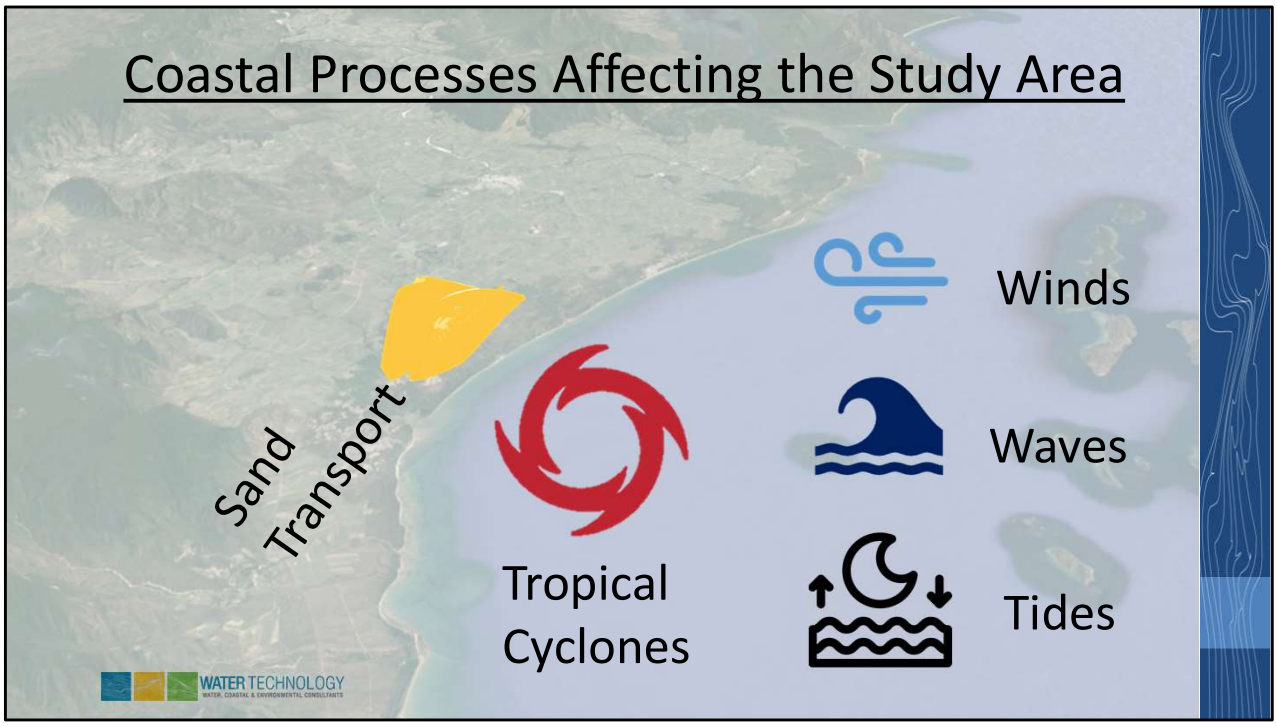
HINCHINBROOK SHIRE COUNCIL

Have Your Say: Coastal Reserves

Coastal Processes 101

28th Sept 2021



When looking at coastal erosion, we need to consider the different processes that move sand around the coast.

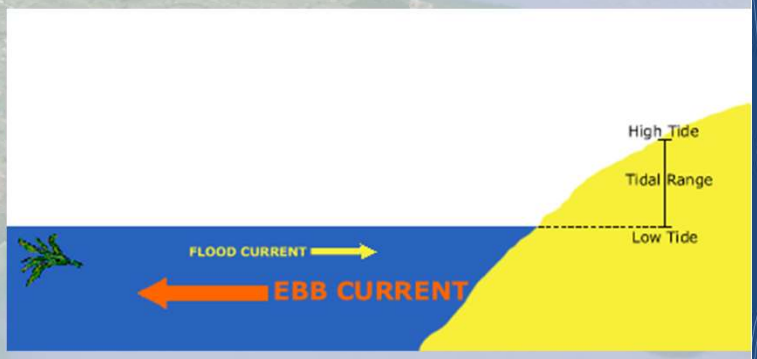
This includes winds, tides, and waves.

