GOVERNMENT OF WESTERN AUSTRALIA

Department of **Water and Environmental Regulation**

Department of **Primary Industries and Regional Development**

Project factsheet

4

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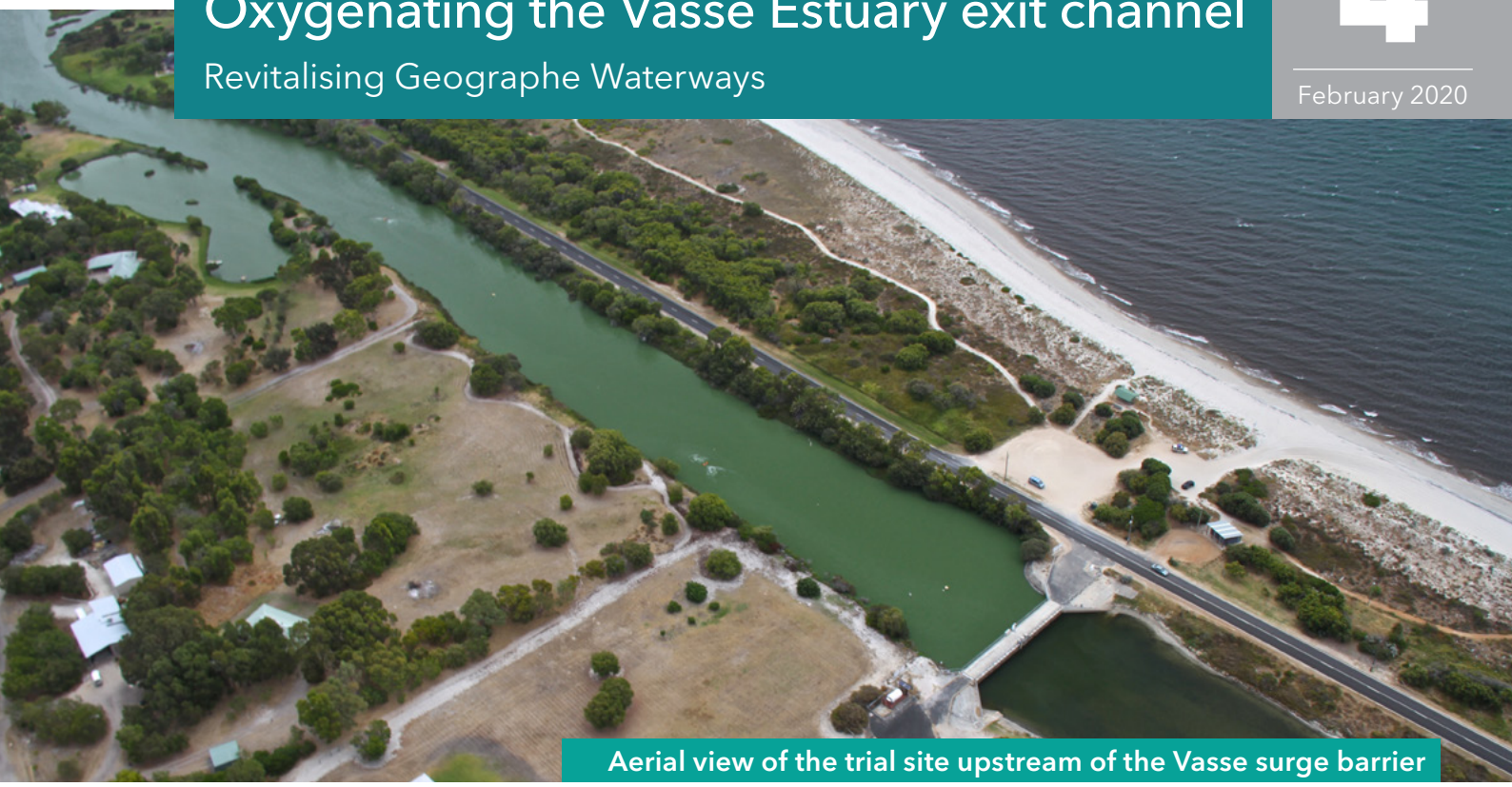
Oxygenating the Vasse Estuary exit channel

Revitalising Geographe Waterways



Aerial view of the trial site upstream of the Vasse surge barrier

The Vasse Estuary is the most nutrient-enriched estuary in the south-west of Western Australia.

During the warmer months, excessive nutrients upstream of the surge barrier fuel algal blooms, leading to periods of low dissolved oxygen which may result in fish kills.

A solvox drop-in unit mounted on a frame

Managing the system to reduce the risk of low oxygen–related fish deaths is a priority for managers over summer, and a range of options to improve water quality have been explored through the Revitalising Geographe Waterways program.

Over the summers of 2015–16 and 2016–17, scientists from the Department of Water and Environmental Regulation (the department) undertook a trial to assess if artificially oxygenating the Vasse exit channel was a viable option for improving water quality upstream of the surge barrier. While artificial oxygenation has been successfully applied to the Swan and Canning rivers for the past two decades, the concept has never been applied to smaller and very shallow water bodies like the Vasse.

The land-based plant on the eastern side of the Vasse Estuary surge barrier

What did we do?

The Vasse Estuary oxygenation plant used new technology (BOC Solvox drop-in units) to achieve high concentrations of oxygen in-situ. The land-based components of the temporary plant were located within a fenced area on the eastern side of the surge barrier and included an oxygen vessel to store liquid oxygen; a vaporiser to convert liquid to gaseous oxygen; a phase convertor to supply three-phase power; and a control panel. Two BOC Solvox drop-in units added oxygen at two locations – one near the surge barrier (20 m upstream in year one and 115 m upstream in year two) and a second further upstream (210 m upstream in year one and 345 m upstream in year two).

