EMR Emergency Breaching Protocols and Decision Support Framework

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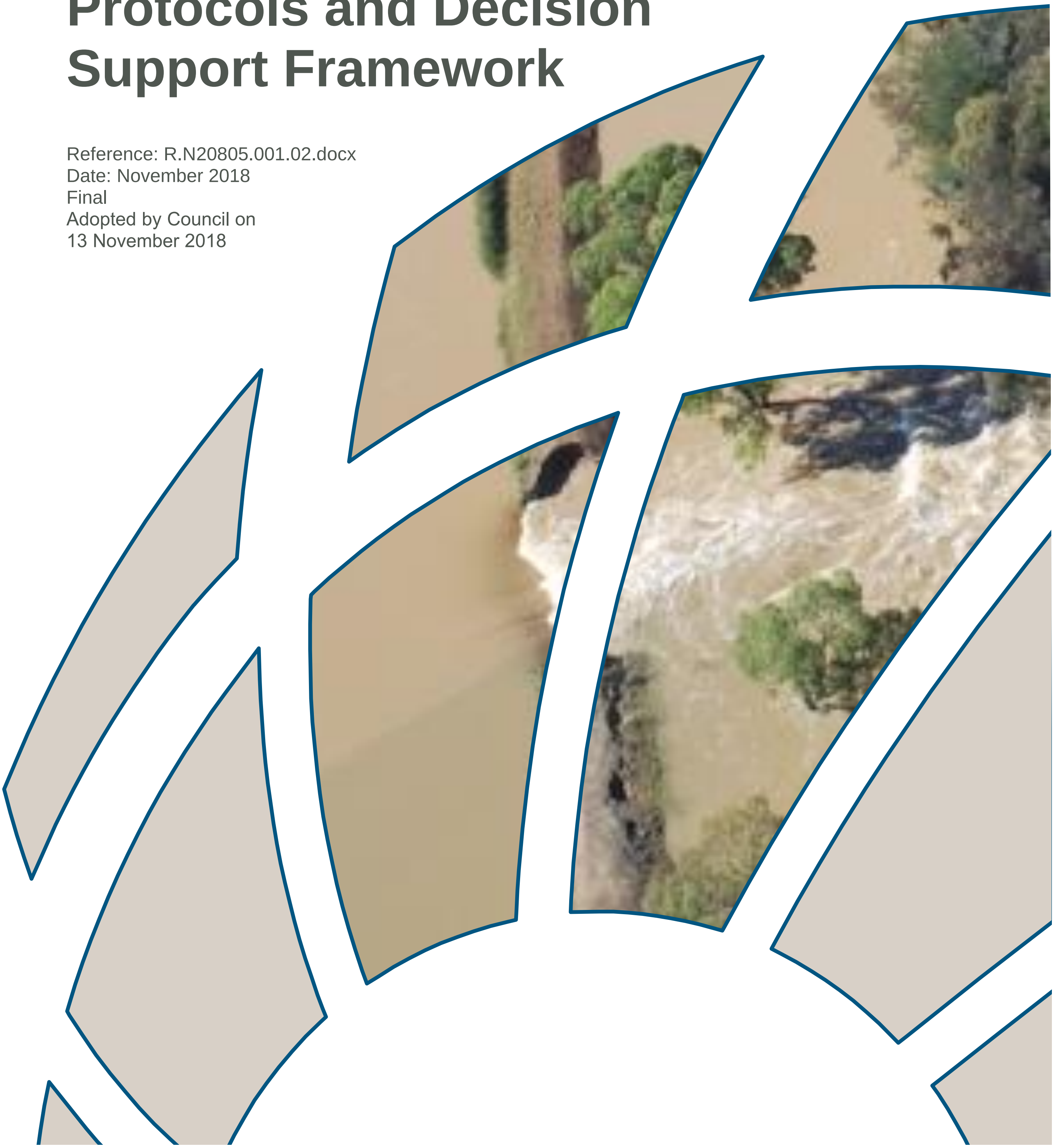
13 November 2018



(b) Council give notice to the Minister for Lands and Forestry of the appointment of the incumbents of these positions as Native Title Managers as required under Section 8.8 of the Crown Land Management Act 2016.

Councillor Mike Neville thanked the Corporate Property Officer for her work regarding this matter.

CL10 TRANSFER OF CROWN ROADS TO COUNCIL - CITRUS ROAD & CALABRIA ROAD

18/362

RESOLVED on the motion of Councillors Rina Mercuri and Mike Neville that:

(a) Council approve the transfer of Citrus Road and Calabria Road from the Crown to Council public roads.

(b) Council delegate authority to the General Manager and Mayor to execute all documents on behalf of Council if so required.

CL11 NEW GRIFFITH AMBULANCE STATION

18/363

RESOLVED on the motion of Councillors Brian Simpson and Christine Stead that the report be noted by Council.

CL12 EMR EMERGENCY BREACHING PROTOCOLS AND DECISION SUPPORT FRAMEWORK

18/364

RESOLVED on the motion of Councillors Dino Zappacosta and Brian Simpson that Council adopt the report, 'EMR Emergency Breaching Protocols and Decision Support Framework'.

CL13 REPORT ON THE LGNSW WATER MANAGEMENT CONFERENCE 2018

18/365

RESOLVED on the motion of Councillors Dino Zappacosta and Doug Curran that the report be noted.

9 INFORMATION REPORTS

Nil.

Document Control Sheet

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<tr><td>Client Reference:</td><td></td></tr>
<tr><td>Synopsis:</td><td colspan="2">This document establishes a set of Emergency Breaching Protocols for the management of Mirrool Creek flood waters at the Murrumbidgee Irrigation Main Canal East Mirrool Regulator. The protocols are informed through a decision support framework, providing tools and information to best understand potential flood events and to respond accordingly.</td></tr>
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REVISION/CHECKING HISTORY

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DISTRIBUTION

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Breaching Protocols Action Card

The Breaching Protocols Action Card has been developed in a consistent format to NSW SES Flood Action Cards. It summarises key aspects of monitoring and responding to Mirrool Creek flood events and the initiation of emergency breaching of the MI Main Canal, if required. Table 1 provides details of the Mirrool Creek flood warning gauge and flood management authorities. Table 2 provides details regarding trigger levels at the warning gauge (supplemented by remote observations), together with the flooding consequences and required actions in response to the triggers. Table 3 makes provision for the relevant members of the incident response team to be populated and/or updated as and when required. A flow chart summarising the decision process and required response actions is presented in Figure 1. Further information regarding the development of the emergency breaching protocols is provided in the main body of this report.

Table 1 Warning Gauge and Management Authority Details

EMERGENCY BREACHING PROTOCOLS – MI MAIN CANAL AT THE EMR			
Gauge Number:	41000283	**Flood Classification**	**Gauge Height (m)**
Stream:	Mirrool Creek @ EMR	Minor	0.9
Gauge Zero:	131.677	Moderate	1.9
Datum Type:	AHD	Major	2.3
Telemetric / Manual:	Telemetric		
Location:	Longitude: -34.334717 Latitude: 146.251783		
Management Authority		**Role**	
Griffith City Council (GCC)		GCC have ultimate authority to operate EMR flood gates and initiate an emergency breach. Any decisions to be made in consultation with MI.	
Murrumbidgee Irrigation (MI)		As the owner of the canal infrastructure, MI are tasked with management of canal infrastructure. This includes lock-down of canal and physically initiating and monitoring an emergency breach.	
Bureau of Meteorology (BOM)		BOM provides weather information to the community, as well as to Council / MI. This includes forecasts, live weather conditions and warnings.	
State Emergency Service (SES)		SES give notice to community based on BOMs warnings, assist BOM in ground-truthing gauges to confirm accuracy of data and assist the community during flood event (e.g. sandbagging).	
WaterNSW		WaterNSW are responsible for the maintenance of rainfall and stream flow gauges within the catchment and the accuracy of information.	

Table 2 Trigger and Response Details

Trigger	Consequences	Actions
Flood Watch issued by BOM.	A Flood Watch will be issued when a weather system is developing which may result in significant rainfall for the catchment.	**GCC:** Early assessment of the risk of an impending rainfall event. Assess current catchment soil moisture conditions (refer Section 2.1).
Minor Flood Warning issued by BOM.	A Minor Flood Warning will be issued when the resultant water level at the EMR from a rainfall event is forecast to exceed the Minor Flood threshold.	**GCC:** Monitor flooding conditions. **SES:** Notify community and take actions, as required.
Moderate Flood Warning issued by BOM.	A Moderate Flood Warning will be issued when the resultant water level at the EMR from a rainfall event is forecast to exceed the Moderate Flood threshold.	**GCC / MI:** Monitor flooding conditions. **Prepare to fully open gates.** **SES:** Notify community and take actions, as required.
Major Flood Warning issued by BOM.	A Major Flood Warning will be issued when the resultant water level at the EMR from a rainfall event is forecast to exceed the Major Flood threshold.	**GCC / MI:** Monitor flooding conditions. **Prepare to fully open gates and plan to initiate Emergency Breach**. **SES:** Notify community and take actions, as required.
*Monitor lower catchment **forecast** rainfall and soil moisture conditions*		
Peak flow at the EMR expected to exceed 15 m^3/s from forecast rainfall (refer Section 2.3)	Minor flood level (or greater) could be reached at EMR.	**GCC:** Monitor forecast rainfall.
Peak flow at the EMR expected to exceed 50 m^3/s from forecast rainfall (refer Section 2.3)	Moderate flood level (or greater) could be reached at EMR.	**GCC / MI:** Monitor forecast rainfall. **Prepare to fully open gates.**
Peak flow at the EMR expected to exceed 80 m^3/s from forecast rainfall (refer Section 2.3)	Major flood level could be reached at EMR.	**GCC / MI:** Monitor forecast rainfall. **Prepare to fully open gates and plan to initiate Emergency Breach**. Expected timeframe available to carry out breaching is in the order of 32 to 48 hours from the onset of rainfall.

Breaching Protocols Action Card

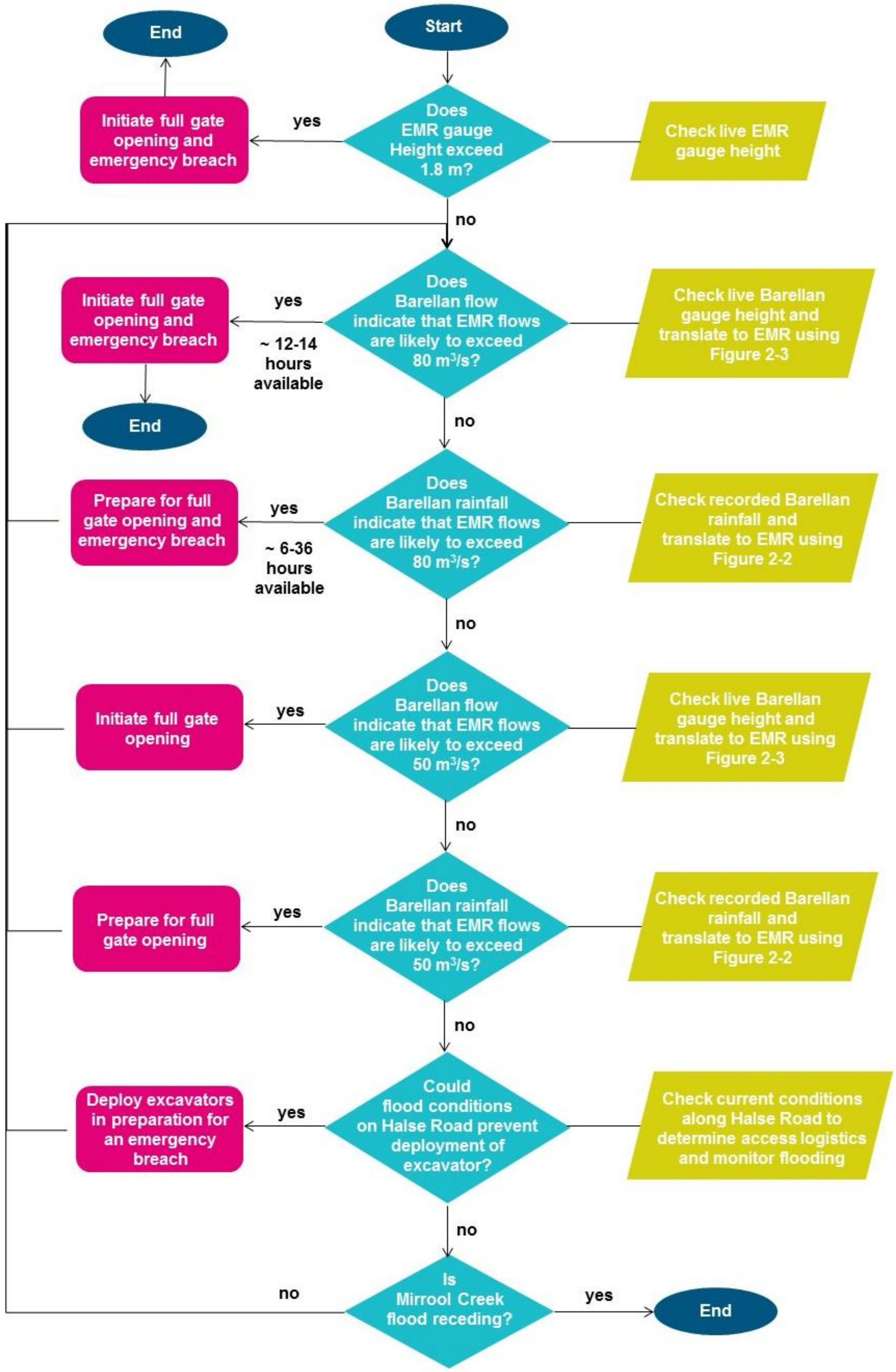
Trigger	Consequences	Actions
*Monitor **recorded** rainfall at Barellan gauge and soil moisture conditions*		
Peak flow at the EMR expected to exceed 15 m³/s from forecast rainfall (refer Section 2.3)	Minor flood level (or greater) could be reached at EMR.	**GCC:** Monitor flooding conditions.
Peak flow at the EMR expected to exceed 50 m³/s from forecast rainfall (refer Section 2.3)	Moderate flood level (or greater) could be reached at EMR.	**GCC / MI:** Monitor flooding conditions. **Prepare to fully open gates.**
Peak flow at the EMR expected to exceed 80 m³/s from forecast rainfall (refer Section 2.3)	Major flood level could be reached at EMR.	**GCC / MI:** Monitor flooding conditions. **Prepare to fully open gates and plan to initiate Emergency Breach**. Expected timeframe available to carry out breaching is in the order of 6 to 36 hours after the rainfall event.
*Monitor **recorded** streamflow levels at Barellan gauge*		
Barellan streamflow gauge height = 2.7 m (flow rate of ~20 m³/s).	Depending on spatial rainfall and soil moisture conditions, could translate to peak flow of ~15 m³/s at the EMR. Flooding of Mirrool Creek at Barellan is likely to remain in-bank at this stage.	**GCC:** Translate recorded Barellan gauge height to expected peak flow at EMR. If flow at EMR is estimated to equal or exceed 15 m³/s, monitor flooding conditions.
Barellan streamflow gauge height = 3.8 m (flow rate of ~65 m³/s).	Depending on spatial rainfall and soil moisture conditions, could translate to peak flow of ~50 m³/s at the EMR. The severity of Mirrool Creek floodplain inundation at Barellan will vary depending on antecedent conditions.	**GCC:** Translate recorded Barellan gauge height to expected peak flow at EMR. **GCC / MI:** If flow at EMR is estimated to equal or exceed 50 m³/s, **initiate full gate opening**.
Barellan streamflow gauge height = 4.1 m (flow rate of ~105 m³/s).	Depending on spatial rainfall and soil moisture conditions, could translate to peak flow of ~80 m³/s at the EMR. The severity of Mirrool Creek floodplain inundation at Barellan will vary depending on antecedent conditions.	**GCC:** Translate recorded Barellan gauge height to expected peak flow at EMR. **GCC / MI:** If flow at EMR is estimated to exceed 80 m³/s, **initiate full gate opening and Emergency Breach**. Expected timeframe available to carry out breaching is in the order of 12 to 24 hours from the flood response at the Barellan gauge.

