



Seelim's Canal Active Floodgate Management Plan

2020-2023

Management Plan operational summary

Seelim's Canal is located about 5 kilometres south west of Coraki, on Sandy Creek, North Eastern NSW. The artificial canal of approximately 620m length drains a low-lying floodplain area that was historically a freshwater wetland. There is no evidence that this area had any previous permanent connection to Sandy Creek.

Seelim's 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 Sandy Creek with 2 x 2100mm aluminium floodgates. An automatic tidal float mechanism was installed on one of the floodgates to allow active floodgate management in 2007. The automatic tidal float mechanism has been replaced with a 600mm x 600mm aluminium sluice gate during 2019 as part of the review of this Active Floodgate Management Plan to deliver more effective tidal flushing. Following consultation with landowners and trials of different opening heights, a normal operating condition for the sluice gate is recommended as a 150mm opening. This opening height has been found to provide good tidal flushing results without unnecessary inundation of backswamp farmland. During very wet weather or periods of significant high tides, the sluice gate can be operated at a reduced height of 80mm. Operation of the floodgates and sluice gate will be undertaken by Rous County Council staff.

Active floodgate management during non-flood periods to allow tidal exchange can improve water quality within Seelim's Canal and Sandy Creek and may reduce weed growth within Seelim's Canal. The frequency and magnitude of acidic discharge may be reduced, as can the accumulation of Mono-sulfidic Black Ooze (MBO) within the drainage system.

Active floodgate management does not prevent or reduce acidic water being present in the drainage system, but can reduce its impact upon the receiving waters of Sandy Creek and Bungawalbyn Creek through dilution. Likewise, it is important to acknowledge that while active floodgate management and increased tidal flushing will improve the local water quality in general, it can do little to reduce significant blackwater events and blackwater discharge that are generated from the West Coraki backswamp and drain through the West Coraki Canal and Seelim's Canal following significant flood events.

While acknowledging the limitations, the environmental impact of the Seelim's 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 Seelim's 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 Seelim's Canal.
2. Reduce the accumulation of MBO within the system.
3. Reduce the impact of Seelim's Canal on its receiving waters of Sandy Creek and Bungawalbyn Creek.

