THE BASIN PLAN IMPLEMENTATION

Darling Alluvium Incident Response Guide

Schedule E

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New South Wales acknowledge and pays its respect to all the Traditional Owners and their Nations of the Murray-Darling Basin.

We acknowledge Aboriginal people as Australia's First Peoples and as the Traditional Owners and Custodians of the land and water on which we rely.

Glossary

Abbreviation	Description
AAL	Aquifer Access Licence
ADWG	Australian Drinking Water Guidelines
AI	Aquifer Interference
AWD	Available Water Determination
Basin Plan	*Basin Plan 2012*, made under the *Water Act 2007* of the Commonwealth
BLR	Basic Landholder Rights
COAG	Council of Australian Governments
CWAP	Critical Water Advisory Panel
CWTAG	Critical Water Technical Advisory Group
DWMS	Drinking water management system
EMPLAN	NSW State Emergency Management Plan
EEC	Endangered Ecological Community
EPL	Environmental Protection Licence
GDE	Groundwater Dependent Ecosystem
HPGDE	High priority Groundwater Dependent Ecosystems
IRG	Incident Response Guide
IWCM	Integrated Water Cycle Management
LWU	Local water utility
MDBA	Murray-Darling Basin Authority
MER	Monitoring, Evaluation and Reporting
Minister	NSW Minister responsible for Water Resources (unless otherwise stated)
SAP	Stakeholder Advisory Panel
TWS	Town Water Supply
WMA 2000	*Water Management Act 2000*
WQMP	Water Quality Management Plan
WRP	Water resource plan

Abbreviation	Description
WRPA	Water resource plan area
WSP	Water sharing plan

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1. Introduction

1.1. Purpose

Incident Response Guides (IRGs) outline the framework for managing extreme events for each major water source in the NSW Murray-Darling Basin based on the principles outlined in the NSW Extreme Events Policy. They provide a progressively expanding toolkit of approaches for water managers to select from as an event becomes more severe. This balances the need to be adaptive in response to changing circumstances, with the need for certainty, to improve longer term planning.

This IRG applies to the Darling Alluvium groundwater resources of the Murray-Darling Basin shown as GW7 in Figure 1-1and in more detail in the Figure E-1.

This IRG has been developed to:

- meet the requirements under section 10.51 of the Basin Plan
- support the statutory functions under sections 49A, 49B, 59, 60, 324 and 331 of the *Water Management Act 2000* (WMA 2000).

The first version of this IRG was published in 2019 and has been updated in 2022.

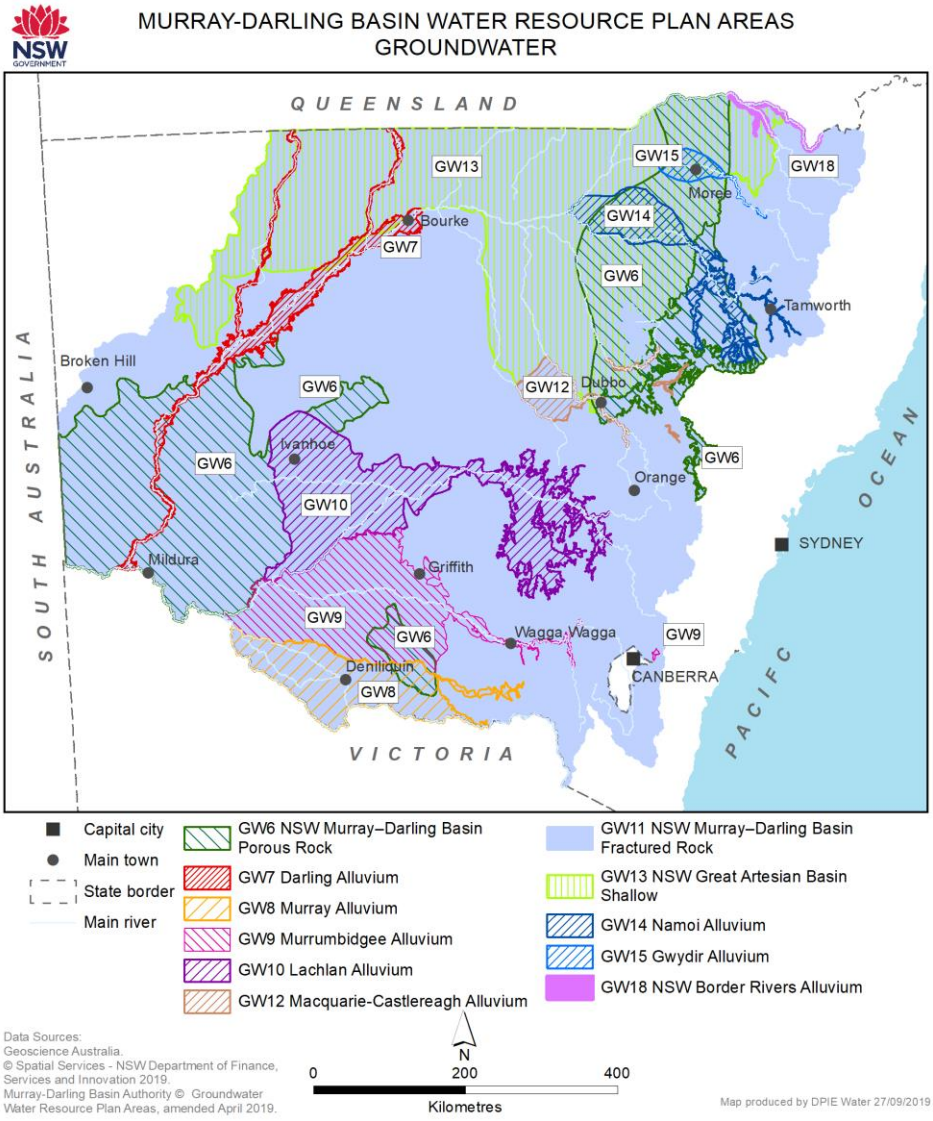

Figure 1-1. Murray-Darling Basin Groundwater Water Resource Plan Areas.

An extreme event is defined in section 10.51 of the Basin Plan, in the Dictionary of the *Water Management Act 2000* (WMA 2000) and in the NSW Extreme Events Policy. It includes extreme dry periods, extreme water quality events, and any other type of event that has led to a management plan previously being suspended in the past 50 years.

For surface water resources, an extreme dry period may include an extended period of low rainfall that leads to a severe water shortage, such as the conditions during the Millennium drought and the more recent 2017-2020 drought. An extreme dry period may also result from other types of events, such as the structural failure of a state-owned water storage facility. In response to a surface water extreme dry period, groundwater resources may be accessed as an alternative supply.

A meteorological or hydrologic drought or extreme dry period does not necessarily correlate with reduced groundwater availability or accessibility. Significant recharge to many groundwater systems can be episodic, and largely dependent on flows across the alluvial floodplain.

For the purposes of this Groundwater IRG an extreme dry period is defined as an extended period during which recharge to the groundwater system from all sources (flood flows, rainfall, river, and through flow) has been below average and is putting at risk the ability to access groundwater of sufficient quantity and/or quality for its intended purpose[1].

An extreme water quality event affecting groundwater may include increased salinity or water pollution.

The measures set out in this IRG provide for the management of access to groundwater resources to meet critical human water needs during groundwater extreme events. Where access to groundwater of a sufficient quantity or quality is compromised due to circumstances that are outside the defined extreme events, the measures to provide for management of those circumstances are set out elsewhere in the relevant groundwater water resource plan (WRP) including at section 3 of Schedule I.

Section 3 of Schedule I details measures affecting access to groundwater where actual take or potential increased groundwater take has an unacceptable impact on groundwater levels, water quality, groundwater dependent ecosystems, aquifer integrity, cultural values, or take by other authorised users.

1.2. Legal and policy context

1.2.1. Statutory management functions

A range of key statutory functions applicable to extreme event management exists within the NSW operating context. These are detailed in the NSW Extreme Events Policy. Any decision made in accordance with this Guide must comply with the provisions of the WMA 2000.

Unless a water sharing plan (WSP) provides otherwise, the priorities set out in the following tables apply to the distribution of groundwater under normal circumstances (Table 1-1) and during severe water shortages in any water management area or water source across the state (Table 1-2) or extreme events in any Basin water management area or water source (Table 1-3). While the water available under all water access licences can be reduced if necessary, the water allocations for higher priority licences as a rule are to be diminished at a lesser rate than the water allocations of lower priority licences.

[1] Water shortage criticality is assessed through analysis by Department of Planning and Environment of groundwater level and pressure data from monitoring undertaken by WaterNSW.

