

# Georgina Wiso

Implementation Actions 2023–2031



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Front page photo: Cattle grazing at sunset

## Acknowledgement of Country

The Department of Environment, Parks and Water Security proudly acknowledges the Northern Territory's Aboriginal communities and their rich culture, and pays respect to the Elders past and present.

We acknowledge Aboriginal peoples as the Traditional Owners and custodians of the lands and waters on which we all rely.

We recognise the intrinsic connection of Traditional Owners to Country and value their contribution to managing the lands, waters and landscapes. We support the need for genuine and lasting partnerships with Traditional Owners to understand their culture and connections to Country in the way we plan and manage the water resources of the Daly Roper Beetaloo Water Control District.



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# 1. Overview

## About the water allocation process

Water allocation is the process of determining how much water is available in the water resource to share between consumptive uses and non-consumptive uses. Water allocation in the Northern Territory is undertaken at a regional level within defined areas known as water control districts, which are declared by the Minister for Environment, Climate Change and Water Security (Minister) by gazette notice.

## About the Georgina Wiso plan area

The Georgina Wiso plan is within the Daly Roper Beetaloo Water Control District (the district), an area of 330,000 km<sup>2</sup>. The district includes a number of basins and aquifers. Separate water allocation plans have been declared or are in draft for different parts of the district. In addition to this plan, water in the district is managed under the Katherine Tindall Limestone Aquifer Plan (declared), Ooloo Dolostone Aquifer Plan (declared) and the Mataranka plan (draft).

The Georgina Wiso plan applies to an area of approximately 155,000 km<sup>2</sup>, extending about 600 km from north to south and 500 km east to west (the plan area). The plan area includes the towns of Daly Waters, Elliott and Newcastle Waters and smaller communities of Jangirulu, Likkaparta, Marlinja, Murranji and Wutunugurra. Pastoral leases cover about 85 per cent of the land with approximately 13 per cent of the plan area recognised as Aboriginal land. Although there is currently very limited water use in the plan area, the primary driver for development of the plan is the final report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory. The report recommended that water allocation plans be developed for the Beetaloo Sub-basin prior to any onshore shale gas production. Petroleum activities are prohibited from using surface water under section 45A of the *Water Act 1992*, so such activities only have the option to use groundwater.

## About this document

This document is one of three core documents prepared as part of the water allocation process for the plan area. This document references other documents and guidelines that may relate to the district, but which do not form part of the core documents. The three core documents are:

**Georgina Wiso Water Allocation Plan 2023–2031.** The Georgina Wiso Water Allocation Plan 2023–2031 (the plan) is declared by the Minister under section 22B(1) of the *Water Act 1992* (Act). The plan describes the estimated sustainable yield for the groundwater resources of the plan area in the two management zones (Schedule D), as defined at 2.6. The estimated sustainable yield is the volume of water that can be taken sustainably from the water resources to which this plan applies. The plan allocates that water amongst declared beneficial uses and provides for trading of water. The plan takes effect from the date of its gazette by the Minister and will remain in force for a period of eight years.

**Georgina Wiso 2023–2031 Background Report.** The Georgina Wiso 2023–2031 Background Report provides details on the information and processes that informed the plan, including available data and research on the water resources of the plan area. It also describes the key environmental values and their dependency on water resources, and the social and developmental context of the region, including current water use and projections of future water demand. This report collates the information and knowledge regarding the plan area at the time it is made.

**Georgina Wiso 2023–2031 Implementation Actions** (this document). The Georgina Wiso 2023–2031 Implementation Actions details how section 34 of the Act with respect to the water resources of the plan area is fulfilled. It defines a continuous program for the management of water resources in the plan area, including the investigation, collection and analysis of data concerning the occurrence, volume, flow, characteristics, quality and use of water resources. That program is described within the document as a series of implementation actions.

The Controller must take into account any water allocation plan applying to the area in question when making a decision referred to in s 90(1) of the *Water Act 1992*. The Georgina Wiso 2023–2031 Background Report, Implementation Actions and other factors may be taken into account, where relevant to the decision.

## 2. Risk and adaptive management

### Overview

The combination of risk management with adaptive management ensures that water resources are managed to be sustainable and resilient over the long term, and that risks are effectively managed to maintain the health and productivity of natural ecosystems and human communities. Both approaches recognise that there is inherent uncertainty and complexity in natural systems, and that ongoing monitoring and adjustment are needed to effectively manage risks and maintain water resource resilience.

Risk management typically involves identifying and assessing potential risks to the water resource, such as water availability, or changes in hydrological patterns due to climate change. Actions are then developed and implemented to reduce the likelihood or impacts of these risks. Adaptive management is a complementary approach that recognizes that there is often uncertainty and complexity around the effectiveness of actions taken, and that continuous learning and adjustment are needed. Adaptive management involves the ongoing monitoring and assessment of the effectiveness of actions, and the development of new actions as needed based on new information and changing conditions.

The objectives of water sharing in the plan are used to guide the development, implementation, monitoring and adjustment of actions to ensure these remain effective over time and meet community expectations.

### 2.1. Risk assessment

The risk assessment process ensures that water resources are allocated in a sustainable and resilient manner. It helps to identify potential risks to the water resource, which enables the development of actions to mitigate them, ensuring that water resources are available for future generations. The risk assessment process involves the identification of hazards, risk analysis and the identification of appropriate actions to mitigate and control the risks.

The primary risks to groundwater resources are changes in groundwater recharge and water availability, reduced discharges to surface water sites (rivers and springs), reduced water quality and the effects of greater climate variability. Groundwater levels are influenced by the amount of rainfall and recharge, the amount of water that is used and from where the water is extracted. Water quality is influenced by the inherent characteristics of the resource, how the land is used and from where water is extracted. Water users also bear the risk of any reductions to water availability resulting from seasonal variability or long term changes in climate.

The risks identified through the water planning processes and development of the water allocation plan reflect the current knowledge and understanding of the water resource, which will improve over time and enable more focused management actions to be developed.

The risk assessment methodology is shown in Schedule F, which provides a description of the qualitative measures of likelihood, consequence and risk rating categories that were used to determine the risk.

#### 2.1.1. Risk management

The detailed assessment and management of the key risks to the water resource are shown in Schedule G. This outlines the actions that are currently being implemented to assess the residual risk, as well as further actions that will be implemented to reach the target risk.

This process involves defining the key events and hazards that may impact the water resource:

1. Groundwater levels decline more than acceptable levels
2. Water quality declines to unacceptable levels
3. Surface water flows and discharges decline more than acceptable levels
4. Water is not used.

