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BETTER MANAGING ENVIRONMENTAL WATER

Active Management in Unregulated Rivers

Draft policy for public consultation

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Introduction

The New South Wales (NSW) Government is committed to improving the way we manage environmental water in the NSW northern Murray-Darling Basin to maximise environmental outcomes that improve the health of the Basin.

An increased level of management, called active management, is proposed in unregulated rivers downstream from regulated water sources to manage environmental water being used in-stream for environmental purposes, referred to as active environmental water.

The need for active management

NSW and Commonwealth Governments have made significant investments to recover water for the environment across the Murray-Darling Basin. Water held under these recovered licences is referred to as *held environmental water* (HEW).

Water sharing plans do not currently protect this water from extraction in unregulated rivers if it is used in-stream for environmental purposes.

Temporary water restriction orders are the only regulatory tool currently available to control take by unregulated access licence holders once their licensed access conditions, including commence to pump/cease to pump (CtP) thresholds, have been met.

The public seek certainty that water recovered for the environment can remain in-stream to be used for its intended environmental purpose. The Intergovernmental Agreement on Implementing Water Reform in the Murray-Darling Basin (the IGA) includes a commitment to establish a mechanism to protect environmental flows in the water resource plans submitted for accreditation by 31 December 2019, and is to be in place and operating by end 2020.

Active management is a new operational tool that ensures that water released for the environment will remain in-stream to be used for its intended environmental purpose.

Benefits of active management

Active management will reduce the need to use temporary water restrictions to manage active environmental water used in-stream and help improve water sharing, compliance and transparency by:

- protecting active environmental water used in stream for environmental purposes
- making it clearer for licence holders to understand when they can take
- increasing public understanding on when water can and cannot be taken, and
- sharing access between licence holders during a unregulated flow event when flows are above CtP thresholds and demand exceeds available flow.

Active management will contribute to maximising environmental outcomes from:

- regulated HEW released from upstream storages that flows through a downstream unregulated river water source that is subject to active management
- planned environmental water (PEW) from upstream water sources that is assessed as additional inflows to those considered when the plan that established the bulk access regime for the water sharing plan where active management applies
- PEW from a regulated water source that is protected from being taken by the rules in the downstream unregulated actively managed river water source (for example, releases of Macquarie Environmental Water Allowance - sub-allowance 2 from Burrendong Dam is protected from being taken in the Macquarie unregulated active management areas), and
- unregulated HEW licences in unregulated water sources where active management applies when used in-stream.

This will help to reach the intended outcomes from the Murray-Darling Basin Plan.

Objectives

Primary objective:

- Manage access to water in unregulated systems to allow HEW to remain and be used in-stream for environmental purposes.

Secondary objectives include:

- Manage access to water to support compliance (with protection of PEW), transparency, and equity of access
- Provide certainty through enduring arrangements, and avoiding reliance on temporary arrangements to manage HEW being used in-stream
- Maximise economic opportunity while meeting the primary objective

Principles for developing and implementing active management

Active management is being developed and implemented with consideration of the following principles:

- a) Avoid unacceptable change to reliability and access characteristics – material impacts are mitigated or offset, and unintended gains are avoided
- b) Solutions are evidence based and outcomes-focussed
- c) Solutions and operation tools are simple, practical and cost-effective
- d) Ongoing adaptive management is required to ensure continuous improvement

This document

This document outlines proposed policy positions we have used while developing the proposed water sharing plan rules for active management. We will also use them when developing an Active Management Procedures Manual (procedures manual) for each water sharing plan where active management applies.

The procedures manuals will set out the operational details for implementing active management to manage active environmental water used in-stream and to share flows.

Key considerations are set out in the italicised grey text under main chapter headings in this document.

Have your say

We seek your comments on the draft policy positions outlined in this document

We have used these policy positions in preparing the draft proposed water sharing plan rules. We will also use these policy positions in preparing the Active Management Procedures Manuals for each area where active management will apply.

The consultation questions below may help guide you in preparing your response and highlight areas that we seek your specific feedback.

We also seek your comments on:

- *Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012 (Proposed Amendments 2020)* available from <https://www.industry.nsw.gov.au/barwon-darling-wrp>
- *Proposed amendments to the Macquarie Bogan unregulated water sharing plan for active management* available from <https://www.industry.nsw.gov.au/water-macquarie-bogan>
- *Proposed amendments to the Gwydir unregulated water sharing plan for active management* available from <https://www.industry.nsw.gov.au/water-gwydir>

Make a submission

To make a submission, refer to the links above. All submissions will be considered when finalising the plan. **Submissions close at 5 pm on Tuesday 29 October 2019.**

Consultation questions

Feedback on the following questions is specifically sought.

Defining active environmental water

1. What are your views on what water will be defined as *active environmental water* and managed through an unregulated water source? (see page 10)
2. Do you support inclusion and protection by active management of planned environmental water releases from upstream water sources that are additional to the inflows that were considered when the Barwon-Darling plan commenced (see page 10)

Areas where active management will apply

3. Do you support the criteria for where active management is to be applied? (see page 13)

Managing active environmental water in-stream

4. What are your views on how accounts will be managed for in-stream use of unregulated held environmental water licences? (see page 15)
5. Do you support assigning river transmission losses proportionally to active environmental water? (see page 16)

Access for unregulated river access licences

6. What are your views on concept of adjusting commence to pump/cease to pump thresholds to protect active environmental water from extraction? (see page 18)
7. What are your views on proposed amendments to water sharing plan access rules to protect active environmental water in each of the water sources where active management is proposed? (see proposed water sharing plan amendments for the [Barwon-Darling](#), [unregulated Macquarie](#) and [unregulated Gwydir](#))
8. Do you support distributing the available volume between licence holders in the Barwon-Darling based on Individual Daily Extraction Limits? (see page 19-20)

9. Do you support distributing the available volume between licence holders in the Barwon-Darling to individuals who have expressed an interest based on Individual Daily Extraction Limits? (see page 19-20)
10. Do you support access being announced? What issues need to be considered in making announcements? (see page 20)

Forecasting flows and managing uncertainty

11. What are your views on how loss estimates will be forecast and how operational uncertainty is proposed to be managed? (see page 22)
12. What other options should be considered?

