Graphinex – Esmeralda Graphite Project Environmental Impact Statement

Appendix D – Aquatic Ecology Assessment

GRAPHINEX

AQUATIC ECOLOGY ASSESSMENT

ESMERALDA GRAPHITE PROJECT



PREPARED FOR
Qld Aus Graphite Pty Ltd

30 September 2026

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1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) was commissioned by Qld Aus Graphite Pty Ltd (the Proponent or Graphinex) to undertake an Aquatic Ecology Impact Assessment for the Esmeralda Graphite Project (the Project) Environmental Impact Statement (EIS).

1.1 Project background

Graphinex proposes to develop the Project, located on light grazing land approximately 70 km south of Croydon, Queensland, Australia (Figure 1). The Project proposes mining of the Esmeralda Granite unit and on-site concentration of graphite ore.

Graphite is recognised as a 'critical mineral' by both the Queensland and Commonwealth Government, reflecting its strategic importance and limited global availability. Local production of graphite will aid the state's renewable energy transition. Furthermore, the advancement of this project will contribute significantly to establishing a sustainable, long-term supply of high-grade graphite, essential for a wide range of renewable energy applications. This initiative aligns with broader national and state objectives to secure vital resources for the emerging green economy and enhance energy independence.

In 2025, as part of the Commonwealth approval process, an *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) Referral for the Project was submitted to the Department of Climate Change, Energy, the Environment, and Water (DCCEEW). The Referral decision on 23 June 2025 states that the proposed action is not a controlled action.

The project is the subject of a 'Coordinated Project' Environmental Impact Statement (EIS) process. In recognition of the critical role this Project will play in the production and supply of graphite, the Project was declared a 'Prescribed Project' by the Queensland Government on the 13th of November 2025.

This assessment has been designed to address the Terms of Reference (ToR) for the EIS, issued in September 2025.

1.2 Project description

The Project proposes to construct and develop an open cut graphite mine, producing up to 3.5 Mtpa of run-of-mine (ROM) ore over an operational mine life of approximately 53 years. Mining is proposed to be via conventional truck and excavator methods, to a maximum depth of approximately 250 m below ground level. Ore extraction necessitates the implementation of controlled blasting techniques. Mine construction is scheduled to span approximately 24 months, with mining ramping up to 3.5 Mtpa ROM over the first three years.

Excavated overburden and non-ore-bearing material will be deposited in one of two out-of-pit waste dumps located adjacent to the mining void. The majority of waste movement will occur within the first 18 years of the mine life.

Graphite ore will be trucked to the mineral processing plant for stockpiling and concentration via conventional flotation methods. The processing method includes an initial crushing and milling circuit that liberates the graphite in 106-micron product. Ore is then fed to a flotation circuit consisting of rougher and flotation stages. Flotation tailings produced from the mineral processing circuit will be transferred to one of three purpose designed storage facilities, to be constructed in stages over the production life of the mine.

Other infrastructure necessary to support project operations will include:

- mine access, tracks and haul roads;
- on-site solar array and energy storage system with back-up diesel generation;
- accommodation facility, ablutions, sewage treatment plant, airfield;

- water management infrastructure, including a 1.8 km long permanent watercourse diversion with a central watercourse width of approximately 5 m, flood levee, dams, drains and bunds;
- mine infrastructure areas including mine offices, bathhouse, crib rooms, warehouse/stores, workshop, fuel storage, refuelling facilities, wash bay, laydown area, effluent and liquid waste storage;
- ROM and product stockpiles and product loading area; and
- power, water and other minor plant and equipment.

The proposed Project development comprises three Project stages:

- Stage 1 - Project construction;
- Stage 2 - Mining and processing (ramping up to full production by Project year 3 – from 100 ktpa to 200 ktpa concentrate), followed by low-grade ore stockpile reclaim (plant feed from stockpiles after pit depletion); and
- Stage 3 - Final site rehabilitation and monitoring.

Mining activities proposed for the Project will occur within Mining Lease Application (MLA) 100430 and MLA 100431, with a proposed Project footprint of 2,413.7 ha. Mining, processing and access will occur within the proposed MLAs. The main Project infrastructure within the MLAs is shown in Figure 2, and the transport corridor in Figure 3. The maximum disturbance area for the Project (referred to as Project disturbance area herein) is shown in Figure 2 and Figure 3. The Project is expected to have a negative water balance, and no water releases are proposed. Groundwater may be extracted for use during the construction phase of the Project subject to the receipt of required approvals. Site rehabilitation will occur in accordance with an approved progressive rehabilitation and closure plan (PRCP) for the Project, generally commencing once mining and processing have been completed.

1.3 Purpose and scope

The purpose of this report is to describe the aquatic ecological values of the Project area and assess the potential impacts of the Project on these values. The study area covers waterways within both proposed MLAs for the Project, with a particular focus on field validation of relevant prescribed environmental matters within the Project disturbance area. Survey efforts were designed to ensure adequate representation of matters across the MLAs. The areas visited during the surveys are shown in Figure 6. Further description of the survey sites is provided in Section 4.2.2.

The ecological assessment considers data collected from surveys undertaken in 2025 and 2026. The scope of the assessment and report was defined by the ToR for the EIS and includes:

- identification of legislation and policies relevant to the Project and aquatic environmental values;
- desktop assessment to identify aquatic conservation significant species that are known or have potential to occur within the Project area and surrounds;
- targeted aquatic ecology survey, designed to identify aquatic ecological values associated with the Project area, including Matters of National Environmental Significance (MNES), Matters of State Environmental Significance (MSES) and Matters of Local Environmental Significance (MLES);
- description and assessment of aquatic habitat health, comprising surface water quality, stream sediment quality and macroinvertebrate assemblages, prepared in accordance with the Australian River Assessment System (AusRivAS) Physical Assessment Protocol (Parsons *et al*. 2002), the Queensland AusRivAS Sampling and Processing Manual (DNRM 2001) and the Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009 (DES 2018);
- an assessment of the aquatic ecological values identified in the Project area and the potential direct and indirect impacts of the Project on these values;
- recommendation of measures to avoid, minimise or mitigate potential impacts associated with the proposed mining activities; and

- identification of requirements for any offsets under the Queensland *Environmental Offsets Act 2014* (EO Act).

A reconciliation of the requirements of the ToR addressed in this assessment is provided in Appendix A.

Terrestrial flora and fauna species have been addressed in the Terrestrial Ecology Assessment (AARC 2026) and are not considered in this report.

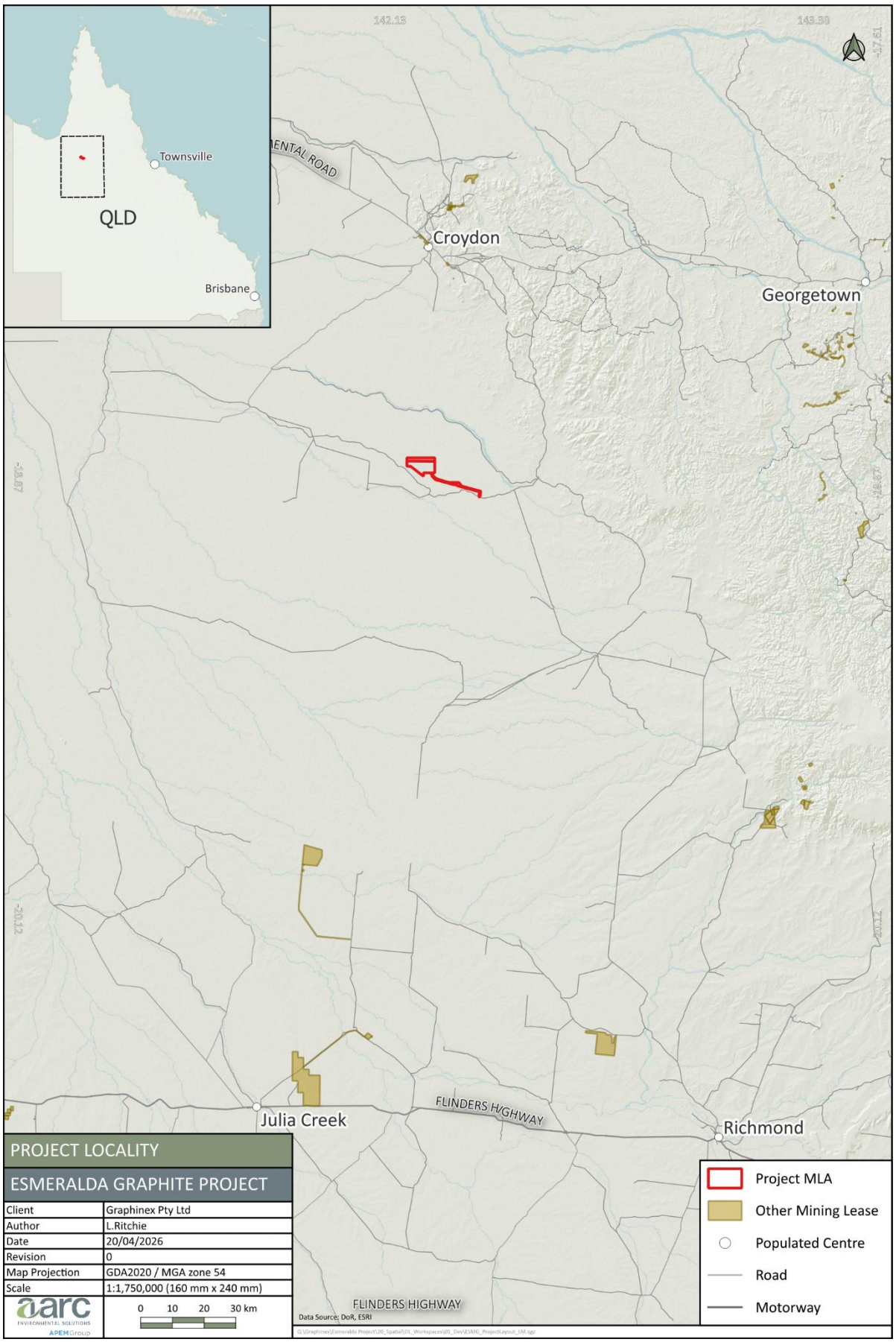


Figure 1: Project location

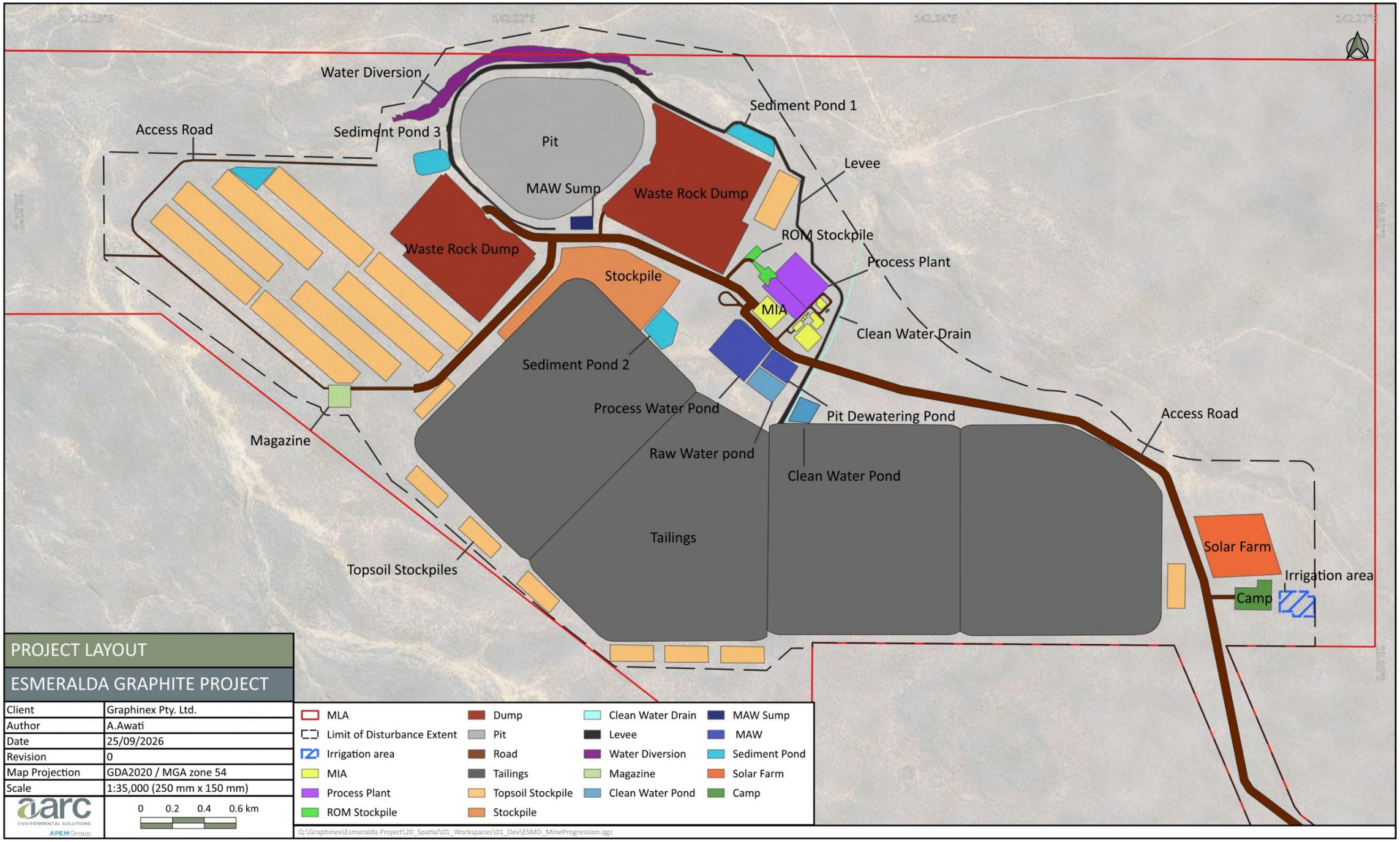


Figure 2: Conceptual project layout (mining and processing area)

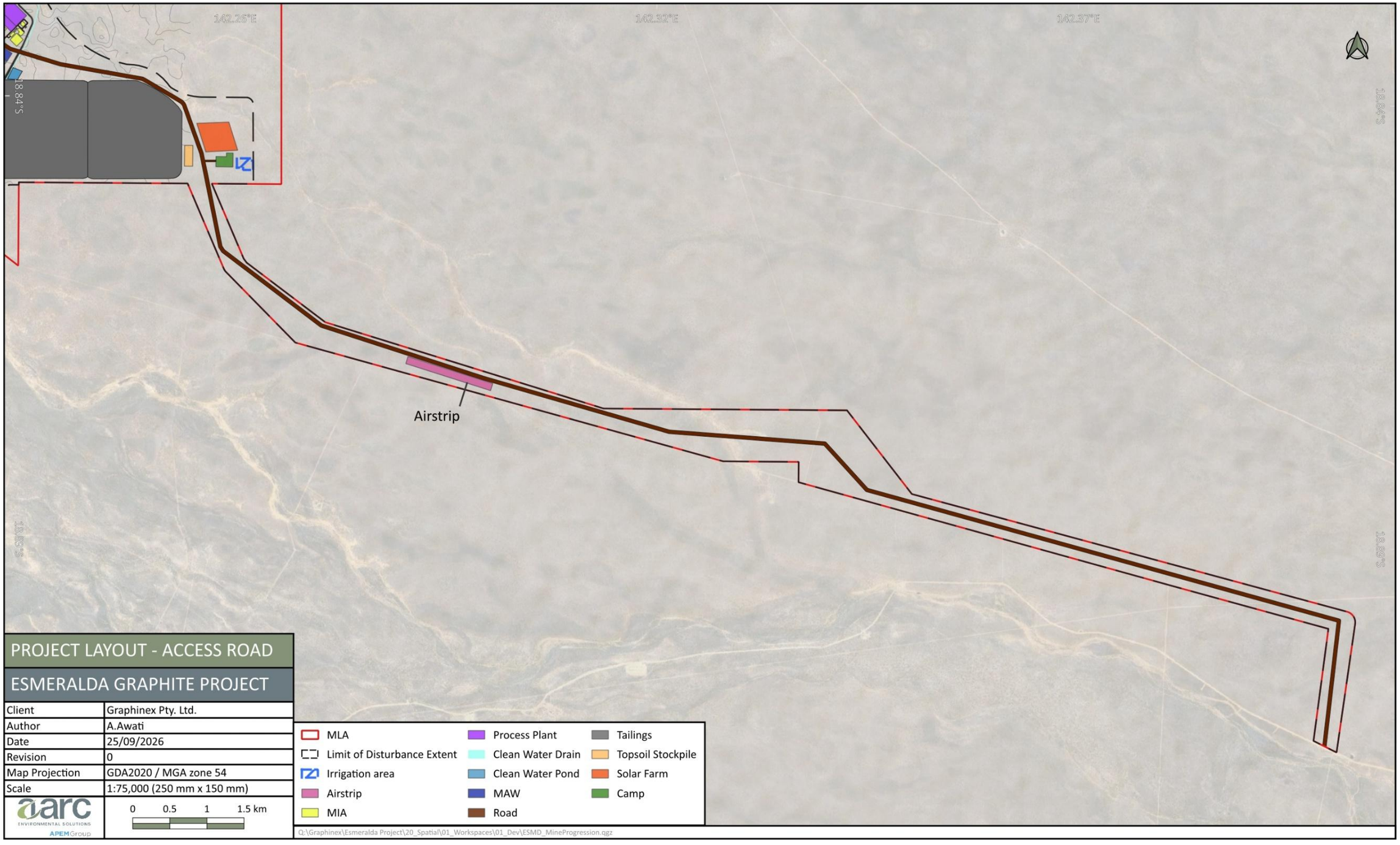


Figure 3: Conceptual project layout (transport corridor)

2 Regional context

2.1 Setting

The Project is located in the Croydon Shire, within the inland area of the Gulf Plains Bioregion. The bioregion encompasses approximately 211,000 km^2 of low-lying country and offshore islands in the Gulf of Carpentaria of northern Queensland and is characterised by extensive alluvial plains and coastal areas. The inland vegetation of the Gulf Plains bioregion is dominated by grasslands, Eucalypt woodlands, *Melaleuca* and *Acacia*, which cover the landscape of plains and river channels, comprising clay and alluvial soils (DEHP 2015).

The Project is located within the Norman Drainage Basin, which encompasses an area of 50,667 km^2 and contains only the Norman River sub-catchment area (DETSI 2013a). The Norman Drainage Basin is part of the Gulf Drainage Division and within the Cape York Southern Basins schedule area, as scheduled under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019.

The Norman River is a major river in the Gulf Country, originating in the Gregory Range and flowing 420 km north-west to the Gulf of Carpentaria. Three major tributaries join the Norman River along its course: the Carron, Clara and Yappar Rivers. The Project is situated between the Clara and Yappar Rivers, approximately 7 km north of the Clara River and 8 km south-west of the Yappar River, at its closest point. Further information regarding the local waterways and hydrology is provided in Section 2.4.

2.2 Climate

The region's climate is described as sub-tropical with monsoonal influence, with a winter dry season and summer wet season. Long-term climate data (1960 to 2026) was retrieved from Queensland Government SILO LongPaddock (Queensland Government 2026) for - 18.85 S, 142.25°E (Figure 4).

Rainfall records indicate annual rainfall is approximately 673 mm/year. Most rainfall occurs during the wet season (December to March), with dry conditions prevailing for most of the year. The mean annual evaporation in the Project area is approximately 2,627 mm, about four times higher than the average rainfall. The mean monthly maximum temperature is highest in December (37.9°C, with the highest recorded temperature of 44.3°C) and lowest in July (28.7°C). The mean monthly minimum temperature is highest in December (24.5°C) and lowest in July (12.7°C), with the lowest temperature of around 2°C registered in 1983 and 2024.

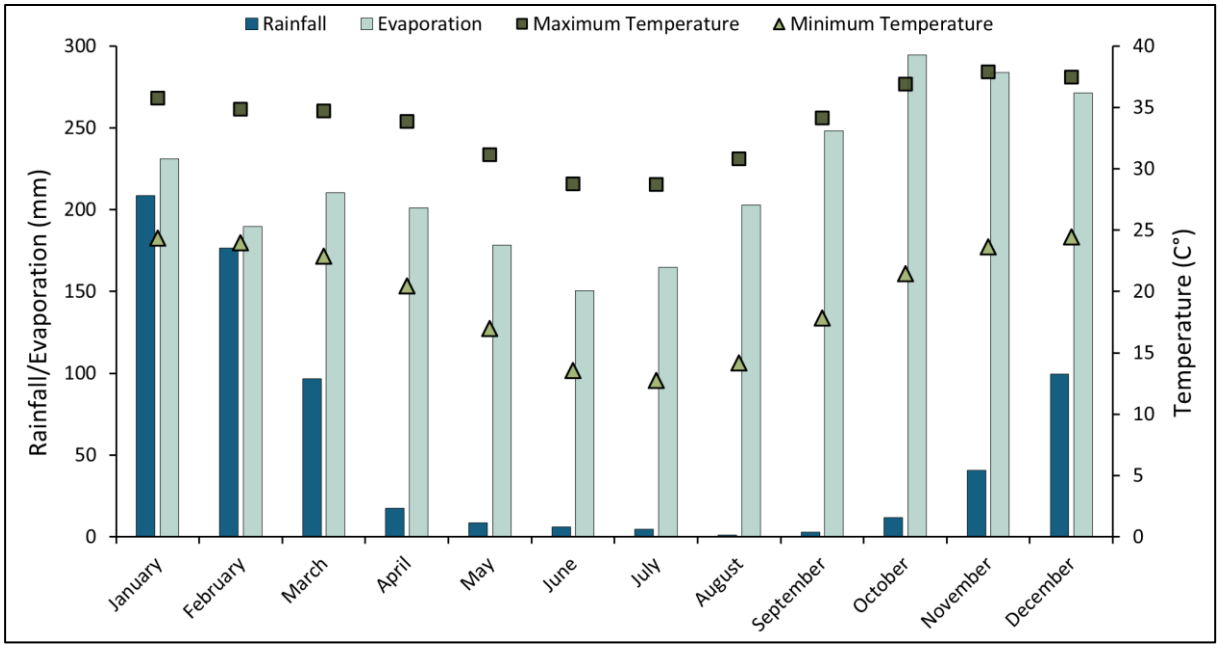


Figure 4: Project climate data (1960 to 2026) (Queensland Government 2026)

2.3 Topography and land zone

The topography of the Project area is generally flat with elevations ranging between 120 m and 140 m Australian Height Datum (AHD).

Two land zones occur within the Project:

1) Land Zone 3 – recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes, and associated wave-built lunettes (Wilson & Taylor 2012). Land Zone 3 excludes colluvial deposits such as talus slopes and pediments. This Land Zone includes a diverse range of soils predominantly Vertosols and Sodosols (Wilson & Taylor 2012). Land Zone 3 also occurs with Dermosols, Kurosols, Chromosols, Kandosols, Tenosols, Rudosols and Hydrosols; and Organosols in high rainfall areas (Wilson & Taylor 2012); and

2) Land Zone 5 – Tertiary - early Quaternary loamy and sandy plains and plateaus (Wilson & Taylor 2012). Land Zone 5 consists of extensive, uniform near level or gently undulating plains with sandy or loamy soils and includes dissected remnants of these surfaces. Soils are usually Tenosols and Kandosols, also minor deep sandy surfaced Sodosols and Chromosols (Wilson & Taylor 2012).

2.4 Hydrology

The Project is located within the Norman River sub-catchment area of north-west Queensland. The Project is situated between two major tributaries of the Norman River, approximately 7 km north of the Clara River and 8 km south-west of the Yappar River, at its closest point.

The Clara River is approximately 385 km in length, flowing in a westerly direction from the Gregory Range and discharging into the Norman River. It is joined by several smaller tributaries, including the Borer River, which is located to the south of the Project area. The Yappar River travels almost parallel with the Clara River, flowing in a north-westerly direction from its origin in the Esmeralda Station before discharging into the Norman River after approximately 340 km.

The Warrigal Creek, a 5th order stream that converges with the Clara River, is located to the south of the Project and intersects the western corner of the Project area. The Warrigal Creek originates approximately 50 km south-east of the transport corridor MLA boundary, flowing north-west before converging with the Borer River and flowing into the Clara River, approximately 45 km north-west of the MLA boundary. Several unnamed, ephemeral waterways (tributaries of Warrigal Creek) traverse the Project area (Figure 5). The proposed mining pit for the Project intersects a section of an unnamed tributary of Warrigal Creek – a stream order 3 waterway. This waterway has a moderate size catchment (115 km^2) and flows in an east west direction through the Project area.

Periods of flow in the Warrigal Creek and its tributaries (including the watercourses flowing through the Project area) are restricted to significant rainfall events in the wet season between the months of December to late March. Topography across the Project area and in the surrounding area is very flat, which results in widespread flooding, with interactions between the nearby major waterways during significant flood events. The unnamed stream order 3 waterway (tributary of Warrigal Creek) receives significant breakout flood flows from the northern banks of Warrigal Creek and the Borer River upstream of the Project area (Engeny 2026). There are several small and isolated ephemeral wetlands mapped by the Queensland government within and surrounding the Project area (Figure 5). During the rest of the year, April to November the water ways on the project are dry with only the occasional water hole persisting until around June when these too dry out.

2.5 Land use

The Project area is located within the Gulf Savannah natural resource management (NRM) region. The land in the Project area is currently used for low-intensity cattle grazing and resource exploration activities (DETSI 2013a). Queensland Land Use Mapping classifies the Project area as ‘Grazing Native Vegetation’ (DNRMMRRD 2026).

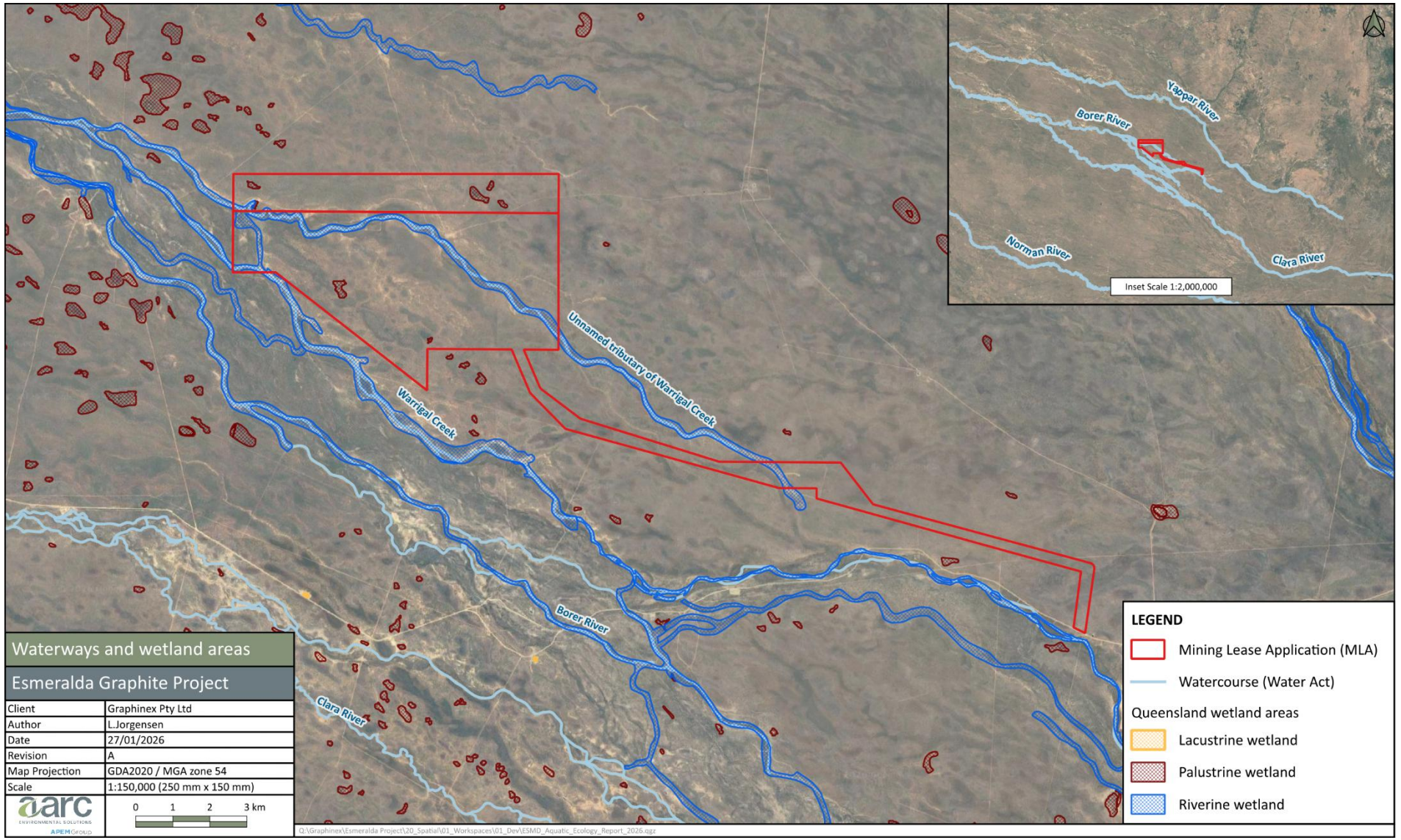


Figure 5: Waterways and wetlands in relation to the Project area

2.6 Environmental values and objectives

2.6.1 Environmental values

The Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (Qld) (EPP [Water and Wetland Biodiversity]) is subordinate legislation under the *Environmental Protection Act 1994* (Qld) (EP Act) and provides a framework for identifying environmental values (EVs) for Queensland waters and deciding water quality objectives (WQOs) to protect or enhance those EVs.

EVs are being progressively determined for Queensland waters, with approved EVs for relevant waters provided in Schedule 1 of the EPP (Water and Wetland Biodiversity). The Project is within the Cape York Southern Basins schedule area, which has not been assessed under the program. For waters not included in Schedule 1, the EVs are determined in accordance with Section 6 of the EPP (Water and Wetland Biodiversity).

The EVs relevant to the Project's area of disturbance have been determined in accordance with Section 6 of the EPP (Water and Wetland Biodiversity) and include:

- slightly disturbed waters; and
- waters that may be used for agricultural purposes (livestock grazing).

2.6.2 Surface water quality objectives

Water quality objectives (WQOs) to support and protect the different EVs identified for waters are scheduled under the EPP (Water and Wetland Biodiversity) for the relevant basin or sub-basin. As for EVs, WQOs for the Norman River drainage basin and sub-basin are yet to be derived and scheduled under the EPP (Water and Wetland Biodiversity). In the absence of scheduled WQOs, the EPP (Water and Wetland Biodiversity) requires WQOs to be a set of water quality guidelines for all indicators that will protect all environmental values for the water.

The Australian and New Zealand guidelines for fresh and marine water quality (ANZG) (ANZG 2018) and Queensland Water Quality Guidelines (QWQG) (DEHP 2009) provide broad-scale thresholds for water quality parameters for varying levels of ecosystem protection. However, both guidelines strongly encourage the collection of local data, where available, to develop guidelines relevant to the area in question (DEHP 2009).

In the absence of published WQOs for the Norman River drainage basin and limited existing water quality monitoring data for the Project area to enable the development of site-specific WQOs, interim WQOs for the Project have been adopted from guideline values for protection of the EVs described in Section 3.2 of the ANZG (2018). Where values for various parameters have not been identified in the revised ANZG, the guideline value for 95% ecosystem protection from the superseded Australian and New Zealand Guidelines for Fresh and Marine Water (ANZECC & ARMCANZ 2000) has been provided.

Where more than one EV applies to receiving waters (e.g., aquatic ecosystem and stock watering), the most stringent WQO for each water quality indicator has been adopted to protect all identified EVs.

The interim WQOs developed for the Project are presented in Table 1.

Table 1: Interim water quality objectives adopted for the Project

Parameter	Unit	Water Quality Objective
Physico-chemical		
Electrical conductivity (EC)	µS/cm	550[a]
pH	pH units	6.0 – 8.0[b]

Parameter	Unit	Water Quality Objective
Dissolved oxygen (DO)	%	85 – 120[b]
Turbidity	NTU	15[b]
Major ions		
Sulphate (total)	mg/L	500[d]
Fluoride (total)	mg/L	1.7[c]
Calcium (total)	mg/L	1000[d]
Magnesium (total)	mg/L	500[d]
Nutrients		
Ammonia (total)	mg/L	0.9[c]
Nitrogen (total)	mg/L	0.3[c]
Phosphorus (total)	mg/L	0.01[c]
Dissolved metals		
Aluminium	mg/L	0.055[c]
Arsenic	mg/L	0.013[c]
Boron	mg/L	0.37[c]
Cadmium	mg/L	0.0002[c]
Chromium	mg/L	0.001[c]
Cobalt	mg/L	0.0014[c]
Copper	mg/L	0.0014[c]
Lead	mg/L	0.0034[c]
Manganese	mg/L	1.9[c]
Mercury	mg/L	0.00006[e]
Molybdenum	mg/L	0.034[c]
Nickel	mg/L	0.011[c]
Silver	µg/L	0.05[c]
Uranium	mg/L	0.0005[c]
Vanadium	mg/L	0.006[c]
Zinc	mg/L	0.008[c]
Total metals		
Aluminium	mg/L	5[d]
Arsenic	mg/L	0.025[d]
Boron	mg/L	5[d]

Parameter	Unit	Water Quality Objective
Cadmium	mg/L	0.01[d]
Chromium	mg/L	0.05[d]
Cobalt	mg/L	1[d]
Copper	mg/L	0.4 (sheep), 1 (cattle), 5 (pigs), 5 (poultry)[d]
Lead	mg/L	0.1[d]
Manganese	mg/L	10[d]
Mercury	mg/L	0.002[d]
Molybdenum	mg/L	0.01[d]
Nickel	mg/L	1[d]
Selenium	mg/L	0.02[d]
Uranium	mg/L	0.2[d]
Vanadium	mg/L	0.1[d]
Zinc	mg/L	20[d]
Total recoverable hydrocarbons		
C6- C9 Fraction	µg/L	20[f]
C10-C36 Fraction (sum)	µg/L	100[f]

[a] 80th percentile for the Gulf catchment (QWQG) (DEHP 2009). [b] DGV provided for lowland rivers in tropical Australia (ANZECC & ARMCANZ 2000). [c] DGV for 95% of species protection for slightly to moderately disturbed waters (aquatic ecosystems) (ANZG 2018). [d] DGV for livestock drinking water (ANZG 2023). [e] DGV for 99% of species protection for slightly to moderately disturbed waters (aquatic ecosystems) (ANZG 2018). [f] Trigger levels (TLs) for aquatic ecosystem protection specified in the 'Guideline: Model mining conditions' (DESI 2024a).

2.6.3 Stream sediment quality objectives

Default guideline values (DGV) for toxicants in sediment are provided in the ANZG (2018). Interim stream sediment quality objectives as per ANZG (2018) relevant to the Project are adopted as presented in Table 2.

Table 2: Interim sediment quality objectives adopted for the Project

Parameter	Default guideline value (mg/kg dry weight)	Upper guideline value (mg/kg dry weight)
Antimony	2.0	25
Arsenic	20	70
Cadmium	1.5	10
Chromium	80	370
Copper	65	270
Lead	50	220
Mercury	0.15	1
Nickel	21	52
Silver	1.0	4.0
Zinc	200	410
Total petroleum hydrocarbons	280	550

3 Relevant legislation and policy

3.1 Commonwealth

3.1.1 *Environmental Protection and Biodiversity Conservation Act 1999*

The Commonwealth EPBC Act provides a framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places, which are defined in the EPBC Act as MNES. The EPBC Act applies to nine MNES:

- world heritage properties;
- national heritage places;
- wetlands of international importance (Ramsar wetlands);
- nationally listed threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mines); and
- a water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act requires assessment and approval for any activity that has, or is likely to have, a significant impact on an MNES. The Project was determined 'not a controlled action' (EPBC reference 2025/10140) under the EPBC Act on 23 June 2025, and therefore, impacts to MNES will not be discussed in this report. However, the assessment does consider other tools, guidelines and conservation listings relevant to the EPBC Act, where they provide important context to the characterisation of the environmental values for the site.

3.1.2 Agreements for migratory species and international conventions

Australia has signed or ratified nearly one hundred environmental treaties that serve as sources of environmental legal obligations (PCA 1999). Providing critical habitat for millions of migratory birds each year, Australia is a party to international conventions and agreements to protect migratory species. These include the:

- China–Australia Migratory Bird Agreement (CAMBA);
- Japan–Australia Migratory Bird Agreement (JAMBA);
- Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA); and
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Bird species listed within the appendices/annexes of these agreements/conventions are subsequently listed as migratory species under the EPBC Act.

Other international biodiversity conventions to which Australia is party to include the:

- Convention on Biological Diversity (CBD);
    - Kunming Montreal Global Biodiversity Framework;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- Convention on Conservation of Nature in the South Pacific (Apia Convention); and

- Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention).

3.2 Queensland

3.2.1 *Environmental Protection Act 1994*

The objective of the (EP Act) and its associated regulations and policies is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. This principle is commonly referred to as ecologically sustainable development. The EP Act addresses the following areas that are relevant to the Project:

- notifiable activities, as listed in Schedule 3 of the EP Act;
- environmental protection policies for water and wetland biodiversity, noise and air which are intended to enhance or protect Queensland's environment and list relevant environmental outcomes and performance criteria;
- Prescribed Environmentally Regulated Activities defined within the EP Act and listed in schedule 2 of the Environmental Protection Regulation 2019;
- Environmental Authorities (EAs) required to carry out an Environmental Relevant Activity (ERA) including a resource activity, and which will include conditions that will regulate the Project; and
- duties of care associated with environmental harm.

3.2.2 *Nature Conservation Act 1992*

The Queensland *Nature Conservation Act 1992* (NC Act) and its associated regulations provide a framework for creating and managing protected areas (such as National Parks), and protecting native and threatened species. The regulations include the Nature Conservation (Animals) Regulation 2020 and the Nature Conservation (Plants) Regulation 2020.

The Nature Conservation (Animals) Regulation 2020 and the Nature Conservation (Plants) Regulation 2020 prescribe the following classes of protected wildlife[1]:

- Extinct;
- Extinct in the wild;
- Critically Endangered;
- Endangered;
- Vulnerable;
- Near Threatened; and
- Least Concern.

The Nature Conservation (Animals) Regulation 2020 prescribes Least Concern fauna as Special Least Concern for the following species:

- Short-beaked Echidna (*Tachyglossus aculeatus*).
- Platypus (*Ornithorhynchus anatinus*).

[1] Under the NC Act the term wildlife refers to any native taxon or species of an animal, plant, Protista, prokaryote or virus.

- A Least Concern bird to which any of the following agreements apply: China-Australia Migratory Bird Agreement, Japan-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement or the Convention on the Conservation of Migratory Species of Wild Animals.

Under the NC Act, a Regulation may prescribe a Least Concern plant as a Special Least Concern plant if the taking or use of the plant is at risk of not being ecologically sustainable.

Permits and licences can be required to authorise impacts to, or the handling of, specified native flora and fauna. For example, if there is a requirement for the clearing of Endangered, Vulnerable, or Near Threatened plants protected under the NC Act, a Protected Plant Clearing Permit would be required under the Nature Conservation (Plants) Regulation 2020.

3.2.3 *Biosecurity Act 2014*

The *Biosecurity Act 2014* (Biosecurity Act (Qld)) provides comprehensive biosecurity measures to safeguard the economy, agricultural and tourism industries, environment, and way of life, from pests, diseases, and contaminants.

Biosecurity matters are separated into two broad categories:

- A 'prohibited matter' is a biosecurity matter that is not found in Queensland but would have a significant adverse impact on our health, way of life, the economy, or the environment if it entered the state. Prohibited matters must be reported to Biosecurity Queensland within 24 hours and all reasonable steps taken to minimise the risks of the prohibited matter and not make the situation worse.
- A 'restricted matter' is a biosecurity matter found in Queensland that has a significant impact on human health, social amenity, the economy, or the environment. There are seven categories whereby specific actions are required to limit the spread and impact of the matter by reducing, controlling, or containing it. Several categories can apply to the one restricted matter. In such cases, the requirements of all the relevant restriction categories would apply.

There is a general biosecurity obligation for parties to take all reasonable and practical steps to minimise the risks associated with other matters under their control. The Biosecurity Act (Qld) is relevant to the Project in regard to control and management of invasive plant and animal species.

3.2.4 *Environmental Offsets Act 2014*

The Queensland environmental offsets framework consists of the *Environmental Offsets Act 2014* (EO Act), Environmental Offsets Regulation 2014, and the 'Queensland Environmental Offsets Policy (Version 1.17)'. The offsets framework requires environmental offsets to be delivered where an activity is likely to result in a significant residual impact on a prescribed environmental matter. The 'Significant Residual Impact Guideline' (DEHP 2014) is used to assess whether the Project will result in a significant residual impact.

Prescribed environmental matters include:

- matters of national environmental significance (MNES);
- matters of state environmental significance (MSES); and
- matters of local environmental significance (MLES).

The Queensland Environmental Offsets Policy establishes an environmental offset hierarchy to avoid duplication of offset conditions between jurisdictions. State and local governments may only impose an offset condition if 'the same, or substantially the same, impact and the same, or substantially the same, matter' has not been subject to assessment under the Commonwealth.

These prescribed environmental matters are outlined in the Environmental Offsets Regulation 2014 (EO Act).

MSES comprise:

- regulated vegetation (determined under VM Act), including:
  - Endangered and Of Concern prescribed REs[2] listed under the VM Act;
  - Prescribed REs that intersect areas shown as wetlands on the VM Act Wetlands map;
  - Prescribed REs located within a defined distance from the defining banks of a relevant watercourse or relevant drainage feature; and
  - Prescribed REs mapped as essential habitat for Endangered and Vulnerable flora and fauna listed under the NC Act;
- areas that provide connectivity and maintain ecosystem functioning;
- wetlands and watercourses, including:
  - a wetland in a wetland protection area;
  - a wetland of high ecological significance shown on the map of Queensland wetland environmental values; and
  - a wetland or watercourse in high ecological value waters.
- designated precincts in a strategic environmental area under the Regional Planning Interests Regulation 2014;
- protected wildlife habitat for Critically Endangered wildlife, Endangered wildlife or Vulnerable wildlife or a special least concern animal (referring only to an echidna (*Tachyglossus aculeatus*) or a platypus (*Ornithorhynchus anatinus*));
- protected areas and highly protected zones of State marine parks;
- fish habitat areas;
- waterways providing for fish passage;
- marine plants; and
- legally secured offsets.

3.2.5 Environmental Protection (Water and Wetland Biodiversity) Policy 2019

The EPP (Water and Wetland Biodiversity) is subordinate legislation under the EP Act. The EPP (Water and Wetland Biodiversity) seeks to protect the quality of natural waters in Queensland while supporting sustainable development.

In particular, the EPP (Water and Wetland Biodiversity) provides a framework for:

- identifying EVs for Queensland waters, and deciding WQOs to protect or enhance those EVs; and
- including the identified EVs and WQOs under Schedule 1 of the EPP (Water and Wetland Biodiversity).

The EPP (Water and Wetland Biodiversity) is relevant to the Project with regard to the protection of EVs occurring in the Norman River drainage basin and associated tributaries.

[2] prescribed regional ecosystem means a regional ecosystem, other than a regional ecosystem mentioned in the Vegetation Management Act 1999, section 8(b), located in a category B area on the regulated vegetation management map, to the extent the ecosystem contains remnant vegetation.

3.2.6 *Water Act 2000*

The *Water Act 2000* (Qld) (Water Act) provides the framework for sustainably managing Queensland's water resources and quarry material, by establishing a system for planning, allocating and using water, and allocating quarry material and riverine protection. The purpose of the Water Act also includes securing water supply and managing demand for the south-east Queensland region and other designated regions and managing impacts on underground water caused by exercising underground water rights by the resource sector.

Under the Water Act, a person must not take or interfere with water unless authorised under the Water Act, or another act. There are a number of declared watercourses that intersect the Project area which are subject to the provisions of the Water Act.

A riverine protection permit may be required where vegetation in a watercourse will be destroyed; material will be excavated; or fill is required to be placed in a watercourse, such as for bank stabilisation. An exemption may apply where the holder has an environmental authority (for a resource activity) under the EP Act, and the area of disturbance is less than 0.5 ha. An approximate 1.5 km long permanent diversion is proposed as part of the Project, exceeding that disturbance area.

3.2.7 *Fisheries Act 1994*

The main purpose of the *Fisheries Act 1994* (Qld) (Fisheries Act) is to provide for the use, conservation and enhancement of Queensland's fisheries resources and fish habitats in a way that seeks to apply and balance the principles of (and promote) Ecologically Sustainable Development (ESD). The Fisheries Act provides for:

- the management and protection of fish habitats;
- the management of commercial, recreational, and indigenous fishing; and
- the management of aquaculture.

Fisheries resources, including declared fish habitat areas, contribute to environmental values of waterways and wetlands.

The Fisheries Act also regulates waterway barrier works where waterway crossings are constructed or upgraded. An approval is not required for waterway barrier works within waterways inside the mining tenure due to an exemption of mining activities from the Fisheries Act.

4 Methodology

4.1 Desktop assessment methods

4.1.1 Government mapping and database searches

A desktop assessment was undertaken to collate information on the aquatic ecological values within the Project area and surrounds. The review informed the aquatic ecology assessment methods and field survey design, ensuring a robust assessment of conservation significant flora and fauna species potentially inhabiting the Project area. Desktop searches consisted of relevant government reports, government mapping, database searches, and a literature review.

For the review of MNES, the EPBC Act Protected Matter Search Tool (PMST) was used to generate an EPBC Act Protected Matters Report, using the Project area as a search area (DCCEEW 2026a). Subsequent reports were generated with a 50 km buffer to provide representation of MNES values potentially present within the broader region.

For the review of MSES and waterways, Queensland Globe, a spatial, interactive and visualisation tool supplied by the Queensland Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (DNRMMRRD 2026) was used in conjunction with state government reports specific to the Project area. These reports included:

- The Department of Environment, Tourism, Science and Innovation (DETSI), Environmental Reports, Matters of State Environmental Significance: to identify known MSES within the Project area and surrounds (DETSI 2025a); and
- The DETSI Environmental Reports, Biodiversity and Conservation Values: to identify known Biodiversity Planning Assessment areas and Aquatic Conservation Assessment areas within the Project area and surrounds (DETSI 2025b).

Searches of databases were also conducted to identify species records. These searches included:

- The DETSI Wildlife online species list: to identify conservation significant species (Critically Endangered, Endangered, Vulnerable, Near Threatened, and Special Least Concern under the EPBC Act and/or the NC Act) species records (searches based on 10, 25 and 50 km buffer) (DETSI 2025c);
- The Atlas of Living Australia Occurrence Records: to further verify conservation significant species records (searches based on 10, 25 and 50 km buffer) (ALA 2025); and
- The Australian Virtual Herbarium (AVH) to identify flora EVNT species records (AVH 2025).

The results of the desktop assessment are described in Section 5.1 and provided in Appendix B. A complete list of the species of conservation significance identified during desktop searches is presented in Appendix C.

4.1.2 Likelihood of occurrence assessment

A likelihood of occurrence assessment for species of conservation significance identified during database searches was prepared by qualified ecologists using the criteria in Table 3. The likelihood assessment considered the desktop assessment results, prior to field surveys and was based on the knowledge of ecologists, species' records distribution, potential habitat suitability, known records, and scientific literature.

Table 3: Criteria adopted for likelihood of occurrence determination

Likelihood of occurrence	Criteria
Known	There are confirmed species records within the Project area.
Likely	Preferred habitat occurs within the Project area, and there are confirmed species records in the nearby surrounds (species-dependent, but approximately 10 km from the Project area). However, the species is not known to occur within the Project area.
Potential	Potential habitat may occur within the Project area, and the species is known to occur in the wider surroundings (species-dependent, but approximately 50 km from the Project area).
Unlikely	Due to a lack of suitable habitat within the Project area and/or the absence of records from the wider surroundings, the species is considered to have a low likelihood of occurring within the Project area.

4.2 Field surveys

The field surveys were designed and conducted in accordance with the following guidelines:

- Aquatic ecology—EIS information guideline' (DESI 2024b);
- 'Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009' (DES 2018);
- 'Queensland Australian River Assessment System (AusRivAS) Sampling and Processing Manual' (DNRM 2001);
- 'Australian River Assessment System (AusRivAS) Physical Assessment Protocol (Parsons *et al*. 2002)';
- 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality' (ANZG 2018).

This report refers to the nationally accepted taxonomy for flora from the Australian Plant Census (APC 2023), and the nomenclature for fauna follows the Australian Biological Resources Study Faunal Directory (ABRS 2022).

4.2.1 Survey timing and conditions

An aquatic ecology survey was conducted for the Project in February 2025 (from the 13 to 19 February, with all samples collected on 14 and 15 February). Supplementary surveys to support the fish passage assessment and provide additional baseline water and sediment data were conducted in December 2025 (12 December) and January 2026 (22 January).

Weather conditions were obtained from SILO/LongPaddock for -18.85 °S, 142.25 °E (Queensland Government 2026). Rainfall in the three months preceding the February 2025 survey was greater than double the long-term average (360 mm vs 160 mm), of which, 200 mm was recorded in the nine days preceding the survey. The survey was undertaken when rainfall decreased, registering a total of 9.4 mm. The minimum temperature ranged from 24.3°C to 26.5°C, marginally above the long-term February average of 24°C. The maximum temperature ranged from 33.6°C to 36.6°C, consistent with the average February maximum of 34.8°C.

Conditions were generally considered suitable for the wet-season aquatic survey, however access to the Project area was limited due to roads being affected by wet conditions. The survey could only be conducted by helicopter, which imposed timing restrictions (i.e. for trapping fish traps) and equipment limitations (due to weight restrictions for the helicopter).

Table 4: Temperatures and rainfall for the survey periods (Queensland Government 2026)

Survey dates	Minimum temp (°C)	Maximum temp (°C)	Rainfall (mm)
11 February 2025	24.7	33.6	2.7
12 February 2025	25.5	34.7	0
13 February 2025	26.5	36.6	0
14 February 2025	25.2	35	3.8
15 February 2025	24.3	33.9	2.9
12 December 2025	25.6	38.0	0
22 January 2026	24.1	34.4	35.3

4.2.2 Representative site selection

Suitable aquatic survey sites were identified during the desktop assessment from publicly available spatial databases and aerial imagery (Section 4.1.1). Sites were selected to:

- target potential habitat for listed threatened species;
- achieve spatial distribution across the Project area to capture aquatic values; and
- capture entry and exit points of waterways traversing the Project area, to enable the collection of suitable baseline data for 'reference' and 'receiving' sites that could be utilised as part of longer-term monitoring programs.

A total of nine standard aquatic ecology monitoring sites were assessed during the February 2025 survey (hereafter referred to as the 'aquatic survey sites').

Supplementary surveys were conducted in December 2025 and January 2026 for the Project. The December 2025 supplementary survey assessed the nine aquatic survey sites, as well as an additional three sites (W10, W11, W12). All survey sites, except for W9, were also assessed during the January 2026 supplementary survey. The supplementary surveys were designed to support the assessment of creek morphology and suitability for fish passage, and consisted of site visual observations, general descriptions of creek morphology, photographic observations and surface water and stream sediment sampling, where conditions were suitable. The supplementary survey efforts did not include any fauna trapping.

The location and survey methods used at each of the survey sites are detailed in Table 5. The location of each of the survey sites are illustrated in Figure 6.

Table 5: Aquatic ecology and water quality survey sites

Site	Location	Latitude	Longitude	Aquatic habitat assessment	Water sampling	Stream sediment sampling	Macroinvertebrate monitoring		Cast netting	Quaternary vegetation assessment	Supplementary creek morphological assessment
							Bed	Edge			
Upstream of the proposed mining area (reference site)											
W1	Unnamed tributary of Warrigal Creek (drainage feature)	-18.87817	142.3255	Yes	Yes	Yes	Yes	Yes	Unsuitable – narrow stream with debris	Yes	Yes
W6	Warrigal Creek	-18.8311	142.19394	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
W7	Unnamed tributary of Warrigal Creek	-18.83765	142.25662	Yes	Yes	Yes	Yes	No	Unsuitable – narrow stream with debris	Yes	Yes
W8	Unnamed tributary of Warrigal Creek	-18.82229	142.23781	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
W9	Palustrine wetland	-18.81202	142.24905	Yes, partial assessment	Yes	Yes	No	No	Unsuitable – shallow water with debris	Yes	NA
Within/adjacent to proposed mining area											
W2	Unnamed tributary of Warrigal Creek (drainage feature)	-18.82494	142.22103	Yes	Yes	Yes	Yes	No	Unsuitable – narrow stream with debris	Yes	Yes

Site	Location	Latitude	Longitude	Aquatic habitat assessment	Water sampling	Stream sediment sampling	Macroinvertebrate monitoring		Cast netting	Quaternary vegetation assessment	Supplementary creek morphological assessment
							Bed	Edge			
Creek morphology assessment sites within proposed mining area											
W10*	Unnamed tributary of Warrigal Creek	-18.81827	142.21720	N/A	N/A	Yes	N/A	N/A	N/A	N/A	Yes
W11*	Unnamed tributary of Warrigal Creek	-18.81971	142.20826	N/A	N/A	Yes	N/A	N/A	N/A	N/A	Yes
W12*	Unnamed tributary of Warrigal Creek	-18.81646	142.22670	N/A	N/A	Yes	N/A	N/A	N/A	N/A	Yes
Downstream of the proposed mining area (receiving site)											
W3	Unnamed tributary of Warrigal Creek	-18.81649	142.20182	Yes	Yes	Yes	Yes	No	Suitable but unavailable due to weight restrictions	Yes	Yes
W4	Unnamed tributary of Warrigal Creek	-18.81268	142.18024	Yes	Yes	Yes	Yes	No	Suitable but unavailable due to weight restrictions	Yes	Yes
W5	Warrigal Creek	-18.80317	142.15756	Yes	Yes	Yes	Yes	No	Suitable but unavailable due to weight restrictions	Yes	Yes

* Site assessed during the supplementary surveys only for stream sediment and creek morphology assessment.

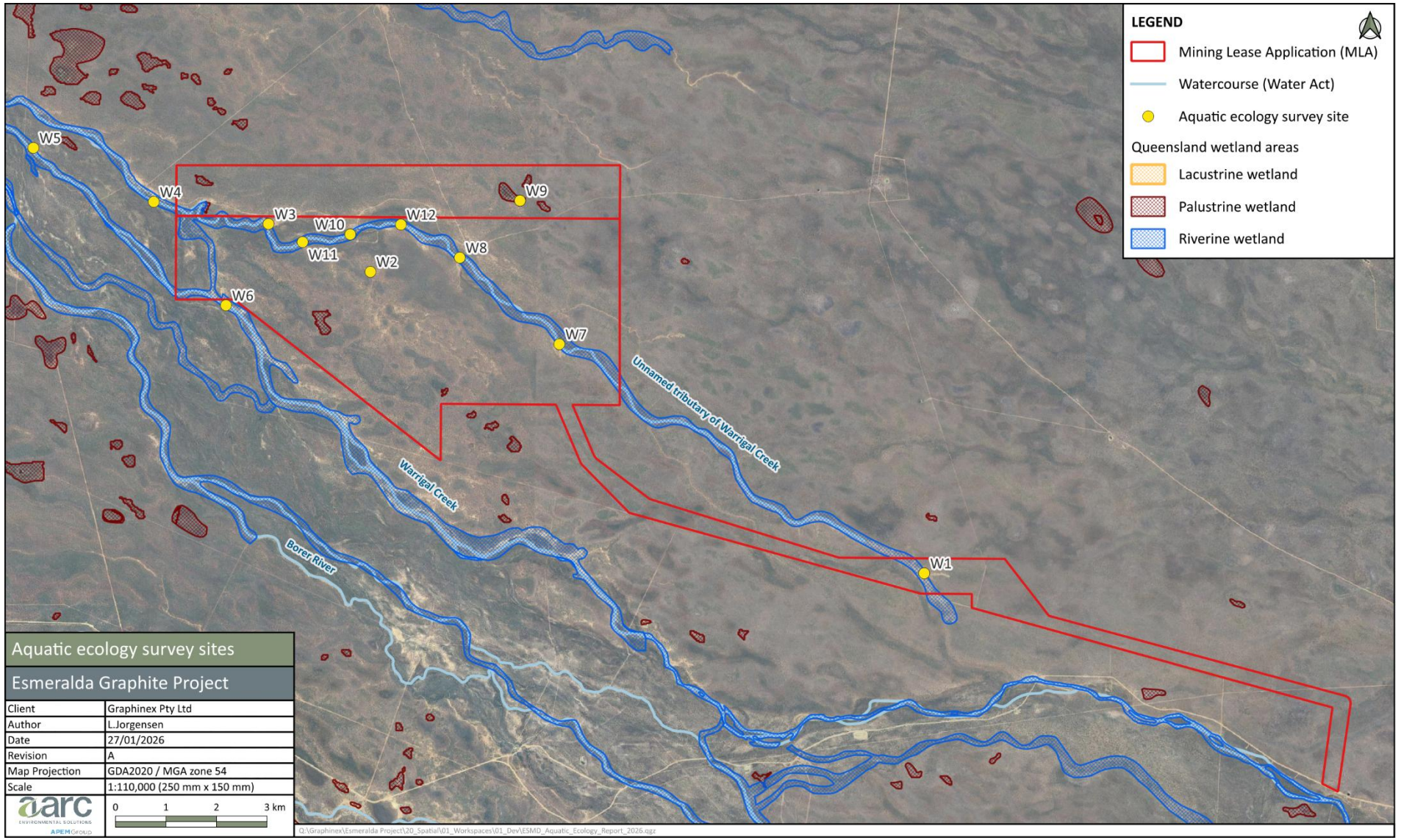


Figure 6: Aquatic ecology survey locations

4.2.3 Surface water quality

Surface water samples were collected at each of the aquatic survey sites during the February 2025 and January 2026 surveys to aid in the interpretation of the biological survey results. Site W9 was not sampled during the January 2026 survey, due to site access constraints. Water samples were not collected during the December 2025 survey as conditions were not suitable (i.e., dry).

