

ECOLOGICAL ASSESSMENT
OF ALTERNATIVE COASTAL
ACCESS OPTIONS FOR
OPOTIKI HARBOUR

OCTOBER 2008

REPORT NO. 1738

Prepared for:

OPOTIKI DISTRICT COUNCIL
P.O. BOX 44
OPOTIKI 3092



WILDLAND CONSULTANTS LTD, 108 THE STRAND, P.O. BOX 838, WHAKATANE 3120
Ph 07-308-9791, Fax 07-308-9793

99 SALA STREET, P.O. BOX 7137, TE NGAE, ROTORUA 3042
Ph 07-343-9017, Fax 07-343-9018, email ecology@wildlands.co.nz, www.wildlands.co.nz

CONTENTS

1.	INTRODUCTION	1
2.	PROJECT SCOPE	1
3.	ECOLOGICAL CONTEXT	2
4.	METHODS	2
5.	PREVIOUS STUDIES	3
6.	VEGETATION AND HABITATS	4
7.	FLORA	10
8.	AVIFAUNA	10
	8.1 Threatened species	13
	8.2 Overview	14
9.	FRESHWATER FISH	14
10.	KEY ECOLOGICAL VALUES	15
11.	POTENTIAL ECOLOGICAL EFFECTS	18
12.	OPTIONS TO AVOID, MINIMISE OR MITIGATE FOR POTENTIAL NEGATIVE ECOLOGICAL EFFECTS	22
13.	CONCLUSIONS	23
	ACKNOWLEDGMENTS	24
	REFERENCES	24
	APPENDICES	
1.	List of vascular plant species	26
2.	Site photographs	29

PROJECT TEAM

Maggie Bayfield - Botanical field survey, report author.
William Shaw - Avifauna survey, report author, project management.
Chris Bycroft - Avifauna survey.

Reviewed and approved for release by:



W.B. Shaw
Director/Principal Ecologist
Wildland Consultants Ltd

© *Wildland Consultants Ltd 2008*

This report has been produced by Wildland Consultants Ltd for Opotiki District Council. All copyright in this proposal is the property of Wildland Consultants Ltd and any unauthorised publication, reproduction, or adaptation of this proposal is a breach of that copyright.

1. INTRODUCTION

Opotiki District Council (ODC) commissioned Wildland Consultants Ltd, as part of a multi-disciplinary study team, to contribute to the ecological component of the Assessment of Environmental Effects for improvements to boat access to the Opotiki Harbour entrance. The Wildland Consultants' part of the project includes assessment of terrestrial and estuarine ecology, including potential effects on vegetation and flora, and avifauna, and includes evaluation of options to avoid, minimise or mitigate for potential negative ecological effects.

The alterations proposed for the harbour entrance are to improve boat access to the harbour, which is currently by tidal and weather effects. Improved access is required to enhance commercial use of the harbour, to service a proposed large mussel farm to be located offshore from Opotiki.

This report provides descriptions of vegetation and habitats in the harbour and on the dunes at the harbour entrance, information on avifauna use of the harbour, an assessment of freshwater fish habitat, and an outline of ecological values. Potential ecological effects have been evaluated, including options to avoid, minimise, or avoid potential effects. A list of vascular plant species is attached, and a selection of habitat photographs.

2. PROJECT SCOPE

This assessment of ecological features within and adjacent to the project area addresses the following:

- estuarine vegetation and inter-tidal habitats (and adjacent terrestrial habitats);
- avifauna and related habitats in the following habitats;
 - riverine;
 - intertidal flats;
 - high tide roosts;
 - duneland;
 - marine;
- whitebait spawning sites;
- potential changes to habitats as a result of changes to river flows and tidal regimes (including salinity) on the Waioeka and Otara Rivers, downstream of the bridges across SH2 and SH35 respectively.

Potential effects arising from the following have been assessed:

- all construction and operational activities within the area bounded by SH2, SH35, Waiohau Surf Club, to the west, and Snell Road, to the east;
- construction and maintenance of the groynes;

- construction of roading and traffic effects;
- potential changes to river alignments;
- opportunities to avoid, minimise, mitigate (and/or restore) for negative ecological effects.

3. ECOLOGICAL CONTEXT

The Opotiki Harbour is a relatively narrow tidal riverine harbour inlet in the eastern Bay of Plenty, adjacent to the township of Opotiki. The harbour is at the mouth of the Waioeka River, which joins with the Otara River a short distance inland from the harbour entrance. These two rivers each bisect the township and both pose a significant flood risk to the town and other adjacent low-lying land. Lower reaches of both rivers have extensive networks of stop banks. Both rivers have large steep catchments and are prone to devastating floods.

Huntress Creek enters the western side of the harbour a short distance from the coast, draining a small catchment between the main Waioeka River and the Waiotahi River. Huntress Creek is important whitebait habitat and also includes the largest area of saltmarsh in the harbour. Opotiki Harbour is in the coastal bioclimatic zone, within Opotiki Ecological District. This district has been heavily modified by land development, particularly farming. The coastal margin is a long strip of sand dunes, some of which has been developed for housing. The balance has been highly modified by a long history of farming and fire and the remaining dunes are heavily weed-infested. There is a complex of small wetlands inside the coastal margin. There are small estuaries at Waiotahi, Opotiki, and Waiaua, with Opotiki being the largest.

The coastal margin, estuaries, and rivers, albeit modified, have significant ecological values for indigenous vegetation and avifauna, and aquatic habitats provide significant habitats for indigenous fish.

4. METHODS

- Collation and evaluation of existing information was undertaken prior to field surveys.
- A field survey of vegetation and habitats was undertaken on 27-28 June 2007 and mapped on aerial photographs. Vegetation and habitats within the study area were mapped and described.
- Field surveys of avifauna were undertaken on 25 July 2007 and 13 December 2007, including Opotiki Harbour and adjacent beach at dune habitats. Additional notes were also made of birds present at the site during a survey of the site by boat on 13 September 2007. Eleven field survey units were identified and the numbers of all birds (except small passerines) were identified and recorded. Small passerines were recorded as 'present', but were not counted, and a note was made if they were common or rare. All counts were undertaken using a telescope,

binoculars, and the naked eye as was considered appropriate in relation to the distances of birds from the observer. Each habitat was assessed as to what other species of avifauna, other than those present at the time of field survey, are likely to utilise the habitats present and a list of these were compiled.

- Potential effects on terrestrial, estuarine habitats and biota were evaluated based on the preliminary design and modelling (DHI 2008).
- Key ecological values within the project area have been identified.
- Options to avoid, minimise or mitigate for potential adverse ecological effects have been considered and evaluated.