Trigger	Consequences	Actions
Monitor local flooding conditions at Halse Road and Daltons Runner		
Local flooding at Daltons Runner independent of flooding on Mirrool Creek	Localised inundation and disruption to travel and farming activities	**GCC / MI:** Consider lock down of Main Canal and operation of Daltons Runner. Consider irrigation season / water supply requirements and expected need to later execute flood management measures at the EMR prior to initiating a lock down.
Local flooding at Daltons Runner in advance of anticipated flooding on Mirrool Creek	Localised inundation and disruption to travel and farming activities	**GCC / MI:** **Initiate operation of Daltons Runner**. If operation of the EMR flood gates is required then Daltons Runner can be operated without unnecessarily impacting the Main Canal supply.
Local flooding along Halse Road independent of flooding along Mirrool Creek	Flooding of Halse Road.	**GCC / MI**: Monitor Halse Road flooding and the implications for excavator access to the Main Canal northern bank breach location. **Mobilise and position excavators whilst access is still possible**, if there is a possibility that Mirrool Creek flooding could occur.
*Monitor **recorded** streamflow levels at the EMR gauge*		
EMR streamflow gauge height = 0.7	Minor overtopping of Delaney Road south-east of Briens Road intersection.	**GCC / SES:** Undertake required community notification, road signage and/or closure.
EMR streamflow gauge height = 0.9 (Minor Flood Classification).	Significant inundation of Mirrool Creek floodway upstream of the Main Canal. Flood depths to be in the order of 0.1 – 0.2 m.	**GCC / MI:** If Mirrool Creek flows expected to exceed 80 m^3/s then mobilise and position excavators in anticipation of executing an emergency breach.
EMR streamflow gauge height = 1.3	Inundation of Halse Road	**GCC / MI:** Monitor Halse Road flooding and the implications for excavator access to the Main Canal northern bank breach location. **Mobilise and position excavators whilst access is still possible**, if there is a possibility that Mirrool Creek flooding could worsen.
EMR streamflow gauge height = 1.6	Whitton Stock Route Rd at Mirrool Creek becomes flooded.	**GCC / SES:** Undertake required community notification, road signage and/or closure.

Trigger	Consequences	Actions
EMR streamflow gauge height = 1.8 **and rising** (flow rate of ~50 m^3/s, and expected to exceed 80 m^3/s).	Significant inundation of Mirrool Creek floodway upstream of the Main Canal.	**GCC / MI: Fully open EMR flood gates.** **Initiate Emergency Breaching.** **SES:** Notify community and take actions, as required.
EMR streamflow gauge height = 1.9 (Moderate Flood Classification).	Floodwater begins spilling from the Mirrool Creek floodway upstream of the Main Canal. Halse Road now inaccessible to heavy vehicles.	**GCC / SES:** Undertake required community notification, road signage and/or closure.
EMR streamflow gauge height = 2.3 (Major Flood Classification).	Halse Road now significantly inundated. Peak flood depth of over 1.0 m.	Emergency Breaching should have already been initiated, as it is now unsafe to do so.
EMR streamflow gauge height = 2.4	Overtopping of Northern Branch Canal Road, north of Halse Road intersection.	**GCC / SES:** Undertake required community notification, road signage and/or closure.

Table 3 Incident Response Team

Agency	Contact Name	Position	Contact Number



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1 Introduction

1.1 Background

The Griffith Main Drain J and Mirrool Creek Floodplain Risk Management Study and Plan was completed for Griffith City Council by BMT WBM in August 2015. The study had been commissioned in response to the devastating flood of March 2012, which severely impacted Yenda. The Floodplain Risk Management Study considered several options to manage flood risk at Yenda, one of which was to establish emergency breaching protocols for the Murrumbidgee Irrigation (MI) Main Canal at the East Mirrool Regulator (EMR).

The protocols provide guidance as to how the responsible authorities can and should manage operation of the flood gates and emergency breaching of the Main Canal embankments at the EMR in response to a flood event. The development of these protocols provides an understanding as to the impact of the emergency management of Mirrool Creek flood waters. It provides the necessary knowledge to enable stakeholders to commit to an agreed process for the response to flooding of Mirrool Creek and to understand the impacts of the actions that are to be taken.

This document establishes the protocols to be followed in the event of a flood of Mirrool Creek including emergency breaching of the Main Canal, if required. It includes discussion of key information and techniques that provide the necessary decision support framework to inform the effective adherence to the protocols. The report is structured in a chronological format reflective of the decision process that would be undertaken during a flood event:

- advanced warning and preparation
- flood event monitoring and response
- emergency breaching.

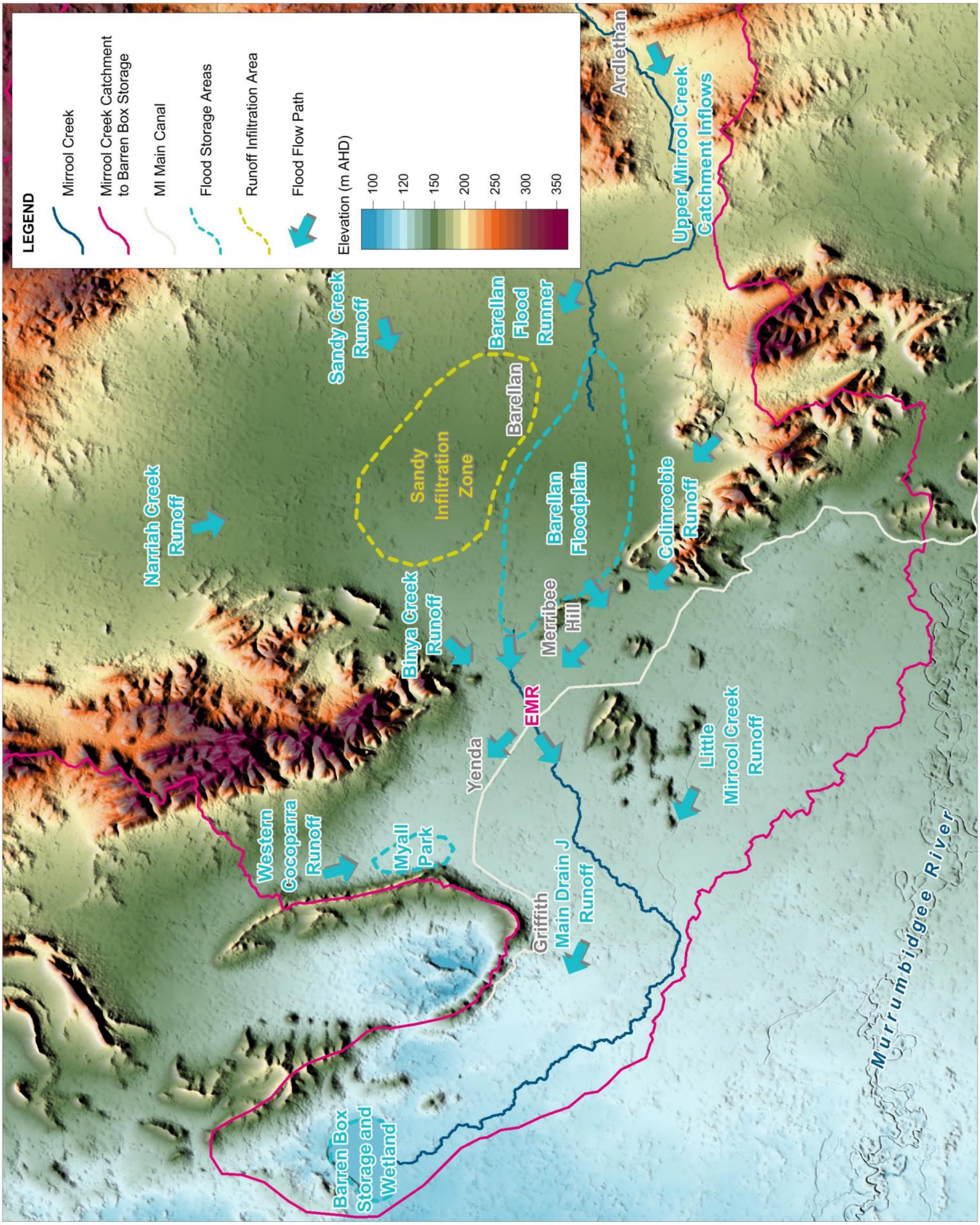
A summary of key aspects for monitoring and responding to Mirrool Creek flood events and the initiation of emergency breaching of the MI Main Canal is provided at the front of this document. Substantial data analysis and modelling was undertaken to develop the decision support framework, details of which are provided in an accompanying technical compendium.

1.2 Catchment Flood Behaviour

A schematisation of the Mirrool Creek catchment flood behaviour is presented in Figure 1-1. Flooding of Mirrool Creek at the Main Canal is driven by the volume of water entering the Barellan floodplain area. The Barellan floodplain is characterised by flat topography which is criss-crossed by a network of field boundaries and access roads. There is no natural creek alignment through the area, but a defined floodway extent is maintained. The flat topography, coupled with elevated field boundaries, provides significant attenuation of flood flows entering the floodplain area.

The Barellan floodplain is fed by the following sources:

- flows from the upper Mirool Creek catchment, which is well-defined downstream to Ardlethan
- local catchment runoff from the Colinroobie area to the south
- rain falling directly on to the floodplain.



Title: **Schematisation of Mirrool Creek Flood Behaviour**	Figure: **1-1**	Rev: **A**

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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0 7.5 15km

Approx. Scale

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Flood flows through the floodplain area are often characterised by a dual response. Rainfall over the Barellan floodplain and Colinroobie produces an early response, which is then followed by a second flood wave from the upper Mirrool Creek (dependant on the rainfall distribution). This was evidenced by the March 2012 flood event. Runoff from the Colinroobie area will typically reach the Barellan floodplain within a day of the rainfall. Flow from the upper Mirrool Creek catchment may take a few days to arrive. Rainfall occurring over specific locations within the catchment at different times will produce a different response, representative of the spatial and temporal rainfall distribution.

When exiting the Barellan floodplain, flood flows can progress both around the north and south of Merribee Hill, along the alignments of Mirrool Creek or the Merribee Station Canal respectively. Runoff from the Colinroobie area will mostly flow around the south of Merribee Hill, whereas Mirrool Creek flows will predominantly proceed around the north of Merribee Hill. As flood flows are attenuated through the Barellan floodplain the flood peak is typically reduced and occurs a day later than the flows entering the floodplain.

Flood flows around the north of Merribee Hill proceed to the EMR along the alignment of Mirrool Creek. Flows around the south of Merribee Hill are impeded by the Main Canal and are pushed north to the EMR. As flood waters build up behind the canal there is the risk of local breaching, as occurred during the March 2012 flood event.

Flood waters arriving at the EMR from the Barellan floodplain are further supplemented by runoff from the Binya Creek catchment. The size of the broader Binya Creek catchment is almost twice that of Mirrool Creek. It therefore has the potential to generate much more substantial flood flows than those of Mirrool Creek. However, there is an extensive flat, sandy area to the north of Barellan in which catchment runoff is infiltrated into the soil.

