SECTION 5

DEVELOPMENT SETBACK RECOMMENDATIONS FOR THE COROMANDEL PENINSULA

The revised development setbacks proposed in *Coromandel Beaches: Coastal Hazards and Development Setback Recommendations* are designed to help manage development in high-risk coastal hazard areas. Development setbacks identify land on the coastal margin where subdivision and development need to be managed to minimise both short and long-term risk.

In built up areas, development setbacks must reflect the reality of existing patterns of development, and the practicalities of any building restrictions. The revised setback recommendations for developed coasts in *Coromandel Beaches: Coastal Hazards and Development Setback Recommendations* are only designed to ensure that hazard risk is avoided or lessened to the fullest extent practicable, including maintaining some natural buffer zone. Therefore, the development setbacks proposed for built up areas are calculated based largely on hazard risk - they are not wide enough to provide for natural character or amenity values.

However, the development setbacks proposed in *Coromandel Beaches: Coastal Hazards and Development Setback Recommendations* for undeveloped areas do include allowance for natural character and amenity values.

SEA LEVEL RISE

In the future, sea level rise and other likely changes caused by projected global warming could alter the stability of many beaches and dunes and lead to widespread dune recession.

The distance of landward change is calculated by using the 'Bruun Rule'. This rule states that as sea level rises, erosion of the beach and dunes provides sediment to offshore areas and then re-creates a beach profile that is in balance with the new environment *(Figure 16)*.

Sea level rise is projected to be 0.5 m over the next 100 years. This is taken from the "most likely" range predicted by several climate ocean models and presented by the International Panel for Climate Change. A Ministry for the Environment report on climate change also uses this figure. Over the next century, sea level rise could lead to recession of 15-20 m at beaches on the eastern Coromandel Peninsula. The amount of recession will depend, in part, on the beach type because different beach profile shapes will react in slightly different ways.

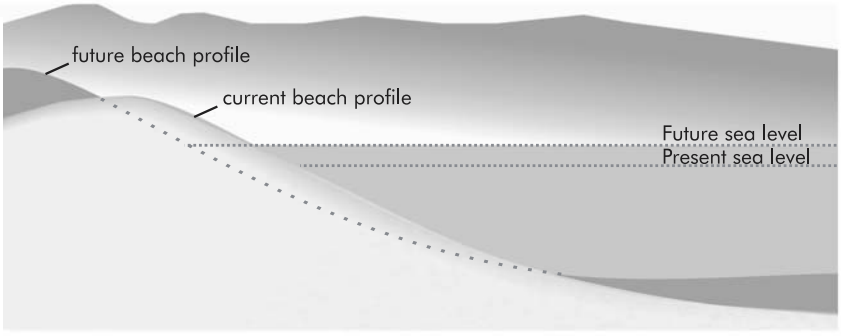

Figure 16: *Long-term sea level rise could result in long-term erosion (recession) on the Coromandel Peninsula of 15-20 m over the next century.*

Key Point

> Projected sea level rise over the next 100 years is expected to cause a long-term recession trend. This is one factor included in the design of development setbacks.

1995/6 BASELINE

Currently there is a 30 m building exclusion zone on the eastern Coromandel Peninsula. This 30 m setback is measured from the toe of the frontal dune at the time of application for the building consent. Houses built following an erosion period may receive more protection between the house and shore than necessary, while those built following accretion may not be well protected from the next period of erosion *(see Figure 17)*.

The photography used for the revised setback mapping was flown in the summer of 1995/6, after a long period of beach and dune recovery. Beach profile records at that time show beaches on the Coromandel Peninsula were relatively accreted and towards the seaward limit of their natural range in movement. The revised setback values described in the following sections were measured from the 1995/6 shoreline position. The 1995/6 shoreline position (shoreline positions are usually measured from the toe of the frontal dune) is used as a fixed baseline or standard reference point for measurement of setback positions. By having the setbacks fixed at the 1995/6 baseline, setback requirements will remain fixed in space rather than moving when the shoreline does. This means that all houses will be built or renovated under the same setback restrictions, resulting in a consistent level of protection for all properties.

