PENTIUM WATER

BARU MARNDA RENEWABLE ENERGY PROJECT

Water Management Report

02 September 2026



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Executive Summary

The Yindjibarndi Energy Corporation (YEC), in partnership with the Yindjibarndi Aboriginal Corporation (YAC), is the proponent for the Baru Marnda Renewable Energy Project.

The YEC Baru Marnda Renewable Energy Project will feature wind and solar power generation facilities, including up to 108 turbines, with capacities of up to 810 megawatts ac (MWac) and 500 MWac, respectively. The project also includes energy storage options, associated electrical hardware, and transmission infrastructure.

Table 1 summarises the Baru Marnda Renewable Energy Project.

Table 1: YEC Baru Marnda Renewable Energy Project Summary

Infrastructure Element	Description
Project Area	• 42,127.47 hectare (ha).
Solar Energy Generation	• Two solar generation stages. • Up to 500 MWac. • Two potential solar array sites are identified as Baru and Marnda.
Wind Energy Generation	• Two wind generation stages. • Up to 810 MWac from up to 108 turbines. • Wind generation areas are focused on the elevated hilltop areas within Baru (Stages 2 and 3) and Marnda (Stages 1 and 4).
Supporting Infrastructure.	• Permanent: o Electrical reticulation and transmission lines (overhead and/or underground) o Substations and switchyards o Internal access roads o Battery Energy Storage Systems (BESS) o Satellite offices o Operations and maintenance facilities o Groundwater production bore and associated pipelines • Construction: o Laydown and storage areas o Borrow pits (sand and rock material) o Turkey's nest(s) o Temporary concrete plant(s)
Access Road	• Internal road access routes connect the project area with Warlu Road/Manuwarra Red Dog Highway to the east. • The internal access roads consist of the following: o Utilise existing cleared access tracks. o Construction of new roads (including creek crossings) • The internal access roads are required for the construction and maintenance of the wind and solar energy infrastructure.
Rehabilitation	• Approximately 4,250 ha of the approved cleared area will be restored during the project's decommissioning phase.

Purpose

This Water Management Report (WMR) details the existing hydrological context, expected impacts, embedded avoidance and mitigation measures, and monitoring actions associated with the implementation of operations for the Baru Marnda Renewable Energy Project.

This WMR has been prepared in accordance with the following guidelines:

- State Planning Policy 2.9 Water (SPP 2.9) (WAPC 2025).
- Renewable Energy Planning Code and guidelines (WAPC 2025).

This WMR does not duplicate monitoring and/or controls in other statutory decision-making processes for water-related activities that manage potential impacts on environmental/hydrological values. This includes regulation administered by the Department

of Water and Environmental Regulation (DWER) under the *Environmental Protection Act 1986* (EP Act) and the *Rights in Water and Irrigation Act 1914* (RiWi Act).

Summary of Potential Hydrological Impacts and Proposed Mitigation Actions

Table 2 summarises the identified potential impacts, the WMR proposed mitigation, and the hydrological outcomes.

Table 2: Summary of the Potential Hydrological Impacts, Proposed Mitigation and Proposed Environmental Outcomes

Element	Description
Potential Impacts	**Surface Water** • Alteration of surface water volume and flow regimes. • Erosion of exposed surfaces by wind, water and construction activities generating sediment loads in surface water runoff flows. • Alteration to Groundwater Dependent Ecosystem (GDE), riparian vegetation and fauna habitat. • Reduction in water quality through: o The release of sediment or contaminated material to nearby surface water and/or groundwater environments across the following project phases: ▪ Construction phase: • Construction of internal access routes, specifically creek crossings. • The installation and use of a turkey's nest. • Construction of substations, switchyards, BESS, borrow pits and laydown/storage areas. • The installation of the temporary concrete plants. ▪ Operational and maintenance phase: • Substations and switchyards • Laydown and storage areas • Operations and maintenance facilities • Satellite offices • Borrow pits • BESS **Groundwater** • Changes to groundwater levels in the Fractured Rock Aquifer.
Mitigation Hierarchy	**Avoidance** • No incompatible land uses within the mapped Harding Dam P1 PDWSA pursuant to Water Quality Protection Note 25 (DWER 2021). • All power infrastructure support poles are to be located outside the 1% AEP creek flood areas. • The concrete batching plant, fuel storage and laydown area will be located a minimum of 500 m from any creek or waterway. • The proposed wind and solar infrastructure areas will be located in areas that are culturally, socially, or environmentally acceptable to YAC and the YNAC. **Minimise** • Co-location of linear infrastructure where possible, to minimise the number and extent of creek line crossings required. • Construct stormwater infrastructure including bunding and sedimentation basins to: o Divert surface water flows around high risk activities such as the concrete plant, fuel storage, laydown areas, wind turbines and solar farm. o Capture and treat dirty water run-off prior to release downstream. • The modification of creeks or waterways through new or upgraded road crossings will be subject to the following DWER approval: o Application to Interfere with Bed and Banks (Form 3P). o A key focus of the Bed and Banks application and approval will be the following elements:

	▪ Demonstrating the maintenance of pre-development surface water flows. ▪ The protection of riparian vegetation. o Sediment and erosion controls during the construction phase. **Rehabilitate** • Rehabilitation of the indicative disturbance footprint following the construction phase. • Rehabilitation of the substantial remainder of the indicative disturbance footprint during the project's decommissioning phase. • All rehabilitation being undertaken with the aim of returning land to its pre-development uses where possible.
Hydrological Monitoring Program	• Implement a surface water monitoring program in areas identified as high-risk areas where riparian and GDEs have been identified and potential impacts are significant. • Undertake groundwater monitoring as defined in the DWER approved groundwater licence. • Monitor the implementation of the rehabilitation program undertaken post the completion of temporary construction stages or staged works.
Proposed Environmental outcomes	**Hydrological Outcomes** • Existing seasonal water flows along waterways and creek lines towards major river systems and the Harding Dam within and downgradient of the project area shall be preserved. Surface water flow will follow the pre-existing waterways and creeks and consequently will continue to sustain: o Riparian and GDEs: ▪ The creek line vegetation communities. ▪ Riparian Flora and Plant Communities PEC (P2). ▪ Cracking Clays of the Chichester and Mungaroona Range PEC (P1). These Priority vegetation communities depend on overland sheet flow. • Aquifers: o Replenish semi-permanent and permanent pools and the adjacent Alluvial Aquifers. o Sustain and replenish water within the deeper Fractured Rock Aquifer. • Harding Dam catchment: o Surface water flows along creek lines and waterways towards the Harding Dam remain unaltered. The flow volumes across the Harding Dam catchment remain unaltered. • Implementation of effective management measures will be employed to mitigate the impacts, including the management of flood events, scouring and sediment during the construction and operational phases. • Surface and groundwater quality will be monitored and managed to prevent significant impacts to the following water features: o Riparian vegetation and GDEs (including Riparian Flora and Plant Communities PEC and Cracking Clays of the Chichester and Mungaroona Range PEC), o Harding Dam Catchment (Priority 1) Water Source Protection Area. o Alluvial and Fractured Rock Aquifers.

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Abbreviation

Term	Definition
AH Act	*Aboriginal Heritage Act 1972*
AEP	Annual Exceedance Probabilities
Baru*	Generic term for all spinifex species
BC Act	*Biodiversity Conservation Act 2016*
BESS	Battery Energy Storage System
bgl	Below Ground Level
BOM	Bureau of Meteorology
CALM Act	*Conservation and Land Management Act 1984*
CHMP	Cultural Heritage Management Plan
DA	Development Application
DAP	Development Assessment Panel
DBCA	Department of Biodiversity, Conservation and Attractions
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GDE	Groundwater Dependent Ecosystem
GWL	Groundwater Licence
Ha	Hectares
Jinbi*	Small permanent spring
kL	Kilolitres
Km	Kilometres
LA Act	*Land Administration Act 1997*
ILUA	Land Use Agreement
m	Metre
mm	Millimeter
MWac	Megawatts Alternating Current
NT Act	Native Title Act 1993
NPUG	Non-Potable Use of Groundwater
NWIS	North West Interconnected System
IFD	Intensity Frequency Duration
PD Act	*Planning and Development Act 2005*
PDWSA	Public Drinking Water Source Area
RIWI Act	*Rights in Water and Irrigation Act 1914*
SPP	State Planning Policy

TEC	Threatened Ecological Community
WAPC	Western Australian Planning Commission
WMR	Water Management Report
WWTP	Wastewater Treatment Plant
YAC	Yindjibarndi Aboriginal Corporation
YEC	Yindjibarndi Energy Corporation

1. Introduction

1.1. Proposal Background

The Yindjibarndi Energy Corporation (YEC) is a partnership between the Yindjibarndi Aboriginal Corporation (YAC) and renewable energy company ACEN Corporation. YEC has proposed developing a renewable energy hub that includes wind, solar, and battery storage on Yindjibarndi Ngurra country in Western Australia's Pilbara region. This encompasses the planned Baru and Marnda wind and solar renewable energy projects within the Yindjibarndi Native Title Determination Areas, situated approximately 55 kilometres (km) south of Karratha.

The project occupies an area of 42,127.47 ha.

Renewable energy generated and stored by the Baru Marnda Renewable Energy Project will be made available for use throughout the Pilbara region, with the Rio Tinto Iron Ore-owned Millstream substation identified as an initial point of connection.

The Baru Marnda Renewable Energy project area is situated near the confluences of the Fortescue River, Maitland River, and Harding River catchments, with the access route passing through Millstream Chichester National Park.

1.1.1. Baru Marnda Renewable Energy Project Summary

The Baru Marnda Renewable Energy Project comprises wind and solar energy generation facilities as defined in Table 3.

Figure 1 illustrates the YEC Baru Marnda renewable-energy-specific infrastructure components and the project area boundary.

Table 3: Baru Marnda Renewable Energy Project Summary

Project Stage	Project Infrastructure
Wind Energy Generation	
Wind Energy Generation	• Up to 810 MWac of wind energy generating infrastructure is proposed to be installed across the elevated ranges.
Infrastructure	• Up to 108 individual wind turbines. • Associated access tracks and construction infrastructure. • Wind turbine electrical reticulation.
Solar Energy Generation	
Solar Energy Generation	• Up to 500 MWac of solar energy generating infrastructure. • The infrastructure comprises a series of solar panels installed in strings, which generally follow existing terrain features.
Infrastructure	• Associated access tracks and construction infrastructure.
Common Project Infrastructure	
Permanent	• Electrical reticulation and transmission lines (overhead and/or underground) • Substations and switchyards • Internal access roads • BESS • Satellite offices • Operations and maintenance facilities • Groundwater production bore and associated pipelines
Construction Phase	• Laydown and storage areas • Borrow pits (sand and rock material) • Turkey's nest(s) • Concrete plant(s)

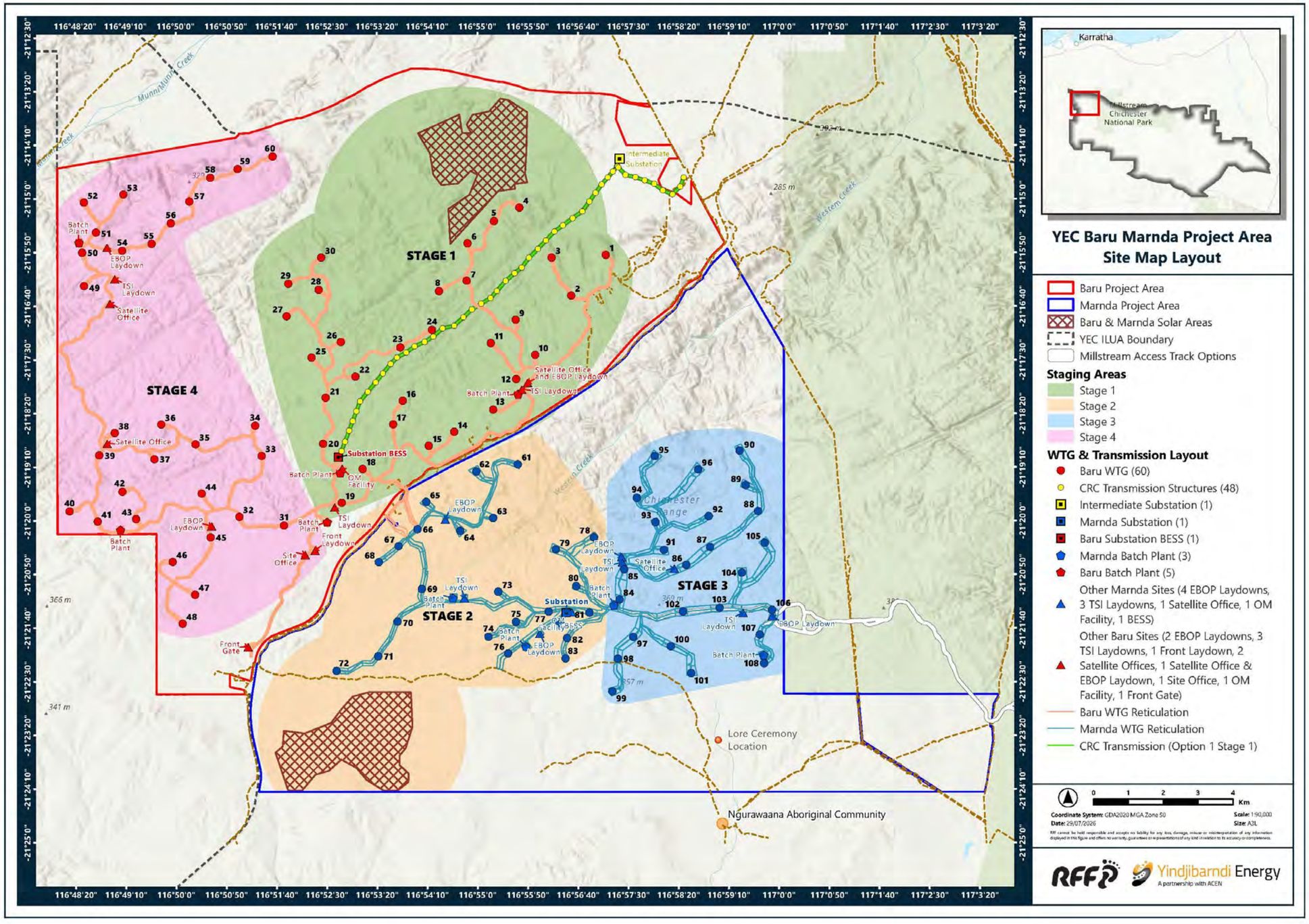


Figure 1: YEC Baru Marnda Renewable Energy Key Infrastructure and Project Area

1.2. Purpose

The purpose of this Water Management Report (WMR) is to provide a framework which describes how the project will assess, manage, monitor and mitigate impacts to surface water and receiving waterways during the construction, operation and decommissioning phases of the project in accordance with the applicable regulatory requirements, permit obligations and industry best practice.

The WMR aligns with the water management objectives defined in the following guidelines:

- State Planning Policy 2.9 Water (SPP 2.9) (WAPC 2025).
- Renewable Energy Planning Code and guidelines (WAPC 2025).

1.3. Scope of Work

The WMR establishes a hydrological management framework tailored to the project, addressing its multiple construction stages (solar and wind infrastructure) and operational phases. Specifically, the WMR applies to:

- The surface water catchment and groundwater aquifers.
- All ground disturbing activities associated with the construction phases and the establishment of the solar and wind renewable energy infrastructure.
- The establishment and use of internal access roads and associated surface water sediment ponds.
- The establishment and operation of core construction elements including temporary concrete plant, fuel storage and laydown facilities.

The scope of the WMR consists of the following elements:

- Identification, characterisation and mapping of surface water resources (waterways and creeks), including results and findings of monitoring and site investigations, including:
    - Surface water catchments and associated landform and geotechnical conditions.
    - Groundwater systems and associated hydrogeology.
    - Sensitive water resource areas and other important environments including:
        - Public Drinking Water Source Area (PDWSA).
    - Catchment flooding and seasonal inundation.
- Identification of Aboriginal heritage values and other heritage values.
- Identification of hydrological risks and issues relevant to the construction of the renewable energy infrastructure, including:
    - Potential impacts resulting from alteration of surface water flows, land clearing and groundwater use.
    - Potential impacts to water quantity and quality from proposed land use change.
    - Potential risks from flooding or inundation.
    - Potential impacts to PDWSAs, other important environments and other important environments requiring protection.
- Regulatory requirements under water and environmental legislation.
- Groundwater demand during the construction and operation phases.
- The infrastructure design and construction approach.
- Identification of project-specific water management objectives and outcomes.
- The adoption of avoidance, mitigation and management measures including:
    - The protection, management, and utilisation of water resources.
    - Sediment and erosion control adopted throughout the construction and operation of the renewable energy project.
- Reporting.

1.3.1. Supporting Investigations and Documents

The following technical investigations, reports and approvals underpin and complement the preparation of this WMR:

- Yindjibarndi Energy Project – Jinbi Flood Extents (Hydrologia 2024).
- Yindjibarndi Energy Project – Phase 2 Geotech Ground-breaking Investigation (Stats Australia 2025).

- Desktop and Detailed Flora and Vegetation Assessment: Yindjibarndi Renewable Energy Project (Mattiske 2025).
- Baru – Preliminary ecological survey findings for access options (RPS 2025).
- Baru-Marnda Renewable Energy Project Subterranean Fauna Desktop Assessment (Biologic Environmental 2026).
- Baru-Marnda Renewable Energy Project Fauna Assessment Report (Bamford Consulting Ecologist 2025).
- Groundwater Licenses 211498(1) & 211499(1).

1.4. Concurrent Approvals

The YEC renewable project is subject to multiple concurrent assessments and approvals under applicable legislation including:

- Parts IV and V of the *Environmental Protection Act 1986* (EP Act) (WA)
- *Land Administration Act 1997* (LA Act) (WA)
- *Rights in Water and Irrigation Act 1914* (RiWI Act) (WA)
- Conservation and Land Management Act 1984 (CALM Act) (WA)
- *Planning and Development Act 2005* (PD Act) (WA)
- *Aboriginal Heritage Act 1972* (AH Act) (WA)
- *Native Title Act 1993* (NT Act) (Cth)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cth).

1.4.1. Planning and Development Act 2005

YEC renewable project is subject to a Development Application (DA), pursuant to the PD Act. The DA provides planning permission for the development of renewable energy infrastructure. The Development Assessment Panel (DAP) is the principal planning approval mechanism. The DAP will examine the DA in accordance with relevant statutory policies and guidelines, including SPP 2.9 - Water (WAPC 2025) and the draft Renewable Energy Planning Code and guidelines (WAPC 2025).

1.4.2. RiWi Act 1914

1.4.2.1. Groundwater Licence

The construction activities will require access to groundwater to support the following activities:

1. Concrete production.
2. Dust suppression.

YEC is the proponent of two DWER approved groundwater licences (GWL 211498 and 211499) allowing for abstraction of up to 200,000 kilolitres (kL) total from the Hamersley - Fractured Rock and the Pilbara - Fractured Rock Aquifers.

The abstraction of groundwater and the construction of groundwater bores will be subject to the following approvals under the RiWi Act:

1. Section 26D ‘licence to construct’ application and approval issued by the DWER.
2. Annual reporting on the two groundwater licences. The reporting includes water use data, monitoring results, and compliance.

