ROUS
COUNTY COUNCIL

BULK WATER SUPPLY | WEED BIOSECURITY | FLOOD MITIGATION

Wades Canal
Active Floodgate Management Plan

2019-2022

Management Plan operational summary

Wades Canal is located south of Coraki in northern New South Wales. The 1.5-kilometre-long drainage system enters Bungawalbyn Creek on its eastern bank. The artificial canal drains a low-lying floodplain area that was historically a freshwater wetland. It is unlikely that this area had any permanent connection to Bungawalbyn Creek.

Wades Canal is an artificial man-made drainage system that shows no natural characteristics. The drain is surrounded by agricultural land used for grazing and tea tree cropping. The drainage system has been floodgated at its junction with Bungawalbyn Creek. A box culvert and a smaller pipe are located through the artificial Bungawalbyn Creek eastern levee and floodgated on the downstream side. The main floodgate on the box culvert was modified to allow active management in 2005. It is that modified floodgate to which this Plan applies. The term 'floodgate' within this Plan refers to the one modified with a sluice window which is opened and closed to allow tidal exchange.

Opening the sluice window to allow tidal exchange, during non-flood periods, can improve water quality within Wades Canal. The frequency and magnitude of acidic discharge can be reduced, as can the accumulation of Mono-sulfidic Black Ooze (MBO) within the drainage system.

Although active floodgate management can improve water quality discharging from the system, it is important to recognise that the reduction in acid discharge will be due to the dilution of acidic water. Active floodgate management does not prevent or reduce acidic water being present in the drainage system, it reduces its impact upon the receiving waters of Bungawalbyn Creek through dilution. Likewise, it is important to acknowledge that active floodgate management does not resolve all water quality issues in the system, e.g. tidal exchange does not reduce deoxygenation (blackwater) events after flooding.

While acknowledging the limitations, the environmental impact of the Wade Canal floodgates can be reduced through active management. This plan outlines how management will continue into the future and suggests additional management strategies to reduce the system's impact further.

Environmental goals and strategies

The goals and strategies listed here specifically relate to Wades Canal and identify the desired outcome from actively managing the floodgate. Goals are listed in priority order.

Goals

1. Reduce the frequency and magnitude of acidic discharge from Wades Canal.
2. Reduce the accumulation of MBO within the system.
3. Reduce the impact of Wades Canal on its receiving waters of Bungawalbyn Creek.

Strategies

- Continue with outlined opening strategy for the canal's floodgate.
- Facilitate the adoption of best management practices and additional remediation strategies to further reduce the impact of Wades Canal on its receiving waters.