This also includes tropical cyclones, which commonly affect the area.

Tides

Tides rise and fall with the movement of the earth, moon, and the sun.

Region has large tidal range of 4 m



Super - elevated tides , known as storm tides, can occur during severe storms such as tropical cyclones

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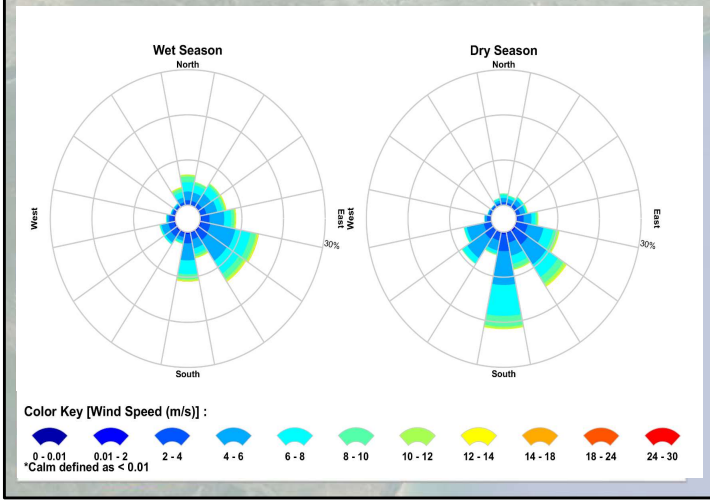
The area has big tides – with a tidal range of around 4m.

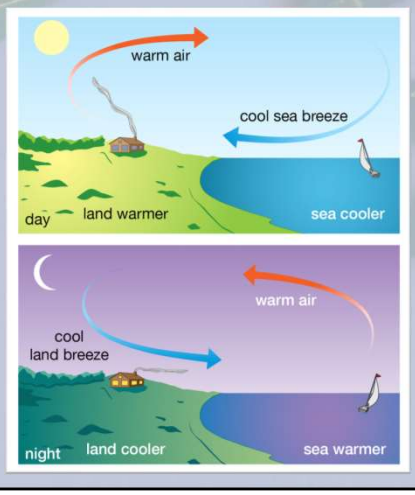
Big tides = strong currents, and these currents (along with the waves), can move sand during each tide.

Winds

The South-East Trade winds dominate the region



Within this broader pattern, some sea-breeze effects are also felt closer to the coastline

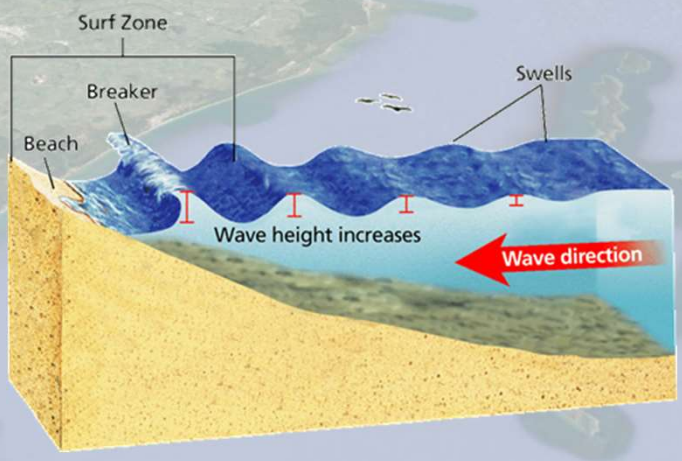


South-East trade winds are very common, particularly in the dry season.

During the wet season, winds are a little bit more east to north-east (including the summer northerlies as well).