1.4.2.2. Bed and Banks Permit

The remaining approval under the RiWi Act pertains to construction activities that disturb or interfere with the bed or banks of a natural watercourse.

The construction of the Baru Marnda renewable energy infrastructure, particularly the wind farm infrastructure on the higher rangeland peaks, will require modifying creeks or waterways via new or upgraded road crossings. The works will include installing culverts in some creeks.

Accordingly, the following DWER approval will be sought for the waterway crossings:

1. Application to Interfere with Bed and Banks (Form 3P).

A key focus of the Bed and Banks application and approval will be the following elements:

- Demonstrating the maintenance of pre-development surface water flows.
- The protection of riparian vegetation.
- Sediment and erosion controls during the construction phase.

2. Local and Regional Context

2.1. Regional Overview

The Baru and Marnda wind and solar renewable energy project is within the Yindjibarndi Native Title Determination Areas and is situated in the Pilbara region, approximately 55 km south of Karratha.

The project encompasses an area of 42,127.47 ha situated within Yindjibarndi country, accessible via the Manuwarra Red Dog (Karratha to Tom Price) Highway. The project area lies on the edges of the Fortescue River, Maitland River, and Harding River catchments. Importantly, this includes the upper Harding Dam Catchment Area.

The objective of this project is to capture and store solar and wind energy for utilisation across the Pilbara region through the North West Interconnected System (NWIS).

The project area sits within the following regional features:

- Culture
    - The entire project area is within Yindjibarndi ngurra country and the determined Ngarluma/Yindjibarndi (WAD6017/96) native title claim area.
- Biogeography
    - The project area is located in the Pilbara bioregion, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) classification system (Commonwealth of Australia 2012; Thackway & Cresswell, 1995).
    - The Pilbara bioregion comprises four subregions: Chichester (PIL01), Fortescue (PIL02), Hamersley (PIL03) and Roebourne (PIL04). The project area is entirely located within the Chichester subregion. The Chichester subregion is described as (McKenzie et al., 2003):
        - Characterised by undulating Archaean granite and basalt plains supporting a shrub steppe characterised by *Acacia pyrifolia* over *Triodia pungens* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on significant areas of basaltic ranges.
- Regional Geology
    - The topography is controlled by the structure of the underlying geology, characterised by the Chichester and Hamersley ranges and creek lines feeding into the Fortescue, Maitland and Harding Rivers.
- Vegetation
    - The project area is situated within the Fortescue Botanical District (Beard 1990). The Fortescue Botanical District is described as consisting essentially of tree and shrub-steppe communities with Eucalyptus trees, Acacia shrubs, and Triodia spp.
    - Ten regional vegetation associations are mapped within the project area. All the regional vegetation associations have 97% or higher remaining.
- Reserves and Public Drinking Water Source Area
    - The western edge of the Millstream Chichester National Park, a Class A reserve (Reserve 35798) vested with the Conservation and Parks Commission of Western Australia and managed by the Department of Biodiversity, Conservation and Attractions (DBCA).
    - The Harding Dam catchment covers part of the northwest area of the project area. The Harding Dam catchment is classified as a Priority 1 (P1) Public Drinking Water Source Area (PDWSA).
- Infrastructure
    - Rio Tinto rail lines, internal mine access roads and mining tenements.
    - The access road to the Ngurrawaana community.
    - The Ngurrawaana community is located immediately south of the project area.

2.1.1. Existing Land Uses

The project area lies within the Shire of Ashburton Local Government Area. The Shire's Local Planning Scheme land use zoning across the project area is 'Public Purpose'. The 'Public Purpose' zoning allows for the development of 'Energy' land uses.

2.1.1.1. Surrounding Land Uses

Surrounding land uses include:

- Ngurrawaana - permanent residential community for the Yindjibarndi people.
- Unallocated Crown land.
- Pastoral lease including Coolawanyah, Mallina, Hooley and Pyramid leases.
- Millstream Chichester National Park.
- Variety of mining tenements.

The regional location and project layout are presented in Figure 2.

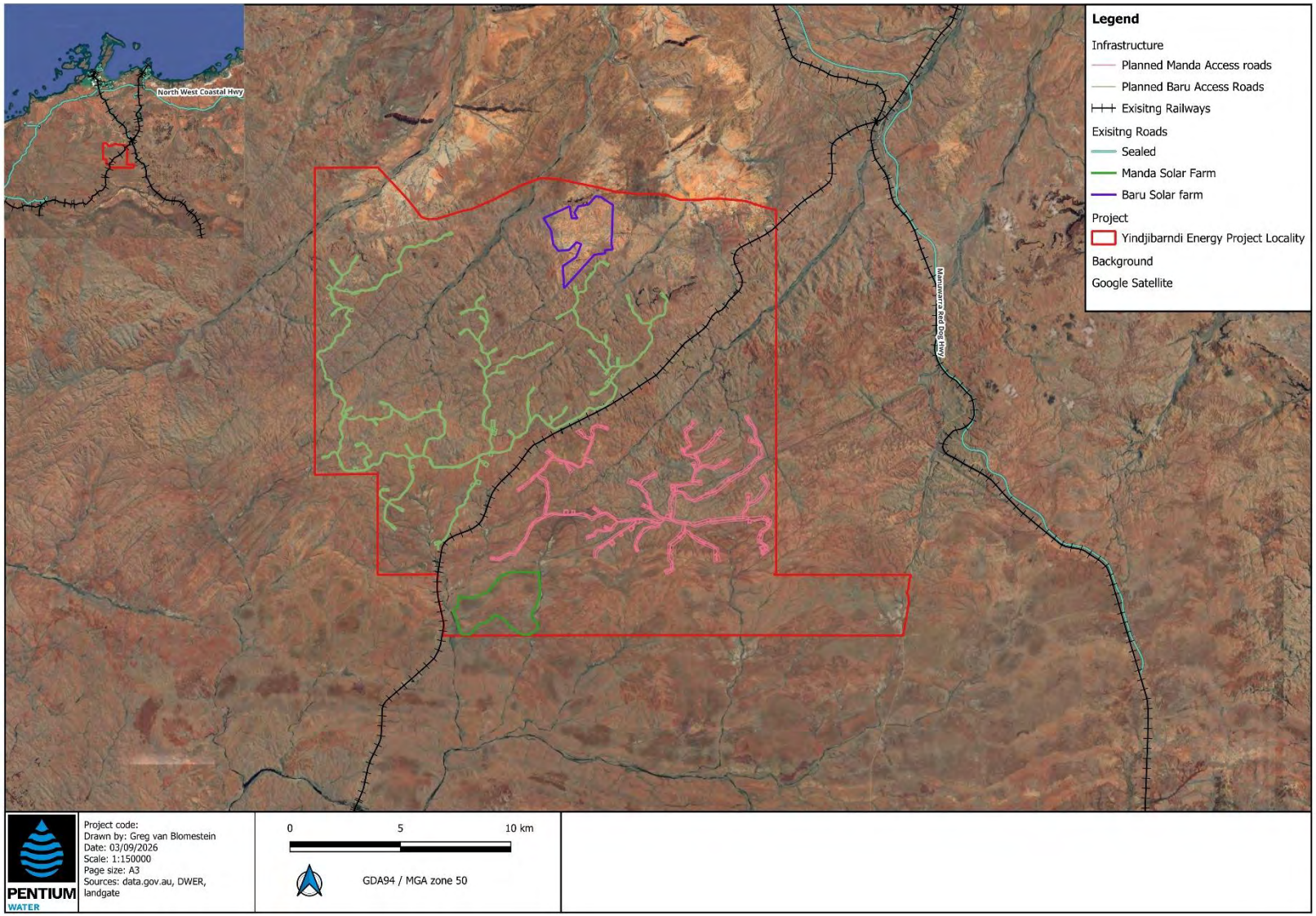


Figure 2: YEC Baru Marnda Renewable Energy Project Area and Regional Context

2.1.2. General Hydrological Context

2.1.2.1. Regional Climate

The Pilbara region is characterised by very hot summers, mild winters, and low, variable rainfall. The project area has an arid to semi-arid climate with hot, humid summers and warm dry winters. The average annual rainfall in the area is about 300 mm and is highly variable year-on-year.

Regionally, the YEC Baru Marnda Renewable Energy Project area is located in an arid-to-semi-arid climate with hot, humid summers and warm, dry winters. The regional climatic conditions are summarised below:

- Temperatures range between 41 ºC in the summer months and 26 ºC in the winter months. The mean minimum temperatures range from 12 ºC in winter to 25 ºC in summer (BOM, 2025).
- The average annual pan evaporation is approximately 3,400 mm.
- Average rainfall is 374 mm per year. Most rainfall is summer rain (57% falls January to March on average), resulting from scattered thunderstorms that produce heavy, localised, and unpredictable falls over short periods, as well as from tropical storms and cyclones.
- Tropical lows usually originate off the Pilbara coast and are the primary source of significant rain events in the region.

The mean monthly rainfall data is shown in the Chart 1. Rainfall data were obtained from the BOM website for the Millstream Station 5012 site, which was the closest station to the project area (BoM 2025).

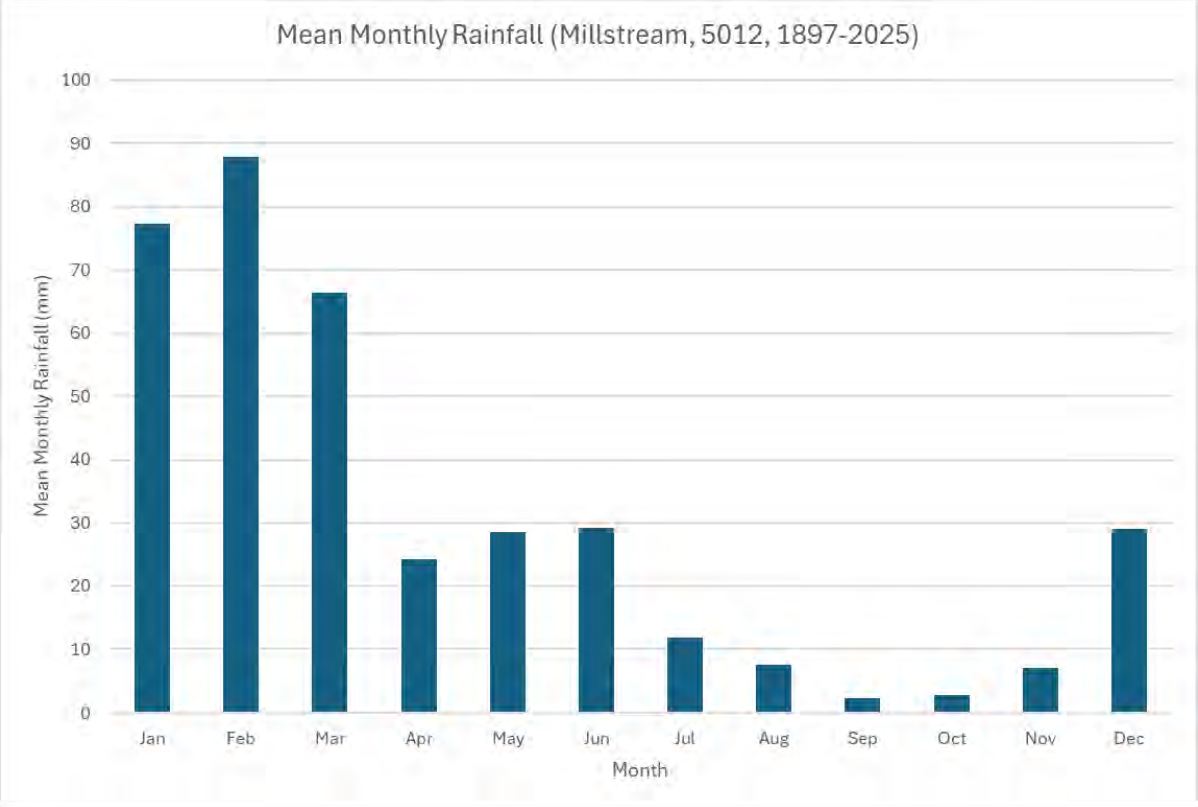


Chart 1: Mean Monthly Rainfall (BoM - Millstream 5012)

The BoM website provides probabilistic or statistically based Intensity Frequency Duration (IFD) rainfall characteristics, which are required to characterise storm rainfall intensities. IFD rainfall depths represent design rainfalls for events of frequent and infrequent occurrence for various annual exceedance probabilities (AEP).

IFD data for the project area are shown in Table 4.

Table 4: Intensity—Frequency—Duration (mm)

Duration (hrs)	63% AEP	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1%AEP
1	26	30	42	51	59	69	77
2	32	37	53	63	74	88	98
6	50	75	93	111	136	155	42
12	51	61	96	121	147	184	213
24	61	75	121	155	190	241	282
36	68	83	135	174	214	272	319
72	79	97	156	200	244	308	360

2.1.2.2. Future Climate

Since 1910, Australia's climate has warmed by an average of 1.44 ± 0.24 °C, resulting in a higher frequency of extreme heat events. Rainfall and streamflow have shown increases in certain areas of northern Australia since the 1970s. Additionally, the number of tropical cyclones observed in the Australian region has declined since 1982 (Cleugh, Helen et al 2020). Looking ahead to the coming decades, climate change predictions for the Pilbara region include (Cleugh, Helen et al 2020):

- Continued warming, with more extremely hot days and fewer extremely cool days.
- More intense short-duration heavy rainfall events.
- Fewer tropical cyclones but a greater proportion projected to be of high intensity, with ongoing large variations from year to year.

2.1.2.3. Topography

The project area consists of steep ridges and gorges as well as some wide flat creek beds. Creeks are ephemeral with some semi-permanent pools. The southern part of the project area is flatter, running along the tops of the hills. Elevations around the project area vary from 128 metres Australian Height Datum (m AHD) to 350 m AHD.

2.2. Hydrological Context

2.2.1. Geotechnical Conditions

2.2.1.1. Geology

The fundamental geological composition of the project area comprises volcanic formations, predominantly characterised by granite-greenstone terranes typical of the Hamersley Basin. The geology of the project area is dominated by the following volcanic derived basaltic rock formations:

- Maddina Formation: Mafic tuffaceous sediments and basalt lavas.
- Tumbiana Formation: Felsic intrusives; granodiorite, granite.
- Kylena Formations: Basalt, andesite, dacite, high-Mg basalt, rhyolite; basaltic agglomerate.

Alluvial deposits are situated both to the north and south of the project area, originating from erosion across the tableland ranges. Drainage lines, creeks, and rivers that flow northward from these ranges have formed extensive alluvial and colluvial deposits.

A map of the regional geology is shown in Figure 3.

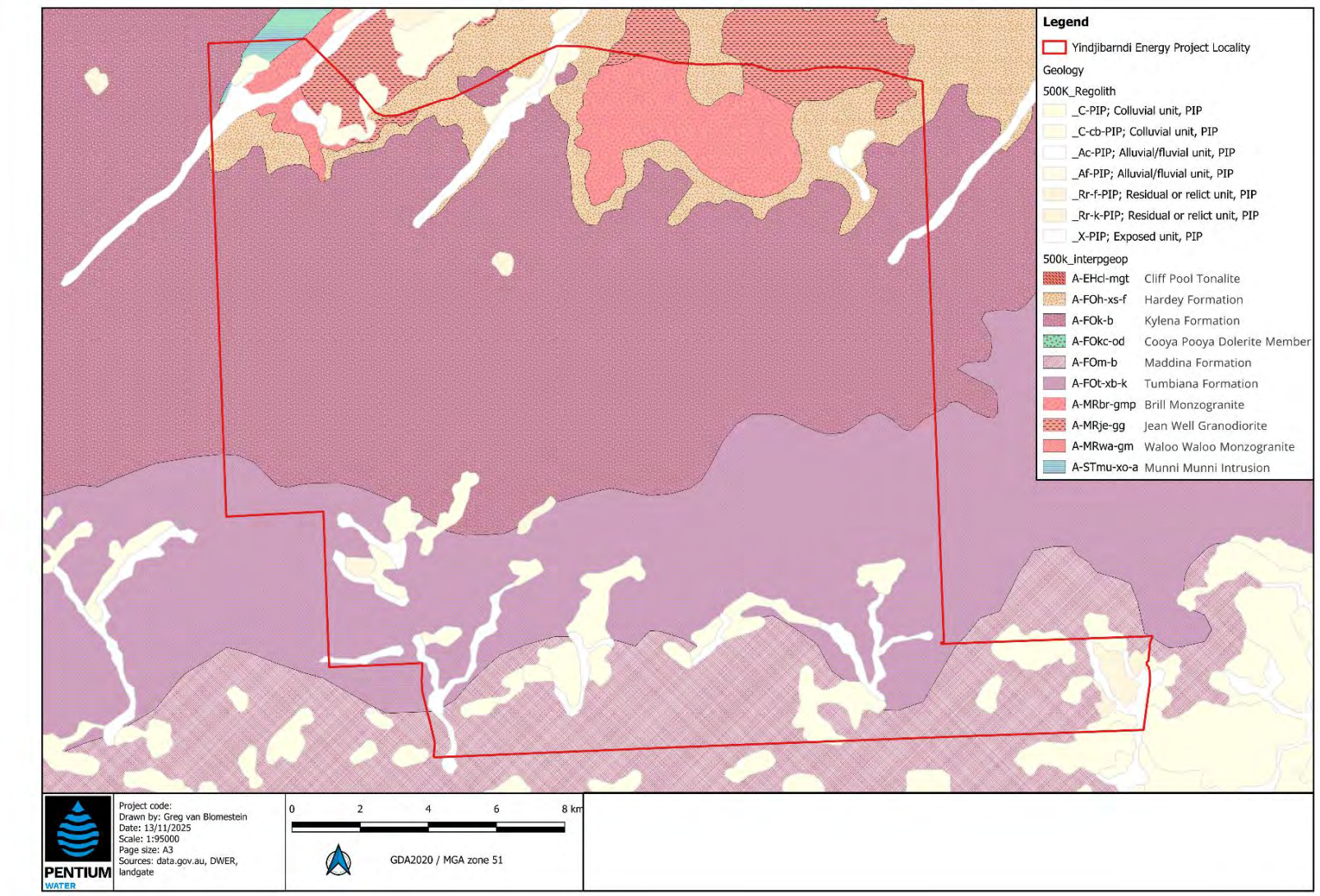


Figure 3: Regional Geology

2.2.1.2. Landforms and Soil Descriptions

The project area lies within the Pinderi Hills region of the Pilbara (Geoscience Australia 2000). The landform comprises exposed rocks, with seven surface geologies present, including:

- **Alluvial Deposits:** Present-day drainage systems containing alluvial clay, silt, and sand in channels on floodplains, and sand and gravel in rivers and creeks.
- **Cherratta Granitoid Complex:** Locally porphyritic, foliated, and weakly banded granite to granodiorite rock.
- **Colluvium Drainage Lines:** Course, pebbly sand, silt, and gravel in outwash fans, scree slopes, and claypans or temporarily flooded areas.
- **Dolerite Dyke:** Massive, medium- to coarse-grained dolerites of various ages.
- **Hardey Formation:** Medium to coarse-grained sandstone, conglomerate, siltstone, shale, and tuff.
- **Lyre Creek Member:** Felsic tuff and agglomerate, and felsic to intermediate volcaniclastic sandstone and conglomerate; locally abundant accretionary lapilli.
- **Porphyritic Syenogranite and Monzogranite:** Metamorphosed medium grained foliated and weakly gneissic plagioclase, quartz and hornblende with extensive outcropping containing megacrysts of microcline.