Table 1-1. Normal WMA 2000 take priority under sections 5(3), 58 and 60(1).

Take type/use	Priority[2]
• Water source and dependent ecosystems • Taking of water by persons exercising basic landholder rights (BLRs)	First
• Local water utility (LWU) access licences • Major utility access licences • Domestic and stock access licences	Second
• All other forms of aquifer access licences (AAL).	Third

Table 1-2. WMA 2000 take priorities for groundwater under sections 60(3) and section 49A order.

Take type /use	Priority[2]
• The taking of water for domestic purposes by persons exercising BLRs • The taking of water for domestic purposes or essential town services authorised by an access licence.	First
• Needs of the environment	Second
• The taking of water for stock purposes by persons exercising BLR • The taking of water for purposes authorised by a domestic and stock access licence or by persons exercising any other water rights in relation to stock • The taking of water for the purposes of supply of commercial and industrial activities authorised by a LWU access licence, subject to the water made available being in accordance with any drought management strategy established by the Minister for that purpose	Third
• Taking of water for purposes authorised by any other category or subcategory of access licence	Fourth

Table 1-3. WMA 2000 take priorities for groundwater under sections 60(3A) and section 49B order.

Take type / use	Priority[2]
• Meeting critical human water needs, which means the needs for a minimum amount of water, that can only reasonably be provided from the Basin water resources, required to meet: (a) core human consumption requirements in urban and rural areas, and (b) those non-human consumption requirements that a failure to meet would cause prohibitively high social, economic or national security costs.	First
To the extent these are not critical human water needs: • The taking of water for domestic purposes by persons exercising BLRs	Second

[2] There is no priority given under the Act between different forms of take 'within' a priority

Take type / use	Priority[2]
• The taking of water for domestic purposes or essential town services authorised by an access licence	
• Needs of the environment, to the extent these are not critical human water needs	Third
To the extent these are not critical human water needs: • The taking of water for stock purposes by persons exercising BLR, • The taking of water for purposes authorised by a domestic and stock access licence or by persons exercising any other water rights in relation to stock, • The taking of water for the purposes of supply of commercial and industrial activities authorised by a LWU access licence, subject to the water made available being in accordance with any drought management strategy established by the Minister for that purpose.	Fourth
• Taking of water for purposes authorised by any other category or subcategory of access licence, to the extent these are not critical human water needs.	Fifth

1.2.2. Relationship to other plans and processes

The IRG is a linking document that references other plans and processes relevant to the management of extreme events in NSW groundwater water sources. It must be consistent with NSW and Commonwealth legislation and is informed by a range of other inputs. Figure 1-2 shows the relationship between this IRG and other documents relevant to groundwater water resource plan areas (WRPAs) in NSW.

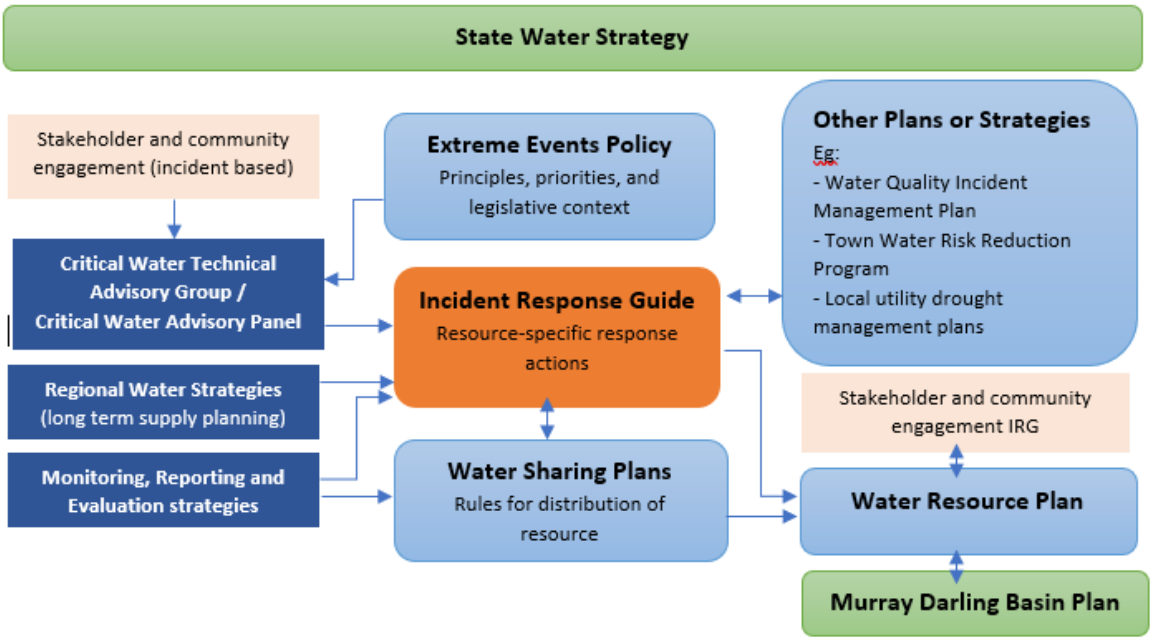

Figure 1-2. Relationship of the IRG to documents relevant to the WRP framework.

1.3. Scope

1.3.1. Water sources

This IRG applies to the NSW groundwater resources within the Darling Alluvium shown in Figure E-1 in Appendix E. Surface water is not specifically covered by this IRG, other than where it has a role as a management response (alternative supply) in extreme events. The extreme event management requirements of the Basin Plan (section 10.51) focus on water availability and water quality.

It should be noted that groundwater take frequently increases in response to extreme events in surface water systems, and this increased take is a common contingency measure in NSW surface water IRGs.

1.3.2. Critical water needs

This IRG outlines how groundwater should be managed during extreme events, particularly how critical water requirements can be met during these events (in accordance with principle two of the NSW Extreme Events Policy). Critical human water needs are those groundwater uses within WRPAs that have been assessed as a core human consumption requirement or non-human consumption requirement that a failure to meet would cause prohibitively high social, economic or national security costs, according to the WMA 2000 section 60(3C).

Critical environmental needs are those required to avoid loss of native species, communities and groundwater dependent ecosystems and irretrievable damage that would prevent the ecosystems from recovering with returned to improved conditions.

Critical needs are shown generically for all groundwater WRPAs in Table 1-4.

Table 1-4. Critical water needs identified within groundwater WRPAs.

Use/value	Description
Water for towns and essential human needs	Domestic supply and essential town services for LWUs. Commercial and industrial activities supplied by town water where closure would result in significant loss of economic activity and employment in the town.
	Domestic use under domestic and stock and native title basic landholder rights (see section 1.3.3) and licensed domestic use for core household use.
Environment and cultural assets	Water to maintain or ensure the survival of critical groundwater dependent ecological communities and cultural assets.
Water for stock	Delivered under BLR and stock access licences for animal welfare purposes.
Inflows associated with aquifer interference (AI) activities	Groundwater associated with AI activities that cannot be ‘controlled,’ usually as a result of mining activities where ceasing of activity would result in significant economic loss.

1.3.3. Bore construction and access to groundwater

Section 52 of the WMA 2000 permits an owner or occupier of a landholding to take water from any aquifer underlying their land to use the water for domestic consumption or grazing stock watering, without the need for an access licence, and subject to approval for construction of a water bore.

Whether or not there is sufficient yield of groundwater available within the groundwater source underlying a particular parcel of land, and the nature of any such groundwater system in terms of its reliability as a water source, may be unknown. Shallow groundwater systems may indeed dry out naturally either seasonally or during drought periods, or more regularly in the absence of

sufficient recharge. These groundwater systems are comparable to unregulated ephemeral streams.

The landholder, therefore, takes the risk that a suitable supply will not be found or that the supply is unreliable in nature. The work (bore) approval, per se, is no 'guarantee' of access.

In other, more persistent groundwater systems, water levels or pressures fluctuate naturally in response to recharge, and also in response to nearby groundwater pumping. Some bores are constructed relatively shallow and therefore only access the top portion of water in the aquifer. Due to this, access may be lost as water levels fall. This is usually a result of inadequate infrastructure which precludes access, rather than the availability of groundwater. To guard against such inefficient bore construction, all bore approvals now contain a condition stating that 'the water supply work must be constructed to a sufficient depth to enable access to the water source for the life of the work'.

In 1997, COAG set key principles for States in this regard in its paper *Allocation and Use of Groundwater: A National Framework for Improved Groundwater Management in Australia - Policy Position Paper for Advice to States and Territories*[3]. In particular, Recommendation 4 in the report stated:

In preparing groundwater management plans, policies and strategies, States should ensure that the efficient utilisation of groundwater resources is not compromised by protection of existing users with inefficiently designed or constructed wells. This particularly applies to domestic and stock wells.

