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# SIGNIFICANT NATURAL AREAS IN THE COASTAL ENVIRONMENT OF BAY OF PLENTY REGION

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# **SIGNIFICANT NATURAL AREAS IN THE COASTAL ENVIRONMENT OF BAY OF PLENTY REGION**

**Contract Report No. 2837**

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## 1. INTRODUCTION

Bay of Plenty Region extends along the coast from Orokawa Bay (near Waihi Beach) in the west, to Taungakawa Bay, on the eastern side of Cape Runaway. It includes Tauranga Harbour, estuaries, river mouths, sandy beaches and rocky headlands. Section 6(c) of The Resource Management Act requires the Bay of Plenty Regional Council (BOPRC, the Council) to provide for the protection of significant indigenous vegetation and significant habitats of indigenous fauna. In the coastal environment, this requirement is addressed in Chapter 6 of the Regional Coastal Environment Plan (RCEP or the Plan) (2003) and through mapping of significant sites.

A mandatory review of the Plan must be initiated by the tenth anniversary of the plan (RMA Section 79(2)), i.e. by 2013. The Council decided that significant sites in the coastal environment are to be reviewed because:

- Additional, site-specific information has been published or otherwise become available since 2003;
- Change No. 1 to the Bay of Plenty Regional Policy Statement (Criteria) became operative in June 2008 and introduced new criteria for determining the significance of indigenous vegetation and habitats of indigenous fauna;
- The Council has acquired additional responsibilities, by way of an amendment to Section 30 of the RMA (August 2003), to maintain indigenous biodiversity; and;
- A new version of the New Zealand Coastal Policy Statement (NZCPS) was released in 2010, and Policies 1 and 11 have potential implications for the identification and classification of significant sites in the coastal environment.

Accordingly, the council instigated a review of the RCEP (2003). As a component of this, in 2006 Wildland Consultants was commissioned to prepare an inventory of significant sites in the coastal environment (Wildland Consultants 2006g and 2007a). That study included both desktop assessments and field assessments. In 2010, Wildland Consultants Ltd was commissioned to review the locations, extents, and assessments of sites of indigenous vegetation and habitats within the coastal environment in the Bay of Plenty Region. However, that work preceded the release of the NZCPS.

Following the release of the NZCPS, Wildland Consultants was commissioned to:

- Review significant sites in the coastal environment, to align site identification and site classification with Policy 1 and Policy 11 of the NZCPS;
- Incorporate ecological information that has become available since the last review (e.g. Wildland Consultants 2008a, Beattie 2011).

This report was prepared in 2012 and presents information on ecologically significant sites within the Bay of Plenty coastal environment in the form of site data sheets, each of which relates to a mapped area within an accompanying GIS data layer.

This report remained in draft format until the Regional Digital Aerial Map (RDAM) 2010 was available. This report was finalised in February 2013, via the steps outlined below:

- Update site boundaries using the 2010 RDAM;
- Insert site extent (ha) in each site information sheet;
- Finalise Section 5.5 of the report, which identifies sites where boundaries have changed since the RDAM 2003.

## 2. PROJECT OBJECTIVES

The objectives of this project were as follows:

- To review and update the location, extent, and ecological information relating to sites of significant indigenous vegetation and significant habitats of indigenous fauna in the coastal environment using aerial photographs, information from local experts (i.e. Department of Conservation staff) and recently-published information (e.g. Beattie 2011).
- To compare and evaluate sites determined previously to be significant using other criteria sets, using the criteria now available in Policy 11 of the NZCPS.
- To identify any significant sites not previously included in the RCEP (2003) because, for example, they meet criteria in Policy 11 of the NZCPS or are within the extended boundaries of the study area (refer to Section 3.2). For each site, to provide a map and site-specific information, and assess the level of relative significance and the relevant clause of Policy 11 of the NZCPS.
- In undertaking the above assessment, apply Criteria Set 3 of Appendix F, Regional Policy Statement Change Number 1 (Criteria for assessing Indigenous Vegetation and Habitats of Indigenous Fauna in the Bay of Plenty Region) (refer to Appendix 1 of this report).
- For each site, update the information on “condition/pressures”, based on aerial photography and any other available information.

