



New South Wales

Floodplain Management Plan for the Gwydir Valley Floodplain 2016

under the

Water Management Act 2000

I, Niall Blair, the Minister for Lands and Water, in pursuance of section 50 of the *Water Management Act 2000*, do, by this Order, make the following Minister's Plan for the Gwydir Valley Floodplain.

Dated this 10th day of August 2016.

NIALL BLAIR, MLC

Minister for Lands and Water

Explanatory note

This Order is made under section 50 of the *Water Management Act 2000*.

The object of this Order is to make the *Floodplain Management Plan for the Gwydir Valley Floodplain 2016*. The concurrence of the Minister for the Environment was obtained prior to the making of this Order.

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Floodplain Management Plan for the Gwydir Valley Floodplain 2016

Part 1 Introduction

Note. Part 10 allows for amendments to be made to this Part.

1 Name of Plan

This Plan is the *Floodplain Management Plan for the Gwydir Valley Floodplain 2016* (*this Plan*).

2 Nature and status of Plan

- (1) This Plan is made under section 50 of the *Water Management Act 2000* (*the Act*).
- (2) This Plan is a plan for floodplain management and generally deals with the matters set out in sections 29 and 30 of the Act, as well as other sections of the Act.

Notes.

- 1 Where a provision of this Plan is made under another section of the Act, the section is referred to in the notes to this Plan.
- 2 *Rural Floodplain Management Plans: draft Technical Manual for plans developed under the Water Management Act 2000* (*the Technical Manual*) details the methodologies used to develop this Plan.

3 Commencement

This Plan commences on the 12th August 2016 and is required to be published on the NSW legislation website.

Notes.

- 1 This Plan replaces the *Lower Gingham Watercourse Floodplain Management Plan 2006* and the *Moomin Creek Floodplain Management Plan 2010*, which were repealed under section 45 of the Act.
- 2 In accordance with section 43 of the Act, this Plan will have effect for 10 years from the 12th August 2016.

4 Application of Plan

This Plan applies to the area within the Gwydir Valley Floodplain shown on the Plan

Map called *Floodplain Management Plan Map (FMP001_Version 1), Floodplain Management Plan for the Gwydir Valley Floodplain 2016 (the Plan Map)*.

Notes.

- 1 The Gwydir Valley Floodplain is declared to be a floodplain under the *Water Management (General) Regulation 2011*. The Dictionary to the Act provides that a **floodplain** means land declared by the regulations to be a floodplain.
- 2 The Plan Map is part of this Plan. An overview of the Plan Map is shown in Appendix 1. Copies of the Plan Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.

5 Management zones

- (1) This Plan establishes the following management zones in the Gwydir Valley Floodplain:

- (a) Gwydir Management Zone A,

Note. Gwydir Management Zone A includes major drainage lines and other areas where a significant discharge of floodwater occurs during all flood events. These areas are generally characterised by high flood flow velocity and depth.

- (b) Gwydir Management Zone B,

Note. Gwydir Management Zone B includes areas of the floodplain that are important for the conveyance of floodwater during large flood events and for the temporary pondage of floodwaters during the passage of a flood. Its outer boundary is defined by the modelled inundation extent of the large design flood described in Part 4.

- (c) Gwydir Management Zone C,

Note. Gwydir Management Zone C contains elevated areas or areas protected by existing flood work development.

- (d) Gwydir Management Zone D.

Note. Gwydir Management Zone D is an environmentally sensitive area that contains core wetland areas and is subjected to significant floodwater discharge in some areas and prolonged flooding durations.

- (2) The management zones in subclause (1) are shown on the map called *Management Zones Map (FMP002_Version 1), Floodplain Management Plan for the Gwydir Valley Floodplain 2016 (the Management Zones Map)*.

Notes.

- 1 The methodology for delineating management zones is described in the Technical Manual. Information on how the management zones were delineated for this Plan is provided in *Rural Floodplain Management Plans developed under the Water Management Act 2000: Background document to the floodplain management plan for the Gwydir Valley Floodplain 2016 (the Background Document)*.

- 2 The Management Zones Map is part of this Plan. An overview of the Management Zones Map is shown in Appendix 2. Copies of the Management Zones Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.

6 Understanding the rules in this Plan

This Plan contains various rules. Where appropriate, the rules specified in this Plan are given effect by the mandatory conditions for flood work approvals contained in Part 9 of this Plan.

7 Interpretation

- (1) Words and expressions that are defined in the Dictionary to this Plan have the meaning set out in the Dictionary.
- (2) Unless otherwise defined in this Plan, words and expressions that are defined in the Act or in the regulations made under the Act have the same meaning in this Plan.
- (3) The Dictionary and Schedules to this Plan form part of this Plan.
- (4) Notes in the text of this Plan do not form part of this Plan.
- (5) Appendices to this Plan do not form part of this Plan.

Part 2 Vision, objectives, strategies and performance indicators

Note. This Part is made in accordance with section 35 (1) of the Act.

8 Vision statement

The vision of this Plan is to contribute to a sustainable, healthy and working floodplain by managing the development of new flood works and amendments to existing flood works to protect the passage of floodwater through the floodplain, whilst recognising the need to minimise the risk to life and property.

9 Acknowledgement

Respect is paid to the traditional owners of this country, who are acknowledged as the first natural resource managers within this floodplain.

10 Objectives

The objectives of this Plan are to:

- (a) facilitate the orderly passage of floodwaters through the Gwydir Valley Floodplain, and
- (b) minimise the risk to life and property from the effects of flooding, and
- (c) maintain flood connectivity to wetlands, other floodplain ecosystems, and areas of groundwater recharge, and
- (d) contribute to the protection of the ecological assets and values of the Gwydir Valley Floodplain, and
- (e) contribute to the protection of cultural, heritage and spiritual features of the Gwydir Valley Floodplain that are significant to Aboriginal people and other stakeholders.

11 Strategies

The strategies of this Plan are to:

- (a) establish management zones for coordinating flood work development, and
- (b) identify the existing and natural flooding regimes in the area, and
- (c) delineate a floodway network that has adequate hydraulic capacity and continuity to effectively convey floodwaters, and
- (d) identify ecological assets and the ecological benefits of flooding, and
- (e) identify cultural assets and the cultural benefits of flooding, and
- (f) identify existing flood works, and
- (g) establish rules for the granting or amending of flood work approvals.

12 Performance indicators

The following indicators are to be used to measure the success of the strategies to reach the objectives of this Plan:

- (a) the extent to which flood works are impacting on the flood connectivity of ecological and cultural assets and groundwater recharge,
- (b) the change to flood connectivity to ecological and cultural assets caused by flood works constructed after commencement of the Plan,
- (c) the extent to which flood works are modifying the hydraulic behaviour of floodwaters,
- (d) the change to the hydraulic behaviour of floodwater caused by flood works constructed after commencement of the Plan, and
- (e) the extent to which the hydraulic behaviour of monitored floods is consistent with the floodway network.

Part 3 Flooding regimes

Notes.

- 1 Part 10 of this Plan allows for amendments to be made to this Part.
- 2 This Part is made in accordance with sections 5 (6) and 29 (a) and (b) of the Act.

13 General

The provisions in this Part deal with the identification of the existing and natural flooding regimes in the area, in terms of the frequency, duration, nature and extent of flooding.

14 Natural flooding regime

- (1) The natural flooding regime in the Gwydir Valley Floodplain was characterised by flood events that occurred prior to the construction of Copeton Dam, river regulation, land use changes and flood work development.

Note. An overview of the envelope of major historical flooding in the Gwydir Valley Floodplain is shown in Appendix 4. on the map called *Flood Extent Map (FMP003_Version 1), Floodplain Management Plan for the Gwydir Valley Floodplain 2016 (the Flood Extent Map)*. This map shows the envelope of major flooding over the period 1950 – 1980 inclusive and was compiled from maps found in the following documents: Gwydir Valley Floodplain Atlas – Cameron McNamara Pty Ltd, Consulting Engineers, (June 1981); Macintyre Valley Floodplain Atlas - Laurie Montgomerie & Pettit Pty Ltd, Consulting Engineers and Surveyors (1982); Namoi Valley Floodplain Atlas - Laurie Montgomerie & Pettit, Consulting Engineers and Surveyors (1982).

- (2) A summary of the nature, extent, frequency and duration of the natural flooding regime is provided in Table 1.

Table 1 — Natural flooding regime

	Natural flooding regime
Nature	<p>Anabranes and effluent streams were well defined between Biniguy and Moree and the Gwydir River. Flooding upstream of Biniguy was largely contained within the Gwydir River.</p> <p>The floodplain along the Gwydir River and its effluents, such as the Carole Creek, became very flat downstream of Moree. Channel size decreased progressively downstream. Flood flow velocities were generally slower than upstream of Moree with floodwaters fanning out in a delta-type drainage pattern. With reduced carrying capacity in the main channel, much of the flow of large flood events in the Lower Gwydir Valley was carried overbank and flowed through a multitude of channels, swamps and natural depressions. In-</p>

	<p>channel flow was carried in four main streams – the Gwydir River, Mehi River, Moomin Creek and Carole Creek.</p> <p>Water commonly moved over the floodplain in broad watercourses such as the Gingham and Big Leather watercourses and Thalaba and Mallowa creeks. These watercourses were typically shallow depressions in the landscape that were naturally a series of swamps that connected occasional waterholes.</p>
Frequency	<p>A number of flood events were recorded in the Gwydir Valley Floodplain between 1955 and 1974 (pre-Copeton Dam). The 1955 flood at the Gravesend Road Bridge gauge was equivalent to a 1.7% (or 1 in 60) annual exceedance probability (AEP) with smaller flood events occurring in 1964 (20% or 1 in 5 AEP), 1971 (7% or 1 in 15 AEP) and 1974 (10% or 1 in 10 AEP).</p>
Duration	<p>The Gwydir Valley Floodplain was subject to prolonged periods of flooding. In the lower parts of the floodplain inundation may have lasted up to six weeks.</p>
Extent	<p>The Gwydir Valley Flood Plain Atlas (Cameron McNamara 1982) shows the extent of major flooding in the area. The extent represents an ‘envelope’ of major flooding over the period 1950 to 1980 inclusive and can be considered to have an AEP of 2% (or 1 in 50 AEP) to 1% (or 1 in 100 AEP). The mapped flood extents cover the majority of the Gwydir Valley Floodplain except for some high areas.</p>

Note. *Annual exceedance probability* is defined in the Dictionary.