The objectives of water sharing in section 3.2 of the plan are used to guide the assessment of the risks in terms of the causes and impacts. The risk assessment methodology is applied to each objective to define the current residual risk with the existing controls in place to manage the resource. To reduce risks, further controls align to the implementation actions to achieve the target risk once these are completed.

## 2.2. Adaptive management

Combining risk management with adaptive management enables a proactive approach to managing risks, while also being flexible and responsive to changing conditions.

Adaptive management provides an iterative process that monitors resource response to water use and actions, and uses this information to improve future actions to meet the objectives of sharing in the plan.

Schedule H shows the steps and relationships in the adaptive management framework for the management of the resource. This means that the actions will be implemented and monitored over time to assure their effectiveness. Based on the results of monitoring, the actions may require refining, implementing new ones or discontinuing those that are not effective.

The water monitoring program is critical to adaptive management and an overview of this program is provided in section 3.

### 3. Water monitoring program

#### Overview

Consistent with section 34 of the Act, a continuous program for the assessment of water resources of the Territory is carried out, including the investigation, collection, collation and analysis of data concerning the occurrence, volume, flow, characteristics, quality, flood potential and use of water resources.

This section describes the water resource monitoring program undertaken by the department to inform management of the water resources in the district. The monitoring is informed by the risk assessment process and underpins the adaptive management to maintain the health and productivity of natural ecosystems and human communities. This monitoring is complemented by monitoring undertaken by licence holders.

#### 3.1. Monitoring by the department

The department has a continuous monitoring program to manage the water resources in the plan area. This monitoring network includes both discrete and time-series data from a series of groundwater monitoring bores. The monitoring program is reviewed annually and includes:

- water level monitoring at 25 groundwater sites
- water quality monitoring at 5 groundwater sites

Data collected under the monitoring program is available on the department's Water Data Portal<sup>1</sup>.

The Georgina Wiso water monitoring network is shown in Schedule E and reflects spatial variability of the resource across the vast plan area.

The purposes of the monitoring program are to:

- ensure spatial coverage consistent with significant water extraction areas
- monitor groundwater level trends and recharge, which will be used for model calibration
- ensure good temporal coverage through biannual site visits and the use of loggers
- monitor each of the different formations making up the water resource
- monitor regional water quality in the vicinity of potential future onshore gas development.

Priorities for the future expansion of the monitoring network includes:

- installation and monitoring of two new bores in the Gum Ridge Formation and the Bukalara Sandstone to better understand aquifer inter-connectivity
- expansion of the current water quality sampling program based on department monitoring bores.

#### 3.2. Monitoring by licence holders

The departmental monitoring program is supported and complemented by the water monitoring that is conducted and reported by licence holders to the department as a condition of their water licences.

<sup>1</sup> <https://water.nt.gov.au/Data>



## 4. Implementation actions

### Overview

This section outlines the actions being implemented as part of the adaptive management cycle, with continuous monitoring, evaluation and adjustment to ensure they remain effective over time.

These implementation actions address the key risks to the water resource and are described in terms of their contribution to the objectives of sharing in the plan. The actions and key performance indicators are defined for both consumptive and non-consumptive water uses. As water is used in the plan area, more specific triggers may be defined to measure and evaluate the actions.

The implementation actions, measured through key performance indicators (KPIs), are shown in Tables 1 to 6 with a dictionary in [Schedule A](#) and abbreviations defined in [Schedule B](#).



## 4.1. Actions related to water requirements of key environmental values

Table 1 Actions and measures to contribute to: balancing the retention and preservation of key environmental values dependent on water with the overall benefits provided by the water resources.

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.1a</b> There is an improved understanding of the characteristics and environmental values of the groundwater and surface water resources	<b>4.1.1</b> Improving understanding of all recharge mechanisms – including the inundation of surface water terminus features using SREBA outcomes	Isotope report published	CSIRO, DEPWS WRD	2023-2024
	<b>4.1.2</b> Improving understanding of the alternative resources including the Bukalara Sandstone aquifer	Additional bores registered and monitored	DEPWS WRD	2031
	<b>4.1.3</b> Refine regional scale map of key environmental values associated with water including springs	Mapping completed	DEPWS WRD, FFD	2031
	<b>4.1.4</b> Improving resource conceptualisation of the area as data is collected through drilling and monitoring in the region, for example, exploration, research institutions and universities	Additional bores registered and monitored	DEPWS WRD	Ongoing
	<b>4.1.5</b> Monitoring and verifying the flow contribution through the Georgina Basin to the Roper River and the Wiso Basin to the Flora River	Additional bores registered and monitored	DEPWS WRD	Ongoing
<b>3.2.1b</b> The condition of GDEs is monitored as far as practicable and appropriately accounted for in water planning and licensing	<b>4.1.6</b> Releasing GDE health and monitoring guideline for use by both the department and licence holders to enable GDE condition to be assessed	GDE guideline released	DEPWS WRD, FFD	2023-2024
	<b>4.1.7</b> Producing regional scale probability mapping for groundwater dependent vegetation for the entire plan area	Probability GDE map	DEPWS WRD, FFD	2024-2025
	<b>4.1.8</b> Completing on-site verification of GDV probability mapping and identification and delineation of any high value GDEs	High value GDE map published	DEPWS WRD, FFD	2027-2028

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.1c Key environmental values are appropriately accounted for in water planning and licensing</b>	<b>4.1.9</b> Producing communication products that explain how environmental values are managed	Materials produced and appropriately communicated	DEPWS WRD	2025-2026 ongoing

## 4.2. Actions related to key Aboriginal and other cultural values associated with water

Table 2 Actions and measures that contribute to: water licence decisions consider Aboriginal and other cultural values dependent on water.

