

Bribie Island Breakthrough – Coastal Processes and Water Quality Assessment

Department of Environment and Science

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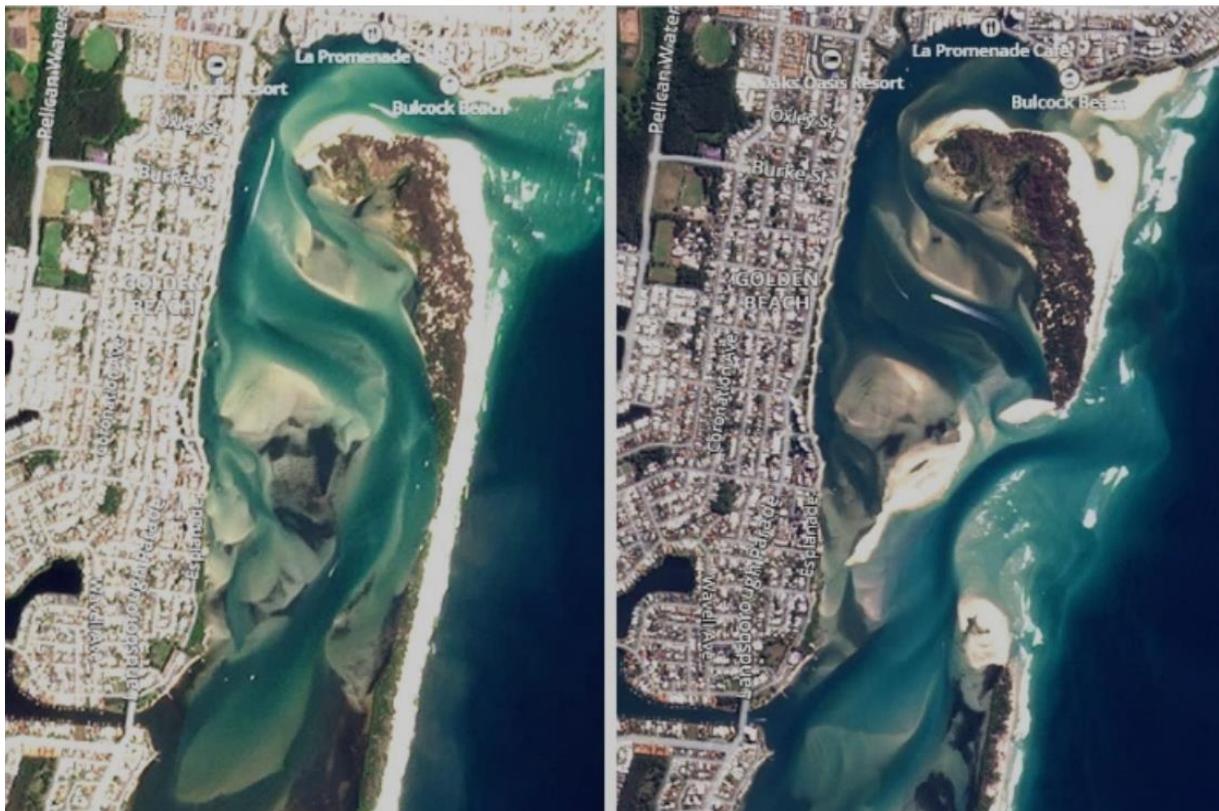
Coastal Processes

Introduction (from Wood et al 2023¹)

Bribie Island at 34 kilometres long and 8 kilometres at its widest, is the smallest and most northerly of the three major sand islands sheltering the northern part of Moreton Bay in south-east Queensland. The others are Moreton Island and North Stradbroke Island. Much of Bribie Island is a national park and Pumicestone Passage is in a marine park conservation zone as well as being a listed Ramsar Wetlands Site. Northern Bribie Island has a long history of coastal erosion, with monitoring by the Queensland Department of Environment and Science since 1995, showing recession of the eastern shoreline of between 1m to 2m per year.

On 2 January 2022, large waves caused by ex-Tropical Cyclone Seth over-washed the dunes on northern Bribie Island and cut a tidal channel through the island, creating a new entrance to Pumicestone Passage from Moreton Bay. Since January 2022, the breakthrough of the island has widened to about 1km and has become the dominant entrance. The Caloundra bar (which is the original entrance to the north) is infilling with sand and closing over and a huge sand bar is now blocking the main north-south channel of the passage. By December 2022 the new entrance appeared to have established a stable entrance opening of about 1000m wide with a deep 150m wide channel to the north. See Figure 1 below.

Figure 1: Bribie Island in December 2021 and May 2023, showing the development of the new tidal channel. Source: Wood et al 2023.



