Department of Climate Change, Energy, the Environment and Water

Background to the Floodplain Management Plan for the Murrumbidgee Valley Floodplain 2025

Background document

July 2025

Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Wiradjuri artist and designer Nathan Peckham from Yurana Creative created Guwunggan*.

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1 Introduction

The Water Group within the NSW Department of Climate Change, Energy, the Environment and Water (the department) is continuing to reform the management of water on the floodplains of inland NSW. Floodplain management plans provide the framework for coordinating the development of flood works on a whole-of-valley basis.

This document provides background to the development of the rules in the *Floodplain management plan for the Murrumbidgee Valley Floodplain 2025* (the FMP) and includes:

- the purpose of statutory floodplain management plans
- the process of plan development including scope, history and basis for decisions
- the activities associated with implementation, monitoring and review of the FMP.

The FMP is a Minister's plan under section 50 of the *Water Management Act 2000*. It will last for 10 years from 1 July 2025 and can be amended at any time if errors are identified and/or it is in the public's best interest.

During the 10-year term, the FMP will be audited by the Natural Resources Commission within the first 5 years and reviewed by the department within the last 5 years. At the end of the 10-year term, it will be replaced with another FMP that will last for 10 years.

This document is part of a range of information available specifically on the FMP including:

- the *Floodplain management plan for the Murrumbidgee Valley Floodplain 2025* — a legal instrument written in its required statutory format as published on the NSW Legislation website
- rule summary sheet — a fact sheet summarising the rules for flood works in each management zone in the FMP published on the department's website
- plan maps — A0 pdf versions of the maps that are listed in the plan and published on the department's website
- interactive spatial map — an online mapping tool to view the floodplain boundary, management zones and identified ecological assets on the floodplain. You can also find the floodplain management plan spatial dataset on the NSW Government's SEED portal for use in your own geographic information system.

More information about how floodplain management plans work and the planning process is available on the department's website.

1.1 Why are floodplain management plans being prepared?

Floodplain management plans (FMPs) are made under the *Water Management Act 2000* (WM Act) and provide the framework for coordinating flood work development to:

- minimise future changes to flooding behaviour

- improve the environmental health of floodplains
- increase awareness of risk to life and property from the effects of flooding.

FMPs establish management zones and rules which provide clarity about where flood works may be constructed on the floodplain and to streamline the approval process for new and amended flood works. Flood works are structures that alter the flow of water to/from a river or alter the movement of floodwater during a flood.

Flood works are built on rural floodplains to enhance the agricultural productivity of land used for grazing, dryland cropping and irrigated cropping. Examples of flood works include levees, earthworks, banks and channels that are constructed to protect crops, stock and properties from flooding; to provide on-farm access; and to manage irrigation, stock and domestic water.

In NSW, all flood works require a flood work approval. Some activities considered low-risk or covered by other legislation may be exempt from an approval. Please see the Exemptions to flood work approvals fact sheet on WaterNSW's website for more information.

To find out more about the flood work approval processes undertaken by WaterNSW, please see the WaterNSW approvals webpage.

The FMPs being developed across southern inland NSW consolidate and update historical floodplain management arrangements to:

- meet the requirements of the WM Act
- establish consistent rules for flood works across the floodplain
- improve the coordinated regulation of flood works across the floodplains of the Murray–Darling Basin.

Floodplain management plans cannot provide a comprehensive response to flooding

The roles and responsibilities of local government and NSW Government agencies in floodplain management and flood risk management are outlined in the NSW Flood Prone Land Policy and Flood risk management Manual (2023).

Improvements to flood risk mitigation were considered through the 2022 NSW Flood Inquiry. Read the inquiry report and the NSW Government response.

As part of developing FMPs, the department provides all modelling information to the relevant Commonwealth, state, and interstate emergency management agencies so that it may assist in their future flood predictions. FMPs set rules for flood works on declared floodplains. They do not deal with flood mitigation or flood response.

2 Scope of the Murrumbidgee Valley FMP

The FMP establishes management zones and rules which provide clarity about where flood works may be constructed on the floodplain and to streamline the approval process for new and amended flood works.

The department is delivering multiple programs across the Murrumbidgee region. While they do not operate in isolation, it's important to note that the plan is unrelated to the department's Reconnecting River Country Program, which is focused on removing constraints to enable more flexible use of water for the environment. For more information on this program, visit: Reconnecting River Country Program.

The FMP does **not** deal with:

- the licensing of floodplain harvesting or other forms of water take
- environmental water management
- cultural watering plans
- access to land for cultural purposes
- the modification or removal of existing flood works — FMPs set rules for the assessment and determination of applications for flood work approvals. They do not set requirements for the removal of flood works
- flood mitigation or actions to manage localised flooding issues — while many historical FMPs included action plans, FMPs prepared under the WM Act only set rules for the assessment and determination of applications for flood work approvals
- emergency flood response.

2.1 Objectives of the FMP

Part 2 of the plan sets the objectives, strategies and performance indicators of the plan. Performance indicators are used to measure the success of the strategies in achieving the objectives of the plan, as shown in the examples in Table 1.

Each strategy may contribute to achieving one or more of the objectives, and one or more performance indicators may be measured to evaluate each of the objectives.

External influences on the floodplain, such as long and short-term climate trends and land use change, may affect progress toward achieving the objectives of the plan.

Table 1: Linkage between objectives, strategies and performance indicators in the FMP

Objective	Strategy	Performance indicator	Understanding the linkages
Facilitate the orderly passage of floodwater through the floodplain	• Delineate a floodway network that accurately represents the passage of floodwater in the floodplain. • Establish management zones with rules and assessment criteria for the granting or amending of flood work approvals in the floodplain. • Establish rules and assessment criteria for flood work approvals that ensure adequate flood connectivity is maintained in the floodplain.	• Extent to which the floodway network map accurately represents the passage of floodwater in the floodplain. • Extent to which flood works, approved in accordance with the rules and assessment criteria in Part 7, and constructed or modified after the commencement of the FMP have altered the hydraulic behaviour of floodwater in the floodplain.	The floodway network map is used to inform the delineation of the management zones. Clause 4 establishes management zones in the floodplain and the provisions in Part 7 establish rules and assessment criteria for flood work approvals specific to each management zone. The plan map shows the extent of the management zones throughout the floodplain. Information about the hydraulic behaviour of monitored floods and approved flood works will be used evaluate this objective.

More information about monitoring, evaluation and reporting is available in section 4 Implementing the floodplain management plan of this background document.

2.2 Plan maps

The plan includes a series of maps that assist in interpreting or applying the rules and assessment criteria.

The **plan map** shows the floodplain boundary and extent of the management zones throughout the floodplain. This map assists landholders in determining what part of their property is wholly or partially within the floodplain, what management zones have been applied throughout their property and, consequently, which rules and assessment criteria in Part 7 of the plan apply.

The **floodway network map** identifies areas of the floodplain where the risk to life and property from the effects of flooding are the greatest. The identification of these areas satisfies the requirement under the WM Act for the FMP to include provisions that deal with the risk to life and property from the effects of flooding.

The **ecological assets map** shows all flood-dependent ecological assets and other floodplain ecosystems throughout the floodplain. Reference to this map is needed when applying the rules and assessment criteria in Part 7 of the plan.

The **peak flood flow distribution map** shows the location of the peak discharge calculation points, and the direction of flood flows throughout the floodplain. A peak discharge calculation location is a section of the floodplain where the flow during the large design flood event is calculated for the purpose of assessing the change in flow behaviour due to proposed flood works. Reference to this map is needed when applying the rules and assessment criteria in Part 7 of the plan.

The plan maps are available in multiple ways to support the implementation of the plan:

- A0 pdf versions of the maps are published on the department's website
- Interactive spatial map — a state-wide online mapping tool to view the floodplain boundary, management zones and identified ecological assets on the floodplain.
- You can also find the floodplain management plan spatial dataset on the NSW Government's SEED portal for use in your own geographic information system.

3 Developing the Murrumbidgee Valley FMP

The department's Water Group coordinates the preparation of FMPs. The planning process is guided by a technical manual for rural floodplain management plans under the *Water Management Act 2000*, available on the department's website.

A variety of tools and information, including hydrologic and hydraulic modelling, mapping, information about ecological and cultural assets, and information about existing floodplain development is used to inform the preparation of FMPs.

The floodplain management planning approach is a 10-step process that includes:

- defining the floodplain boundary (Step 1)
- identifying hydraulic, ecological, cultural and socio-economic information about the floodplain to be used in decision-making (Steps 2–6)
- delineating management zones and developing rules (Steps 7–9)
- assessing the socio-economic impacts of the proposed floodplain management plan (Step 10).

Information about these steps is provided in the following sections.

3.1 The Murrumbidgee Valley Floodplain boundary

As part of the commencement of the FMP, the department has amended the *Water Management (General) Regulation* to:

- repeal the Murrumbidgee River Hay to Maude floodplain

- repeal the Murrumbidgee Old Man and Sandy Creeks (Currawarna to Narrandera) floodplain
- replace part of the Billabong Creek Floodplain (Walbundrie to the junction of Wangamong Creek with Billabong Creek)
- establish the Murrumbidgee Valley Floodplain.

The Murrumbidgee Valley Floodplain (the floodplain boundary), shown in Figure 1, is the area to which the FMP applies. The floodplain boundary extends downstream from Wagga Wagga in the east to the junction of the Murray and Murrumbidgee rivers in the west. The floodplain includes the northern end of the Yanco and Colombo creek systems, as well as the Gum Creek anabranch.

The floodplain will connect with the floodplain boundaries for the FMPs being developed for the Billabong Creek, NSW Murray and Lachlan valleys, improving the assessment of cumulative impacts from individual flood works across the southern Murray–Darling Basin.

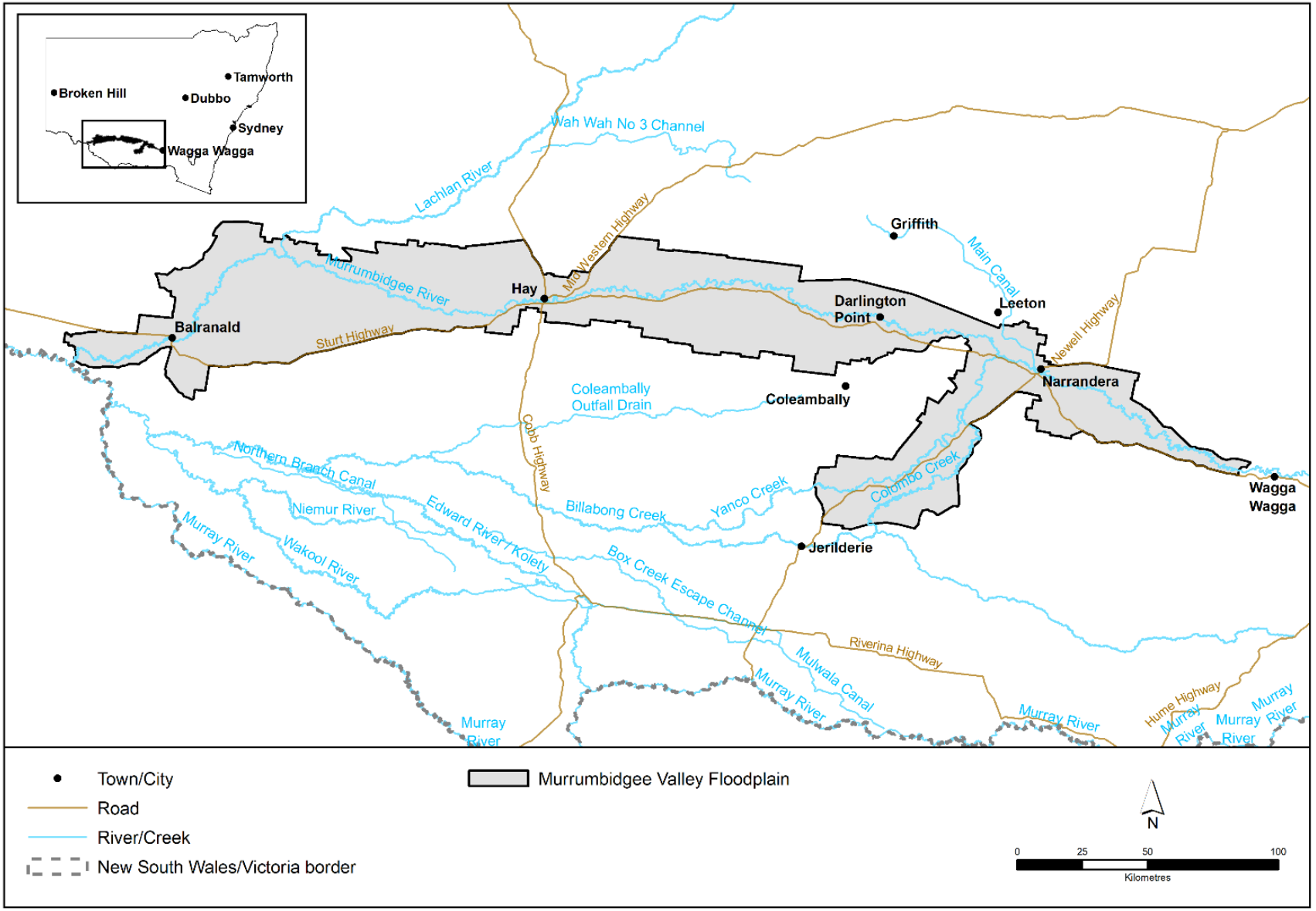
A combination of hydraulic and administrative factors, where appropriate, have been used to develop the floodplain boundary including:

- inundation data within the Murrumbidgee catchment
- hydraulic model development
- the historical localised Hay to Maude FMP (now repealed)
- water source boundaries, as established in water sharing plans
- local government areas
- major roads and railways which act as barriers to large scale flood movement.

The department sought community feedback on the proposed floodway network during Stage 1 public consultation. In response to feedback received, the department made two refinements to the floodplain boundary. The feedback received and the changes made in response can be viewed in the What we heard during Stage 1 public consultation report. No further changes were made to the floodplain boundary following Stage 2 public exhibition.

The floodplain boundary is published on the department's website on the **Plan Map** (Figure 1) (FMP039_Version 1). A state-wide interactive spatial map that includes the floodplain boundary is available on the department's Water website. You can also find the floodplain management plan spatial dataset on the NSW Government's SEED portal for use in your own geographic information system.

Figure 1: Map of the Murrumbidgee Valley Floodplain



3.2 Determining the floodway network

The FMP will coordinate flood work development on the floodplain to ensure that floodwater can move freely to and from rivers and creeks. To do this, an understanding of how water moves across the landscape when it floods is required.

Five hydraulic models were developed to simulate the movement of floodwater through river channels, wetlands and the wider floodplain during the large and small design floods. This modelling process identifies areas of the floodplain that have the deepest and fastest flowing floodwater and pose the greatest risk to life and property. These areas are known as floodways, and together with areas of ponding, they make up the floodway network which is described below.

The floodway network is published on the department's website on the **Floodway Network map** (FMP040_Version 1).

The floodway network is comprised of **floodways** and the **inundation extent** (ponding areas) and has been defined by:

- mapping the outputs of the hydraulic modelling
- considering the floodway networks in the historical FMP and floodplain development guidelines, and aligning with them where appropriate
- reviewing additional flood photography and satellite imagery.

The department sought community feedback on the proposed floodway network during Stage 1 public consultation. In response to feedback received, the department made 15 refinements to the floodway network. The feedback received and the changes made in response to feedback can be viewed in the What we heard during Stage 1 public consultation report.

Further refinements were made to the floodway network following Stage 2 public exhibition in response to feedback about the extent of the management zones. These changes were to ensure consistency between the floodway network and the management zones. More information about refinements made to the management zones following Stage 2 public exhibition can be found in section 3.7.1 Management zones.

More information about how the hydraulic models and the floodway network were developed is available in Appendix 1 Development of the floodway network.

3.2.1 Design floods

A design flood is a flood of known magnitude that can be modelled and used for planning or engineering purposes. They are usually based on recorded historical events that are preferably within the living memory of a community. Selection of a design flood is based on an understanding of flood behaviour and associated flood risk. Multiple design floods are often selected to account for the social, economic, ecological and cultural consequences associated with floods of different magnitudes.

Design flood events that are selected will be described through the following attributes:

- the flood event that it is based on (month, year)
- where the data is taken from, such as a section of river and associated gauge
- the probability of an equivalent (or larger) flood event occurring in any given year, known as the annual exceedance probability (AEP).

A large design flood is a large magnitude flood event that generally has a 5% or less probability of occurring in any given year (AEP) while a small design flood is a smaller magnitude flood event that has at least a 10% probability of occurring in any given year (AEP). There may be some slight variances in the AEP associated with a large or small design flood because of the nature of the flood event that the design flood is based on.

The FMP has been developed using 2 design floods of different magnitudes. Five hydraulic models were created to simulate the movement of these design floods through the river channels and floodplain. The following design floods were used to model the floodway network:

- large design flood of March 2012: 2% AEP at the Murrumbidgee River at Narrandera gauge (410005)
- small design flood of October 2016: 14% AEP at the Murrumbidgee River at Narrandera gauge (410005).

More information on how the design floods were selected, and the associated hydraulic models is available in Appendix 1 Development of the floodway network.

The department sought community feedback on the proposed design floods during Stage 1 public consultation. No changes were made to the design floods in response to public feedback. The feedback received during Stage 1 public consultation and the department's response can be viewed in the What we heard during Stage 1 public consultation report. No changes were made to the design floods following Stage 2 public exhibition.

