



Section C
**THE MARLBOROUGH
COASTAL ENVIRONMENT**

Introduction to the Marlborough Coastal Environment and its Sub-Regions

In this section, the broad characteristics of the Marlborough Sounds and South Marlborough sub-regions are described and evaluated at the sub-regional scale (see Section B, Figure 6, Level 2) and also Map 4, opposite.

The coastline of Marlborough is one of the longest in New Zealand. It can be divided broadly into two very different types of land.

Marlborough Sounds

The first land type is the fractured landscape of islands, elongated spurs and complex sinuous waterways of the Marlborough Sounds, formed from drowned former river valleys. The intricate and complex coastline contains a diverse range of ecosystems, geology, climate and biota. Parts of the sounds are relatively shallow and strong tidal currents are evident around French Pass, due to its narrow constriction between the shallow embayment of Tasman Bay to the west and the outer sounds to the east. The highest point is Mount Stokes, which rises to 1,203 metres above sea level. Pelorus and Queen Charlotte Sounds are the two main inlets leading to the settlements of Havelock and Picton respectively. Geological evidence above and below the water suggests that the striking faults along the Queen Charlotte Fault zone show the former river systems that moulded the Marlborough Sounds landscape before they were flooded. These river systems flowed southwards and connected with the Pelorus River at Havelock and through the broad Kaituna valley towards the Wairau Valley.

South Marlborough

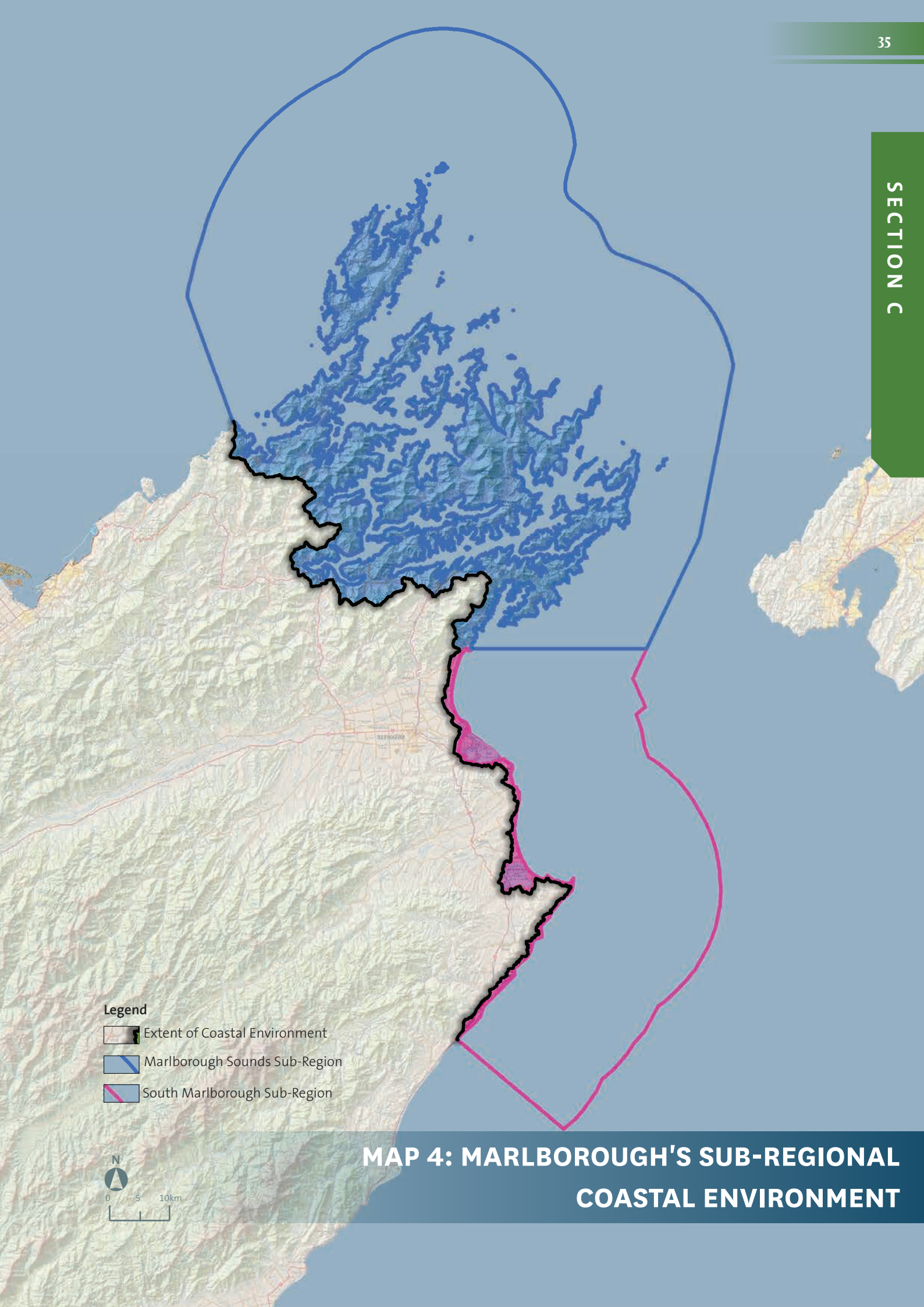
The second landtype is the South Marlborough Coastline, extending from Rarangi in the north, to the region's southern boundary on the Kaikoura coast includes the broad, low-lying sweep of Cloudy Bay and its associated coastal marshes, lagoons and sand bars south of the Wairau River and sequence of coastal ridges and swales at Rarangi. It also includes part of the wide river corridors of the Wairau and Awatere. Further south are the eroded cliffs of the White Bluffs

that form the division between Cloudy Bay to the north and Clifford Bay to the south, the coastal cliffs around Cape Campbell, and the stranded former bay of shallow Lake Grassmere. South of Cape Campbell are the coastal limestone features around the Flaxbourne River Mouth to Chancet Rocks and south to Weld Cone and Needles Point. Marlborough's coastlines, like its landscapes, are diverse.




