Coastal Processes in southern Tasman Bay

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NCEA Level 3 Geography AS90701 3.1

Credits 3 external

and

NCEA Level 3 Geography AS 90705 3.5

Carry Out Geographic Research with Consultation

Credits 3 Internal

This requires fieldwork at two sites: The Boulder Bank and Tahuna Beach

Linz aerial

Some definitions and examples

• A natural process has physical and /or biological elements, involves a sequence of related actions and is capable of maintaining or modifying an environment.

Coastal processes, including geomorphological and hydrological processes, have shaped the shores of Tasman Bay creating landforms such as the Boulder Bank and Tahuna Beach.

• Processes have lower order components that act together in an environment.

One aspect of climatological process is aeolian action or the action of wind.

• Processes interact to create landforms.

Aeolian action contributes to sorting available beach material, a pedological process, to create dunes at Tahuna Beach.

Wave energy and direction, hydrological processes, interact with the boulders supplied from Mackays Bluff, a pedological process, to make the Boulder Bank

• Spatial variations may occur over time or result from a process occurring in one place and not in another.

In the 1850s the eastern end of the beach at Tahuna was rocky because the drainage channel from the Waimea Estuary was in a different place than it is today; the western end was sandy because long shore drift brought granite sand from the west.

Longshore drift is responsible for the south-westerly movement of boulders to make the Boulder Bank on the eastern side of Tasman Bay. It is also responsible for the movement of sand in an easterly direction from the west of Tasman Bay.

Coastal Processes associated with formation of the Boulder Bank

During the ice ages, 12 000 years ago, the sea bed in what is now Tasman Bay was dry. Rocks falling from Mackays Bluff collected in a fan beneath it.

When the ice melted about 9000 years ago the sea slowly rose and eroded material out of the fan. This material was carried south-west by a process we call longshore drift. This process continues today.

The top of the bank migrated eastwards leaving a succession of ridges behind it and these have been eroded and added to the sand banks to the west of the Boulder Bank

Geomorphological Processes: Origin of Boulder Bank rocks

• At Mackays Bluff the Port Hills Gravels were separated from Brook Street Volcanics and Tasman Intrusives by the Flaxmore fault.

• Movement along the fault has weakened the structures. The gravels have been eroded and these igneous rocks have been exposed.

Outside the Boulder Bank
Hydrological Process: Wave action

• Waves, particularly at storm events, have eroded the cliff and the rocks have fallen into the sea.
• Waves strike obliquely to edge of the Boulder Bank causing *Longshore Drift.*
• Constructive wave action because swash is stronger than backwash.
• High wave energy (Hydrological) interacts with steep bottom slope (Geomorphological) to maintain a steep outer beach.

Pedological processes: Deposition

• Ridges of boulders and stones on the outside of Boulder Bank run parallel to it. They represent old bank levels and past storm action.
• Very large boulders are moved less often and are less rounded tending to collect as pavement boulders at the base of the bank.

Inside the Boulder Bank Hydrology: Wave Action : Pedology : Deposition

• Low wave energy and tidal action result in deposition of fine sand and mud.
• Ridges are oblique to the beach and represent successive stages of the build up of the Boulder Bank.

Human modification

• Sand build up to the south and west of the tip of the Boulder Bank made shipping difficult so in 1906 The Cut was opened.
• Constant dredging is needed to keep the passage clear as the Boulder Bank continues to move and sand continues to build up on the outside.
• Department of Conservation are responsible for manaakitanga (care) of the Boulder Bank and katiakitanga (guardianship)is held by local iwi.

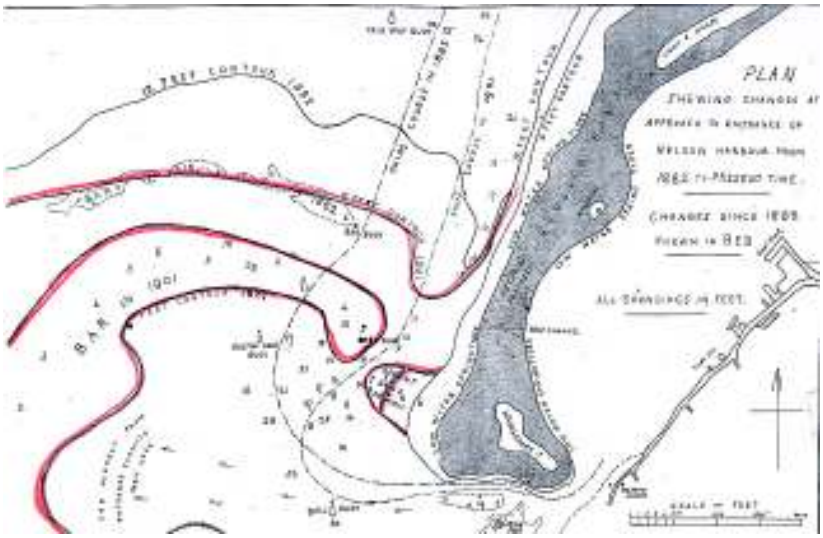
Some history of Tahuna Beach and The Cut

When the first European settlers arrived in Nelson, Tahuna Sands Reserve was the main channel draining the Waimea Inlet alongside Beach Road, and at low tide the intertidal sandbank of Rabbit Island extended across to the western end of the present Tahuna beach.

The beach alongside Rocks Road was a gravel beach, and much gravel was taken from it for building roads in the Tahuna area. The stones had come from erosion of the Tahuna slump. They were already rounded as they had their origins in the Moutere gravels.

Old Tahuna Beach Brusewitz Collection NPM 6x8 35

In the 1870s a new channel broke through the sandbank and the old channel started to silt up. By 1900 the present area of Tahuna Sands Reserve was largely formed, but most of it was an intertidal sandbank, completely covered by water at high tide.



Sand brought over from the west built up sandbars and made shipping increasingly difficult. The ‘Cut, opened in 1906, was made by deepening a low part of the Boulder Bank which was covered in water at the highest tides. The Cut still needs constant dredging to keep the harbour entrance safe for shipping.

Coastal Processes associated with the Waimea Inlet and Tahunanui Beach

Climatological processes:

- The dominant wind comes from the west and drives the waves (fetch).
- In the summer there is a strong onshore breeze in the evenings.
Sand is blown in, about knee height, encouraging dune formation.
- The dunes are sometimes destroyed by storm action.

Biogeographic Processes: Dune fixing

- Native grasses such as Tasman Bay spinifex and pingao help to keep sand on the dunes.

Geomorphological and Hydrological Processes:

- Breaking waves form in shallow water.
- Beach has a gentle slope.
- Waves are reflected by the sea wall and are diffracted around Haulashore Island.
- Water coming out of the Blind Channel slows quickly and drops sand that is building up at the western end of the beach. A spit has formed in that area.
- The Blind Channel is moving eastwards and is causing erosion of the Back Beach area.
- The sand at the eastern end was kept wet by a small stream. The sand couldn't absorb any more water so the waves couldn't release its sand.
- The eastern end of the beach is eroding with each storm event.

Human Modification

• Stormwater containment directs the stormwater away from the beach and allows it to flow into the sea furthur along the sea wall. As a result sand is now being deposited and the beach is recovering.

• Reinforcement wall built by Motor Camp to prevent the Blind Channel eroding their property.