OTAKI RIVER ENVIRONMENTAL STRATEGY

Opportunities to Enhance the Otaki River Environment

March 1999

THE REGIONAL COUNCIL

caring about you & your environment

there's a future here

KAPITICOAST DISTRICT COUNCIL

OTAKI RIVER

ENVIRONMENTAL STRATEGY

Opportunities to Enhance the Otaki River Environment

March 1999

Publication No: WRC/FPSA-G-99/06

Produced by:
Flood Protection Group
Wellington Regional Council
and
District Planner
Kapiti Coast District Council

Prepared by:
André Visser, Resource Planner
Flood Protection Group (Strategy and Assets)

THE REGIONAL COUNCIL
caring about you & your environment

there's a future here
KAPITICOAST
DISTRICT COUNCIL

Foreword

This Strategy is the combined effort of the Wellington Regional Council and Kapiti Coast District Council. It was developed to help co-ordinate the activities of the different agencies, community groups and landowners involved in protecting and improving the river environment.

The Strategy is the result of the very good working relationship that exists between the two councils. This relationship is crucial for effective resource management - especially in areas such as rivers where there are a large number of cross-boundary issues.

The support of Ernie Gates, the previous chairman of the WRC Landcare Committee, and Denis Ferrier, the previous chairman of the KCDC Planning and Environment Committee was a factor in the successful development of this document.

The Strategy is important because it is a proactive document. It sets out recommendations for action beyond those carried out within normal statutory and operational frameworks. On-going commitment to these recommendations will ensure continued improvement in the river environment.

_____ _____

Dick Werry
Chairman, Landcare Committee

Wellington Regional Council

Diane Ammundsen
Chairperson, Planning & Environment Committee
Kapiti Coast District Council

Contents

Appendices

Figures

Photographs

1. Introduction

1.1 The Purpose of the Strategy

Numerous agencies, community groups and landowners have an interest or a role to play in the Otaki River and its environs. Each of these parties has their own objectives for managing, protecting and enhancing the river environment. Overall co-ordination of their different roles is necessary to ensure that they are consistent, and to ensure that all opportunities and priorities for environmental enhancement are realised.

This Strategy is a first step in providing this overall co-ordination. It identifies a large number of enhancement opportunities within a consistent framework. Therefore it is useful reference point for anybody with an interest in the river environment. It will also ensure that management options, as they occur, are consistent with a long-term vision.

The Strategy is a living document, which will be reviewed and updated from time to time. Only limited consultation was undertaken to produce this initial version (see Section 1.3 Methodology). However future revisions will allow for on-going public input. Groups such as 'Friends of the Otaki River' will be vehicles for these changes (see Appendix B).

1.2 Who is the Strategy For?

The Strategy is the combined effort of Kapiti Coast District Council and Wellington Regional Council.

1. Wellington Regional Council (WRC) Flood Protection Group

The Regional Council's Flood Protection Group (FPG) initiated the Strategy. The FPG is responsible for mitigating the effects of flooding on the community. To achieve this they undertake flood protection works from the river mouth to just above below Otaki Gorge. The area they work within is called the River Corridor (see Figure 10 and Appendix A). WRC own a large part of the River Corridor.

When implementing these flood protection measures Council intend to enhance and protect the natural character of the River Corridor. This objective is a response to public desire for environmental enhancement that became apparent during the floodplain management planning process. The Strategy, which is an outcome of this process, will guide Council's efforts to enhance the River Corridor.[1]

[1] The *Otaki Floodplain Management Plan, 1997* is the result of a five stage planning process. This process was undertaken to determine the community's requirements for flood mitigation and the best methods of meeting these requirements. It provides direction to WRC's activities in the River Corridor.

2. Kapiti Coast District Council (KCDC)

KCDC is responsible for land use management of the River Corridor and its environs, excluding the bed of the river. Its instrument for regulation and control is the District Plan.

KCDC will use the Strategy as a reference in relation to:

- its statutory land management functions
- its operational works
- any proactive efforts to improve the river environment

3. Other Parties

The Strategy could also be used as a reference by other agencies, groups and individuals with an interest in the river. These include:

- Iwi
- Department of Conservation
- Fish and Game Council
- Community groups
- Environmental organisations
- Private landowners

These parties will be able to use the Strategy to identify specific opportunities in the River Corridor where they could carry out environmental work (such as the planting of native trees). The Strategy will also be useful as a guide to the types of government support available to groups and individuals who wish to improve the river.

The recommendations in the Strategy place no additional obligations upon any of the parties involved. Instead the recommendations are actions which they can chose to adopt if funding is available.

Due to limited resources, the roles and objectives of private landowners and community groups are not specifically addressed in the Strategy.

1.3 Methodology

The vision for the river described in Section 3.2 is central to this document. It provides the objectives for all the recommended actions that follow. Local input was used in developing this vision so that it would reflect community values. This was achieved by holding a meeting of certain local people with an interest in the river. The principal recommendations of this group - revegetation and improved public access - have been adopted as the core objectives of the Strategy.

Two studies of the river were undertaken to develop the Strategy. One was a landscape/recreation study carried out by Shona McCohan of Boffa Miskell Ltd. The other was an ecological survey undertaken by Isobel Gabites. The landscape assessment was limited to a literature study combined with a one-day familiarisation site visit. The ecological study involved a literature study and a three-day site visit. The literature reviewed is listed in the Bibliography.

The results of these studies have been pulled together into a consistent set of recommendation which address all three environmental values.

Both of these studies resulted in a set of recommendations for specific reaches of the river and these recommendations were incorporated into the Strategy. Not surprisingly, the landscape reaches differed from the ecological reaches. However, to make the Strategy user-friendly, the reach boundaries were adjusted to produce a single set of reaches that combine the ecological as well as landscape/recreational recommendations (see Recommendations for Each Reach). Inconsistencies between the two surveys were weighed up; to produce recommendations that strike a balance between ecological and recreational/landscape values.

The ecological 'Domains' identified by Isobel Gabites, which are a basis for plant species selection, have been mapped separately (see Section 5). Any boundary adjustments of these Domains would have made the recommendations inaccurate.

Other existing methods of environmental protection and enhancement are described in the Appendices to provide the reader with a complete overview if s/he requires it.

2. The Scope of the Environmental Strategy

2.1 The Strategy Places No Obligation on the WRC and KCDC Beyond their Existing Statutory Responsibilities

It is acknowledged that:

- WRC and KCDC have their own mandate and responsibilities
- one party cannot prescribe what another might do
- WRC and KCDC have limited financial resources, and costly objectives recommended in the Strategy may only be achieved over a long period
- the rights of private landowners within the river environment must be respected

Therefore, the Strategy is flexible, relying on the good will and co-operation of all agencies involved.

2.2 The Geographical Area Covered by the Strategy

The Strategy covers the River Corridor as defined in the KCDC District Plan (see Appendix A). In some cases it also makes recommendations which extend beyond the boundaries of the River Corridor. This Strategy deals with the length of the River from the Estuary to the beginning of the Gorge.

A more extended study of the upper catchment was not possible because of limited funds.

2.3 The Strategy is a Long-term Plan Which Will Only Be Realised in Stages

The Strategy contains recommendations for significant changes in the river environment. These changes can only be implemented incrementally, as funds and opportunities become available.

It is realistic to suggest that all the aims of the Strategy could be achieved in 40-50 years time.

2.4 The Strategy Does Not Address the Effects of Routine Flood Protection Works

An Environmental Code of Practice is being developed by WRC (FPG), in addition to the Environmental Strategy. Together the two documents will provide a complete environmental framework for WRC's flood protection activities. The Strategy addresses the long term protection and enhancement of the river environment, and the cumulative effects of flood protection works. In contrast, the Code of Practice addresses the immediate effects of routine flood protection works.

The Environmental Code of Practice is a generic document that applies to the Waikanae, Otaki and Hutt Rivers.

Photograph 1: The highly modified lower Otaki River landscape

3. Issues and Objectives

3.1 The Issues - The Current State of the River Environment

The Otaki River environment has changed enormously since European settlement. The principal causes have been:

- the extensive clearance of lowland forest for farming, including the removal of riparian vegetation
- the introduction of weeds, pests, and cattle
- flood protection works that have restricted river to a single channel.

These changes have had huge impacts on the natural character of the river.

Visually the river is now dominated by stopbanks and unbroken bands of willows that cut it off from the surrounding landscape. Landscape quality is generally low to average in the middle reaches of the river but of higher quality in the gorge and estuary/river mouth reaches.