15 Existing flooding regime

- (1) The existing flooding regime in the Gwydir Valley Floodplain is generally characterised by flood events that have occurred after the construction of Copeton Dam.
- (2) The construction of Copeton Dam, the coinciding river regulation, land use and flood work development have caused changes to the nature, frequency, extent and duration of flooding in the Gwydir Valley Floodplain.
- (3) Changes to the nature of flooding include:
 - (a) alteration of the direction and depth of flood flows in some areas, and
 - (b) alteration of river, creeks and overland flow path flood volume carrying capacity in some areas, and
 - (c) increase in the velocity of flood flow rates, with flows getting to the lower reaches of the floodplain faster since the construction of development for irrigation purposes.
- (4) Changes to frequency of flooding include a decrease in the frequency of large floods that occurred pre-Copeton Dam, which are now smaller, and a decrease in the frequency of smaller events.

- (5) Changes to duration of flooding include a reduction or increase in flooding duration in some flood events due to the changes to the nature of flooding.
- (6) The existing flooding regime, including the nature, frequency and extent, was used as part of hydraulic modelling to delineate the floodway network in the following ways:
 - (a) nature: the hydraulic models that underpin the floodway networks for the floodplain contain information on the nature of flooding, including the size and roughness of floodways and connections between floodways. The models represent rivers, streams, overland flowpaths and wetlands to simulate the movement of floodwater through the floodplain,
 - (b) frequency: a flood frequency analysis was undertaken to select small and large design floods to use when modelling the floodway network. The flood frequency analysis uses flooding information from when the flooding regime was relatively natural, as well as information that encompasses the existing flooding regime,
 - (c) extent: modelled inundation extent of a small and large design flood are represented in the floodway networks.
- (7) The existing flooding regime as captured in the floodway network, including its nature, frequency and extent, was used as the basis for delineating management zones for the floodplain.

Part 4 Floodway network

Notes.

- 1 Part 10 allows for amendments to be made to this Part.
- 2 This Part is made in accordance with sections 29 and 30 of the Act.

16 General

- (1) The provisions in this Part deal with the identification of a floodway network for this Plan.

Note. The floodway network is the hydraulic basis for determining the management zones and rules in this Plan. The methodology for delineating the floodway network is described in the Technical Manual. Detail specific to delineating the floodway network for this Plan is provided in the Background Document.

- (2) The floodway network is shown on the map called *Floodway Network Map (FMP004_Version 1)*, *Floodplain Management Plan for the Gwydir Valley Floodplain 2016 (the Floodway Network Map)* held by the Department.

Notes.

- 1 The Floodway Network Map is part of this Plan. An overview of the Floodway Network Map is shown in Appendix 5. Copies of the Floodway Network Map may be inspected at the offices listed in Appendix 3 are available on the NSW legislation website.
 - 2 The Floodway Network Map represents those areas on the floodplain that have adequate hydraulic capacity and continuity to effectively convey flood waters. It is comprised of:
 - a coordinated and integrated network of floodways where a significant discharge of floodwater occurs during floods,
 - the inundation extent of small and large design floods,
 - areas that preserve floodplain connectivity, and
 - areas that provide sufficient pondage for floodwater.
 - 3 Gwydir Management Zone C represents those areas within the designated floodplain that are not part of the floodway network.
- (3) Two hydraulic categories are mapped in the floodway network:
 - (a) floodways, which are areas where a significant discharge of floodwater occurs during design floods, and

- (b) inundation extent, which includes areas of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.
- (4) Two design floods were used to model the floodway network:
- (a) design flood of February 2012 (4% or 1 in 25 AEP at the Gravesend gauging station, *the large design flood*), and
 - (b) design flood of January 2004 (10% or 1 in 10 AEP at the Gravesend gauging station, *the small design flood*).
- (5) The floodway network was determined using:
- (a) hydraulic model outputs:
 - (i) depth-velocity product maps for the large design flood (areas that reached the depth-velocity product threshold of $>0.1\text{m}^2/\text{s}$ were categorised as floodways), and
Note. *Depth-velocity product* is defined in the Dictionary.
 - (ii) discharge and velocity values along flow paths, and
 - (iii) inundation extent for the small and large design floods, and
 - (b) other data:
 - (i) flood aerial photography and satellite imagery, and
 - (ii) spatial watercourse layers and topographical mapping, and
 - (iii) previous rural floodplain management plans and guidelines, and
 - (iv) local knowledge obtained from floodplain communities and floodplain managers.

Part 5 Benefits of flooding

Notes.

- 1 Part 10 allows for amendments to be made to this Part.
- 2 This Part is made in accordance with sections 5 (2) and (6) and 29 (b) of the Act.

Division 1 General

17 General

The provisions in this Part deal with the identification of ecological and cultural assets that benefit from flooding.

Division 2 Ecological assets and values dependent on flooding

18 Ecological benefits of flooding

The ecological benefits of flooding in the Gwydir Valley Floodplain identified for the purposes of this Plan are:

- (a) maintaining or improving the structure and condition of habitat for waterbirds, fish and other amphibious fauna, and
- (b) recharging groundwater reserves and drought refuges, and
- (c) contributing to nutrient, sediment and carbon cycling, and
- (d) improving opportunities for floodplain fauna to migrate, reproduce and feed, and
- (e) supporting recruitment of floodplain vegetation, including flowering, seeding and germination, and
- (f) suppressing the growth and intrusion of invasive vegetation weed species, and
- (g) improving wetland ecosystem resilience.

19 Ecological assets

- (1) The types of ecological assets identified for the purposes of this Plan are:
 - (a) wetlands:
 - (i) semi-permanent (non-woody), and
 - (ii) floodplain (woody), and
 - (b) other floodplain ecosystems:
 - (i) flood-dependent forest, and
 - (ii) flood-dependent woodland, and
 - (iii) floodplain watercourses, and
 - (iv) non flood-dependent vegetation communities that provide habitat for flood-dependent fauna, and
 - (c) likely areas of groundwater recharge:
 - (i) alluvial soils, and
 - (ii) rivers and watercourses, and
 - (iii) vegetation communities that are associated with groundwater recharge.

Note. The nature of groundwater recharge is complex and recharge may occur in areas other than those listed in paragraph (c).

- (2) The types of ecological assets in subclause (1) are described in detail in Schedule 1.
- (3) Areas of ecological assets are shown on the map called *Ecological Assets Map (FMP005_Version 1)*, *Floodplain Management Plan for the Gwydir Valley Floodplain 2016 (the Ecological Assets Map)* held by the Department.

Note. The Ecological Assets Map is part of this Plan. An overview of the Ecological Assets Map is shown in Appendix 6. Copies of the Ecological Assets Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.

20 Ecological values

- (1) The ecological values identified for the purposes of this Plan are:
 - (a) areas of state and international conservation significance, and
 - (b) habitat for flood-dependent fauna, and
 - (c) floodplain vegetation and fauna species, including threatened species.
- (2) The ecological values in subclause (1) are listed in detail in Schedule 1.

Notes.

- 1 **Ecological assets, ecological values** and **flood-dependent assets** are defined in the Dictionary.
- 2 Further information is provided in the Background Document on how ecological values were used as surrogates for biodiversity to prioritise the ecological assets.

Division 3 Cultural assets and values dependent on flooding

21 Aboriginal values

- (1) The Aboriginal values that have been identified for the purposes of this Plan are the flood-dependent assets described in subclause (2). The functions, services and features identified as benefiting Aboriginal people and their cultures described in subclause (3) are listed in one of the following databases:
 - (a) Office of Environment and Heritage's Aboriginal Heritage Information Management System,
 - (b) DPI Water's Aboriginal Water Initiative System,
 - (c) NSW State Heritage Register,
 - (d) Commonwealth Heritage Register.
- (2) Aboriginal values that have been identified as flood-dependent assets for the purposes of this clause are:
 - (a) places or sites that are, or could be, used for cultural activities and that benefit from flooding, such as fish traps made of stone or sticks, and

- (b) flood-dependent ecological assets that:
 - (i) are recognised for their spiritual and/or cultural significance, or
 - (ii) have been culturally modified, including:
 - (A) scarred trees, and
 - (B) tree carvings, or
 - (iii) are or contain resources that are or were utilised in cultural activities, or
 - (iv) are associated with places that are used for contemporary cultural activities.
- (3) Aboriginal values involving the following functions, services and features identified as benefitting Aboriginal people and their cultures for the purposes of this clause are:
 - (a) Aboriginal cultural processes that are dependent on flooding, including:
 - (i) harvesting traditional flood-dependent resources, and
 - (ii) cultural activities connected with and dependent upon flood events,
 - (b) continuation of Aboriginal cultural practices connected with flooding,
 - (c) preservation and longevity of Aboriginal values,
 - (d) maintaining potential for cultural renewal,
 - (e) maintaining spiritual connection with the floodplain landscape.

Notes.

- 1 **Aboriginal values** is defined in the Dictionary.
- 2 Details on the identification and cultural assessment of the Aboriginal values identified in subclause (2) are described in the Background Document.
- 3 For an Aboriginal site to be identified in this clause for the purposes of this Plan, it has to be listed on a Commonwealth Heritage Register, a State Heritage Register, or the Register being compiled by the Department's Australian Water Initiative. Aboriginal sites identified as part of this planning process were added to the relevant register.