In-situ water quality sampling was conducted in accordance with the methodology outlined in the 'Queensland Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009' (DES 2018). Field readings of pH, dissolved oxygen (DO), turbidity, electrical conductivity (EC) and temperature were collected using a multi-parameter water quality meter that was laboratory calibrated to the manufacturers' specifications.

Grab samples were collected at a depth of 10 to 20 cm, where sufficient water was available. Water samples, including field filtered and unfiltered samples, were collected at each site. All samples were held in the appropriate conditions (e.g., in eskies in the field and during transport) and delivered to a NATA accredited laboratory for analysis of the relevant physico-chemical and water quality parameters.

Water quality samples were analysed under laboratory testing conditions for the following parameters:

- pH (pH unit)
- EC (µS/cm)
- Total dissolved solids (mg/L)
- Total hardness (mg/L)
- Sulphate (mg/L)
- Fluoride (mg/L)
- Calcium (mg/L)
- Magnesium (mg/L)
- Ammonia (mg/L)
- Nitrogen (mg/L)
- Phosphorous (mg/L)
- Aluminium (mg/L)
- Arsenic (mg/L)
- Arsenic (mg/L)
- Boron (mg/L)
- Cadmium (mg/L)
- Chromium (mg/L)
- Cobalt (mg/L)
- Copper (mg/L)
- Lead (mg/L)
- Manganese (mg/L)
- Mercury (mg/L)
- Molybdenum (mg/L)
- Nickel (mg/L)
- Selenium (mg/L)
- Silver (mg/L)
- Uranium (mg/L)
- Vanadium (mg/L)
- Zinc (mg/L)

The results were compared to the interim WQOs for the Project area, provided in Table 1.

4.2.4 Sediment quality

Sediment samples were collected at each of the aquatic survey sites during the February 2025 and January 2026 surveys to aid in the interpretation of the biological survey results. Site W9 was not sampled during the January 2026 survey, due to site access constraints. Supplementary samples were also collected during the December 2025 survey for all 12 aquatic survey sites.

Sediment sampling was undertaken in accordance with the methods 'Queensland Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009' (DES 2018)

A minimum of five sub-samples (approximately 500 g each) of the streambed substrate were taken at each survey site along an approximate 50 m transect in the streambed. Samples were collected using a clean, non-metallic trowel. The sub-samples were then mixed in a clean plastic bucket to obtain a composite sample (approximately 500 g) to be sealed in sterilised plastic sample bags and/or glass jars.

All samples were held under the appropriate conditions (e.g., in eskies in the field and during transport) and delivered to a NATA accredited laboratory for analysis of particle size and chemical analysis for the following parameters:

- Antimony (mg/kg)
- Arsenic (mg/kg)
- Cadmium (mg/kg)
- Chromium (mg/kg)
- Copper (mg/kg)
- Lead (mg/kg)
- Mercury (mg/kg)
- Nickel (mg/kg)
- Silver (mg/kg)
- Zinc (mg/kg)

The results were compared to the interim sediment quality objectives for the Project area, provided in Table 2.

4.2.5 Aquatic macroinvertebrates

Macroinvertebrates have been adopted as the standard biological indicators of aquatic ecosystem health and water quality and are, therefore, frequently used to assess the condition of a waterway. Macroinvertebrates live, for at least some part of their life, in the aquatic system and are usually large enough to be seen with the naked eye. This group includes dragonflies, caddis flies, biting flies (e.g. midges), mites, snails, mussels, prawns and crayfish (Lloyd & Cook 2002).

Macroinvertebrates are chosen because of their abundance and diversity nationally, their sensitivity to changes in water quality, flow regime and habitat conditions, and relatively good taxonomic knowledge. Impacts on these animals are relatively long lasting and can be detected for some time after the impact. They are also limited in their ability to migrate from an area of the watercourse that is being adversely impacted and only have the ability to recolonise quite slowly after any pollution events. These animals have been utilised worldwide as good indicators of river and stream health and are increasingly used for rapid bio-assessment (Lloyd & Cook 2002).

Macroinvertebrate sampling is common in waterway health assessments for the following reasons (Chessman 2003):

- they are generally sensitive to the cumulative impacts of a wide range of disturbances and pollutants;
- they are abundant in freshwater systems;
- they are relatively easy to identify; and
- they are easy to collect.

The conjunction of macroinvertebrate indices and habitat quality factors is the most robust method for assessing macroinvertebrate assemblages and stream health. Macroinvertebrate sampling has been conducted using a method adapted from the 'Queensland Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009' (DES 2018), AusRivAS Physical Assessment Protocol (Parsons *et al*. 2002); and Queensland AusRivAS Sampling and Processing Manual (DNRM 2001). AusRivAS is a nationally standardised method for undertaking an assessment of the biological health of inland rivers within Australia. The following sections outline the methods used to assess habitat quality and calculate macroinvertebrate indices.

4.2.5.1 Physical assessment

This monitoring technique assessed several criteria adapted from the following environmental sampling manuals:

- AusRivAS Physical Assessment Protocol (Parsons *et al.* 2002); and
- Queensland AusRivAS Sampling and Processing Manual (DNRM 2001).

The criteria adopted for the aquatic habitat physical assessments are presented in Table 6. As the physical assessment does not require the presence of water, it was undertaken at relevant aquatic sites surveyed in

February 2025. Some characteristics were not recorded as part of the assessment at the wetland site (W9), as the assessment is applicable only to watercourses.

Table 6: Physical assessment methodology

Characteristic	Monitoring methodology
Bank characteristics	
Bank shape	Categorises the predominant shape of the left and right banks along the length of the survey site in accordance with the AusRivAS physical assessment categories for bank shape (i.e., concave, convex, stepped, wide lower bench or undercut).
Bank slope	Categorises the predominant slope of the left and right banks along the length of the survey site in accordance with the AusRivAS physical assessment categories for bank slope (i.e., vertical, steep, moderate, low or flat).
Factors affecting bank stability	Identifies disturbance factors present that may negatively influence bank stability of either the left or right bank.
Artificial bank stability features	Notes the presence of any artificial bank protection measures.
Large woody debris	Visually estimates the percent cover of large woody debris within the lower embankment and channel area, along a length of stream that is equal to the length of the survey site. Large woody debris includes logs and branches with a diameter greater than 10 cm.
Turbidity, water and sediment oils and odours	Visually assesses and categorises the presence of oily residues or odours in surface water and stream sediments at the survey site.
Erosion characteristics	
Bare ground	Notes the extent of bare ground including eroded areas or those not supporting vegetation, due to some form of disturbance that would otherwise be expected to be vegetated.
Exposed tree roots	Notes whether tree roots are exposed due to any disturbances.
Gully erosion	Records any visible gully erosion adjacent to the watercourse.
Bank slumping	Records any evidence of bank slumping along the watercourse.
Local catchment erosion	Notes the erosion in the surrounding catchment on the approach to the survey site.

4.2.5.2 Habitat bioassessment

Habitat bioassessments were performed at relevant sites using a modified version of the AusRivAS protocols provided in the Queensland AusRivAS Sampling and Processing Manual (DNRM 2001). The assessment considered the morphological characteristics of waterways, including the broad habitat type, channel pattern, water level and flow, substrate character and cover, bed and bank stability, and riparian cover at each survey site. Parameters were collected at each site and evaluated to receive a score out of a total of 135. The score was used to rate the habitat, with higher scores indicating favourable habitats normally associated with healthy waterways. The rating framework for interpreting habitat bioassessment scores is summarised in Table 7.

The habitat bioassessment does not require the presence of water and was able to be undertaken at relevant aquatic sites surveyed in February 2025. The assessment was not completed at the wetland site (W9), as the assessment is applicable only to watercourses.

Table 7: AusRivAS habitat assessment ratings

Habitat assessment score	Rating	Interpretation
0 – 35	Poor	Habitat is poor. There is limited habitat availability for in-stream fauna. There is little variation in velocity and depth of water, and the creek bed consists of a single sediment type. The water body typically consists of a small, shallow pool. Streamside vegetation, if present, consists of grasses and sedges. There is moderate to significant erosion on the banks.
36 – 70	Fair	Habitat variety is fair. This could be due to leaf litter and other vegetation or detritus in the water, or the presence of boulders and rocks. The streamside vegetation consists mainly of grasses and sedges. There is moderate evidence of bank erosion, and the percentage of vegetative cover on the banks is less than 50%.
71 – 100	Good	Habitat is relatively good. The bank is stable. There is variety in depth and velocity within the water body and substrate type is variable and tending towards boulders and rocks. Streamside vegetation is of trees and shrubs, adding to the bank stability. The percentage of streamside cover by vegetation is relatively high.
101 – 135	Pristine	Indicates a pristine and favourable habitat. There is no bank erosion and the dominant vegetation is trees. There is great variety in depth and velocity, and the habitat is quite complex, offering many types of protection for fauna. This is usually afforded by logs and branches, leaf litter, variety in substrate type, variety in water depth, and presence of vegetation living within the water body.

4.2.5.3 Condition assessment

A condition assessment, provided by Queensland AusRivAS Sampling and Processing Manual (DNRM 2001) was undertaken to evaluate the possible impacts to aquatic environmental values caused by major disturbances within the waterway.

Each category is scored from one to five, with one indicating a 'very major' disturbance, and five indicating an 'indiscernible' disturbance. This assessment evaluated the influence of:

- agriculture upstream;
- major extractive industry (current or historical) upstream;
- a major urban area upstream;
- a major point source wastewater discharge upstream;
- a dam or major weir;
- alteration to seasonal flow regime;
- alteration to the riparian zone;
- erosion and damage by stock on riparian zone and banks;
- major geomorphological change on stream channel; and
- an alteration to in-stream conditions and habitats.

The survey technique was deployed at all aquatic sites during February 2025 survey.

4.2.5.4 Bed and edge habitat sampling

Macroinvertebrate sampling was conducted in accordance with the AusRivAS sampling and assessment methodology as outlined by the 'Queensland Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009' (DES 2018).

Along a 10 m stretch of the waterbody, a D-frame net (350 mm x 250 mm with 250 µm mesh) was used to sample macroinvertebrates at each survey site containing sufficient and suitable aquatic habitat (refer to Table 5). The net is passed through the water column in a series of short, upward-sweeping movements at right angles to the bank along a total 10 m bank length. While doing so, the stream substrate is stirred up, and the net is passed through the resulting plume to capture the now-suspended benthic animals. Macroinvertebrates were live picked and preserved on-site. Samples were sent for taxonomic identification to an AusRivAS accredited laboratory.

This procedure aims to target various micro-habitats, where available, including riffles, runs, pools and edge/backwaters. Due to the ephemeral nature of the creeks and in the receiving environment, micro-habitats available for sampling were limited to pool and edge habitats. Ideally, survey sites should allow for sampling in shallow and deep sections to target the various micro-habitats, however, this was only possible at one site (W1).

Data collected was assessed using a range of indices including:

- Total abundance – the total number of animals collected from each survey site during each sampling event.
- Taxonomic richness – a count of the number of different taxa collected from each survey site during each sampling event. Taxonomic richness considers common and abundant taxa equally.
- PET (taxa from the orders Plecoptera, Ephemeroptera and Trichoptera) richness –taxa from these orders are considered to be particularly sensitive to changes in their environment and, thus, are good indicators of habitat degradation and poor water quality. Low PET scores generally indicate poor habitat condition, and high PET scores generally indicate good habitat condition. However, PET taxa are often naturally rare in ephemeral Queensland rivers and creeks (preferring clear, fast-flowing streams), therefore low PET richness is not necessarily indicative of anthropogenic impacts.
- SIGNAL (Stream invertebrate grade number average level) 2 biotic index – weighted SIGNAL 2 scores were calculated following Chessman (2003), using the family version of the calculation method. Different macroinvertebrate taxa have been given a sensitivity grade number that reflects their sensitivity to various pollutants. This number is then weighted for abundance of the taxa. Taxa that do not have a sensitivity grade number, for example *Copepoda*, *Cladocera* and *Ostracoda*, were not used in the calculation of the SIGNAL index as recommended in the 'Queensland Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009' (DES 2018). A low SIGNAL score indicates that taxa are tolerant to a range of environmental conditions, and a high score indicates that taxa are more sensitive to such conditions.
- Pollutant tolerant taxa – the percentage of pollution-tolerant taxa calculated from the SIGNAL2 indices. Tolerant taxa are classified as those with a SIGNAL2 score of 3 or less (DES 2018). Macroinvertebrate families in this group are expected to be able to tolerate changes to their environment, including habitat degradation and some pollution. An absence of more sensitive taxa suggests environmental conditions may be too harsh for sensitive taxa (those with SIGNAL2 scores above 3) to tolerate.

A SIGNAL2 bi-plot was created for the survey that plots the SIGNAL2 scores against the number of families found in the sample. The bi-plot demonstrates the level of pollution and suitability of the survey site for macroinvertebrate habitation. The bi-plot is divided into four quadrants, with each quadrant indicative of environmental conditions that may influence a community, as follows:

- Quadrant 1 – Typically favourable habitat or chemically dilute water
- Quadrant 2 – High salinity or nutrient levels (may be natural)
- Quadrant 3 – Toxic pollution or harsh physical environments
- Quadrant 4 – Urban, industrial, or agricultural pollution

The quadrant boundaries have been set according to the suggested interim quadrant boundaries provided in Chessman (2001).

4.2.6 Aquatic flora and fauna

Any aquatic flora observed at each of the survey site was recorded. Quaternary flora assessments were conducted at the survey sites as part of the terrestrial ecology assessment, which included identification of flora species with aquatic characteristics, where relevant (AARC 2026).

Observations of aquatic fauna species were recorded during targeted survey efforts and opportunistically throughout the February 2025 survey. Targeted aquatic fauna survey techniques included the use of cast-net trapping for fish at sites with suitable conditions (non-flooding, wide enough creek, holding water and absence of debris). Survey sites W3, W4, W5 showed physical conditions suitable for survey by cast net, however the cast net was not available at these sites due to helicopter weight restrictions.

Additional trapping methods, including the use of fyke, opera house and box traps, were not feasible, given the landscape conditions. Access to the site during the February 2025 survey was limited to helicopter, meaning traps could not be checked within suitable timeframes.

No targeted aquatic fauna survey techniques were implemented during the supplementary surveys in December 2025 and January 2026.

4.2.7 Waterways providing for fish passage

The supplementary surveys in December 2025 and January 2026 involved the collection of general creek morphology and aquatic habitat observations at all survey sites to support the assessment of waterways providing for fish passage. Data collected at each site included:

- GPS locations (waypoints) for each site;
- photographs of upstream, downstream, and left and right banks;
- measurement of the main channel width and bank height;
- categorisation of the bank shape and slope of the left and right banks; and
- a brief description of the watercourse with respect to identifying attributes of waterways that provide for fish passage including;
    - observed habitat features including the presence of fish;
    - flow conditions and whether they are adequate to providing connectivity for fish passage;
    - bed and bank definition with respect to suitability for fish passage.

Representative photographs and the site descriptions are provided in Appendix E.

Waterways have been validated during a watercourse determination for the Project. The results of a waterway determination have been reviewed and used to supplement the fish passage assessment.

5 Results

The Commonwealth and State governments (DCCEEW and DETSI respectively) regularly assess and reclassify the status of flora and fauna species. The status of listed threatened and migratory species under the EPBC Act that has been reported in this assessment is in accordance with the listing status prior to the EPBC Act referral decision for the Project (23 June 2025, EPBC reference 2025/10140). Any subsequent gazetted listings have not been included in this assessment.

The NC Act listed species status reported in this assessment is accurate as of the time of reporting (January 2026).

5.1 Desktop assessment results

5.1.1 Regional ecosystems associated with wetlands and waterways

Following the field verification of regional ecosystems undertaken during the Terrestrial Ecology Assessment (AARC 2026), an application was made to the Queensland Herbarium to change the RE mapping, which supports mapped wetlands (section 4.1.1). The accepted RE mapping (Queensland Herbarium reference MAR_3594) will be incorporated into Version 14 of the RE mapping (AARC 2026). The accepted regional ecosystems associated with the palustrine and lacustrine wetlands for the Project area confirmed the REs associated with wetlands are in Table 8, Figure 7, Figure 8, and Figure 9.

In the Project area, Warrigal Creek and the unnamed tributary of Warrigal Creek are vegetated with River Red Gum (*Eucalyptus camaldulensis*) woodland to low woodland, with *Melaleuca* spp. along them. There are some areas of River Red Gum (*Eucalyptus camaldulensis*) low woodland, with Broad-leaved Paperbark (*Melaleuca viridiflora*), often in the smaller channels.

The wetlands are mapped as seasonal swamps with either Coolibah (*Eucalyptus microtheca*) and Broad-leaved Paperbark (*Melaleuca viridiflora*) woodland in closed depressions on alluvial plains, or Broad-leaved Paperbark (*Melaleuca viridiflora*) low woodland in shallow closed depressions on sand sheets.

Table 8: Regional Ecosystems analogous with Wetlands (AARC 2026)

RE	Description	VM Act status	Wetland association
RE 2.3.26a	River Red Gum (*Eucalyptus camaldulensis*) woodland to low woodland, with *Melaleuca* spp., on fringes and in channels of minor watercourses	Least concern	Riverine
RE 2.3.26c	River Red Gum (*Eucalyptus camaldulensis*) low woodland, with Broad-leaved Paperbark (*Melaleuca viridiflora*), on fringes of minor watercourses in broad sand sheets	Least concern	Riverine
RE 2.3.55d	Seasonal swamp (wooded). Broad-leaved Paperbark (*Melaleuca viridiflora*) low woodland in shallow closed depressions on sand sheets	Least concern	Palustrine
RE 2.3.61c	Seasonal swamp (wooded). Coolibah (*Eucalyptus microtheca*) and Broad-leaved Paperbark (*Melaleuca viridiflora*) woodland in closed depressions on alluvial plains	Least concern	Palustrine

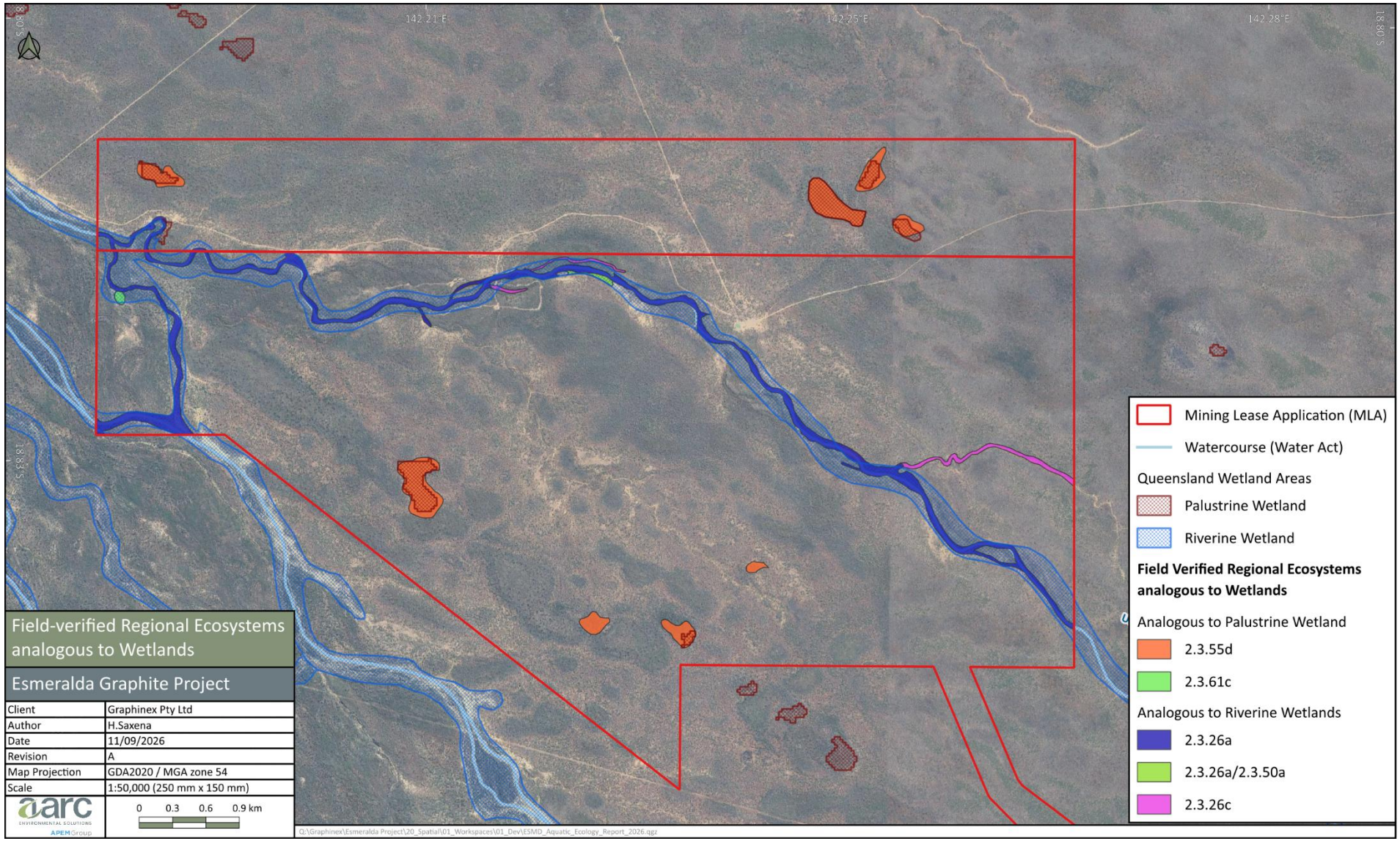


Figure 7: Field verified Regional Ecosystems analogous to wetlands (mining and processing area)

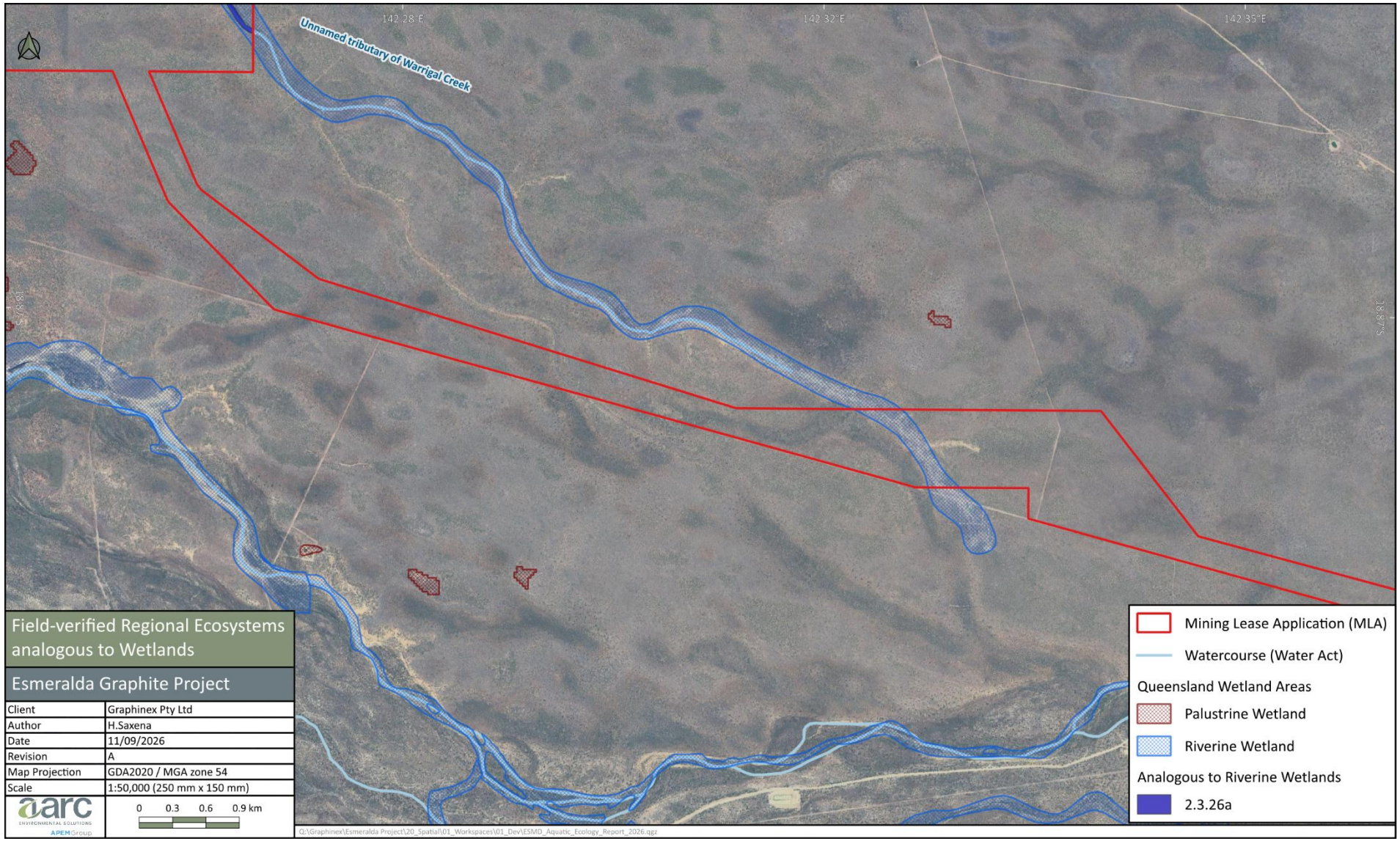


Figure 8: Field verified Regional Ecosystems analogous to wetlands (western transport corridor)

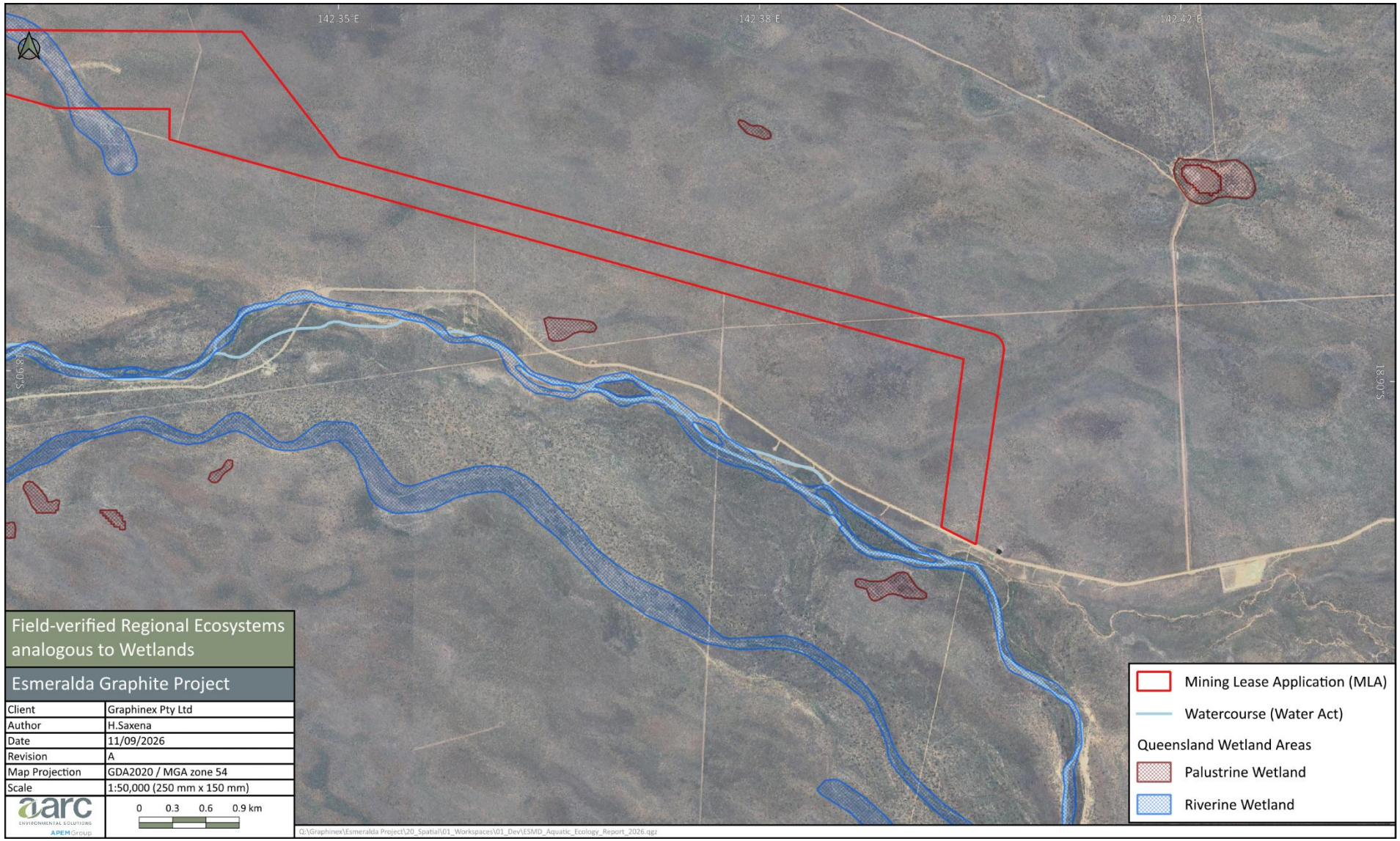


Figure 9: Field verified Regional Ecosystems analogous to wetlands (eastern transport corridor)

5.1.2 Matters of National Environmental Significance

5.1.2.1 EPBC Act listed threatened and migratory species

Database searches did not identify any flora species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act (within a 50 km search area) (Refer to Appendix B, Appendix E).

Desktop searches indicate potential for conservation significant aquatic species (listed as threatened and/or migratory under the EPBC Act) to inhabit the wider surroundings (species-dependent, but approximately 50 km from the Project area).

One shark species, the Largetooth Sawfish (*Pristis pristis*), listed as vulnerable and migratory under the EPBC Act (at the time of the referral decision), has been identified from the desktop searches. The Protected Matters Search Tool (PMST) search identified potential habitat for the species occurring within 50 km of the Project area. The nearest record for the species is approximately 175 km north-west of the Project area (ALA 2025). This species can occur in upper reaches of freshwater rivers and isolated water holes across northern Queensland (DCCEEW 2026b). Potential habitat for the species is unlikely to occur within the area due to the ephemeral nature of the waterways and lack of water holes within and surrounding the Project area. As such, the species is considered unlikely to occur in the Project area. The likelihood of occurrence assessment is provided in Appendix D.

Several terrestrial threatened and migratory species (including migratory wetland birds) have been identified from the desktop searches. These species have been addressed in the Terrestrial Ecology Report (AARC 2026) for the Project and are not considered in this report.

5.1.3 Matters of State Environmental Significance

5.1.3.1 Wetland values

The Map of Queensland wetland environmental values is a state-wide statutory map under the 'Environmental Protection (Water and Wetland Biodiversity) Policy 2019'. The map defines:

- High Ecological Significance (HES) wetlands;
- Wetland Protection Areas (WPAs), which comprise;
    - HES wetlands within the Great Barrier Reef Catchments; and
    - trigger areas that represent the area of hydrological influence of HES wetlands.
- General Ecological Significance (GES) wetlands.

Wetlands in WPAs and HES wetlands are identified as MSES under the Environmental Offsets Regulation 2014.

No WPAs or HES wetlands have been mapped within or surrounding the Project area. The closest HES wetland is approximately 35 km north-east of the Project area.

The Map of Queensland wetland environmental values identified several GES wetlands intersecting the Project area. These included both palustrine and riverine wetlands (DNRMMRRD 2026). Palustrine wetlands are primarily vegetated (with more than 30% emergent vegetation) non-riverine or non-channel environments of less than eight hectares. This includes billabongs, swamps, bogs, springs, soaks and similar features (DETSI 2013b).

In comparison, riverine wetlands include all wetland and deepwater habitat that occurs within a channel. The channels can be naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. This includes rivers, streams, creeks, brooks, rivulets, canals, channels, and watercourses and tributaries (DETSI 2023).

Vegetation Management Act wetlands occur within the Project area. These areas have values aligned with GES wetlands. The assessment of impacts to regulated vegetation within defined distances of these wetland areas is assessed in the Terrestrial Ecology Assessment (AARC 2026).

5.1.3.2 High ecological value waters

A wetland or watercourse in high ecological value waters are identified as MSES under the Environmental Offsets Regulation 2014. High ecological value waters are defined under the EPP (Water and Wetland Biodiversity) as waters with effectively unmodified or highly valued biological integrity.

No high ecological value waters listed under the EPP (Water and Wetland Biodiversity) have been identified intersecting the Project area or in the surrounding area.

5.1.3.3 Protected wildlife habitat

Protected wildlife habitat is defined as an area of habitat for an Endangered, Vulnerable or Special Least Concern (non-migratory) species under the NC Act. Habitat is defined as the area occupied (including periodically and occasionally) by any species, population or ecological community, or an area used by species during different stages of their life cycles (DEHP 2014).

Protected wildlife habitat is also a prescribed matter in areas that:

- are shown as a high risk area on the flora survey trigger map and that contain plants that are critically endangered wildlife, endangered wildlife or vulnerable wildlife; and
- areas not shown as a high risk area on the flora survey trigger map, to the extent the area contains plants that are critically endangered wildlife, endangered wildlife or vulnerable wildlife.

No wildlife habitat for Endangered or Vulnerable species (NC Act) has been mapped within the Project area, nor has high risk area in the flora survey trigger map.

Conservation significant species identified from desktop searches were subjected to a likelihood of occurrence assessment, undertaken as part of the initial desktop assessment, provided in Appendix D.

One shark species, the Largetooth Sawfish (*Pristis pristis*), listed as endangered under the NC Act, has been identified from the desktop searches. This species is also listed as endangered and migratory under the EPBC Act and has been discussed in Section 5.1.2.1. Based on the absence of the potential habitat for the species and lack of species records in the Project area and surrounding area, the species is considered unlikely to occur in the Project area.

Terrestrial flora and fauna species identified in the desktop searches have been addressed in the Terrestrial Ecology Report (AARC 2026) and are not considered in this report.

5.1.3.4 Waterways providing fish passage

The Environmental Offsets Regulation 2014 (EO Regulation) states that any part of a waterway providing for passage of fish is a MSES if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.

A ‘waterway’ is defined under the Regulation as a river, creek, stream, watercourse or inlet of the sea and ‘waterway barrier works’ is defined as a dam, weir or other barrier across a waterway.

The ‘Queensland waterways for waterway barrier works’ spatial data layer indicates the level of ‘risk’ associated with undertaking waterway barrier works within Queensland waterways. Waterways with higher stream orders, steeper slopes, higher flow rates, greater number of fish present and fish with stronger swimming abilities receive a higher risk level.

As Project activities will be undertaken within the MLA under the conditions of an EA, a waterway barrier works approval under the Fisheries Act is not required. However, waterways providing for fish passage are MSES under the EO Regulation, where the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway. As such, the level of risk assigned to the mapped watercourses is a useful tool for considering the potential value of watercourses and, thus, the potential impacts to aquatic ecology values from the Project.

Of the waterways identified as providing fish passage within the Project area (Figure 20):

- Warrigal Creek and one minor waterway associated with Warrigal Creek (stream order 4) (in the far west of the Project area) – is classified as having a high value to fish movement;
- the unnamed stream order 3 waterway (tributary of Warrigal Creek) is classified as having a moderate value to fish movement; and
- the remaining unnamed stream order 2 waterways (tributaries of Warrigal Creek) are classified as having a low value to fish movement.

The proposed waterway barrier works will be located along a section of the unnamed stream order 3 waterway (tributary of Warrigal Creek), which is categorised as having a moderate value at this location. Upgrades to existing crossings of unnamed stream order 2 waterways (tributaries of Warrigal Creek) within the transport MLA will also likely be required as part of the Project's development and operation, classified as low value.

An assessment of Project impacts to waterways providing fish passage is provided in Section 7.1.

5.1.4 Matters of Local Environmental Significance

No MLES are identified within the State Planning Policy (SPP) biodiversity mapping of the Croydon Shire Planning Scheme (Croydon City Council 2019). The planning scheme refers only to MSES, which will be addressed under the EO Act.

5.2 Field survey results

5.2.1 Aquatic habitat

5.2.1.1 Physical assessment

The physical assessment involved the collection of information on the physical degradation of the banks for the receiving waterways (bank shape, bank slope, artificial bank stability features, etc.), quality characteristics (e.g., sediment, water oils and odours, turbidity, etc.), and erosion characteristics, as detailed in Section 4.2.5.1. The physical assessment results from each aquatic survey site (Figure 10) are provided in Table 9. Site descriptions and photos are provided in Appendix E.

The effects of erosion on the banks of the waterways were minimal across all the aquatic survey sites. The leading cause of local erosion appeared to be stock access. Cattle compact soil structures and trample vegetation, both of which can lead to increased overland flow and deposition of sediments in waterways. The high intensity rainfall event prior to the February 2025 survey may have also increased or exacerbated local erosion and run-off, by washing sediment from the bank and depositing it into the waterways.

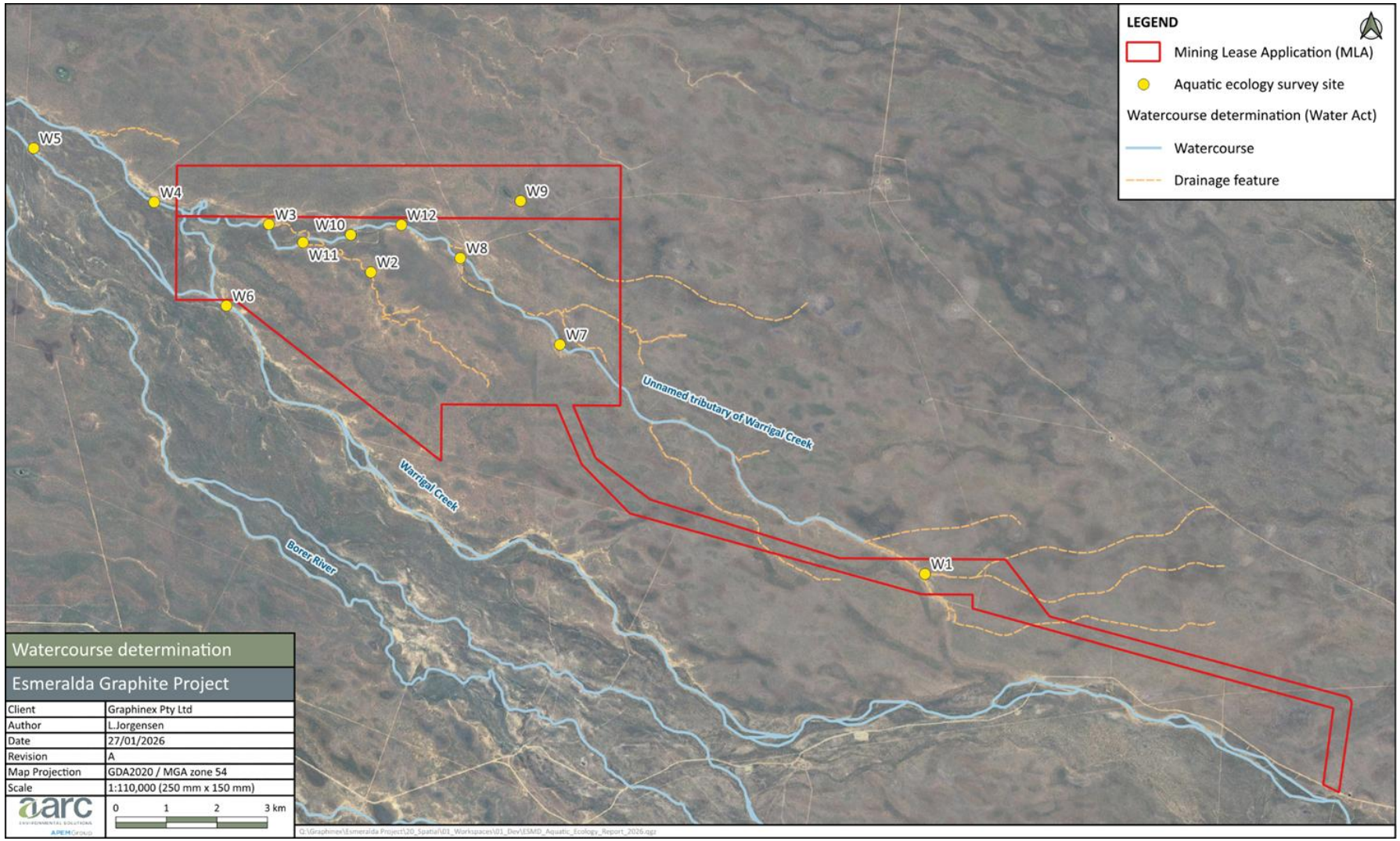


Figure 10: Watercourse determination within the Project area

Table 9: Physical assessment results for aquatic survey sites

Characteristic		W1	W2	W3	W4	W5	W6	W7	W8	W9
Bank characteristics										
Bank shape	Left bank	Concave	Wide lower bench	Convex	Concave	Stepped	Wide lower bench	Convex	Stepped	NA
	Right bank	Wide lower bench	Wide lower bench	Wide lower bench	Convex	Wide lower bench	Concave	Concave	Concave	NA
Bank slope	Left bank	Low (10-30°)	Steep (60-80°)	Low (10-30°)	Steep (60-80°)	Moderate (30-60°)	Steep (60-80°)	Low (10-30°)	Low (10-30°)	NA
	Right bank	Moderate (30-60°)	Steep (60-80°)	Steep (60-80°)	Moderate (30-60°)	Steep (60-80°)	Moderate (30-60°)	Moderate (30-60°)	Moderate (30-60°)	NA
Factors affecting bank stability		Stock access; feral animals (pigs)	Stock access; feral animals (pigs)	Stock access; feral animals (pigs)	Stock access; feral animals (pigs)	Stock access; feral animals (pigs)	Stock access; feral animals (pigs)	Stock access; feral animals (pigs)	Stock access; feral animals (pigs)	Stock access
Artificial bank stability features		None	None	None	None	None	None	None	None	None
Large woody debris (%)		0	1	1	1	1	5	6	10	NR
Water flow		No flow	Low	Low – no flow	Low – no flow	Low	Low	Low	Low	No flow
Water odour		Normal/ none	Normal/ none	Normal/ none	Normal/ none	Normal/ none	Normal/ none	Normal/ none	Normal/ none	Normal/ none
Water oils		None	None	Sheen	None	Sheen	None	None	None	None
Water colour		Opaque	Clear	Opaque	Opaque	Clear	Clear – opaque	Opaque	Opaque	NR
Turbidity		Turbid	Slight – turbid	Slight – turbid	Slight	Slight	Slight	Slight	Slight	Clear
Plume		Some	Some	Some	Some	NR	NR	Some	NR	Little
Water surface condition		Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal

Characteristic	W1	W2	W3	W4	W5	W6	W7	W8	W9
Erosion characteristics									
Bare ground	None	Little	Extensive	Extensive	Some	Moderate	Moderate	None	NR
Exposed tree roots	Little	None	None	None	None	None	None	Little	NR
Gully erosion	None	None	None	None	None	None	None	None	NA
Bank slumping	None	None	None	None	None	None	None	None	NA
Local catchment erosion	Some	Some	Some	Some	NR	NR	NR	Some	NA

NR: not recorded.

5.2.1.2 Habitat bioassessment

This assessment considered the morphological characteristics of waterways, as outlined in Section 4.2.5.2. The sites were given a score out of 135 and categorised into the relevant rating category (Poor, Fair, Good and Excellent) on the basis of the habitat score, with 135 representing a perfect score for a healthy waterway. These results are indicative of the general health of the waterways and the surrounding systems; the scores do not consider the quality of the water present.

Habitat assessments were completed at the relevant aquatic survey sites during the February 2025 survey. The habitat bioassessment scores for each site are presented in Figure 11, along with the upper limits of each rating category (refer to Table 7). Photographic representation of aquatic habitat condition at each site is provided in Appendix E.

Most sites recorded habitat bioassessment scores that fell into the 'Fair' category, with one site scoring in the 'Poor' category; no sites recorded a score within the 'Good' or 'Excellent' categories (Figure 11). The scores ranged from 33 (W1) to 60 (W7). The habitat scores for sites across the waterways were similar, with unnamed tributaries of Warrigal Creek were slightly lower than at Warrigal Creek, with an average score of 50 compared to 54.

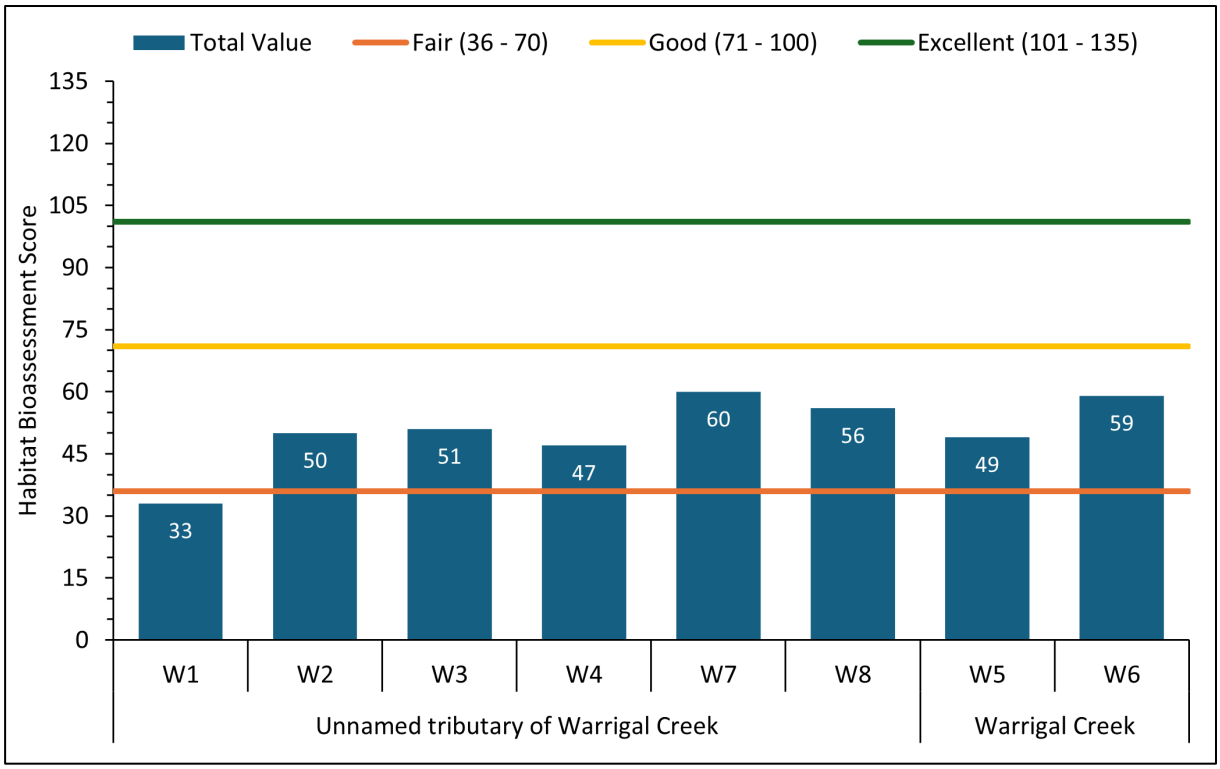


Figure 11: Habitat bioassessment scores for aquatic survey sites

5.2.1.3 Condition assessment

The condition assessment considered the impact of ten different upstream activities on the waterways (as outlined in Section 4.2.5.3), with 50 representing the maximum score (no impact) and 10 representing the minimum score (full impact). Condition assessments were completed at the aquatic survey sites during the February 2025 survey. The site assessment scores are presented in Figure 12.

Condition assessment scores were consistent across all sites and the different waterways, ranging from 46 to 48, with an average score of 47. All sites recorded condition scores above 40, indicating that the influence of any upstream activities has had a minimal impact on the waterways.

The most prominent alteration to waterway conditions was identified as the influence of erosion and damage to the riparian zone, banks and creek bed by livestock. The current land use of the Project area is low intensity cattle grazing and, in the absence of regular watering stations, livestock are reliant on natural waterways for drinking.

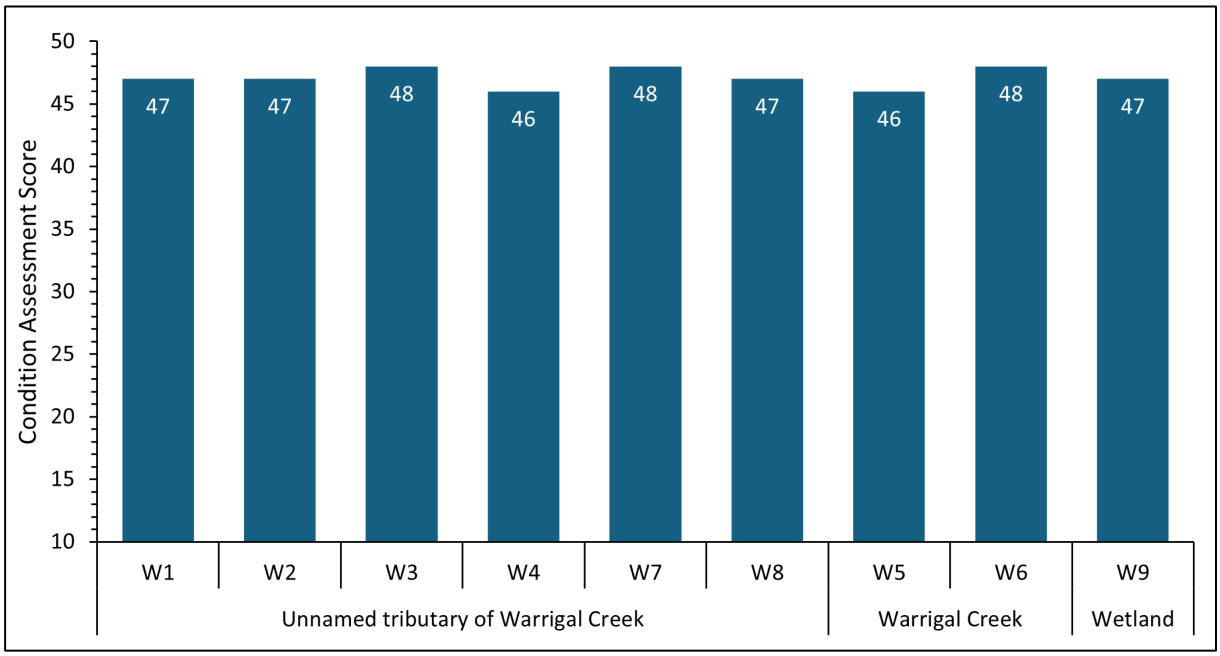


Figure 12: Condition assessment score for aquatic survey sites

5.2.2 Surface water quality

Water samples were collected at the aquatic survey sites during the February 2025 survey. Additional samples were collected following a significant rainfall event in January 2026. All results from the surface water sampling are provided in Table 10.

The results from the surface water quality analysis were compared to the interim WQOs (refer to Table 1) to identify baseline water quality elevated compared to the WQOs. The following exceedances were identified for parameters tested during the investigation:

- Dissolved oxygen (%) (DO) values were outside the interim WQOs (85-120%) at sites W1 and W6.
- Turbidity levels at each site exceeded the interim WQO (50 NTU), except at site W9 where this parameter was not recorded.
- Total nitrogen exceeded the interim WQO value (0.3 mg/L) at all sites.
- Total phosphorus exceeded the interim WQO value (0.01 mg/L) at all sites.
- Dissolved aluminium concentrations exceeded the interim WQO value (0.055 mg/L) at all sites.
- Dissolved copper concentrations exceeded the interim WQO value (0.0014 mg/L) at sites W2 and W9.
- Dissolved silver concentrations exceeded the interim WQO value of (0.05 mg/L) at site W1.

Several factors, such as grazing and agricultural land practices and direct access of cattle to the waterways, are likely to influence on the water results. The elevated parameters of aluminium and copper were assumed to be linked to natural mineralisation in the sub-soils of the area. Despite elevated concentrations of the parameters, baseline water quality results were considered typical of a slightly disturbed aquatic ecosystem in this region.

The laboratory certificate for water analyses is provided in Appendix F and Appendix G.

Table 10: Surface water quality results and comparison to interim WQOs for the Project area

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Physico-chemical (in situ)												
Electrical conductivity (EC)	uS/cm	550	February 2025	96.2	195.7	88.5	82.3	86.1	85.5	109.9	101.6	NA*
			January 2026	381.4	121.2	60.1	60.8	86.8	79.1	61.7	62.9	NA*
pH	pH units	6.0 – 8.0	February 2025	6.44	6.88	6.97	6.71	7.04	6.87	6.9	6.86	NA*
			January 2026	6.45	7.10	6.83	6.62	7.00	6.97	6.99	6.94	NA*
Dissolved oxygen (DO)	%	85 – 120	February 2025	81.8	90	105	85.1	95.5	83.8	104.8	100.3	NA*
			January 2026	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
Turbidity	NTU	15	February 2025	227.2	118.8	100.5	50.7	44.7	46.1	67.7	61.4	NA*
			January 2026	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
Temperature	ºC	-	February 2025	30.1	36.2	37.6	36.5	30.6	29.5	37.5	37.6	NA*
			January 2026	34.8	34.4	33.3	33.4	33.3	33.4	31.8	32.2	NA*
Major ions												
Sulphate (as SO_4)	mg/L	500	February 2025	<1	<1	<1	<1	<1	<1	<1	<1	<1
			January 2026	<1	<1	<1	<1	<1	<1	<1	<1	NA*
Fluoride (total)l	mg/L	1.7	February 2025	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			January 2026	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*
Calcium (total)	mg/L	1000	February 2025	<1	2	<1	2	2	2	2	2	2
			January 2026	3	4	4	3	2	2	4	4	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Magnesium (total)	mg/L	500	February 2025	<1	2	<1	2	2	2	2	1	1
			January 2026	2	2	2	2	1	1	2	2	NA*
Nutrients												
Ammonia (total)	mg/L	0.9	February 2025	<0.01	0.23	0.34	0.25	<0.01	0.42	0.13	<0.01	0.02
			January 2026	0.01	<0.01	0.03	0.02	<0.01	<0.01	0.03	<0.01	NA*
Nitrogen (total)	mg/L	0.3	February 2025	0.4	1.3	0.8	0.8	0.9	1.4	0.9	0.4	2.3
			January 2026	0.9	0.7	0.8	0.8	0.6	0.7	0.7	0.8	NA*
Phosphorus (total)	mg/L	0.01	February 2025	0.05	0.10	0.07	0.05	0.04	0.04	0.06	0.03	0.17
			January 2026	0.03	0.05	0.05	0.04	0.03	0.04	0.04	0.05	NA*
Dissolved metals												
Aluminium	mg/L	0.055	February 2025	0.34	0.63	0.25	0.09	0.06	0.07	0.36	0.29	0.07
			January 2026	0.23	0.15	0.22	0.27	0.11	0.15	0.23	0.26	NA*
Arsenic	mg/L	0.013	February 2025	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Boron	mg/L	0.37	February 2025	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
			January 2026	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NA*
Cadmium	mg/L	0.0002	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Chromium	mg/L	0.001	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Cobalt	mg/L	0.0014	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Copper	mg/L	0.0014	February 2025	<0.001	0.002	<0.001	0.001	0.001	0.001	0.001	<0.001	0.002
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Lead	mg/L	0.0034	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Manganese	mg/L	1.9	February 2025	0.004	0.045	0.009	0.059	0.017	0.009	0.076	0.009	0.022
			January 2026	0.002	0.002	0.018	0.011	0.005	0.005	0.013	0.018	NA*
Mercury	mg/L	0.00006	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Molybdenum	mg/L	0.034	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Nickel	mg/L	0.011	February 2025	<0.001	0.002	<0.001	0.001	0.002	0.001	0.003	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Silver	µg/L	0.05	February 2025	0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
			January 2026	0.14	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA*
Uranium	mg/L	0.0005	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Vanadium	mg/L	0.006	February 2025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			January 2026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Zinc	mg/L	0.008	February 2025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
			January 2026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA*
Total metals												
Aluminium	mg/L	5	February 2025	4.66	3.33	1.87	1.13	1.04	0.93	1.52	2.58	0.10
			January 2026	0.47	0.74	0.55	0.56	0.65	1.11	0.47	0.48	NA*
Arsenic	mg/L	0.025	February 2025	<0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Boron	mg/L	5	February 2025	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
			January 2026	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NA*
Cadmium	mg/L	0.01	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Chromium	mg/L	0.05	February 2025	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	<0.001
			January 2026	<0.001	<0.001	<0.001	0.001	0.002	0.002	<0.001	<0.001	NA*
Cobalt	mg/L	1	February 2025	0.001	0.002	<0.001	0.002	<0.001	<0.001	0.002	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Copper	mg/L	1	February 2025	0.002	0.003	0.002	0.002	0.002	0.004	0.002	0.002	0.001
			January 2026	0.002	0.002	0.001	0.001	0.002	0.002	0.001	<0.001	NA*
Lead	mg/L	0.1	February 2025	0.002	0.002	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
Manganese	mg/L	10	February 2025	0.017	0.063	0.020	0.074	0.028	0.022	0.131	0.025	0.025
			January 2026	0.008	0.019	0.044	0.033	0.017	0.025	0.021	0.027	NA*
Mercury	mg/L	0.002	February 2025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
			January 2026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA*
Molybdenum	mg/L	0.01	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Nickel	mg/L	1	February 2025	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	0.001	0.002	<0.001	<0.001	NA*
Selenium	mg/L	0.02	February 2025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			January 2026	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NA*
Uranium	mg/L	0.2	February 2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			January 2026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA*
Vanadium	mg/L	0.1	February 2025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			January 2026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA*
Zinc	mg/L	20	February 2025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
			January 2026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA*
Total recoverable hydrocarbons												
C6- C9 Fraction	µg/L	20	February 2025	<20	<20	<20	<20	<20	<20	<20	<20	<20
			January 2026	<20	<20	<20	<20	<20	<20	<20	<20	NA*

Parameter	Units	WQO	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9
C10-C36 Fraction (sum)	µg/L	100	February 2025	<50	<50	<50	<50	<50	<50	<50	<50	120
			January 2026	<50	<50	<50	<50	<50	<50	<50	<50	NA*

Note - Cells shaded blue indicate exceedance of objective.
* Indicates sites and/or parameters not assessed during the relevant survey period.

