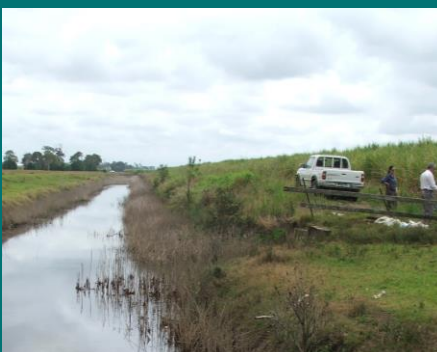


Richmond River County Council

Floodgate and Drain Management Guidelines

January 2015





This document was produced by
Richmond River County Council

Richmond River County Council acknowledges the assistance of
Ron Kemsley of Kempsey Shire Council.

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Chapter 1: Management Guidelines

These guidelines have been developed by Kempsey Shire Council and amended to assist Richmond River County Council staff, private contractors and landholders to undertake 'Best Practice' in flood mitigation drain and floodgate management, with permission from Kempsey Shire Council.

The majority of flood mitigation drains require regular maintenance in order to maintain the integrity of the floodgate mitigation system. This includes weed removal/management and floodgate servicing. A large proportion of these drains service Acid Sulfate Soil (ASS) landscapes. It is acknowledged that disturbing drain sediment and exposing ASS can lead to detrimental impacts on both the terrestrial and aquatic environment. Drain maintenance has been recognised among the most important issues relating to ASS management.

What is 'Best Practice'?

Best Practice is the application of currently recognised drain maintenance strategies, tactics and techniques that are capable of delivering optimal environmental and economical outcomes.

Richmond River County Council's commitment

Richmond River County Council (RRCC) is committed to delivering and implementing 'Best Practice' techniques and strategies when undertaking all aspects of drain and floodgate management. This is done to reduce environmental impacts when working within volatile landscapes in the Richmond River floodplain to protect and enhance the surrounding ecosystems for current and future generations.

RRCC endorsement

RRCC adopted the Floodgate and Drain Management Guidelines at a Council meeting on 15 June 2006 (resolution 2519-06). This resolution endorses the methods and techniques described within these guidelines when undertaking flood mitigation infrastructure management and maintenance works.

Where do these guidelines apply?

- These guidelines apply to all flood mitigation drains, as well as all natural and man-made watercourses within the Richmond River floodplain.
- They apply to both RRCC managed and privately owned/managed drainage systems and structures.
- They are to be referred to before any drain construction and/or maintenance works commence.

Staff training

Under Section [Part 2](#) [Division 2](#) [Section 19](#) of the *Work Health & Safety Act 2011 No 10*, RRCC **must** provide training, instruction, information and supervision to ensure the health and safety of its employees.

RRCC shall ensure that all staff are appropriately trained in aspects of flood mitigation management/maintenance before any works commence. As a large portion of the flood mitigation systems in the Richmond River floodplain are underlain by ASS, the team leader shall have appropriate training in identification and handling ASS material.

All machinery operators, team leaders and on-ground staff engaged in drain and flood mitigation work programs will need to become familiar with the implementation of these guidelines.

Chemical/herbicide weed control **must** be undertaken by trained personnel (refer Chapter 5).

Guidelines

A copy of the Floodgate & Drain Management Guidelines **must** be available for reference during construction and/or any maintenance works programs. In addition, copies of any consent/permit documentation and work procedures and Contingency Plans **must** be on hand for reference during any scheduled construction and/or maintenance works.

Records of all aspects of the scheduled works program should be kept, including consent/permits; laboratory results; receipts for lime; etc.

Works Procedures Plans

Works Procedures Plans are documents that outline site specific works programs, methods and procedures. They detail what work is to be undertaken where and how, as well as any special conditions or considerations that may apply to intended works.

A model Works Procedure document is shown in Appendix 1.

Contingency Plans

A Contingency Plan **must** be developed prior to any drain/floodgate maintenance and/or construction works commence. A Contingency Plan sets out any possible remediation tactics that may be implemented in the event of unforeseen circumstances. Contingency Plans **must** be developed for each site-specific works program.

A model Contingency Plan is shown in Appendix 2.

Required approvals

Prior to any floodgate or drain maintenance works commencing the team leader and/or operator **must** obtain approval from relevant constituent councils and state agencies, and check that the pending works are not in breach of the council or departmental policies.

Works undertaken by Council on Council owned and managed systems

In general, before any works commence the team leader **must** ensure that the proposed works program complies with the relevant constituent council's Local Environmental Plan (LEP) and/or Development Control Plans (DCPs).

If the team leader is unfamiliar with relevant councils' requirements, they are to contact their supervisor and seek confirmation before works commence.

Before RRCC can undertake any tidal outlet or natural waterway, drainage maintenance work the works foreman **must** acquire a NSW Fisheries Dredging & Reclamation Permit. *This situation may be amended if yearly (blanket) consent is given by NSW Fisheries based on the undertaking of works in accordance with these guidelines.* If works are required within State Environmental Planning Policy 14 (SEPP 14 wetland) landscapes, approval **must** be obtained from the relevant constituent council, and possibly Planning NSW (formerly DUAP). Refer maps on pages 6 & 7 for ASS and SEPP 14 areas.

Works undertaken by RRCC on privately owned and managed systems

Private Drainage Boards (PDBs) and/or private landholders **must** obtain all relevant approvals for pending works. Approval is usually required from the Office of Environment & Heritage (OEH) and Department of Trade & Investment, Regional Infrastructure & Services (DTIRIS) NSW in most instances. If the RRCC is engaged by PDBs and/or private landholders, the operator and/or team leaders **must** ensure all relevant consents have been acquired and that all conditions subject to the consent are met. The operator **must** ensure relevant documentation is provided and on site during all works.