22 Heritage sites

Heritage sites that have been identified as flood-dependent assets for the purposes of this

Plan are sites, objects or places listed in at least one of the following databases:

- (a) NSW State Heritage Register,
- (b) NSW State Heritage Inventory,
- (c) Aboriginal Historic Information Management System,
- (d) Historic Heritage Information Management System,
- (e) DPI Water's Aboriginal Water Initiative System,
- (f) Commonwealth Heritage Register,

where the heritage value of the listing is associated with flooding.

Note. Heritage sites may be sensitive to changes in flood behaviour or disturbance from the construction of flood works. Where a heritage site is located within the area of a flood work application it will be assessed against criteria to ensure these sites are not adversely impacted.

Part 6 Existing flood works

Notes.

- 1 Part 10 allows for amendments to be made to this Part.
- 2 This Part is made in accordance with sections 5 (2) (e)–(g) and (6), 29 (c) and 30 (b)–(d) of the Act.

23 General

The provisions in this Part deal with the identification of existing flood works in the area and the way they are managed, their benefits in terms of the protection they give to life and property, and their cultural, socio-economic and ecological impacts, including cumulative impacts.

24 Types of flood works

The following types of flood works are present in the Gwydir Valley Floodplain:

- (a) infrastructure protection works,
- (b) levees,
- (c) access roads,
- (d) storages,
- (e) supply channels,
- (f) stock refuge works,
- (g) other earthworks and embankments.

Note. *Infrastructure protection work* is defined in the Dictionary.

25 Approved flood works

At the commencement of this Plan, 286 flood works were approved in the Gwydir Valley Floodplain. The types of approved flood works include:

- (a) above ground channels, and

(b) levees and embankments, and

(c) storages.

Note. A single approval may be comprised of numerous individual works. Some structures can be used for other purposes, for example, levees and embankments can also be used as roads or infrastructure protection works.

26 Area enclosed by existing flood works

- (1) At the commencement of this Plan, the area enclosed by flood works in the Gwydir Valley Floodplain Management Plan area is estimated to be 193,400 hectares.
- (2) The area enclosed by existing flood works is shown on the map called *Existing Flood Works Map (FMP006_Version 1)*, *Floodplain Management Plan for the Gwydir Valley Floodplain 2016 (the Existing Flood Works Map)* held by the Department.

Notes.

- 1 The Existing Flood Works Map is part of this Plan. An overview of the Existing Flood Works Map is shown in Appendix 7. Copies of the Existing Flood Works Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.
- 2 The Existing Flood Works Map depicts the overall footprint of major works constructed in the Gwydir FMP area and the major areas enclosed by those works. The map does not depict individual works, and it does not include all works in the area.

27 Ecological impacts of flood works

- (1) The positive impacts of existing flood works on ecological assets identified in clause 19 in relation to flood behaviour and flood connectivity can include:
 - (a) increased localised flooding frequency and duration (due to the diversion and retention of floodwaters) for ecological assets when flooding regimes have generally been reduced by river regulation, and
 - (b) increased localised groundwater recharge due to the diversion and retention of floodwaters in areas where groundwater recharge is generally restricted by altered flooding regimes.
- (2) The negative impacts of existing flood works on ecological assets identified in clause 19 in relation to flood behaviour and flood connectivity can include:
 - (a) altered flood connectivity, which may result in:

- (i) disconnection of ecological assets from flooding by blocking or partially obstructing flow paths, and
 - (ii) diversion of flood flows away from ecological assets, and
 - (iii) increased flooding duration of ecological assets that exceeds the requirements of floodplain species, and
 - (iv) decline in available forage, nesting and refuge habitat for fauna reliant on ecological assets, and
- (b) restricted native fish passage, which may result in:
- (i) reduction of fish migration within the floodplain, and
 - (ii) fish becoming stranded by existing flood works on the floodplain when floodwaters recede, and
 - (iii) reduced access to habitat and food resources during floods, and
 - (iv) decline in the abundance and distribution of native fish, and
- (c) reduction in groundwater recharge during floods as extent and duration of flooding is reduced, and
- (d) net reduction of floodwater available to ecological assets as a result of river regulation and existing flood works.

28 Cultural impacts of flood works

- (1) The positive impact of existing flood works on cultural assets identified in clauses 21 and 22 in relation to flood behaviour and flood connectivity can include increased localised flooding frequency and duration (due to the diversion and retention of floodwaters) for flood-dependent cultural places with flooding regimes reduced by river regulation.
- (2) The negative impacts of existing flood works on cultural assets identified in clauses 21 and 22 in relation to flood behaviour, flood risk and flood connectivity can include:
- (a) altered flood connectivity to cultural assets, which may result in:
 - (i) disconnection of flood-dependent cultural assets from flooding by flows

- blocking or partially obstructing flow paths, and
- (ii) diversion of flood flows away from flood-dependent cultural assets, and
 - (iii) increased flooding duration of flood-dependent cultural assets that exceeds the requirements of those assets, and
- (b) increase in flood velocity, which may result in scour and erosion damage to cultural places, such as burial sites.

29 Socio-economic impacts of flood works

- (1) The positive impacts of existing flood works on socio-economic factors in relation to flood behaviour and flood risk can include:
 - (a) flood protection of crops and property, and
 - (b) flood protection for on-farm access, and
 - (c) infrastructure for managing irrigation or stock and domestic water.
- (2) The negative impacts of existing flood works on socio-economic factors in relation to flood behaviour, flood risk and flood connectivity are redistribution of flood flows and altered flood behaviour which may result in:
 - (a) re-direction of flood flows onto adjacent properties, and
 - (b) increase in flood velocity leading to increased erosion and scour, and
 - (c) increase in flood levels on adjacent and downstream properties, and
 - (d) disruptions to daily life, for instance limited or no property access during floods, and
 - (e) loss of crops and infrastructure.

30 Cumulative impacts of flood works

- (1) This Plan recognises the positive socio-economic, cultural and ecological impacts of existing flood works where they are constructed in a coordinated manner, but also recognises that cumulative negative impacts of flood works can occur where their

construction is uncoordinated.

- (2) This Plan addresses the potential negative cumulative impacts of existing and proposed flood works through:
- (a) identifying existing flood works in the Gwydir Valley Floodplain for use in the hydraulic modelling of different floodplain scenarios, and
 - (b) using hydraulic modelling to compare undeveloped floodplain scenarios to existing developed floodplain conditions, in order to understand the cumulative impacts of existing flood works across the floodplain, and
 - (c) developing management zones and rules for granting and amending flood work approvals in consideration of the cumulative impacts additional flood works may have across the floodplain.

Note. The mechanisms used by the Plan to address cumulative impacts are interrelated. For instance, hydraulic modelling shows that, taking account of identified existing works, the construction of new flood works in major discharge areas would have a significant cumulative impact on the distribution of flow and flood levels. These areas are represented by Management Zones A and D where only minimal flood work development is permitted.

Part 7 Risks from flooding

Note. This Part is made in accordance with sections 5 (6) and 29 (d) of the Act.

31 General

The provisions in this Part deal with the risk to life and property from the effects of flooding.

32 Risk to life and property

Risk to life and property from the effects of flooding includes, but is not limited to:

- (a) the risk of tangible flood damage, which is financial in nature, including:
 - (i) the damage or loss caused by floodwaters wetting goods, possessions and crops, and
 - (ii) property damage, which includes contents damage (e.g. carpets and furniture), structural damage (e.g. wall, floors and windows) and external damage (e.g. high value infrastructure and parked motor vehicles), and
 - (iii) the loss of livestock, and
 - (iv) the loss of wages and extra outlays incurred during clean-up operations, and
- (b) the risk of intangible flood damage, including:
 - (i) increased levels of emotional stress, and
 - (ii) mental and physical illness caused by the flood episode, and
 - (iii) disruption to daily life, such as restricted or no access to property.

33 Consideration of risk to life and property

The risk to life and property from the effects of flooding is addressed in this Plan in Parts 4, 6, and 8.

34 The floodway network

The floodway network addresses the risk to life and property through:

- (a) identification of areas within the floodway network that may impact on life and property, such as:
 - (i) major flood discharge areas, and
 - (ii) areas of the floodplain that are subject to inundation during times of flooding, and
- (b) flood risk awareness, through:
 - (i) mapping of floodways, and
 - (ii) mapping the extent of modelled historic flood flows.

35 Management zones and rules for granting or amending flood work approvals

- (1) The risk to life and property from the effects of flooding is addressed in the design of the management zones and rules for granting or amending flood work approvals by:
 - (a) identifying hydraulic thresholds within management zones where the local and cumulative impact of flood work development should be limited to prevent flood flow redistribution, increased flood velocities and flood levels, and
 - (b) developing rules to limit the granting of flood work approvals for flood works that are minor in nature, including flood protection works to protect infrastructure and livestock, in zones where major flood discharge occurs (Gwydir Management Zones A and D), and
 - (c) developing rules to allow landholders to apply for certain flood protection works in Gwydir Management Zone B (where temporary storage of large floods occurs) without requiring advertising, to protect infrastructure, crops and livestock from flood events, and
 - (d) specifying the nature of flood works that can be constructed.
- (2) The implementation of the management zones and rules for granting or amending flood

work approvals will minimise flood risk by:

- (a) coordinating and controlling the type and nature of flood work development, and
- (b) preventing the construction of flood works that pose a significant risk to property, and
- (c) increasing flood risk awareness and informing land use planning through mapping of management zones that highlight areas subject to frequent inundation (Gwydir Management Zones A and D).

36 Existing works

The risk to life and property from the effects of flooding was considered through the identification of existing flood works by:

- (a) consideration of existing flood works in the delineation of the floodway network and the design of the management zones, and
- (b) identification of areas within the floodplain where cumulative impacts from existing works may be high, and
- (c) limiting flood-work development in parts of the floodplain where cumulative impacts are high, and
- (d) adoption of cumulative impact assessment thresholds that take into account existing flood work development.