Consistent with the discussion and principles above, priority provision of access for BLRs specified in Table 1-4 will be afforded where the groundwater resource is 'available' for take, and if bores are 'efficiently constructed' - that is, constructed to such a depth that they can access available water over the full range of climate and pumping conditions.

1.4. Potential extreme events in groundwater WRPAs

1.4.1. Extreme event types, occurrence, and risk

Risks to meeting the identified critical water needs are identified in the individual groundwater WRPAs risk assessment reports and their associated Water Quality Management Plan (WQMP). Potential and past extreme events, as defined in section 10.51(1) of the Basin Plan are summarised in Table 1-5.

Table 1-5. Section 10.51(1) possible extreme event types.

Event type	Description	Context - potential or actual past events
Severe water shortage	• Extreme dry period characterised by unacceptable local water level drawdown or depressurisation.	• Has occurred in parts of the Namoi Alluvium WRPA and parts of the Lachlan Alluvium WRPA. • Potential in parts of the Gwydir Alluvium and Murrumbidgee Alluvium WRPAs.
	• Land subsidence or sediment compaction resulting from groundwater extraction.	• Evidence of minor land subsidence and aquifer compaction in the Lower Namoi Alluvium WRPA pre 1990s. • Not identified in other areas.

[3] Task Force on COAG Water Reform Sustainable Land Water Resource Management Committee, Occasional Paper Number 2 December 1996, Commonwealth of Australia, 1997

Event type	Description	Context - potential or actual past events
	• Contaminated site threatening groundwater quality.	• As contained on the contaminated land register maintained by the NSW Environment Protection Authority.
Water quality events	• Induced connection with poor quality (saline) groundwater (as a result of unacceptable depressurisation/drawdown).	• Has occurred in isolated areas of the Namoi Alluvium and the Murrumbidgee Alluvium WRPAs. • Potential in the down gradient areas of the Namoi Alluvium, Macquarie–Castlereagh Alluvium, Lachlan Alluvium, Murrumbidgee Alluvium and Murray Alluvium WRPAs.
Suspension of WSP	• Event causing suspension of WSP within the WRPA.	• Has occurred in the Darling Alluvium WRPA. In 2015, clause 42(3) of the Water Sharing Plan for the Lower Murray-Darling Unregulated and Alluvial Water Sources 2011, which prohibited extraction under aquifer access licences when the available water determination for regulated river (general security) access licences (surface water) was greater than zero, was suspended for a short time.[4]

2. Incident response framework and process

2.1. Criticality stages

The response framework taken by the IRGs is consistent with the principles introduced in the NSW Extreme Events Policy. Where circumstances put at risk the ability to access groundwater of sufficient **quantity**, the framework involves progressively introducing more stringent measures to support the highest priority needs as the circumstances becomes more critical. This supports principle five in the NSW Extreme Events Policy to maximize certainty in water management. Water quality events may trigger any criticality stage, depending on the nature and severity of the event.

The general management approaches available during each stage are outlined below in Table 2-1, and the criticality stages are defined in Table 3-1 and Table 3-2.

The criticality stages apply at the groundwater resource unit scale or a defined area within it.

[4] It was always intended to allow access to groundwater in the Lower Darling Alluvium during extreme events when access under regulated river general access licences was limited. As written, Clause 42(3) of the *Water Sharing Plan for Lower Murray-Darling Unregulated and Alluvial Water Sources 2011* did not allow this as intended. This provision was revised in 2020 plan to provide for the intended groundwater access in multiple situations where surface water access is restricted.

Table 2-1. Stages of the IRG framework.

Stage based on level of risk	Agency/management approaches	Water sharing plan approaches		
		Normal rules	WSP local scale management measures	Suspension (in part)
Stage 1	Normal management operations - long term planning, including drought security planning.	In force		
Stage 2	Local impact management measures implemented as required. Emergency management readiness implemented. Inter-agency groundwater advisory group briefed. Initial communications with potentially affected communities and stakeholders.	In force	Possibly activated	
Stage 3	Adjustments to access management. Emergency management on stand-by. Critical Water Advisory Panel established and operational, with regular Ministerial updates. Communications with affected communities and stakeholders increased.	Possibly also in force	In force	Possibly activated
Stage 4	Some or all normal access management untenable, emergency management activated. State agency/regional response implemented if required/triggered. Critical Water Advisory Panel maintained, with regular Ministerial updates. Regular communications with affected communities and stakeholders increased.	Possibly also in force	In force	Possibly activated

Note that the 'stages' outlined in Table 2-1 and section 3 for this IRG are not aligned with or related to local government water restriction 'levels'. The stages refer to increasing criticality of an extreme event in the WRPA as a whole. Measures in this IRG may affect the total amount of water made available to a town or village. However, it is the responsibility of the water service provider (local government or supply authority) to manage access to that available water within the town or village consistent with their established demand and drought management processes.

2.2. Advisory panels and stakeholder input

The information in Table 1-3 is designed to be guiding, not binding, and flexibility in the prioritisation of groundwater access during extreme conditions may be required, as recommended in principle six of the NSW Extreme Events Policy.

To deliberate further in specific WRPAs, a Critical Water Technical Advisory Group (CWTAG) comprised of agency experts and a Critical Water Advisory Panel (CWAP) comprised of local council and stakeholder representatives may be convened. Their key role would be to provide the Department of Planning and Environment on appropriate response measures and criticality levels. Their purpose would be defined in the Terms of Reference, to be developed when the panels convened.

Critical Water Technical Advisory Group (CWTAG)

The CWTAG may be convened at Stage 2 – Emerging Drought. It may be comprised of agency experts in areas such as town water supplies, environment, and planning and agriculture. The objective of the CWTAG is to provide advice on drought progression and management measures while maintaining consistency with the requirements of the WMA 2000.

Critical Water Advisory Panel (CWAP)

The CWAP may be convened at Stage 3 – Severe Drought or earlier if required. It may be comprised of State and Local Government and local stakeholder representatives. The objective of the CWAP is to ensure that advice on priorities comes from a local contextual basis. The CWAP will have a particular focus on early, appropriate, and broad communications with potentially affected parties, and on bringing local area perspectives to the selection of management response measures (see section 3) in specific groundwater areas.

The Department of Planning and Environment will consider advice provided by the CWTAG, CWAP and any other relevant inputs. Recommendations will then be developed and presented with evidence for decision by the appropriate decision maker.

A communications and engagement plan will be developed to outline communication and engagement processes with external stakeholders and affected parties, including local councils and other water supply authorities, Aboriginal communities, environmental groups, and other water users. Opportunities to use existing engagement mechanisms, such as WaterNSW's Customer Advisory Groups (CAGs) and water user groups will be evaluated. The plan will describe the approach to information sharing, confidentiality, handling market sensitive information and transparency.

2.2.1. Engagement with First Nations people

Advice will be sought from agency Aboriginal Cultural Liaison Officers (or equivalent) on extreme event response measures. The Department of Planning and Environment will consider advice provided by the liaison officers and any other relevant inputs. Recommendations will then be developed and presented with evidence for decision by the appropriate decision maker.

Liaison officers will provide:

- information on key cultural considerations within the area
- advice on further First Nations consultation
- advice on culturally appropriate literature and communication.

3. Management responses

Details for groundwater WRPAs, in terms of events, their criticality and the management response toolkit, are shown in Table 3-1 (quantity events) and Table 3-2 (quality events). These tables are the key elements of this IRG.

Management responses will be guided by the type of event, particularly for water quality events, which can be varied, and are often managed by parties other than Department of Planning and Environment—Water (Appendix B). For example, if a water quality event triggers the *State Emergency & Rescue Management Act 1989*, the processes and responses specified in that Act will prevail.

The management responses in Table 3-1 and Table 3-2 constitute **options for consideration** by the resource managers and the CWTAG and CWAP when convened, and are consistent with the statutory priorities and approaches set out in section 1.

Three general principles will apply in relation to drought or water shortage response measures:

- Every attempt will be made to maintain the operation of the statutory water sharing plans (as per principle one of the NSW Extreme Events Policy).
- The Government will expect water access licence holders to use the water market to manage their own supply shortage risks in all but extreme circumstances (evidence of actual or imminent market failure).
- In all but very extreme circumstances, restricted access will apply at the access licence 'category' or 'sub-category' level. Available water determinations for one or more individual access licences (as provided for under s.59(1)(b) of the WMA 2000) will only be used as a last resort.