The diversity of Marlborough's coastal environment can be attributed to its variable morphology and underlying formative processes. As with other parts of the country, much of the original natural land cover within the coastal environment has been modified, although remnants of coastal bush and indigenous broadleaf forest still remain, most notably within areas of the Sounds, on steeper terrain. Much of the cleared land within the Sounds has, in recent years, been retired and is gradually reverting back to scrub and indigenous forests. Large parts of the Marlborough Sounds are managed by the Department of Conservation, including the Queen Charlotte Track and numerous predator-free scientific reserves such as Maud Island.

Marlborough's marine environment is equally diverse, influenced greatly by the region's location at the top of the South Island, flanked on one side by the warmer sheltered waters of Tasman Bay and on the other by the colder and very exposed waters of Cook Strait and the south Marlborough coast. Nestled in between are the very sheltered waters of the enclosed Marlborough Sounds.

Several broad environmental gradients traverse the length and breadth of the region, notably wave exposure, temperature, substrates and depth, but also tidal influence, productivity, sedimentation and salinity. These interacting variables help shape the highly complex marine environment which is so evident across the Marlborough region.



Legend

-  Extent of Coastal Environment
-  Marlborough Sounds Sub-Region
-  South Marlborough Sub-Region



MAP 4: MARLBOROUGH'S SUB-REGIONAL COASTAL ENVIRONMENT

The Marlborough Sounds Sub-Region

The Marlborough Sounds display a unique combination of landforms formed by drowned river valleys resulting in a highly fractured coastline with numerous offshore islands. The Marlborough Sounds include very steep to moderately steep dissected coastal hills, peninsulas and islands with a mix of vegetated and cleared hill slopes. The sub-region contains a diverse range of ecosystems determined by a wide range of geology, landforms, climate and biota. There are extensive areas of intact upland forest and large tracts of lowland and coastal forest. Modification is predominantly close to the land/ sea interface, where houses, ports and recreation related activities are most prolific. There are also areas of forestry and cleared grazing land.

The Marlborough Sounds' marine environment is diverse, notable for its connections to Cook Strait and its highly convoluted form of interconnected sounds, inlets, bays, reaches, and channels with numerous islands, stacks, headlands and reefs. Several physical variables (e.g. shelter/exposure, temperature, salinity, turbidity/sedimentation, depth, substrate, tides and currents) create overlapping layers of complexity to the Sounds' marine environment. Aquaculture tends to be located within western parts of the Sounds (i.e. concentrated in Pelorus Sound).

The interplay of the various characteristics both on land and sea creates a unique environment notable for its broad-scale variability.

Marine

Collective Characteristics of the Marlborough Sounds Marine Environment

The Marlborough Sounds marine environment retains much of its natural character. Bordered by Tasman Bay to the west and Cook Strait to the north-east, exposed to open ocean conditions along its south-eastern flank, yet largely sheltered by its convoluted form, the Marlborough Sounds are uniquely structured and situated.

A number of broad and sometimes interacting environmental gradients traverse the length and breadth of the Marlborough Sounds, notably; depth, wave exposure, tidal influence (currents, tidal height, and water exchange), turbidity, sedimentation, temperature, salinity, nutrient availability, and substrate composition.



Above: The exposed outer Sounds are subjected to high winds funnelling through Cook Strait.

The marine and terrestrial environments combine visually to form a region of distinctive natural character. Notable features include: the Marlborough Sounds' intricate coastline formed from the many sounds, reaches, inlets, bays, coves and estuaries; numerous headlands, islands and offshore rocks and stacks; wild and remote localities; exposed and sheltered waters; and moderate to very strong tidal flows around the flanks of the Sounds and along the main channels.

Collective Abiotic Characteristics of the Marlborough Sounds Marine Environment

The exposed eastern and northern areas of the outer Sounds are subjected to high winds funnelling through Cook Strait. The south-eastern coast is also exposed to oceanic swells from the south. Shores in these exposed localities can be subjected to very rough seas. Elsewhere the Marlborough Sounds are noted for their relatively sheltered conditions.

Strong tidal currents occur around the outer Sounds, especially near headlands and within constricted channels, and through Tory Channel. Moderate currents also occur off the exposed faces and headlands of the major channels and reaches within the enclosed areas of the Sounds. Tidal currents tend to be weak in sheltered bays and inlets, so that waters remain in these localities for much longer time periods.

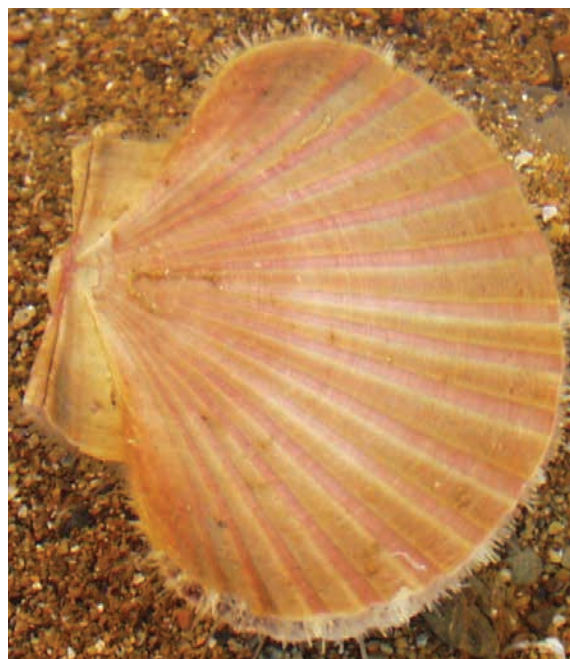
Tidal range varies across the Sounds, with much larger tides in the west (up to 4.5m in French Pass) compared to the east (up to 1.6m in Picton). Other notable features include: very complex and variable hydrodynamics; relatively low sediment loadings in Queen Charlotte Sound and the outer Sounds generally; moderate to high sediment levels in inner-Pelorus Sound, Port Underwood and near Cloudy Bay; colder waters in the east, warmer waters in the west; reduced salinities towards the head of Pelorus Sound; nutrients predominantly derived from river inflows, from upwelling in Cook Strait and from sediment remineralisation; and generally very good water quality except in close proximity to Havelock and Picton.