The ecological landscape is dominated by exotic species that are adapted to survival amidst predation and disturbance. The original ecological processes have been severely disrupted, and the quantity and variation of species has been reduced. Few natural sites remain within the River Corridor itself.

Public access to the river is limited, firstly, by the comparatively few roads which lead to the river and, secondly, by the significant proportion of privately owned land within and adjacent to the River Corridor. This restricts the recreational opportunities such as walking, fishing, hunting, canoeing, swimming and picnicking. Because of the limited access points, people who explore the river are obliged to return by the same route if they are not to trespass (or wet their feet by crossing the river!)

On the other hand, the river mouth area gets a lot of recreational use and is valued for its undeveloped character and easy access. It is also one of the most ecologically important parts of the river. It is a rich breeding ground for marine, aquatic and terrestrial wildlife species, with diverse habitats and stressful environmental conditions.

This has resulted in a significant conflict between natural processes and human recreational interests. The river mouth beaches, especially on the north bank, have become riddled with tracks and roads.

This, and subsequent roaming of dogs and bikes:

- reduces the undisturbed bird roosting and nesting opportunities
- introduces weeds
- opens up vegetation that relies upon aerodynamic stability for its vigour

The use of vehicles and motorbikes may also impact on other recreational use.

3.2 The Objectives - A Vision for the River Environment

Despite all the modifications, the river has a lot going for it. This derives largely from:

- the remnant native vegetation on the plain
- the coastal swamps
- the scattered totara on the river terraces
- the bush remnants on the steep terrace edges
- the native forest visible on the slopes of the mountain backdrop

These provide the basis for larger and biotically richer areas, and in landscape terms, give the floodplain a recognisable local identity based on its natural character: - a 'sense of place'.

This section describes the qualities of the river environment that we want to protect and improve. It provides direction for the Strategy's recommendations.

This vision for the river deals with the natural character of the river environment, as well as our relationship with that natural character.[2] That includes landscape, ecosystems (both indigenous and exotic), public access and recreation.

The Strategy does not seek to re-establish the natural environment that existed before human habitation. This would be unrealistic and would exclude the community.

[2] 'Natural character' can be thought of as the extent to which naturally occurring ecology and/or physical processes of the river environment remain intact.

1. The Otaki River as a Greenbelt

The role of the Otaki River as a greenbelt is the central concept in this vision for the river environment. All the recommendations in this Strategy feed into, or are consistent with, this concept. The objective is to protect and improve the natural character of the land adjacent to the river. This will provide a corridor of particular landscape, ecological and recreational value that connects the coast and inland hills.

This concept does not exclude development but requires it to be discrete and of low density.

2. Landscape

The Otaki River is an important visual link between the Tararua Ranges and the coast. It is also significant as a distinct feature that provides variation in the landscape of the coastal plain.

The landscape qualities that are sought for this area are:

- a large proportion of natural vegetation, habitats and landforms
- sufficient vegetation to enhance the river as an unbroken natural feature
- variation, with a mix of enclosed bush, open spaces, and visual links with the surrounding rural landscape
- minimal structural development

3. Ecosystems

The greenbelt will be an ecological corridor providing for the distribution, feeding, breeding and roosting needs of birds, fish, invertebrates and plants within a continuous habitat. The aim then is to restore the native and natural biodiversity of the area where possible. Not only is the aim to increase the volume and diversity of indigenous species, but also the natural ecological processes and systems.

4. Access and Recreation

Providing better public access, especially more points of access to the river, is the key to improving recreational opportunities. This will enhance the river as a corridor for recreation, used for walking, fishing, hunting, canoeing, swimming and picnicking.

There is also potential to extend the recreational value of the river by developing linkages to adjacent areas. These could include round trips for walking, cycling or horse riding.

However, the disturbance and destruction of natural ecosystems that can occur as a result of public access to the river must also be recognised. The aim therefore, should be:

- to establish a track network which provides for good recreational opportunities
- to close down tracks which are not part of the track network

5. Flood Protection Works

While many of the flood protection measures are not ideal from an environmental point of view[3], they are essential to protect the community from flooding. Therefore, a principle of the Strategy is to look for opportunities to mitigate effects, improve the existing environment and make positive use of flood protection measures, (such as using stopbanks for public access.) Where possible, low cost improvements are suggested that can be combined with major or routine improvements.

Photograph 2: Native plants used on the Otaki River

[3] P.102, *Draft Otaki Floodplain Management Plan, May 1998*

General Recommendations

4. Environmental Enhancement Techniques

4.1 Summary

Planting Techniques

- inter-plant with local native species to diversify the visual character of plantings
- landmark plantings
- 'light gap' planting
- nursery crops
- give priority to planting wet ground
- give priority to species which are known to germinate readily and regenerate freely in open or modified sites
- planting around tree lucerne
- experiment with coppicing mahoe
- 'seal off' willow plantings
- allow for the natural regeneration of native plants

Controlling the Effects of Weeds, Pests and Cattle

- fence off stock from the riparian areas
- weed control
- pest control

Enhancing Landscape and Public Access

- reduce the width of willow planting in the berm area
- set back the plantings of willows from the river edge
- maintain clear access at regular intervals through the willows

4.2 Planting Techniques

1. Inter-plant with local native species to diversify the visual character of plantings

This is feasible towards the back of the plantings since the willow protection is most essential at the river edge.

2. Landmark plantings

This involves planting key landmark locations identified specifically as enhancement projects (like the Chrystall's Bend pond area) with well-planned planting and maintenance programmes. In the long term, as the planting develops, these locations will become landmarks along the river, adding to its visual interest.

The aim of landmark planting of natives is to maximise their impact and success. If native planting is implemented in random locations and small areas, it will be harder to locate and its maintenance more likely to be overlooked.

3. 'Light gap' planting

One of the problems of mixing native and willow species is that few New Zealand plants thrive under deciduous trees, especially in windy sites. Many of our species that are shade tolerant as seedlings also require stable, humid air of a complete canopy to grow well. Winter exposure is not beneficial. Seedlings that are light demanding, on the other hand, do not appreciate annual shading by leafy willows.

One solution is to deliberately create 'light gaps' in willow plantings. Within these light gaps establish groups of light-demanding pioneers such as coprosmas or mahoe in combination with shade tolerant species. This is an economical way of introducing fruit and flower-bearing plants into the riparian strip.

Birds should soon take over the distribution of seeds for further establishment of natives.

4. Nursery crops

'Nursery' crops are recommended for the shelter of young broadleaf species planted on the sides of stopbanks. This is because these sites are exposed to wind which is particularly damaging to plants on excessively drained stopbank slopes.

The inland sides of stopbanks are often permanently damp. There is less stress on suitably adapted plants, and vegetation programmes are likely to be more successful and require less sheltering.

5. Give priority to planting wet ground

The easiest areas to revegetate will be those with permanently wet soils that can be planted with wetland species. There are several sites on the south bank in Domain I and on private land in Domain II, which are suitable for planting programmes. Blackberry is likely to be the main weed threatening successful plantings.

6. Give priority to species that are known to germinate readily and regenerate freely in open or modified sites

The best way to optimise value for money is to concentrate on species that are known to germinate readily and regenerate freely in open or modified sites. Generally speaking, riverbank plantings should concentrate on using adventives such as kowhai, manuka, hebe, broom, tutu, toetoe, tauhinu and karamu for rapid spread and resilience to flooding.

On stable ground, early succession plants which attract birds (karamu, poroporo, Coprosma rhamnoides, mahoe and kawakawa) will achieve rapid results (check the appropriate species recommended in Domain descriptions).

7. Planting around tree lucerne

It is logical to concentrate new plantings where there is tree lucerne, which will already be attracting bird life, and providing year-round shade.

8. Experiment with coppicing mahoe

Several native tree species can be induced to coppice in the same way that willows naturally coppice and provide a dense thicket of stems to impede floodwaters. One of these species is mahoe, which is a common component in the floodplain vegetation.

It is suggested that an experimental area for trialling mahoe coppicing be created within Domain II (which has optimal conditions for mahoe growth).

9. 'Seal off' willow plantings

'Sealing off' a stand of willows as completely as possible from wind is another way of encouraging shelter-demanding forest species within the stand. This can achieved by planting dense shelterbelts of fast growing, light-demanding forest edge species such as:

- poroporo
- large-leafed coprosmas
- kawakawa
- mahoe

Suitable 'interior' species are listed in Section 4.