5. PREVIOUS STUDIES

Bay of Plenty Coastal Survey 2006

The project area was identified and described as two sites in a study of a study of significant indigenous vegetation and significant habitat of indigenous fauna in the coastal Bay of Plenty Region, undertaken for Environment Bay of Plenty by Wildland Consultants (2006b): 'Waioweka Estuary' and 'Hikuwai Beach'. These sites are both described below:

Waioweka Estuary

The Waioweka Estuary was ranked as being of regional significance in Wildland Consultants (2006b) as it contains a diverse range of estuarine, sand dune and wetland vegetation, including five sites of 'outstanding' conservation value, two of 'high' rank and one of 'moderate' value (as ranked in Walls 1998). The site rankings were also based on the threatened bird species known to occur at the site (two 'acutely threatened', three 'at risk', and a range of wading bird species) as well as spawning sites for inanga (whitebait) (Wildland Consultants 2006b).

The Waioweka Estuary was also identified by Beadel *et al.* 1999 as a Category 1 Natural Heritage Site.

Hikuwai Beach

Hikuwai Beach is ranked as being of 'local' significance in Wildland Consultants (2006b). It is a relatively large site that, although substantially modified by a pervasive and diverse range of weeds, and by human activity, has high potential for restoration. Threatened northern New Zealand dotterel (*Charadrius obscurus aquilonius*) breed there, although it has been suggested that numbers have declined at the site (one pair was recorded by Bridson 2003)¹. It has moderate to high scenic and

¹ However, at least two pairs were breeding at the spit to the east of the Waioweka River mouth in the 2007-2008 breeding season indicating that the number of birds breeding at the site are fluctuating from year to year).

recreation values, due to its close proximity to Opotiki township. There has been significant revegetation of the dunes, with planting of pingao and spinifex in 1994 which is now well established.

Environment Bay of Plenty 1999

The Bay of Plenty Maritime Wetlands Database (Environment Bay of Plenty 1999) provides an overview of maritime wetlands in the Bay of Plenty Region, based on vegetation mapping undertaken from 1991 to 1999. Regionally, Tauranga and Ohiwa Harbours are very significant systems, containing *c.*93 percent of all estuarine wetlands in the Region (estuarine wetlands comprise vegetated systems, including rushland, shrubland, sedgeland, reedland, or herbfield). These two harbours and estuaries also include *c.*95% of palustrine wetlands, in these types of systems, on a regional basis. Opotiki harbour and estuary, by comparison, contains only 0.8 percent and 0.6 percent of regional estuarine and palustrine wetlands respectively in Bay of Plenty harbours and estuaries. Opotiki does have, however, the largest amount of freshwater inflow relative to the size of the estuary and, because of this, has the greatest relative abundance of reed-dominant vegetation for estuarine and palustrine wetlands within Bay of Plenty harbours and estuaries (Environment Bay of Plenty 2000). This includes 4.0 ha estuarine rushland and 13.8 ha of reedland, with a further 2.9 ha of palustrine reedland (Environment Bay of Plenty 2000).

Department of Conservation Assessment 1998

Notes on conservation values and management recommendations were made for the coastline of Opotiki Ecological District by the Department of Conservation (Walls 1998). The mouth of Huntress Creek and the eastern side of the entrance to the Waioeka-Otara Estuary were ranked as being of 'Outstanding' conservation value (containing natural features of national significance, or outstanding within the ecological district). The Waioeka-Otara Estuary waterways, mudflats, and rushland on the western side of the estuary were ranked as being of 'High' conservation value (natural features significant within the ecological district). Whitebait spawning sites in the lower Waioeka and Otara Rivers were ranked as being of 'Outstanding' value.

Other Relevant Reports

Descriptions of the indigenous vegetation types and indigenous fauna of the Waioeka Estuary and Hikuwai Beach are included in Wildland Consultants (1999). This report includes site maps and descriptions for natural areas throughout Opotiki Ecological District (and the wider Opotiki District). A map of vegetation and habitats in the Opotiki District Council's Hikuwai Beach Recreation Reserve is included in Wildland Consultants (2006a).

6. VEGETATION AND HABITATS

Vegetation and habitats within the project are somewhat dynamic, being subject to changes due to coastal processes, especially on dunes and the sand spit at the harbour entrance. Location of vegetation types and habitats have been grouped into the following categories and mapped in Figure 1:

1. Dunes
2. Sandflats
3. Saltmarsh
4. Freshwater wetland
5. Intertidal sand and mudflats
6. Open water - harbour
7. Open water - ocean
8. River
9. Alluvial flat
10. River banks

The units listed above are described below:

1. Dunes

- 1.1 Rank pasture↔rank pasture-blackberry grassland↔pohuehue-blackberry vineland↔rarahu fernland↔smilax-rank pasture

This area of dunes and dune hollows is a mosaic of types dominated by exotic species, except for small areas of pohuehue (*Muehlenbeckia complexa*) vineland near the coast. Tree privet (*Ligustrum lucidum*) is scattered throughout the area but has been subject to recent control.

- 1.2 Gorse-blackberry-boxthorn-smilax scrub

The margins of Huntress Creek estuary and the northern sand spit have a cover of scrub dominated by gorse (*Ulex europaeus*). Boxthorn (*Lycium ferocissimum*) has been cut/removed from the area between the fence and the sea.

- 1.3 Boxthorn-gorse/pohuehue-kikuyu-fescue shrubland

A mosaic of pohuehue (*Muehlenbeckia complexa*), kikuyu (*Pennisetum clandestinum*), adventive grasses, gorse, and boxthorn.

- 1.4 Plantings/pohuehue-fescue shrubland

Ngaio (*Myoporum laetum*), ti kouka (cabbage tree; *Cordyline australis*), and pohutukawa (*Metrosideros robusta*) have been planted amongst a mixed cover of pohuehue, boxthorn, and rank grass.

- 1.5 Privet-radiata pine forest

The steep bank on the southern side of the estuary has a cover of tree privet, mature pines, gorse, and other adventive species.






- N
- Legend**
-  Vegetation and habitat types (refer to text)
 -  Whitebait spawning
 -  Stopbank

Figure 1. Vegetation and Habitat Types of Opotiki Harbour



Map of Opotiki Harbour - 1:12,500 scale



Scale: 1:12,500
 Date: 19-06-08
 Cartographer: NWS
 Map format: A3R

1.6 Spinifex-*Carex pumila*-kikuyu-bare sand grassland

The foredune to the north of the estuary has a variable cover of mostly spinifex (*Spinifex sericeus*) and *Carex pumila*, with other common associates including *Caystegia soldanella* and adventive grasses.

1.7 Spinifex-pingao grassland

This area was planted by Opotiki District Council in 1994 and, many of these plantings on the foredune are now well established.

1.8 Boxthorn-gorse/pohuehue-*Carex pumila*-spinifex-bare sand shrubland

Bare sand with patches of *Carex pumila* interspersed with patches of pohuehue and boxthorn.

2. Sandflats

2.1 Bare sand-driftwood sandflat

Bare sand with scattered driftwood. This type is present on both sides of the harbour entrance, where it extends over reasonably extensive areas. Floods and/or high seas periodically deposit driftwood on these sites and the eastern side of the harbour entrance is usually as a nesting site by New Zealand dotterel.