Strategies

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

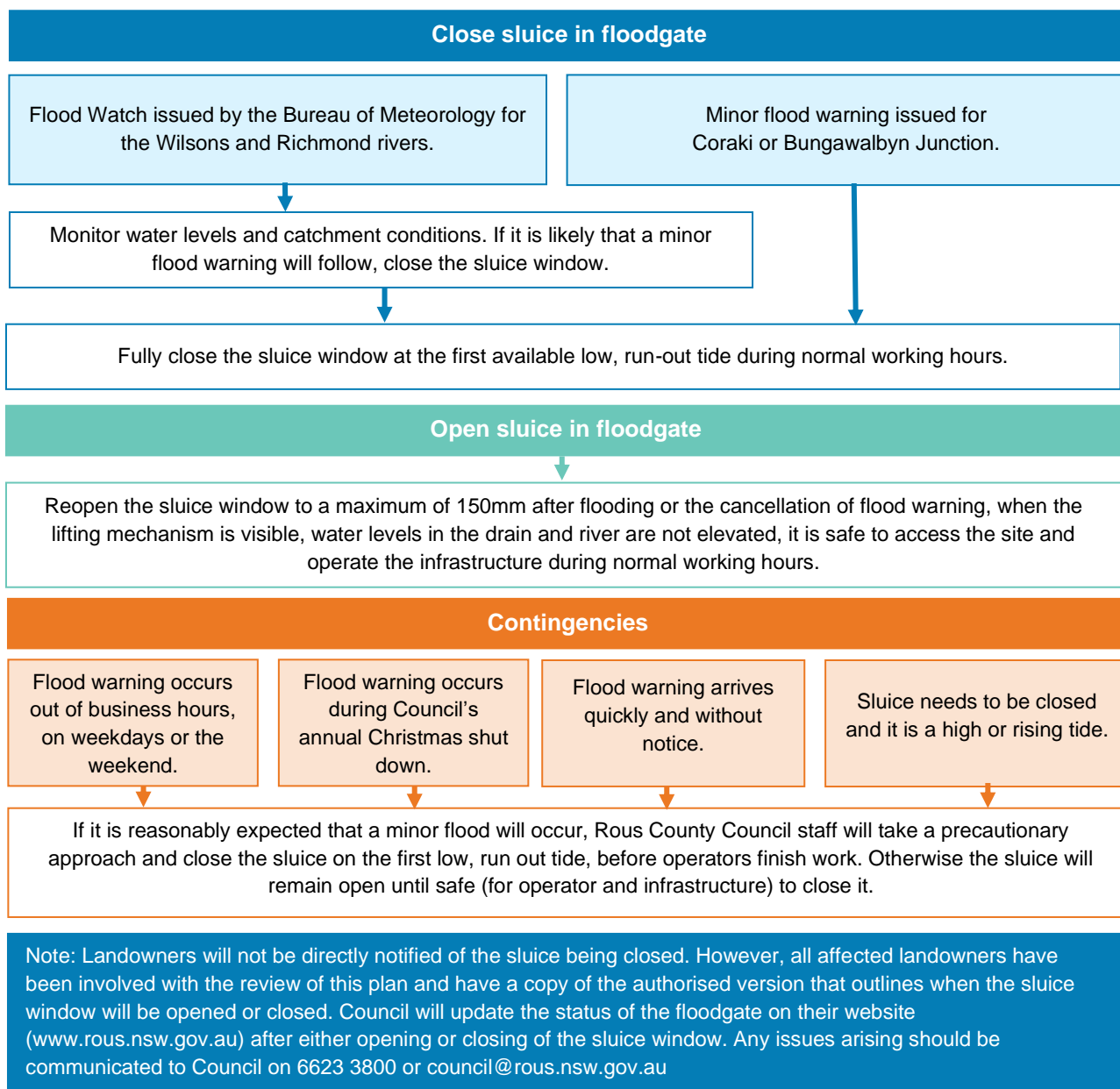
Opening strategy for floodgates

There are two floodgates at Seelim's Canal, asset numbers 2050-030-01 and 2050-030-02.

An automatic tidal float mechanism allowing for active flood management was installed by Richmond River County Council in 2007. While useful for providing some tidal flushing, a sluice gate was assessed as being more suitable for this location by Rous County Council staff in 2018. A sluice gate of 600mm x 600m was installed in 2019, replacing the tidal gate. Following installation, the sluice window has been kept partially open (no greater than 300mm in height), except during floods and after heavy rainfall.

The sluice window will remain partially open all year, and only be 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. The nominated opening height for the sluice gate is 150mm. This degree of tidal exchange has been found to improve water quality during the testing phase of 2019 and 2020, while having minimal impact on surrounding land use.

The floodgate will be opened and lowered into the operational position, in accordance with the details below. Council 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. Those landowners have signed a letter of endorsement stating they understand the management strategy for the floodgates, including the triggers for opening and closing the sluice window.

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Version control

Version	Description	By	Date
1.0	Draft developed before landowner consultation	Stuart Hood	24/06/2020
2.0	Final plan for distribution to stakeholders	Stuart Hood	5/09/2020

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1. Overview

The majority of 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. Opening a floodgate for 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 system and its floodgates, considering their 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 Council and landowners on how tidal exchange will occur on the identified drainage system. The Plan has been developed in consultation with landowners whose property may be impacted from the floodgate's operation.

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 <i>Fisheries Management Act 1994</i>