Works to undertaken by a PDB or private contractor

Prior to any PDB, private contractor and/or landholders commence works on any drainage network servicing ASS landscapes, consent under Part 3A of the *Rivers & Foreshore Improvement Act 1948* may be required from the NSW Office of Water (NOW).

Part 3A applies to 'protected land', which includes all banks, shores, and beds and adjacent land within 40 metres of the top of the banks or shores. Part 3A may also apply to land further than 40 meters from a water body if intended works pose a threat to protected waters and/or protected lands.

Works other than maintenance of existing drains and associated structures will require development consent from the relevant constituent council. Any widening or deepening of drains will require consent from that council.

If works are required within SEPP 14 (wetlands) consent **must** be obtained from the relevant constituent council and, depending on type of works proposed, Planning NSW.

New drain construction

Before any new drain construction works commence, the team leader **must** ensure that all planned works are compliant with all relevant statutory requirements. This is likely to include Development Consent from the relevant constituent council and licenses from DTIRIS, Planning NSW, and OEH. Refer Chapter 3.

Usually a number of conditions will be attached to the consent. These conditions **must** be adhered to at all times during any works described in the application.

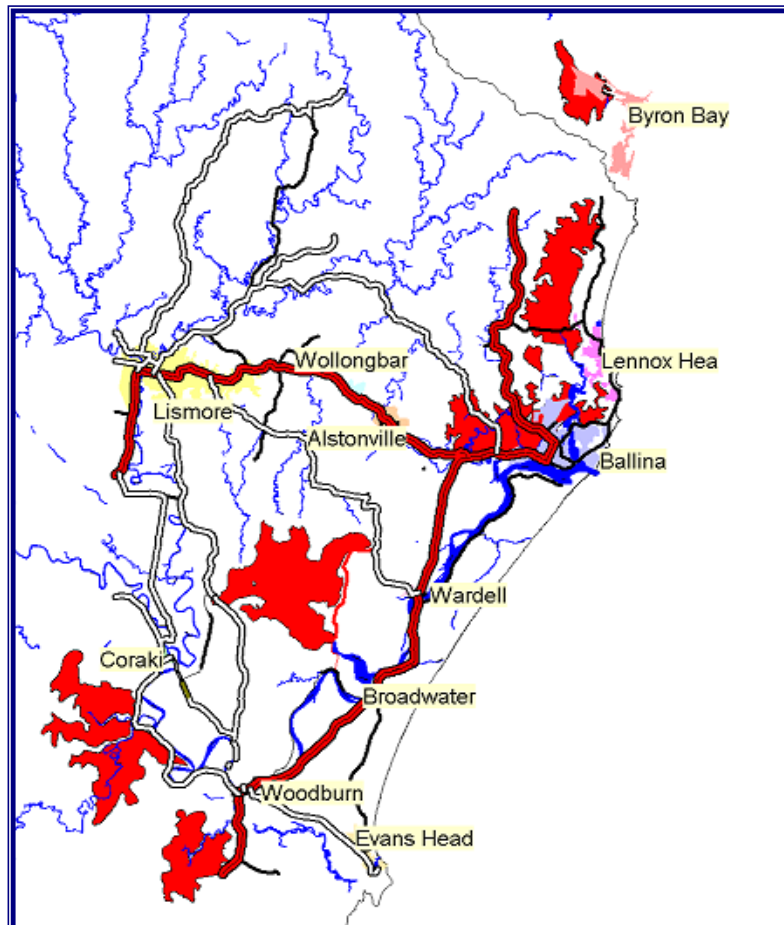


Figure 1: Map of ASS hot spot locations within the Richmond River catchment.

When designing and/or excavating new drains, all efforts are to be made to ensure that the invert (base) of the drain will not be excavated deeper than 0.5m above the ASS layer. As a general rule, drains should be designed to be wide and shallow rather than narrow and deep.