The relatively large catchments of Narriah Creek to the north and Sandy Creek to the east generate significant flood overland flow paths. These then soak away when traversing the sandy infiltration zone. This was observed during the March 2012 flood event and is evident within the associated satellite imagery. Therefore, runoff from the Binya Creek catchment is predominantly driven by local runoff from the southern Cocoparra Range. Binya Creek runoff would typically reach the EMR within a day of the rainfall.

Flood flows from Mirrool Creek will reach the Main Canal at the EMR. Flood flows around the south of Merribee Hill will spread out behind the Main Canal near Burnt Hill, where they are further attenuated. The flood waters will then progress in a northerly direction towards the EMR. This interface between the flood wave and the Main Canal presents the possibility of flow transfer across the canal prior to reaching the EMR. There is a siphon structure that feeds the top end of Little Mirrool Creek but this is relatively small. Localised breaching of the canal may also occur such as at Briens Road and Parizotto's during the March 2012 event. Flood flows from Binya Creek will generally be conveyed towards the EMR but there is also the potential for flood waters to be diverted towards the Whitton Stock Route in Binya Forest (bypassing the EMR), particularly when Mirrool Creek is in flood.

Flood waters arrive at the EMR firstly from Binya Creek, followed by runoff from the Colinroobie area and finally from Mirrool Creek, as the flood level begins to rise behind the Main Canal. Flood waters are conveyed to the downstream Mirrool Creek floodplain through the siphon structures and the operation of flood gates to allow flood flows into the canal and then out again through the downstream side. When the capacity of these structures is exceeded then flood waters can spill over the Northern Branch Canal and proceed to the township of Yenda.

Flood waters spilling into Yenda from Mirrool Creek will build up behind the railway before overtopping and progressing into the Myall Park floodplain storage area. The Myall Park storage area is a natural topographic depression that collects runoff from the western slopes of the Cocoparra Range, in what would have historically been a terminal ephemeral wetland. However, the area is now drained by the irrigation infrastructure and is conveyed along Main Drain J and into Mirrool Creek upstream of Barren Box Storage and Wetland (BBSW).

Flooding within the Main Drain J catchment is essentially driven by local runoff from the land situated to the west of Yenda, between the Main Canal and Mirrool Creek. The runoff from the western Cocoparra and flood flows from Mirrool Creek via Yenda are contained within Myall Park and well regulated by the Main Canal and associated siphon structures.

Discharge across the Main Canal at the EMR is supplemented by runoff from the Little Mirrool Creek and Main Drain J catchments and discharges to BBSW. It takes some three days or so for the flood wave to travel from the EMR to BBSW.

1.3 Mirrool Creek Flood Warning System

The Mirrool Creek Flood Warning System was established concurrently with this study. It includes the installation of two telemetered gauges within the catchment:

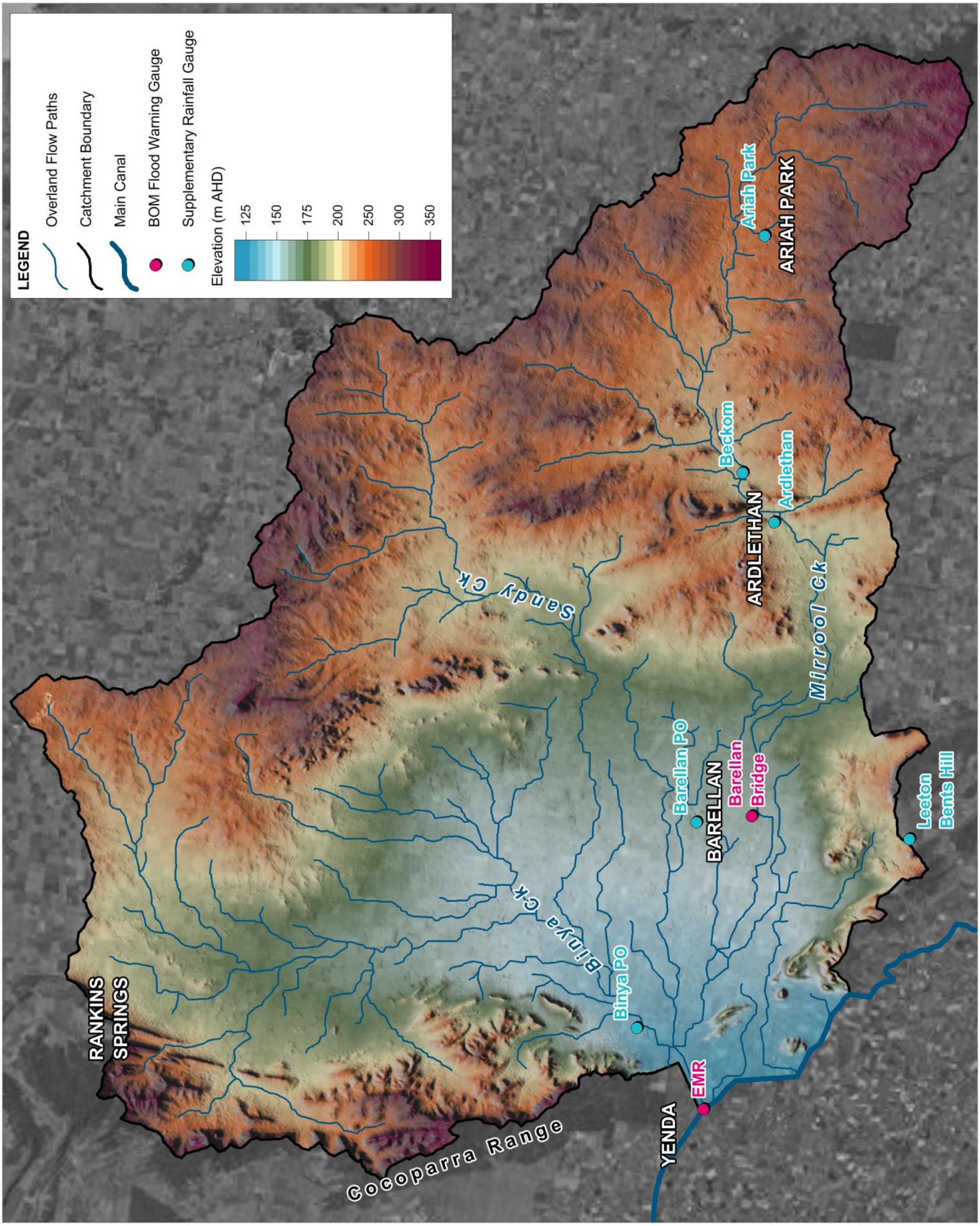
- a combined rainfall and stream level gauge on Mirrool Creek at Barellan (site 41000282)
- a stream level gauge on Mirrool Creek at the EMR (site 41000283).

The Flood Warning System is used by the Australian Bureau of Meteorology (BoM) to monitor the conditions in the Mirrool Creek catchment and to issue Flood Warnings, as required. Flood Warnings are specific to Yenda and will inform the community as to the expected flood conditions at the EMR. BoM uses a three-tiered classification scheme to define the expected flooding as minor, moderate or major. The classification at the EMR is presented in Table 1-1, where flood levels relate to the height above gauge zero (131.68 m AHD).

Table 1-1 Flood Warning Classification at the EMR

Flood Classification	Gauge Height (m)	Expected Response
Minor	0.9 (132.58 m AHD)	Potential operation of Dalton's Runner
Moderate	1.9 (133.58 m AHD)	Likely operation of EMR Flood Gates
Major	2.3 (133.98 m AHD)	Likely implementation of EMR Emergency Breaching Protocols

The Flood Warnings issued by BoM align with the recommendations presented within the Emergency Breaching Protocols and supporting decision support framework. However, the use of peak flow estimation techniques is also provided in Section 2.3. This enables an expected response in terms of flood management at the EMR to be planned for in advance of specific triggers being reached at the flood warning gauges.



Title:

Mirrool Creek Catchment Flood Warning System and Supplementary Gauge Locations

Figure: **1-2**

Rev: **A**

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1.4 Roles and Responsibilities

Various stakeholders have specific roles and responsibilities in the emergency flood response to an expected event on Mirrool Creek, including:

- Griffith City Council (GCC),
- Murrumbidgee Irrigation (MI),
- Bureau of Meteorology (BOM),
- State Emergency Service (SES), and
- Department of Primary Industries (DPI) Office of Water.

The specific roles and responsibilities of each agency are summarised in Table 1 in the Breaching Protocols Action Card.

Within each of these agencies, there will be multiple key personnel required to coordinate activities and take action during a flood event on Mirrool Creek. It is envisaged that these people will form the Incident Response Team (IRT), which will formally be established once this document is adopted by Council. Names and contact details for key personnel within the IRT can be entered in Table 3 of the Breaching Protocols Action Card.

To ensure members of the IRT are aware of the process and their role in such an event, it is suggested that regular exercising with all stakeholders be undertaken. This could be in the form of a workshop / desktop exercise whereby members convene to discuss and simulate expected emergency flood response in a safe and controlled environment. To account for likely turnover in key staff members within each agency, it is recommended that this exercise be completed regularly – at least every five years.

Although the canal infrastructure is a privately-owned asset belonging to MI, the decision to breach ultimately lies with GCC. Following an emergency breach situation, the responsibility to reinstate infrastructure will lie with GCC and MI. In the event of a breach, financial assistance to reinstate the canal may be available (following application) through the NSW Public Works Advisory Natural Disaster Relief program. These funds are provided to local governments by Commonwealth and NSW Governments for the emergency work and restoration of damaged council assets.

2 Advanced Warning and Preparation

2.1 Catchment Soil Moisture Conditions

The principal driver of flooding in the Mirrool Creek catchment (particularly in relation to the EMR) is the soil moisture content at the onset of a rainfall event. Review of historic rainfall and flood information has found that intense rainfall can result in only a minor flood response at the EMR if the catchment soils are relatively dry prior to the rainfall event (such as those of January 1984 and February 2003). Conversely, only moderately intense rainfall events can result in a major flood response as the prior soil moisture conditions approach saturation (such as those of June 1931 and September 2016). The catchment hydrological model for Mirrool Creek was developed and calibrated to historic flood events to best represent this observed behaviour.

The principal source of catchment soil moisture data available to assist in the flood forecasting process is through the BoM Australian Landscape Water Balance (ALWB) system. This is a web-based database of soil moisture content of various soil depth layers. The data is based on sophisticated modelling of soil moisture over the last century. However, only the data for the last decade or so is available online. The modelling is being continually refined and updated, calibrating modelled outputs to observed data. The ALWB can be accessed via the following link: http://www.bom.gov.au/water/landscape/#

In developing this decision support framework a relationship between the catchment hydrological model representation of initial soil moisture calibrated for each historic event and the corresponding data in the ALWB was established. This enables an estimation of the expected catchment flood response to an impending rainfall event to be made based on the existing soil moisture conditions presented in the ALWB. Figure 2-1 presents the few simple steps required to extract the relevant information from the ALWB to inform the decision support framework.

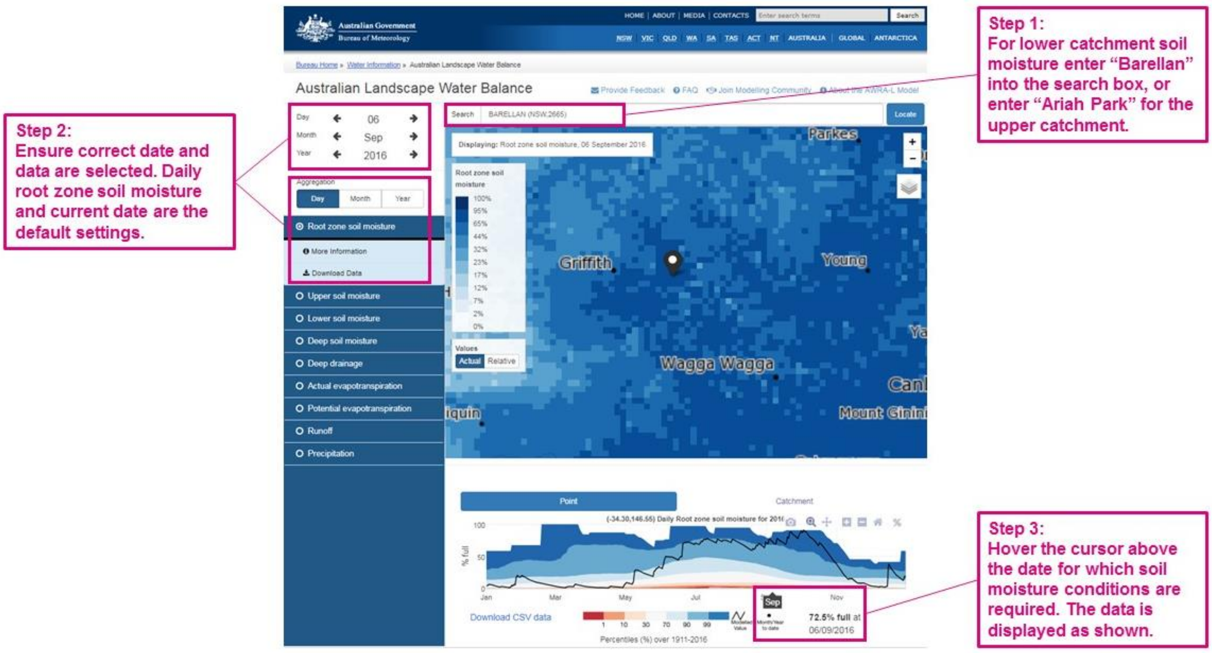


Figure 2-1 Extracting Catchment Soil Moisture Conditions from the ALWB

2.2 Flood Watch and Forecast Rainfall

The first stage of the BoM Flood Warning Service is a Flood Watch. A Flood Watch status will be issued for a catchment when a weather system is developing which may result in significant rainfall for the catchment. A Flood Watch may be issued up to four days in advance of expected flooding and is updated on at least a daily basis. The issuing of a Flood Watch for Mirrool Creek provides an early opportunity to assess the risk of an impending rainfall event.

