Lake Tyers Estuary Fact Sheet

Estuaries are dynamics environments, where fresh waterways meet the ocean. These systems host important and at times competing social, economic, cultural, environmental, and recreational values.

What controls an estuary opening?

Some estuary entrances periodically open and close to the ocean; these estuaries are termed Intermittently Open and/or Closed Estuaries.

Natural estuary openings and closures are driven by a combination of external forces including catchment inflows, tides, waves and wind, and the shape of the estuary. Estuary mouths close when water levels within the estuary are low and large waves deliver sand onto the beach, creating a barrier (berm) closing the entrance. The mouth can naturally open during periods of high river inflows, when water levels increase enough to breach the berm reconnecting the estuary to the ocean. Estuaries can also be artificially opened by means of manually excavating a channel for water to flow from the estuary to the ocean.

The success of an estuary artificial opening is dependent on several physical factors, including a steep hydraulic head (Figure 1), low offshore wave heights, high fluvial inflows, and low tides. The relationship between all these factors will determine how long an estuary remains open and the chance of the mouth closing.

Under the right conditions, an artificially opened estuary can remain open for several years. However, if undertaken during unsuitable conditions, an artificial opening can fail to open or re-close in a matter of days or weeks.

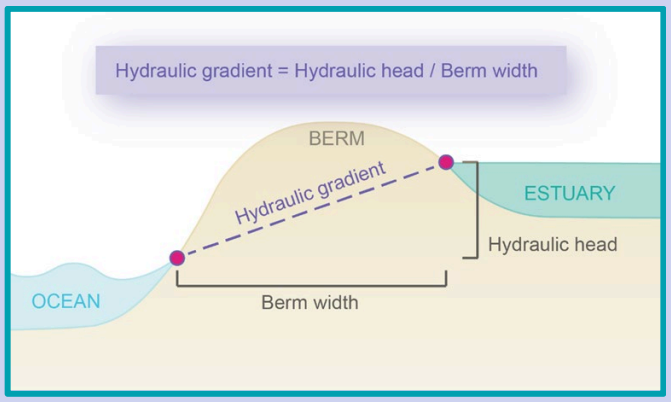

Figure 1: Schematic showing the hydraulic gradient across the berm of a closed estuary.

When do we open an estuary?

The estuaries of the Gippsland coast are susceptible to entrance closures caused by sand build-up at the mouth of the estuary, which can lead to flooding of neighbouring land and place community assets at risk.

The East Gippsland Catchment Management Authority (EGCMA) is the lead waterway manager responsible for decision making and approval conditions for estuary artificial openings in East Gippsland. The EGCMA prefers natural openings as they most often result in better entrance scour and a longer-lasting open entrance. However, an estuary artificial opening may be considered as a management option when high water levels have a significant impact on the environmental, social and economic values of the estuary and adjoining community assets.

The EGCMA are guided by a set of *Estuary Opening Protocols* which outline the decision-making framework for estuary artificial openings. It is important to carefully consider all the potential risks associated with an artificial estuary opening, including environmental, cultural and socio-economic values of each estuary.

A streamlined and coordinated approach to estuary openings is essential to balance competing values and minimise the risks to the community and the environment.

Estuary Opening Protocols

Since 2014, the management of artificial estuary openings in East Gippsland has been guided by an *Estuary Opening Protocols* document, which outlines the decision-making framework for artificial openings.

The EGCMA have recently reviewed and updated their *Estuary Opening Protocols* to better inform the management, occurrence and operation of artificial openings across their four priority estuaries on the Gippsland Coast: Mallacoota Inlet, Sydenham Inlet, Snow River Estuary, and Lake Tyers.

Following the updated protocols, the flood indicator level remains at 2.3 m AHD (Australian Height Datum) for Lake Tyers.

Negative impacts of artificial openings on estuary values

Estuaries are home to a variety of fish, bird, and vegetation species, each with a unique set of ideal environmental conditions that are impacted by the open or closed status of the estuary. For example, water in an estuary that has been closed for an extended period can separate into two layers; an oxygen-rich freshwater layer on top and an oxygen-poor saline layer on the bottom. If an estuary in this condition is artificially opened, the oxygen-rich surface layer flows out first, leaving behind water with critically low oxygen levels. When this occurs, there is a high likelihood of fish deaths.

Vegetation communities in estuaries are complex and will adapt to changes in flow and water quality within an estuary. Artificial openings can interfere with natural estuary processes and impact on the type and extent of vegetation communities as well as the overall the amenity of the site.

Lake Tyers Estuary

The Lake Tyers Estuary is subject to long closures due to its small catchment size relative to its surface area. The estuary has formed behind a long (approximately 800 m) sand barrier. Westerly waves and winds play a large role in driving sediment transport and building the sand barrier in front of Lake Tyers Estuary, disconnecting the estuary from Bass Strait. With its relatively small catchment, high rainfall and river flows are needed to trigger a natural opening and sustain an artificial opening at Lake Tyers.