5.2.3 Sediment quality

Sediment samples were collected at the aquatic survey sites during the February 2025, December 2025 and January 2026 surveys. The three additional sites (W10, W11, W12) were also sampled during the December 2025 survey. Only minor differences in sediment particle size distribution were recorded between samples collected in February (Figure 13) and December 2025 (Figure 14) and January 2026 (Figure 15), consistent with the expected variability of highly ephemeral watercourses.

The waterways showed similar particle size distribution, characterised by high percentages of sand at all sites (averaging 90%) and minimal levels of clay and silt. The lowest proportion of sand was recorded in February at a site in the Warrigal Creek (76% at W5), while site W8 in the unnamed tributary of Warrigal Creek recorded the highest proportion (99%, December survey). The clay and silt fractions were variable, however, the majority of sites recorded less than 1% of each fraction. The highest proportion of clay was recorded at W5 in February (10%), while the highest proportion of silt was recorded at W9 in December (7%). A variable proportion of gravel was recorded across the sites, with the highest proportion of at W6 in February (18%) and lowest at W1 in December (<1%) and averaging 7%. All sites recorded minimal cobble at less than 1%.

No exceedances of the interim sediment quality objectives were identified during the sediment quality assessment (Table 11). All results were recorded below both the upper guideline and default guideline values (refer to Table 2).

The laboratory certificates for sediment analyses are provided in Appendix H, Appendix I and Appendix J.

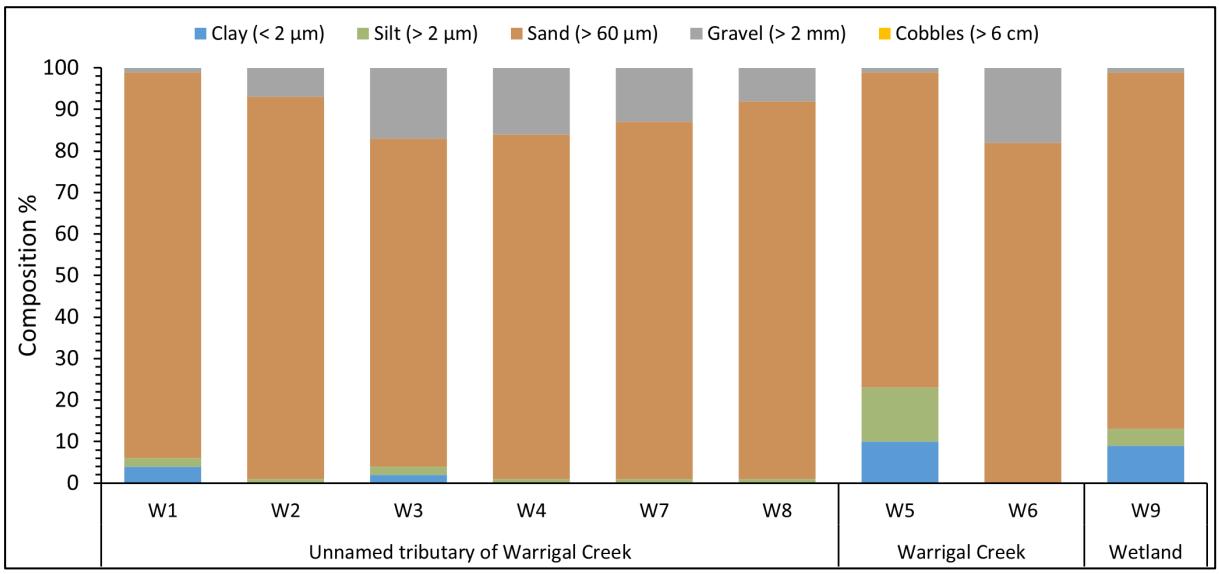


Figure 13: Sediment particle size classification (February 2025)

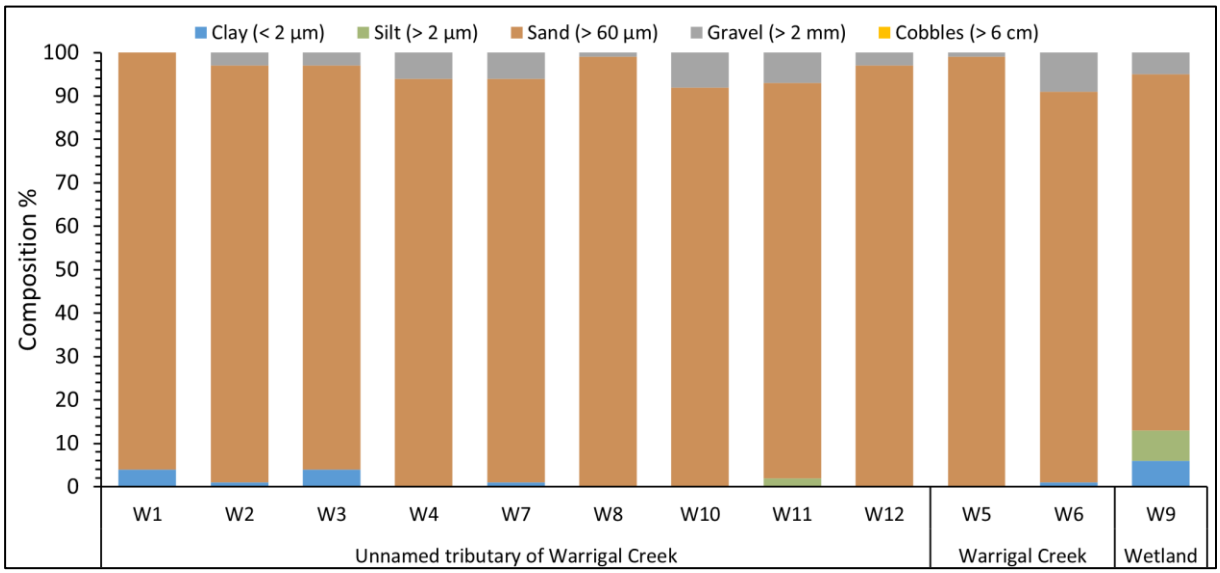


Figure 14: Sediment particle size classification (December 2025)

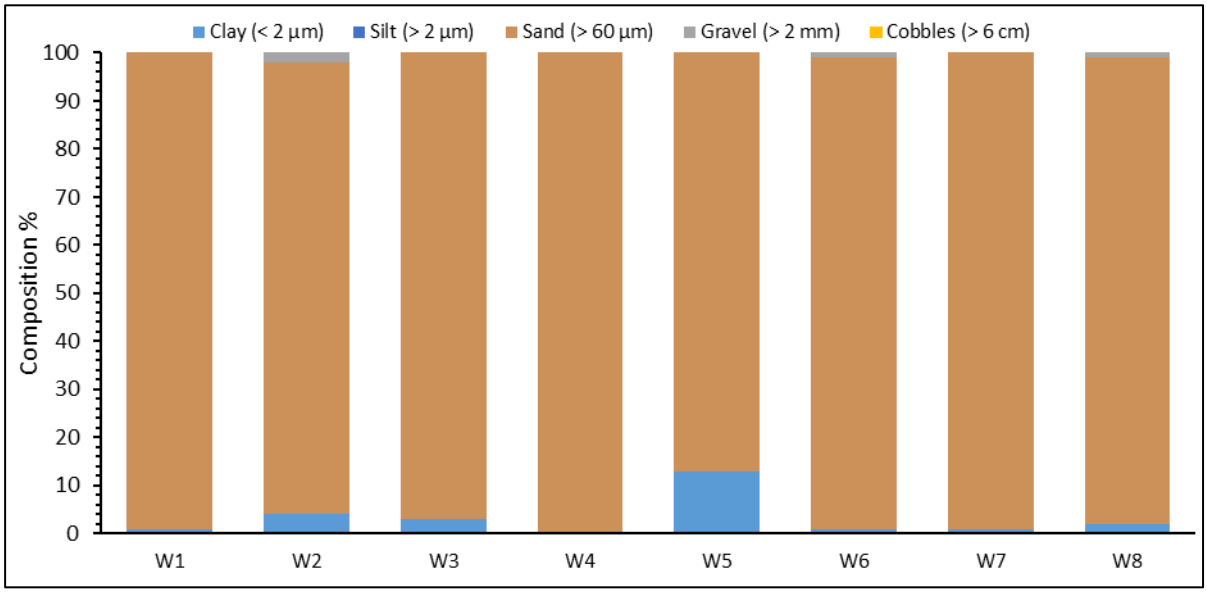


Figure 15: Sediment particle size classification (January 2026)

Table 11: Sediment quality results and comparison to interim objectives for the Project area

Parameter	Default guideline value(mg/kg)	Upper guideline value (mg/kg)	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Antimony	2.0	25	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*
Arsenic	20	70	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*
Cadmium	1.5	10	February 2025	<1	<1	<1	<1	<1	<1	<1	<1	<1	NA*	NA*	NA*
			December 2025	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			January 2026	<1	<1	<1	<1	<1	<1	<1	<1	NA*	NA*	NA*	NA*
Chromium	80	370	February 2025	4	2	3	<2	4	2	4	2	2	NA*	NA*	NA*
			December 2025	5	3	3	<2	2	2	3	2	3	6	3	2
			January 2026	4	3	3	<2	<2	2	2	<2	NA*	NA*	NA*	NA*
Copper	65	270	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*
Lead	50	220	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*

Parameter	Default guideline value(mg/kg)	Upper guideline value (mg/kg)	Survey period	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Mercury	0.15	1	February 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*
			December 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			January 2026	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*	NA*
Nickel	21	52	February 2025	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA*	NA*	NA*
			December 2025	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
			January 2026	<2	<2	<2	<2	<2	<2	<2	<2	NA*	NA*	NA*	NA*
Silver	1.0	4.0	February 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*
			December 2025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			January 2026	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA*	NA*	NA*	NA*
Zinc	200	410	February 2025	<5	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*
			December 2025	<5	<5	<5	<5	<5	<5	9	<5	8	<5	<5	<5
			January 2026	<5	<5	<5	<5	<5	<5	<5	<5	NA*	NA*	NA*	NA*

* Indicates sites and/or parameters not assessed during the relevant survey period.

5.2.4 Aquatic macroinvertebrates

5.2.4.1 Abundance

Total macroinvertebrate abundance for each aquatic survey site is presented in Figure 16, representing the bed and/or edge habitat of the waterways at each site. Edge samples were collected for all aquatic survey sites, however, only one site, W1, had suitable conditions to enable a bed habitat sample to be collected.

The total abundance of macroinvertebrates was highly variable across the survey sites and across waterways. Both sites within Warrigal Creek recorded similar levels of abundance (18 and 16 individuals), averaging 17 individuals. The average abundance at the unnamed tributaries of Warrigal Creek was greater than double Warrigal Creek, at 42 individuals; however, this reflects the greater variability recorded in this system, which ranged from 17 individuals (W2) to 85 individuals (W1 (Edge)).

The complete list of identified macroinvertebrates is provided in Appendix K.

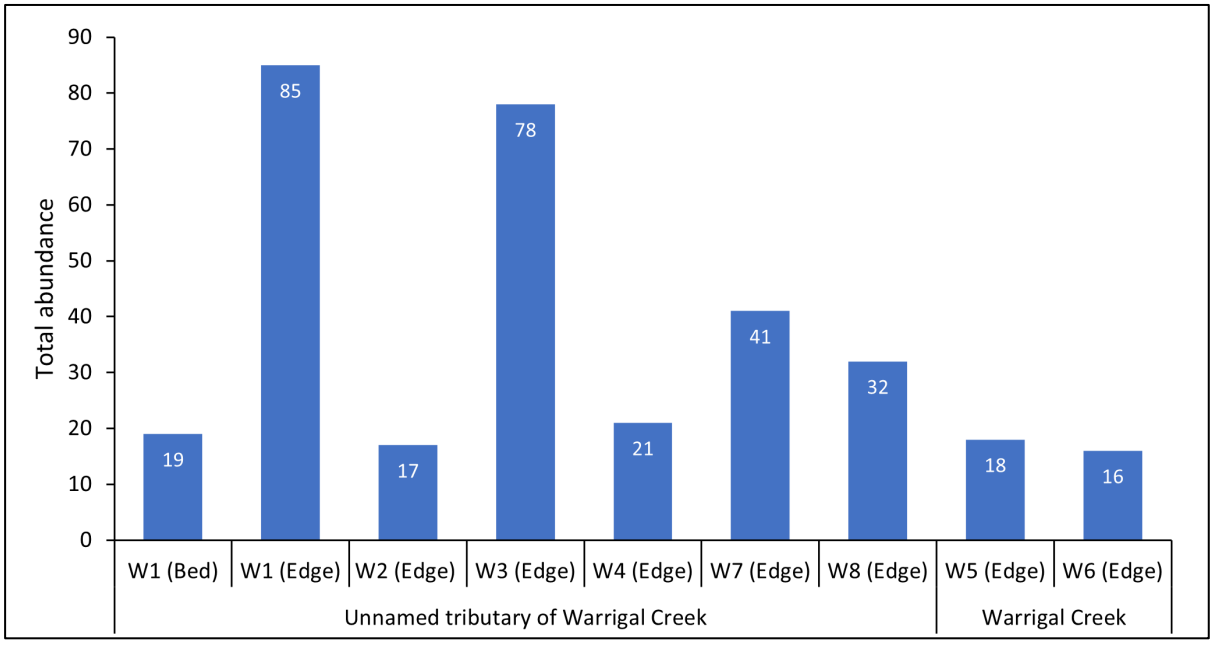


Figure 16: Total macroinvertebrate abundance at aquatic survey sites

5.2.4.2 Taxonomic richness

Macroinvertebrate taxa richness for each aquatic survey site is presented in Figure 17. Sample richness ranged between 5 (W6) and 16 taxa (W3), with a combined total of 27 taxa identified across all aquatic survey sites. On average, the taxa richness was marginally higher in the unnamed tributaries of Warrigal Creek compared to Warrigal Creek (12 and 7 taxa, respectively).

No guideline values for macroinvertebrate richness have been developed for the Norman Basin or sub-basin in which the Project is located; as such, no comparison has been made. The taxonomic richness is assumed to be reflective of the ephemeral nature of the watercourses in the Project area and likely to be representative of aquatic ecosystems in the Norman River sub-basin.

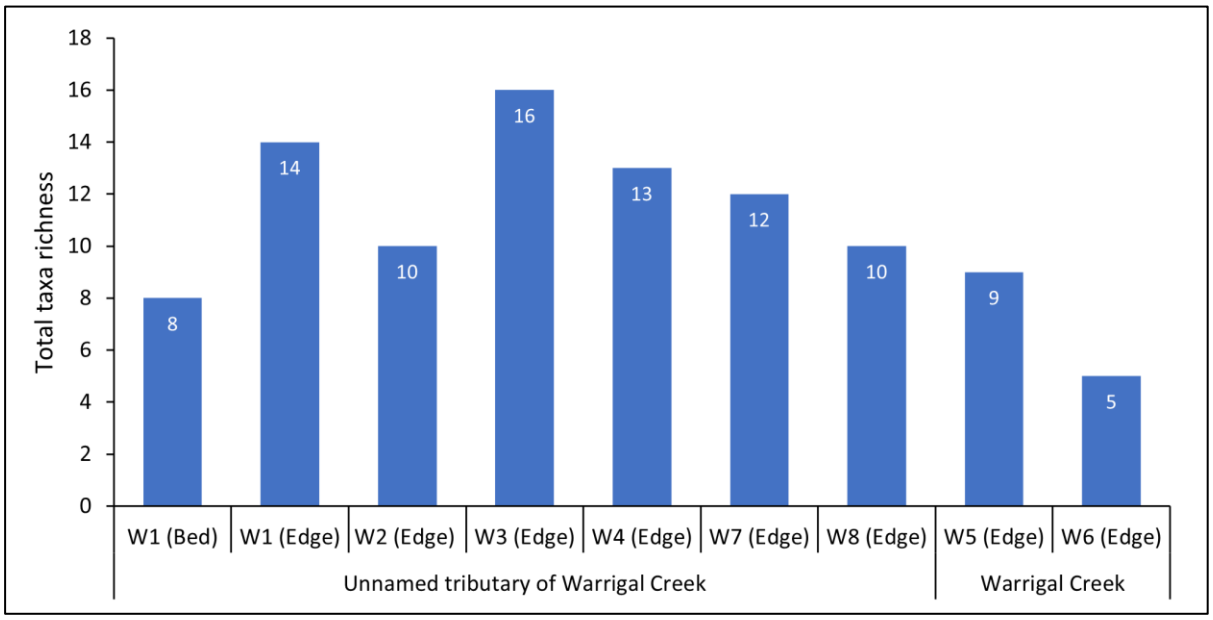


Figure 17: Total macroinvertebrate taxonomic richness at aquatic survey sites

5.2.4.3 PET taxonomic richness

The PET taxa are three orders of macroinvertebrate (Plecoptera, Ephemeroptera, Trichoptera) that are particularly sensitive to disturbance, as they require favourable water quality conditions and diverse habitat to survive. PET taxa richness in ephemeral waterways tends to be low, due to the naturally harsh conditions (i.e., poor water quality and low habitat diversity). However, trending declines in the number of PET taxa at a site may indicate pollution or poor water quality.

Only two PET taxa were identified during the aquatic ecology survey, Leptophlebiidae and Caenidae, both belonging to the order Ephemeroptera. Leptophlebiidae was recorded at four sites (W3, W4, W5, W6), whilst Caenidae was recorded from two sites (W4, W6) (Table 12).

The low levels of PET taxa sampled is likely due to the ephemeral nature of the waterways and the high rainfall event prior to the February 2025 survey period.

Table 12: PET taxonomic richness at aquatic survey sites

Taxa	Unnamed tributaries of Warrigal Creek								Warrigal Creek	
	W1 (Bed)	W1 (Edge)	W2 (Edge)	W3 (Edge)	W4 (Edge)	W7 (Edge)	W8 (Edge)	W9 (Edge)	W5 (Edge)	W6 (Edge)
Plecoptera	0	0	0	0	0	0	0	0	0	0
Ephemeroptera	0	0	0	1	2	0	0	1	2	0
Trichoptera	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**1**	**2**	**0**	**0**	**1**	**2**	**0**

5.2.4.4 SIGNAL2 scores

The weighted SIGNAL2 scores of the samples collected from the aquatic survey sites were relatively consistent, with an average score of 3.2. All sites recorded generally low scores between 2.5 and 3.5, except for one site in the Warrigal Creek (W6), which had the highest SIGNAL2 score of 5.1. When comparing across waterways, the Warrigal Creek recorded a higher average SIGNAL2 score of 4.2, compared to the unnamed tributaries of Warrigal Creek, which averaged a score of 2.8.

The quadrant boundaries for the bi-plot were set according to the suggested interim quadrant boundaries provided in Chessman (2001). Compared to the Chessman (2001) quadrant boundaries, the results of all sites are considered indicative of water quality impacted by pollution. The current land use for the Project area is low intensity cattle grazing. Some water quality impacts are likely to have been caused by these activities, however, it is considered more likely that the low SIGNAL2 scores and taxonomic richness of the macroinvertebrate communities is due to the harsh physical environments of the ephemeral watercourses of the Project area (Figure 18).

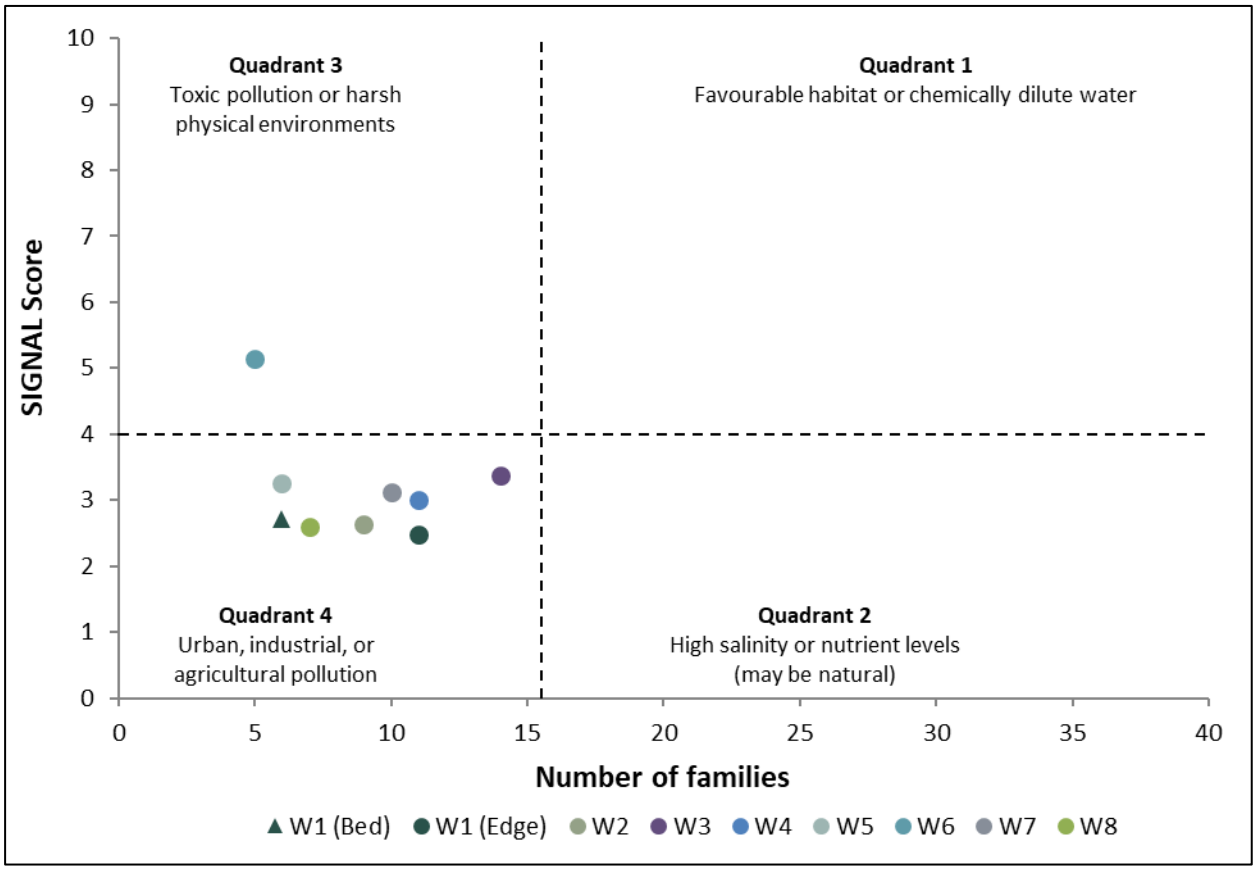


Figure 18: SIGNAL2 bi-plot for aquatic ecology survey sites

5.2.4.5 Tolerant taxa index

It is expected that a site experiencing adverse impacts will result in a change in the proportion of tolerant taxa abundance. The Percent Tolerant Taxa index is based on the proportion of total taxa that are rated as having a 'tolerant' sensitivity grade (SIGNAL grades 1, 2 and 3). The lower the SIGNAL grade, the more tolerant to impacts the taxa are, and subsequently, a higher proportion of tolerant taxa indicates poorer water quality and/or a more disturbed ecosystem.

The proportion of pollutant tolerant taxa was generally consistent across the aquatic survey sites and across the waterways, with an average of 64%. The highest and lowest proportion of tolerant taxa were both recorded at sites within the unnamed tributaries of Warrigal Creek; the highest proportion was recorded at W1 (edge sample) at 73%, while W3 recorded the lowest proportion at 50% (Figure 19).

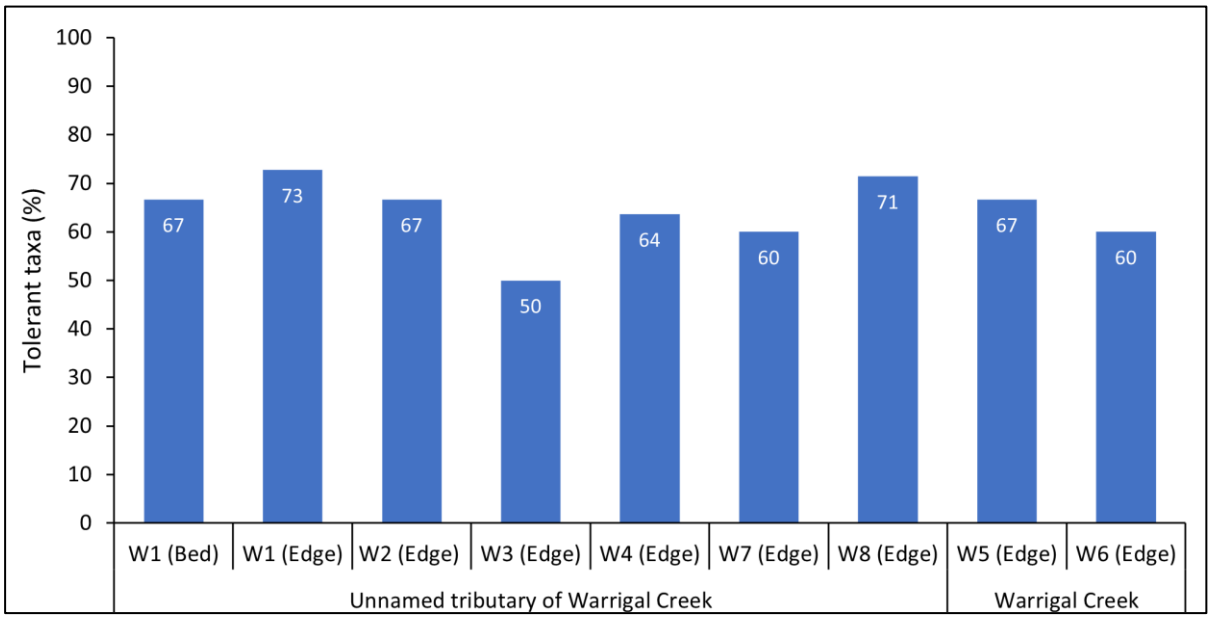


Figure 19: Proportion of tolerant taxa for aquatic survey sites

5.2.5 Aquatic flora and fauna

No aquatic flora species listed as threatened under the EPBC Act or NC Act were identified during the aquatic ecology survey.

The aquatic flora species encountered were common emergent macrophyte species, two semi-aquatic sedges, *Cyperus* sp. and *Juncus* sp. across the aquatic survey sites. The lack of both diversity and abundance of aquatic plants at some sites is likely indicative of harsh physical conditions, cattle grazing and trampling, or a combination of these factors.

The aquatic fauna assessment was limited during the aquatic ecology survey, given the broader landscape conditions during the survey period and the lack of suitable conditions for trapping at many sites (i.e., non-flooding, wide enough creek, holding water and absence of debris). Cast-net trapping for fish was able to be conducted at two sites in the unnamed tributaries of Warrigal Creek, W6 and W8. However, no fish were captured during the fish surveys at these sites.

Observations of aquatic fauna species were recorded during targeted survey efforts and opportunistically throughout the February 2025 survey. Unidentified fish species were opportunistically observed at site W7, and unidentified tadpoles were observed at sites W2, W7, and W9.

No aquatic fauna listed as threatened or migratory under the EPBC Act or NC Act were observed at any of the survey sites during the survey.

5.2.5.1 Fauna species of cultural significance

The Mertens' Water Monitor (*Varanus mertensi*) is considered a culturally significant species to the Tagalaka People. The likelihood assessment considered the species as unlikely to occur in the Project area as potential habitat has not been identified within the Project area and there are no confirmed records within 100 km (Refer to Table 4, Table 6, Appendix F of the Terrestrial Ecology Assessment).

The wet season surveys, including active searches at all habitat types within the Project area, were undertaken during optimal climatic conditions for the Mertens' Water Monitor. Neither the Mertens' Water Monitor nor its potential aquatic habitat have been identified from the Project area. Occasional small shallow ponds were observed in larger watercourses; however, the highly ephemeral flow patterns and sandy channel substrate of these streams do not provide sufficient aquatic value to support Mertens' Water Monitor habitat.

5.2.6 Waterways providing for fish passage

During the December 2025 and January 2026 surveys, observations were recorded to support the assessment of fish passage in the Project area. The assessment results – including site photographs – are detailed in Appendix E.

The results of the aquatic survey have been assessed in conjunction with a watercourse determination request submitted and approved for the Project. The watercourse determination involved validating the presence and classification of waterways in the Project area as either a 'watercourse' or 'drainage feature', in accordance with the Water Act. The updated watercourse mapping relating to the Project area and aquatic ecology survey is provided in Figure 20.

The aquatic survey results were assessed in combination with the watercourse determination results to validate the existing waterway barrier mapping for the Project area. There are four waterways identified in the 'Queensland waterways for waterway barrier works' mapping within the Project area, namely, Warrigal Creek, an unnamed stream order 4 waterway (tributary of Warrigal Creek, in the far west of the Project area), an unnamed stream order 3 waterway (tributary of Warrigal Creek) and an unnamed stream order 2 waterway (tributary of Warrigal Creek).

Sites within these waterways had attributes consistent with waterways providing for fish passage including by allowing species access to upstream habitats and refuges. As a result of the assessment, all 'Queensland waterways for waterway barrier works' mapped waterways that were identified to be watercourses through the watercourse determination process, are considered likely to provide value for fish passage. Of these, only one waterway – a section of the unnamed stream order 3 waterway (tributary of Warrigal Creek) – is proposed to undergo waterway barrier works.

The drainage features, including the drainage feature in the transport corridor, were identified through the watercourse determination process by the Department of Primary Industries (Figure 20). They are considered to not have attributes consistent with waterways providing for fish passage. These drainage features are considered unlikely to provide value for fish passage.

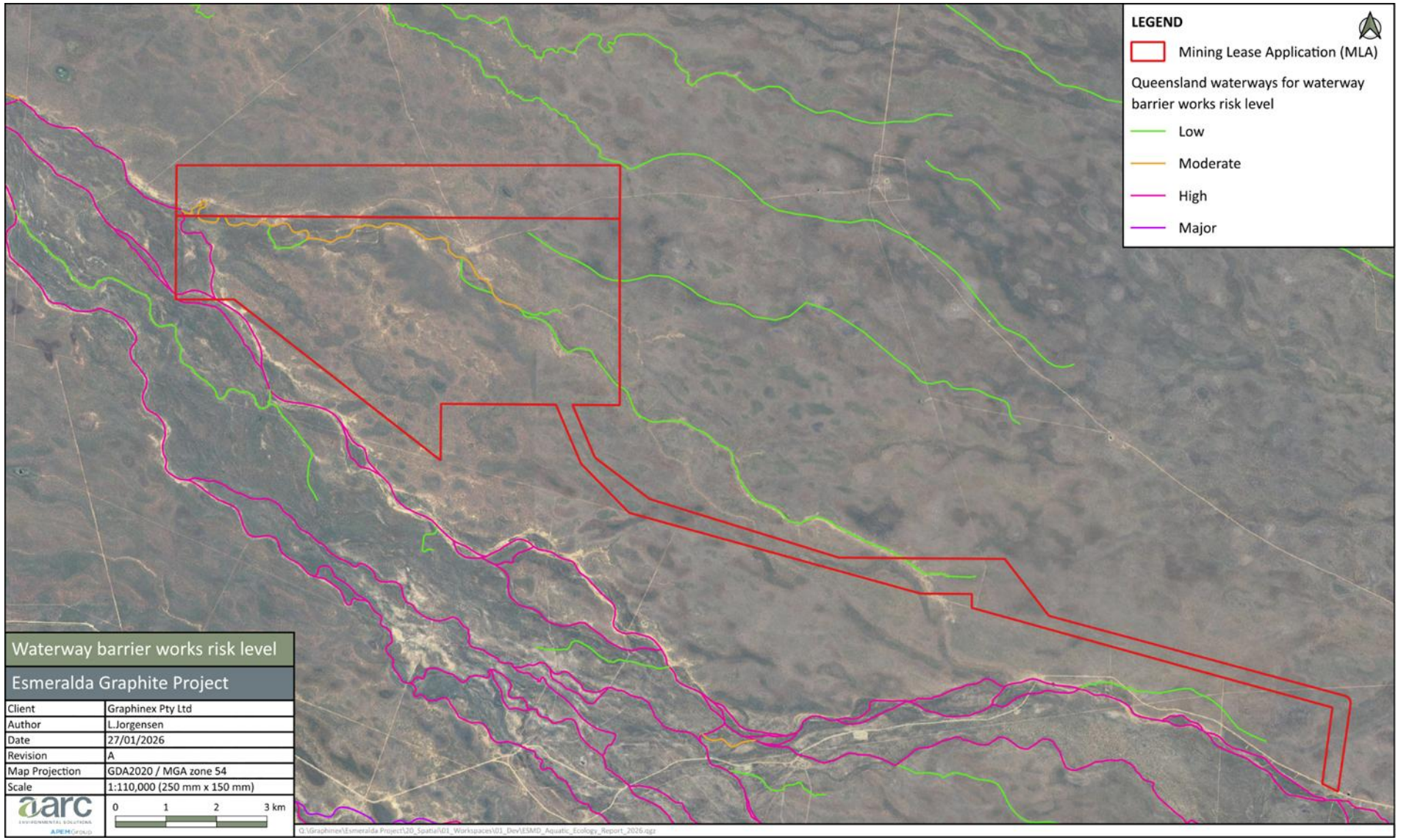


Figure 20: Waterway barrier works risk level for the Project area

6 Potential impacts, avoidance, mitigation and management measures

The proposed Project development comprises three Project stages:

- Stage 1 - Project construction;
- Stage 2 - Mining and processing (ramping up to full production by Project year 3 - 3.5 Mtpa), followed by low-grade ore stockpile reclaim (plant feed from stockpiles after pit depletion); and
- Stage 3 - Final site rehabilitation and monitoring.

The potential Project impacts on aquatic environmental values, and the proposed measures developed to avoid, mitigate and manage those impacts, are described in Sections 6.1, 6.2 and 6.3.

Section 7 provides an impact assessment specific to the identified aquatic environmental values and assesses the significance of the residual impacts on these matters after adoption of avoidance and mitigation measures.

6.1 Direct impacts

6.1.1 Modification of waterways and wetlands

The Project infrastructure has been sited to consider aquatic values of the environment with the aim of providing safe operations, while minimising impacts to these values. Project infrastructure location has been designed such that direct impacts to environmental values has been avoided or minimised as much as practicable. However, the target resource is located such that its recovery requires that the open-cut pit to access the resource requires direct impact to a waterway. The location of the pit in relation of the waterway requires the development of associated flood management structures such as a levee and the permanent diversion of a 1.5 km section of the unnamed tributary of Warrigal Creek (stream order 3 waterway).

The waterway will be diverted around the northern extent of the planned mining area for a length of 1.8 km, which will include an excavated drainage channel, with a channel base width of approximately 5 m, and low flow channel depth of one metre. The levee embankments will prevent flows along the old waterway and provide flood immunity to the open cut pit. The diversion will connect to the existing waterway, east of the pit and divert it around the pit's northern extent to tie back into the original waterway. The diversion is designed in accordance with the DNRME guidelines for permanent watercourse diversions to maintain the existing hydrology, hydraulic, geomorphic and ecological features of the existing waterway (DNRME, 2019). The diversion will remain at closure.

The Watercourse Diversion Functional Design Report (Engeny 2026) outlines the design of the diversion, which has utilised channel design parameters representative of the morphology of a creek or waterway present in the catchment. To achieve this, the diversion design has utilised the hydraulic conditions, geology (sediment size and supply), and topography in the existing catchment. The design of the creek diversion adopted a reference reach approach, identifying the typical cross section geometry and longitudinal grade of the existing creek. The hydraulic threshold of the creek diversion was compared against the existing creek to confirm that dynamic equilibrium will be maintained. The proposed geometric design is summarised in Table 13, demonstrating that the design matches the average cross section dimensions and stream power of the existing watercourse. By matching the channel dimensions and stream power, the diversion is designed not to impede fish passage by maintaining hydrological, hydraulic connectivity and environmental conditions to support fish habitat.

The proposed diversion geometry and grade are comparable to those in the existing reach of the creek that is to be diverted. The diversion matches the conditions upstream and downstream of the tie in points. Revegetation is proposed to be undertaken using species present in the local ecosystem.

Table 13: Detailed channel cross section and longitudinal gradient summary

Channel geometry	Value	Basis
Channel bed width	5 m	Average cross section of existing watercourse
Low flow channel depth	1 m	Average cross section of existing watercourse
Low flow bank grade	1V:8H	Average cross section of existing watercourse
High flow channel depth	1.5 m	Average cross section of existing watercourse
High flow bank grade	4%	Average cross section of existing watercourse
Longitudinal grade	0.11%	Match stream power to existing watercourse

Results from the flooding assessment (refer to the Project Surface Water Assessment) for the project determined that there will be minor impacts to Warrigal Creek and Borer River due to the diversion of the unnamed waterway (stream order 3):

- This impact is expected to include isolated increases in peak flood levels at the location of the diversion drain and south of the TSFs, as well as a minor decrease in flood levels in Warrigal Creek downstream of the Project site.
- The changes in flood depth are minor and not expected result in any adverse impacts to the waterway.
- Increases to peak flood velocity are confined to the diversion drains and associated northern breakout flooding. Decreases in peak flood velocity have been modelled at the inlet and outlet of the diversion drain.
- Peak flood velocities in natural environments are expected to increase by a maximum of 0.5 m/s in the breakout flow path north of the watercourse diversion in the 1% AEP flood event however the absolute peak velocity in the operational phase model remains <0.6m/s.

Upgrades to existing crossings of small tributaries within the transport MLA will also likely be required as part of the Project's development and operation.

The disturbance activities are not subject to the 'Accepted development requirements for waterway barrier works' (DPI 2025) and 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022) because they will be located within the Project's ML and, therefore, are exempt from assessment under the Planning Act. Notwithstanding, to minimise impacts to waterways providing fish passage, these activities will be configured and developed according to the accepted development requirements provided in the relevant guidelines.

In particular the diversion will be designed in accordance with the 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022) performance outcomes that are relevant to 'All Development' under the code, including:

- Development is designed, constructed and maintained to avoid and minimise impacts on matters of state environmental significance;
- Aspects of development are only permitted within a waterway where there is a functional requirement, and the development cannot be feasibly located elsewhere. Ancillary elements are to be located outside of the waterway;
- Development does not result in adverse impacts to fisheries resources;
- The design, construction and maintenance of the development does not result in non-essential hardening or unnatural modification of the main channel of the waterway;
- The development retains natural fish habitat and features such as shade, pools, riffles, rock outcrops and boulders, wherever possible;

- The design, construction and maintenance of the development does not result in straightening of meandering waterways;
- Where channels are to be significantly modified, the design and construction of the development replicates natural waterways and habitat features;
- The development is designed, constructed and maintained to provide water exchange sufficient to maintain or improve water quality and flow conditions on which fisheries resources depend; and
- The development is designed, constructed and maintained to not result in adverse impacts to beds, banks and vegetation adjacent to the permanent development footprint.

Development activities within the waterways will be avoided during the wet season and will not occur during elevated flow periods. Given that direct disturbance will occur when waterways are not flowing, the likelihood of aquatic fauna becoming stranded or experiencing direct mortality is low. No listed threatened aquatic species have been identified from the waterway during field surveys of the Project area. The potential adverse impacts on all aquatic species and their habitats will be avoided and minimised through proposed management measures. Given the diversion has been designed matching the average cross section dimensions and assessed stream power of the existing watercourse, and the design will meet the 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022) performance outcomes, the diversion is expected to achieve acceptable outcomes for aquatic ecology values.

No WPAs, HES wetlands or high ecological value waters identified under the Environmental Protection (Water) Policy 2009, schedule 2 are present in the Project area. The proposed mining and processing area will likely have direct impacts to riverine and palustrine wetland ecosystems; however, these are mapped as GES wetlands. These wetlands are not expected to provide habitat to listed threatened species.

The impacts of direct disturbance to riparian and wetland vegetation communities are assessed in the Terrestrial Ecology Assessment (AARC 2026).

6.1.2 Barriers to fish passage

The levees and the permanent diversion of a tributary of Warrigal Creek and upgrades to existing crossings have the potential to create barriers to fish passage along the waterways. At the location of the proposed diversion, the unnamed stream order 3 waterway is mapped as being of moderate value for fish passage from waterway barrier works (refer to Section 5.1.3.4). Existing crossings of unnamed stream order 2 waterways (tributaries of Warrigal Creek) are classified as low value for fish passage from waterway barrier works (Section 5.1.3.4).

The fish passage assessment for the Project validated the presence of waterways providing for fish passage. The unnamed stream order 3 waterway is likely to support fish passage (refer to Section 5.2.6 and Appendix E). The diversion will be designed and constructed such that it meets the performance outcomes of the 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022). The diversion will be expected to maintain fish passage and be representative of the existing waterway conditions.

Upgrades of existing crossings of small tributaries along the transport MLA are unlikely to constitute barriers to fish passage. These areas have been validated as drainage features through the watercourse determination process and are considered unlikely to support fish passage (refer to Section 5.2.6). Nonetheless, these crossings will be designed and constructed in accordance with the 'Accepted development requirements for waterway barrier works' (DPI 2025). They will be bed level or low-level crossings, or culvert crossings to comply with western drainage basins on a green waterway.

In the instance that the crossing will be a bed level or low-level crossing the crossing dimensions and design will meet the following requirements from the 'Accepted development requirements for waterway barrier works' (DPI 2025):

- works within the waterway commence and finish within 360 calendar days;
- the bed level or low level crossing is no greater than 15 metres wide in an upstream/downstream direction that does not include waterway bed scour protection;

- new bed level or low level crossings are aligned perpendicular, within 10°, to the water flow. This does not apply to replacement of existing crossings
- where the bed level, or low level crossing is constructed using rocks:
    - use clean rocks that are an equivalent or larger size than the natural bed material at the site, and at least 50 mm diameter. Minimal fine material is present. Where rocks larger than 300mm are used, use mixed sizes of rock to lock the structure together, promote surface flows suitable for fish passage, and minimise fish entrapment.
    - the surface is left rough and is not over compacted, such as a track-rolled finish or rougher.

In the instance that the crossing will be a culvert crossing the configuration will meet the following requirements from the 'Accepted development requirements for waterway barrier works' (DPI 2025):

- has a minimum, combined culvert aperture width of 1.2m;
- all culvert cells are installed at or below bed level;
- the obvert of the culvert cell(s) is a minimum of 300 mm above the level that water commences to flow through the culvert, or bed level, for ephemeral waterways;
- the culvert is installed at no steeper gradient than the waterway bed gradient; and
- new culvert cells are aligned parallel, within 10°, to the direction of water flow to minimise turbulence. This does not apply to replacement of existing culvert crossings.

As the development will be compliant with the accepted development requirements, it is considered unlikely that fish salvage will be required. Additionally, all fish species potentially inhabiting the waterways are assumed to be adapted to conditions of ephemeral waterways, which will not be substantially altered by the Project. No pumping of water from the waterways is proposed, therefore measures to prevent the entrainment of fish into pumping infrastructure is not required. In the event that pumping of surface water is required, screening will be incorporated to prevent the entrainment of fish into water pumping infrastructure.

The proposed disturbance activities to these waterways will be located within the MLA. Development within an ML is exempt from requiring development approval for water barrier works under the Fisheries Act. However, assessment of potential impacts to a waterway providing for fish passage as an MSES is applicable.

The potential impact to waterways providing fish passage is assessed in Section 7.

6.2 Indirect impacts

The Project has the potential to have indirect impacts on aquatic ecology values through changes to water quality and hydrology. The potential indirect impacts have been identified and are described below.

6.2.1 Invasive species

The Project is unlikely to introduce or exacerbate impacts of invasive species which would be harmful to aquatic ecology values. No invasive aquatic species were recorded during the aquatic ecology surveys.

Assessment of biosecurity risks and proposed management will be provided through the biosecurity assessment in the Project EIS.

6.2.2 Downstream waterway flows

Aquatic ecosystems are dependent on water flows, and changes to flows can impact the aquatic ecosystem values. The proposed diversion of natural waterways and overland flow around mining activities will be designed to sustain flow.

Nonetheless, the potential for a reduction of catchment area for waterways impacted by the Project was assessed by the Project Surface Water Assessment (Engeny 2026) through surface water modelling. The model indicates that impacts to downstream streamflow are expected to be largely confined to smaller local drainage paths immediately downstream of the Project. The affected contributing catchment area represents a relatively small proportion of the broader receiving catchments and, therefore, reductions in flow volumes and duration are not expected to materially alter regional hydrological processes or downstream water availability. Progressive rehabilitation of disturbed areas is also expected to reduce long-term runoff interception by re-establishing stable landforms and promoting infiltration and revegetation over the life of the Project. Given the Project is not expected to materially alter regional hydrological process, impacts to aquatic ecosystem values due to altered flow are not expected.

Mine water storages associated with the Project do not have potential to discharge offsite. All mine water dams overflow to the mining pit. The pit has excess capacity to contain all overflow volumes, ensuring that there would be minimal actual or potential discharge of contaminants to waters that may or have the potential to cause an adverse effect on identified environmental values.

To manage potential impacts on downstream waterway flows, a water management plan will be developed and implemented to ensure effective design and management of surface flows around the mining operation, with consideration of surrounding biota, including wetlands. A water quality monitoring program will be developed and implemented to confirm the effectiveness of management practices and the protection of downstream ecosystems. Further detail of the water management plan and water quality monitoring program is given in Engeny 2026.

6.2.3 Changes to flood regimes

Topography across the Project area and in the surrounding area is very flat, which results in widespread flooding, with interactions between the nearby major waterways during significant flood events. The unnamed stream order 3 waterway (tributary of Warrigal Creek) receives significant breakout flood flows from the northern banks of Warrigal Creek and the Borer River upstream of the Project area (Engeny 2026).

The proposed flood management structures may alter the flooding regime of the unnamed stream order 3 waterway, and adjacent landscape. A flood levee will be part of the final landform for the Project and minimise surface water incursion into the open-cut pit. The extent of any potential impacts on environmental values will be assessed through detailed modelling and reporting as part of the Surface Water Assessment for the Project.

The diversion and flood protection measures will be designed to ensure existing channel features are maintained, and flood regimes are not significantly altered. Impacts to aquatic ecology values are expected to be negligible as a result of flood regime changes.

A water management plan will be developed and implemented to ensure effective design and management of surface flows around the mining operation, with consideration of surrounding biota, including wetlands. A water quality monitoring program will be developed and implemented to confirm the effectiveness of management practices and the protection of downstream ecosystems. Further detail of the water management plan and water quality monitoring program is given in Engeny 2026.

6.2.4 Groundwater drawdown

Surface construction activities will not intersect the groundwater table. However, construction activities will require a water supply, and a portion of this may be sourced from groundwater. In this instance, supply bore(s) will be installed to provide the necessary construction water supply and advance dewatering prior to mining development.

Potential impacts to groundwater from mining include depressurisation and drawdown of aquifers occurring from excavation of the mining void, reduction of groundwater resource available to existing users, changes to natural groundwater level impacting groundwater dependent ecosystems and potential for contamination from seepage or spills. The exact nature and extent of direct impacts to groundwater will be assessed in detail as part of the Groundwater Assessment for the Project, to be prepared by Hydrogeologist.

6.2.5 Changes to water quality

Surface water quality in downstream waterways can be impacted through a number of mechanisms including increased sedimentation and turbidity, increased concentrations of nutrients and contaminants (such as metals and hydrocarbons) and saline and acid drainage. These effects can impact the health, composition and resilience of aquatic fauna and flora and thereby impact aquatic ecology values. The potential drivers and impacts to water quality due to the Project are discussed below.

6.2.5.1 Erosion and sedimentation

The Project has the potential to result in erosion of disturbed areas and sedimentation of waterways from clearing vegetation for the development of open-cut pits and constructing haul roads and other infrastructure.

An erosion and sediment control plan for the Project will be developed and implemented to mitigate erosion processes and protect downstream ecosystems from increased sediments loads.

A water quality monitoring program will also be developed and implemented to confirm the effectiveness of management practices and the protection of downstream ecosystems.

Further detail of the water management plan and water quality monitoring program is given in Engeny 2026.

6.2.5.2 Water releases

Controlled water releases are not proposed for the Project. Effective containment of mine affected water and implementation of an effective water management system will be designed to prevent the release of contaminants. Where possible, mine affected water will be re-used and re-cycled on site as part of Project water supply. A detailed site water balance will be prepared to account for all water inputs and outputs, and the necessary on-site storage and management infrastructure will be developed accordingly.

- Mine water storages associated with the Project do not have potential to discharge offsite. All mine water dams overflow to the mining pit. The pit has excess capacity to contain all overflow volumes, ensuring that there would be minimal actual or potential discharge of contaminants with potential for acute and chronic toxicity to waters that may or have the potential to cause an adverse effect on identified environmental values.
- The sediment dams have been designed to provide sufficient storage for settlement of suspended solids so that water quality during overtopping events has negligible impact on the water quality in the receiving waterway. Sediment dams will also include overflow control structures with scour protection (rock chutes, rock aprons or level spreaders) to ensure non-erosive discharges. Monitoring of overtopping events will be undertaken to assess the performance of the sediment dams and ensure downstream environmental values are maintained and validate the design assumptions. Sediment dam overflows and associated water quality are not expected to have adverse impacts on water quality and environmental values in receiving waterways downstream of the Project.
- Any runoff and seepage produced by the waste rock dumps will be collected in Sedimentation Dam 1 and 3. Seepage produced by the waste dumps will be collected in the sediment dams and managed by the water management system.
    - Seepage produced during dry to medium rainfall events will be contained and managed by the sediment dams.
    - Any seepage produced during large rainfall events that result in overtopping of the sediment dams would receive significant dilution immediately in the receiving waterway. Because the metal concentrations in the water materials are low compared to the receiving waterway WQOs, the expected dilution with natural flows in the downstream waterway is expected to reduce concentrations below the WQOs. Based on the seepage, a material impact on the environmental value of receiving waters is not expected.

A water management plan will be developed and implemented to ensure effective design and management of surface flows around the mining operation, with consideration of surrounding biota, including wetlands. A water quality monitoring program will be developed and implemented to confirm the effectiveness of management practices and the protection of downstream ecosystems. Given the Project proposes no water releases, the water monitoring program will not be required to be designed to monitor for impacts of controlled releases. Further detail of the water management plan and water quality monitoring program is given in Engeny 2026.

6.2.5.3 Litter, waste and spills

Waste generated from the Project activities could enter aquatic ecosystems and affect aquatic fauna and flora. Waste from the Project will be managed in accordance with the waste and resource management hierarchy from the *Waste Reduction and Recycling Act 2011*, which lists waste and resource management strategies in the order of most to least preferred option:

1) avoid unnecessary resource consumption;
2) reduce waste generation and disposal;
3) re-use waste resources without further manufacturing;
4) recycle waste resources to make the same or different products;
5) recover waste resources, including the recovery of energy;
6) treat waste before disposal, including reducing the hazardous nature of waste; and
7) dispose of waste only if there is no viable alternative.

Any hazardous waste would be removed from the site by a licenced contractor and disposed of or recycled at appropriate off-site facilities.

6.3 Cumulative impact

Cumulative impacts can be defined as the total impact on the environment that results from the incremental impacts of the action (the Project) added to other past, existing, and reasonably foreseeable future actions in the region. Cumulative impacts include direct and indirect impacts on the environment.

The Project is unlikely to impact major watercourses, such as the Warrigal Creek, the Borer River or the Clara River. These watercourses are also considered unimpacted by other minerals Projects, though they are considered likely to have been impacted by the agricultural land use activities of the area. Considering the lack of other development in the local catchment area, key ecosystem cycles are unlikely affected by cumulative impacts.

7 Significant residual impact assessment

7.1 Waterways providing for fish passage

Under the EO Act, offsets are required for significant residual impacts to any part of a waterway that provides for fish passage, if the Project includes the construction, installation and/or modification of a waterway barrier that will limit fish passage along that waterway.

Within the Project disturbance area, Warrigal Creek and unnamed stream order 4 waterway (tributary of Warrigal Creek) are classified as having a high value for fish passage, the stream order 3 waterway (tributary of Warrigal Creek) is classified as having a moderate value for fish passage, and the stream order 2 waterway (tributary of Warrigal Creek) is classified as having a low value for fish passage.

Potential barriers to fish passage proposed for the Project include the flood levees and diversion of the unnamed stream order 3 waterway (tributary of Warrigal Creek) and upgrades to existing crossings of tributaries (drainage features) in the transport corridor.

The waterway diversion will be constructed around the northern extent of the planned mining area for a length of 1.5 km, which will include an excavated drainage channel, with a channel base width of approximately 5 m, and low flow channel depth of one metre. Levee embankments will be constructed to plug the old waterway and provide flood immunity to the open cut pit. The diversion will connect to the existing waterway, east of the pit and divert it around the pits northern extent to tie back into the original waterway. The diversion is designed in accordance with the DNRME guidelines for permanent watercourse diversions to maintain the existing hydrology, hydraulic, geomorphic and ecological features of the existing waterway (DNRME 2019). The diversion will remain at closure. The proposed diversion geometry and grade are comparable to those in the existing reach of the creek that is to be diverted. The diversion matches the conditions upstream and downstream of the tie in points. Revegetation is proposed to be undertaken using species present in the local ecosystem. Results from the flooding assessment (refer to section 6.1.1 and the Project Surface Water Assessment) for the project determined that there will be minor impacts to Warrigal Creek and Borer River due to the diversion of the unnamed waterway. A water management plan will be implemented for the Project.

Upgrades of existing crossings of small tributaries along the transport MLA are unlikely to constitute barriers to fish passage. These areas have been validated as drainage features through the watercourse determination process and are considered unlikely to support fish passage (refer to Section 5.2.6). Nonetheless, these crossings will be designed and constructed in accordance with the ‘Accepted development requirements for waterway barrier works’ (DPI 2025). They will be bed level or low-level crossings, or culvert crossings to comply with western drainage basins on a green waterway.

An assessment of the likelihood of significant impacts on the waterways providing for fish passage in accordance with the Significant Residual Impact Guideline (DEHP 2014) is provided in Table 14.

Table 14: Waterways providing for fish passage significant impact assessment

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a waterway providing for fish passage if there is a real possibility that it will:	
Result in the mortality or injury of fish	The Project is unlikely to result in the mortality or injury of fish. The waterways in the Project area are ephemeral and provide limited fish passage for most of the year. Construction works within the proposed disturbance area will occur during dry period when the ephemeral waterway is not flowing. The proposed diversion, flood levees and upgrades to existing crossings will be constructed in consideration of the ‘Accepted development requirements for waterway barrier works’ (DPI 2025) and ‘State code 18: Constructing or raising waterway barrier works in fish habitats’ (DAF 2022) to minimise or avoid impacts on fish passage. The design of the waterway will be in accordance with the DNRME (2019) guidelines for permanent watercourse diversions to maintain the existing hydrology, hydraulic, geomorphic and ecological features of the existing waterway.