Part 8 Rules for granting or amending flood work approvals

Notes.

- 1 Part 10 allows for amendments to be made to this Part.
- 2 Rules for flood work approvals in this Part are made in accordance with sections 5, 29, 30 and 95 of the Act.

Division 1 General

37 General

- (1) The rules in this Part apply to granting or amending flood work approvals for flood works in the Gwydir Valley Floodplain.
- (2) Where a flood work approval is sought for a flood work that is located or is proposed to be located in more than one management zone, the rules in each of the management zones in which the work is located apply only to that portion of the work located within the management zone.

Division 2 Rules for granting or amending flood work approvals in Gwydir Management Zone A

38 Flood works authorised in Gwydir Management Zone A

- (1) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Gwydir Management Zone A unless, in the Minister's opinion, the flood work approval is for one of the following:
 - (a) an access road,
 - (b) a supply channel below the natural surface level,
 - (c) a stock refuge,
 - (d) an infrastructure protection work.

- (2) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of an access road in Gwydir Management Zone A unless, in the Minister's opinion, the access road is or is proposed to be:
- (a) no more than 15 cm in height above the natural surface level at any location, and
Note. *Natural surface level* is defined in the Dictionary.
 - (b) constructed with causeways situated at no higher than the natural surface level located at least once every 200 m of road length, and
 - (c) constructed with causeways that comprise at least 10% of the total length of the access road that is in Gwydir Management Zone A, and
Note. This applies to access roads within a single property and that span multiple properties.
 - (d) constructed so that the borrow associated with the construction and maintenance of the access road is located on the downstream side of the road and is of no greater depth than 15 cm below the natural surface level.
Note. *Borrow* is defined in the Dictionary.
- (3) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of a supply channel below the natural surface level in Gwydir Management Zone A unless, in the Minister's opinion, the supply channel is or is proposed to be:
- (a) constructed in such a way as to allow for the adequate passage of floodwater and to adequately prevent the diversion of floodwater, and
Note. The Department may require that a structure be put in place at a low point of the supply channel to meet the requirements of this paragraph.
 - (b) constructed so that spoil from its construction and maintenance:
 - (i) is windrowed parallel to the direction of flow such that it does not block more than 5% of the width of Gwydir Management Zone A at the location where the work is being constructed, or
 - (ii) is levelled to a maximum of 10 cm above the natural surface level at any location.
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Note. Windrow is defined in the Dictionary.

- (4) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of a stock refuge in Gwydir Management Zone A unless, in the Minister's opinion, the stock refuge is or is proposed to be:
- (a) no more than 10 ha in area in any single location within Gwydir Management Zone A, and
 - (b) no more than 5% of the total area of the landholding, and
 - (c) no more than 5% of the width of Gwydir Management Zone A at any location.
- (5) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction of an infrastructure protection work on a landholding of less than or equal to 20 ha in area in Gwydir Management Zone A unless, in the Minister's opinion, the area enclosed by the infrastructure protection work accounts for no more than 10% of the total area of the landholding.

Notes.

1 **Infrastructure protection works** is defined in the Dictionary.

2 For example, if a landholding is 10 ha in area, the infrastructure protection work must enclose no more than 1 ha.

- (6) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction of an infrastructure protection work on a landholding of greater than 20 ha in area in Gwydir Management Zone A unless, in the Minister's opinion, the area enclosed by the infrastructure protection work accounts for no more than the greater of the following:
- (a) no more than 2 ha, or
 - (b) no more than 1% of the total landholding.

Note. For example, if a property is 25 ha in area, the area enclosed by infrastructure works must be no more than 2 ha in area. A property that is 300 ha in area may have infrastructure protection works that enclose an area no more than 3 ha in area.

- (7) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction of an infrastructure protection work in Gwydir

Management Zone A if, in the Minister's opinion, it would block more than 5% of the width of Gwydir Management Zone A at the location of the works.

39 Existing flood structures and works in Gwydir Management Zone A

- (1) A flood work approval in Gwydir Management Zone A may be granted for flood works that do not comply with the requirements of clause 38, provided the flood work meets all of the following criteria:
 - (a) the flood structure was constructed as at the date of commencement of this Plan,
 - (b) the flood structure is, in the Minister's opinion, for:
 - (i) an access road, or
 - (ii) a supply channel below the natural surface level, or
 - (iii) a stock refuge, or
 - (iv) an infrastructure protection work,
 - (c) as at the date of application, the flood structure is not the subject of:
 - (i) an undetermined controlled work application under Part 8 of the *Water Act 1912*, or
 - (ii) a previously refused Part 8 application of the *Water Act 1912*, or
 - (iii) an undetermined flood work application under the Act, or
 - (iv) a previously refused flood work application under the Act.

 - (2) An amendment of a flood work approval in Gwydir Management Zone A may be granted for a flood work that does not comply with the requirements of clause 38, provided the flood work meets all of the following criteria:
 - (a) the flood work was constructed as at the date of commencement of this Plan,
 - (b) the proposed modification to the flood work will, in the Minister's opinion, reduce the impact of the works on flow patterns (distribution of flows, drainage, depth or velocity) in Gwydir Management Zone A.
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- (3) An application under this clause must be assessed against the assessment criteria outlined in clause 40 of this Plan.

40 Assessment criteria for flood works in Gwydir Management Zone A

Note. The Department may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) Flood work applications in Gwydir Management Zone A must be assessed against the assessment criteria outlined in this clause.
- (2) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone A unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity:
- (a) to ecological and/or cultural assets, and
 - (b) to facilitate fish passage,

under a range of flood scenarios, including at a minimum, scenarios for the 2004 and 2012 design floods.

- (3) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone A if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.

Note. Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the databases referred to in clause 22.

- (4) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone A unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.
- (5) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone A unless the Minister has considered the cumulative impact that the proposed flood work and other existing works on the landholding may have on adjacent landholdings, and on other landholdings that may be affected by the proposed flood work and the floodplain environment.

Division 3 Rules for granting or amending flood work approvals in Gwydir Management Zone B

41 Advertising for flood work approvals in Gwydir Management Zone B

An application for a new or amended flood work approval in Gwydir Management Zone B must be advertised, unless the flood work is or is proposed to be:

- (a) no more than a maximum height of 40 cm above the natural surface level at any location, or
- (b) used as a stock refuge, and:
 - (i) accounts for no more than 5% of the total area of the landholding, and
 - (ii) is no more than 10 ha in size in any single location in Gwydir Management Zone B, or
- (c) used to protect infrastructure and the area enclosed by the flood work accounts for no more than 1% of the total area of the landholding.

42 Assessment criteria in Gwydir Management Zone B

Note. Applicants for flood work approvals may be required to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) Flood work applications in Gwydir Management Zone B must be assessed against the assessment criteria outlined in this clause.
- (2) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone B unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity:
 - (a) to ecological and/or cultural assets, and
 - (b) to facilitate fish passage,

under a range of flood scenarios including, at a minimum, scenarios for the 2004 and 2012 design floods.

- (3) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone B if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.

Note. Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the databases referred to in clause 22.

- (4) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone B unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.

- (5) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone B if, in the Minister's opinion, construction of the flood work is likely to:

- (a) redistribute the peak flood flow by more than 5% on adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to the peak flood flow under existing development conditions for a range of flood scenarios including at a minimum the 2012 design flood, or
- (b) increase flood levels by more than or equal to 10 cm on adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to flood levels under pre-development and existing development conditions for a range of flood scenarios, including at a minimum the 2012 design flood, or

Note. *Pre-development conditions* refer to the natural flow regimes. *Existing development conditions* refer to the level of development at the commencement of this Plan.

- (c) increase flow velocity by more than 50% on the landholding under application, adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to flow velocity under pre-development and existing development conditions for a range of flood scenarios, including at a minimum the 2012 design flood, or
- (d) increase flow velocity by an amount that, in the Minister's opinion, is likely to have more than a minimal impact on soil erodibility on adjacent landholdings and other landholdings that may be affected by the proposed flood work, taking into
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account the ground cover on those landholdings.

This subclause does not apply to flood works that are not required to be advertised under clause 41.

- (6) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone B if, in the Minister's opinion, construction of the flood work is likely to redistribute the peak flood flow by more than 5% at any of the Peak Discharge Calculation Points shown on the map called *Peak Flood Flow Distribution (2012) Map (FMP007_Version 1), Floodplain Management Plan for the Gwydir Valley Floodplain 2016 (the Peak Flood Flow Distribution (2012) Map)* under existing development conditions.

Notes.

- 1 The Peak Flood Flows Distribution (2012) Map is part of this Plan. An overview of the Peak Flood Flow Distribution (2012) Map is shown in Appendix 8. Copies of the Peak Flood Flow Distribution (2012) may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.
- 2 In conducting assessments under subclause (6), the Minister may not require modelling to inform decisions for flood works that do not require advertising in accordance with clause 41.
- (7) In addition to the requirements of subclause (6), a flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone B if, in the Minister's opinion, the construction of the flood work would be likely to redistribute the peak flood flow by more than 5% at any location and under any other flood scenario considered relevant by the Minister.

Note. In conducting the assessments described under subclauses (5) (7), the Minister may consider any flood scenario that is appropriate to the flood work that is proposed and its location on the floodplain, including the 2004 design flood under existing and/or natural conditions, the 1% AEP flood under existing and/or natural conditions, or any other relevant flood scenario.

Division 4 Rules for granting or amending flood work approvals in Gwydir Management Zone C

43 Assessment criteria in Gwydir Management Zone C

Note. Applicants for flood work approvals may be required to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) Flood work applications in Gwydir Management Zone C must be assessed against the
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assessment criteria outlined in this clause.

- (2) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone C unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity:

(a) to ecological and/or cultural assets, and

(b) to facilitate fish passage,

under one or more flood scenarios, including at a minimum scenarios for the 2012 design flood and the 1% AEP flood.