These planting patterns are suited to large clusters of willows that will be allowed to mature.

10. Allow for the natural regeneration of native plants

Where possible, willows should not be cut or replanted, to allow for the natural regeneration of native plants. Conversely, do not plant natives where willows will be cut on an ongoing basis.

4.3 Controlling the Effects of Weeds, Pests and Cattle

1. Fence off stock from the riparian areas

Stock should fenced off from riparian areas:

- to allow the establishment of palatable species
- to prevent stock gaining access to the watercourses where they can do damage, pollute, and introduce weeds

2. Weed control

The vegetative character of an alluvial riverbed is one of change and of extremes of heat, wind, drought and inundation. The plants that establish in these stressful sites are adventives that germinate promptly, and establish strong roots. A great number of exotic weeds are perfectly adapted to these conditions and will compete successfully with native species.

Greater priority must be given to weed control along a riverbed than on stable country – especially as the seeds will be distributed by water in addition to wind and birds. All modifications to the riparian environment must anticipate the weed control requirements. There are different weeds to target in each ecological domain.

3. Pest control

It is anticipated that different pests become a priority in different reaches of the river. In Domain I (sand country) wild cats, stoats and rabbits probably present the greatest ecological threats. In Domain II (seasonally dry alluvial plains) possums and magpies, and in Domain III (humid alluvial plains and foothills) possums, rats, stoats and on the loess hillslopes rabbits and hares.

4.4 Enhancing Landscape and Public Access

1. Reduce the width of willow planting in the berm area

The need for extensive willow planting in the berm areas should be accessed on a site by site basis prior to planting. Willows should not be planted where they are not necessary.

2. Set back the plantings of willows from the river edge

Where possible willows should be set back from the river edge. For example, where there is alternative bank protection such as riprap.

3. Maintain clear access at regular intervals through the willows

This serves a dual purpose, allowing for routine river inspections as well as public access.

5. Species Selection

The biogeoclimate zones ("Domains") that the Otaki River passes through are mapped in Figure 1. These Domains gives us an indication of what environmental factors are limiting, or allowing, plant growth. This lets us predict what native plants are best suited to planting programmes in these different zones (hence Figure 1 is labelled 'Planting Zones').

Similarly we might learn what energy and habitat dynamics are influencing wildlife distribution and predict the effects human intervention in the natural river system is likely to have. Recognising the characteristics of Domains lets us plan enhancement and mitigation works economically and effectively.

The Domains and sub-zones are based on a correlation between climatic factors, topography and substrate characteristics, which results in distinctive, recognisable biological boundaries. Domains identified in the broad mapping techniques applied to the Wellington Region by Gabites 1998, form the basis of this more detailed zonation.

5.1 Domain I

Dry Duneland and Sandplain with Wetlands

The coastal climate here is very dry (1011mm mean annual rainfall) with little seasonal variation in rainfall (winter is the wettest season). The predominant winds are from the north to northwest (i.e. parallel or oblique to the coast), or in calm conditions a south-westerly sea breeze often prevails from late morning.

These winds are dry and salt-laden and this combination determines the biotic communities on dry dunes where soils are generally thin to non-existent and not very fertile.

Streams in the sand country are deep, narrow, meandering channels providing excellent eel, freshwater mussel and fish habitat unless polluted by excessive farm run-off or trampled by stock. Swamps and estuaries formed behind the foredunes, on the other hand, are often shallow, ephemeral and water is warm. Wildlife habitat is improved by the shading of the water in these sites by riparian or swamp vegetation. These low-lying areas absorb much of the energy and volume of freshwater in a flood.

The flat sand plains provide important roosting habitat for coastal birds, and the swamps and waterways, both ephemeral and permanent, provide waterfowl habitat. The dominance of grass and sedge species in this zone (especially pingao, spinifex, toetoe, sea-rush, raupo and now the exotic pampas and marram) attracts finches and larks.

Figure 1: Planting Zones

Clearly, in this zone micro-conditions are important biotically and create diversity in an otherwise limited biotic community. *This is arguably the most important zone in the floodplain strategy, requiring the most care and foresight* – it is a rich breeding ground for marine, aquatic and terrestrial wildlife species, with diverse habitats and stressful environmental conditions. It is also the zone with the greatest interaction and potential conflict between natural processes and human recreational interests.

5.1.1 Sub-zone (i)

- coastal foredune and sandy beach
- relatively homogenous character
- frost-free
- ground conditions are hot and dry, usually experiencing summer drought
- estuarine areas of brackish or salt water occur behind the foredunes

Planting Suggestions

Suitable Species on dry Foreshore	**Suitable Species around Brackish Estuarine Areas**	**Exotic Plant Threats**	**Replacement Policy**
Spinifex hirsutus (spinifex) *Desmochoenus spiralis* (pingao) *Muehlenbeckia complexa* (pohuehue) *Acaena* sp. (sand piripiri) *Coprosma acerosa* (sand coprosma) *Pimelea arenaria* (shore pimelea) *Coprosma repens* (taupata).	*Leptospermum scoparium* (manuka) *Plagianthus divaricatus* (marsh ribbonwood) *Phormiun tenax* (harakeke) *Juncus maritimus* (sea rush)	****** (boxthorn)	******** (marram) with *Spinifex hirsutus* (spinifex)

5.1.2 Sub-zone (ii)

- older dunes and sand plain
- diverse micro-climates and niches
- ground conditions on the dunes are hot and dry, usually experiencing summer drought
- on the sand plains behind the foredunes the water table can be close to, or at, ground level and soils conditions are wet and cold
- frost becomes a major environmental factor on flat, open land sheltered from onshore breezes or the mild influence of the sea, from autumn to spring

Photograph 3: Fishing from Otaki Beach

Planting Suggestions

Suitable Species on Dunes and Dry Sand Plain	Exotic Weed Threats	Suitable Species in Permanently Damp Sites on Sand Plains	Exotic Weed Threats	Replacement Policy
Coprosma repens (taupata) *C. propinqua* *Kunzia ericoides* (kanuka) *Dodonea viscosa* (akeake) *Myoporum laetum* (ngaio) *Cassinia leptophylla* (tauhinu)	** (boxthorn) ** (pampas) *Ulex* *** (gorse) *** lupin	*Phormium tenax* (harakeke) *Cordyline australis* (cabbage tree) *Cortaderia toetoe* (toetoe) *Eugenia maire* (swamp maire) *Dacrydium dacrycarpus* (kahikatea) *Leptospermum scoparium* (manuka) in open water, rushes such as: *Typha orientalis* (raupo) *Cyperus ustulatus* *Carex secta* (niggerhead)	**** (blackberry)	*Pampas* **** (pampas) with *Cortaderia toetoe* (toetoe)

5.2 Domain II

Dry Alluvial Plains

This zone also experiences a dry (approximately 1011mm mean annual rainfall), hot climate with little seasonal variation in rainfall, and often heavy frosts away from the mild influence of the river or the foreshore, but the alluvial and fertile river-silt substrates have a marked influence on biotic communities. The dynamics of the river and its past and present floodplains dominate this Domain.

Plant life is limited to species which, although having a preference for fertile substrates, must also tolerate seasonal drought, low air humidity, excessive drainage, stony ground and in some areas frost as well. The result (in the past) has been a dense forest canopy of totara and matai with some titoki, with kawakawa and mahoe dominant sub-canopy species and an understorey of small-leafed shrubs such as *Coprosma rhamnoides* or *C. areolata*.

The riverbanks are areas of erosion and deposition characterised by adventive species (these days mostly weeds species but previously would have been dominated by toetoe, tutu, hebe, karamu, broom etc.). Where riverbank sites have been stabilised longer, a diverse, frost-free plant association of would grow alongside the river including tree ferns (probably *Dicksonia* species) and possibly kowhai and wineberry (although there is no direct evidence of these trees now).

An important aspect of this domain is the salt-water wedge (the furthest extent of salt-water up-stream during spring high tides). *This defines the winter whitebait spawning zone and special care should be taken to preserve, create and improve the habitat required.*

The hinterland has a significant influence on the river in this Domain, as ground water flows horizontally through terrace alluvials and into the riverbed. Although it is not within the scope of this strategy to encourage filtration planting on neighbouring properties, there are some sites where riparian planting has the additional benefit of filtering run-off and ground water from farmland.