The soil comprises shallow, stony, brown, and earthy loams derived from basalt lavas and dolerite formations, with large areas having no soil cover. These soils are usually brown loams with significant areas of earthy, loamy soils (Van Vreeswyk et al. 2004).

2.2.2. Groundwater

The project area comprises the following two groundwater systems:

- A shallow Alluvial Aquifer groundwater system associated with the rivers, drainage lines and creeks that flow through the project area
- A deeper Fractured Rock Aquifer groundwater system with low permeability and storage characteristics.

2.2.2.1. Alluvial Aquifer

Alluvial deposits occupy present drainage channels and have also formed on the floodplains and deltas of major rivers (Ferguson and Ruddock 2001). They consist of unconsolidated or partly consolidated clay, silt, sand and gravel.

The presence of wider creek lines and semi-permanent pools in the project area indicates the potential for Alluvial Aquifers. Captured surface water from seasonal rain events feeds and maintains the Alluvial Aquifers.

The spatial location and depth of the Alluvial Aquifers are directly influenced by the low-permeable bedrock outcrops. Bedrock outcrops were observed along the ridgelines and on the valley floors throughout the project area. The Alluvial Aquifer, if present, would likely be spatially limited and thin.

2.2.2.2. Fractured Rock Aquifer

The drilling program in the project area did not establish the existence of a substantial Fractured Rock Aquifer. However, it was considered possible that some of the semi-permanent pools located near bedrock outcrops may provide a downward leakage to a Fractured Rock Aquifer.

The six constructed bores recorded massive fresh granite to depth, with very few small water bearing fractures intercepted.

The five historic bores in the project area (associated with the railway) show that four were dry when drilled. This provides evidence that the area's basement rocks have negligible porosity. Groundwater is expected to be confined to fractured areas within bedrock intrusions where different rock types meet. These fractures may provide pathways for water movement; however, they have limited storage capacity.

2.2.2.3. Aquifer Recharge

The project area's two aquifer types rely heavily on rainfall for recharge. Along the ridgeline peaks within the project area, the dominant geological feature is the outcrops of basement rock. The basalt bedrock outcrops, combined with steep topography, promote surface water runoff with limited infiltration capacity. Surface water from the range peaks is directed to the valley floors.

Consequently, across the majority of the project area, there is limited connection to the Alluvial and the Fractured Rock Aquifers. Further, any groundwater captured within either Aquifer system would likely be spatially isolated.

The primary method of groundwater replenishment resulting from precipitation events occurs within the following hydrological features:

- Drainage channels
- Creek beds
- Pools

Aquifer water levels respond directly to rainfall or creek flood events. Groundwater discharges as a result of the hydraulic gradient to local creeks (as throughflow, springflow, and evapotranspiration).

In summary, the hydraulic connectivity between the aquifers is anticipated to be restricted owing to the presence of comparatively impermeable fresh basaltic bedrock that constrains the project area both laterally and vertically, as well as the limited observed near-surface sand and alluvial materials.

The conceptual model for the recharge of groundwater in the area is shown in Figure 4.

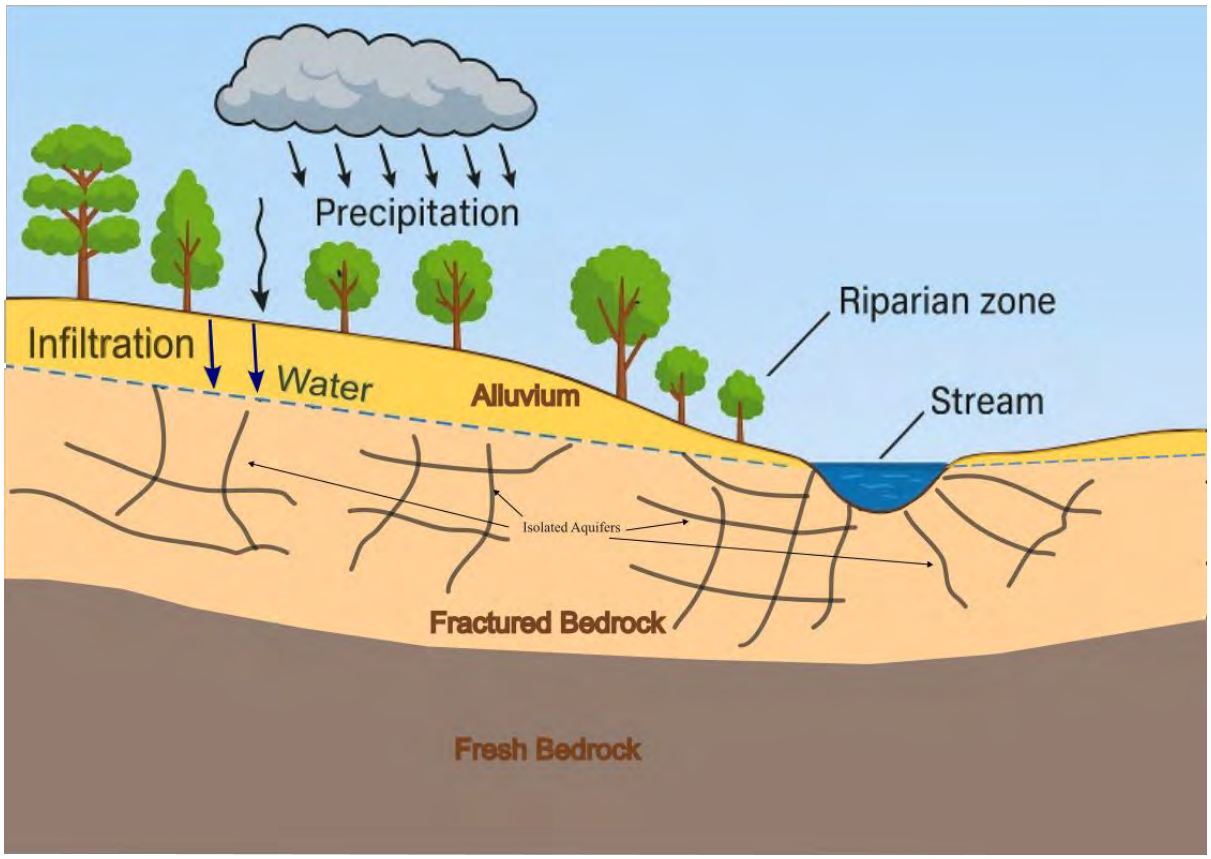


Figure 4: Conceptual Model for Groundwater Recharge

2.2.2.4. Depth to Groundwater and Yield

The fracture rock zones interpreted from magneto-telluric geophysics were specifically targeted to support the project's water supply requirements. The geophysical data

confirmed the presence of fractures and dykes that will be targeted for water supply drilling and were identified at depths of 80 m below ground level (bgl) or greater.

Groundwater at both production bores was encountered between 70 m and 80 m bgl, i.e., within the fractured bedrock seams consistent with the conclusions drawn from the magneto-telluric geophysics assessment.

The water within the Fracture Rock Aquifer is confined within areas of fresh granitic bedrock intrusions with limited weathered bedrock. The pumping tests indicate transmissivity of approximately 1–1.7 m^2/day and storativity of approximately 6×10^{-4}, with sustained drawdown observed during testing. Sustainable groundwater yields are therefore low and unlikely to exceed approximately 1 L/s per bore.

2.2.2.5. Groundwater Quality

Groundwater analysis from the three production bores (PB1, PB2 and PB3) compared against the Non-Potable Use of Groundwater (NPUG) guidelines (DWER 2021) is provided in Table 5.

Table 5: Groundwater Analysis Compared to DWER NPUG

Analyte	Unit	LOR	NPUG	PB1	PB2	PB3
pH		0.01	6.0-8.0	8.12	8.03	8.24
EC	µS/cm	1		2680	897	752
TDS (site)	mg/L			1729	609	
TDS	mg/L	10		1740	583	489
Suspended solids	mg/L	0.1		<5	<5	<5
TOC	mg/L	1		18	4	<1
COD	mg/L	10		18	<10	<10
BOD	mg/L	2		8	4	3
Temp	ºC			31.1	28.2	
Turbidity	NTU	0.1		1.8	1.6	
Total Hardness -$CaCO^3$	mg/L	1		230	250	318
Hydroxide Alkalinity - $CaCO^3$	mg/L	2		<1	<1	<1
CarAlk_$CaCO^3$	mg/L	1		<1	<1	<1
BicarAlk_$CaCO^3$	mg/L	1		548	349	353
Total Residual Chlorine	mg/L	0.01		<0.01	<0.01	
Silicon as SiO_2	mg/L	0.01		40.3	42.5	54
Total-N	mg/L	0.1		1.9	0.9	1.4
Nitrate-N	mg/L	0.01	500	0.58	6.11	4.21
Ammonium-N	mg/L	0.01		0.09	<0.01	0.02
Total-P	mg/L	0.01		<0.10	<0.10	0.02
Ca	mg/L	1		46	49	53
Mg	mg/L	1		28	31	45
Na	mg/L	1		571	86	55
K	mg/L	1		5	3	1
Cl	mg/L	1	250	510	60	42
SO4	mg/L	1	1000	93	22	14
Mn	mg/L	0.0001		0.253	0.01	0.012
Ba	mg/L	0.001		0.138	0.054	0.011
Sr	mg/L	0.001		1	0.576	0.298
Bo	mg/L	0.05		0.92	0.26	0.19
Fe	mg/L	0.05		0.28	0.07	0.33
F	mg/L	0.1		1.8	0.7	0.4

Overall, the baseline hydrochemistry results demonstrate:

- The groundwater quality ranges from fresh to slightly brackish groundwater.
- PB1 contains moderately saline, sodium-chloride rich groundwater with elevated organic matter and manganese.
- PB2 and PB3 contain fresher bicarbonate groundwater with generally low nutrient and trace metal concentrations.

2.2.2.6. Surface and Groundwater Interaction

The opportunity for direct interaction between groundwater and surface water systems in the project area is limited by the depth to groundwater and the limited extent of the alluvial

and fractured rock formations. The episodic recharge of the largely disconnected Fractured Rock Aquifer water table is primarily from major, sustained cyclonic or seasonal flood events that surface water pools long enough to infiltrate deep vertical fracture networks.

The wind turbines will, by necessity, be installed at elevated heights throughout the project area. Consequently, the risk of any interaction between construction activities and groundwater within the fractured bedrock material located at an estimated depth of 70 – 80 m bgl is minimal.

2.2.2.7. Existing Ground Water Licenses

The project area contains three groundwater licences approved by DWER (Table 6).

Importantly, YEC holds two groundwater licences allowing for abstraction of up to 100,000 kL from the Hamersley Fractured Rock and the Pilbara Fractured Rock Aquifers.

The third licence is held by Pilbara Iron Company (Services) Pty Ltd (PIC). This groundwater licence allows for the abstraction of up to 150,000 kL per year from the Hamersley Fractured Rock Aquifer. This bore was originally a water supply for rail construction and is used in the rail maintenance program.

Table 6: Groundwater Licenses Summary (Water Online 2026)

Licence Number	Licence Type	Aquifer	Licence Allocation
Yindjibarndi Energy Corporation Pty Ltd			
211498	Groundwater Licence	Hamersley – Fractured Rock	100,000 kL
211499	Groundwater Licence	Pilbara – Fractured Rock	100,000 kL
Pilbara Iron Company (Services) Pty Ltd			
169174	Groundwater Licence	Hamersley – Fractured Rock	150,000 kL

2.2.2.8. Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) are ecosystems that rely on groundwater for their continued existence (BoM 2024). GDEs can be represented by many different assemblages of biota that rely on groundwater and, as a result, come in many forms. For terrestrial ecosystems, there are three key types of GDE (BoM 2024):

- Aquatic ecosystems that rely on the surface expression of groundwater
- Terrestrial ecosystems that rely on the subsurface presence of groundwater – this includes all vegetation ecosystems or Groundwater Dependent Vegetation (GDV)
- Subterranean ecosystems: this includes cave and aquifer ecosystems.

Consultant botanists, Mattiske Consulting Pty Ltd (Mattiske), completed a desktop and detailed flora and vegetation assessment of the project area in 2024. The botanical results specific to riparian and GDE vegetation are summarised below (Mattiske 2025):

Vegetation Communities

- Creek lines and semi-permanent pools consist of the following vegetation types (Mattiske, 2025):
    - **C1:** *Eucalyptus victrix* low open woodland over *Melaleuca linophylla*, *Acacia bivenosa*, *Acacia coriacea* subsp. *pendens* mid sparse shrubland over *Cyperus vaginatus*, *Stemodia grossa*, *Tephrosia rosea var. clementii* low sparse shrubland in ephemeral drainage channels.
    - **C2:** *Melaleuca argentea*, *Eucalyptus camaldulensis*, *Eucalyptus victrix* mid woodland over *Acacia ampliceps*, *Acacia coriacea* subsp. *pendens*, *Melaleuca linophylla* mid open shrubland over *Cyperus vaginatus*, *Typha domingensis*, *Schoenoplectus subulatus* tall open sedgeland in drainage channels.
    - **C3:** *Eucalyptus victrix*, *Eucalyptus camaldulensis* low woodland over *Acacia coriacea* subsp. *pendens*, *Melaleuca glomerata*, *Acacia* spp. (*A. bivenosa, A. pyrifolia var. pyrifolia, A. tumida*) mid sparse shrubland over *Cyperus vaginatus*, *Stemodia grossa*, *Eriachne benthamii* low sparse shrubland in drainage channels.
    - **C4:** *Eucalytpus victrix*, *Eucalytpus camaldulensis* low open woodland over *Acacia coriacea* subsp. *pendens*, *Flueggea virosa* subsp. *melanthesoides*, *Terminalia*

circumalata mid sparse shrubland over *Cyperus vaginatus*, *Typha domingensis*, *Schoenoplectus subulatus* sedgeland around pools with high water permanence.
- **C5:** *Terminalia circumalata* low sparse woodland over *Acacia coriacea* subsp. *pendens*, *Flueggea virosa* subsp. *melanthesoides*, *Cynanchum viminale* subsp. *australe* low sparse shrubland over *Cyperus vaginatus*, *Triodia wiseana*, *Cymbopogon ambiguus* low sparse grassland in narrow rocky sandstone gorges.
- **C6:** *Eucalyptus victrix*, *Corymbia hamersleyana* low sparse woodland over *Acacia tumida* var. *pilbarensis*, *Acacia pyrifolia*, *Acacia bivenosa* low open shrubland over *Triodia wiseana*, *Cymbopogon ambiguus*, *Enneapogon lindleyanus* low sparse hummock grassland in minor drainage channels.

GDEs

- The creek line vegetation communities (C1-C6) qualify as GDEs. Mattiske evaluated the groundwater dependence of each riparian vegetation community as follows:
  - High and Moderate groundwater dependency (C1, C2 C3 and C4)
  - Low groundwater dependency (C5 and C6).
- Spatially, the GDE vegetation was observed at the following locations (Mattiske 2025):
  - The high groundwater dependency (C2) occurred primarily in the deepest valleys/gorges where groundwater flow is supplied by the surrounding hills.
  - The moderately groundwater dependent communities (C1 and C3) loosely corresponded with moderately deep valleys.
  - Vegetation communities C5 and C6 with low groundwater dependence were associated with minor drainage channels in headwaters and on hilltops.

Priority Ecological Community (PEC)

- Vegetation communities C2 and C4 were assessed as Riparian Flora and Plant Communities PEC (P2). The vegetation present, particularly Melaleuca argentea plant species (which is entirely groundwater dependent), indicates the high water permeance of these areas (Mattiske 2025).
- The mapped G2 vegetation community consisting of *Aristida latifolia*, *Triodia wiseana* low sparse tussock grassland over *Rhynchosia minima*, *Streptoglossa bubakii* low isolated shrubs with diverse annual herbs and grasses on friable cracking clay on hilltops and flats was considered highly likely to represent the Cracking Clays of the Chichester and Mungaroona Range PEC (P1).
- The Cracking Clays of the Chichester and Mungaroona Range are considered to be dependent upon overland sheet-flow of water.
- The Mitchell grass and Roebourne Plain grass (*Eragrostis xerophila*) plain on gilgai PEC (P3) was identified approximately 10 km north of the renewable energy project area. This PEC is described as:

  "*Gilgaied clay plains supporting tussock grasslands and minor grassy snakewood shrublands*" (van Vreeswyk et al. 2004).

Figure 5 illustrates the surveyed GDEs, including the Riparian Flora and Plant Communities (P2) PEC (Mattiske 2025) and Pilbara pool mapping (DWER 2025).

Figure 6 illustrates the location of the Cracking Clays of the Chichester and Mungaroona Range (P1) PEC and the Mitchell grass and Roebourne Plain grass (Eragrostis xerophila) plain on gilgai (P3) PEC (Mattiske 2025).

