sedge-rushland communities (2.03), wet pasture (2.02) and manuka wetlands (2.05).

Photo 10: Location of El Rancho Wetland (Weggery) wetland monitoring plot within stock-induced turf and moss-fields. Scattered manuka and Juncus in background. Project Footprint.

Photo 25: Location of wetland condition monitoring plot in manuka wetlands (2.05) within the El Rancho Wetland (Weggery). Sector 3. Outside of Project Footprint.

Photo 26: Close-up of Nertera scapanoides within the Raumati South Peatlands.

Photo 27: Wetland condition monitoring plot within the blackberry dominated weedlands (3.01) of the Central Otaihanga Wetland in Sector 3. Project Footprint.

Photo 28: Landfill Drain and blackberry dominated weedlands (3.01) adjacent to the wetland condition monitoring plot within the Central Otaihanga Wetland in Sector 3. Project Footprint.

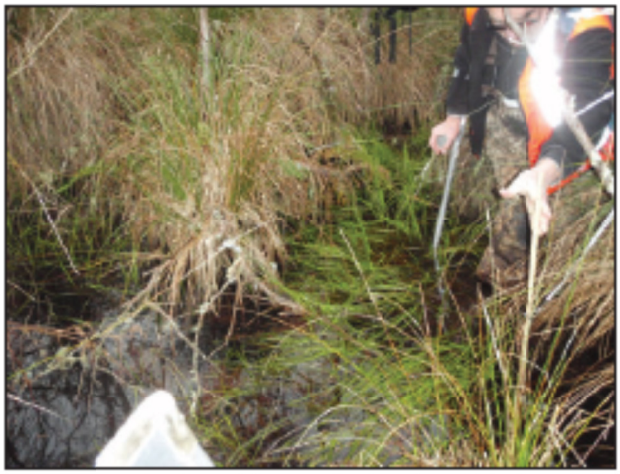

Photo 29. Wetland condition monitoring plot within the manuka wetland with Sphagnum vegetation (2.06) of the Northern Otaihanga Wetland. Project Footprint.

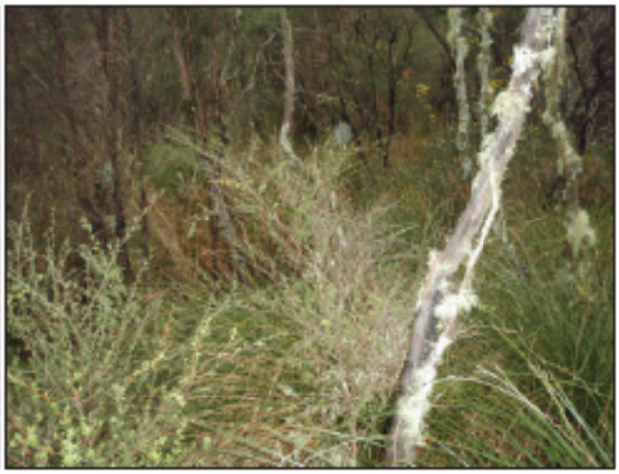

Photo 10: Wetland condition monitoring plot within the manuka wetland with Sphagnum vegetation (2.06) of the Northern Otaihanga Wetland. Project Footprint.

Photo 25: Wetland condition monitoring plot within Baumea rushland (2.03) in the Southern Otaihanga Wetland. Project Footprint.

Photo 26:

Photo 27: Wetland condtion monitoring plot lcoation within the purei-sedgeland (2.03) of the Southern Otaihanga Wetland. Outside of Project Footprint.

Appendix 27.I

Site Specific Species Lists

Appendix 27.I: Site specific species lists

These lists are based on botanical surveys carried out by Pat Enright and Matiu Park. This survey focused on representative habitats either located within or in close proximity to the proposed MacKays to Peka Peka Expressway Alignment, including shrublands, wetlands, and forest remnants. Survey locations are shown on

Figure 2 **and photographs are included in** Error! Reference source not found..

LIST OF VASCULAR PLANTS IN AND AROUND 200 MAIN ROAD, RAUMATI

GPS Location
Pat Enright and Matiu Park for NZTA M2PP Project team –
Survey dates: 13 October 2010 (1 hour), 4 November 2010 (2.5 hours), 28 January 2011 (2 hours).
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has not been recorded in any previous inventories (including Wildlands Kāpiti Coast District Council Survey).

This site is a manuka dominated wetland with sphagnum, Isolepis prolifer and Baumea teretifolia with large areas of open water at the northern extent. At the southern extent, the wetland is dominated by Carex secta, Isolepis prolifer and *Juncus* species.

During both site visits, the wetland was an average of 500mm deep, with saturated sphagnum visible throughout and manuka on slightly more elevated areas (but still underwater). Baumea teretifolia was present on drier edges and areas of raised ground. Nertera scapanoides and Gonocarpus micranthus common on drier edges and in open areas recently disturbed. Some evidence of manuka (Leptospermum scoparium)die-back and the relatively small and uniform size and stature of manuka indicative of recent hydrological changes and flooding suspected.

Of note, Nertera scapanoides is a dominant ground cover in large wet areas and Baumea teretifolia and Gleichinea microphylla were also found at the site.

A number of adventive species were present, although limited by the large areas of open water. The edges of the wetland included large areas of gorse, blackberry and wild cherry the dominant adventive species. Silver birch was also present. Garden waste dumping has also introduced a number of adventives on the western side of the wetland. Of note, the noxious weed Purple loosestrife (Lythrum salicaria) was present on the western edge of the wetland (and reported to GWRC pest control).