5.2.1 Sub-zone (i)

Shifting banks, bars and islands near the coast - frost free

Planting Suggestions

Suitable plants for coastal shingle/silt banks	Main weed threats
Cortaderia toetoe (toetoe) *Coprosma repens* (taupata) *C propinqua* *Disphyma* sp. (iceplant) *Coriaria arborea* (tutu) *Hebe stricta* *Carmichaelia* sp. (NZ broom) *Cassinia leptophylla* (tauhinu) (rushes, etc.)	Lupin arboreus *Crocosmia* (Montbrettia)

5.2.2 Sub-zone (ii)

- alluvial waterway and riverbanks
- frost free
- wind is not a limiting factor

Planting Suggestions

Suitable adventive plants for riverbanks, stopbanks and rock groynes (open ground) ***(* suitable as nursery crop)***	Suitable plants for riverbanks (sheltered by willows) ***(* suitable as shelterbelts)***	Main weed threats
Cortaderia toetoe (toetoe) *Coprosma propinqua* *Coprosma repens* (taupata) *near the coast* *Coriaria arborea* (tutu) *Hebe stricta** *Carmichaelia* sp. (NZ broom) *Cassinia leptophylla* (tauhinu) *Melicytus ramiflorus* (mahoe) *Myrsine australis* (mapou)	*Macropiper excelsum* (kawakawa)* *Dicksonia squarrosa* (wheki) *Melicytus ramiflorus* (mahoe) *Coprosma robusta* (karamu)* *C. rhamnoides* *C. areolata* *Phymatorus postulatus* (Hounds tongue fern)	*Crocosmia* (Montbrettia)

5.2.3 Sub-zone (iii)

- alluvial terraces
- frosty

Planting Suggestions

Suitable Plants Open Ground ***(* suitable as nursery crop)***	**Suitable plants where shaded by willows** ***(* suitable as shelterbelts)***	**Suitable Plants on Wet Sites**	**Main Weed Threats**
*Kunzia ericoides (kanuka)** *Podocarpus totara* (totara) *Prumnopitys taxifolia* (matai) *Melicytus ramiflorus* (mahoe)* *Alectryon excelsum* (titoki) *Myrsine australis* (mapou) *Pennantia corymbosa* (kaikomako)	*Geniostoma ligustrifolia* (hangehange) *Dicksonia squarrosa* (wheki) *Melicytus ramiflorus* (mahoe)* *Coprosma robusta* (karamu)* *Phymatorus postulatus* (Hounds tongue fern) *Macropiper excelsum* (kawakawa) *Metrosideros perforata* (climbing rata) *Melicope simplex* (poataniwha) *Rubus schmedelioides* (bush lawyer)	*Phormium tenax* (harakeke) *Cordyline australis* (cabbage tree) *Cortaderia toetoe* (toetoe) *Eugenia maire* (swamp maire) *Dacrydium dacrycarpus* (kahikatea) *Laurelia novae-zelandiae* (pukatea)	Arum lily (damp sites)

5.3 Domain III

Humid Alluvial Terraces and Foothills

At the inland edge of the plains, and over the lowest foothills, there is a markedly different climate. Here there is a greater rainfall (1200-1400mm mean annual rainfall spread fairly evenly throughout the year) which is enough to encourage humidity-dependent tree species such as tawa, kohekohe and wharangi to dominate forest growth. Frosts are light to non-existent because of the proximity to night breezes drifting down off the higher hills and the movement of air down the Otaki Gorge. Totara and matai are still major components of the alluvial vegetation (and rimu is the common podocarp on hillslopes). The current dominance of totara on paddocks on the high southern terraces is most likely due to that species' relative tolerance of stock browsing unlike kohekohe and wharangi.

Note that the distinction between Domain II and III is not clear-cut.

On the low northern terraces there are soils which are prone to flooding and are both poorly drained and fertile (due to frequent silt deposition). With some shelter, the plant communities expected here would include more tawa, and other moisture-tolerant species such as pigeonwood, rangiora, nikau and swamp maire.

This is an important area for bird habitat enhancement as it has the potential for extending the forest food resource for tui and NZ pigeon in particular (for example, in winter tui eat fruits, but only native fruits, and kohekohe flowers are a major source of unseasonal nectar. Attracting NZ pigeon down onto the plains will be beneficial for regeneration of large-fruiting trees such as tawa and titoki).

On the raised southern alluvial terraces ground water flows horizontally into the river bed, carrying with it any chemicals and nitrate concentrations that have built up on the farmland.

Photograph 4: Wetland created during river realignment at Chrystall's Bend

5.3.1 Sub-zone (i)

- year-round rainfall; no summer drought
- frost-free to light frost
- fertile soils

Planting Suggestions

Suitable Plants for Open Sites *(* suitable as nursery crop)*	**Suitable Plants where Sheltered by Willows** *(* suitable as shelterbelts)*	**Suitable Plants on Damp, Silty Sites**	**Main Weed Threats**
Leptospermum scoparium (manuka)* *Solanum aviculare* (poroporo)* *Dysoxylem spectabile* (kohekohe) *Aristotelia serrata* (wineberry) *Pennantia corymbosa* (kaikomako) *Carmichaelia sp*. (NZ broom)	*Geniostoma ligustrifolium* (hangehange) *Melicope ternata* (wharangi) *Dysoxylem spectabile* (kohekohe) *Beilschmedia tawa* (tawa) *Brachyglottis repanda* (rangiora) *Pseudopanax arboreus* (five finger)* *Solanum aviculare* (poroporo)*	*Beilschmedia tawa* (tawa – requires shelter) *Brachyglottis repanda* (rangiora) *Hedycarya arborea* (pigeonwood) *Weinmannia racemosa* (kamahi) *Rhipogonum scandens* (supplejack)	*Passiflora mollisima (Banana passionfruit)* *Clematis vitalba*

5.3.2 Sub-zone (ii)

- mobile alluvium and steep stony banks in river corridor
- year-round rainfall; no summer drought
- frost-free

Suitable Plants for Open Sites *(* suitable as nursery crop)*	**Main Weed Threats**
Leptospermum scoparium (manuka)* *Carmichaelia sp*. (NZ broom) *Hebe stricta** *Kowhai microphylla* *Aristotelia serrata* (wineberry)	*Phytolacca octandra* (inkweed)

Photograph 5: Native bankside vegetation in the Upper Reaches

6. Proposed Public Access Network

Figure Two provides an overview of the network of existing and proposed public access both to and along the river. These pathways are also shown on the aerials of the river in Figures 5 to 9.

7. Other Methods of Protecting and Restoring the River Environment

There is a wide range of existing methods for protecting and restoring the Otaki River environment. These have described in the Appendices to allow the recommendations of this Strategy to be seen within the wider context. The relevant appendices are listed below.

Appendix B - Community and Tangata Whenua Involvement

Appendix C - Kapiti Coast District Plan

Appendix D - Open Space and Conservation Covenants

Appendix E - Land Information Memorandum

Appendix F - Public Ownership of the River Corridor

Appendix G - Water Quality and Quantity

Appendix H - Instream Habitat Requirements

Figure 2: Proposed Public Access Network

Recommendations for Each Reach

8. Reach One - Estuary to Pylons

8.1 General Recommendations

1. **Enhance backwaters and sluggish water shaded by banks or vegetation (WRC)**

   These sites are prime fisheries habitats. Therefore:

   - avoid earthworks in these areas
   - undertake enhancement plantings
   - create new backwaters where possible in the course of flood mitigation works

2. **Create new islands or shingle banks (WRC)**

   New islands or shingle areas should be created whenever old ones are removed, to provide roosting sites for coastal birds. These should be located away from riverbanks. Major works such as these should not be undertaken February to May and October to November.

3. **Plant riverbed sides with natives (WRC)**

   The objective is to use the stopbanks to provide the habitat naturally provided by stabilised dunes.

4. **Replace pampas with toetoe (KCDC)**

   This could occur when riverbanks are rock lined.

8.2 Recommendations for Specific Areas

North Bank

North bank river mouth area (KCDC)

The river mouth area has high recreational use and yet is also one of the most ecological sensitive areas of the river. The impacts of recreational users on the area are described in the issues and objectives section of this Strategy.

The following recommendations will help to control and reduce these effects.

1. Provide a well-maintained public walkway to enable people to reach the beach.

North Bank (cont.)

2. Close down unnecessary tracks. Aim to limit access along the inland banks of the estuary. (There is a need for a consultative process with regular users and residents, carried out in a way that they 'buy in' to any changes. Also monitoring is needed to ensure that track closure is not resulting in new tracks being created elsewhere).