These response measures aim to maximise certainty provided to water users, whilst balancing the need to implement fit-for-purpose strategies that treat all licence holders within a licence category or sub-category equally in accordance with principles four, five and six in the NSW Extreme Events Policy. The statutory priorities for water access rights outlined in section 1 of this IRG will apply if water access needs to be reduced in response to an extreme event. To be clear, higher priority access rights will be reduced to a lesser extent than lower priority access rights. This does not mean that higher priority rights must be satisfied in full prior to making water available to lower priority rights. It does mean, however, that higher priority rights cannot be reduced to the same extent as, or more than, lower priority access rights.

Connectivity between water sources should be considered by resource managers and the CWTAG and CWAP when convened, to ensure water is available to meet critical needs in connected systems during an extreme event. This is consistent with principle nine of the NSW Extreme Events Policy.

3.1. Water quantity event management

Table 3-1 outlines the potential measures available if circumstances cause the quantity or accessibility of groundwater in all or part of a WRPA to become insufficient for meeting critical human and non-human water requirements.

Water shortage criticality is assessed through analysis by Department of Planning and Environment of groundwater level and pressure data from monitoring undertaken by WaterNSW.

Table 3-1. IRG criticality matrix and management responses for extreme water quantity events within NSW groundwater WRPAs.

Criticality level	Management response toolkit options and responsibility
Stage 1  Groundwater levels remain within acceptable ranges, with annual recovery as expected given rainfall/recharge events.	Department of Planning and Environment—Water and WaterNSW: • Maintain WSP rules for distribution of access • Ongoing monitoring of groundwater levels and take • Planning/programs for continuity of access for BLR for 'efficiently' constructed works 5 • Planning under the Regional Water Strategy. Local water utilities: • Long term water security and emergency/drought contingency planning as part of Integrated Water Cycle Management (IWCM) Strategy.

Stage 2
 
Unacceptable groundwater level and or pressure declines potentially or actually impacting on groundwater availability to high priority GDEs, BLRs and/or LWUs.
	Department of Planning and Environment—Water and WaterNSW:
	As for green (Stage 1) criticality, and in addition:
	• Assess the extent of the actual or potential impact - the entire water source or a local area
	• As and where required, impose extraction restrictions (s.324 WMA 2000) on lower priority, AALs within the impacted areas, and/or restrict or deny trades (allocation or share assignments) if trade would result in an increase in authorised extraction in the impacted area:
	  ○ to maintain or protect water levels/water pressure at key points within the groundwater source (i.e. at key monitoring bores), or
	  ○ to prevent potential subsidence, or
	  ○ to protect groundwater-dependent ecosystems.
	Local water utilities:
	• Accelerate implementation of the IWCM Strategy measures and commence readiness planning of Emergency/drought contingency response plan measures.
	• Activate *Water Management (General) Regulation 2018* notices as required - in times of water shortages water supply authorities can restrict the volumes, times and methods by which water is taken.

Stage 3
 
Continuing unacceptable groundwater level or pressure declines and potential for water quality declines from mobilisation of poorer water quality.
Unacceptable drawdown impacts on 'efficiently constructed' BLR bores (i.e. levels below the pump or deeper than the bore).
Drawdown to levels that could lead to sediment compaction.
	Department of Planning and Environment—Water and WaterNSW:
	As for yellow (Stage 2) criticality, and in addition:
	• Commence implementation of protection measures for efficiently constructed BLR bores, if required
	• Announce reduced available water determinations (AWD) for aquifer access licences and if required higher priority access licences
	• If necessary, make S.324 WMA 2000 temporary water restrictions order on aquifer access licences to limiting take to a percent of licence shares
	• Possible suspension of water allocation account clauses in applicable WSP, with temporary arrangements that:
	  ○ Further limit water account debits
	  ○ Limit the AWD for AALs within the impacted area,
	  ○ Limit the AWD for AALs for one or more individual access licences.
	Local water utilities:
	• Continue accelerated implementation of the IWCM Strategy measures, commence implementation of demand-side emergency/drought contingency response plan measures, and continue readiness planning of supply-side emergency measures
	• Restriction notices as required.

Stage 4  Water level declines pose a risk to long term availability of the groundwater resources - subsidence, and/or mobilisation and induced flow of poorer water quality. Access by 'efficiently constructed' BLR bores significantly impacted. Evidence of aquifer compaction.	Department of Planning and Environment—Water and WaterNSW: As for orange (Stage 3) criticality, and in addition: • Potential suspension of all take under AALs • Further restriction of priority access as required • If necessary, S.324 WMA 2000 order restricting groundwater take by LWUs and under BLRs, • S.331 WMA 2000 directions to BLR holders to take specified measures. Local water utilities: • Complete implementation of the IWCM Strategy, review and enhance implementation of demand-side emergency/drought contingency response plan and commence implementation of supply-side emergency measures. • Restriction notices as required.

3.2. Water quality event management

Table 3-2 outlines the potential measures available if an event causes the groundwater in all or part of a WRPA to be of insufficient quality to meet critical human and non-human water requirements and other established local values and uses.

Water quality event management in NSW is the responsibility of a wide variety of organisations, including NSW State agencies, NSW local government and the Murray Darling Basin Authority (only for those events within the Murray-Darling Basin). The NSW EPA is the primary regulatory authority of water pollution activities. In most other cases, the regulatory authority is the relevant local council. WaterNSW is responsible for implementing management strategies throughout their areas of operation. The Department of Planning and Environment—Water Group contributes to water quality management in groundwater sources through the development of Water Quality Management Plans within the Murray-Darling Basin.

Table 3-2 includes only management responses that relate directly to the availability of water for use, consistent with the Basin Plan and NSW WSPs, and the impact that water quality events may have on this water availability. It does not include actions undertaken by the EPA under the relevant environmental protection legislation, including pollution control mechanisms and management orders relating to significantly contaminated land. Water quality criticality will typically be evidenced by:

- Water quality 'event' reporting to the Environment Protection Authority
- Declarations of significantly contaminated land under Division 2, Part 3 of the NSW *Contaminated Land Management Act 1997*
- Exceedance of Australian Drinking Water Guidelines 2011 values as specified in LWUs' Drinking Water Management Systems
- Water quality sampling and analysis that reveals a potential risk to water quality, for example unusual levels of:
    - dissolved oxygen
    - pH
    - salinity
    - heavy metals
    - organic compounds
    - nitrates
    - other known contaminants, etc.

Table 3-2. IRG criticality matrix and management responses for extreme water quality events within NSW groundwater WRPAs.

Criticality level	Management response toolkit options and responsibility

Stage 1
 
Raw water able to be treated under normal process conditions.
 	
Water quality able to meet other established local values and uses.
 	
Stage 2
 
Raw water able to be treated with some adjustments (minor cost) to process conditions.
 	
Water quality able to meet other established local values and uses.
	Department of Planning and Environment—Water and WaterNSW:
	• Maintain WSP rules for distribution of access
	• Ongoing monitoring of groundwater quality
	• Mapping of reports from Environment Protection Authority (below) against groundwater vulnerability.
	Local water utilities:
	• Implementation of Quality Assurance Program – Drinking Water Management System (DWMS) under the NSW *Public Health Act 2010* and *Public Health Regulation 2012*
	• Activate *Water Management (General) Regulation 2018* notices requiring the installation of meters for measuring the quantity of water supplied to urban users as required.
	Others:
	• EPA reporting to Department of Planning and Environment—Water of any:
	  ○ Existing or new declarations of significantly contaminated land under the NSW *Contaminated Land Management Act 1997,*
	  ○ Pollution incidents reported under the *Protection of the Environment Operations Act 1997*,
	  ○ Environment Protection Licences (EPLs) in the groundwater sources, particularly for underground fuel storage and waste disposal/management.

Stage 3  Raw water able to be treated with major adjustments (major cost) to process conditions. Water quality unable to meet some established local values and uses.	As for Stage 1 & 2 criticality, and in addition: Department of Planning and Environment—Water and WaterNSW: • Apply WMA 2000 s.324 and/or s.331 orders restricting or prohibiting groundwater take if necessary, in affected areas • Notify groundwater works approval holders in affected areas of potential water quality issues • Apply WMA 2000 s.110 order placing an embargo on applications for new bores (water supply works) in specified areas • Broad public communications re: groundwater quality/contamination risks • NSW Department of Planning and Environment—Water notification of groundwater quality contamination to Environment Protection Authority, NSW Health and LWU. Others: • EPA implementing and reporting to NSW Department of Planning and Environment—Water of any incident or contaminated lands management actions triggered under the *Contaminated Land Management Act 1997* or the *Protection of the Environment Operations Act 1997*, and • EPA notification of groundwater quality contamination to NSW Health, Department of Planning and Environment—Water and LWU.
Stage 4  Raw water: • unable to be treated with current process train, to meet ADWG health-related values, and • likely to remain untreatable over the longer term. Water quality unable to meet most established local values and uses.	As for Stage 3 criticality, and in addition: • If required, activate provisions of the *Essential Services Act 1988* and the *State Emergency and Rescue Management Act 1989* as required therein.