Dicotyledonous trees and shrubs		***Schoenus mascalinus***	
Coprosma robusta	***karamu***		
Leptospermum scoparium	***manuka***		
Melicytus ramiflorus	***mahoe***	***Rushes and allied plants***	
		Juncus australis	
Monocotyledonous trees and shrubs		***Juncus edgerae***	
Cordyline australis	***ti, cabbage tree***	***Juncus pallidus***	
		Juncus planifolius	
Dicotyledonous lianes and related trailing plants		***Juncus sarophorus***	
Calystegia sepium subsp. roseata	***pink bindweed***		
Muehlenbeckia australis	***pohuehue***	***Remaining Monocotyledonous plants***	
		Lemna minor	
Ferns		***Phormium tenax***	***harakeke, flax***
Azolla filiculoides	***water fern***		
Dicksonia squarrosa	***tree fern***	***Composite herbs***	
Gleichinea microphylla (hybrid – TBC)		***Cotula coronopifolia***	***batchelors button***
Histiopteris incisa	***mata, water***		
bracken		***Dicotyledonous herbs other than Composites***	
Paesia scaberula	***matata, scented***	***Centella uniflora***	
fern		***Gonocarpus micranthus***	
Pteridium esculentum	***rauaruhe, bracken***	***Hydrocotyle novae-zelandiae agg.***	
		Lobelia anceps (unc)	
Orchids		***Myriophyllum propinquum***	***water milfoil***
Microtis uniflora		***Nertera scapanoides***	
		Persicaria decipiens	
Grasses			
Cortaderia fulvida (unc)	***toetoe***	***Mosses***	
		Cyathophorum bulbosum	
Sedges		***Sphagnum sp.***	
Baumea teretifolia			
Carex geminata (unc)		***Birds***	
Carex secta		***Canadian goose***	
Carex virgata		***Pukeko***	
Isolepis distigmatosa		***Tui***	
Isolepis prolifer		***King fisher***	
		Harrier hawk	

LIST OF VASCULAR PLANTS IN EL RANCHO WETLAND COMPLEX (WEGGERY)

GPS Location WP 045 and surrounding environs
Pat Enright and Matiu Park for NZTA M2PP Project team –
Survey dates: 13 October 2010 (2 hours), 28 January 2011 (2 hours).
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has been recorded in previous inventories, including the Kāpiti Coast District Plan (Ecosite K170). Of note, an earlier site inventory (Cameron 19953) recorded the nationally critical Ophioglossum petiolatum (stalked adder's tongue fern) present in the wetland. Other botanical surveys since have not confirmed this present. NEEDS TO BE UPDATED WITH WETLAND CODNTION RESULTS

This site is a manuka (Leptospermum scoparium) dominated wetland with occasional scattered (remnant) kahikatea. Historical drainage and more recent (2005?) vegetation clearance has modified some areas with corresponding vegetation assemblages. Manuka is a range of age classes and Baumea rubiginosa is present in large areas of the understorey. During the first site visit in October 2010, which followed recent rain and relatively high water tables along the Kāpiti Coast, large areas of the wetland consisted of wet hollows with raised dry areas. The January site visit was much drier with most ephemeral areas regenerating. Rapid colonisation of the recently cleared manuka was occurring in the central section of the wetland. Our observations suggest that this is a relatively unmodified wetland complex, largely unaffected (or well stabilised) by any water table or drainage modifications.

A number of adventive species were present, with large areas of blackberry (Rubus fruticosus agg.), gorse (Ulex europaeus) and climbing asparagus (Asparagus scandens) the dominant adventive species. Japanese honeysuckle (Lonicera japonica), wild cherry, lupin (Lupinus aroreus) and evergreen buckthorn (Rhamnus alaternus) were also present in lower densities.

Gymnosperm trees	
Dacrycarpus dacrydioides	***kahikatea***
Dicotyledonous trees and shrubs	
Coprosma propinqua	
Coprosma robusta	***karamu***
Coprosma robusta x propinqua	
Coprosma tenuifolia	***swamp coprosma***
Geniostoma ligustrifolium var. ligustrifolium	***hangehange***
Knightia excelsa	***rewarewa***
Kunzea ericoides agg.	***kanuka***
Leptospermum scoparium	***manuka***
Melicytus ramiflorus	***mahoe, whitey wood***
Myrsine australis (unc)	***mapou***
Pseudopanax arboreus	***five finger***
Pseudognaphalium luteoalbum agg.	***pukatea***
Solanum laciniatum	***poroporo***
Monocotyledonous trees and shrubs	
Cordyline australis	***ti, cabbage tree***
Dicotyledonous lianes and related trailing plants	
Muehlenbeckia australis	***pohuehue***
Muehlenbeckia complexa	
Parsonsia heterophylla	***kaihua, N.Z. jasmine***
Parsonsia capularis	
Rubus australis	***swamp lawyer***
Ferns	
Asplenium flaccidum	***hanging spleenwort***
Asplenium polyodon	***sickle spleenwort***
Blechnum minus	***swamp kiokio***
Blechnum hybrid	
Blechnum novae-zelandiae	***kiokio***
Cyathea medullaris	
Dicksonia squarrosa	***tree fern***
Histiopteris incisa	***mata, water bracken***
Hypolepis ambigua	
Hypolepis distans (unc)	
Microsorum pustulatum subsp. pustulatum	***kowaowao, hounds tongue***
Paesia scaberula	***matata, scented fern***
Pteridium esculentum	***rauaruhe, bracken***
Tmesipteris elongata	***fork fern***
Orchids	
Simpliglottis cornuta	***duck orchid***
Thelymitra pauciflora agg.	
Grasses	
Cortaderia fulvida	***toetoe***
Sedges	
Baumea rubiginosa	
Baumea tenax	
Carex dipsacea	
Carex geminata	
Carex virgata	
Eleocharis gracilis	***slender spike sedge***
Isolepis distigmatosa	
Isolepis prolifer	
Schoenus maschalinus	
Rushes and allied plants	
Ficinia nodosa	***wiwi, knobbly club rush***
Juncus articularis	
Juncus edgariae	***wiwi***
Juncus pallidus	
Juncus planifolius	***grass-leaved rush***
Remaining Monocotyledonous plants	
Phormium tenax	***harakeke, flax***
Triglochin striata	
Composite herbs	
Euchiton involucratus	***cudweed***
Senecio minimus	