- (3) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone C if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.

Note. Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the databases referred to in clause 22.

- (4) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone C unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.

- (5) In determining whether to grant or amend a flood work approval to authorise the construction of a flood work in Gwydir Management Zone C, the Minister may have regard to whether construction of the flood work would be likely to:

(a) redistribute the peak flood flow by more than 5% on adjacent landholdings and other landholdings that may be affected by the proposed flood work under one or more flood scenarios, or

(b) increase flood levels by more than or equal to 10 cm on adjacent landholdings and other landholdings that may be affected by the proposed flood work under one or more flood scenarios, or

(c) increase flow velocity by more than 50% on the landholding under application, adjacent landholdings and other landholdings that may be affected by the proposed

flood work under one or more flood scenarios, or

- (d) increase flow velocity by an amount that, in the Minister's opinion, is likely to have more than a minimal impact on soil erodibility on adjacent landholdings and other landholdings that may be affected by the proposed flood work, taking into account the ground cover on those landholdings.
- (6) In determining whether to grant or amend a flood work approval to authorise the construction of a flood work in Gwydir Management Zone C, the Minister may have regard to whether construction of the flood work would be likely to redistribute the peak flood flow by more than 5% under existing development conditions at any of the 2012 Peak Discharge Calculation Points shown in the Peak Flood Flow Distribution (2012) Map at any location and at any other flood scenario considered relevant by the Minister.

Note. In conducting the assessments described under subclauses (5) and (6), the Minister may consider any flood scenario that is appropriate to the flood work that is proposed and its location on the floodplain, including the 2012 design flood under existing and/or natural conditions, the 1% AEP flood under existing and/or natural conditions, or any other relevant flood scenario.

Division 5 Rules for granting or amending flood work approvals in Gwydir Management Zone D

44 Flood works authorised in Gwydir Management Zone D

Note. Applicants for flood work approvals may be required to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone D unless, in the Minister's opinion, the flood work approval is for one of the following:
 - (a) a stock refuge,
 - (b) an infrastructure protection work.
- (2) Subject to subclause (1) and clause 46, a flood work approval must not be granted or amended to authorise the construction or modification of a stock refuge in Gwydir Management Zone D unless, in the Minister's opinion, the stock refuge is or is proposed to be:

- (a) no more than 10 ha in area in any single location within Gwydir Management Zone D, and
 - (b) no more than 5% of the total area of the landholding.
- (3) Subject to subclause (1) and clause 46, a flood work approval must not be granted or amended to authorise the construction of an infrastructure protection work on a landholding of less than or equal to 20 ha in area in Gwydir Management Zone D unless, in the Minister's opinion, the area enclosed by the infrastructure protection work accounts for no more than 10% of the total area of the landholding.

Note. For example, if a landholding is 10 ha in area, the infrastructure protection work must enclose no more than 1 ha.

- (4) Subject to subclause (1) and clause 46, a flood work approval must not be granted or amended to authorise the construction of an infrastructure protection work on a landholding of greater than 20 ha in area in Gwydir Management Zone D unless, in the Minister's opinion, the area enclosed by the infrastructure protection work accounts for no more than the greater of the following:

- (a) 2 ha,
- (b) 1% of the total landholding.

Note. For example, if a property is 25 ha in area, the area enclosed by infrastructure works must be no more than 2 ha in area. A property that is 300 ha in area may have infrastructure protection works that enclose an area no more than 3 ha in area.

- (5) Subject to subclause (1) and clause 46, a flood work approval must not be granted or amended to authorise the construction of an infrastructure protection work in Gwydir Management Zone D if, in the Minister's opinion, it would block more than 5% of the width of Gwydir Management Zone D at the location of the works.

45 Existing flood structures and works in Gwydir Management Zone D

- (1) A flood work approval in Gwydir Management Zone D may be granted for flood works that do not comply with the requirements of clause 44, provided the flood work meets all of the following criteria:
- (a) the flood structure was constructed prior to the commencement of the Lower Gingham Floodplain Management Plan and is, in the Minister's opinion, for an access road,

Note. The *Lower Gingham Watercourse Floodplain Management Plan 2006* was adopted in May 2006, and was repealed under section 45 of the Act at the commencement of this Plan.

- (b) the flood structure was constructed as at the date of commencement of this Plan, and is, in the Minister's opinion, for:
 - (i) a stock refuge, or
 - (ii) an infrastructure protection work,
- (c) as at the date of application, the flood structure is not the subject of:
 - (i) an undetermined controlled work application under Part 8 of the *Water Act 1912*, or
 - (ii) a previously refused Part 8 application of the *Water Act 1912*, or
 - (iii) an undetermined flood work application under the Act, or
 - (iv) a previously refused flood work application under the Act.
- (2) An amendment of a flood work approval in Gwydir Management Zone D may be granted for a flood work that does not comply with the requirements of clause 44, provided the flood work meets all of the following criteria:
 - (a) the flood work was constructed as at the date of commencement of this Plan, and
 - (b) the proposed modification to the flood work will, in the Minister's opinion, reduce the impact of the works on flow patterns (distribution of flows, drainage, depth or velocity) in Gwydir Management Zone D.
- (3) An application under this clause must be assessed against the assessment criteria outlined in clause 46 of this Plan.

46 Assessment criteria in Gwydir Management Zone D

Note. The Department may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) Flood work applications in Gwydir Management Zone D must be assessed against the assessment criteria outlined in this clause.

(2) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone D unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity:

- (a) to ecological and/or cultural assets, and
- (b) to facilitate fish passage,

under a range of flood scenarios including, at a minimum, scenarios for the 2004 and 2012 design floods.

(3) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone D if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.

Note. Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the databases referred to in clause 22.

(4) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone D unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.

(5) A flood work approval must not be granted or amended to authorise the construction of a flood work in Gwydir Management Zone D unless the Minister has considered the cumulative impact that the proposed flood work and other existing works on the landholding may have on adjacent landholdings, other landholdings and the floodplain environment.

Part 9 Mandatory conditions

Notes.

- 1 Part 10 allows for amendments to be made to this Part.
- 2 This Part is made in accordance with section 17 (c) of the Act.

47 General

- (1) In this Part, a requirement to notify the Minister in writing will be satisfied by making a notification in writing to one of the addresses listed in Appendix 3 of this Plan or to the email address for the Department's Advisory Service, Water Regulation.

Note. At the commencement of this Plan, the email address for the Department's Advisory Service, Water Regulation is water.enquiries@dpi.nsw.gov.au.

- (2) Flood work approvals for flood works in this Plan must have mandatory conditions where required to give effect to the following:
 - (a) the rules for granting or amending flood work approvals in Part 8,
 - (b) the approval holder must notify the Minister, in writing, immediately upon becoming aware of a breach of any condition of the approval,
 - (c) the approval holder must, within two months of completion of the construction of the flood work, or within two months after the issue of the flood work approval if the approval is for the amendment of an existing flood work, submit the details of the flood work to the Department in a form approved by the Minister,
 - (d) if the approval holder intends to permanently cease using a flood work, the following requirements apply:
 - (i) the approval holder must provide the Minister with a notice in writing that the approval holder intends to decommission the work that includes a work plan for the decommissioning at least ninety days before commencing action to decommission the work,
 - (ii) the approval holder must not commence decommissioning the work unless the approval holder receives a notice in writing from the Minister authorising the decommissioning of the work,

- (iii) if the approval holder receives a notice in writing from the Minister requiring the work not to be decommissioned, or requiring the work to be decommissioned according to specific requirements, the approval holder must act in accordance with the requirements in the notice,
- (iv) within sixty days of the completion of flood work decommissioning, the approval holder must notify the Minister in writing that the flood work has been decommissioned and provide details of the decommissioning,
- (d) the requirements of any action plan made as part of this Plan,
- (e) any other condition required to implement the provisions of this Plan.

Part 10 Amendment of this Plan

48 General

- (1) Amendments specified throughout this Plan and in this Part are amendments authorised by this Plan.
- (2) An amendment authorised by this Plan is taken to include any consequential amendments required to be made to this Plan to give effect to that particular amendment.

Note. For example, if Part 1 is modified, this may require amendments to other parts of this Plan to include rules for that management zone.

49 Part 1

Part 1 may be amended to do any of the following:

- (a) modify the area to which this Plan applies,
- (b) modify the Plan Map,
- (c) modify a management zone using any of the following information, or other supporting information as determined by the Minister:
 - (i) an aerial photograph or equivalent satellite image showing flood inundation at the property scale of either the small design flood or the large design flood,
 - (ii) oblique photos showing flood inundation of either the small design flood or the large design flood that contain verifiable land marks,
 - (iii) oblique photos of flood survey marks that can be verified for either the small design flood or the large design flood.

Note. A hydraulic study which provides velocity and depth information for the large design flood may be used to support this information.

50 Part 3

Part 3 may be amended to do any of the following:

- (1) modify the description of the natural flooding regime,
- (2) modify the description of the existing flooding regime.

51 Part 4

Part 4 may be amended to do any of the following:

- (1) add, remove or modify the design floods used to establish the floodway network,
- (2) modify the Floodway Network Map.

52 Part 5

Part 5 may be amended to do any of the following:

- (a) modify the ecological benefits of flooding specified in clause 18,
- (b) add, remove or modify ecological assets in clause 19,
- (c) add, remove or modify Aboriginal values in clause 21,
- (d) add, remove or modify heritage sites in clause 22.

53 Part 6

Part 6 may be amended to do any of the following:

- (a) add, remove or modify the types of flood works in clause 24,
- (b) add, remove or modify the number or types of flood works in clause 25,
- (c) modify the area enclosed by existing flood works in clause 26.

54 Part 8

Part 8 may be amended to do any of the following:

- (a) add, remove or modify rules for granting or amending flood work approvals,
- (b) add rules to give effect to an action plan made under Part 8 including rules for:
 - (i) the granting or amending of flood work approvals, and

- (ii) the modification or removal of existing flood works,
- (c) add rules for the removal or modification of existing flood works.