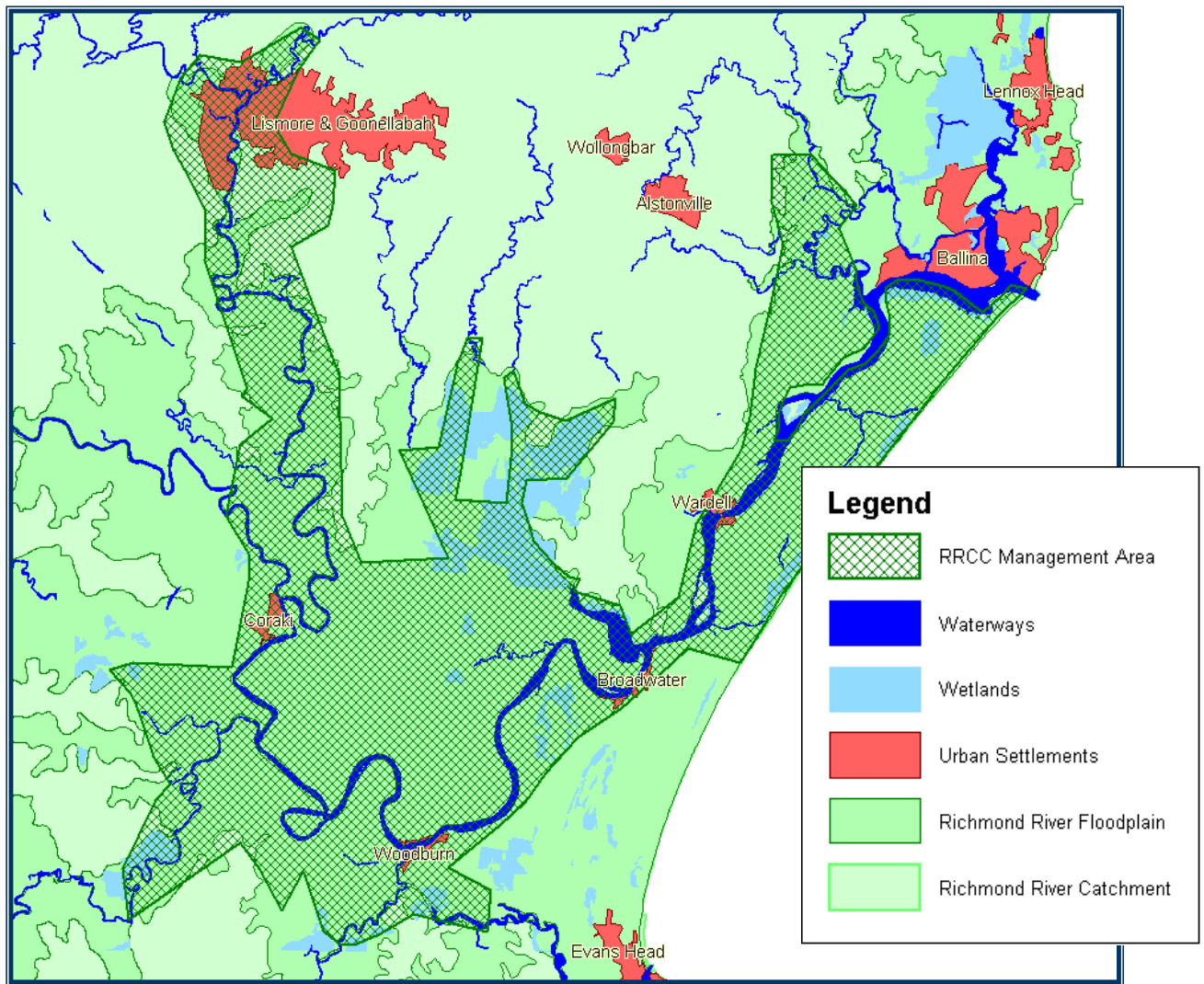


Figure 2: Map of wetlands within the RRCC Management Area

Areas mapped with codes 0 or 1 on the ASS Risk Maps should generally be excluded from further drainage. Guidelines for drain design in ASS landscapes are provided in the OEH publication *ASS Remediation Guidelines for the management of coastal floodplains in New South Wales 2007*.

Chapter 2: Floodgate Management Guidelines

The guidelines set out in the following chapter shall be adhered to in all floodgate maintenance activities.

Floodgates are simple passive operative structures that are designed with the intent of preventing water moving upstream past the structure. Most floodgates are top-hinged, allowing the pressure from the weight of the down-stream water to seal the gate against a pipe or headwall. When downstream water levels fall, the water head behind the floodgates forces the floodgate to open to permit drainage.

The Richmond River floodplain consists of several variations of floodgates, varying from single gates on small creeks and local drains, to large multi-gated structures on creeks and canals.



Clockwise from top left: Two round flap style floodgates - A 24m outlet with eight square flap style floodgates, three of which are fitted with sluice gates - Sluice gate fitted to square flap style floodgate - Six square flap style floodgates with lifting gear.

Working with the tide

Floodgates should only be lifted at low tide and closed on low or ebbing tides. At no time are floodgates to be lifted on a high or a making tide.

Machinery access

All effort is to be made to avoid disturbing areas of high conservation values.

Before entering Crown land or private property with construction and/or equipment, notification **must** be provided to the property owners and/or managers of Crown land at least two weeks prior to commencing works. All effort is to be made to avoid damaging farm infrastructure. Where damage has occurred, all effort is to be made to have the damages repaired before day's end.

Lifting and closing floodgates

It is an offence to interfere with the floodgates without consent: Local Government Act 1993 - Section 635.

Floodgates are typically only lifted to undertake repairs and/or remove debris. Where floodgate structures are owned by RRCC, only County Council staff are permitted to operate the floodgates. The exceptions are when sluice gates have been fitted to the floodgates, and a Floodgate Management Plan (FMP) and a section 355 committee has been implemented by the RRCC (refer Chapter 6.). Under these circumstances the landholder is permitted to operate the sluice gate in accordance with the objectives of the FMP. Often floodgates are operated to improve water quality, weed management, greater control over surface and ground water management, and in certain situations, pasture inundation.

Under NO circumstance shall attempts be made to lift floodgates at high or making tide as damage to the floodgates can occur and heightened risk of injury to the operator. Floodgates should ONLY be lifted on low or ebbing tides.

Lifting and closing equipment

Only appropriate approved equipment is to be used to open and/or close floodgates.

When lifting larger floodgates; only Council staff are permitted to operate heavy lifting machinery. Only personnel who have received floodgate management training are permitted to open or close floodgates. The operator **must** ensure that all lifting equipment and devices are in proper order and comply with safe working load (SWL) standards. When lifting large and/or heavy floodgates, the maintenance crew or floodgate management teams, **must** ensure that no-one is standing and/or working in or entering the immediate area. Once lifted, no work is to commence on any floodgate until the floodgate, or floodgates, are fully secured.

Some floodgates covered by FMPs have been retrofitted with lifting devices and safe working platforms. In the situation where these devices have been fitted to Council owned structures, and an FMP is in place, it is the responsibility of the section 355 committee (refer Chapter 6) to inform RRCC of any equipment failure or maintenance problems at the earliest possible stage.