3.2.2 About the floodway network

3.2.2.1 Floodways

Throughout a floodplain, there will be pathways of fast-flowing floodwater during times of flood. These areas are floodways and are part of the floodway network. They are often aligned with naturally defined channels. Floodways are high-risk areas that, even if only partially blocked, would cause significant changes in the movement of floodwater across the floodplain. It is a critical area of the floodplain as it allows water to leave or return to a river or creek during times of flood or deliver floodwater to ecological assets and Aboriginal cultural values that depend on it.

Floodways pose the greatest risk to life and property during times of flood.

3.2.2.2 Inundation extent (ponding areas)

Along the floodways there will be areas where floodwater breaks out (flood discharge) and forms ponds. These areas are known as the inundation extent and are also part of the floodway network. The inundation extent is critical to storing floodwater during times of flood. Without these areas, the depth and speed of the floodwater in the floodway would dramatically increase. It is important that flood works constructed in these areas are coordinated so that they do not block inundation, particularly during large floods.

3.2.2.3 Other areas of the floodplain

The remaining area of the floodplain can be categorised as **flood fringe** areas or **flood-protected areas**. These areas do not form part of the floodway network. The flood fringe is an area which may be flooded but is not considered critical in the flow of water during times of flood. Flood-protected areas do not receive floodwater. This may be due to the area being higher ground or the presence of existing flood works prevents the passage of floodwater.

3.2.3 Consideration of unapproved flood works

The development of the floodway network includes consideration of existing flood works in the landscape, such as levees, embankments and roads. Each of these features can have a significant impact on the movement of floodwater and must be accounted for in the hydraulic models. Some of these flood works do not have a flood work approval. A process for determining how unapproved flood works were considered in the development of the floodway network is shown in Figure 3 in Appendix 1 Development of the floodway network.

This process considers:

- the potential flooding impacts of the unapproved work
- whether the impact is contained within the landholding or if it impacts on other neighbouring properties
- whether the impacted area is recognised as a floodway within the historical FMP and guidelines for floodplain development.

Unapproved flood works are a significant issue for many local landholders. To report concerns regarding unapproved works, please visit the NRAR website at www.nrar.nsw.gov.au/suspicious-activites

You can also contact NRAR on 1800 633 362 during business hours or via email nrar.enquiries@nrar.nsw.gov.au

3.3 Identified Aboriginal cultural assets and values

Aboriginal cultural assets and values on the floodplain can be:

- flood-dependent, such as waterholes, fish traps or scarred trees that require inundation
- flood-impacted, such as Aboriginal burial grounds or shell middens that can be damaged by scour and erosion caused by flooding or directly during the construction of a flood work.

Aboriginal cultural assets and values on the floodplain are identified in the FMP to support their protection and restoration, which in turn provides social and economic benefits to the community. Healthy waterways and floodplains are critical to the culture and wellbeing of Aboriginal people. Water provides food, kinship, connection, recreation, stories, songlines and healing.

The FMP aims to protect Aboriginal cultural assets and values on the floodplain by establishing rules for flood works to:

- prevent direct damage that may be caused during the construction of flood works
- prevent an increase in erosion that may result from changes to flood flows
- maintain the flow of floodwater to Aboriginal cultural values that need this water to survive.

Aboriginal cultural assets and values within the floodplain are registered on the Aboriginal Heritage Information Management System (AHIMS). Identified Aboriginal cultural assets and values have been considered in the mapping of the management zones. For more information, see section 3.7.1 Management zones.

As part of assessing and determining an application for a flood work approval, a search of AHIMS must also be conducted. To ensure that Aboriginal cultural assets and values are protected from impacts associated with flood works, the department has been explaining and promoting the use of AHIMS as part of consultation with Aboriginal communities.

The department sought community feedback on the identified Aboriginal cultural assets and values on the floodplain during Stage 1 public consultation. For more information on consultation with Aboriginal communities in the floodplain, including the feedback received, please see:

- Appendix 2 of the Report to assist Stage 1 public consultation
- the What we heard during Stage 1 public consultation report
- the Water we heard during Stage 2 public exhibition report.

Information on how FMPs can protect Aboriginal cultural assets and values and the AHIMS database is also available on the department's website (navigate to 'Developing floodplain management plans and then 'Community consultation').

3.4 Identified heritage sites

Heritage sites may be sensitive to changes in flood behaviour or disturbance from flood work construction. Heritage sites are cultural heritage objects and places as listed on the following Commonwealth, state and local government heritage registers:

- Australian Heritage Database
- NSW Aboriginal Heritage Information Management System
- NSW Historic Heritage Information Management System
- NSW State Heritage Register.

Some Aboriginal cultural assets and values may also be listed on heritage registers and are discussed in the previous section.

During the development of the FMP there were no identified flood-dependent heritage sites in the floodplain other than Aboriginal cultural assets and values that are dependent on or connected with flooding. However, some heritage sites, such as historic buildings or cemeteries, may be flood-impacted as they could be damaged by flooding or directly impacted during the construction of a flood work.

The FMP aims to protect heritage sites in the floodplain by establishing rules for flood works to:

- prevent direct damage that may be caused during the construction of flood works
- prevent an increase in erosion that may result from changes to flood flows
- maintain the flow of floodwater to heritage that need this water to survive (should any flood-dependent heritage sites be identified in the future).

As part of assessing and determining an application for a flood work approval a search of the State Heritage Inventory must be conducted. This online search tool holds information about most statutory protected heritage items in NSW, including the NSW State Heritage Register. Find out more about heritage listed items and significant sites in NSW by visiting the Heritage NSW website.

The department sought community feedback on the identified heritage sites on the floodplain during Stage 1 public consultation. Feedback received in response to the identified heritage sites presented during Stage 1 public consultation can be viewed in the What we heard during Stage 1 public consultation report.

3.5 Identified ecological assets and values

A key objective of the FMP is to maintain flood connectivity to flood-dependent ecological assets. This means that flood works should not block the floodways that connect them to floodwaters.

Flood-dependent ecological assets rely on flooding to maintain their ecological character and sustain essential processes. Flood-dependent ecological assets are identified in FMPs to support their protection, which in turn provides social and economic benefits to the community.

A similar process was applied in the historical Hay to Maude FMP (now repealed) with the identification and inclusion of flood-dependent ecosystems and 'areas of possible wetland value', and the requirement for flood works to be assessed against section 166 of the *Water Act 1912* (repealed) and Part 5 of the *Environmental Planning and Assessment Act 1979* to ensure connectivity to identified ecological sites and protection of fish passage.

Within the floodplain, the following types of ecological assets were identified as part of the development of the FMP:

- flood-dependent ecological assets, that are within the floodway network:
  - semi-permanent wetlands (non-woody)
  - other flood-dependent ecosystems, including floodplain wetlands (flood-dependent shrubland wetlands), flood-dependent forest/woodland (wetlands) and flood-dependent woodlands
- other floodplain ecosystems, that are outside of the floodway network.

The identified ecological assets are published on the department's website on the **Ecological asset map** (FMP041_Version 1).

An interactive spatial map that includes the ecological assets is available on the department's Water website. You can also find the floodplain management plan spatial dataset on the NSW Government's SEED portal for use in your own geographic information system.

As part of assessing and determining an application for a flood work approval, a search of this spatial dataset must be undertaken. All applications for a flood work approval must demonstrate that flood or flow connectivity is maintained to these ecological assets. More information about the applicable rules and assessment criteria for flood works is provided in section 3.7.2 Rules for flood works in each management zone.

3.5.1 About the identified flood-dependent ecological assets

The ecological assets are categorised according to the flooding requirements of their vegetation communities, which correlates to the degree of connectivity required to the floodway network. For example, wetlands and their associated vegetation communities are highly flood-dependent and therefore will either be located within the floodway network or have a direct connection to the floodway network.

The ecosystems also provide important habitat for native fish, amphibians, reptiles, waterbirds, woodland birds and mammals, and invertebrate and microbial biota. Habitats for fish (and fish passage), waterbirds and other water-dependent fauna have been identified and were considered in the development of the FMP.

The ecological assets have been identified using the best available vegetation mapping and survey information, including the NSW State Vegetation Type Map[1] and wetland mapping. More information about how ecological assets have been identified and categorised is available in Appendix 3 Ecological asset identification and categorisation.

The department sought community feedback on the identified ecological assets during Stage 1 public consultation. In response to feedback received, the department made refinements to the identified ecological assets in 10 areas. The feedback received and the changes made in response to feedback can be viewed in the What we heard during Stage 1 public consultation report. Further refinements were made to the identified ecological assets prior to Stage 2 public exhibition and prior to commencement to remove:

- assets that were no longer visible within developed or cultivated areas
- minor erroneous assets that overlapped major water infrastructure
- isolated trees in areas that have previously been cleared
- gardens associated with rural dwellings and outbuildings.

3.6 Socio-economic information

There are approximately 43,000 people in the floodplain, with urban centres providing the population hubs[2]. The floodplain includes the urban areas of Narrandera, Darlington Point, Hay, Maude and Balranald. The city of Wagga Wagga is located outside of the floodplain boundary and flood risk management is the responsibility of Wagga Wagga City Council.

There are 11 local government areas covered within the floodplain boundary including:

- Balranald Shire Council
- Carathool Shire Council
- Coolamon Shire Council
- Federation Council
- Griffith City Council
- Hay Shire Council
- Leeton Shire Council
- Murray River Council

[1] Department of Planning and Environment (2022) NSW State Vegetation Type Map. Release C1.1.M1.1 (December 2022)

[2] Australian Bureau of Statistics Data by region 2011-2023, by ASGS Statistical Level 2 (ASGS Edition 3 (2021 – 2026)) https://dbr.abs.gov.au/index.html

- Murrumbidgee Council
- Narrandera Shire Council
- Wagga Wagga City Council.

The floodplain covers the traditional lands of the Wiradjuri, Nari Nari and Muthi Muthi peoples.

Agriculture is the significant economic activity of the region's economy. The dominant agricultural uses on the floodplain are grazing, and annual and permanent crop producers. Cropped areas are more intensive in the upper reaches between Wagga Wagga and Darlington Point. Further west, grazing becomes more dominant, particularly in the Lowbidgee area of the floodplain. Annual crops grown in the region include cotton, rice, potatoes, wheat, oats, barley and lucerne (hay). Permanent crops include almonds, olives, viticulture, nectarines/peaches and oranges. The highest value crops being cotton (annual) and almonds (permanent)[3].

Based on engagement activities undertaken for Stage 1 public consultation, private landholders in the floodplain range from small family-owned farms to large corporate agribusinesses with major irrigation infrastructure.

To enhance agricultural productivity, works have been built on the floodplain to improve land used for irrigated cropping, perennial horticulture, dryland cropping and grazing. Typically, flood works such as levees, earthworks, banks and channels are built to protect crops, land, stock and properties from flooding, provide on farm access, and to deliver and store irrigation, stock, and domestic water. Delivery of water is also supported by flood works owned and managed by irrigation corporations and private irrigation districts. It is the construction and use of these flood works, both existing and proposed, that is affected by the FMP.

More information about the region's economy and an assessment of the impact of the FMP is available in section 3.9 and Appendix 5 Socio-economic impact assessment.

3.7 Management zones and rules

The FMP aims to manage the construction or modification of flood works on the floodplain by:

- **establishing management zones** that reflect the presence and movement of floodwater during times of flood, and
- **applying rules and assessment criteria specific to each management zone** that protect the passage of floodwater while minimising the risk to life and property from the effects of flooding.

3.7.1 Management zones

The management zones are published on the department's website on the **Plan Map** (FMP039_Version 1). An interactive spatial map that includes the management zones is available on

[3] Economic base case assessment for the NSW Murray and Murrumbidgee regions (May 2024)

the department's website. You can also find the floodplain management plan spatial dataset on the NSW Government's SEED portal for use in your own geographic information system.

The management zones represent the hydraulic, ecological or Aboriginal cultural (or combination of) attributes of the land. No attribute was given precedence over another. Instead, a classification tool, shown in Figure 2, was applied to each area of the floodplain to determine the appropriate management zone.

Based on the management zone assigned, the relevant rules and assessment criteria apply. These rules are detailed in section 3.7.2 and are reflective of the nature of the area and associated impact that a flood work may have on the movement of flood water and risk to life and property.

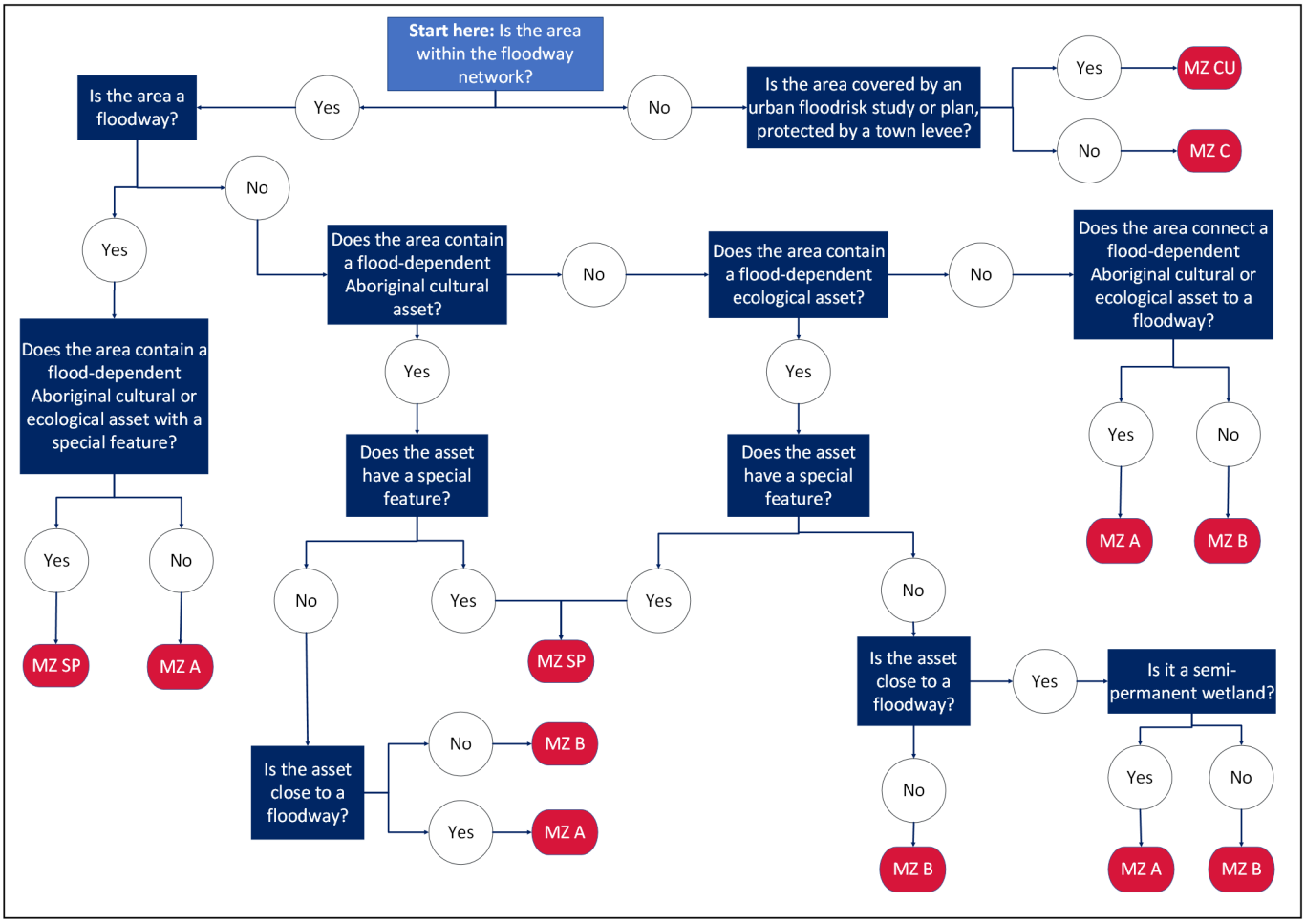
The percentage of the floodplain covered by:

- management zone A (predominantly floodways) is 8.3%
- management zone B (inundation extent and flood storage) is 34.6%
- management zone C (flood fringe) is 54.6%
- management zone CU (urban areas) is 0.3%
- management zone SP (special protection) is 2.2%

More information about the application of the management zone classification tool (Figure 2) is available in Appendix 4 Management zone classification.

The floodway network forms the basis of the management zones. More information about the delineation of the floodway network is available in section 3.2 Determining the floodway network and Appendix 1 Development of the floodway network.

Figure 2: Management zone classification tool



The department sought feedback on the proposed management zones, particularly at a property scale, during Stage 2 public exhibition. In response to feedback received during public exhibition, the department made multiple refinements to the spatial extent of the management zones prior to the commencement of the FMP. These refinements are shown on the maps in Appendix 2 of the What we heard during Stage 2 public exhibition report.

3.7.2 Rules for flood works in each management zone

In NSW all flood works require a flood work approval unless an exemption applies.

Part 7 of the plan sets the rules and assessment criteria which aim to restrict the types of flood works constructed in management zones A and SP while ensuring comprehensive rules and assessment criteria are applied to all flood works throughout the floodplain.

This section describes the types of flood works that can be submitted for a flood work approval. A rule summary sheet is also available on the department's website.

For more information on exempt flood works, please refer to the Exemptions to flood work approvals fact sheet on WaterNSW's website. For more information on the flood work approval processes undertaken by WaterNSW, please see the WaterNSW approvals webpage.

3.7.2.1 Management zones A and SP rules

The construction of a flood work in a floodway (management zone A) can significantly increase the risk to life and property during times of flood; both on the property where the flood work is constructed and on neighbouring properties.

Areas which contain flood-dependent ecological assets that have a special feature (management zone SP), such as important wetlands, are vulnerable to the impacts of flood works. Further, they are heavily reliant on floodwater to survive.

