Australian Government

MURRAY–DARLING BASIN AUTHORITY

Bank erosion along the River Murray between Hume Dam and the Ovens Junction

With a focus on the impacts of vessel wash

April 2017

Published by the Murray–Darling Basin Authority

MDBA publication no: 09/17
ISBN (online): 978-1-925599-21-3

GPO Box 1801, Canberra ACT 2601

02 6279 0100

engagement@mdba.gov.au

mdba.gov.au

Accessibility

The Murray–Darling Basin Authority makes its documents and information available in accessible formats. On some occasions the highly technical nature of the document means that we cannot make some sections fully accessible. If you encounter accessibility problems or the document is in a format that you cannot access, please contact us.

Acknowledgement of the Traditional Owners of the Murray–Darling Basin

The Murray–Darling Basin Authority acknowledges and pays respect to the Traditional Owners, and their Nations, of the Murray–Darling Basin, who have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. The MDBA understands the need for recognition of Traditional Owner knowledge and cultural values in natural resource management associated with the Basin.

The approach of Traditional Owners to caring for the natural landscape, including water, can be expressed in the words of the Northern Basin Aboriginal Nations Board:

> …As the First Nations peoples (Traditional Owners) we are the knowledge holders, connected to Country and with the cultural authority to share our knowledge. We offer perspectives to balance and challenge other voices and viewpoints. We aspire to owning and managing water to protect our totemic obligations, to carry out our way of life, and to teach our younger generations to maintain our connections and heritage through our law and customs. When Country is happy, our spirits are happy.

The use of terms 'Aboriginal' and 'Indigenous' reflects usage in different communities within the Murray–Darling Basin.

Cover image: Bank erosion on a property between Corowa and Bundalong (photo by Ben Berry)

Contents

Introduction and summary

The Murray–Darling Basin Authority (MDBA) is responsible for regulating flow along the River Murray to provide water for downstream water users. It is recognised that the significant change in the flow regime due to river regulation contributes to bank erosion between Hume Dam and Lake Mulwala. In response, the Commonwealth, New South Wales, Victorian and South Australian Governments financially contribute to a River Works Program through the MDBA, to mitigate the detrimental geomorphic and ecological impacts of flow regulation in that section of the river. This works program is overseen by the Advisory Group for Hume to Yarrawonga Waterway Management (AGHYWM), which consists of representatives from NSW and Victoria state agencies, local councils and local landholders.

During the last 17 years, more than $25 million has been spent to implement physical bank protection works and to monitor bank erosion along the Hume to Lake Mulwala reach (the reach). In most areas, the use of log revetment and revegetation is favoured over rock beaching due to the ecological benefits for habitat and because it allows the river to continue to gradually migrate across the floodplain, which is what floodplain rivers do.

The use of motorised recreational craft on inland waters has increased significantly in the last 30 years. It is likely that this trend will continue. The River Murray is one of the most attractive sites for water-skiing and wakeboarding due to its width, which allows vessels to pass safely in opposite directions, and some protection from wind waves due to the presence of dense riparian vegetation.

This report summarises some of the results of the bank erosion monitoring program between 2009 and 2016 and focuses on areas that are being impacted by high boating activity. Erosion monitoring and other observations indicate that bank erosion is increasing and that it is particularly apparent in areas where there is increased vessel wash due to wake enhancing activities.

In some high boat use areas, log revetment bank protection works are also being undermined by exposure to vessel wash and are failing. These works require repair at significant expense. For example, in the region around Corowa NSW (a high boat use area), a total of $650,000 was spent in 2015-16 to retrofit and repair log revetment works that had failed. In contrast, in areas that are subject to lower rates of vessel wash (eg Parlour Reach upstream of Howlong), the river works continue to perform as designed. The variable most likely responsible for the failure of the log revetment works is vessel wash.

The MDBA has also received many representations from a range of stakeholders regarding the impacts of powered boating within the project area, including bank erosion, environmental degradation, safety issues and deterioration of recreational qualities for more passive river users.