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. Seelim's Canal

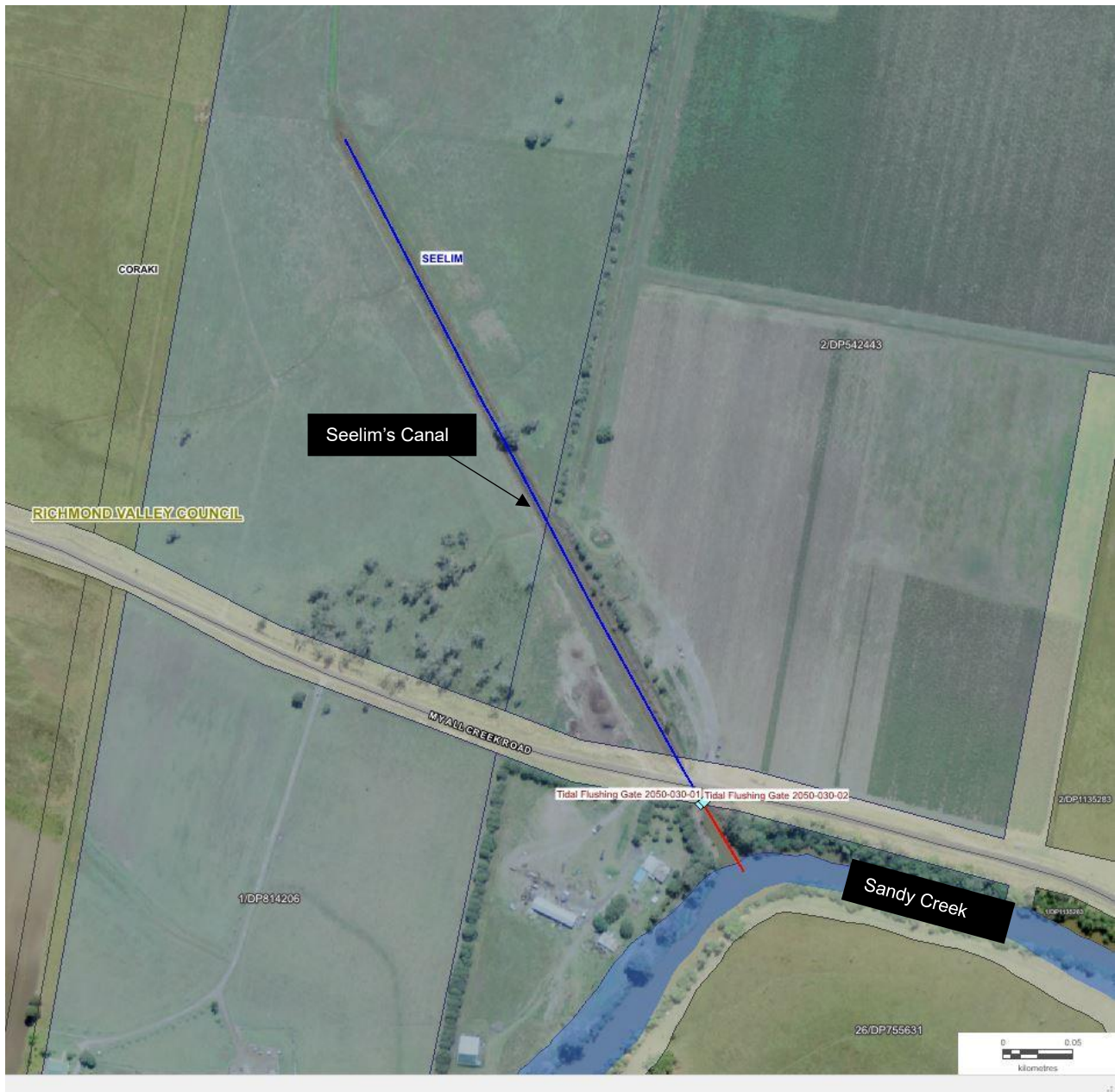
Asset number and description

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

Asset number 2050 – Seelim's Canal floodgates

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

Asset No.	Description	Number
2050-030-01	Aluminium floodgate (2100mm square) with 600mm x 600mm sluice window	1
2050-031-02	Aluminium floodgate (2100mm square)	1
2050-060	Lifting gear	1
2050-290	Outlet	1
2050-261	Seelim's Canal	1



1: Seelim's Canal locality map.



2: Seelim's Canal floodgates and entry to Sandy Creek, 10 January 2020.



3: View looking upstream Seelim's Canal, 10 January 2020.

Drainage system characteristics

Location in estuary.	Mid-upper estuary.
Location in landscape.	Floodplain and former low-lying freshwater wetland.
Land elevation.	0.8 – 3.585m AHD (refer catchment map Appendix 1).
Land use.	Agriculture: cattle grazing and tea tree cropping.
Vegetation.	Grasses and pastures. Nearby are <i>Casuarina glauca</i> and <i>Melaleuca quinquenervia</i> , which are trees associated with Endangered Ecological Communities under the <i>NSW Biodiversity Conservation Act 2016</i> .
Salinity levels and estuary dilution capacity.	Low.
Tidal range.	Low.
Land elevation adjacent to drains.	Relatively high, graduating from natural levee along Sandy Creek.
Soil type.	Higher floodplain is dominated with alluvial sediment.
Acid sulfate soils.	High risk, areas of sulfuric sediments (actual sulfate soils).
Hydraulic conductivity.	Unknown.
Acid export.	Unknown, system drains low-lying acid sulfate soil area, so it is likely.
Water quality issues.	Known to discharge significant amounts of deoxygenated water (blackwater) after flooding.