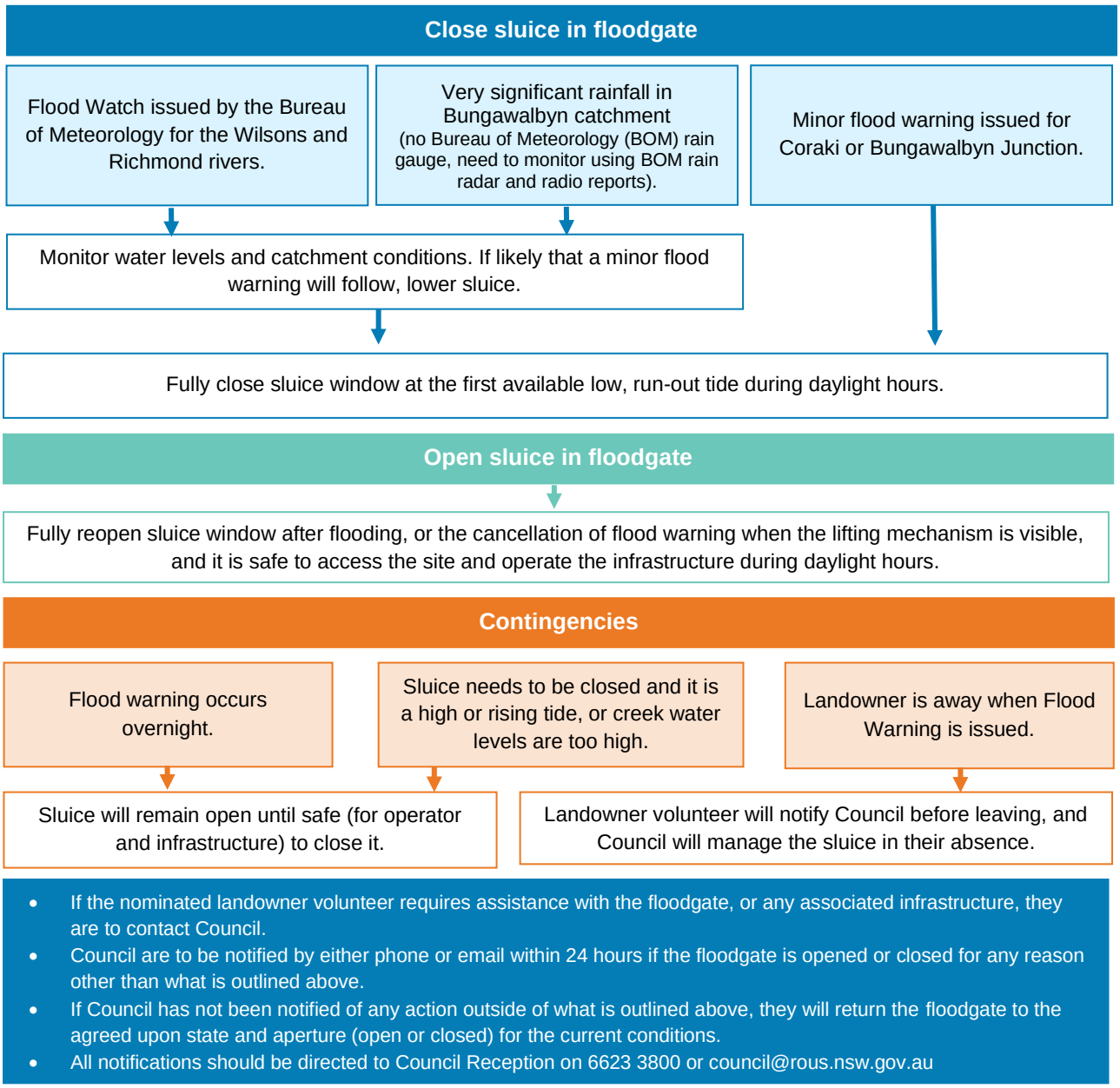
Opening strategy for floodgate

The main floodgate at Wades Canal is fitted with a sluice window, which can be winched open. The sluice opening is 450mm x 600mm and going forward the window will be kept fully opened.

After installation in 2005, the sluice window was kept open, except during floods and after heavy rainfall. Landowner ownership has changed in recent years and the review and update of this management plan is an opportunity to confirm how the sluice window will be managed into the future.

The sluice window will remain fully open all year, and only lowered before flood events to protect upstream areas from riverine inundation. This is the optimal strategy for the existing floodgate structure and no improvement is suggested at this time for its future management. This degree of tidal exchange is noted to improve water quality while having minimal impact on surrounding land use.

The sluice window will be opened and closed, in accordance with the details below by the nominated landowner volunteer. Council and the landowner volunteer acknowledge there are many variables during flood events and will be guided by the details below. This plan will not restrict Council from taking emergency actions outside of those listed, taking into consideration safe work procedures



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Authorisation

This plan has been endorsed by Council and the landowners within the immediate catchment whose land is influenced by the management of floodgates.

Landowners have signed a letter of endorsement stating they understand the management strategy for the floodgate, including the triggers for opening and lowering into the operational position.

The nominated landowner volunteer has agreed to operate the floodgate on behalf of Council, as outlined in this Active Floodgate Management Plan and in accordance with the Workplace Health and Safety advice and directions provided to them.

Disclaimer and copyright

Version control

Version	Description	By	Date
0.1	Draft developed before landowner consultation	Chrisy Clay	31/05/2019
0.2	Final draft incorporating landowner feedback	Chrisy Clay	10/07/2019
1.0	Final version – issued to landowners	Brenda Ford	13/08/2019

Rous County Council File 2547.1/17

Contents

1. Overview

Many coastal floodplains in New South Wales have been extensively modified by networks of constructed drains, altered water courses and floodgates. These are designed to mitigate the impacts of floods and large rainfall events.

Constructed drains reduce inundation after flooding and floodgates prevent flood waters and tidal brackish water from inundating low areas of the floodplain. This in many cases has converted prior wetlands and low-lying floodplain areas into dryland farming areas. While these developments have enhanced rural settlement and agricultural industries, they have also caused unintended adverse impacts to downstream water users, fisheries and the ecology of estuaries.

Rous County Council ('Council') is the Flood Mitigation Authority operating across the local government areas of Ballina, Lismore and Richmond Valley. Council is responsible for the construction, replacement and routine maintenance of flood mitigation infrastructure, including floodgates and some pipes, levees, rural drains and canals. Council's natural resource management function relates to the environmental consequence resulting from the operation of this infrastructure. Council is responsible for reducing the environmental impact of these floodgates and other infrastructure, while retaining their benefits for flood mitigation.