In respect to the decision support framework for flood management at the EMR, forecast rainfall across the upper Mirrool Creek catchment area (centred around Ariah Park) and the catchment area between Ardlethan and Yenda (centred around Barellan and in this context referred to as the lower Mirrool Creek catchment area) are important. Rainfall forecast data may be available within the Flood Watch information, the BoM's online latest weather forecast system or through direct contact with the BoM Flood Warning team if necessary.

2.3 Estimation of Catchment Flood Response

The availability of current soil moisture and expected rainfall conditions enables a preliminary estimation of the expected Mirrool Creek catchment flood response to be made. Using data generated through the simulation of many hypothetical combinations of rainfall and soil moisture conditions, simple relationships between these two key inputs and the expected outcome have been developed.

The method for a preliminary flood estimation at the EMR is dependent on the overall spatial distribution of the event rainfall across the Mirrool Creek catchment. Three spatial distributions of rainfall were considered within the modelling assessment:

- lower catchment events with no rainfall across the upper catchment
- uniform catchment rainfall with similar rainfall depths across both the upper and lower catchments
- upper catchment dominated events with rainfall depths across the upper catchment being 50% greater than those across the lower catchment.

For events dominated by rainfall across the lower catchment advanced warning of flooding at the EMR may not be adequately captured by the Barellan Bridge gauge. Therefore, an estimation of peak flow conditions at the EMR can be made from rainfall-runoff of the lower catchment. Any later flow contribution from the upper catchment will either extend the hydrograph at the EMR (i.e. increase period of inundation) or may result in a higher peak flow than the initial estimate for the lower catchment.

Estimation of flooding from rainfall events with significant contributions from the upper catchment can be made by translating the recorded flow rate at Barellan to an expected peak flow at the EMR, whilst considering the soil moisture and rainfall conditions across the lower catchment.

When estimating peak flood flows at the EMR for lower catchment dominated rainfall events, reference is made to Figure 2-2, which presents the relationship between the lower catchment soil moisture preceding the event, the forecast or recorded event rainfall and the expected resultant peak flood flow at the EMR gauge. A selection of significant historic flood events is also presented for context. The lower catchment root zone soil moisture is derived as discussed in Section 2.1. The lower catchment rainfall represents the average total rainfall depth of the event across the lower catchment area. It should be noted that the soil moisture to be used is that representing the catchment condition prior to the rainfall event. Following the rainfall event the soil moisture estimate on the ALWB will increase for the next day, accounting for the additional precipitation. An estimation of runoff from a subsequent rainfall event would then be made using the increased soil moisture level.

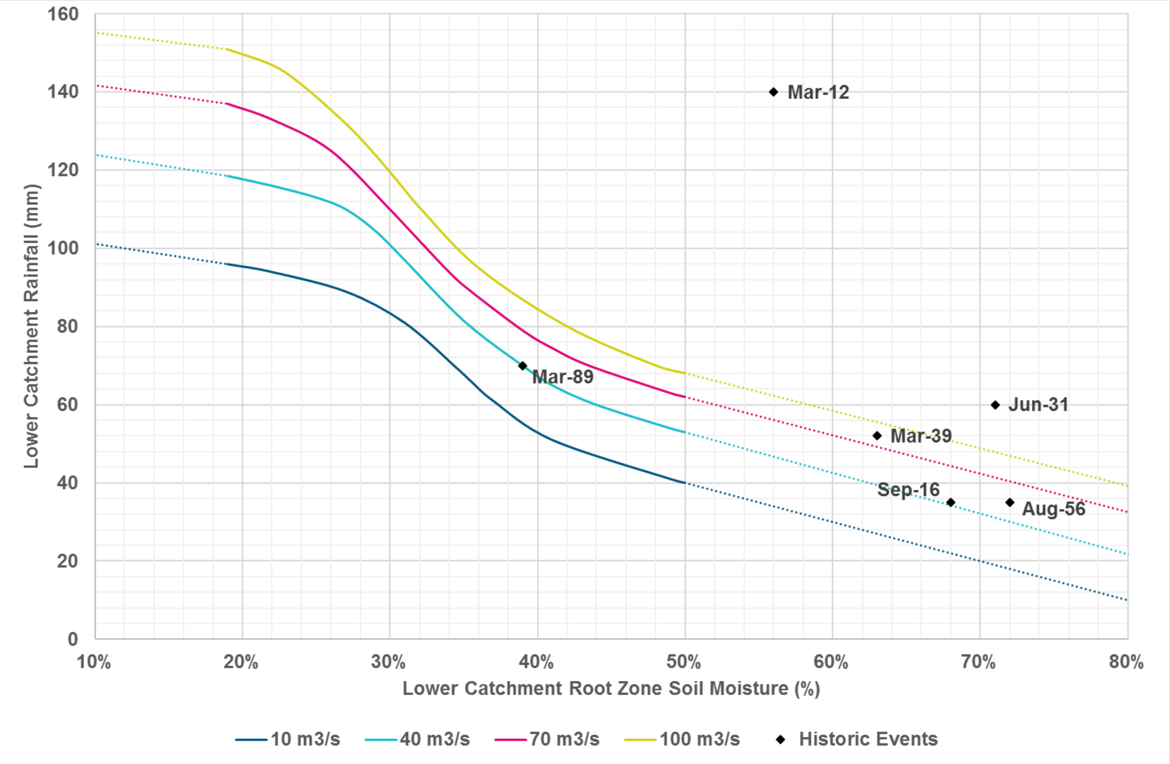


Figure 2-2 Estimation of Peak Flood Flow at the EMR for Lower Catchment Dominated Events

The rainfall condition for the lower catchment may initially be derived from forecast rainfall information and then subsequently updated with recorded rainfall during, or immediately following, the rainfall event. The rainfall recorded at the Barellan flood warning gauge would typically be best representative of the overall lower catchment rainfall. However, additional manual gauge readings may also be sought from the surrounding daily rainfall gauges, to obtain an indication of spatial variability and improve the estimation of the average total rainfall depth across the lower catchment.

For rainfall events that are dominated by, or have a significant contribution from the upper catchment, recorded water levels at the Barellan Bridge streamflow gauge can be translated to an expected peak flow at the EMR. Reference is made to Figure 2-3 to estimate a peak flow at the EMR, dependent on the overall spatial distribution of rainfall across the catchment and the soil moisture content of the lower catchment preceding the occurrence of the rainfall event.

Each rainfall event will exhibit a different spatial rainfall distribution. However, reference to the expected flood response at the EMR for the hypothetical conditions presented in Figure 2-3 should enable a reasonable estimation for most flood event scenarios. For example, estimating the expected flood flow for an event with an average total rainfall depth across the upper catchment that is 25%

greater than that across the lower catchment would consider the individual estimations of the uniform catchment rainfall and the upper catchment dominated scenarios (where a 50% greater rainfall depth than the lower catchment was considered).

Consider the following scenario. It is determined that the average total rainfall depth for the event is around 80 mm across the lower catchment and around 100 mm across the upper catchment (i.e. 25% greater than the lower catchment). The initial soil moisture of the lower catchment is estimated to be around 20%. With reference to Figure 2-2, a lower catchment average rainfall of 80 mm combined with an initial soil moisture of 20% would be expected to result in a flow of less than 10 m^3/s at the EMR. However, continued monitoring of the Barellan Bridge gauge record peaks at a flow of 220 m^3/s the following day. With reference to Figure 2-3, the expected peak flow at the EMR would be estimated at around 75 m^3/s.

If for this same scenario, the initial soil moisture across the lower catchment was estimated to be around 40% then the expected peak flow at the EMR based on lower catchment rainfall alone would be estimated at around 70 m^3/s (refer Figure 2-2). This time, the recorded flow of 220 m^3/s at the Barellan Bridge gauge provides an expected peak flow at the EMR of around 145 m^3/s. Here, the initial step of estimating peak flows based on lower catchment rainfall only provides the earliest possible warning that a large flood event would be expected to occur at the EMR. Peak flow estimates should be updated as the event progresses, and recorded data becomes available.

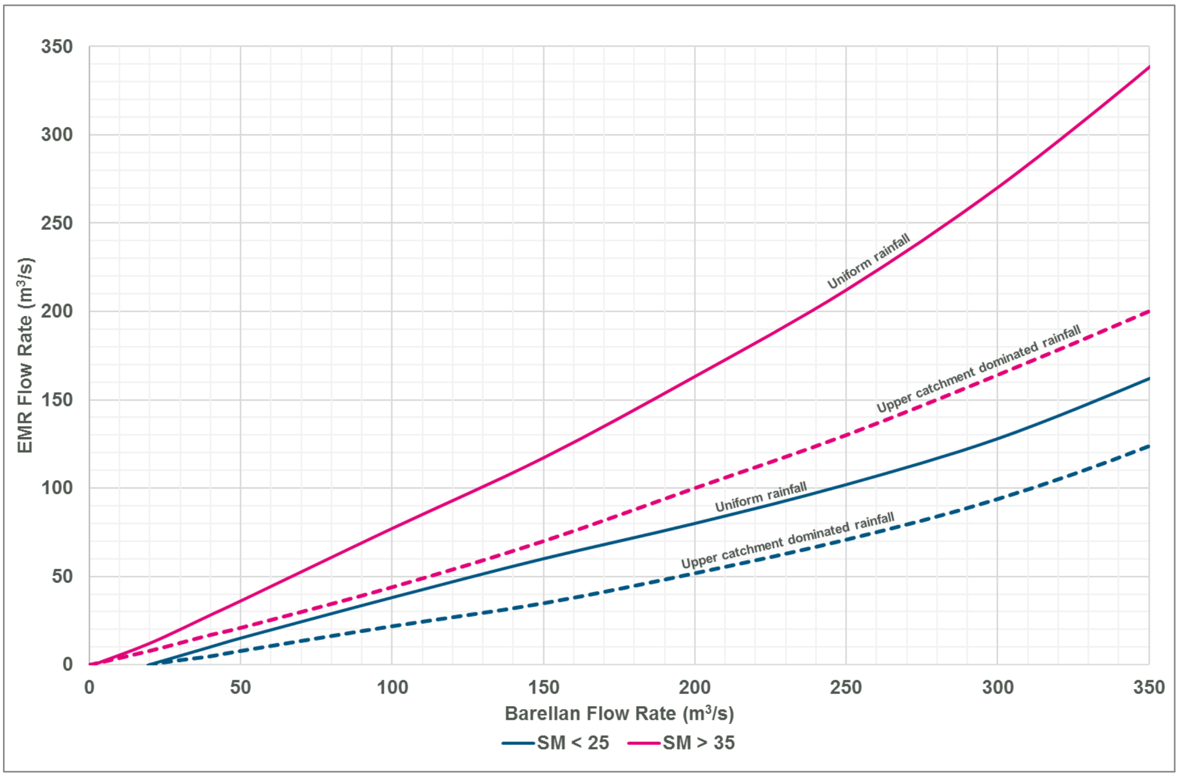


Figure 2-3 Estimation of Peak Flood Flow at the EMR for a Uniform or Upper Catchment Dominated Rainfall Event

The use of the peak flow estimation tools enables an expected response in terms of flood management at the EMR to be planned for in advance of specific triggers being reached at the flood warning gauges.

2.4 Timeframes for Decision Making

The principal factor that affects the available timeframes in the decision-making process is the overall spatial distribution of rainfall across the catchment. Flood events dominated by rainfall across the lower catchment provide a shorter amount of time to plan and respond than for events dominated by rainfall across the upper catchment.

Decisions regarding the operation of the flood gate structures and the discharging of Daltons Runner flood waters into the Main Canal are generally not time critical, as the operation of the flood gates can be controlled remotely. The available warning time is more critical for the preparation and execution of an emergency breaching of the Main Canal. Excavators need to be sourced and driven to the breach locations prior to accessibility being compromised. The excavation itself then needs to occur prior to flood levels exceeding the elevation of the required breach crest.

From analysis of the modelled flood scenarios, the available timeframes within which to complete the emergency breaching excavation, responding to observed flooding thresholds at the Barellan gauge are:

- around 16 hours for lower catchment dominated rainfall events
- around 36 hours for upper catchment dominated rainfall events
- within the above ranges for uniform catchment rainfall events.

In addition to this available response time between flood conditions at Barellan and subsequent emergency breaching at the EMR, planning in anticipation of the likely response can be already set in motion based on estimations of flood flows from forecast and recorded event rainfall.

A key factor to consider in the decision-making process is the time of day that flow thresholds are expected to be reached. Night time and dusk are dangerous conditions to be initiating a breach due to obvious issues with visibility (e.g. safety of excavator operators and monitoring of canal scouring). Previous flood events have also shown that there is a strong community interest and presence during breaching operations. Safety of community members could also be compromised in darkness.