Cobble/boulder and bedrock shores, interspersed by the occasional small sand/gravel beach, dominate the intertidal and shallow subtidal zones of the

Marlborough Sounds. Sediments with a mixture of sand, broken shell and silt can occur below the reef zone in shallow wave-worked areas or areas with moderate-high currents. An extensive and comparatively uniform mud/silt bottom typically extends beyond, dominating the sea floor especially within sheltered parts of the Sounds.

Exceptions to this general pattern include: offshore reefs/shoals, rocks and stacks especially in the outer Sounds; areas of coarse sediments (sands, gravels and cobbles) in some exposed offshore locations; mud/sand flats in estuarine areas; pea gravel beaches in eastern Cook Strait; and a very limited array of sandy shores.

Notable coastal landforms include: estuaries and tidal flats; cusped forelands; coastal bluffs; offshore islands, stacks, emergent rocks, and reefs; and numerous headlands and bays as a result of the convoluted and intricate nature of the Sounds as a whole.



Above: A scallop shell. Some areas of the Marlborough Coastline are highly productive

Collective **Biotic** Characteristics of the Marlborough Sounds **Marine** Environment

Natural biodiversity of the Sounds as a whole is high as a result of the diverse range of environmental conditions and physical habitats. However, on a more localised scale biodiversity can range from the very diverse (e.g. reefs and offshore rocks/stacks of the outer Sounds) to the relatively simple (e.g. benthic communities in the more sheltered enclosed bays). There is an overall gradient in species diversity from the inner to the outer Sounds, with the number of species generally increasing with proximity to the open ocean.

Productivity is variable, but generally moderate across the region. Some areas are distinguished by their very high productivity (e.g. estuaries and exposed parts of the outer coast, especially those most influenced by Cook Strait) whereas other areas have comparatively low productivity (e.g. particular enclosed, sheltered bays with limited water exchange).

Key marine ecological features in the Marlborough Sounds include: near-shore reef communities in sheltered regions dominated by mobile and encrusting animals; rich and abundant reef communities in areas exposed to strong wave action and strong currents; high current sediment communities in areas subjected to strong tidal flows; relatively few conspicuous species inhabiting offshore sediment areas; biogenic communities (e.g. brachiopods, hydroids, horse mussels, bryozoans, tube worms, rhodoliths and offshore red algae beds) in certain localised areas; scallop beds; *Macrocystis* beds in colder, sheltered eastern areas; various estuaries both large and small; elephant fish spawning grounds; and a coastal fish fauna noteworthy for the predominance of blue cod and spotties.

A wide range of marine mammal species inhabit or migrate past the Marlborough Sounds. Cook Strait is an important migratory route for several large whale species, including sperm, humpback, blue, minke and southern right whales. Pods of orca (killer whales) are regular visitors to the Marlborough Sounds and dusky dolphins can be relatively numerous at times, mainly over winter and spring in the mid-outer Sounds. A small resident population of Hector's dolphins is located in Queen Charlotte Sound. Hector's dolphins also venture into Port Underwood from neighbouring Cloudy Bay, but are rare elsewhere in the Sounds. A moderate-sized population of bottlenose dolphins (>380 individuals) is found across the top of the

South Island, many of which utilise the Marlborough Sounds. New Zealand fur seals have established small haul-out colonies at various sites through the mid-outer Sounds, along with a large breeding colony on Takapourewa (Stephens Island) and a smaller rookery on the Trio Islands.

Numerous seabirds feed through the mid-outer Sounds including terns, gulls, shearwaters, petrels, prions, shags and gannets. King shags, endemic to the Marlborough Sounds, are restricted to only a few breeding sites in the outer Sounds. Little blue penguins occur in good numbers throughout the Marlborough Sounds.

Tidal wetlands are found at the heads of most major bays and inlets, forming an important wetland network within the Marlborough Sounds. Most of these wetlands are relatively small, the major exceptions being Whangarae Estuary (Crosisilles Harbour) and a very significant estuarine complex centred on Pelorus/Kaituna Estuary at the head of Pelorus Sound. Collectively these coastal wetlands are crucial habitat for numerous wetland bird species including threatened banded rail, marsh crake and banded dotterel.



Above: Numerous seabirds feed through the mid-outer Sounds including King Shag.

Collective Experiential Characteristics of the Marlborough Sounds Marine Environment

The Marlborough Sounds comprise of an extensive labyrinth of waterways, the experiential characteristics of the marine environment are extremely varied and include isolated and remote bays, open seas and busy waterways used by many people. Ultimately, the way people experience the waters of the Marlborough Sounds will be highly dependent on their accessibility to and involvement with, the water. There is, of course, some cross-over with the experiential characteristics of the Marlborough Sounds Terrestrial Natural Character areas, so the focus here is on experiences, perception intactness and modification to the water.

The network of waters of the Marlborough Sound are well known both nationally and internationally and are one of the most popular places to visit, holiday in or reside in the upper South Island. The passenger ferry which connects Picton to Wellington and travels through part of Queen Charlotte Sound and Tory Channel provides visitors with opportunities to view the spectacular waters framed by steep, often bush-clad hills. Various smaller craft provide private and public access and enjoyment to all inner and outer Sounds waters.

Queen Charlotte Sound is the most popular area of water (or sound), where most people of the Marlborough Sounds reside. In the numerous bays of Queen Charlotte Sound, many jetties, wharves and moorings are present with boats and yachts, often anchored. By contrast, Pelorus Sound is less inhabited, although most of the waters contain 'working aquaculture farms' that bring numerous related activities to many of the bays.