3. Replant closed access tracks and other areas with natives. In particular, replace pampas with toetoe.

4. Develop a picnic area and toilet block. These should be located towards the housing area to reduce the need for vehicles to drive onto the beach.

5. The toilets should be designed and located to be unobtrusive. It is important that, while they are well maintained, the facilities and tracks provided are in keeping with the area's informal, undeveloped character.

6. On-site interpretation of the estuary habitat should be considered as a means of fostering appreciation and understanding of the special features to be seen in the estuary.

7. The question of unrestricted vehicle access onto the beach may need to be addressed at some stage. The low key, undeveloped nature of the beachfront with easy access to the river mouth for fishing and whitebaiting is clearly one of its attractions. However, motor bikes are already a problem[4] and, if numbers build too much, vehicles could detract from the atmosphere.

Ngatoko Stream (KCDC)

1. Advocate and assist in riparian planting along Ngatoko Stream.

2. Create a public walkway along Ngatoko Stream.

North Stopbank (WRC)

1. Plant the inland side of the north stopbank nearest the river mouth with natives as if it were a stabilised dune.

2. The transition from the enclosed inland river landscape to the wide, estuarine landscape is accentuated by the reduction in willow planting which characterises so much of the river. Willow planting that is proposed at the lower end of the riprap bank protection on the north bank would dilute this different character and it is recommended that alternative protection be investigated.

[4] P. 90, *1992 Environmental Investigations*

3. Open the north stopbank to public access.

South Bank

Remove stock (WRC)

Aim to securely fence off and remove all stock from the pylons out to the river mouth on the south bank. This should occur incrementally, with a concurrent weed control and planting programme, concentrating first on the wetter areas.

Whaka-pawaewae Wetland and Pahiko Drain (WRC/KCDC)

1. Plant the following areas:
   - the banks beside the Pahiko Drain
   - the backwater between Mangahanene Island and the south bank
   - Whakapawaewae Wetland
2. Reduce the options for human (dog and vehicle) access.
3. Ensure that good fish passage is provided for through the floodgates.

Mangahanene Island (WRC)

The flood mitigation scheme proposes to remove a significant part of the north side of Mangahanene Island in order to widen the main river channel and reduce erosion on the north bank. The channel on the south side of the island will be closed off. The top end of the closed channel will be planted - the rest will be left to revegetate naturally.

South bank walkway (WRC/KCDC)

The river berm right along this side of the river has considerable existing amenity value and makes a pleasant walking route along the stopbank track from the possible picnic area suggested near State Highway 1. It is in public ownership, and stiles over the fences indicate that it may already attract public use.

1. Formalise this public access by providing signs.
2. An issue that may need to be discussed further, is the point at which public access is to cease at the downstream end where the land passes out of public ownership.

Figure 3: Reach One - Estuary to Pylons

9. Reach Two - Between Pylons and Bridges

(270 metres below bridges)

9.1 Recommendations for the Whole Reach

Base Vegetation Enhancement on Existing Remnants

The nuclei for a diverse riparian vegetation already exists along this stretch, with mahoe (primarily), kawakawa, taupata and scattered coprosmas and tutu amongst the grasses, tree lucerne and weeds of the stopbanks. This is a stretch of the river with potential for self-enrichment. Any future willow planting should make allowance for these packets to expand.

Riverbank Cover

Larger trees should be encouraged to grow on the north stopbank, as any shading here will be beneficial to river life.

9.2 Recommendations for Specific Sites

North Bank

Public Walkway

This side of the river lends itself to being a public walkway because:

- the stopbank provides an easy walking route
- its elevation provides views out over the willow plantings
- the river berm is in public ownership
- it is the closest part of the river to the Otaki township

(The river itself is less accessible along much of this side, due to the relatively narrow berm at the base of the stopbank and the dense willow plantings in many places).

To enhance the walkway:

- provide walkway signs and public entry points
- clear access ways to the river with graded access down the stopbank
- provide some clearings on the river berm behind the protection plantings

North Bank (cont.)

- ensure that there are views out to the river where rip-rap bank protection reduces the need for willow planting

- plant more native tree species in well-defined groups behind the willows

Lowering Stopbank Height

The stopbank is taller than required for flood control purposes. Some stopbank reforming and undulations could be developed as part of these works. This would improve the river environment by reducing its dominance from within the River Corridor and reducing its visual effect as a barrier from outside the corridor. However, if any change in height were considered, it would make the walkway more interesting to vary the height, rather than having one standard specification - perhaps retaining one or two places at the existing height as viewpoints.

Winstones Aggregates Site

Winstones are considering relocating this shingle processing plant to the main Firths site upstream of SH1. This would not only remove an unsightly industrial use from the river berm area, but would also present an opportunity to develop public open space on land that is in public ownership and is easily accessible from the Otaki township.

Rehabilitation will need to be considered if Winstones Aggregates Ltd vacate the site. We recommend that the site be developed as a public entry point to the river environs. This might include:

- parking and picnic facilities

- access over the stopbank to the river

- parkland amenity plantings

The potential for habitat enhancement similar to that at Chrystall's Bend, with ponds or a lake, should be investigated. There is currently a pond on the site, which has apparently been excavated for use by the shingle plant, but the feasibility of retaining or extending this should be investigated. In this investigation include the matters set out below.

1. The recharge of water would be a critical consideration as to whether ponds would retain water permanently with adequate water quality.

North Bank (cont.)

2. A project like this might be one that could attract sponsorship as PR for private enterprise or grants from environmental trusts, etc.).

KCDC oxidation ponds

If the Winstones Aggregates site were to be developed as a public entry point, its value would be greatly enhanced by developing an improved connection to Riverbank Road. While the oxidation ponds are screened from Riverbank Road by planting, additional screen planting along the access road would improve the approach to the river.

Winstones settling ponds

The settling ponds area used to be the old refuse station prior to its relocation across the right of way. In the short term the area could however be improved with suitable screen planting. Relocation of the settling ponds would open up the Winstones Aggregates site towards the township with the potential for extending appropriate amenity plantings as a visual connection to the river.

South Bank

Willow planting (WRC)

The willow planting proposed along the south bank would adversely affect the variation and visual connection with the river. To mitigate this:

1. Maintain access ways through the willows to the river.

2. Maintain clear areas or set back willows from the river, where riprap bank protection is proposed.

WRC Farmland (WRC)

The farmland along the stopbank in public ownership presents one of the best opportunities for wetland development (wetland areas already exist with soggy ground and perhaps pools in the winter). Therefore:

1. The lease should not be renewed.

2. The area should be incrementally de-stocked (incremental to keep control of the planting and weed control programme).

3. The area should be planted in native species on the inner side of the stopbank (dense planting of harakeke, cabbage tree, maire, kahikatea and manuka).

Public access could be enhanced by separate bridal and pedestrian tracks.

South Bank (cont.)

Open parkland area (WRC)

1. The stopbank runs parallel to a natural cliff edge for some distance from SH1, where there is a very attractive parkland character of open ground with scattered amenity trees.

2. The stopbank creates a very obvious artificial barrier, effectively separating a significant part of the parkland from the river itself. The opportunity exists to move or realign the stopbank - setting it back along the natural cliff edge to open up this parkland area to the river.

Photograph 6: School children helping plant native trees at Chrystall's Bend

Figure 4: Reach Two - Between Pylons and Bridges (270m below bridges)

10. Reach Three - Bridge Area to Rahui

10.1 General Recommendations

Base Vegetation Enhancement on Existing Remnants

The nuclei for a diverse riparian vegetation already exists along this stretch, with mahoe (primarily), kawakawa, taupata and scattered coprosmas and tutu amongst the grasses, tree lucerne and weeds of the stopbanks. This is a stretch of the river with potential for self-enrichment. Any future willow planting should make allowance for these packets to expand.

Riverbank Cover

Larger trees should be encouraged to grow on the north stopbank, as any shading here will be beneficial to river life.

10.2 Recommendations for Specific Areas

North Bank

Access along the river (WRC/ KCDC)

1. Develop a continuous recreation route from SH1 to the Rahui area, eventually emerging at the Rahui Road end.
2. In a number of areas this route is dependent on either;

   - public ownership of what is currently private land in the River Corridor, or
   - negotiating public access over private land

   If the land is purchased private landowners adjacent to the recreation route may still have concerns about increased public access near their land. Ongoing consultation is recommended to ensure that their concerns are addressed and assistance with fencing and/or screen planting considered.