3 Flood Event Monitoring and Response

3.1 Recorded Rainfall

During an event, recorded rainfall data can be used to confirm and/or update rainfall forecasts. Live rainfall conditions for gauges within BoMs flood forecasting network can be accessed via the following link:

http://www.bom.gov.au/nsw/flood/centralwest.shtml

Alternatively, the two gauges sites included in the Mirrool Creek Flood Warning System are operated by Water NSW. Water level and continuous rainfall data (Barellan gauge only) recorded at these gauges is freely available on the Water NSW website or via the mobile phone app. The website is updated with recorded data at least hourly and can be accessed via this link:

http://realtimedata.water.nsw.gov.au/water.stm

Direct correspondence with the local post office sites for manual daily rainfall gauge readings can be undertaken to gain useful information relating to spatial rainfall distribution. This is particularly relevant to the Ariah Park gauge site, as it is likely that rainfall recorded here will generally represent rainfall conditions across the upper Mirrool Creek catchment. The location of the Ariah Park gauge, along with other daily read rainfall locations within the catchment are presented in Figure 1-2. Daily rainfall totals recorded at the other gauge sites should be used to confirm the suitability of rainfall recorded at the Barellan gauge site to be used as a representative lower catchment rainfall average.

The flood flow estimation tools provided in Section 2.3 are event based. Some flood scenarios may persist over an extended period of days or weeks, comprising multiple rainfall events. It is important that the catchment soil moisture estimates are updated to be representative of the conditions prior to each rainfall event. The ALWB is updated daily and so catchment soil moisture values should be obtained accordingly.

Monitoring rainfall and soil conditions during an event will allow for peak flow estimations at Barellan and the EMR to be re-calculated as live recordings become available, improving confidence in expected conditions as the flood progresses through the catchment.

3.2 Mirrool Creek at Barellan Gauge Monitoring

The Mirrool Creek at Barellan gauge (site number 41000282) is operated by Water NSW. From accessing the website via the link provided above, water levels recorded at the Barellan gauge can be found by searching for the site number under the “Rivers and Streams” heading on the left-side toolbar.

Recorded stream water levels can be converted to a flow estimate using the modelled rating curve for the Barellan gauge site as presented in Figure 3-1. Note that this is a modelled rating only and has not yet been validated against recorded data. It must be noted that data extracted from the website is referenced in meters from gauge zero, which is 154.56 m AHD. For example, a gauge recording of 3.4 m corresponds to a water level at the site of around 158.0 m AHD. With reference to Figure 3-1, this produces a flow estimate of 40 m^3/s.

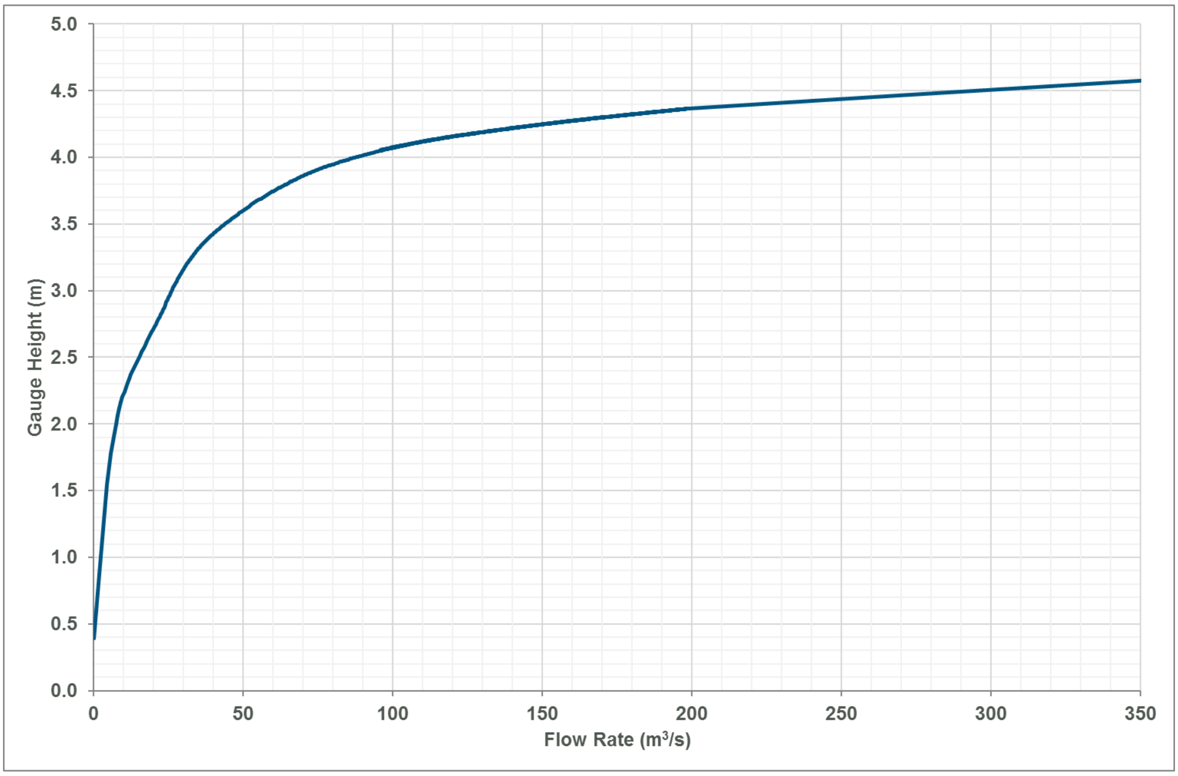


Figure 3-1 Mirrool Creek at Barellan Modelled Rating Curve

Having first established a peak flow at Barellan, this can then be translated to an expected peak flow at the EMR. Reference is made to Figure 2-3 to estimate a peak flow at the EMR for upper catchment dominated and uniform catchment rainfall events. The estimation process is dependent on the overall spatial distribution of rainfall across the catchment and the soil moisture content of the lower catchment preceding the occurrence of the rainfall event.

3.3 Mirrool Creek at EMR Gauge Monitoring

The flood response on Mirrool Creek at the EMR (site number 41000283) can be monitored during an event by extracting water level recordings at the gauge site from the Water NSW website.

Recorded stream water levels can be converted to a flow estimate using the modelled rating curve for the EMR gauge site presented in Figure 3-2. As with the rating curve presented for the Barellan gauge, this is a modelled rating only and has not yet been validated against recorded data. Water levels recorded at the EMR gauge are also referenced in meters from gauge zero, which is 131.68 m AHD. For example, a gauge recording of 2.3 m corresponds to a water level at the site of around 134.0 m AHD. With reference to Figure 3-2, the siphon structures are capable of discharging around 52 m^3/s at this level. The discharge capacity at this level increase to around 78 m^3/s when the flood gate structures are fully open and up to around 95 m^3/s in the event of an emergency breaching of the Main Canal.

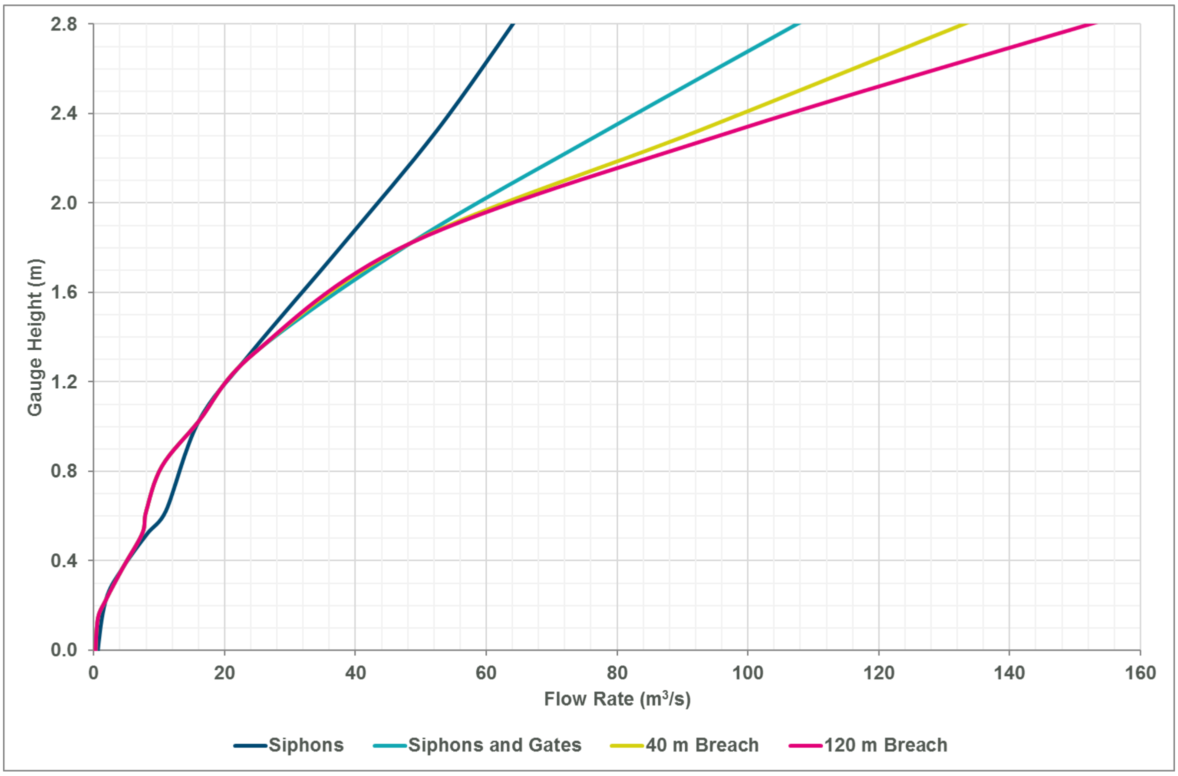


Figure 3-2 Mirrool Creek at EMR Modelled Rating Curve

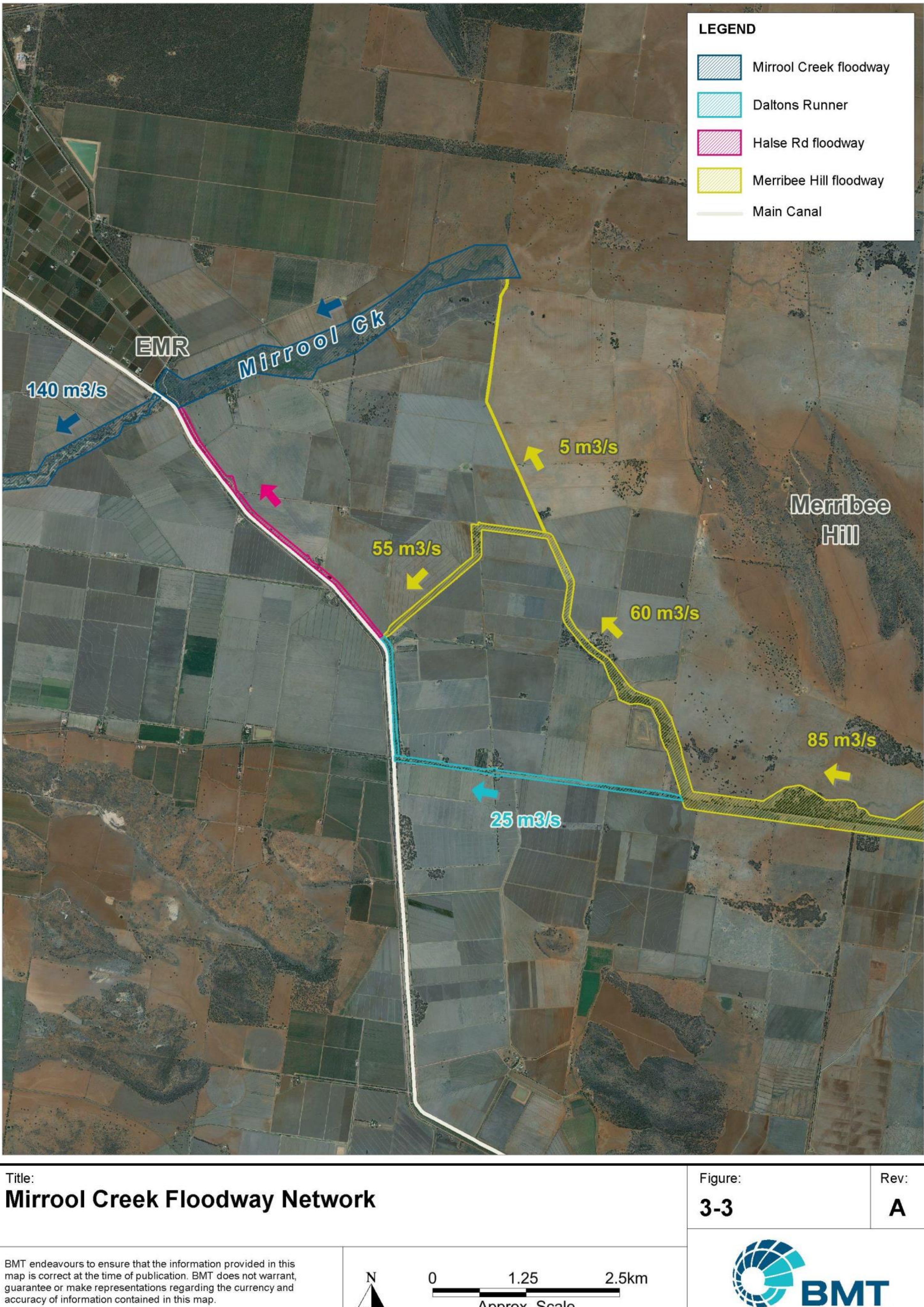
3.4 Operation of Daltons Runner

The Daltons Runner forms part of the established floodway to manage Mirrool Creek catchment flooding approaching the Main Canal around the south of Merribee Hill. It is understood to have a capacity of around 25 m^3/s. Daltons Runner forms part of a broader network of floodways upstream of the Main Canal, as presented in Figure 3-3.

