

Citizen Science and Foreshore Inundation – Tidal Valves

COUNCIL NAME

Lake Macquarie City
Council

WEB ADDRESS

lakemac.com.au

SIZE

758 square kilometres

POPULATION

204,166

FUNDING PROGRAM

[Building Resilience to
Climate Change](#)

Overview

Marks Point is a low lying area that experiences frequent tidal inundation from Lake Macquarie. Local tidal inundation is projected to increase as sea levels rise due to climate change. As part of the Marks Point and Belmont South Local Adaptation Plan, the community proposed to address this risk by using tidal flaps (or valves) on stormwater outlets to prevent the ingress of lake water into the stormwater system. Lake Macquarie City Council installed tidal flaps on two stormwater outlets to trial their effectiveness under local conditions. The community monitored the performance of the flaps during high tides and rainfall events. While the flaps were successful at preventing lake inundation during high tides, they caused the stormwater system to backup during rainfall events resulting in localised flooding. The trial has identified further design considerations including head pressure within the stormwater system.



Village Bay Close inundated by lake water May 2015. Credit: Greg D. Jones, Lake Macquarie City Council

Background

Since 2015, the community of Marks Point and Belmont South have engaged with Council to understand the hazards to their community from projected sea level rise and lake flooding. With a projected 0.9 metre increase in lake levels, and without managing the hazard, 4km of roads, 1.8km of drains, and 22ha of foreshore land will become permanently inundated in the two lakeside suburbs. Some of this land and infrastructure is already affected during biannual king tides.

The community developed a Local Adaptation Plan that sets a strategy to 2100 and an action plan for the next 10 years to make their community more resilient. One of the measures in the

action plan is to assess the effectiveness of tidal flaps on stormwater drains in managing tidal inundation.

The community and Council wanted to test the usefulness of flaps in estuarine environments with relatively small tidal ranges, and maintenance requirements as this had been identified as an issue by other councils. Two different styles of flap were trialled in the lake environment, and the effectiveness was assessed with community participation, thereby ensuring transparency while building and sharing knowledge of the project.

Implementation

Council installed two rubber tidal flaps (or valves) of different design ('Checkmate' in-line and 'Tideflex' duck-bill) at stormwater outlets at Marks Point (northern end of Marks Parade and Village Bay Close).

A monitoring program was designed using tidal and rainfall measurements available from nearby gauges operated by Manly Hydraulics Laboratory and involving community volunteers to observe and photograph flooding events.

Invitations to participate in the project went to 120 local households, and more than 30 residents attended meetings and agreed to monitor the performance of the flaps, for example by reporting to Council if they saw water covering roads or yards. Monitored sites included foreshore areas both with and without the tidal flaps on stormwater outlets. Residents reported flooding on four high tide events and several rainstorms events.



The 'Checkmate' valve installed at Marks Parade.
Credit: Rob Mackenzie.



The duckbill valve installed at Village Bay Close.
Credit: Rob Mackenzie.

REFERENCES

www.haveyoursaylakemac.com.au/future-flood-planning

Outcomes

Community monitoring from June to December 2016 showed the flaps were effective in stopping lake inundation during high tides. However, there was an increase in nuisance stormwater pooling during frequent, small rain events.

The data showed the two designs tested were successful in preventing tidal inundation, and operated under conditions of partial blockage by silt and seaweed, but restricted the rate of stormwater run-off causing an increase in nuisance flooding. The flaps were designed to open at very low 'cracking pressure'. Whilst they were opening as designed, the rate of flow was restricted due to small head-pressure in this very low-lying area, causing the stormwater to pool and lie for an extended period.

In consultation with the community, the two tidal flaps were removed after 7 months. Although the technology did not prove effective, by engaging the community in the trials, social capital was built along with community knowledge of the operation and effectiveness of the technology, and also of the localised impacts of stormwater run-off.

Council intends to reuse the removed valves at other locations around the lake foreshore that have more gradient in the stormwater drains and higher head pressure to allow the valves to work effectively.

Key Learnings

As climate change adaptation is an iterative process, it was always intended to apply the experience and knowledge gained from the trial to inform local adaptation planning in other locations around the lake.

This trial was listed as an action in the Marks Point and Belmont South Local Adaptation Plan, and will inform further discussions and actions in those communities. The trial insights will be used to inform adaptation for other lakeside communities, with discussions currently underway for the Pelican and Blacksmiths communities.

Although the tidal flaps did not work as expected, the project provided sound evidence for Council and the community about the suitability of the approach to manage tidal inundation as lake levels rise with rising sea levels, and reiterated the importance of planning and implementing adaptation actions together.

Contact

Name: Susan Woodhouse

Position: Environmental Security Officer

Phone: swoodhouse@lakemac.nsw.gov.au

Email: 4921 0714



This project has been assisted by the NSW Government through its Environmental Trust