The flood mitigation directive that Council operates under in the *Local Government Act 1993* is *'Prevent and mitigate menace to the safety of life or property from floods and natural resource management issues arising therefrom'.*

Purpose of a Floodgate Management Plan

Council has an Active Floodgate Management Plan ('the Plan') for each of its floodgates that are actively managed. Active management is the opening of floodgates during non-flood periods when the floodgate is otherwise operating passively. Opening floodgates and allowing tidal exchange can reduce their environmental impact by improving water quality and enhancing aquatic habitat and fish passage. Tidal exchange can occur through modifying a floodgate with a sluice window or an automatic, tidally operated float system or the floodgate can be winched opened.

These Plans document and communicate:

- how active management can assist in reducing the environmental impact of the floodgate,
- a strategy for how that will be monitored and achieved,
- appropriate and consistent strategy for opening the floodgate and returning it to the operational position or state and by whom,
- safe operating procedures for volunteers and Council staff,
- how adverse effects on current land use will be identified and prevented, and
- additional management strategies for the drainage system that would further reduce the environmental impact of flood mitigation.

Each Plan is tailored for the individual floodgate, considering its location, purpose and function.

Guiding principles for management

- Rous County Council is the Flood Mitigation Authority, and acts in consultation with stakeholders on the management of its infrastructure.
- The primary function of Council's infrastructure is for flood mitigation.
- The intention of active floodgate management is to reduce environmental impact without causing adverse effect on current land use.
- All landowners behind the floodgate whose property may be impacted will be invited to participate in reviewing and updating the Plan and will be sent a final version of the Plan for their records. Where property ownership changes, the new landowner will be involved at the time the Plan is reviewed unless their location and role is critical to the management strategy.
- Active floodgate management is a cooperative exercise between Council, as the Flood Mitigation Authority, and the surrounding landowners. Council appreciates landowners' continued support of this important activity.

Stakeholder involvement

This Active Floodgate Management Plan is a formal agreement between Rous County Council and landowners on how the identified floodgate will operate. The Plan has been developed in consultation with landowners whose property may be impacted from the floodgate's operation.

Rous County Council seeks the input and support of other stakeholders for their Active Floodgate Management program and its delivery.

Organisation	Role
Rous County Council	Owns, develops and uses individual Active Floodgate Management Plans.
Relevant landowners	Endorses and uses individual Active Floodgate Management Plans.
Lismore City Council Ballina Shire Council Richmond Valley Council	Supports active floodgate management and provides input on general program where relevant.
NSW Department of Primary Industries	Supports active floodgate management and provides input on general program where relevant. Regulatory role under *Fisheries Management Act 1994*

Plan review frequency

The Plan will be formally reviewed every three years (from the date of adoption) and the effectiveness of the outlined strategy assessed.

Feedback on the Plan and active floodgate management matters

Feedback and comments should be referred to Council by telephone on (02) 6623 3800 or by email: council@rous.nsw.gov.au

2. Wades Canal

Asset number and description

A reference in this section to ‘asset number’ is to a unique reference that Council has assigned to the specified asset.

Asset number 1940 – Wades Canal floodgates

- Two floodgates
  - One square 2100mm floodgate with a sluice window, operated with a winch.
  - One round 600mm floodgate.

Asset No.	Description	Number
1940-030-01	Aluminium floodgate (2100mm square) with sluice window	1
1940-031-02	Aluminium floodgate (600mm round)	1
1940-035	Lifting gear	1
1940-060	Lifting gear	1
1940-263	Canal	1
6580-410	Bungawalbyn Creek eastern levee	1

Aerial photograph of asset location and images of asset

1: Wades Canal locality map.

2: Wades Canal floodgates with sluice window open.

3: Wades Canal looking upstream from floodgates.

Drainage system characteristics

Location in estuary.	Mid-upper estuary.
Location in landscape.	Floodplain and former low-lying freshwater wetland.
Land elevation.	2.6m – 0.8m AHD.
Land use.	Agriculture: cattle grazing and tea tree cropping.
Vegetation.	Grasses and pastures.
Salinity levels and estuary dilution capacity.	Low.
Tidal range.	Low.
Land elevation adjacent to drains.	Low, graduating from artificial levee along Bungawalbyn Creek.
Soil type.	Higher floodplain is dominated with alluvial sediment, low-lying area drained by canal has peat soils similar to that of nearby Boggy Creek. (NSW DPI, 2005)
Acid sulfate soils.	High risk, areas of sulfuric sediments (actual sulfate soils). Low-lying area at end of canal contains peat acid sulfate soils similar to Boggy Creek. (NSW DPI, 2005)
Hydraulic conductivity.	Very high. (NSW DPI, 2005)
Acid export.	High and chronic. Groundwater-driven export. (NSW DPI, 2005)
Water quality issues.	Chronic acidic discharge with low dilution capacity within Bungawalbyn Creek, which is a High Conservation Value water course. (Foster, 2001) Can discharge deoxygenated water (blackwater) after flooding.