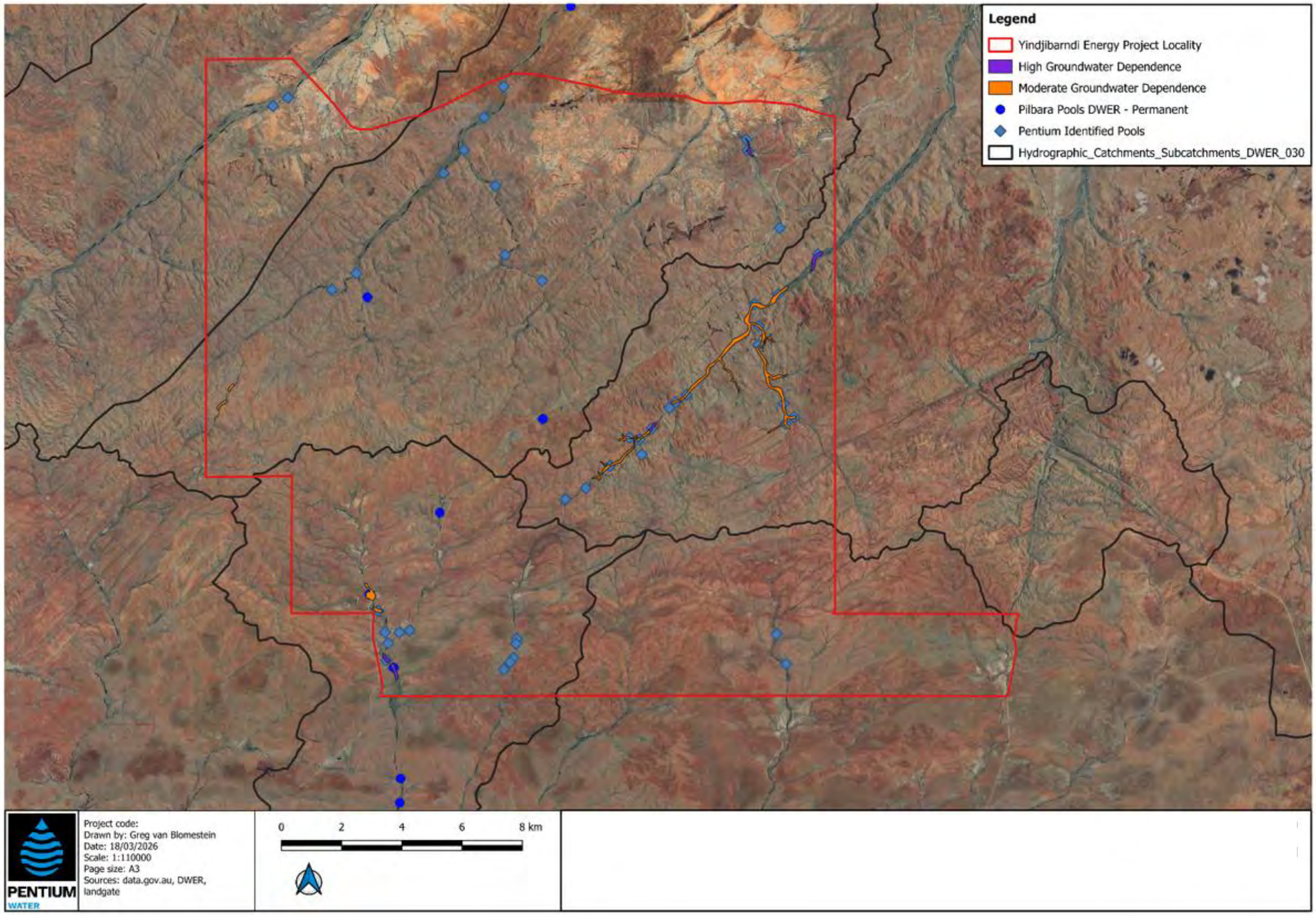


Figure 5: Mapped GDEs (Mattiske 2025) and Pilbara Pool Mapping (DWER 2025) within the YEC Baru Marnda Renewable Energy Key Project Area

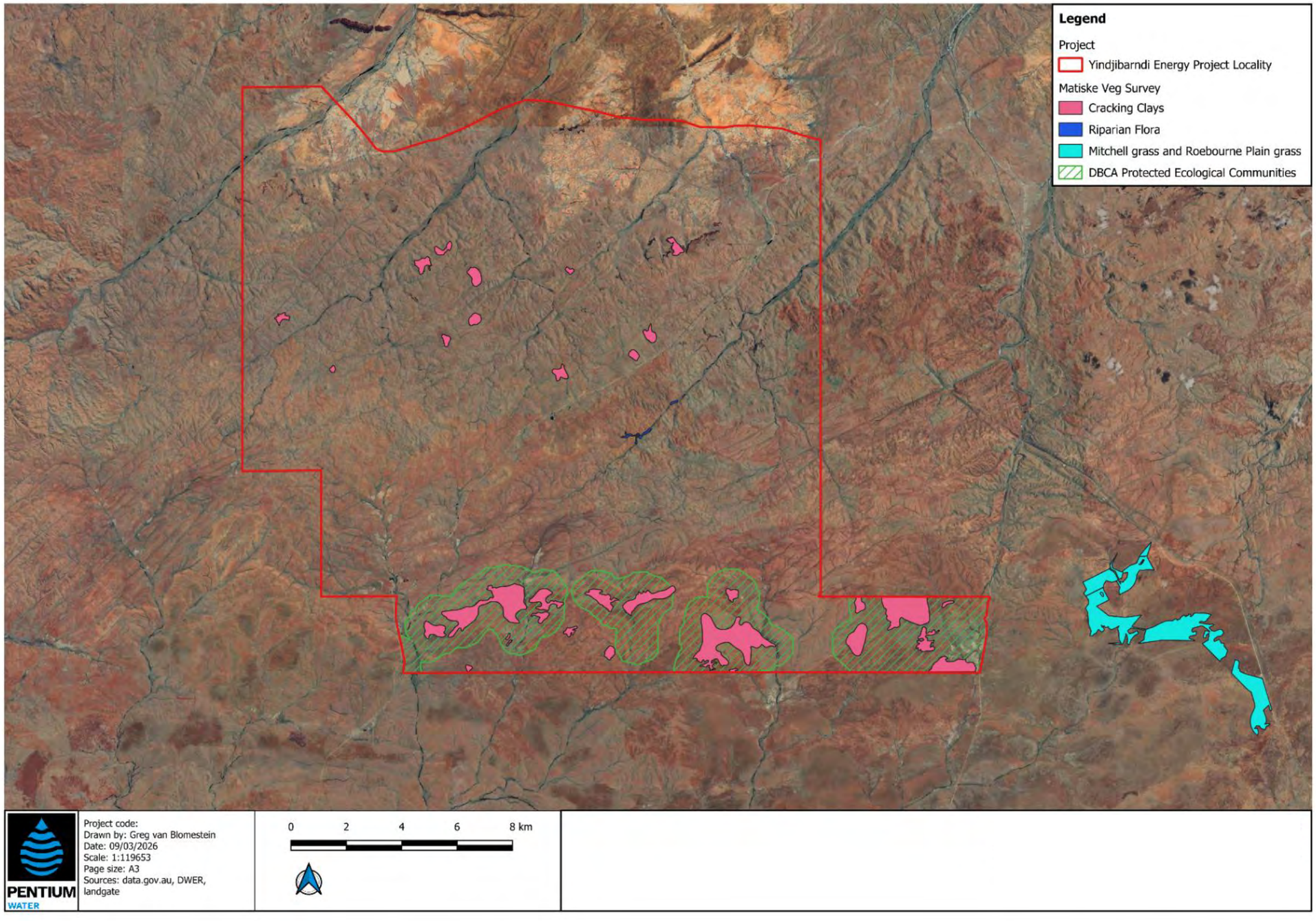


Figure 6: Priority Ecological Communities (Mattiske 2025) and Creekline Riparian Vegetation within and adjacent to the Baru Marnda Renewable Energy Key Project Area

2.2.2.9. Subterranean Fauna

Subterranean fauna are defined as those that live their entire lives below the earth's surface (EPA 2016). They are divided into the following two groups:

- Troglofauna: invertebrate fauna living in the aerobic, unsaturated region above the water table and within weathered and mineralised rock types and alluvial formations.
- Stygofauna: partially anaerobic, below water table organisms.

Most subterranean fauna species are classified as short-range endemics, primarily because they have geographic ranges of less than 10,000 km^2 and poor dispersal capabilities (Harvey 2002).

The presence of subterranean fauna is strongly linked to geology and hydrology, and to the availability of suitable microhabitats, such as air-filled voids or caves for troglofauna, and non-hypersaline aquifers for stygofauna (EPA 2016).

Key geological formations suited for subterranean fauna include calcretes, alluvial formations, fractured-rock aquifers, karst limestone, channel iron deposits, banded iron formations, alluvium/colluvium in valley-fill areas, and weathered or fractured sandstone.

The subterranean assessment of the project area drew the following conclusions (Biologic Environmental 2026):

- The majority of the project area (82.8%) comprises igneous lithologies such as basalts, andesites and dolerites that have a low level of inferred stygofauna habitat suitability. The basalts, andesites, and dolerites are of significant mass and therefore are unlikely to contain adequate subterranean habitat (or spaces) to support either stygofauna or troglofauna.
- Fractured Rock Aquifers are generally interpreted as having low habitat suitability, although this can vary with the degree of fracturing and transmissivity, and with depth from the surface (with prospectivity decreasing with depth). For instance, the habitat suitability of Fractured Rock Aquifers would increase where fracturing is extensive, and the aquifer is near the surface.
- The limited lithological borehole log data suggests that there is limited fractured rock at depth and potentially limited connectivity within the Fractured Rock Aquifer.
- Stygofauna habitat:
    - The project area is highly likely to support stygofauna. In the surrounding Millstream Chichester National Park and Harding River catchment (approximately 30 km south of the project area), the calcrete and alluvial aquifers contain stygofaunal communities.
    - Stygofauna within the project area similar to the confirmed habitats in the surrounding areas are likely to reside in the Alluvial Aquifers within Quaternary geological units (primarily calcrete, alluvium and colluvium) typically located along and adjacent to creek beds, river systems and some pools.
    - It was considered possible that stygofauna occur in Fractured Rock Aquifers, although these are regarded as less prospective, and their distribution within this aquifer remains unclear.
    - The primary potential impact to species of stygofauna is habitat loss resulting from groundwater drawdown.
    - The project's groundwater source is the deeper Fracture Rock Aquifer and avoids drawdown in proximity to waterways, creeks, permanent and semi-permanent pools and riparian vegetation/GDEs. These actions minimise impacts on potential stygofauna habitat.
- Troglofauna habitat:
    - It is possible that troglofauna occurs in the same Quaternary geological units that are prospective for stygofauna.
    - There is also some potential for troglofauna to occur in igneous lithologies containing rock fractures above the water table, although it is unlikely that assemblages in these habitats will be species rich.
    - The renewable energy project does not propose large-scale excavations within areas of calcrete, alluvium and colluvium (i.e., creeks and waterways). This limits

risks to the troglofauna habitat and associated species and communities that may be present.

2.2.3. Surface Water

2.2.3.1. Catchments

Regionally, the project area sits within the following surface water catchments:

- Fortescue River catchment
  - The southern part of the project area is in the Fortescue River catchment. This catchment is situated between the Hamersley and Chichester plateaus.
  - The Fortescue River catchment contains ephemeral tributaries that drain southward into Withnell Creek, Coondinnar Creek and Portland River, and subsequently into the westward-draining Fortescue River.
  - Several permanent or semi-permanent pools occur within the Fortescue River catchment within the project area.
  - Approximately 20 km south of the Study Area, the Fortescue River bisects Millstream Chichester National Park.
- Maitland River catchment
  - The Maitland River catchment is located in the northern and north-western portion of the project area.
  - Surface water drains northward into Maitland River and Munni Munni Creek.
  - Both the Maitland River and Munni Munni Creek support permanent and semi-permanent pools.
- Harding River catchment
  - The Harding River catchment is located in the eastern portion of the project area.
  - Surface water within this catchment drains into the north-northeasterly draining Western Creek, Harding River and Harding River East.
  - The botanical survey (Mattiske 2025) and DWER Pilbara Pools mapping identify the potential for permanent and semi-permanent pools along Western Creek and its tributaries.

The surface water events within each catchment are dominated by summer rainfall associated with tropical low-pressure systems producing thunderstorms and cyclones. Each catchment is dominated by a major river system originating in rangelands (i.e., the Hammersley and Chichester Ranges) and fed by a series of ephemeral creeks and waterways.

The surface flows support a range of downgradient wetlands, including permanent and semi-permanent pools, claypans, and associated water dependent native vegetation communities and fauna habitats.

Flooding events are the significant source of recharge to the Alluvial and Fractured Rock Aquifers.

Importantly, the surface water catchment is subject to intense periods of high-energy sheet wash and torrents emanating from the Hamersley and Chichester ranges during cyclones or severe tropical storms. This natural process rapidly mobilises weathered fine clays, skeletal soils, and alluvial sediments, flushing loads of suspended material into the catchment via waterways and creeks towards the major regional rivers.

The creeks and river systems have evolved in response to periods of high-intensity rainfall and associated spikes in turbidity, as well as siltation, which can temporarily alter aquatic and riparian habitats.

Figure 7 shows the regional surface water catchment boundaries intersecting the Baru Marnda Renewable Energy Key Project Area.

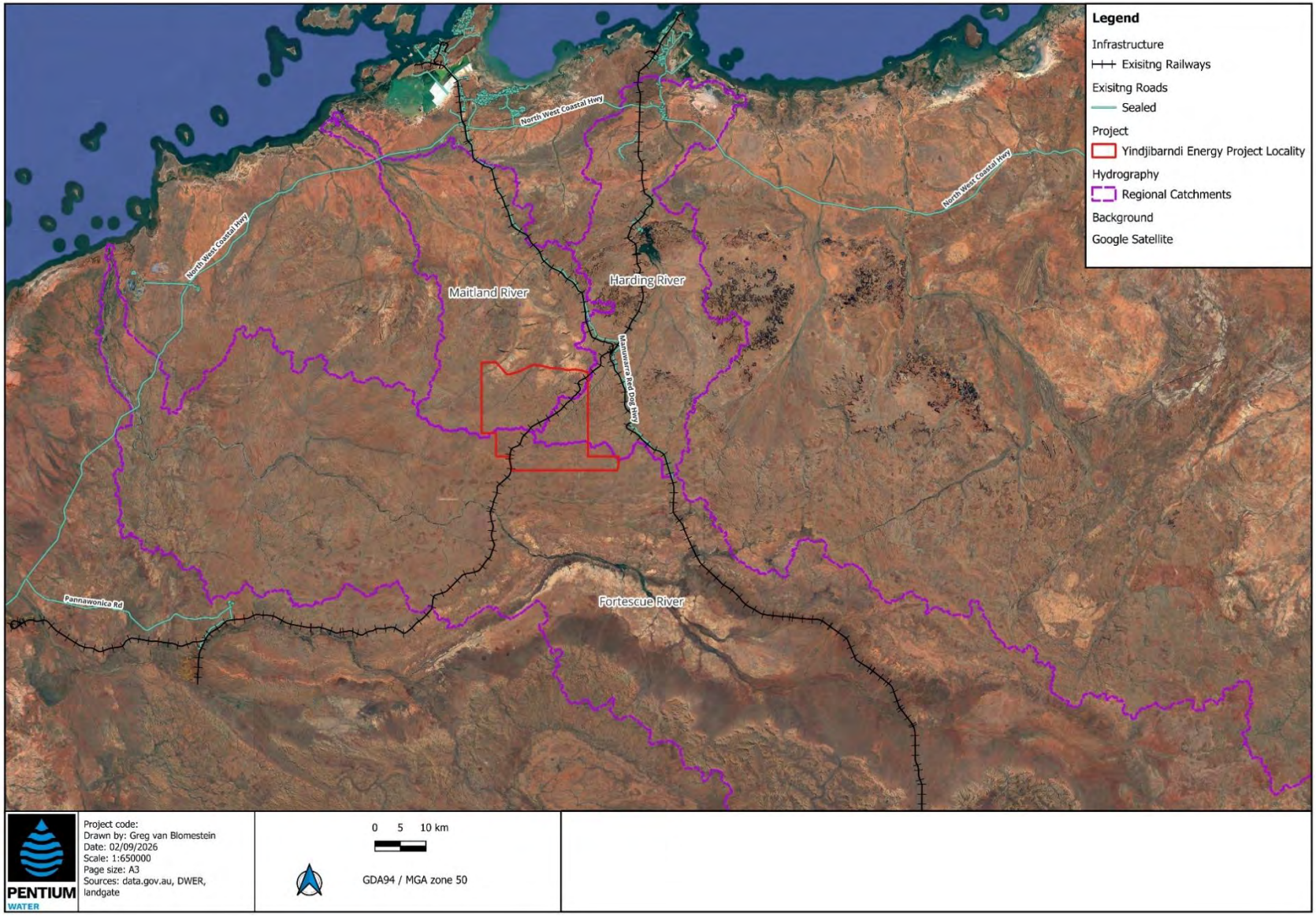


Figure 7: Regional Surface Water Catchments intersecting the YEC Baru Marnda Renewable Energy Key Project Area

Harding River Catchment

The eastern portion of the project area is situated within the Harding Dam Catchment Area. This catchment is designated as a P1 water protection area (Water and Rivers Commission 1999).

The Harding River is a surface water system that originates within the project area and discharges into Harding Dam, located 23 km from Roebourne. This dam serves as the primary storage facility for the West Pilbara Water Supply Scheme, which supplies drinking water to the townships of Karratha, Dampier, Wickham, Roebourne, and Point Samson. Surface water flows from the Chichester rangelands towards key creeks (i.e., Western Creek), which ultimately discharge into the Harding River.

The Harding River P1 Water Protection Areas are managed to ensure that the water source is not degraded, and land development is generally not permitted. Guidance on the type of land uses appropriate within P1 water protection areas is provided by the Water Quality Protection Note (WQPN) 25 ‘Land use compatibility in Public Drinking Water Source Areas’ (DWER 2021).

WQPN 25 (DWER 2021) identifies the major threats to water quality within the Harding Dam Catchment Area include:

- Fuel and chemical storage
- Mechanical servicing
- Wastewater treatment plant (WWTP)
- Rubbish.

According to the land use compatibility criteria specific to the Harding Dam Water Source Protection Plan (Water and Rivers Commission 1999), ‘Power Stations’ is included as an ‘incompatible’ land use. However, the ‘Power Stations’ land use criteria, which were set in 1999, are defined as large fossil fuel or nuclear sites. It did not contemplate a ‘renewable energy’ source.

Figure 8 illustrates the portion of the Harding Dam catchment that covers the project area.

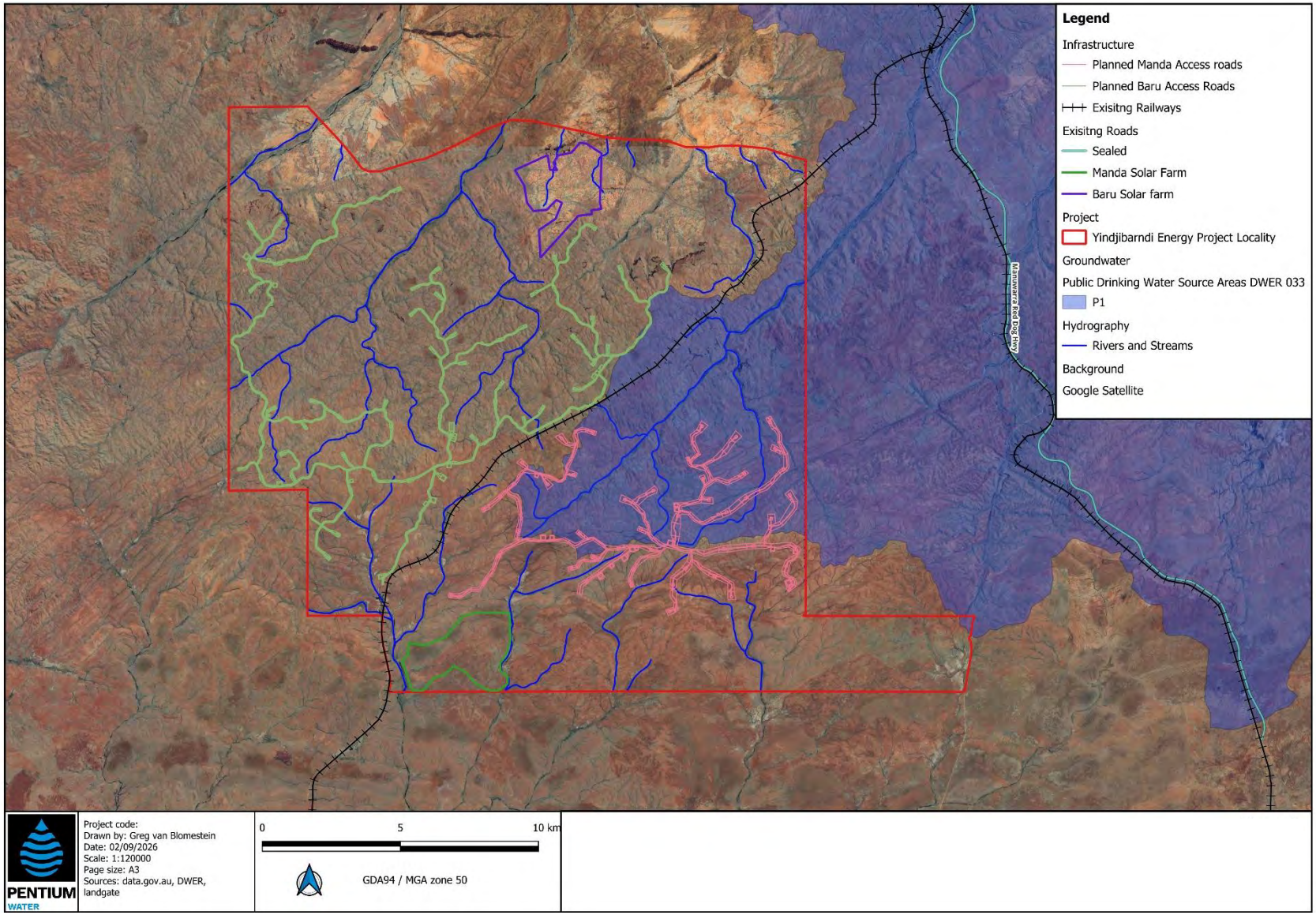


Figure 8: Harding Dam Catchment Dam

Fortescue River and Maitland River Catchments

The southern part of the project area intersects the lower portion of the Fortescue River catchment. Surface water from the Fortescue River catchment drains from the Hamersley Ranges.