		Viola lyallii	*haaka, New*
Dicotyledonous herbs other than Composites		*Zealand native violet*	
Centella uniflora			
Dichondra brevifolia (AG)		*Mosses*	
Gonocarpus micranthus		*Sphagnum sp.*	
Hydrocotyle novae-zelandiae agg.			
Hydrocotyle pterocarpa		*Birds*	
Hypericum pusillum	*swamp hypericum*	*Tui*	
Lobelia anceps		*Bellbird*	
Microtis uniflora		*Grey warbler*	
Nertera depressa		*Fantail*	

LIST OF VASCULAR PLANTS IN OSBOURNES SWAMP

GPS Location WP 047,
Pat Enright and Matiu Park for NZTA M2PP Project team –
Survey dates: 3 November 2010 (2 hours)
unc = uncommon (only 1 or 2 specimens seen)
P = presumed planted
Note: adventive species not described.

This site is listed as a QE II Covenant (Osbourne's Swamp) and is listed in the Kāpiti Coast District Plan (Ecosite: K068). No historical biological inventories are known.

This site consists of a large open area of water dominated by Myriophyllum propinquum surrounded by raupo and a smaller distinct vegetated wetland to the north dominated by Carex secta, Coprosma propinqua, raupo (Typha orientalis) and flax. (Phormium tenax) Ecological investigations suggest the open pond area has been formed through excavation from the original wetland. Historical native and exotic plantings are numerous in this area.

A number of adventive species were present, including blackberry (Rubus fruticosus agg.) , gorse (Ulex europaeus), Cape ivy (Senecio angulatus) and climbing asparagus (Asparagus scandens) the dominant adventive species. Wandering Willie (Tradescantia flumenensis) was also observed.

Gymnosperm trees	
Dacrycarpus dacrydioides (P)	***kahikatea***
Dicotyledonous trees and shrubs	
Coprosma propinqua	
Coprosma repens	***taupata***
Geniostoma ligustrifolium var. ligustrifolium	***hangehange***
Hoheria sexstylosa (P)	***houhere, lacebark***
Kunzea ericoides agg.	***kanuka***
Leptospermum scoparium	***manuka***
Macropiper excelsum subsp. excelsum	***kawakawa, pepper tree***
Melicytus ramiflorus	***mahoe***
Pittosporum tenuifolium (P)	***kohuhu***
Solanum laciniatum	***poroporo***
Monocotyledonous trees and shrubs	
Cordyline australis	***ti, cabbage tree (P)***
Dicotyledonous lianes and related trailing plants	
Muehlenbeckia australis	***pohuehue***
Muehlenbeckia complexa	
Tetragonia implexicoma	***NZ spinach***
Ferns	
Asplenium oblongifolium	
Azolla filiculoides	***water fern***
Blechnum minus	
Cyathea medullaris	
Dicksonia squarrosa	***tree fern***
Hypolepis ambigua	
Hypolepis distans	
Microsorum pustulatum subsp pustulatum	***kowaowao, hounds tongue***
Pteridium esculentum	***rauaruhe, bracken***
Pteris tremula	
Grasses	
Cortaderia fulvida	***toetoe***
Sedges	
Carex geminata	
Carex inversa	***creeping lawn sedge***
Carex secta	
Carex virgata	
Cyperus ustulatus	
Eleocharis acuta	
Isolepis prolifer	
Rushes and allied plants	
Juncus pallidus	
Juncus planifolius	
Remaining Monocotyledonous plants	
Lemna minor	
Phormium tenax	***harakeke, flax***
Potamogeton cheesemanii	***red pondweed***
Typha orientalis	***raupo***
Dicotyledonous herbs other than Composites	
Haloragis erecta subsp. erecta	***toatoa, fireweed***
Hydrocotyle novae-zelandiae agg.	
Myriophyllum propinquum	***common water milfoil***
Persicaria decipiens	
Birds	
Tui	
Dabchick	
Pukeko	
Fantail	

LIST OF VASCULAR PLANTS IN OTAIHANGA LANDFILL

GPS Location – WP 612, 613, 614 615 (includes dry bush remnants)

Pat Enright and Matiu Park for NZTA M2PP Project team –
Survey dates: 13 October 2010 (3 hours),
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has not been recorded in previous inventories; however, the Wildlands survey for Kāpiti Coast District Council in 2001 noted the site.