## 3. METHODS

### 3.1 Collation of existing information to update site information

Published and unpublished digital and hardcopy information was collated and reviewed and used to update the site information sheets. The information sources are cited in the ‘References’ section and include:

- Regional Digital Aerial Mosaic (RDAM 2010), based on aerial photography flown in 2010/2011.

- The Regional Coastal Environment Plan (2003), which includes descriptions of 41 sites in the Coastal Habitat Protection Zone (CHPZ) that are internationally, nationally, or regionally significant; 57 Significant Sites in the Coastal Marine Area (SSCMA) that are of local significance; and 121 Sites of Significance on Land (SSL) range from local to international significance. There are also 24 Areas of Significant Conservation Value (ASCV), some of which overlap with CHPZ, SSCMA, or SSL sites.
- Digital maps of CHPZ, SSL, SSCMA, and ASCV zones (RCEP 2003).
- An inventory of significant indigenous vegetation in the Bay of Plenty coastal zone (Wildland Consultants 2006g). The report identified a ‘Significant Vegetation and Habitat Zone’ (SVHZ) based on 214 individual sites with a total extent of 35,048 ha. Each site in the zone was described and mapped at a scale no greater than 1:3000 using ESRI ArcGIS8.3.
- The 2007 addendum to the inventory of sites which revised the assessments of seven sites, and identified an additional four sites (Wildland Consultants 2007a).
- Natural heritage reports (and digital data layers) commissioned by various local government agencies such as Ōpōtiki District Council (e.g. Walls 1998, Wildland Consultants 1999a) and Tauranga City Council (e.g. Wildland Consultants 2009).
- Protected Natural Areas Programme (PNAP) survey reports and digital layers relating to ecological districts that extend into the study area (refer to Figure 1), for the following ecological districts:
  - Motū (Clarkson *et al.* 1986);
  - Pukeamaru (Regnier *et al.* 1988);
  - Waihī (Humphreys and Tyler 1995);
  - Taneatua (Beadel *et al.* 1999);
  - Ōtānewainuku (Beadel 2006);
  - Tauranga (Wildland Consultants 2008a);
  - Te Teko (Beadel *et al.* 2011).

Most of these reports were either complete or available as a draft when the RCEP was published in 2003, but the report on Tauranga Ecological District is more recent. Therefore, it was particularly important to utilise relevant information from the Tauranga report in the current assessment.

- Stand-alone ecological reports on particular areas.
- Data held by the Department of Conservation and the Ornithological Society of New Zealand.
- Marshbird habitat surveys, e.g. Owen (1993, 1994a), Beattie (2010).
- A threatened plant survey of Ōhiwa Harbour (Wildland Consultants 2011b).
- Information on sensitive sites gathered in relation to the grounding of the Rena (BOPRC 2012).



- Information on bird roosts in the Bay of Plenty (Owen *et al.* 2006). This document had not been published when the previous inventory of coastal sites was completed (i.e. Wildland Consultants 2006g, 2007a), although much of the information in Owen *et al.* (2006) had been made available for inclusion in the 2006 inventory.
- Schedule 1 of the Bay of Plenty Regional Water and Land Plan, which lists the habitats and migratory pathways of indigenous fish (BOPRC 2008).
- In 2006 and 2007, local experts from the Ornithological Society of New Zealand (OSNZ) were consulted about bird distribution and habitat use, and any other information which they could provide on flora and fauna. Staff from the Department of Conservation were consulted in 2006, 2007, 2010, and 2012.
- Regionally uncommon plants were identified using Beadel (2009).
- National threat classifications follow:
  - Allibone *et al.* (2009) for freshwater fish;
  - de Lange *et al.* (2009) for vascular plants;
  - Miskelly *et al.* (2008) for avifauna;
  - Hitchmough *et al.* (2007) for other fauna.