Waves

- The Great Barrier Reef blocks most of the Pacific Ocean Swell.
- Generated by local winds.
- Generally arrive from the south-east (due to trade winds)
- As they get closer to the coast they align with the shoreline



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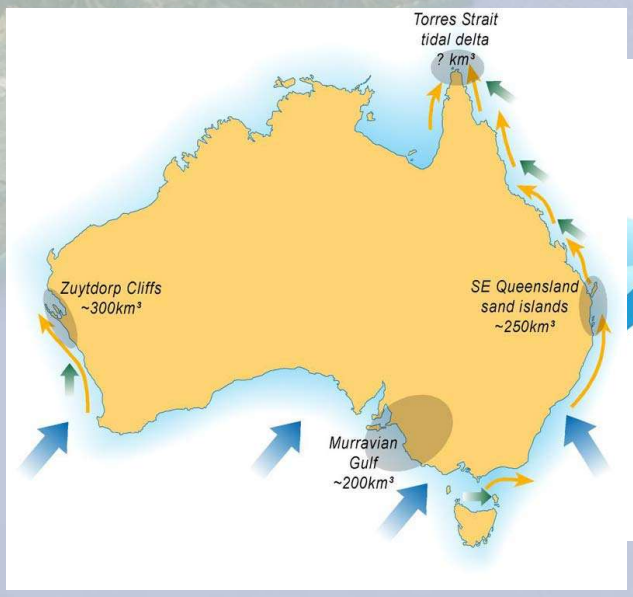
Because the winds are generally from the south-east, so too are the waves.

Coastal Sediment Transport

- Waves can “push” sand up and down the coast
- Most waves come from the south-east, this causes an overall northwards flow of sand along the coast.
- The effect is small on any given day, but can add up to a large amount of sand years (and decades)



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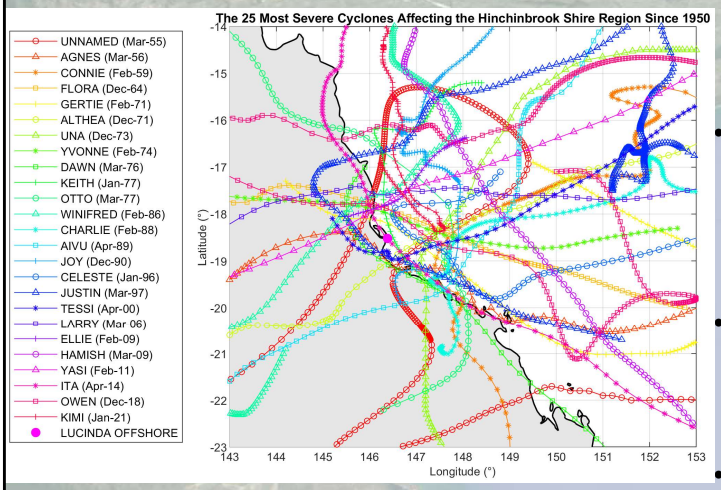
As the waves generally come from the south east – this means that the waves push sand along the coast from south to north. This northerly directed sand movement occurs along much of the east coast of Australia.

Sand flows generally northwards along Forrest Beach.

Tropical Cyclones



- From 1969-2019:
  - 40 cyclones within 200 km
  - Average = Almost 1 per season
- Notable:
  - TC Yasi (Feb 2011)
  - TC Larry (March 2006)
  - TC Winifred (Jan 1986)
- Twice as likely during La Niña periods, but severe ones can occur in any given season
- More dangerous when they make landfall to the North of us