Significance criteria	Assessment of significance
	No material impacts to water quality are expected. A water management plan will be implemented for the Project to manage sediment, and runoff from mine areas.
Result in conditions that substantially increase risks to the health, wellbeing and productivity of fish seeking passage such as through the depletion of fishes energy reserves, stranding, increased predation risks, entrapment or confined schooling behaviour in fish	The Project is unlikely to create conditions that will substantially increase risks to the health, wellbeing and productivity of fish seeking passage. The waterways in the Project area are ephemeral and provide limited fish passage for most of the year. The proposed diversion will be designed to replicate the geomorphic features of the existing waterways to ensure the waterway conditions are reproduced, where possible. The diversion matches the conditions upstream and downstream of the tie in points. Revegetation is proposed to be undertaken using species present in the local ecosystem. The proposed diversion, flood levees and upgrades to existing crossings will be constructed in consideration of the 'Accepted development requirements for waterway barrier works' (DPI 2025) and 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022) to minimise or avoid impacts on fish passage. The flooding assessment for the project determined that there will be minor changes to Warrigal Creek and Borer River due to the diversion of the unnamed waterway.
Reduce the extent, frequency or duration of fish passage previously found at a site	The proposed diversion is unlikely to reduce the extent, frequency or duration of fish passage conditions. The waterways in the Project area are ephemeral and provide limited fish passage for most of the year. The proposed diversion will be designed to replicate the geomorphic features of the existing waterways to ensure the waterway conditions are reproduced, where possible. The proposed diversion, flood levees and upgrades to existing crossings will be constructed in consideration of the 'Accepted development requirements for waterway barrier works' (DPI 2025) and 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022) to minimise or avoid impacts on fish passage. The flooding assessment for the project determined that there will be minor changes to Warrigal Creek and Borer River due to the diversion of the unnamed waterway.
Substantially modify, destroy or fragment areas of fish habitat (including, but not limited to in-stream vegetation, snags and woody debris, substrate, bank or riffle formations) necessary for the breeding and/or survival of fish	The Project is unlikely to substantially modify, destroy or fragment areas of fish habitat. The waterways in the Project area are ephemeral, and aquatic habitat is largely limited to discrete isolated pools separated by substantial lengths of dry stream bed for most of the year. Fish species in the area are assumed to be adapted to ephemeral systems and poor habitat quality. The proposed diversion will be designed to replicate the geomorphic features of the existing waterways to ensure the waterway conditions are reproduced, where possible. The diversion matches the conditions upstream and downstream of the tie in points. Revegetation is proposed to be undertaken using species present in the local ecosystem. The diversion will extend the watercourse length, from an impacted 1.5 km to a developed 1.8 km. The proposed diversion, flood levees and upgrades to existing crossings will be constructed in consideration of the 'Accepted development requirements for waterway barrier works' (DPI 2025) and 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022) to minimise or avoid impacts on fish passage. The flooding assessment for the project determined that there will be minor changes to Warrigal Creek and Borer River due to the diversion of the unnamed waterway. Erosion resulting from the Project has the potential to reduce in-stream habitat for fish locally, where these features are present. However, development and implementation of an erosion and sediment control plan will mitigate erosion processes and protect these habitats from increased sediments loads.
Result in a substantial and measurable change in the hydrological regime of the waterway, for example, a substantial change	The Project is unlikely to create conditions that result in a substantial and measurable change in the hydrological regime of the waterway. The flooding assessment for the project determined that there will be minor changes to Warrigal Creek and Borer River due to the diversion of the unnamed waterway. This impact is expected to include isolated increases in peak flood levels at the location of the diversion drain and south of the TSFs, as well as a minor decrease in flood levels in Warrigal Creek downstream of the Project site. The changes in flood depth are minor and not expected result in any adverse impacts to the

Significance criteria	Assessment of significance
to the volume, depth, timing, duration and frequency of flows	waterway. Increases to peak flood velocity will be confined to the diversion drains and associated northern breakout flooding. Decreases in peak flood velocity have been modelled at the inlet and outlet of the diversion drain. Peak flood velocities in natural environments are expected to increase by a maximum of 0.5 m/s in the breakout flow path north of the watercourse diversion in the 1% AEP flood event however the absolute peak velocity in the operational phase model remains <0.6m/s. The proposed diversion will be designed to replicate the geomorphic features of the existing waterways to ensure the waterway conditions are reproduced, where possible. The volume, timing, duration, frequency and depth of flows are expected to be maintained in the diverted channel. The proposed diversion, flood levees and upgrades to existing crossings will be constructed in consideration of the 'Accepted development requirements for waterway barrier works' (DPI 2025) and 'State code 18: Constructing or raising waterway barrier works in fish habitats' (DAF 2022) to minimise or avoid impacts on fish passage.
Lead to significant changes in water quality parameters such as temperature, dissolved oxygen, pH and conductivity that provide cues for movement in local fish species	The Project is unlikely to lead to a significant change in water quality within the waterways. Development and implementation of an erosion and sediment control plan will mitigate erosion processes and protect waterways from increased sediments loads. A water quality monitoring program will also be developed and implemented to confirm the effectiveness of management practices and the protection of downstream ecosystems. A water management plan for the Project will be implemented. Where possible, mine affected water will be re-used and re-cycled on site as part of Project water supply. A detailed site water balance will be prepared to account for all water inputs and outputs, and the necessary on-site storage and management infrastructure will be developed accordingly. Mine water storages associated with the Project do not have potential to discharge offsite. All mine water dams overflow to the mining pit. The pit has excess capacity to contain all overflow volumes, ensuring that there would be minimal actual or potential discharge of contaminants to waters that may or have the potential to cause an adverse effect on identified environmental values. The sediment dams have been designed to provide sufficient storage for settlement of suspended solids so that water quality during overtopping events has negligible impact on the water quality in the receiving waterway. Sediment dams will also include overflow control structures with scour protection (rock chutes, rock aprons or level spreaders) to ensure non-erosive discharges. Monitoring of overtopping events will be undertaken to assess the performance of the sediment dams and ensure downstream environmental values are maintained and validate the design assumptions. Sediment dam overflows and associated water quality are not expected to have adverse impacts on water quality and environmental values in receiving waterways downstream of the Project. Any runoff and seepage produced by the waste rock dumps will be collected in Sedimentation Dam 1 and 3. Seepage produced by the waste dumps will be collected in the sediment dams and managed by the water management system. Seepage produced during dry to medium rainfall events will be contained and managed by the sediment dams. Any seepage produced during large rainfall events that result in overtopping of the sediment dams would receive significant dilution immediately in the receiving waterway. Because the metal concentrations in the water materials are low compared to the receiving waterway WQOs, the expected dilution with natural flows in the downstream waterway is expected to reduce concentrations below the WQOs. Based on the seepage, a material impact on the environmental value of receiving waters is not expected.
Conclusion	The Project will not result in a significant residual impact on a waterway providing for fish passage.

8 Environmental offset requirements

The significant impact assessments for the relevant aquatic environmental values for the Project have been provided in Section 7. The assessment indicates that the Project is unlikely to result in a significant impact on waterways providing for fish passage. Consequently, offsets as per the EO Act and Queensland Environmental Offsets Policy will not be required for this matter.

No other aquatic values listed as MNES, MSES and/or MLES are likely to be impacted by the Project. Offsets as per the 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' (DSEWPC 2012) or the EO Act and Queensland Environmental Offsets Policy will not be required.

As previously discussed, the potential impact to terrestrial ecology values has been addressed separately in the Terrestrial Ecology Assessment (AARC 2026) prepared for the Project. Any offset requirements for the Project for a significant residual impact on relevant terrestrial ecology values have been addressed in the Terrestrial Ecology Assessment (AARC 2026).

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Appendix A. Relevant Terms of Reference

Terms of reference – Content requirement of the EIS		Section
Section 14 – Water resources		
14.1	The following guidance is relevant for the assessment of water resources: (a) Queensland Government, Water – EIS information guideline, ESR/2020/5312 (b) Queensland Government, Groundwater dependent ecosystems – EIS information guideline, ESR/2020/5301 (c) Queensland Government, Application requirements for activities with impacts to water, ESR/2015/1837 (d) Queensland Government, Stormwater and environmentally relevant activities, ESR/2015/1653 (e) Queensland Government, Our policies (website), available at: **www.dlgwv.qld.gov.au/about-us/our-policies** (f) Queensland Government, Requirement for site-specific and amendment applications underground water rights – Guideline, ESR/2016/3275.	Section 1 to Section 8 Appendices A-K The requirements for surface water and groundwater will be discussed in the Surface Water Assessment and Groundwater Assessment to be prepared for the Project.
Water resources – Existing environment		
14.3	Describe, map and illustrate water features within the existing surface water environment in the project footprint, surrounding area and potential impact area including: (a) natural, modified, ephemeral and perennial waterways, watercourses, drainage features, lakes (including waterholes, lagoons, wetlands and swamps) and springs (b) drainage patterns, catchments, stream order, sediment processes and geomorphology (c) hydrology and streamflow characteristics, including the frequency, duration and magnitude of flow events, and seasonal variations (supported by site-specific hydrological modelling) (d) flooding and overland flow patterns, including flood-prone or low-lying land within the project footprint (e) waterways providing for fish passage, and natural or artificial waterway barriers (f) alterations or interferences with the flow regime, including impoundments (dams, weirs, etc.) diversions, levees and stormwater management systems (g) groundwater-surface water interactions, including identification of waterways as gaining or losing streams, and potential for groundwater baseflow to other water features (e.g. wetlands) (h) current and potential surface water uses and users, including supported environmental values (e.g. aquatic ecosystem health), licenced and unlicenced abstraction (including location, purpose and volumes where relevant) their existing condition and the streamflow required to support uses and users (i) the significance of water features within the local and regional surface water environment (j) the sensitivity of the surface water environment to change, particularly within the context of project-related changes.	Section 2.4 Section 5.2 Appendix E The requirements for surface water will be discussed in the Surface Water Assessment to be prepared for the Project.

Terms of reference – Content requirement of the EIS		Section
14.13	Describe and map any waterway barrier works that may interfere with fish passage. Include any upstream inundation areas caused by project infrastructure; and impacts to downstream flow regimes that may impact fisheries resources that are reliant on environmental flows. Measure and document the main channel and bankfull widths of each impacted waterway at representative points throughout the impacted area.	Section 5.2 Appendix E The requirements for surface water will be discussed in the Surface Water Assessment to be prepared for the Project.
Section 18 – Flora and fauna		
18.1	Guidance material relevant for the flora and fauna assessment includes: (a) Queensland Government, *Aquatic ecology - EIS information guidelines*, ESR/2020/5295 (b) Queensland Government, *Terrestrial ecology - EIS information guideline*, ESR/2020/5309. (c) Queensland Government, *Groundwater dependent ecosystems - EIS information guideline*, ESR/2020/5301 (d) Queensland Government, Water - EIS information guideline, ESR/2020/5312 (e) Queensland Government, Business Queensland, Fish salvage (website), available at: **www.business.qld.gov.au/industries/farms-fishing-forestry/fisheries/development/waterways/salvage** (f) Queensland Government, Policy for Vegetation Management, VEG/2014/1084 (g) Queensland Government, Waterway Barrier Works (website), available at: **https://www.business.qld.gov.au/industries/farms-fishing-forestry/fisheries/development/waterways/barriers**.	Section 4.2 Appendices A-K The requirements for terrestrial ecology have been discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).
Flora and fauna – Existing environment		
18.2	Describe the legislative context for flora and fauna in the project footprint and surrounding area, including the protection and conservation status of each identified ecological value under the *Nature Conservation Act 1992* (NC Act), *Vegetation Management Act 1999* (VM Act), *Fisheries Act 1994*, *Marine Parks Act 2004* (MP Act), EP Act, EPBC Act, local government planning scheme and any other relevant statutory instrument	Section 3 Appendix B Appendix C Appendix D The requirements for terrestrial ecology have been discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).
18.3	Identify and describe matters of national environmental significance (MNES), matters of state environmental significance (MSES), matters of local environmental significance (MLES), fauna and flora of cultural significance to Aboriginal peoples and/or Torres Strait Islander peoples, state and regionally significant biodiversity, and the environmental values of the terrestrial and aquatic ecosystems likely to be impacted by the project. The description should include flora and fauna environmental values in the project area, and surrounding areas, identified in desktop analysis and field surveys, and shown on maps in relation to their habitat and connectivity in the landscape (including upstream and downstream of the project). This includes, but is not limited to the following: (a) regulated vegetation under the VM Act (b) regional ecosystems and biodiversity status (c) connectivity areas	Section 2 Section 5.2 Appendix D The requirements for terrestrial ecology have been discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).

Terms of reference – Content requirement of the EIS		Section
	(d) wetlands and waterways (e) threatened ecological communities and wildlife habitat (f) migratory species (g) protected areas and conservation areas (h) waterways providing for fish passage (i) designated precincts in a strategic environmental area under the Regional Planning Interests Regulation 2014 (j) biodiversity offset areas approved by the State or Australian governments (if any)	
18.4	Describe, with photographs and detailed mapping (at a suitable scale), the context of the project footprint in relation to surrounding MSES/MLES (or any matter identified at TOR item 18.3) including the location of project activities, disturbance footprint, infrastructure and buffers.	Section 1.2
18.5	Provide details of the scope, methodology, timing, effort and results of the field surveys (including spatial data for the survey sites, extent and location of transects, and fauna and flora records on site) undertaken in the EIS. Field surveys should appropriately cover seasonal fluctuations in conditions (i.e. wet and dry seasons). Ecological survey reports (including field proformas and data sheets) should be provided as searchable and hyperlinked appendices.	Section 4 Section 5.2 Appendix D Appendix E
18.6	Describe, using relevant literature, habitat mapping, and the results of surveys, the natural and existing upstream and downstream movement and habitat requirements of all aquatic and terrestrial flora and fauna species in the project area and surrounding area. Identify sensitivity to change of aquatic and terrestrial flora and fauna groups, REs, and significant species.	Section 5.1 Section 5.2
18.7	Describe the existing quality and suitability of habitat for all flora and fauna species that are known to occur, likely to occur, or have the potential to occur in the project footprint. Provide the area of existing habitat in hectares for each species in the project footprint based on field verification. For habitat area calculations, identify the use (if any) of high value regrowth vegetation and non-remnant areas.	Section 5.2 Appendix D
18.8	Discuss how the environmental values relating to flora and fauna informed the project design (i.e. constraints, impact mitigation).	Section 6.1
18.9	Address any obligations imposed by State or Commonwealth legislation or policy or international treaty obligations, such as the China–Australia Migratory Bird Agreement, Japan–Australia Migratory Bird Agreement, Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (if relevant) or Republic of Korea–Australia Migratory Bird Agreement.	Section 3.1.2
Flora and fauna – Impact assessment		
18.10	Describe all relevant impacts (direct, indirect, cumulative and facilitated) on biodiversity and natural environmental values identified at TOR item 18.3 (including the type of habitat impacted, such as breeding, roosting, nesting and foraging habitat) from the project across all stages. The assessment should consider known and potential impacts of the project, and must include: (a) terrestrial and aquatic ecosystems including groundwater-dependent ecosystems (b) biological diversity (c) the integrity of ecological processes, including habitats of listed threatened, near threatened or special least concern species	Section 6.1 Section 6.2 Section 6.3 The requirements for terrestrial ecology have been discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).

Terms of reference – Content requirement of the EIS		Section
	(d) connectivity within and between aquatic and terrestrial habitats and ecosystems (e) identification of analogous (reference) sites and the collection of sufficient baseline information to inform rehabilitation criteria post mining (f) the integrity of landscapes and places, including wilderness and similar natural places (g) chronic, low-level exposure to contaminants or the bioaccumulation of contaminants (h) direct and indirect impacts on terrestrial and aquatic species and ecosystems, whether due to: vegetation clearing; hydrological changes; discharges of contaminants to water, air or land; noise; artificial light; and other relevant matters (i) impacts of waterway barriers on fish passage in all waterways (consider waterways that are mapped on the Queensland Waterways for Waterway Barrier Works spatial data layer and waterways that are present on the ground that are not mapped), including details of any significant diversion or interception of water flows and the effects of subsidence and groundwater drawdown	
18.11	When identifying impacts, ensure figures are appropriately scaled and provided for each activity/component and for each phase of the project.	Section 6
18.12	Describe any actions of the project that require an authority under the NC Act, and/or would be assessable development for the purposes of the VM Act, Regional Planning Interests Act 2014, Fisheries Act 1994, and Planning Act 2016. Features to consider include RE, environmentally sensitive areas, wetlands, nature refuges, protected areas and strategic environmental areas.	Section 3.2 Section 6.1.1 Discussed in the Terrestrial Ecology Assessment (AARC 2026) and Soils and Land Suitability Assessment to be prepared for the Project.
18.13	Identify where any proposed clearing is accepted or exempt development under relevant planning instruments.	Section 6.1.1 Discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).
18.14	Provide an assessment against the relevant prescribed solution(s) for strategic environmental areas impacted by the project, if relevant.	Discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).
18.15	Provide an assessment against SDAP State code 16: Native vegetation clearing addressing the relevant assessment benchmarks, if relevant	Discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).
18.16	Provide an assessment against SDAP State code 18: Constructing or raising waterway barrier works in fish habitats for any assessable waterway barrier works required for the project, including construction activities, if relevant	Section 6.1 Section 7.1
Flora and fauna - Mitigation measures		
18.17	Demonstrate how the proposal avoids native vegetation clearing, or where avoidance is not reasonably possible, minimises clearing to conserve vegetation, avoid land degradation and maintain ecological processes.	Discussed in the Terrestrial Ecology Report prepared for the Project (AARC 2026).

Terms of reference – Content requirement of the EIS		Section
18.18	Describe how the project will be designed, constructed and operated to avoid direct or indirect impacts on ecological environmental values.	Section 6.1 Section 6.2
18.19	Where impacts to MSES cannot reasonably be avoided, describe measures to minimise and then mitigate the direct or indirect impacts on ecological values.	Section 6.1 Section 6.2
18.20	Assess how nominated quantifiable indicators and standards may be achieved for nature conservation management. Address measures to protect or preserve any listed threatened, near threatened or special least concern species. Describe the practicality, effectiveness and risks for each avoidance and mitigation measure. Include the timeframes in which results would be achieved, frequency of monitoring, and how corrective actions will be managed for all phases of the project.	Section 6.1 Section 7.1
18.21	Justify how applying all proposed avoidance and management measures would result in acceptable outcomes for terrestrial and aquatic ecology. Describe how achieving the measures successfully will be monitored, measured and audited. Include provisions to regularly evaluate all the mitigation measures so that improvements may be made as new technologies and best practices evolve.	Section 6.1 Section 7.1 Discussed in the Surface Water Assessment to be prepared for the Project
18.22	Propose measures that would avoid the need for waterway barriers. Where waterway barrier works cannot be reasonably avoided, propose measures to mitigate the impacts of their construction and operation.	Section 6.1 Section 7.1 Discussed in the Surface Water Assessment to be prepared for the Project
18.23	Describe, illustrate, and demonstrate how the project provides safe and adequate upstream and downstream aquatic fauna passage, including all monitoring and maintenance measures.	Section 6.1 Section 7.1 Discussed in the Surface Water Assessment to be prepared for the Project
18.24	Detail measures to ensure waterway diversions are designed and constructed to resemble the natural waterway they replace. Demonstrate waterway diversions tie in with the natural bed and banks of waterways upstream and downstream of the diversion. Demonstrate any proposed diversion will function as a natural waterway and will provide and maintain similar connectivity, hydrological, hydraulic and environmental conditions and include similar profiles, fish habitat and fish passage features.	Section 6.1 Section 7.1 Discussed in the Surface Water Assessment to be prepared for the Project
18.25	Describe and illustrate any screening incorporated to prevent the entrainment of fish into water pumping infrastructure.	Not applicable, no proposed water pumping infrastructure in natural waterways
18.26	Assess the need for buffer zones and the retention, rehabilitation or planting of movement corridors. The assessment must take into account the role of buffer zones in maintaining and enhancing riparian vegetation and wetlands to improve water quality, promote habitat connectivity and provide habitat.	Section 6.1
18.27	Propose rehabilitation criteria, in relation to natural values, that would be used to measure progressive rehabilitation of disturbed areas. Describe how the achievement of the objectives will be monitored and audited, and how corrective actions will be managed. Proposals for rehabilitation of disturbed areas must, in suitable habitat, describe terrestrial and aquatic fauna habitat features to achieve rehabilitation outcomes.	Addressed elsewhere in the EIS

Terms of reference – Content requirement of the EIS		Section
18.28	Demonstrate how the project will meet the environmental objectives and performance outcome of the EP Regulation.	Discussed in the technical reports to be prepared for the prepared, including, but not limited to an Air Quality and Greenhouse Gas (GHG) Report, Surface Water Report, Groundwater Report, Terrestrial Ecology Report, Noise and Vibration Report, and Soils and Land Suitability Assessment Report.
Flora and fauna – Environmental offsets		
18.29	After demonstrating that all reasonable steps have been taken to avoid and then mitigate impacts, identify whether the project will result in a significant residual impact (SRI) to MSES/MLES requiring an environmental offset with reference to the Queensland Environmental Offsets policy, Significant Residual Impact Guideline, and Queensland environmental offset framework. Characterise the scale of SRI in hectares.	Section 7.1 Section 8
18.30	Propose offsets consistent with the relevant State legislation or policies for any SRI. If an SRI will occur on a prescribed environmental matter as outlined in the Environmental Offsets Regulation 2014, offset(s) must be consistent with the requirements of the Environmental Offsets Act 2014 and the latest version of the Queensland Environmental Offsets Policy.	Section 8
9.67	In addition to TOR item 18.30, propose environmental offsets, that at a minimum: (a) consider the full extent of potential impacts on prescribed environmental matters for the entire project as part of the SRI assessment (b) identify whether an SRI to MSES will be addressed through a financial or proponent driven offset (land-based offset) (c) evaluate how the proposed offset will achieve a conservation outcome for the impacted matter (d) for land-based offsets: (i) provide results of a habitat quality assessment on both the impact area and the proposed offset area(s) to compensate for impacts (ii) assess the vulnerability and resilience of any proposed offset site(s) under climate change scenarios (e.g. reduced water availability, increased bushfire risk, increased flood risk, sea level rise) (iii) describe any active restoration actions that would be undertaken to improve, enhance and manage native vegetation or threatened species habitat at the proposed offset site (e) for financial offsets, provide a financial offset calculation.	Relevant MSES discussed in the State Environmental Offsets Strategy to be prepared for the Project.
18.32	Describe how the achievement of the offset will be monitored and audited, and how corrective actions will be managed.	Relevant MSES discussed in the State Environmental Offsets Strategy to be prepared for the Project.
18.33	Describe any proposed measures that would be used to avoid, minimise, or mitigate any impact on agricultural land of state or regional significance when meeting environmental offset requirements required for the project.	Relevant MSES discussed in the State Environmental Offsets

Terms of reference – Content requirement of the EIS		Section
		Strategy to be prepared for the Project.
Section 19 – Biosecurity		
19.1	The following guidance is relevant for the biosecurity assessment: (a) Queensland Government, Biosecurity – EIS information guideline, ESR/2020/5297	Section 4.2 Section 5.2
Biosecurity – Existing environment		
19.2	Survey terrestrial and aquatic pest animals and weeds and describe their current distribution and abundance in the project footprint and surrounds. Field surveys should appropriately cover seasonal fluctuations in conditions (i.e. wet and dry seasons). Provide maps showing pest animal and weeds distribution in relation to the project footprint and ecologically significant areas identified as containing, or likely to contain, listed flora, fauna, and ecological communities of MSES or MNES. This survey is to include prohibited and restricted matters listed in the Biosecurity Act 2014 and Biosecurity Regulation 2016, Weeds of National Significance, pests and weeds declared under local laws, and designated pests under the Public Health Act 2005	Section 4.2 Section 5.2
Biosecurity – Impact assessment		
19.3	Describe for each project phase, the potential spread of terrestrial and aquatic pest animals, terrestrial and aquatic weed species, and disease within the project footprint, construction and operations access routes, and into adjoining properties (where relevant).	Section 6.2.1 The requirements for terrestrial ecology have been discussed in the Terrestrial Ecology Assessment prepared for the Project (AARC 2026).
Biosecurity – Mitigation measures		
19.4	Propose detailed measures using best practice to prevent, remove, control and limit the spread of pests, weeds, diseases, pathogens and contaminants within and surrounding the project footprint and adjacent areas. Detail alignment with any relevant local government area Biosecurity Plans and pest management priorities or initiatives undertaken by Biosecurity Queensland. Include a discussion on minimising any susceptibility to biosecurity risks with the introduction and/or expansion of temporary and permanent infrastructure.	Section 6.2.1

Appendix B. Desktop search results

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest

EPM: 28274

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@qld.gov.au

Disclaimer

Whilst every care is taken to ensure the accuracy of the information provided in this report, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness, or suitability, for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which the user may incur as a consequence of the information being inaccurate or incomplete in any way and for any reason.



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Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Details for area of interest: EPM: 28274, with area 5184.83 ha

Local Government(s)	
Croydon Shire	
Bioregion(s)	**Subregion(s)**
Gulf Plains	Claraville Plains
Catchment(s)	
Norman	

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Biodiversity Planning Assessment(s)	Aquatic Conservation Assessment(s) (riverine)	Aquatic Conservation Assessment(s) (non-riverine)
Gulf Plains v1.1	Eastern Gulf of Carpentaria v1.1	Eastern Gulf of Carpentaria v.1.1

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	0.00	0.00
Of concern	1,061.25	20.47
No concern at present	4,123.58	79.53

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	3,504.67	67.59
Regional	1,386.21	26.74
Local or Other Values	293.95	5.67

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
Number of Palustrine wetlands	3
Total number of non-riverine wetlands	3

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

Name	Permanency
BORER RIVER	Non-perennial
WARRIGAL CREEK	Non-perennial

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	5,184.83	100.00

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
High	1.06	0.02
Medium	10.63	0.21

Biodiversity Planning Assessments

Introduction

The Department of the Environment, Tourism, Science and Innovation (DETSI) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DETSI. Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	3,504.67	67.59
Regional	1,386.21	26.74
Local or Other Values	293.95	5.67

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the *Environment Protection and Biodiversity Conservation Act 1999*. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	3,504.67	67.59
Regional	Remnant contains at least one Of Concern RE (B1)	1,386.21	26.74
Local or Other Values	Refer to diagnostic data for additional information	293.95	5.67

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	0.00	0.00	0.00	0.00	656.81	12.67	4,528.02	87.33
B1: Ecosystem Value (Bioregion)	0.00	0.00	4,890.88	94.33	293.95	5.67	0.00	0.00
B2: Ecosystem Value (Subregion)	0.00	0.00	0.00	0.00	5,184.83	100.00	0.00	0.00
C: Tract Size	0.00	0.00	5,184.83	100.00	0.00	0.00	0.00	0.00
D1: Relative RE Size (Bioregion)	3,504.67	67.59	0.00	0.00	0.00	0.00	1,680.16	32.41

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
D2: Relative RE Size (Subregion)	3,504.67	67.59	0.00	0.00	1,017.74	19.63	662.42	12.78
F: Ecosystem Diversity	1,363.56	26.30	316.60	6.11	3,504.67	67.59	0.00	0.00
G: Context and Connection	5,184.83	100.00	0.00	0.00	0.00	0.00	0.00	0.00

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

(No Records)

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al*. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ia: Centres of Endemism	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ib: Wildlife Refugia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ic: Disjunct Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Id: Limits of Geographic Ranges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ie: High Species Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
If: Relictual Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ig: Variation in Species Composition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ih: Artificial Wetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ii: Hollow Bearing Trees	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ij: Breeding or Roosting Site	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ik: Climate Refugia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

  - Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;
  - Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;
  - Maintaining large scale seasonal/migratory species processes and movement of fauna;
  - Maximising connectivity between large tracts/patches of remnant vegetation;
  - Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

  - Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);
  - Follow major watershed/catchment and/or coastal boundaries;
  - Incorporate major altitudinal/geological/climatic gradients;
  - Include and maximise connectivity between large tracts/patches of remnant vegetation;
  - Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

  - Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

(No Records)

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

(No Records)

Expert panel decision descriptions:

(No Records)

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	5,184.83	100.00

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	0.00	0.00	5,184.83	100.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	515.09	9.93	0.00	0.00	4,669.74	90.07	0.00	0.00
3. Diversity and richness	0.00	0.00	5,184.83	100.00	0.00	0.00	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	5,184.83	100.00	0.00	0.00	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	0.00	0.00	4,103.88	79.15	0.00	0.00
6. Special features	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
(No Records)	

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Medium	10.63	0.21
High	1.06	0.02

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	11.69	0.23	0.00	0.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	1.06	0.02	0.00	0.00	10.63	0.21	0.00	0.00
3. Diversity and richness	0.00	0.00	11.69	0.23	0.00	0.00	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	11.69	0.23	0.00	0.00	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	0.00	0.00	10.63	0.21	0.00	0.00
6. Special features	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	0.00	0.00	11.69	0.23	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/ Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
(No Records)	

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

(No Records)

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DETSI internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**B - Convention on the Conservation of Migratory Species; C - China-Australia Migratory Bird Agreement; J - Japan-Australia Migratory Bird Agreement; E - East Asian-Australasian Flyway Partnership; R - Republic of Korea-Australia Migratory Bird Agreement.*

***I - wetland indicator species; D - wetland dependent species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

(No Records)

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

(No Records)

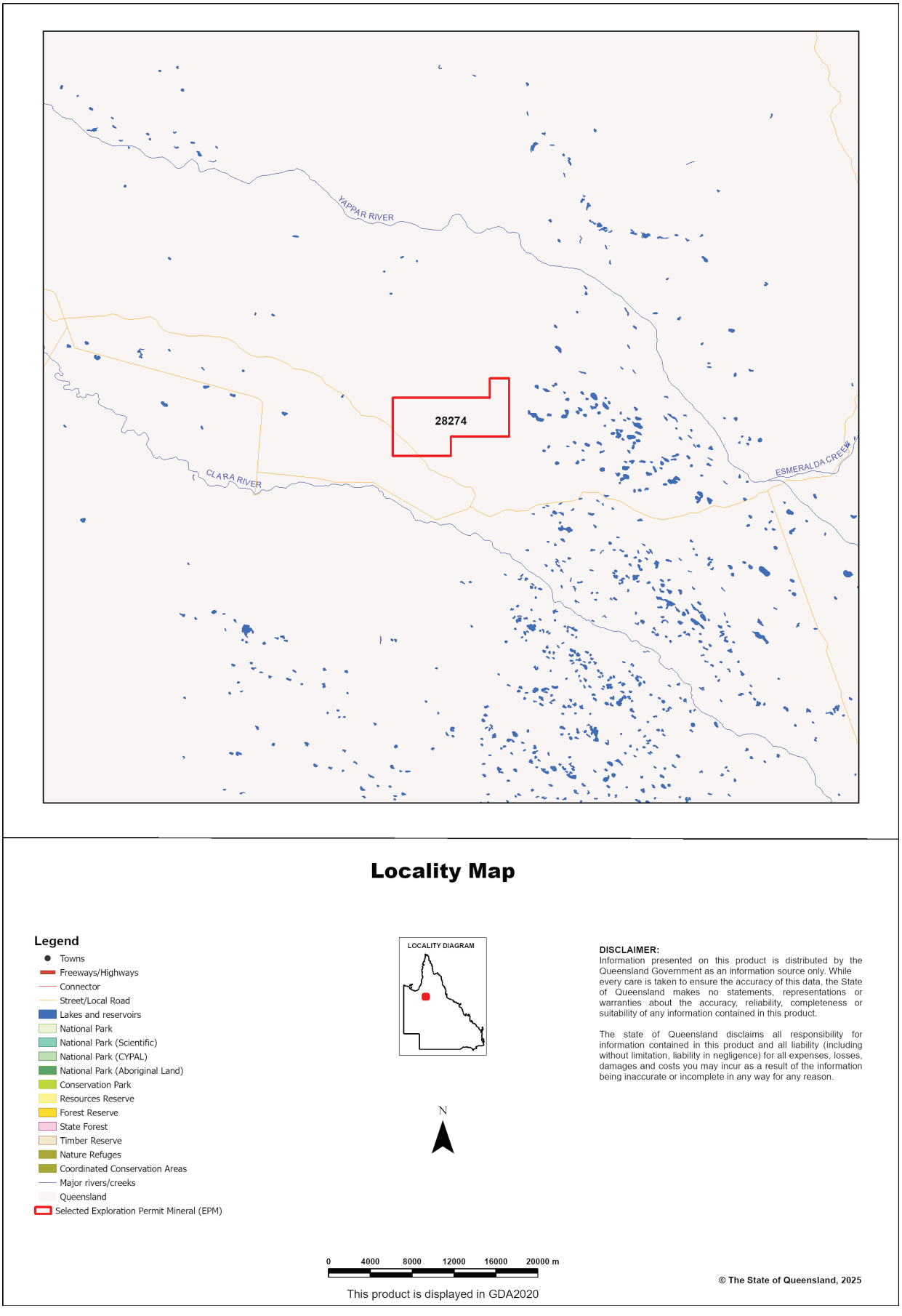
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

(No Records)

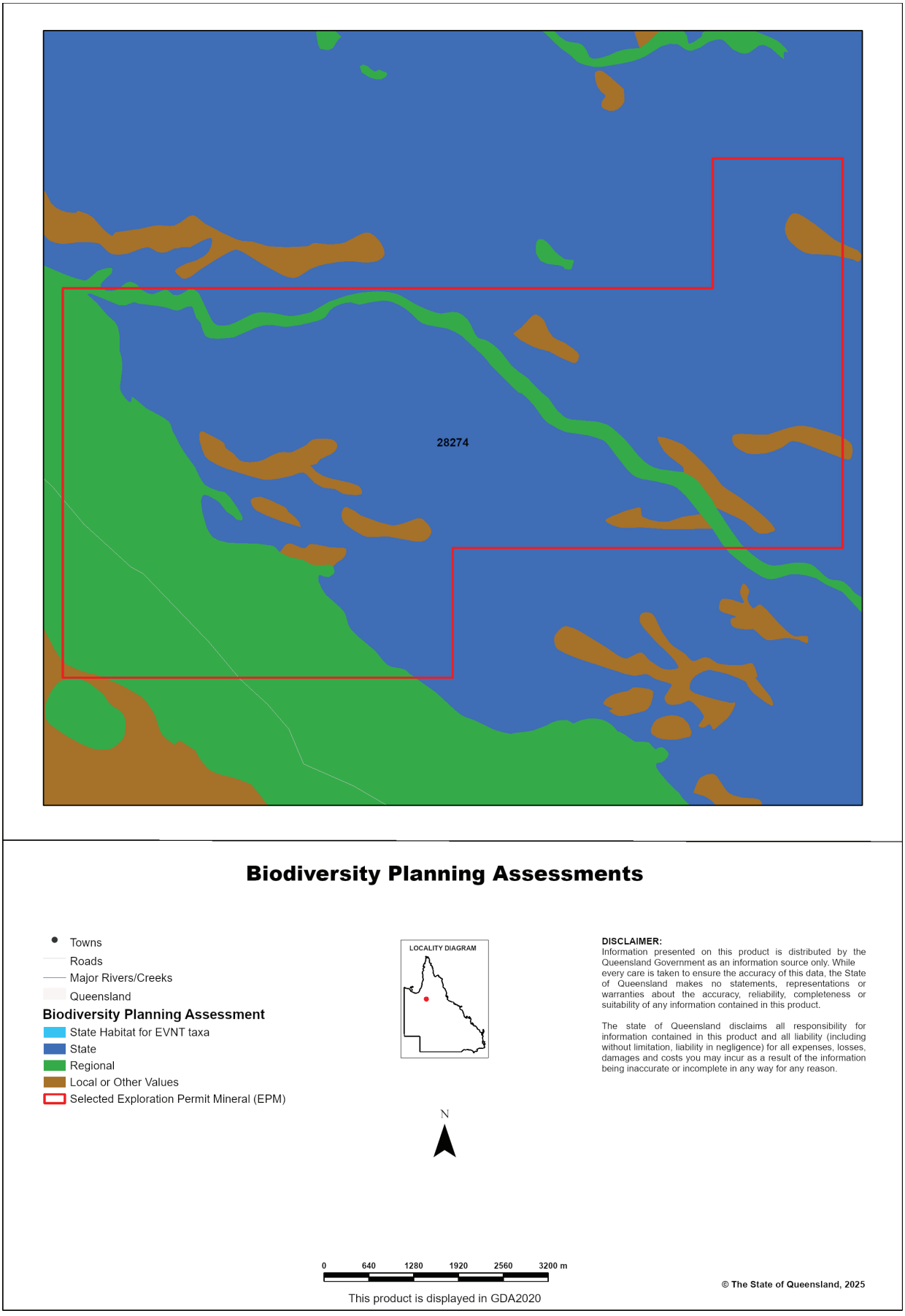
NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

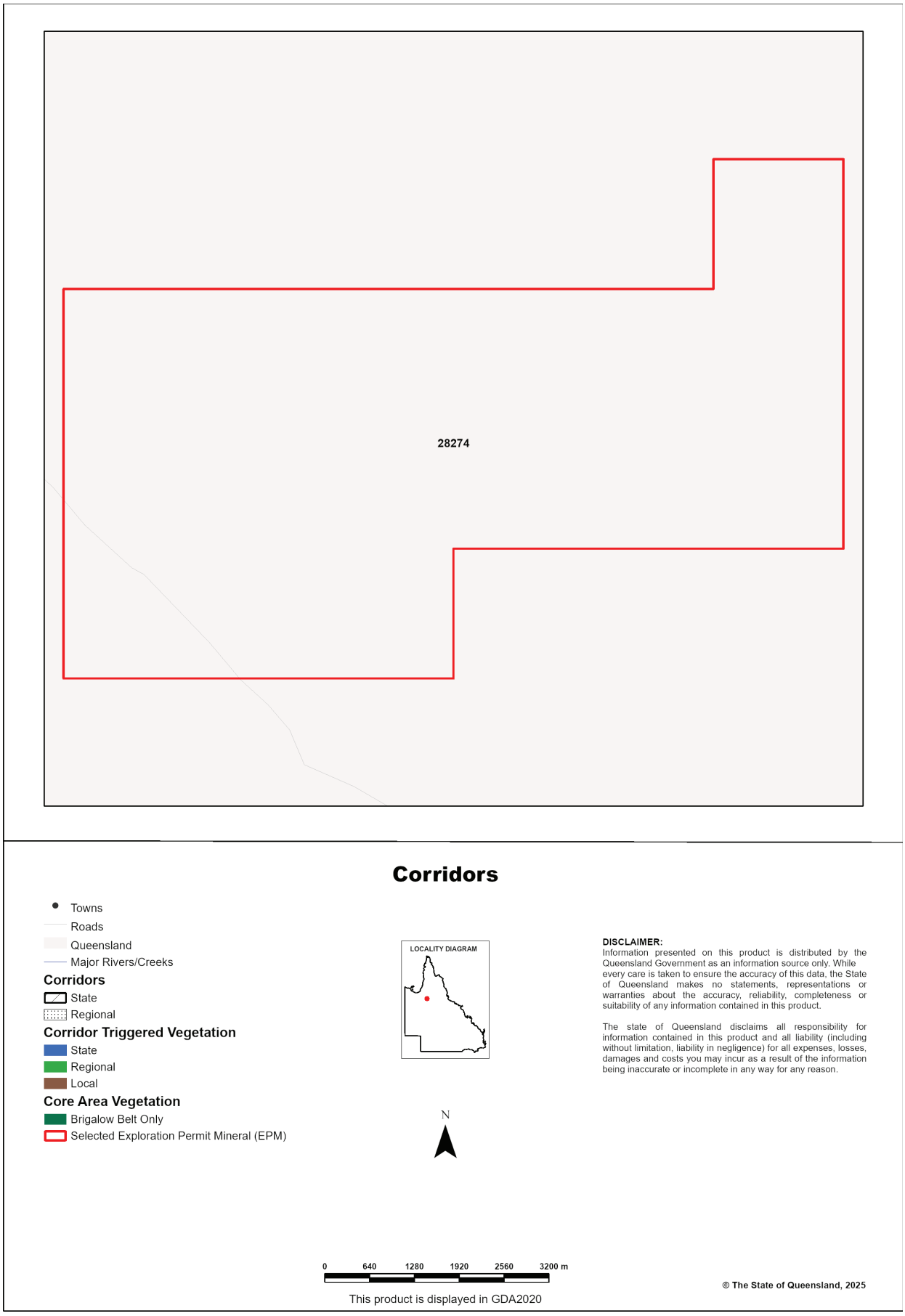
Map 1 - Locality Map



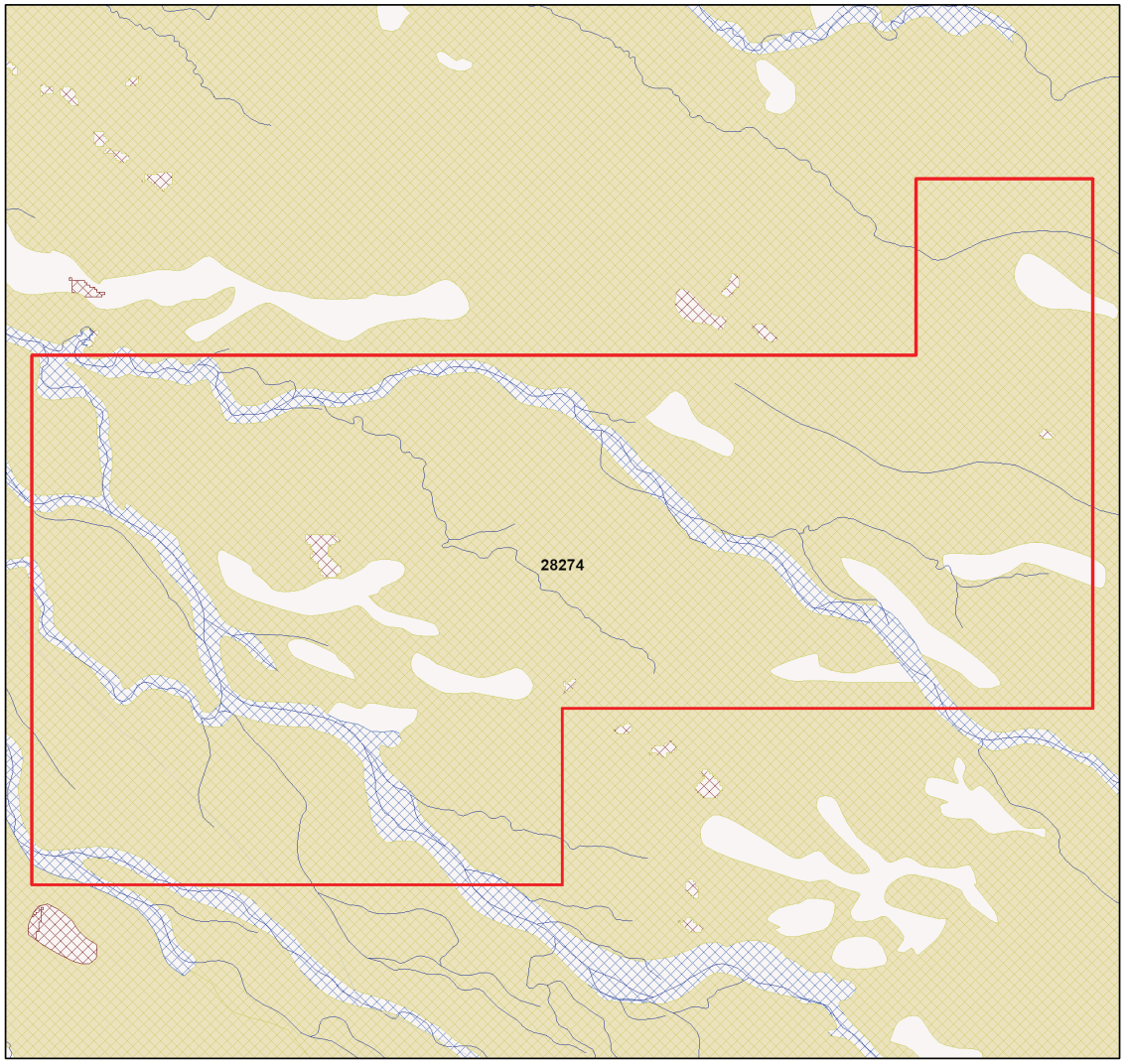
Map 2 - Biodiversity Planning Assessment (BPA)



Map 3 - Corridors



Map 4 - Wetlands and waterways



Wetlands and Waterways

- Towns
- Roads
- Springs
- Rivers/Creeks
- Directory of Important Wetlands
- Ramsar Sites - QLD

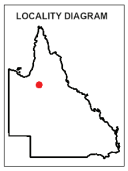
Wetland Type

Hydrologically natural Wetlands
- Lacustrine Wetlands (hydrologically natural)
- Palustrine Wetlands (hydrologically natural)
- Riverine Wetlands (hydrologically natural)
- Intertidal Wetlands (hydrologically natural)
- Subtidal Wetlands (hydrologically natural)
- Intertidal/Subtidal Wetlands (hydrologically natural)

Hydrologically Modified and Artificial Wetlands
- Lacustrine Wetlands (hydrologically modified or artificial)
- Palustrine Wetlands (hydrologically modified or artificial)
- Riverine Wetlands (hydrologically modified or artificial)
- Intertidal Wetlands (hydrologically modified or artificial)
- Subtidal Wetlands (hydrologically modified or artificial)
- Intertidal/Subtidal Wetlands (hydrologically modified or artificial)

Subdominant Wetlands
- Subdominant Wetlands (51 - 80%)

Contains Wetlands
- Contains Wetlands (1 - 50%)
- Queensland
- Selected Exploration Permit Mineral (EPM)



N

0 640 1280 1920 2560 3200 m

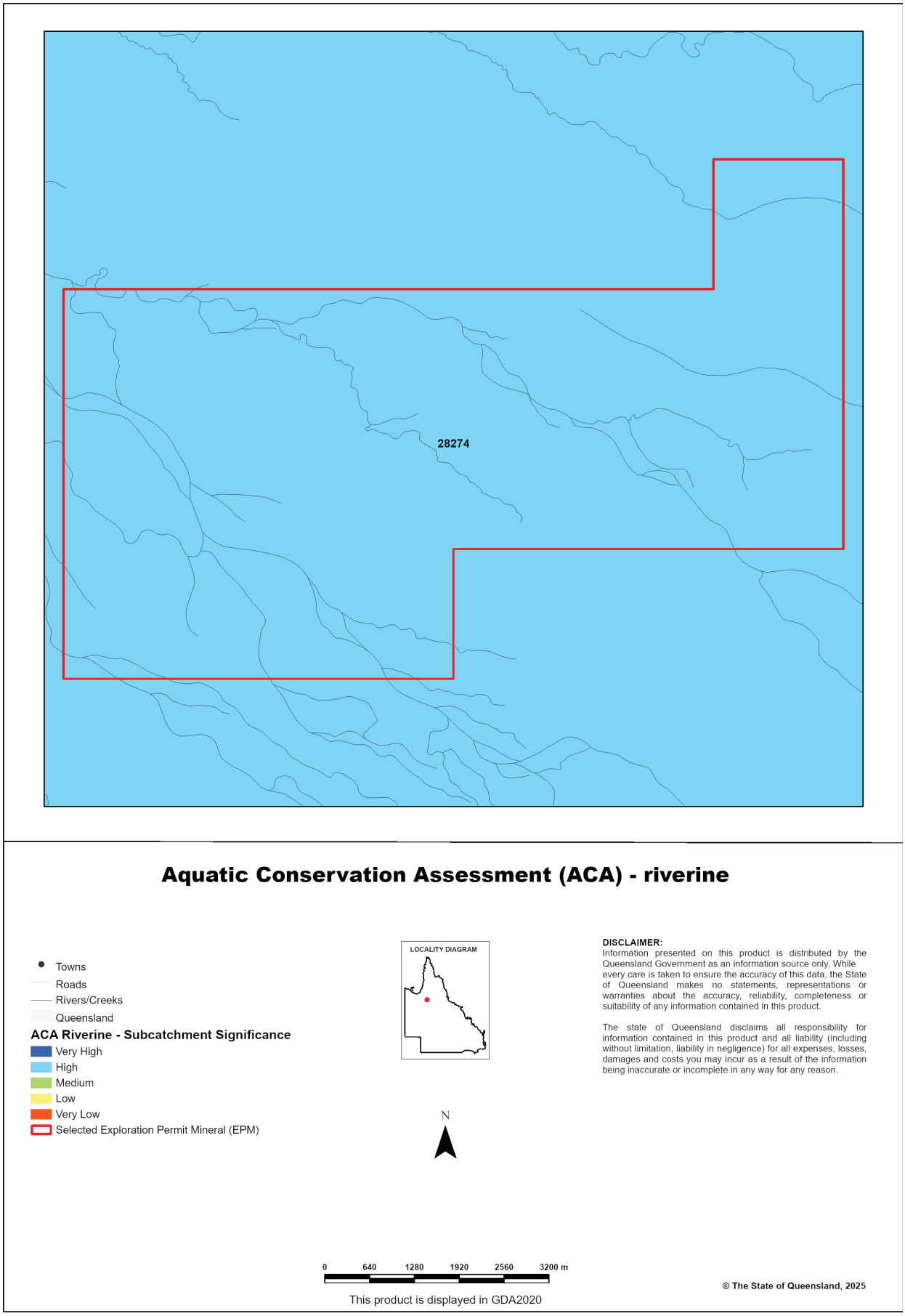
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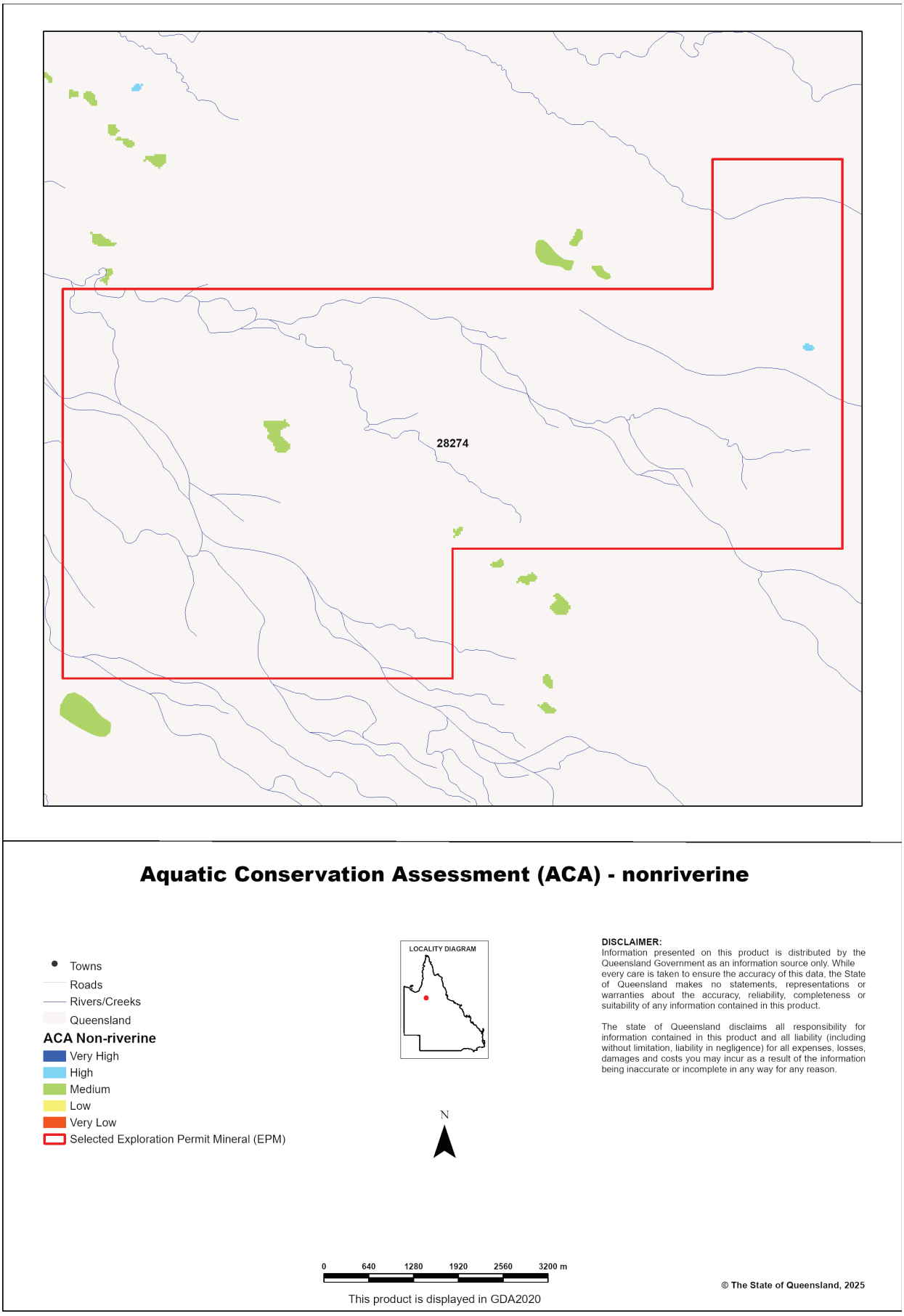
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Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



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Clayton, P.D., Fielder, D.F., Howell, S. and Hill, C.J. (2006) *Aquatic biodiversity assessment and mapping method (AquaBAMM): a conservation values assessment tool for wetlands with trial application in the Burnett River catchment.* Published by the Environmental Protection Agency, Brisbane. ISBN 1-90928-07-3. Available at

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Environment and Heritage Protection 2014*, Biodiversity Assessment and Mapping Methodology.* Version 2.2. Department of Environment and Heritage Protection, Brisbane.

Morton, S. R., Short, J. and Barker, R. D. with an Appendix by G.F. Griffin and G. Pearce (1995). *Refugia for Biological Diversity in Arid and Semi-arid Australia. Biodiversity Series*, Paper No. 4, Biodiversity Unit, Environment Australia.

Sattler, P.S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDBB Non-riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1 Southern Gulf Catchments Non-riverine ACA v1.1 WBBGBRCC Non-riverine ACA v2.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDBB Riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1 Southern Gulf Catchments Riverine ACA v1.1 WBBGBRCC Riverine ACA v2.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v3.1 Northwest Highlands v1.1 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.7
Threatened Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

These datasets are available at:
http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DETSI	- Department of the Environment, Tourism, Science and Innovation
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA2020	- Geocentric Datum of Australia 2020
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest

EPM: 25210

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@qld.gov.au

Disclaimer

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Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Details for area of interest: EPM: 25210, with area 20099.51 ha

Local Government(s)	
Croydon Shire	
Bioregion(s)	**Subregion(s)**
Gulf Plains	Claraville Plains
Catchment(s)	
Norman	

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Biodiversity Planning Assessment(s)	Aquatic Conservation Assessment(s) (riverine)	Aquatic Conservation Assessment(s) (non-riverine)
Gulf Plains v1.1	Eastern Gulf of Carpentaria v1.1	Eastern Gulf of Carpentaria v.1.1

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	0.00	0.00
Of concern	281.41	1.40
No concern at present	19,807.06	98.54

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	16,336.71	81.28
Regional	1,439.12	7.16
Local or Other Values	2,254.61	11.22

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
Number of Palustrine wetlands	26
Total number of non-riverine wetlands	26

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

(No Records)

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	15,423.67	76.74
Very High	4,675.83	23.26

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
High	78.19	0.39
Medium	31.35	0.16

Biodiversity Planning Assessments

Introduction

The Department of the Environment, Tourism, Science and Innovation (DETSI) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DETSI. Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	16,336.71	81.28
Regional	1,439.12	7.16
Local or Other Values	2,254.61	11.22

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the *Environment Protection and Biodiversity Conservation Act 1999*. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	16,336.71	81.28
Regional	Remnant contains at least one Of Concern RE (B1)	1,396.73	6.95
Local or Other Values	Refer to diagnostic data for additional information	2,297.00	11.43

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	0.00	0.00	0.00	0.00	0.00	0.00	20,030.44	99.66
B1: Ecosystem Value (Bioregion)	0.00	0.00	17,733.44	88.23	2,297.00	11.43	0.00	0.00
B2: Ecosystem Value (Subregion)	0.00	0.00	0.00	0.00	20,030.44	99.66	0.00	0.00
C: Tract Size	0.00	0.00	19,948.26	99.25	0.00	0.00	82.18	0.41
D1: Relative RE Size (Bioregion)	16,336.71	81.28	0.00	0.00	0.00	0.00	3,693.73	18.38

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
D2: Relative RE Size (Subregion)	16,336.71	81.28	0.00	0.00	12.29	0.06	3,681.44	18.32
F: Ecosystem Diversity	283.98	1.41	11,445.85	56.95	7,976.86	39.69	323.75	1.61
G: Context and Connection	19,904.06	99.03	60.97	0.30	65.41	0.33	0.00	0.00

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
Regional	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	106.97	0.53

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al*. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ia: Centres of Endemism	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ib: Wildlife Refugia	0.00	0.00	106.97	0.53	0.00	0.00	0.00	0.00
Ic: Disjunct Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Id: Limits of Geographic Ranges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ie: High Species Richness	0.00	0.00	106.97	0.53	0.00	0.00	0.00	0.00
If: Relictual Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ig: Variation in Species Composition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ih: Artificial Wetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ii: Hollow Bearing Trees	0.00	0.00	106.97	0.53	0.00	0.00	0.00	0.00
Ij: Breeding or Roosting Site	0.00	0.00	106.97	0.53	0.00	0.00	0.00	0.00
Ik: Climate Refugia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

- Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;
- Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;
- Maintaining large scale seasonal/migratory species processes and movement of fauna;
- Maximising connectivity between large tracts/patches of remnant vegetation;
- Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

  - Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);
  - Follow major watershed/catchment and/or coastal boundaries;
  - Incorporate major altitudinal/geological/climatic gradients;
  - Include and maximise connectivity between large tracts/patches of remnant vegetation;
  - Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

  - Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

(No Records)

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

Decision Number	Description	Panel Recommended Significance	Criteria Values
gup_l_45	Wetlands	Regional	Ib (wildlife refugia): HIGH Ie (high species diversity):HIGH Ii (high density of hollow-bearing habitat trees): HIGH Ij (significant breeding or roosting sites): HIGH

Expert panel decision descriptions:

Decision Number	Description
gup_l_45	Wetlands have a range of biodiversity values, both in their own right, and for the role they play in maintaining water quality, protecting downstream aquatic ecosystems, and as part of the wetland ecosystem continuum where they are periodically connected with other aquatic ecosystems. Wetlands act as refugia for many species, and play a vital role in the life cycle of others. Wetlands are a defining characteristic of the bioregion, in their extent, diversity, and condition. Wetlands were given a 200m buffer with the same significance rating to ensure that all areas adjacent to them, and the areas most likely to have higher values, were also included. Numerous decisions in southern Gulf of Carpentaria ACA relate to wetlands within the Flinders, Norman and Gilbert river catchments (Rollason and Howell 2010).

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	15,423.67	76.74
Very High	4,675.83	23.26

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	0.00	0.00	20,099.51	100.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	18,714.65	93.11	0.00	0.00	1,384.85	6.89	0.00	0.00
3. Diversity and richness	0.00	0.00	20,099.51	100.00	0.00	0.00	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	20,099.51	100.00	0.00	0.00	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	4,675.83	23.26	6,654.97	33.11	0.00	0.00
6. Special features	4,675.83	23.26	5,270.12	26.22	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	4,675.83	23.26	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
nn_r_ec_03	Carron Forrest country	Norman	6.2.1,6.4.1	3,3
nn_r_ec_04	Perennial waterholes in active streams	Norman	5.2.1,6.1.1,6.2.1,6.3.1,6.3.4,6.4.1,7.1.2	3,3,3,4,3,3,3

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
nn_r_ec_03	The Carron Forrest country contains tiny wetlands along coolibah flats. The area has value as a large interconnected aggregation rather than as individual wetlands. Overflow from the Gilbert is associated with the back swamps however on the sand surfaces, the circular wetlands are groundwater recharged. The wetland systems have significant diversity and longevity and contain very thick vegetation including melaleuca, swamp box *Lophostemon suaveolens* and spear grass. The area is also subject to flash flooding from the Gilbert River.
nn_r_ec_04	In the seasonally dry tropics of the Eastern Gulf, perennial waterholes in active streams provide critical refugial (6.3.1) dry season habitat for obligate freshwater species including conservation dependent and listed species such as juvenile freshwater sawfish *Pristis pristis* and snapping turtles and represent a priority aquatic ecosystems (5.2.1). They are also important for migratory fish species (7.1.2) in particular sooty grunter *Hephaestus fuliginosus* and adult phase eel tailed catfish. Permanent waterholes in active streams support a range of ecological processes that are distinct relative to the more extensive seasonal aquatic habitats that characterise the eastern Gulf (6.2.1). Within the seasonally dry climate of the eastern Gulf the presence of permanent freshwater usually owes its existence to a combination of special geomorphic features (6.1.1) and hydrological regimes (6.4.1). Within the suite of exiting perennial waterholes are subset will also have an increasingly important role as refugia within the increasingly variable rainfall and elevated temperature regimes predicted under climate change (6.4.1).