The northern portion of the project area intersects the headwaters of the Maitland River catchment, which emanates from the Chichester Range.

Ephemeral water flows within the project area originate from the rangeland in direct response to rainfall events. Rainfall events mainly occur during the summer months, from December through March, and are associated with tropical cyclones. Surface water drains along shallow channels, creeks and smaller waterways towards the major rivers. Importantly, the water flowing in the creeks and waterways in the higher-gradient portions of the project area is typically short-lived and ceases soon after rainfall passes. In the larger river channels that drain larger catchments, runoff can persist for several weeks, and possibly months, following major rainfall events.

The Fortescue River and Maitland River catchments within the project area support the following hydrological connections

1. Recharges the underlying aquifers during flood events.
2. The water sustains riparian vegetation and permanent or semi-permanent pools.

Figure 9 illustrates the local catchment boundaries.

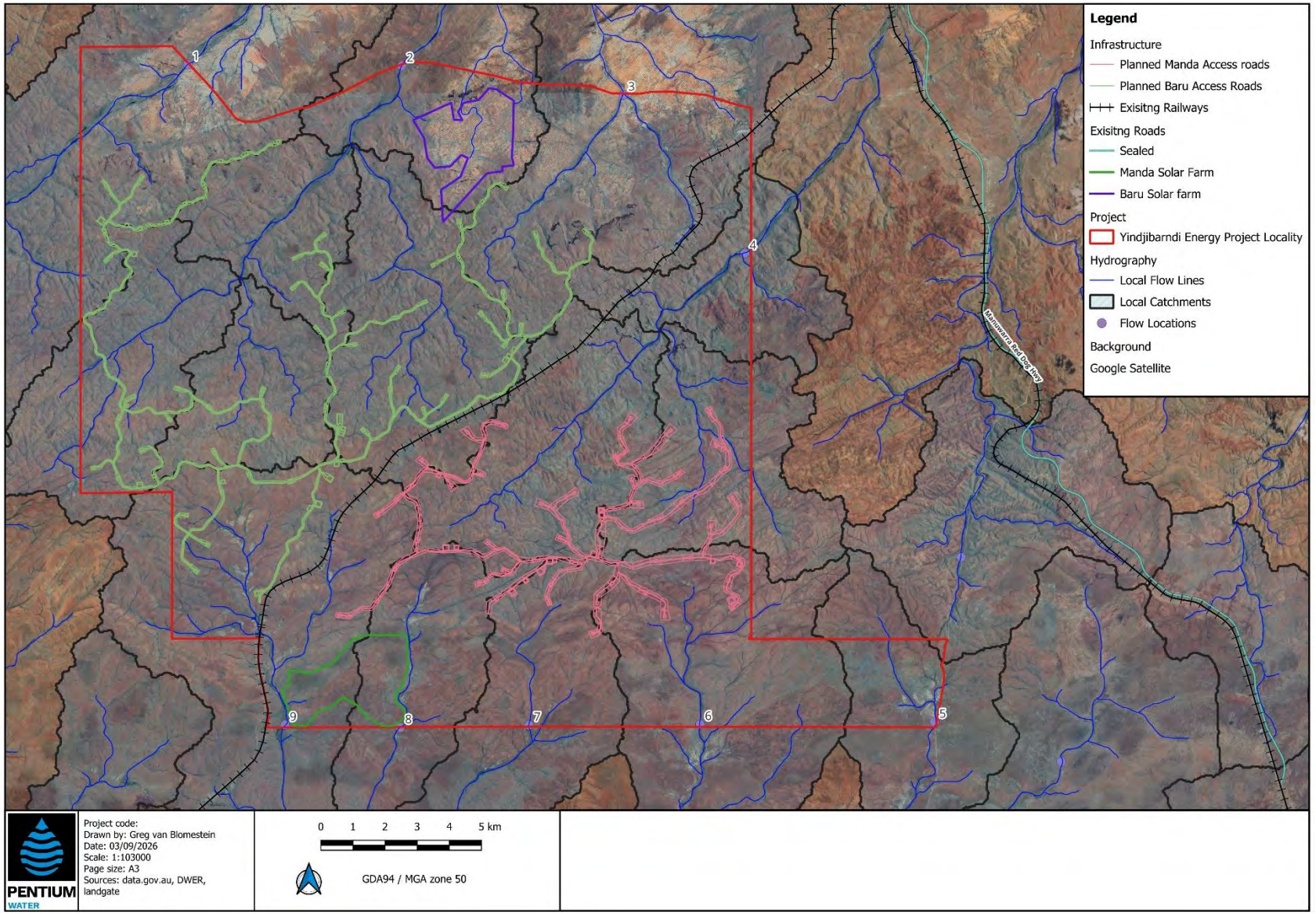


Figure 9: Local Surface Water Catchment Boundaries

2.2.3.2. Flood Modelling Methodology

Surface water post-rainfall events (minor and significant) within the project area across the Fortescue River, Maitland River and Harding River catchments were subject to surface water modelling.

The flood model (HEC-RAS) was used to undertake 2D hydraulic modelling based on the existing topography (i.e., a digital terrain model) and existing infrastructure, i.e., the rail line, access roads, and the Manuwarra Red Dog Highway. A rain-on-grid (RoG) model was used to represent terrain topography from the available LIDAR survey and FABDEM (global terrain) data where LIDAR is not available.

The model performs hydraulic calculations over the terrain and network of natural channels and flow paths.

Flood Terminology

Probability terminology from the 2019 Australian Rainfall and Runoff (Bell et al, 2019) has been adopted, in particular the term Annual Exceedance Probability (AEP). AEP is defined as the probability of a rainfall event being equalled or exceeded within a year, usually expressed as a percentage (%). It is the chance that a rainfall event of a given size or larger will occur in any given year. The flood model adopted the following AEP events:

- 1% AEP (i.e., 1% chance of occurring).
- 5% AEP (i.e., 5% chance of occurring).

Pre-Development Surface Water Modelling Observation

Key observations from the 1% AEP pre-development surface water modelling include:

- The maximum flood depths reach several metres in the larger creeks, while being less in the smaller tributaries that drain the hilly terrain and feed into these larger watercourses.
- The velocities in the larger creeks are generally low (<2 m/s), with occasional localised areas of higher velocity.
- Maximum velocities were predicted in the steeper (rocky) feeder gulleys located higher in the topography.

The 1% AEP (100-year event) maximum flood depth and velocities are shown in Figures 10 and 11.

The modelling flows illustrate the typical water movements originating from the Fortescue and Chichester Ranges, characterised by rapid runoff in the steep-gradient rocky upland areas during heavy rainfall. Water flows quickly to lower valleys and then into the Fortescue, Maitland, and Harding Rivers along widening creek lines.

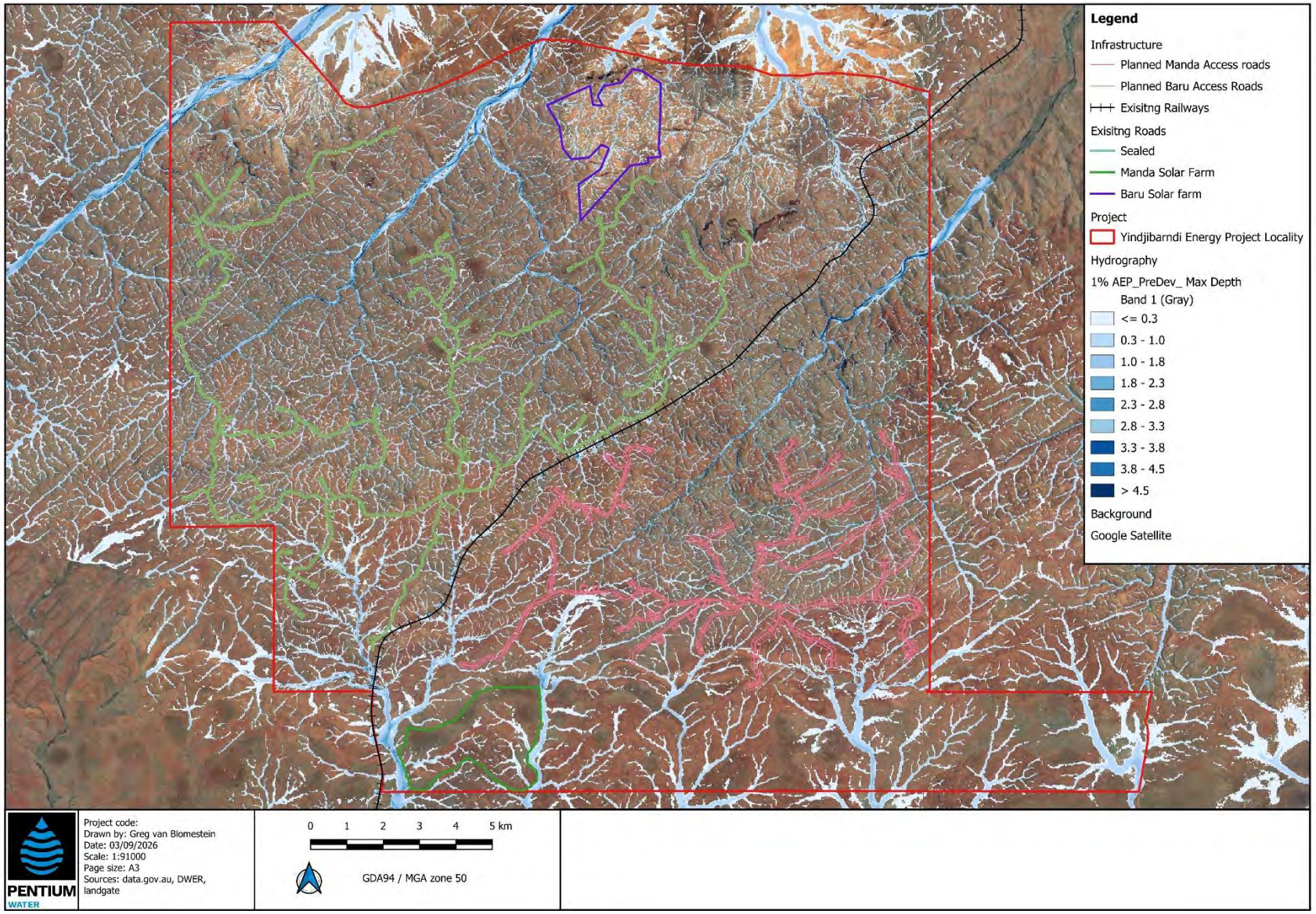


Figure 10: 1% AEP Pre-Development Flood Depths

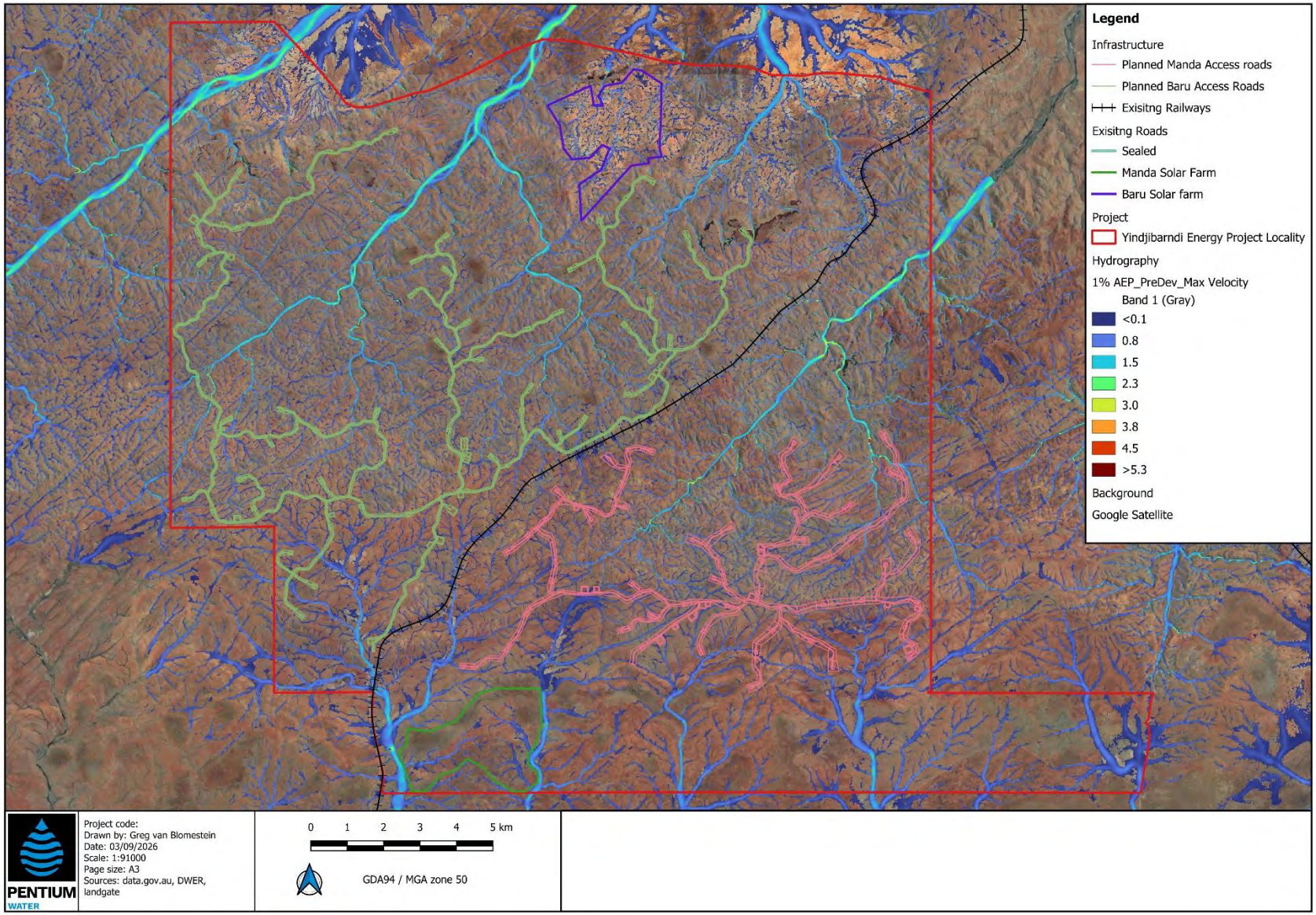


Figure 11: 1% AEP Pre-Development Velocities

2.2.3.3. Post-Development Flood Modelling

The Marnda and Baru proposed infrastructure layout was added to the surface water (HEC-RAS) model to represent the post-development scenario, including access roads and associated creek crossings. The post-development modelling was undertaken for the 5% AEP and 1% AEP rainfall events

This modelling aimed to evaluate post-development stormwater peak runoff rates. The goal was to verify that surface water mitigation measures effectively prevent runoff rates from exceeding pre-construction levels during the 100-year storm event.

Adopted Mitigation Measures

The post-development surface water model and peak flow assessment adopted the following flood mitigation assumptions:

- Avoidance:
  - Locating the renewable infrastructure outside of major creeks.
- Mitigation:
  - The solar farm areas will be contained within a bunded area. The constructed bund will be up to 5 m in height.
  - Rainfall falling over the solar panel arrays is trapped inside the solar farm areas.
  - Installing floodways/culverts through access road. The culverts at creek crossings are to be sized for the 50% AEP flood event.
  - Construction of sediment control basins along access roads and adjacent to construction infrastructure areas, e.g., laydown areas and temporary concrete plants.

Post-Development Surface Water Model Observations

Key observations from the 1% AEP surface water modelling of the post-construction of the Marnda and Baru proposed renewable infrastructure include:

- No significant flooding risk is observed post-development, with major flows confined to the waterways and creeklines.
- The maximum flood depths consistent with the pre-development flows are:
  - Several metres in the larger creeks, and less in the smaller tributaries draining the hilly terrain and feeding into those larger creeks.
- The flow velocities in the larger creeks remain low (<2 m/s), with occasional localised areas of higher velocity. The post-development flow velocities broadly spatially align with the pre-development creek velocities.
- The solar farm bund situated adjacent to creeks and waterways results in a minor and localised increase in peak flow velocity downstream. This slight escalation diminishes within less than 500 meters downstream, aligning with pre-development flow conditions.
- The maximum velocities are contained within the steeper (rocky) feeder gulleys. This outcome matches the pre-development hydraulic gradient.
- No significant alteration to the flood risk (compared with the pre-development 1% AEP event) was observed for the following proposed and existing infrastructure elements:
  - The proposed renewable infrastructure areas and transmission corridor.
  - The existing central access road.
  - Rio Tinto rail line and the access road to the Ngurrawaana community.

The post-development modelling confirms that, with the implementation of key water management measures, the stormwater peak runoff rates align with the pre-development peak runoff rates.

The 1% AEP (100-year ARI) maximum flood depth and velocities are shown in Figures 12 and 13.