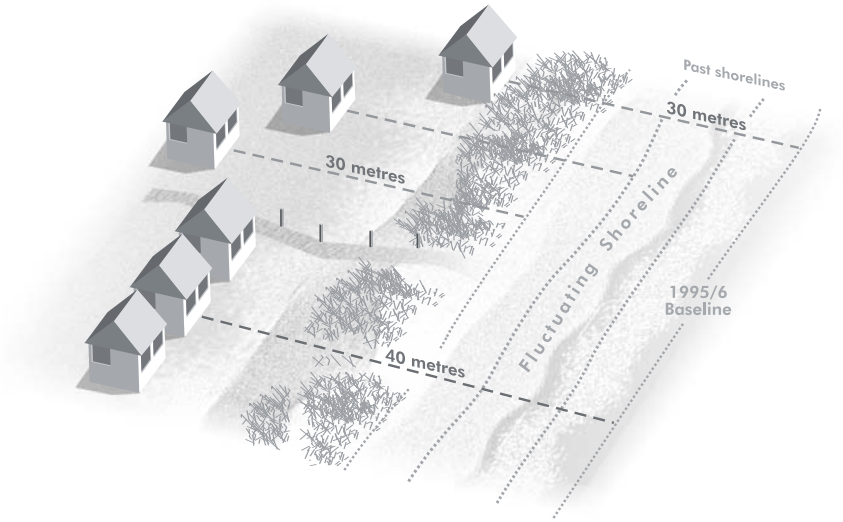

Figure 17: *The effect of the two different approaches to development setbacks. Where the setback controls move with the shoreline, houses built or renovated at different times can receive different levels of protection. By measuring the revised setbacks from a line that doesn't move when the shoreline does, all building activities are given enough protection without being overly conservative.*

Key Points

> The revised development setbacks are measured from a fixed baseline, which is mapped from 1995/6 photographs.
> The revised setback areas do not move when the shoreline erodes or accretes.

DEVELOPMENT SETBACKS FOR DEVELOPED COASTLINE

Setbacks for Eastern Coromandel Peninsula

The revised development setbacks outline two different levels of risk:

The first setback provides for the maximum shoreline movement driven by existing coastal processes. This includes dynamic short-term shoreline changes, as well as any existing longer-term trends for progressive shoreline recession or movement towards the sea. The setback designed to give protection from these short-term changes is called the **Primary Development Setback.** Primary development setbacks are 40 m for dune barrier beaches and 35 m for pocket beaches *(Table 1)*.

The second setback provides for the additional recession that is likely to occur from projected global warming and sea level rise over the next 100 years. This is not the **maximum** shoreline change that could occur, but rather a reasonable provision for future change based on best present information. This additional area of coastal margin is identified as the **Secondary Development Setback.** Secondary development setbacks are 60 m for dune barrier beaches and 50 m for pocket beaches *(Table 1)*.

Setbacks near, for example, river and harbour entrances, have been determined from site-specific information for each site. This has been done by estimating the likely size of dynamic changes based on historic aerial photography, and the limited cadastral survey information that is available.

Table 1: Development Setbacks (metres) for developed Eastern Coromandel Peninsula Beaches.

	Dune Barrier Beaches	Pocket Beaches
Natural dynamic fluctuation	30 m	25 m
Protective dune buffer	10 m	10 m
Primary Development Setback	**40 m**	**35 m**
Recession due to sea level rise	20 m	15 m
Secondary Development Setback	**60 m**	**50 m**

Setbacks for Western Coromandel Peninsula

The setbacks on the western coast of the Coromandel Peninsula are based on very similar principles to those for the eastern coast. The **Primary Development Setback** provides for dynamic shoreline change, plus a suitable buffer to allow for reduction of high velocity water effects during periods of wave overtopping.

The **Primary Development Setback** adopted is 25 m, to allow for dynamic shoreline fluctuations of 15 m, plus an additional 10 m that represents the area of most significant wave overwash *(Table 2)*.

There's an exception to the blanket setback of 25 m at Otautu Bay, where a setback of 15 m has been recommended. This site is well elevated above existing or potential coastal flooding and is subject only to coastal erosion.

The **Secondary Development Setback** includes an allowance for aggravation of existing coastal hazards likely to be driven by projected sea level rise (0.5 m over the next 100 years). The effect of the rise in sea level on erosion of the deltaic fans on the western coast of the Coromandel Peninsula is difficult to estimate. The Bruun Rule is designed for open coast sandy beaches and is not suited to the narrow, often gravely beaches of the western Coromandel Peninsula. However, the most significant effect would probably be the increased hazard from coastal flooding and wave over-topping.

A **Secondary Development Setback** of 50 m *(Table 2)* has been recommended to allow for the effects of wave over-topping and coastal flooding during storms. Although this setback alone is probably not enough to protect from increased flooding and wave effects, it does provide a buffer to allow for likely recession from sea-level rise and additional width for the construction of any wave and flood protection embankment. Some flood protection works will almost certainly be required if sea levels rise 0.5 m, and probably required well before the full rise occurs.

Setbacks near river and stream entrances have been determined from site-specific information for each site. This has been done by estimating the likely size of dynamic changes based on historic aerial photography, and the limited cadastral survey information that is available.

Table 2: Development Setbacks (metres) for developed Western Coromandel Peninsula Beaches.

Natural dynamic fluctuation	15 m
Protective buffer for wave overwash	10 m
Primary Development Setback	**25 m**
Recession due to sea level rise and space for flood protection	25 m
Secondary Development Setback	**50 m**

Property Protection

At some beaches, property protection structures have been placed along the beachfront (e.g. Buffalo, Cooks and Hahei beaches). None of these works have been consented as long-term solutions and most lack proper engineering design and construction.