3.3. Returning to standard management practices following an extreme event

As conditions improve, a conservative, risk-based approach will be taken when making decisions to conclude measures that were implemented during stages 2 to 4. This is to ensure that de-escalation does not exacerbate conditions and cause a need for the decision to be reversed. Consultation with key stakeholders is expected to occur prior to any decision being made. Providing certainty to the market is also a key consideration.

A decision to recommence any suspended water sharing plan provisions earlier than at the end of the water year will be made by the Minister responsible for water management with the concurrence of the Minister responsible for the Environment. All other decisions may be made by the delegated officer, Department of Planning and Environment - Water.

For water quality, a return to standard operations will occur when raw water is able to be effectively treated under normal process conditions and the water quality is able to meet other established local values and uses.

4. IRG evaluation and review

The IRG evaluation framework outlined in Figure 4-1 will be used to assess the effectiveness of IRGs and to inform IRG reviews. The evaluation framework follows a program logic approach that is consistent with NSW Government Program Evaluation Guidelines and other Department of Planning and Environment monitoring, evaluation, and review (MER) frameworks.

The IRGs will be reviewed and evaluated after an extreme event, or as new scientific evidence emerges. Findings from IRG evaluation and review, when undertaken, are relevant to Department of Planning and Environment – Water annual Basin Plan reporting against Schedule 12, Matter 13.

Under the Basin Plan and individual WRPs, it is the formal responsibility of Department of Planning and Environment - Water to monitor new scientific knowledge relevant to the likelihood of extreme events of a kind referred to in section 10.51(1) of the Basin Plan. It is also Department of Planning and Environment - Water's formal responsibility to consider if the water resources in a WRPA should be managed differently as a result of the new information.

To this end, Department of Planning and Environment - Water will review IRGs after significant incidents or when other improvement opportunities are identified (in accordance with principle eight of the NSW Extreme Events Policy), such as:

- through any applicable groundwater or surface water monitoring, evaluation and reporting plan or relevant strategy.
- if there are significant changes to water infrastructure or water savings measures.

In addition, Department of Planning and Environment - Water in concert with any review of the water sharing plans for surface or groundwater sources applicable in the relevant WRPA, or of the relevant WRP, will consider whether changes to the IRG are required.

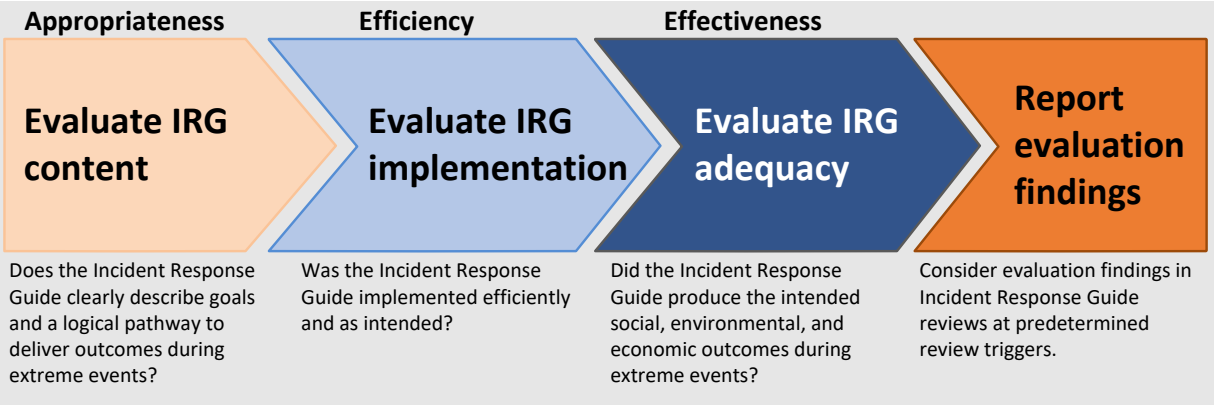

Figure 4-1. IRG evaluation and review framework.

A key feature of the evaluation framework is flexibility which allows assessment effort to be varied according to event type and severity. The extent of IRG evaluation will be determined by the occurrence, scale, and intensity of extreme events during the review period. Evaluation will only progress through the framework if evidence is available to assess the framework stage. Effectiveness evaluation will only occur if both appropriateness and efficiency stages are completed. This approach avoids unnecessary review of IRG content and ensures findings are only made when adequate evidence is available.

Evaluation in this context is a systematic, evidence-based review of IRG success in meeting critical water needs during extreme events. Identification of factors that enable or restrict the achievement of desired outcomes is also considered. A series of questions are used to evaluate each framework stage; examples are provided in Appendix D. Questions may be restricted or extended according to required evaluation effort.

Appendix A. WRPs and applicable WSPs

WRPA GW No.	WRPA and 2020 WSPs	Applicable WSPs pre 2020
6	NSW Murray-Darling Basin Porous Rock *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020*	NSW Murray Darling Basin Porous Rock Groundwater Sources 2011
7	Darling Alluvium *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020*	Barwon-Darling Unregulated and Alluvial Water Sources 2012
		Lower Murray-Darling Unregulated and Alluvial Water Sources 2011
		Intersecting Streams Unregulated and Alluvial Water Sources 2011
8	Murray Alluvium *Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020*	Lower Murray Groundwater Source
		Murray Unregulated and Alluvial Water Sources 2011
		Lower Murray Shallow Groundwater Source 2012
		Murrumbidgee Unregulated and Alluvial Water Sources 2012
9	Murrumbidgee Alluvium *Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020*	Lower Murrumbidgee Groundwater Sources 2003
		Murrumbidgee Unregulated and Alluvial Water Sources 2012
10	Lachlan Alluvium *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020*	Lachlan Unregulated and Alluvial Water Sources 2012
		Lower Lachlan Groundwater Source 2003
11	NSW Murray-Darling Basin Fractured Rock *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020*	NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011
12	Macquarie-Castlereagh Alluvium *Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources 2020*	Lower Macquarie Groundwater Sources 2003
		Macquarie Bogan Unregulated and Alluvial Water Sources 2012
		Castlereagh River Unregulated and Alluvial Water Source 2011

13	NSW Great Artesian Basin Shallow *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020*	NSW Great Artesian Basin Shallow Groundwater Sources 2011
14	Namoi Alluvium *Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020*	Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources 2010
		Upper and Lower Namoi Groundwater Sources 2003
		Namoi Unregulated and Alluvial Water Sources 2012
15	Gwydir Alluvium *Water Sharing Plan for the Gwydir Alluvial Groundwater Sources 2020*	Lower Gwydir Groundwater Source 2003
		Gwydir Unregulated and Alluvial Water Sources 2012
18	NSW Border Rivers Alluvium *Water Sharing Plan for the NSW Border Rivers Alluvial Groundwater Sources 2020*	NSW Border Rivers Unregulated and Alluvial Water Sources 2012

Appendix B. NSW extreme event operating context and relevant plans

A range of instruments exist within NSW that have relevance for the management of extreme water quantity and quality events. Some of these instruments specify the development and implementation of statutory 'plans' or 'systems.' The information below summarises those instruments of relevance to this IRG.

Instrument[6]	Event Relevance	Summary	'Plan' or other Obligation	Responsibility[7]
Best Practice Management Guidelines (*Local Government Act 1993* (NSW), S. 409(6)(a))	Water quantity and quality	Administered by Department of Planning and Environment - Water, sets out best practice long-term water security, water quality & emergency response contingency planning and management and expectations of LWUs. Includes: • 30-year strategy for supply-demand measures. • Trigger points for drought water restrictions. • Identification of contingencies to ensure water supply system does not run out of water.	Integrated Water Cycle Management Strategy. Drought Management Plan.	LWU
Essential Services Act 1988	Water quality Water quantity	Applies to those services classified as essential including: • Supply or distribution of water. • Regulation of bulk water supply by the Water Administration Ministerial Corporation in the exercise of its rights to the control, use and flow of water.	Links to Emergency Management Plan.	Depends on event.
Protection of the Environment Operations Act 1997	Water quality (environment)	Important for: • Licensing and compliance. • Incident response management. • The requirement to publish and/or make pollution monitoring data available.	Environment Protection Licence. Pollution Incident Response Management Plans.	Licensee (LWU or other).

[6] NSW instruments unless otherwise specified. A reference to an Act also implies a reference to a regulation (if not specifically stated).
[7] For plan implementation and revision.