Due to the reasons explained above, flood works proposed to be constructed in management zone A and SP are restricted to specific types that are essential for the protection of life and property, or improvement of the floodplain. Each type of flood work permitted will be subject to size or height restrictions to ensure the impact on the passage of floodwater is minimised. Please refer to Table 2 for more information.

There are additional types of flood works permitted for those that were constructed prior to the commencement of the FMP. All flood works in management zone A and SP will be assessed using the **standard assessment criteria** while enhancement flood works will also be assessed using the **hydraulic assessment criteria**.

Table 2: Types of flood works permitted in management zones A and SP and associated specifications

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
Standard access road (within a property)	To ensure landholders have basic provisions to access property.	Permitted in management zone A Not permitted in management zone SP	Permited in management zone A and SP	**Maximum height** of 30 cm above the natural surface of the ground. **Causeways** at least every 200 m, at the lowest point of the floodway, are no higher than the natural surface of the ground and comprise at least 10% of the total length of the road within management zone A. **Borrow** associated with construction/maintenance is located on the downstream side of the access road and is no deeper than 15 cm below the natural surface of the ground.
Primary access road (to/from a house)	To further ensure landholders have basic provisions to access	Permitted in management zone A Not permitted in	Permited in management zone A and SP	**Maximum height** of 50 cm above the natural surface of the ground. **Causeways** at least every 200 m, at the lowest point of the floodway, are no higher than the natural surface of the ground and

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
	property or evacuate during a major flood event by permitting higher level roads that directly service homes.	management zone SP		comprise at least 10% of the total length of the road within management zone A. **Borrow** associated with construction/maintenance is located on the downstream side of the access road and is no deeper than 15 cm below the natural surface of the ground.
Supply channel	To ensure landholders can access water rights from water sources.	Permitted in management zone A Not permitted in management zone SP	Permited in management zone A and SP	**Height** must be below the natural surface of the ground. **Allow** for the passage of floodwater and prevent diversion of water. **Spoil** associated with construction/maintenance must be located in a heaped line parallel to flow direction with a maximum height of 10 cm above the natural surface of the ground and not block more than 5% of the width of management zone A (at the location of the channel and perpendicular to flow direction).
Stock refuge	To account for animal welfare and to minimise a landholder's potential to lose stock to floodwaters.	Permitted in management zone A Not permitted in management zone SP	Permited in management zone A and SP	**Maximum area** of 10 hectares and no other stock refuge in that area. **Total maximum area** of all stock refuges is no more than 5% of total property area. **Does not block** more than 5% of the width of management zone A (at the location of the refuge and perpendicular to flow direction).
Infrastructure protection work	For protecting high value infrastructure such as homes and	Permitted in management zone A Not permitted in	Permited in management zone A and SP	**Maximum area** enclosed by the work is: • 10% of the total area of the property if the maximum area of management zone A on the property is no more than 20 hectares, or

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
	sheds. To minimise the risk to life and property from flooding.	management zone SP		• 2 hectares or 1% of the total area of the property (whichever is largest) if the maximum area of management zone A on the property is more than 20 hectares. **Does not block** more than 5% of the width of management zone A (at the location of the work and perpendicular to flow direction).
Flood enhancement works (Aboriginal cultural, ecological or heritage site)	To improve flood connectivity to a recognised flood-dependent ecological or Aboriginal cultural or heritage site.	Permited in management zone A and SP	Permited in management zone A and SP	**The primary purpose must be to improve flood connectivity** to a flood-dependent ecological asset, Aboriginal cultural value or heritage site. **The improvement in flood connectivity must contribute to the protection or conservation** of one or more flood-dependent ecological assets, Aboriginal cultural values or heritage sites. **Must be part of an active government program** such as the Reconnecting River Country Program, a cultural watering plan or a natural resource management project with Local Land Services. **Comply** with both the standard and hydraulic assessment criteria.
Protection works (Aboriginal cultural or heritage site)	For protecting flood-impacted cultural sites such as burial grounds/ cemeteries, heritage buildings or shell midden sites that may be damaged by	Permited in management zone A Not permitted in management zone SP	Permited in management zone A and SP	**Demonstrate protection** for a flood-impacted Aboriginal cultural asset or heritage site listed on AHIMS or Heritage register. **Does not block** more than 5% of the width of management zone A (at the location of the work and perpendicular to flow direction) **Maximum area** enclosed by the work is: • 10% of the total area of the property if the maximum area of management zone A on the property is 20 hectares, or

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
	erosion or inundation.			• 2 hectares or 1% of the total area of the property (whichever is largest) if the maximum area of management zone A on the property is greater than 20 hectares.

3.7.2.2 Existing flood works in management zones A and SP

For flood works that were constructed in a floodway (management zone A) or within an area that contains a flood-dependent ecological asset that has a special feature (management zone SP) prior to the FMP commencing, there are some variations in the types of works permitted and associated rules. These variations are designed to ensure that a flood work approval can be obtained.

The existing flood work must not be the subject of an undetermined or previously refused application for a flood work approval. If an existing flood work, of the type listed below, cannot comply with the specifications listed in Table 2, a flood work approval may be granted, if it complies with the standard assessment criteria:

- access roads (standard and primary)
- stock refuge
- infrastructure protection work
- supply channel.

In addition to the types listed in Table 2, existing above ground supply channels are permitted within management zones A and SP, subject to complying with the standard assessment criteria.

The rules for existing works are intended to provide a pathway for the approval of some relatively minor flood works. They are not intended for the retrospective approval of major irrigation infrastructure.

3.7.2.3 Management zones B, C and CU

Any type of flood work will be permitted in management zones B, C and CU. All flood works in management zones B, C and CU will be assessed using the standard assessment criteria.

Larger flood works in management zone B and flood works that may cause a significant impact in management zones C and CU will also be assessed using the hydraulic assessment criteria.

Please refer to section 3.8.2, Table 3 and Table 4 for more information.

Some flood works are exempt from requiring a flood work approval in management zones B, C and CU. For more information on exempt flood works, please refer to the Exemptions to flood work approvals fact sheet on the WaterNSW website.

3.7.2.4 Advertising requirements

The requirement to advertise a flood work application applies in management zone B, when the flood work is:

- greater than 40 cm above the natural surface of the ground, or
- a stock refuge with a maximum area larger than 10 hectares and no other stock refuge in that area, or
- a stock refuge on a property and the total maximum area of all stock refuges is larger than 5% of total property area, or
- an infrastructure protection work with an area that is larger than 1% of the total area of the property.

When a flood work application is required to be advertised, the hydraulic assessment criteria will also apply. This is because flood works that exceed the above thresholds are assumed to be larger in area and/or height there is a need to manage impacts on neighbouring properties, areas of Aboriginal cultural significance, heritage sites and the environment.

3.7.2.5 Existing flood works in management zone B

Across the Murrumbidgee, Billabong Creek, NSW Murray and Lachlan valleys, landholders and peak water user groups have consistently raised concerns about having to get flood work approvals for existing flood works in areas that are outside of the FMPs historically made under the *Water Act 1912*. Of particular concern is irrigation infrastructure and access roads or farm tracks that have been in place for decades.

In many cases, there is a lack of awareness of what constitutes a flood work and the legal requirement for a flood work approval, including areas without an in-force FMP. However, the objections mostly relate to the cost and inconvenience of having to get a flood work approval.

In response to this feedback, a unique, temporary rule set has been included in the FMP for existing flood works in management zone B (inundation extent).

Unapproved flood works located in management zone B that were constructed prior to 3 December 1999 will be required to meet the standard assessment criteria only. The relevance of 3 December 1999 is the commencement of the *Water Amendment (Flood Control Works) Act 1999* which made provision for the approval of works that may affect or prevent flooding.

This temporary rule provides a pathway for the approval of existing flood works constructed prior to 3 December 1999 by simplifying the assessment process and potentially avoiding the cost of having to prepare a flood study.

However, if an existing unapproved flood work in management zone B:

- has the potential to impact high value infrastructure such as roads, railways or dwellings, or
- has existing flood works nearby that have a limited height condition, or

- may create a new or restore an old flood flow path,

the flood work must be advertised and meet the hydraulic assessment criteria, including cumulative impact assessment. This may require a flood study (hydraulic modelling). This assessment will ensure that impacts on neighbouring properties and the environment are avoided or minimised.

This rule will only apply for the first three years following commencement of the FMP (until 30 June 2028) to encourage landholders to obtain a flood work approval.

Proposed new flood works or modification of existing approved flood works would continue to be assessed against the standard assessment criteria and hydraulic assessment criteria as outlined in section 3.8.2, Table 3 and Table 4.

3.7.2.6 Flood works in management zones C and CU

For flood works that were constructed in management zones C or CU prior to the FMP commencing, the same rules and assessment criteria apply for both new and existing flood works.

Applications for flood works in management zones C and CU will not require advertisement.

3.7.3 Assessment criteria

Part 7 of the FMP specifies the assessment criteria, which are common throughout each management zone. However, there are some criteria which may not be applied in certain management zones or only applied to certain types of flood works. There are two sets of assessment criteria:

1. **Standard assessment criteria** (Table 3) which applies to all flood works, and
2. **Hydraulic assessment criteria** (Table 4) apply to the following types of flood works:
    a. enhancement flood works in management zones A and SP
    b. flood works in management zone B that require **advertisement** (larger works) unless constructed prior to 3 December 1999[4], or
    c. flood works constructed prior to 3 December 1999 in management zone B[5] or flood works in management zone C or CU, which:
        i. may impact high value infrastructure such as roads, railway or dwellings, or
        ii. have existing flood works nearby that have a limited height condition, or
        iii. may create a new or restore an old flood flow path.

[4] This provision for works constructed prior to 3 December 1999 only applies until 30 June 2028

[5] This provision for works constructed prior to 3 December 1999 only applies until 30 June 2028

If a flood work is required to comply with the hydraulic assessment criteria, the cumulative impact criteria within the standard assessment criteria does not apply. This is because a cumulative impact assessment is undertaken as part of the hydraulic assessment criteria.

The purpose of the assessment criteria is to manage impacts on neighbouring properties, areas of Aboriginal cultural significance, heritage sites and the environment. This is consistent with the water and floodplain management principles as set out in sections 5(2) and 5(6) of the WM Act. The use of hydraulic modelling is generally required to demonstrate that the hydraulic assessment criteria has been met. The cost for hydraulic modelling will vary depending on the scale and nature of the flood work. However, the average cost is approximately $10,000.

All types of flood works are permitted within management zones B, C and CU subject to complying with the requirements and assessment criteria specified in Table 3 and Table 4.

Table 3: Summary of the standard assessment criteria for flood work applications in each management zone

Note: A cross means that the assessment criteria does not apply in this management zone

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Impacts to ecological assets, Aboriginal cultural assets or heritage sites	**Maintain adequate flood connectivity** under a range of flood scenarios, including the large and small design flood, to flood-dependent ecological assets, flood-dependent Aboriginal cultural assets, flood-dependent heritage sites and facilitate fish passage[6]. **Maintain adequate flow connectivity** to floodplain ecosystems (in areas outside of the floodway network). **Not disturb the ground surface or cause erosion** to an Aboriginal cultural asset or heritage site during construction or modification of the work.	✓	✓	✓	✓	✓
Drainage impacts	**Maintain adequate drainage** in areas on the property, including neighbouring properties, that may be affected by the flood work.	✓	✓	✓	✓	✓

[6] Fish passage refers to connectivity that allows native fish species to move between upstream and downstream habitats as well as adjacent riparian and floodplain areas. Areas of key fish habitat include rivers, creeks and flood flow paths and are available on the Fisheries NSW spatial data portal.

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Cumulative impacts	**Consider the cumulative impact** of the flood work and other existing works located on the property to adjacent properties, any other properties affected by the flood work and the floodplain environment.	✓ Not required for flood enhancement works as these works are required to meet the hydraulic assessment criteria	✗	✗	✗	✓ Not required for flood enhancement works as these works are required to meet the hydraulic assessment criteria

Table 4: Summary of the hydraulic assessment criteria for flood work applications in each management zone

Note: Hydraulic modelling is generally required to demonstrate that these assessment criteria have been met.

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Redistribution of flood flow	**Maximum 5% redistribution of peak flood flow** on neighbouring properties that may be affected by the flood work (compared to peak flood flow under existing development conditions for a range of flood scenarios including the large design flood).	✓ Flood enhancement works only	✓ For works that require advertisement and existing flood works constructed prior to 3 December 1999 that may have significant impacts	✓ In limited circumstances	✓ In limited circumstances	✓ Flood enhancement works only
Change in flood levels	**Maximum 10 cm increase in flood levels** on neighbouring properties that may be affected by the flood work (compared to flood levels under pre-development and existing development conditions for a range of flood scenarios including the large design flood). **Not increase flood levels** that would result in impacts to high value infrastructure (compared to flood levels under pre-development and existing development	✓ Flood enhancement works only	✓ For works that require advertisement and existing flood works constructed prior to 3 December 1999 that may have	✓ In limited circumstances	✓ In limited circumstances	✓ Flood enhancement works only

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
	conditions for a range of flood scenarios including the large design flood).		significant impacts			
Change in flood flow velocity	**Maximum 50% increase in flood flow velocity** on the property and neighbouring properties that may be affected by the flood work (compared to flood flow velocity under pre-development and existing development conditions for a range of flood scenarios including the large design flood) unless: • increases greater than 50% are isolated on the property and average impact across the property is less than 50%, and • increases are not greater than 50% at the property boundary. **Not increase flood flow velocity** that would result in more than minimal soil erosion on the property and neighbouring properties that may be affected by the flood work taking into account the ground cover on those properties.	✓ Flood enhancement works only	✓ For works that require advertisement and existing flood works constructed prior to 3 December 1999 that may have significant impacts	✓ In limited circumstances	✓ In limited circumstances	✓ Flood enhancement works only

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Redistribution of flood flow **(Cumulative impact)**	**Maximum 5% redistribution of peak flood flow** at any of the peak discharge locations shown on the peak flow distribution map (compared to redistribution under existing development conditions). **Maximum 5% redistribution of peak flood flow** at any location and under any other flood scenario considered relevant by the Minister.	✓ Flood enhancement works only	✓ For works that require advertisement	✓ In limited circumstances	✓ In limited circumstances	✓ Flood enhancement works only

3.8 Consideration of historical planning arrangements

Consideration was given to the historical floodplain management arrangements in the following statutory and non-statutory documents when developing the FMP. Further, the boundaries of the existing designated floodplains have been incorporated into the boundary of the Murrumbidgee Valley Floodplain.

As part of the commencement of the FMP, the department has:

- repealed the Murrumbidgee River Hay to Maude Floodplain Management Plan (2014), and
- amended the *Water Management (General) Regulation* to:
  - repeal the Murrumbidgee River Hay to Maude floodplain
  - repeal the Murrumbidgee Old Man and Sandy Creeks (Currawarna to Narrandera) floodplain
  - replace part of the Billabong Creek Floodplain (Walbundrie to the junction of Wangamong Creek with Billabong Creek)
  - establish the Murrumbidgee Valley Floodplain.

In addition to the above statutory arrangements, the plan replaces the following historical non-statutory guidance documents:

- Guidelines for Sandy and Poison Waterholes Creeks Floodplain Development Kywong to Narrandera
- Guidelines for Floodplain Development: Old Man Creek
- Guidelines for Floodplain Development: Murrumbidgee River Beremed to Narrandera
- Lowbidgee Management Plan Stage One Protected Lands and Floodway Scheme (1989).

A comprehensive comparison of the historical localised FMP against the rules in the new FMP is provided in Appendix 5 Comparison with historical planning arrangements.

3.9 Assessing socio-economic impacts of the FMP

A socio-economic impact assessment is a useful tool to help understand the potential range of impacts of a proposed change, and the likely response if the change occurs. This understanding can help design impact mitigation strategies to minimise negative and maximise positive impacts of any change.

A qualitative assessment was undertaken to consider the potential impacts of the FMP. This assessment, as outlined in Appendix 6 Socio-economic impact assessment includes information about the nature of the change, the groups who are impacted by the FMP, benefits of the FMP and measures to mitigate and manage potential impacts.

The assessment found that while there are some localised negative impacts on individual landholders, there are significant benefits from the implementation of the FMP that are expected to outweigh these localised negative impacts.

3.10 Other components of the FMP

There are several other components of the FMP which, in some instances, do not directly relate to the rules for flood work approvals and criteria that will be used to assess applications.

Under the WM Act, an FMP must include provisions that relate to the:

- preservation and enhancement of water quality
- monitoring and reporting requirements
- conditions that a flood work approval will have applied
- circumstances when the FMP may be amended
- identification of existing and natural flooding regimes (frequency, duration, nature and extent)
- identification of ecological benefits of flooding
- identification of existing flood works (management, benefit, ecological impacts and cumulative impacts)
- risk to life and property from the effects of flooding.

Each of the requirements and how it is met in the FMP is described below.

3.10.1 Water quality

Part 2 of the FMP sets the objectives, strategies and performance indicators of the FMP. The performance indicators are used to measure the success of the strategies in achieving the objectives of the FMP, as described in section 2.1.

The FMP sets the following objective in relation to the preservation and enhancement of water quality: contribute to the protection of water quality within the floodplain to support flood-dependent ecosystems and social, cultural and economic values.

The first strategy designed to achieve this objective is the establishment of rules and assessment criteria for flood work approvals that ensure flow velocity is minimised in the floodplain. This prevents erosion and consequential impacts on water quality.

The second strategy designed to achieve this objective is the proposed mandatory condition that requires all flood works to minimise erosion during construction and use.

3.10.2 Mandatory conditions

As required under the WM Act, part 8 of the FMP specifies the conditions that apply to flood work approvals. These are known as mandatory conditions.