Water quality

Seelim's Canal is a likely source of acidity into Sandy Creek and Bungawalbyn Creek. Acidification is likely from the oxidation of acid sulfate soils within the drainage sub-catchment. The West Coraki Canal to the north and Seelim's Canal to the south, both contribute to the drainage of the West Coraki backswamp, with West Coraki Canal having a far greater total catchment area, potential flow rate and potential water quality impact to the Richmond River than Seelim's Canal.

Very little water quality monitoring has occurred at Seelim's Canal.

Active floodgate management can improve water quality discharging from Seelim's Canal by diluting the acidic discharge before it enters Sandy Creek and Bungawalbyn Creek, potentially reducing the accumulation of MBO. The system has benefited during sluice gate testing throughout late 2019 and 2020, with enhanced tidal flushing being achieved over the conditions that existed previously. The previous automatic tidal float mechanism at Seelim's Canal was not achieving the desired tidal flushing, with increased weed growth occurring in the canal and generally poorer water quality.

The landowner's willingness to trial enhanced tidal flushing and acid reduction strategies through the installation of the new sluice gate should lead to improved water quality over time.

The system is known to produce deoxygenated water (blackwater) after flooding, and during flood conditions (as observed in February 2020) a significant discharge of blackwater through the system occurs. Under flood conditions Seelim's Canal and West Coraki Canal are hydraulically connected and each assist in flood drainage of the West Coraki backswamp area.

Aquatic habitat values

The former freshwater wetland that historically existed throughout the West Coraki backswamp would have had significant aquatic habitat values. Seelim's Canal itself is an artificial canal that aided the drainage of the southern portion of the West Coraki Swamp. As such, no aquatic habitat existed previously in Seelim's Canal, however as a tidally flushed canal with good connectivity to the Richmond River, it has the capacity to provide additional aquatic habitat. The canal crosses the

Sandy Creek levee bank and a higher floodplain area before intercepting the low-lying area at the top of the canal. Little information exists 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)

The surrounding land has been modified for grazing, tea tree, and previously sugar cane.

Without tidal flushing, the water level in the canal is often low and water quality unfavourable for aquatic life. However, Seelim's Canal discharges into Sandy Creek and then 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 Seelim's Canal floodgates is focused on reducing the system's impact upon Sandy Creek and 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 Seelim's 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.

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 Seelim's Canal, Council has management responsibility for the main floodgates and the main canal. 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.	No.	Main canal.	Review concept with current landowners, identify any future opportunities.	Private landowners. Local Government: • Rous County Council.
	Reducing drainage density – removing drains or reshaping so shallow and wide to only drain surface water.	No.	Main canal.	Explore possibility with landowners.	State Government: • North Coast Local Land Services. • Department of Primary Industries. • Department of Planning, Industry and Environment (previously Office of Environment and Heritage). • Marine Estate Management Authority.
Tidal flushing for dilution of acidification.	Actively manage floodgates on drain headworks.	Yes, in 2007 by RRCC. Yes in 2019 by RCC.	An automatic tidal float mechanism 2007. A sluice window 2019.	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: <ul style="list-style-type: none"> Richmond Valley Council. Rous County Council.
Reduce impact of deoxygenation events.	Reduce drainage density – removing drains or reshaping so shallow and wide to only drain surface water.	No.	Private drainage system.	Explore possibility with landowners.	State Government: <ul style="list-style-type: none"> North Coast Local Land Services. Department of Primary Industries. Department of Planning, Industry and Environment (previously Office of Environment and Heritage). Marine Estate Management Authority.
	Return lowest lying land to a more natural water regime, i.e. shallow and permanent inundation.				
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: <ul style="list-style-type: none"> Rous County Council.

RRCC = Richmond River County Council, former Flood Mitigation Authority on the Richmond.

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 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 Council operators, who must consult and follow the approved Safe Work Procedure relevant for the activity.
- Operating the floodgate 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 Sandy Creek / Bungawalbyn Creek enters the drainage system.

Increased salt levels in drainage system.

Salinity levels are low in Sandy Creek / 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 Seelim's 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 Seelim's Canal was constructed. The main headworks and floodgates are thought to have been installed in the 1960s or 70s.

Private drainage history

There are no secondary drains running into the main canal. Seelim's Canal ends at a low area of farmland / wetland approximately 620m from the main headwall at Sandy Creek.