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.2a There is an improved understanding of Aboriginal cultural values and other cultural values associated with the water resource</b>	<b>4.2.1</b> Collaboration with Traditional Owners and appropriate Aboriginal representatives to establish and maintain an Aboriginal reference group or appropriate mechanism to share knowledge of resources and ways in which Aboriginal people can be involved in water management	Group established and maintained	AAPA, CLC, NLC, Aboriginal representatives DEPWS WRD	2024-2025 ongoing
	<b>4.2.2</b> Collaboration with Traditional Owners and appropriate Aboriginal representatives to agree suitable regional mapping of cultural values and how information is disseminated (if appropriate)	Used in decision making	AAPA, CLC, NLC, DEPWS WRD	2025-2026
	<b>4.2.3</b> Collaboration with Traditional Owners and appropriate Aboriginal representatives to identify baseline conditions of key cultural sites	Baseline assessment completed	CLC, NLC, DEPWS WRD	2026-2027
	<b>4.2.4</b> Collaboration with Traditional Owners and appropriate Aboriginal representatives to quantify water requirements of key cultural sites and establish ongoing monitoring	Sites identified and water defined	CLC, NLC, DEPWS WRD AAPA	2027-2028

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.2b Key Aboriginal cultural sites that rely on water are monitored and potential impacts are appropriately accounted for in water planning and licensing</b>	<b>4.2.5</b> Collaboration with Traditional Owners and appropriate Aboriginal representatives to document key Aboriginal cultural sites where significant water extraction is occurring (property scale).	Regulatory compliance	DEPWS WRD, Licence holders	Ongoing
	<b>4.2.6</b> Collaboration with Traditional Owners and appropriate Aboriginal representatives to monitor and assess the condition of key Aboriginal cultural sites and delivery of monitoring programs	Monitoring delivered locally	DEPWS WRD, Licence holders	Ongoing
<b>3.2.2c Other cultural values that rely on water are monitored and potential impacts are appropriately accounted for in water planning and licensing</b>	<b>4.2.7</b> Collaboration with other stakeholders in the identification, protection and monitoring of other cultural sites and values	Sites identified and protected	DEPWS WRD	2027-2028
	<b>4.2.8</b> Collaboration with Traditional Owners and appropriate Aboriginal representatives to produce appropriate communication products explaining how Aboriginal cultural sites are identified and monitored in water management	Materials produced and appropriately communicated	DEPWS WRD	Ongoing

### 4.3. Actions related to water for rural stock and domestic purposes

Table 3 Actions and measures that contribute to: predicting and protecting water for rural stock and domestic purposes.

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.3a The amount of water needed to support stock and domestic use is met</b>	<b>4.3.1</b> Reviewing and improving the methodology used for estimating domestic water needs and use	Improved methodology applied	DEPWS WRD	2025-2026
<b>3.2.3b The quality of water sourced for stock and domestic purposes is maintained</b>	<b>4.3.2</b> Implement water quality monitoring program across the plan area, including licence conditions requiring monitoring and reporting	Regulatory compliance	DEPWS WRD, Licence holders	Ongoing

<b>3.2.3c Community members and relevant stakeholders understand water management</b>	<b>4.3.3</b> Using appropriate communication materials and methods to increase understanding by community members and stakeholders of water supply and water management arrangements, service delivery and the application of regulations and policies	Materials developed and appropriately communicated	DEPWS WRD, OWS, DTFHC, PWC	2024 ongoing
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## 4.4. Actions related to water security for public water supplies

Table 4 Actions and measures that contribute to: outcomes for public water supplies.

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.4a The amount of water needed to support public water supply continues to be met</b>	<b>4.4.1</b> Reviewing long-term planning for population and community growth for public water supplies	Allocation sufficient for public water supply needs	PWC	2032-2033
<b>3.2.4b The quality of water sourced for public water supplies is maintained</b>	<b>4.4.2</b> Regular water quality monitoring of water extracted for public water supplies and reporting to WRD	Source Water quality data to WRD	PWC, DEPWS WRD	Annually
<b>3.2.4c Community members and relevant stakeholders understand water management arrangements</b>	<b>4.4.3</b> Using appropriate communication materials and methods to increase understanding by community members and stakeholders of water supply and water management arrangements, service delivery and the application of regulations and policies	Materials developed and appropriately communicated	DEPWS WRD, OWS, DTFHC, PWC	2024 ongoing

## 4.5. Actions related to water for local Aboriginal economic development

Table 5 Actions and measures that contribute to: setting aside water to support local Aboriginal economic development.

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.5a Local Aboriginal people have access to water through the Aboriginal water reserve to support economic development</b>	<b>4.5.1</b> Using appropriate communication materials and methods to support the use of water from the Aboriginal water reserve (AWR) in partnership with appropriate Aboriginal representatives	Materials developed and appropriately communicated	CLC, DEPWS WRD, OWS	2023-2024
<b>3.2.5b Arrangements to access the Aboriginal water reserve are documented and communicated</b>	<b>4.5.2</b> Assisting eligible Aboriginal water rights holders to access the Aboriginal water reserve for their own enterprise, or in partnership with others	AWR Licence applications lodged	CLC, DCMC, DITT	Ongoing
<b>3.2.5c Aboriginal people are receiving benefits from Aboriginal water reserve</b>	<b>4.5.3</b> Licensing water usage from the Aboriginal water reserve. Defining local benefits (qualitative and quantitative)	AWR water licences are used	NLC, DCMC	Ongoing

## 4.6. Actions related to water for sustainable development in the region

Table 6 Actions and measures that contribute to: providing access to water to support sustainable development for the benefit of the region.

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
<b>3.2.6a Water is available to support sustainable economic development in the region</b>	<b>4.6.1</b> Completing model recalibration using actual data from current and future water users and reviewing future climate change projections (funded by NWGA)	Model recalibration completed	DEPWS WRD	2025-2026
	<b>4.6.2</b> Staging significant extraction against development plans which is regulated to ensure water extraction is occurring as planned	Regulatory compliance	DEPWS WRD, Licence holders	Ongoing

Outcomes of water sharing	Actions	KPI	Responsibility	Timeframe
	<b>4.6.3</b> Recovering unused water and return to the consumptive pool for further development	Regulatory compliance	DEPWS WRD	Ongoing
<b>3.2.6b Industry is confident to invest in the region</b>	<b>4.6.4</b> Regional investments and employment are underpinned by reliable water resource planning and management	\$ investment and local jobs	NTG	2028-2029
<b>3.2.6c Water is used for productive purposes and in a water-efficient manner</b>	<b>4.6.5</b> Appropriate crop management practices and remedial measures adopted to avoid deterioration of the resource	Water use	DEPWS WRD, licence holders	Ongoing

## 5. Reporting

### Overview

This section outlines how the management of water resources in the plan area will be reported. Regular public reporting by the Department will ensure an improved level of community understanding of the management of the resource.

The department maintains a public record of all water extraction licences on its Water Licensing Portal<sup>2</sup>.

The department maintains a public record of water monitoring results on its Water Data Portal<sup>3</sup>.

The department will produce an annual report for the district summarising:

- an overview of the water resources
- key monitoring results
- regulatory performance
- progress on implementation actions.