The first mandatory condition in the FMP requires notice to be given to WaterNSW of an intention to decommission an **approved** flood work and again when the flood work has been decommissioned. The decommissioning process is to ensure that the area where the approved flood work is located is returned to the height of the natural surface of the ground and that potential flooding impacts on neighbouring properties that may result from the removal of the flood work are considered.

When an approved flood work is decommissioned, the flood work approval will either require amendment to remove the individual flood work (for example, removed from the list of works and/or from the associated map) or be surrendered.

The second mandatory condition in the FMP requires erosion to be prevented during the construction and use of a flood work. This aims to protect water quality and is described in section 3.10.1.

If deemed appropriate, the Minister may apply a discretionary condition to a flood work approval at any time. This may involve conditions related to the protection of the environment. If a decision is made to apply a discretionary condition, the approval holder will be provided with a written notice and will be given a reasonable opportunity to make a submission on the proposed discretionary condition.

3.10.3 Amendment provisions

Under the WM Act the FMP may be amended at any time, if it is in the public's best interest. The department keeps a record of any requests for amendment via an amendment register. Amendment of the FMP requires approval from the Minister for Water and concurrence from the Minister for the Environment.

Administrative amendments, that do not change the intent of existing rules or correct a typographical error, will generally not involve public consultation. Conversely, any amendment that may impact on existing flood work approval holders or other landholders within the floodplain will involve a public consultation period including a formal submission process.

As required under the WM Act, part 9 of the FMP specifies the circumstances when an amendment may occur during the 10-year term. These include:

- amending any of the maps
- refining the management zones
- amending the design flood events used to map the floodway network
- refining the rules and assessment criteria.

The historical localised FMP required that any review should explore the capacity of the plan to adapt to address climate change impacts on flood risk exposure, flood-dependent ecosystems and rural economies. In response to this requirement, the department has committed to amending the FMP within the first 3 years (before 1 July 2028) to include rules and assessment criteria that consider the effects of climate change.

The department is currently working to collect and analyse information on predicted changes to flooding as a result of climate change, which will underpin any future changes to the FMP. Further public consultation will be undertaken before any rules are introduced in the FMP relating to climate change.

3.10.4 Existing and natural flooding regimes

Part 3 of the FMP identifies the existing and natural flooding regimes within the floodplain. This identification does not relate to any rule or assessment criteria but is required under the WM Act.

The natural flooding regime is characterised by flood events prior to any development on the floodplain while the existing flooding regime is characterised by changes in flooding following development on the floodplain.

The FMP has used the construction of the Blowering and Burringjuck dams and the Snowy Mountain Scheme as the defining feature for development on the floodplain.

As required under the WM Act, the natural and existing flooding regimes are identified in terms of nature, frequency, duration and extent.

3.10.5 Benefits of flooding

Part 4 of the FMP identifies the benefits of flooding, both to the identified flood-dependent Aboriginal cultural assets and values and flood-dependent ecological assets within the floodplain. This identification does not relate to any rule or assessment criteria but is required under the WM Act.

To assist in enhancing the benefits of flooding to Aboriginal cultural assets, ecological assets and heritage sites that are flood-dependent, the FMP includes rules and assessment criteria that allow for the construction of flood enhancement works.

3.10.6 Existing flood works

Part 5 of the FMP identifies the types and extent of existing approved flood works within the floodplain. It also outlines the benefits in terms of the protection the flood works provide to life and property, and the cultural, socio-economic and ecological impacts of the flood works including the cumulative impacts. This part of the FMP does not relate to the rules or assessment criteria for flood works but is required under the WM Act.

There are approximately 48 flood work approvals covering 89 flood works within the floodplain for the following types of flood works:

- access roads
- infrastructure protection works
- levees
- stock refuges

- storages
- supply channels (above and below ground).

3.10.7 Risks from flooding

Part 6 of the FMP identifies the risks to life and property from the effects of flooding in the floodplain and clarifies how the FMP addresses these risks. This identification does not relate to any rule or assessment criteria but is required under the WM Act. The floodway network map contributes to this identification (see section 3.2).

The primary risks to life and property include:

- loss of life
- physical injury and illness
- damage to or loss of property, goods, possessions, livestock and crops
- financial costs
- emotional stress including mental illness
- restricted access to/from property.

The FMP considers the risk to life and property from the effects of flooding by identifying the floodway network including high risk areas (floodways), restricting the types of flood works permitted within high-risk areas and raising awareness of flood risk.

3.11 Interagency review

An interagency working group is responsible for reviewing draft FMPs on a whole-of-government basis and considers the advice provided by technical staff and comments received from stakeholders during public consultation. Key experts from the NSW Department of Primary Industries and Regional Development (agriculture and fisheries interests) and the NSW Department of Climate Change, Energy, the Environment and Water (Aboriginal, water and environmental interests) are represented on this interagency working group. Experts from the Natural Resources Access Regulator and WaterNSW may also attend meetings of the interagency working group to provide advice on consultation activities and other matters relevant to their expertise.

The interagency working group reviewed the preparation of the FMP at three key stages:

- prior to Stage 1 public consultation (March 2024)
- prior to Stage 2 public exhibition (July 2024)
- prior to the preparation of the final FMP for commencement (December 2024).

All feedback from consultation processes for the preparation of FMPs is reviewed by the interagency working group prior to updating the plan.

3.12 Consultation

Consultation for the development of the FMP was undertaken using a two-stage process:

Stage 1 public consultation (25 March to 5 May 2024)

Submissions were invited on key elements including the boundary, floodway network, floodplain assets and default plan rules. This included confirming and verifying property scale information, which enabled the department to respond to stakeholder feedback and, where appropriate, make changes to the key elements prior to developing the draft FMP for public exhibition.

The comments received during initial public consultation were considered by the interagency working group before the draft FMP was prepared and released for public comment during Stage 2 public exhibition.

An overview of Stage 1 public consultation, the feedback received, and the department's response is available in a What we heard during Stage 1 public consultation report, published on the department's website.

Stage 2 public exhibition (19 August until 29 September 2024)

The draft FMP was formally exhibited for a minimum period of 40 days and public information sessions were held within the plan area to provide information on the development of the draft management zones, the draft rules and how to make a submission.

An overview of Stage 2 public exhibition, the feedback received and the department's response is available in a What we heard during Stage 2 public exhibition report, published on the department's website.

Feedback and submissions received during Stage 2 public exhibition were considered by the interagency working group before the final FMP was submitted to the Minister for Water for approval and the Minister for Environment for concurrence in early 2025.

Once concurrence was received from the Minister for the Environment the FMP was returned to the Minister for Water for final approval. The FMP commenced on 1 July 2025 and was published on the NSW Legislation website.

4 Implementing the FMP

4.1 Implementation

While the department's Water Group is responsible for the development of FMPs under the WM Act, responsibility for their implementation sits across multiple government departments and agencies. Table 5 provides an overview of these responsibilities.

Table 5: Summary of the government departments and agencies that are responsible for the implementation of the FMP

Department/agency	Responsibilities
WaterNSW	• Receive, assess and approve flood work applications • Supply data and information to external stakeholders/ customers to support the preparation of flood work applications • Notify mandatory conditions to existing approval holders
Water Group	• The Licensing & Approvals team receive, assess and approve flood work applications from their customers. • Provide plan interpretation advice to WaterNSW and Licensing & Approvals to assist with flood work approval assessments. • Update models and spatial data based on new flood works in the landscape to enable a cumulative assessment to be undertaken by WaterNSW and Licensing & Approvals. • Management of data products, supply of data products to WaterNSW and Licensing & Approvals to support flood work approvals. • Periodically review and amend FMPs within the provisions of the WM Act. • Maintain amendment register. • Consulted as part of the audit of FMPs by the Natural Resources Commission. • Develop and apply mandatory conditions for flood work approvals.
Natural Resources Access Regulator (NRAR)	• Conduct compliance activities on flood work approvals.
Natural Resources Commission (NRC)	• Audit FMPs under section 44 of the WM Act.
Local government	• Integrated development applications can consider FMPs but don't require a flood work approval.
NSW Department of Planning	• Integrated development applications can consider FMPs but don't require a flood work approval.

4.2 Monitoring, evaluation and reporting

To demonstrate whether the objectives of the FMP are being achieved, the department will undertake monitoring, evaluation and reporting which will assess key performance indicators. The

monitoring and evaluation will use multiple lines of evidence. It will involve assessment of all new flood works and will include:

- Hydraulic assessment with updated hydraulic models to examine any predicted changes to flooding behaviour and if there are any potential impacts to other property, ecological and cultural assets.
- Hydrological and spatial assessment of flood events that occurred in the 10-year term of the FMP to determine if there are any major obstructions or changes to inundation extent and compare/validate hydraulic modelling where applicable.
- Use of modelling and flood data to assess floodway network connectivity, the passage of floodwater in the floodplain and connectivity to ecological and cultural assets.
- Identification of any changes to the management zones or rules that could further facilitate the FMP in meeting its key objectives.

Within the first five years of the 10-year term of the FMP, the Natural Resources Commission will also undertake an audit to determine whether the provisions are being given effect to. This includes the objectives, strategies and performance indicators.

5 Appendices

5.1 Appendix 1 Development of the floodway network

Computer-based hydraulic models are used to simulate the movement of floodwater across the landscape for the large and small design floods. Modelling data, as well as additional information such as flood imagery and topographical information, is used to map the floodway network. This appendix describes the design floods and the hydrologic and hydraulic modelling that has been used to develop the floodway network for the floodplain.

5.1.1 Design floods

A design flood is a flood of known magnitude or annual exceedance probability (AEP) that can be modelled. A design flood forms the basis of the floodway network, and this information is used as the hydraulic basis when developing the management zones in an FMP. Selection of a design flood is based on an understanding of flood behaviour and associated flood risk. Multiple design floods may be selected to account for the social, economic and ecological consequences associated with floods of different magnitudes.

Two design floods were selected for the floodplain:

- large design flood – March 2012 (2% AEP at the Murrumbidgee River at the Narrandera gauge)
- small design flood – October 2016 (14% AEP at the Murrumbidgee River at the Narrandera gauge).

AEP is the chance of a flood of a given or larger size occurring in any given year, usually expressed as a percentage (%) or a likelihood of 1 flood in *x* years. For example, a flood with an AEP of 5% means there is a 5% chance that a flood of the same size or larger will occur in any given year.

A flood frequency analysis was done to assist with the selection of the design floods, shown in Table 6. The flood frequency analysis was used to determine the relationship between peak flood discharge at a location of interest and the likelihood that a flood event of that size or greater would occur.

Table 6: AEP for historic flood events at selected locations in the Murrumbidgee Valley Floodplain

Location (gauge number)	Reason for gauge selection	1974 flood event AEP (%)	2010 flood event AEP (%)	2012 flood event AEP (%)	2016 flood event AEP (%)	2022 flood event AEP (%)
Murrumbidgee River at Wagga Wagga (410001)	Has a long-term flow record and a reliable high flow estimate	0.7	13	2.5	20	11

Location (gauge number)	Reason for gauge selection	1974 flood event AEP (%)	2010 flood event AEP (%)	2012 flood event AEP (%)	2016 flood event AEP (%)	2022 flood event AEP (%)
Murrumbidgee River at Narrandera (410005)	Has a long-term flow record and a reliable high flow estimate	1.1	10	2.1	14	5.9
Murrumbidgee River at Darlington Point (410021)	Has a long-term flow record and a reliable high flow estimate	1.0	7.7	1.4	6.7	2.9
Murrumbidgee River downstream of Hay Weir (410136)	Has a long-term flow record and a reliable high flow estimate	4.4	13	4.4	8.3	2.2

The large design flood (March 2012) was used to delineate floodways with significant discharge and to determine the extent of the floodway network. The large design flood was selected as:

- it is a recent large flood and is likely to be in the collective memory of floodplain communities
- it is representative of large floods in the floodplain
- there is a significant amount of information available for the event.

The large design flood (March 2012) is a 2% AEP flood event at the Murrumbidgee River at Narrandera gauge. This larger event was selected because of the consistent AEP values throughout the floodplain (2.5% AEP upstream to 4.4% AEP downstream) compared to other large flood events, such as the 2022 flood event. Specifically, the 2022 flood event was 11% AEP at the Wagga Wagga gauge (upstream) and 2.2% AEP at the Hay Weir gauge (downstream).

The small design flood (October 2016) is a 14% AEP flood event at the Murrumbidgee River at Narrandera gauge. This smaller event was selected to ensure that critical flow paths were identified in the floodway network, where the modelled inundation extent of this event is compared to the identified floodways to ensure the accuracy of the network.

5.1.2 Hydraulic modelling

The floodplain was divided into five reaches for hydraulic modelling purposes. These reaches are described in Table 7 and shown in Figure 3.

A suite of advanced one-dimensional (1D) and two-dimensional (2D) computer simulation software for hydraulic modelling of flood behaviour in rural and urban settings, known as TUFLOW, was used for each of the five reaches. The study area was modelled in the 2D domain with key structures, such as culverts, incorporated as 1D elements. Successful calibration and validation of the hydraulic

models allowed historical flood events, including design flood events, to be replicated with an acceptable degree of accuracy.

For the purpose of defining acceptable degrees of accuracy, a hydraulic modelling standard specification was developed. It stipulates that all models need to be within 200 mm of inundation depths (based on gauge data and spot elevations) and 5% of the inundation width (based on aerial photography and satellite imagery).

5.1.2.1 Hydraulic model data and parameters

Hydraulic models have several parameters that need to be calibrated to correctly represent how floodwater behaves across the floodplain. The choice of values for these parameters can significantly affect the accuracy of the model outputs and lead to incorrect delineation of the floodway network. Some of these parameters include:

- Hydrometric and hydrologic model data: Recorded (gauged) hydrograph data was used as boundary inflows for the hydraulic models.
- Boundary conditions: Each model identifies the inflow conditions at the upstream start of the project area and outflow conditions at the downstream finish of the project area.

  Representation of inflows is critical so that the model has the appropriate volumes and flow rates within the study area. Similarly, at the downstream boundary, water needs to be removed from the model at the correct rates to avoid artificially increasing or decreasing flooding.
- Topographic information: A digital elevation model of the existing floodplain topography was developed using a range of topographic datasets acquired from available bathymetry, river cross sectional surveys and Light Detection and Ranging (LiDAR) laser surveying.
- Grid size: The model grid size, which is the spatial distance between calculation points, can have a significant impact on the accuracy of results. In particular, if areas with a high variation in topography are represented too coarsely, the flow distribution between different flow paths will be impacted. Grid sizes used in the hydraulic models for the floodplain are presented in Table 7.
- Hydraulic structures: All bridges, culverts, weirs, and regulators likely to impact flow along key watercourses and across adjoining floodplain areas were also included in the models as either 1D or 2D structures. In general, structures that were less than the model grid cell size wide (e.g., smaller floodplain culverts) were represented as 1D structures.

  It is important that all structures on the floodplain are represented in the model with a high level of accuracy. If structures are not represented correctly, they will behave differently. For example, water may overtop a levee sooner in the model than it does in reality, or water may be constricted by a bridge to a greater degree in the model than in reality.

  Data for all significant structures in the model area were captured by ground survey in previous studies (e.g. Reconnecting River Country Program) and many remaining structures were measured during field inspections.
- Existing hydraulic models: Specific information such as surveyed topographical data and hydraulic structures information from previous developed hydraulic models within the study area

were extracted and used in the hydraulic models developed for the Murrumbidgee River Floodplain.

- Land use / vegetation: Available land use and vegetation layers covering the study area were used to inform the “roughness" of the ground surface. Floodwater moves more slowly through dense vegetation compared to a cleared field. As part of the calibration process, flood observations, such as gauge data, satellite imagery, flood images, or footage, are compared to the model results, and the parameters like roughness are modified if the model is not aligning with the observed information.
- Satellite imagery - Sentinel and Landsat: Available satellite (Sentinel and Landsat 8) imagery of various dates during selected flood events were used for hydraulic model calibration and validation.
- Data collected during previous flood events: Flood information such as local flood levels, flow directions, flood extents and inundation duration collected during previous community consultation has been used for hydraulic model calibration and validation. Throughout June, July and August 2023, landholders and local councils provided a range of data including ground and aerial flood level imagery and identification of areas where flood flow connectivity was compromised. To date, the department has collected an abundance of flood images, some drone footage and a significant number of verbal accounts of the 2022 flood event across all four valleys. While not used as a design flood, the 2022 flood was one of the events used to validate the models. There was also an abundance of historical flood information provided such as historical flood photos and descriptions of floodplain behaviour during past events from the 1950s to 2016.
- Existing flood works: A range of natural and constructed embankments extending across the floodplain, such as levees, rail, and road embankments, were included in the hydraulic models. Each of these features can have a significant impact on the movement of floodwater. Some of these flood works do not have a flood work approval.

A process for determining how unapproved flood works were considered in the development of the floodway network is shown in Figure 4. This process considers the potential flooding impacts of the unapproved work, whether the impact is contained within the landholding or if it impacts on other neighbouring properties and whether the impacted area is recognised as a floodway within the historical planning arrangements. A summary of the historical planning arrangements in the floodplain is provided in Appendix 5 Comparison with historical planning arrangements.