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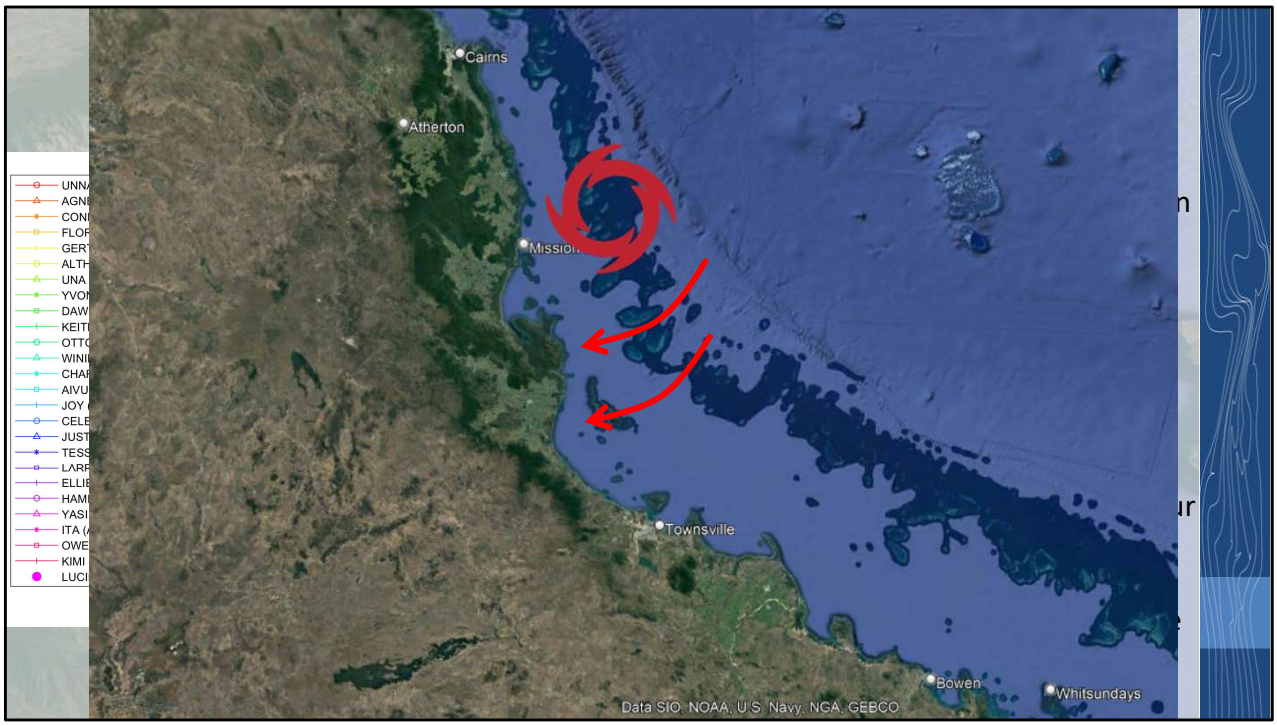
We also need to consider severe erosion that can occur due to Tropical Cyclones.

They are very common in this area, with one coming within 200 km of the area just under once per season (on average).



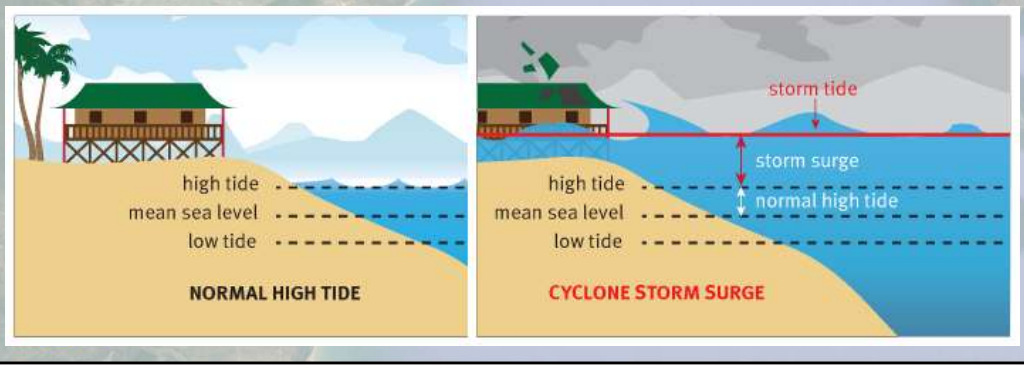
Because cyclones rotate clockwise in the southern hemisphere, they are more dangerous when they make landfall to the North of us.

When they are positioned to the north, the clockwise rotation causes easterly winds that push water and waves up onto the coast – resulting in erosion and flooding.

Storm Tides

Strong winds can cause water to “pile up” against the coast and generate a “storm surge”.