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<sup>2</sup> <https://depws.nt.gov.au/water/permits-and-licences/water-licensing-portal>

<sup>3</sup> <https://water.nt.gov.au/Data>



## Schedule A: Dictionary

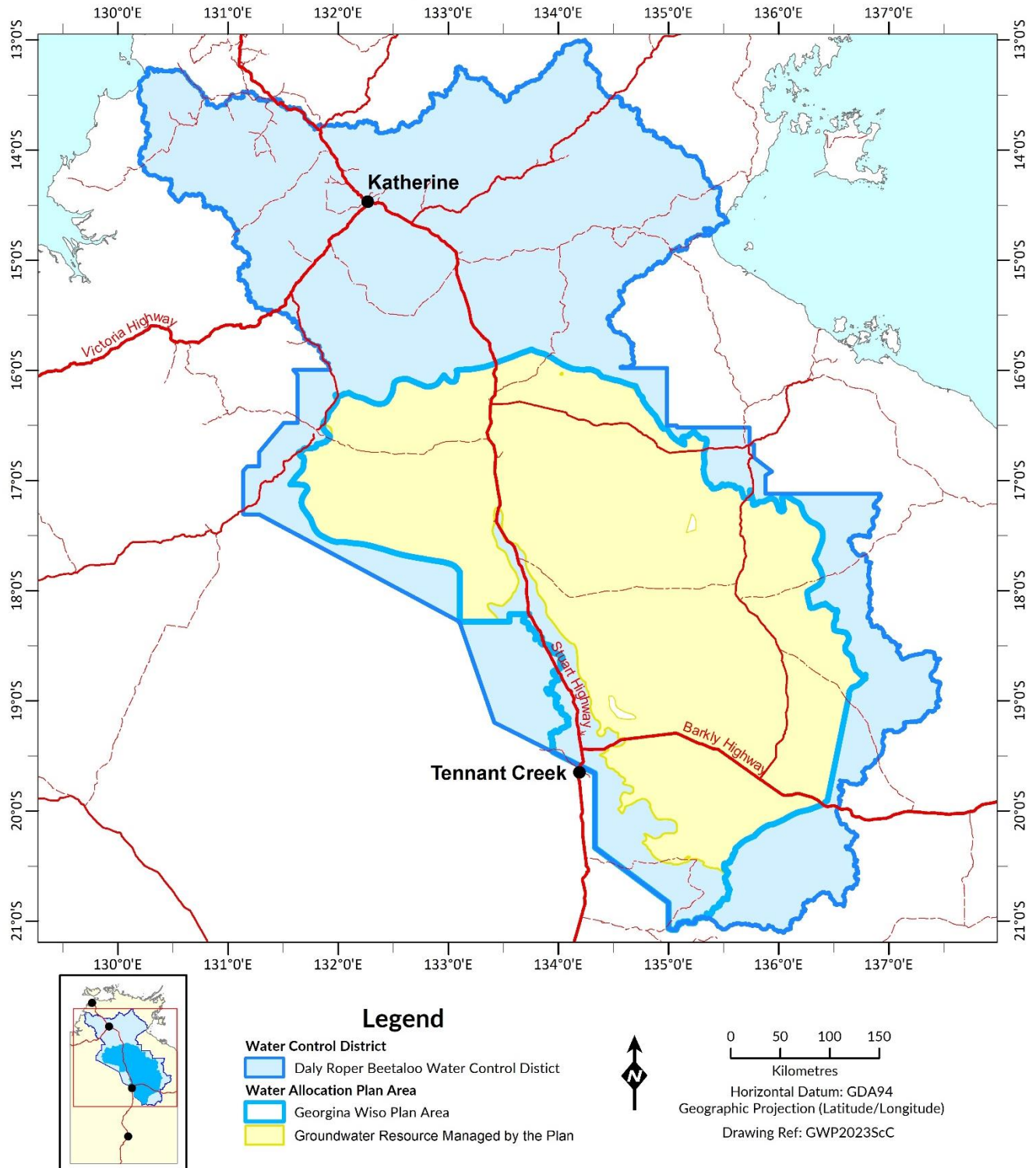
Term	Definition or reference
Aboriginal water reserve	Section 4(1) of the Act
Act	<i>Water Act 1992</i> <sup>4</sup>
Beneficial uses	The beneficial uses for the Daly Roper Beetaloo Water Control District declared by gazette on 19 October 2022. A copy of the declaration is included in Schedule E of the plan
Cambrian Limestone Aquifer	The Cambrian Limestone Aquifer (CLA) is a collective term for an extensive groundwater system covering 570,000km <sup>2</sup> straddling the NT and QLD border. The CLA comprises the geological basins of the Daly, Georgina and Wiso. The aquifer consists primarily of limestone.
Controller	Controller of Water Resources appointed under section 18 of the <i>Water Act 1992</i>
Department	Northern Territory Government department with administrative responsibility for the Act, currently the Department of Environment, Parks and Water Security
Designated land	Section 22C of the Act
Eligible land	Section 4B of the Act
Estimated sustainable yield	Amount of water that can be allocated from the water resource to support declared beneficial uses that is sustainable. Section 3.4 of the plan
Groundwater	Section 4(1) of the Act
Groundwater dependent ecosystem or GDE	Ecosystems that require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services
Implementation actions	Georgina Wiso Implementation Actions 2023–2031, as amended from time to time
Licence holder	Those who hold a water extraction licence granted under section 60 of the Act
Plan area	Section 2.4 and Schedule C of the plan
Water control district	Daly Roper Beetaloo Water Control District, declared by gazette notice dated 19 October 2022 under section 22 of the Act. A copy of the declaration is included in Schedule E of the plan
Water management zone	Areas of land within the plan area separated for management purposes as depicted in Schedule D of the plan