The waters of the outer Sounds are popular locations for fishing, diving and sailing; with the frequency of all of these activities being more or less dictated by the weather conditions. Often sheltered bays in the outer sounds provide refuge from the exposed winds and strong currents of Cook Strait during storms. Long distance panoramic views are available from the water to the horizon, where Mt. Taranaki and the Kapiti Coast can often be seen.

The key urban settlements that influence the natural character of the water include Picton, its main port and Shakespeare Bay, Waikawa and its marina, Havelock and its marina and Okiwi Bay.

Aquaculture also reduces the naturalness of the water. Mussel farms are principally found in the western areas of the Sounds, including Admiralty Bay, Waitata Reach (and Bays), Pelorus Sound, Forsyth, Beatrix and Crail Bays. Salmon farms are also evident, although sporadically located throughout the Sounds.

The variety of the Marlborough Sounds' waters allows for a diverse range of experiences to be gained when visiting or living nearby. Different parts of the community (i.e. residents, local or international visitors) value different parts of the Sounds, depending on the level of remoteness and type of recreational pursuits. The more sheltered inner waters attract often different activities to the more exposed, wild and rugged coastal waters of the outer Sounds. Where accessibility and a rugged coastline coincide, some of the most popular and memorable parts of the Sounds. In terms of experiencing a sense of wildness, remoteness and isolation, the least developed parts of the coast rate the highest for the purposes of this natural character assessment.

People's enjoyment of the various Sounds' marine environments is also affected by transient and sensory factors. In intertidal areas on pebble and sandy beaches, for instance, the ebb and flow of the water creates different moods. The aroma of the sea and the sound of the lapping or crashing waves is often associated with emotions and feelings. Seasons affect the experiential values of the marine environment, where fish and pods of dolphins or whales can be seen from a variety of viewpoints.

People's experience of the waters of the Sounds depends on their knowledge, their activity and their role with the area. For a diver, a visitor on a boat, a mussel farmer or for tangata whenua, the experience can be very different.

Terrestrial

Collective Characteristics of the Marlborough Sounds Terrestrial Environment

The Marlborough Sounds is a nationally important landscape with extensive wild and scenic areas and an intricate coastline with numerous islands. Strong winds often dominate the land. Islands provide a refuge for threatened species and seabirds dominate the maritime ecosystems natural to the area. Natural biota characteristic of a Gondwanaland remnant with highly distinctive species such as tuatara. Steep gradients in wind velocity from north to south.

Collective Abiotic Characteristics of the Marlborough Sounds Terrestrial Environment

The landscape of the Marlborough Sounds is dominated by steep to very steep hill and mountain slopes, sea cliffs, rocky shorelines and islands. The partial drowning of an established incised dendritic drainage network by subsidence and marine incursion has resulted in an intricate array of small inlets, coves, headlands, peninsulas, deeply recessed bays and harbours. Undulating to rolling and gently sloping fluvial depositional landforms such as terraces, fans and floodplains are a minor component of the landscape. Barrier spits and tombolos, estuaries and lagoons, rolling sandy beaches, beach ridges and dunes, and prograding inlet head and river deltas are present but are also a minor landscape component.

The outer Sounds are exposed, with very steep to precipitous coastal escarpments and sea cliffs, extensive bare rock, steep coastal slopes, sinuous headlands, and numerous islands and stacks facing onto the Tasman Sea, Cook Strait, or the South Pacific Ocean. These erosional landforms result from and are continually rejuvenated by the high wave energy. In contrast, while steep rocky shorelines are common in the more sheltered inner Sounds, precipitous sea cliffs are not a feature.

The Marlborough Sounds are underlain by a variety of rocks ranging from siliceous, weakly to strongly foliated textural zone (t.z.) 11B, 111A and 111B schist, and poorly bedded and well bedded sedimentary sandstones and siltstones, and minor igneous lithologies of the Caples Group; and weakly foliated

t.z. 11A, and 11B schist, and well to poorly bedded sandstone-siltstone sedimentary rocks of the Torlesse Supergroup. D'Urville Island and surrounds are underlain by ultrabasic, intermediate, and acid intrusive and extrusive rocks, and serpentinitic melange (collectively known as the mineral belt rocks); and associated hard and very hard poorly bedded and well bedded sandstone and siltstone sedimentary strata.

Soils derived from the ultrabasic rocks have severe nutrient imbalances and sometimes toxic levels of exchangeable magnesium, whereas those derived from Brook Street Volcanic Group rocks are of medium fertility, and those from siliceous sedimentary and schist rocks range from low to medium fertility.



Above: Cooks scurvy grass, *Lepidium oleraceum*

Collective Biotic Characteristics of the Marlborough Sounds Terrestrial Environment

In terms of indigenous vegetation, there are a few land areas of gentle topography at low altitude where naturalness has not been significantly compromised. Here there is an indigenous forest cover of karaka [this species has been introduced to the Sounds], kohekohe, ngaio, tawa, titoki, occasional podocarps and southern rata. D'Urville Island, Mt. Stokes and the forests of upper Tennyson Inlet retain much of their indigenous cover, making a major contribution to the natural character of the Sounds as a whole. Steep lands with regenerating and old growth indigenous forest provide natural character, despite a long history of modification. The overall pattern is that natural character is better retained in the west. These western areas are representative of the natural character intrinsic to the Sounds and their preservation and restoration would contribute greatly to the natural character of the Sounds as a whole. Where predominantly indigenous vegetation areas exist in the east, and in low altitude areas of the Pelorus, they break up the predominantly modified landscape and make a strong contribution to the natural character of the Sounds as a whole.

High natural diversity is due to habitat heterogeneity and the presence of island refugia. Generally, natural productivity is moderate across the Sounds, with limited areas of extremely high productivity (seabird islands) and of very low productivity (ultramafic areas). Natural biotic patterns are strongly influenced by intricate landforms, substrate and strong climatic gradients between the Pelorus hinterland (high rainfall/low wind) to Cook Strait narrows (low rainfall/strong winds).