The wider site consists of a series of small elongated wetlands, each with different species assemblages and water tables. The wetlands in this location range from relatively weed-free and unmodified manuka and Carex wetlands, through to highly modified blackberry dominated wetlands with areas of open water. Manuka in all the wetlands is a range of age classes and blackberry is particularly common through the site. The old Otaihanga Landfill is located on the edge of this site, with water quality issues observed influencing the central wetland and dry lands. Historic road access into the area and associated culverts etc. look to have altered the wetlands hydrology over recent years, with some areas showing signs of manuka die-back and changed species composition.

Plantation pine forest makes up all the elevated sand dunes surrounding and within this wider site. Within this location are two stands of old growth vegetation, including an area of kanuka forest and a smaller area of regenerating broadleaved forest surrounding a large remnant rimu tree.

A number of adventive species were present, with large areas of blackberry the dominant adventive specie. Gorse, willow, Japanese honeysuckle, wild cherry, climbing asparagus, Tradescantia, green goddess lily, sycamore, willow, pampas, Clematis vitalba were also observed in varying densities through the wider site.

Gymnosperm trees	
Prumnopitys taxifolia	***matai, black pine***
Dicotyledonous trees and shrubs	
Brachyglottis repanda	***rangiora***
Coprosma propinqua	
Coprosma robusta	***karamu***
Coprosma robusta x propinqua (hybrid)	
Coprosma repens	***taupata***
Coprosma rhamnoides	
Dysoxylum spectabile	***kohekohe***
Geniostoma ligustrifolium var. ligustrifolium	***hangehange***
Knightia excelsa	***rewarewa***
Kunzea ericoides agg.	***kanuka***
Leptospermum scoparium	***manuka***
Macropiper excelsum subsp. excelsum	***kawakawa, pepper tree***
Melicytus ramiflorus	***mahoe***
Myrsine australis	***red matipo, mapou***
Pittosporum tenuifolium	***kohuhu***
Pseudopanax arboreus	***five finger***
Pseudopanax hybrids	
Solanum laciniatum	***poroporo***
Monocotyledonous trees and shrubs	
Cordyline australis	***ti, cabbage tree (P)***
Dicotyledonous lianes and related trailing plants	
Muehlenbeckia australis	***pohuehue***
Muehlenbeckia complexa	
Parsonsia heterophylla	***kaihua, N.Z. jasmine***
Ferns	
Asplenium bulbiferum	***Hen and chicken fern, pikopiko***
Asplenium flaccidum	***hanging spleenwort***
Asplenium flabellifolium	
Asplenium gracillimum	***hen + chicken fern***
Asplenium oblongifolium	
Asplenium polyodon	***Sickle spleenwort***
Cyathea dealbata	***Silver fern, Ponga***
Cyathea medullaris	
Dicksonia squarrosa	***tree fern***
Histiopteris incisa	***mata, water bracken***
Hypolepis ambigua	
Microsorum pustulatum subsp. pustulatum	***kowaowao, hounds tongue***
Paesia scaberula	***matata, scented fern***
Pteridium esculentum	***rauaruhe, bracken***
Pteris tremula	***tender brake***
Orchids	
Microtis unifolia	***onion leaved orchid***
Grasses	
Microlaena stipoides	***meadow rice grass, slender rice grass***
Sedges	
Carex secta	
Carex virgata	
Cyperus ustulatus	***Coastal cutty grass, giant umbrella sedge***
Isolepis prolifer	
Rushes and allied plants	
Baumea teritifolia	
Juncus pallidus	
Remaining Monocotyledonous plants	

Lemna minor

Composite herbs
Senecio hispidulous

Dicotyledonous herbs other than Composites
Centella uniflora
Dichondra repens

Hydrocotyle moschata

Birds
Tui
Bellbird
Grey warbler
Fantail
Grey duck

LIST OF VASCULAR PLANTS IN POPLAR AVE WETLAND

GPS LOCATION:
Pat Enright and Matiu Park for NZTA M2PP Project team
Survey dates: 4 November 2010 (2 hours)
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has not been recorded in previous inventories; however, the Wildlands survey for Kāpiti Coast District Council in 2001 noted the area.

This site is a manuka and sphagnum wetland surrounded by reed and rushlands. At the northern extent is a small area of open water dominated by raupo, Carex secta and flax (Phormium tenax). Moving southwards, manuka becomes dominant with Carex virgata, Isolepis prolifa, Eleocharis acuta and Baumea teretifolia. The southern extent of the wetland system is dominated by Carex virgata, Eleocharis acuta and Baumea teretifolia. The entire extent of the wetland is surrounded by recent plantings of manuka, kanuka, Coprosma propinqua and other species.

Raised water tables, dominance of Isolepis prolifa and suspected stressed manuka suggest slightly changed water tables.

The area has a small number of adventive species, with Japanese honeysuckle being particularly common through the wetland area and other common pasture species present.

Dicotyledonous trees and shrubs
Coprosma robusta — ***karamu***
Coprosma propinqua
Kunzea ericoides agg. (P) — ***kanuka***
Leptospermum scoparium — ***manuka***

Monocotyledonous trees and shrubs
Cordyline australis — ***ti, cabbage tree (P)***

Dicotyledonous lianes and related trailing plants
Muehlenbeckia australis — ***pohuehue***
Parsonsia heterophylla — ***kaihua, N.Z. jasmine***

Ferns
Asplenium oblongifolium (unc) — ***huruhuruwhenua, shining spleenwort***
Blechnum minus
Histiopteris incisa — ***mata, water bracken***
Hypolepis ambigua
Hypolepis distans
Microsorum pustulatum subsp. pustulatum — ***kowaowao, hounds tongue***
Paesia scaberula (unc) — ***matata, scented fern***

Orchids
Microtis unifolia — ***onion leaved orchid***

Grasses
Cortaderia fulvida (P?)