55 Part 9

Part 9 may be amended to do any of the following:

- (a) add, remove or modify requirements for the decommissioning of works,
- (b) add, remove or modify conditions to implement an action plan made as part of this Plan.

56 Dictionary

The Dictionary may be amended to add, modify or remove a definition.

57 Schedules

Schedule 1 may be amended to add or remove any ecological assets or values that benefit from flooding.

Dictionary

Note. Unless otherwise defined in this Plan, words and expressions that are defined in the Act or in the regulations have the same meaning in this Plan.

Aboriginal values are sites, objects, landscapes, resources and beliefs that are important to Aboriginal people as part of their continuing culture.

Annual Exceedance Probability is the chance of a flood of a given or larger size occurring in any one 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 same size or larger will occur in any one year.

borrow is an area of land where material is excavated or removed to construct a flood work at another location. The removal of material from this area results in a depression or hole in the ground.

connectivity refers to the unimpeded passage of floodwater through the floodplain. Connectivity is important for in-stream aquatic processes and biota and the conservation of natural riverine systems.

cultural asset is an object, place or value that is important for people to maintain their connection, beliefs, customs, behaviours and social interaction.

depth-velocity product is a hydraulic model output that can be used to indicate areas of a floodplain where a significant discharge of water occurs during floods; that is, areas where flow velocity and/or water depth are relatively high.

design flood is a flood of known magnitude or annual exceedance probability that can be modelled. A design flood is selected to design floodway networks which are used to define management zones for the planning and assessment of the management of flood works on floodplains. The selection 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.

discharge (or flow) is the rate of flow measured in volume per unit of time (e.g. megalitres per day = ML/day).

ecological assets are wetlands or other floodplain ecosystems, including watercourses that depend on flooding to maintain their ecological character. Areas where groundwater reserves are recharged by floodwaters are also considered to be ecological assets. Ecological assets are spatially explicit and are set in the floodplain landscape.

ecological values are surrogates for biodiversity that are used to prioritize the ecological assets and include fauna species and fauna habitat, vegetation communities and areas of conservation significance.

fish passage refers to connectivity that facilitates the movement of native fish species between upstream and downstream habitats (longitudinal connectivity) and adjacent riparian and floodplain areas (lateral connectivity). Areas that are important for fish passage include rivers, creeks and flood flow paths.

flood structure refers to any existing floodplain feature (such as a barrage, causeway, cutting or embankment) without a flood work approval for which a flood work approval is now required, from the commencement of this Plan.

flood-dependent assets refers to assets that have been identified in this Plan as having important ecological or cultural features which rely on inundation by floodwaters to sustain essential processes.

flooding regime refers to the frequency, duration, nature and extent of flooding.

floodplain watercourses include:

- (a) permanent flowing rivers and creeks, including those where the flow is modified by upstream dam(s),
- (b) intermittent flowing rivers and creeks that retain water in a series of disconnected pools after flow ceases including those where the flow is modified by upstream dam(s), to the top of the natural bank regardless of whether the channel has been physically modified, and
- (c) flood channels or flood runners that run across or along floodplains during high flow events.

floodways are areas where a significant discharge of floodwater occurs during small and large design floods.

groundwater recharge areas are areas where water from a flood event leaks through the soil profile into the underlying aquifers.

heritage sites are cultural heritage objects and places as listed on Commonwealth, State and local government heritage registers.

infrastructure protection work refers to a flood work that is for the protection of houses, stock yards and other major infrastructure, such as machinery sheds.

management zones are areas in the floodplain that have specific rules to define the purpose, nature and construction of flood works that can occur in those areas.

natural surface level is the average undisturbed surface level in the immediate vicinity of a flood work.

windrow refers to a row or line of cut vegetation or other material.

Schedule 1 Ecological assets and ecological values

1 Ecological assets identified for the purposes of this Plan:

- (1) wetlands:
 - (a) semi-permanent (non-woody):
 - (i) common reed (*Phragmites australis*),
 - (ii) cumbungi (*Typha domingensis*),
 - (iii) cumbungi/marsh club rush (*Typha domingensis* / *Bolboschoenus fluviatilis*),
 - (iv) tussock rush (*Juncus aridicola*),
 - (v) ribbed spikerush (*Eleocharis plana*),
 - (vi) water couch (*Paspalum distichum*),
 - (b) floodplain (woody):
 - (i) coolibah/river cooba (*Eucalyptus coolabah* / *Acacia stenophylla*),
 - (ii) lignum (*Duma florulenta*),
 - (iii) river cooba/lignum (*Acacia stenophylla* / *Duma florulenta*),
- (2) other floodplain ecosystems:
 - (a) flood-dependent forest: river red gum (*Eucalyptus camaldulensis*),
 - (b) flood-dependent woodland:
 - (i) coolibah (*Eucalyptus coolabah*),
 - (ii) black box (*Eucalyptus largiflorens*),
 - (c) floodplain watercourses:
 - (i) drainage lines,

- (ii) lagoons,
- (iii) billabongs,
- (iv) waterholes,
- (v) lakes,
- (d) non flood-dependent vegetation communities that provide habitat for flood-dependent fauna:
 - (i) windmill grass (*Chloris truncata*),
 - (ii) curly windmill grass (*Enteropogon acicularis*),
 - (iii) belah (*Casuarina cristata*),
 - (iv) native millet/cup grass (*Panicum decompositum/ Eriochloa crebra*),
- (3) areas of groundwater recharge:
 - (a) alluvial soils,
 - (b) rivers and watercourses,
 - (c) vegetation communities that are associated with groundwater recharge:
 - (i) poplar box (*Eucalyptus populnea*) and white cypress pine (*Callitris glaucophylla*) woodlands on sandy loam soils,
 - (ii) dirty gum (*Eucalyptus chloroclada*) and white cypress pine (*Callitris glaucophylla*) woodlands on alluvial sand lenses.

2 Ecological values identified for the purposes of this Plan:

- (1) areas of state and international conservation significance that are dependent on flooding:
 - (a) Ramsar Convention:
 - (i) Gwydir Wetlands: Gingham and Lower Gwydir (Big Leather) Watercourses, specifically:

- (A) 'Windella',
 - (B) 'Crinolyn',
 - (C) 'Goddard's Lease', and
 - (D) 'Old Dromana',
- (b) State Conservation Areas:
- (i) Gwydir Wetlands,
- (c) wetlands identified in existing rural floodplain management plans:
- (i) *Lower Gingham Watercourse Floodplain Management Plan 2006*,
 - (ii) *Moomin Creek Floodplain Management Plan 2010*.

Note. The Midkin Nature Reserve was identified in the floodplain but is not flood-dependent and therefore was not considered when prioritising the ecological assets.

- (2) habitat for flood-dependent fauna:
- (a) observed and modelled waterbird breeding habitat sites,
 - (b) mapped flood-dependent vegetation communities:
 - (i) semi-permanent wetland,
 - (ii) floodplain wetland (river cooba/lignum),
 - (iii) floodplain wetland (coolibah/river cooba/lignum),
 - (iv) flood-dependent forest (river red gum),
 - (v) flood-dependent woodland (coolibah),
 - (vi) flood-dependent woodland (black box),
 - (vii) non flood-dependent vegetation (belah),
 - (viii) non flood-dependent vegetation (windmill grass),
 - (ix) non flood-dependent vegetation (native millet/cup grass), and
-

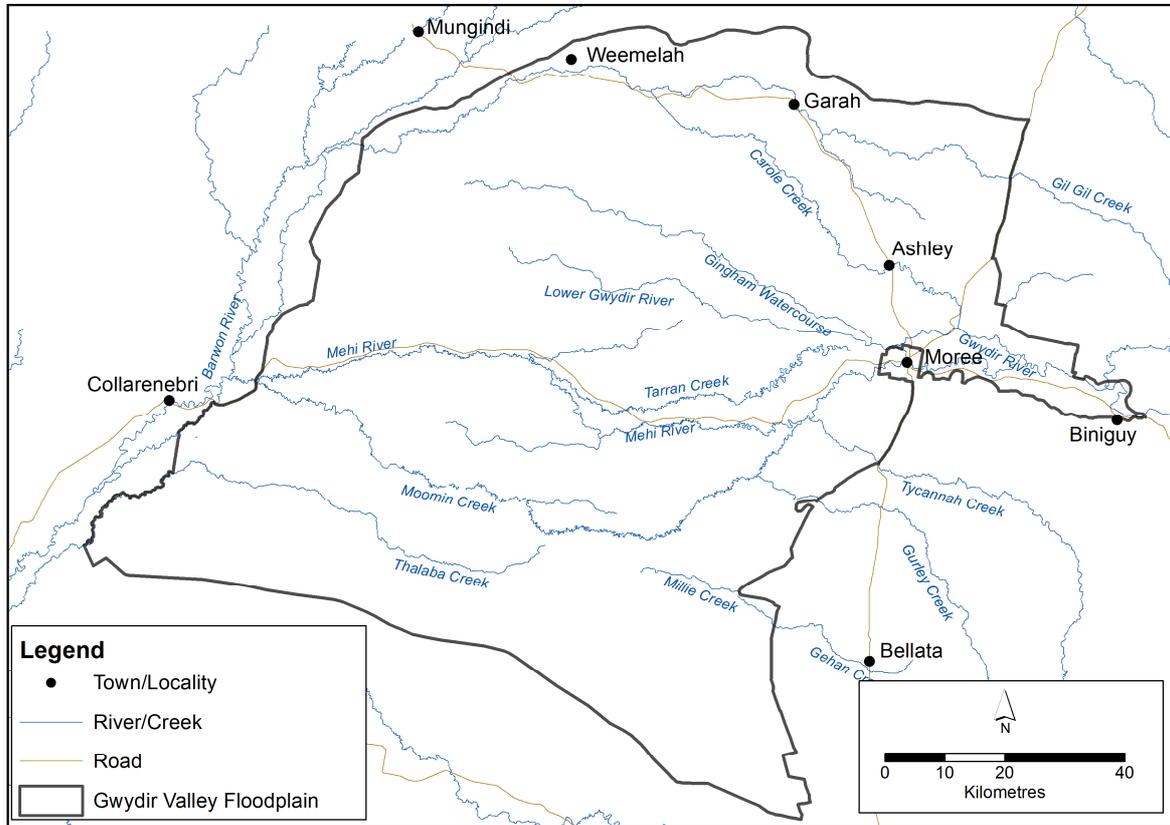
- (c) drought refuges,
- (3) floodplain vegetation and fauna species, including threatened species:
 - (a) observed fish and amphibious fauna records:
 - (i) hardyhead (*Craterocephalus stercusmuscarum fulvus*),
 - (ii) Australian smelt (*Retropinna semoni*),
 - (iii) bony bream (*Nematalosa erebi*),
 - (iv) carp gudgeon (*Hypseleotris* spp),
 - (v) midgeleys carp gudgeon (*Hypseleotris* spp),
 - (vi) firetail gudgeon (*Hypseleotris galii*),
 - (vii) western carp gudgeon (*Hypseleotris klunzingeri*),
 - (viii) golden perch (*Macquaria ambigua*),
 - (ix) Murray cod (*Maccullochella peelii*),
 - (x) rainbowfish (*Melanotaenia fluviatilis*),
 - (xi) spangled perch (*Leiopotherapon unicolor*),
 - (xii) catfish (*Tandanus tandanus*),
 - (xiii) eastern sign-bearing froglet (*Crinia parinsignifera*),
 - (xiv) barking marsh frog (*Limnodynastes fletcheri*),
 - (xv) broad palmed frog (*Litoria latopalmata*),
 - (xvi) eastern long-necked turtle (*Chelodina longicollis*),
 - (xvii) broad shelled turtle (*Chelodina expansa*),
 - (xviii) Macquarie turtle (*Emydura macquarii*),
 - (xix) water dragon (*Physignathus lesueurii*),