<sup>4</sup> <https://legislation.nt.gov.au/Legislation/WATER-ACT-1992>

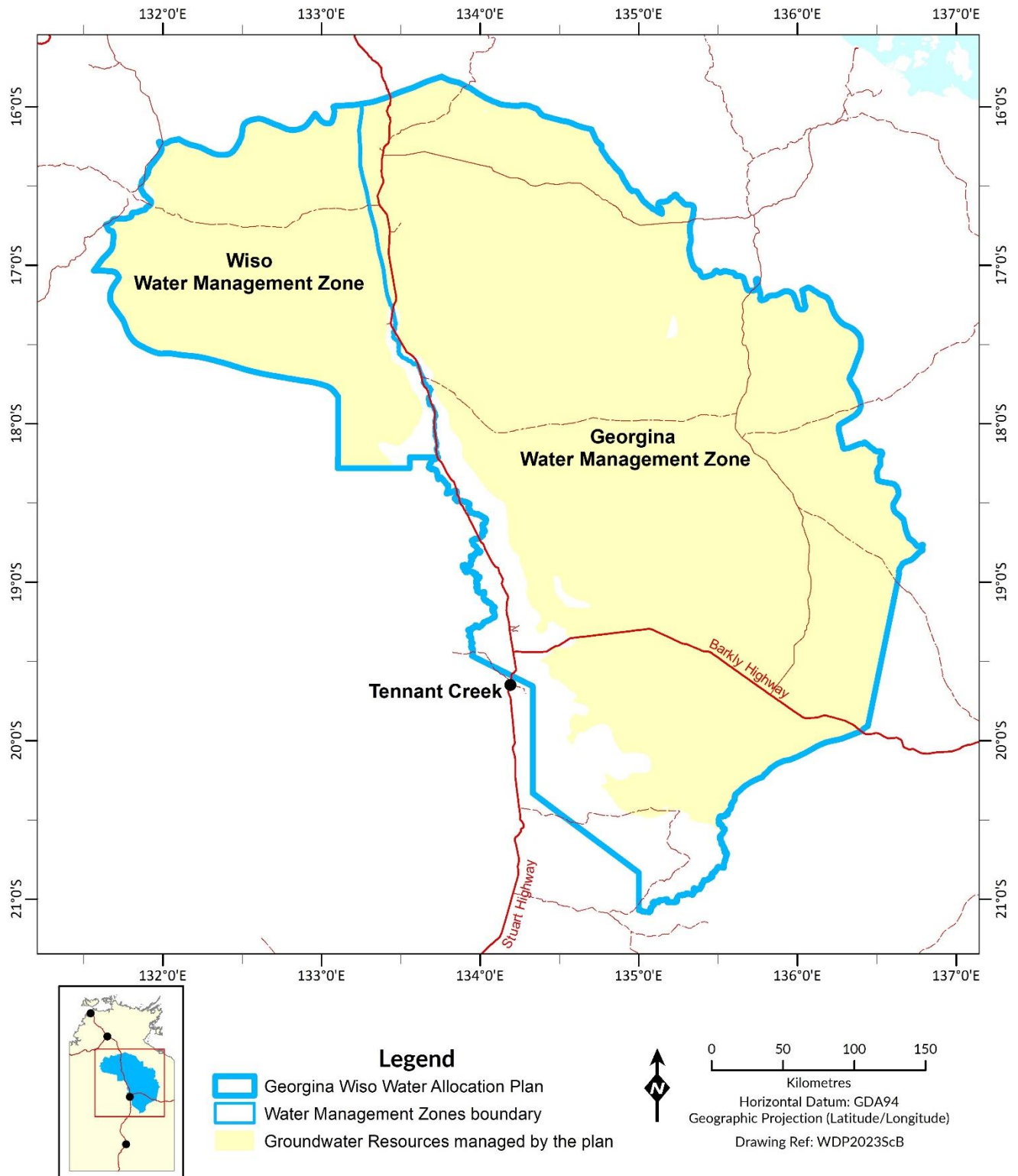
## Schedule B: Abbreviations and acronyms

Abbreviations and acronym	Full form
AAPA	Aboriginal Areas Protection Authority
Act	<i>Water Act 1992</i>
AWR	Aboriginal water reserve
CLA	Cambrian Limestone Aquifer
CLC	Central Land Council
DCMC	Department of Chief Minister and Cabinet
District	Daly Roper Beetaloo Water Control District
DEPWS	Department Environment, Parks and Water Security
DITT	Department Industry, Tourism and Trade
DTFHC	Department of Territory Families, Housing and Communities
ESY	Estimated sustainable yield
FFD	Flora and Fauna Division, DEPWS
GDE	Groundwater dependent ecosystem
KPI	Key performance indicator
KM	Kilometre
Minister	Minister for Environment, Climate Change and Water Security
ML	Mega litres
NLC	Northern Land Council
NTG	Northern Territory Government
OWS	Office of Water Security, DEPWS
Plan	Georgina Wiso Water Allocation Plan 2023–2031
PWC	Power and Water Corporation
SREBA	Strategic Regional Environmental and Baseline Assessment
WRD	Water Resources Division, DEPWS