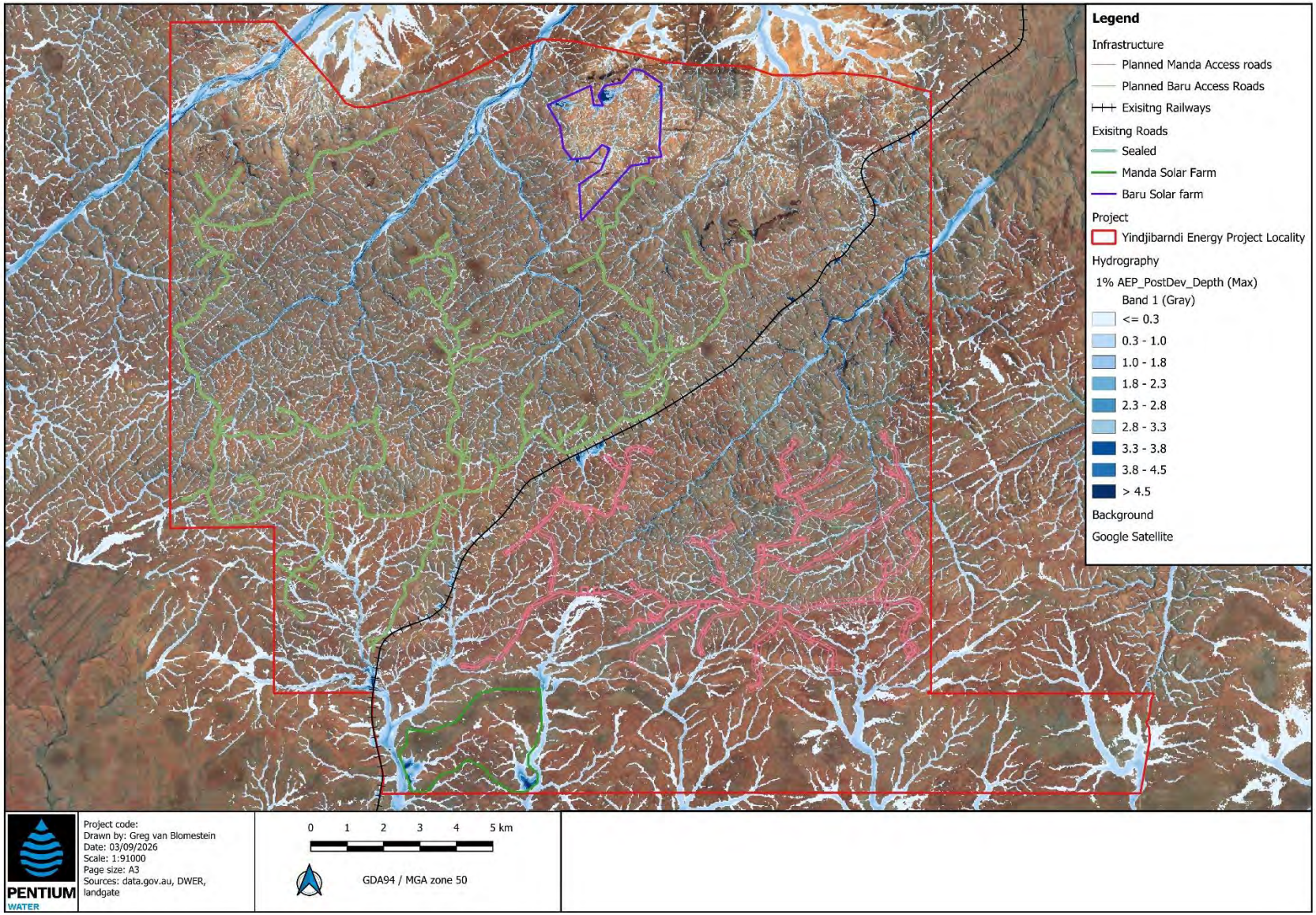


Figure 12: 1% AEP Post-Development Flood Depths

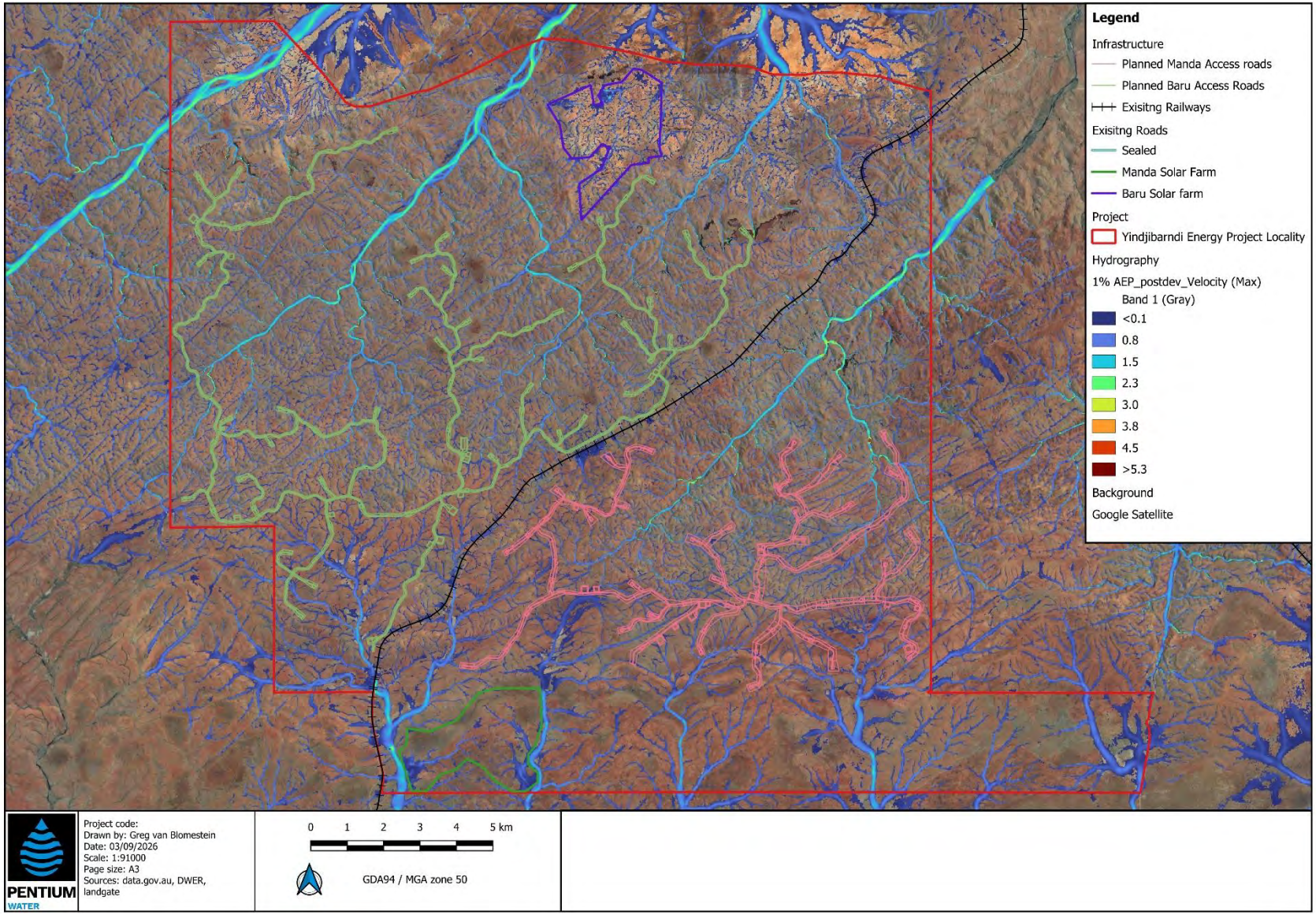


Figure 13: 1% AEP Post-Development Velocities

2.2.3.4. Surface Water Quality

Flow in Pilbara creeks is typically short-lived, occurring only after substantial rainfall. These intermittent flows often carry organic material, debris, and sediment. As such, surface water quality can vary significantly depending on recent weather patterns, local geology, and land cover. After rainfall, especially following dry periods, creek water often has high sediment loads due to loose, dry soil and sparse vegetation, which can lead to turbidity (cloudiness).

Surface water in the Pilbara following rainfall tends to have high sediment loads, moderate salinity, and neutral to slightly alkaline pH. Water is often turbid with suspended sediment, and as flow decreases, water in pools can become more saline and stagnant. These characteristics reflect the region's arid climate and sparse vegetation, as well as the mineral-rich geology of the Pilbara.

2.3. Water Supply

2.3.1. Potable Water

The peak potable demand will occur during the construction phase, which will require the engagement of a range of specialists and construction workers, as well as temporary workers' accommodation. Potable water will be supplied through the following options:

1. Water will be trucked to the project area from Karratha. This water will be stored in holding tanks.
2. A portion of the groundwater allocation will be subject to a reverse osmosis treatment plant to supply safe drinking water for the workers' operational camp and non-process infrastructure.

2.3.2. Water Demand

YEC have approval to abstract 200,00 kL/annum with the two licenses held (GWL 211498 and 211499) across the Pilbara and Hamersley Fracture Rock Aquifer.

2.3.2.1. Construction Phase

The 200,000 Kl/annum allocation will underpin water demand over the 3 to 6 year construction period. The key drivers of water demand during the construction phase include the concrete batching plant and dust control.

The Pilbara and Hamersley Fracture Rock Aquifer are highly reliant on recharge from rainfall. The project's groundwater abstraction approach is underpinned by the following approach:

- The construction of multiple bores within the targeted areas distributed across the fracture rock aquifers and the project area.
- Seasonal bore monitoring to assess water variability and annual yields for each production bore.
- Flexibility to reduce or cease abstraction from specific production bores demonstrating a reduction in water levels or yield.

2.3.2.2. Operational and Maintenance Phase

The operational water demand is significantly reduced to an estimated 3,100 kL/annum (0.1 L/s).

2.3.3. Project Water Supply Assessment

The project's construction and operational water supply will be sourced from the fracture rock aquifers in accordance with the approved groundwater licences 211498 and 211499.

The limited groundwater drilling operations completed to date (YW 2025) drew the following conclusions:

- Only three of six boreholes produce water.
- The yields obtained from two boreholes (PB01 and PB02) were notably low (<1 L/s). Conversely, the third borehole demonstrated a significantly greater productivity rate of 9.8 L/s.

- Groundwater was generally sourced over 70 m bgl.

The low-yielding production bore reflects the dominant underlying geology, which consists of low-porosity bedrock formations with limited zones of fractured rock.

2.3.3.1. Production Bore Location Avoidance Measures and Optimisation Criteria

Recognising the limitations in hydrological conditions and water supply, potential sites for groundwater extraction boreholes were subsequently identified based on the following criteria:

- Avoidance:
  - Avoiding all semi-permanent or permanent pools, creeks and rivers.
  - Avoid GDEs with the establishment of a minimum buffer to the GDEs of 500 m or 1,700 m depending on the water drawdown. Noting the groundwater subject to abstraction is located over 70 m bgl and is therefore disconnected from the water supplying the GDEs.
- Optimising bore yield:
  - Positioning bores within valleys or confluence zones to enhance the likelihood of accessing more sustainable water flows recharging the aquifers, within the lower catchment areas.
  - Targeting areas intersecting potential alluvial aquifers increases recharge potential and available volumes.
  - Targeting fractured rock geological structures with higher porosity and flow rates.
  - In proximity to geological faults or dykes.
- RiWi Act:
  - All proposed future production bores will be subject to a DWER approved 26D licence approving the construction of a bore.

Based on the above production bore siting criteria, 33 potential production bore locations were identified (Figure 14).

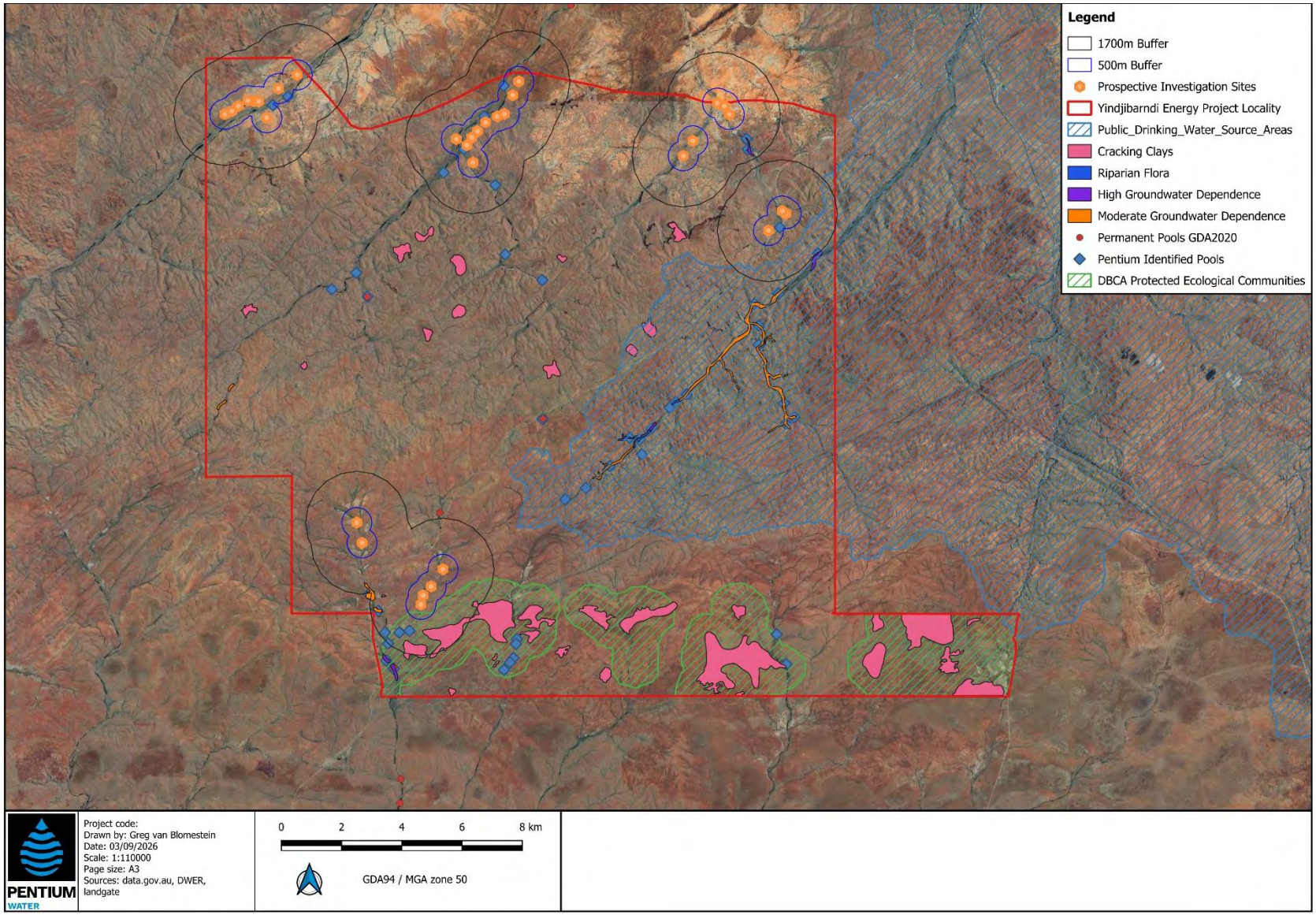


Figure 14: Prospective Groundwater Production Bore Sites

2.3.4. Wastewater Treatment

Wastewater management will be subject to a future detailed assessment premised on the construction methodologies, timeframes and workforce requirements. Recognising the hydrological constraints, any wastewater treatment design will be subject to the following criteria:

- Avoidance:
  - Located outside of the following sensitive areas:
    - The Harding Dam Catchment P1 PDWSA.
    - A minimum of 100 m buffer to creeks and waterways.
- Mitigation:
  - Adoption of best practice technology.
  - A bund designed to divert clean surface run-off and contain any accidental plant overflows will surround the perimeter of wastewater infrastructure, depending on the plant design.

Any future wastewater treatment application will address and respond to the following WA Health Department specific legislation and guidelines:

- *Health* (Treatment of Sewage and Disposal of Effluent and Liquid Waste) *Regulations 1974*.
- Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's) – where applicable.
- Guidance on Site-and-Soil Evaluation for Onsite Wastewater Management (Department of Health 2025).

2.4. Heritage

2.4.1. Yindjibarndi Cultural Heritage

The Baru Marnda Renewable Energy Project is located on Yindjibarndi Ngurra, on land where Yindjibarndi People hold exclusive possession native title rights and interests. The Yindjibarndi people are the primary source of information regarding the values of their heritage. Accordingly, the implementation of the Baru Marnda Renewable Energy Project is subject to an Indigenous Land Use Agreement (ILUA) and a Heritage Protection Agreement.

YEC is completing detailed heritage surveys across the project infrastructure area in collaboration with Yindjibarndi representatives.

2.4.1.1. Registered and Lodged Aboriginal Heritage Sites

Aboriginal heritage places and objects are legally protected in Western Australia by the AH Act. Reported Aboriginal heritage sites in accordance with the AH Act, situated within the project area, are presented in Table 7.

Table 7: Registered and Lodged Aboriginal Heritage Sites within the Baru Marnda Renewable Energy Project Area

Site ID	Heritage Site Status	Place Type
Access Route		
Plateau Hill / Powerline 084 (10943)	Registered	• Engraving • Other • Quarry
Powerline Survey 085 (10944)	Registered	• Quarry
Mirinkinya (7855)	Registered	• Camp • Water Source
W3-01 Artefact Scatter, Grinding Patches (18777)	Registered	• Artefacts/Scatter • Grinding areas/Grooves
KTP/FS5 (19908)	Registered	• Artefacts/Scatter Engraving • Grinding areas/Grooves Quarry
W3-03 Artefact Scatter (18780)	Registered	• Artefacts/Scatter

Site ID	Heritage Site Status	Place Type
W3-02 Grinding Patches	Registered	• Grinding areas/Grooves
KTP/FS6 (19909)	Lodged	• Artefacts/Scatter
Artefact Scatter (23046)	Lodged	• Artefacts/Scatter
Renewable Energy Infrastructure Area		
Portland River Tributary 2 (6892)	Registered	• Artefacts/Scatter • Quarry
Powerline Survey 080 (10940)	Registered	• Artefacts/Scatter
Powerline Survey 081 (10941)	Registered	• Artefacts/Scatter
Powerline Survey 087 (10894)	Registered	• Quarry
Portland River Tributary 1 (6891)	Lodged	• Artefacts/Scatter
Powerline Survey 079 (10938)	Lodged	• Artefacts/Scatter
Powerline Survey 083 (10939)	Lodged	• Artefacts/Scatter
Munni Munni 5/2001 (18993)	Lodged	• Engraving

The spatial location of the reported Aboriginal sites within the project area is shown in Figure 15.

2.4.1.2. Yinjibarndi Knowledge Informed Design

The water systems within the Baru Marnda project area have historically supported ecosystems and cultural traditions of the Yindjibarndi custodians. YEC recognises that waterways, creeks, rivers, and aquifers are vital to Yindjibarndi cultural and environmental heritage. As a result, the project design has been guided by consultations and site surveys conducted with the Yindjibarndi community.

2.4.2. Aboriginal Heritage Avoidance and Mitigation Measures

The YEC projects are the most advanced of any First Nations renewable energy projects in Western Australia. Key agreed avoidance and management measures formally adopted in the ILUA and a Heritage Protection Agreement include (Coterra 2025):

- Avoidance:
  - The proposed wind and solar infrastructure areas will only be located in areas that are culturally, socially, or environmentally acceptable to YAC and the Yindjibarndi Ngurra Aboriginal Corporation (YNAC).
  - All construction activities will comply with the ILUA and Heritage Protection Agreement.
  - Where places and objects of cultural significance are identified, no disturbance to these sites will occur without the express consent of YAC and YNAC.
- Mitigation:
  - To ensure the promotion, preservation and management of Yindjibarndi cultural heritage within and in the vicinity of construction activities, a project-specific Cultural Heritage Management Plan (CHMP) will be prepared and implemented. The CHMP will be prepared in a manner consistent with the ILUA and associated Heritage Protection Agreement and will be informed by detailed heritage surveys.