- (xx) water rat (*Hydromys chrysogaster*),
- (b) modelled fauna species distribution:
 - (i) barking frog,
 - (ii) eastern sign bearing froglet,
 - (iii) turtle assemblage, and
- (c) modelled fish biodiversity.

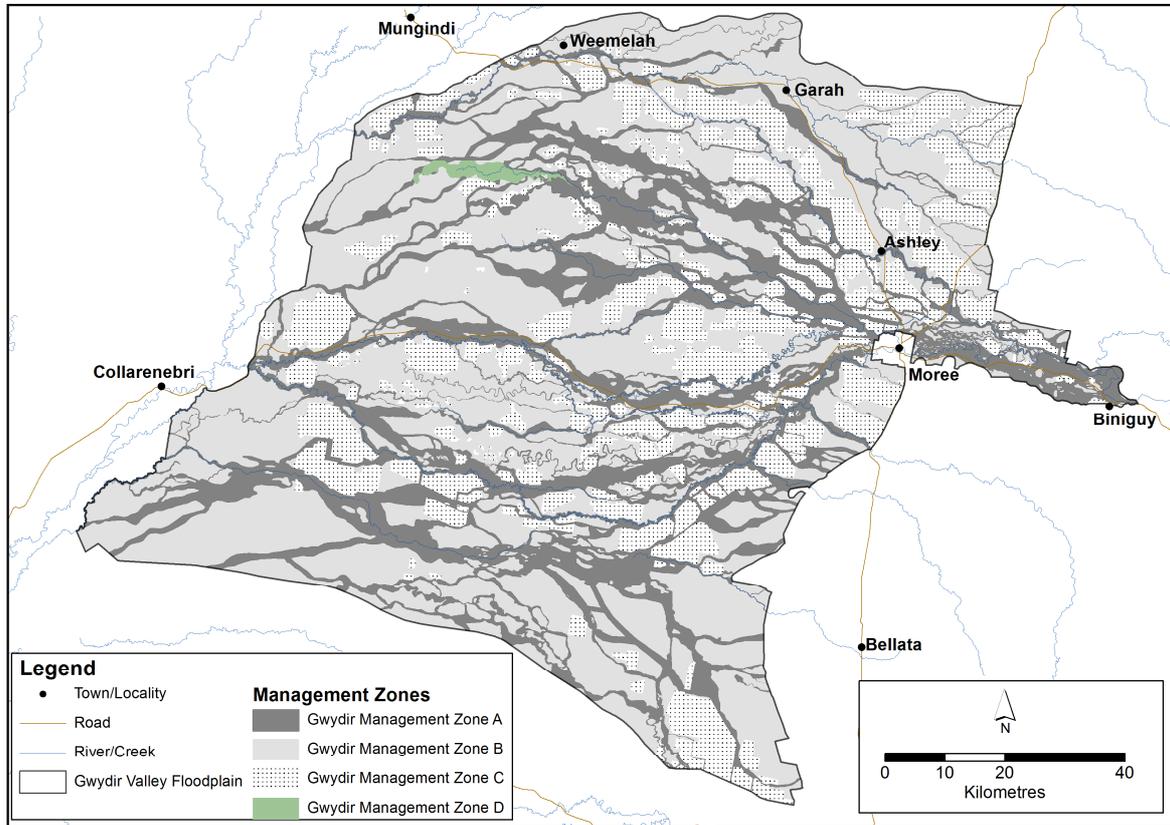
Note. Commonwealth and State environmental watering priority areas are comprised of ecological assets and values. The following strategies and policies were considered:

- *Gwydir Wetlands Adaptive Environmental Management Plan 2011*, Department of Environment, Climate Change and Water,
- *Gwydir Valley Annual Environmental Watering Plan 2013 -14*, Office of Environment and Heritage,
- *Commonwealth environmental water use options 2013-14: Gwydir River Valley*. Commonwealth Environmental Water Office,
- *Constraints Management Strategy 2013 to 2024*, Murray-Darling Basin Authority, and
- *Assessment of environmental water requirements for the proposed Basin Plan: Gwydir Wetlands, 2012*, Murray-Darling Basin Authority.

Appendix 1 Overview of the Plan Map



Appendix 2 Overview of the Management Zones Map



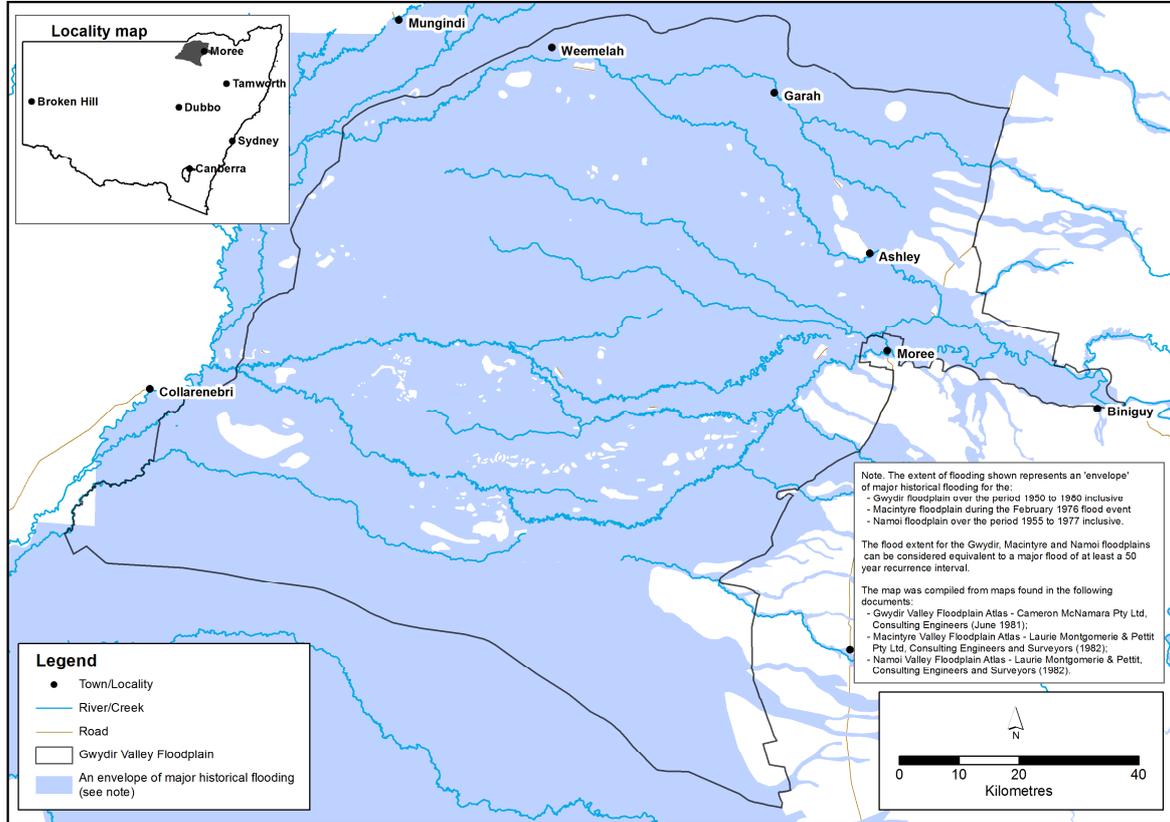
Appendix 3 Inspection of maps and notifications

Copies of the Plan Map, the Floodway Network Map, the Ecological Assets Map, the Existing Flood Works Map and the Peak Flood Flow Distribution (2012) Map may be inspected at the offices listed below. Any notifications that may be required to be made to the Minister, as specified in this Plan can be made to either of the offices listed below.