Sedges
Baumea teretifolia
Baumea rubiginosa
Carex secta
Carex virgata
Cyperus ustulatus
Eleocharis acuta
Isolepis prolifer

Rushes and allied plants
Juncus australis
Juncus pallidus
Juncus planifolius

Remaining Monocotyledonous plants
Lemna minor
Phormium tenax — ***harakeke, flax***
Typha orientalis — ***raupo***

Dicotyledonous herbs other than Composites
Hydrocotyle moschata
Hydrocotyle novae zelandiae agg.

Mosses
Sphagnum sp

Birds
Tui
Pukeko
Swallow
Harrier hawk

LIST OF VASCULAR PLANTS IN AND AROUND RAUMATI SAND DUNES, RAUMATI ROAD

GPS Location WP606
Pat Enright and Matiu Park for NZTA M2PP Project team –
Survey dates: 13 October 2010 (2 hours),
unc = uncommon (only 1 or 2 specimens seen)
This wider site has not been recorded in any previous inventories (including Wildlands Kāpiti Coast District Council Survey).

The botanical survey covered the remnant raised sand dunes north and south of Raumati Road, focusing on regenerating vegetation of the raised dune formations. Blackberry, lupin and gorse were the dominant weed species, with blackberry dominating the lower dune depressions with gorse and lupin on the more elevated dunes. A number of other weed species present

Dicotyledonous trees and shrubs

Coprosma robusta ***karamu***
Coprosma repens ***taupata***
Kunzea ericoides agg. ***kanuka***
Melicytus ramiflorus ***mahoe***
Solanum aviculare ***poroporo***

Dicotyledonous lianes and related trailing plants

Muehlenbeckia australis ***pohuehue***
Tetragonia implexicoma ***New Zealand spinach***

Birds

Tui
Harrier hawk

LIST OF VASCULAR PLANTS IN RAUMATI SOUTH PEATLANDS

GPS Location WP 601, 602, 603, 616,
Pat Enright and Matiu Park for NZTA M2PP Project team –
Survey dates: 13 October 2010 (3 hours), 14 October 2010 (3 hours), 4 November 2010 (1 hour), 28 January 2011 (2.5 hours).
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has not been recorded in previous inventories; however, the Wildlands survey for Kāpiti Coast District Council in 2001 noted the area.

This site is a manuka dominated wetland with five-finger on raised areas. Manuka is a range of age classes and bracken is particularly common through the site with large areas of blackberry and gorse, particularly around northern and western extents of wetland. Baumea teretifolia occurs in small patches throughout the wetland.

During the first site visit, which followed recent rain and relatively high water tables along the Kāpiti Coast, much of the wetland was under water, with some small dry patches. The November site visit was much drier, with large leaf-loss observed in the five finger, although there were still a number of small pools of water throughout.

Our observations suggest that this is a relatively unmodified wetland complex, largely unaffected (or well stabilised) by any water table or drainage modifications.

A number of adventive species were present, with large areas of blackberry (Rubus fruticosus agg), gorse (Ulex europaeus), Japanese honeysuckle (Lonicera japonica), wild cherry (Prunus sp.), evergreen buckthorn (Rhamnus alaternus), Cape ivy (Senecio angulatus) and climbing asparagus (Asparagus scandens) the dominant adventive species. Wandering Willie (Tradescantia flumenensis) was also observed in some areas adjacent to residential areas to the east of the wetland. Boneseed (Chrysanthemoides molinifera subsp. monilifera) was beginning to become established in small areas of the wetland, particularly the eastern edge.

Of note:
Nertera scapanoides an uncommon herb in the Wellington Conservancy is a dominant ground cover in large wet areas.
Baumea teretifolia which is at its sotuthern limit in the conservancy.
Gleichenia dicarpa / G. microphylla hybrid also somewhat uncommon in the conservancy. It's actual specific designation is being looked into at Te Papa

Gymnosperm trees
Podocarpus totara (unc) ***totara***

Dicotyledonous trees and shrubs
Carpodetus serratus ***putaputaweta, marbleleaf***
Coprosma grandifolia
Coprosma robusta ***karamu***
Coprosma repens ***taupata***
Coprosma rhamnoides
Griselinia lucida ***puka, broadleaf***
Kunzea ericoides agg. ***kanuka***
Leionema nudum – planted
Leptospermum scoparium ***manuka***
Melicytus ramiflorus ***mahoe***
Myrsine australis (unc) ***red matipo, mapou***
Pittosporum crassifolium ***karo***
Pittosporum tenuifolium ***kohuhu***
Pseudopanax arboreus ***five finger***
Pseudopanax crassifolius ***lancewood***
Pseudopanax hybrids (garden escapes)

Monocotyledonous trees and shrubs
Cordyline australis ti, cabbage tree (P)

Dicotyledonous lianes and related trailing plants
Clematis paniculata ***puawhangana***
Muehlenbeckia australis ***pohuehue***
Muehlenbeckia complexa
Parsonsia heterophylla ***kaihua, N.Z. jasmine***

Ferns
Asplenium flaccidum ***hanging spleenwort***
Blechnum minus
Blechnum novae-zelandiae ***kiokio***
Dicksonia squarrosa ***tree fern***
Gleichenia dicarpa / G. microphylla hybrid