### 3.2 Study area boundaries

In the RCEP (2003) the coastal environment is defined as “all coastal marine areas, all offshore islands, and the area of land one kilometre inland from mean high water springs, of the Bay of Plenty Region”. The Council has subsequently redefined the extent of the coastal environment to reflect Policy 1 of the NZCPS by identifying a ‘zone of coastal dominance’ which is generally narrower than 1km (Boffa Miskell 2011). A ‘zone of coastal influence’ was also identified which is generally much wider than 1 km.

Thirty of the sites described in 2006 (Wildland Consultants 2006g) extend further inland than the 1 km limit of the coastal environment. The names of these sites are followed by the suffix “part” to indicate that the natural area extends further inland than 1 km, e.g. Ohinekoao (Part), Oroi (Part).

BOPRC has determined that the ‘zone of coastal dominance’ is to be used to define the extent of the coastal environment. Most of the 214 significant sites identified in Wildland Consultants 2006g lie wholly or partly inside the ‘zone of coastal dominance’ but the Council has advised that no sites should be decreased in extent in this technical report because they all lie within the ‘zone of coastal influence’ (J. Noble, Bay of Plenty Regional Council, pers. comm. 2011).

At 16 locations, the ‘Zone of Coastal Dominance’ extends further inland than the 1 km boundary within which sites were originally identified. These 16 locations range in area from c.2 ha to c.483 ha, encompassing a total area of c.758 ha. Parts of these areas may meet criteria in Policy 11 of the NZCPS.

### 3.3 Location and extent of sites

Digital aerial photographs flown in 2010/11 were used to update site boundaries and site boundaries were adjusted (as required) using these photographs. Prior to the 2013 work on the GIS layer, and except for new sites or where sites had been adjusted based on new information, site boundaries were based on the 2003 RDAM

### 3.4 Identification of additional sites

Additional sites were identified by using the following approach:

- Review of information published since 2006 (e.g. Beattie 2011, Wildland Consultants 2008a, Wildland Consultants 2009b).
- Consulting with relevant experts, e.g. Department of Conservation staff.
- Inspection of aerial photographs for areas within the ‘zone of coastal dominance’ that were not within the study area as it was defined in 2006.
- Analysing the criteria in Policy 11 of the NZCPS (2010) and adding, for example, the mouths of rivers and streams as far inland as the limit of the coastal marine area (using the GIS layer entitled Coastal Plan\_River Mouths supplied by BOPRC in March 2012) or, if a stream was not included in that data layer, as far inland as the limit of the vegetated parts of the site.

### 3.5 Review of the condition and pressures at each site

A “conditions/pressures” field is included in each site information sheet. This field provides an opportunity to include information on threats to biodiversity values at each site associated with, for example, weeds, pest animals, grazing of domestic stock, vehicles, altered hydrology, and surrounding land use. Management actions at a site may also have been included, e.g. fencing, pest or weed control programmes, restoration planting. Conditions and pressures for each site were reviewed and updated based on recent aerial photography, published information, and consultation with relevant experts familiar with specific sites.

### 3.6 Completion of site data sheets

A data information sheet was completed for each site. At the top of each sheet, information is provided on the location and extent of the site, geology-landform class (refer to Section 3.8 below), and, if applicable, a High Value Ecological Site (HVES) Number<sup>1</sup>. HVES Numbers were derived from a GIS layer supplied by Bay of Plenty Regional Council in March 2012. Not every site described in this report is a HVES, but if all or part of any coastal site includes all or part of a HVES, the applicable HVES Number is included in a field near the top of each site information sheet.

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<sup>1</sup> Two hundred and six (206) HVES have been identified throughout the Region. These sites were identified by the Regional Council on the basis of having the greatest ecological value in the Region. They include Category 1 sites identified in PNAP survey reports, and/or sites identified as being of international, national, or regional significance in more recent assessments. HVES were identified for BOPRC operational purposes as priorities for management under the Biodiversity Programme and attract a higher grant rate than non-HVES.