Adaptive management

13. What information do you consider is important to document and consider in order to continuously improve active management? (page 26)

Additional issues or information

14. What risks need further consideration?
15. What additional issues should be considered in actively managing flows?

More information

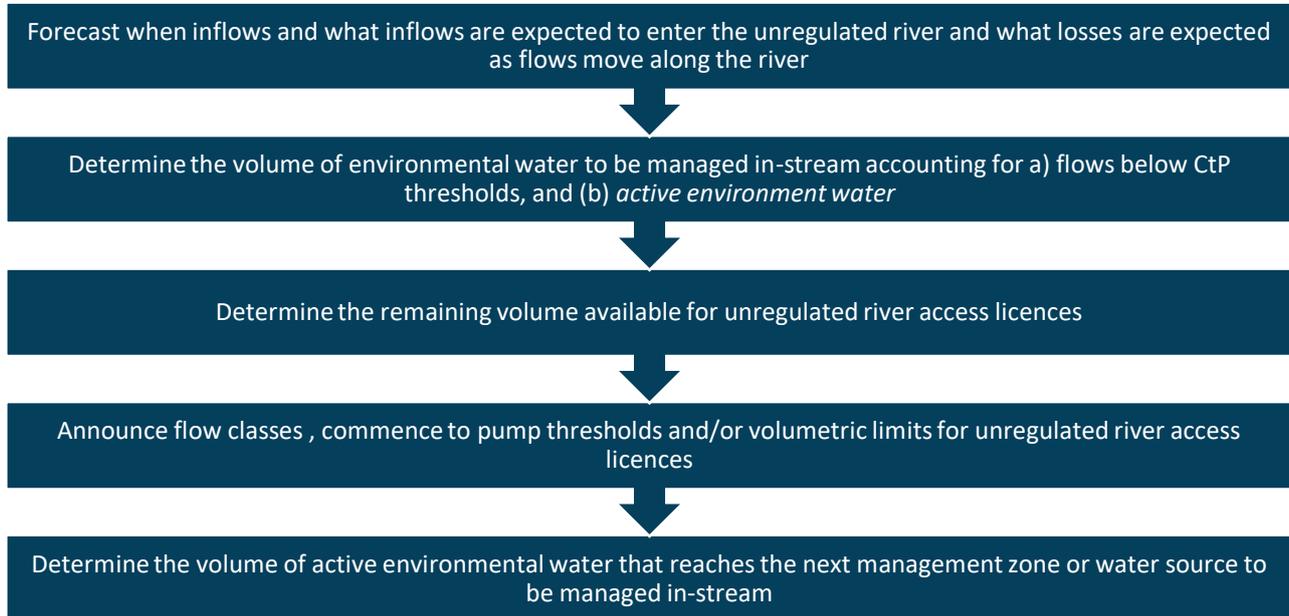
The draft Barwon-Darling Watercourse Water Resource Plan and other fact sheets are available from <https://www.industry.nsw.gov.au/barwon-darling-wrp>

If you want to be kept informed about all of the departments upcoming engagement activities please visit our [website](#) or join our [newsletter](#).

Framework

Process

To actively manage an unregulated river, we will:



The process will be simplified if only active environmental water is present.

The volume of active environmental water to be protected from extraction in the next management zone or water source will be reduced by its share of river transmission losses in the previous river reach or zone.

Concept

Under current arrangements, unregulated river access licence holders must check flows at specified reference points to determine if flow is above CtP thresholds specified in the water sharing plan for their licence or licence class or as specified on their water access licence.

Under the active management proposal the Minister will determine and announce the flow class, CtP thresholds and/or volumetric limits that apply.

The CtP threshold defined in the water sharing plan or on the licence conditions will be adjusted by the volume of active environmental water in-stream to be protected from extraction before making an announcement.

The concept is illustrated by an example in Figure 1 where 150 ML/day of active environmental water is present in scenarios 2–5 and the base CtP threshold in the water sharing plan is 200 ML/day.

Access will be permitted if:

- there is no active environmental water in-stream and flows are above the base CtP threshold, provided all other access conditions and account management requirements are met, as illustrated in scenario 1 in Figure 1
- there is active environmental water in-stream and flows are above the adjusted CtP threshold, provided all other access conditions and account management requirements are met, as illustrated in scenario 5 in Figure 1

Access will be prohibited if:

- only active environmental water is in-stream, as illustrated in scenario 2 in Figure 1
- flow is below the base CtP threshold, as illustrated in scenario 3 in Figure 1
- flow is above the base CtP threshold (due to the presence of active environmental water) but below the adjusted CtP threshold, as illustrated in scenario 4 in Figure 1

Active Management Concept

In this example, when active environmental water is not present, licence holders can commence to pump when flows exceed 200ML/day (base CtP) and must cease to pump if flow drops to 200ML/day or less.

When 150ML/day of active environmental water is present (scenarios 2-5) licence holders can commence to pump when flows exceed 350ML/day (the adjusted CtP) and must cease to pump if flows drop to 350ML/day or less.

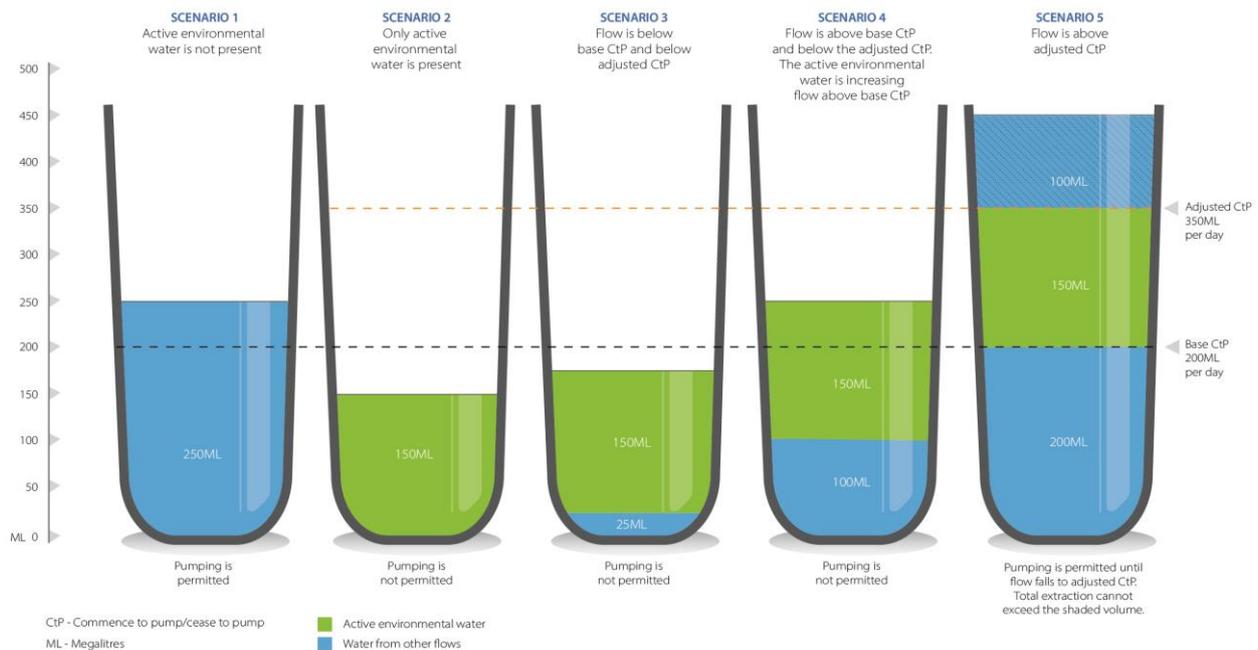


Figure 1: Active management concept

In addition or as an alternative to announcing the flow class or CtP thresholds, the available volume (hashed blue in scenario 5 in Figure 1) may also be determined and distributed among the unregulated river access licences. For example in the Barwon-Darling we are proposing the flow class is announced (either permitting or prohibiting access) and if access is permitted the volume available is distributed among licences by announcing the volume that can be taken per daily flow share.