A current constraint of the floodway network is that there is a discontinuity in the system between the Daltons Runner and Halse Road floodways, being severed by a road embankment. This road was cut during the September 2016 event to relieve local flood inundation. The provision of cross-drainage infrastructure at this location would be beneficial.

Daltons Runner is effectively an easement containing the local irrigation supply canal. During a flood event the offtake structures through the Main Canal embankment can be opened fully, to drain floodplain inundation into the Main Canal and discharge it into Mirrool Creek at the EMR. To utilise the Daltons Runner in this manner requires the lock down of the Main Canal and opening of the flood gate structures at the EMR to draw down the water level in the canal. The capacity of the two offtake structures to discharge flood waters from Daltons Runner into the Main Canal is unknown. However, the structures are relatively small and so the capacity is likely in the order of a few cumecs and has no implications for the broader flood management at the EMR.

Due to the nature of spatial rainfall distribution and resultant runoff in the Mirrool Creek catchment, there is no consistent relationship between flood conditions at Daltons Runner and those at the Barellan or EMR gauge locations. Therefore, the requirement to operate Daltons Runner for the purposes of flood management is best assessed through the monitoring of local flood conditions.



Title:
Mirrool Creek Floodway Network

Figure: 3-3

Rev: A

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The lock down of the Main Canal can potentially have a significant impact on Murrumbidgee Irrigation's service delivery. The decision to operate Daltons Runner therefore requires careful consideration and needs to evaluate the impacts of continued local flood inundation and those on the delivery of irrigation water. This decision may be influenced by the time of year in relation to the irrigation season and to the expected requirement to execute flood management measures at the EMR, which also require a lock down of the Main Canal. A better long-term solution for the management of flood waters in the Daltons Runner would be to improve the floodway connectivity through to the Halse Road floodway and divert the flows to the EMR siphons.

3.5 Operation of EMR Flood Gates

The operation of the flood gates at the EMR may be undertaken to relieve localised flood inundation in conjunction with the discharging of flood waters from Daltons Runner into the Main Canal. In this case there would be a lock down of the Main Canal and the downstream flood gate structures would be opened at the EMR to discharge this incoming flood water to the Mirrool Creek floodway. With no significant flooding from Mirrool Creek upstream of the Main Canal, the flood gates (release doors) on the upstream side could remain closed.

The sill level of the upstream gate structures is around 132.6 m AHD (gauge height 0.9 m) and so the transfer of flows along Mirrool Creek from the upstream to downstream side of the Main Canal cannot occur until the upstream water level (at the EMR gauge location) exceeds this level.

The Moderate flood level at the EMR gauge is around 133.6 m AHD (gauge height 1.9 m). If the water level at the gauge reaches this threshold then the flood gates should be opened fully if not already done so. However, the flood gates should be operated prior to reaching this gauge level if the expected peak flow at the EMR is to exceed 80 m^3/s. This can be determined through use of the flood flow estimation tools presented in Section 2.3.

3.6 Initiation of Emergency Breaching

The initiation of an emergency breaching of the Main Canal requires forward planning. Whilst the Major flood level at the EMR is around 134.0 m AHD, waiting until this occurs to initiate breaching would significantly compromise the execution of the operation. At a gauge level of 134.0 m AHD (gauge height 2.3 m) the depth of flood waters across Halse Road would be around 1.0 m, making accessibility to the upstream canal embankment difficult, if not impossible. Further, the upstream flood level would be around 0.5 m above the intended elevation of the breach crest level. This would hinder the excavation efforts and could potentially present a risk to the safety of the excavator and operator in the event of sudden erosion. The preparation for and subsequent execution of emergency breaching of the Main Canal therefore needs to be undertaken with consideration of the expected flood conditions at the EMR and current flood conditions at Barellan.

Through use of the flood flow estimation tools presented in Section 2.3, the initiation of the emergency breaching protocols should be undertaken as soon as it becomes clear that the peak flow at the EMR is likely to exceed 80 m^3/s. The excavation of the upstream embankment of the Main Canal should ideally be completed prior to the EMR gauge height reaching 1.8 m (around 50 m^3/s).

4 Emergency Breaching

4.1 Preparing for a Breach

In preparation of an emergency breaching of the Main Canal there a few key tasks that need to be undertaken. Firstly, the forming of an Emergency Breaching Executive Committee needs to be assembled, including representatives from the key stakeholders in the planning and execution of the breaching of the Main Canal, including:

- Griffith City Council, as the authority responsible for floodplain risk management
- SES, as the authority responsible for overall emergency flood response
- Murrumbidgee Irrigation, as owners and operators of the Main Canal infrastructure.

The committee representative should maintain regular contact with each other and supporting staff to ensure that the latest information regarding flood warning and the expected flood conditions are available and that the necessary steps for planning, preparation and execution of the emergency breaching protocols are carried out.

The task of the committee is then to plan the logistics of the deployment of excavators to the emergency breaching locations. Two excavators need to be sourced and driven to the breach locations on the upstream and downstream side embankments of the Main Canal, as presented in Figure 4-1. The access routes may vary depending on from where the excavators are sourced. However, it is likely that they would come from the general direction of Griffith via the Irrigation Way, or from Yenda via Whitton Road.

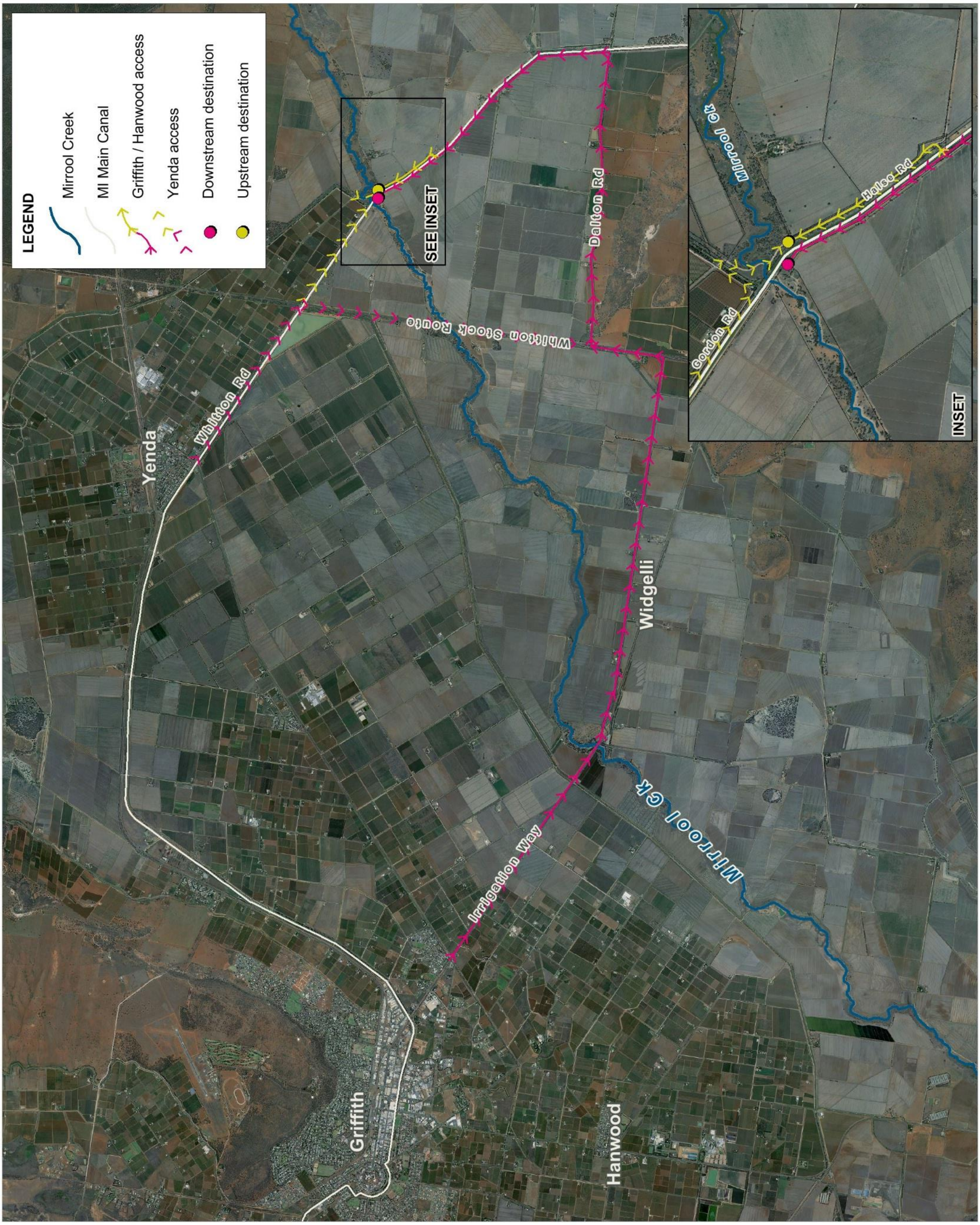
The approach to the downstream embankment location is via Whitton Stock Road, Dalton Road and Delaney Road. The approach to the upstream embankment location is via Halse Road. These approach routes are relatively flood-free and should be trafficable by heavy vehicles. The main constraint is the lower flood immunity of Halse Road and so the excavators need to be deployed prior to accessibility along Halse Road being prevented.

The Executive Committee would also be expected to disseminate relevant information regarding the initiation of an emergency breaching, including potential impacts and the broader context within the overall flood emergency response.

4.2 Initiating a Breach

Once excavators are positioned on-site, the emergency breach may be initiated. The proposed location and footprint of excavation for emergency breaching is shown on Figure 4-2. The downstream canal embankment is to be excavated to 132.5 m AHD (gauge height 0.8 m) and the upstream canal embankment to 133.5 m AHD (gauge height 1.8 m). These elevations represent the limit of the effective breaching depths that can practically be achieved.

It is advised that the downstream embankment of the Main Canal be breached first to maintain control over spilling floodwaters. The southern excavator should proceed toward the EMR structure, initiating the breach at the western extent of the footprint. Working backward, a total length of 40 m is to be excavated. The breach identified on Figure 4-1 is approximately 15 m wide and will typically involve removing around 0.5 to 1.8 m depth of fill.



Title:

Access Routes for the Excavation Plant to the EMR

Figure: 4-1

Rev: A

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0 1.25 2.5km
Approx. Scale

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Following the downstream embankment breach, the northern excavator may breach the upstream embankment. The upstream beach should be initiated at the eastern extent of the footprint, working backward to excavate a total length of 40 m. The upstream breach is 18 to 23 m wide and will involve removing around 0.7 to 1.4 m depth of fill.

4.3 Monitoring of Breach

As the flood progresses, the breach should be monitored for uncontrolled scouring. If this occurs, there is potential to increase the breach length up to 120 m on both the upstream and downstream sides. Manually increasing the breach should provide additional flow conveyance, reducing velocities, so that scouring can be controlled.

With reference to Figure 3-2, as the gauge heights exceed 2.1 m there is potential for a larger breach to convey additional flows. For gauge heights of 2.8 m, a 120 m breach can convey up to 155 m^3/s (in conjunction with the siphon and flood gates) compared to 135 m^3/s for a 40 m breach. However, further conveyance across the Main Canal is becoming constrained by the available capacity of the downstream floodway at this point.

It is advised that two excavators be used for the emergency breaching process – with one positioned at each of the upstream and downstream embankment locations. If breach lengthening is required to control scouring, manoeuvring of excavators through floodwaters would likely prevent the relocation of a single excavator between the two breach locations.

There remains a risk that breach capacity may be further exceeded additional uncontrolled breaching may occur – there will always exist the rare likelihood of a flood event magnitude exceeding the capacity for controlled flood management. In this event there is little that can be done in terms of predicting what might transpire and the appropriate response. The Executive Committee should use their knowledge and resources to best respond to developments during such a flood event.