2.2 Sea rush-bare sand sandflat

Bare sand with local patches of searush (*Juncus kraussii* subsp. *Australiensis*). A small area on the western side of the river, a short distance downstream from the Otara-Waioeke junction.

2.3 Ririwaka-bare sandflat

Patches of ririwaka (*Bolboschoenus fluviatilis*) on an otherwise bare sand flat. Adjacent to 2.2 above.

3. Saltmarsh

3.1 Searush-oioi-ririwaka sedgeland

A mosaic of relatively large patches mostly dominated by searush (*Juncus kraussii* subsp. *australiensis*), oioi (*Apodasmia similis*), and ririwaka. Other species present include *Baumea juncea*, with *Samolus repens* and three square (*Schoenoplectus pungens*) on mudflats close to the water margin.

3.2 Marsh ribbonwood/searush-oioi sedgeland

A single pohutukawa (c.2 metres high), occasional pampas (*Cortaderia selloana*), and harakeke (flax; *Phormium tenax*) occur in this area of saltmarsh sedgeland which is slightly drier than the surrounding area.

3.3 Ririwaka-(jointed twig-rush) sedgeland

Ririwaka dominates this saltmarsh type, with occasional jointed twig-rush (*Baumea articulata*) scattered throughout, particularly adjacent to the water margin.

3.4 Marsh ribbonwood/tall fescue shrubland

Marsh ribbonwood (*Plagianthus divaricatus*) plants of varying size are scattered throughout, and are emergent above an area of tall fescue grassland.

4. Freshwater Wetland

4.1 Raupo-harakeke reedland

This small wetland has been formed where the creek has been re-routed artificially to cut off an old meander. Harakeke and marsh ribbonwood are present in the centre of the wetland (Vegetation Type 4.3 below) with ririwaka and reed sweet grass (*Glyceria maxima*) common on the margins. It would appear that raupo (*Typha orientalis*) has become more dominant in this wetland since previous studies (Walls 1998 survey).

4.2 Sweet reed grass-jointed twig rush-ririwaka grassland

Part of the wetland created by re-routing of the creek channel. A shallow drain separates this area from the raupo reedland.

4.3 Marsh ribbonwood-harakeke shrubland

Dense marsh ribbonwood and scattered harakeke shrubland in the centre of the wetland created by rerouting of Huntress Creek.

4.4 *Carex geminata* sedgeland

A very small area of riparian sedgeland just below the bridge on the Otara River which is dominated almost entirely by *Carex geminata*.

5. Intertidal Sand/Mud

The largest extent of this habitat occurs near the harbour entrance, on the true-right side of the river. This is a relatively large intertidal flat, used by a diverse range of waders and other bird species at low tide. Occasional sparse patches of ririwaka, and three square occur in parts of this habitat. There is a bed of gravel

just below the Waioeka bridge on SH 2 on the true right of the river. There is vehicle access to this area.

6. Open Water - Harbour

The main section of harbour in the lower Otara and Waioeka Rivers; subject to marked tidal fluctuations.

7. Open Water - Ocean

The main section of harbour in the lower Otara and Waioeka Rivers; subject to marked tidal fluctuations and wave action.

8. River Channel

Characterised by flowing water, upstream of main tidal influence.

9. Alluvial Flat

9.1 Crack willow forest and treeland

Crack willow (*Salix fragilis*) is abundant over swampy pasture.

9.2 Blackberry-(tradescantia)-(gorse) vineland

Swampy pasture with weed species, particularly blackberry (*Rubus fruticosus* agg.), throughout.

9.3 Rank pasture

Herbs such as yarrow (*Achillea millefolium*), dock (*Rumex obtusifolius*), fleabane (*Conyza albida*), lotus (*Lotus pedunculatus*), pink bindweed (*Calystegia sepium*) occur throughout vegetation dominated by exotic grasses such as tall fescue (*Schedonorus phoenix*), Yorkshire fog (*Holcus lanatus*), and browntop (*Agrostis capillaris*). Pampas is locally dominant to the south of the willow forest.

9.4 Mercer grass-*Eleocharis acuta*-three square sedge-grassland ↔ Raupo reedland ↔ Ririwaka-sea rush-gorse-Mercer grass-pasture sedgeland

A small wetland on alluvial flat near the sports ground, and a known whitebait spawning site. The vegetation is dominated by the adventive Mercer grass (*Paspalum distichum*), with indigenous sedges *Eleocharis acuta* and three-square common throughout. *Triglochin striatum* is also present. There are also dense clumps of raupo either with no other associated species or with *Carex geminata*. Close to the river is an area that is subject to flooding and has had a history of disturbance. This area has a mosaic of species including ririwaka, searush, gorse, mercer grass and pasture grasses. Vehicles have access to this area.

9.5 Sea rush sedgeland

Sea rush forms a dense narrow band in several places on the margin of the river.

10. Dry Riverbank/Riparian Margin

Dry riverbanks with mostly rank pasture (tall fescue-dominant) with some planted trees (not mapped separately). Some sections have had rock rip rap reinforcement.

7. FLORA

A list of vascular plant flora recorded at the site is provided in Appendix 1. Twenty-six indigenous species were recorded and 32 adventive species (only limited attention was paid to exotic species in habitats such as rank pasture). The only threatened species present (pingao, *Desmoschoenus spiralis*, classified as being 'Chronically Threatened-Gradual Decline' in Hitchmough *et al.* 2007) has been planted on the front of the foredune to the east of the river mouth.

8. AVIFAUNA

A total of 30 bird species were recorded or are considered likely to be present in the study area (see Table 1 below). Twenty-one of these species are indigenous and nine are introduced. Six of these species are listed as threatened or at risk by Hitchmough *et al.* (2007). Rail footprints were common in the salt marsh in the July 2007 survey, but were not identified to species level. It is almost certain that these footprints were banded rail (*Gallirallus philippensis assimilis*), although they could also be spotless crane (*Porzana tabuensis plumbea*). These species are both ranked as 'At Risk-Sparse' (Hitchmough *et al.* 2007). An additional seven indigenous and six exotic species are likely to utilise habitats in the study area, but were not recorded in the current survey. A summary of the species present, their threat status in Hitchmough *et al.* 2007, and notes on habitat and likely population in the study area are presented in Table 1.

Table 1: Bird species recorded or likely to utilise habitats at Opotiki Harbour and surrounding habitat. Species in **bold** were recorded during site surveys. Threat status is given for indigenous species (as per Hitchmough *et al.* 2007).

Common Name	Scientific Name	Status	Notes
Gannets and boobies (sulidae)			
Australasian gannet	<i>Morus serrator</i>	At Risk-Sparse	Present in coastal waters.
Shags (phalacrocoracidae)			
Black shag (kawau)	<i>Phalacrocorax carbo</i>	At Risk-Sparse	Scattered birds alongside Otara River and Waioweka River.
Pied shag (karuhiruhi)	<i>Phalacrocorax varius</i>	Not threatened	Common in sandy areas alongside river and at river mouth. Roosts on logs and trees.