Determining and distributing a volume is needed where an unregulated access licence holder (for example, holders of HEW) in a water source that is being actively managed seeks to use their share of the flow in-stream for environmental purposes. It can also be considered to be used to equitably share flows when demand exceeds the volume available to unregulated river access licences. Distributing a daily volumetric limit to each licence can simplify compliance requirements for licence holders where access rules are complex reducing the risk of licence holders interpreting information incorrectly.

Water sharing plans and procedures manuals

Amendments are required to water sharing plans where active management is proposed. To implement active management a change is needed to the rules that set out how water is accessed by unregulated river access licences and to allow CtP thresholds or flow classes to be increased

by the amount of active environmental water to be protected from extraction or a volumetric limit to be determined and distributed among licence holders.

The water sharing plan will establish the requirement for the Active Management Procedures Manual (*procedures manual*).

A procedures manual will be prepared for each water sharing plan where active management applies.

Procedures manuals will provide sufficient flexibility to respond to each flow event while providing clarity on how active management will be implemented.

Procedure manuals will be regularly reviewed to ensure an adaptive approach allowing refinements over time to better manage risks and respond to new information or insights.

Procedures manuals will set out the operational details for implementing active management including outlining:

- where the procedures manual applies
- what water will be protected from extraction in the area it applies
- how flows are forecast
- how losses are calculated and shared
- how operational uncertainty is managed (e.g. adjustments to flow forecasts)
- how the volume of active environmental water is determined
- how the adjusted flow class, CtP threshold and/or volumetric limit is determined
- the form of an announcement and what information announcements must contain
- what unregulated licence holders who want to leave their water in-stream will need to do and how their water allocation account will be debited for water managed in-stream
- reporting requirements
- timeframes, circumstances, procedures and responsibilities for review of the procedure manual
- who approved the procedures manual and when

This policy will guide the preparation of each procedures manual.

The Department will consult on the development of the procedures manuals before active management is implemented.

Appendix 1 describes the proposed content of water sharing plan rules and the procedures manuals.

Defining active environmental water

Active environmental water is the water in the water source identified on any given day as requiring protection from extraction so it can remain in-stream and be used for environmental purposes.

The primary objective of active management is to manage access to water in unregulated systems to allow HEW to remain and be used in-stream for environmental purposes.

There are other types of environmental water that could be actively managed so that it remains in-stream for environmental purposes, for example some types of PEW released from upstream regulated storages that flow through the downstream unregulated river to benefit environmental assets.

Not all water described as environmental water should be protected as active environmental water in the downstream water source. Water sharing plans were developed to manage environmental outcomes within the water source and flows to downstream water sources are available to be shared in accordance with the rules in the downstream water sharing plan. Any new policy that changes the way in which inflows to a water source are shared from that when the water sharing plan commenced has the potential to effect reliability for water access licences in that water source.

It is therefore important that we define active environmental water in a way that minimises any effects on downstream water sharing arrangements, including unregulated river access licence reliability.

Active environmental water will be limited to flows arising from:

- a) in-stream use of regulated river HEW licences when account water is released from an upstream regulated storage to flow through to the downstream actively managed unregulated water source.*
- b) regulated river supplementary water HEW licences where a volume of water is debited from the account and recognised as active environmental water during a supplementary access event and flows through to the downstream actively managed unregulated water source.*
- c) unregulated river HEW licences where a volume of water is debited from the water allocation account and recognised as active environmental water used in-stream within an unregulated river water source where active management applies.*
- d) PEW from upstream water sources required to be protected from extraction under the existing rules in the downstream unregulated water sharing plan where active management is applied.*
- e) PEW releases from upstream water sources that are assessed as additional to the inflows that were considered in the establishment of the bulk access regime for the water sharing plan where active management applies when the plan commenced.*

Held Environmental Water

Initially we will only manage the following HEW as active environmental water:

- a) HEW being used in-stream that is released from northern NSW regulated storages and Queensland storages in the Border Rivers that flows into an unregulated actively managed river and
- b) unregulated HEW that is held within one of the actively managed unregulated rivers.

Flows arising from HEW licences originating from Queensland

Flows arising from HEW licences originating from Queensland (other than releases from the regulated Border Rivers System) will not be recognised as active environmental water and managed through NSW systems until a method for determining the volume of HEW arriving at the

NSW-Queensland border is agreed by NSW. If methods are developed and agreed by NSW and Queensland governments then this water may also be considered for active management.

The IGA includes a commitment for an accounting method supported by protocols and procedures for Queensland-to-NSW cross-border held environmental water to be established and operating by end 2020.

Flows arising from HEW licences originating from upstream NSW unregulated water sources

Flows arising from HEW licences originating from upstream NSW unregulated water sources that flow into an actively managed unregulated water source (either directly or through a regulated river water source) will not be recognised as active environmental water and managed through NSW unregulated systems until a method for determining the additional volume of water arising from the HEW licence arriving into the active management river is agreed.

For example there are unregulated HEW licences held in the Warrego River water source managed under the *Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources 2011*. The Warrego River is a tributary of the Barwon-Darling River. How this water is managed through the Barwon-Darling River requires further consideration and should be part of the adaptive management approach to implementing active management.

Planned environmental water

Water sharing plans were developed on the basis that inflows to a water source are shared as set out in the rules in the plan, without regard to where the water originated from. Unregulated water sharing plans typically do not recognise that specific flows from an upstream water source are for specific purposes. These arrangements have informed the understanding of the long-term reliability of the water source.

Reliability may be effected if the inflows to a water source that arose as a result of PEW in an upstream water source were to be set aside for the environment where those inflows had previously been available to unregulated river access licences.

To minimise the effect on unregulated reliability water identified as PEW in an upstream water source that flows into an active management river should not be protected from extraction. However there are two exceptions:

a) **Upstream PEW that is protected in downstream unregulated water sources by a water sharing plan**

For example Clause 53 (27) of the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012* requires that inflows attributable to the release of water from the Environmental Water Allowance Sub-allowance 2 from Burrendong Dam in the regulated Macquarie water source are to be protected from extraction in a number of unregulated water sources.

b) **PEW that is discretionary in nature and assessed as additional to the inflows that were considered in the establishment of the bulk access regime for the water sharing plan where active management applies when the plan commenced**

There have been some changes to how PEW that is discretionary in nature is managed since the unregulated water sharing plans commenced. For example, the Gwydir Environmental Contingency Allowance (Gwydir ECA) provided for under the *Water Sharing Plan for the Gwydir Regulated River Water Source 2016* was used to contribute to the 2019 Northern Fish Flows Event protected in the Barwon-Darling under a temporary water restriction order. There is no prior history of the Gwydir ECA being used in this way, as it is predominantly used to provide water to the Gwydir wetlands. This water, released for the specific purpose of providing downstream flows, is considered additional to the inflows that would make up the flows to be shared in accordance with the rules in the Barwon-Darling water sharing plan.