While enjoyment of the river by the boating community is encouraged, it has become apparent that a sound management strategy is a necessity for the majority of the high-use waters. Rivers should be managed for safety, fairness, and with consideration for the environment, in order to avoid a deterioration to both their environmental and recreational qualities and to ensure the river can be enjoyed by everyone for generations to come.

In order to reduce the current impact of vessel wash on the river banks and ecology of the river, and to ensure that all river users can continue to enjoy the River Murray, the MDBA and AGHYWM suggest that the NSW Roads and Maritime Services (RMS) consider a restriction on wake-enhancing activities in some areas of the river system between south of Corowa to the Ovens Junction.

Figure 1: An intact section of river bank with good cover of bank vegetation

Figure 2: Boat wash breaking on the bank of the River Murray, near Corowa

MDBA River Works Program

Compared to other rivers around the world, the River Murray has evolved as a naturally low-energy river system with slow currents, low natural wave energy and comparatively low rates of erosion. However, a number of processes have accelerated the rate of erosion in certain areas. These processes include river regulation for agriculture and human consumptive uses, clearing of riparian vegetation, de-snagging, stock access and the wash from powered boats.

The recognition that flow regulation contributes to river bank erosion was one of the factors leading to the formation of the Hume to Dartmouth review, commissioned in 1998 by the MDBA (then the Murray-Darling Basin Commission). The review resulted in changes in river operations and the formation of the AGHYWM. This group provides advice in regards to management along the reach.

This review also triggered a major works program in the reach that focused on:

- River bank stabilisation works
- Access bridges
- Acquisition of easements to flood at flows of up to 25,000ML/day
- Re-snagging.

The total expenditure on river works in the Hume to Lake Mulwala reach during the last 17 years has been $23.7 million. A further $1.3 million was spent on re-snagging and an additional $5 million for purchasing easements from landholders to ensure the MDBA could deliver water to meet the requirements of downstream water users (Table 1).

Table 1: Total expenditure and extent of works undertaken since 1998 in the Hume Dam to Lake Mulwala Project area.

River assets (as of 1st July 2016)	Number of works	Total length (km)	Value (based on 2016 cost replacement)
Timber groyne	95	14.2	$5.4 million
Avulsion control structure	28	N/A	$1.7 million
Rock revetment	231	24.4	$9 million
Log revetment	141	14.8	$4.5 million
Other Works	52	1.3	$287,000
Fencing	346	137.5	$1.65 million
Revegetation	378	127.5	$1.07 million
Signage	84	N/A	$168,000
Access work	90	N/A	$2.7 million (built cost non indexed)
Re-snagging works	4450	N/A	$1.3 million
Total - works	**1350**		**$25 million (excl. access works)**

The program extends as far back as 1959, making it the longest running major river works program of its kind. However, the program has evolved. Since 1998, the program changed from a focus on rock beaching to a vision to manage the river in a manner that is consistent with its laterally migrating, anabranching morphology.

Hard engineering techniques like rock beaching are not sympathetic to this vision. Instead, preference is now given to a range of innovative erosion control techniques using timber and revegetation. These include engineered log-jams, log revetment, pile fields (Figure 3), re-snagging, and revegetation. When necessary, rock beaching is still used.

Figure 3: Pile fields are one type of river work technique implemented to reduce rates of erosion. These structures were designed to be sympathetic to the natural behaviour of the river. They are ineffective at addressing erosion caused by boat waves as these wave travel perpendicular to the bank.

Interaction of river regulation, boating and vessel wash

Much of the water released from Hume Dam is to deliver water for irrigation, mainly during the summer and early autumn. This results in the river running at relatively high but in-channel, during these months.

These relatively stable summer and early autumn flows combined with the naturally low levels of wind on the river due to the dense riparian vegetation, provide ideal conditions for powered boating, particularly aquaplaning activities.

While there is a general understanding that vessel wash contributes to riverbank erosion, river flow regulation and vessel wash interact in complex ways, often compounding and amplifying the level of erosion along river banks.