Safety first

*All persons **must** ensure that the manner in which they perform their duties and responsibilities does not interfere with the health and safety of themselves and others.*

RRCC and private contractors have an obligation under the *Work Health & Safety Act 2011 No 10* to provide and maintain a workplace that is safe and without risks of personal injury. It is the responsibility of the operator to ensure that all duties undertaken are in a safe and approved manner.

Before any works commence, hazard risk assessments **must** be carried out by the operator in consultation with the team leaders to determine if any persons are at risk and/or that the machinery and equipment is suitable for the intended works.

Operators responsibilities

Operators have an obligation (Duty of Care) to take reasonable care for the health of other persons in the workplace and to cooperate with their employers in the interests of health and safety.

Floodgate and lifting machinery operators have an obligation to take reasonable care for the health and safety of other persons in the workplace. Any person who has, to any extent, control of a place of work, the means of access or egress, or plant or substance used, has an obligation to ensure health and safety with respect to those matters under their control.

Personal Protective Equipment

*All personal protective equipment (PPE) **must** display the appropriate Australian Standard and WorkCover approval number.*

Before commencing work, RRCC and/or contractors **must** provide and arrange for the use of appropriate and compatible PPE complying with the relevant Australian Standards. Personal protective clothing and appropriate equipment (waders, lifejacket, safety helmet, high visibility garments, eye protection, safety gloves and footwear, hearing protection and UV (sun) protection) **must** be worn at all times during any construction, floodgate and drain maintenance works.

Chapter 3: Drain Management Guidelines

The guidelines set out in the following chapter shall be adhered to in all flood mitigation, private drain maintenance activities and/or any works intended to be undertaken in natural or man-made water bodies.

Only experienced and licensed personnel may operate excavating equipment.

Machinery access

Before entering private property or Crown land with excavating equipment, notification **must** be provided to the property owners and/or managers of Crown land at least two weeks prior to commencing works.

All effort is to be made to avoid disturbing areas of high conservation values.

All effort is to be made to avoid damaging farm infrastructure.

Timing of works

There is a high risk of causing environmental impacts on receiving waters when drains are flowing.

Drain cleaning works using excavation machinery should be scheduled for drier climatic conditions to avoid runoff. Usually the drier months occur in late winter and early spring. Herbicide application should be timed to ensure an efficient kill (see Chapter 5).

Drain construction

*New drain construction **must** incorporate appropriate alignment and depth designs to minimise environmental impacts during all stages of construction and subsequent operation.*

No new drain construction works are to be undertaken without first obtaining consent from the relevant constituent council, DTIRIS (a Dredging & Reclamation Permit may be required), Planning NSW (if a SEPP 14 wetland is involved), and Department of Water (a 3A Permit under the *Rivers & Foreshore Improvement Act* may be required).

All effort is to be made to ensure that the invert (base) of the drain **not be** excavated deeper than 0.5m above the ASS layer. As a rule, any drain should be designed to be wide and shallow, rather than narrow and deep. Areas mapped with codes 0 or 1 on the ASS Risk Maps should be excluded from further drainage. Guidelines for drain design in ASS landscapes are provided in the DLWC ASS.

Remediation Guidelines for the management of coastal floodplains in New South Wales 2007.

Mechanical weed removal

Using a 'reed bucket' is preferred over a standard bucket when mechanically removing weed from drains.

Many aquatic plants have root systems within the drain sediments and this makes it impossible to avoid sediment disturbance when removing drain weeds. However, all operators, **to the best of their ability, must** endeavour to minimise sediment disturbance during aquatic weed removal works.

It is recommended that for the removal of aquatic weeds a *reed bucket* be used whenever possible (see image). All efforts are to be made to avoid widening and/or deepening drainage channels while excavating weeds.



Reed buckets are the preferred excavation equipment when removing weeds from waterways.

Drain sediment and weed removal

Drain sediments can become very acidic and when disturbed can lead to a reduction in oxygen concentrations to lethal levels.

All care **must** be taken to ensure that the works **do not** result in the deepening and/or widening of drains.

If possible, floodgates and/or other water level control structures should be kept closed during maintenance works and, if possible, remain closed for at least a week to fourteen days after works have been completed. Preferably, sediment curtains should be erected (downstream of works).

Where at all possible, works should commence in the upper reaches of the drain and progressively work towards the outlet.

All effort **must** be made to undertake drain sediment extraction works during dry climatic conditions. In the event that rainfall is predicted or occurs during scheduled drain maintenance, works **must not** commence or continue.

Riparian vegetation (vegetation growing along watercourses) shall not be disturbed and/or removed unless absolutely necessary to facilitate access for the excavating machinery.

Equipment used for the extraction of drain sediment **must** be suited to specific site conditions. For most drain cleaning maintenance programs, the use of a *reed bucket* (see image above) is preferred over standard digging buckets.

In the event that accidental deepening or widening of the drain occurs, the disturbed soils **must** be tested to confirm the presence of ASS. If ASS presence is confirmed, the excavated soil is to be placed away from the drain and treated at the recommended liming rate (refer Chapter 4).

Sediment and spoil management

Drain sediments need to be handled very carefully as they can begin to oxidise and generate acidic products within minutes of excavation.

Many drains have areas of accumulation of mono-sulfide black ooze (MBOs). MBOs are a very unstable material. The black oily material often generates hydrogen sulfide, which has an unpleasant odour (rotten egg gas).

When disturbed, the black ooze reduces the dissolved oxygen concentration in the water to often below critical levels for aquatic life. In addition, when black ooze is oxidised (exposed to air) it has the capacity to produce acidic products that are also toxic to aquatic organisms.

Sediment and/or spoil excavated **must** be placed away from the drain and positioned to prevent runoff and/or leachate entering into watercourses. Excavated material **must not** be positioned below high water mark.