Common Name	Scientific Name	Status	Notes
Little black shag	<i>Phalacrocorax sulcirostris</i>	At Risk-Range Restricted	Likely to be common in habitats present, not recorded in current survey.
Little shag (kawaupaka)	<i>Phalacrocorax melanoleucos</i>	Not threatened	Common on river, open waters of estuary and river margins.
Herons, bitterns and egrets (ardeidae)			
White-faced heron	<i>Ardea novaehollandiae</i>	Not threatened	Common on river and harbour margins.
Australasian bittern	<i>Botaurus poiciloptilus</i>	Acutely Threatened-Nationally Endangered	Likely to occasionally utilise freshwater and coastal wetland habitats present. Recorded as being present by Walls (1998).
Waterfowl (anatidae)			
Black swan	<i>Cygnus atratus</i>	Not threatened	Scattered birds present on harbour.
Feral goose	<i>Anser anser</i>	Introduced	Scattered birds recorded on harbour.
Paradise shelduck (putangitangi)	<i>Tadorna variegata</i>	Not threatened	Scattered birds recorded on harbour.
Mallard	<i>Anas platyrhynchos</i>	Introduced	Common on harbour and river habitats.
Raptors (accipiteridae and falconidae)			
Australasian harrier (kahu)	<i>Circus approximans</i>	Not threatened	Likely to be present throughout the study area.
Gamebirds (phasianidae)			
Pheasant	<i>Phasianus colchicus</i>	Introduced	Scattered birds present in scrub and shrubland habitat on river and harbour margins.
Rails, gallinules and coots (rallidae)			
Banded rail (Moho-pereru)	<i>Rallus philippensis</i>	Sparse	Likely to be present in salt marsh habitats.
Spotless crake (puweto)	<i>Porzana tabuensis</i>	Sparse	Likely to be present in freshwater wetland habitats.
Pukeko	<i>Porphyrio porphyrio</i>	Not threatened	Common in wetlands, sand dunes and surrounding open water habitats
Oystercatchers (haematopodidae)			
Variable oystercatcher (torea, toreapango)	<i>Haematopus unicolor</i>	Not threatened	Common on harbour margins, sand spit, and at river mouth. Likely to nest at sand spit.
Stilts and avocets (recurvirostridae)			
Pied stilt	<i>Himantopus himantopus</i>	Not threatened	Common on harbour and river margins.
Plovers, dotterels and lapwings (charadriidae)			
Northern New Zealand dotterel (tuturiwhatu)	<i>Charadrius obscurus aquilonius</i>	Nationally vulnerable	Four birds recorded at the sand spit.
Spur-winged plover	<i>Vanellus miles</i>	Not threatened	Scattered birds present throughout the study area.
Snipe, sandpipers, godwits and curlews (scolopacidae)			
Kuaka (bar-tailed godwit)	<i>Limosa lapponica</i>	Migrant	Seasonally present in estuary and on sandy beaches
Gulls, terns and noddies (laridae)			

Common Name	Scientific Name	Status	Notes
Southern black-backed gull (karoro)	<i>Larus dominicanus</i>	Not threatened	Common throughout the study area.
Red-billed gull (tarapunga)	<i>Larus novaehollandiae</i>	Chronically Threatened-Gradual Decline	Common throughout the study area.
Caspian tern (taranui)	<i>Sterna caspia</i>	Acutely Threatened-Nationally Vulnerable	Scattered birds present in harbour, at river mouth and open sea habitats.
White-fronted tern (tara)	<i>Sterna striata</i>	Chronically Threatened-Gradual Decline	Scattered birds present at river mouth and open sea habitats.
Pigeons and doves (Columbidae)			
Rock pigeon	<i>Columba livia</i>	Not threatened	Occasionally present throughout the study area
Kingfishers (alcedinidae)			
Sacred kingfisher (kotare)	<i>Todiramphus sanctus</i>	Not threatened	Likely to be common throughout study area.
Larks (alaudidae)			
Skylark	<i>Alauda arvensis</i>	Introduced	Common adjacent to harbour.
Swallows and martins (hirundinidae)			
Welcome swallow	<i>Hirundo tahitica</i>	Not threatened	Common throughout.
Pipits (motacillidae)			
New Zealand pipit	<i>Anthus novaeseelandiae</i>	Not threatened	Not recorded. Likely to utilise habitat throughout the study area.
Accentors (prunellidae)			
Dunnock	<i>Prunella modularis</i>	Not threatened	Not recorded. Likely to be present in terrestrial habitats.
Thrushes (muscapidae)			
Blackbird	<i>Turdus merula</i>	Introduced	Common in terrestrial habitats throughout.
Song thrush	<i>Turdus philomelos</i>	Introduced	Common in terrestrial habitats throughout.
North Island fernbird (matata)	<i>Bowdleria punctata vealeae</i>	Sparse	A relatively large area of good quality habitat for this species is present in the Huntress Creek salt marsh.
Australasian warblers (acanthizidae)			
Grey warbler (riroriro)	<i>Gerygone igata</i>	Not threatened	Common in terrestrial woody habitats throughout.
Monarch flycatchers (monarchidae)			
North Island fantail (piwakawaka)	<i>Rhipidura fuliginosa placabilis</i>	Not threatened	Common in terrestrial habitats throughout.
White-eyes (zosteropidae)			
Silvereye (tauhou)	<i>Zosterops lateralis</i>	Not threatened	Common in terrestrial habitats throughout.
Honeyeaters (meliphagidae)			
Bellbird (korimako, makomako)	<i>Anthornis melanura</i>	Not threatened	Seasonally present in terrestrial woody habitats.
Tui	<i>Prothemadera novaeseelandiae</i>	Not threatened	Likely to be common in terrestrial habitats.

Common Name	Scientific Name	Status	Notes
Buntings, cardinals, and tanagers (emberizidae)			
Yellowhammer	<i>Emberiza citrinella</i>	Introduced	Likely to be common in terrestrial habitats.
Finches (fringillidae)			
Chaffinch	<i>Fringilla coelebs</i>	Introduced	Likely to be common in terrestrial habitats.
Greenfinch	<i>Carduelis chloris</i>	Introduced	Likely to be common in terrestrial habitats.
Goldfinch	<i>Carduelis carduelis</i>	Introduced	Likely to be common in terrestrial habitats.
Redpoll	<i>Carduelis flammea</i>	Introduced	Likely to be common in terrestrial habitats.
Sparrows and weavers (ploceidae)			
House sparrow	<i>Passer domesticus</i>	Introduced	Common in terrestrial habitats.
Starlings and mynas (sturnidae)			
Starling	<i>Sturnus vulgaris</i>	Introduced	Common in terrestrial habitats.
Indian myna	<i>Acridotheres tristis</i>	Introduced	Common in terrestrial habitats.
Bell magpies (cracticidae)			
Australian magpie	<i>Gymnorhina tibicen</i>	Introduced	Likely to be common in terrestrial habitats.