When coinciding with a normal high tide, this can cause a super-elevated sea levels known as a “storm tide”

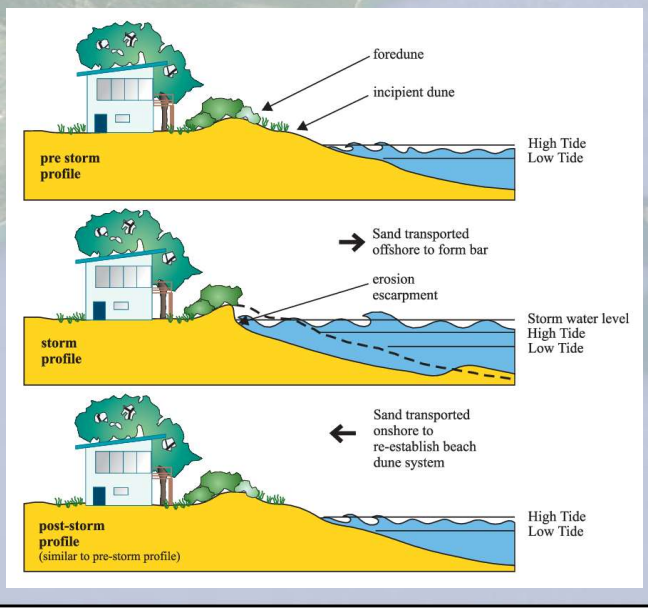


Cyclones can generate severe storm surges and wind causes water to pile up against the coast.

This can cause severe coastal flooding that can damage properties and important infrastructure.

Coastal Erosion

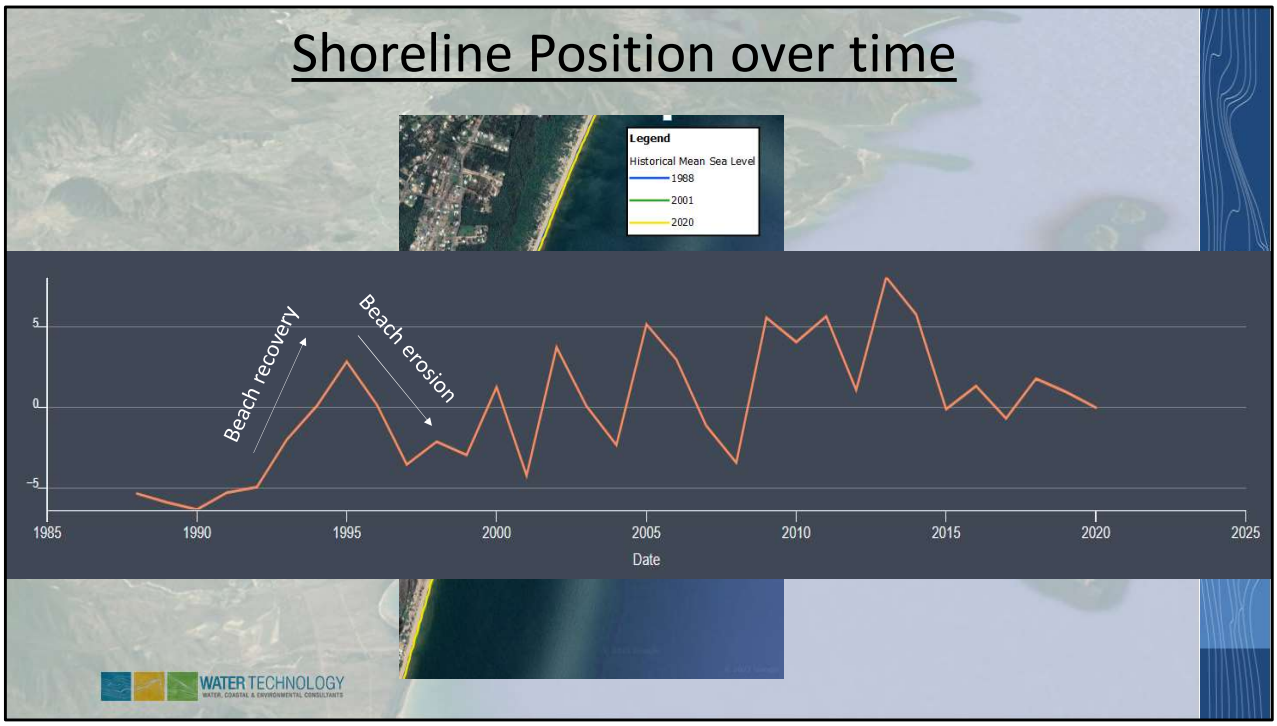
- High tides + large waves = storm erosion
- Waves erode sand from the upper beach face and sand dunes → and deposit that sand into surf zone sand bars
- Calm waves gradually return this sand back up on to the beach
- Can take months or even years to naturally recover)