Where possible, excavated sediment and/or leachate should be monitored to determine possible (based on results) management options.

When possible, sediment control curtains should be positioned around excavated sediments. The curtain **must** be of suitable material with aperture size to retain clay particles preferred.

Excavated sediments and vegetation shall not be placed in overland flow paths or areas where leachate can run back into watercourses. All effort is to be made to prevent placing spoil on ground with a surface slope greater than 10%.

Where possible, spoil heaps will be positioned and shaped to improve farm access, as they are often the only high ground during flood events. Uneven spoil heaps positioned on drain banks are dangerous and reduce access.



Sediment should be placed away from drain and positioned to avoid leachate running back into the drains and watercourse.
(Source: Kempsey Shire Council).

Rock removal at Bagotville Barrage

Following floods or high flow events, rocks can become lodged between the barrage gates and the concrete apron below the gates. Damage to the gates can occur if the rocks are not removed. The removal of rocks at the Bagotville Barrage will be contracted to qualified divers, after receiving and reviewing their qualifications, insurances and safe works procedures. A traffic plan for the barrage will be organised by Council staff and set up prior to the divers' arrival on site. In addition, staff will ensure that all sluice gates are closed.

All care will be taken to ensure the safety of the divers. On arrival on site the Operation Supervisor will induct the divers onto the site. Diving will only occur under optimal conditions, during a non discharge period, with slow tidal flows. All divers **must** wear the appropriate PPE, including a hard shell on dive hat. A crane supplied by Council will open floodgates. Only one gate will be worked on at a time. A standby diver with communications will be present at all times. A First Aid Kit with Oxygen Resuscitation equipment and communication devices will be on site at all times (supplied by the diving contractor). It is the responsibility of the contracted diving team to maintain their equipment.

Operator's responsibilities

Operators have an obligation to take reasonable care for the health of themselves and any other persons in the workplace, and to cooperate with their employers in the interests of health and safety.

Floodgate and lifting machinery operators have an obligation to take reasonable care for the health and safety of other persons in the workplace. Any person who has, to any degree, control of a place of work, the means of access or egress, or plant or substance used, has an obligation to ensure health and safety regarding those matters under their control.

Risk assessment

Hazard and risk assessment processes should be carried out at the planning and preparation stage of the works to determine if persons are, or will be, at risk.

Risk assessment process:

- Identify the likely/possible risk/hazards
- Assess the level of risk/hazard
- Use appropriate control measures
- Monitor and review control measures.

Personal Protective Equipment

All PPE must display the appropriate Australian Standard and WorkCover approval number.

Before commencing work, Council and/or contractors **must** provide and arrange for the use of appropriate and compatible PPE complying with the relevant Australian Standards. Personal protective clothing and appropriate equipment (waders, lifejacket, safety helmet, high visibility garments, eye protection, safety gloves and footwear, hearing protection and UV (sun) protection) **must be worn at all times** during any construction, floodgate and drain maintenance works.

Chapter 4: Lime Application Guidelines

Neutralisation

The rate at which neutralisation occurs is dependent on, and will vary with, the techniques and type of lime used. To be effective it must be uniformly spread and thoroughly incorporated. For optimum results, fine soluble high-grade lime is preferred.

Monitoring waters for pH should be undertaken during and after lime has been applied to evaluate the effectiveness of the treatment.

Neutralisation rates improve when lime is incorporated into the extracted drain sediment rather than by spreading lime on the exposed surfaces. Drain water lime requirement will vary depending on the initial pH of the water. Liming rates **must** be calculated to avoid over-shooting environmental levels of pH 6.5 – 8.5.

Health and environment issues

Lime can be absorbed into the body by inhalation of its aerosol and by ingestion.

Hydrated lime (Calcium hydroxide $\text{Ca}(\text{OH})_2$) is more soluble than agricultural lime and is very effective, quick acting and theoretically more suited for acid water treatment. However the material is caustic and therefore has special handling and application requirements. Hydrated lime has a caustic reaction and will burn mouth and throat, irritate stomachs, burn eyes and eye lids and cause irritation, burns and rashes to skin (refer Material Safety Data Sheet). In addition, the use of too much hydrated lime can result in overshooting (elevating pH values in excess of environmental normalities) the required liming rates with the potential to impact on estuarine ecosystems. As a result, the use of agricultural lime (Calcium carbonate CaCO_3) with a pH of ~8.2 is the preferred option.

Facemasks, gloves and protective overalls and eye protection **must be worn at all times** when mixing and applying lime.

Acid Sulfate Soils

ASS is the common name given to soils containing iron sulfides. They occur on coastal floodplains. If the ASS is exposed to the air, it may produce sulfuric acid.

When working in ASS, **all** spoil, as well as disturbed drain sediments, **must be** treated with recommended liming dosages. The application rate will be determined by the degree of hazard. The degree of hazard is identified by soil analysis. The liming rate **must** confer with recommendation provided in the *ASS Remediation Guidelines for the management of coastal floodplains in NSW 2007*.



Lime being spread over area where spoil is to be placed. (Source: Kempsey Shire Council).

In line with **best practice** for drain maintenance, it is recommended a layer of lime should be spread on the ground where the spoil is to be placed (prior to excavation) to assist in the neutralisation process.

A number of recommended methods for liming application are described in the *ASS Remediation Guidelines for the management of coastal floodplains in NSW 2007*.



Aluminium flocculants in acid water behind the Bagotville Barrage, an indicator of acid sulfate soils. Photo taken prior to the implementation of tidal flushing.

