Frederick Henry Bay TAS01.04.02

Regional Setting

This compartment extends from Outer North Head to Cape Contrariety.

Both south-westerly and Tasman Sea swells may refract into Frederick Henry Bay, but the long refraction pathway means there is very little variation in swell direction at the beaches within the bay. Swell waves are negligible in sheltered Norfolk Bay (deep within Frederick Henry Bay), where local wind waves dominate coastal processes. This coastline experiences micro-tides.

The dominant regional processes influencing coastal geomorphology in this region are the humid warm to cool temperate climate, micro-tides, south-easterly Tasman Sea swells, easterly seas, dominantly quartz (terrigenous) sediments with northerly longshore transport in the northern part, and the El Nino Southern Oscillation (driving beach erosion/accretion cycles, cyclone frequency).

Regional hazards or processes driving large scale rapid coastal changes include: East Coast Lows (extra-tropical cyclones), mid-latitude cyclones (depressions), and storm surges (<1m).

Justification of sensitivity

The sensitivity rating for most beaches in this compartment is a 3 - sand loss is negligible and a continuing onshore supply of sand is likely. However, Roches Beach has a sensitivity rating of 5 as it is already receding, has a declining sand budget, and is therefore likely to be an early responder to sea-level rise.

Most sand in the compartment is probably glacio-fluvial sand, supplied by the Derwent and Huon Rivers from the glaciated Central Highlands to Storm Bay continental shelf during glacial low sea stands, and reworked onshore during post-glacial marine transgressions. There is negligible present-day sand supply from rivers. However, the Bay is mainly sand-floored (SEAMAP habitat mapping:

http://seamap.imas.utas.edu.au/), and there is probably minor continuing wave-driven movement of shelf sand into and through the bay (Harris & Heap 2014). A tidal lagoon at Pipe Clay Lagoon and a tidal estuary at Pittwater are major sand sinks within the compartment. There is negligible landwards sand loss via aeolian transport, although transgressive dunes were active behind some beaches during the mid-Twentieth Century. Most beaches are well-embayed between rocky headlands, so that there is probably little alongshore sand leakage into or out of most beach embayments. The major exception to this is the drift-aligned Roches Beach, which is losing sand to Seven Mile Beach.

Most swell-exposed beaches in the compartment (including Clifton, Seven Mile and Carlton Beaches) are continuing to recover from erosion events and are not showing clear evidence of progressive recession as yet; inferred continuing onshore sand supply may make them slow-responders to sea-level rise.

In contrast, drift-aligned Roches Beach has a losing sand budget and has been progressively receding since the 1980s (Sharples 2010), with numerous houses at Lauderdale at risk. Roches Beach is probably an early responder to sea-level rise.

Cremorne Beach, at the mouth of Pipeclay Lagoon, is currently stable and continuing to recover from erosion events. However, it is likely that ongoing sea-level rise will create more sand accommodation space in the lagoon, causing it to increasingly become a sink for sand eroded from Cremorne Beach. This beach may, therefore, be a medium-term responder to sea-level rise and could begin progressively receding earlier than most beaches in the compartment, other than the already-receding Roches Beach.

In addition, all sandy and cohesive clay shores within the tidal but swell-sheltered Pittwater estuary and Pipe Clay Lagoon have been progressively receding since at least the 1940s. The only road to Cremorne Township is imminently at risk from this erosion at the north end of Pipe Clay Lagoon. Soft shores within both re-entrants are probably early-responders to sea-level rise.

Other comments

Extensive areas of Lauderdale and Seven Mile Beach townships are low-lying and at risk of coastal inundation, which has affected parts of these townships previously. Other extensive areas, such as those adjacent to Pipe Clay Lagoon, are susceptible to coastal inundation.

Confidence in sources

Moderate to high confidence: Based on published and ongoing in-progress studies.

Additional information

Beach profile monitoring for several beaches within compartment: www.tasmarc.info

SEAMAP habitat mapping (includes subtidal seabed compositions for Frederick Henry Bay): http://seamap.imas.utas.edu.au/

Carley, JT, Blacka, MJ, Timms, WA, Anderson, MS, Mariani, A, Rayner, DS, McArthur, J & Cox, RJ 2008, *Coastal Processes, Coastal Hazards, Climate Change and Adaptive Responses for Preparation of a Coastal Management Strategy for Clarence City, Tasmania*, Water Research Laboratory, University of New South Wales.

Harris, PT & Heap, A 2014, 'Geomorphology and Holocene Sedimentology of the Tasmanian Continental Margin', in KD Corbett, PG Quilty & CR Calver (eds), *Geological Evolution of Tasmania*, Geological Society of Australia (Tasmania Division), pp. 530-539.

Shand, TD & Carley, J 2011, *Investigation of Trial Groyne Structures for Roches Beach*, Water Research Laboratory, University of New South Wales.

Sharples, C 2010, *Shoreline Change at Roches Beach, South-Eastern Tasmania, 1957-2010*, Antarctic Climate and Ecosystems co-operative Research Centre, University of Tasmania, Hobart.

Figure 1: *Compartment TAS01.04.02 Frederick Henry Bay. Red arrows indicate inferred dominant ongoing sand transport pathways.*