8.1 Threatened species

Threatened species (as per Hitchmough *et al.* 2007) recorded, or likely to be present, from this survey are listed below with general comments on the population of these species in New Zealand. Also included below are three species likely to be present, but not recorded during the current surveys: Australasian bittern, banded rail, and spotless crane.

‘Acutely Threatened-Nationally Endangered’

Australasian bittern: Between 520-780 birds estimated as present in New Zealand in 1980 (Hitchmough *et al.* 2007). They are usually solitary birds and often appear cryptic. They feed on fish, frogs, koura (freshwater crayfish) and aquatic insects (Heather and Simpson 1996). Bittern may often be present at a site but not viewed, as they are a cryptic species, often blending in with raupo, sedges and rushes.

‘Acutely Threatened-Nationally Vulnerable’

Northern New Zealand dotterel: Population of c.1,200 birds in 1996 (Hitchmough *et al.* 2007). There is evidence of a decline in the last 100 years as well as evidence of a decline over part of its range since this time. Threatened by human use of habitat (e.g. housing development, pine plantations, plantings of marram grass, human disturbance, dogs, and stock) and introduced predators (Heather and Robertson, 1996). A New Zealand endemic this species is restricted to the northern half of the North Island.

Caspian tern: c.3,000 birds in New Zealand. Colonies vary in size from year to year, but rarely exceed 100 pairs. Colonies have been threatened by increased human activity and the planting of pine trees and marram grass on their favoured sandspits. It is an almost Cosmopolitan species (Heather and Robertson 1996).

‘Chronically Threatened-Gradual Decline’

Red-billed gull: three colonies with >5,000 breeding pairs (Heather and Robertson 1996), however there is evidence of a decline in population in the three largest colonies in recent years (Hitchmough *et al.* 2007).

White fronted tern: 15,000-20,000 pairs in 1997, but for some unknown reasons the number of birds appears to be declining rapidly (Heather and Robertson 1996).

‘At Risk-Sparse’

Black shag: between 5,000-10,000 birds scattered throughout New Zealand (Heather and Robertson 1996).

Spotless crane: The drainage of many lowland wetlands and introduced predators have undoubtedly had a major impact on spotless crane populations, however because of their secretive nature are probably more common than records suggest (Heather and Robertson 1996). This subspecies is also present in Australia.

Banded rail: Locally common near the coast of the northern North Island, a small population in the northern South Island. Population is likely to have declined through habitat modification with modification of estuaries, mangrove wetlands and predation by introduced mammals (Heather and Robertson 1996)

North Island fernbird: Widespread and locally common on the North and South Islands (South Island subspecies). Threats include the loss of habitat (e.g. the draining of wetlands) and predation by introduced mammals (Heather and Robertson 1996).

8.2 Overview

The Opotiki Harbour and its surrounds provide good habitat for a number of bird species that utilise open water, salt marsh, intertidal sandflats, and sand spit habitats. Intertidal flats are utilised by a diverse range of terns, gulls, ducks, and waders. The sand spit habitat provides important nesting sites for the threatened northern New Zealand dotterel, as well as variable oystercatchers (not threatened). The salt marsh habitat provides good quality habitat for fernbirds, as well as rail species (the species most likely to utilise the salt marsh habitats is banded rail with spotless crane also likely to be present). It may also provide habitat for the ‘Nationally Endangered’ Australasian bittern.

9. FRESHWATER FISH

There is a significant whitebait fishery in the Waioeka and Otara Rivers, with several known whitebait spawning sites on the banks of both rivers, as shown in Figure 1. The spawning ground on the true left side of the Otara River, on the floodplain adjacent to Opotiki township - 1.25 km upstream of the Waioeke-Otara confluence - is the largest spawning ground recorded in the Bay of Plenty (Mitchell 1990).

The freshwater fishery has been investigated by Coffey and Associates, as part of the multi-disciplinary team for this project.

10. KEY ECOLOGICAL VALUES

A list of ecologically significant habitats is set out below, along with a brief discussion of key elements and issues. A map of relative ecological values presented in Figure 2.

Intertidal Sand/Mudflat

The intertidal sand/mudflats provide important feeding grounds for northern NZ dotterel and a wide range of waders, including international migrants. This is also likely to be an important feeding area for Caspian terns when they are feeding juveniles.

Sand Dune System

While the vegetation of the dune system is highly modified, with a pervasive and diverse range of adventive species, the dune system has previously been assigned a conservation rank of 'Moderate-High' for its restoration potential (Walls 1998). More recently it was ranked as being of 'Local' ecological significance (Wildland Consultants 2006b).

Saltmarsh Vegetation at Huntress Creek

This area was ranked as being of 'outstanding' conservation value by Walls (1998), and of 'regional' ecological significance as part of the larger Waioeka Estuary (Wildland Consultants 2006b). It also provides important habitats for threatened wetland bird species.

Avifauna - Threatened Species

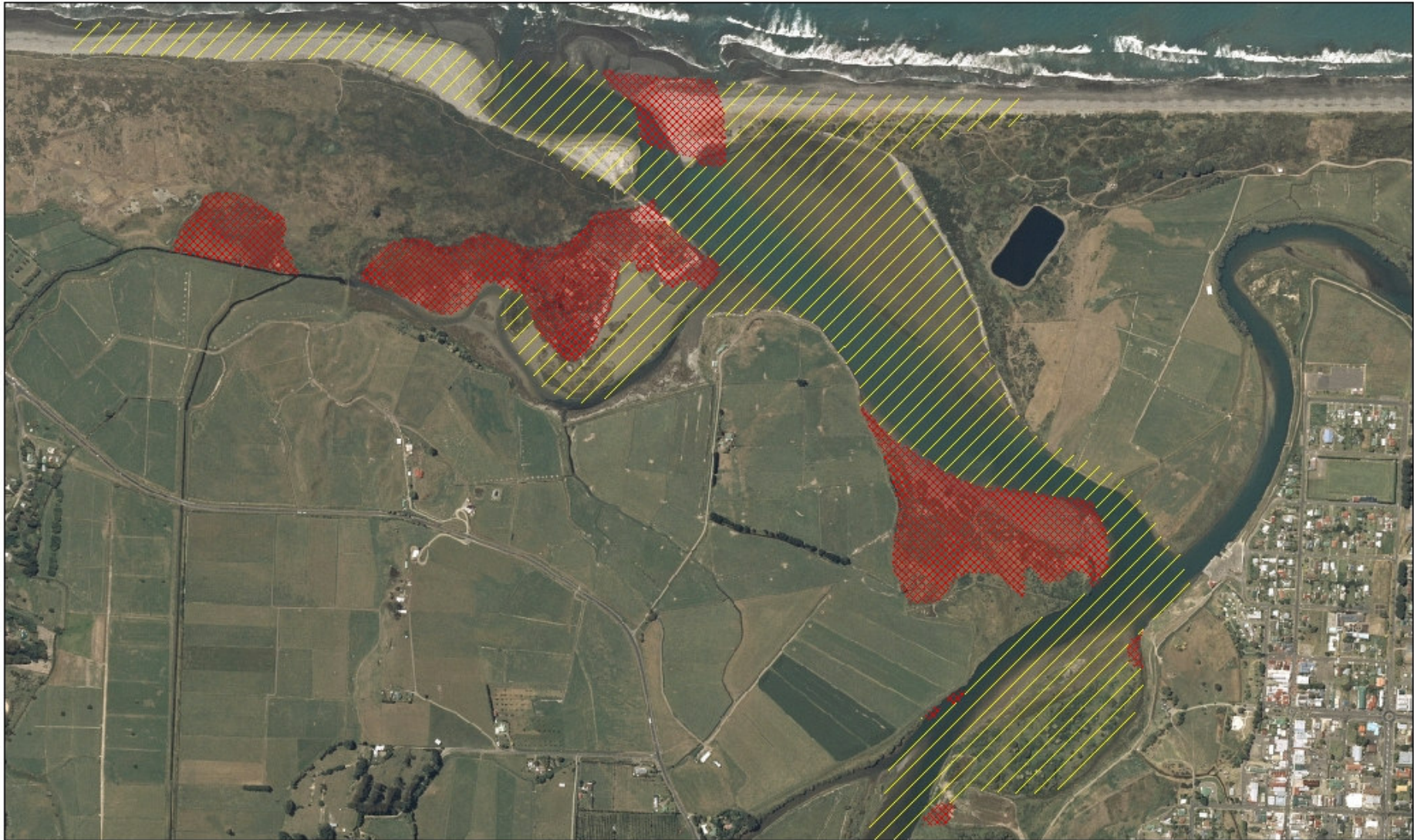
Northern NZ dotterels - classified as 'Acutely Threatened-Nationally Vulnerable' - breed on the sandspit at the mouth of estuary. The breeding site is situated on the eastern side of the Waioeka River and includes the entire sand spit at the river mouth.