Site location diagrams are presented in each site data sheet. These are indicative of site location and generally show the site to be slightly larger than reality. Following the site location diagram there are descriptions of vegetation and habitat types, records of nationally Threatened or At Risk<sup>1</sup> species of plants or fauna<sup>2</sup>, conditions or pressures that the site may be subject to (refer to Section 3.5 above), and key features of the site. Each sheet also includes assessments of relative ecological significance (refer to Section 3.9 below). A description of each field in the data sheet is provided in Appendix 9.

### 3.7 Ecological context

Each site was evaluated within the relevant ecological district (Table 1).

Table 1: Ecological regions and ecological districts relevant to coastal environments of the Bay of Plenty Region.

Ecological Region	Ecological District
Coromandel	Waihi Mayor Island
Northern Volcanic Plateau	Tauranga Mōtītī Ōtānewainuku White Island
Whakatāne	Te Teko Taneatua Ōpōtiki
Raukūmara	Motu
East Cape	Pukeamaru

### 3.8 Geology-landform classes

Broad geology/landform types present in the study area were identified, to provide a further spatial framework for ecological evaluation.

Assessment and identification of geology and landform units was based on a combination of geological maps and professional knowledge. Three geological maps were used: a geology shapefile supplied by Bay of Plenty Regional Council (dated 2009), and hard copy maps from Owen (1962) at a scale of 1:500,000, and Healy *et al.* (1975) at a scale of 1:250,000.

The following geology-landform classes were used:

- Volcanic hard rock
- Volcanic soft rock
- Sedimentary (volcanic) unconsolidated
- Greywacke hard coast
- Sedimentary coastal hinterland

<sup>1</sup> Threat classifications follow de Lange *et al.* (2009) for vascular plants, Miskelly *et al.* (2008) for avifauna, Allibone *et al.* 2010 for fish, and Hitchmough *et al.* (2010) for reptiles.

<sup>2</sup> A small number of very sensitive records have not been included, at the request of Department of Conservation, to protect particular species from illegal collectors.

- Sand
- Alluvium beaches
- Low gradient alluvium
- Estuarine

Geology-landform class or classes were mapped using GIS for each site at a scale of 1:1,000 (for sand dune sites in Tauranga Ecological District) and 1:5,000 for all other sites in 2010 based on the 2006/2007 RDAM. If more than one geology-landform class was present in a site, each class within the site was delineated (see example provided in Figure 2). In 2013 this layer was updated to include all new sites, and changes to site boundaries, based on the 2010 RDAM. Ecosystem boundaries within sites have not been updated. A GIS shapefile depicting all sites and their respective geology-landform classification has been provided to BOPRC.

### 3.9 Evaluation of ecological significance and NZCPS Policy 11

Following the review of each site and the updating of the site data sheets, three sets of criteria were used to assess each site:

- Indigenous Vegetation and Habitats of Indigenous Fauna criteria presented in Set 3, Appendix F, of the Bay of Plenty Regional Policy Statement (Environment Bay of Plenty 2005a). This provides criteria for the identification and assessment of significant indigenous vegetation and significant habitats of indigenous fauna. A set of guidelines was developed to assist with assessment of the degree to which each criterion is met. These were developed in accordance with the 'User Guide' for these criteria (Environment Bay of Plenty 2008) (see Appendix 1).
- The relative significance of each site was assessed using criteria presented in Appendix 2. The criteria were used to classify each site as being nationally, regionally or locally significant, and are consistent with the criteria set used to identify the sites in the 2003 plan. Each site was assessed against criteria for national significance, then regional criteria, and finally local criteria.
- The criteria and process developed to assess each site in terms of Policy 11 of the NZCPS (Appendix 11) as presented in the assessment form in Appendix 12. The assessment process was developed in consultation with BOPRC (Wildland Consultants 2012).