Instrument[6]	Event Relevance	Summary	'Plan' or other Obligation	Responsibility[7]
		• The requirement for organisations and individuals to report pollution incidents.		
Contaminated Land Management Act 1997 and *Contaminated Land Management Regulation 2013*	Water quality	Declaration and management of contaminated lands, including responsibilities, assessment of contamination and the supervision of the investigation and management of contaminated sites.	Plans of Management, management and maintenance orders.	EPA and 'owner'
Public Health Act 2010 *Public Health Regulation 2012*	Water quality (drinking water)	The *Public Health Act 2010* along with the Public Health Regulation 2012 (Clause 34), require water suppliers to implement and adhere to a 'quality assurance program' consistent with the Framework for Management of Drinking Water Quality in the *Australian Drinking Water Guidelines* (2011).	Quality Assurance Program – interpreted practically as a Drinking Water Management System (DWMS).	LWU
State Emergency and Rescue Management Act 1989	Overarching (general, can include environment, public health)	Management of imminent or actual emergencies.	State-wide Emergency Management Plan or EMPLAN. Subordinate plans: • Energy and Utilities Services Supporting Plan. • Engineering Services Supporting Plan. • Environmental Services Supporting Plan. • Health Services Supporting Plan.	Depends on event

Appendix C. Contact details

This appendix provides indicative information for all groundwater WRPA IRGs at the time of publication of this IRG.

Agency	Contact details
Department of Planning and Environment—Water Department of Planning and Environment – Biodiversity and Conservation	**Water** Ph: 1300 081 047 Email: water.enquiries@dpie.nsw.gov.au complete our online contact us form **Environment** Ph: (02) 9995 5000 or 131 555 Email: info@environment.nsw.gov.au
Natural Resources Access Regulator (NRAR)	Report illegal activities Ph: 1800 633 362 Email: nrar.enquiries@nrar.nsw.gov.au
WaterNSW	Ph: 1300 662 077 Email: Customer.Helpdesk@waternsw.com.au Emergency reporting: 1800 061 069
Environment Protection Authority	Ph: 131 555 Email: info@epa.nsw.gov.au
Department of Primary Industries - Agriculture	Ph: 1800 808 095 Email: nsw.agriculture@dpi.nsw.gov.au Fishers Watch 1800 808 095
Fire and Rescue NSW and other emergency services including Rural Fire Service, SES and NSW Police	Ph: 000
Local Land Services	Ph 1300 795 299 Online enquiry form
NSW Health - Water Unit	Ph: 02 9391 9939 Email: HSSG-WaterQual@doh.health.nsw.gov.au

Appendix D. Evaluation questions

In the context of this document evaluation refers to a systematic, evidence-based assessment of IRG success in meeting critical human water needs during extreme events. Review refers to the formal revision and updating of IRG documents.

The following questions are a guide to IRG appropriateness, efficiency, and effectiveness evaluation. The nature of extreme events may restrict or extend this list. Question scope should be considered prior to commencing any evaluation. Also note evaluation is a staged process progressing only when adequate evidence is available with effectiveness evaluation reliant on completion of appropriateness and effectiveness stages.

Appropriateness example evaluation questions
Does the IRG reflect current policy and legislative instruments such as the NSW Extreme Events Policy, *Water Management Act* 2000, Basin Plan 2012 and relevant WSPs?
Does the IRG clearly describe critical water needs and how they will be prioritised and met during an extreme event?
Are the described range of measures and triggers appropriate for the WRP area?
Are the governance arrangements for the establishment and operation of CWTAG and CWAPs appropriate and readily available? This includes membership, decision documentation, and communications.
Is the decision-making process clearly defined, well documented and transparent?
Does the IRG base management of water resources during extreme events on the best available scientific event likelihood information? This is a requirement of section 10.51(3) of the Basin Plan.
Is the range of instruments and information identified in the IRG and Appendices A, B and C appropriate, relevant and current?

Efficiency example evaluation questions
Was relevant and adequate information readily available to detect an approaching extreme event? Examples include water level assessments, salinity and pollution monitoring.
Was a CWTAG and a CWAP formed when required?
Was adequate and timely information available to inform CWTAG and CWAP advice?
Was CWTAG/CWAP advice provided in a timely, transparent manner?
Were management decisions well documented and communicated efficiently and as early as possible to stakeholders?
Were multi-state, multi-agency and issue-specific groups consulted when relevant and in a timely manner?
Were issue specific management plans utilised when required?
Were the staged responses adequately spaced, realistic, and a relevant guide to management decisions?
Was the IRG reviewed and updated by Department of Planning and Environment - Water after significant events and at other identified review trigger points?

Efficiency example evaluation questions
Has a list of relevant scientific knowledge and information sources been identified to inform IRG review?

Effectiveness example evaluation questions
Was the IRG effective in delivering outcomes to meet the critical human water needs identified in Table 1-3? Outcomes should be assessed with regard to appropriateness and efficiency findings; both intended outcomes and unintended adverse outcomes; WMA 2000 takes priority during extreme events; and non-water management contextual information. Effectiveness assessment is based on economic, social, and environmental. Performance indicators have not been specified at this stage due to the variable nature, extent and duration of extreme events. Information collected under a variety of monitoring programs and WRP specific MER plans will be considered in future IRG evaluation and review.

Appendix E. IRG Information Darling Alluvium WRPA

1. Context

The Darling Alluvium WRPA (Figure E-1) includes two SDL resource units, the boundaries of which correspond with groundwater sources managed under the *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020:*

- Lower Darling Alluvium (GS23) – consisting of the Lower Darling Alluvial Groundwater Source,
- Upper Darling Alluvium (GS42) - consisting of three groundwater sources, the Upper Darling Alluvial, the Warrego Alluvial and the Paroo Alluvial.

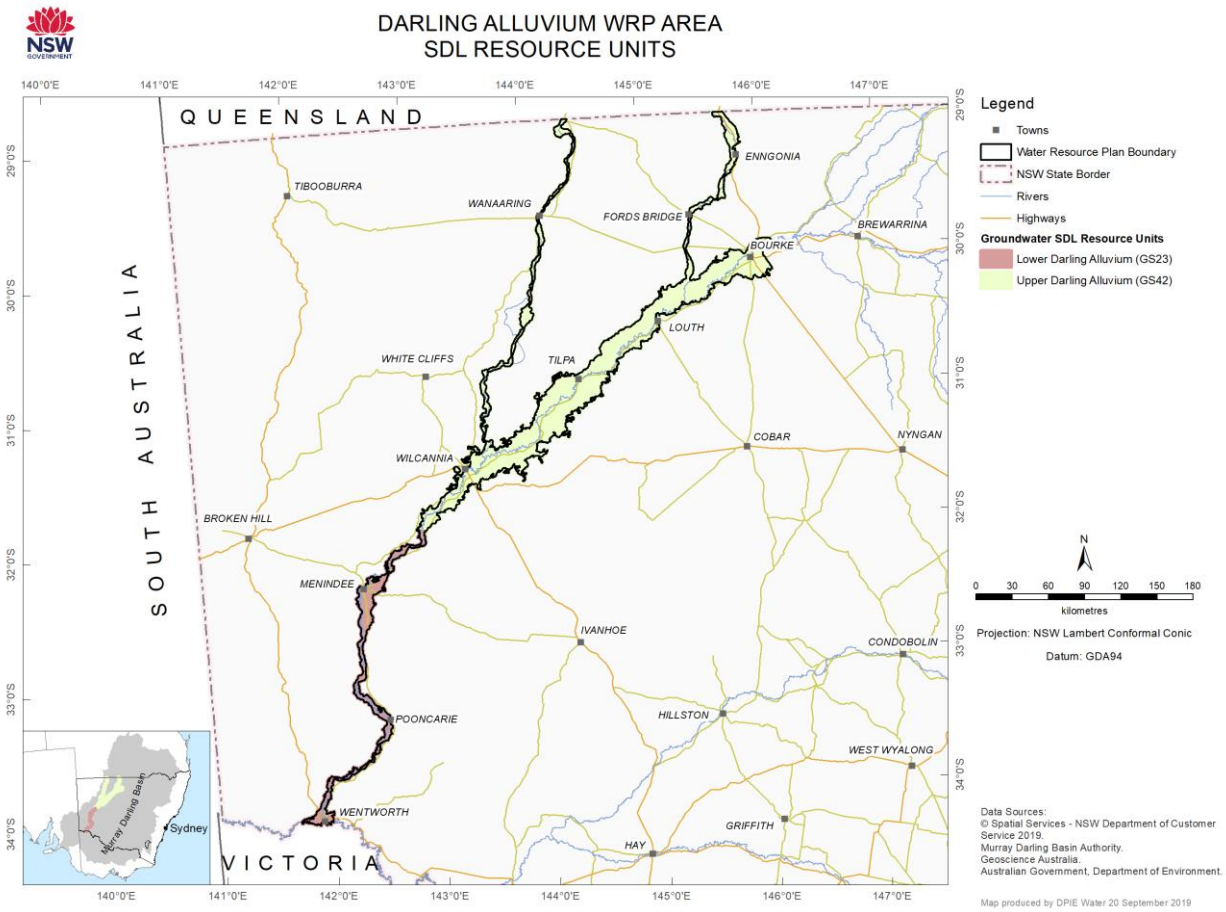

Figure E-1. Darling Alluvium WRPA.