Banded rail - classified as 'At Risk-Sparse' - are present in salt marsh and freshwater wetland habitats at Huntress Creek. Spotless crane (same threat ranking) could also be presented. The saltmarsh and freshwater habitats at Huntress Creek will not be affected by the proposed development.

Caspian tern - 'Acutely Threatened-Nationally Vulnerable' - utilise the intertidal flat on the eastern side of the lower river and also roost at the adjacent sand spit and beaches during high tides.

Other significant species known to be present or likely to utilise habitats in the project area include:

- Australasian bittern;
- red-billed gull;
- white fronted tern;



Legend



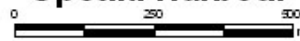

-  High ecological value (approximate)
-  Moderate ecological value (approximate)

Figure 2. Areas of High and Moderate Ecological Value, Opotiki Harbour



e:\optiki\Wildoeka_river\Wabeka_cons_value.mxd

 **Wildlands**

Scale: 1:12,500
 Date: 26/05/08
 Cartographer: RPB

- black shag;
- spotless crake;
- banded rail;
- international migrants (e.g. godwit).

Inanga Spawning Sites

Spawning sites for inanga are important for maintenance of the culturally and commercially important fishery. Five galaxiid species make up the whitebait catch: inanga, banded kōkopu, koaro, shortjaw kōkopu, and giant kōkopu. In most river systems, the inanga (*Galaxias maculatus*; not threatened) makes up most of the whitebait catch. Banded kōkopu (*Galaxias fasciatus*) and kaoro (*Galaxias brevipinnis*) are also not threatened, however giant kōkopu (*Galaxias argenteus*) is classified as ‘Chronically Threatened-Gradual Decline and short jaw kōkopu (*Galaxias postvectis*) is ranked as ‘At Risk-Sparse’ (Hitchmough *et al.* 2007). All of the known spawning sites are upstream of the proposed works.

11. POTENTIAL ECOLOGICAL EFFECTS

Various options have been assessed for alterations to the harbour entrance, with the preferred option being Option F as presented in DHI (2008), as set out in Figure 3 below. This option, and others, could potentially affect the following:

- Breeding habitat for northern NZ dotterel;
- Salinity levels, with resultant effects on estuarine vegetation and other biota;
- Whitebait fishery;
- Intertidal flat habitat;
- Dune system adjacent to the river mouth;
- Flooding.

Discussion of each of these matters is set out below:

Breeding Habitat for Northern NZ Dotterel

Northern NZ dotterels (ranked as ‘Acutely Threatened-Nationally Vulnerable’) currently nest on the sandspit. Option F (DHI 2008 - refer to Figure 3) includes the realignment of the river channel directly through the sandspit where the NZ dotterels nest, destroying this breeding location for dotterel and other species such as variable oystercatcher.

There is considerable variation in nesting time depending on seasonal weather patterns. Monitoring by the Department of Conservation Opotiki area breeding sites commenced in September 2005 and ended in March 2006. Birds are particularly vulnerable when breeding and disturbance can cause birds to abandon nesting. The Department of Conservation fences off breeding areas and erects information signs to keep people out of the area and keep dogs under control.



Figure 3. Proposed Footprint Layout for New Harbour Entrance

Wildlands

Scale: 1:9,000
 Date: 17-09-08
 Cartographer: NWS
 Format: A4

Salinity Levels

Results of salinity modelling (DHI 2008) predict that the impact of the training works on salinity levels will be confined to the very lower reaches of the estuary. Salinity intrusion occurs further upstream than at present but the impact upstream of the Waioeka-Otara confluence is predicted to be negligible. There is unlikely therefore to be any adverse effect on either the saltmarsh vegetation of Huntress Creek or inanga spawning sites.

Whitebait Fishery

The construction works carried out to realign the river channel may affect the whitebait fishery if carried out during the spawning season January-May. Refer also to the section above on Salinity Levels.

Intertidal Habitat

The removal of the large intertidal sand/mudflat (Habitat Type 5) just inside the river mouth - by realignment of the river will result in the loss of feeding grounds for a wide range of birds, including migratory waders, NZ dotterels, and Caspian terns.

Dune System

The natural dune system along the coast may be altered significantly for several hundred metres on both sides of the realigned river mouth due to sediment accretion and/or erosion. The DHI report notes that 'the long term coastal impacts on a regional scale will be small due to the low net sediment transport rates at the site, but the large gross sediment transport rates can lead to rapid local morphological impacts.....the littoral sediment transport simulations show that littoral transport in one direction could be as high as 500,000 m³....assuming that this sediment is eroded over a length of 1 km to a depth of 5 m, this leads to an average coastal setback of 100 m, which represents very significant erosion.' This would have a major adverse impact on the dune system.

Flooding

Impacts of flooding on vegetation and habitats are likely to be minor given the likely short duration of inundation anticipated. A maximum increase of water level of between 5-10 cm near the town have been predicted from modelling (DHI 2008), however with future climate change taken into account this increases the maximum flood level impacts by a further 3-4 cm. While anticipated to be minor, monitoring should be carried out to assess impacts and likely trends on significant salt marsh vegetation, particularly at Huntress Creek.