To mitigate effects on reliability of unregulated river water access licence holders it will be important to assess whether any PEW arising from upstream water sources that is discretionary in nature can be considered as additional inflows.

Areas where active management will apply

There are many unregulated water sources across NSW where active environmental water may be delivered or used in-stream within the water source.

We propose to implement active management in priority areas in the northern Basin before considering application elsewhere.

Other areas may be considered in the future and will be prioritised after considering the objectives of this active management policy and the active management principles. If active management is to be considered in other water sources the relevant water sharing plans would require amendments and stakeholders would be consulted if such changes were proposed in the future.

Active management may be considered in the future for unregulated surface water sources that are downstream from a regulated river water source and where:

- a) environmental water from upstream regulated rivers has been delivered or identified as additional inflows, is intended to be delivered within the next 5 years and there is no protection for HEW when used in-stream, and could be taken by downstream unregulated river access licences under their current licence conditions*
- b) unregulated river HEW access licences are located in the water source and there is a no protection for HEW originating from these licences when used in-stream and could be taken by downstream unregulated access licences*
- c) it will be effective to meet the objectives and principles set out in this policy.*

Priority areas for implementation

Priority areas identified in the northern Basin for the initial implementation of active management include:

1. Barwon-Darling Unregulated River Water Source to the last flow gauge in the Barwon-Darling Unregulated River Water Source or to the point active environmental water attenuates, whichever is upstream
2. Lower Macquarie Bogan
 - a. Lower Macquarie River Water Source including Gum Cowal, Lower Macquarie River downstream and Lower Macquarie River upstream management zones
 - b. Marthaguy Creek Water Source (downstream of Terrigal Creek confluence)
3. Gwydir
 - a. Gingham Watercourse Water Source
 - b. Mallowa Creek (within the Mehi Creek Water Source)

These are unregulated rivers downstream of a regulated river water source where:

- environmental water has been delivered previously
- the environmental water holders intend to deliver environmental water in the future
- HEW used in-stream could be taken by unregulated access licences under their current licence conditions, and
- it is operationally feasible to implement active management.

The prioritisation of these areas also considered the unique characteristics of the Barwon-Darling as the key conduit for the northern Basin, making it a high priority to protect HEW so that it can be used to achieve northern Basin connectivity outcomes.

Other areas considered

The Lower Gwydir River Unregulated Water Source and the Marra Creek, Bogan River and Marthaguy Creek above the confluence with Terrigal Creek in the Lower Macquarie valley were considered for application of an active management approach but are not part of the proposed initial implementation as there are no plans to deliver environmental water to these areas in the short term. Should this change they may be considered in the future.

Limits to recognition of active environmental water

The Lower Darling water source is a regulated system as such active management is not required.

Recognition of a volume of active environmental water that may flow into the Lower Darling water source would be dependent on future management decision for Menindee Lakes, amendments to the Murray – Darling Basin Agreement and a method agreed by NSW for determining the volume of active environmental water that flows into Lake Wetherell.

Managing active environmental water in-stream

The issues that need to be considered when developing the active management framework include:

- a) Managing an equivalent volume in-stream to that defined as active environmental water
- b) Accounting for in-stream use of HEW – to enable the unregulated HEW to be debited from the water allocation account
- c) Assigning river transmission losses – to determine the active environmental water that is ‘used’ in-stream.

Managing an equivalent volume in-stream

Active management will manage the take of water so that an equivalent volume to that defined as active environmental water is left in-stream for environmental purposes. The volume of active environmental water managed in-stream will be determined in accordance with the Active Management Procedures Manual.

Tracking specific parcels or molecules of water as either environmental or consumptive is widely recognised as being beyond the ability of current tools and processes available. For example if there was inflow of HEW from a regulated tributary into the Barwon-Darling, it would quickly become indistinguishable from other flows.

Active management will not track specific parcels or molecules of active environmental water. Instead active management will manage take of water so that an equivalent volume to that defined as active environmental water remains in-stream for environmental purposes.

The closer this can be done in time to a volume of environmental water flowing past a given licence holder, the more closely active management will be able to approximate the protection of an actual environmental volume of water.

The volume of active environmental water managed in-stream will be determined in accordance with the procedures manual.

Accounting for in-stream use of unregulated HEW

Water originating from an unregulated HEW licence being used in-stream must be debited from the allocation account for that licence to be recognised as active environmental water.

The volume debited from an unregulated HEW licence allocation account will be the volume nominated by the environmental water holder that it is to be used in-stream up to the volume made available to the HEW licence under announcements.

To manage active environmental water originating from an unregulated HEW access licence held within the water source where active management is applied we need to:

1. determine the volume available to the unregulated HEW licence
2. confirm the proportion of the water available that the HEW licence holder wants to use in-stream
3. debit the HEW licence allocation account by the volume to be used in-stream which is then actively managed through downstream management zones.

The volume available to an unregulated HEW licence must be assigned in the same manner as other unregulated access licences so that the characteristics of the licence are maintained.

The sections below describing access for unregulated river access licences under active management explain how the initial volume of water that can be considered active environmental water from an unregulated HEW access licence is determined.

There is currently no ability to debit water from a licensed account other than via metered water use, estimated water use or a recognised dealing.

The water sharing plans will include account rules in water sources where active management applies providing for:

- unregulated river access licence holders to notify the Minister that they want to leave some or all of the water permitted to be taken under their licence in-stream for environmental purposes
- the volume of water that is used in-stream as active environmental water to be debited from the HEW licence allocation account.

The volume debited will then be actively managed through downstream zones.

The procedures manual for the relevant water source will describe the process for assigning a volume to the unregulated HEW licence and notify the Department what proportion is to be managed in-stream for environmental purposes. Note that these account debiting rules can apply to any unregulated river access licence where the licence holder wants to use their water in-stream as active environmental water, not just HEW licences.

Assigning river transmissions losses

The volume of active environmental water must be reduced by its share of losses in proportion to the total flows in the management zone or river reach.

Some of the active environmental water being used in-stream will evaporate, be used by plants, or seep into the ground. These processes, contribute to the health of the river system and associated ecosystems, and form part of the river transmission losses.

As the active environmental water flows downstream, the volume of active environmental water must be reduced by its share of these river transmission losses.

Figure 2 outlines three options for assigning river transmission losses to the active environmental water.

The preferred approach is to assign losses proportionally as it is simple and a reasonable approach to sharing losses.