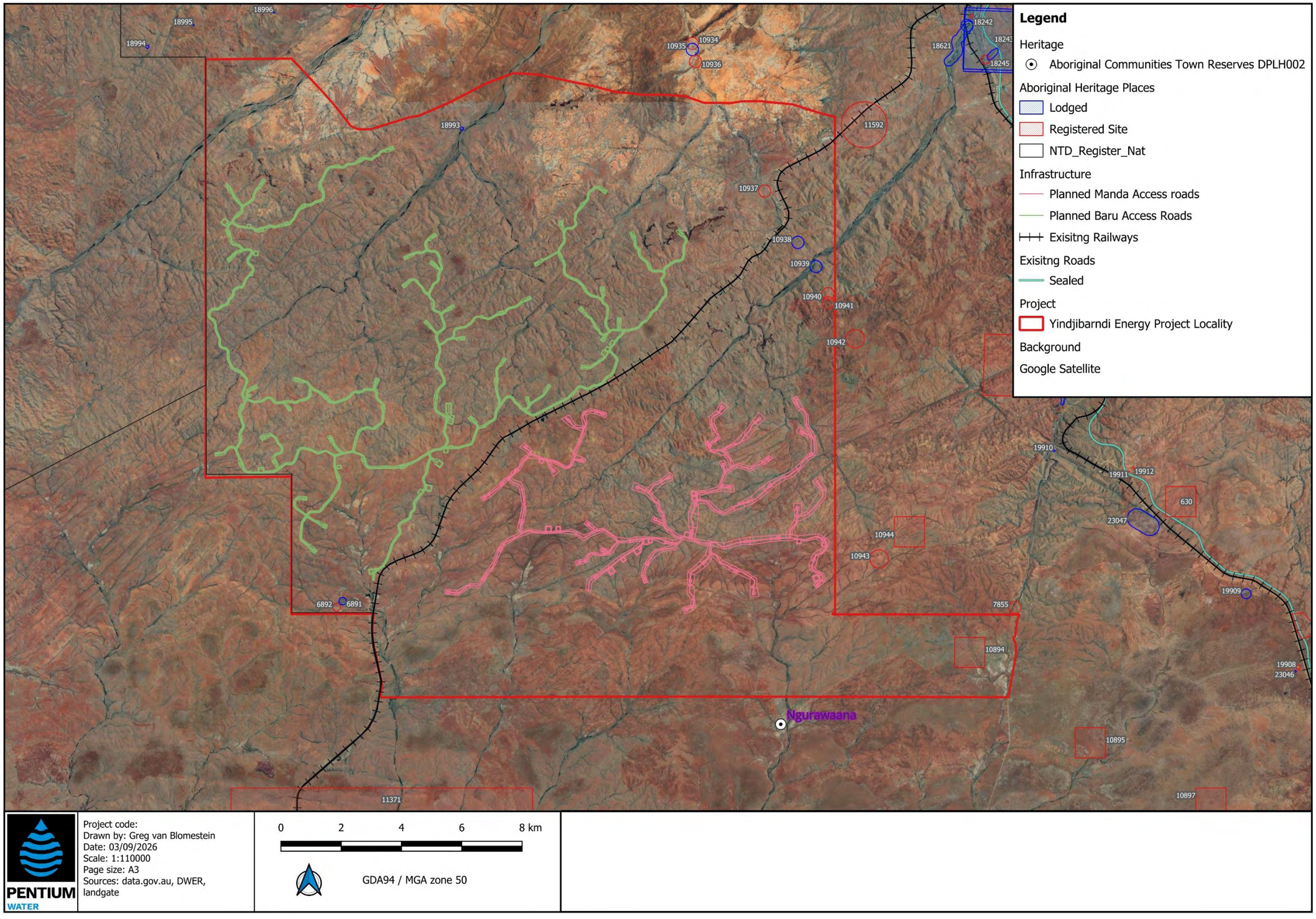


Figure 15: Registered Aboriginal Heritage Sites

3. Water Management

3.1. Hydrological Receptors

The key features within the project area and regional area which contain known or potential hydrological receptors include:

3.1.1. Surface Water Receptors

- Major river systems including the Fortescue, Maitland and Harding Rivers.
- Creeks, waterways and permanent and semi-permanent pools.
- Permanent and semi-permanent pools host riparian vegetation and are considered to have high ecological and cultural value due to the presence of water for extended periods, which is rare in the region.
- Harding Dam P1 PDWSA. The P1 classification of the Harding Dam catchment means that land use risk avoidance and the maintenance of existing surface water flows are the main goals.

3.1.2. Riparian Vegetation and GDE Communities Receptors

  - The botanical assessment evaluated the groundwater dependence of each riparian vegetation community as High and Moderate groundwater dependency (C1, C2, C3 and C4) to Low groundwater dependency (C5 and C6) (Mattiske 2025).
  - Spatially, the GDE vegetation was observed at the following locations (Mattiske 2025):
    - The high groundwater dependency (C2) occurred primarily in the deepest valleys/gorges where groundwater flow is supplied by the surrounding hills.
    - The moderately groundwater dependent communities (C1 and C3) loosely corresponded with moderately deep valleys.
    - Vegetation communities C5 and C6 with low groundwater dependence were associated with minor drainage channels in headwaters and on hilltops.
  - Vegetation communities C2 and C4 were assessed as Riparian Flora and Plant Communities PEC (P2). The vegetation present, particularly *the Melaleuca argentea plant species* (which is entirely groundwater dependent), indicates the high water permeability of these areas (Mattiske 2025).
  - These vegetation communities are dependent on surface water flows and potentially the underlying Alluvial Aquifer.

3.1.3. Groundwater Receptors

- The project area comprises the following two groundwater systems:
  - A shallow Alluvial Aquifer groundwater system associated with the rivers, drainage lines and creeks that flow through the project area
  - A deeper Fractured Rock Aquifer groundwater system with low permeability and storage characteristics.
- YEC is the proponent of two groundwater licences. These licences permit the abstraction of 200,000 kL of groundwater from the Fractured Rock Aquifer.
- The Fractured Rock Aquifer is episodically recharged from major, sustained cyclonic or seasonal flood events that surface water pools long enough to infiltrate deep vertical fracture networks.

3.1.4. Heritage and Cultural Receptors

The project area contains registered and lodged heritage sites.

3.2. Regulatory Requirements

The implementation of Baru Marnda renewable energy is governed by environmental legislation at both the Commonwealth and State levels. Legislation directly concerning the management of water is outlined in Table 8.

Table 8: Commonwealth and State Legislation relating to Water Management

Legislation	Application
EPBC Act (Cth)	Protection of environmental matters of national significance such as national heritage sites, wetlands of international importance, nationally threatened species, and ecological communities and migratory species
EP Act	Prevention, control, and abatement of pollution; conservation, protection, and enhancement of the environment. The Baru Marnda renewable energy will be required to obtain a licence under Part V of the EP Act to supply power and operate a temporary concrete plant as 'prescribed premises' under the Act.
RiWi Act	Relates to rights in water resources, to make provision for the regulation, management, use and protection of water resources, to provide for irrigation schemes, and for related purposes. A permit to obstruct or interfere with beds and banks, as defined under the Act, will be obtained.
Soil and Land Conservation Act 1945	Addresses the conservation of soil and land resources and the mitigation of erosion impacts.
Biodiversity Conservation Act 201	Provides for the conservation and protection of wildlife (flora and fauna).

The following standards and guidelines are also of relevance to this WMR:

- Harding Dam Water Source Protection Plan – West Pilbara Water Supply Scheme (Waters and Rivers Commission 1999).
- WQPN 10: Contaminant Spills — Emergency Response Plan (DWER 2020).
- WQPN 56: Tanks for Fuel and Chemical Storage near Sensitive Water Resources (DWER 2018).
- Dangerous Goods Safety Act 2004 and Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007
- *Occupational Safety and Health Act 1984*
- *Environmental Protection* (Controlled Waste) *Regulations 2004*.
- *Health* (Treatment of Sewage and Disposal of Effluent and Liquid Waste) *Regulations 1974*.
- Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's) – where applicable.
- Guidance on Site-and-Soil Evaluation for Onsite Wastewater Management (Department of Health 2025).

3.3. Baru Marnda Renewable Energy Project Summary

The Baru Marnda Renewable Energy Project is proposed to be constructed over an estimated three to six-year period. The operational period is approximately 50 years.

The Baru Marnda renewable energy key infrastructure and project area is shown in Figure 1.

The proposed renewable layout within a development envelope of 42,127.47 ha occurs in four stages (i.e., two solar and two wind farm stages) and incorporates the following infrastructure elements:

- Two solar generation stages.
  - Up to 500 MWac.
- Two wind generation stages.
  - Up to 810 MWac from up to 108 turbines.
- Permanent infrastructure:
  - Electrical reticulation and transmission lines (overhead and/or underground)
  - Substations and switchyards
  - Internal access roads
  - BESS
  - Satellite offices
  - Operations and maintenance facilities
  - Groundwater production bore and associated pipelines

- Construction infrastructure:
  - Laydown and storage areas
  - Borrow pits (sand and rock material)
  - Turkey's nest(s)
  - Temporary concrete plant(s)
- Access Roads
  - Internal road access routes connect the project area with Warlu Road/Manuwarra Red Dog Highway to the east.
- Rehabilitation
  - Approximately 4,250 ha of the approved cleared area will be restored during the project's decommissioning phase.
  - Groundwater production bores

3.3.1. Hydrological Risks, Avoidance and Mitigation Measures

Cyclones or severe tropical storms that generate extreme rainfall naturally drive high-energy sheet wash and torrents across the Hamersley and Chichester ranges. This natural process rapidly mobilises weathered fine clays, skeletal soils, and alluvial sediments, flushing loads of suspended material into the catchment via waterways and creeks towards the major regional rivers. The creeks and river systems have evolved in response to periods of high-intensity rainfall and associated spikes in turbidity and siltation, which can temporarily alter aquatic and riparian habitats.

In summary, the Baru Marnda Renewable Energy Project is situated in a region characterised by elevated sediment mobilisation. This results in increased turbidity in waterways, creeks, and rivers during rainfall events.

To reduce hydrological risks associated with the proposed construction and operational activities, the Baru Marnda renewable energy project employs a range of water conservation, mitigation, and management strategies that align with existing stormwater runoff patterns and comply with regulatory standards.

Table 9 highlights the construction and operational activities of the Baru Marnda renewable energy project that could affect surface and groundwater, as well as the adopted mitigation strategies currently in place to avoid, mitigate, or manage the identified impacts.

The potential impacts to the hydrological environment and the existing adopted mitigation strategies are discussed in more detail in the following sections.

Table 9: General Construction and Operational Activities and their Associated Potential Hydrological Impacts

Activity	Potential Hydrological Impacts	Adopted Avoidance and Mitigation Measures
• Construction of solar and wind farm infrastructure and associated access roads, laydown areas, satellite offices and borrow pits.	• Alteration of surface water volume and flow regimes. • Erosion of exposed surfaces by wind, water and construction activities generating sediment loads in surface water runoff flows. • GDE, riparian vegetation and fauna habitat loss	**Avoidance** • No incompatible land uses (such as concrete batching plants) being proposed within the mapped Harding Dam P1 PDWSA pursuant to Water Quality Protection Note 25 (DWER 2021). • All power infrastructure support poles are to be located outside the 1% AEP creek flood areas. • The proposed wind and solar infrastructure areas will only be located in areas that are culturally, socially, or environmentally acceptable to YAC and the YNAC. **Minimise** • Co-location of linear infrastructure where possible, to minimise the number and extent of creek line crossings required. • Construct stormwater infrastructure including bunding and sedimentation basins to: o Divert surface water flows around high-risk activities such as the concrete plant, wind turbines and solar farm. o Capture and treat dirty water run-off prior to release downstream. • The modification of creeks or waterways through new or upgraded road crossings will be subject to the following DWER approval: o Application to Interfere with Bed and Banks (Form 3P). • A key focus of the Bed and Banks application and approval will be the following elements: o Demonstrating the maintenance of pre-development surface water flows. o The protection of riparian vegetation. o Sediment and erosion controls during the construction phase. **Rehabilitate**
• Storage of stockpile material and hazardous substances.	• Reduction in water quality through: o The release of sediment or contaminated material/hydrocarbon or chemicals to nearby surface water and/or groundwater environments	
• Dust suppression activities	• Discharge of water and wash-off of sediments into surrounding waterways and creek environments.	

Activity	Potential Hydrological Impacts	Adopted Avoidance and Mitigation Measures
		• Rehabilitation of the indicative disturbance footprint following the construction phase. • Rehabilitation of the substantial remainder of the indicative disturbance footprint during the project's decommissioning phase. • All rehabilitation being undertaken with the aim of returning land to its pre-development uses where possible.
• Groundwater abstraction	• Changes to groundwater levels in the Fractured Rock Aquifer.	**Avoid and Minimise** • The groundwater within this aquifer is situated between 60 m and 80 m below ground level and, therefore, is not directly connected to riparian or GDE vegetation. However, to minimise potential impacts, the groundwater production bores implement the following avoidance measures in proximity to the following specified hydrological features: o Avoid all semi-permanent or permanent pools, creeks and rivers. o Avoid GDEs through the implementation of a minimum of 500 m or 1,700 m depending on the water drawdown to riparian vegetation/GDEs. • Groundwater abstraction will be undertaken in accordance with the DWER approved GWL 211498 and 211499. • Annual reporting on the two groundwater licences. The reporting includes water use data, monitoring results, and compliance.

3.4. Hydrological Mitigation Actions

3.4.1. Management Objectives

The following performance objectives to prevent the unmanaged discharge of surface water to the surrounding environment from the project's construction and operational activities:

- Maintain the integrity of flow paths and water quantities to protect riparian vegetation, GDEs and associated Alluvial and Fractured Rock Aquifers.
- Minimising ground disturbance and other environmental impacts on significant vegetation.
- Minimising the impact of flooding.
- Minimising the potential impacts associated with altered hydrological regimes.
- Preventing leaks or spills of chemicals and other contaminants from entering surface water.

3.4.2. Surface Water

The significant surface water risks are primarily focused during the project's construction phase, which requires the following activities:

- Land clearing and creation of borrow pits.
- Construction of access roads including creek and waterway crossings.
- The installation of temporary infrastructure including concrete plants, sand/rock stockpiles and laydown areas.
- Power line and BESS infrastructure.
- Spillage of hydrocarbons, chemicals handled or transported on site.
- The installation of flood and sediment control management measures, i.e., bunds, diversion drains and sediment ponds.

Operationally, the surface water risks diminish. The key risks focus on:

- Spillage of hydrocarbons, chemicals, waste water stored, handled or transported on site.
- Reinstatement of flood and sediment control management measures.
- Truck wash down.

3.4.2.1. General Avoidance Actions

The project's construction and operational activities will protect the Harding Dam Water Catchment (water supply) Area through the following avoidance actions:

- No incompatible land uses being proposed within the mapped Harding Dam P1 PDWSA pursuant to Water Quality Protection Note 25 (DWER 2021).
- All power infrastructure support poles are to be located outside the 1% AEP creek flood areas.
- The concrete batching plant, fuel and refuelling area, and laydown areas will be located a minimum of 500 m from any creek or waterway.
- Locate and design borrow pits to minimise interference and disruption of natural surface water flows and any potential downstream impacts to surface water dependent systems.

3.4.2.2. Surface Water Management

The project area is in an environment with ephemeral creeks that are subject to flooding events following rainfall, predominantly during the wet season, particularly during the summer months from January to March, when the potential exposure to high-intensity tropical cyclone-related rainfall is greatest.

The hazard that such events pose to onsite facilities depends, amongst other things, on the following:

- The magnitude of the flood event.
- The proximity of the facility to the watercourse in flood.
- The sensitivity of the facility to flooding.
- The level of protective flood measures provided to the facility.

The last three factors can be controlled or mitigated; however, the magnitude of the naturally occurring rainfall-runoff events that may lead to flooding cannot be controlled. Some remedial earthworks requirements would be expected following greater-than-design events.

The flood risks were assessed on the likelihood of occurrence each year, and the potential impacts on the construction works and specific assets. The flood standards presented reflect the intended function and criticality of the various infrastructure elements. 1% AEP has been applied to critical infrastructure requiring a greater level of immunity (i.e. all power infrastructure).

Table 10 summarises the preliminary design criteria adopted for the Baru Marnda renewable energy infrastructure.

Table 10: Infrastructure Design Criteria

Infrastructure		AEP	Freeboard	Avoidance
High Risk Infrastructure				
Laydown area		1% AEP	500 mm	• The infrastructure is located outside of the mapped Harding Dam P1 PDWSA. • All power infrastructure support poles are to be located outside the 1% AEP creek flood areas. • The concrete batching plant, fuel storage and refuelling area, and laydown areas will be located a minimum of 500 m from any creek or waterway.
Fuel and chemical storage		1% AEP	500 mm	
BESS		1% AEP	500 mm	
Concrete plant		2% AEP	500 mm	
Rock and sand stockpiles and laydown area		2% AEP	500 mm	
Access Roads				
Entry and Access Road	Culverts	50% AEP	150 mm - 300 mm overtopping the road	• The modification of creeks or waterways through new or upgraded road crossings will be subject to the following DWER approval: o Application to Interfere with Bed and Banks (Form 3P). • A key focus of the Bed and Banks application and approval will be the following elements: o Demonstrating the maintenance of pre-development surface water flows. o The protection of riparian vegetation. o Sediment and erosion controls during the construction phase.
Wind farm access roads	Culverts	50% AEP	150 mm - 300 mm overtopping the road	

Solar Farm and Construction Infrastructure Areas

The strategy for surface water management addresses the following areas:

- **Solar Farm Areas**
  - Flood Management
    - Two creeks run north-south along the eastern and western sides of the proposed solar farm footprint. Flood bunding along the eastern and western sides will be constructed to prevent external flows from entering the solar farm areas.
    - The constructed stormwater bund diverts ‘clean’ water runoff away from the higher-risk construction activity areas. This water does not need to be directed to run-off sediment ponds.

        - Flood depths along the western edge of the project area reach up to 2 m during the 1% AEP event, and 1.5 m along the eastern boundary. The water velocities are relatively low, at less than 2 m per second; therefore, erosion protection measures such as rock rip-rap are deemed unnecessary.
    - Sediment and Water Quality Management
        - Rain runoff collected within the solar farm areas shall be directed towards constructed sediment basins via diversion drains or low bunds as necessary.
        - The sediment basins will be located at topographical low areas.
- **Construction Activity Areas**
    - Flood protection bund will be constructed for the following infrastructure areas:
        - Laydown area
        - Fuel storage areas
        - Sand and rock stockpile areas
        - BESS
        - Temporary concrete plant.
    - Within the construction activity areas, the following surface water management actions will be adopted:
        - Surface water run-off will be captured or diverted through the following:
            - Bunds and/or diversion drains.
        - All surface water runoff will be diverted towards sediment ponds. The basins will be designed with respect to the catchment and predicted flow levels during higher-rainfall events.
        - Temporary surface water structures will be designed to reduce run-off velocities by using a combination of bunds, wide diversion drains and sediment basins.
        - Revegetation will be undertaken at the completion of temporary construction areas.

Wind Farm Infrastructure Area

- **Construction Activity Phase:**
    - The wind turbine foundations will primarily be located at elevated points within the rangeland area. The wind turbine pads constitute a minimal proportion of the overall surface water catchment areas.
    - During the wind turbine construction phase, to reduce total suspended solids (TSS) in water flowing offsite, the pads and laydown areas will be graded to a low point (away from the access road) and bunded to trap and retain sediment and water at a set location. The retained water would evaporate or, in a significant flood event, overtop the bund.
    - The sediment basin batter slopes will be protected with coarse material appropriate for the design slope and pad size to protect against erosion from local rainfall runoff.
    - Temporary laydown areas will be required at each wind turbine pad location. These temporary laydown areas will be subsequently minimised or rehabilitated during the operational phase.
    - Locate and design borrow pits to minimise interference and disruption of natural surface water flows and any potential downstream impacts to surface water dependent systems.