Histiopteris incisa ***mata, water bracken***
Hypolepis distans
Microsorum pustulatum subsp. pustulatum ***kowaowao, hounds tongue***
Paesia scaberula ***matata, scented fern***
Pteridium esculentum ***rauaruhe, bracken***

Orchids
Simpliglottis cornuta ***duck orchid - note pale white form.***
Microtis unifolia ***onion leaved orchid***

Grasses

Cortaderia fulvida
toetoe
Microlaena stipoides
meadow rice grass

Sedges
Baumea teretifolia
Carex geminata
Carex lessoniana
Eleocharis acuta
Isolepis prolifer
Schoenus maschalinus

Rushes and allied plants
Juncus australis
Juncus pallidus
Juncus planifolius
Juncus sarophorus

Remaining Monocotyledonous plants

Dianella nigra
blueberry
Phormium tenax
harakeke, flax

Dicotyledonous herbs other than Composites
Centella uniflora
Drosera binata (unc)
Gonocarpus micranthus
Hydrocotyle novae-zelandiae agg.
Lobelia anceps
Nertera scapanoides

Mosses
Cyathophorum bulbosum

Birds
Tui
Bellbird
Grey warbler
Fantail

LIST OF VASCULAR PLANTS IN WET PASTURE DEPRESSIONS, NORTHERN SMITH PROPERTY

GPS Location WP 617, 618, 619 and 620 (wet pasture in north of property)
Pat Enright and Matiu Park for NZTA M2PP Project team –
Survey dates: 14 October 2010 (1 hour)
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has not been recorded in previous inventories.

These sites all consist of low lying wet dune depressions dominated by exotic and native *Juncus*. All sites are heavily grazed and cattle pugged peat with a number of adventive pasture species. All sites are seasonally inundated with water and during the site visit, water was still present. Carex ovalis, *Juncus* effusus and *Juncus* articulatus are common.

Dicotyledonous lianes and related trailing plants
Muehlenbeckia australis pohuehue

Ferns
Blechnum minus

Sedges
Baumea rubiginosa
Carex geminata
Carex secta
Carex virgata
Cyperus ustulatus

Rushes and allied plants
Juncus edgariae
Juncus pallidus
Juncus planifolius
Juncus sarophorus

Remaining Monocotyledonous plants
Lemna minor

Dicotyledonous herbs other than Composites
Gonocarpus micranthus
Hydrocotyle novae-zelandiae (NZ).
Hypericum pusillum

Birds
Tui
Harrier hawk
Pukeko
Paradise shelduck

LIST OF VASCULAR PLANTS IN NGARARA WETLAND, SMITH PROPERTY,

GPS Location WP 621 (Ngarara Wetland, adjacent to Ngarara Road).
Pat Enright and Matiu Park for NZTA M2PP Project team (with Jonathan Smith, landowner, present).
Survey dates: 14 October 2010 (2 hours)
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has been recorded in previous inventories, noting in particular the presence of the dwarf mistletoe, *Korthalsella salicornioides.*

This site consists of a manuka dominated wetland with areas of open rush land and Carex surrounded by regenerating forest with kahikatea. Blackberry and gorse are rapidly dominating with access to the central area of the wetland difficult during the botanical survey. Of note, *Korthalsella salicornioides* (dwarf or leafless mistletoe) is present in large numbers on manuka in the central area of the wetland.

A number of adventive species were present, with large areas of blackberry and gorse rapidly overtaking the site margins.

Gymnosperm trees
Dacrycarpus dacrydioides ***kahikatea***

Dicotyledonous trees and shrubs
Coprosma aerolata
Coprosma propinqua subsp. propinqua
Coprosma propinqua x robusta (various hybrids)
Coprosma robusta ***karamu***
Geniostoma ligustrifolium var. ligustrifolium ***hangehange***
Korthalsella salicornioides ***dwarf or leafless mistletoe***
Kunzea ericoides agg. ***kanuka***
Leptospermum scoparium ***manuka***
Melicytus ramiflorus ***mahoe***
Myrsine australis (unc) ***mapou***
Olearia solandri ***coastal tree daisy***
Pennantia corymbosa ***kaikamako***
Pittosporum eugenioides ***tarata, lemonwood***
Pseudopanax arboreus ***five finger***
Pseudopanax crassifolius ***lancewood***
Pseudopanax hybrids

Monocotyledonous trees and shrubs
Cordyline australis ***ti, cabbage tree (P)***

Dicotyledonous lianes and related trailing plants
Muehlenbeckia australis ***pohuehue***
Muehlenbeckia complexa
Parsonsia heterophylla ***kaihua, N.Z. jasmine***
Tetragonia implexicoma

Ferns
Asplenium oblongifolium ***shining spleenwort***
Hypolepis ambigua
Pteridium esculentum ***rauaruhe, bracken***

Grasses
Cortaderia fulvida ***toetoe***
Microlaena stipoides ***meadow rice grass***

Sedges
Carex geminata
Carex secta
Carex virgata
Cyperus ustulatus ***Coastal cutty grass, Giant umbrella sedge***

Rushes and allied plants
Juncus pallidus
Luzula picta var. picta

Remaining Monocotyledonous plants
Phormium tenax ***harakeke, flax***

LIST OF VASCULAR PLANTS IN TI KOUKA WETLAND, SMITH PROPERTY

GPS Location WP xxx (Regenerating wetland)
Pat Enright and Matiu Park for NZTA M2PP Project team (with Jonathan Smith, landowner, present).
Survey dates: 14 October 2010 (2 hours)
unc = uncommon (only 1 or 2 specimens seen)
Note: adventive species not described.