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Medium	31.35	0.16
High	78.19	0.39

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	109.54	0.55	0.00	0.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	78.19	0.39	0.00	0.00	31.35	0.16	0.00	0.00
3. Diversity and richness	0.00	0.00	109.54	0.55	0.00	0.00	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	99.14	0.49	10.40	0.05	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	0.00	0.00	31.35	0.16	0.00	0.00
6. Special features	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	0.00	0.00	109.54	0.55	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/ Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
(No Records)	

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

(No Records)

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DETSI internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**B - Convention on the Conservation of Migratory Species; C - China-Australia Migratory Bird Agreement; J - Japan-Australia Migratory Bird Agreement; E - East Asian-Australasian Flyway Partnership; R - Republic of Korea-Australia Migratory Bird Agreement.*

***I - wetland indicator species; D - wetland dependent species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

(No Records)

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

(No Records)

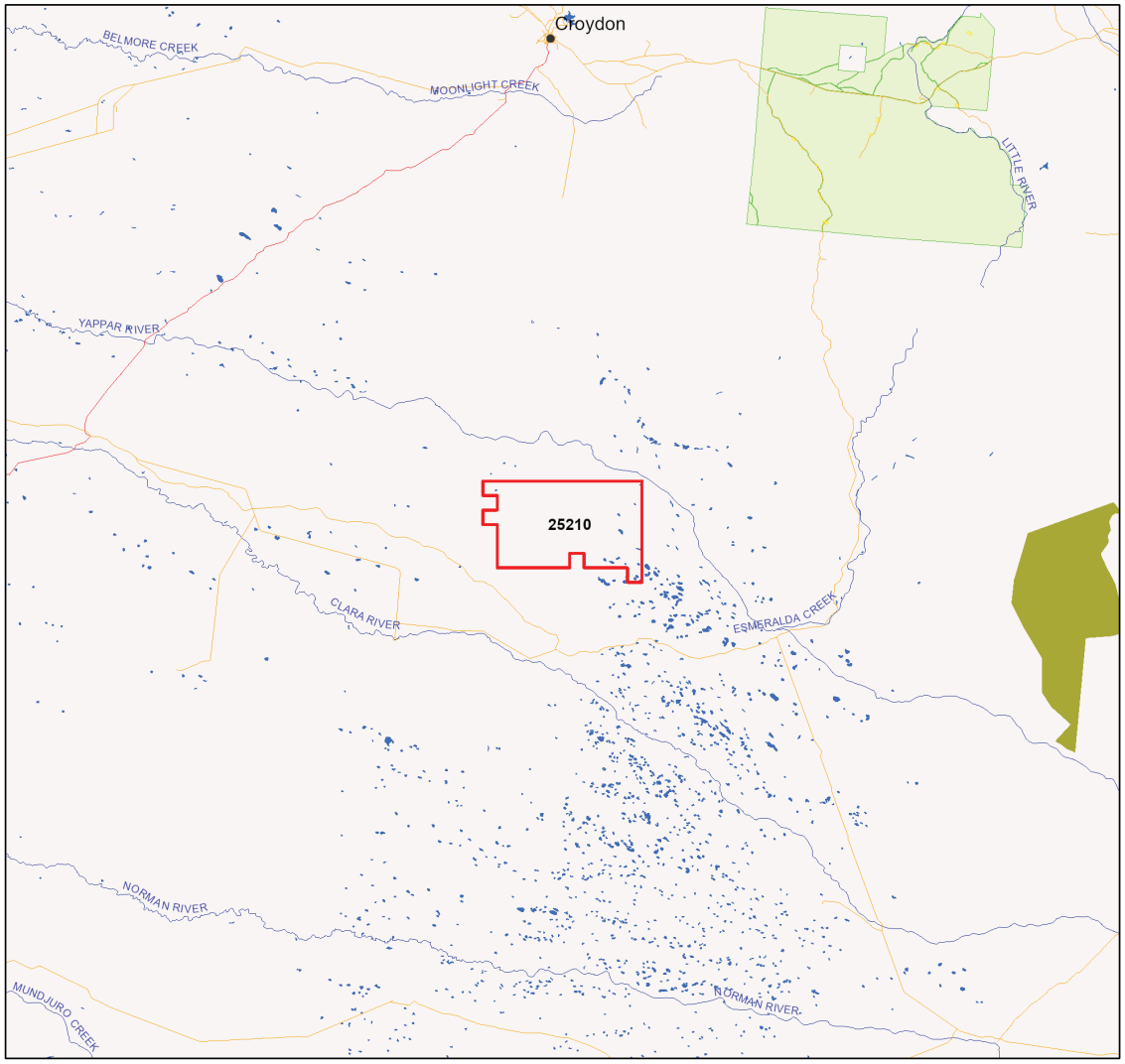
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

(No Records)

NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

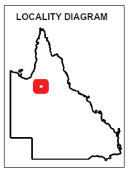
Map 1 - Locality Map



Locality Map

Legend

- Towns
- Freeways/Highways
- Connector
- Street/Local Road
- Lakes and reservoirs
- National Park
- National Park (Scientific)
- National Park (CYPAL)
- National Park (Aboriginal Land)
- Conservation Park
- Resources Reserve
- Forest Reserve
- State Forest
- Timber Reserve
- Nature Refuges
- Coordinated Conservation Areas
- Major rivers/creeks
- Queensland
- Selected Exploration Permit Mineral (EPM)



N

0 7500 15000 22500 30000 37500 m

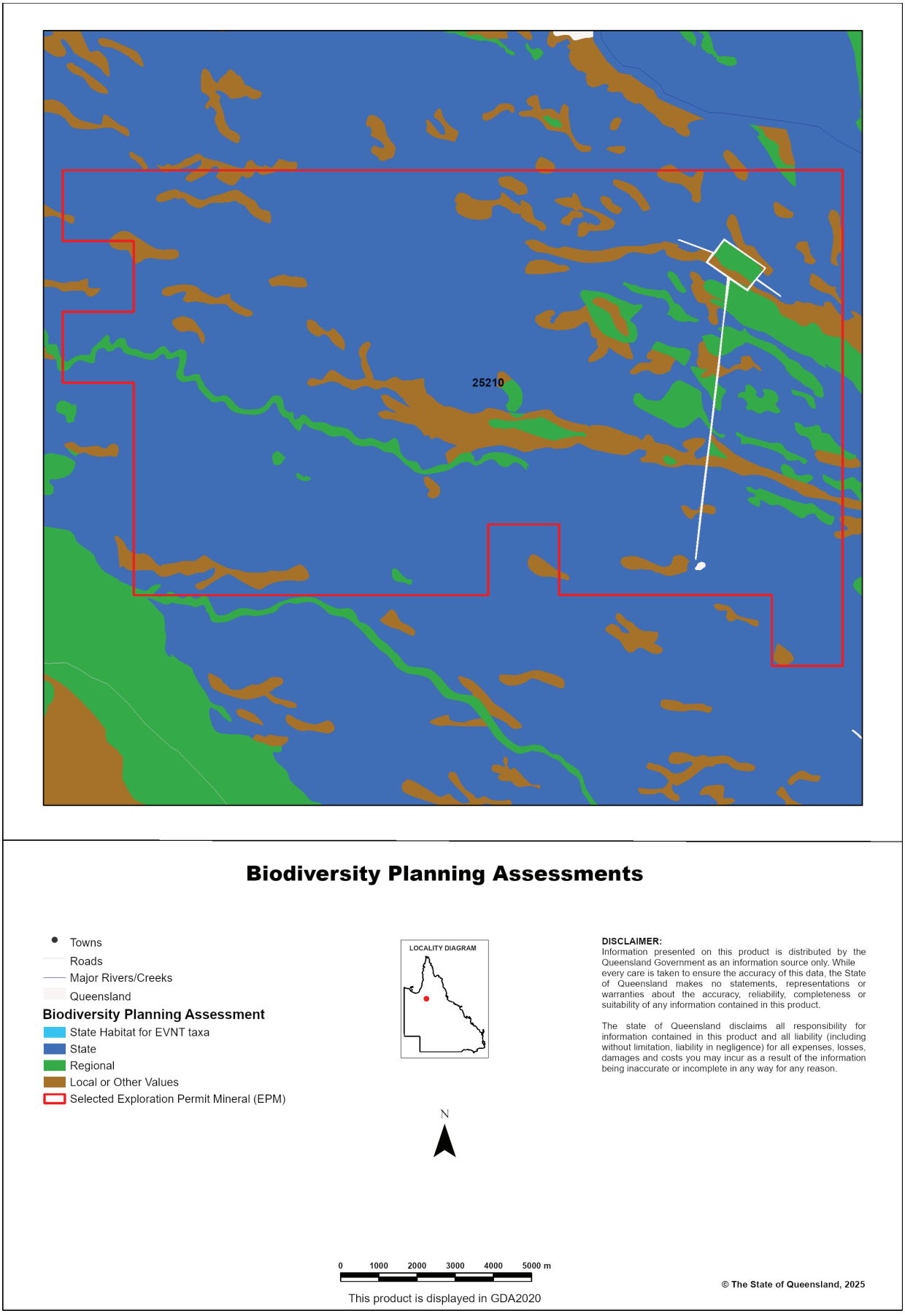
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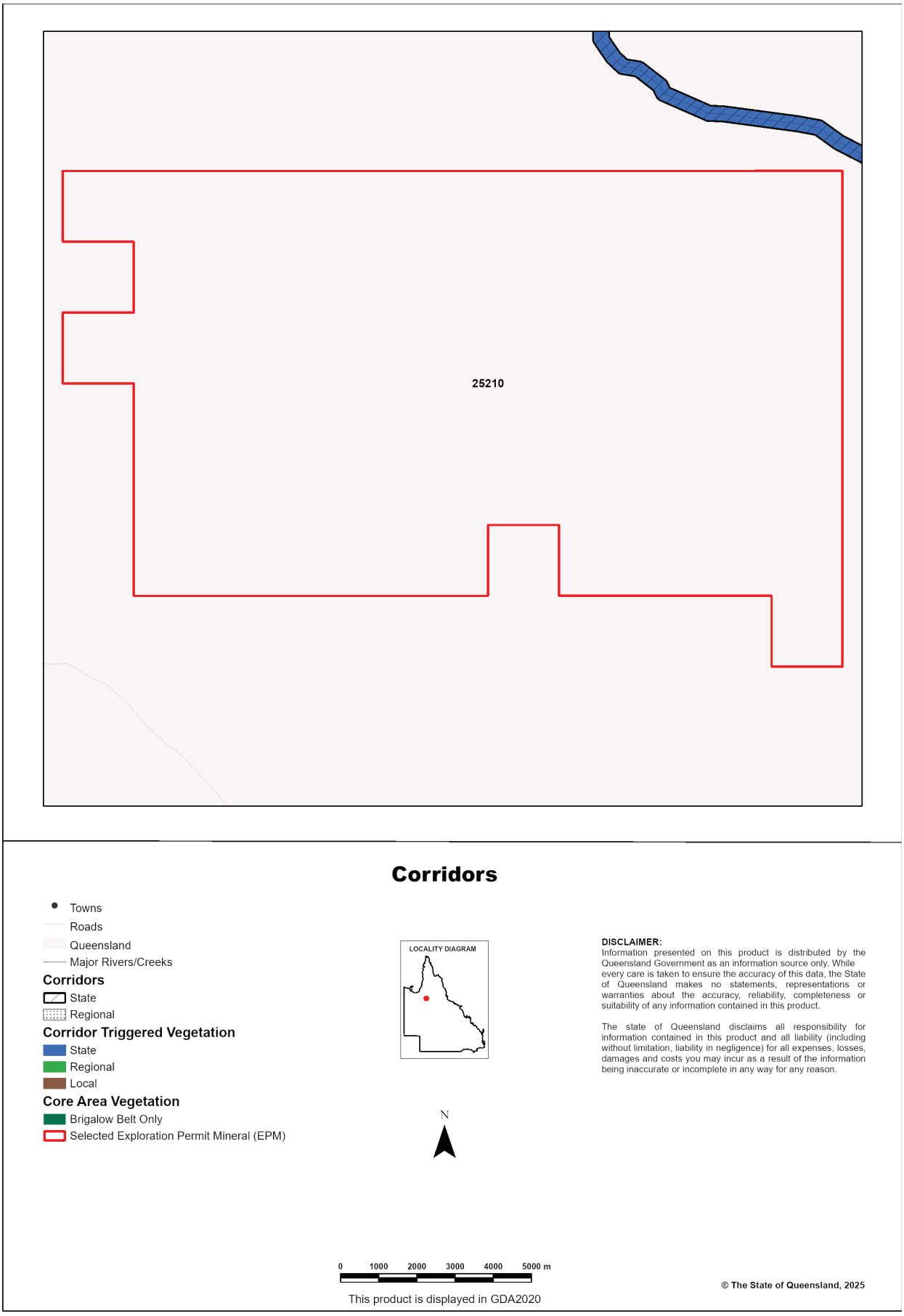
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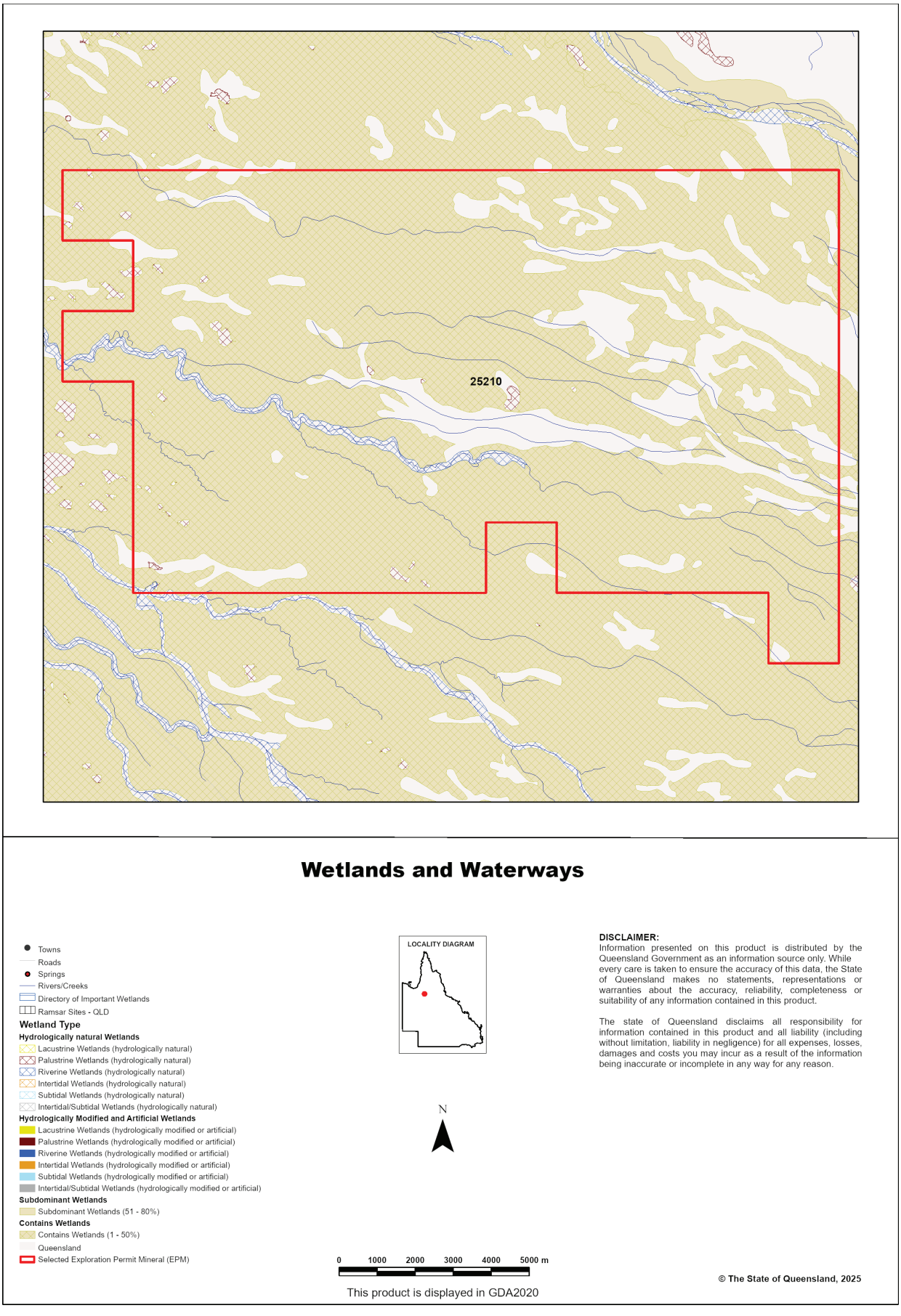
Map 2 - Biodiversity Planning Assessment (BPA)



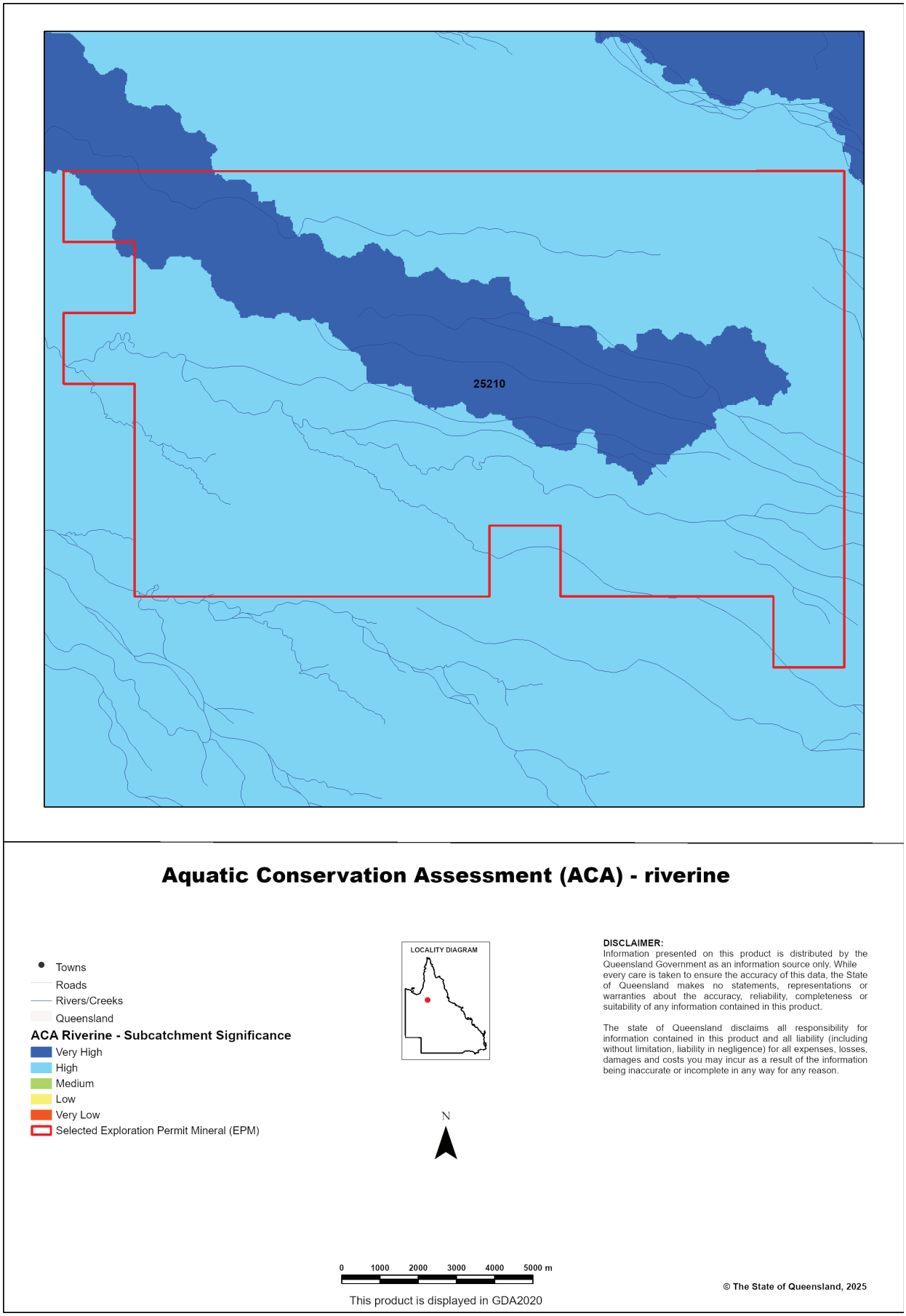
Map 3 - Corridors



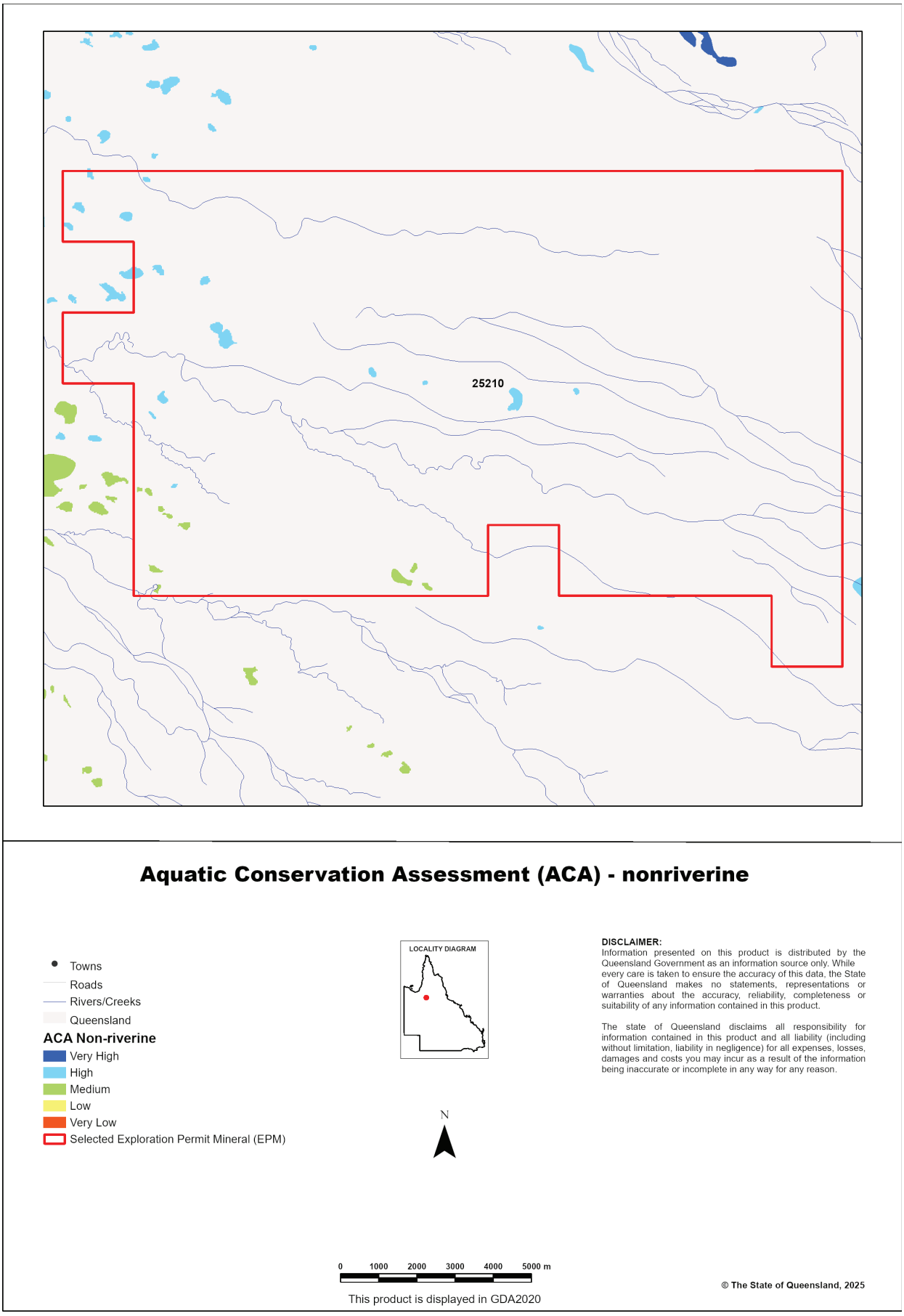
Map 4 - Wetlands and waterways



Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



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Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDBB Non-riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1 Southern Gulf Catchments Non-riverine ACA v1.1 WBBGBRCC Non-riverine ACA v2.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDBB Riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1 Southern Gulf Catchments Riverine ACA v1.1 WBBGBRCC Riverine ACA v2.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v3.1 Northwest Highlands v1.1 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.7
Threatened Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

These datasets are available at:
http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DETSI	- Department of the Environment, Tourism, Science and Innovation
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA2020	- Geocentric Datum of Australia 2020
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest

EPM: 27195

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@qld.gov.au

Disclaimer

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Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Details for area of interest: EPM: 27195, with area 23644.37 ha

Local Government(s)	
Croydon Shire	
Bioregion(s)	**Subregion(s)**
Gulf Plains	Claraville Plains
Catchment(s)	
Norman	

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Biodiversity Planning Assessment(s)	Aquatic Conservation Assessment(s) (riverine)	Aquatic Conservation Assessment(s) (non-riverine)
Gulf Plains v1.1	Eastern Gulf of Carpentaria v1.1	Eastern Gulf of Carpentaria v.1.1

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	0.00	0.00
Of concern	2,511.08	10.62
No concern at present	21,112.58	89.29

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	7,216.75	30.52
Regional	3,459.50	14.63
Local or Other Values	12,791.19	54.10

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
Number of Palustrine wetlands	16
Total number of non-riverine wetlands	16

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

Name	Permanency
BORER RIVER	Non-perennial
DINNER CREEK	Non-perennial
GREGORY CREEK	Non-perennial
WARRIGAL CREEK	Non-perennial
YAPPAR RIVER	Non-perennial

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	23,154.89	97.93
Very High	489.48	2.07

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
High	4.00	0.02
Medium	111.81	0.47

Biodiversity Planning Assessments

Introduction

The Department of the Environment, Tourism, Science and Innovation (DETSI) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DETSI. Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	7,216.75	30.52
Regional	3,459.50	14.63
Local or Other Values	12,791.19	54.10

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the *Environment Protection and Biodiversity Conservation Act 1999*. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	6,898.61	29.18
Regional	Remnant contains at least one Of Concern RE (B1)	3,166.31	13.39
Local or Other Values	Refer to diagnostic data for additional information	13,393.66	56.65

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	0.00	0.00	0.00	0.00	19.60	0.08	23,438.98	99.13
B1: Ecosystem Value (Bioregion)	0.00	0.00	10,064.91	42.57	13,393.66	56.65	0.00	0.00
B2: Ecosystem Value (Subregion)	0.00	0.00	0.00	0.00	23,458.57	99.21	0.00	0.00
C: Tract Size	0.00	0.00	22,895.49	96.83	545.10	2.31	17.98	0.08
D1: Relative RE Size (Bioregion)	6,898.61	29.18	0.00	0.00	3,984.51	16.85	12,575.46	53.19

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
D2: Relative RE Size (Subregion)	7,639.11	32.31	75.17	0.32	3,290.54	13.92	12,453.75	52.67
F: Ecosystem Diversity	7,319.89	30.96	9,206.31	38.94	6,932.37	29.32	0.00	0.00
G: Context and Connection	20,224.70	85.54	2,325.02	9.83	908.86	3.84	0.00	0.00

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	61.85	0.26
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I) & Remnant forms part of a bioregional corridor (J)	28.68	0.12
State	Remnant forms part of a bioregional corridor (J)	0.07	0.00
State	Refer to Expert Panel data for additional information	306.74	1.30
Regional	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	355.02	1.50
Regional	Refer to Expert Panel data for additional information	124.24	0.53

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al*. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological

significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	306.74	1.30	124.24	0.53	0.00	0.00	0.00	0.00
Ia: Centres of Endemism	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ib: Wildlife Refugia	90.53	0.38	355.02	1.50	0.00	0.00	0.00	0.00
Ic: Disjunct Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Id: Limits of Geographic Ranges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ie: High Species Richness	90.53	0.38	355.02	1.50	0.00	0.00	0.00	0.00
If: Relictual Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ig: Variation in Species Composition	90.53	0.38	63.64	0.27	0.00	0.00	0.00	0.00
Ih: Artificial Wetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ii: Hollow Bearing Trees	90.53	0.38	291.38	1.23	0.00	0.00	0.00	0.00
Ij: Breeding or Roosting Site	90.53	0.38	291.38	1.23	0.00	0.00	0.00	0.00
Ik: Climate Refugia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

- Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;
- Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;
- Maintaining large scale seasonal/migratory species processes and movement of fauna;
- Maximising connectivity between large tracts/patches of remnant vegetation;
- Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

- Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);
- Follow major watershed/catchment and/or coastal boundaries;
- Incorporate major altitudinal/geological/climatic gradients;
- Include and maximise connectivity between large tracts/patches of remnant vegetation;
- Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

- Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

Biodiversity Significance	Area (Ha)	% of AOI
State	28.75	0.12

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

Decision Number	Description	Panel Recommended Significance	Criteria Values
gup_fl_19	High precision records for priority taxa of State significance are contained within the remnant.	State	Criteria H: VERY HIGH
gup_l_45	Wetlands	Regional	Ib (wildlife refugia): HIGH Ie (high species diversity):HIGH Ii (high density of hollow-bearing habitat trees): HIGH Ij (significant breeding or roosting sites): HIGH
gup_l_41	Riparian ecosystems and associated areas	State	Ib (wildlife refugia): VERY HIGH Ie (high species diversity): VERY HIGH Ig (REs show distinct variation in species composition): VERY HIGH Ii (high density of hollow-bearing habitat trees):VERY HIGH Ij (significant breeding or roosting sites): VERY HIGH
gup_l_47	Riparian corridors	State	Criterion J (corridors): State
gup_fa_05	Bauhinia woodlands	Regional	Ib (wildlife refugia): HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH
gup_fa_17	High precision records for priority taxa of Regional significance are contained within the remnant.	Regional	Criteria H: HIGH

Expert panel decision descriptions:

Decision Number	Description
gup_fl_19	Remnant contains core habitat for priority taxa with high precision records.
gup_l_45	Wetlands have a range of biodiversity values, both in their own right, and for the role they play in maintaining water quality, protecting downstream aquatic ecosystems, and as part of the wetland ecosystem continuum where they are periodically connected with other aquatic ecosystems. Wetlands act as refugia for many species, and play a vital role in the life cycle of others. Wetlands are a defining characteristic of the bioregion, in their extent, diversity, and condition. Wetlands were given a 200m buffer with the same significance rating to ensure that all areas adjacent to them, and the areas most likely to have higher values, were also included. Numerous decisions in southern Gulf of Carpentaria ACA relate to wetlands within the Flinders, Norman and Gilbert river catchments (Rollason and Howell 2010).
gup_l_41	Riparian ecosystems in the Gulf Plains provide a refuge in otherwise seasonally droughty and sparsely vegetated landscapes that dominate non-riparian areas. See also gup_fa_08 for specific values of western riparian systems.
gup_l_47	Riparian corridors in the Gulf Plains are particularly significant for biodiversity, both as a climatic refuge and as a major element of habitat continuity. This decision is based on the bioregional corridor values of major riparian areas. The refugial and other values of riparian areas are covered by decision gup_l_41.
gup_fa_05	Seasonally important for nectarivores (honeyeaters, white-browed woodswallows Artamus supercilious, white-winged trillers Lalage sueurii and varied lorikeets Psitteuteles versicolor) (Richard Johnson in lit). Important for honeyeater diversity given relatively high fertility and productivity with shallow sands over shales. Bauhinia woodland on alluvium may be at risk given possible future development of agriculture in the region (Richard Johnson in lit).
gup_fa_17	Remnant contains habitat for priority taxa with high precision records.

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	23,154.89	97.93
Very High	489.48	2.07

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	0.00	0.00	23,644.37	100.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	3,273.76	13.85	0.00	0.00	20,370.60	86.15	0.00	0.00
3. Diversity and richness	0.00	0.00	23,280.01	98.46	364.36	1.54	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	23,644.37	100.00	0.00	0.00	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	125.12	0.53	18,368.08	77.68	0.00	0.00
6. Special features	489.48	2.07	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	125.12	0.53	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
nn_r_ec_01	Sandstone gorges	Norman	6.1.1,6.3.1	4,4
nn_r_ec_04	Perennial waterholes in active streams	Norman	5.2.1,6.1.1,6.2.1,6.3.1,6.3.4,6.4.1,7.1.2	3,3,3,4,3,3,3

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
nn_r_ec_01	This special feature is a high gorge section in the upper reaches of the Norman catchment that uncharacteristically flow out of sandstone springs. The area is thought to have similar physical characteristics Cobbold Gorge decision. The area is characterised by highly dissected sandstone that supports unique unstable wetlands. The area also has good connectivity, contains permanent waterholes with refugial values and refugial rainforest flora species in riparian communities.
nn_r_ec_04	In the seasonally dry tropics of the Eastern Gulf, perennial waterholes in active streams provide critical refugial (6.3.1) dry season habitat for obligate freshwater species including conservation dependent and listed species such as juvenile freshwater sawfish *Pristis pristis* and snapping turtles and represent a priority aquatic ecosystems (5.2.1). They are also important for migratory fish species (7.1.2) in particular sooty grunter *Hephaestus fuliginosus* and adult phase eel tailed catfish. Permanent waterholes in active streams support a range of ecological processes that are distinct relative to the more extensive seasonal aquatic habitats that characterise the eastern Gulf (6.2.1). Within the seasonally dry climate of the eastern Gulf the presence of permanent freshwater usually owes its existence to a combination of special geomorphic features (6.1.1) and hydrological regimes (6.4.1). Within the suite of exiting perennial waterholes are subset will also have an increasingly important role as refugia within the increasingly variable rainfall and elevated temperature regimes predicted under climate change (6.4.1).

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Medium	111.81	0.47
High	4.00	0.02

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	115.81	0.49	0.00	0.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	0.00	0.00	0.00	0.00	115.81	0.49	0.00	0.00
3. Diversity and richness	0.00	0.00	115.81	0.49	0.00	0.00	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	34.27	0.14	81.54	0.34	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	0.00	0.00	115.81	0.49	0.00	0.00
6. Special features	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	4.00	0.02	111.81	0.47	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/ Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
(No Records)	

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

Species	Common name	NCA status	EPBC status	Migratory species*	Wetland species**	Identified flora/fauna
Acacia armitii		NT				FL
Poephila cincta cincta	black-throated finch (white-rumped subspecies)	E	E			FA

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DETSI internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**B - Convention on the Conservation of Migratory Species; C - China-Australia Migratory Bird Agreement; J - Japan-Australia Migratory Bird Agreement; E - East Asian-Australasian Flyway Partnership; R - Republic of Korea-Australia Migratory Bird Agreement.*

***I - wetland indicator species; D - wetland dependent species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

Species	Common name	Identified flora/fauna
Artamus cinereus	black-faced woodswallow	FA
Bonamia sp. (Croydon K.R.McDonald KRM4000)		FL
Climacteris picumnus	brown treecreeper	FA
Corymbia setosa subsp. setosa		FL
Crotalaria inaequalis		FL

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

Species	Common name	Identified flora/fauna
Melaleuca fluviatilis		FL

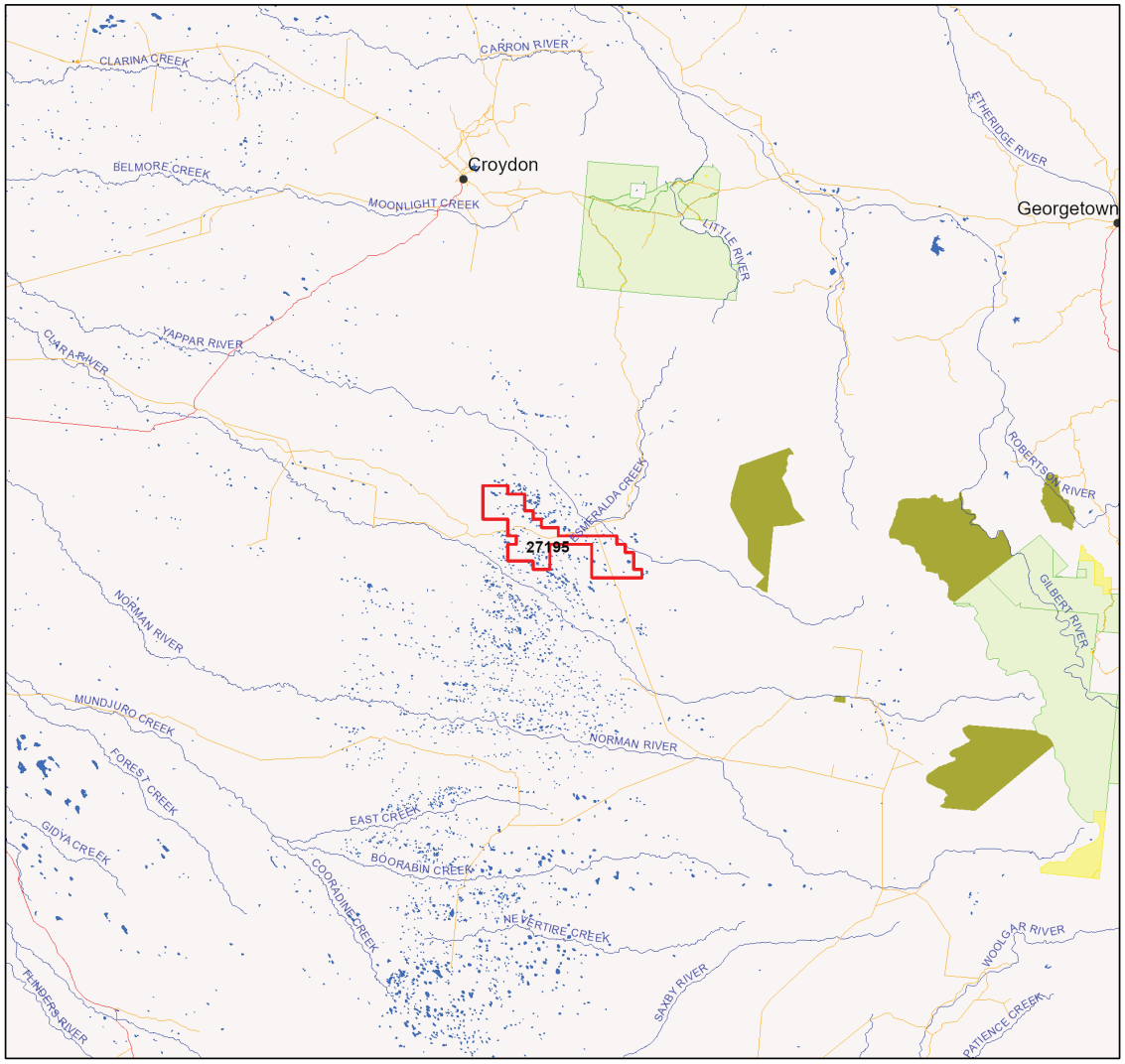
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

Species	Common name	Identified flora/fauna
Pseudoraphis spinescens	spiny mudgrass	FL

NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

Map 1 - Locality Map

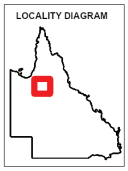


Locality Map

Legend

- Towns
- Freeways/Highways
- Connector
- Street/Local Road
- Lakes and reservoirs
- National Park
- National Park (Scientific)
- National Park (CYPAL)
- National Park (Aboriginal Land)
- Conservation Park
- Resources Reserve
- Forest Reserve
- State Forest
- Timber Reserve
- Nature Refuges
- Coordinated Conservation Areas
- Major rivers/creeks
- Queensland
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



N

0 10000 20000 30000 40000 50000 m

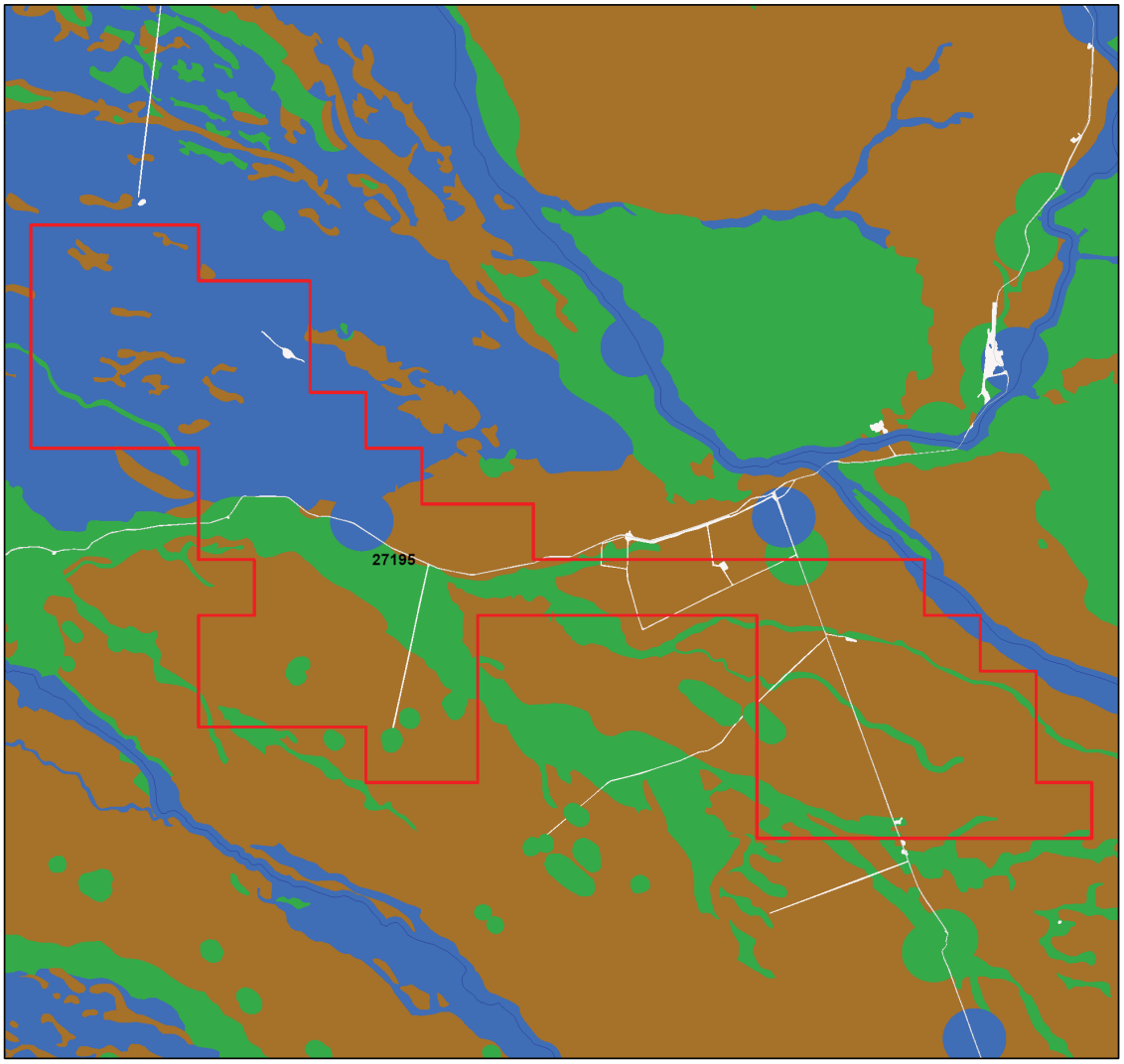
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Map 2 - Biodiversity Planning Assessment (BPA)



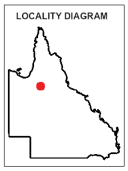
Biodiversity Planning Assessments

- Towns
- Roads
- Major Rivers/Creeks
- Queensland

Biodiversity Planning Assessment

- State Habitat for EVNT taxa
- State
- Regional
- Local or Other Values
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



N

0 2000 4000 6000 8000 10000 m

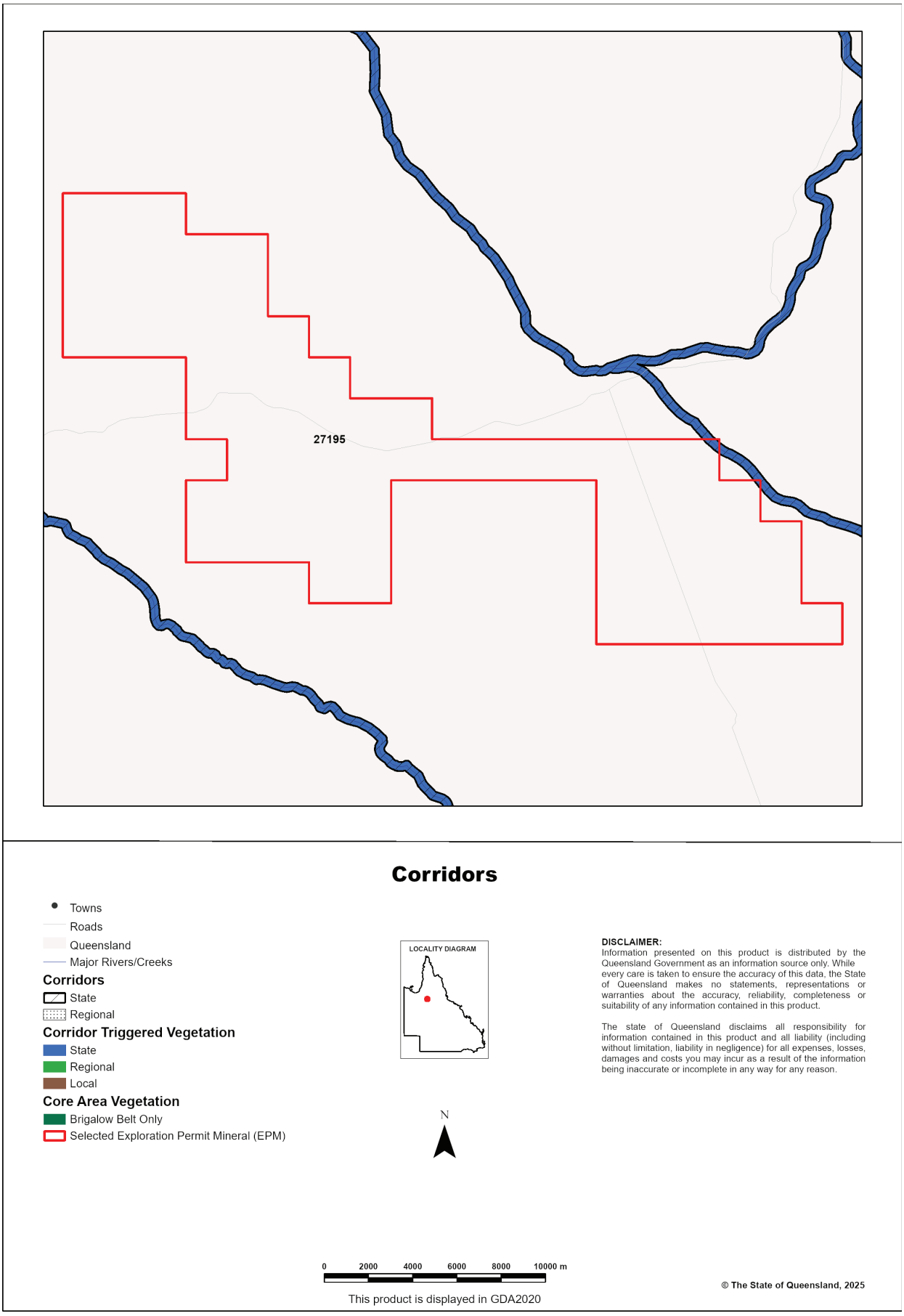
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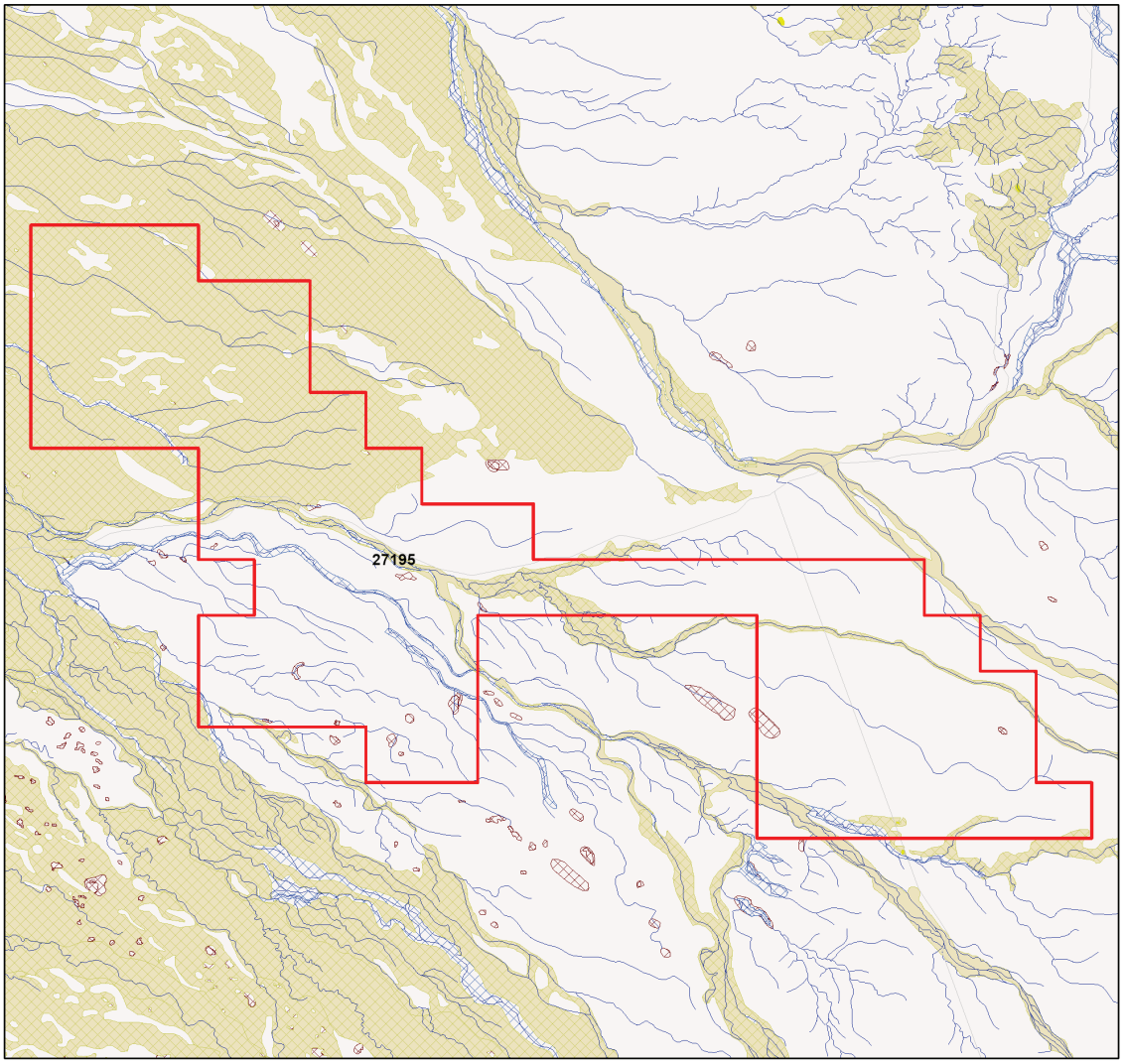
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Map 3 - Corridors



Map 4 - Wetlands and waterways



Wetlands and Waterways

- Towns
- Roads
- Springs
- Rivers/Creeks
- Directory of Important Wetlands
- Ramsar Sites - QLD

Wetland Type

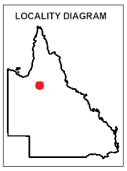
Hydrologically natural Wetlands
- Lacustrine Wetlands (hydrologically natural)
- Palustrine Wetlands (hydrologically natural)
- Riverine Wetlands (hydrologically natural)
- Intertidal Wetlands (hydrologically natural)
- Subtidal Wetlands (hydrologically natural)
- Intertidal/Subtidal Wetlands (hydrologically natural)

Hydrologically Modified and Artificial Wetlands
- Lacustrine Wetlands (hydrologically modified or artificial)
- Palustrine Wetlands (hydrologically modified or artificial)
- Riverine Wetlands (hydrologically modified or artificial)
- Intertidal Wetlands (hydrologically modified or artificial)
- Subtidal Wetlands (hydrologically modified or artificial)
- Intertidal/Subtidal Wetlands (hydrologically modified or artificial)

Subdominant Wetlands
- Subdominant Wetlands (51 - 80%)

Contains Wetlands
- Contains Wetlands (1 - 50%)
- Queensland
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



N

0 2000 4000 6000 8000 10000 m

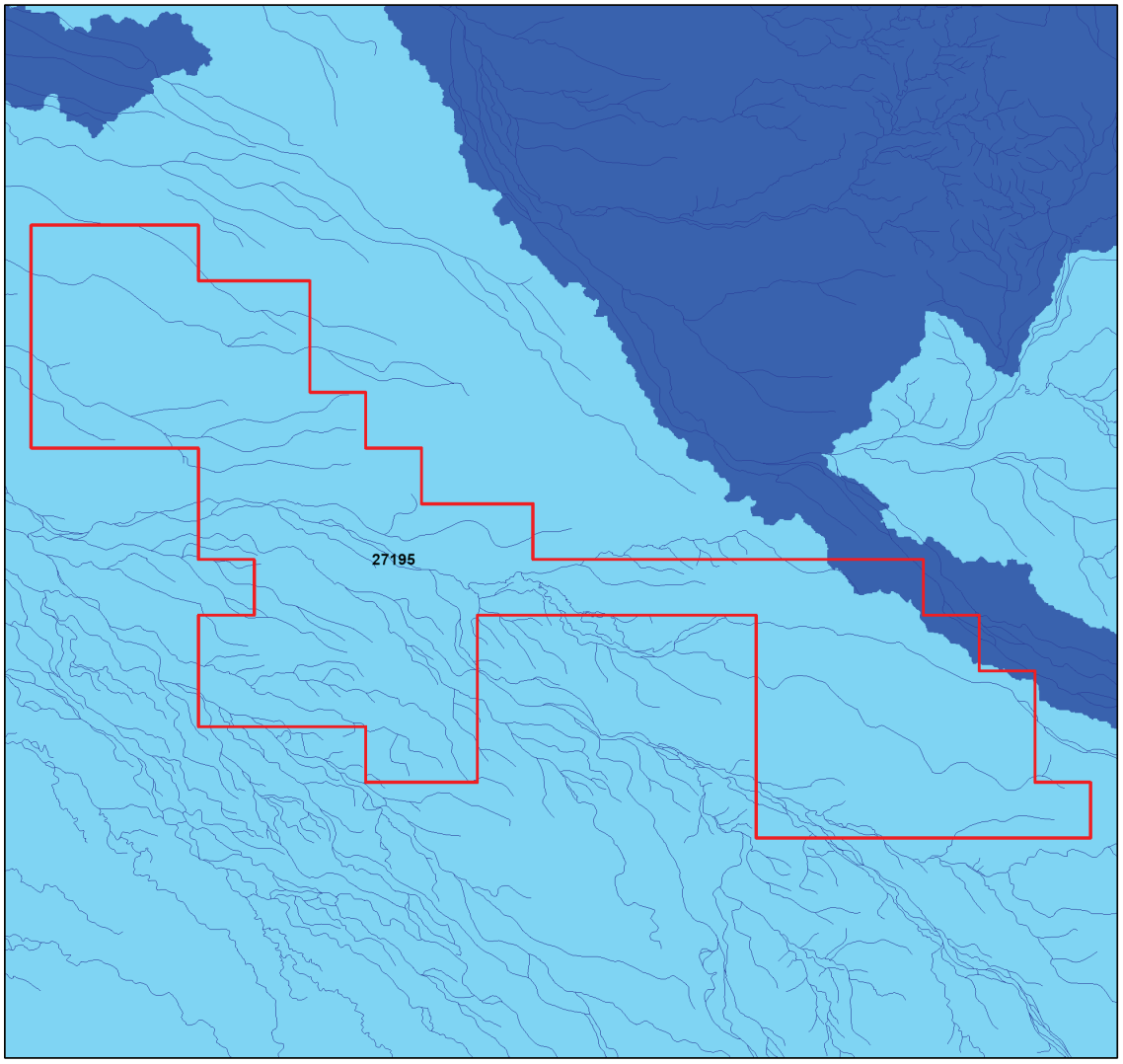
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Map 5 - Aquatic Conservation Assessment (ACA) - riverine



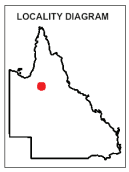
Aquatic Conservation Assessment (ACA) - riverine

- Towns
- Roads
- Rivers/Creeks
- Queensland

ACA Riverine - Subcatchment Significance

- Very High
- High
- Medium
- Low
- Very Low
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