Assigning losses incrementally is the most neutral approach in that it considers the actual losses arising from the use of active environmental water however it is a more complex process and not practical within the timeframe of a flow event and will still include a number of assumptions.

Socialising losses would result in the active environmental water not being reduced as it flows downstream, reducing the available volume to unregulated licences and contravene the principle of mitigating impact on other licence holders.

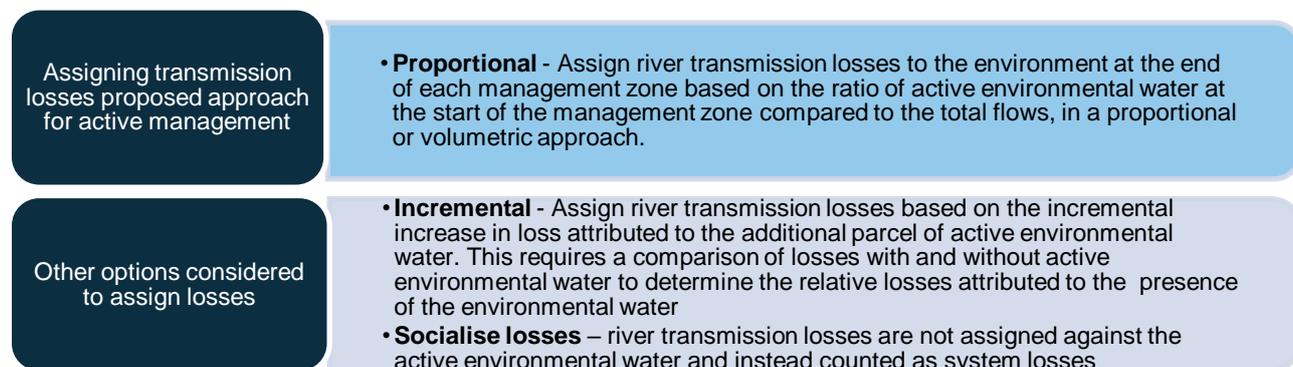


Figure 2: Options for assigning river transmission losses to active environmental water

When unregulated HEW is first recognised in a management zone by debiting the licence allocation account, the transmission losses have already been accounted for in defining the volume available to the licence so the volume of unregulated HEW to pass onto the next management zone and actively managed is not reduced.

Access for unregulated river access licences

Access arrangements must:

- a) be flexible to accommodate varying river conditions, flow volumes and timing of active environmental water delivery and unique circumstances in each active management area
- b) be clear for licence holders and the public to understand when water can and cannot be taken
- c) provide for unregulated HEW licences to be used in-stream within the water source for environmental purposes
- d) support the sharing of water among licence holders when there is limited supply.

Access arrangements

The CtP threshold or flow classes in water sharing plans and licence conditions that regulate access for unregulated river access licences, will be increased by the volume of active environmental water to be protected and/or individual volumetric limits will be determined that protects the volume of active environmental water instream.

The adjusted flow class or CtP threshold and/or individual volumetric limits will be announced.

Access arrangements to implement active management need to protect an equivalent volume of active environmental water in-stream from extraction while still providing for access permitted under the water sharing plans.

Adjusting CtP thresholds

Water sharing plans for the unregulated rivers establish CtP thresholds for unregulated river access licences. These may be expressed as simple CtP conditions or as flow classes. Flow classes are established in the Barwon-Darling and Gwydir unregulated water sources and simple CtP conditions are established in the Macquarie unregulated water sources.

Water access licence conditions detail the flow class or the CtP thresholds that apply for each licence. Unregulated river access licences can take water when flows at flow reference points (often a river gauge) are above the CtP conditions specified on their licences or the CtP threshold for the flow class nominated on their licence, provided all other licence access conditions and account management requirements are met.

In some cases water sharing plans also require a visible flow at the pump site and some licences may have additional or more stringent CtP thresholds than those detailed in the water sharing plan.

Under active management CtP thresholds detailed in the water sharing plan or on licence conditions will be adjusted by the volume of active environmental water to be protected unless the procedures manual requires the river operation to only set a daily volumetric limit for each licence holder. All other licence and account management conditions must be met.

The procedures manual will outline how the river operator will forecast inflows and losses along the river to determine the adjustment required to protect active environmental water present in-stream from extraction.

Licences subject to only visible flow conditions at the pump site

Some licences do not have CtP thresholds linked to a river flow gauge, instead access is permitted provided there is visible flow at the pump site.

For these licences the Minister will announce if access is permitted whether there is active environmental water present or not. All other licence and account management conditions must be met. Access will be prohibited if only active environmental water is present.

If there is flow arising from in-stream active environmental water and other sources of flows access may be linked to a CtP at an appropriate river flow gauge or a volumetric limit for take per day may be announced. The method used will depend on the circumstances in each water source including the feasibility of determining the active environmental water in-stream and the infrastructure available.

The procedures manual will outline how access for these licences will be varied to protect active environmental water used in-stream.

Default access arrangements

Access will be prohibited if active environmental water is the only source of flows in-stream.

If active environmental water is not the only source of water in-stream and the volume of active environmental water cannot be determined the current access conditions will apply.

This may be necessary in active management rivers where current infrastructure is insufficient to determine the volume of active environmental water present or in the event of upstream gauging station failures.

Distributing the volume available among licences

The volume available to unregulated river access licences (i.e. the volumetric limit) may be determined and distributed among individual unregulated river access licences within a water source, management zone or flow class.

Where the volume available is distributed among unregulated river licence holders distribution will be based on Individual Daily Extraction Limits (IDELs) (where they exist) or share components on water access licences.

The volume available must be distributed among individual unregulated water access licences in management zones or water sources that have unregulated HEW licences.

Under current unregulated water sharing plans, access is on a first-come, first-served basis. We can continue with a similar arrangement under active management or determine and distribute the volume available above the adjusted CtP threshold among licences. Different approaches may suit different water sources.

The procedures manual for the relevant water source will outline if and how the volume available is to be distributed.

Options for the distributing the volume available include:

- a) **Do not distribute volume available** to individual licences – that is, adjust CtP thresholds only
- b) **Distribute volume available** among unregulated river access licences proportional to IDELs where they apply or shares
- c) **Distribute volume available** among unregulated river access licences **to licences who express an interest** up to IDELs where they apply. If the total interest exceeds the available volume then distribute proportional to the IDELs where they exist or shares of those that expressed interest.

The procedures manual will outline if and how the available volume is to be distributed.

No distribution

This option is the simplest and best reflects current management arrangements in unregulated rivers.

This option does not define a share of the volume available to unregulated held environmental water licences to use in-stream and is therefore not suitable in areas where unregulated HEW licences are located.

This option is proposed for the Gwydir active management areas and the Macquarie active management areas except in the Lower Macquarie River Upstream Management Zone where a HEW licence is held.