Water quality

Wades Canal is a source of acidity into Bungawalbyn Creek. This acidification is from the oxidation of acid sulfate soils within the drainage sub-catchment, particularly the low-lying area underlain by peat. (NSW DPI, 2005)

Very little water quality monitoring has occurred at Wades Canal, although it is likely to share similar characteristics to nearby Boggy Creek. Previous spot readings and visual observations support that assumption, with a pH reading of 3.5 recorded in the top end of the drainage system. (RRCC, 2005) The acidity found within the canal is also likely to be groundwater driven, with macropores and indicators of high hydraulic conductivity previously observed. (NSW DPI, 2005)

Active floodgate management can improve water quality discharging from Wades Canal by diluting the acidic discharge before it enters Bungawalbyn Creek and reducing the accumulation of MBO. The system has benefited from the previous landowner's trial of acid reduction strategies, including the installation of a groundwater retention gate on a culvert upstream. This gate attempted to contain the acid runoff within the surrounding soil and groundwater and reduce its discharge into the drain.

The system can also produce deoxygenated water (blackwater) after flooding.

Aquatic habitat values

The former freshwater wetland that historically existed at the top end of Wades Canal would have had some aquatic habitat values. Little information has been documented or recorded on what the area was like before extensive drainage, however older landowners remember riding through a similar wetland nearby at Boggy Creek on horseback and being surrounded by high and thick reeds. (NSW DPI, 2005)

Wades Canal is an artificial man-made drainage system that shows no natural characteristics. It crosses a higher floodplain area before intercepting the low-lying area at the top of the canal. The surrounding land has been modified for grazing, tea tree and previously sugar cane. The drainage system provides little habitat and the water quality within the system is often unfavourable for aquatic life.

However, Wades Canal discharges into Bungawalbyn Creek, which has been previously identified as a High Conservation Value watercourse. (Foster, 2001) Bungawalbyn Creek provides important aquatic habitat, particularly for fish, within the wider Richmond floodplain (NSW DPI, 2016).

The active management of the Wades Canal floodgates is focused on reducing the system's impact upon Bungawalbyn Creek.

Whole of system management

If improvements to water quality (beyond what can be achieved by active floodgate management) are desired, additional works or changes will be required within the Wades Canal system. The following table outlines what management changes have already been made and what could be explored in the future. A cooperative approach that balances the needs of current land use and environmental benefits is promoted by Council. Wades Canal has benefitted from the willingness of previous landowners to trial and adopt different management strategies to improve water quality and Council acknowledges their efforts.

Council provides this information for landowners and other organisations that are responsible for promoting and facilitating natural resource management on private freehold land. This information identifies a range of relevant strategies for improving water quality based on the characteristics of the system and are consistent with current best management practice.

On Wades Canal, Council has management responsibility for the main floodgates including the sluice window, the main canal, as well as the Bungawalbyn Creek eastern levee. All other minor drains and other flood mitigation structures in the system are owned by others.

Management strategy	Works	Undertaken	Location	Recommendation	Responsibility
Acidic groundwater containment.	Groundwater containment weirs or structures installed in drainage system.	Yes, a slide dropboard was installed on piped crossing by NSW DPI in 2005 (funding assistance by NRCMA).	On culvert 0.75km upstream of floodgate.	Review concept with current landowners, identify any future opportunities.	Private landowners. Local Government: • Rous County Council. State Government: • North Coast Local Land Services. • Department of Primary Industries. • Office of Environment and Heritage. • Marine Estate Management Authority.
	Reducing drainage density – removing drains or reshaping so shallow and wide to only drain surface water.	No.	Main canal.	Explore possibility with landowners.	
Tidal flushing for dilution of acidification.	Actively manage floodgates on drain headworks.	Yes, in 2005 by NSW DPI and RRCC (funding assistance by NRCMA).	A sluice window in one of the floodgates.	Continue with outlined management strategy.	Private landowners. Local Government: • Rous County Council.