Access Road

- **Construction Activity Phase:**
    - A heavy vehicle access road, suitable for heavy vehicles and designed to transport wind turbine blades, is required to each turbine location, as well as for ongoing maintenance. This road will be constructed across creeks and minor waterways at bed level, but some creek crossings will require raised vertical road geometry to expedite wind blade transport.
    - A combination of floodways and culverts to ensure water does not get trapped behind road embankments, and existing downstream water flows are maintained.

- The type of infrastructure within waterway and creek crossings will be determined by the following criteria:
  - The level of immunity from flooding.
  - The time of closure acceptable during flooding.
- The water management response includes:
  - Low level floodway crossings (grading the road surface through the water course and gravelling the surface as required) allow water to flow across the roads at natural flow paths. For cars and trucks, road closure is normally assumed when the flow depth exceeds approximately 0.25 m and 0.5 m respectively. These floodway crossings will require maintenance post storm event.
  - In elevated areas, where the road passes across an incised creek, increasing the downslope velocity and scouring risks, the following actions will be taken:
    - The road pavement will be designed and protected to withstand periods of submersion.
    - Installation of culverts designed for the 50% AEP rainfall event to ensure continued flow in the creeks downstream.
    - During larger events (i.e. 5% or 1% AEP), the culverts will not have a significant impact on peak flood levels; however, they will reduce the time of any ponding behind the roads and ensure flow is not fully blocked from the downstream environment.
- Detailed road crossing designs should incorporate floodway armouring and other details to provide scour mitigation.
- Road batter slopes will be protected with coarse material appropriate for the road design slope to protect against erosion from local rainfall runoff.
- The construction activities within waterways and creek beds will be undertaken in accordance with a DWER approved permit to interfere with bed and banks (Form 3P).

Sedimentation Basin Design

- The central erosion and sediment control measures within the disturbed areas focus on capturing and treating dirty water runoff prior to release downstream through bunding and sediment basins.
- The detailed design of sedimentation ponds will be based on removing the settleable fraction down to a selected minimum design particle size based on an analysis of the sediment particle size distribution reporting to the pond. The target particle sizes for detention include:
  - Silt (2–63 µm).
  - Fine sand (63–200 µm).
- During significant flood events, water will flow out of the sediment basin over a spillway, set within the allowed freeboard.
- The sediment basin design can be configured as follows:
  - A dry basin continually drains through a ‘control’ outlet (such as an overflow pit/pipe system) over a day or so, and the basin is therefore normally dry.
  - A wet basin has no ‘control’ outlet, hence any water trapped in the basin is left to slowly infiltrate and evaporate.
  - The sediment basin batter slopes will be protected with coarse material appropriate for the design slope to protect against erosion from local rainfall runoff.
- Sedimentation basins are retained in place until revegetation of surfaces and surface stability has been achieved. The basin and bunds are then removed.

3.4.3. Groundwater

The DWER approved YEC groundwater licences (GWL 211498 and 211499) are situated within the deeper Fractured Rock Aquifers (Hamersley and Pilbara). According to the historical drilling program, the Fractured Rock Aquifer within the project area is located at depths ranging from 70 m to 80 m bgl. At this depth, the aquifer is not directly connected to riparian

or GDE vegetation. These vegetation communities are predominantly situated along creek lines and around semi-permanent and permanent pools, and are typically associated with the Alluvial Aquifer.

3.4.3.1. Groundwater Management Focus

Groundwater management for the Baru Marnda Renewable Energy Project centres on the following elements:

1. The abstraction of groundwater from the Fractured Rock Aquifer will be undertaken in accordance with the DWER approved groundwater licences (GWL 211498 and 211499). These licences mandate annual reporting on water-use data, groundwater monitoring results, and compliance.
2. Locating the groundwater production bores outside of the confirmed hydrological and ecological features:
    a. Avoiding the P1 Harding Dam PDWSA.
    b. Avoiding all semi-permanent or permanent pools, creeks and rivers.
    c. Avoiding GDEs and setting a minimum buffer to the GDEs (based on a two-year drawdown period) at a minimum of 500 m or 1,700 m depending on the water drawdown.
3. Maintaining existing surface water flows that infiltrate into the Fracture Rock Aquifer, likely through alluvium-dominated surface geology.
4. Implementation of surface water controls and mitigation measures.

3.4.3.2. Fuel Storage and Refuelling

An onsite self-bunded fuel tank and refuelling area will be required during the construction phase to service operational machinery, vehicles, and generators. In addition to the fuel tank, other hydrocarbon sources that may be stored on-site include limited volumes of lubricating oil and coolant.

Fuel Storage Requirements

The bunded fuel storage tank will be located in a central refuelling area, at least 500 m from any creeks and waterways, and outside the mapped Harding Dam P1 PDWSA.

The tank will be constructed to the following specifications:

- The fuel storage tank and pipework will be stored above ground.
- The tank and refuelling area will be in high topographical locations and not near low-lying areas or areas prone to flooding.
- The fuel volume mirrors the fuel requirements.
- The fuel tank, including mobile diesel storage, will have integrated secondary containment. Integrated secondary containment includes:
- A second skin can contain the inner tank's full volume plus 10%.
- Non-earthen bunding per AS/NZ 1940.
- The tank fill points will be provided with an appropriate spill containment device to catch and contain any minor spill during refilling, per AS/NZ 1940.
- The tank will be designed to prevent overfilling (i.e., fitted with auto shut-off and high-level alarms).
- The tank signage will be consistent with Dangerous Goods Safety (General) Regulations (2007).
- Any leakage or spillage from a tank will be contained by bunding to prevent contamination of the surrounding soil or runoff from entering any watercourse or drainage system.

Hydrocarbon Spill Response

DWER's WQPN 10 Contaminant spills — emergency response plan (DWER, 2020) defines a scaled (High, Moderate and Low) impact response to potential hydrocarbon spills. The scale of the spill response depends on the volume of hydrocarbon discharged, the contaminant pathway, and the potential for impacts on people, the environment (including water resources), and property.

This WMR adopted the following scaled response criteria:

- Low spill incident: Less than 10 litres or less than 4 metres in diameter.
- Moderate or High spill incidents: Greater than 15 litres (Moderate) or greater than 30 litres (High).

In alignment with WQPN 10, the spill management response incorporates the following actions:

- Immediate Spill Control Actions
    - Take measures to protect life. Assist and remove injured persons from danger and provide first aid.
    - Take all reasonable measures to prevent access to the area.
    - Inform the YEC construction manager.
- Respondent staff will wear appropriate protective clothing (i.e., safety glasses, gloves) to address any spill events and control the source of the hydrocarbon spill.
- The staff, if safe, will control the source of the hydrocarbon leak, if possible, through the adoption of the following actions:
    - All pumps will be stopped and switched off.
    - If possible, isolate the area - cordon off the contaminated area, keep people at least 5 metres from the spill.
- Do not leave the spill site until the hydrocarbon spill is contained, the cleaned-up actions are completed, and the danger is removed.

3.5. Water Management Summary

A summary of the water management actions, including performance indicators, is provided in Table 11.

Table 11: Key Management Actions for Surface Water Management

Reference	Management Actions	Performance Indicators	Reporting	Timing	Responsibility
Implement water management actions to minimise potential impacts on surface water flows, surface water quality and associated riparian and GDEs					
1	• Ensure staff and contractors are provided with appropriate training to ensure impacts to surface water and associated riparian vegetation and GDEs within identified high risk areas are minimised.	• Inductions completed. • Role dependent training completed.	• Induction materials and register of attendees. • Training materials/ records.	All stages.	YEC Project Manager/ HSES Manager.
2	• Ensure drainage infrastructure location and associated construction activities align with the detailed engineering design for creek road crossing and culverts, sediment basins, flood bunds to minimise impacts to surface water flows, quality and associated riparian vegetation and GDEs.	• Location and construction of the drainage infrastructure align with the detailed engineering plans.	• Monitoring reports.	Construction phase.	YEC Project Manager/environmental team.
3	• Construct road, creek, and waterway crossings, including culvert installation and batter management consistent with the DWER approved permit to interfere with bed and banks.	• Compliance with the DWER approved permit.	• Permit to interfere with bed and banks compliance monitoring report.	Construction phase. All creek and waterway crossings.	YEC Project Manager/environmental team.
4	• Locate and design borrow pits to minimise interference and disruption of natural surface water flows and any potential downstream impacts to surface water dependent systems.	• Location and design of borrow pits reduce downstream impacts.	• Pit design.	Construction phase / borrow pit design and extraction periods.	YEC Project Manager/environmental team.
5	• No incompatible land uses (such as concrete batching plants and fuel storage areas) being proposed within the mapped Harding Dam P1 PDWSA pursuant to Water Quality Protection Note 25 (DWER 2021).	• High risk and incompatible land uses are located outside of the Harding Dam P1 PDWSA.	• Confirm compliance in site location and spatial mapping.	Construction and operational phases.	YEC Project Manager/environmental team.

Reference	Management Actions	Performance Indicators	Reporting	Timing	Responsibility
6	• Hydrocarbon storage areas, concrete batching plant, and laydown area will be designed, constructed, and operated a minimum of 500 m outside of creeks.	• Location of the high-risk infrastructure aligns with the detailed engineering plans and is located a minimum 500 m from creeks.	• Confirm compliance in site location and spatial mapping.	• Construction and operational phases.	YEC Project Manager/environmental team.
7	• Ensure that the fuel storage and refuelling infrastructure are installed in accordance with Australian Standards.	• The fuel storage tank and associated infrastructure will be designed and constructed to the following specifications: o The fuel storage tank and pipework will be stored within a bund area. o The tank and refuelling area will be in high topographical locations and not near low-lying areas or areas prone to flooding. o The fuel tank, including mobile diesel storage, will have integrated secondary containment. o The tank fill points will be provided with an appropriate spill containment device to catch and contain any minor spill during refilling, per AS/NZ 1940.	• Confirm that the installation of the fuel storage tank, refuelling area and bunded area is in accordance with Australian Standards. • All maintenance actions will be documented. • Audit spill kit and firefighting equipment.	• Construction and operational phases.	YEC Project Manager/environmental team.

Reference	Management Actions	Performance Indicators	Reporting	Timing	Responsibility
		o The tank will be designed to prevent overfilling (i.e., fitted with auto shut-off and high-level alarms). o The tank signage will be consistent with Dangerous Goods Safety (General) Regulations (2007). o Any leakage or spillage from a tank will be contained by bunding to prevent contamination of the surrounding soil or runoff from entering any watercourse or drainage system. o The fuel storage tank and the associated refuelling infrastructure will be subject to regular maintenance to ensure compliance and operational safety. • Spill kits will be appropriately located, stocked, and held in proximity to the fuel storage and refuelling area			

Reference	Management Actions	Performance Indicators	Reporting	Timing	Responsibility
		to assist with containment of spills.			
8	• Where rainfall runoff has come into contact with hydrocarbon storage areas and is potentially contaminated, verify water quality meets discharge requirements prior to release to the environment.	• Monitoring demonstrates water quality within baseline limits.	• Surface water monitoring/laboratory results.	Construction and operational phases.	YEC Project Manager/environmental team.
Develop and implement a surface water monitoring program					
9	• Implement a surface water monitoring program in areas identified as high-risk areas where riparian and GDEs have been identified and potential impacts are significant.	• Monitoring program implemented	• Surface water monitoring reports	Operations/ decommissioning and closure.	YEC Project Manager/environmental team.
Groundwater management and monitoring program					
10	• Locating the groundwater production bores outside of the confirmed hydrological and ecological features: ○ Avoiding the P1 Harding Dam PDWSA. ○ Avoiding all semi-permanent or permanent pools, creeks and rivers. o Avoiding GDEs and setting a minimum buffer to the GDEs (based on a two-year drawdown period) at a minimum of 500 m or 1,700 m depending on the water drawdown.	• Location and construction of the production bore align with the GWL approval requirements. • Location of the production bores is confirmed to be located a minimum 500 m from riparian vegetation/GDEs.	• DWER annual groundwater monitoring report and compliance with the 26D licence to construct a bore approval.	Construction and operational phases.	YEC Project Manager/environmental team.
11	• Undertake groundwater monitoring as defined in the DWER approved groundwater licence.	• Monitoring program implemented	• Annual groundwater licence report.	Construction and operational phases.	YEC Project Manager/environmental team.

Reference	Management Actions	Performance Indicators	Reporting	Timing	Responsibility
Rehabilitation					
12	• Monitor the implementation of the rehabilitation program undertaken post the completion of temporary construction stages or staged works.	• Implement revegetation activities including the reinstatement of topsoil, contour ripping/scarification and/or seeding.	• Rehabilitation monitoring reports.	Operations/ decommissioning and closure.	YEC Project Manager/environmental team.

3.6. Predicted Outcomes

3.6.1. Surface Water Flows

The detailed hydraulic modelling (Pentium Water 2026) indicates that there will be no significant change or variability in surface water flows, or flow velocities post the implementation of flood and sediment mitigation measures.

Existing seasonal water flows along waterways and creek lines towards major river systems and the Harding Dam within and downgradient of the project area shall be preserved. Surface water flow will follow the pre-existing waterways and creeks and consequently will continue to sustain:

- Riparian and GDEs:
  - The creek line vegetation communities.
  - Riparian Flora and Plant Communities PEC (P2).
  - Cracking Clays of the Chichester and Mungaroona Range PEC (P1). The Cracking Clays of the Chichester and Mungaroona Range are considered to be dependent upon overland sheet-flow of water.
- Aquifers:
  - Replenish semi-permanent and permanent pools and the adjacent Alluvial Aquifers.
  - Sustain and replenish water within the deeper Fractured Rock Aquifer.
- Harding Dam catchment:
  - Surface water flows along creek lines and waterways towards the Harding Dam remain unaltered. The flow volumes across the Harding Dam catchment remain unaltered.

3.6.2. Surface Water Quality

Construction activities such as clearing, road upgrades, and creek crossings can cause erosion and sedimentation. To minimise erosion and scouring, sediment basins, flood bunds, and diversion drains will be employed, and, where necessary, erosion control measures such as rock armouring will be implemented.

The high-risk construction infrastructure will be subject to site-specific management measures including:

- Locating the infrastructure above the 1% or 2% AEP flood event.
- Placing the infrastructure inside containment bunds.
- Locating these infrastructure items outside of the mapped Harding Dam P1 PDWSA.
- Constructing the infrastructure in accordance with existing regulations and guidelines, such as:
  - WQPN 10: Contaminant Spills — Emergency Response Plan (DWER 2020).
  - WQPN 56: Tanks for Fuel and Chemical Storage near Sensitive Water Resources (DWER 2018).
  - Dangerous Goods Safety Act 2004 and Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007.
  - Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974.
  - Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's) – where applicable.
  - Guidance on Site-and-Soil Evaluation for Onsite Wastewater Management (Department of Health 2025).

3.6.3. Groundwater Levels and Quality

The groundwater within this aquifer is situated between 60 m and 80 m below ground level and, therefore, is not directly connected to riparian or GDE vegetation. However, to minimise potential impacts, the groundwater production bores implement the following avoidance measures in proximity to the following specified hydrological features:

- Avoid all semi-permanent or permanent pools, creeks and rivers.

- Avoid GDEs through the implementation of a minimum of 500 m or 1,700 m depending on the water drawdown to riparian vegetation/GDEs.

The abstraction of groundwater from the Fractured Rock Aquifer will be undertaken in accordance with the DWER approved groundwater licences (GWL 211498 and 211499). These licences mandate annual reporting on the water use data, groundwater monitoring results, and compliance.

3.6.4. Monitoring and Reporting

The implementation of the water monitoring program provides direct feedback on the mitigation and management measures for surface water and groundwater.

4. Water Monitoring Program

4.1. Water Monitoring

The guiding objectives of the water monitoring program include:

1. Obtain adequate data to measure spatial and temporal changes in site hydrology within the project area.
2. Determine if the quality of water being discharged via drainage and sediment basin infrastructure is significantly different from acceptable guideline values and/or control site values.
3. Monitor and measure the success of management measures to minimise potential scouring, sedimentation and contamination impacts during the construction phase.
4. Inform the groundwater yield, groundwater quality and levels.
5. Inform the adaptive management approach.

Baseline and operational monitoring will be informed by the findings of the monitoring itself as they become available. These findings may lead to ongoing refinements to this WMR and the associated management strategies in alignment with the adaptive management approach.

Baseline groundwater and surface water quality monitoring will be conducted following the construction of production groundwater bores and significant rainfall events. To account for seasonal variation, water samples will be collected over a three-year period to ensure a statistically valid dataset of the groundwater and surface water quality.

4.2. Water Monitoring Program Summary

The water monitoring program may adapt over time, depending on the quality and quantity of data collected at each monitoring site, with innovations in monitoring techniques and methodologies iteratively incorporated into the program design.

A summary of monitoring parameters and methods has been provided in Table 12.

Table 12: Monitoring Parameters and Methods

Monitoring Parameters	Method
Rainfall	**Rainfall gauge**
Surface Water Quality	Field measurements using calibrated instruments Field sample with laboratory analysis
Groundwater Quality	
Water Levels	Peak level indicators

Table 13 provides the monitoring parameters.

Table 13: Types and Associated Parameters and Site Locations

Type	Parameter	Site
Rainfall	Rainfall volume	• Suitable location within the project area.
Surface Water		
Surface water discharge points	Water levels	• Downstream of discharge point, within the approval area.
	Water Quality	• Downstream of discharge points, within the approval area.
Sedimentation basins, wash down facilities, hydrocarbon storage areas	Water Quality	• Discharge point of water ponds/sumps or closest sediment basin.
Creeks – representative sites	Water Quality	• Suitable representative location with safe access
	Water levels	
Groundwater		
Groundwater	• Groundwater quality • Groundwater levels • Abstraction volumes	• Groundwater production bores.

4.2.1. Contingency

The water monitoring program will be technically assessed and reviewed every three years throughout the construction phase.

The main objective of the assessment and review will be to ensure that the methods, parameters, and frequency used are appropriate to the findings of the monitoring program.

5. Reporting and Adaptive Management

5.1. Annual Monitoring Report

Annual monitoring reporting will be prepared summarising the results of the monitoring programs. This report will outline the monitoring data collected during the reporting period and the analysis required to assess compliance with baseline water quality targets.

YEC, as the proponent of two groundwater licences (GWL 211498 and 211499), is responsible, as a condition of the licence, to provide DWER with an annual groundwater report. This report addresses annual water abstraction volumes, groundwater quality, and groundwater levels.

5.2. Adaptive Management

YEC will implement adaptive management practices to learn from the implementation of mitigation measures, and to monitor and evaluate against baseline water quality targets, to more effectively meet the conditioned environmental objective.

Adaptive management practices may include:

- Evaluation of the monitoring program, data and comparison to baseline data and reference sites on an annual basis to verify whether responses to project activities are the same or similar to predictions.
- Evaluation of assumptions and uncertainties of the management and monitoring program.
- Re-evaluation of the hydrological risks as a result of monitoring outcomes.
- Review of management actions as the project matures and new management measures and technologies become available that may be more effective for environmental management.
- Assessment of changes which are outside the control of the project and the management measures identified (i.e. a regional change affecting management).

5.3. Review of the WMR

Review of this Plan will be undertaken every three years.

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