Distributing by shares or IDELs where they apply

Distributing the volume available based on a proportion of shares or IDELs (where they apply) provides increased clarity on what volumes can be pumped by each licence. It also equitably shares the volume available when it is less than the sum of individual daily extraction limits or less than the total pump capacity in a management zone or water source.

Where there are HEW licences located in the water source the volume available must be distributed to apportion a volume to the unregulated HEW licences that can then be left in-stream as active environmental water.

This option is proposed in active management areas where HEW licences are held including:

- the Barwon-Darling River with distribution based on IDELs
- the Lower Macquarie River and Marthaguy Water Sources based on shares.

This option shares the volume available among licences irrespective of whether a licence holder intends to take water or not. Note that licence holders may not want to take their share of available water from time to time for various reasons.

Trade of IDELs in the Barwon-Darling could provide a market mechanism for licence holders to adjust their access where they need more or less water. The proposed rules allowing permanent trade of IDELs within river sections would allow licence holders to increase shares in daily events before an event commences however flexibility would be limited once an event starts and daily shares are allocated .

Distributing by expression of interest

An expression of interest process could distribute the volume of available water to just those licences that have expressed an interest in taking water using the same primary distribution mechanism (i.e. proportional to IDELs or shares), until the volume available has been distributed, or all licences that have expressed an interest have been allocated up to their IDEL (where they apply). The Minister would announce the volumes accessible by each licence holder.

This option allows the volume available to be distributed to those who wish to take water supporting the secondary objective of maximising economic opportunity while still meeting the primary objective.

The maximum volume of water taken under an access licence on any day will be the lesser of the volume permitted to be taken in accordance with the announcement and the IDEL where they apply. Under this option, only those who submitted an expression of interest for access on a given day would be permitted to take water.

Water allocation accounts would be debited by the volume taken.

This is the most complicated option. The procedures manual would outline the process which would include a process for a licence holder to express an interest and a process for the Minister to confirm what volume can be taken by each licence.

Announcements

Under current arrangements licence holders must check the flows at the relevant river flow gauge/s, making sure flows are above the CtP thresholds for their licence or licence class before they pump.

Under active management the Minister will announce what flow class applies or the CtP threshold for any particular day and any volumetric limits that may apply.

Before making the announcement, the CtP thresholds as detailed in the water sharing plan, will be adjusted by an amount necessary to protect active environmental water present in-stream from extraction and/or a volumetric limit will be determined.

The change to an announcement approach will provide clarity on when pumping is permitted.

Licence holders will need to know the CtP thresholds that apply to their licence or the flow class that their licence permits them to extract from where flows classes exist.

The announcements could be made on a daily basis during an event, or at less frequent intervals (i.e. announcements could be for longer than one day), depending on whether there was sufficient certainty regarding flow forecasts.

More frequent announcements allows for operational responses to forecasting uncertainty to be made and achieve the appropriate balance between consumptive access and environmental water protection.

The procedures manual will outline how announcements are made and what announcements must include.

Access under basic landholder rights and other licence categories

Access under basic landholder rights will not be changed by implementation of active management.

Access under licence categories other than unregulated river access licences (for example, local water utilities and domestic and stock licences) , will not be changed by implementation of active management unless evaluations demonstrate a significant risk to active environmental water from extraction under these licences and there has been assessment of effects, risks, feasibility and cost effectiveness of amending access.

Forecasting flows and managing uncertainty

The river operator will need to forecast flows to determine:

- the volume of water expected to reach a particular point in the river
- the volume of active environmental water in-stream
- the volume available to unregulated licence holders
- the volume of active environmental water that will pass into the next management zone.

Forecasting is the primary operational risk in implementing active management.

Forecasting involves estimating the:

- inflows to each river reach/management zone from upstream water sources and tributaries including the volume of inflows, the makeup of those inflows, and when inflows are expected
- river transmission losses expected along the zone, and
- take permitted under basic landholder rights and water access licences.

Forecasting will be inexact given the inherent variability in natural river systems and environmental watering activities. Actual flows may fall short of, or exceed, forecast flows.

Uncertainty in forecasting flows in each river reach can arise from uncertainty in estimating water use, river transmissions losses, tributary inflows or flow routing effects, as detailed in Appendix 2 – Sources of Uncertainty in flow forecasting.

A balance must be struck between managing the uncertainty to minimise any potential effects in over or underestimating the volume of active environmental water protected or the water available to unregulated river access licences within the limits of operational feasibility and cost effectiveness.

Approaches should be reviewed through an adaptive management approach to improve how uncertainty is managed.

Estimating losses

Initial and ongoing loss estimates will be based on an assessment of the average losses for comparable past historical events. The ongoing losses will be adjusted based on observed losses during that event.

For unregulated rivers there may be very low or no flows prior to an event. Initial losses from the point when flows first pass the top flow gauge in a management zone until the flows reach the bottom flow gauge in a management zone need to be estimated.

Initial losses as a result of filling depleted weir pools and natural river pools and saturating dry river bed and banks following prolonged dry periods can result in considerable variations to initial flows.

Estimating initial losses is one of the greatest sources of uncertainty. Where events are of a short duration, the initial loss estimates are even more important.

Initial losses are dependent on antecedent conditions. The analysis of past river transmission losses shows that a range of initial losses is possible, even when considering similar past events and further categorisation into wet, average, and dry antecedent conditions.

Once flows have been established along a river reach, ongoing losses can be relatively small, as the bed and banks have “sealed up”.

Similarly to initial losses, basing ongoing loss estimates on average losses for previous similar events is most likely to minimise any bias in the difference between forecast and actual losses over the longer term. Under this approach the risk is shared.

Options to estimate losses are outlined in Figure 3. The choice affects where the risk would lie (i.e. with the environment water or unregulated licence holders).

The use of average loss estimates for comparable events is most likely to minimise any bias in the difference between forecast and actual losses over the longer term. Under this approach the risk is shared.

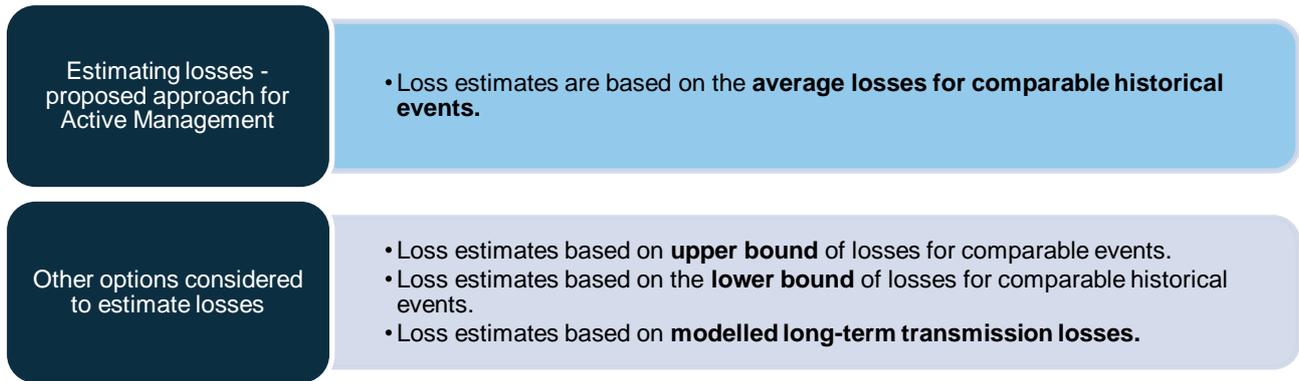


Figure 3: Options for estimating initial and ongoing losses

Managing mismatches between forecast and actual flows

Forecasting flows will primarily rely on forecasting river losses. To manage uncertainty, the following operational responses that minimise the mismatch between forecast and actual losses during an event will be considered.