When large waves coincide with high tides, that can cause severe erosion of the foreshore.

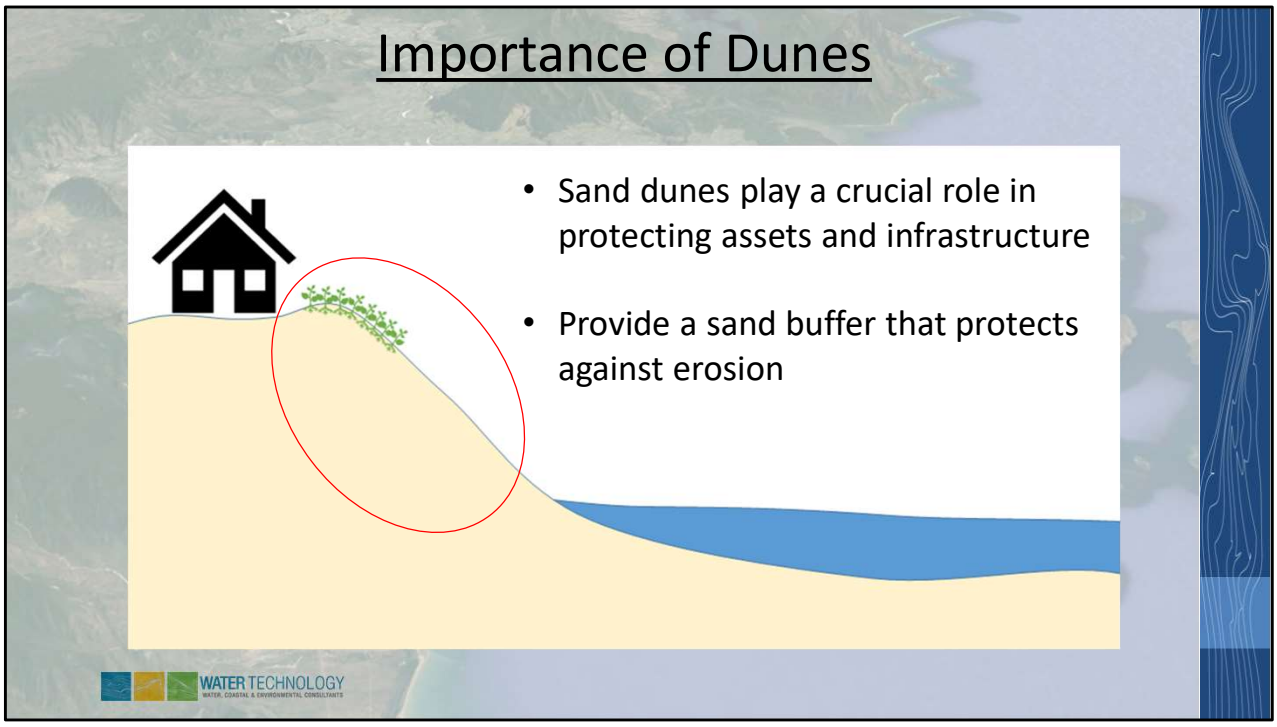
Most open coast beaches will naturally recover in the month/years/decades after a big erosion event – as the sand naturally returns.

Based on this, most beaches go through cycles of erosion and rebuilding. Therefore, the shoreline is almost never “stable” and is constantly changing.