The Sounds provide habitat important for the survival of a number of nationally threatened, at-risk or locally endemic species, including: the giant land snails (*Powelliphanta hochstetteri bicolor* and *P. obscura*); ngaio weevil (*Anagotus 'stephenensis'*); land snail (*Rhytida greenwoodi stephenensis*); giant weta (*Deinacrida rugosa*); Cook Strait click beetle; Hector's dolphin; king shag; Cook Strait tuatara and Brothers Island tuatara; striped gecko; Hamilton's frog and Maud Island frog; Cook's scurvy grass (*Lepidium oleraceum*); muttonbird groundsel (*Senecio sterquilinus*); *Kirkianella 'glauca'*; titirangi (*Hebe speciosa*); Cook Strait bristle tussock (*Rytidosperma petrosum*); Mt. Stokes cushion daisy

(*Celmisia macmahonii* subsp. *macmahonii*) and carrot (*Anisotome haastii* var.); D'Urville mineral belt hebe (*Hebe rigidula* var. *sulcata*); two Cook Strait mahoe (*Melicytus* aff. *obovatus* and *M. aff. novae-zelandiae*); bamboo tussock (*Anemanthele lessoniana*); fierce lancewood (*Pseudopanax ferox*); large-leaved milktree (*Streblus banksii*); sand spurge (*Euphorbia glauca*); white mistletoe (*Tupeia antarctica*).

Nationally outstanding and unusual community types include: Cook Strait maritime terrestrial plant communities; coastal and lowland mineral belt communities; bird and reptile islands; and Mt. Stokes alpine zone. Habitats associated with nationally rare and endangered species include: predator free habitats (for species such as kaka, kakariki, tuatara, Hamilton's frog, white mistletoe, little spotted kiwi, and South Island saddleback); riparian vegetation; maritime terrestrial vegetation (for species such as *Kirkianella*, Cook Strait bristle tussock, and fierce lancewood); coastal vegetation (for species such as large-leaved milk tree and sand spurge); and bird islands (for species such as Cook's scurvy grass and mutton bird groundsel).

Islands which lack one or more introduced mammalian pests are nationally rare. Vulnerable ecosystems unique to the coastal environment include coastal dunes. Natural movement of some species, such as sea birds and penguins move between land and sea. Natural movement of wildlife between areas of natural vegetation



Above: Karaka trees were planted by Māori as a source of food

Collective Characteristics of the Marlborough Sounds Freshwater Environment

There is an abundance of small coastal streams with good water quality and in-stream habitat which makes the area nationally significant for its native fishery values.

Collective Abiotic Characteristics of the Marlborough Sounds Freshwater Environment

The gullies within the Sounds are generally small with short, often ephemeral watercourses. There is an abundance of small coastal streams located throughout the Sounds. There is a strong climatic gradient between the Pelorus hinterland (i.e. beyond the coastal environment – i.e. high rainfall) to Cook Strait – i.e. low rainfall, which influences the catchment size and summer low flows.

Natural water quality of the Marlborough Sounds is generally very high although degraded in some lowland river catchments from farming activities (e.g. Kaituna) and localised contamination from septic tanks and other wastewater discharges or seepages.

Generally very clear, cool waters flow from forested catchments. Plantation forest harvesting activities and slash management compromise water quality and habitat episodically.

Freshwater invertebrate populations typically reflect the conditions of high water quality with a large number of more sensitive insect groups such as caddis and mayflies.

Collective Biotic Characteristics of the Marlborough Sounds Freshwater Environment

High freshwater diversity exists due to habitat heterogeneity, and coastal proximity. There is a wide range of natural levels of biological productivity, and a valued trout fishery in large catchments such as the Pelorus. Water abstraction is reducing habitat values in some waterways. Very diverse native fisheries are present in small low-gradient coastal streams, particularly in the outer Sounds.

The sounds provides a habitat for a diverse range of native freshwater fish species including the following threatened species (Allibone 2010) inanga, New Zealand longfin eel koaro, torrentfish, blue-gill and redfin bullies, torrentfish, shortjaw and giant kokopu, lamprey and dwarf galaxias. Also commonly found

but not considered threatened are banded kokopu, common bully and shortfin eel.

Riparian, wetland and estuarine habitat and water quality; unimpeded passage for migratory fish, including coastal access; low trout densities; and the absence of other exotic fish, all contribute importantly to sustaining native freshwater fish and invertebrate species diversity found in the Marlborough Sounds. Numerous small estuaries, wetlands and streams are vulnerable to disturbance.



Above: Banded kokopu

Natural biotic patterns are complex. Strongly influenced by intricate landforms, substrate patterns, strong climatic gradients between Pelorus hinterland (high rainfall) to Cook Strait (low rainfall).

Collective Experiential Characteristics of the Marlborough Sounds Terrestrial and Freshwater Environment

As outlined in relation to the experiential characteristics of the marine environment, the Marlborough Sounds are extensive and convoluted, providing a diverse range of experiences. Due to the methodology adopted for this study, there will be some cross-over with the experiential characteristics of the marine descriptions, due principally to the close interplay of the marine and terrestrial components. Irrespective of this, the Sounds as a whole is a nationally rare and important landform containing a range of biophysical, social, experiential attributes.

The network of headlands, slender coastlines, razorback ridges, narrow peninsulas, vegetated peaks and rocky islands culminate in making the terrestrial component of the Sounds very memorable. Renowned both locally and nationally as a place to visit and reside, the Sounds are one of this country's most memorable landscapes. The main areas of residential development are focussed within the eastern part of the Sounds, around Queen Charlotte Sound and the main urban centre of the area, Picton. Here numerous small roads weave their way along narrow and sinuous landforms,

connecting bays and small harbours. Houses often align with many of these roads, perched on localised high points to capture views of the surrounding water. Forestry and areas of pasture are evident land use practices; however, substantial areas are still clothed in indigenous vegetation, despite these modifications.