- *adaptively adjusting ongoing loss forecasts based on observed unaccounted difference*
- *adjusting access during a flow event based on the cumulative mismatch between forecast and actual unaccounted differences.*
- *increasing the frequency of announcements*

Mismatches between forecasts and actual unaccounted differences will not be reconciled between events.

There is a trade-off between achieving desired sharing outcomes in each event versus simplicity (which influences costs) and transparency or clarity (for licence holders and the public).

To provide transparency for licence holders and the public, and to manage the degree of judgement required each day, the procedures manual will codify operational arrangements including how initial and ongoing losses are estimated and how any mismatch can be adaptively managed.

Operational responses to manage mismatches during an event

The preferred approach is to undertake operational responses during an event to minimise mismatch and improve the likelihood that the volume protected is equivalent to the volume of water defined as active environmental water and effects on unregulated river access licence reliability are mitigated.

Operational responses during an event can include:

- providing an **initial conservative announcement of water available to unregulated river access licences** and refine as event proceeds once losses are better understood as the event progresses
- adaptively **adjusting ongoing loss forecasts** based on actual unaccounted differences
- **adjusting access based on the cumulative mismatch** between forecast losses and actual unaccounted differences during a flow event.

The procedure manual will outline approaches to manage mismatches during an event. The effectiveness of these approaches will be reviewed annually as part of the adaptive management approach.

Initial conservative access announcements

An approach that makes an initial conservative access announcement that provides a higher CtP threshold or lower volume of water available to licences until river losses are better understood has potential to impact on the reliability of access for unregulated river access licences as there may be missed opportunities for access. For this reason conservative access announcements are not supported.

Adaptively adjusting ongoing loss forecasts

Adaptively adjusting ongoing loss forecasts based on observed losses (i.e. unaccounted differences between flows at upstream and downstream gauges) provides an opportunity to address (at least partially) any mismatch between forecast and actual flows ensuring mismatches arising from uncertainty in ongoing loss forecasts don't compound as an event proceeds. This option therefore has potential to minimise risks to the active environmental water and licence holders.

This option increases decision making requirements and resourcing. To provide for transparency the decision making process can be outlined in the procedures manual.

Experience in regulated systems suggests that the forecasting activity and updating of loss estimates will need to be undertaken on a daily basis during an event, even if announcements or management actions regarding water availability occur less frequently.

Adjusting access based on the cumulative mismatch

Adjustments to address mismatch on the previous day(s) of an event to reduce imbalances between active environmental water and water available for unregulated licences is possible and if applied with other options reduces the likelihood of mismatch across an event.

This option increases decision making requirements and resourcing.

This option would be enabled by increasing the frequency of announcements. More frequent announcements for shorter periods allows for operational responses to be made.

The procedures manual we will need to define when adjustments should occur i.e. what is an acceptable level of mismatch and what is considered a significant mismatch that should be adjusted during an event to mitigate possible impacts

Other options to manage mismatches not supported

No operational response to manage mismatches during an event - Under this option adjustments are not made to minimise mismatches during an event. Instead there are pre-agreed approaches to forecasting flows, including estimating initial and ongoing river transmission losses that would apply for the entirety of an event (and possibly across multiple events), only changed via a specific review process, such as an annual review.

While not making any operational response during an event reduces the decision making involved in the forecasting flows, it is likely to lead to mismatches accumulating downstream and over time to unacceptable levels causing concern to all stakeholders (environmental water managers, licence holders, and the wider community). For this reason having no operational responses is not supported.

Operational responses to manage mismatches between events - An approach that reconciles mismatches between forecasts and observed flows between events in an unregulated river could have impacts on individual access license reliability. For example, one licence may take water in the first event but not in the second so those taking water in the second event could pay or gain from the mismatch of the previous event. This results in inequitable distribution of the mismatches over time and along the length of the river.

Given unregulated systems are generally highly variable it would create further uncertainty around timing and reliability of access for future events. For this reason reconciling operational responses between events are not supported.

Improving information

Active management will be implemented using existing information including the current hydrometric and rainfall monitoring networks.

We will consider if there are opportunities to reduce flow forecasting uncertainty by increasing flow measurement points. Additional rainfall measurement points may also be considered.

A robust new metering framework to improve the standard and coverage of non-urban water meters across NSW commenced on 1 December 2018. Licensed water users will be required to install compliant metering equipment on works that meet the metering thresholds, by their roll-out date. Improved metering and telemetry will reduce some areas of uncertainty in flow forecasting.

The adaptive management cycle will include review of opportunities to improve flow forecasting by increasing flow measurement points within active management rivers or tributaries of active management rivers. This will be considered along with opportunities to improve rainfall measurement points and tools to better understanding losses.

Adaptive management

An adaptive management approach will be adopted to ensure active management continuously improves and is responsive to improved information, insights, infrastructure, tools or systems.

The management of active environmental water through unregulated rivers is a significant change to the current management arrangements, with many challenges particularly in forecasting river flows and understanding the implications of uncertainty in forecasting flows.

An adaptive management approach will be adopted to ensure there is 'learning by doing' and to allow the approach to be responsive to improved information, insights, infrastructure, tools or systems. This is an important component to ensure the success of active management, allowing arrangements to evolve over time.

Each procedures manual will include an adaptive management procedure so that the implementation of active management can be assessed on a regular basis.

Annual reports and evaluations will be required to inform the review of active management procedures and assess compliance with the procedures manual.

Reporting

Annual reporting is necessary to provide transparency on how active management has been implemented and provides the necessary basis to inform the annual analysis to evaluate the implementation of active management.

This will then inform ongoing improvements to ensure that the objectives of active management are achieved in a manner that recognises the policy principles and responds to new information and insights.