This site has not been recorded in previous inventories.

This site is a mix of low-lying mahoe dominated secondary regenerating forest and smaller areas of wetland vegetation in a low dune depression. A number of remnant primary forest species are present, including swamp maire (1 tree) and a number of kahikatea. Large areas of the site are densely vegetated in blackberry. Of note is the sole swamp maire.

A number of adventive species were present, with large areas of blackberry around the site margins.

Gymnosperm trees

Dacrycarpus dacrydioides	***kahikatea***

Dicotyledonous trees and shrubs

Alectryon excelsus subsp. excelsus	***titoki***
Beilschmiedia tawa	***tawa***
Coprosma aerolata	
Coprosma crassifolia	
Coprosma grandifolia	
Coprosma propinqua	
Coprosma propinqua x areolata (various hybrids)	
Coprosma robusta	***karamu***
Coprosma repens	***taupata***
Coprosma tenuicaulis	***swamp coprosma***
Dysoxylum spectabile	***kohekohe***
Geniostoma ligustrifolium var. ligustrifolium	***hangehange***
Hedycarya arborea	***pigeonwood***
Kunzea ericoides	***kanuka***
Leptospermum scoparium	***manuka***
Macropiper excelsum	***kawakawa***
Melicytus ramiflorus	***mahoe***
Myoporum laetum	***ngaio***
Myrsine australis	***mapou***
Olearia solandri	***coastal tree daisy***
Pennantia corymbosa	***kaikamako***
Pseudopanax arboreus	***five finger***
Pseudopanax crassifolius	***lancewood***
Pseudopanax - various hybrids	
Solanum laciniatum	***poroporo***
Syzygium maire	***swamp maire***

Monocotyledonous trees and shrubs

Cordyline australis	***ti, cabbage tree (P)***

Dicotyledonous lianes and related trailing plants

Calystegia tuguriorum	***Climbing convolvulus, NZ bindweed***
Muehlenbeckia australis	***pohuehue***
Muehlenbeckia complexa	
Parsonsia heterophylla	***kaihua, N.Z. jasmine***
Rubus australis	***swamp lawyer***

Ferns

Asplenium oblongifolium	***shining spleenwort***
Asplenium polygonum	***sickle spleenwort***
Asplenium flaccidum	***hanging spleenwort***
Blechnum chambersii	***lance fern, nini***
Blechnum filiforme	***thread fern***
Blechnum novae-zelandiae	***kiokio***
Cyathea dealbata	***silver fern, ponga***
Cyathea medullaris	***black tree fern, ,manamku***
Dicksonia squarrosa	***tree fern***
Histiopteris incisa	***mata, water bracken***
Hypolepis ambigua	
Hypolepis distans	
Leptopteris hymenophylloides	***Crape fern, Heruheru***
Microsorum pustulatum	***kowaowao, hounds tongue***
Polystichum neozelandicum subsp. zerophyllum	
Pteridium esculentum	***rauaruhe, bracken***

Sedges

Carex geminata	
Carex virgata	
Histiopteris incisa	***water fern, matata***
Isolepis prolifer	
Isolepis reticularis	

Rushes and allied plants

Juncus pallidus
Baumea tenax
Schoenus maschalinus

Remaining Monocotyledonous plants

Phormium tenax	***harakeke, flax***	***Centella uniflora*** ***Hydrocotyle novae-zelandiae agg.*** ***Stellaria parviflora***

Composite herbs

Senecio hispidulus ***Senecio minimis***	***fireweed***	

Dicotyledonous herbs other than Composites

Birds

Tui
Bellbird
Grey warbler
Fantail

Appendix 27.J

Combined Plant Species list for MacKays to Peka Peka and Surrounds

Appendix 27.J: Combined plant species list for MacKays to Peka Peka and surrounds

Plant species lists developed by Pat Enright and Matiu Park for proposed MacKays to Peka Peka Expressway Project based on botanical surveys undertaken during October 2010, November 2010 and January 2011.

Gymnosperm trees and shrubs

Dacrycarpus dacrydioides	***kahikatea***
Podocarpus totara	***totara***
Prumnopitys taxifolia	***matai***

Dicotyledonous trees and shrubs

Alectryon excelsus subsp. excelsus	
titoki	
Brachyglottis repanda	
rangiora	
Carpodetus serratus	***putaputaweta, marbleleaf***
Coprosma aerolata	
Coprosma crassifolia	
Coprosma grandifolia	
Coprosma propinqua	
Coprosma propinqua subsp. propinqua	
Coprosma propinqua x areolata (various hybrids)	
Coprosma propinqua x robusta (various hybrids)	
Coprosma repens	***taupata***
Coprosma rhamnoides	
Coprosma robusta	***karamu***
Coprosma robusta x propinqua	
Coprosma robusta x propinqua (hybrid)	
Coprosma tenuicaulis	***swamp coprosma***
Coprosma tenuifolia	***swamp coprosma***
Dysoxylum spectabile kohekohe	
Geniostoma ligustrifolium var. ligustrifolium	
	hangehange
Griselinia lucida	***puka, broadleaf***
Hedycarya arborea	
pigeonwood	
Hoheria sexstylosa (P)	
houhere, lacebark	
Knightia excelsa	***rewarewa***
Korthalsella salicornioides	***dwarf or leafless mistletoe***
Kunzea ericoides agg.	***kanuka***
Leionema nudum – planted	
Leptospermum scoparium	***manuka***
Macropiper excelsum subsp. excelsum	***kawakawa, pepper***
tree	
Melicytus ramiflorus	***mahoe, whitey wood***
Myoporum laetum	
ngaio	
Myrsine australis	***red matipo, mapou***
Olearia solandri	***coastal tree daisy***
Pennantia corymbosa	***kaikamako***
Pittosporum crassifolium	***karo***
Pittosporum eugenioides	
tarata, lemonwood	
Pittosporum tenuifolium	***kohuhu***
Pseudopanax - various hybrids	
Pseudopanax arboreus	***five finger***
Pseudopanax crassifolius	***lancewood***
Pseudopanax hybrids (garden escapes)	
Solanum aviculare	***poroporo***
Solanum laciniatum	
poroporo	
Syzygium maire	
swamp maire	