Several options have been proposed (DHI 2008) in order to mitigate potential flooding impacts. One of these options includes realignment of the Waioeka-Otara confluence. This would provide a more direct path to the sea for the Waioeka flows by cutting through the true left bank upstream of the confluence. This would directly affect saltmarsh vegetation and inanga spawning sites along this stretch of the Waioeka River.

Habitat Losses (and Potential Gains)

The proposed development footprint - including the new channel to be excavated, construction sites, and areas to be infilled - were overlaid with the maps of vegetation and habitat types (refer to Figure 3). Table 2 below provides a summary of the areas of various vegetation and habitat types to be affected.

Table 2: Areas of vegetation and habitat types to be affected by the proposed development of the Opotiki Harbour entrance.

Type No.	Type Name	Area (ha)
Infill		
1.3	Boxthorn-gorse/pohuehue-kikuyu-fescue shrubland	0.380
1.7	Spinifex-pingao grassland	0.120
2.1	Bare sand-driftwood sandflat	0.000
1.8	Boxthorn-gorse/pohuehue- <i>Carex pumila</i> -spinifex-bare sand shrubland	0.020
1.7	Spinifex-pingao grassland	0.390
2.1	Bare sand-driftwood sandflat	0.090
Construction Sites		
1.3	Boxthorn-gorse/pohuehue-kikuyu-fescue shrubland	0.380
1.7	Spinifex-pingao grassland	0.120
2.1	Bare sand-driftwood sandflat	0.000
1.8	Boxthorn-gorse/pohuehue- <i>Carex pumila</i> -spinifex-bare sand shrubland	0.020
1.7	Spinifex-pingao grassland	0.390
2.1	Bare sand-driftwood sandflat	0.090
New Channel		
1.3	Boxthorn-gorse/pohuehue-kikuyu-fescue shrubland	0.43
1.7	Spinifex-pingao grassland	0.31
5	Intertidal sand/mud	10.53
2.1	Bare sand-driftwood sandflat	0.35

Most losses of particular habitat types are relatively small. The largest habitat loss is Type 5 - intertidal flats, which is to be excavated to form the new harbour entrance and associated channel. The loss of these flats will affect a relatively large proportion of this type within Opotiki Harbour. It is feasible, however, that new intertidal flats will form on the western side of the new channel.

There will also be new areas of sandflat on the western side of the new harbour entrance, where the existing channel is to be infilled.

12. OPTIONS TO AVOID, MINIMISE OR MITIGATE FOR POTENTIAL NEGATIVE ECOLOGICAL EFFECTS

Potential to Avoid/Minimise Effects

Where possible, the timing of works should be planned to reduce or to have minimal effects. While the realignment of the river channel through the sandspit will destroy the breeding habitat for NZ dotterel and other birds it would still be preferable to avoid commencement of construction until after the main breeding season (i.e. September-December) so as to minimise disturbance to nesting birds. Adult birds should relocate.

The realignment of the river channel should be carried out at a time to avoid the period of inanga migration (in Spring).

Potential to Mitigate Adverse Effects

It is hoped that NZ dotterels will relocate to other areas for breeding once the habitat currently used has been destroyed. Other adverse effects on dotterel breeding include predation, and disturbance by humans, dogs, and/or vehicles. Habitat management for dotterels elsewhere in the Bay of Plenty would assist in enhancing the overall population of this 'Acutely Threatened' species.

The creation and maintenance of habitat suitable for NZ dotterel (bare sand-driftwood habitat) as part of the overall design of harbour entrance may provide an alternative breeding location for displaced birds. However, from the coastal processes modelling (DHI 2008), it would appear that there are likely to be significant local changes in sediment accumulation and erosion. This would indicate that it may not be possible to create permanent suitable habitat at the harbour entrance and the proposed development may result in the local extinction of this threatened species from this site.

Facilitation of the removal of grazing animals from inanga spawning sites from January until May would help to provide more successful whitebait spawning. If the realignment of the confluence proceeds, and inanga spawning sites are modified (which is unlikely) then enhancement of new areas for inanga spawning should be carried out. Inanga spawn in estuarine areas amongst riparian vegetation that is flooded by spring tides, usually near and upstream of the upper limit of the saltwater wedge (McDowall 2000).

Monitoring of key vegetation and bird populations should be carried out to determine any effects of the works and to assess whether there is any need to mitigate those effects.

There is no potential to avoid, minimise or mitigate the potential for adverse effects of sediment erosion/accretion on the natural dune system adjacent to the river mouth. It has been suggested (DHI 2008) that, to create a buffer against significant erosion, part of the material dredged to form the new river channel may be used to replenish and nourish the adjacent beaches, placed well back on the dunes. It is likely that regular monitoring and capital sand nourishment will be required on an ongoing basis rather

than the dumping of river dredgings during construction, particularly given the uncertainties as to what will happen. Dumping of dredgings from construction would effectively create a stopbank which would also have potentially adverse effects on the natural dune system.

13. CONCLUSIONS

A range of natural and modified habitats occur within the study area.

Key ecological values include threatened avifauna (NZ dotterels, banded rail, Caspian tern); saltmarsh vegetation at Huntress Creek; the whitebait fishery and spawning sites; intertidal sand/mudflat habitat which provides important feeding grounds for birds; and the natural dune system along the coastal margin.

The realignment of the Waioeka river mouth and construction of training walls at the Opotiki Harbour entrance will have significant local effects on the avifauna that utilise the area, particularly 'Acutely Threatened' northern NZ dotterels which currently nest on the site proposed for the new river mouth. Feeding grounds for migratory waders and other species will also be adversely affected by channelling and changed river flow patterns. The habitat type most affected by the proposed development is intertidal flat, of which 10.5 ha is to be lost. This may be replaced, at least in part, by infilling of other parts of the existing harbour entrance and channel.

There is no potential to avoid adverse effects on northern NZ dotterel but there is potential to mitigate effects on the population of this acutely threatened species by carrying out measures to protect other populations in the Bay of Plenty.

There are unlikely to be adverse effects on saltmarsh vegetation at Huntress Creek as a result of salinity changes in the main channel, based on the work of DHI (2008).

Potential effects on vegetation from increased flood levels are likely to be minor given the short duration of inundation.

There is potential to avoid adverse effects on the whitebait fishery if works to realign the river mouth and upstream channel avoid spawning sites and the season (September-November) when they migrate in from the sea.

If the option to realign the Waioeka-Otara confluence proceeds, inanga spawning sites will be modified, thus affecting the fishery unless alternative sites are available. In addition, a substantial area of saltmarsh habitat will be destroyed. This area, whilst not as significant as the saltmarsh vegetation and intertidal habitat at Huntress Creek, is one of the few such areas left in the Opotiki Harbour and also provides habitat for birds and other biota that utilise this habitat type.

Monitoring of key vegetation and habitat types, and bird populations should be carried out to determine effects and to assess the need to mitigate those effects.