Unapproved flood works are a significant issue for many local landholders. To report concerns regarding unapproved works, please visit the NRAR website at nrar.nsw.gov.au/report-suspicious-water-activities

You can also contact NRAR on 1800 633 362 during business hours or via email at nrar.enquiries@nrar.nsw.gov.au

Table 7: Hydraulic models in each reach of the Murrumbidgee Valley Floodplain

Floodplain model reach	Model grid cell size	Model description
Wagga Wagga to Narrandera	20m	A TUFLOW 1D/2D grid model was built from upstream of Wiradjuri Bridge at Wagga Wagga to the Newell Highway bridge at Narrandera. The major watercourses within this reach include Houlaghans Creek, Sandy Creek, Boggy Creek, Redbank Creek, Old Man Creek and Bullenbong Creek.
Narrandera to Darlington Point	20m	A TUFLOW 1D/2D grid model was built from the Newell Highway bridge at Narrandera to the Bridge Street bridge at Darlington Point. The model also includes the flow split between the Murrumbidgee and Yanco Creek.
Darlington Point to Hay Weir	40m	A TUFLOW 1D/2D grid model was built from Bridge Street at Darlington Point Bridge to 4.5km downstream of Hay Weir. The major tributary inflows within this reach include Uri Creek, Bringagee Creek and Gum Creek.
Hay Weir to Murray River confluence	40m	A TUFLOW 1D/2D grid model was built from 4.5km downstream of Hay Weir to the confluence with the Murray River. The model extends on both the northern and southern floodplains, including the Gayini/Nimmie-Caira system as well as the Redbank and Yanga areas.
Yanco Creek and Colombo Creek	20m	A TUFLOW 1D/2D grid model was built along Yanco Creek from the Murrumbidgee River to downstream of the Kidman Way bridge. The model also includes the Colombo Creek system.

Figure 3: The five reaches of the hydraulic models within the Murrumbidgee Valley Floodplain

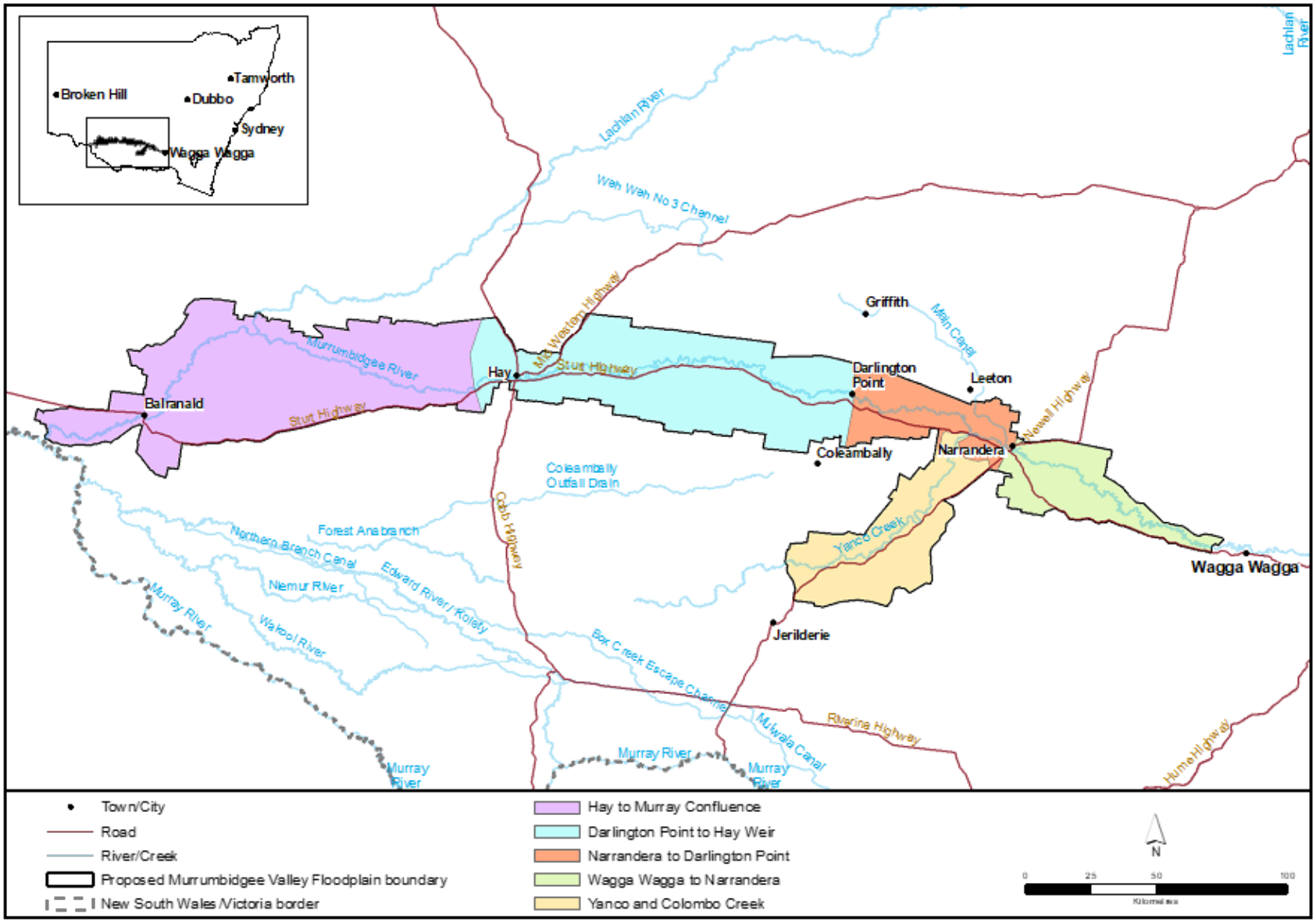
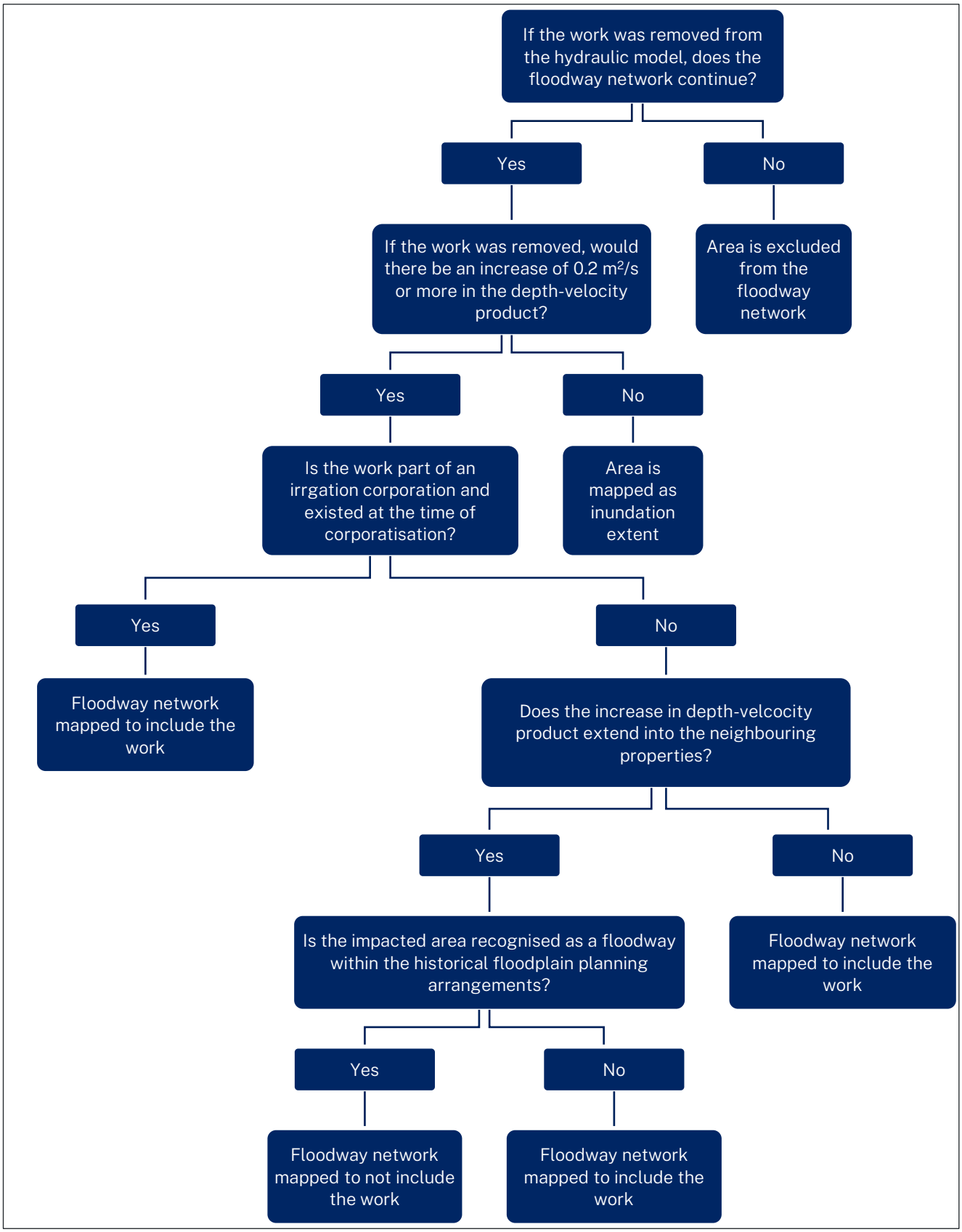


Figure 4: Process for determining how an unapproved work was considered in the development of the floodway network



5.1.4 Hydrologic modelling

Flood flow data at various points across the floodplain is a key input in the hydraulic models that are used to map the floodway network. Within the Murrumbidgee Valley Floodplain, flood flows were derived from mainstream and tributary streamflow gauges, while flows for ungauged tributaries were estimated using hydrologic models simulating rainfall-runoff on a catchment by converting storm rainfall to flow hydrographs. Watershed Bounded Network Model (WBNM) software was used to develop the hydrologic models in this study.

Hydrologic models were developed for the following ungauged tributaries:

- Gap Creek
- Bullenbong Creek
- Sandy Creek
- Cowabbie Creek.

CatchmentSIM was used to automatically calculate key hydrologic properties for each sub catchment in WBNM. WBNM incorporates a non-linear routing calculation to account for routing of flows along watercourses within each sub catchment.

Historic rainfall for the Beavers Creek at Mundowey gauge (410137) was applied to the WBNM models. This gauge was selected as it is centrally located to each WBNM model, and it includes recorded rainfall for all calibration and validation floods.

As there are no stream gauges located within the WBNM model areas, it was not possible to complete a direct calibration of the WBNM models against historic stream flow records. Therefore, a joint validation was performed with the TUFLOW hydraulic model using the gauge inflows only and gauge inflows plus WBNM inflows. Then, the simulated flow and water level hydrographs at the Berembed Weir and Beavers Creek at Mundowey stream gauges were compared with and without the WBNM flows to understand whether the WBNM inflow provided an improved reproduction of the recorded water level information.

The simulated inundation extents for each of the WBNM tributaries were compared against Sentinel and Landsat flood imagery to confirm the inflows, and when combined with the TUFLOW model results, were providing reasonable reproduction of the observed inundation extents. This comparison was limited by the availability of flood imagery for these tributaries.

5.1.5 Hydraulic model calibration and validation

The hydraulic models were calibrated and validated using selected historic flood events that are around the design flood magnitude and are likely to activate all flood flow paths.

The following flood events were used for calibration and validation:

- March 2012 flood event as the large calibration event (the large design flood)
- October 2016 flood event as the small calibration event (the small design flood)
- November 2022 flood event as the validation event.

The models were calibrated against a range of data sources, particularly:

- peak flood heights at streamflow gauge locations
- available flow distribution calculations for the existing non-statutory floodplain development guidelines
- the peak discharge magnitude and timing at streamflow gauge locations
- flood extents from satellite imagery and aerial photography.

A summary of the peak recorded flows and water levels during the 2016, 2012 and 2022 flood events for calibration and validation of the hydraulic models is presented in Table 8.

Table 8: Peak recorded flows and water levels during selected flood events for calibration and validation of hydraulic models

Gauge	2016 flood water level (mAHD*)	2016 flood flow (ML/day)	2012 flood water level (mAHD)	2012 flood flow (ML/day)	2022 flood water level (mAHD)	2022 flood flow (ML/day)
Murrumbidgee River at Narrandera	145.40	82,275	146.38	212,164	145.89	136,027
Murrumbidgee River at Darlington Point	125.03	67,438	125.61	107,875	125.47	96,684
Yanco Creek at Morundah	128.09	5,262	129.00	7,846	128.60	10,282
Columbo Creek at Morundah	128.15	2,490	128.41	4,038	128.22	2,878
Murrumbidgee River at Hay	86.92	55,057	87.20	66,378	87.34	73,794
Murrumbidgee River at Balranald	61.14	30,103	61.05	26,026	61.45	46,659

*mAHD means elevation in metres with respect to the Australian Height Datum.

A summary of the hydraulic models' calibration results is presented in Table 9.

Table 9: Summary of hydraulic models' calibration results for peak inundation depth differences (metres)

Gauge	Small calibration event	Large calibration event
Murrumbidgee River at Narrandera	-0.1	-0.06
Murrumbidgee River at Darlington Point	0.04	-0.19
Yanco Creek at Morundah	0.23	0.21
Columbo Creek at Morundah	-0.07	0.05
Murrumbidgee River at Carrathool	-0.06	0.02
Murrumbidgee River at Hay	-0.27	-0.04
Murrumbidgee River at Balranald	0.11	-0.09

Overall, the TUFLOW model results agreed well with recorded in-bank flow estimates and agree with documented flood extents.

5.1.6 Hydraulic model outputs

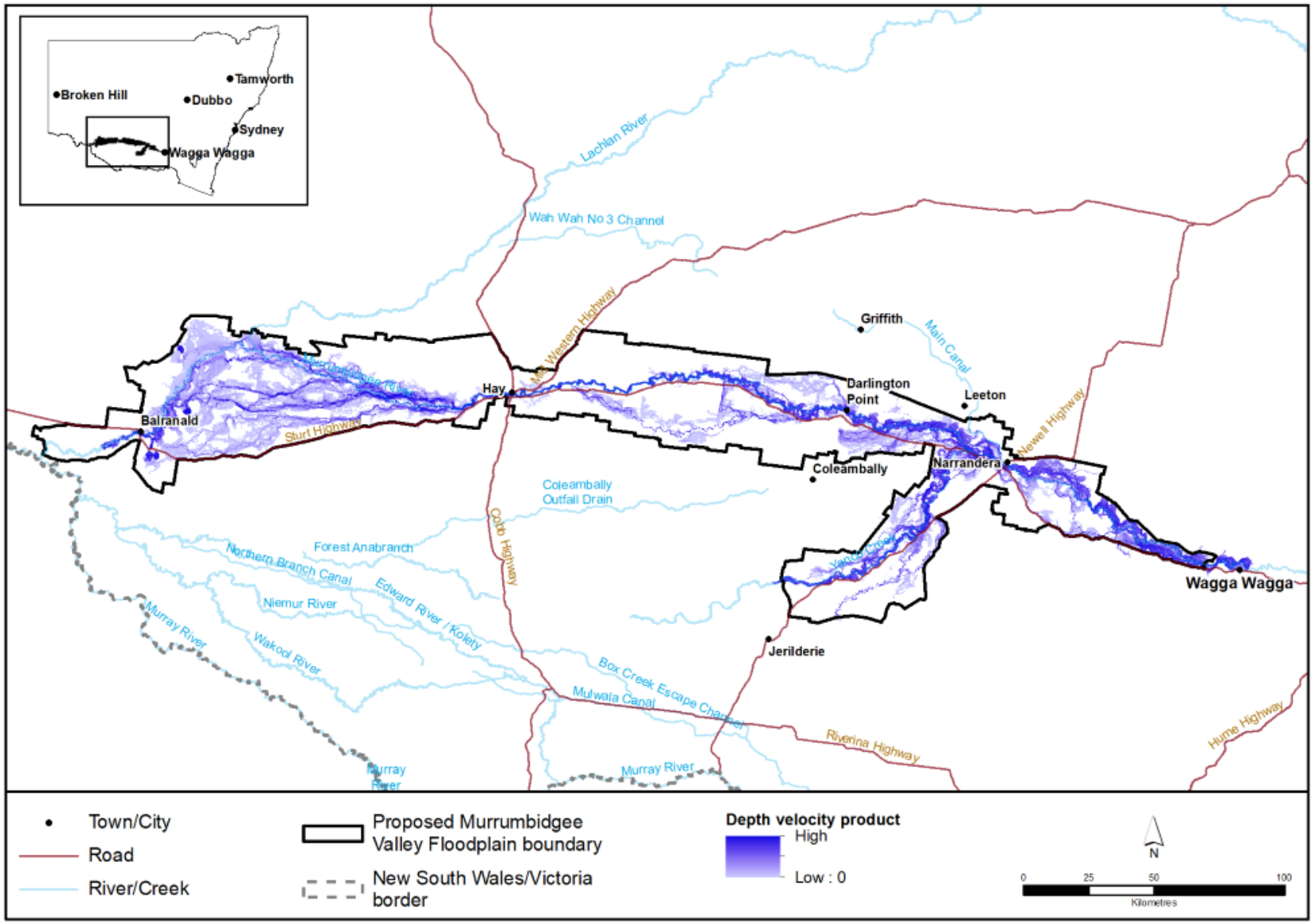
The hydraulic model outputs used to develop the floodway network included:

- depth-velocity product maps for the large design flood (March 2012, Figure 5).
- inundation extents for the small design flood (October 2016) and the large design flood (March 2012).

A depth-velocity product is derived by multiplying the modelled depth and velocity results at each calculation point. This is used to indicate areas of high flow (deep and fast flowing) throughout the floodplain.

These outputs were used to determine the appropriate size of each floodway and the overall floodway network. In areas where hydraulic data was not sufficient to accurately map the flood extents, the limits to the floodway networks were determined by using aerial and satellite flood imagery captured for the design flood events.

Figure 5: Hydraulic modelling results (depth-velocity product) map from all five models for the large design flood event (March 2012 – 2% AEP at the Murrumbidgee River at Narrandera gauge)



5.1.7 Mapping the floodway network

5.1.7.1 Hydraulic criteria

The small and large design floods provide the hydraulic basis for delineating the floodway network. The hydraulic criteria that were used to delineate the floodway network are described in Table 10.