The relatively stable water level also results in vessel wash impacting on a concentrated section of the bank profile, rather than being spread across it. This tends to accelerate the formation of a notch at the water level, which undermines the upper bank profile and leads to subsequent block collapse. This increases the rate of retreat of the upper bank profile, leading to the development of a pronounced elongated ledge (Figure 4). This is a common bank profile seen in high boat use areas. In such cases, both river regulation and boating clearly play important roles, but their effects are compounded through interaction.

While boat numbers have steadily increased in the last 30 years, it is likely that the millennium drought (2002-2010) may have altered the behaviour of water-skiers and wake boarders, resulting in more boating traffic on the River Murray. During the millennium drought the level of water in many Victorian lakes was very low, while the level in the river was often relatively high as water continued to be delivered for downstream users. This may have led people to shift from the lakes to the river, a change that may not have been fully reversed following the end of the drought.

Figure 4: Erosion near Corowa that is typical of the impacts of boating.

Monitoring methods

As part of the River Works Program, a monitoring program was established to assess bank condition, the extent of erosion overtime and to understand if the river works were performing as designed. Although the monitoring program was not developed to assess the impacts of boating, the data suggests that boating has made a significant contribution to bank erosion along the reach.

The river bank condition assessment is undertaken (by boat) on an annual basis and includes:

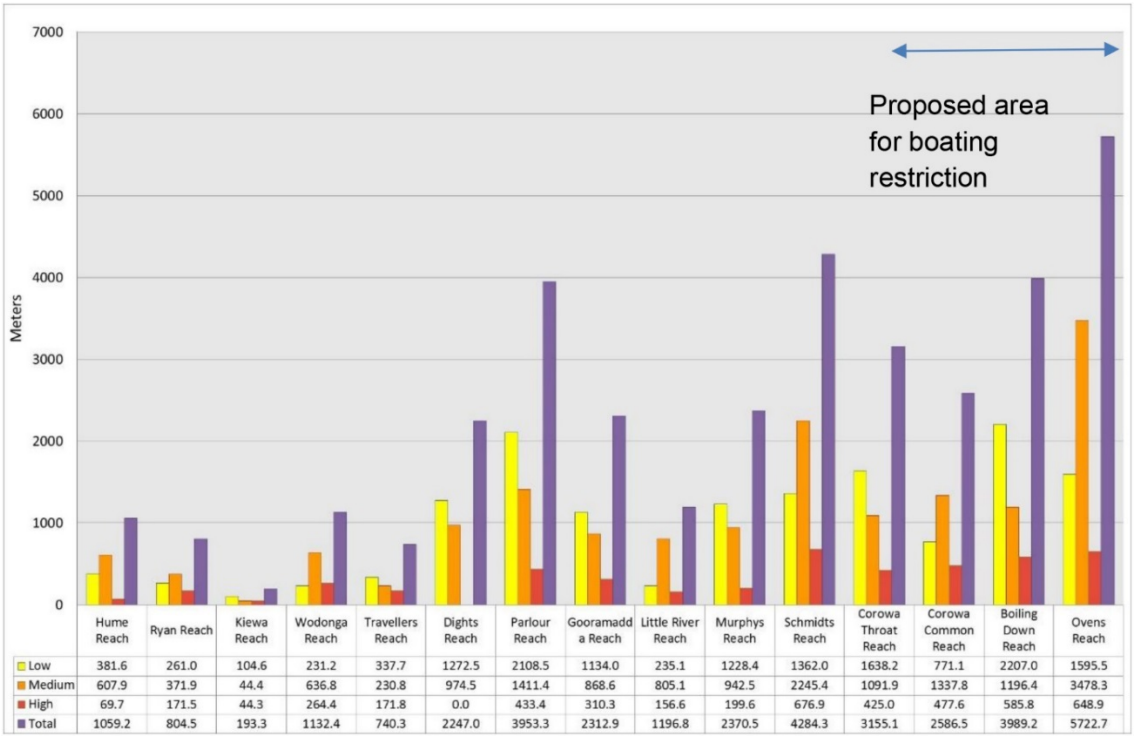
- Mapping and prioritisation of each section of the bank according to the urgency for erosion control works to be undertaken (high, moderate, low or stable)
- Photographs and an assessment of each work site to monitor performance and stability
- Partial and full channel width cross-sections to measure channel change.