## Schedule C: Daly Roper Beetaloo water control district and Georgina Wiso plan area



## Schedule D: Georgina Wiso water management zones



## Schedule E: Georgina Wiso groundwater monitoring network

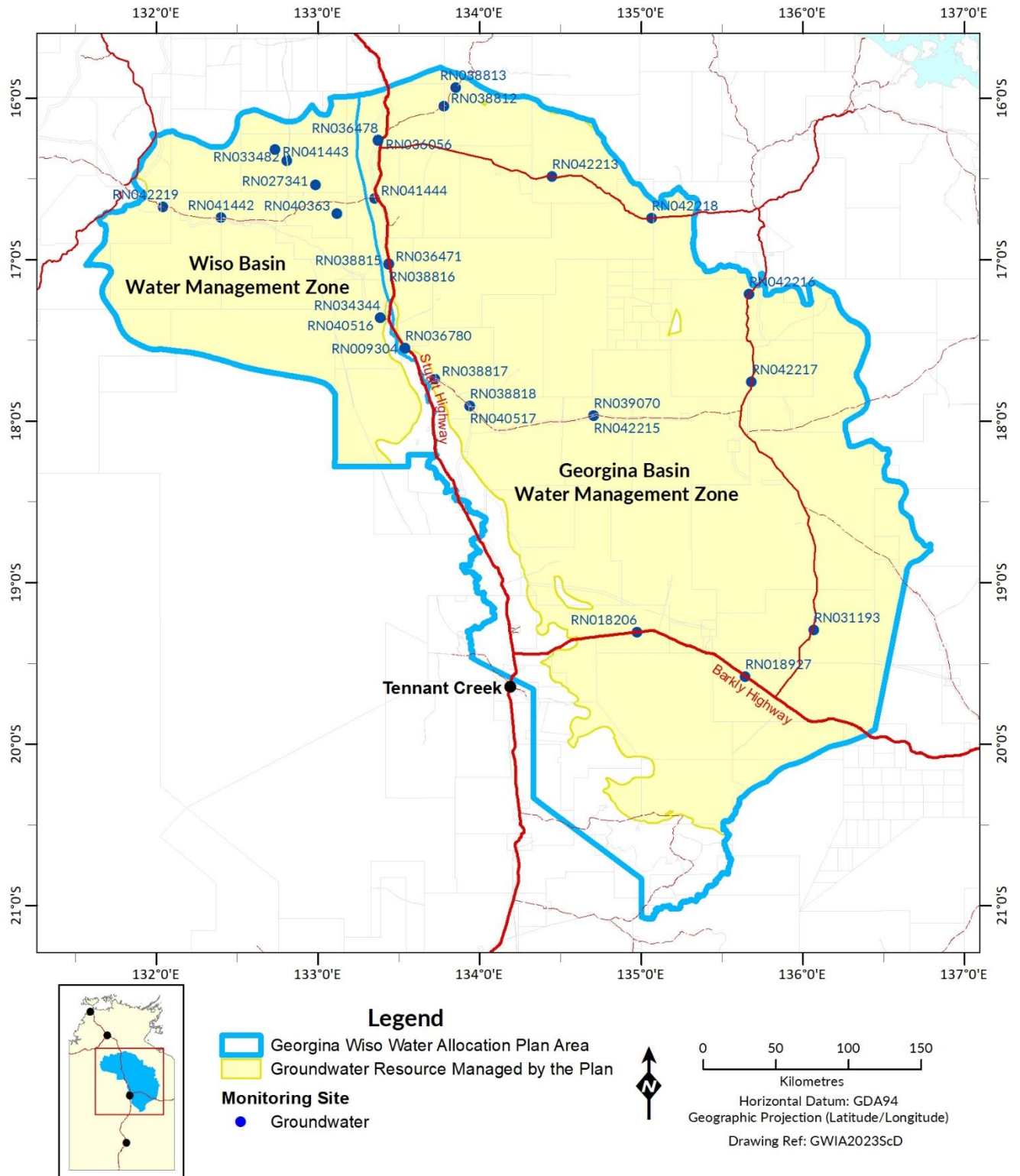




Table 3 Georgina Wiso groundwater level monitoring network

Water management zone	Aquifer monitored	Site	Latitude	Longitude	Started monitoring groundwater level (year)	Purpose	Groundwater level logger	Water quality
Georgina	Combined CLA (GRF & ALF)	RN036471	-17.027012	133.440364	2014	Regional	Yes	-
	Lower CLA (GRF)	RN009304	-17.55013325	133.5382988	2021	Regional	Yes	-
	Lower CLA (GRF)	RN018206	-19.30586063	134.9754512	2021	Regional	Yes	-
	Lower CLA (GRF)	RN018927	-19.58129381	135.6450468	2021	Regional	Yes	-
	Lower CLA (GRF)	RN029013	-15.866647	133.406031	1993	Regional	-	-
	Lower CLA (GRF)	RN031193	-19.29365719	136.0694337	1998	Regional	Yes	-
	Lower CLA (GRF)	RN036056	-16.25956823	133.374222	2021	Regional	Yes	-
	Lower CLA (GRF)	RN036478	-16.26096817	133.3741169	PWC Bore	Regional	-	Yes
	Lower CLA (GRF)	RN036780	-17.54813062	133.5412256	PWC Bore	Regional	-	Yes
	Lower CLA (GRF)	RN038812	-16.04920411	133.7803845	2014	Regional	Yes	-
	Lower CLA (GRF)	RN038813	-15.9339997	133.8533321	2015	Regional	Yes	-
	Lower CLA (GRF)	RN038815	-17.02747057	133.4400221	2015	Regional	Yes	-
	Lower CLA (GRF)	RN038817	-17.7400999	133.7249089	2021	Regional	Yes	-
	Lower CLA (GRF)	RN038818	-17.90527058	133.939069	2015	Regional	Yes	-
	Lower CLA (GRF)	RN041444	-16.62158048	133.3502388	2020	Regional	Yes	-
	Lower CLA (GRF)	RN042213	-16.48605229	134.4498385	2021	Regional	Yes	-
	Lower CLA (GRF)	RN042216	-17.96379823	134.7057551	2021	Regional	Yes	-
	Lower CLA (GRF)	RN042218	-17.75696677	135.6823682	2021	Regional	Yes	-
	Unnamed Cretaceous sandstone	RN042215	-17.90525958	133.9387103	2021	Regional	Yes	-
	Upper CLA (ALF)	RN038816	-17.02662262	133.440217	2015	Regional	Yes	-
	Upper CLA (ALF)	RN039070	-17.96372651	134.7061424	2021	Regional	Yes	-

Water management zone	Aquifer monitored	Site	Latitude	Longitude	Started monitoring groundwater level (year)	Purpose	Groundwater level logger	Water quality
Wiso	Upper CLA (ALF)	RN040517	-17.90500757	133.9389006	2021	Regional	Yes	-
	Upper CLA (ALF)	RN042217	-17.21417671	135.6676881	2021	Regional	Yes	
	Lower CLA (ML)	RN027341	-16.53609281	132.986894	2021	Regional	-	Yes
	Lower CLA (ML)	RN028087	-15.955123	132.762799	1999	Regional	-	
	Lower CLA (ML)	RN033482	-16.38616162	132.8088997	2020	Regional	Yes	
	Lower CLA (ML)	RN034344	-17.36082889	133.38632	PWC Bore	Regional	-	Yes
	Lower CLA (ML)	RN040363	-16.71521824	133.118568	2021	Regional	-	Yes
	Lower CLA (ML)	RN040516	-17.35872996	133.3882486	2021	Regional	Yes	-
	Lower CLA (ML)	RN041442	-16.73957852	132.4005408	2020	Regional	Yes	-
	Lower CLA (ML)	RN041443	-16.31957557	132.7359862	2020	Regional	Yes	-
	Lower CLA (ML)	RN042219	-16.74248517	135.0664149	2021	Regional	Yes	-

ALF = Anthony Lagoon Formation, GRF = Gum Ridge Formation, ML = Montejinni Limestone



## Schedule F: Risk assessment methodology

An assessment of the level of risk posed by the described risk can be a useful way to prioritise the way in which the water will be managed. The relative level of a certain risk can be determined by considering the likelihood of a threat occurring and the consequence associated with that threat on a scale of 1 to 5, and using a matrix below to determine the risk level:

### Risk level

RISK LEVEL		CONSEQUENCE				
		Insignificant	Minor	Moderate	Major	Catastrophic
LIKELIHOOD	Rare	very low	very low	low	moderate	moderate
	Unlikely	very low	low	low	moderate	high
	Possible	low	low	moderate	high	high
	Likely	low	moderate	moderate	high	very high
	Almost certain	moderate	moderate	high	very high	very high

### Likelihood

LIKELIHOOD			
Category	Qualitative descriptor	Frequency	Probability of occurring in life of plan
1	Rare	Event occurs 1 in every 100 years	< 1%
2	Unlikely	Event occurs 1 in every 20–50 years	1 – 20%
3	Possible	Event occurs 1 in every 5–10 years	21 – 80%
4	Likely	Event occurs annually	81 – 95%
5	Almost certain	Event occurs many times per year	> 95%

### Consequence

CONSEQUENCE			
Category	Qualitative descriptor	Ecological / water quality impacts	Socio-economic impacts
1	Insignificant	No noticeable impact to ecosystem.	Short period of low level water restrictions causing minor inconvenience to households, no material impact on irrigation allocations, minimal financial impact on industry and little to no loss of amenity.
2	Minor	Some impact on marginal ecosystems (For example, edges of riparian zones or small mixed dependency ecosystems).	Extended period of low level water restrictions causing some inconvenience to households, reduction in irrigation allocations with minimal material impact, potential financial impact for some industries and minor loss of amenity. First signs of impact on public morale.