Drain water treatment

Water volumes can be calculated by assuming 1 cu metre of acid water is equivalent to 1 kilolitre (1000 litre) and 1000 cu. metre is equivalent to 1 megalitre (ML).

$$1 \text{ m}_3 (\text{water}) = 1000 \text{ litres}$$
$$1000 \text{ m}_3 = \text{megalitre (ML)}$$

During works, lime (premixed with water) must be added to the drain water at a predetermined rate based on pH values at the time of works (refer below table). This is usually achieved manually by adding the appropriate amount of lime to a bucket of water, mixing thoroughly and dispersing the contents into the drain immediately adjacent to the works at regular intervals.

The following table is an extract from the *DLWC ASS Remediation Guidelines for the management coastal floodplains in NSW* and should be used as a guide to determine or estimate, minimum quantities of lime needed to treat 1 megalitre of acidic water.

Quantities of neutralising agent required to raise pH to pH7 for 1 megalitre (ML) of low salinity acid waters:

Current water pH	[H+] {mol/L}	Lime to neutralise 1 ML (kg pure CaCO ₃)	Hydrated lime to neutralise 1 ML (kg pure Ca(OH) ₂)
2.0	0.010000	500.000	370.000
2.5	0.003200	160.000	118.000
3.0	0.001000	50.000	37.000
3.5	0.000320	16.000	12.000
4.0	0.001000	5.000	4.000
4.5	0.000032	1.600	1.180
5.0	0.000010	0.500	0.370
5.5	0.000032	0.160	0.120
6.0	0.000001	0.050	0.037
6.5	0.000003	0.016	0.012

Monitoring pH and dissolved oxygen

Monitoring water quality is an effective tool to identify trends in water quality changes and provides further experience in the way systems respond to various rainfall events and seasonal conditions.

A comprehensive monitoring program testing for changes in pH and dissolved oxygen levels, should be undertaken to monitor water quality during and after works. It is recommended that monitoring be undertaken at strategic locations (i.e. drain outlet) and at certain depths within the water column. Monitoring should continue for at least one week after works are completed.

Applicator's responsibilities

Applicator's have an obligation to take reasonable care for the health of themselves and other persons in the workplace and to cooperate with their employers in the interest of health and safety.

All personnel involved in liming applications have an obligation to take reasonable care for the health and safety of other persons in the workplace/immediate area. Any person who has, to any degree, control of a place of work, the means of access or egress, or plant or substance used, has an obligation to ensure health and safety regarding those matters under their control.

Risk assessment

Hazard and risk assessment processes should be carried out at the planning and preparation stage of the works to determine if persons are, or will be, at risk (see Risk Assessment Chapter 3).

Personal Protective Equipment

All PPE must display the appropriate Australian Standard and WorkCover approval number.

Before commencing any liming work, Council and/or contractors **must** provide and arrange for the use of appropriate and compatible PPE complying with the relevant Australian Standards. Personal protective clothing and appropriate equipment (waders, lifejacket, safety helmet, high visibility garments, eye protection, safety gloves and footwear, hearing protection and UV (sun) protection) **must be worn at all times** during any construction, floodgate and drain maintenance works.

Chapter 5: Chemical Work Control Guidelines

A herbicide is a chemical product that has the primary purpose to kill, stunt or inhibit the growth of plants. They can be selective or non-selective. They can be instantaneous or residual. They can act on contact or be systemic.

Only experienced personnel who hold a current *Chemcert* certificate are permitted to use and apply chemicals.

It is important to identify weed infestation properly and to choose the most appropriate method of control, while taking into consideration the cost of control and the potential environmental impacts. Avoid total destruction of vegetation growing on drain banks or levees, to prevent soil exposure and erosion.

Broad application on banks or levees is not recommended. Where possible, alternatives to herbicides, such as selective removal by hand and/or slashing, are the preferred control option.

Notification

As a requirement under the *Environmental Protection & Assessment Act*, before Council undertakes any herbicide spraying of watercourses, notification **must** be advertised in media outlets, along with notification in writing to all connecting landholders, and the erection of sign post indicating a spraying program is underway.

PDBs and private landholders wishing to apply herbicides on watercourses **must** notify all connecting landholders of the intended herbicide application program.

Herbicide preparation

Always prepare herbicides in accordance with the instructions on labels and information booklets in a well-ventilated area. NEVER MIX HERBICIDES.

Before preparing herbicide(s), carefully calculate the amounts that may be required to cover the area to be sprayed. Avoid having to dispose of unused herbicide by never mixing excessive volumes. All herbicide preparation **must** be in accordance with the manufacturer's specifications.

Aquatic weed control

Herbicides can adversely affect water quality, rendering it unsuitable for many aquatic species.

All effort is to be made to ensure that the application of herbicide **does not** result in the polluting of waterways. Herbicide should only be used in accordance with the conditions on the label and advice given in these guidelines.

ONLY CHEMICALS REGISTERED FOR USE ON AQUATIC SYSTEMS ARE TO BE USED WHEN SPRAYING WEEDS IN DRAINS.

Weed Control Officers **must** have obtained appropriate training in the correct and registered use of all chemicals intended for spraying weeds in drains and watercourses. All care shall be taken to minimise the amount of chemicals used, and entering into drains or receiving water bodies. Spraying schedules are to be undertaken in appropriate climatic conditions, with consideration given to wind and other elements.

The operators **must** apply herbicides in accordance with the label directions or an off-label permit issued by the National Registration Authority. *This is a requirement by law and the operator MUST comply at all times.*

Terrestrial weed control

All effort is to be made to avoid total blanket application when spraying drain banks and levees to minimise any possible erosion problems. Weed-specific spot application is preferred.