3. It is envisaged that the route will generally follow the stopbank and/or associated access track. However, below Chrystall's Bend the route should be brought out along the riverbank where there is riprap edging, for more variety in the setting. On these edges, planting can be kept back and clear views of the river gained.

North Bank (cont.)

4. As the access road is used as a haul road by the Winstones Stresscrete plant, there are potential conflict and safety concerns with recreational use. Discussion with Firths will be needed to resolve this, taking into account the feasibility of:

   - imposing speed limits on the trucks
   - setting aside one side of the road for recreation use
   - providing adequate warning signs for recreational users
   - diverting the recreation route off the haul road in the most frequently used part

SH1 access and parking area (WRC)

If public access is opened up on this side of the river, a parking area off SH1 should be considered. This should logically be located near the Stresscrete site entrance and some reorganisation would be required to separate the Winstones traffic from the public parking area. Discussions would be needed with Winstones. The entry point would need parking, some amenity planting and sign posting.

Between bridges and Chrystall's Bend (WRC)

1. Planting along the road frontage and riverbank vegetation currently screens the Stresscrete site reasonably well. However, two comparatively long stretches of riprap reinforcement are proposed along the riverbank. This is likely to result in considerable disturbance and may make the industrial site more visible from the bridge crossings.

2. Native planting in this area should be concentrated on the bank above the riprap, since willow plantings are not as necessary where riprap edging is in place.[5] This will introduce a contrast to the extensive willows currently visible upstream of the bridge crossings.

3. In addition, the potential for bringing the recreation route down from the haul road to the top of the rip-rap bank should be considered, since the Stresscrete plant would be screened from view. This could also solve the possible haul road conflicts mentioned above.

[5] WRC notes for consultants, N/6/21/16

North Bank (cont.)

Chrystall's Bend Rip-Rap Extension (WRC)

The existing riprap bank at Chrystall's bend is to be extended downstream in the near future. Native planting budgeted with this project would be best spent:

1. On inter-planting the existing native plantings where there are significant gaps.

2. On extending the native plantings behind the new riprap if the budget permits.

Chrystall's Bend Habitat Enhancement Project (WRC)

Continue maintenance, monitoring and in-fill planting.

Waimanu Stream access and planting (WRC/KCDC)

1. Create a public walkway linkage along Waimanu Stream to Rahui Road. This opportunity may arise when land titles are rationalised.

2. Advocate and assist in riparian planting along Waimanu Stream.

Plant between Chrystall's Bend and Rahui (WRC)

There are two good opportunities for native planting along this stretch.

1. 'Light-gap' inter-planting of willows marked on Aerial 3B (Figure 6). There should be an increasing intensity of native species towards Chrystall's Bend in order to encourage ecological linkage with that habitat.

2. 'Landmark' planting of natives at the back of the proposed realignment marked on Aerial 3C (Figure 7). Natives are more likely to survive in this area because of the plant stability that should be provided by the proposed debris fences. In due course, when these plantings mature they will provide a landmark to visually link the native vegetation on the cliffs opposite.

Native plantings in this stretch of the river should be concentrated in these two areas for maximum impact and easier maintenance.

South Bank

Existing SH1 rest area

The SH1 bridge crossing is a critical point on the river because this is where most people see the river and could be enticed to stop and enjoy it. However, the existing public rest area between SH1 and the railway serves as little more than a comfort stop for travellers. The cramped site between transport routes has little appeal as a picnic area and its relationship with the river is dominated by bridge structures.

Potential SH1 picnic area (WRC/ KCDC)

However, on the downstream side of SH1, the river berm area has considerable potential as a more extensive riverside picnic area.

1. The riverbank is relatively open with scattered amenity plantings and there is reasonable access to the river - a character that extends for some distance along the river.

2. The area could provide a much-improved base for the canoe slalom and instruction activities that occur in this vicinity and could be a pick up point for kayakers from up river.

The following changes are needed to develop the picnic area.

1. To ensure traffic safety:
   - widen and extend the vehicle access area on the west side of SH1
   - allow entrance to south bound traffic only

2. Provide vehicle access underneath the bridge, allowing vehicles from the existing rest area to reach the proposed picnic area.

3. Permit the both north and southbound traffic to exit the access point to the existing rest area. However, for traffic safety reasons only permit for the entrance of north bound traffic at this point.

4. Provide attractive entry sign posting.

5. Relocate the public toilets from the existing picnic area.

6. Provide picnic tables.

7. Maintaining access to the river through the riverbank willow plantings.

South Bank (cont.)

'Light gap' interplanting area (WRC) (Aerial 3A)

An area recommended for 'light gap' inter-planting of willows is identified on Aerial 3A (Figure 5). The objective will be to encourage the development of an understorey. This understorey will assist in buffering the river from adjacent horticultural activities.

Access track along the river (WRC/ KCDC)

Public access along river is realistically confined to the area downstream of the cliffs.

Entry points to the track (KCDC/WRC)

1. Ideally two entry points to this track should be the aim, so that a round trip can be achieved taking in Chrystall's Bend and Gorge Road. Two possible entry points are identified on Aerials 3A and 3B but opportunities for alternative entry points should also be born in mind. For instance, consent conditions for 'life style' block subdivisions might include providing access to the river.

2. There are already quite a lot of 'life style' block holdings on this side of the river, and horse riding may be a popular activity. This round trip has potential as a horse-riding route.

Old quarry entry point (Aerial 3A)

A Crown-owned access strip runs from Otaki Gorge Road through an old quarry site to the river. Apparently, this was once a picnic site. Investigate:

- the reasons for its lapse as a picnic site
- the potential for it to be developed as a public entry point

If it proves to be a worthwhile entry, amenity landmark plantings should be considered. Initially, this should be very low-key, simply providing vehicle parking, sign-posting and easy access to the river.

Potential 'landmark' planting and picnic area (Aerial 3B)

Harper's Road leads from Gorge Road to a farmhouse some little distance from the river. As this property extends into the River Corridor, the feasibility of obtaining public access to the river via this road should be investigated if the land is ever brought into public ownership.

If this is opened up as an entry point amenity landmark planting, vehicle parking, sign-posting and easy access to the river should be developed.

South Bank (cont.)

Native planting base of the cliff (WRC) (Aerials 3C & D)

The river is being straightened here, leaving a former river bend at the base of the cliff.

1. Investigate its potential for habitat restoration here.

2. Maximise the amount of native species planted in groyne development (minimise use of willows).

3. Concentration on a diverse selection of native species here will boost the potential for understorey development.

4. Adjacent totara-dominated paddocks should they be protected from stock.

5. Kowhai will be a useful addition to the riparian vegetation on stony banks along this stretch.

Potential enhancement project

This site straddles Reaches Three and Four. See Reach Four for details (Figure 9).

Photograph 7: Rafting on the Upper Otaki River

Figure 5: Reach Three (A) - Bridges to Rahui (Winstones)

Figure 6: Reach Three (B) - Bridges to Rahui (Chrystall's Bend)

Figure 7: Reach Three (C) - Bridges to Rahui (Hughes/Lutz)

Figure 8: Reach Three (D) - Bridges to Rahui (Rahui)

11. Reach Four - Upper Rahui

11.1 Recommendations for the Whole Reach

Extend Upstream Forest

Extend the up stream forest vegetation back down onto the plains. The aim is to strengthen the habitat links down on to the plains.

Riparian Planting of Streams

Advocate and assist in riparian planting of all tributaries.

11.2 Recommendations for Specific Sites

North Bank

Access (Aerials 3D & 4 Access Map)	1. Negotiate for public access to the river from the Rahui Road end. 2. Provide a walking/cycling/horse-riding route along stopbank/access track to link to next reach downstream.
Rahui Road picnic area (KCDC/ WRC)	If public access from the road end is gained develop a low key picnic area. This may need to be little more than some open grassy space with shade trees, particularly if an entry point is developed on the opposite bank.
Swimming holes	If there are swimming holes at the base of the cliff the top end of this reach could become a popular spot, provided that public access to the river from Rahui Road or Gorge Road could be achieved.

South Bank

Enhancement project (WRC)	This area straddles Reaches Three and Four. The proposed river realignment here provides the opportunity to develop a landmark planting behind and within the proposed willow band. Maximise the amount of native species. As far as possible minimise use of willows.

South Bank (cont.)

Potential recreation area (WRC)

1. This would be an ideal picnic area, with an attractive setting, relatively easy access to the river, and swimming holes in the outside of the bend? (See above). Drive on access would be preferable as it is over a kilometre from the Gorge Road.