CONSEQUENCE			
Category	Qualitative descriptor	Ecological / water quality impacts	Socio-economic impacts
3	Moderate	Water availability is so low, such that only the highest value environmental sites receive or retain water, putting vulnerable species at risk.	Medium level of water restrictions directly impacting on households, reduction in irrigation allocations resulting in some loss of productivity, some industries severely impacted or forced to close tourism, prioritisation of watering for amenities, increased impact on morale.
4	Major	Water availability is at critically low levels and groundwater systems become depleted beyond recharge rate. Extensive damage to ecosystems occurs with potential irreparable damage in some areas.	High level water restrictions directly limiting household water use, limited irrigation allocations resulting in low levels of productivity, some industries forced to close which may impact on national economy, severe loss of amenity and morale, some people leave.
5	Catastrophic	Irreparable damage to ecosystem; severe adverse impacts to environment.	Water supply to major town becomes insufficient to ever again sustain community or nationally significant activity; no irrigation allocations, collapse of industry, total loss of amenity, dislocation of people, and significant impact to the national economy.

### Risk response

The risk level will indicate the type of response that may be required to mitigate or avoid the risk.

Risk Level	Action	Timing
Very low – low	Continue routine approach to management – no specific actions required	Ongoing
Moderate – high	Manage by specific monitoring or response procedures	Within plan period
Very high	Develop management or investigation plan, cease activities for which high risks may arise	Immediate

## Schedule G: Risk and adaptive management

Event scenario - risk			Existing controls	Current residual risk			Further controls	Target risk		
Hazard identification	Why can it happen	Impact on objectives	Management in place	Likelihood	Consequence	Risk level	Actions	Likelihood	Consequence	Risk Level
<b>Groundwater levels decline more than acceptable levels</b>	Lack of rainfall and recharge due to drought and impacts of climate variability	3.2.1 Regional loss of GDE health more than acceptable levels	3.1 monitoring program (this document)  Groundwater model developed and used	<b>Unlikely</b>  Model is available that uses: <ul style="list-style-type: none"> <li>cautionary drawdown parameters in predictions</li> <li>calibrated with real data with good results in areas for development</li> <li>considers cumulative effect of extraction against mapped GDEs</li> </ul>	<b>Minor</b>  GDE mapped and not extensive as Groundwater too deep (>40m) for trees of GDE to access  Department monitoring continues across the region	Low	4.1.3 Environmental values mapping  4.1.4 improve conceptualisation  4.1.5 improve understanding of flow  4.1.6 GDE health guideline  4.1.7 Probability GDE map  4.1.8 verify GDE	Unlikely	Minor	Low
		3.2.2 Regional loss of key cultural sites due to reduced access to water	3.1 monitoring program (this document)  Plan for area: <ul style="list-style-type: none"> <li>3.3 recognition cultural values</li> </ul> Funding to improve Aboriginal involvement	<b>Possible</b>  Cultural sites have not been defined yet to be accounted for in water management	<b>Moderate</b>  Significant extraction will have licence conditions for property mapping prior to extraction		4.2.1 Aboriginal people involved in water management  4.2.2 culture considered in decisions  4.2.3 baseline condition cultural sites  4.2.4 define cultural site water requirements			

Event scenario - risk			Existing controls	Current residual risk			Further controls	Target risk		
Hazard identification	Why can it happen	Impact on objectives	Management in place	Likelihood	Consequence	Risk level	Actions	Likelihood	Consequence	Risk Level
							4.2.7 other cultural aspects defined			
		3.2.4 Insufficient security of public water supplies	5.3.2 Prioritisation of public water supplies in allocation and licensing	<b>Unlikely</b> Public water supplies are highest priority in water used  Demand is relatively low  Majority of development not in close proximity to Public water supplies	<b>Minor</b> Regional aquifer with extensive volumes of good quality water available  Department monitoring continues to enable early action if triggered	Low	4.4.1 long term planning of demand  4.1.2 Develop alternate or improved water supply (groundwater sources, deeper bores)	Rare	Minor	Very low
		3.2.5 and 3.2.6 reducing amount of water available through licences and reducing development	3.1 monitoring program (this document)  Regulatory compliance and enforcement of licence conditions	<b>Unlikely</b> Water allocations are based on stored water which currently exists  Model is available that uses cautionary drawdown parameters in predictions, calibrated with real data with good results in areas for development	<b>Minor</b> Regional aquifer with extensive volumes of good quality water available  Department monitoring continues to enable early action if triggered	Low	4.6.1 further model development	Rare	Minor	Very low

Event scenario - risk			Existing controls	Current residual risk			Further controls	Target risk		
Hazard identification	Why can it happen	Impact on objectives	Management in place	Likelihood	Consequence	Risk level	Actions	Likelihood	Consequence	Risk Level
	Excessive impact of water extraction	3.2.1 Local loss of GDE health more than acceptable levels	3.1 monitoring program (this document)  Groundwater too deep (>40m) for trees of GDE to access  Groundwater model developed and used	<b>Unlikely</b>  Current extraction is relatively low  Extraction is regularly reported and monitored to ensure impacts remain acceptable	<b>Minor</b>  GDE mapped and not extensive as Groundwater too deep (>40m) for trees of GDE to access  Department monitoring continues across the region	Low	4.1.3 Environmental values mapping  4.1.4 improve conceptualisation  4.1.5 improve understanding of flow  4.1.6 GDE health guideline  4.1.7 Probability GDE map  4.1.8 verify GDE	Unlikely	Insignificant	Very low
		3.2.2 Local loss of key cultural sites due to reduced access to water	3.1 monitoring program (this document)  Plan for area: <ul style="list-style-type: none"> <li>3.3 recognition cultural values</li> </ul> Funding to improve Aboriginal involvement	<b>Possible</b>  Cultural sites have not been defined yet to be accounted for in water management	<b>Moderate</b>  Significant extraction will have licence conditions for property mapping prior to extraction	Moderate	4.2.1 Aboriginal people involved in water management  4.2.2 culture considered in decisions  4.2.3 baseline condition cultural sites  4.2.4 define cultural site water requirements  4.2.7 other cultural aspects defined	Unlikely	Moderate	Low
		3.2.3 Reduced availability or access to water for rural stock and	Plan for area  Refined methodology for stock use	<b>Unlikely</b>  Low demand compared to water availability	<b>Minor</b>  Department monitoring continues to enable	Low	4.3.1 improve methodology for domestic use	Rare	Minor	Very low