Record keeping

To ensure safe and appropriate use of herbicides the operator **must** keep comprehensive records on all herbicide spraying events. Information recorded should include the herbicide used, site identification, climatic conditions, date of application, rate of application and any other relevant information such as copies of notices, advice to third parties etc.

Handling and storage

Some herbicides are classified as dangerous goods and subsequently require specific storage and handling considerations.

Herbicides **must** be transported, handled, stored and disposed of in a way that minimises potential environmental impacts. The operator is responsible for being aware of the requirements for use of each herbicide. Safe handling and storage instructions can be found on herbicide labels.

It is an offence under the Pesticides Act to disregard these instructions.

Weed Control Officer's responsibilities

Weed Control Officers have an obligation to take reasonable care for the health of themselves and other persons in the workplace and to ensure no pollution of watercourses results from herbicide application.

All personnel involved in weed control procedures have an obligation to take reasonable care for the health and safety of other persons in the workplace/immediate area. Any person who has, to any degree, control of a place of work, the means of access or egress, or plant or substance used, has an obligation to ensure health and safety regarding those matters under their control.

Risk assessment

Hazard and risk assessment processes should be carried out at the planning and preparation stage of the work, to determine if persons are, or will be, at risk (see Risk Assessment Chapter 3).

Personal Protective Equipment

All PPE must display the appropriate Australian Standard and WorkCover approval number.

Before commencing any herbicide spraying work, Council and/or contractors **must** provide and arrange for the use of appropriate and compatible PPE complying with the relevant Australian Standards.

Personal protective clothing and appropriate equipment (waders, lifejacket, safety helmet, high visibility garments, eye protection, safety gloves and footwear, hearing protection and UV (sun)

protection) **must be worn at all times** during any construction, floodgate and drain maintenance works.

Additional information

National Registration Authority for Agriculture and Veterinary Chemicals – John Curtain House, 22 Brisbane Ave, Barton, ACT 2600.

Environmental Protection Authority “DRAFT” *Guidelines for the Use of Herbicides Near Water 2000*. Phone 131 555.

Specific human-toxicity information can be also obtained from the NSW WorkCover Authority.

Chapter 6: Floodgate Management Plans

Landholder Floodgate Management Plans (FMP) are designed to authorise local landholders to operate floodgates, to improve the overall management of drainage systems to achieve desired environmental outcomes, while maintaining the system flood mitigation integrity.

It is illegal to interfere with flood control structure without direct consent from Council.

Floodgates structures and drainage systems are dominant features of the Richmond River floodplain. RRCC manages:

- 113 drainage canals totalling over 198km in length
- 391 flood control structures such as floodgates and culverts
- 97 levees totalling 78 kilometres in length
- 6 pump stations used to reduce flooding in Lismore (located at Browns, Hollingsworth and Gasworks creeks)
- A concrete fixed weir to restrict the flow of salt water from the Evans River (located in Tuckombil Canal, 1km south of Woodburn on the Pacific Highway)
- South Lismore levee totalling 5.5km in length – designed to protect South Lismore in the event of a 1 in 10 year flood
- 55 sites (approximately 63km) is under active management.

Active floodgate management is **one** recognised method of addressing water quality and environmental impacts associated with drainage networks as well as, in some circumstances, providing the opportunity to improve farmland production.

Floodgate Management Plans

Landholder FMPs are agreements between landholders, Council and State agencies, such as NSW Fisheries, Department of Land & Water and NSW Agriculture. They define agreed responsibilities and methods as to how the system is managed. They are documents that formalise site-specific maintenance programs, management strategies, drain and floodgate maintenance scheduling, and approved techniques. From a FMP stems a section 355 committee. This committee performs a task for Council and is covered by Council's insurance.

They function on an ongoing basis, and are reviewed annually, given training and PPE.

Section 355 committees

Section 355 committees are landholders selected by landholders connected to or influenced by a given drainage network/system to lift and close floodgates and sluice gates in accordance to the FMP.

Section 355 committees are provided with training in the following:

- Resolution of the decision-making process
- Insurance issues
- Safe operations of floodgates
- Water quality monitoring
- Safety considerations
- Emergency provisions
- Reporting to Council.



Section 355 meeting involving landholders and RRCC

Appendices

Appendix 1

Recommended procedures for drain cleaning works

Notification: Council should attempt to the best of its ability to contact all landholders connected to the system at least three (3) days prior to the commencement of works. In addition, project coordinator must notify NSW Fisheries to inform them of the works (as a requirement of the Dredging & Reclamation consent).

Site entrance: The machinery used in drain cleaning works should where possible enter the work site via a road or road reserve or where minimal damage will occur to native vegetation and farm infrastructure.

Weather: In the event of the likelihood of rain, works are not to commence. In the event where rain occurs during works, work is to stop and the operator is to refer to the Contingency Plan.

Work site: Works are only to occur in those areas shown on the provided aerial photograph and/or map.

Site disturbance: The operator must attempt at all times to conduct the works ensuring minimum disturbance to the surrounding environment, with particular reference to the banks and terrestrial vegetation.

Works: A silt curtain must be positioned within the drain at a height of approximately 200mm above the current water level to assist in controlling the movement of the disturbed sediments. The silt curtain is to remain in position for one week after the event. Work must not commence without adequate lime on site (refer section spoil and drain water treatment). The operator must ensure that NO deepening or widening of the drain occurs. *This is an illegal activity under this consent.* Only vegetation identified under best practice management as hindering maintenance, future and present, is to be removed.

The operator must ensure to the best of his ability that only vegetation is removed and that minimum sediment removal from the drain occurs.

Spoil placement: After extraction from the drain the spoil must be positioned to ensure that no leachate (water/moisture contained with the spoil) can enter back into the drain or as a result of rainfall that may occur immediately after the works.