¹Peter Wood¹, Chris Voisey¹, Sel Sultmann², Ian Teakle³, Alex Waterhouse³, Daniel Wishaw³ Bribie Island Breakthrough – A Dynamic Coastal System, Australasian Coasts & Ports 2023 Conference – Sunshine Coast, QLD, August 2023

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After the Bribie Island breakthrough

The Department commissioned an independent study into the causes of erosion on Bribie Island. The [Review of Causes of Northern Bribie Island Erosion \(PDF, 18 MB\)](#), BMT, February 2023, examined the causes of beach and dune erosion on northern Bribie Island that resulted in the tidal breakthrough in January 2022.

The review indicated that natural coastal processes influenced both shorelines of Bribie Island. The two natural processes resulted in a consistent trend of erosion from the 1940s to the present time, and were identified as the leading cause of erosion on the northern portion of Bribie Island.

Wood et al 2023² stated that the key processes following the breakthrough of Bribie Island have been:

- Formation of a new entrance 1.4 km south of the Caloundra Bar which has increased both tidal range and tide level within Pumicestone Passage.
- Infilling of the Caloundra Bar due to the reduction in ebb tide flow and the migration of the ebb tide delta sands into the entrance from wave action.
- Formation of a tidal delta at the new entrance with large sand bars. An important part of this process has been the migration of a large volume of sand westward towards Golden Beach.
- Increased wave and storm surge penetration from Moreton Bay into Pumicestone Passage which has caused erosion and nuisance flooding along the Golden Beach coast.
- Wave penetration into Pumicestone Passage which has caused the loss of extensive seagrass beds by sediment reworking and migration.

Water Quality Assessment

The Department has been routinely monitoring water quality in Pumicestone Passage since 2000 as part of the South East Queensland Ecosystem Health Monitoring Program. Water quality has been assessed monthly for eight months of the year (not January, April, June, or July), at ten sites along the passage from Sandstone Point in the south to Bulcock Beach in the north.

Seagrass, as a biological indicator of water quality, is being monitored bi-annually at Gallaghers Point and opposite Bells Creek. Some water quality monitoring was undertaken prior to 2000, and intermittent data are available back to 1977 for some of the Pumicestone Passage water quality monitoring sites.

The water quality and seagrass monitoring sites are shown at Figure 2.

The water quality indicators being monitored include water temperature, turbidity, salinity, pH and concentration of dissolved oxygen, chlorophyll-a, total nitrogen, nitrogen oxides, ammonia, total phosphorus and filterable reactive phosphorus. Physico-chemical indicators, for example temperature, pH and dissolved oxygen, are measured at each monitoring site at two metre intervals down through the water column, and samples are collected for nutrient analysis from surface waters. The resulting water quality data for each month of sampling are available upon request to water.data@qld.gov.au.

As water quality in the northern-most section of Pumicestone Passage may change as the tidal exchange of water is reduced with the formation of the new entrance, the Department has increased water quality monitoring in the northern portion of Pumicestone Passage. The frequency of water quality monitoring at the five northern-most sites of Pumicestone Passage has been increased to monthly monitoring, and an additional site has been established inside of the new bar opening. The measurement of the concentration of *Enterococci* bacteria has been added to the suite of water quality indicators being monitored every month.

Analysis of the water quality data since the Bribie Island breakthrough has demonstrated there has been no substantial change in water quality within the northern portion of Pumicestone Passage since the formation of the new entrance in January 2022. A large transient increase in ammonia and filterable reactive phosphorus concentration was observed on one occasion following formation of the new entrance, but concentrations of those nutrients has since returned to typical values. Water quality in the northern section of Pumicestone Passage remains consistent with other sites further south. The Department will continue checking for any water quality change over the coming wet season when stormwater inflows are likely to increase.

² Refer footnote 1.

Water quality monitoring data visualization

A link to the Ecosystem Health Monitoring Program monthly water quality data for the Pumicestone Passage sites, as shown in Figure 2 below, follows:

[WaterNav – Estuarine/Marine Link](#)

After opening the link - select the waterway (Pumicestone Passage), select the monitoring site from the site map, and select the financial year (all or specific year).

The water quality results for turbidity, total nitrogen and total phosphorus are displayed, and compared with the water quality guideline (solid black line) that aligns to the current water quality objectives under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019.

Figure 2 Pumicestone Passage water quality and seagrass monitoring sites



Contingency actions

The Department supports the maintenance of natural coastal processes and is not proposing any remedial action for the breakthrough, but impacts caused by the breakthrough may require Queensland Government Departments to address specific issues.

The northern Pumicestone Passage is being closely monitored by the Department, Maritime Safety Queensland, within the Department of Transport and Main Roads, and the Sunshine Coast Council.

The frequency of Pumicestone Passage water quality monitoring has increased from eight times per year to monthly monitoring, and enterococci bacteria monitoring has commenced at the northern sites to detect the presence of any faecal contamination.

Sunshine Coast Council is managing erosion impacts at Golden Beach by seawall upgrades and beach nourishment, and Maritime Safety Queensland is monitoring and advising on navigation issues in Pumicestone Passage.