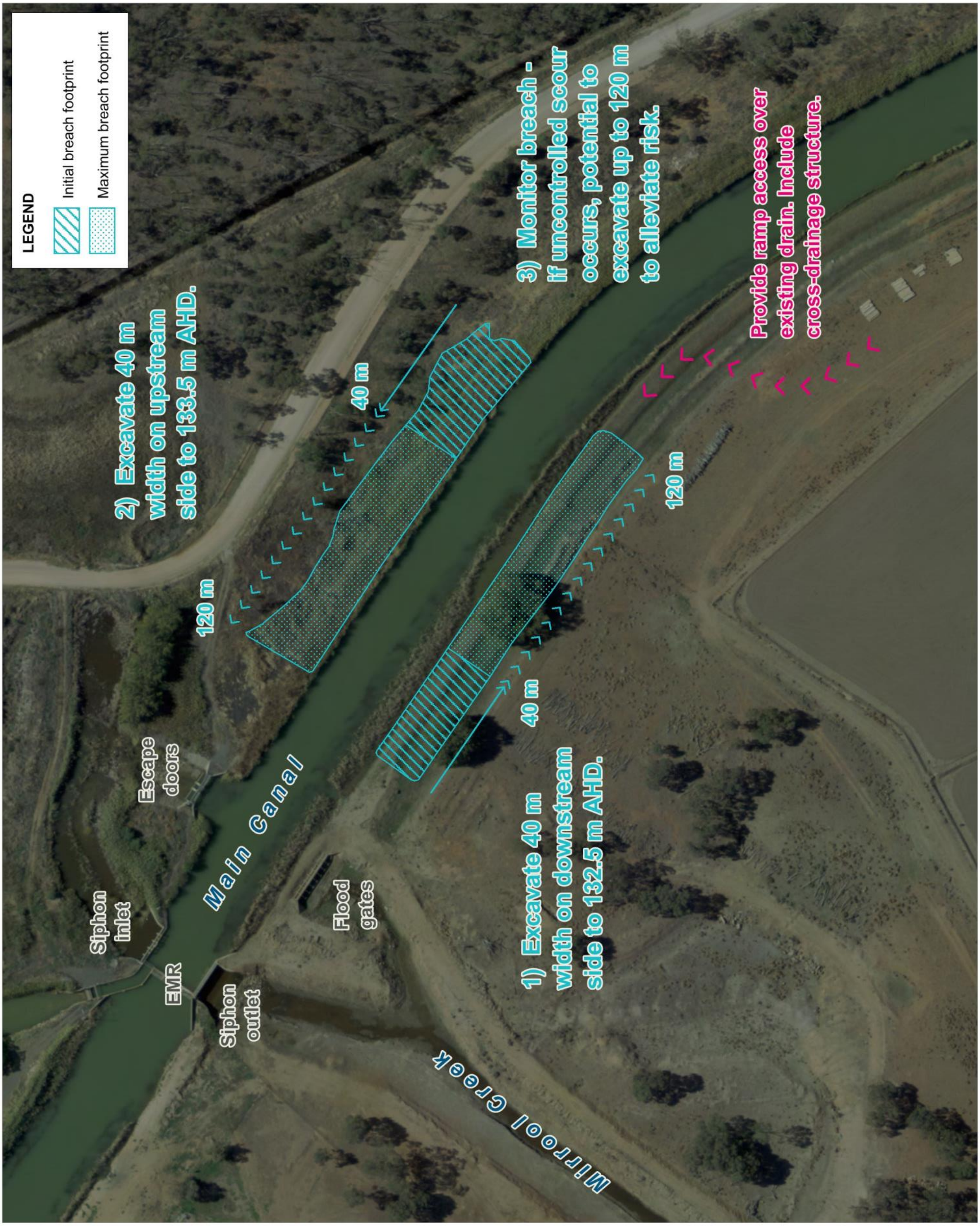
4.4 Post-breach Recovery

Following an emergency breaching of the Main Canal and subsequent recession of flood waters, the Executive Committee should first determine whether the flood risk is now over, or if additional flood events are imminently expected. Once the risk of flooding has subsided then the recovery process can begin.

The post-breaching recovery process effectively involves the repairing of the breached sections of the Main Canal, returning the excavated material and re-forming the canal embankments to the required standard. An inspection of the broader Main Canal embankment length and additional repair works may be required if any additional uncontrolled breaching has occurred during the flood event. The flood gates structures should also be tested to ensure that they are still functioning correctly.

Following completion of any required repair works to the irrigation infrastructure, Murrumbidgee Irrigation should be able to resume normal service in delivery of water supply.

Finally, a post-event review should be undertaken to assess the overall performance of the flood warning process and the execution of the emergency breaching protocols. Any lessons learnt and potential improvements to the process should be identified and documented accordingly for the benefit of future flood event response and management.



Title:

Emergency Breaching Concept Plan

Figure: **4-2**

Rev: **A**

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5 Downstream Impacts

The emergency breaching protocols have been developed to manage the flood risk at Yenda. While the operation of the EMR flood gates and initiation of an emergency breach of the MI Main Canal will alleviate flood risk to Yenda, potential downstream impacts to the Mirrool Creek floodplain will need to be considered.

Potential impacts include:

- change in peak flood levels,
- increased period of inundation, and
- additional volume of floodwater discharging into Barren Box Storage and Wetland (BBSW).

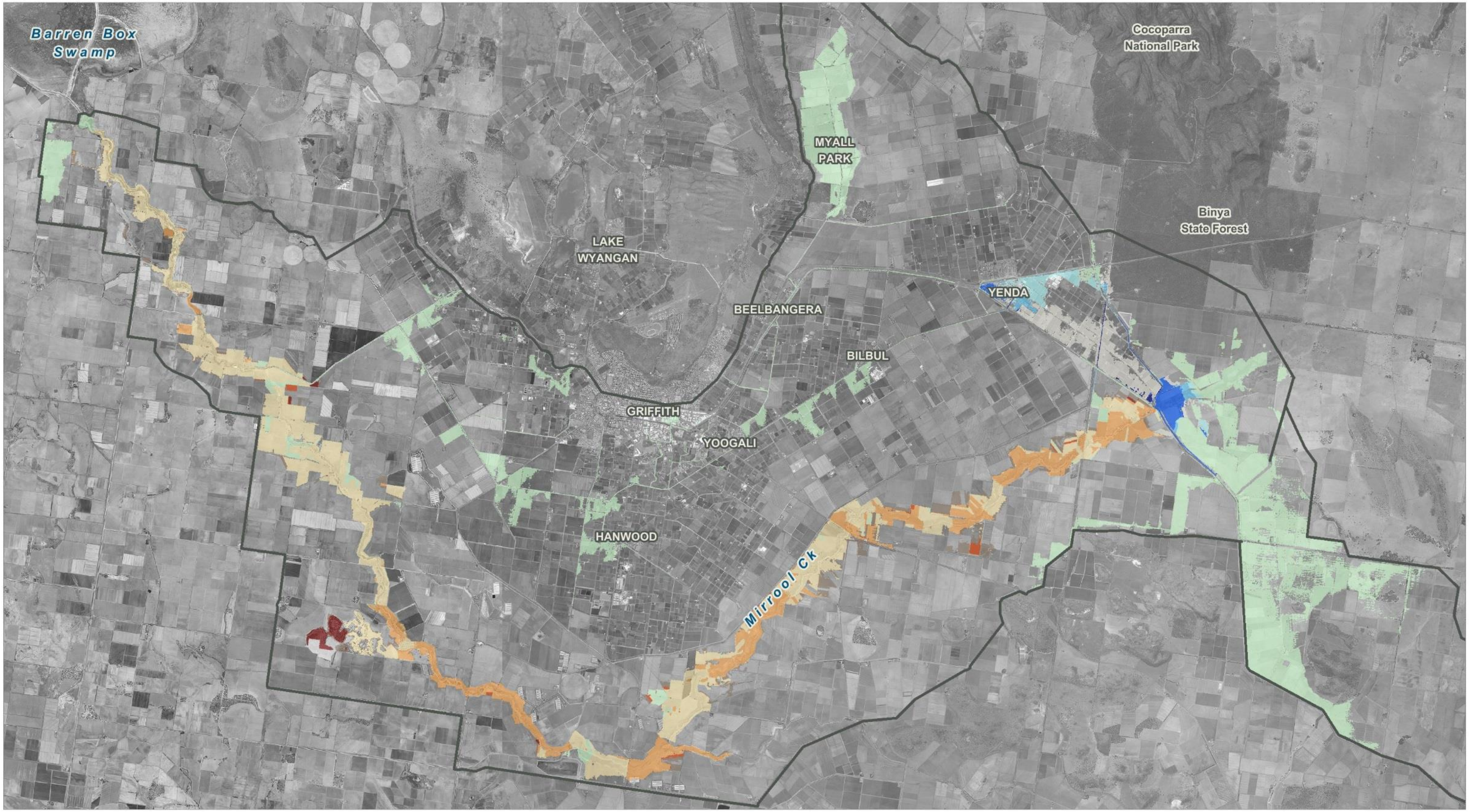
To assess the potential magnitude of flood impacts associated with the execution of flood mitigation actions at the EMR, two scenarios were considered. These scenarios provide a “worst case” condition in terms of downstream flood impacts that may be expected to result from decisions that could be made regarding flood mitigation actions at the EMR:

- a flood event with a peak flow of 50 m^3/s can theoretically be discharged through the siphon structures without the need for operation of the gates. However, the gates are opened in advance of the flood in anticipation of a higher flow
- a flood event with a peak flow of 80 m^3/s can theoretically be discharged through the siphon and gate structures without the need for an emergency breaching of the Main Canal. However, a breach is executed in advance of the flood in anticipation of a higher flow.

For flood larger flood events exceeding 100 m3/s there is a strong likelihood of uncontrolled breaching occurring if the breaching protocols are not executed, as was demonstrated in the March 2012 event. Therefore, the impacts of a controlled breaching at the EMR cannot be assessed with any confidence, as the events that would unfold otherwise are too uncertain to predict. It is therefore reasonable to assume that the execution of the emergency breaching protocols for flood events exceeding the design capacity of the siphon and gate structures (i.e. around 80 m^3/s) would not have a significant downstream flood impact.

For the 50 m^3/s flood flow condition the results of a simulation with open flood gates was compared to one in which the gates remain closed, as presented in Figure 5-1. For the 80 m^3/s flood flow condition the results of a simulation with a breached canal bank was compared to one in which the gates were opened but no breaching occurs, as presented in Figure 5-2.

With reference to Figure 5-1, modelled peak flood levels along the Mirrool Creek floodplain downstream of the Main Canal increased by less than 0.1 m when opening the gates. The extent of inundation is similar and is a function of the presence of field embankments across the floodplain. Flood levels upstream of the Main Canal have decreased. Inundation of Yenda emanating from the Mirrool Creek floodplain is eliminated, as can be seen in Figure 5-1 as the “was wet, now dry” area, shaded light grey. The resultant flood levels in Yenda have typically decreased by around 0.1 m (up to 0.2 m in some areas). Remaining inundation to Yenda is effectively limited to local catchment runoff.



LEGEND

Peak Flood Level Impact (m)

- < -0.20
- -0.20 to -0.10
- -0.10 to -0.05
- -0.05 to -0.02
- -0.02 to +0.02
- +0.02 to +0.05
- +0.05 to +0.10
- +0.10 to +0.20
- > +0.20

- Hydraulic Model Extent
- Was Dry, Now Wet
- Was Wet, Now Dry

Title:

Impact of Opening Gates (Compared to Siphons Only) 50 m3/s Peak Flow Rate at the EMR

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Approx. Scale

Figure: 5-1

Rev: A

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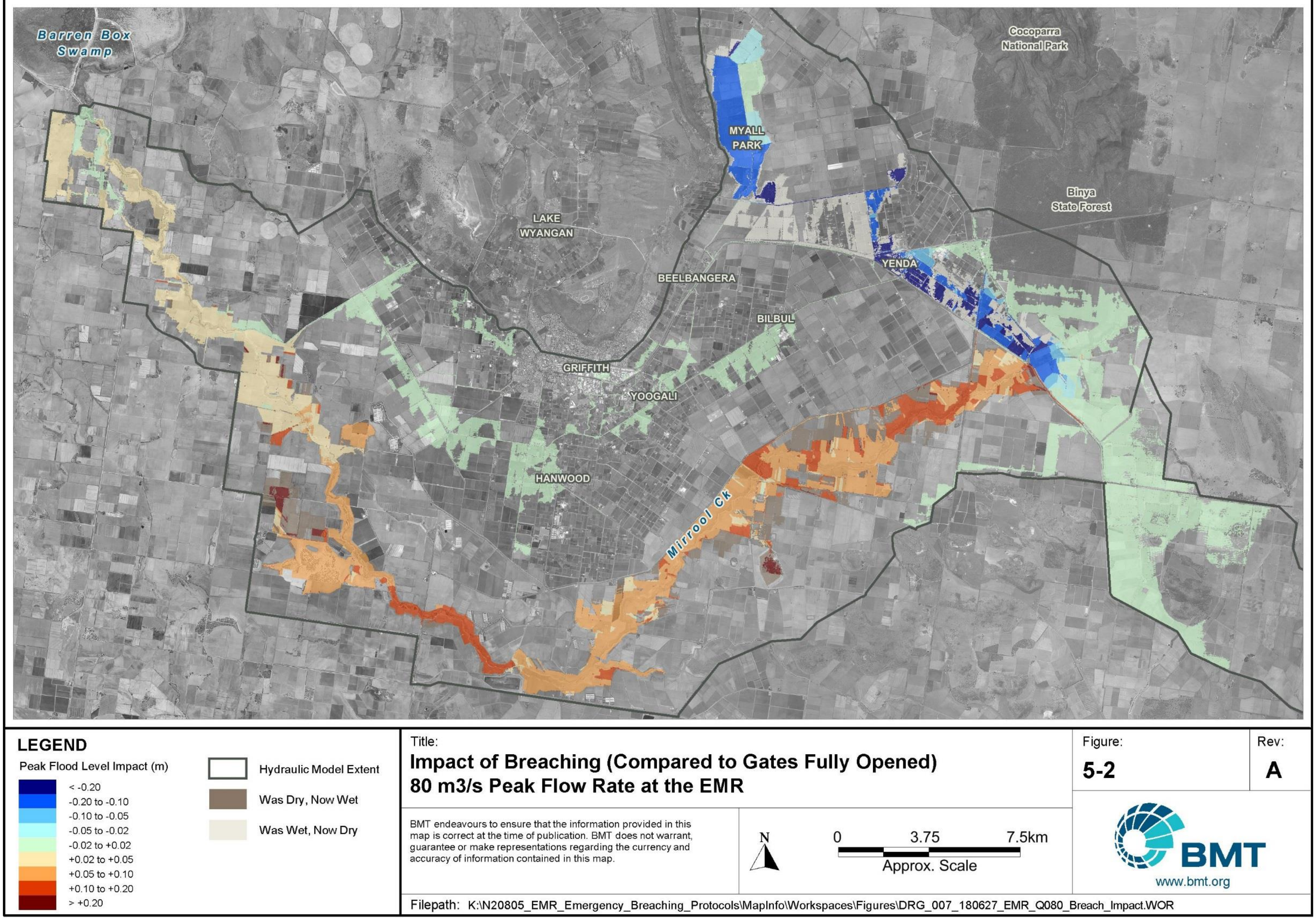

Title:

Impact of Breaching (Compared to Gates Fully Opened)
80 m3/s Peak Flow Rate at the EMR

Figure: **5-2**

Rev: **A**

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The results of the 80 m³/s modelled scenario are shown in Figure 5-2 and indicate that breaching of the canal will significantly reduce flood impacts upstream of the Main Canal and to the township of Yenda, as well as Myall Park. In Yenda, peak flood levels are reduced by around 0.3 m (up to 0.5 m in some areas). Downstream of the Main Canal, peak flood levels have again increased across the Mirrool Creek floodplain. Typically, levels are increased by 0.1 to 0.2 m. Areas of additional inundation can be seen on Figure 5-2 as the "was dry, now wet" area, shaded brown. The area between the Main Canal and Irrigation Way at Mirrool Creek is most significantly impacted.