The Solvox drop-in units are new technology which has been successfully applied to the aquaculture industry. They are compact (approximately 1.5 m long and 25 cm in diameter), and contain a submersible pump, an oxygen dissolver and a distribution system.

Each unit was programmed to turn on when dissolved oxygen concentrations dropped below 4 mg/L (below this concentration dissolved oxygen may be a limiting factor for fish function and survival) and turn off when it exceeded either 6 or 8 mg/L.

Scientists wanted to determine if the technology could be practically applied to such a shallow water body, as well as determine how well the plant was able to maintain concentrations above the critical thresholds of 4 and 2 mg/L, thereby reducing the likelihood of a fish kill.

The oxygenation plant added substantial quantities of oxygen to the Vasse exit channel in both years (1,515 kg in year one and 6,145 kg in year two). The in-river units drew water at a rate of 20 L/s, adding between 1–6 kg/hr of oxygen under high pressure, and discharging jets of highly oxygenated water back into the channel. Department staff monitored water quality at seven sites upstream in year one and 11 sites in year two to determine the impact of the plant.

Did it work?

For much of the trial period, the oxygenation plant was able to maintain adequate dissolved oxygen concentrations in the trial area 470 m upstream of the surge barrier. During periods where exceptionally large algal blooms were present, the capacity of the plant was inadequate to counter the rapid drawdown of oxygen when the algae was respiring (generally in the early hours of the morning).

The BOC Solvox drop-in oxygenation units were found to be suitable in the shallow and estuarine Vasse exit channel, working best where operation was automatically triggered when oxygen concentrations dropped below 4 mg/L. Losses of oxygen to the atmosphere appeared to be minimal.

Overall, in year one of the trial, the plant:

- prevented low oxygen conditions (<4 mg/L) 62% of the time
- averted hypoxia (dissolved oxygen < 2 mg/L) and the risk of a fish kill 82% of the time.

In year two, the plant:

- prevented low oxygen conditions (<4 mg/L) 45% of the time
- averted hypoxia (dissolved oxygen < 2 mg/L) and the risk of a fish kill 67% of the time.

Towing oxygenation unit for installation

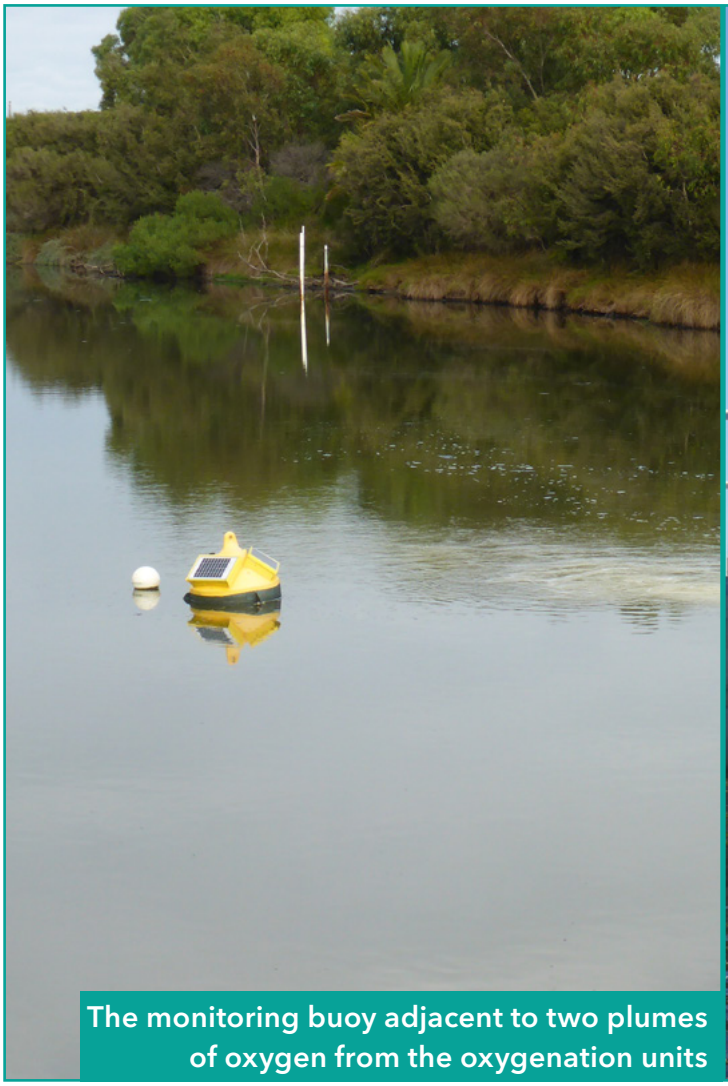
Plumes of bubbles from oxygenation plant

Where to next?

Artificial oxygenation was shown to be a viable method of responding to low oxygen conditions to help prevent fish kills. While there is no immediate plan to install a permanent oxygenation plant, oxygenation is an additional tool that could be considered in the future to complement other water quality management options in the Vasse Estuary.

The Revitalising Geographe Waterways program has explored a range of other management tools aimed at improving water quality in the Vasse Estuary including seawater inflow trials, sediment investigations and removal, and reducing nutrients entering from the catchment. Surge barrier management guidelines have been updated, and managing seawater inflows through the surge barrier has been the most effective measure to reduce algal blooms and low dissolved oxygen to prevent fish kills.

The full report detailing the oxygenation trial can be found under resources at rgw.dwer.wa.gov.au/publications.



The monitoring buoy adjacent to two plumes of oxygen from the oxygenation units

Lowering a unit into the water column

GeoCatch

More information is available at:
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Revitalising Geographe Waterways

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