2. Any subdivision of property in this reach into smaller 'life style' blocks should include public access negotiated as a condition of the subdivision.

3. Drive on access may also make it a useful pick-up point for canoe/rafting trips down the gorge.

Photograph 8: Upper Rahui reach looking towards Mansell's

Figure 9: Reach Four - Upper Rahui

Bibliography

A Guide for Consultants Working on the Environmental Strategy, File N/6/21/16, Wellington Regional Council.

Chrystall's Bend, Enhanced Habitat, Landscape Design Report, Wellington Regional Council, April 1995.

Draft Kapiti Coast District Leisure Plan (Stage II), APR Consultants for Kapiti Coast District Council, September 1997.

Draft Otaki Floodplain Management Plan, for the Otaki River and its Environment, Flood Protection Group, Wellington Regional Council, May 1998.

Kapiti Coast District Council Landscape Assessment, works Consultancy Services Limited for Kapiti Coast District Council, April 1994.

Kapiti Coast Proposed District Plan, Kapiti Coast District Council, December 1997.

Otaki River Floodplain Management Plan Environmental Investigations, Boffa Miskell Limited for Wellington Regional Council, June 1992.

Otaki River Floodplain Management Plan: Phase Three Investigations, Environmental Evaluation, Boffa Miskell Limited for Wellington Regional Council, May 1996.

Appendices

Appendix A: The River Corridor

(See Figure 10)

The River Corridor comprises the riverbed and the adjacent floodway. It is the minimum area able to contain a major flood and enable the water to pass safely to the sea.

In a flood the depth and speed of waters in the River Corridor are such that any development is likely to sustain major damage, and the evacuation of people and their possessions could be extremely difficult. The rise of water may be rapid. There may be a danger to life, and social disruption and financial loss could be very high.

Almost any development would worsen the impact of flooding on other nearby properties. The River Corridor is an area that, if only partially blocked, would cause a significant redistribution of flood flow. Therefore, appropriate land uses and development potential is extremely limited.

Appendix B: Community and Tangata Whenua Involvement

Community and tangata whenua involvement in the management of river is crucial for its long term environmental protection and enhancement. The Regional Council will adopt two key processes to ensure this involvement.

1. 'Friends of the Otaki River'[6]

To ensure community involvement in the Otaki Floodplain Management Plan the Regional Council will establish an informal community group called 'Friends of the Otaki River'. Protection and enhancement of the river environment is likely to be a central focus for this group.

Friends of the River will be an advisory group. They will also be used to transfer information between WRC, KCDC, tangata whenua, DoC and the community. WRC FPG staff will be responsible for co-ordinating the group, with meetings held on an agreed basis.

2. Annual Walkover of the River Corridor[7]

WRC (FPG) will hold an annual 'walkover' of the River Corridor with 'Friends of the Otaki River', DoC, KCDC, Fish and Game Council and Iwi. This inspection will ensure everyone is thoroughly informed about any proposed works, and has had enough time to air and discuss their concerns.

3. Landowner and Community Support

KCDC and WRC support the environmental protection and enhancement by of the river by encouraging the efforts of private landowners and community groups. Providing technical advice and materials does this. Budget restrictions determine the extent of this support.

6 *WRFMP* October 1997, p.78 *OFMP* June 1998, p.72
7 *WRFMP* October 1997, p.44 *OFMP* June 1998, p.43

Appendix C: Kapiti Coast District Plan

Land use controls in the Kapiti Coast District Plan enable KCDC to ensure that land uses are suitable for protecting and enhancing the river environment. These controls reflect KCDC's Strategic Plan and are consistent with the objectives of this Strategy.

1. Zones and Subdivision Areas

Subdivision is restricted within the District Plan areas and zones listed below (see Figure 1). These controls provide for a rural greenbelt along the river margins. They also ensure that the opportunities to develop a more extensive planted ecological corridor in the future are not lost.

The River Corridor Zone

The River Corridor is a zone in the District Plan. Subdivision is a non-complying activity within the River Corridor. Land uses are restricted to rural and open space recreation activities within the Corridor because of the high risk of flooding and erosion.

1% Flood Event level

Parts of the Otaki floodplain would be inundated in a major flood. These areas are identified on the District Plan as the 1% Flood Extent. Further subdivision and development in these areas is generally not possible, as each subdivided lot must have a building site above the 1% flood level.[8]

Restriction on Lot Size in the Rural Zone

As part of the green belt concept intensive subdivision is restricted on the rural land within the immediate visual context of the river to provide a buffer of compatible land uses along the River Corridor. Within the Rural Zone adjacent to the River Corridor there are three different areas with different subdivision restriction:

- Alluvial Plain - minimum lot size 4ha, average lot size 6ha[9]
- Coastal Dune Environment - minimum lot size 0.4ha, average lot size 4ha[10]
- Hill Country – minimum lot size 20ha

[8] *District Plan* D2.2.2 General Standards (e)
[9] *District Plan,* D.2.2.2 Subdivision (ii)
[10] *District Plan,* D2.2.3 Subdivision (i)

Figure 10: District Plan Areas and Zones

2. Esplanade Reserves and Esplanade Strips

Reserving Land as a Condition of Subdivision Consent

Esplanade Reserves and Strips taken as a condition of subdivision consent facilitate the creation of the greenbelt. Esplanade Reserves and Strips can be taken without compensation from allotments of less than 4ha. The maximum widths of esplanade reserves/strips that can be required are set out below.

	Width of Esplanade Reserve	**Width of Esplanade Strip**
Downstream of the SH1 bridge	20 metres (for recreation, access and hazard management purposes)	-
Upstream of the SH1 bridge	-	20 metres (for recreation, access, ecological and hazard management purposes)

Outside these areas Council will require reserve contributions in either cash or land. Where cash is taken, the money will be set aside for land purchase and enhancement in other areas.[11]

Establishing Esplanade Strips through Negotiation

Where subdivision is unlikely KCDC will negotiate with landowners to establish Esplanade Strips where subdivision is unlikely and/or public access is a high priority.

Council will seek co-operation with other agencies such as the Department of Conservation (DoC) and WRC in considering the need for acquiring Esplanade Reserves. Co-operation between agencies will be encouraged where there is a high priority for Esplanade Reserves that could protect a range of values.

3. Access Strips

Access Strips to Esplanade Reserves and Strips, sought as a condition of subdivision consent, are not effected by lot size. Therefore, it is a very useful method of providing for public access. Council will negotiate with landowners where public access is a high priority and purchase or use the reserve contribution requirement to secure an Access Strip. Each case will be looked at on its merits and will in part depend on available funds and type of subdivision.

[11] *District Plan* C.12, Policy 7)

Generally access strips shall be fenced and will be at least 3m wide. They shall include boardwalks where erosion to sand dunes by pedestrians is likely. Any structures on dune systems (including boardwalks) shall be designed so as to avoid deflecting or accelerating erosion. However, the conditions of access, fencing requirements and the provision of boardwalks will be negotiated when Council purchases the easement.[12]

4. Natural Heritage Sites

Ecological Sites and Outstanding Landscapes are identified in the Planning Maps and protected through policies and rules. For example the Otaki River mouth and estuary is an Outstanding Landscape and Significant Ecological Site and is protected from development that would be visually obtrusive.

Sites of ecological significance within the catchment are identified in Figure 11.

12 *District Plan*, H.7

Figure 11: Ecological Sites and Outstanding Landscapes

Appendix D: Open Space and Conservation Covenants

Land use covenants are a voluntary agreement between an agency and a private landowner. They are used to restrict land uses and protect landscape or habitat values on private land. While landowners enter into covenant agreements on a voluntary basis, they are binding on the landowner once they are signed and are registered against the title in perpetuity.

The District Council, DOC and the Queen Elizabeth II National Trust all have powers to enter into covenant agreements with landowners to protect areas of conservation value.[13]

Covenants are either established to protect open space values (Open Space Covenants) or conservation values (Conservation Covenants). DoC use either Conservation Covenants provided for in the Conservation Act 1987 or open Space Covenants provided for in the Reserves Act 1997. The Regional and District Council use Open Space Covenants provided for under the Reserves Act 1977. The Queen Elizabeth the Second National Trust use Open Space Covenants provided for under the Queen Elizabeth the Second National Trust Act 1977.