For the areas negatively impacted by conservative gate operation and breaching, it is expected that flood levels would be unnecessarily increased for a period of two to three days. However, much of the affected areas would be exposed to depths of around 0.3 m during a major flood event and the additional flood water received would not likely increase the total period of inundation. Therefore, the changed flooding condition is not expected to have a significant tangible impact.

BBSW is a natural ephemeral wetland within the broader Mirrool Creek catchment and is located some 60 km downstream of the EMR. It is an integral component of the MI infrastructure. BBSW receives catchment runoff from the Mirrool Creek system, return flows from the upstream irrigation areas and diversions from the Murrumbidgee River. These system inputs are essentially stored in the BBSW before being used for the purposes of water supply for land downstream.

Management of the EMR, including gate operation and canal bank breaching, has the potential to alter the peak flow rate and total volume of floodwater discharging into BBSW. Flow hydrographs extracted from the model scenarios at McNamara Road (located upstream of BBSW) are presented in Figure 5-3. The cumulative volume of floodwater crossing McNamara Road is shown in Figure 5-4.

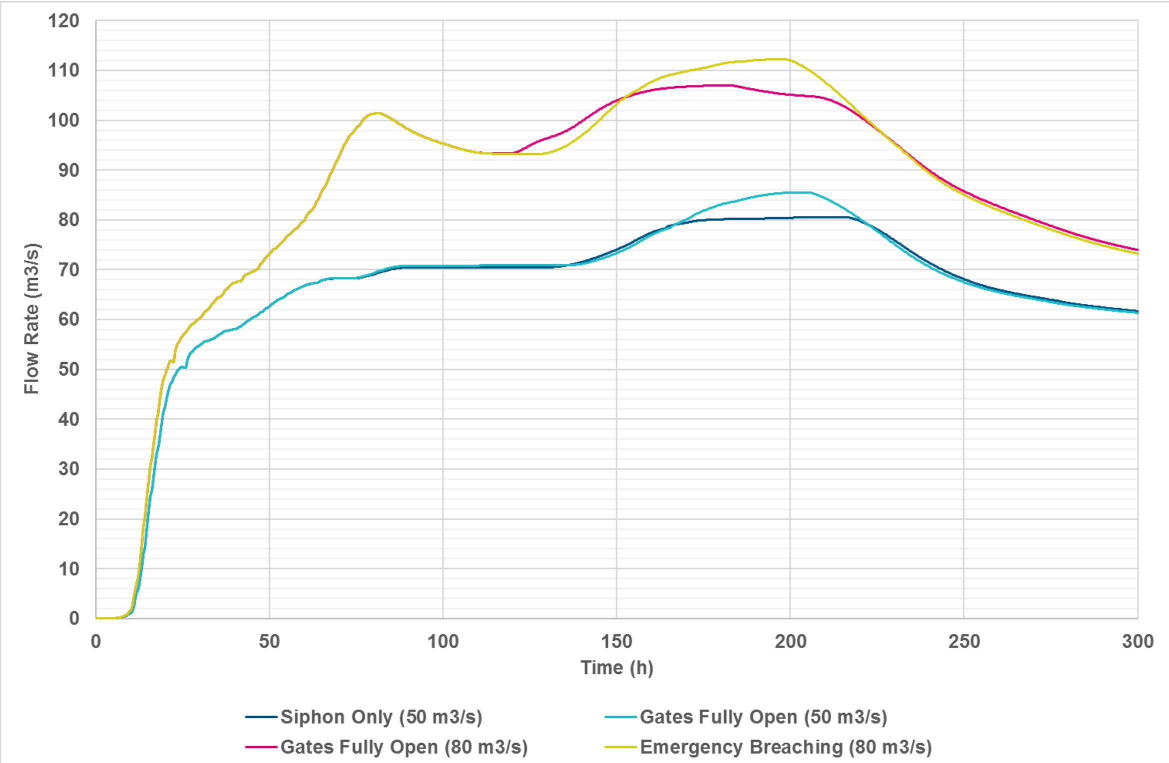

Figure 5-3 Modelled Flow Hydrograph Upstream of BBSW (McNamara Road)

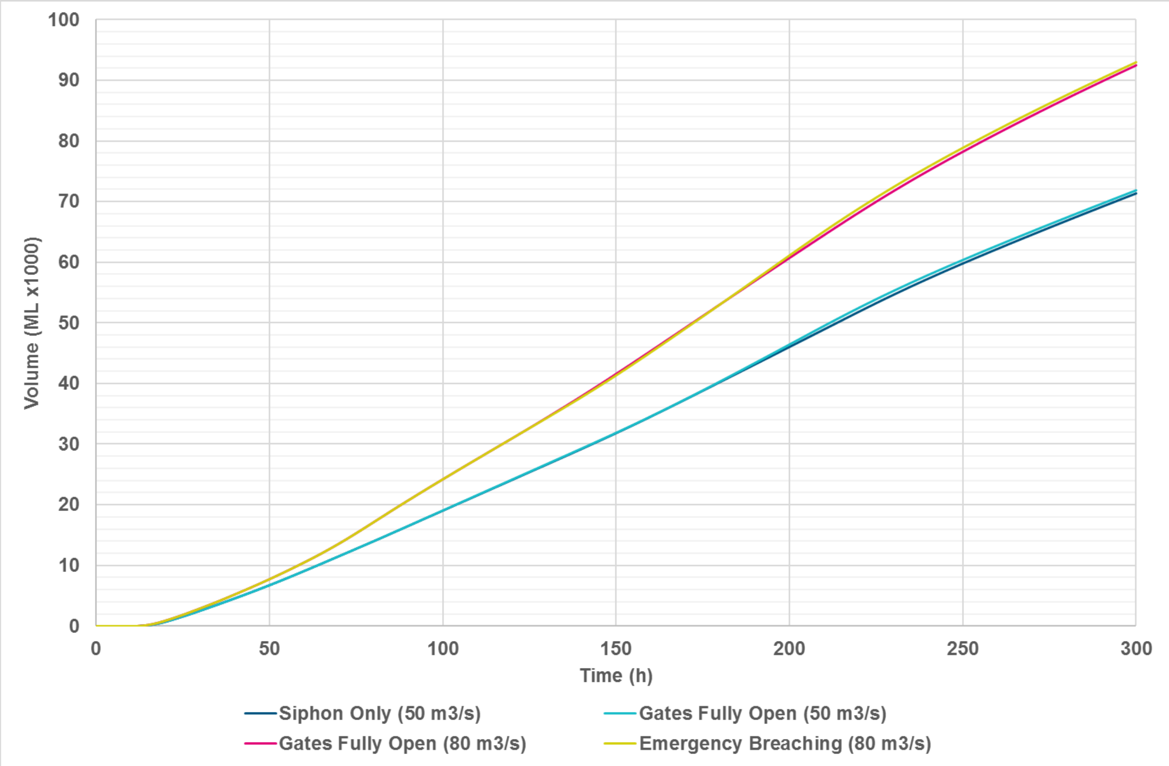

Figure 5-4 Modelled Cumulative Volume into BBSW (McNamara Road)

Each of the modelled scenarios includes additional flow inputs from the Murrumbidgee Irrigation Area (MIA), hence the peak flows entering BBSW are higher than those at the EMR. The actual flow contribution from the MIA would differ between events, depending on the spatial rainfall distribution and time of year. However, Figure 5-4 shows that the overall impact on volumes of water entering BBSW is likely to be insignificant. The impact on peak BBSW flows is more significant, but still relatively minor in the context of the overall flood hydrograph. Nonetheless, the implications of this may have some tangible impact to the management of flooding at BBSW, where operation for the effective management of flooding is already constrained.

6 Recommendations

It is recommended that the Emergency Breaching Protocols and supporting decision support framework be implemented for the management of flood risk at Yenda. However, there are a few additional recommendations that could also be undertaken to further improve flood risk management of Mirrool Creek:

- the recent flood events of 2012 and 2016 have demonstrated that upstream floodplain waters breaching the Main Canal embankment between Burnt Hill and the EMR can compromise the ability to effectively manage the flood risk. The state of the right bank of the MI Main Canal should be assessed and regular maintenance and repair work carried out to raise low spots and maintain the integrity of the embankment
- options for the improved management of local flood waters from Colinroobie runoff and floodplain flows around the south of Merribee Hill should be investigated. The objective of this investigation should be to identify a flood risk management option that both reduces the impact to irrigation supply operations and improves the reliability of Halse Road access for the deployment of emergency breaching excavators
- major floods on Mirrool Creek at the EMR will result in flood waters flowing along the eastern side of the Northern Branch Canal towards Myall Park, which could present a residual flood risk to Yenda. Options to improve the management of these flood waters should be investigated, particularly in the area around the Burley Griffin Way and Griffith – Temora Railway crossings of the NBC.

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CLAUSE CL12

TITLE EMR Emergency Breaching Protocols and Decision Support Framework

FROM Graham Gordon, Director Utilities

TRIM REF 18/94294

SUMMARY

Council commissioned consultant, BMT to undertake the detailed modelling and prepare the 'EMR Emergency Breaching Protocols and Decision Support Framework'. The consultant has finalised the report. The draft report was exhibited for public comments until 4 October 2018. No submissions were received during the exhibition period.

The report, 'EMR Emergency Breaching Protocols and Decision Support Framework' in its current form contains the information as required in accordance with the Council's project brief.

The purpose of this report is for Council to make a determination in relation to adoption of the report, 'EMR Emergency Breaching Protocols and Decision Support Framework'.

RECOMMENDATION

Council adopt the report, 'EMR Emergency Breaching Protocols and Decision Support Framework'

REPORT

Council commissioned consultant, BMT to undertake the detailed modelling of Mirrool Creek catchments, and prepare 'EMR Emergency Breaching Protocols and Decision Support Framework'. The consultant has finalised the Report. The report was exhibited for public comments until 4 October 2018. No submissions were received during the exhibition period.

On 23 August 2018, the report was discussed in a workshop with representatives from the Bureau of Meteorology (BOM), Office of Environment and Heritage (OEH), Murrumbidgee Irrigation (MI), Consultant BMT. The report was also presented to the Floodplain Management Committee on the same day after the workshop.

On 18 September 2018, a Council Workshop was held at the Yenda Diggers Club. During the workshop, the report was thoroughly discussed and explained to Yenda community.

The report, 'EMR Emergency Breaching Protocols and Decision Support Framework' in its current form contains the information as required in accordance with the Council's project Brief.

A final version (November 2018) of the report, 'EMR Emergency Breaching Protocols and Decision Support Framework' is attached for Council's reference.

OPTIONS

OPTION 1

Council adopt the report, 'EMR Emergency Breaching Protocols and Decision Support Framework' (RECOMMENDATION);

OPTION 2

Other resolution as determined by Council.

POLICY IMPLICATIONS

Not applicable

FINANCIAL IMPLICATIONS

Council will be responsible for costs associated with carrying out the breaching of the Main Canal and then restoring the site.

LEGAL/STATUTORY IMPLICATIONS

Not Applicable

ENVIRONMENTAL IMPLICATIONS

Not Applicable

COMMUNITY IMPLICATIONS

The EMR Emergency Breaching Protocols and Decision Support Framework is a public document that is to be used in times of flood so as to prevent the village of Yenda from becoming inundated with flood waters from the Mirrool Creek catchment.

LINK TO STRATEGIC PLAN

This item links to Council's Strategic Plan item 8.4 Mitigate the impact of natural disasters.

CONSULTATION

Senior Management Team
NSW Office of Environment and Heritage (OEH)
Murrumbidgee Irrigation (MI)
Floodplain Management Committee

ATTACHMENTS

(a) EMR Emergency Breaching Protocols and Decision Support Framework - Final Document (under separate cover)

Murrumbidgee Irrigation

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13 November 2018

Brett Stonestreet
General Manager
Griffith City Council
1 Benerembah Street, Griffith NSW 2680

Dear Brett.

MURRUMBIDGEE IRRIGATIONS SUPPORT FOR THE EMR
EMERGENCY BREACHING PROTOCOLS AND DECISION SUPPORT FRAMEWORK 2018

Murrumbidgee Irrigation (MI) fully support the EMR Emergency Breaching Protocols and Decision Support Framework produced for Griffith City Council (GCC) by consultants BMT and placed on public exhibition in September 2018.

MI understands the importance of the flood mitigation measures that GCC put in place to protect the Yenda Township from Mirrool Creek flooding as part of its broader flood management responsibilities for the Griffith Local Government Area.

During any Mirrool Creek flooding events, MI will work with GCC and operate the automated EMR Floodgates (which is currently being constructed) as necessary and in accordance with the EMR Emergency Breaching Protocols.

MI will also cooperate and assist in carrying out the breaching of Main Canal under instruction from GCC and in accordance with the EMR Emergency Breaching Protocols if necessary during any major flood events.

Yours faithfully

Brett Jones
CHIEF EXECUTIVE OFFICER