A description of the water sources can be found in the *Darling Alluvium Water Resource Plan – Groundwater Resource Description* (NSW Department of Planning, Industry and Environment, 2019).

2. Water requirements

2.1 Overview

Total water entitlements in the Darling Alluvium water resource plan area are 7,954 ML/yr comprising 4,453 ML of licensed entitlement and an estimated 3,501 ML for domestic and stock use under basic landholder rights.[8] Of the licensed entitlement, the majority is held as salt and water table management licences (3,300 ML) and 220 ML under a local water utility licence for town water supply in the Upper Darling Alluvial, with 928 ML of aquifer licences in the Lower Darling Alluvial. There are no licensed entitlements in the Warrego and Paroo Alluvial water sources and only small volumes for basic landholder rights in these water sources.

The Basin Plan establishes sustainable diversion limits (SDLs) for each of the four groundwater sources. These SDLs equate to the Long Term Average Annual Extraction Limit (LTAAEL) in the water sharing plan. Where average annual take of water exceeds the compliance trigger by 5 percent of the limit for the three groundwater sources of the Upper Darling Alluvium, and by 10 percent for the Lower Darling Alluvium, over the preceding 5 years, measures are required to be taken to return the take of water to below the limit. Table E-1 lists entitlements and SDLs for each of the water sources.

Table E-1. Water entitlements and LTAAELs – Darling Groundwater Sources

Groundwater source – Alluvial	Licensed entitlement (@January 2022) Unit shares	Basic landholder rights (BLR) ML/yr	Total requirements (licences + BLR) ML/yr	LTAAEL ML/yr	SDL GL/yr
Lower Darling	928	739	1,667	2,230	2.23
Upper Darling	3,525	2,281	5,806	6,009	6.59
Warrego	0	239	239	289	
Paroo	0	242	242	292	
TOTAL	**4,453**	**3,501**	**7,954**	**192,402**	

Where the SDL/LTAAEL is at or less than the total volume of water access rights, the long term ‘reliability of access is potentially impacted upon by growth in use. In these groundwater sources total licensed entitlements have not increased since 2018/19 and total entitlements are less than the SDL and LTAAEL for each water source.

2.2 Town water and other requirements

Central Darling Shire Council holds the only town water supply licence (220 ML/yr) which is in the Upper Darling Alluvial Groundwater Source and is for Wilcannia as an emergency back-up supply during droughts. Groundwater was used during the recent drought when Wilcannia Weir dropped to very low levels. A larger replacement weir for Wilcannia is to be constructed.

Ten of the 11 aquifer access licences (876 ML) were granted in 2003 to licence holders in the Lower Darling Regulated River as a drought management measure. When granted, these aquifer licences were subject to conditions in the water sharing plan limiting their use for permanent plantings and when surface water supply was low. The largest extraction was in 2018/19 when

[8] As per the NSW Water Register January 2022.

around 345 ML was taken under these licences. However, the licensees have now sold their high security entitlements to the Commonwealth and removed the perennial plantings. The *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020* was amended in August 2022 to allow the water to be used for other purposes than permanent plantings.

The salinity and water table management licence in the Upper Darling Alluvial comprise the largest entitlement volume. The purpose of this licence is to reduce saline discharges to the river. The highest volume extracted in recent years was 1,480 ML in 2018/19. The *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020* allows salinity and water table management licences to be granted in the Upper Darling Alluvium and the Lower Darling Alluvium.

Table E-2. Town water requirements compared to total requirements

Groundwater source - Alluvial	Town water entitlements (@ January 2022) Unit shares	Total licensed entitlements (including town water) ML/year	Basic Landholder Rights ML/year	Total requirements ML/yr
Lower Darling	0	928	739	1,667
Upper Darling	220	3,525	2,281	6,026
Warrego	0	0	239	239
Paroo	0	0	242	239
TOTAL	**220**	**4,453**	**3,501**	**8,171**

2.3 Environmental water requirements

The groundwater-dependent ecosystem (GDE) ecological values in and around the Darling Alluvium have been mainly classified as medium to high. There are limited areas of very high value in this groundwater source. The WRP area is dominated by the vegetation GDE communities of river red gum woodland wetlands, lignum wetlands, freshwater wetlands, black box woodlands, cane grass swamps, Coolabah-River coobah-lignum woodland wetlands and chenopod shrublands. These communities are characterised by having endangered ecological communities, DIWA/Ramsar wetlands (that is, the Paroo wetlands and associated Menindee wetlands), extensive connected riparian corridors and basin target vegetation species of black box, lignum and river red gums.

The riparian communities provide vital habitat to nesting species and contribute to instream ecosystem function. Generally, the GDE communities with high ecological value have large vegetation patches, are highly connected (such as riparian corridors) and have a moderate number of threatened species present especially in the wetland areas.

Very high and high ecological value vegetation GDEs and associated Ramsar/DIWA wetlands considered as key environmental assets have been listed in the *Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020* as high priority GDEs for management purposes.

3. Water shortage and quality risks

Government monitoring bore locations are shown in Figure E-2. Four groundwater level hydrographs with data from the 1990s is displayed in figures E-3 to E-6 (locations identified in Figure E-2). Groundwater level trends across the Darling Alluvium are generally relatively stable over time with a minor declining trend since around 2012 at most sites and some recovery after the 2017-220 drought. Given the low level of development, abstraction is not a major driver of groundwater level change.

Specific risks in the Darling Alluvium WRP area relating to water quality and quantity are outlined in the Darling Alluvium Risk Assessment. Detail about specific water quality risks in the Darling Alluvium can be found in Darling Alluvium Water Quality Management Plan.

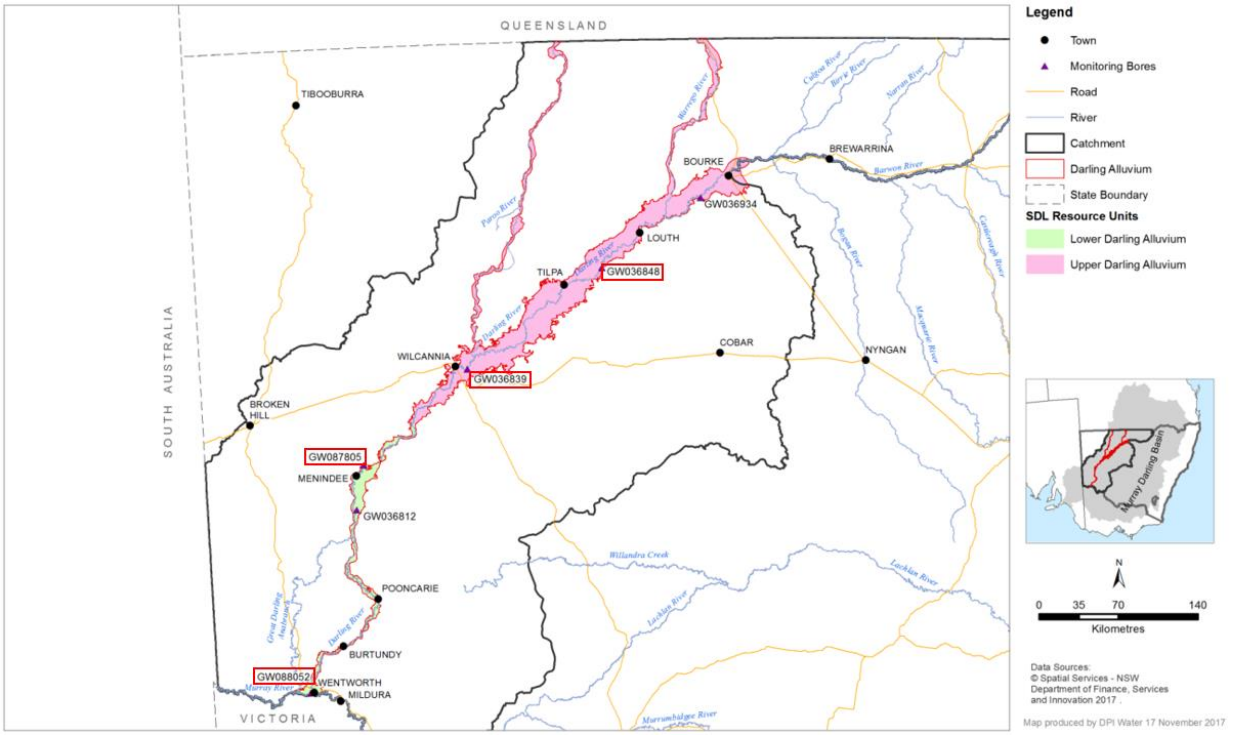

Figure E-2. Darling Alluvial groundwater sources government monitoring bores, the boxed sites are the hydrograph locations