ACKNOWLEDGMENTS

Steve Everitt of Waterline provided project liaison and useful information.

REFERENCES

- Bridson L. 2003: New Zealand Dotterel Monitoring Report Opotiki Area 2002-2003. *Unpublished report*. Department of Conservation, Opotiki Area Office.
- DHI 2008: Opotiki Harbour Access Modelling and Preliminary Design Final Report. Volume 2: Main Modelling Report. DHI. Water and Environment Limited.
- Environment Bay of Plenty 2000: Bay of Plenty Maritime Wetlands Database. Environmental Report 2000/21. Environment Bay of Plenty, Whakatane.
- Heather B.D. and Robertson H.A. 2000. The Field Guide to the Birds of New Zealand. Viking, Auckland. 432pp.
- Hitchmough R., Bull L. and Cromarty P. (comp.) 2007: New Zealand Threat Classification System lists - 2005. *Science and Technical Publishing*. Department of Conservation, Wellington. 194 pp.
- McDowall R.M. 2000: The Reed Field Guide to New Zealand Freshwater Fishes. Reed Publishing (NZ) Ltd. 224 pp.
- Mitchell C.P. 1990: Whitebait spawning grounds in the Bay of Plenty. *NZ Freshwater Fisheries Miscellaneous Report No 40*. Report prepared for Department of Conservation.
- Rasch G. 1989: Wildlife and wildlife habitat in the East Cape Region. *Regional Report Series Number 12*. Department of Conservation, Rotorua. 172 pp. plus maps.
- Walls G. 1998: Ecological survey of the Opotiki Ecological District coastal zone. *Conservation Advisory Science Notes: 189*. Department of Conservation, Wellington. 21 pp.
- Wildland Consultants 1999: Category 1 natural heritage sites in the Rotorua and Opotiki Districts, Bay of Plenty Region. *Wildland Consultants Ltd Contract Report No. 292*. 13 pp. plus maps.
- Wildland Consultants 1999: Natural Heritage of Opotiki District. *Wildland Consultants Contract Report No. 185*. Prepared for Opotiki District Council & Environment Bay of Plenty.

Wildland Consultants 2006a: Ecological and historic site management of selected Opotiki District Council coastal reserves. *Wildland Consultants Contract Report No. 978*. Prepared for Opotiki District Council, Opotiki.

Wildland Consultants 2006b: Significant indigenous vegetation and significant habitats of indigenous fauna in the coastal environment of the Bay of Plenty Region. *Wildland Consultants Contract Report No. 1345*. Prepared for Environment Bay of Plenty.

LIST OF VASCULAR PLANT SPECIES

Key

* = planted,

** = possibly planted

INDIGENOUS SPECIES

Monocot. trees and shrubs

Phormium tenax harakeke, flax

Dicot. trees and shrubs

Myoporum laetum * ngaio
Ozothamnus leptophyllus * tauhinu
Metrosideros robusta pohutukawa
Pittosporum crassifolium ** karo
Plagianthus divaricatus marsh ribbonwood
Pseudopanax lessonii ** houpara

Dicot. Lianes

Calystegia sepium pohue, pink bindweed
Calystegia soldanella panahi
Muehlenbeckia complexa pohuehue

Ferns

Pteridium esculentum bracken, rarahu

Grasses

Microlaena stipoides patiti
Spinifex sericeus * kowhangatara

Sedges

Baumea articulata
Baumea juncea
Bolboschoenus fluviatilis ririwaka
Carex pumila
Cyperus ustulatus toetoe upokotangata
Desmoschoenus spiralis * pingao
Ficinia nodosa wiwi

Schoenoplectus pungens three square

Rushes

Juncus kraussii subsp. *australiensis* wi (sea rush)

Monocot. herbs (other than orchids, grasses, sedges and rushes)

Apodasmia similis oioi

Typha orientalis raupo

Dicot. herbs

Samolus repens makaokao

ADVENTIVE SPECIES

Gymnosperms

Pinus radiata radiata pine

Dicot. trees and shrubs

Lycium ferocissimum African boxthorn

Paraserianthes lophantha brush wattle

Rubus sp. (*R. fruticosus* agg.) blackberry

Solanum mauritianum woolly nightshade

Ulex europaeus gorse

Grasses

Agrostis capillaris browntop

Cortaderia selloana pampas

Dactylis glomerata cocksfoot

Elytrigia pycnantha sea couch

Glyceria maxima reed sweetgrass

Holcus lanatus Yorkshire fog

Paspalum dilatatum paspalum

Paspalum distichum mercer grass

Pennisetum clandestinum kikuyu grass

Schedonorus phoenix tall fescue

Setaria viridis green bristle grass

Monocot. herbs (other than orchids, grasses, sedges and rushes)

Asparagus asparagoides smilax

Composite herbs

<i>Achillea millefolium</i>	yarrow
<i>Conyza albida</i>	fleabane
<i>Cotula coronopifolia</i>	bachelor's button
<i>Lactuca serriola</i>	prickly lettuce

Dicot. herbs (other than composites)

<i>Cakile maritima</i>	sea rocket
<i>Carpobrotus edulis</i>	ice plant
<i>Daucus carota</i>	wild carrot
<i>Euphorbia peplus</i>	milkweed
<i>Lepidium</i> sp.	
<i>Lotus pedunculatus</i>	lotus
<i>Rumex obtusifolius</i>	dock
<i>Solanum nigrum</i>	black nightshade
<i>Verbena bonariensis</i>	purple-top
<i>Verbena officinalis</i>	vervain





Plate 1: Northern New Zealand dotterel and oystercatcher nesting habitat at the river mouth.



Plate 2: Northern New Zealand dotterel nesting habitat at top of sandspit.



Plate 3: Dunes and sandspit, looking to the west



Plate 4: Dunes adjacent to the river mouth, to the east.



Plate 5: Foredune and plantings to the east of the river mouth.



Plate 6: Dunes and end of sandspit on eastern side of river mouth.



Plate 7: Dunes at proposed new harbour entrance, looking to the east.



Plate 8: End of dunes at proposed new harbour entrance, looking to the west.



Plate 9: Searush and oioi at Huntress Creek (refer to vegetation type 3.1).



Plate 10: Estuary margin at Huntress Creek, with marsh ribbonwood adjacent to searush and oioi saltmarsh.



Plate 11: Saltmarsh at Huntress Creek with a weedy margin.



Plate 12: Saltmarsh at Huntress Creek with marsh ribbonwood common on the margins.



Plate 13: Searush and oioi at Hunters Creek with scattered marsh ribbonwood.



Plate 14: Mixed low vegetation on rear dunes, including pohuehue, rank grasses, blackberry and fernland.



Plate 15: Raupo - flax wetland in lower Huntress Creek.



Plate 16: Willow treeland upstream of Waioweka-Otara confluence.



Plate 17: Riparian margin opposite wharf, at the confluence of the Otara and Waioweka Rivers.