N

0 2000 4000 6000 8000 10000 m

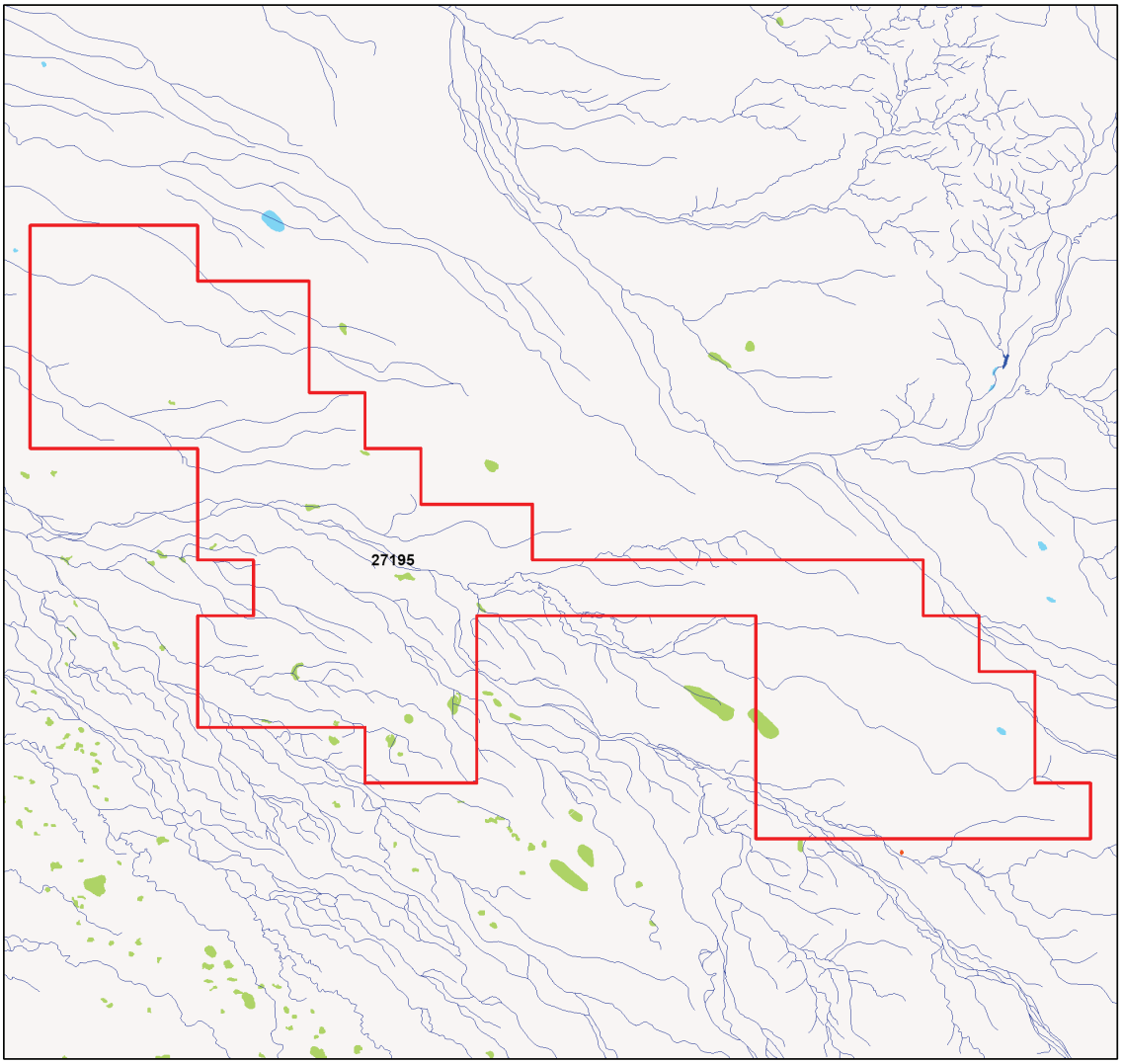
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Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



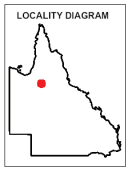
Aquatic Conservation Assessment (ACA) - nonriverine

- Towns
- Roads
- Rivers/Creeks
- Queensland

ACA Non-riverine

- Very High
- High
- Medium
- Low
- Very Low
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



N

0 2000 4000 6000 8000 10000 m

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Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDBB Non-riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1 Southern Gulf Catchments Non-riverine ACA v1.1 WBBGBRCC Non-riverine ACA v2.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDBB Riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1 Southern Gulf Catchments Riverine ACA v1.1 WBBGBRCC Riverine ACA v2.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v3.1 Northwest Highlands v1.1 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.7
Threatened Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

These datasets are available at:
http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DETSI	- Department of the Environment, Tourism, Science and Innovation
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA2020	- Geocentric Datum of Australia 2020
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest

EPM: 27818

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@qld.gov.au

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Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Details for area of interest: EPM: 27818, with area 2267.95 ha

Local Government(s)	
Croydon Shire	
Bioregion(s)	**Subregion(s)**
Gulf Plains	Claraville Plains
Catchment(s)	
Norman	

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Biodiversity Planning Assessment(s)	Aquatic Conservation Assessment(s) (riverine)	Aquatic Conservation Assessment(s) (non-riverine)
Gulf Plains v1.1	Eastern Gulf of Carpentaria v1.1	Eastern Gulf of Carpentaria v.1.1

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	0.00	0.00
Of concern	573.76	25.30
No concern at present	1,694.19	74.70

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	1,395.48	61.53
Regional	670.38	29.56
Local or Other Values	202.09	8.91

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
Number of Palustrine wetlands	5
Total number of non-riverine wetlands	5

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

Name	Permanency
BORER RIVER	Non-perennial
WARRIGAL CREEK	Non-perennial

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of the Environment, Tourism, Science and Innovation's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	2,267.95	100.00

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Medium	12.82	0.57

Biodiversity Planning Assessments

Introduction

The Department of the Environment, Tourism, Science and Innovation (DETSI) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DETSI. Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	1,395.48	61.53
Regional	670.38	29.56
Local or Other Values	202.09	8.91

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the *Environment Protection and Biodiversity Conservation Act 1999*. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	1,395.48	61.53
Regional	Remnant contains at least one Of Concern RE (B1)	670.38	29.56
Local or Other Values	Refer to diagnostic data for additional information	202.09	8.91

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	0.00	0.00	0.00	0.00	482.02	21.25	1,785.94	78.75
B1: Ecosystem Value (Bioregion)	0.00	0.00	2,065.86	91.09	202.09	8.91	0.00	0.00
B2: Ecosystem Value (Subregion)	0.00	0.00	0.00	0.00	2,267.95	100.00	0.00	0.00
C: Tract Size	0.00	0.00	2,267.95	100.00	0.00	0.00	0.00	0.00
D1: Relative RE Size (Bioregion)	1,395.48	61.53	0.00	0.00	0.00	0.00	872.48	38.47

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
D2: Relative RE Size (Subregion)	1,395.48	61.53	0.00	0.00	574.86	25.35	297.62	13.12
F: Ecosystem Diversity	574.86	25.35	297.62	13.12	1,395.48	61.53	0.00	0.00
G: Context and Connection	2,267.95	100.00	0.00	0.00	0.00	0.00	0.00	0.00

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

(No Records)

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al*. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ia: Centres of Endemism	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ib: Wildlife Refugia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ic: Disjunct Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Id: Limits of Geographic Ranges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ie: High Species Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
If: Relictual Populations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ig: Variation in Species Composition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ih: Artificial Wetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ii: Hollow Bearing Trees	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ij: Breeding or Roosting Site	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ik: Climate Refugia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

  - Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;
  - Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;
  - Maintaining large scale seasonal/migratory species processes and movement of fauna;
  - Maximising connectivity between large tracts/patches of remnant vegetation;
  - Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

  - Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);
  - Follow major watershed/catchment and/or coastal boundaries;
  - Incorporate major altitudinal/geological/climatic gradients;
  - Include and maximise connectivity between large tracts/patches of remnant vegetation;
  - Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

  - Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

(No Records)

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

(No Records)

Expert panel decision descriptions:

(No Records)

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

https://qldspatial.information.qld.gov.au/catalogue/custom/index.page

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	2,267.95	100.00

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	0.00	0.00	2,267.95	100.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	0.00	0.00	0.00	0.00	2,267.95	100.00	0.00	0.00
3. Diversity and richness	0.00	0.00	2,267.95	100.00	0.00	0.00	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	2,267.95	100.00	0.00	0.00	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	0.00	0.00	2,131.16	93.97	0.00	0.00
6. Special features	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
(No Records)	

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Medium	12.82	0.57

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	12.82	0.57	0.00	0.00	0.00	0.00	0.00	0.00
2. Naturalness catchment	0.00	0.00	0.00	0.00	12.82	0.57	0.00	0.00
3. Diversity and richness	0.00	0.00	12.82	0.57	0.00	0.00	0.00	0.00
4. Threatened species and ecosystems	0.00	0.00	12.82	0.57	0.00	0.00	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	0.00	0.00	12.82	0.57	0.00	0.00
6. Special features	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativeness	0.00	0.00	0.00	0.00	12.82	0.57	0.00	0.00

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/ Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

Decision number	Description
(No Records)	

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

(No Records)

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DETSI internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**B - Convention on the Conservation of Migratory Species; C - China-Australia Migratory Bird Agreement; J - Japan-Australia Migratory Bird Agreement; E - East Asian-Australasian Flyway Partnership; R - Republic of Korea-Australia Migratory Bird Agreement.*

***I - wetland indicator species; D - wetland dependent species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

Species	Common name	Identified flora/fauna
Artamus cinereus	black-faced woodswallow	FA
Climacteris picumnus	brown treecreeper	FA

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

Species	Common name	Identified flora/fauna
Eucalyptus camaldulensis		FL

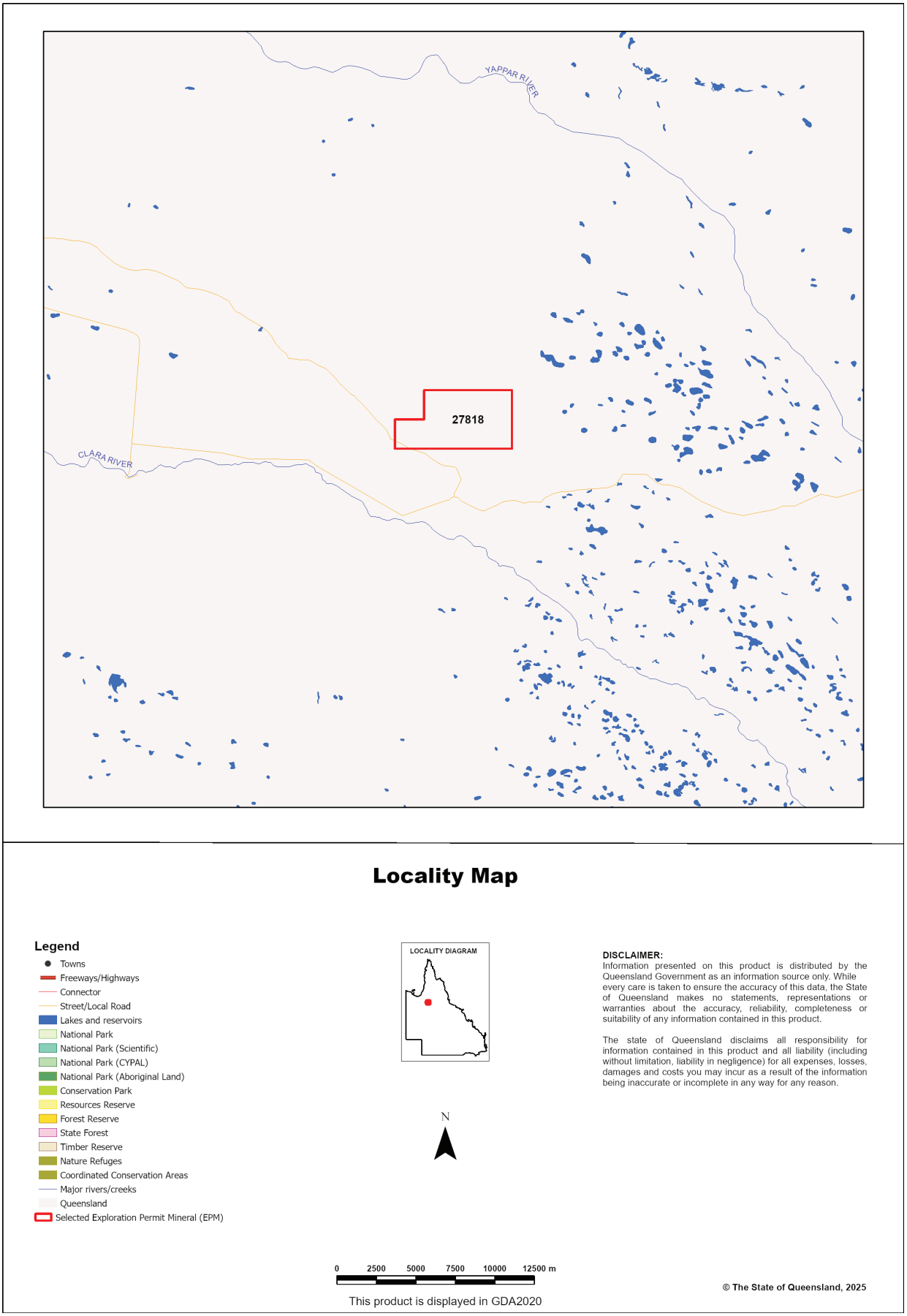
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

Species	Common name	Identified flora/fauna
Eucalyptus camaldulensis		FL

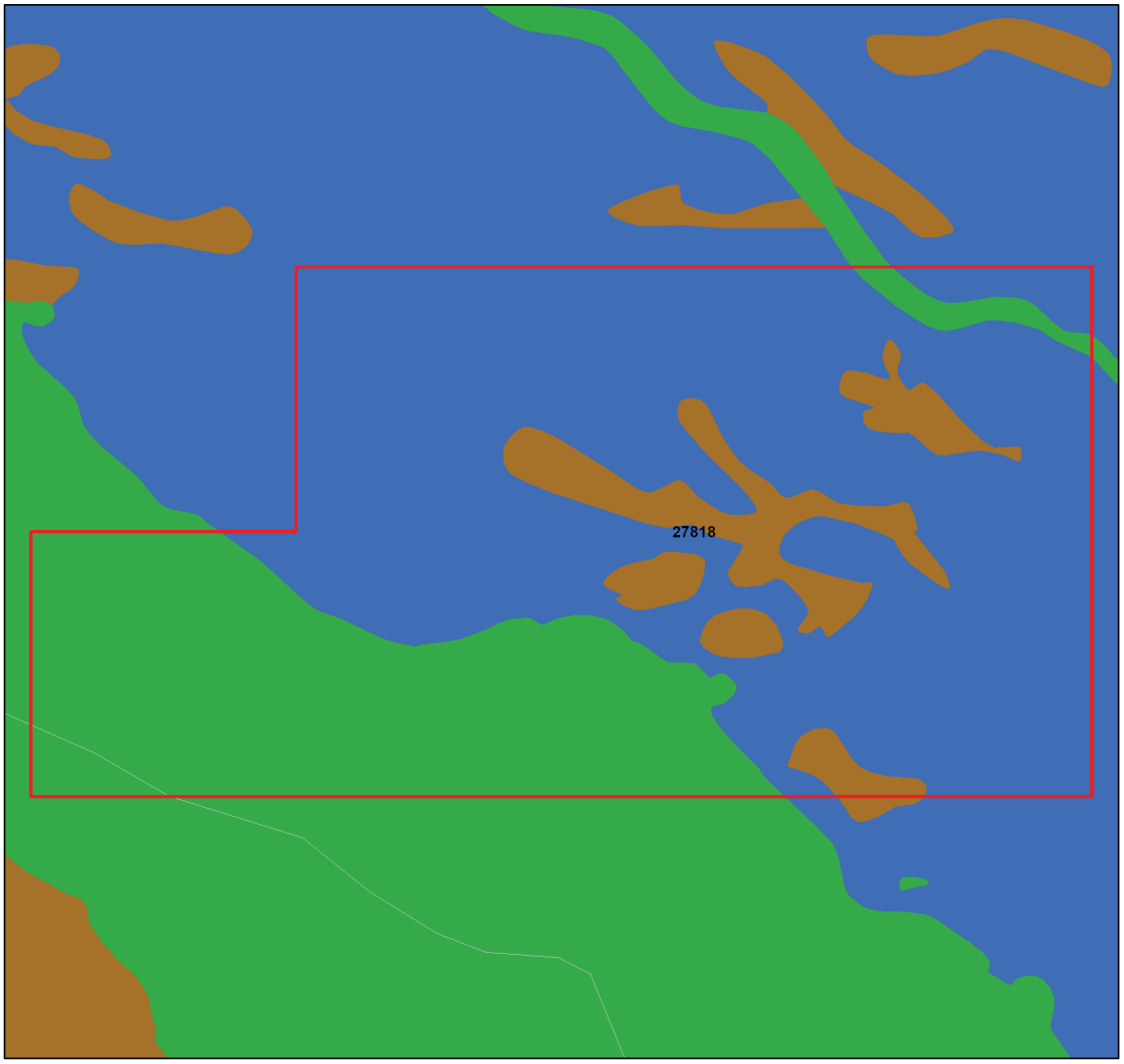
NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

Map 1 - Locality Map



Map 2 - Biodiversity Planning Assessment (BPA)



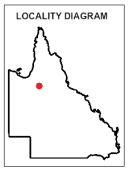
Biodiversity Planning Assessments

- Towns
- Roads
- Major Rivers/Creeks
- Queensland

Biodiversity Planning Assessment

- State Habitat for EVNT taxa
- State
- Regional
- Local or Other Values
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



N

0 420 840 1260 1680 2100 m

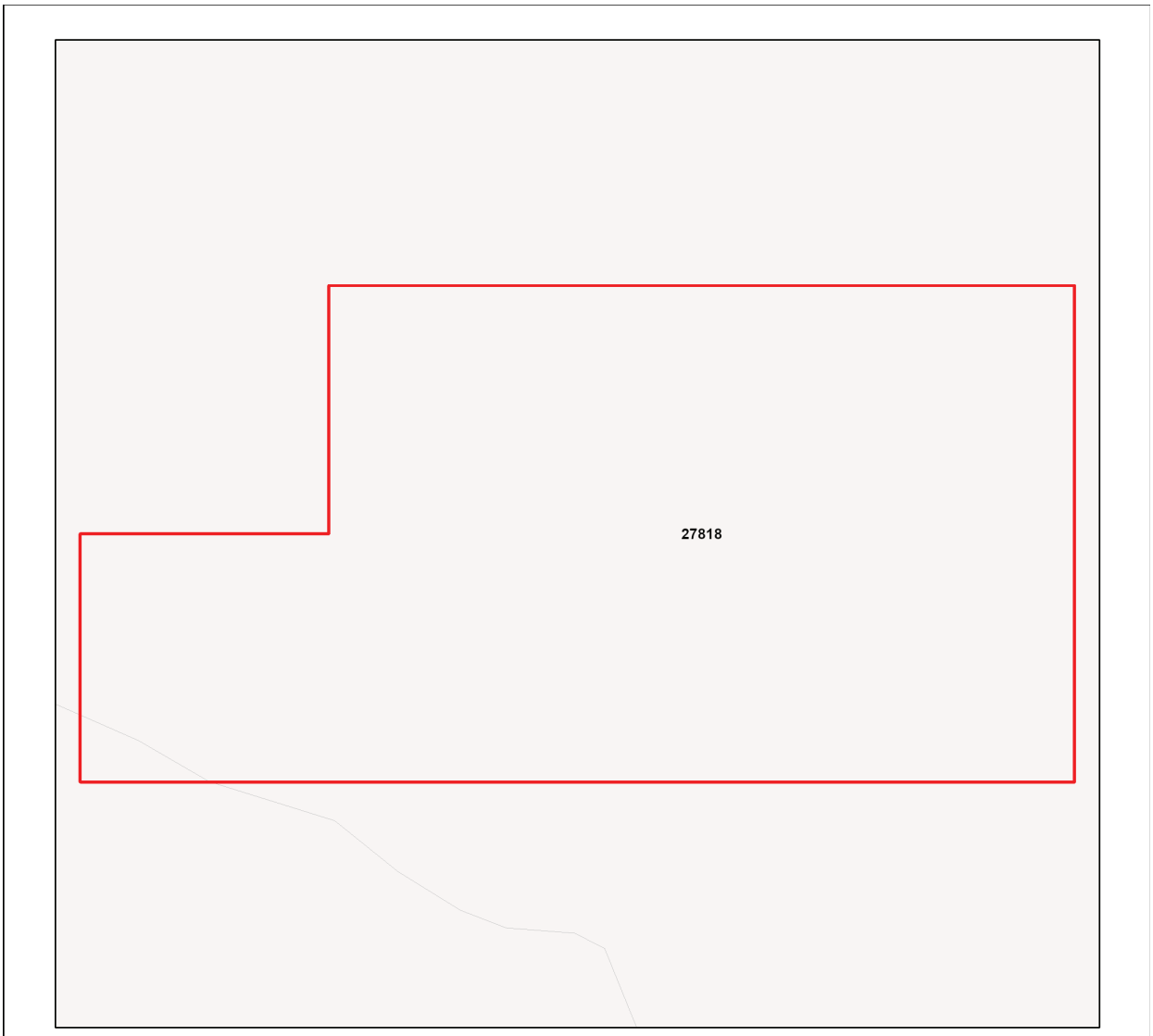
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Map 3 - Corridors



Corridors

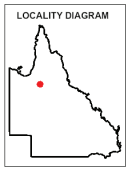
- Towns
- Roads
- Queensland
- Major Rivers/Creeks

Corridors
- State
- Regional

Corridor Triggered Vegetation
- State
- Regional
- Local

Core Area Vegetation
- Brigalow Belt Only
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



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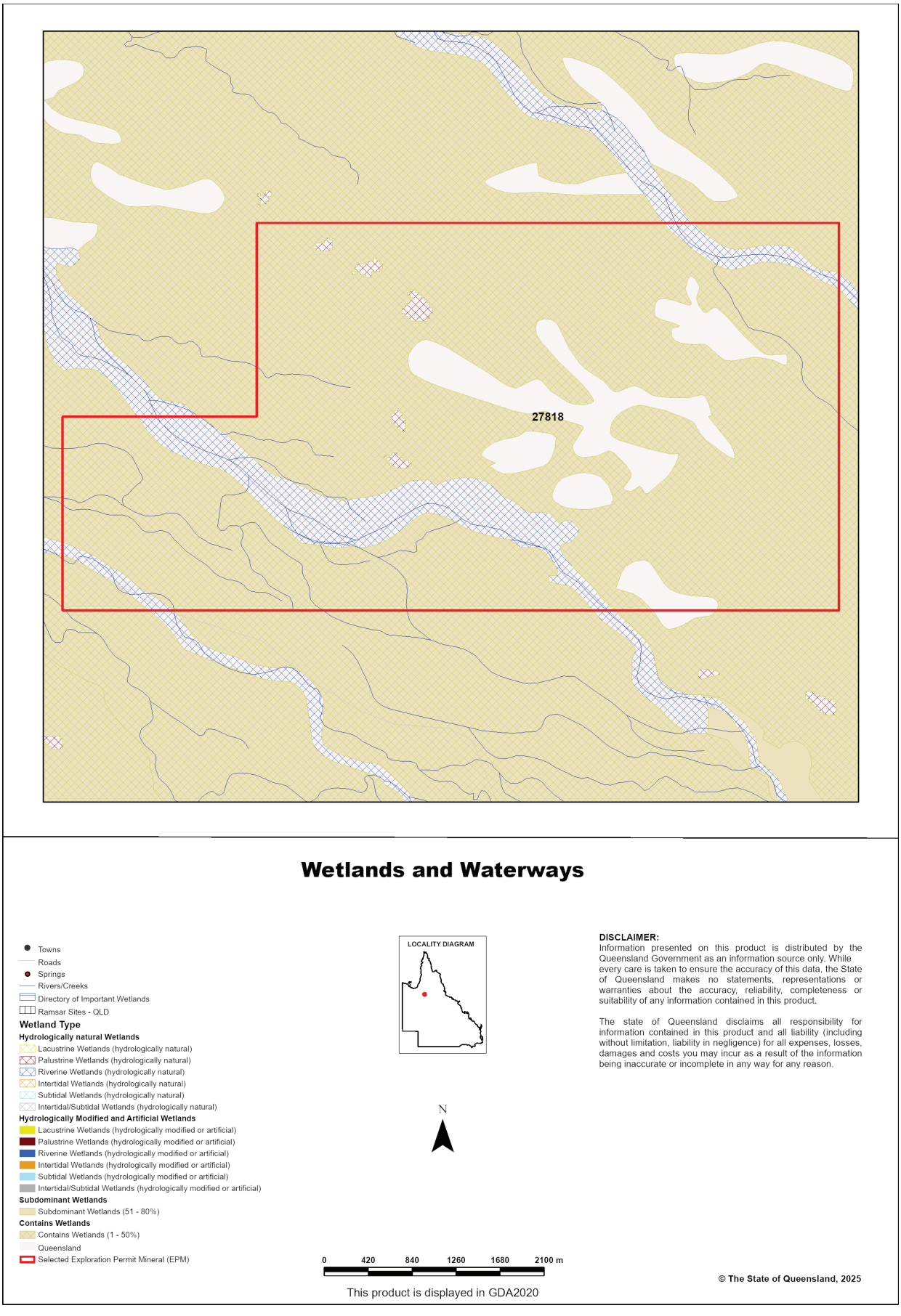
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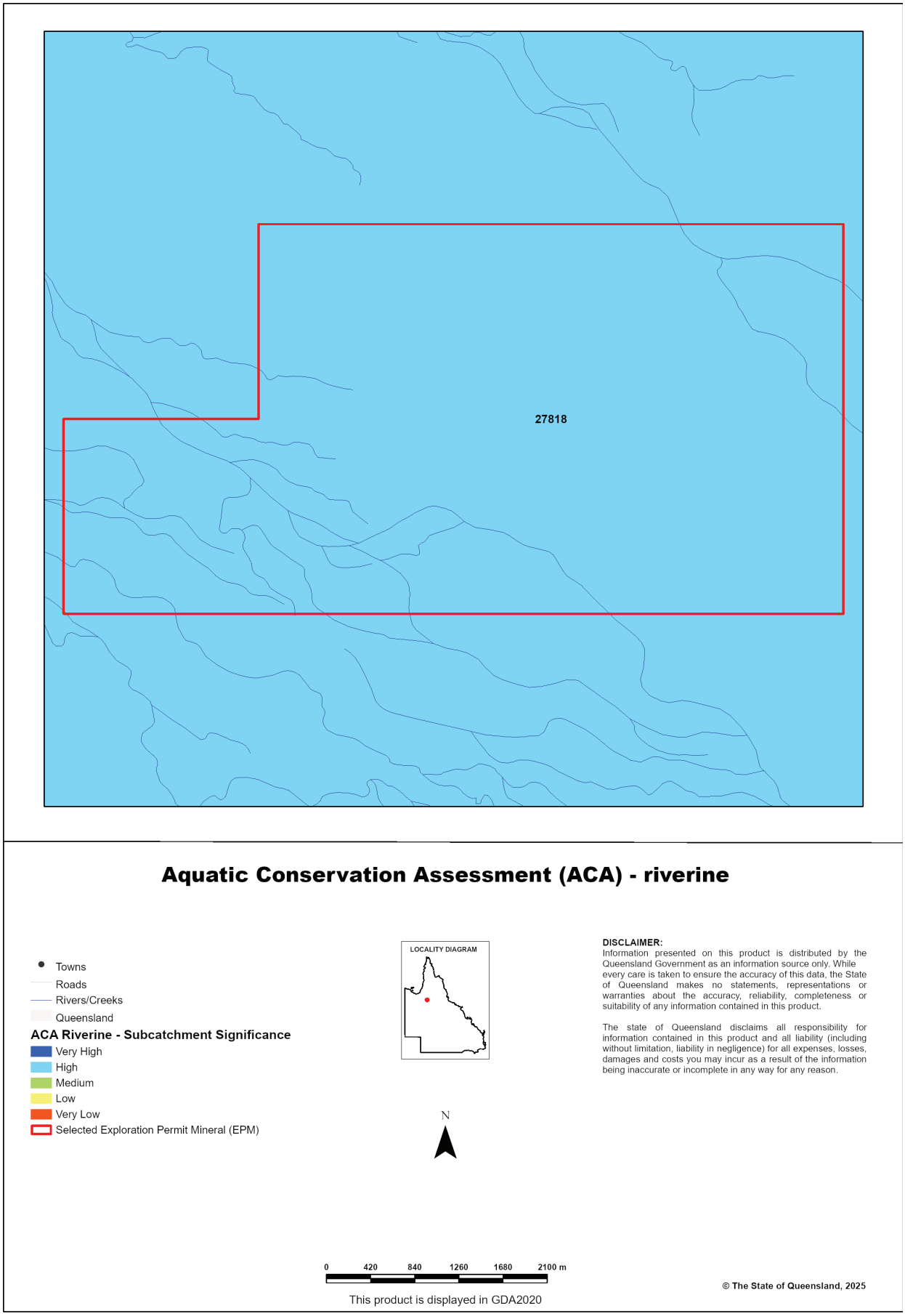
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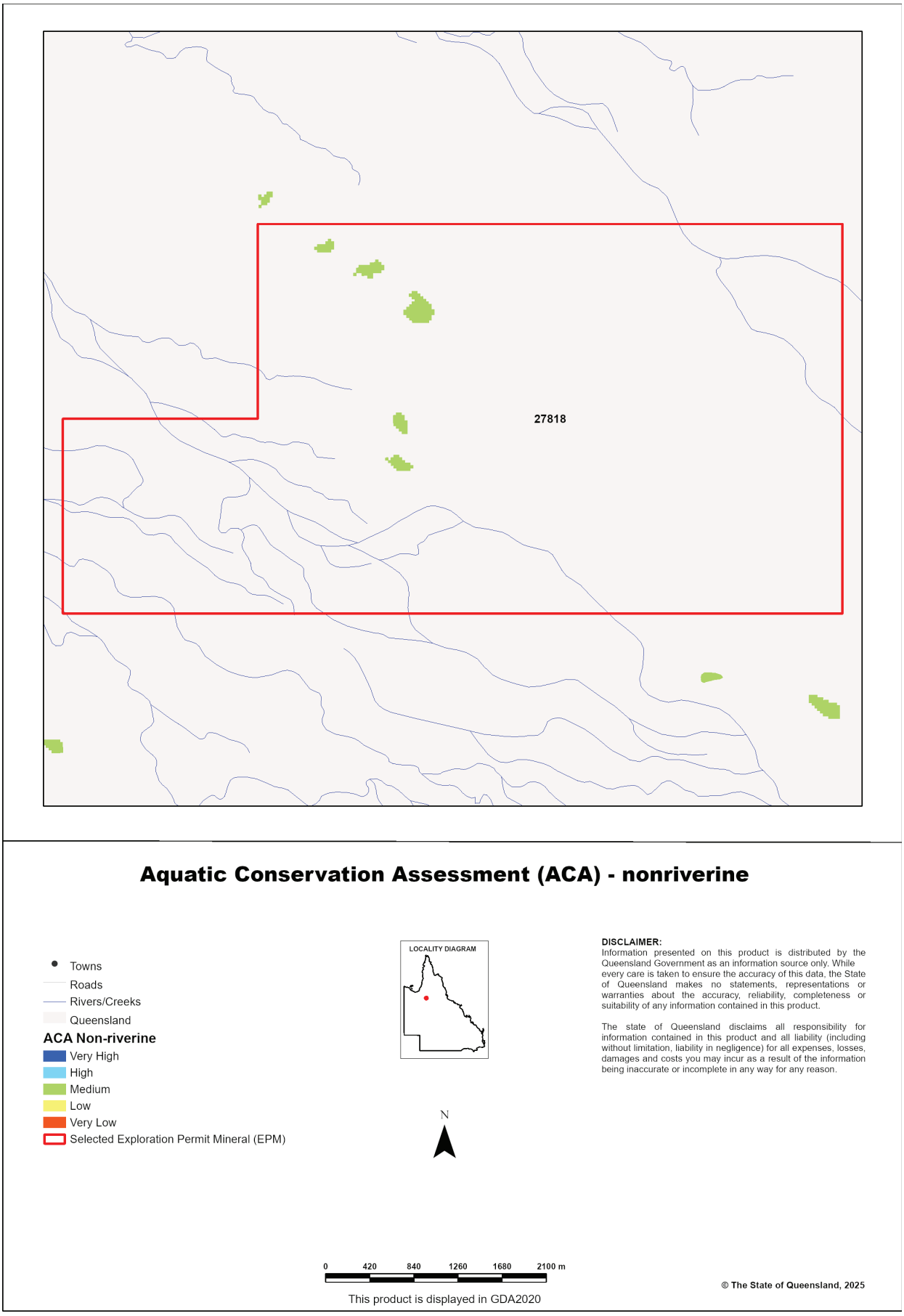
Map 4 - Wetlands and waterways



Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



References

Clayton, P.D., Fielder, D.F., Howell, S. and Hill, C.J. (2006) *Aquatic biodiversity assessment and mapping method (AquaBAMM): a conservation values assessment tool for wetlands with trial application in the Burnett River catchment.* Published by the Environmental Protection Agency, Brisbane. ISBN 1-90928-07-3. Available at

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca/

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Morton, S. R., Short, J. and Barker, R. D. with an Appendix by G.F. Griffin and G. Pearce (1995). *Refugia for Biological Diversity in Arid and Semi-arid Australia. Biodiversity Series*, Paper No. 4, Biodiversity Unit, Environment Australia.

Sattler, P.S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDBB Non-riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1 Southern Gulf Catchments Non-riverine ACA v1.1 WBBGBRCC Non-riverine ACA v2.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDBB Riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1 Southern Gulf Catchments Riverine ACA v1.1 WBBGBRCC Riverine ACA v2.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v3.1 Northwest Highlands v1.1 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.7
Threatened Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DETSI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

These datasets are available at:
http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DETSI	- Department of the Environment, Tourism, Science and Innovation
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA2020	- Geocentric Datum of Australia 2020
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest

EPM: 28274

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and a field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@detsi.qld.gov.au

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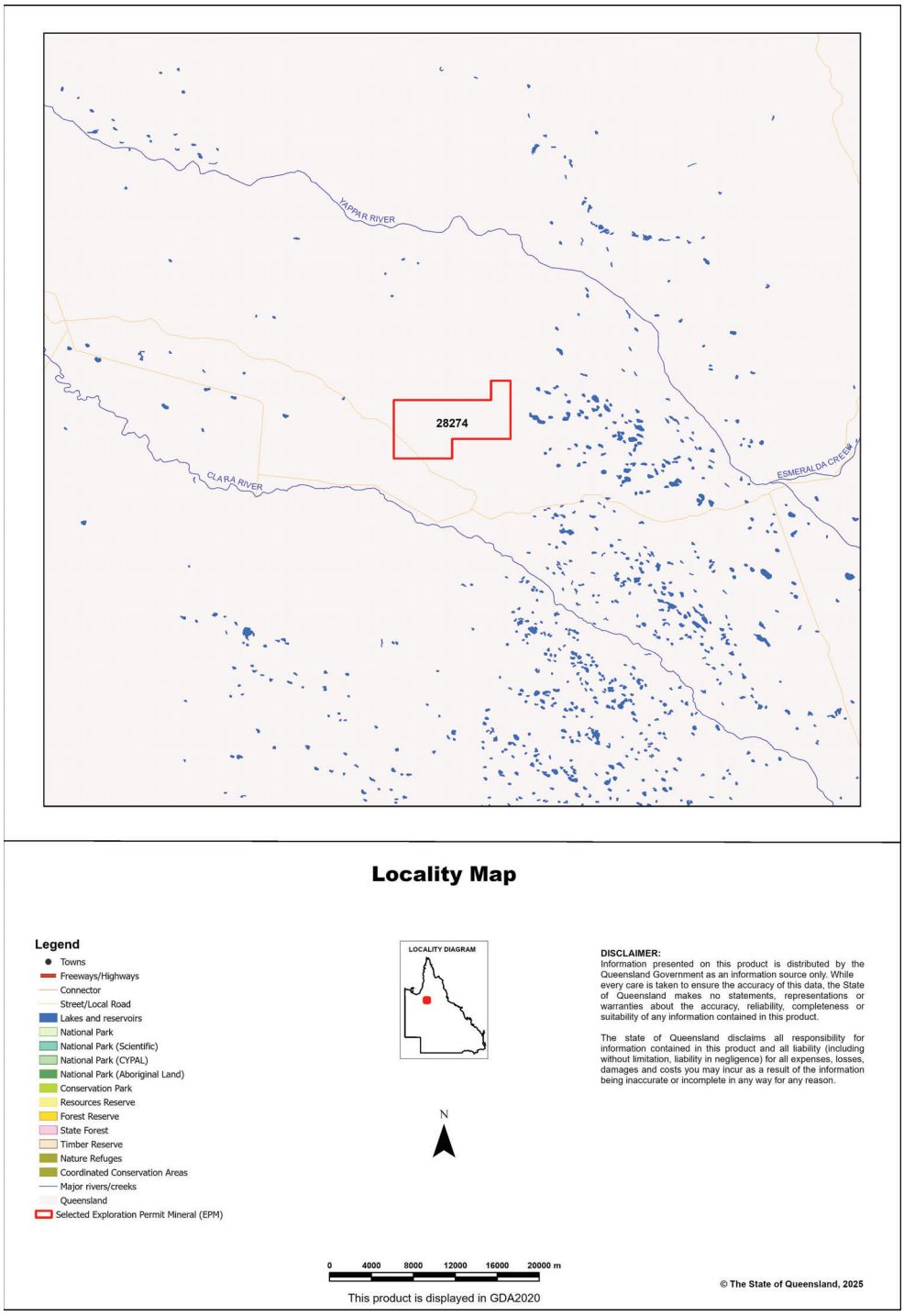
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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI: EPM: 28274, with area 5184.83 ha

Local Government(s)	Catchment(s)	Bioregion(s)	Subregion(s)
Croydon Shire	Norman	Gulf Plains	Claraville Plains



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992;*

- *Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the Marine Parks Act 2004 ;*

- *Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;*

- *Threatened wildlife under the Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

  - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
  - Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
  - Category R areas on the regulated vegetation management map;
  - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;
  - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;
- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0 ha	0.0%
1b Protected Areas- nature refuges	0 ha	0.0%
1c Protected Areas- special wildlife reserves	0 ha	0.0%
2 State Marine Parks- highly protected zones	0 ha	0.0%
3 Fish habitat areas (A and B areas)	0 ha	0.0%
4 Strategic Environmental Areas (SEA)	0 ha	0.0%
5 High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values	0 ha	0.0%
6a High Ecological Value (HEV) wetlands	0 ha	
6b High Ecological Value (HEV) waterways	0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	0 ha	0.0%
7b Special least concern animals	0 ha	0.0%
7c i Koala habitat area - core (SEQ)	0 ha	0.0%
7c ii Koala habitat area - locally refined (SEQ)	0 ha	0.0%
7d Sea turtle nesting areas	0 km	Not applicable
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	0 ha	0.0%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	0 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	0 ha	0.0%
8d Regulated Vegetation - Essential habitat	0 ha	0.0%
8e Regulated Vegetation - intersecting a watercourse	55.7 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	47.77 ha	0.9%
9a Legally secured offset areas- offset register areas	0 ha	0.0%
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0 ha	0.0%

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(No results)

1b. Protected Areas - nature refuges

(No results)

1c. Protected Areas - special wildlife reserves

(No results)

2. State Marine Parks - highly protected zones

(No results)

3. Fish habitat areas (A and B areas)

(No results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(No results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

(no results)

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Not applicable

7b. Special least concern animals

Not applicable

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

7d. Wildlife habitat (sea turtle nesting areas)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii	Keys boronia	V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	E	None
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Euastacus bindal	Mount Elliot crayfish	CR	None
Euastacus binzayedi		CR	None
Euastacus eungella		E	None
Euastacus hystricosus		E	None
Euastacus jagara	Jagara hairy crayfish	CR	None
Euastacus maidae		CR	None
Euastacus monteithorum		E	None
Euastacus robertsi		E	None
Taudactylus pleione	Kroombit tinkerfrog	E	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Macadamia integrifolia		V	None
Melaleuca irbyana	swamp tea-tree	E	None
Macadamia ternifolia		V	None
Macadamia tetraphylla	bopple nut	V	None
Petrogale penicillata	brush-tailed rock-wallaby	V	None
Petrogale coenensis	Cape York rock-wallaby	E	None
Petrogale purpureicollis	purple-necked rock-wallaby	V	None
Petrogale sharmani	Sharmans rock-wallaby	V	None
Petrogale xanthopus celeris	yellow-footed rock-wallaby (Qld subspecies)	V	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	E	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Xeromys myoides	Water Mouse	V	None

*For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.

Threatened (endangered or vulnerable) wildlife species records

(No results)

Special least concern animal species records

(No results)

Shorebird habitat (critically endangered/endangered/vulnerable)

Not applicable

Shorebird habitat (special least concern)

Not applicable

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** and **Map 3c - MSES - Wildlife habitat (sea turtle nesting areas)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:

https://environment.ehp.qld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Not applicable

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Not applicable

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Not applicable

8d. Regulated Vegetation - Essential habitat

Not applicable

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number
B	7360

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

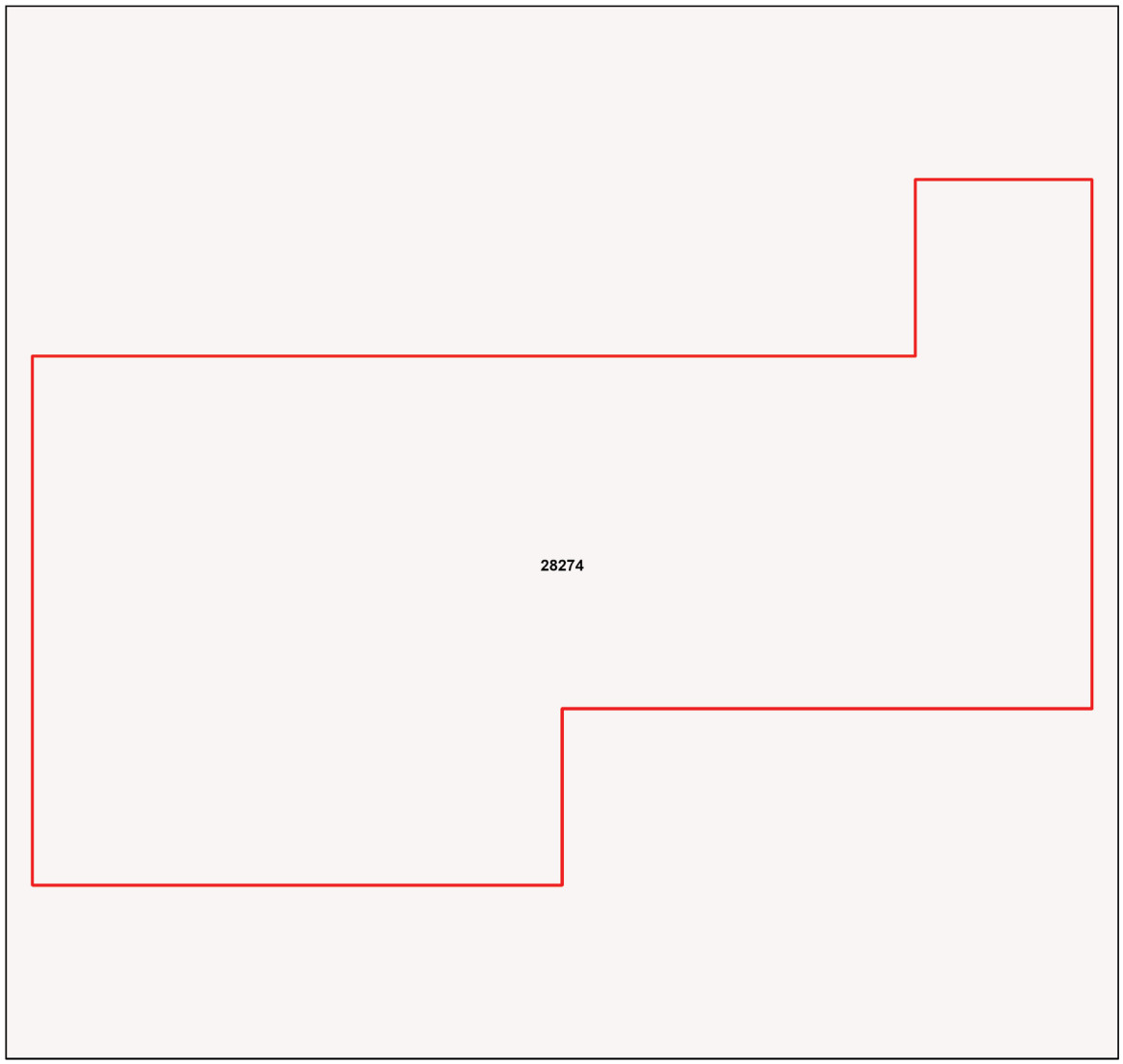
(No results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

(No results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

Map 1 - MSES - State Conservation Areas



MSES - State Conservation Areas

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates, nature refuges, special wildlife reserves)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



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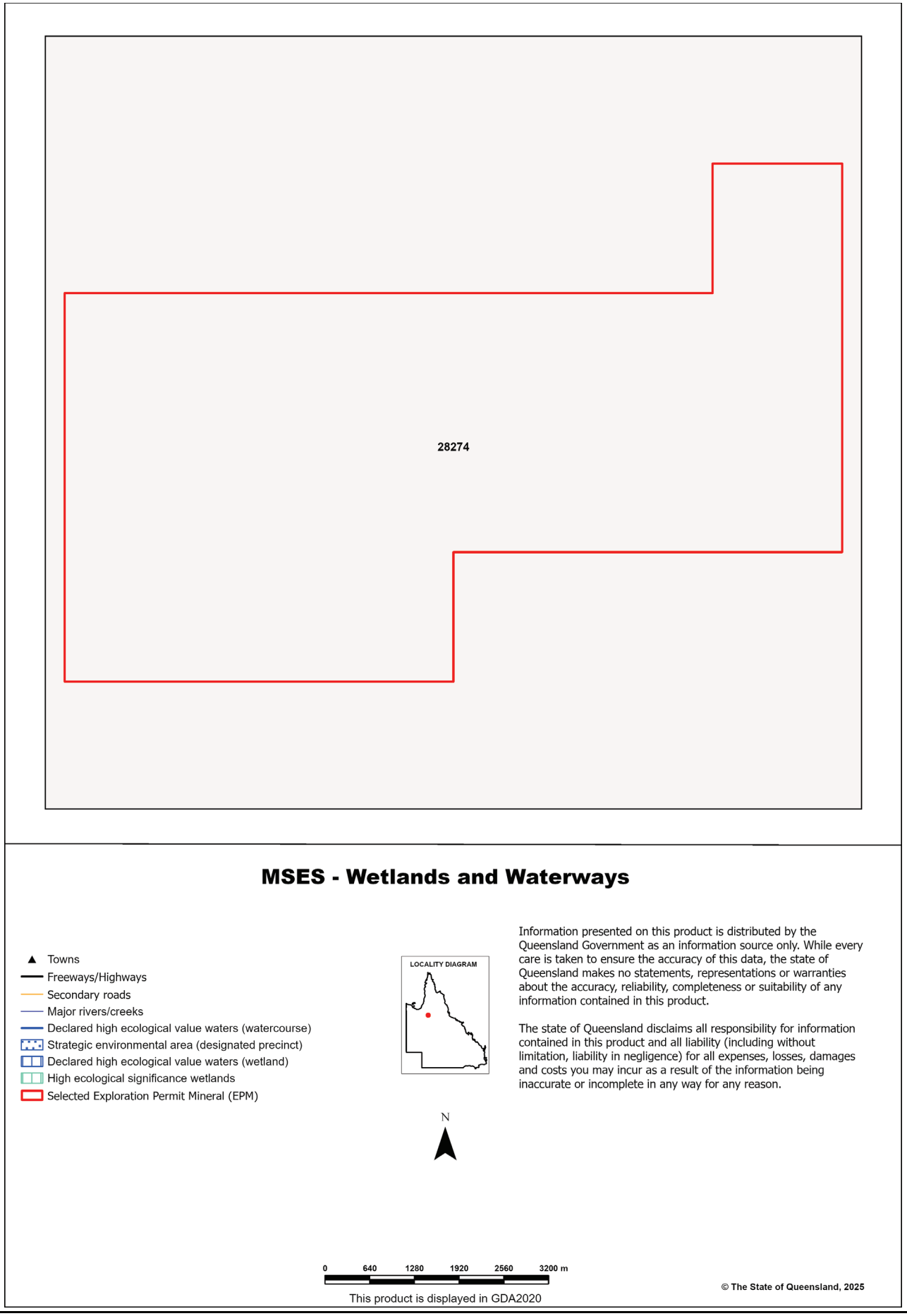
N

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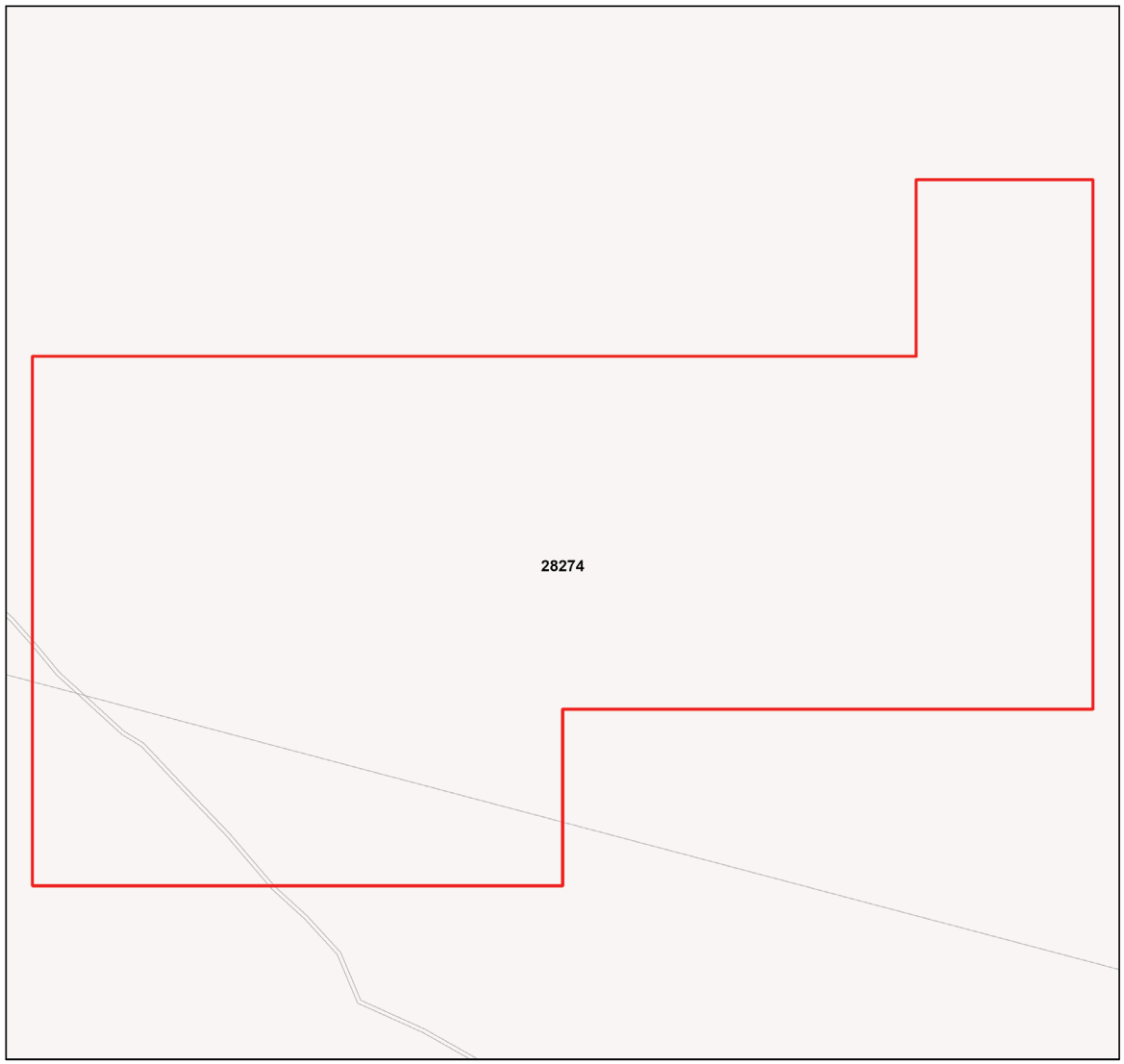
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Map 2 - MSES - Wetlands and Waterways



Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



MSES - Species
Threatened (endangered or vulnerable) wildlife and special least concern animals

- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (special least concern)
- Wildlife habitat (endangered or vulnerable)
- Selected Exploration Permit Mineral (EPM)



N

0 640 1280 1920 2560 3200 m

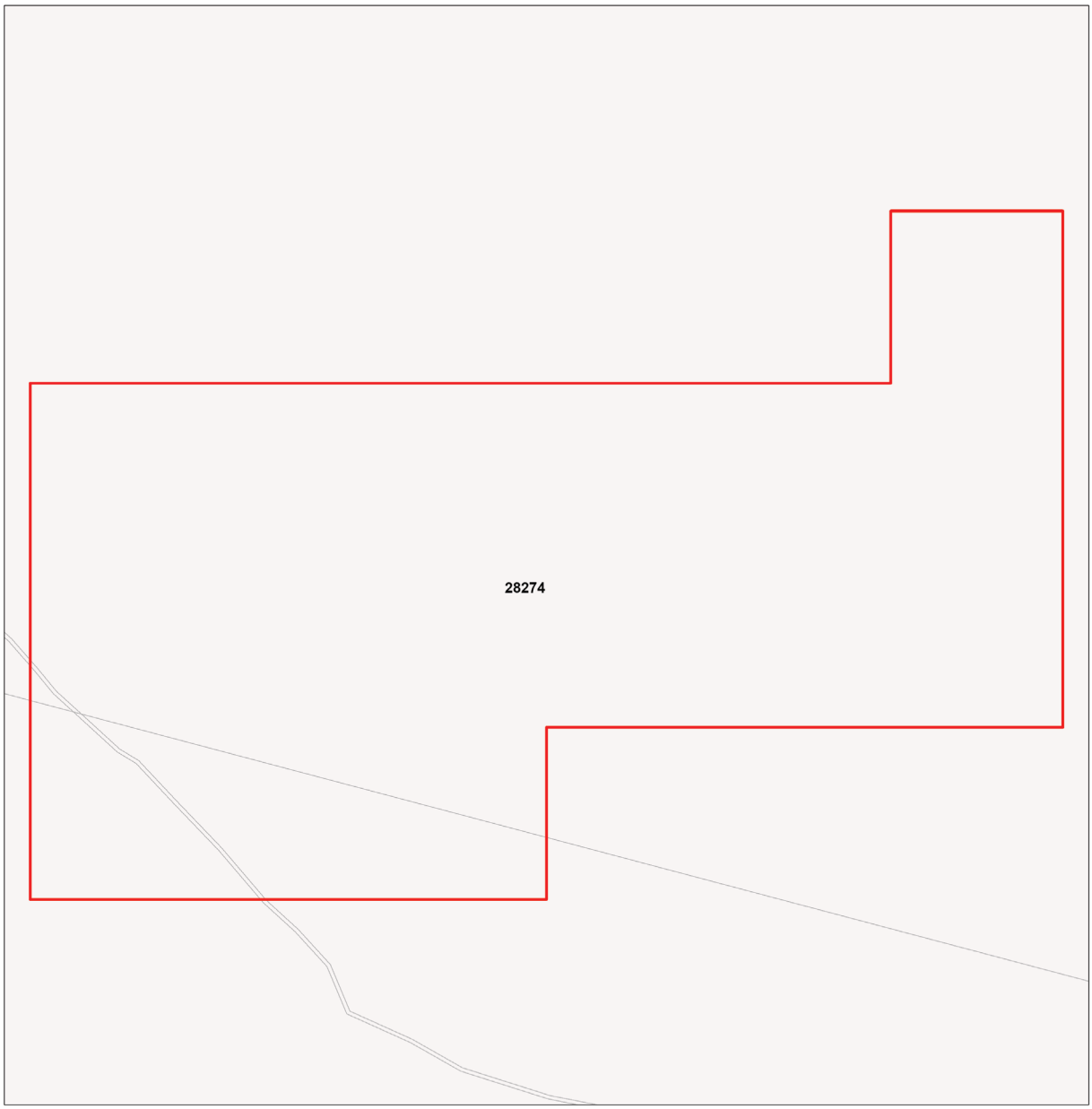
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Map 3b - MSES - Species - Koala habitat area (SEQ)



MSES - Species
Koala habitat area (SEQ)

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



0 600 1,200 1,800 2,400 3,000 m

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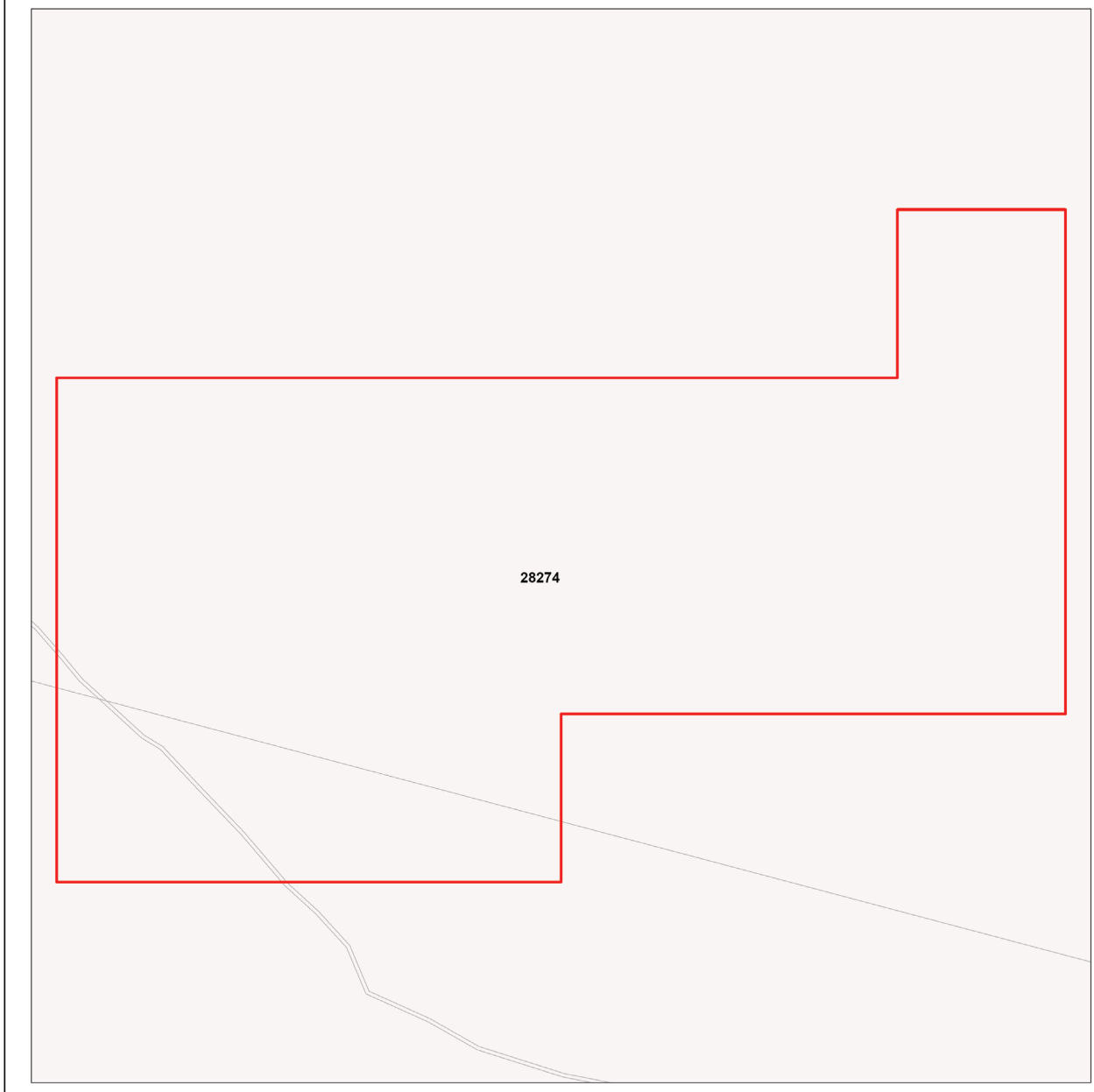
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The represented layers for SEQ 'koala habitat area-core' and 'koala habitat area- locally refined' in MSES are sourced directly from the regulatory mapping under the Nature Conservation (Koala) Conservation Plan 2017. Whilst every effort is made to ensure the information remains current, there may be delays between updating versions. Please refer to the original mapping for the most recent version. See https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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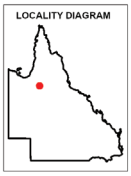
Map 3c - MSES - Species - Wildlife habitat (sea turtle nesting areas)



MSES - Wildlife habitat (sea turtle nesting areas)

Towns
Freeways/Highways
Secondary roads
Major rivers/creeks
Wildlife habitat (sea turtle nesting areas)
Selected Exploration Permit Mineral (EPM)

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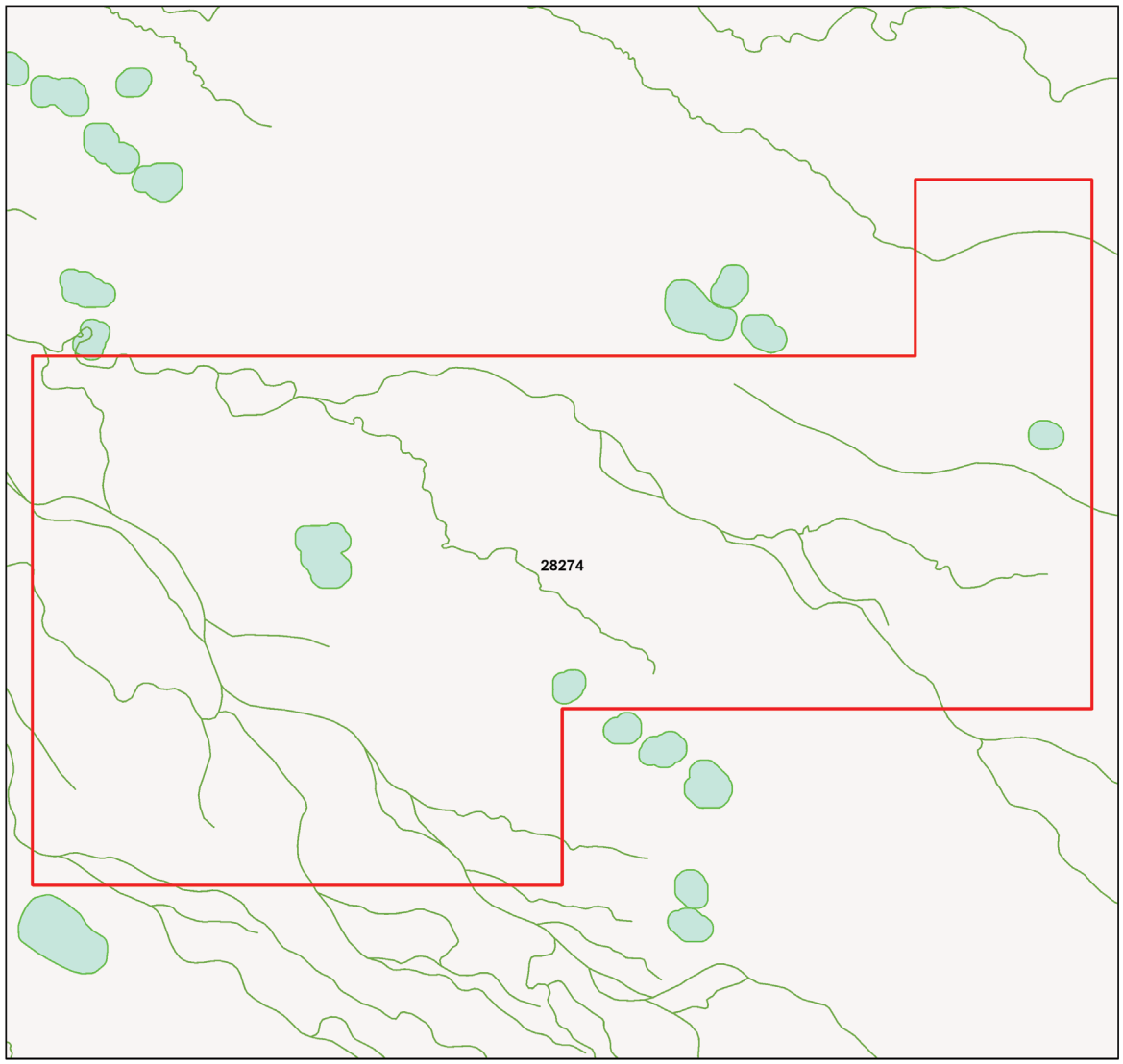
MSES mapping of sea turtle nesting areas identifies beaches where the recorded number of turtle nests are over 1% of the turtle species or genetic stock. The linework is also deliberately extended along nearby rocky coastlines and headlands to recognise that significant numbers of nesting adults and hatchlings can become disoriented by light pollution from development on rocky coastlines and headlands while navigating offshore from nesting beaches.