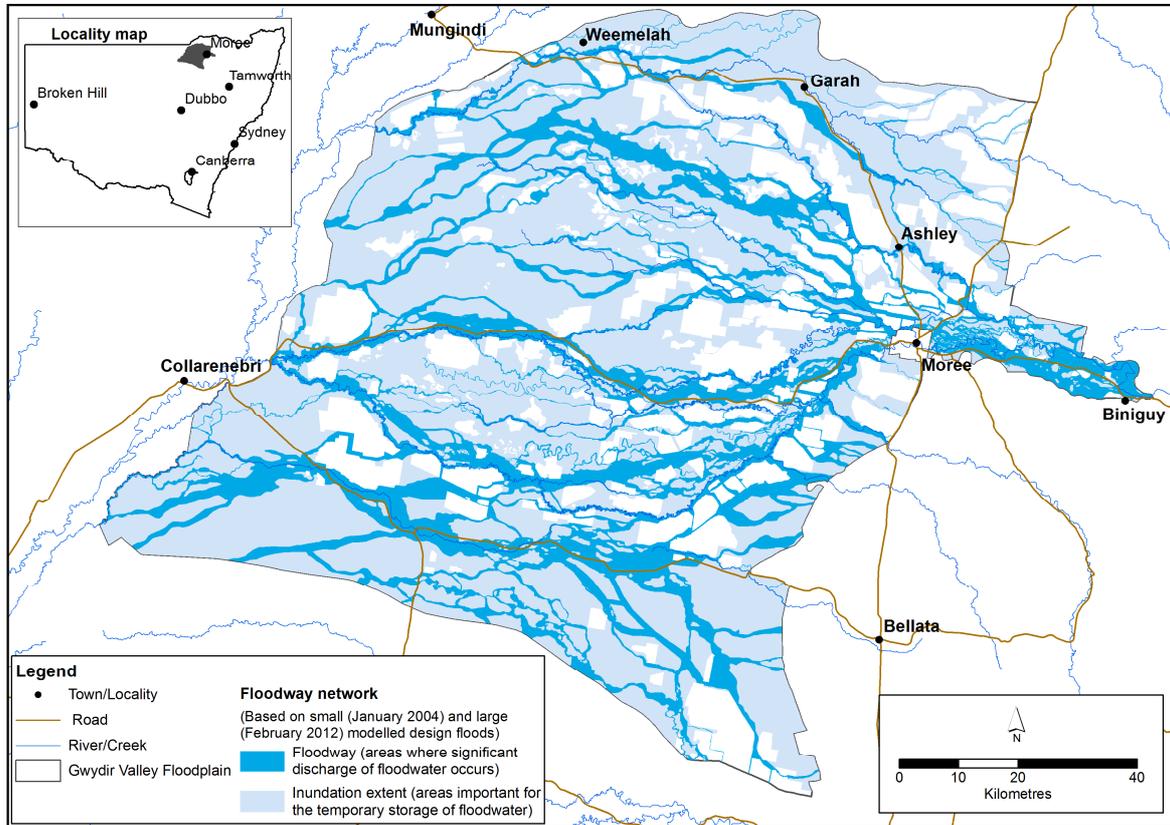
DPI Water
NSW Department of Primary Industries
66-68 Frome Street
MOREE NSW 2400

DPI Water
NSW Department of Primary Industries
Tamworth Agricultural Institute
4 Marsden Park Road
CALALA NSW 2340

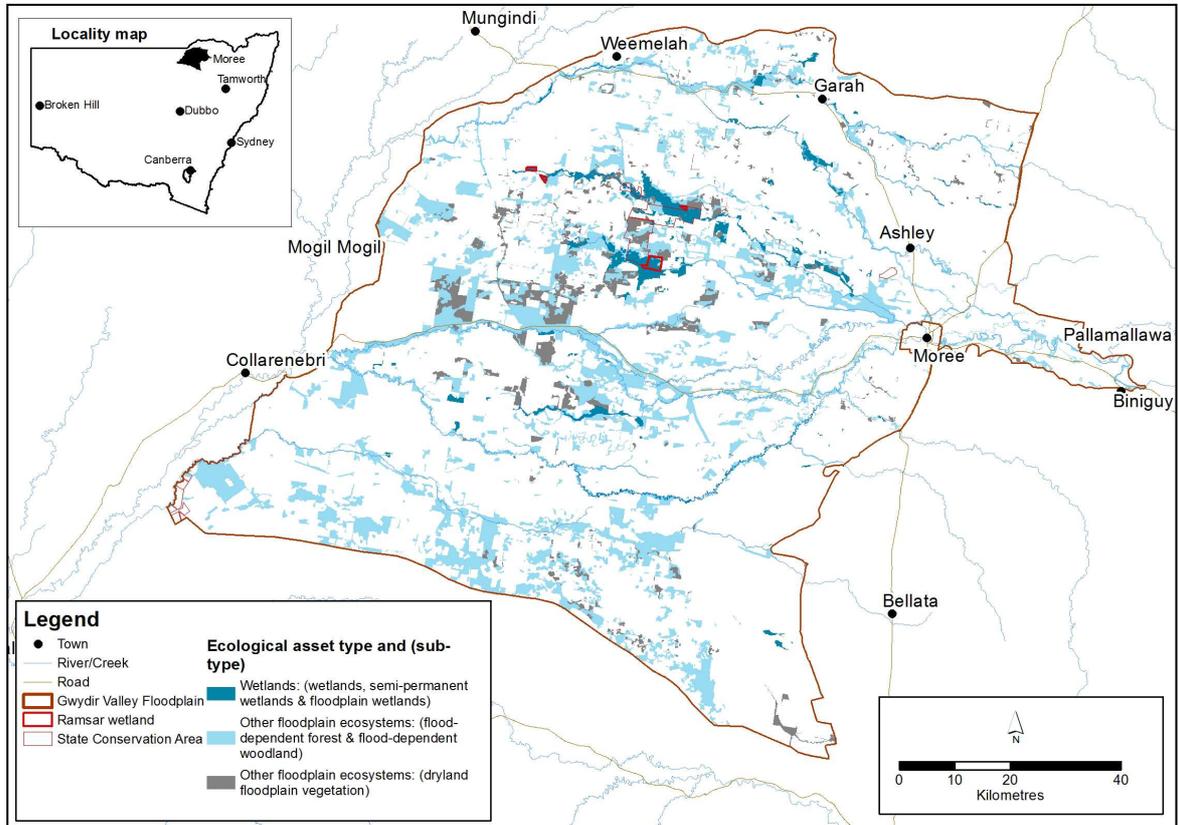
Appendix 4 Overview of the Flood Extent Map



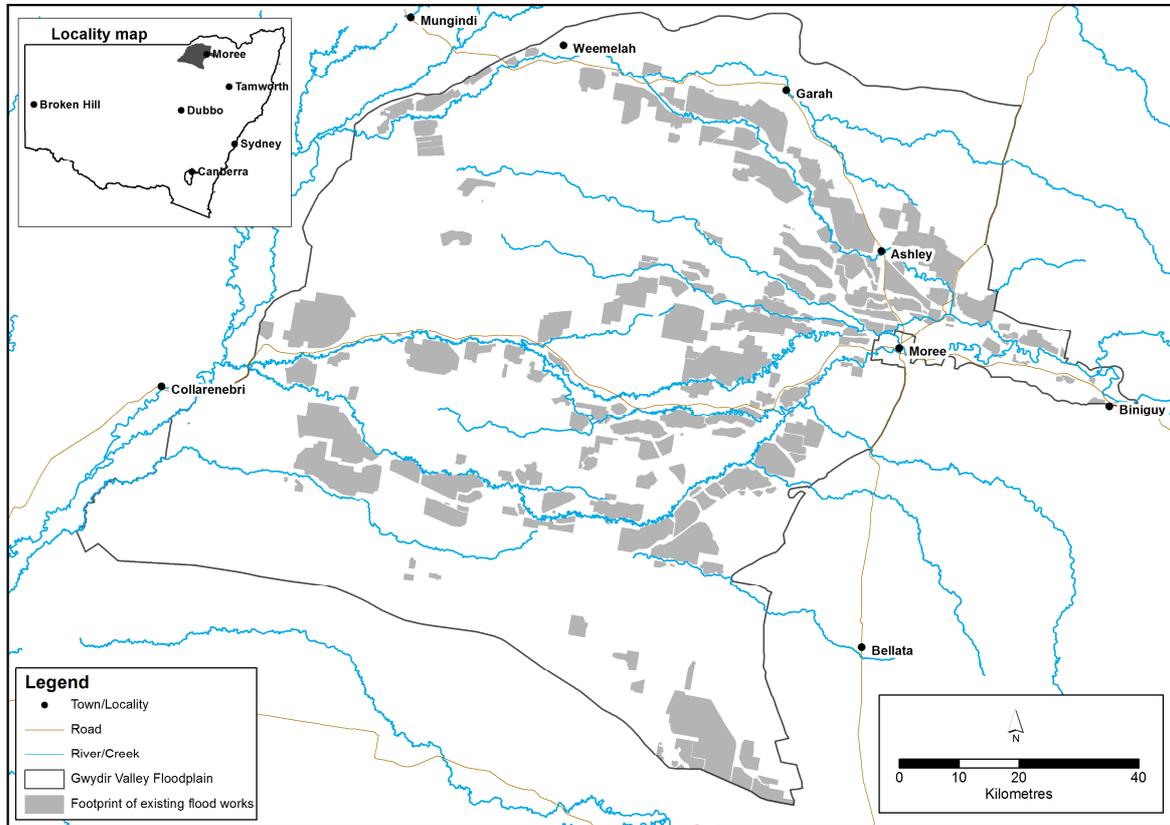
Appendix 5 Overview of the Floodway Network Map



Appendix 6 Overview of the Ecological Assets Map



Appendix 7 Overview of the Existing Flood Works Map



Appendix 8 Overview of the Peak Flood Flow Distribution (2012) Map