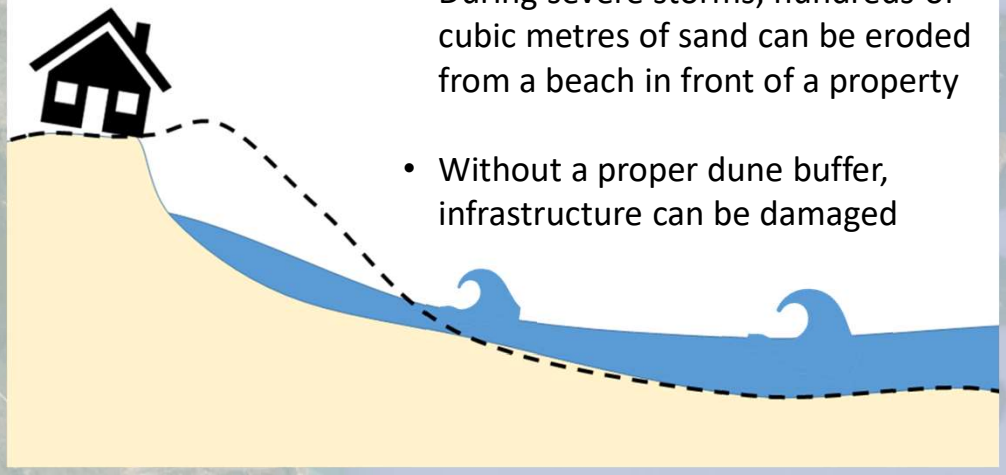
This graph shows how Forrest beach has experienced natural cycles of beach erosion and rebuilding over the last 30 years.

The shoreline has fluctuated forward and back about 10 m since as it has been hit by storm events, then recovered.



A healthy, vegetated coastal dune systems provide a natural buffer against erosion and coastal flooding.

Importance of Dunes



- During severe storms, hundreds of cubic metres of sand can be eroded from a beach in front of a property
- Without a proper dune buffer, infrastructure can be damaged

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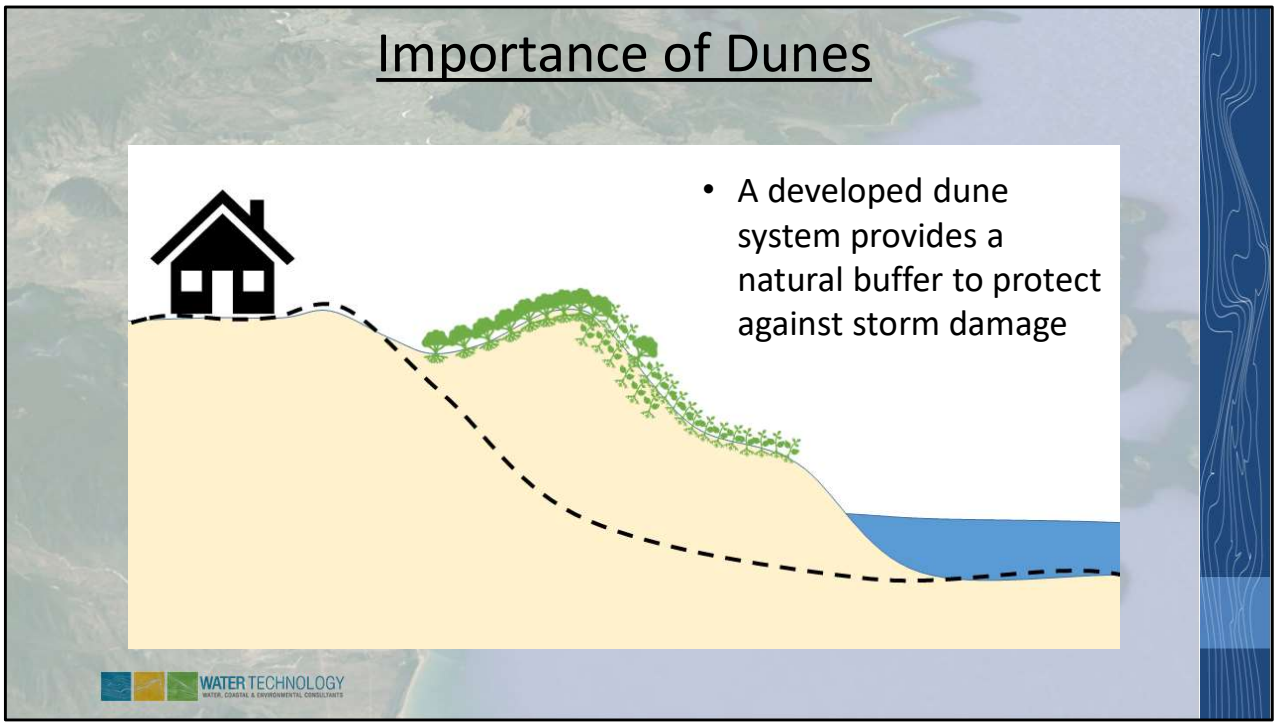
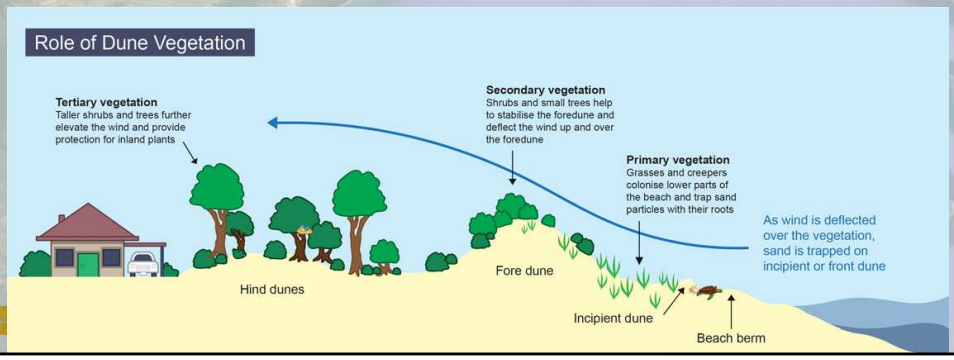
If we build too close to the front of the dunes, property and infrastructure can get washed away by erosion and flooding.