0 600 1,200 1,800 2,400 3,000 m

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Map 4 - MSES - Regulated Vegetation



MSES - Regulated Vegetation

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)
- Selected Exploration Permit Mineral (EPM)

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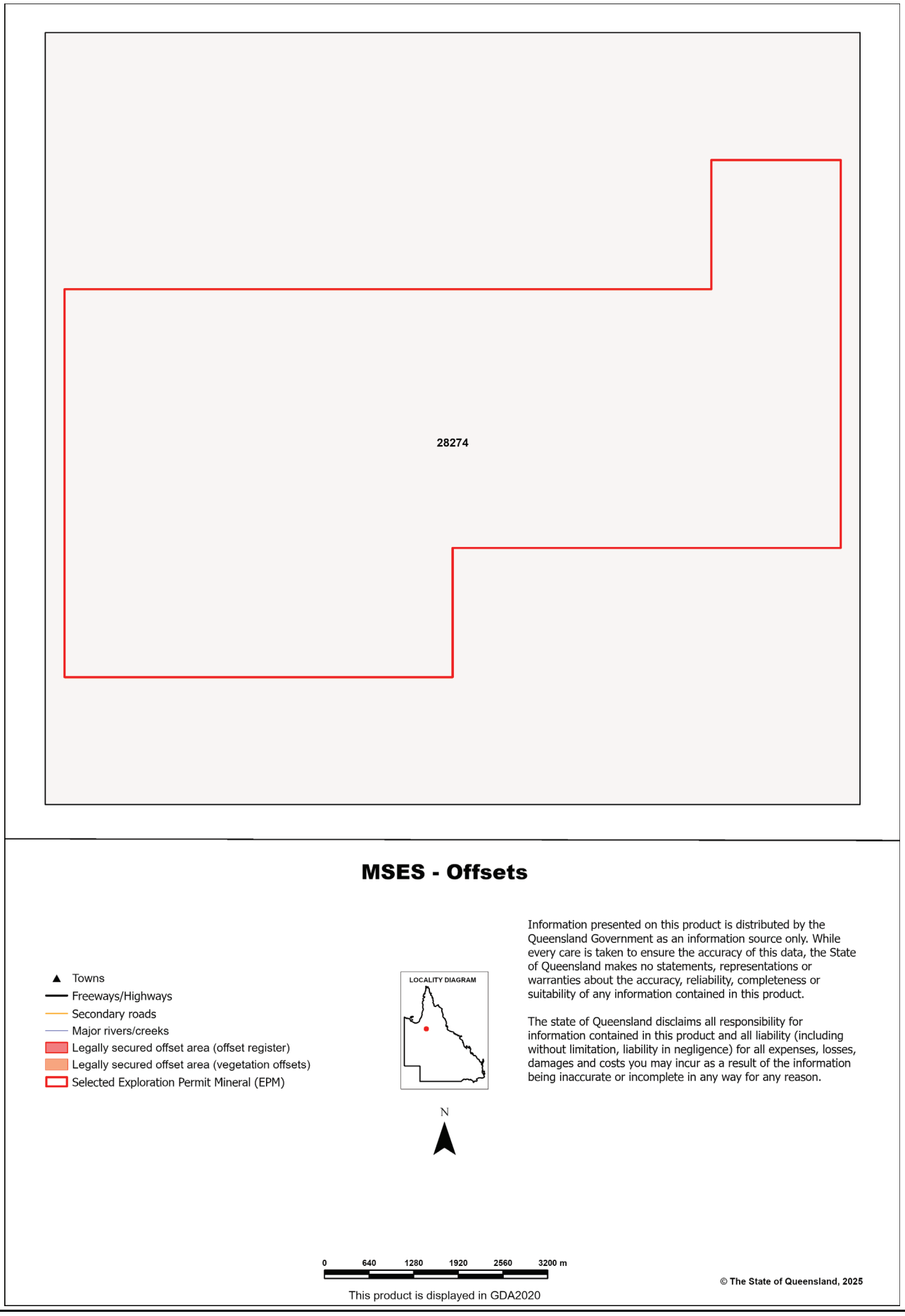
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Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). Its primary purpose is to support implementation of the SPP biodiversity policy.

MSES mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

MSES mapping does not determine whether state or local development assessment is required. For state assessment triggers refer to the Development Assessment Mapping System (DAMS). For local assessment triggers, refer to the relevant local planning scheme.

The Queensland Government's "Method for mapping - matters of state environmental significance can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

Appendix 2 - Source Data

The datasets listed below are available on request from:

http://qldspatial.information.qld.gov.au/catalogue/custom/index.page

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	**current QSpatial data (http://qspatial.information.qld.gov.au)**
Protected Areas-Estates, Nature Refuges, Special Wildlife Reserves	- Protected areas of Queensland - Nature Refuges - Queensland - Special Wildlife Reserves- Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Queensland Wetland Environmental Values
Wetlands in HEV waters	HEV waters: - EPP Water intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 5) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000)
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various) - SEQ koala habitat areas under the Koala Conservation Plan 2019
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map
VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DETSI
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DETSI	- Department of the Environment, Tourism, Science and Innovation
EP Act	- Environmental Protection Act 1994
EPP	- Environmental Protection Policy
GDA2020	- Geocentric Datum of Australia 2020
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- Nature Conservation Act 1992
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- Vegetation Management Act 1999

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest

EPM: 25210

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and a field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@detsi.qld.gov.au

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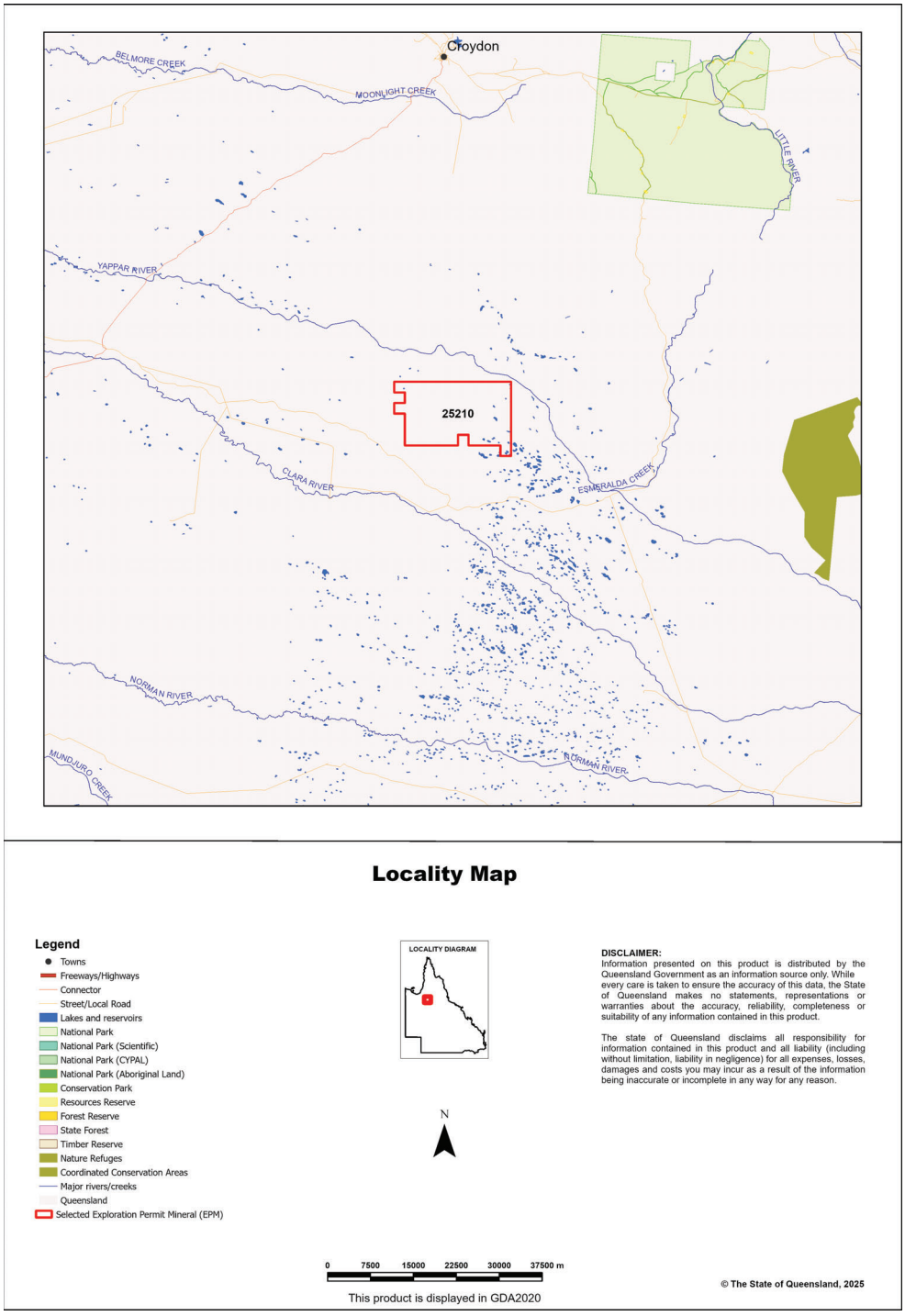
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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI: EPM: 25210, with area 20099.51 ha

Local Government(s)	Catchment(s)	Bioregion(s)	Subregion(s)
Croydon Shire	Norman	Gulf Plains	Claraville Plains



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992;*

- *Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the Marine Parks Act 2004 ;*

- *Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;*

- *Threatened wildlife under the Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

  - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
  - Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
  - Category R areas on the regulated vegetation management map;
  - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;
  - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;
- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0 ha	0.0%
1b Protected Areas- nature refuges	0 ha	0.0%
1c Protected Areas- special wildlife reserves	0 ha	0.0%
2 State Marine Parks- highly protected zones	0 ha	0.0%
3 Fish habitat areas (A and B areas)	0 ha	0.0%
4 Strategic Environmental Areas (SEA)	0 ha	0.0%
5 High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values	0 ha	0.0%
6a High Ecological Value (HEV) wetlands	0 ha	
6b High Ecological Value (HEV) waterways	0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	0 ha	0.0%
7b Special least concern animals	0 ha	0.0%
7c i Koala habitat area - core (SEQ)	0 ha	0.0%
7c ii Koala habitat area - locally refined (SEQ)	0 ha	0.0%
7d Sea turtle nesting areas	0 km	Not applicable
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	0 ha	0.0%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	0 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	0 ha	0.0%
8d Regulated Vegetation - Essential habitat	0 ha	0.0%
8e Regulated Vegetation - intersecting a watercourse	133.8 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	403.14 ha	2.0%
9a Legally secured offset areas- offset register areas	0 ha	0.0%
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0 ha	0.0%

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(No results)

1b. Protected Areas - nature refuges

(No results)

1c. Protected Areas - special wildlife reserves

(No results)

2. State Marine Parks - highly protected zones

(No results)

3. Fish habitat areas (A and B areas)

(No results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(No results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

(no results)

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Not applicable

7b. Special least concern animals

Not applicable

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

7d. Wildlife habitat (sea turtle nesting areas)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii	Keys boronia	V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	E	None
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Euastacus bindal	Mount Elliot crayfish	CR	None
Euastacus binzayedi		CR	None
Euastacus eungella		E	None
Euastacus hystricosus		E	None
Euastacus jagara	Jagara hairy crayfish	CR	None
Euastacus maidae		CR	None
Euastacus monteithorum		E	None
Euastacus robertsi		E	None
Taudactylus pleione	Kroombit tinkerfrog	E	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Macadamia integrifolia		V	None
Melaleuca irbyana	swamp tea-tree	E	None
Macadamia ternifolia		V	None
Macadamia tetraphylla	bopple nut	V	None
Petrogale penicillata	brush-tailed rock-wallaby	V	None
Petrogale coenensis	Cape York rock-wallaby	E	None
Petrogale purpureicollis	purple-necked rock-wallaby	V	None
Petrogale sharmani	Sharmans rock-wallaby	V	None
Petrogale xanthopus celeris	yellow-footed rock-wallaby (Qld subspecies)	V	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	E	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Xeromys myoides	Water Mouse	V	None

*For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.

Threatened (endangered or vulnerable) wildlife species records

(No results)

Special least concern animal species records

(No results)

Shorebird habitat (critically endangered/endangered/vulnerable)

Not applicable

Shorebird habitat (special least concern)

Not applicable

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** and **Map 3c - MSES - Wildlife habitat (sea turtle nesting areas)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:

https://environment.ehp.qld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Not applicable

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Not applicable

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Not applicable

8d. Regulated Vegetation - Essential habitat

Not applicable

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number
B	7360

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

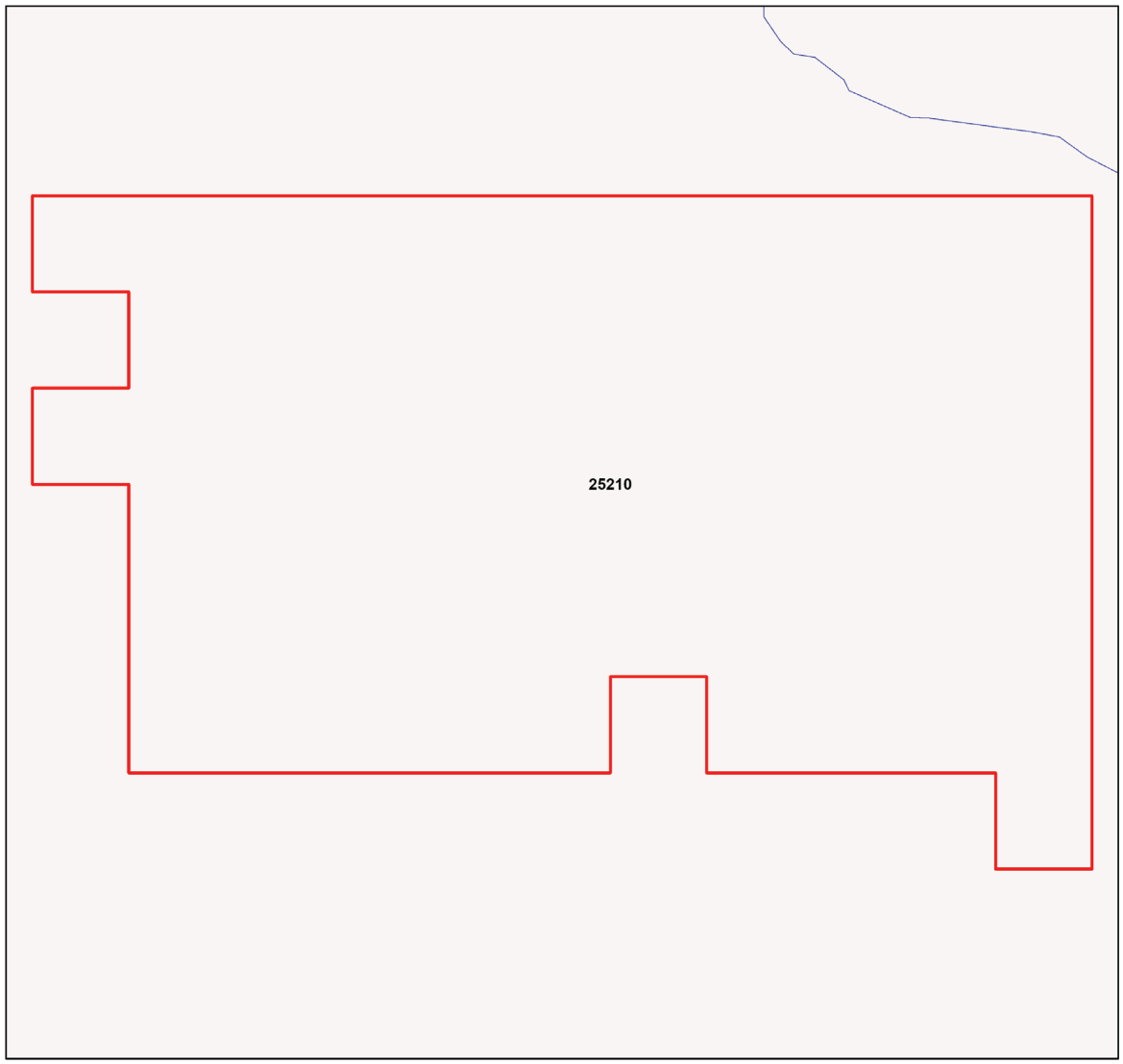
(No results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

(No results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

Map 1 - MSES - State Conservation Areas



MSES - State Conservation Areas

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates, nature refuges, special wildlife reserves)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)
- Selected Exploration Permit Mineral (EPM)

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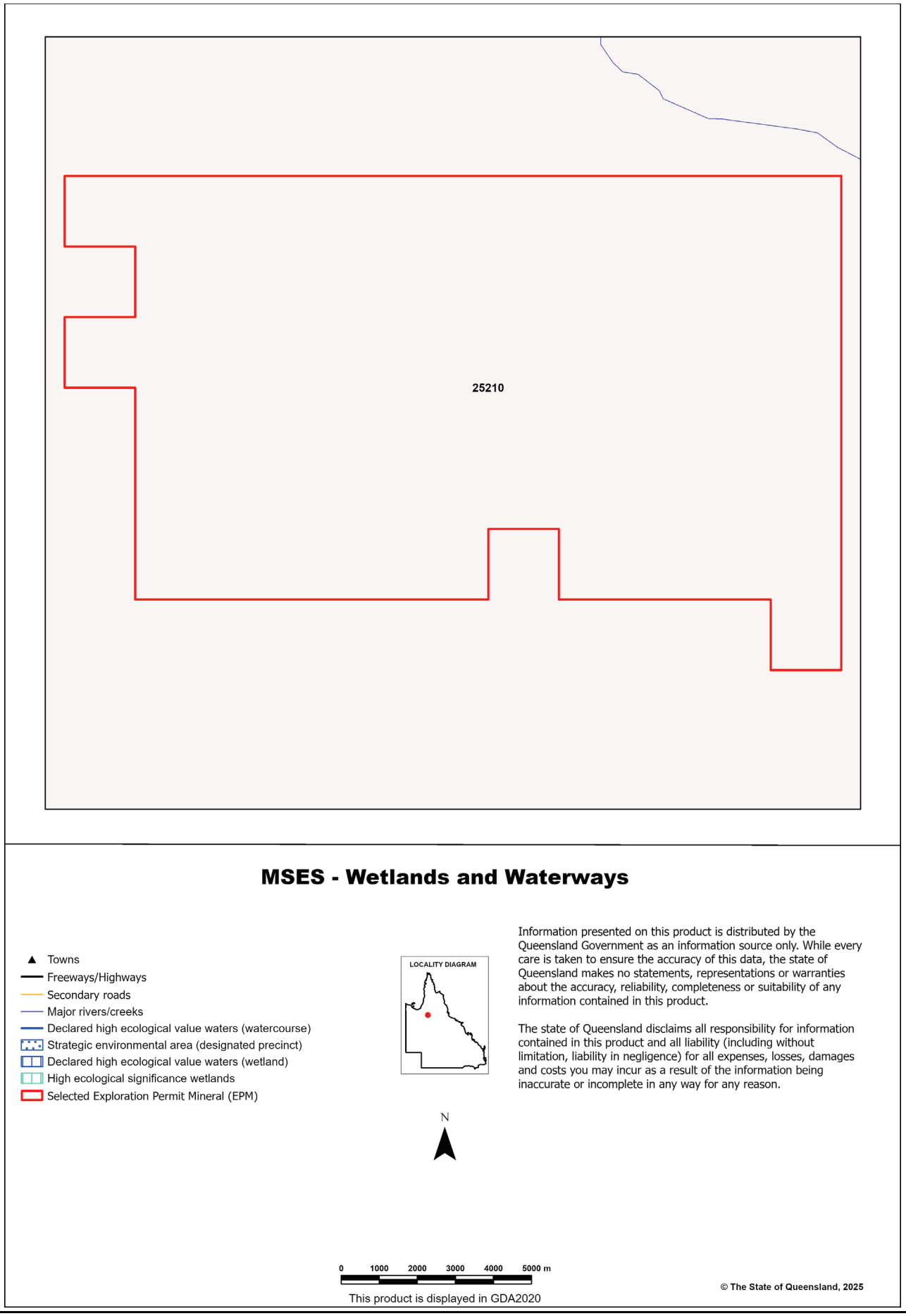
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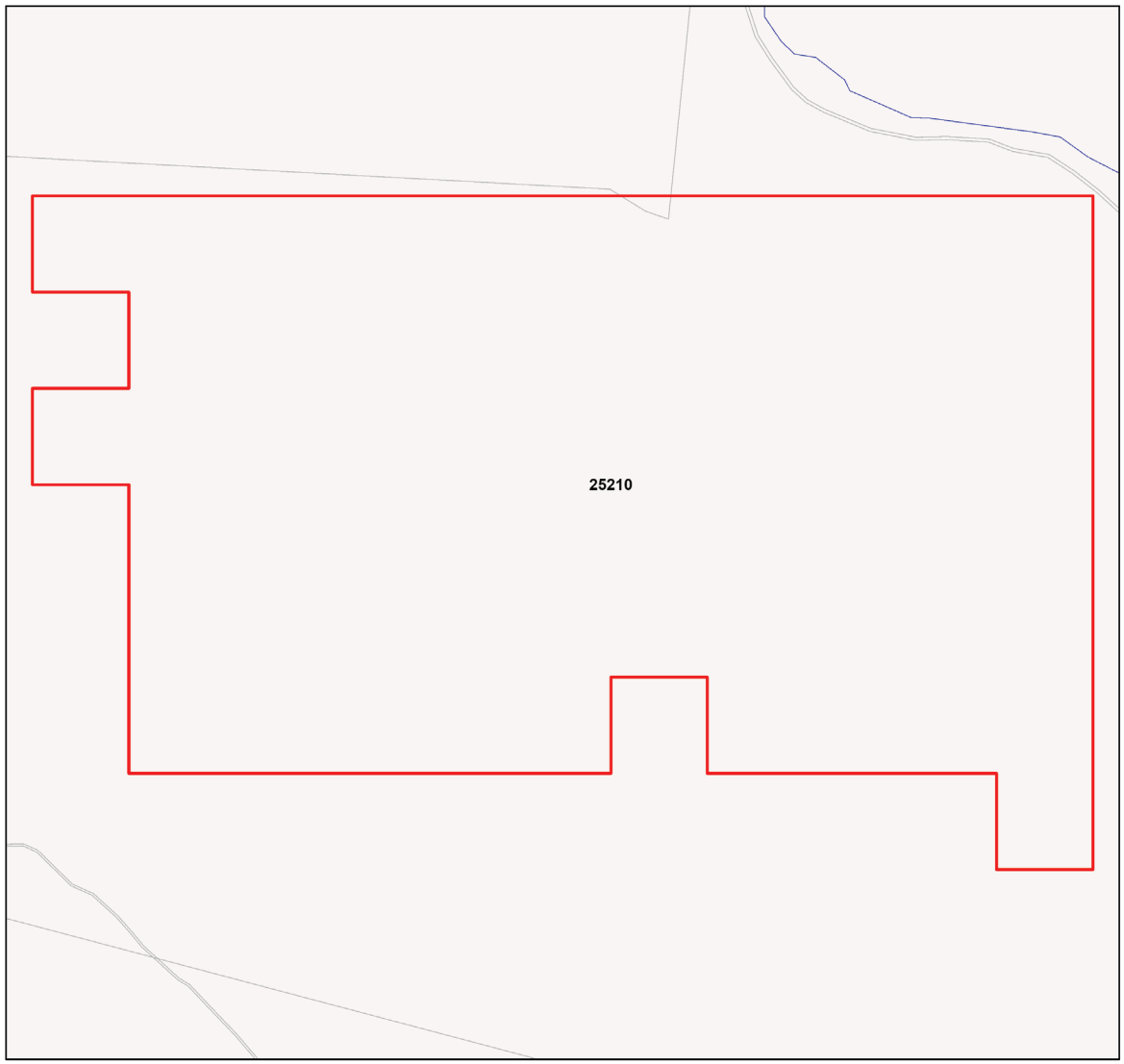
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Map 2 - MSES - Wetlands and Waterways



Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



MSES - Species
Threatened (endangered or vulnerable) wildlife and special least concern animals

- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (special least concern)
- Wildlife habitat (endangered or vulnerable)
- Selected Exploration Permit Mineral (EPM)



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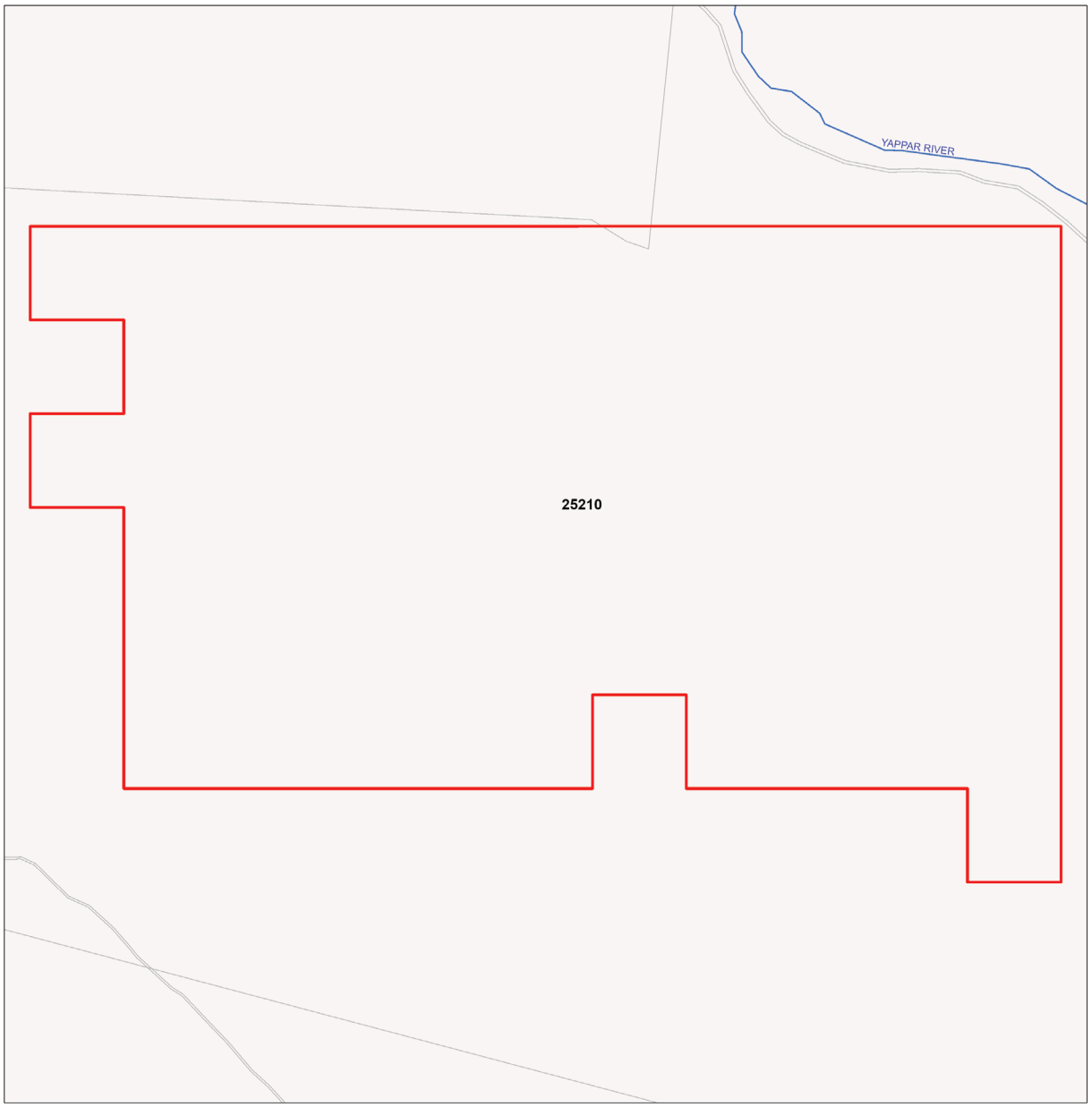
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Map 3b - MSES - Species - Koala habitat area (SEQ)



MSES - Species
Koala habitat area (SEQ)

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Selected Exploration Permit Mineral (EPM)

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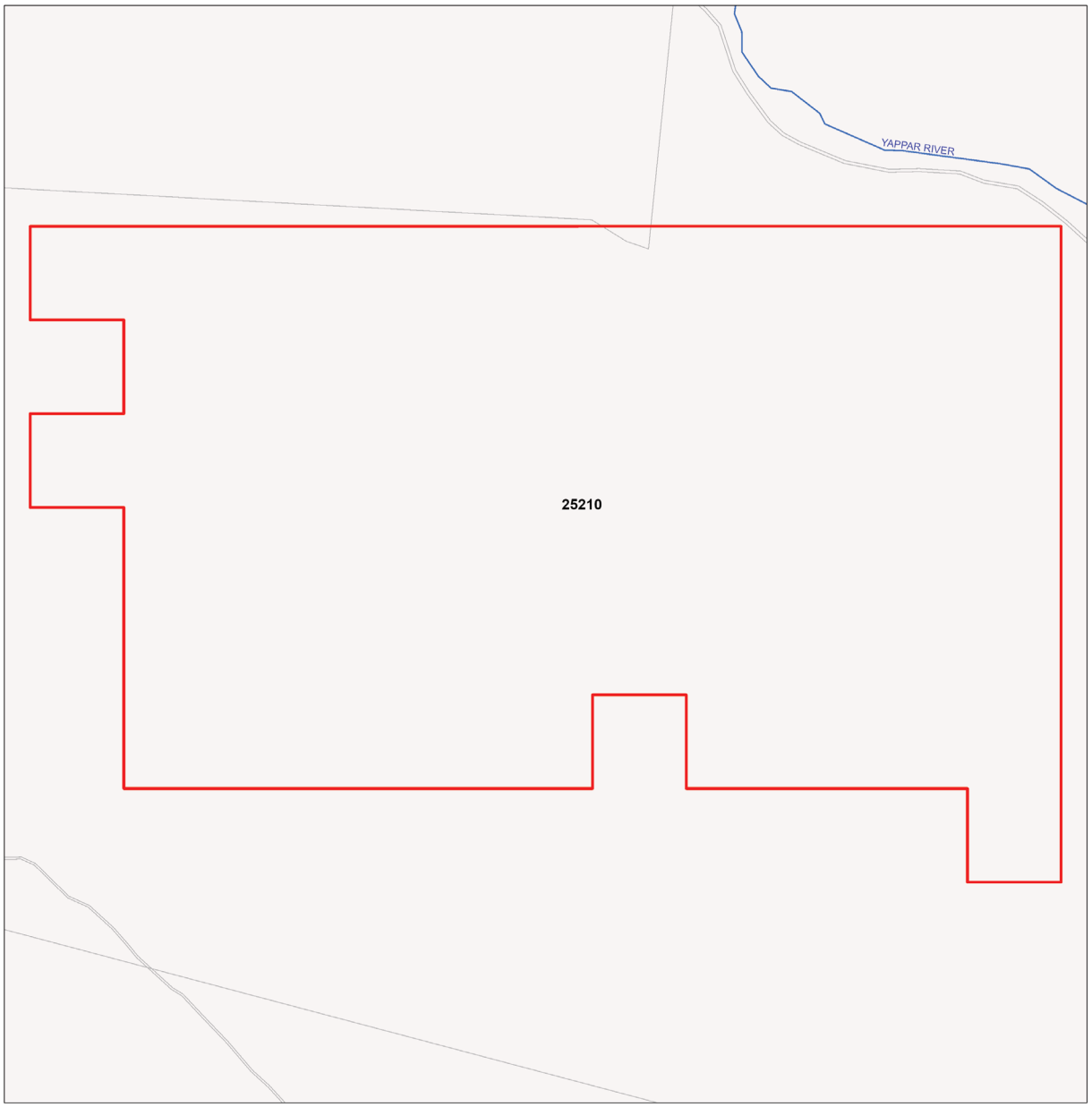
The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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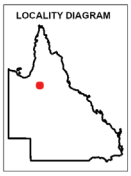
Map 3c - MSES - Species - Wildlife habitat (sea turtle nesting areas)



MSES - Wildlife habitat (sea turtle nesting areas)

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (sea turtle nesting areas)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



0 1,000 2,000 3,000 4,000 5,000 m

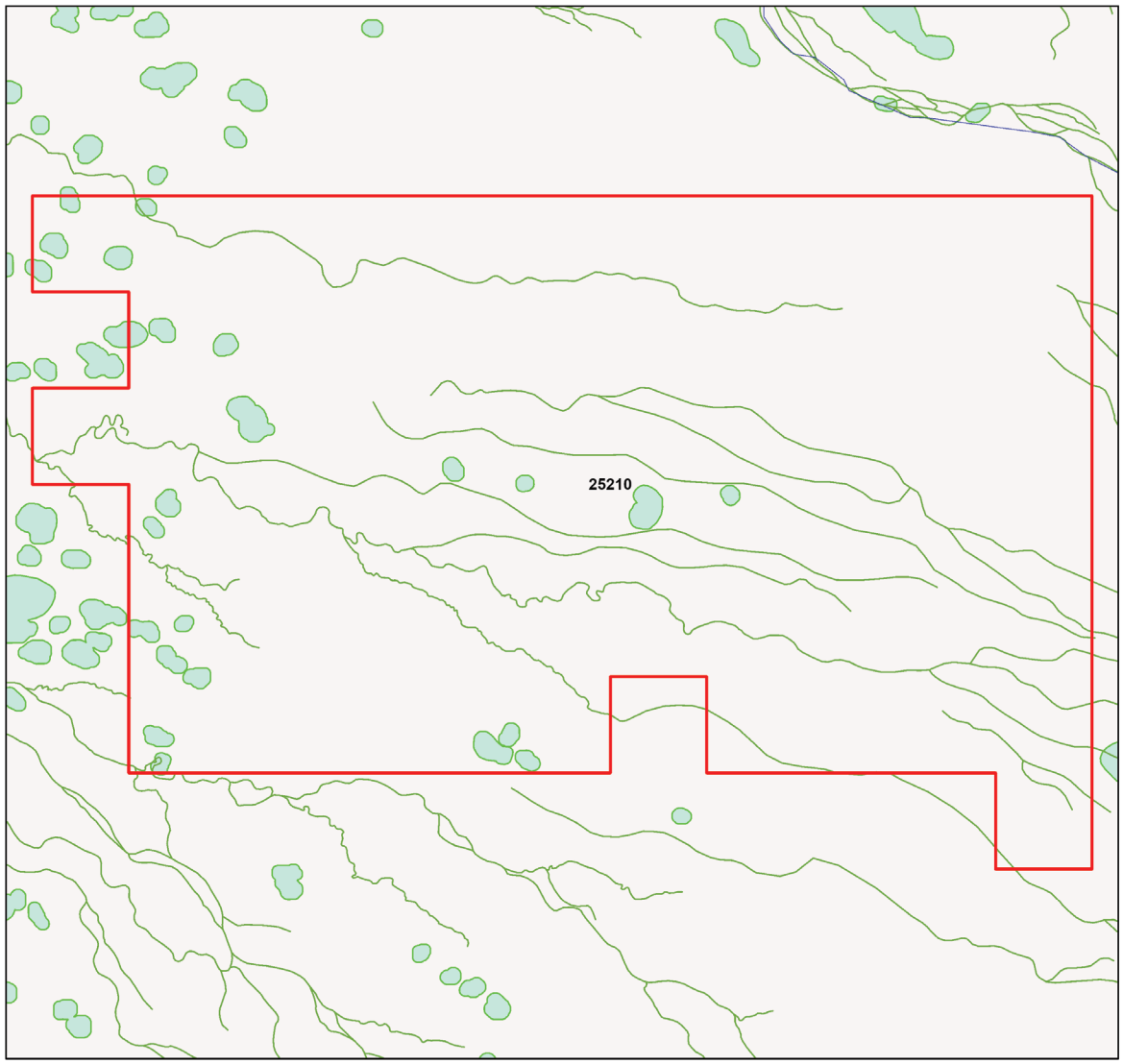
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MSES mapping of sea turtle nesting areas identifies beaches where the recorded number of turtle nests are over 1% of the turtle species or genetic stock. The linework is also deliberately extended along nearby rocky coastlines and headlands to recognise that significant numbers of nesting adults and hatchlings can become disoriented by light pollution from development on rocky coastlines and headlands while navigating offshore from nesting beaches.

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Map 4 - MSES - Regulated Vegetation



MSES - Regulated Vegetation

- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



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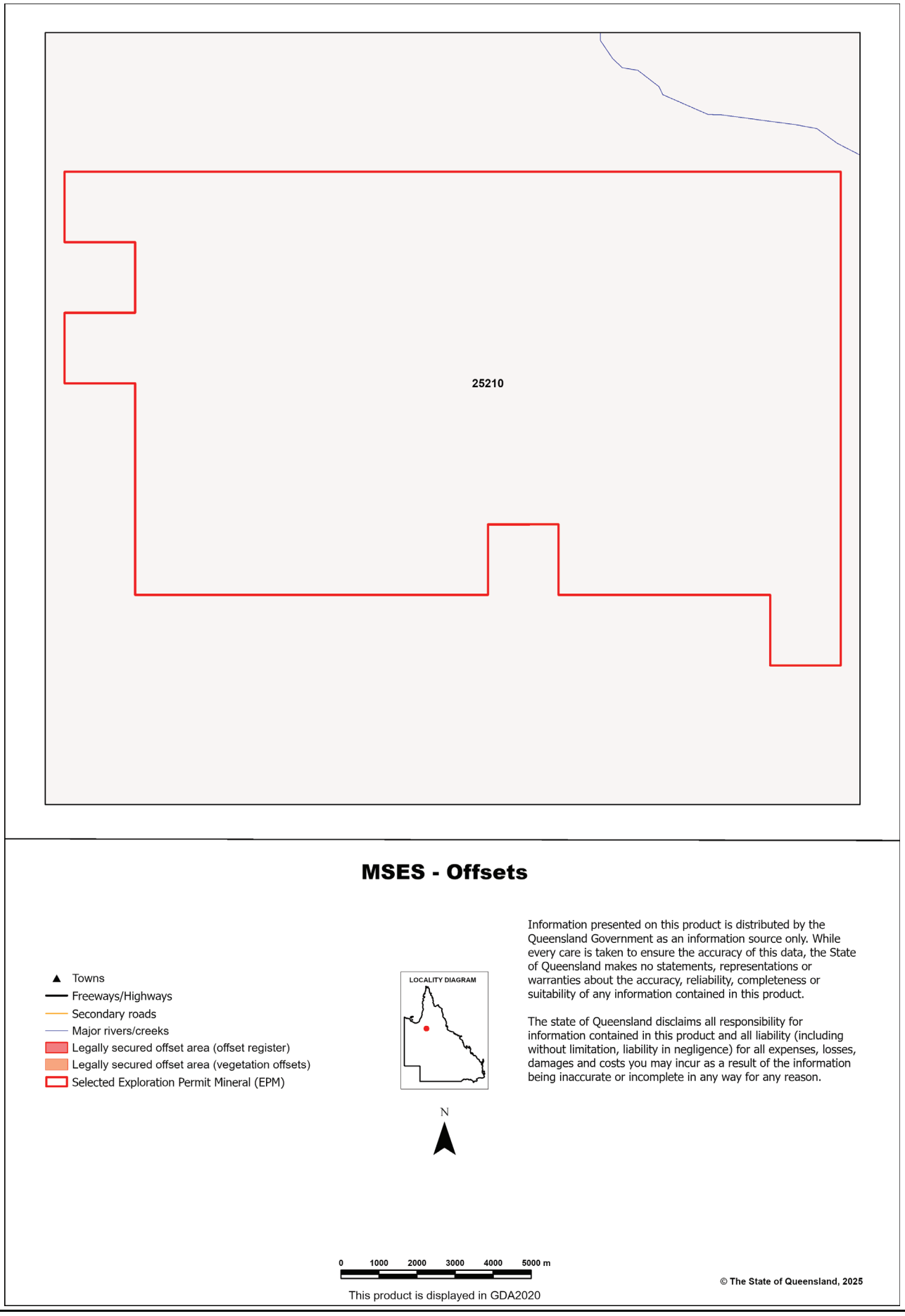
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Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). Its primary purpose is to support implementation of the SPP biodiversity policy.

MSES mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

MSES mapping does not determine whether state or local development assessment is required. For state assessment triggers refer to the Development Assessment Mapping System (DAMS). For local assessment triggers, refer to the relevant local planning scheme.

The Queensland Government's "Method for mapping - matters of state environmental significance can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

Appendix 2 - Source Data

The datasets listed below are available on request from:

http://qldspatial.information.qld.gov.au/catalogue/custom/index.page

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	**current QSpatial data (http://qspatial.information.qld.gov.au)**
Protected Areas-Estates, Nature Refuges, Special Wildlife Reserves	- Protected areas of Queensland - Nature Refuges - Queensland - Special Wildlife Reserves- Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Queensland Wetland Environmental Values
Wetlands in HEV waters	HEV waters: - EPP Water intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 5) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000)
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various) - SEQ koala habitat areas under the Koala Conservation Plan 2019
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map
VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DETSI
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DETSI	- Department of the Environment, Tourism, Science and Innovation
EP Act	- Environmental Protection Act 1994
EPP	- Environmental Protection Policy
GDA2020	- Geocentric Datum of Australia 2020
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- Nature Conservation Act 1992
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- Vegetation Management Act 1999

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest

EPM: 27818

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and a field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@detsi.qld.gov.au

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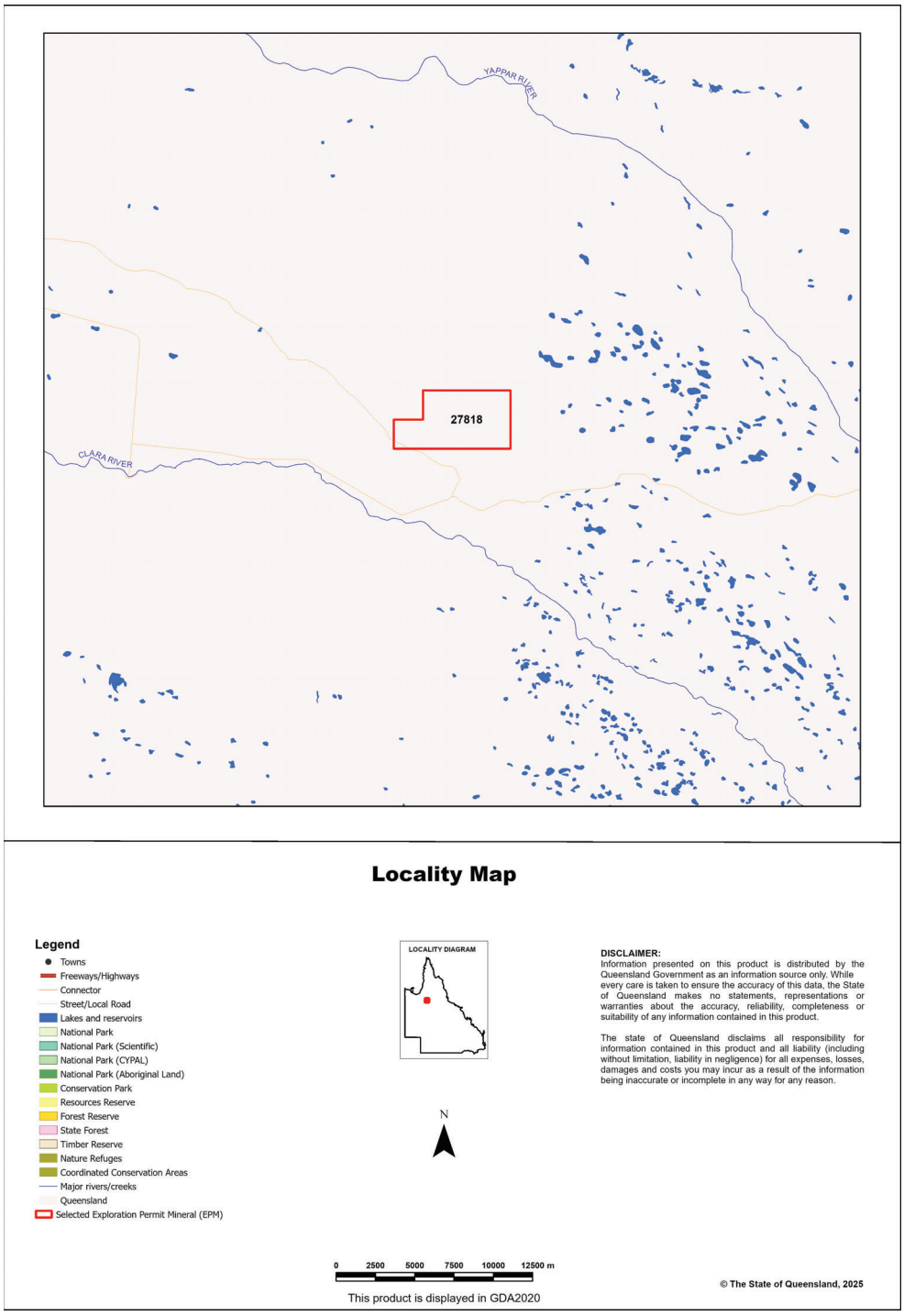
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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI: EPM: 27818, with area 2267.95 ha

Local Government(s)	Catchment(s)	Bioregion(s)	Subregion(s)
Croydon Shire	Norman	Gulf Plains	Claraville Plains



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992;*

- *Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the Marine Parks Act 2004 ;*

- *Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;*

- *Threatened wildlife under the Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

  - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
  - Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
  - Category R areas on the regulated vegetation management map;
  - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;
  - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;
- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0 ha	0.0%
1b Protected Areas- nature refuges	0 ha	0.0%
1c Protected Areas- special wildlife reserves	0 ha	0.0%
2 State Marine Parks- highly protected zones	0 ha	0.0%
3 Fish habitat areas (A and B areas)	0 ha	0.0%
4 Strategic Environmental Areas (SEA)	0 ha	0.0%
5 High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values	0 ha	0.0%
6a High Ecological Value (HEV) wetlands	0 ha	
6b High Ecological Value (HEV) waterways	0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	0 ha	0.0%
7b Special least concern animals	0 ha	0.0%
7c i Koala habitat area - core (SEQ)	0 ha	0.0%
7c ii Koala habitat area - locally refined (SEQ)	0 ha	0.0%
7d Sea turtle nesting areas	0 km	Not applicable
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	0 ha	0.0%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	0 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	0 ha	0.0%
8d Regulated Vegetation - Essential habitat	0 ha	0.0%
8e Regulated Vegetation - intersecting a watercourse	24.9 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	64.35 ha	2.8%
9a Legally secured offset areas- offset register areas	0 ha	0.0%
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0 ha	0.0%

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(No results)

1b. Protected Areas - nature refuges

(No results)

1c. Protected Areas - special wildlife reserves

(No results)

2. State Marine Parks - highly protected zones

(No results)

3. Fish habitat areas (A and B areas)

(No results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(No results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

(no results)

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Not applicable

7b. Special least concern animals

Not applicable

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

7d. Wildlife habitat (sea turtle nesting areas)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii	Keys boronia	V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	E	None
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Euastacus bindal	Mount Elliot crayfish	CR	None
Euastacus binzayedi		CR	None
Euastacus eungella		E	None
Euastacus hystricosus		E	None
Euastacus jagara	Jagara hairy crayfish	CR	None
Euastacus maidae		CR	None
Euastacus monteithorum		E	None
Euastacus robertsi		E	None
Taudactylus pleione	Kroombit tinkerfrog	E	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Macadamia integrifolia		V	None
Melaleuca irbyana	swamp tea-tree	E	None
Macadamia ternifolia		V	None
Macadamia tetraphylla	bopple nut	V	None
Petrogale penicillata	brush-tailed rock-wallaby	V	None
Petrogale coenensis	Cape York rock-wallaby	E	None
Petrogale purpureicollis	purple-necked rock-wallaby	V	None
Petrogale sharmani	Sharmans rock-wallaby	V	None
Petrogale xanthopus celeris	yellow-footed rock-wallaby (Qld subspecies)	V	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	E	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Xeromys myoides	Water Mouse	V	None

*For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.