Event scenario - risk			Existing controls	Current residual risk			Further controls	Target risk		
Hazard identification	Why can it happen	Impact on objectives	Management in place	Likelihood	Consequence	Risk level	Actions	Likelihood	Consequence	Risk Level
		domestic purposes			early action if triggered					
		3.2.4 Insufficient security of public water supplies	5.3.2 Prioritisation of public water supplies in allocation and licensing	<b>Unlikely</b> Public water supplies are highest priority in water used  Demand is relatively low  Majority of development not in close proximity to Public water supplies	<b>Minor</b> Regional aquifer with extensive volumes of good quality water available  Department monitoring continues to enable early action if triggered	Low	4.4.1 long term planning of demand  4.1.2 Develop alternate or improved water supply (groundwater sources, deeper bores)	Rare	Minor	Very low
		3.2.5 and 3.2.6 reducing amount of water available through licences and reducing development	ESY set in Plan  3.1 monitoring program (this document)  Groundwater model developed and used  Factors the Controller considers when making a water licensing decision  Regulatory compliance and enforcement of	<b>Unlikely</b> Model is available that uses: <ul style="list-style-type: none"> <li>cautionary drawdown parameters in predictions,</li> <li>calibrated with real data with good results in areas for development</li> <li>considers cumulative effect of extraction</li> </ul>	<b>Minor</b> Regional aquifer with extensive volumes of good quality water available  Department monitoring continues to enable early action if triggered	Low	4.6.1 further model development  4.6.2 staging licence conditions for significant extraction  4.6.3 recovering water not used	Rare	Minor	Very low

Event scenario - risk			Existing controls	Current residual risk			Further controls	Target risk		
Hazard identification	Why can it happen	Impact on objectives	Management in place	Likelihood	Consequence	Risk level	Actions	Likelihood	Consequence	Risk Level
			licence conditions							
<b>Water quality declines to unacceptable levels</b>	Water use increases groundwater salinity levels	3.2.1 Local loss of GDE health more than acceptable levels	3.1 monitoring program (this document)  Groundwater too deep (>40m) for trees of GDE to access  Groundwater model developed and used	<b>Unlikely</b>  Current extraction is relatively low  Extraction is regularly reported and monitored to ensure impacts remain acceptable	<b>Minor</b>  GDE mapped and not extensive as Groundwater too deep (>40m) for trees of GDE to access  Department monitoring continues across the region	Low	4.1.3 Environmental values mapping 4.1.4 improve conceptualisation 4.1.5 improve understanding of flow 4.1.6 GDE health guideline 4.1.7 Probability GDE map 4.1.8 verify GDE	Unlikely	Insignificant	Very low
		3.2.2 Local loss of key cultural sites due to reduced water quality	3.1 monitoring program (this document)  Plan for area: • 3.3 recognition cultural values  Funding to improve Aboriginal involvement	<b>Possible</b>  Cultural sites have not been defined yet to be accounted for in water management	<b>Moderate</b>  Significant extraction will have licence conditions for property mapping prior to extraction	Moderate	4.2.1 Aboriginal people involved in water management 4.2.2 culture considered in decisions 4.2.3 baseline condition cultural sites 4.2.4 define cultural site water requirements 4.2.7 other cultural aspects defined	Unlikely	Moderate	Low



Event scenario - risk			Existing controls	Current residual risk			Further controls	Target risk		
Hazard identification	Why can it happen	Impact on objectives	Management in place	Likelihood	Consequence	Risk level	Actions	Likelihood	Consequence	Risk Level
		3.2.3 Reduced water quality available for rural stock and domestic	3.1 water quality monitoring program (this document)	<b>Unlikely</b> Very low demand compared to water availability	<b>Moderate</b> Generally high quality water suitable for drinking  Department monitoring continues to enable early action if triggered	Low	4.3.2 water quality monitoring and licence conditions	Rare	Minor	Very Low
		3.2.4 Insufficient quality for public water supplies	Water quality monitoring program (PWC)	<b>Unlikely</b> Very low demand compared to water availability	<b>Moderate</b> Generally high quality water treated for drinking that is regularly monitored	Low	4.4.2 water quality monitoring program  4.4.3 communication on service delivery arrangements	Rare	Minor	Very Low
		3.2.5 and 3.2.6 land use and practises increases the rate	3.1 monitoring program (this document)  Groundwater model developed and used  Factors the Controller considers when making a water licensing decision  Regulatory compliance and enforcement of licence conditions	<b>Unlikely</b> Salinity naturally varies  Large area with limited development	<b>Minor</b> Regional aquifer with extensive volumes of good quality water available  Department monitoring continues to enable early action if triggered	Low	4.4.2 water quality monitoring program  4.6.1 further model development  4.6.2 staging licence conditions for significant extraction  4.6.3 recovering water not used  4.6.5 Appropriate crop management practices	Rare	Minor	Very low

Event scenario - risk			Existing controls	Current residual risk			Further controls	Target risk		
Hazard identification	Why can it happen	Impact on objectives	Management in place	Likelihood	Consequence	Risk level	Actions	Likelihood	Consequence	Risk Level
Water isn't used	Sustainable development isn't achieved	3.2.5 water isn't used to provide benefits to eligible land holders through AWR	Aboriginal water reserve supports Aboriginal economic development  Monitor water use	<b>Possible</b> Extraction is currently very low with modest impact on economic development	<b>Moderate</b> Economic status of the region remains the same	Moderate	4.5.2 promote and support eligible land holders to benefit from access to water  4.5.1 Aboriginal water reserve	Unlikely	Minor	Low
		3.2.6 water isn't used to provide benefits to the region	4.6.2 applying unused water policy  Regulatory compliance and enforcement of licence conditions	<b>Possible</b> Extraction is currently very low with modest impact on economic development	<b>Moderate</b> Economic status of the region remains the same	Low	4.1.9 communication on maintaining environmental values  4.2.9 communication on maintaining cultural values  4.3.3 communication water management	Unlikely	Minor	Low

## Schedule H: Adaptive management framework