A natural dune system gives us a protective buffer. If the dunes are tall and wide enough, then when cyclones come and erode dune, there is still enough sand left in front of our property to remain safe.

Healthy Dune Vegetation

- **Before storms:** Allows dune to build out by trapping sand with both its roots and canopy
- **During storms:** The vegetated sand buffer protects assets & infrastructure. Vegetation itself also provides protection from waves.
- **After storms:** Helps the dune recover naturally and more quickly



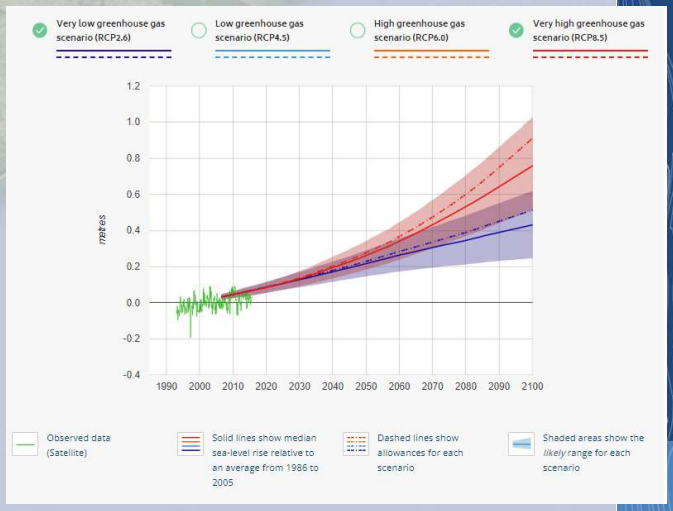
Native dune vegetation is crucial to helping build and maintain a dune buffer. It is important before, during, and after storms.

Future, Longer Term Issues

Sea Level Rise and coastal flooding

Coastal erosion and long term shoreline recession

Increased cyclone intensity



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We also need to think about how these erosion processes might change over coming decades due to long-term processes, like those associated with climate change.

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Questions

jenna.johnston@watertech.com.au
chris.beadle@watertech.com.au

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