Spoil treatment: (*Safety glasses and gloves should be worn at all times when applying or mixing lime*). All spoil must be treated with lime at the recommended rate. Treatment is achieved by spreading lime on the ground where the spoil is to be positioned and by spreading lime over the extracted spoil.

Drain water treatment: During works, lime (pre-mixed with water) must be added to the drain water at a rate of (this will be based on pH values at the time of works). This is usually achieved by adding the predetermined liming rate to a bucket of water, mixing thoroughly and dispersing the contents into the drain immediately adjacent to the works at regular intervals. Please refer to table on page 20 of the Floodgate and Management Guidelines.

Other instructions: If any of the above conditions cannot be met the operator MUST stop work and contact RRCC Floodplain Services Manager or Floodplain Project Officer before commencing further with any works.

The operator must have a copy of NSW Fisheries Drainage & Reclamation Consent on site at all times.

Works completion: The project coordinator must be informed on completion of the above-described works. The project coordinator will arrange for a joint on-site inspection with a representative from NSW Fisheries (consent requirement).

Appendix 2

Drain cleaning works Contingency Plan

This Contingency Plan has been developed in accordance with Contingency Plan guideline provided in the DLWC Acid Sulfate Soils Remediation Guidelines (Tulau 2000 unpub.).

1. Remedial action

(Remedial action will be implemented if the monitoring results indicate any adverse impact).

- a. Greater quantities of neutralising agent than that calculated (based on S% testing) will be stored on site.
- b. If for some reason the physical characteristics of the drain have be altered (deepened or widened) work is to stop immediately and not continued until the matter is fully resolved.
- c. In the event of the possibility of rain during works, the proposed works are not to commence until favourable climatic (dry) conditions are ensured.
- d. In the event that rain commences while the works are underway the works are to stop and liming rates increased by a factor of 10% for that area already completed.

2. Restoration action:

(Restoration action is to be implemented when remediation action fails or monitoring results indicate strategy failure).

- a. Position silt curtain downstream to prevent sediment migration.
- b. All areas incorporated within the works to be limed to rate including a 1.5 safety factor.
- c. All removed sediment and vegetation be limed and positioned to avoid leachate entering the drain.

Appendix 3

Procedure for work within ASS affected areas

1. Prior to commencing works

Review ASS risk maps for the area. If site is not in a risk area, works can proceed as planned. If site is identified as at risk, continue to follow procedure.

Refer to constituent Councils' Local Environmental Plan ASS Maps to identify land class. Which of the five land classes does the site appear?

Class 1

Prior to any works commencing contact DTIRIS and Council for permit.

Class 2

If works are below natural ground surface level and likely to lower the water table, contact DTIRIS and Council for permit, otherwise go to section 3.

Class 3

If works are beyond 1m below the natural ground surface or likely to lower the water table beyond 1m of the natural ground surface, contact DTIRIS and Council for permit, if not go to section 3.

Class 4

If works are beyond 2m below the natural ground surface or likely to lower the water table beyond 2m of the natural ground surface, contact DTIRIS and Council for permit, otherwise go to section 3.

Class 5

If works are within 500m of an area classed 1-4 and are likely to lower the groundwater table beyond 1m of the natural ground surface in adjacent lands, contact DTIRIS and Council for permit, continue to section 3.

2. Permits

Apply for permit from DTIRIS and/or Council (whichever is applicable), if permit is not granted works will not proceed.

The Site Supervisor must ensure that the relevant documentation is provided and on site during all works.

3. Soil and water testing

Soil should be tested for S% regardless of whether a permit was needed. This will determine the appropriated liming rate should acid sediments be disturbed. When working in a drain or waterway test water quality prior to commencing work. Parameters of particular importance are pH, dissolved oxygen and turbidity.

4. Machinery access

The machinery used in on-ground works should, where possible, enter the work site via a road or road reserve, or where minimal damage will occur to native vegetation and farm infrastructure.

In the event that damage occurs to farm infrastructure all effort will be made to repair the damage by day's end.

5. Weather

In the event of the likelihood of rain, works are not to commence. In the event were rain occurs during works, work is to stop and the operator is to refer to the Contingency Plan.

6. Work site

Works are only to occur in those areas shown on the supplied Site Map.

7. Site disturbance

The operator must attempt at all times to conduct the works ensuring minimum disturbance to the surrounding environment, with particular reference to the banks and terrestrial vegetation.

8. Spoil placement and disposal site preparation

Prior to work commencing, an appropriated position to place spoil should be chosen and prepared. The spoil disposal site should ensure that no leachate (water/moisture contained with the spoil) can enter back into the drain or as a result of rainfall that may occur immediately after the works.

In preparation for spoil disposal the ground must be limed. Safety glasses and gloves should be worn at all times when applying or mixing lime.

9. Working in drains and waterways

When drain cleaning, refer to drain cleaning Procedure. If working in a floodgate system under active management, close the sluice gate at least three days prior to commencing work and notify landholder that you have done so. If necessary, coffer dam area for works and/or install silt curtain to reduce downstream turbidity.

10. Spoil treatment

On completion of works spoil must be limed with appropriate rate as determined by prior test. Where clean material is available, cap spoil.

Contacts

Richmond River County Council (Lismore)	(02) 6621 8314
Department of Trade & Investment, Regional Infrastructure & Services (Wollongbar)	(02) 6626 1200
Office of Environment & Heritage (Alstonville)	(02) 6627 0100
NSW Planning (Grafton)	(02) 6640 2160
Ballina Shire Council (Ballina)	(02) 6686 4444
Lismore City Council (Lismore)	(02) 6625 0500
Richmond Valley Council (Casino)	(02) 6660 0300