Management strategy	Works	Undertaken	Location	Recommendation	Responsibility
Detailed site assessment and hydrologic options study.	Obtain up to date technical information on the system's hydrology, drainage and flooding patterns to provide guidance on how acid discharge could be addressed without impacting upon current land use.	No.	Whole system.	Explore possibility with landowners and Council. Assess cost versus benefit.	Private landowners. Local Government: • Richmond Valley Council. • Rous County Council. State Government: • North Coast Local Land Services. • Department of Primary Industries. • Office of Environment and Heritage. • Marine Estate Management Authority.
Reduce impact of deoxygenation events.	Reduce drainage density – removing drains or reshaping so shallow and wide to only drain surface water. Return lowest lying land to a more natural water regime, i.e. shallow and permanent inundation.	No.	Private drainage system.	Explore possibility with landowners.	
Management Plan.	Collation of site information, identification of management options.	No.	Whole system.	Assess cost versus benefit. Explore possibility with landowners.	
Water quality monitoring.	Monitoring program to identify any water quality issues and confirm benefits of managing floodgate.	No, only spot samples and observations.	Main floodgates.	Program developed to determine success of Active Floodgate Management Plan. Identify resources required and assess cost versus benefit.	Local Government: • Rous County Council.

3. Risks of actively managing floodgates

Work Health and Safety

- The sluice window is fitted with a winch and large forces can be involved in winch systems.
- The sluice window should only be opened on a low or falling tide. This will reduce the risk of the wire rope breaking and the floodgate bowing.
- The sluice window is opened and closed by nominated landowner volunteer or Council operator, who should consult and follow the approved Safe Work Procedure and Floodgate Fact Sheet relevant for the activity and undertake their own risk assessment before operating the floodgate.
- Operating the sluice window during and after heavy rain or flooding can require working in wet and slippery conditions. Safe access to the site should be assessed after events.
- The sluice window is only to be operated during daylight hours.

Environmental / Agricultural

Flooding

There is a significant risk of flooding to land upstream of the floodgate and surrounding areas, if the sluice window is not closed before a flood arrives and floodwater from Bungawalbyn Creek enters

the drainage system. From this location floodwaters from Bungawalbyn Creek can travel overland to the Swan Bay area.

Increased salt levels in drainage system

Salinity levels are low in Bungawalbyn Creek, even during droughts and periods of low flows. There is no risk posed by tidal water overtopping banks in low-lying areas or of lateral salt seepage into the banks.

4. Monitoring, evaluation and reporting

Council will explore whether water quality monitoring can occur at Wades Canal. However, if resources are not available for monitoring, scientific principles and visual observations support the assumption that implementing the outlined management strategy will improve water quality.

An evaluation of the success of the Plan will be made at the three-yearly review, and a report provided by Council to landowners and relevant stakeholders.

5. Historical context

History of when and why asset was installed

There is very little historical information on when and why Wades Canal was constructed. The main headworks and floodgates are thought to have been installed in the 1960s or 70s.

The artificial canal drains a low-lying floodplain area that was historically a freshwater wetland. It is unlikely that this area had any permanent connection to Bungawalbyn Creek.

Wades Canal also appears to receive water draining from the top of a large, elevated ridge which runs to the south of the drainage system (see map in Appendix).

Private drainage history

In 2005, NSW Department of Primary Industries installed a slide dropboard on the privately-owned piped crossing on the canal, with funding from the Northern Rivers Catchment Management Authority. The slide dropboard was installed to trial holding drain water levels back in the system to prevent acidic groundwater discharge into the drain.

4: Slide dropboard that was fitted to the private piped crossing to hold drain water levels up above stream.

There are a number of private secondary drains that run into the main canal. It is not known when they were constructed.

History of active floodgate management

NSW Department of Primary Industries commenced landowner extension in the area in 2000 and obtained funding to modify infrastructure on Wades Canal from the Northern Rivers Catchment Management Authority.

After installation in 2005, the sluice window was kept open, except during floods and after heavy rainfall. Landowner ownership has changed in recent years and the review and update of this Plan is an opportunity to confirm how the floodgate will be managed into the future.

The sluice window will remain fully open all year, and only lowered before flood events to protect upstream areas from riverine inundation. The sluice window will be operated by the nominated landowner volunteer in accordance with this Plan.

6. References

Foster, J. (2001) Assessment of the Bungawalbyn Region for High Conservation Value Status. Unpublished report by expert panel for the Far North Coast River Management Committee.

NSW Department of Primary Industries (2005) Wades Canal ASS remediation project. Unpublished information.

Richmond River County Council (2005) Laboratory water quality results from Wades Canal. Unpublished information.

Appendix: Wades Canal drainage system

Wades Canal Catchment

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.

Disclaimer: The material contained on this map is made available on the understanding that Rous County Council is not hereby engaged in rendering professional advice. While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no warranty is given that the information contained on this map is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user.
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Printed Date: 05/06/2019
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