Table 10: Summary of the criteria used to delineate the hydraulic categories in the floodway network

Hydraulic category	Criteria
Floodways	• Areas that have a depth-velocity product of greater than or equal to 0.2m^2/s for the large design flood (March 2012). • Areas that support tributary flows and outer floodplain floodways that have a depth velocity product of greater than or equal to 0.15 m2/s for the large design flood (March 2012). • Parts of the small design flood extent (October 2016) that ensure continuity of floodways.
Inundation extent	• Flood extent of the small design flood (October 2016) and the large design flood (March 2012). • In areas outside the hydraulic model extent flood imagery from the 2012 flood event derived from Sentinel and Landsat imagery.
Areas outside of the floodway network	• Flood fringe areas outside the large design flood (March 2012) extent. • Floodplain area enclosed by existing flood works that were not designed to be overtopped by floodwater.

Hydraulic modelling outputs may not always account for all the important floodways. As such, additional data is used to ensure that the floodway network represents on-ground conditions. The following information was used to validate the floodway network:

- flood aerial photography and satellite imagery
- spatial watercourse layers
- non-statutory rural floodplain development guidelines
- local knowledge from floodplain communities, and floodplain and environmental managers
- existing flood work development.

5.1.7.2 Floodways

Floodways in the floodplain were mapped using the outputs of the hydraulic models, in particular the depth-velocity products from the large design flood (March 2012).

Floodways derived from the target depth-velocity threshold were compared with the inundation extent of the small design flood (October 2016). This comparison was undertaken to ensure that

areas of the floodplain activated during small floods were identified as floodways, irrespective of whether they reached the selected depth-velocity threshold. Such areas are also likely to be the first floodways activated during large flood events and may be important for connecting flood-dependent ecological and cultural assets to floodwater during smaller floods.

5.1.7.3 Inundation extent

The hydraulic modelling also produced the inundation extent of the large design flood (March 2012) across the floodplain. Where the flood extent was reliable via confirmation with observed data, its outer limits were used to determine the extent of the floodway network.

Areas within the extent of the large design flood are considered important for providing temporary pondage during large floods. Areas beyond the extent of the design flood may also be flood-prone but would only become inundated during larger floods including extreme events and would generally have low conveyance or pondage capacity.

5.2 Appendix 2 Ecological asset identification and categorisation

Two types of flood-dependent ecological assets have been identified in the Murrumbidgee Valley Floodplain: **wetlands** and **other flood-dependent ecosystems**.

Wetlands and other flood-dependent ecosystems include the vegetation communities that were identified and categorised according to the surface water requirements of the dominant or canopy species in the floodplain vegetation community, including:

- semi-permanent (non-woody) wetlands
- floodplain wetland (flood-dependent shrubland wetlands)
- flood-dependent forest / woodland (wetlands)
- flood-dependent woodlands.

Where an ecological asset is located *outside* of the floodway network, it is assumed to not be entirely flood-dependent. These areas are referred to as **other floodplain ecosystems**.

5.2.1 Identifying ecological assets on the floodplain

Vegetation mapping including the State Vegetation Type Map[7], the Nimmie Caira Ecological Assessment[8] and Thelangerin Addition to Lachlan Valley State Conservation Area and Lachlan Valley National Park vegetation survey[9] of plant community types (PCTs) and several wetland studies were predominantly used to identify wetlands. PCTs identify recurring patterns of native plant species assemblages in relation to environmental conditions. More information about NSW plant community type classification is available on the department's website.

[7] Department of Planning and Environment (DPE) (2022) NSW State Vegetation Type Map. Current Release C1.1.M1.1 (December 2022)

[8] Biosis (2014) Nimmie-Caira Ecological Assessment, Nimmie-Caira Ecological Assessment: Stage 2, Phase 2: Assessment of Ecological Status, a report on the ecological values of the Nimmie-Caira landholding, lower Murrumbidgee River floodplain, NSW. Prepared for NSW Office of Water. Authors: Looby, M., Steelcable, T., Gilmore, D. and Smales, I. Biosis Pty Ltd, Wangaratta Office. Project no. 18206

[9] Porteners, M.F. (2013) Vegetation Survey of Thelangerin Addition to Lachlan Valley State Conservation Area and Lachlan Valley National Park and PCT Alignment of Existing Mapping for Thelangerin, Kalyarr National Park (Darcoola), Kalyarr State Conservation Area (Norwood) and Lachlan Valley National Park (McFarlanes). Report to the Office of Environment and Heritage, Department of Premier and Cabinet (Marianne Porteners Environmental Consulting: Sydney).

The following previous wetland studies and datasets were identified:

- Mid-Murrumbidgee wetland mapping[10]
- Wetlands, Gundagai to Hay[11]
- Yanco Creek Wetlands[12]
- Directory of Important Wetlands in Australia[13]
- Wetlands of the Lachlan River Catchment vs1.0[14]
- NSW Hydro Area dataset which contains delineations of named wetlands
- NSW Landuse 2017 dataset which contains delineations of marsh/wetlands and lakes.

The State Vegetation Type Map, Porteners 2013 and Biosis 2014 mapping of PCTs supersedes the vegetation mapping that was used to identify flood-dependent ecosystems as a part of the design process for the floodway network for the existing localised FMP. More information about the reliability and spatial precision of the State Vegetation Type Map is available on the department's website.

The following wetlands within the floodplain are listed in the Directory of Important Wetlands in Australia:

- Lowbidgee Floodplain (NSW021)
- Mid Murrumbidgee Wetlands (NSW052).

A small area of the Great Cumbung Swamp (NSW045) is located on the edge of the floodplain. The majority of the Great Cumbung Swamp will be included in the proposed Lachlan Valley Floodplain.

The State Vegetation Type Map, Porteners 2013 and Biosis 2014 mapping of PCTs and several wetland studies was predominantly used to identify other flood-dependent ecosystems, including flood-dependent forest/woodland (wetlands) and flood-dependent woodlands.

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[10] Hall, A., Duffy, D., Horta, A and Wassens, S (2023) Improving wetland boundary accuracy by state of art spatial knowledge, Gulbali Institute, Spatial Data Analysis Network, Charles Sturt University, Albury. NSW Final Report to Department of Planning and Environment 2023

[11] Frazier, P (2001) River flow/wetland inundation relationships for the mid-Murrumbidgee River: Gundagai – Hay. Charles Sturt University - Wagga Wagga (April 2001)

[12] Webster, R (2007) Investigation into potential water savings from the Yanco Creek System (Off-take to Yanco Bridge) Wetlands by Rick Webster 2007

[13] Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2016) Directory of Important Wetlands in Australia.

[14] Powell, M, Hodgins, G, Cowood, A, Ling, J, Wen, L, Tierney, D and Wilson C (2017) NSW Building a NSW wetland inventory: Lachlan River Catchment wetland mapping methods. Report for NSW Office of Environment and Heritage

5.2.2 Plant community types and their watering requirements

The PCTs that make up the wetlands and other flood-dependent ecosystems on the floodplain and their watering requirements are shown in Table 11, Table 12, Table 13 and Table 14. Lignum swamps are a priority for the NSW and Commonwealth Governments outlined in the Murrumbidgee Long Term Water Plan[15], the Murrumbidgee Valley Water Plan 2023-24[16] and the Basin-wide environmental watering strategy[17].

Table 11: Semi-permanent (non-woody) wetland plant community types in the Murrumbidgee Valley Floodplain and their watering requirements

Plant community type name (ID)	Ideal watering frequency (average recurrence interval)*
• Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion & Murray Darling Depression Bioregion; PCT 12) • Swamp grassland wetland of the Riverine Plain (PCT 47) • Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains (PCT 53) • Common Reed - Bushy Groundsel aquatic tall reedland grassland wetland of inland river systems (PCT 181) • Cumbungi rushland wetland of shallow semi-permanent water bodies & inland watercourses (PCT 182) • Permanent and semi-permanent freshwater lakes wetland of the inland slopes and plains (PCT 238) • Rush - Sedge - Common Reed mainly lentic channel wetland of the Upper Murray and mid-Murrumbidgee River floodplains in the NSW South Western Slopes Bioregion (PCT 336)	1 in 1-2 years

[15] Department of Planning, Industry and Environment (DPIE) (2020) Murrumbidgee Long Term Water Plan. Part A: Murrumbidgee catchment. ISBN 978-1-922317-79-7 EES 2020/0078 July 2020

[16] Commonwealth of Australia 2023, Commonwealth Environmental Water Holder Water Management Plan 2023–24, Canberra. CC BY 4.0. ISBN 978-1-76003-434-4

[17] Murray-Darling Basin Authority (MDBA) (2019) Basin-wide environmental watering strategy. Second Edition. 22 November 2019. Published by the Murray-Darling Basin Authority. MDBA publication no: 42/19. ISBN (online): 978-1-925762-47-1

Table 12: Floodplain wetland (flood-dependent shrubland) wetland plant community types in the Murrumbidgee Valley Floodplain and their watering requirements

Plant community type name (ID)	Ideal watering frequency (average recurrence interval)*
Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 17)	From once every 1–3 years to once every 7–10 years
Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains (PCT 24)	From once every 2-3 years to once every 5-7 years
Nitre Goosefoot shrubland wetland on clays of the inland floodplains (PCT 160)	From once every 1–2 years to once every 2–7 years
River Coobah tall shrubland wetland of the floodplains in the Riverina Bioregion and Murray Darling Depression Bioregion (PCT 240)	Once every 3-7 years
Lignum shrubland wetland on regularly flooded alluvial depressions in the Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion (PCT 247)	From once every 1–3 years to once every 7–10 years

*Refers to the frequency at which a flow event is required to maintain the ecological character of the wetland, expressed as an average recurrence interval (the long-term average number of years between a flood event). Adapted from the Murrumbidgee Long Term Water Plan.

River Red Gum woodlands and Black Box woodlands are target ecological populations in the *Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2016* and are a priority for the NSW and Commonwealth Governments outlined in the Murrumbidgee Long Term Water Plan and the Basin-wide environmental watering strategy.

Table 13. Flood-dependent forest/woodland (wetland) plant community types in the Murrumbidgee Valley Floodplain and their watering requirements

Plant community type name (ID)	Ideal watering frequency (average recurrence interval)*
• River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW (PCT 2) • River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) • River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion (PCT 7) • River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 11)	Once every 1–3 years
• River Red Gum - Warrego Grass - Couch Grass riparian tall woodland wetland of the semi-arid (warm) climate zone (Riverina Bioregion and Murray Darling Depression Bioregion; PCT 8) • River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion (PCT 9) • River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 10) • Yellow Box – River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion (PCT 74) • River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW (PCT 249)	Once every 2–4 years

Table 14: Flood-dependent woodland plant community types in the Murrumbidgee Valley Floodplain and their watering requirements

Plant community type name (ID)	Ideal watering frequency (average recurrence interval)*
• Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 13) • Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 16) • Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 15)	From once every 3–7 years to once every 5–10 years

*Refers to the frequency at which a flow event is required to maintain the ecological character of the wetland, expressed as an average recurrence interval (the long-term average number of years between a flood event). Adapted from the Murrumbidgee Long Term Water Plan.

5.2.3 Consideration of water-dependent fauna and habitat in the identification of the flood-dependent ecological assets

The identification of the flood-dependent ecological assets within the floodplain includes consideration of key habitat features for water-dependent fauna including areas of native fish passage[18], observed waterbird breeding habitat sites and drought refugia. The management zones and associated rules aims to provide for the adequate passage of floodwater to these areas to maintain their ecological value.

Native fish

The extensive range of aquatic habitat in the floodplain supports a diverse assemblage of species, including 18 native freshwater finfish. The floodplain also contains threatened fish species distributions including olive perchlet (*Ambassis agassizii*), silver perch (*Bidyanus bidyanus*), flathead galaxias (*Galaxias rostratus*), trout cod (*Maccullochella macquariensis*), southern pygmy perch (*Nannoperca australis*) and freshwater catfish (*Tandanus tandanus*)

[18] Fish passage refers to connectivity that allows native fish species to move between upstream and downstream habitats as well as adjacent riparian and floodplain areas. Areas of key fish habitat include rivers, creeks and flood flow paths and are available on the Fisheries Spatial Data Portal

A variety of datasets were used to identify areas of native fish passage, including Key Fish Habitat Maps[19], Fish Communities and Threatened Species Distributions of NSW[20], Fisheries NSW fish occurrence data, Murray-Darling Basin Fish Survey[21] database records and long-term fish monitoring data as part of the Flow-MER Program.

Waterbirds

The ecological assets on the floodplain also support important habitat for waterbird feeding and breeding. The Lowbidgee area of the floodplain is one of the most important colonial nesting waterbird breeding sites in the Murray-Darling Basin[22]. Waterbird breeding locations were identified from a variety of sources including historical records of colonial waterbird breeding areas (such as aerial and ground survey records) and published scientific literature. Information about the specific location of colonial waterbird breeding areas is not always publicly available due to the sensitive nature of these breeding events but the information is held by the department to support decision making.

Other water-dependent fauna

Habitat information for other water-dependent fauna including aquatic snails, frogs, reptiles and mammals, was sourced from BioNet Atlas, the Atlas of Living Australia, the Flow-MER Program and the Fisheries NSW Spatial Data Portal.

[19] Key Fish Habitat datasets are available on the Fisheries Spatial Data Portal.

[20] Fish communities and threatened species distributions of NSW'. Published by the NSW Department of Primary Industries Fish Communities and Threatened Species Distributions of NSW First published May 2016 Second edition July 2016 ISBN 978 1 74256 923 9. Dataset available on the Fisheries Spatial Data Portal.

[21] Murray-Darling Basin Authority (2023) Murray-Darling Basin Fish and Macroinvertebrate Survey

[22] Kingsford, R.T and Thomas, RF (2004) Destruction of wetlands and waterbird populations by dams and irrigation on the Murrumbidgee River in arid Australia. Environmental Management 34: 383-396

5.3 Appendix 3 Management zone classification

This section provides a more detailed explanation of the application of the management zone classification tool as described at section 3.7.1 Management zones.

The department sought feedback on the proposed management zones, particularly at a property scale, during Stage 2 public exhibition. In response to feedback received during public exhibition, the department made multiple refinements to the spatial extent of the management zones prior to the commencement of the FMP. These refinements are shown on the maps in Appendix 2 of the What we heard during Stage 2 public exhibition report.

5.3.1 Floodway network (management zone A and B)

The floodway network was presented as part of Stage 1 public consultation. It has been defined by:

- mapping the outputs of the hydraulic modelling
- considering the floodway networks in the existing localised FMP and historical floodplain development guidelines, and aligning with them where appropriate
- reviewing additional flood photography and satellite imagery.

In response to feedback received in Stage 1 public consultation, multiple refinements were made to the floodway network. These refinements can be seen in Appendix 2 of the What we heard during Stage 1 public consultation report.

The floodway network is comprised of **floodways** and the **inundation extent** (ponding areas).

For more information on the development of the floodway network, please refer to Appendix 1 Development of the floodway network.

5.3.1.1 Floodways (management zone A)

Floodways are areas of fast-flowing floodwater during times of flood. These areas are identified by a modelled depth velocity product of at least 0.2 m^2/s for the large design flood (March 2012), and at least 0.15 m^2/s in areas of broad flood flow without deep incised channels, such as the Lowbidgee area of the floodplain.

Floodways are high-risk areas that, even if only partially blocked, would cause significant changes in the movement of floodwater across the floodplain.

It is a critical area of the floodplain as it allows water to leave or return to a river or creek during times of flood or deliver floodwater to ecological assets and Aboriginal cultural values that depend on it. Floodways also pose the greatest risk to life and property during times of flood.

All floodways have been assigned management zone A.

5.3.1.2 Inundation extent (management zone B)

The inundation extent is the area where floodwater breaks out (flood discharge) and forms ponds. It is identified by the modelled flood extent of the large design flood and small design flood, plus any flooded areas identified through Sentinel and Landsat imagery during the 2012 flood event.

These areas are critical to storing floodwater during times of flood. Without these areas, the depth and speed of the floodwater in the floodway would dramatically increase. It is important that flood works constructed in these areas are coordinated so that they do not block inundation, particularly during large floods.

All the inundation extent has been assigned management zone B.

5.3.2 Identified Aboriginal cultural assets and values

Aboriginal cultural assets and values on the floodplain can be:

- flood-dependent, such as waterholes, fish traps or scarred trees that require inundation
- flood-impacted, such as Aboriginal burial grounds or shell middens that can be damaged by scour and erosion caused by flooding or directly during the construction of a flood work.

As part of assessing and determining an application for a flood work approval, a search of the Aboriginal Heritage Information Management System (AHIMS) must be conducted. AHIMS is a secure electronic database that holds over 100,000 records and information about Aboriginal Places, objects, and other significant sites across NSW. Due to cultural sensitivities, the Aboriginal cultural assets in the floodplain are not shown on a map in the FMP.

To ensure that Aboriginal cultural assets and values are protected from impacts associated with flood works, the department has been explaining and promoting the use of AHIMS as part of consultation with Aboriginal communities.

As part of assigning management zones, the department has identified all flood-dependent Aboriginal cultural assets within the floodplain that are recorded on AHIMS. It is these assets which require consideration in assigning management zones to ensure that the flow of floodwater is maintained.

5.3.2.1 Aboriginal cultural assets within or near a floodway (management zone A)

Where a flood-dependent Aboriginal cultural asset is located within or near a floodway, it has been assigned management zone A. Where the flood-dependent Aboriginal cultural asset is located near a floodway, the area is connected to the floodway with a management zone A connector. More information on connectors is provided in section 5.3.5.