The procedures manual will include details of reporting requirements that will inform the annual review. As a minimum the reports will need to:

- document relevant data – such as forecast and actual river flows, forecast and actual transmission losses, active environmental water protected, environmental water used in-stream, the volume of water available to unregulated licence holders in each management zone, and volume available to each licence if distributed.
- audit implementation against procedure manuals
- document issues arising in implementing active management and any recommendations to address those issues or improve operations
- include feedback from consultation with stakeholders

Review

Department of Planning, Industry and Environment will conduct an annual evaluation and review of the operation of active management. The principles and objectives for Active Management, as set out in this document, will guide the review.

The review should consider whether the objectives of active management, to protect active environmental water from extraction, have been fulfilled. However it will not include, monitoring of environmental outcomes arising from use of the environmental water. This is the responsibility of the environmental water holders.

The procedures manuals will include details of the annual review cycle. It will need to allow for reporting, consultation, evaluation and review, including any amendments to active management procedure manuals to give effect to recommendations arising from the review.

Appendix 1 – Summary of proposed water sharing plan rules and contents of procedures manual

The water sharing plans will:	The procedures manual will document:
<p>Define active environmental water</p> <p>Define the term active environmental water including the broad categories of environmental water that will be actively managed</p>	<p>The criteria and process for determining what is active environmental water</p> <p>What environmental water will be classified as active environmental water in each active management river.</p>
<p>Managing active environmental water</p> <p>Require a licence holder who wants to leave the water permitted to be taken under their licence in - stream to notify the Minister in accordance with the procedures manual.</p> <p>Provide for the water allocation account of an access licence to be debited if water permitted to be taken under the licence is to be used in-stream for environmental purposes in accordance with the procedures manual.</p>	<p>How the volume of active environmental water entering an unregulated river is determined</p> <p>The water sources where a licence holder can request their licence be used in-stream.</p> <p>The process for the environmental water holder to nominate in-stream use of their share of the available water.</p> <p>How the volume of unregulated HEW to be actively managed is to be determined</p> <p>That the volume debited from an unregulated HEW licence account will be actively managed water through the downstream zones or water sources where it will be classified as active environmental water.</p> <p>That the volume of active environmental water is to be reduced as it moves through each management zone or water source based on a proportional share of river transmission losses.</p> <p>Account management processes to debit water from an unregulated HEW account that is nominated for use in-stream</p>
<p>Areas where active management may apply</p> <p>The access rules for water source where active management is applied will be amended.</p> <p>Management zones may be established for active management areas where required.</p>	<p>The area the procedures manual applies to.</p>

The water sharing plans will:	The procedures manual will document:
<p>Access and sharing under active management</p> <p>Provide for flow class thresholds or CtP thresholds to be increased by an amount determined by the Minister in order to protect active environmental water from extraction and/or a volumetric limit to be determined.</p> <p>Provide for flow classes, CtPs and volumetric limits to be announced and announcements to apply for a 24 hour period</p> <p>Provide for Active Management Procedure Manuals to be established</p> <p>Provide for the Minister to announce a share of the available volume that can be taken by an individual licence on a given day</p>	<p>How the amount of active environmental water to be protected is determined (including flow forecasting approaches) and how access is adjusted to protect the active environmental water present – including how CtP thresholds will be adjusted or the volume available to unregulated river access licences will be distributed</p> <p>How announcements are made</p> <p>What an announcement must contain</p> <p>The steps required to make an announcement</p> <p>How any delays in announcements will be managed</p> <p>The maximum volume that can be used in-stream will be the lesser of the licence Individual Daily Extraction Limit (where they exist) or the share of the available flow.</p>
<p>Forecasting flows and managing uncertainty</p>	<p>How initial and ongoing losses are estimated</p> <p>How mismatches in forecast and actual losses are managed</p>
<p>Adaptive management</p> <p>Allow for amendment of access rules to facilitate active management to share flows including requiring the taking of water to be carried out in accordance with Ministerial notices or announcements or to require licence holders to express interest in accessing their entitlement during an event</p>	<p>Monitoring and reporting requirements</p> <p>Reporting and review responsibilities and timeframes</p> <p>Matters to be considered in review</p> <p>Improvement opportunities</p> <p>Requirements and processes for the river operator, environmental water manager, licence holder or other stakeholder representatives to present proposals for changes or improvements to the procedures manuals for consideration.</p>

Appendix 2 – Sources of Uncertainty in flow forecasting

Water use

To forecast flows, assumptions need to be made about the expected water use. An initial assumption that all licence holders will take water available to them would result in a conservative estimate of the *available volume* for downstream reaches.

Unmetered use where metering is not required such as access for basic landholder rights is generally captured in the estimates for river transmission losses.

Tributary inflows

For regulated tributaries there are well-established processes for forecasting flows and there is scope to update forecasts as flows travel down these systems.

However for unregulated tributaries, there is currently no process in place to forecast flows that might reach the active management rivers. For example understanding the timing and volume of outflows from the Macquarie Marshes and the Gwydir wetlands is likely to be less certain than flows from other sources.

While some tributaries of the Barwon-Darling have a flow gauging station near their confluence with the Barwon-Darling, for other tributaries flow gauging stations may be upstream of the confluence, and some forecasting of losses and travel times is required to estimate the inflows to an actively managed stream.

Further consideration is required to understand what scope there is to undertake forecasts, and whether any additional flow gauging stations might be needed.

At times there can also be significant flows from smaller local creeks following heavy local rainfall. These local inflows within an actively managed river may happen quickly, and be more difficult to forecast. It is unlikely that these inflows would be able to be measured in many cases, and active management would need to rely on the river operator to assess the unaccounted differences against expected losses to estimate these inflows.

River transmission losses

River transmission losses include, evaporation from the water surface of the river, seepage, and evapotranspiration from surrounding vegetation

River transmission losses can vary due to a number of factors, including antecedent conditions, prevailing climatic conditions, and the rate of flow in the river.

It has been observed that there is less variation in the seepage loss after flow has been established, but there may be a considerable variation in the “initial seepage loss” as a result of filling depleted weir pools and natural river pools following prolonged drought and saturating dry river bed and banks.

Once flows have been established, seepage losses can be relatively small, as the bed and banks “seal up”. Overall these types of losses are relatively small but dependent on antecedent conditions they may alter from a loss to a gain.

Once water starts to flow out of the banks and across the floodplain, there is a transition period, when for a relatively small increase in height there is a large change in the area inundated and the change in flow is difficult to determine. It can also be difficult to estimate losses when flows break out into anabranch in the system.

Determining river transmission losses

River transmission losses can't be directly measured.

For the operational management of rivers, the river transmission losses are estimated as the unaccounted differences between flow recorded at gauges at the top and bottom of the management zone.

These unaccounted differences can vary unpredictably from day to day.

Forecasts of river transmission losses are normally based on the trends in the unaccounted differences in the preceding days and weeks. Where a significant change in river flows occurs, forecasts of losses might also be based on similar past events.

The unaccounted differences can also be attributed to flow and extraction measurement errors (e.g. a river flow gauge not accurately measuring flow), or routing effects (e.g. where losses vary to a change in the flow path and alterations in travel times).