## 4. OVERVIEW OF THE BAY OF PLENTY COASTAL ENVIRONMENT

Sand dunes line the Bay of Plenty coast from Waihi to Ōpape, broken only occasionally by river and harbour mouths, volcanic landforms (e.g. Bowentown and Mauao), and rocky headlands (e.g. Kōhi Point). Harbours and estuaries are also a feature of the Region (e.g. Tauranga Harbour, Maketū Estuary, Waihi Estuary, and Ōhiwa Harbour) and include saltmarshes and estuarine wetlands dominated by mixtures of oioi (*Apodasmia similis*), sea rush (*Juncus kraussii* var. *australiensis*), and/or mangroves (manawe, *Avicennia marina* subsp. *australasica*)<sup>1</sup>. Freshwater

<sup>1</sup> Common and scientific names of plant species referred to in the text are presented in Appendix 3.

wetlands were originally common around the harbour margins, and inland of sand dunes. Some of these were previously very extensive (e.g. Rangitāiki Swamp, Kawa Swamp, and Waihī Swamp) but most wetlands in the Region have now been drained and developed for farming. Low coastal hills and headlands adjoin Tauranga Harbour and Ōhiwa Harbour and the coast between Pukehina and Matatā.

Between Ōpape and Raukōkore there are steep, rugged, greywacke headlands, interspersed by gravel beaches on long exposed reaches, and finer sand and pebble beaches in the numerous small secluded bays. North-east of the Raukōkore River there is a series of narrow coastal terraces. The rugged, cliffed coastline is broken only by a few small sandy beaches and the wide, flat-bottomed valley floor of the Whangaparaoa River.

There are four relatively large islands and several smaller islands and stacks in the Region, in three ecological districts. The islands are virtually all of volcanic origin and one, Whakaari (White Island), is an active volcano. Geothermal activity on Moutohorā (Whale Island).

In the past, sand dunes would have been dominated by indigenous sand binders including spinifex (*Spinifex sericeus*), pingao (*Ficinia spiralis*), and sand tussock (*Poa billardierei*, hinarepe), with tall forest extending on to the dunes. Mangroves, sea rush, and oioi would have dominated estuarine wetlands, grading into saltmarsh ribbonwood (*Plagianthus divaricatus*) and manuka (*Leptospermum scoparium*). Raupo (*Typha orientalis*), sedges, harakeke (*Phormium tenax*) and ti kouka (cabbage tree; *Cordyline australis*) would have dominated freshwater wetlands, with local swamp forest. Coastal hillslopes and headlands would have been forested, dominated by pohutukawa (*Metrosideros excelsa*) or mixed coastal forest including pohutukawa, puriri (*Vitex lucens*), karaka (*Corynocarpus laevigatus*), tawa (*Beilschmiedia tawa*), rewarewa (*Knightia excelsa*), kohekohe (*Dysoxylum spectabile*), and (locally) hard beech (tawhai raunui, *Nothofagus truncata*). Steep coastal cliffs would have supported an array of coastal trees, shrubs, and herbs, including pohutukawa, manuka, wharariki (*Phormium cookianum*), New Zealand ice plant (*Disphyma australe*), kanuka (*Kunzea ericoides*), mingimingi (*Leucopogon fasciculatus*), and *Ficinia nodosa*.

Vegetation in the Bay of Plenty coastal environment has had a long history of modification and disturbance by humans, starting with extensive modification by Polynesians during pre-European times, mainly by large-scale burning. Modification continued following the arrival of Europeans and much of the original vegetation has been substantially modified or removed. However, there are remnant examples, albeit modified, of the major vegetation associations e.g. sand dune vegetation is widely distributed along the coastline; coastal forest remains on some hillslopes and headlands (e.g. Mauao, Matatā Scenic Reserve, and Ōhope Scenic Reserve), and estuarine wetlands remain in Harbours and Estuaries. It is notable, however, that no examples of relatively unmodified primary forest remain on the margins of estuaries or on dune systems. The natural character of the coastal environment in each ecological district is described in more detail in Sections 6-9 below.