Monocotyledonous trees and shrubs

Cordyline australis	***ti, cabbage tree***

Dicotyledonous lianes and related trailing plants

Calystegia sepium subsp. roseata	
pink bindweed	
Calystegia tuguriorum	***Climbing convolvulus, NZ***
bindweed	
Clematis paniculata	***puawhangana***
Muehlenbeckia australis	***pohuehue***
Muehlenbeckia complexa	
Parsonsia capularis	
Parsonsia heterophylla	***kaihua, N.Z. jasmine***
Rubus australis	***swamp lawyer***
Tetragonia implexicoma	***New Zealand spinach***

Ferns

Asplenium bulbiferum	***Hen and chicken fern, pikopiko***
Asplenium flabellifolium	
Asplenium flaccidum	***hanging spleenwort***
Asplenium gracillimumhen	***chicken fern***
Asplenium oblongifolium (unc)	***huruhuruwhenua, shining***
spleenwort	
Asplenium polyodon	***sickle spleenwort***
Azolla filiculoides	***water fern***
Blechnum chambersii	***lance fern, nini***
Blechnum filiforme	***thread fern***
Blechnum hybrid	
Blechnum minus	***swamp kiokio***
Blechnum novae-zelandiae	***kiokio***
Cyathea dealbata	***silver fern, ponga***
Cyathea medullaris	***black tree fern, ,manamku***
Dicksonia squarrosa	***tree fern***
Gleichenia dicarpa / G. microphylla hybrid	
Gleichinea microphylla (hybrid – TBC)??	
Histiopteris incisa	***mata, water bracken***
Hypolepis ambigua	
Hypolepis distans (unc)	
Pseudognaphalium luteoalbum agg. **pukatea**	
Leptopteris hymenophylloides	
Crape fern, Heruheru	
Microsorum pustulatum subsp. pustulatum	
	kowaowao, hounds tongue
Paesia scaberula	***matata, scented fern***
Polystichum neozelandicum subsp. zerophyllum	
Pteridium esculentum	***rauaruhe, bracken***
Pteris tremula	***tender brake***
Tmesipteris elongata	
fork fern	

Orchids

Microtis unifolia	***onion leaved orchid***
Simpliglottis cornuta	***duck orchid - note pale white***
form.	
Thelymitra pauciflora agg.	

Grasses

Austroderia fulvida	***toetoe***
Microlaena stipoides	***meadow rice grass, slender***
rice grass	

Sedges

Baumea rubiginosa	
Baumea tenax	
Baumea teretifolia	
Carex dipsacea	
Carex geminata	
Carex inversa	***creeping lawn sedge***
Carex lessoniana	
Carex secta	
Carex virgata	
Cyperus ustulatus	
Eleocharis acuta	
Eleocharis gracilis	***slender spike sedge***
Histiopteris incisa	***water fern, matata***
Isolepis distigmatosa	
Isolepis prolifer	
Isolepis reticularis	
Schoenus mascalinus	

Rushes and allied plants

Baumea tenax	
Ficinia nodosa	***wiwi, knobbly club rush***
Juncus articularis	
Juncus australis	
Juncus edgariae	
wiwi	
Juncus pallidus	
Juncus planifolius	***grass-leaved rush***
Juncus sarophorus	
Luzula picta var. picta	
Schoenus maschalinus	

Remaining Monocotyledonous plants

Dianella nigra	***blueberry***
Lemna minor	
Phormium tenax	***harakeke, flax***
Potamogeton cheesemanii	
red pondweed	
Triglochin striata	
Typha orientalis	***raupo***

Composite herbs

Cotula coronopifolia	***batchelors button***
Euchiton involucratus	***cudweed***
Senecio minimus	
Senecio hispidulous	

Dicotyledonous herbs other than Composites

Centella uniflora
Dichondra brevifolia (AG)
Dichondra repens
Drosera binata (unc)
Gonocarpus micranthus
Haloragis erecta subsp. erecta
toatoa, fireweed
Hydrocotyle moschata
Hydrocotyle novae zelandiae agg.

Hydrocotyle novae-zelandiae (NZ).	
Hydrocotyle pterocarpa	
Hypericum pusillum	***swamp hypericum***
Leptostigma setulosa	
Lobelia anceps	
Microtis uniflora	
Myriophyllum propinquum	***water milfoil***
Nertera depressa	
Nertera scapanoides	
Persicaria decipiens	
Stellaria parviflora	
Viola lyallii	***haaka, New Zealand native***
violet	

Mosses

Cyathophorum bulbosum
Sphagnum sp.