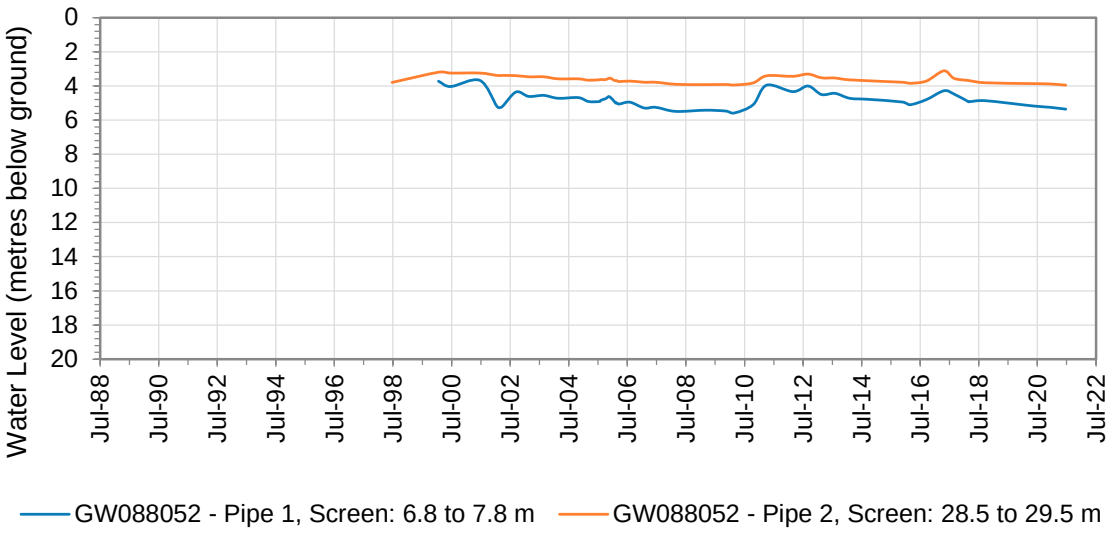

Figure E-3. Government monitoring bore hydrograph for site GW088052 (near Wentworth)

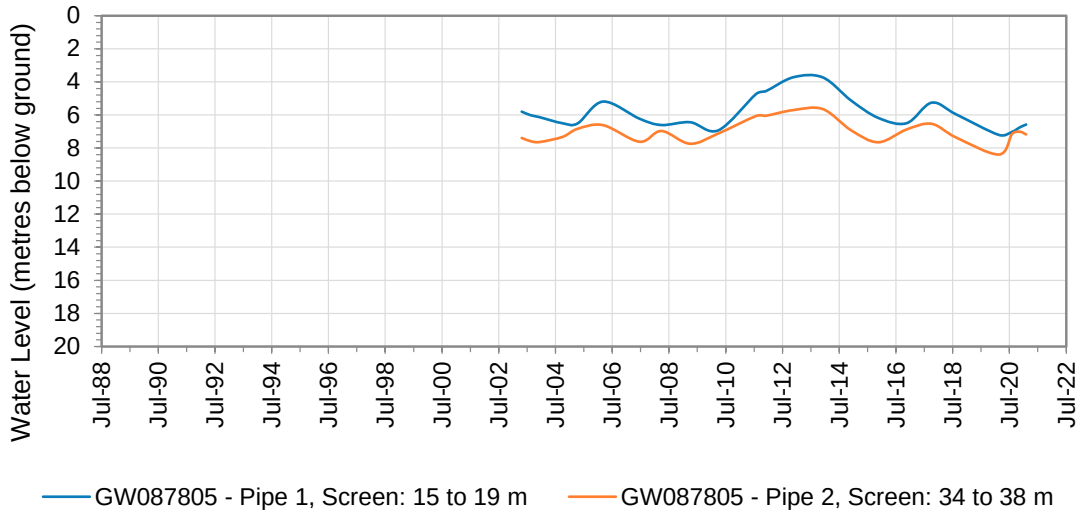

Figure E 4. Government monitoring bore hydrograph for site GW087805 (near Menindee)

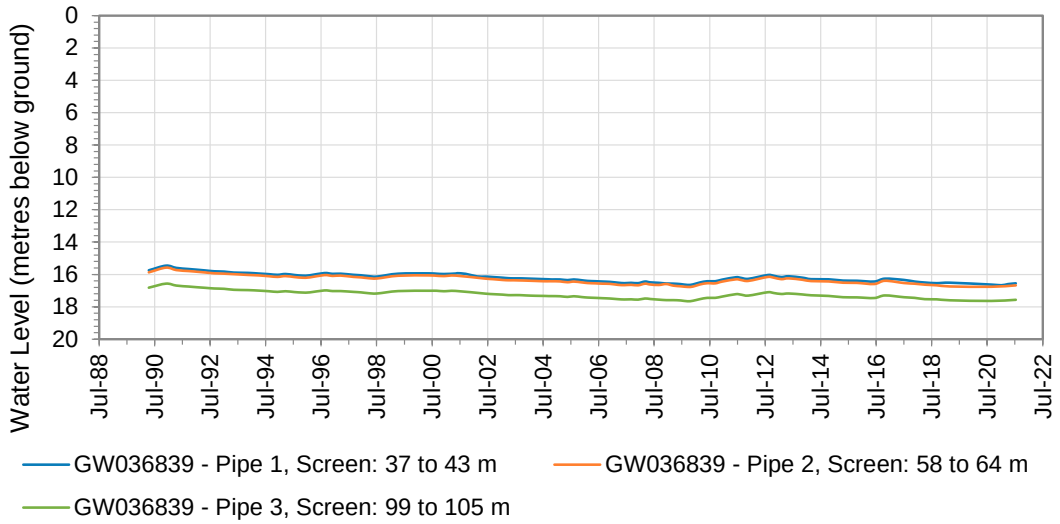

Figure E 5. Government monitoring bore hydrograph for site GW087805 (near Wilcannia)

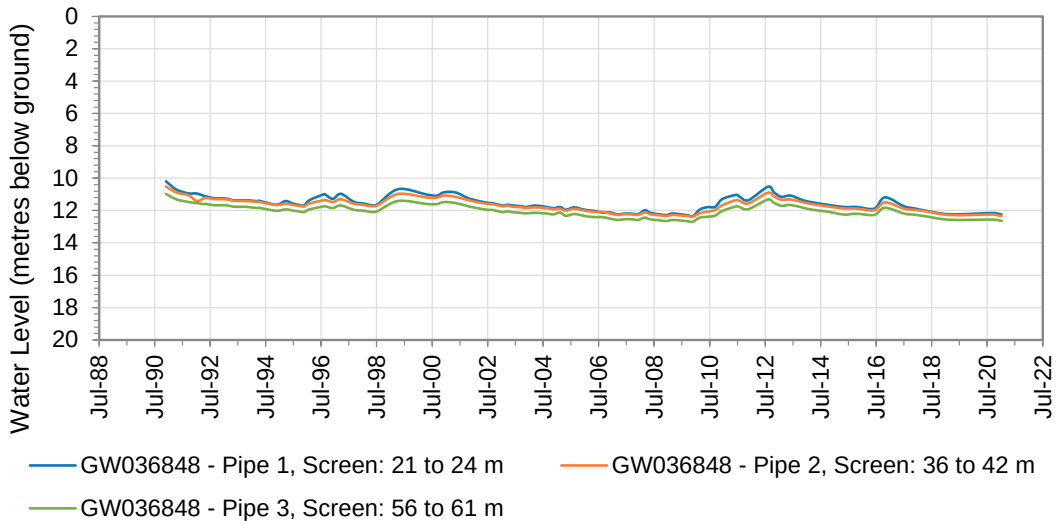

Figure E-6. Government monitoring bore hydrograph for site GW036848 (between Louth and Tilpa)

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