Summary of results

River bank erosion results

The monitoring program divides the reach into 15 sub-reaches along the main stem of the River Murray. The majority of erosion generally occurs in the mid and lower parts of the reach, from just upstream of Corowa (Schmidt's reach) to the junction with the Ovens River (Ovens reach). This can be seen from the 2012 monitoring when there was a full set of comparative data (Figures 5 and 6). In 2012, several lower reaches had more than 14% of the river bank identified as a priority for erosion works (Figure 6).

In recent years there has been a significant increase in erosion along the lower parts of the reach. For example, sections of river banks in the Ovens reach have significantly deteriorated in the past seven years (Figure 7). In 2009, there was about 4.2 km of erosion sites and only 280 metres of this was classified as high priority. By 2016 there was more than 10 km of erosion sites with 4.5 km of this being high priority. This represents a doubling of all erosion sites and a twenty-fold in increase in high priority erosion in this area. At present, 27% of the river banks along the Ovens reach are now categorized as actively eroding.



	Hume Reach	Ryan Reach	Kiewa Reach	Wodonga Reach	Travellers Reach	Dights Reach	Parlour Reach	Gooramadda Reach	Little River Reach	Murphys Reach	Schmidts Reach	Corowa Throat Reach	Corowa Common Reach	Boiling Down Reach	Ovens Reach
Low	381.6	261.0	104.6	231.2	337.7	1272.5	2108.5	1134.0	235.1	1228.4	1362.0	1638.2	771.1	2207.0	1595.5
Medium	607.9	371.9	44.4	636.8	230.8	974.5	1411.4	868.6	805.1	942.5	2245.4	1091.9	1337.8	1196.4	3478.3
High	69.7	171.5	44.3	264.4	171.8	0.0	433.4	310.3	156.6	199.6	676.9	425.0	477.6	585.8	648.9
Total	1059.2	804.5	193.3	1132.4	740.3	2247.0	3953.3	2312.9	1196.8	2370.5	4284.3	3155.1	2586.5	3989.2	5722.7

Figure 5: Length of low, medium, high and total erosion in each sub-reach in 2012. Upper reaches are shown on the left and lower reaches shown on the right.