Some examples of flood-dependent Aboriginal cultural assets assigned as management zone A include scarred river red gum trees and waterholes.

There may also be some flood-impacted Aboriginal cultural assets located within a floodway. These areas have also been assigned management zone A as they already form part of the floodway network, as explained in section 5.3.1. There are rules that allow for Aboriginal cultural protection works to be constructed to protect these areas from the impacts of flooding. Please refer to the rules for management zone A in section 3.7.2.1 for more information.

5.3.2.2 Aboriginal cultural assets not near a floodway (management zone B, C and CU)

Where an Aboriginal cultural asset is located within the inundation extent but not near a floodway, it has been assigned management zone B, regardless of whether it is flood-dependent or flood-impacted.

Where an Aboriginal cultural asset is located outside of the floodway network, it is assumed to not be flood-dependent or flood-impacted. These areas are assigned management zone C if it is located within the flood fringe (see section 5.3.6.1) or management zone CU if it is located within an urban area (see 5.3.6.2).

5.3.2.3 Aboriginal cultural assets requiring special protection (management zone SP)

For some flood-dependent Aboriginal cultural assets, there is a need to apply a special protection management zone. These areas are identified through:

- a high level of flood-dependency, such as waterholes, swamps, billabongs or fish traps that are strongly dependent on the passage of floodwater, and
- a high level of cultural significance to the Aboriginal community, including spiritual, archaeological or resource use-values.

These areas are also recorded on the AHIMS.

Management zone SP has the greatest restriction on the types of flood works permitted.

An example of this would be a ceremonial site located within a wetland that is listed on AHIMS.

5.3.3 Identified heritage sites

Heritage sites may be sensitive to changes in flood behaviour or disturbance from flood work construction. The heritage sites identified within the floodplain that are listed on the NSW State Heritage Register are not dependent on or connected with flooding. However, some of these sites may be flood-impacted as they could be damaged by flooding or directly impacted during the construction of a flood work.

Any heritage sites located:

- within a floodway have been assigned management zone A
- within the inundation extent have been assigned management zone B
- outside the floodway network have been assigned management zone C or CU.

Where a flood-impacted heritage site is located within a floodway, there are rules proposed that allow for Heritage site protection works to be constructed to protect these areas from the impacts of flooding. Please refer to the rules and assessment criteria for management zone A in section 3.7.2.1 for more information.

As part of assessing and determining an application for a flood work approval, a search of the State Heritage Inventory must be conducted. This online search tool holds information about most statutory protected heritage items in NSW, including the State Heritage Register.

5.3.4 Identified ecological assets

The following types of ecological assets, shown in the **Ecological asset map**, have been identified within the floodplain:

- semi-permanent wetlands (non-woody): requires flooding every 1-2 years,
- floodplain wetlands (flood-dependent shrubland wetlands): requires flooding every 1-7 years,
- flood-dependent forest/woodland (wetlands): requires flooding every 1-4 years, and
- flood-dependent woodland: requires flooding every 3-10 years.

The ecological assets are identified using the best available vegetation mapping and survey information, including the NSW State Vegetation Type Map[23] and wetland mapping.

The ecological assets are categorised according to the flooding requirements of their vegetation communities, which correlates to the degree of connectivity required to a floodway. Semi-permanent wetlands have the highest dependency on flooding, while flood-dependent woodland have the lowest dependency on flooding.

In addition, there are flood-dependent ecological assets which contain a special feature, such as an identified waterbird breeding site or nationally recognised wetland, which warrants an additional layer of protection.

When assigning management zones, the following approach is taken:

- semi-permanent wetlands will be assigned management zone A
- any flood-dependent ecological assets with a special feature will be assigned management zone SP
- identified flood-dependent ecological assets within the floodway network will be assigned:
  - management zone A if within a floodway
  - management zone B with a connector if near a floodway, or
  - management zone B without a connector if not near a floodway
- identified ecological assets (other floodplain ecosystems) outside the floodway network will be assigned management zone C or CU.

More information on connectors is provided in section 5.3.5 Connectors (management zone A).

In response to feedback received in Stage 1 public consultation, multiple refinements were made to the identified flood-dependent ecological assets to reflect private gardens or areas where crops are grown. These refinements can be seen in Appendix 3 of the What we heard during Stage 1 public consultation report.

[23] Department of Planning and Environment (2022) NSW State Vegetation Type Map. Current Release C1.1.M1.1 (December 2022)

5.3.4.1 Ecological assets within or near a floodway (management zone A or B)

All semi-permanent wetlands located within or near a floodway will be assigned management zone A. For those located near a floodway, a connector will be used to ensure the flow of floodwater from the floodway to the asset is maintained.

All other flood-dependent ecological assets will only be assigned management zone A if they are located within a floodway. If they are located near a floodway, they will be assigned management zone B and have a connector which runs to and through the asset to ensure the flow of floodwater from the floodway to the asset is maintained.

5.3.4.2 Ecological assets not near a floodway (management zone B, C or CU)

Flood-dependent ecological assets located within the inundation extent but not near a floodway will be assigned management zone B without the use of a connector.

Where an ecological asset is located outside of the floodway network, it is assumed to not be entirely flood dependent. These areas, referred to as other floodplain ecosystems, are assigned management zone C if it is located within the flood fringe (see section 5.3.6.1) or management zone CU if it is located within an urban area (see section 5.3.6.2).

5.3.4.3 Ecological assets requiring special protection (management zone SP)

For some flood-dependent ecological assets, there is a need to apply a special protection management zone. These areas of the floodplain are identified as locations:

- with a demonstrated history of supporting waterbird, native fish or frog populations, such as a lagoon, including:
  - habitat for waterbird species, including those listed under the *Biodiversity Conservation Act 2016* (NSW) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
  - waterbird breeding sites
  - habitat for native fish and freshwater turtles
  - habitat for native frogs, including survey sites that find threatened species (for example, the Southern Bell Frog *Litoria raniformis*), or
- that have the capacity to provide refuge for aquatic life during drought, such as a billabong or lagoon, or
- that are recognised in local, state or Commonwealth legislation or policy, including
  - areas of international conservation significance (RAMSAR wetlands)
  - areas of national conservation significance (Directory of Important Wetlands in Australia), or
- that have received or are a priority for NSW and Commonwealth Government environmental water deliveries, or
- a combination of any of the above.

Where the asset is located within the inundation extent, a connector will be used to ensure the flow of floodwater from the floodway to the asset is maintained.

Management zone SP has the greatest restriction on the types of flood works permitted.

There are 136 areas identified in the floodplain which are being assigned management zone SP. These include:

- habitat for migratory waterbird species
- habitat for native fish and freshwater turtles
- waterbird breeding sites
- aquatic drought refuge (lagoons or billabongs)
- nationally significant wetland (Directory of Important Wetlands in Australia)
- areas that have received Commonwealth environmental water
- sites throughout the Murrumbidgee Valley National Park.

5.3.5 Connectors (management zone A)

Connectors are pathways that connect flood-dependent ecological assets and flood-dependent Aboriginal cultural assets to the floodway. They are assigned management zone A to ensure the flow of floodwater from the floodway to the asset is maintained.

The location and size of connectors are determined through the use of satellite imagery, LiDAR and modelling results to confirm existing flood flow paths.

All connectors are assigned management zone A.

5.3.6 Flood fringe (management zone C and CU)

Areas of the floodplain that are not within the floodway network can be categorised as flood fringe areas or flood protected areas.

5.3.6.1 Flood fringe (management zone C)

The flood fringe is an area which may be flooded but is not considered critical in the flow of water during times of flood. Flood-protected areas do not receive floodwater. This may be due to the area being higher ground or the presence of existing flood works preventing the passage of floodwater.

Areas of flood fringe are assigned management zone C.

5.3.6.2 Urban area (management zone CU)

Flood risk in urban areas is generally managed by local councils through flood risk management plans and studies developed in accordance with the Flood Risk Management Manual. Urban areas may also be protected from flooding by a town levee.

Urban areas where a flood risk management plan or strategy applies, or are protected by a town levee, are assigned management zone CU.

5.4 Appendix 4 Comparison with historical planning arrangements

5.4.1 Overview

The FMP consolidates and updates the historical floodplain management planning arrangements to:

- meet the requirements of the WM Act
- establish consistent rules for flood works across the floodplain
- improve the coordinated regulation of flood works across the southern Murray–Darling Basin.

This is a change from the previous floodplain management planning arrangements in the historical localised FMP. Under the previous planning arrangements any type of flood work within floodways may be applied for, subject to comprehensive assessment processes and advertising requirements for most types of flood works.

The difference in approaches between the historical localised FMP and the new FMP relates to the requirement under the WM Act for an FMP to consider the risk to life and property from the effects of flooding. The construction of a flood work in a floodway can significantly increase the risk to life and property; both on the landholding where the flood work is constructed and on neighbouring properties.

5.4.2 Previous planning arrangements

The Murrumbidgee River Hay to Maude Floodplain Management Plan (2014) (the historical localised FMP), was adopted under the *Water Act 1912* in April 2014. On 21 September 2015, it was adopted under the WM Act and was repealed on 1 July 2025 upon commencement of the new Murrumbidgee Valley FMP. The key components of the historical localised FMP are detailed below.

Table 15: Summary of the historical localised FMP

Component	Details
Area	1700 square kilometres
Design flood	1974 (40-year ARI)
Floodway network	Comprised of: • Zone A (major discharge areas) • Zone B (flood storage) • Zone C (connecting flow paths to flood-dependent ecosystems).
Monitoring and reporting	Key locations for flood monitoring provided in the plan, to be led by the then Office of Environment and Heritage. Environmental monitoring of flood-dependent ecosystems, coordinated by the then Office of Environment and Heritage. Guidelines for monitoring activities set out in plan.

Component	Details
Existing flood works	Environmental connectivity and hydraulic issues identified associated with existing flood works. Modifications proposed for each area to resolve the issues.
Complying works	• All flood works outside Zone A, B and C, or • flood works that meet criteria specified below, or • existing flood works that were modified in accordance with the specifications in the plan.
Non-complying works	• Flood works in Zone A, B or C that do not meet the criteria specified below, or • existing flood works that were not modified in accordance with the specifications in the plan.
Advertisement	All non-complying flood works.
Complying works criteria: Zone A	
Obstruction	Maximum 10% obstruction of width (except irrigation channels).
Flood level	Maximum increase in flood levels of: • 200 mm at irrigation channel openings • 100 mm on adjacent properties • 10 mm on high value infrastructure No significant effect on drainage times on adjacent properties.
Redistribution	Maximum flow redistribution of 10% (cumulative) and 5% (adjacent properties)
Velocity in floodways	Maximum increase of 50% up to a maximum of 0.5 m/sec. No increase when velocity is already above 0.5 m/sec.
Environment	No blocking, impeding or diverting flooding regimes in flood-dependent ecosystems within the floodway network. No impeding the delivery of environmental water as specified in the Lowbidgee Water Management Plan.
Complying works criteria: Zone B	
Works > 300 mm **Redistribution and flood levels**	Maximum flow redistribution of 10% (cumulative) and 5% (adjacent properties). Maximum increase in flood levels of: • 100 mm on adjacent properties • 10 mm on high value infrastructure.
Works < 300 mm **Environment**	No blocking, impeding or diverting flooding regimes in flood-dependent ecosystems within the floodway network. No impeding the delivery of environmental water as specified in the Lowbidgee Water Management Plan.

Complying works criteria: Zone C	
Environment	No blocking, impeding or diverting flooding regimes in flood-dependent ecosystems within the floodway network. No impeding the delivery of environmental water as specified in the Lowbidgee Water Management Plan.

5.4.3 Comparison between the historical localised FMP and the Murrumbidgee Valley FMP

The key difference between the Hay to Maude FMP (the repealed historical localised FMP) and the new FMP is the increase in area covered by the new FMP. While there are some tightening of rules within floodways under the new FMP, there are also some relaxations in the assessment required for minor works outside of floodways. Table 19 identifies the similarities and differences.

Table 16: Comparison of the historical localised FMP and the Murrumbidgee Valley FMP

Component	Murrumbidgee Valley FMP	Hay to Maude FMP (repealed)	Comparison
Area	12,300 square kilometres	1,700 square kilometres	A significant increase in area. This allows for a consistent rule set to be applied throughout the floodplain and connection to adjacent floodplains to be recognised.
Design flood/s	2012 (large design flood) 2016 (small design flood)	1974	It is appropriate that the FMP relies on more recent flooding events as they are more commonly remembered by the local community.
Floodway network	Floodways and inundation extent Management zones A, B and SP	Flood discharge areas (floodways) and flood storage areas (inundation extent) Zones A, B and C	Floodways in the new FMP are generally narrower west of Hay (except for the floodway along the Murrumbidgee River). This is because the delineation of the floodways in the new FMP is based on areas with typically higher depth-velocity products (the deepest, fastest flowing floodwater). Changes in the inundation extent are due to improvements in modelling since the historical FMP was developed.

Component	Murrumbidgee Valley FMP	Hay to Maude FMP (repealed)	Comparison
Outside floodway network	Flood fringe and flood-protected Management zones C and CU	Not applicable	Management zones C and CU have been included in the new FMP to ensure that flood work applications are assessed and determined consistently across the floodplain. The historical FMP does not include these zones.
Monitoring and reporting	Performance indicators specified to measure the success of the strategies in achieving the objectives of the FMP.	Key locations for flood monitoring were provided in the historical FMP, with monitoring programs to be led by the then Office of Environment and Heritage. Environmental monitoring of flood-dependent ecosystems was coordinated by the then Office of Environment and Heritage. Guidelines for monitoring activities were set out in the historical FMP.	An audit of the historical FMP in 2020 identified that many of the implementation recommendations were not implemented. The new FMP allows for flexibility in how the performance indicators are applied while ensuring that they are clearly linked to the associated strategies and objectives. Monitoring and evaluation activities are planned and implemented separately from the FMP.
Existing flood works	If existing works within management zone A or SP cannot comply with the specifications, they can be approved, subject to complying with the standard assessment criteria: access roads supply channel (below ground) stock refuge infrastructure protection works. In addition, existing above ground supply channels may be approved, subject to	Existing flood works that were causing connectivity and hydraulic issues are identified in the historical FMP and proposed modifications specified to allow for approval of works and resolve identified issues. All existing works, not identified in the proposed modifications, were treated the same as proposed works.	The historical FMP provided modification requirements to allow for the approval of existing flood works which were causing connectivity and hydraulic issues. Conversely, the new FMP does not identify unapproved flood works. Instead, it provides for the approval of some types of existing flood works in management zone A and SP while ensuring all flood works (existing or proposed) are treated consistently in all other management zones.

Component	Murrumbidgee Valley FMP	Hay to Maude FMP (repealed)	Comparison
	complying with the standard assessment criteria. If existing works in management zone B that were constructed prior to 3 December 1999 and are unlikely to cause significant impacts nearby, they may be approved, subject to complying with the standard assessment criteria. To access this rule, applications must be lodged within the first 3 years of the FMP commencing. Existing works in management zone C and CU are treated in the same manner as proposed works. Overview of existing approved flood works provided in the FMP, as required under the WM Act		Activities to manage flood works that are causing connectivity and hydraulic issues are planned and implemented separately from the FMP.
Advertisement	Required for flood works in management zone B that are: • greater than 40 cm above the natural surface of the ground, or • a stock refuge with a maximum area larger than 10 hectares and no other stock refuge in that area, or • a stock refuge on a property and the total maximum area of all stock refuges is larger than 5% of total property area, or	Required for: • flood works in Zone A, B or C that did not meet the complying works criteria, or • existing flood works that were not modified in accordance with the specifications in the plan.	The requirement for advertisement is less extensive under the new FMP compared to the historical FMP.

Component	Murrumbidgee Valley FMP	Hay to Maude FMP (repealed)	Comparison
	• an infrastructure protection work with an area that is larger than 1% of the total area of the property.		
Rules for zone A	Limited types of works permitted: • access roads • stock refuges • supply channel (below ground) • infrastructure protection works • enhancement flood works • flood protection works. Standard assessment criteria applied to all except flood enhancement works which also requires hydraulic assessment criteria.	No restriction on the types of works permitted. Hydraulic assessment criteria applied to all flood works.	The new FMP restricts the types of works permitted but only applies standard assessment criteria. Conversely, the historical FMP permitted any type of flood work but applied hydraulic assessment criteria. Hence, many types of flood works would not be permitted as they could not meet the criteria specified.
Rules for zone B	Any type of flood work permitted subject to standard and hydraulic assessment criteria. Advertising requirements apply to larger works (see above).	Any type of flood work permitted. Large flood works required to comply with subset of hydraulic criteria while small flood works required to comply with basic assessment criteria.	The approach taken in the new FMP and the historical FMP is similar. Under the new FMP, larger works are required to be advertised and be assessed under the hydraulic criteria while smaller works are to be assessed under the standard criteria.
Rules for zone C and CU	Any type of flood work permitted subject to complying with standard assessment criteria. Hydraulic assessment criteria applied when flood work may impact on high value infrastructure.	Any type of flood work was permitted subject to complying with basic assessment criteria.	Zone C in the historical FMP is a connector while management zone C and CU in the new FMP is the flood fringe or flood protected areas. The approach taken in the new FMP and the historical FMP is similar. However, new FMP specifies situations where more assessment may be required, such as the

Component	Murrumbidgee Valley FMP	Hay to Maude FMP (repealed)	Comparison
			potential to impact on high value infrastructure.
Rules for zone SP	Proposals for new flood works are limited to flood enhancement works. Some types of existing works are permitted. Standard assessment criteria apply to all flood works and hydraulic assessment criteria also applied to flood enhancement works.	Not applicable	The new FMP identifies areas of the floodplain that are especially vulnerable to the potential impacts associated with a flood work and recognises this through the restriction on the types of flood works permitted.
Risk to life and property	This is considered through the development of the floodway network and limit on the types of flood works permitted within a floodway.	Not applicable	The WM Act requires the draft FMP to consider the risk to life and property from the effects of flooding. Conversely the *Water Act 1912* did not have the same requirement for the historical FMP.