In the past, the Bay of Plenty coastal environment would have supported a much richer assemblage of fauna. Coastal hills and cliffs would have supported extensive colonies of seabirds including, but not limited to, species which persist on the offshore islands of the



region such as grey-faced petrel, flesh-footed shearwater and diving petrel<sup>1</sup> (c.f. Holdaway *et al.* 2001). Large nutrient inputs provided by these seabird colonies would have influenced the structure and composition of coastal vegetation and supported rich and varied reptile and invertebrate communities, including species such as tuatara, Duvaucel's gecko, Whitaker's skink (Towns and Daugherty 1994), and probably northern giant weta species (Sherley 1998). A wide range of forest birds would have inhabited pohutukawa-dominant forests on hillsides and headlands, including species such as North Island saddleback, North Island kākā, North Island kokako and stitchbird, which are now either confined to the offshore islands of the region or occur in a few places on the mainland within the region.

The Bay of Plenty coastal environment contains extensive areas of wader and shore bird habitat in large harbours such as Tauranga and Ōhiwa, and numerous estuaries, lagoons, sandspit and beach sand dune systems, particularly where the major rivers disgorge into the sea. Some Threatened or At Risk species, such as northern New Zealand dotterel are scattered across the coastal environment, but other species which were formerly widespread, such as brown teal, have suffered range contractions or local extinctions.

Freshwater and saline water bodies associated with the Bay of Plenty coastal environment still contain some of New Zealand's rarer and Threatened fish species. Giant kōkopu (At Risk-Declining) are found in the coastal streams, swamps and lake margins of the Region. Shortjaw kōkopu (At Risk-Declining) are present in forested streams, and longfin eels are also present in various waterways throughout the region. Inanga (*Galaxias maculatus*, At Risk-Declining) is a culturally important species because it forms a large proportion of the whitebait catch. It uses vegetation around the upper limits of tidal riverine areas for spawning, and a number of such spawning sites have been identified in Bay of Plenty rivers (Mitchell 1990). Threats to freshwater fish in the Bay of Plenty coastal environment include habitat reduction and modification, barriers to passage, and competition from introduced species (Department of Conservation 2005).

## 5. FINDINGS

Two hundred and thirty (230) sites of significance were identified in the Bay of Plenty coastal environment. Eighty-two (82) of these sites are consistent with Policy 11a of the NZCPS (2010) and 148 sites are consistent with Policy 11b. Site data sheets are presented in Sections 6-10 of this report, arranged by ecological district (Table 1), with sites generally listed from west to east. A list of sites by ecological district is provided in Appendix 10.

### 5.1 New sites

Twenty-one sites additional to the 2006 review of significant sites in the coastal environment (Wildland Consultants 2006g) have been mapped and described in this study:

- Eight sites identified in the study of natural areas in Tauranga Ecological District (Wildland Consultants 2008a).

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<sup>1</sup> Scientific names of fauna species mentioned in the text are presented in Appendix 4.

- One site identified in the Tauranga City State of the Environment report, 2008 (Wildland Consultants 2009b).
- Eight sites in Ōhiwa Harbour identified by Beattie (2011).
- One river mouth (Tōrere River Mouth).
- One site (Kaituna Wildlife Management Reserve) within the zone of coastal dominance that was not within the study area defined in 2006.
- One site (Rangiwāea Island Sandspit) identified in the current study as providing significant habitat for fauna.
- One site identified on Matakana Island in 2011: Tahunamanu Pohutukawa (Wildland Consultants 2011d).

## 5.2 Sites amalgamation

Thirteen sites identified in 2006 (Wildland Consultants 2006g) were amalgamated into four larger sites (Table 2). In some cases, minor changes were also made to the boundaries of these sites. Sites were amalgamated where there was a consistency in ecological significance levels and to recognise ecological linkages.

Table 2: Sites from Wildlands Consultants (2006g) which have been amalgamated in the current study.