The western part of the Sounds is centred on Pelorus Sound and accessed predominantly via SH6 from Havelock or the Rai Valley. It retains a slightly different character, where residential dwellings are less obvious and the land appears to take on a more 'working' appearance. This 'working' appearance is seen in large-scale land use practices where large headlands and peninsulas have occasionally been cleared of their original vegetation for farming and forestry purposes. There are, however, areas where native bush cover is regenerating, assisting in providing an alternative income through eco-tourism. In the water, aquaculture is also more evident within this western part.

Islands are numerous and are often free of significant modification. Many are island sanctuaries, where indigenous biodiversity values are exceptionally high.

The variety of the Marlborough Sounds terrestrial environment allows for a diverse range of experiences when visiting or living in the coastal environment. Different parts of the Sounds present the opportunity for different memories, experiences and perceptions. It is obvious that different parts of the community (i.e. residents, local or international visitors) value different parts of the Sounds. The more sheltered inner waters attract greater concentrations of residential

development while more exposed wild and rugged areas of the outer Sounds offer different opportunities. The highest areas of natural character are the least modified and these tend to be located on the more difficult terrain, or the more exposed, isolated locations, such as islands, prominent headlands, and rocky cliffs and bays. More accessible, modified areas such as sheltered bays typically hold lower levels of natural character. It is these more sheltered areas, or 'easy' country, where human modifications have proliferated, and include activities such as forestry, marine farms and areas of settlement.



Above: Of the numerous bays that demarcate Queen Charlotte Sound's shores, many jetties, wharves and moorings can be found

Level 2: Overall Sub-Regional Rating for the Marlborough Sounds (Marine & Terrestrial)

Degree of Natural Character	Natural Character Attributes		
	Abiotic	Biotic	Experiential
Very High	✓		✓
High		✓	
Moderate to High			
Moderate			
Moderate to Low			
Low			
Very Low			
Overall Natural Character Rating			Very High

The South Marlborough Sub-Region

The coastal environment to the south of the Sounds ('South Marlborough') comprises a slender strip of wide river plains, numerous river mouths and crumpled limestone and hard-rock hills. The climate is dry and generally hot and quite different from the Sounds. The coast here is almost uniformly exposed, distinguished by strong wave action, cold turbid waters, a wide continental shelf and long sand/gravel beaches interrupted in places by nearshore reefs. The Wairau Estuary (Vernon Lagoons) is a highly significant feature of this coast.

Marine

Collective Characteristics of the South Marlborough Marine Environment

In contrast to the Marlborough Sounds, the South Marlborough coast is relatively simple with exposed open shores, broad curving bays and a wide gently shelving continental shelf. Notable features include Cape Campbell, Wairau/Vernon lagoons and the region's extensive mixed sand and gravel beaches.

The region is flanked in the north by the indented rocky shoreline of the Marlborough Sounds' outer eastern coast and in the south by expansive sand/gravel shores extending down to and beyond the Clarence River mouth. It is bordered offshore by the depths of the Cook Strait Canyon and landwards by the dry and mostly modified hills and plains of South Marlborough.

Collective Abiotic Characteristics of the South Marlborough Marine Environment

The coast is exposed at times to strong winds and large waves from the south, east and north-east. Cape Campbell offers some shelter from the south. Cold turbid waters prevail.

Mixed sand and gravel beaches predominate, though intertidal and subtidal reefs are a dominant feature in the vicinity of Cape Campbell and are distributed intermittently along the southern sector of this coast.

The continental shelf is broad and gently shelving in this sub-region, dominated by silty sand, mud and in places gravels. Well offshore, the seabed drops steeply into the deep canyon systems associated with Cook Strait and the Hikurangi Trough.

The South Marlborough coast is distinguished by two large estuarine systems: The Wairau Estuary (Vernon Lagoons) at the mouth of the Wairau River, and the much modified Lake Grassmere at the head of Clifford Bay.

Collective Biotic Characteristics of the South Marlborough Marine Environment

A relatively depauperate biota inhabits the mixed sand/gravel beaches. The more stable sediments beyond the high-energy surf zone are home to a typical array of shellfish and mobile invertebrate species. Offshore beds of the giant kelp *Macrocystis pyrifera* are a distinctive feature in the vicinity of Cape Campbell.



Above: Gravel beach at Rarangi

Intertidal and subtidal reefs support moderately diverse species assemblages representative of moderate-high wave swept conditions. Various mobile and encrusting invertebrates as well as numerous seaweed species inhabit the reefs. Notable reef dwelling species include bull kelp, rocklobster and various sponges, ascidians and bryozoans.

The Wairau Estuary (Vernon Lagoons) is a significant estuarine ecosystem, with extensive saltmarsh (notably glasswort) and a diverse avifauna.

A variety of seabirds and marine mammals are regularly seen offshore. Hector's dolphins are abundant and dusky dolphins are present especially over winter/spring. Humpback whales are winter migrants.

Terrestrial

Collective Characteristics of the South Marlborough Terrestrial & Freshwater Environment

The South Marlborough coast is exposed, oceanic and mainly east-facing. It has large nationally important wetland ecosystems, extensive dunes, an array of raised and contemporary gravel beaches, several cliff systems, a series of small stream-mouth wetlands and some dramatic coastal stacks. The geological complexity is reflected in the high diversity of native vegetation and fauna. There are suites of regionally endemic plants adapted to the dry windy climate, rocky habitats and different rock types. There are also regionally endemic species of invertebrates and lizards.

Collective Abiotic Characteristics of the South Marlborough Terrestrial & Freshwater Environment

The landscape of the exposed dynamic ocean coastline of South Marlborough is dominated by either large open bays (Cloudy and Clifford Bays), or steep to very steep active or recently abandoned sea cliffs backed by strong rolling to moderately steep predominately soft rock hill country. Both have relatively smooth straight coastlines.