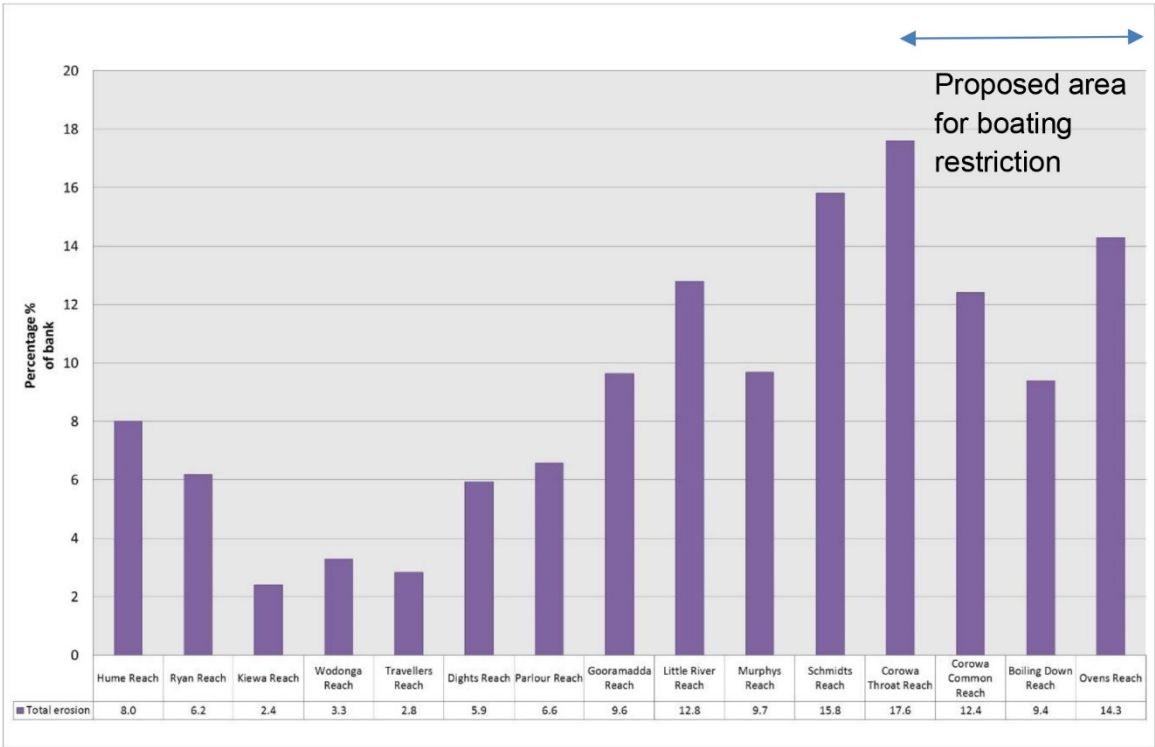


Figure 6: Percent of total bank erosion in each sub-reach in 2012. Upper reaches are shown to the left and lower reaches are shown to the right.