[13] The Department of Conservation use Conservation Covenants provided for in the Conservation Act 1987 or the Reserves Act 1977. The Regional and District Council use Conservation Covenants provided for under the Reserves Act 1977. The Queen Elizabeth The Second National Trust use Open Space Covenants provided for under the Queen Elizabeth The Second National Trust Act 1977. The majority of the 1200 covenants registered with the Trust protect Recommended Areas for protection or areas of similar conservation value.

Appendix E: Land Information Memorandum

A Land Information Memorandum (LIM) is a set of all the legal and resource information relating to a particular lot. LIMs are held by Kapiti Coast District Council and available to landowners for a small fee. The Environmental Strategy will be referenced on Land Information Memorandums (LIMs) for properties bordering or within the River Corridor. This will help to raise landowner awareness of the value of their properties as part of the river environment.

Appendix F: Public Ownership of the River Corridor

The following excerpt is from the *Otaki Floodplain Management Plan*, p.28.

> *"In the long term it is proposed that the remaining privately owned land in the River Corridor, 85 hectares, be brought into public ownership. Figure 9 in the Floodplain Management Plan shows the land currently in private ownership. There are a number of opportunities available for procuring this land, which include:*
>
> - *land swap*
> - *reserve contribution - as part of adjacent subdivisions*
> - *reserve contribution - funding from pool*
> - *purchase - by the Crown, the Council or KCDC*
> - *vesting*
>
> *Purchase of River Corridor land will be considered as a last resort. At this stage, none of the public agencies are able to commit to the funding for land purchase, though they agree with the long-term strategy. Individual cases will have to be considered on their merits when the opportunities arise."*

Appendix G: Water Quality and Quantity

1. Proposed Freshwater Plan for the Wellington Region

The Environment Section of WRC administers the Proposed Freshwater Plan. In the Plan, the Otaki catchment is recognises to have 'Regional Significant Amenity and Recreation Values', and is to be managed for 'Contact Recreation Purposes'. The Plan sets restrictions on discharges to and abstractions from the river aimed at achieving these goals.

The proposed abstraction of water from the Otaki River for the Otaki town supply will only be allowed to proceed if it meets the requirements of the Proposed Freshwater Plan, the Transitional Regional Plan and the Resource Management Act 1991.

Appendix H: Instream Habitat Requirements

1. Fish Passage

In accordance with the Freshwater Fisheries Regulations 1983 DoC has a responsibility to ensure that fish passage is maintained. Within the Otaki River catchment the Department is surveying instream structures to identify fish barriers. An initial list of structures that need to be modified to allow fish passage will soon be available. Ongoing surveys are likely to add further structures to this list. Modifications to these structures to make them passable is a relatively minor, inexpensive exercise due to the natural ability of many native fishes to climb or wriggle over obstacles

2. Bank Edge Vegetation and Habitat

Bank edge vegetation, backwaters and wetlands are an important part of instream habitat. Actions to provide this vegetation/habitat are recommended through out the Strategy.

3. Water Quality and Quantity

These are crucial for fish habitat. For example, increased sediment loading decreases visibility that in turn affects the ability of fish to catch their prey. Reducing water quantity reduces depth, which can increase water temperatures above the levels at which they can survive. See Appendix G for the methods used to maintain water quality and quantity.

4. Habitat Variation for Trout

An ongoing sequence of pools and riffles is ideal trout habitat. This can provided when undertaking river management works in the bed of the river. A specified number of pools are required along the river as a condition of the long-term consent for river maintenance works.

Ideal habitat for trout includes undercut banks, providing deep shaded pools in which trout can rest. However, undercut banks are generally inconsistent with river protection objectives aimed at reducing bank edge erosion. This issue needs to be worked through by WRC and the New Zealand Fish and Game Council.

Appendix I: The Use of Willows as a Flood Protection Method

Flood protection is the principal objective of river management within the River Corridor and the use of willows for bank edge erosion control is an integral part of that management system. Environmental enhancement of the River Corridor is a secondary goal. Therefore any recommendations for environmental enhancement should not be inconsistent with the use of willows as an erosion protection method.

The nature and extent that willows are used as a means for flood protection is outlined below.

1. Willows cannot be replaced by Native Species for Bank Edge Protection

- Native plant species can not replace willows as front line bank edge protection. This is true both in the long and the short term. Native species may provide sufficient bank edge protection in less modified catchments. However, flood flow volumes and velocities in the Otaki River Corridor have been significantly increased because the river has been confined within a much narrower channel. The stronger bank edge protection provided by willows is needed to counter these increased velocities and volumes.

- The interwoven root structure of willows makes them a superior form of bank edge protection. The root mass holds willows in place and protects the bank edge in flood flows that would undermine large established indigenous trees.

- Also, unlike native species willows can be layered when they become old or ineffective. This involves partly cutting the trunk so that the tree lays in the edge of the flow. This reduces flow and builds up silts along the river edges, allowing the willows to sucker new root systems and re-establish themselves. This is very useful quality for bank edge protection.

- Willows are also faster growing and significantly cheaper than native species, allowing them to be used as sacrificial bank edge protection that can be replaced relatively quickly. In contrast the loss of native species planted for bank edge protection would be a much greater set back because of the time and cost involved in replacing them.

2. The Extent of Willow Planting

Within the River Corridor a band of willows will be maintained in the 20m strip immediately adjacent to the river. The River Corridor area behind this is strip will be available for indigenous planting.

3. Factors Mitigating the Effect of Willows

- A native understorey could be established beneath the willows. This could be allowed to develop naturally or through planting. However, this vegetation will be kept as an understorey and will not replace the willows.

- The willows will be sterile.

- *Matsudanae Moutere* or similar clone will be used. When fully grown *Moutere* stand up to 10m tall with around 1.70m clearance between the ground and the lowest overhanging branches. This provides access through the willow band to the river.

- Breaks can occur in the willow band of up to 6m for purposes such as access.

- Willows are not necessary in areas where the river edge has been rock lined; where the river hits a natural hardened surface (e.g. a rock face); or on the inside corner of a permanent river bend where water velocities are reduced. These areas provide opportunities for either open space or native vegetation to be extended to the river's edge.

Appendix J: Landscape Reaches within the Study Area

1. Estuary/River Mouth

The river widens here, opening out around Katihiku Island to a low-lying estuarine landscape with swamps and marshlands to north and south. There is an expansive coastal lagoon, with large areas of silt flats that attract bird life. The Rangiuru and Ngatoko Streams join the river through swamps to the north and the Pahiko Drain flows Whakapawaewae swamp to the south (an ecologically and visually important remnant of formerly more extensive swamps). Distinct swamp and coastal vegetation is characteristic. This area is of higher landscape quality than the rest of the floodplain reaches: - memorable for its wide-open landscape, with Kapiti Island a distant feature, and its greater natural character. The area is popular for fishing, whitebaiting, shooting, and beachfront recreation such as firewood gathering.

2. Lower Otaki Reach

This is reach extends downstream from the railway bridge to the point at which the river opens out to the estuary at around Katihiku Island. The river has been considerably straightened and narrowed with old stop banks on both sides. The north bank is associated with the industrial sector of Otaki, an impression which is reinforced by a gravel extraction plant adjacent to the river, with an adjoining refuse station and oxidation ponds. The south side is more attractive with a parkland setting near the highway and rural/horticultural land adjacent.

3. Upper Otaki Reach

This reach extends from the bend downstream of the Mansell property to the railway bridge. At the upstream end on the south bank, the cliffs are a distinctive feature, accentuated by totara remnants on the terraces above. The cliffs become gradually lower in height and merge with the flatter floodplain. The north bank opens out to flat farmland all the way downstream to the Winstones shingle extraction and processing plant adjacent to SH1. Landscape quality is better where the cliffs provide a strong definition to the river but deteriorates downstream where the monotony of the willow plantings becomes dominant in the wide plains setting. Although it is not yet visible from outside the immediate site, the pond and native revegetation at Chrystall's Bend, is an unexpected contrast to the adjacent river environment. This was an enhancement project to earlier river works.

This reach varies in character from the upper to lower parts, but as the recommended actions, at the brood scope of this exercise, are consistent throughout it is discussed as one reach.

4. Rahui River Reach

This is a short reach where the river bends around the Mansell property and emerges from the narrow gorge to the plain. Vegetated cliffs on both sides enclose the river at the bend. The cliffs continue below the Mansell property on the south bank but the land opens out to the plain on the north bank. The partial enclosure and variety of river edge contributes to a higher visual quality here than the middle reach downstream.