Above: *Raoulia cushions*

Extensive low-lying depositional landforms of alluvial gravels and silts lie behind a protective gravel boulder bank formed across the mouth of Cloudy Bay. Undulating to rolling marine gravel beach ridges and associated inter-ridge wetlands, with an active gravel beach, occupy the area north of the Wairau River mouth. A complex river mouth/lagoon/estuary/bird's foot delta system of interlinked channels, broad shallow lagoons, small islands and expansive intertidal flats has developed south of the river mouth to White Cliffs. Similarly, Lake Grassmere, centrally located in Clifford Bay, forms a shallow brackish lagoon-lake trapped behind a protective gravel-boulder bank. The terraces and recent floodplains of the Awatere River terminate in low coastal cliffs and escarpments with active shoreline beaches and narrow sand dune belts, or transition seamlessly to an active river mouth/beach bar and lagoon complex.

The hill country component of the southern Marlborough coastline terminates in steep to very steep active or recently abandoned sea cliffs and escarpments with extensive shoreline reefs; wave-cut platforms, outcrops and rocky headlands. The rock types present include loess-mantled, weakly consolidated poorly bedded siltstone, sandstone

and conglomerates with minor amounts of more resistant limestone. The limestone and calcareous mudstones cover the structural components of the landscape and the numerous coastal rock outcrops, wave-cut platforms and reefs that extend outwards from the coast e.g., Mussel Point, Cape Campbell and Long Point. Steep deeply incised slotted gorges and gullies commonly cut through the sea cliffs. Narrow accumulative debris slopes at the foot of abandoned former sea cliffs and narrow basal cliff beach sand dune belts are frequently present. Raised coastal terraces and gravel beaches are also present. Extensive sand dune fields are present between Willawa Point and the Waima River. North of the Waima River from Mirza Creek to Needles Point and south of Cape Campbell strong south-easterly winds drive migrating sand dunes up onto the toe and mid slopes of abandoned former sea cliffs to elevations of more than 40 m. Hard rock hill slopes underlain by very strong well-bedded sandstone and mudstone and poorly bedded sandstone are of limited extent.

Collective Biotic Characteristics of the South Marlborough Terrestrial & Freshwater Environment

Little natural vegetation remains due to the modification resulting from people's ready access on the relatively gentle terrain, combined with the harsh climate, which is dry, often hot and frequently windy. Originally the land would have been almost entirely forest-clad. Totara would have been dominant on hill country, accompanied by matai, black beech, kanuka and a range of broadleaved species. Kahikatea would have grown on the margins of wetlands, which would have had fringing zones of harakeke, raupo, cabbage trees and various rushes and sedges. Coastal slopes and terraces would have had forests dominated by ngaio. All these forests would have been alive with birds (including flightless species), lizards and invertebrates. Streams and wetlands would also have been full of animal life. Sufficient remnants of forests and wetlands exist to hint at what was once there. Mostly, though, the only native vegetation where there was formerly forest is shrubland and silver tussock,



Above: Sand tussock duneland with pingao.

simplified and depleted by domestic stock and farming practices. Most streams and many wetlands are also accessible to domestic stock and, as a result, are not very good habitats for native waterfowl, fish or invertebrates.

The dunes, raised beach terraces and beach ridge systems are large and distinctive. Their primeval cover would have been a mosaic that included sand-binders, tough shrubs, cushion plants and hardy trees such as ngaio. Quite a lot of this still remains, although mostly reduced to remnants. Marram grass now dominates the dunes, smothering them and preventing the mediated ebb and flow of sand that provides optimum conditions for native coastal birds, lizards and invertebrates.

A recovering remnant of the originally prolific coastal fauna is present in the growing number of New Zealand fur seals. Burrowing sea birds (petrels and shearwaters) have gone completely, but could be re-introduced.

Overall, there is considerable diversity of parent material and topography. This provides quite a wide range of habitats and is reflected in the considerable diversity of vegetation, flora and fauna, despite the degree of ecosystem modification. This complexity, coupled with the hot dry windy climate and erosion-prone rock types, has resulted in flora and fauna adapted to peculiarly southern Marlborough ecosystems. The dynamic nature and variety of the exposed coast allows many to persist in the coastal environment. Plant examples are *Carmichaelia muritai*, *C. astonii*, *Muehlenbeckia astonii* and *Pachystegia insignis*.

Nationally outstanding and unusual biotic community types include: gravel beach ridge communities (Wairau, Grassmere, Campbell and Wharanui), boulder bank communities (Wairau), freshwater and estuarine communities (especially Wairau, but also Grassmere), dune slack communities (Wairau, Grassmere, Campbell and Wharanui), limestone communities (Campbell and Wharanui), regionally endemic rock communities (Campbell and Wharanui) and braided river floodplain communities (Awatere).



Above: *Carmichaelia muritai* (Coastal tree broom).

Collective Experiential Characteristics of the South Marlborough Terrestrial & Freshwater Environment

The broad, open and extensive coastline of South Marlborough is spatially and profoundly different from the narrow convoluted waterways and channels of the Marlborough Sounds located to the north. The broad plains of the Wairau and Awatere Rivers broad plains form relatively long open and flat coastline, providing panoramic views of the seascape. The Wairau Lagoons and Lake Grassmere amplify the openness of the area. These areas also present the greatest opportunities to access the coast, where roads and coastal settlements (including Rarangi) provide direct access for a range of recreational activities. The remaining areas of the coastal environment are rugged and farmed, so that public access across the privately often difficult.

Particularly memorable features of the South Marlborough coastline include the Wairau Lagoons, White Bluffs, Lake Grassmere, Cape Campbell and the southern rugged limestone coastline, containing features including Chancet Rocks and the Needles. Whilst access is more restrictive in these southern areas, they provide extremely memorable experiences, due to the range of sculpted rocks, the marine wildlife and the active and dramatic surf.

In contrast to the Sounds, the exposed south coast allows for little safe boat access to the sea.