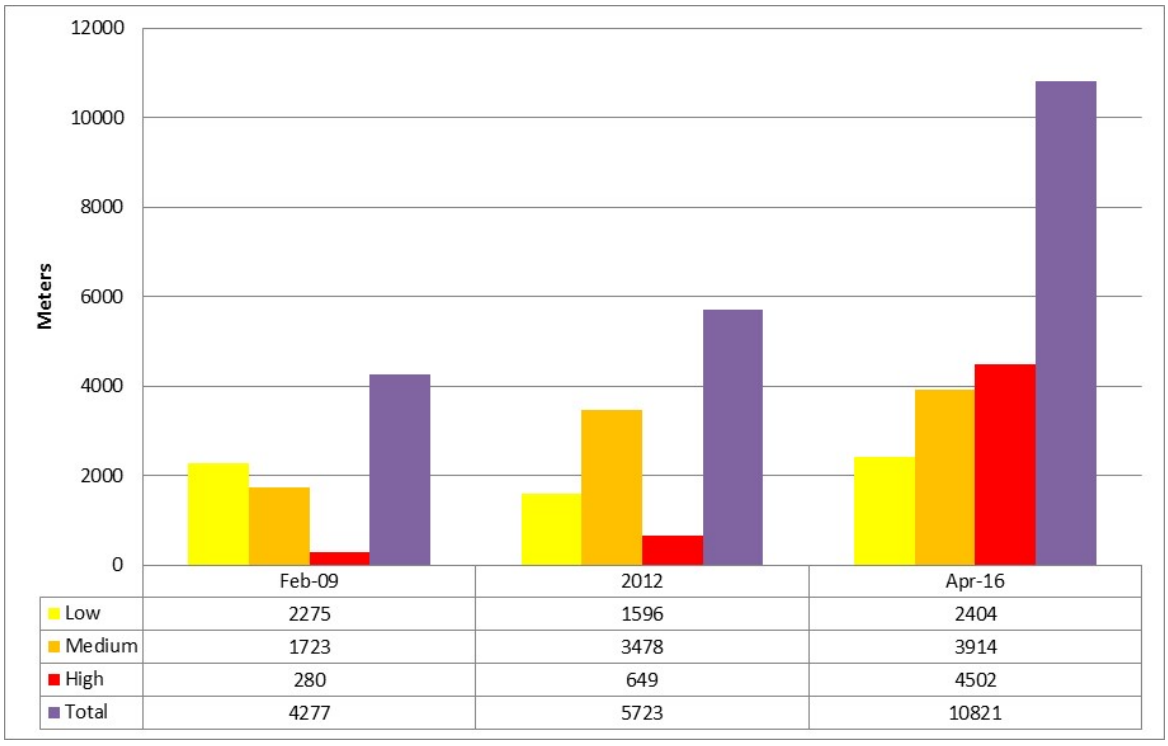
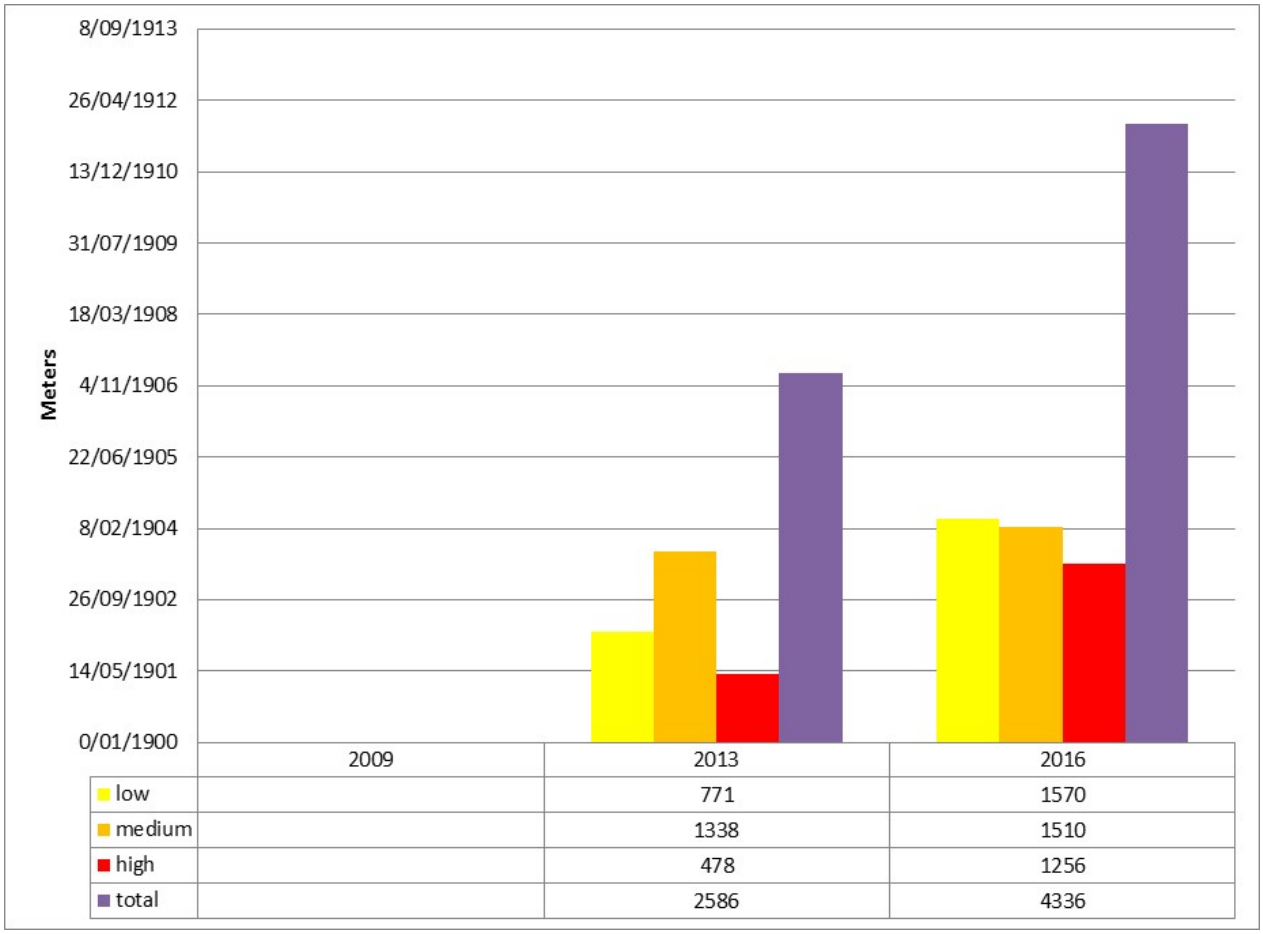


Figure 7: Length of low, medium, high and total erosion in the Ovens sub-reach from 2009 to 2016. Data in 2012 same as that presented in Figure 5.