In some places, property protection works hold the shoreline well seaward of where it would otherwise be. Where this occurred in the 1995/6 photographs, a professional judgement was made and the 1995/6 baseline was placed where the shoreline would have been if the structure was not present. This was done to allow for any additional erosion that might occur if the protection works were removed and the shoreline allowed to re-adjust to its natural position.

For example, at Cooks Beach, unauthorised property protection structures hold a short stretch of shoreline seaward of where it would naturally lie. A 'natural' position was estimated by smoothing to adjacent shorelines. The development setback lines were then mapped from this smoothed shoreline position.

Key Points

> In some places, there are unauthorised property protection structures that hold the shoreline seaward of its natural position.
> The baseline from which the setbacks are measured has been located where the shoreline would naturally lie if there were no protection structures in place.

Setbacks for New Development on Undeveloped Coastline

In all undeveloped areas on the eastern Coromandel Peninsula, a single, minimum setback of 100 m is proposed. This setback will ensure that a buffer zone of at least 40-50 m will remain in front of development even after the most serious erosion likely to occur in the next 100 years. This would allow other values to be protected, such as natural character, biodiversity, public access to the beach, amenity values and sometimes, cultural heritage.

The 100 m setback is based on the decision of the Planning Tribunal for the Matarangi subdivision, which in 1978 said that ocean front subdivision and building should be prohibited in the strip 100 m wide inland from the seaward toe of the outer foredune. This decision was based primarily on the need to preserve natural character. Wider or lesser setbacks may be appropriate at some sites but would need site-specific assessment based on all relevant coastal management factors.

On the Western Coromandel Peninsula, a blanket setback of 50 m (the same as the **Secondary Development Setback** for the area) has been proposed. At Tapu and Waikawau, a wider setback has been used in undeveloped areas to prevent use of the recent accretion at Tapu and to reflect the relative instability of the Waikawau delta.

GLOSSARY

Beach erosion The carrying away of beach materials by wave action, water currents, or wind to cause a loss of beach volume and/or a change in shoreline position.

Beach profile A cross-section taken perpendicular to a beach contour; the profile may extend from the back of the dunes to across the foreshore, and seaward underwater.

Cadastral survey Determining and defining land ownership and boundaries and presented on a map.

Deltaic fans An alluvial deposit, usually triangular, at the mouth of a river of other stream. It is normally built up only where there is no tidal or current action capable of removing the sediment as fast as it is deposited, and hence the delta builds forward from the coastline.

Development setbacks A required open space, specified in shoreline management programs, measured horizontally inland from a defined reference position located on the coast.

Dune barrier beach An accumulation of sand essentially parallel to the shore, which has been built up so that its crest rises above the normal high water level.

Dynamic equilibrium A term used to describe a state that is not chaning in the long term but fluctuates around an 'average'.

El Nino Southern Oscillation A natural cyclic fluctuation of the ocean-atmosphere system in the Tropical Pacific having important consequences for weather and climate.

Embayment An indentation in a shoreline forming an open bay.

Erosion scarps A steep exposed face where erosion has cut back into dune or beach material.

Frontal dune The dune immediately landward of the beach.

Global warming The progressive gradual rise of the earth's temperature thought to be caused by the greenhouse effect and responsible for changes in global climate.

High velocity water Fast moving water, either from breaking waves or tidal currents.

Interdecadal Pacific Oscillation Recurring pattern of ocean-atmosphere climate variability centred over the Pacific basin. Over the past century, this climate pattern has varied irregularly at interannual-to-interdecadal time scales.

Intertidal The zone between the high and low water marks.

Meterological The atmosphere and atmospheric phenomena as well as the atmosphere's interaction with the earth's surface, oceans, and life in general.

Natural buffer zone A parcel or strip of land that is to permanently remain vegetated in an undisturbed and natural condition to protect property. The buffer zone adds a margin of safety to development setbacks.

Pocket beach	A beach, usually relatively short and steep, between two headlands.
Progradation	The process of accumulating land through natural processes.
Primary development setbacks	Open space required to protect development from the risks of existing fluctuations in shoreline position.
Radiocarbon dating	A method of scientific dating used for samples which were once alive (e.g. in shell, charcoal, wood). All of these contain carbon, a proportion of which is radioactive. The decreasing concentration of radioactivity can be measured and the date when the material died estimated.
Recession	(1) A continuing landward movement of the shoreline. (2) A net landward movement of the shoreline over a specified time.
Seawall	A structure built along a portion of a coast primarily to prevent erosion and other damage by wave action. It retains earth against its shoreward face.
Secondary development setbacks	Open space required to protect development from the risks of sea level rise and climate change over the next 100 years.
Sediment budget	The balance between the amount of sediment eroded or deposited on the shore. If a shore has a balanced budget, as much sediment is deposited as is eroded, producing a beach in equilibrium.
Toe of the dune	The point of break in slope between a dune and a beach face.