Above: The vivid pink salt ponds of Lake Grassmere.

Level 2: Overall Sub-Regional Rating for South Marlborough (Marine & Terrestrial)

Degree of Natural Character	Natural Character Attributes		
	Abiotic	Biotic	Experiential
Very High			
High	✓		
Moderate to High		✓	✓
Moderate			
Moderate to Low			
Low			
Very Low			
Overall Natural Character Rating			Moderate to High



A seal on the south coastline of Marlborough

Study Findings: Coastal Natural Character Values at the Sub-Regional scale (Level 2)

This summary section identifies the characteristics, values and evaluation of the two sub regions: the Marlborough Sounds and South Marlborough (i.e. at Level 2 of diagram on page 27).

The overall natural character rating for each sub-region is: Very High for the Marlborough Sounds and Moderate to High for South Marlborough.

Within the sub-regions, forestry, farming, aquaculture and houses/ structures are important land uses that modify the coastal environment, so, where these are abundant, natural character values are lower. The coastal environment of

South Marlborough, where much of the land has been cleared for pasture and is generally devoid of its natural cover, is more modified than the Marlborough Sounds. Pockets of existing bush and areas of regenerating bush are gradually improving the sub-region's natural character, however.

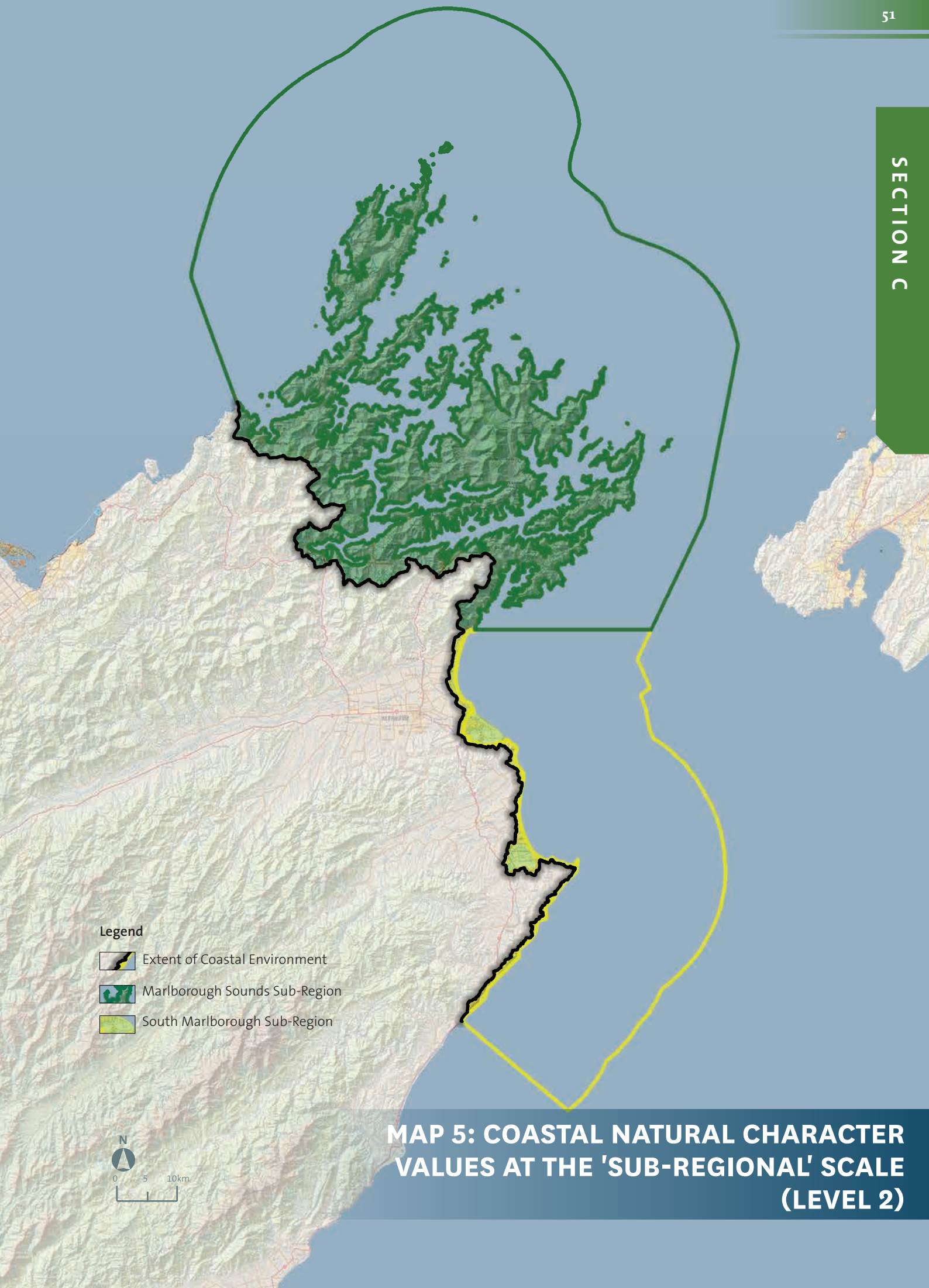
More detailed descriptions of the areas within these sub-regions (i.e. described at detail levels 3, 4 & 5 shown in Figure 6) are contained in Section D (Marlborough Sounds) and Section E (South Marlborough) of this report.

Summary Table of Natural Character Evaluation at the 'Sub-Regional' scale (i.e. Level 2):




Sub Regional Scale - Natural Character Rating		
1	Marlborough Sounds	Very high
2	South Marlborough	Moderate- High



Above: The Awatere River Mouth Lagoon in South Marlborough.



Legend

-  Extent of Coastal Environment
-  Marlborough Sounds Sub-Region
-  South Marlborough Sub-Region



MAP 5: COASTAL NATURAL CHARACTER VALUES AT THE 'SUB-REGIONAL' SCALE (LEVEL 2)