5.5 Appendix 5 Socio-economic impact assessment

5.5.1 Background

A socio-economic impact assessment is a useful tool to help understand the potential range of impacts of a proposed change, and the likely response if the change occurs. This understanding can help design impact mitigation strategies to minimise negative and maximise positive impacts of any change. This is a qualitative assessment only.

5.5.2 Scope of the assessment

5.5.2.1 Nature of the proposed change

Agricultural production is a significant contributor to the economy of the Murrumbidgee Valley Floodplain. To enhance agricultural productivity, works have been built on the floodplain to improve land used for irrigated cropping, irrigated perennial horticulture, dryland cropping and grazing. Typically, flood works such as levees, earthworks, banks and channels are built to protect crops, land, stock and properties from flooding, provide on farm access, and to manage and store irrigation, stock and domestic water. It is the construction and use of these flood works, both existing and proposed, that is affected by the FMP.

The FMP applies to the assessment and determination of flood work approvals within the floodplain, including applications to amend existing flood work approvals. It does not apply to existing flood works located outside the floodplain. Urban areas in the floodplain will be minimally affected as flood risk management in these urban areas is the responsibility of local council.

The following assumptions are also considered:

- A flood work approval is required under section 91D of the WM Act regardless of whether there is an FMP in place. Some activities considered low-risk or covered by other legislation are exempt from the rules in FMPs.
- Even if there is no FMP in place, the determining authority for flood work approvals (WaterNSW or the department) will need to consider the water management principles set out in section 5 of the WM Act, as well as address the minimal harm requirements under section 97 (2) of the Act.
- New FMPs are developed using the best available information and build on existing floodplain management planning arrangements.
- FMPs may be amended during their 10-year term if it is in the public interest.
- FMPs will be upgraded as better data and modelling becomes available.

5.5.2.2 Groups who are potentially impacted

There are four main groups who are potentially impacted by the FMP with overlap between groups. The following table identifies these groups in order of least potential impact to greatest potential impact are those landholders:

1. within the new floodplain
2. outside of the area of the historical localised FMP

3. within the inundation extent (management zone B) on their property
4. who have a floodway (Management zone A) on their property
5. who have an area of ecological or cultural significance (Management zone SP) on their property.

Floodplain land used for irrigated cropping, irrigated perennial horticulture, dryland cropping and grazing are the primary commercial activities that may be affected by the FMP. Based on engagement activities undertaken for public consultation, private landholders in the floodplain range from small family-owned farms to large corporate agribusinesses with major irrigation infrastructure. However, the FMP may be a useful tool for property and business planning as it relates to potential flooding impacts.

The major land uses in the Murrumbidgee Valley Floodplain[24] include:

- grazing (native vegetation and modified pastures)
- cropping (including irrigated cropping)
- irrigated perennial horticulture
- forestry
- intensive animal production.

Accordingly, agriculture, forestry and fishing (as a group) appear in the top 2 employment industries for 8 of the 11 local government areas that cover the Murrumbidgee Valley Floodplain[25].

5.5.2.3 Key impacts of interest

The following key impacts of the draft FMP have been identified.

a. the economic cost of gaining approval for existing and future flood works (direct impact), including:
    i. application fees
    ii. advertising fees, where required
    iii. preparation of technical information including hydraulic modelling and ecological studies
b. the ability or potential inability to gain approval for existing flood works, depending on where the work is located and the management zone classification (direct impact)
c. the ability or inability to gain approval for future flood works, depending on the management zone classification on an individual property (direct impact)
d. changes to the risk to life and property from the effects of flooding, where the FMP aims to steer inappropriate development away from high-risk floodways and to minimise changes to flood behaviour in other areas that may cause impacts on neighbouring landholdings (positive impact)
e. the economic cost to maintain a flood work approval (extension fees)
f. the economic cost of constructing flood works (for example, the cost of earth moving equipment and technical expertise)

[24] NSW Landuse 2017 version 1.5 published December 2023

[25] Sourced from REMPLAN Economy based on statistics from the Australian Bureau of Statistics

g. the economic cost of maintaining flood works, particularly prior to and after flood events.

5.5.2.4 Information available and usefulness

The following information has been identified to support the assessment.

Table 17: Summary of available information to support the assessment

Available information	Value (if known)	Usefulness
Area of the floodplain	12,300km^2	Identifying the scale of impacts.
% of the floodplain is covered by a historical localised FMP	23%	Identifying areas where there is more change as opposed to the area that was already subject to an in-force FMP.
% of floodplain covered by floodways (Management zones A and SP)	10.5%	Identifying areas where the risk to life and property is the greatest and where flood works will be most restricted by the FMP.
% of floodplain subject to flooding but outside of a floodway (Management zone B)	34.6%	Identifying areas where landholders may need flood works to protect cropped areas or infrastructure and where the proposed hydraulic assessment criteria will apply.
Cost of gaining a flood work approval (external influence)	As of $3,350 (inclusive of advertising, if required) or $624.95[26] for an administrative amendment without engineering review plus, around $10,000 for hydraulic modelling.	Understanding how expensive and difficult it may be for an individual landholder to plan for and seek a flood work approval for a particular type of work. Large corporations may be able to absorb costs as part of business as compared to small family farms.
Cost of constructing a flood work (external influence)	Unknown and variable depending on the scale of the work.	Understanding how expensive and difficult it may be for an individual landholder to construct a flood work in accordance with their approval (drawn from the specifications in the FMP).
Cost of maintaining a flood work (external influence)	Unknown and variable depending on the scale of the work.	Understanding how expensive and difficult it may be for an individual landholder to maintain flood works in accordance with their approval. For example, an embankment may be required to be maintained at a specified height.

[26] WaterNSW 2024-25 Application Fees. The cost of a flood work application is not set by IPART.

5.5.2.5 Types of activities which may be affected: who, when and where

The type of activity affected by the FMP is limited to the construction and use of flood works within the declared floodplain. This activity could be undertaken by any landholder at any time. Anecdotal feedback from community members during the department's June 2023 information gathering (listening tour) suggests that this activity may increase prior to and during major flood events as landholders respond to the threat of flooding on their properties and communities.

5.5.2.6 Extent or scale of the activities potentially affected

The construction and use of flood works throughout the floodplain will be affected to some extent. However, the largest impact will be on landholders with properties within the floodways (Management zone A) and special protection areas (Management zone SP) where the types of flood works are proposed to be restricted. However, feedback from public consultation suggests that landholders are generally aware of floodways on their properties and the limitations they pose for agricultural production and property management.

5.5.2.7 Other factors impacting on these activities

Other factors that will impact the construction and use of flood works in the floodplain may include:

- The requirement under section 91D the WM Act to have a flood work approval and community awareness (or lack of awareness) of this requirement and related exemptions in the Regulation.
- Community awareness of historical planning arrangements for flood work development and the evolution of floodplain management reform. For example, knowledge of the historical guidelines for floodplain development released in the 1980s and the historical localised FMP that was adopted in 2014.
- How recent communities have experienced major flooding. Many landholders and communities are still recovering from the 2022 floods. This may include plans to build or re-build flood works to protect homes and infrastructure or to improve on-farm access.

5.5.2.8 Geographic location

Potential impacts of the FMP are limited to the area within the floodplain boundary. Some landholders may have only part of their property located inside the floodplain.

The FMP builds on previous floodplain management planning arrangements. Landholders within the historical Hay to Maude FMP area will be less impacted than those landholders in areas without an FMP.

There may be individual farm level impacts that are more significant depending on where the property is situated in the landscape. The FMP will likely have a greater impact on landholders whose properties are within the mapped floodways and areas of special protection (management zones A and SP). Landholders whose properties are within management zones B (flood storage and inundation extent) and C (flood fringe) will also be impacted, where a flood work approval is also required, subject to meeting the relevant advertising requirements and assessment criteria.

Urban areas in the floodplain mapped as (Management zone CU) will be minimally affected as flood risk management in these urban areas is the responsibility of local government.

5.5.2.9 Proportion of the group or proportion of activities likely to be affected

The proposed floodplain boundary is 12,300 square kilometres in area and approximately 10.5% of this area is mapped as management zone A (floodways) and management zone SP (special protection). The ability to construct and use flood works is most restricted in these zones.

However, the level of impact also depends on what the affected land can be used for. Floodways generally align with rivers and creeks and will therefore be unsuitable for cropping or horticulture. Similarly, it is unlikely that a flood work will currently be approved in a floodway with a comprehensive hydraulic assessment being required for all flood work applications in areas outside of an FMP.

Most of the floodplain is allocated to management zones B (34.6%) and C (54.6%) where the *type* of flood works are not restricted but a flood work approval will still be required, subject to meeting the relevant advertising requirements and assessment criteria.

5.5.3 Assessment of potential impact

An assessment of the potential impact of the FMP against the key impacts identified under section 5.6.2.3 needs to be undertaken with consideration of external influence, as detailed in section 5.6.2.7. The impact of the FMP can be described as high, moderate or low but may be reduced when considered against the pre-existing impact of the external influence. For example, the FMP may have an identified high impact on a specified activity but there is also a high external influence on this impact. In this example, the resultant impact of the FMP (marked red), once the external influence is considered, is low. This is demonstrated in Table below.

Table 18: Impact assessment matrix

		External influence		
		Low	**Moderate**	**High**
Impact of the FMP (intensity of the impact)	**Low**	Low	Low	Low
	Moderate	Moderate	Low	Low
	High	High	Moderate	Low

The assessment of the key impacts of the FMP and adjustment in response to external influences is detailed in Table 19 below. This assessment was updated following Stage 2 public exhibition of the FMP to reflect feedback in relation to approvals for existing flood works in management zone B.

Measures to mitigate potential negative impacts of the FMP are provided in section 5.6.3.2.

Table 19: Assessment of key potential negative impacts of the FMP

Factor	Types of new flood works are restricted in Management zone A and SP	Types of existing flood works are restricted in Management zones A and SP	Applicable assessment criteria in management zones B and C	Cost to obtain a flood work approval	Construction and maintenance
Impact	Lost ability to seek approval for new flood works other than access roads, infrastructure protection works, stock refuges, supply channels, enhancement flood works, cultural protection works.	Lost ability to seek approval for existing flood works other than access roads, infrastructure protection works, stock refuges and supply channels (above and below ground).	Large scale flood works near high value infrastructure and floodways are likely to need to demonstrate that they meet both the standard and the hydraulic assessment criteria to ensure that flooding impacts on neighbouring properties and the environment are minimised or avoided. Existing unapproved flood works may need to be modified to reduce flooding impacts or applications may be refused[27]. Proposals for new flood works may need to be adjusted to minimise or avoid flooding impacts or applications may be refused.	Cost of applying for a flood work approval. Preparation of technical studies including hydraulic modelling is required when the hydraulic assessment criteria apply.	Cost of constructing a flood work approval in accordance with an approval, then maintaining the work at the height and/or scale of the approval.
Stakeholder group impacted	Individual landholders	Individual landholders	Individual landholders	Individual landholders	Individual landholders
Scale: extent & intensity of the impact	Landholder scale: Negative, high impact	Landholder scale: Negative, medium impact	Landholder scale: Negative, medium to high impact	Landholder scale: Negative, medium impact	Landholder scale: Negative, medium impact
Likelihood & duration of the impact	Landholder scale: Medium, permanent impact	Landholder scale: Medium, permanent impact	Landholder scale: Medium, permanent impact	Landholder scale: Medium, temporary (upfront cost) impact	Landholder scale: Medium, temporary (upfront cost) impact
External influences	A flood work approval is required regardless of whether an FMP is in place. Flood works in or near floodways are unlikely to be approved anyway. Land capability[28] may be influenced by proximity to rivers, creeks and other natural areas. For example, it may flood too often for regular cultivation, and it may not be economically feasible to build flood works. Cultivation may be better placed higher up in the landscape within Management zones B or C. **Adjusted intensity of the impact: moderate**	A flood work approval is required regardless of whether an FMP is in place. Flood works in or near floodways are unlikely to be approved anyway unless the impact on neighbouring properties is minimised. It is not in the public's interest to retrospectively approve existing flood works that may be having a significant impact on neighbouring properties or the environment. **Adjusted intensity of the impact: low**	A flood work approval is required regardless of whether an FMP is in place. Depends on where in the landscape the works are (or are proposed to be) and the size of the flood works. Works that are further away from high value infrastructure in less developed areas and areas further out on the floodplain are less likely to cause significant impacts and may possibly avoid having to be assessed against the hydraulic assessment criteria. It is not in the public's interest to retrospectively approve existing flood works that may be having a significant impact on neighbouring properties or the environment. Community feedback suggests some existing works are causing localised flooding issues.	Cost of application fees is set by WaterNSW. Cost of hydraulic modelling and other technical studies is determined by the market (consultants). Once an application is approved, the ongoing cost is limited to renewal fees (also set by WaterNSW). **Adjusted intensity of the impact: low**	Cost of construction is determined by the market (either contract earth moving businesses or cost to complete the work if equipment is owned by the landholder). Cost of land surveys to ensure compliance with the approval is determined by the market (consultants). Once a flood work is constructed, maintenance may be limited to prior to or after a flood. **Adjusted intensity of the impact: low**

[27] In response to landholder feedback in Stage 2 public exhibition, a temporary rule was included in the FMP to provide a pathway for the approval of existing flood works in management zone B that were constructed prior to 3 December 1999. Unapproved flood works located in management zone B that were constructed prior to 3 December 1999 will be required to meet the standard assessment criteria only, provided that they are not likely to have significant impacts on nearby high value infrastructure or the environment. This is similar to the rules and assessment criteria for management zone C. More information about this temporary rule in management zone B is provided in 3.7.2 Existing flood works in management zone B.

[28] The NSW Land and soil capability assessment scheme (2017 version 1.5 published December 2023) defines classes based on the biophysical features of the land. These biophysical features determine the on-site and off-site limitations and hazards of the land and include soil type, slope, landform position, acidity, salinity, drainage, rockiness and climate.

Factor	Types of new flood works are restricted in Management zone A and SP	Types of existing flood works are restricted in Management zones A and SP	Applicable assessment criteria in management zones B and C	Cost to obtain a flood work approval	Construction and maintenance
			It is not in the public's interest to approve new flood works that may pose a risk of flooding impacts on neighbouring properties or the environment. **Adjusted intensity of the impact: moderate**		

5.5.3.1 Benefits of the FMP

There are significant benefits from the implementation of the FMP that are expected to outweigh any localised negative impacts. These benefits include:

- Minimising flood impacts on neighbours: the FMP is designed to steer inappropriate development away from high-risk floodways and to minimise changes to flood behaviour in other areas that may cause impacts on neighbouring properties.
- Improved clarity for landholders: Applying a standardised rule set and assessment criteria for flood work applications will make it clearer for landholders and other stakeholders about where flood works can and can't be built.
- Improved flood risk awareness: The proposed floodway network also identifies areas of the floodplain that pose the greatest risk to life and property during times of flood — the main floodways and the extent of historical large flood events. The publication of these maps and an interactive spatial tool will contribute to increased flood risk awareness in the valley and may be used for future property and business planning. For example, an individual landholder may use the mapping to decide which areas are suited to broadacre cropping or grazing depending on the proximity to a floodway; or to identify areas where flood works may be beneficial. This additional knowledge, combined with the proposed rules for flood works may, in turn, assist in reducing some of the production risk associated with agriculture on the floodplain. That is, there may be more certainty that floodwater will not be transferred onto their property as a result of inappropriate flood works being built nearby.
- Supporting coordinated flood preparedness and flood response: The FMP maps and data will also be shared with other government agencies that are responsible for flood mitigation and flood response including the NSW State Emergency Service, Local Land Services and local councils. This may contribute to improved flood preparedness and coordinated flood response.
- Cultural benefits: The FMP is designed to protect the passage of floodwater through the floodplain to ensure that flood works do not inadvertently block flow paths to flood-dependent Aboriginal cultural assets and values. The FMP supports their protection and restoration, which in turn provides social and economic benefits to the community. Healthy waterways and floodplains are critical to the culture and wellbeing of Aboriginal people. Water provides food, kinship, connection, recreation, stories, songlines and healing.
- Environmental benefits: Similarly, the FMP is designed to maintain flood-connectivity to ecological assets on the floodplain, including nationally significant wetlands. Protection of ecological assets provides social and economic benefits to the community.

5.5.3.2 Mitigation and management

In developing the FMP, the following measures are applicable to minimise possible impacts on landholders within the proposed floodplain:

- more lenient rules for existing flood works in floodways and areas of special protection (management zones A and SP)
- advertising of flood work applications will not be required within floodways and areas of special protection, and then only for larger scale works within Management zone B (inundation extent)
- nearly 90% of the floodplain is proposed to be allocated to Management zones B and C where all types of flood works are permitted. This means that, subject to meeting the hydraulic

assessment criteria to manage impacts on neighbouring properties, all flood work applications in these areas will be assessed on a case-by-case basis rather than being restricted to a particular type of work.

- state-wide exemptions under the Regulation apply for some flood works outside of floodways
- sharing spatial data online through the NSW Government's SEED portal to allow for property planning prior to making an application for a flood work approval (possibly avoiding lost time and money on applications that are unlikely to be approved)
- guidance on costs for hydraulic modelling so that landholders may avoid overcharging by private consultancies
- inclusion of amendment provisions to allow the FMP to be updated within its 10-year term if it is in the public's interest to do so.