History of active floodgate management

An automatic tidal float mechanism\gate was installed at the Seelims Canal floodgates in 2007 by Richmond River County Council to assist with tidal flushing and provide active floodgate management. This tidal gate was replaced by Council in 2019 with a 600mm x 600mm aluminium sluice gate operated by a winch, to provide improved tidal flushing capability.

The sluice window will remain partially open all year, and only lowered before flood events to protect upstream areas from riverine inundation. The floodgates will be operated by Council in accordance with this Plan.

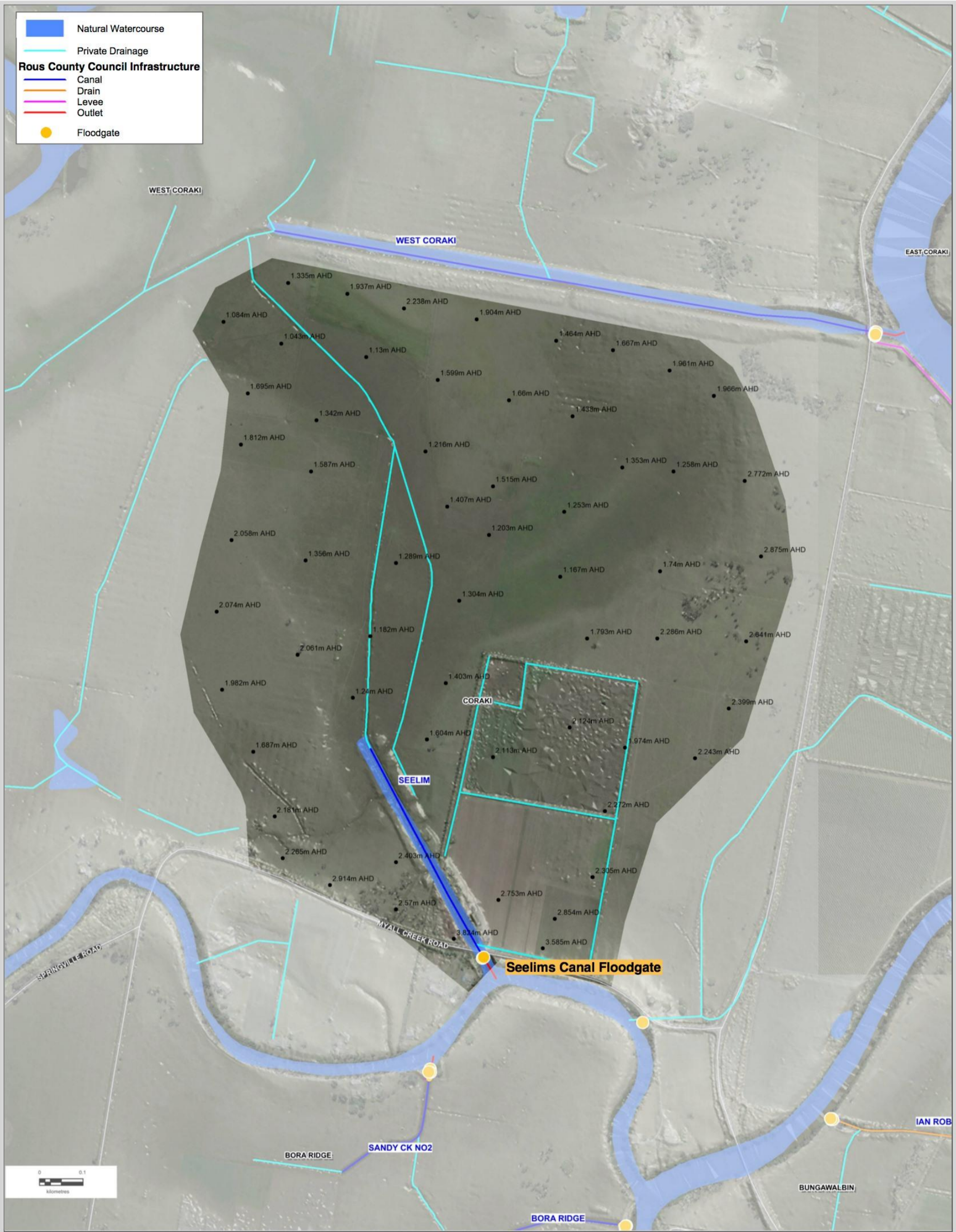
6. References

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 Seelim's Canal. Unpublished information.

Appendix 1: Seelim's Canal drainage system



Seelims Canal Catchment

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.

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