Current Study (2012)		Former Site Names and Numbers (Wildland consultants 2006g)
Site Number	Name	
223	Te Ranginui-Oruaiti-Whangaparaoa-Tapuaeharuru (Part)	Te Ranginui SVHZ-192 Oruaiti SVHZ-194 Whangaparaoa SVHZ-196 Tapuaeharuru SVHZ-195
215	Haparapara River-Te Kaha (Part)	Haparapara River SVHZ-184 Te Kaha (Part) SVHZ-185
067	Opureora	Opureora Spit SVHZ-84 Opureora Islet SVHZ-86 Motungaio Island SVHZ-87
055	Tauranga Harbour-unvegetated and sparsely vegetated intertidal and subtidal areas	North Tauranga Harbour SVHZ-9 Tauranga Harbour SVHZ-14 Mid Tauranga Harbour SVHZ-34 Tauranga Harbour at Motungaio Island SVHZ-94

## 5.3 Division into separate sites

Three sites identified in 2006 (Wildland Consultants 2006g) were divided into separate sites (a total of seven sites), reflecting the reassessment of ecological significance within different parts of the larger sites (Table 3).

Table 3: Sites identified in 2006 which have been divided into two or more sites in the current study.

Current Study (2012)		2006 (Wildland Consultants 2006)	
Site Number	Site Name	Site Number	Site Name
135	Ōtamarākau-Matatā-Whakatāne Dunes A	SVHZ-115	Ōtamarākau-Matatā-Whakatāne Dunes
130	Ōtamarākau-Matatā-Whakatāne Dunes B		
138	Ōtamarākau-Matatā-Whakatāne Dunes C		
014 005	Tanners Point Tuapiro	CHPZ-3	Tuapiro
100 101	Rangataua Bay A Rangataua Bay B	SVHZ-66	Rangataua Bay

#### 5.4 River mouths

Policy 11(b)(v) of the NZCPS identifies “areas and routes important to migratory species”. Therefore, river mouths that had not been included within sites in 2006 (Wildland Consultants 2006g) were added to existing sites (Table 4). For one river mouth (Tōreire River), a new site was created (refer to Section 5.1 above).

Table 4: Waterways (rivers and streams) added to sites in the current study in accordance with Policy 11(b)(v) of the New Zealand Coastal Policy Statement.

Waterway	Site Name	Site Number
Waiau River	Athenree	021
Tuapiro Creek	Tuapiro	005
Tahawai Stream	Katikati Inlet	002
Uretara Stream	Katikati Inlet	002
Ngututuru Stream	Te Rereatukahia	001
Aongatete River	Aongatete Estuary	020
Wainui River	Wainui Estuary	023
Waipapa River	Waipapa Estuary	041
Te Puna Stream	Te Puna Estuary	047
Wairoa River	Wairoa River Wetlands	068
Kopurererua Stream	Waikareao Estuary 2	082
Waimapu Stream	Waimapu Estuary	080
Kaitemako Stream	Kaitemako Stream Mouth	090
Waitao Stream	Waitao Stream	102
Hāwai River	Hāwai-Motū River (Part)	212



## 5.5 Boundary revisions

Based on the 2010 aerial photographs, the boundaries of 226 sites were revised. No changes were made to four of the 230 sites. Changes were made where:

- Minor changes were made relating to the use of higher quality aerial images, or due to working at a more detailed scale - 224 sites;
- Vegetation had been cleared or removed - 51 sites;
- Indigenous vegetation has increased in extent - 19 sites;
- Recent, higher quality images showed that vegetation previously identified as indigenous is actually exotic - 18 sites;
- It is apparent that vegetation previously identified as exotic is actually indigenous - 31 sites;
- Boundary revision achieves consistency in boundary definition across similar types of sites - sand 85 sites and rock 16 sites.

In addition, for many of the sites containing sand dunes, there were minor changes to site boundaries (i.e. 1-2 m in places) due to the dynamic nature of the dune environment, but these small changes have not been included in the sites identified above as having changed in extent.

For many sites there was more than one factor contributing to boundary changes. For 159 sites, changes to boundaries were a consequence of the use of better quality aerial photographs, and do not indicate 'real' changes on-the-ground. For 65 sites, the boundary changes were a result of real, on-the-ground changes to the extent of the natural areas, due to vegetation clearance or the increased extent of indigenous vegetation.

The high number of 'real' changes, such as changes in vegetation extent, highlight the need for regular updates to this data set. Further evaluation of the changes and the extent of change, to identify where change is occurring and in what type of habitats, would provide useful information for State of the Environment reporting.