The approximate costs to protect these sites with rock to make the river banks resilient to boat wash is approximately $250 per lineal meter. To treat the 4.5 km of high priority erosion sites in this reach with rock would cost $1,125,000.

The recent increase in erosion is not isolated to the Ovens reach. There has also been a significant increase in high priority sites occurring in the Corowa Common reach between 2013-2016 (Figure 8).



	2009	2013	2016
low		771	1570
medium		1338	1510
high		478	1256
total		2586	4336

Figure 8: Length of low, medium, high and total erosion in the Corowa Commons sub-reach from 2013 to 2016.

Horizontal Pin monitoring has also been used to determine the direct impact of boating in some areas. During 42 days of anecdotally high boating activity at the Hawke property (Corowa) in the summer of 2014, 320 millimetres of bank retreat was recorded, averaging 7.6 millimetres per day (Figure 9).

Figure 9: Horizontal pin monitoring at the Hawke property (Corowa) during summer 2014.

Impact on works due to high boat wash activities

In 2010, the works program constructed approximately 800 metres of bank protection works to address actively eroding river banks at Corowa, a high boat traffic area.

The technique initially comprised log revetment and machine placed Common Reed (*Phragmites* spp.) rhizomes. This has become the preferred river bank protection work mitigation technique. The technique is generally effective at addressing erosion caused by river regulation and has an estimated design life of 30 years.

However, after only five years the log revetment had effectively failed and this is thought to be due to undermining due to vessel wash (Figure 10-11). In 2016 another $670,000 was spent to repair the damaged river bank protection works and to reinforce the river banks with rock beaching to protect against boat wash (Figures 12-14).

There are works with a value of $2.5 million dollars in the proposed boating restriction zone that are currently at risk of failure if boating trends continue.

Figure 10: Undermined log revetment leading to ongoing retreat of the upper bank.

Figure 11: Ball Park log revetment undermined from boat wash.

Figure 12: Retrofitted rock beaching behind the log revetment to protect against vessel wash. Note the elongated sloping ledge - a common feature seen in areas that are subjected to high levels of vessel wash, where the upper vertical face retreats much faster than the toe of the bank.

Figure 13: Ball Park log revetment being repaired and retro-fitted with rock beaching and backfilled.

Figure 14: Ball Park logs now repaired with the aim of being able to withstand the impact of vessel wash.

A proposal to reduce further bank erosion

In order to reduce the current impact of vessel wash and to ensure that all river users can continue to enjoy the River Murray, the MDBA with support from the AGHYWM would like NSW RMS to consider restricting wake enhancing activities along a section of the river between the south of Corowa and the Ovens Junction. The proposal will also protect works to the value of $2,497,000 that have been implemented to mitigate the impacts of regulation along this section of the river.

It is suggested that other vessels, including water skiing, fishing boats, personal water craft and other powered vessels are allowed to continue to use the river where the current rules permit.

In brief, this proposal is founded on the basis of:

- Monitoring that indicates an increase in bank erosion in the area
- Riverbank protection works that are being undermined in areas of high boat traffic
- Anecdotal evidence suggesting an increase in boating activity in the area
- Reducing further damage to river banks in the area
- Reducing the cost to government for the construction of new bank protection works or retrofitting damaged river bank protection works.

Attachment A: Other photos of boating-related erosion along the reach

Figure 15: Steep bank erosion with waves breaking.

Figure 16: Bank erosion with a stand of Common Reed growing adjacent to bank.

Figure 17: Severe bank slumping of grassy bank face.

Figure 18: Bank sheering behind pile fields.