An assessment of Lake Tyers Estuary's opening and closure trends has shown the estuary is open 22% of the time, or 82 days per year on average (from 1987 to 2023) (Table 1). Due to the long periods of closure, the site is also more likely to be susceptible to water quality issues compared to other estuaries in East Gippsland.

Figure 2: Map showing previous locations of the estuary opening at Lake Tyers.

Table 1: Summary statistics of Lake Tyers Estuary openings and closures.

Estuary	Data period	% open across data period	Average days/year open	Mean open duration	Number of closures across data period	Mean duration of closure
Lake Tyers	28/5/1987 to 10/11/2023	22%	82 days/year	104 days	31 closures	312 days

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Figure 3: Flood and indicator flood levels and coastal infrastructure across Lake Tyers.

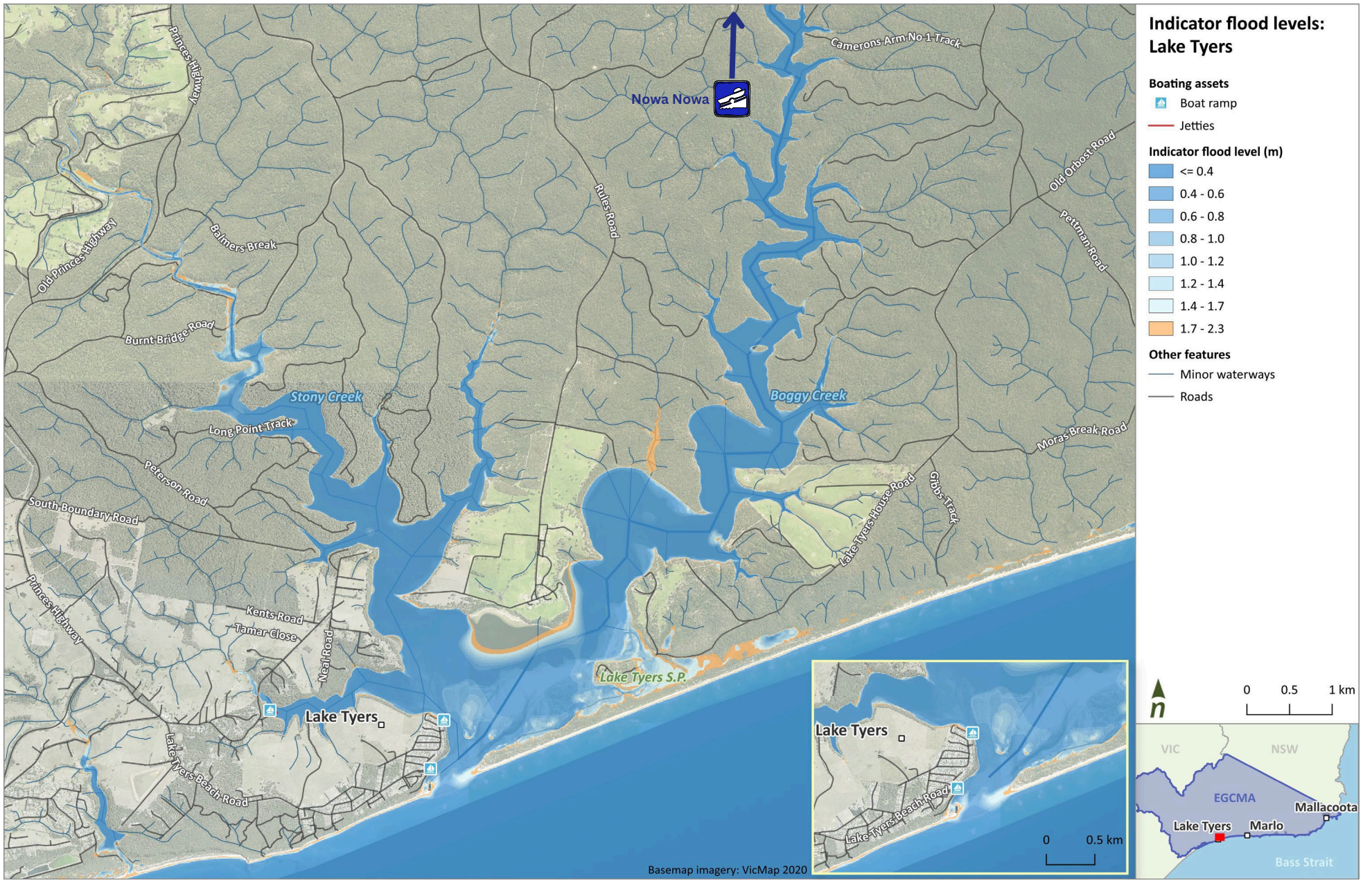

Figure 4: Photographs highlighting the environmental and infrastructural values around the Lake Tyers Estuary.