Threatened (endangered or vulnerable) wildlife species records

(No results)

Special least concern animal species records

(No results)

Shorebird habitat (critically endangered/endangered/vulnerable)

Not applicable

Shorebird habitat (special least concern)

Not applicable

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** and **Map 3c - MSES - Wildlife habitat (sea turtle nesting areas)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:

https://environment.ehp.qld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Not applicable

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Not applicable

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Not applicable

8d. Regulated Vegetation - Essential habitat

Not applicable

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number
B	7360

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

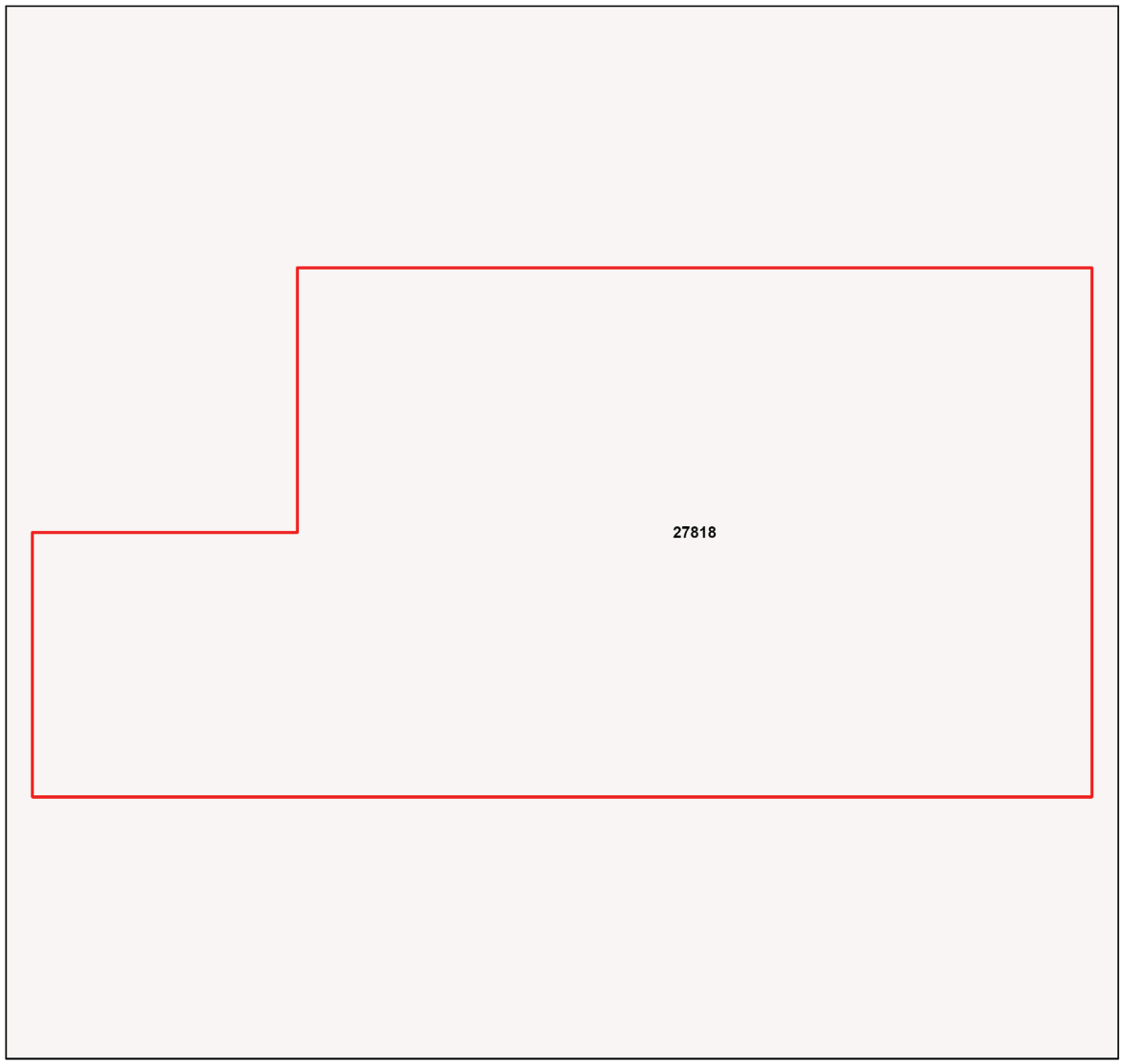
(No results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

(No results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

Map 1 - MSES - State Conservation Areas



MSES - State Conservation Areas

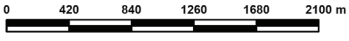
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates, nature refuges, special wildlife reserves)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)
- Selected Exploration Permit Mineral (EPM)



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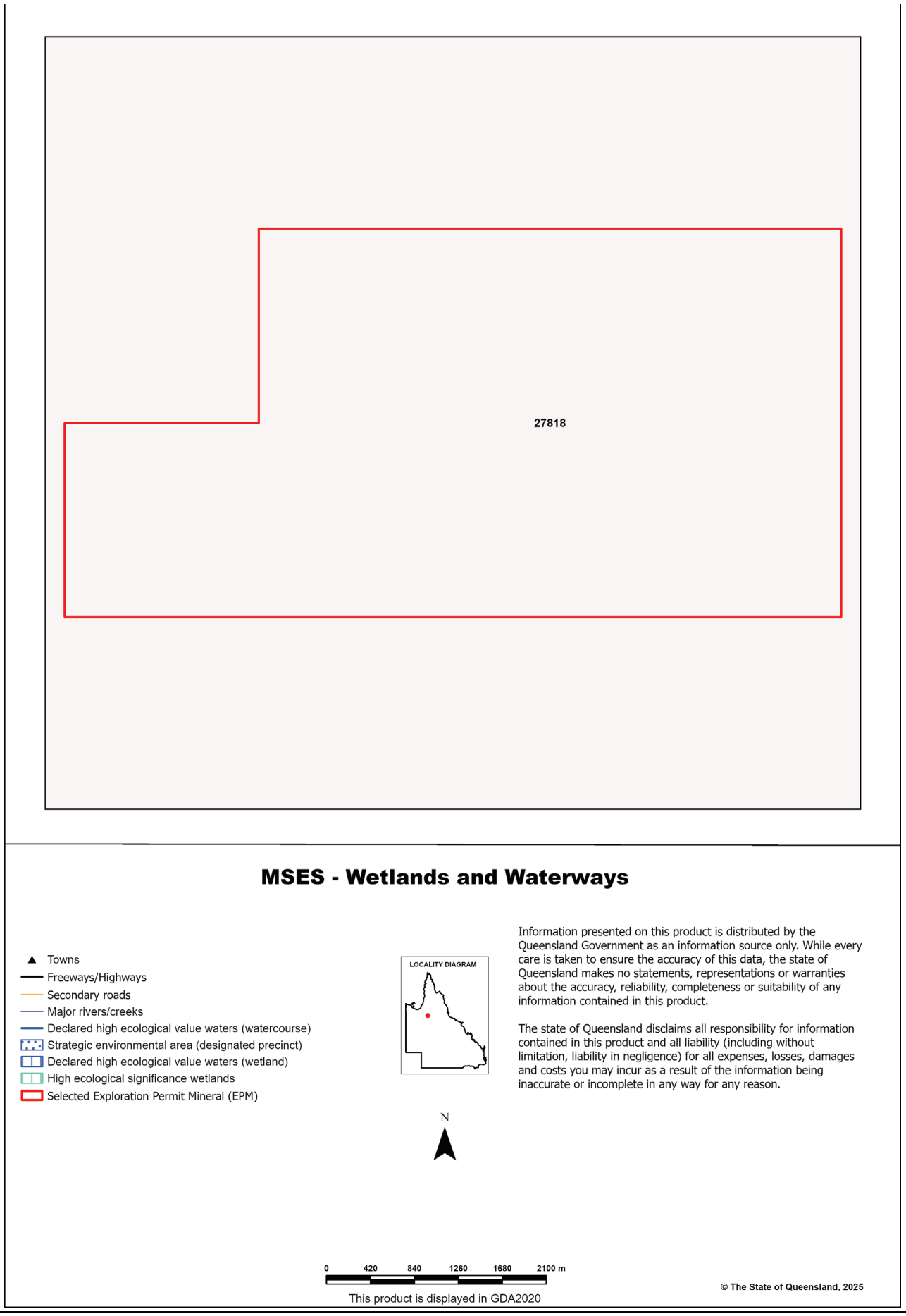




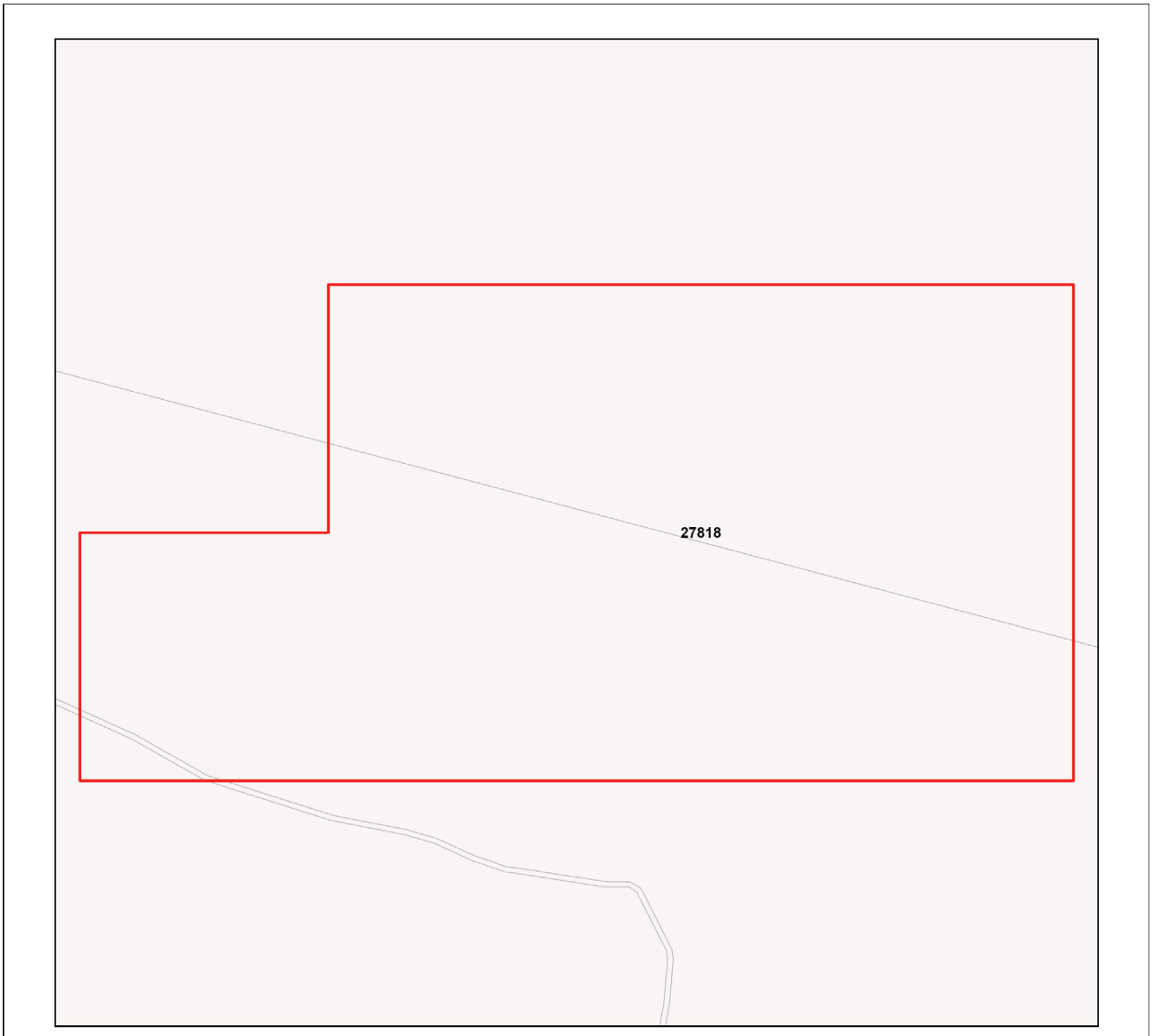
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Map 2 - MSES - Wetlands and Waterways



Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



MSES - Species
Threatened (endangered or vulnerable) wildlife and special least concern animals

- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (special least concern)
- Wildlife habitat (endangered or vulnerable)
- Selected Exploration Permit Mineral (EPM)



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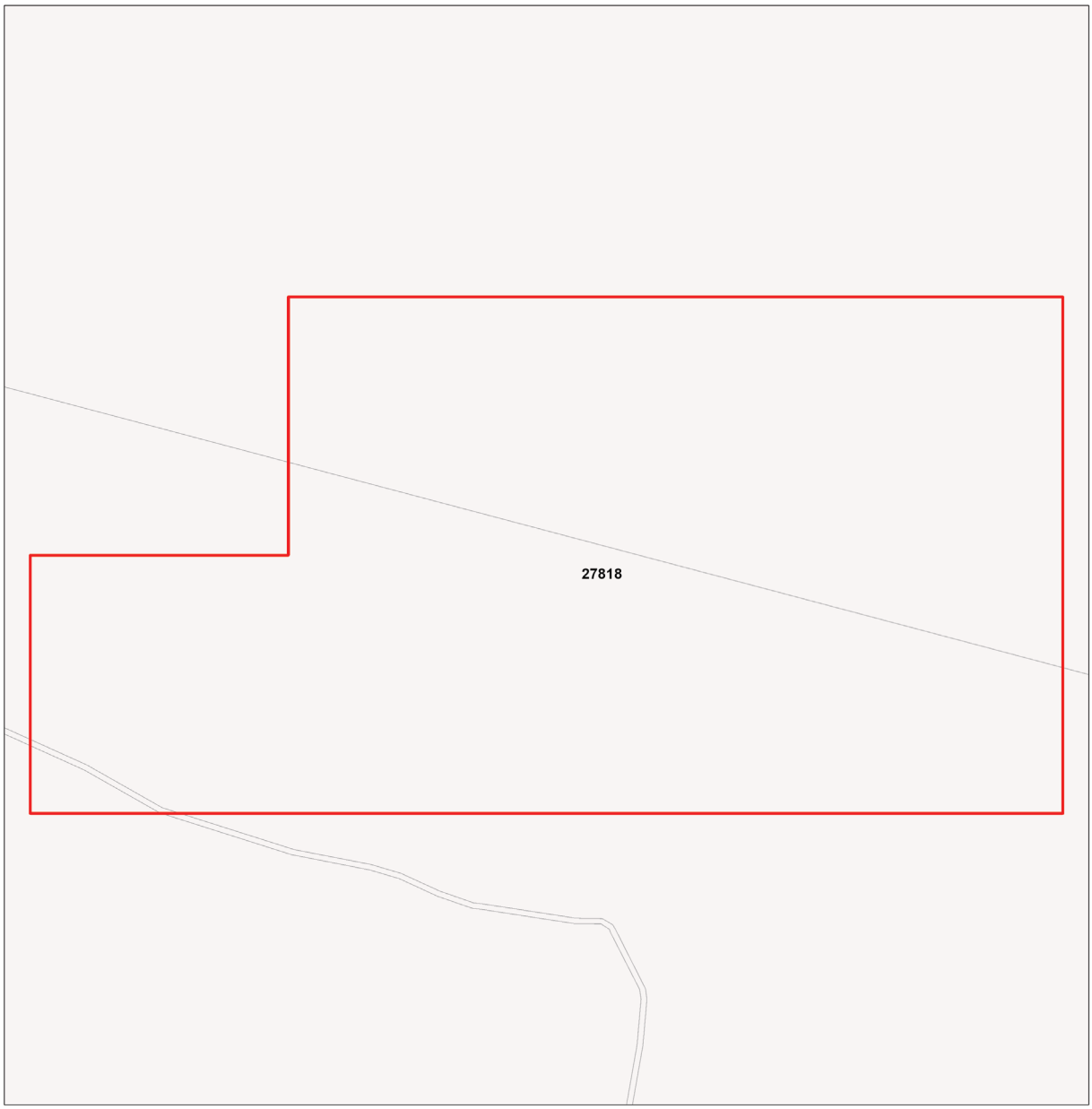
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Map 3b - MSES - Species - Koala habitat area (SEQ)



MSES - Species
Koala habitat area (SEQ)

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



0 400 800 1,200 1,600 2,000 m

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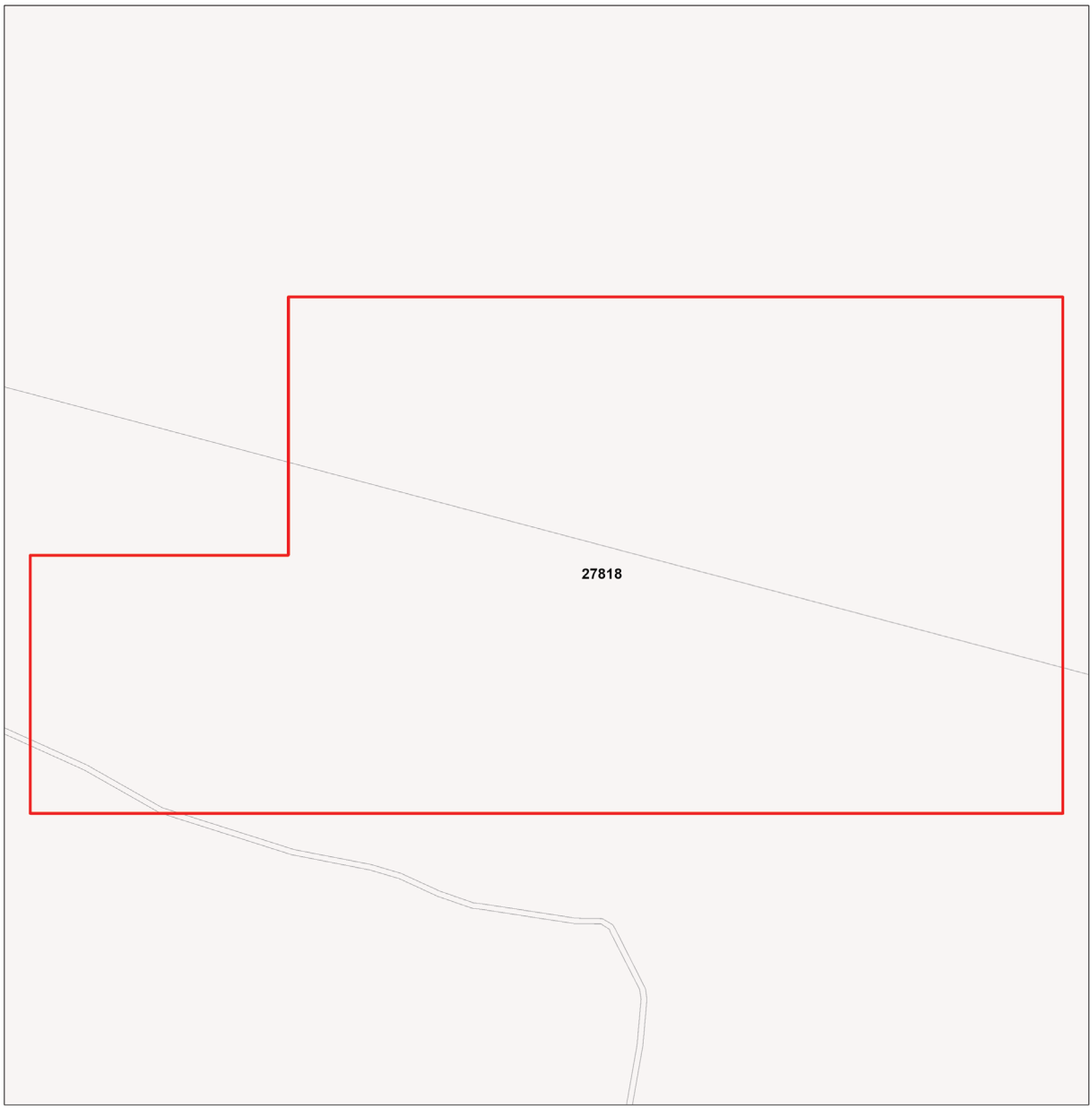
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The represented layers for SEQ 'koala habitat area-core' and 'koala habitat area- locally refined' in MSES are sourced directly from the regulatory mapping under the Nature Conservation (Koala) Conservation Plan 2017. Whilst every effort is made to ensure the information remains current, there may be delays between updating versions. Please refer to the original mapping for the most recent version. See https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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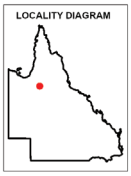
Map 3c - MSES - Species - Wildlife habitat (sea turtle nesting areas)



MSES - Wildlife habitat (sea turtle nesting areas)

Towns
Freeways/Highways
Secondary roads
Major rivers/creeks
Wildlife habitat (sea turtle nesting areas)
Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



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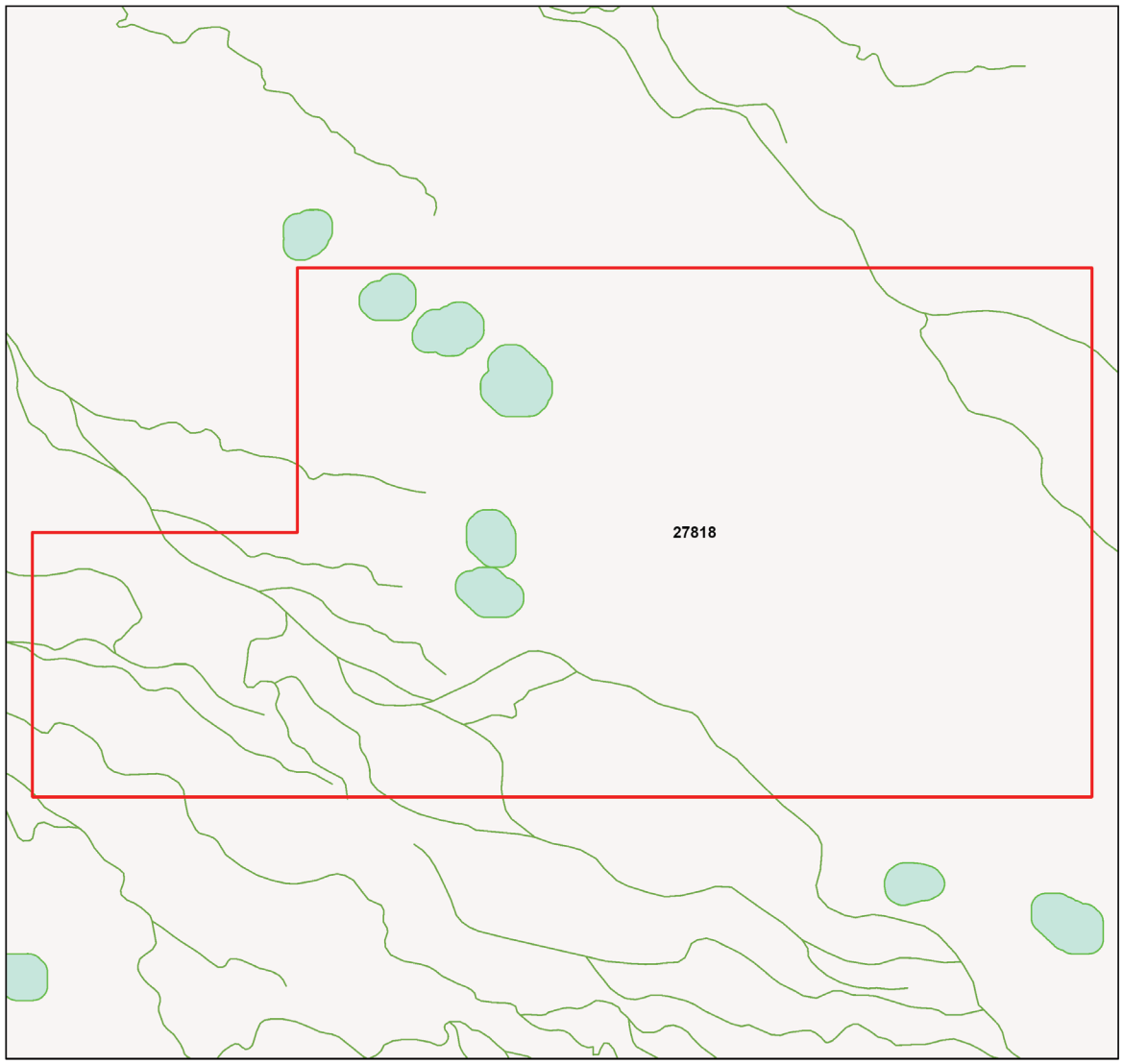
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0 400 800 1,200 1,600 2,000 m

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Map 4 - MSES - Regulated Vegetation



MSES - Regulated Vegetation

- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



N

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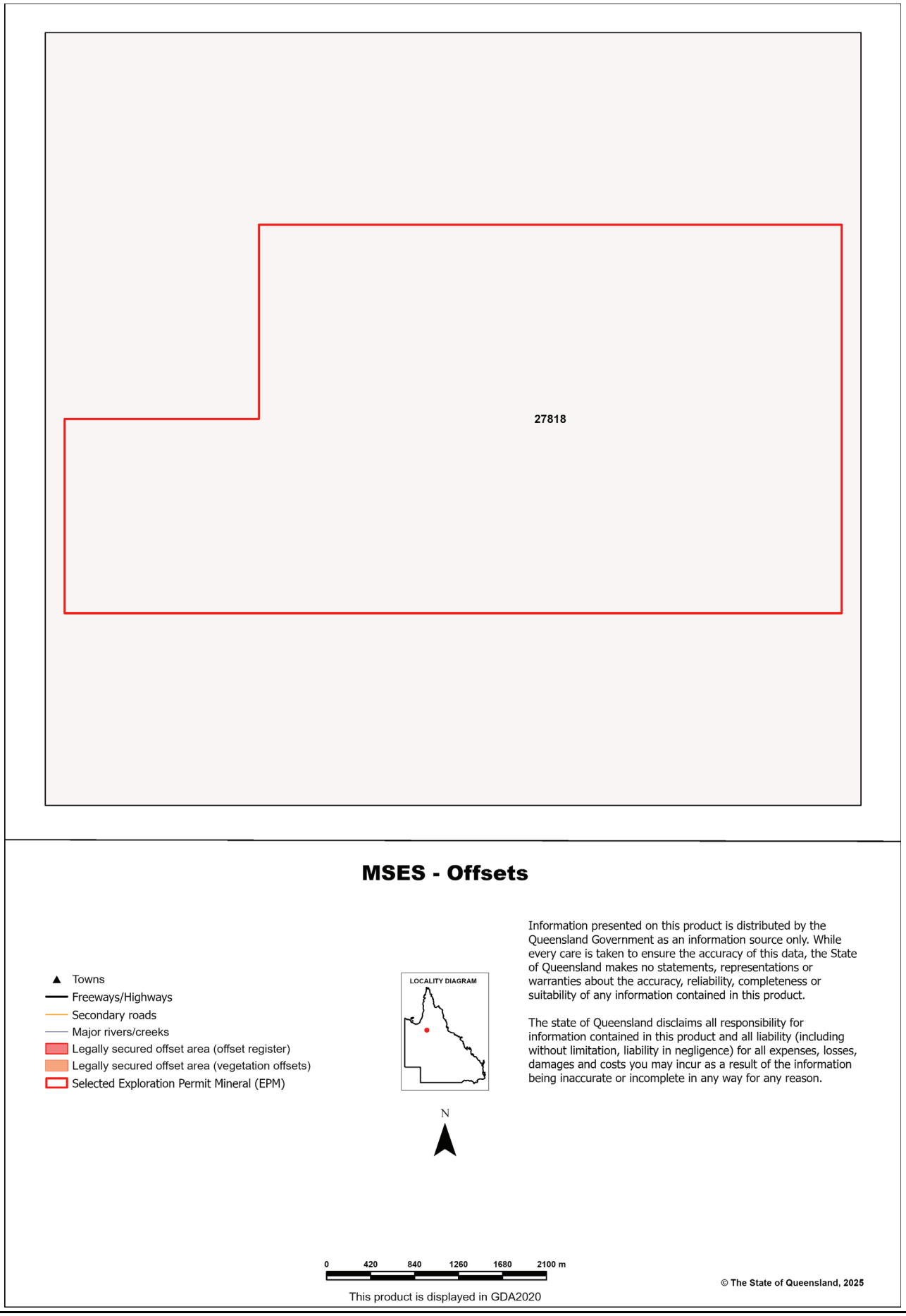
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0 420 840 1260 1680 2100 m

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Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). Its primary purpose is to support implementation of the SPP biodiversity policy.

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The Queensland Government's "Method for mapping - matters of state environmental significance can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

Appendix 2 - Source Data

The datasets listed below are available on request from:

http://qldspatial.information.qld.gov.au/catalogue/custom/index.page

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	**current QSpatial data (http://qspatial.information.qld.gov.au)**
Protected Areas-Estates, Nature Refuges, Special Wildlife Reserves	- Protected areas of Queensland - Nature Refuges - Queensland - Special Wildlife Reserves- Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Queensland Wetland Environmental Values
Wetlands in HEV waters	HEV waters: - EPP Water intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 5) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000)
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various) - SEQ koala habitat areas under the Koala Conservation Plan 2019
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map
VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DETSI
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DETSI	- Department of the Environment, Tourism, Science and Innovation
EP Act	- Environmental Protection Act 1994
EPP	- Environmental Protection Policy
GDA2020	- Geocentric Datum of Australia 2020
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- Nature Conservation Act 1992
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- Vegetation Management Act 1999

Queensland Government

Department of the Environment, Tourism, Science and Innovation

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest

EPM: 27195

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 2020). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and a field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@detsi.qld.gov.au

Disclaimer

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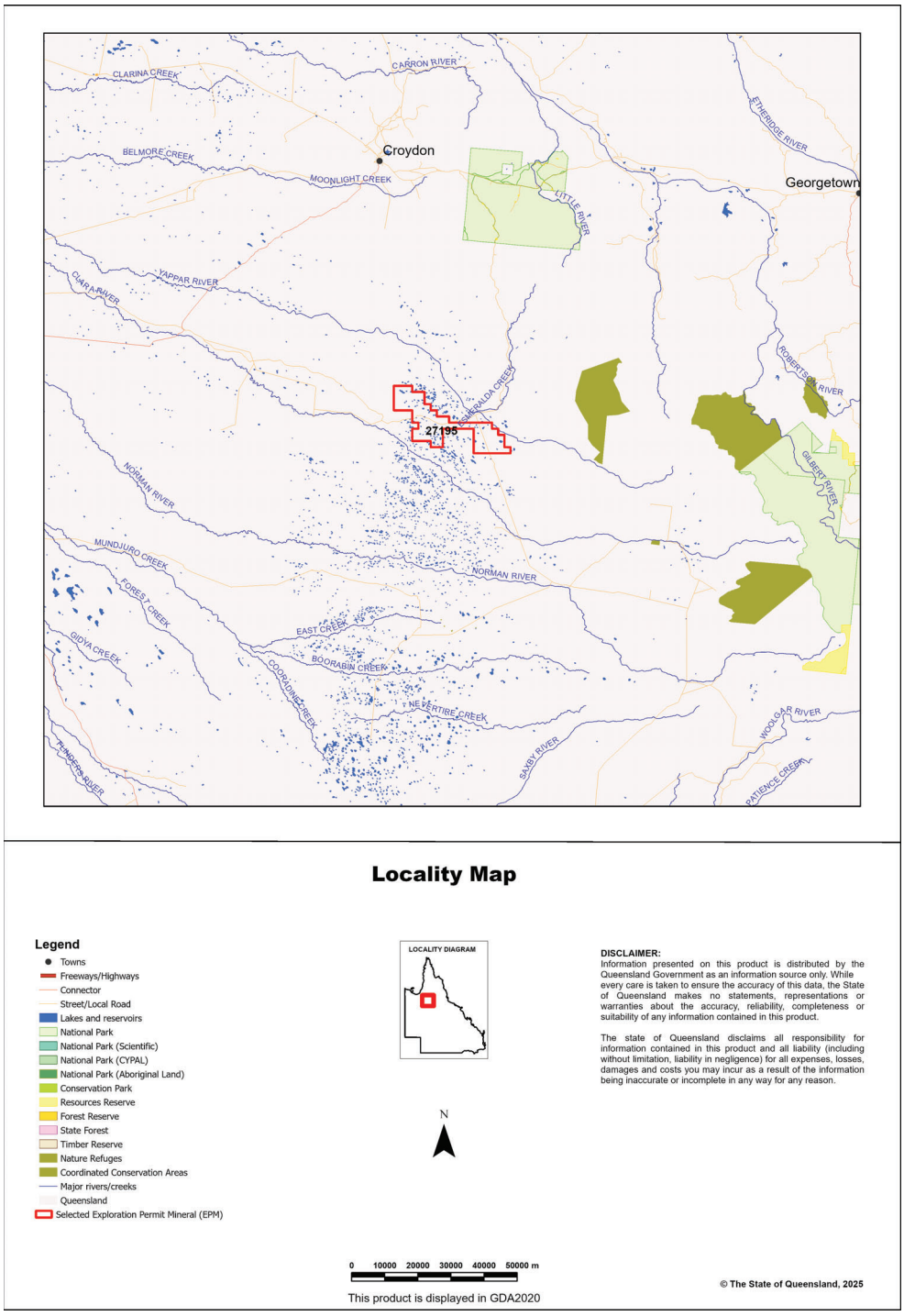
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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI: EPM: 27195, with area 23644.37 ha

Local Government(s)	Catchment(s)	Bioregion(s)	Subregion(s)
Croydon Shire	Norman	Gulf Plains	Claraville Plains



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992;*

- *Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the Marine Parks Act 2004 ;*

- *Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;*

- *Threatened wildlife under the Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

  - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
  - Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
  - Category R areas on the regulated vegetation management map;
  - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;
  - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;
- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0 ha	0.0%
1b Protected Areas- nature refuges	0 ha	0.0%
1c Protected Areas- special wildlife reserves	0 ha	0.0%
2 State Marine Parks- highly protected zones	0 ha	0.0%
3 Fish habitat areas (A and B areas)	0 ha	0.0%
4 Strategic Environmental Areas (SEA)	0 ha	0.0%
5 High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values	0 ha	0.0%
6a High Ecological Value (HEV) wetlands	0 ha	
6b High Ecological Value (HEV) waterways	0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	268.74 ha	1.1%
7b Special least concern animals	0 ha	0.0%
7c i Koala habitat area - core (SEQ)	0 ha	0.0%
7c ii Koala habitat area - locally refined (SEQ)	0 ha	0.0%
7d Sea turtle nesting areas	0 km	Not applicable
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	4.24 ha	0.0%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	0 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	0 ha	0.0%
8d Regulated Vegetation - Essential habitat	268.98 ha	1.1%
8e Regulated Vegetation - intersecting a watercourse	235.4 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	318.9 ha	1.3%
9a Legally secured offset areas- offset register areas	0 ha	0.0%
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0 ha	0.0%

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(No results)

1b. Protected Areas - nature refuges

(No results)

1c. Protected Areas - special wildlife reserves

(No results)

2. State Marine Parks - highly protected zones

(No results)

3. Fish habitat areas (A and B areas)

(No results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(No results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

(no results)

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Values are present

7b. Special least concern animals

Not applicable

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

7d. Wildlife habitat (sea turtle nesting areas)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii	Keys boronia	V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	E	None
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Euastacus bindal	Mount Elliot crayfish	CR	None
Euastacus binzayedi		CR	None
Euastacus eungella		E	None
Euastacus hystricosus		E	None
Euastacus jagara	Jagara hairy crayfish	CR	None
Euastacus maidae		CR	None
Euastacus monteithorum		E	None
Euastacus robertsi		E	None
Taudactylus pleione	Kroombit tinkerfrog	E	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Macadamia integrifolia		V	None
Melaleuca irbyana	swamp tea-tree	E	None
Macadamia ternifolia		V	None
Macadamia tetraphylla	bopple nut	V	None
Petrogale penicillata	brush-tailed rock-wallaby	V	None
Petrogale coenensis	Cape York rock-wallaby	E	None
Petrogale purpureicollis	purple-necked rock-wallaby	V	None
Petrogale sharmani	Sharmans rock-wallaby	V	None
Petrogale xanthopus celeris	yellow-footed rock-wallaby (Qld subspecies)	V	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	E	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Xeromys myoides	Water Mouse	V	None

*For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.

Threatened (endangered or vulnerable) wildlife species records

Scientific name	Common name	NCA status	EPBC status	Migratory status
Poephila cincta cincta	black-throated finch (white-rumped subspecies)	E	E	None

Special least concern animal species records

(No results)

Shorebird habitat (critically endangered/endangered/vulnerable)

Not applicable

Shorebird habitat (special least concern)

Not applicable

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** and **Map 3c - MSES - Wildlife habitat (sea turtle nesting areas)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:

https://environment.ehp.qld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Regional ecosystem	Vegetation management polygon	Vegetation management status
2.3.21j/2.3.71	O-subdom	rem_oc

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Not applicable

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Not applicable

8d. Regulated Vegetation - Essential habitat

Values are present

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number
B	7360
B	7460

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

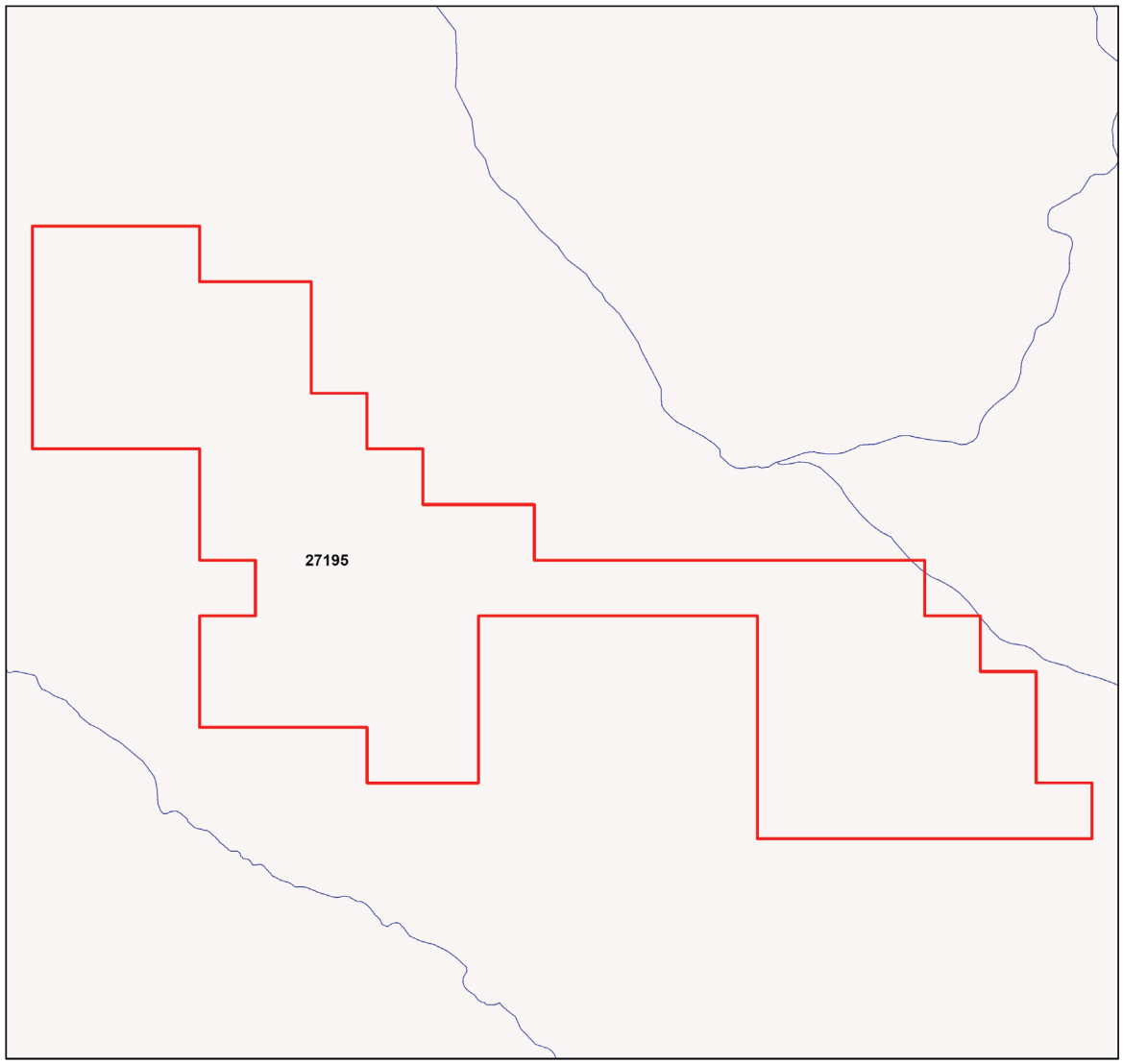
(No results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

(No results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

Map 1 - MSES - State Conservation Areas



MSES - State Conservation Areas

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates, nature refuges, special wildlife reserves)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



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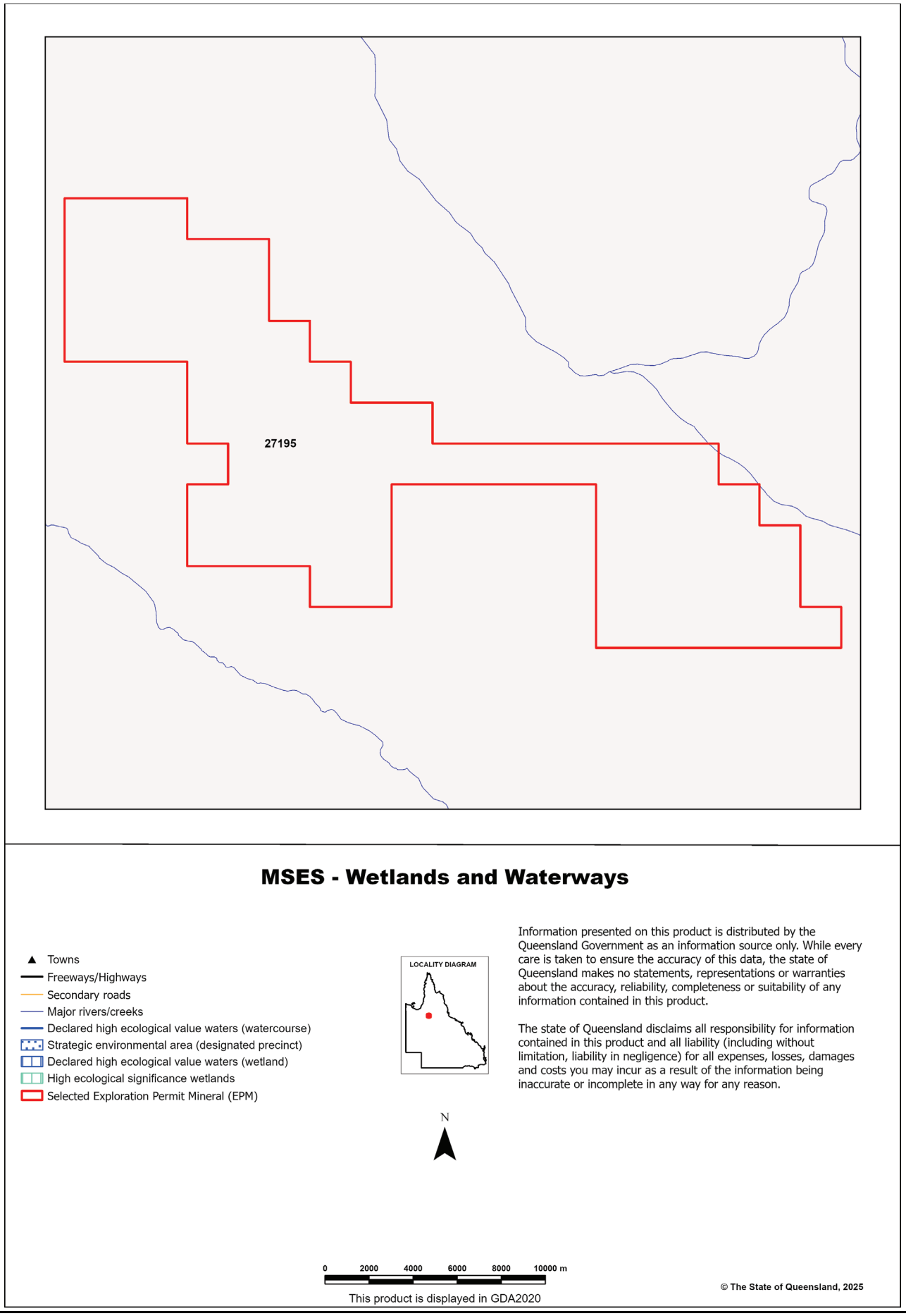
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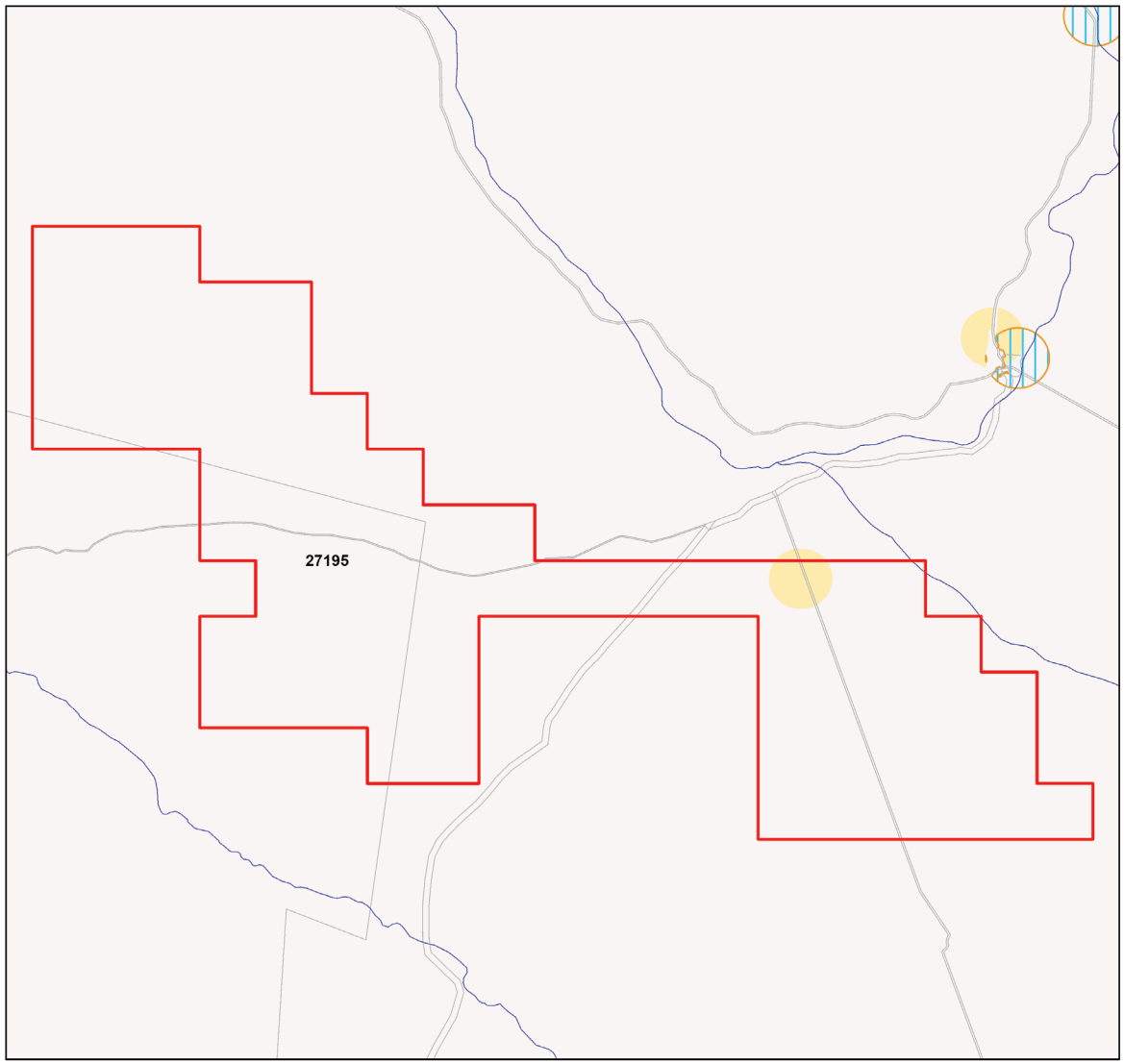
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Map 2 - MSES - Wetlands and Waterways

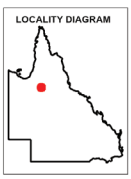


Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



MSES - Species
Threatened (endangered or vulnerable) wildlife and special least concern animals

- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (special least concern)
- Wildlife habitat (endangered or vulnerable)
- Selected Exploration Permit Mineral (EPM)



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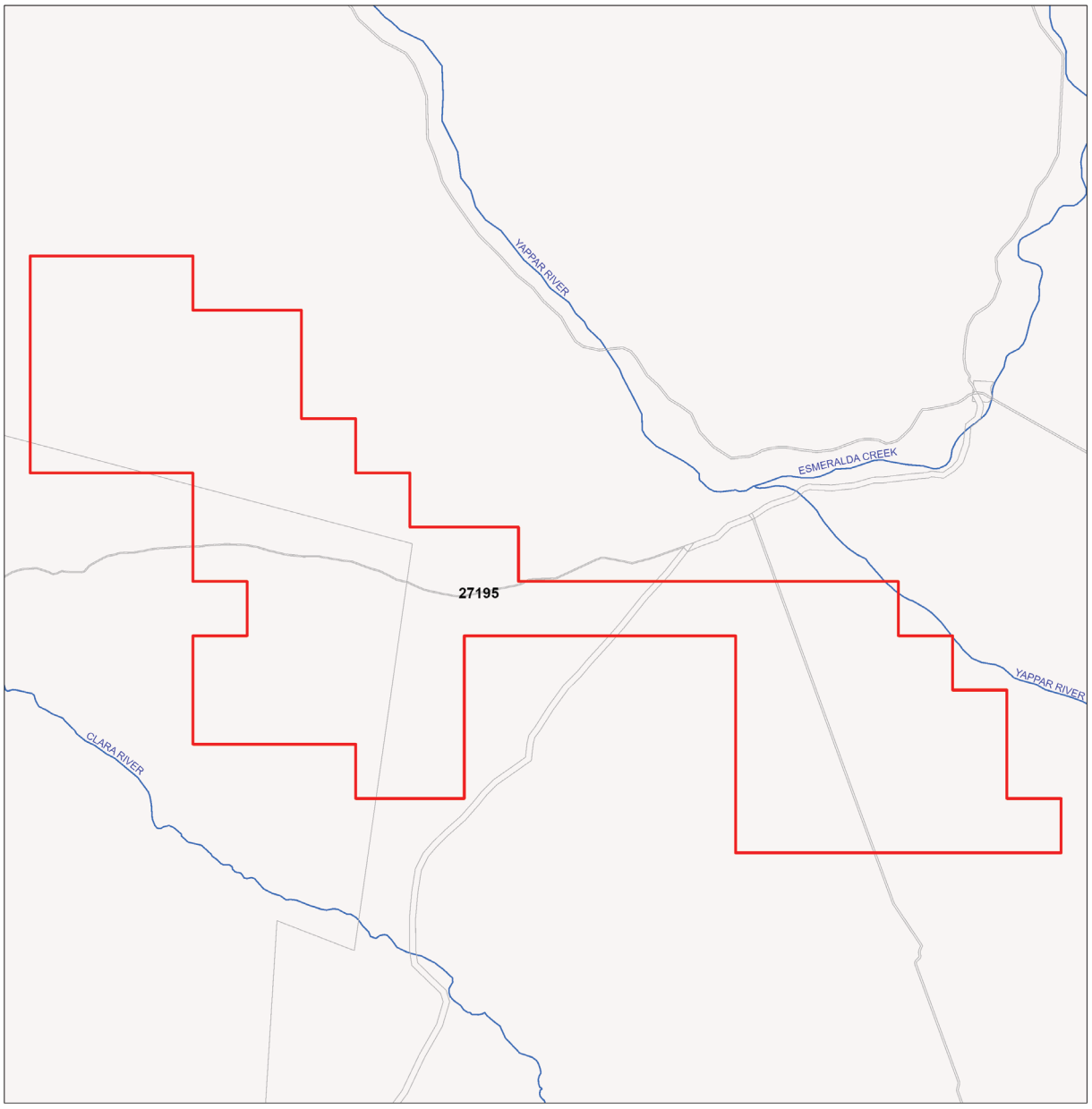
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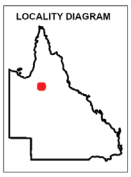
Map 3b - MSES - Species - Koala habitat area (SEQ)



MSES - Species
Koala habitat area (SEQ)

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Selected Exploration Permit Mineral (EPM)

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The represented layers for SEQ 'koala habitat area-core' and 'koala habitat area- locally refined' in MSES are sourced directly from the regulatory mapping under the Nature Conservation (Koala) Conservation Plan 2017. Whilst every effort is made to ensure the information remains current, there may be delays between updating versions. Please refer to the original mapping for the most recent version. See https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

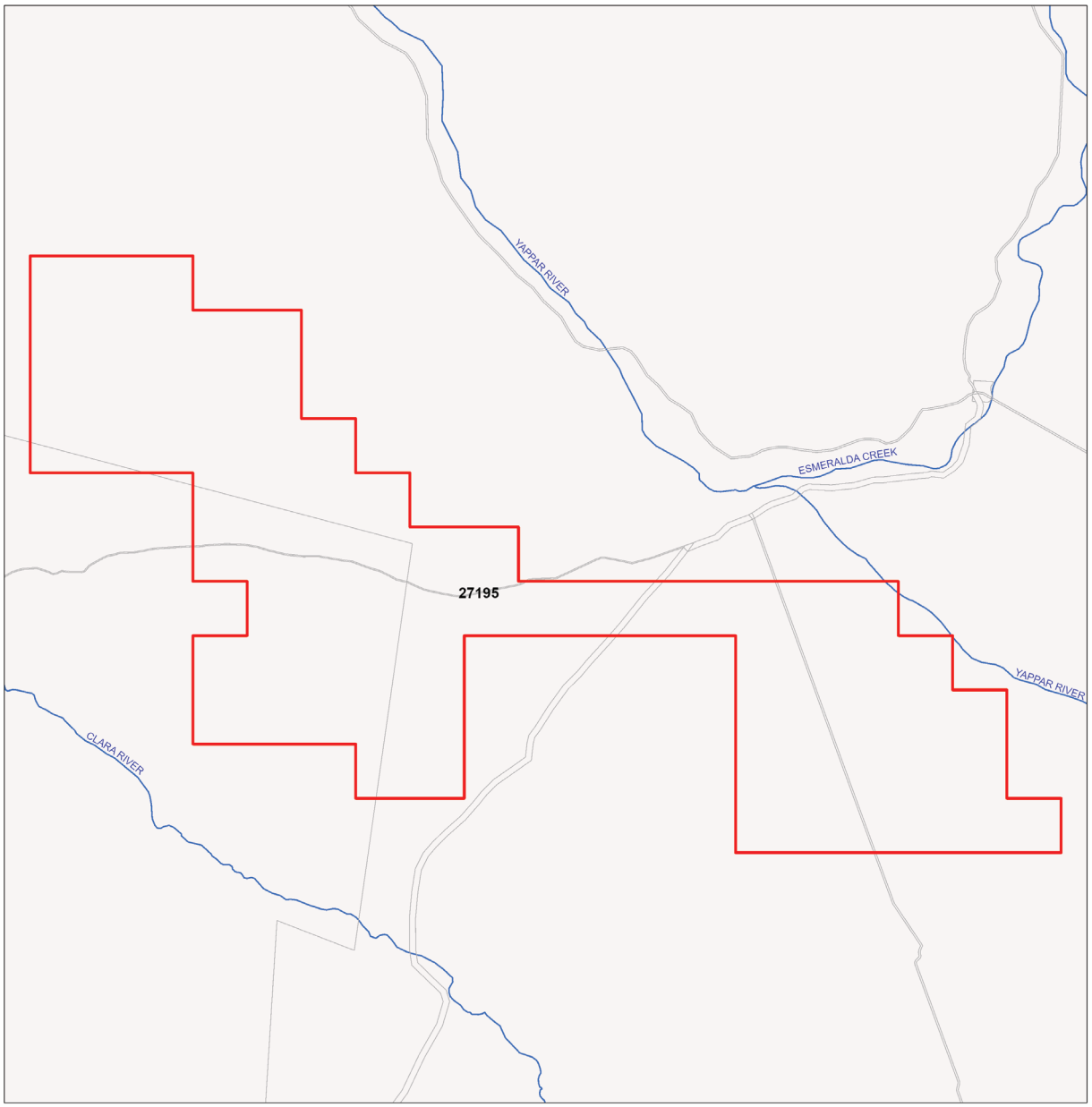
The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

0 1,000 2,000 3,000 4,000 5,000 m

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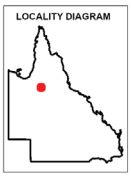
Map 3c - MSES - Species - Wildlife habitat (sea turtle nesting areas)



MSES - Wildlife habitat (sea turtle nesting areas)

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (sea turtle nesting areas)
- Selected Exploration Permit Mineral (EPM)

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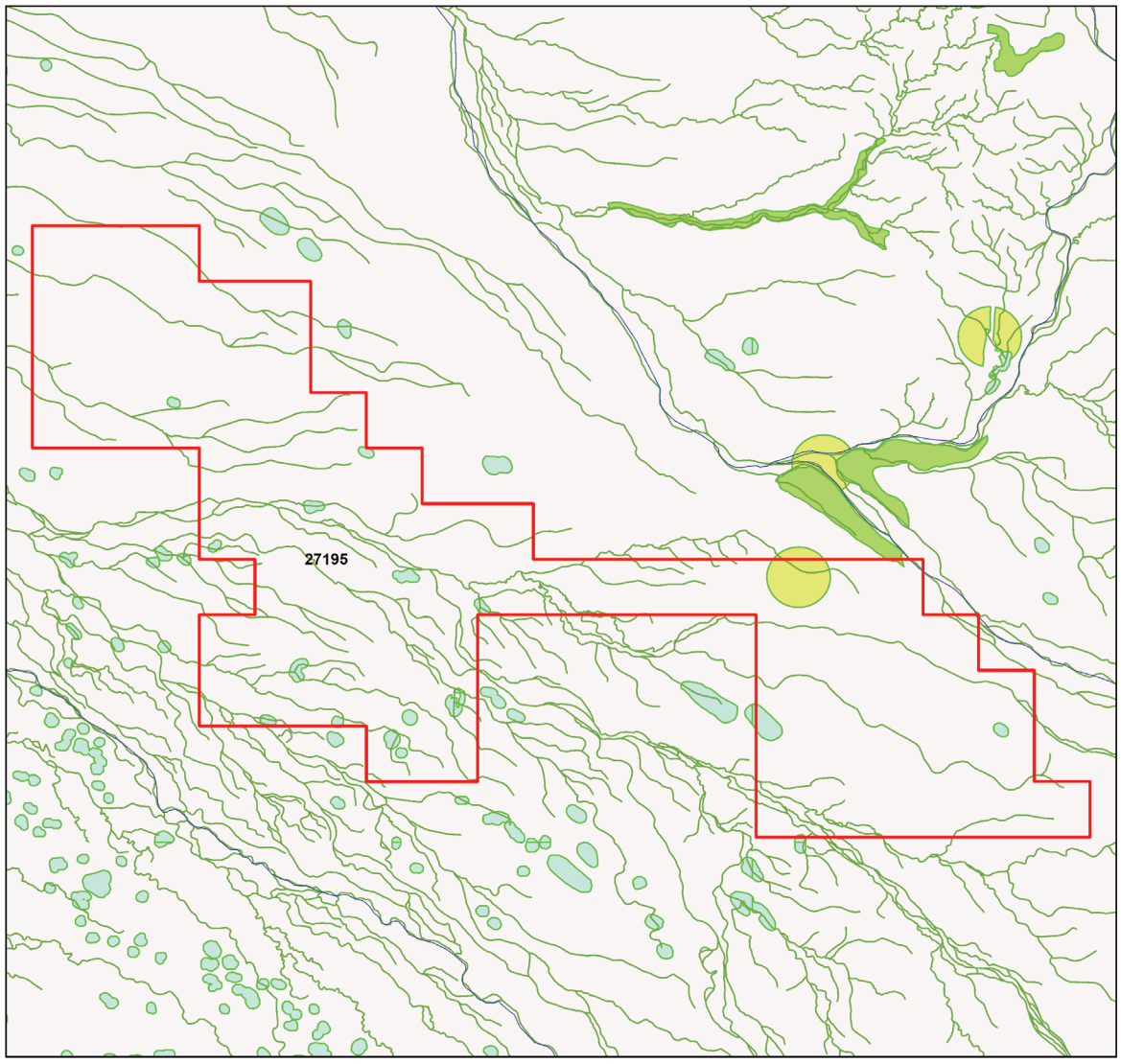
MSES mapping of sea turtle nesting areas identifies beaches where the recorded number of turtle nests are over 1% of the turtle species or genetic stock. The linework is also deliberately extended along nearby rocky coastlines and headlands to recognise that significant numbers of nesting adults and hatchlings can become disoriented by light pollution from development on rocky coastlines and headlands while navigating offshore from nesting beaches.

0 1,000 2,000 3,000 4,000 5,000 m

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Map 4 - MSES - Regulated Vegetation



MSES - Regulated Vegetation

- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)
- Selected Exploration Permit Mineral (EPM)

LOCALITY DIAGRAM



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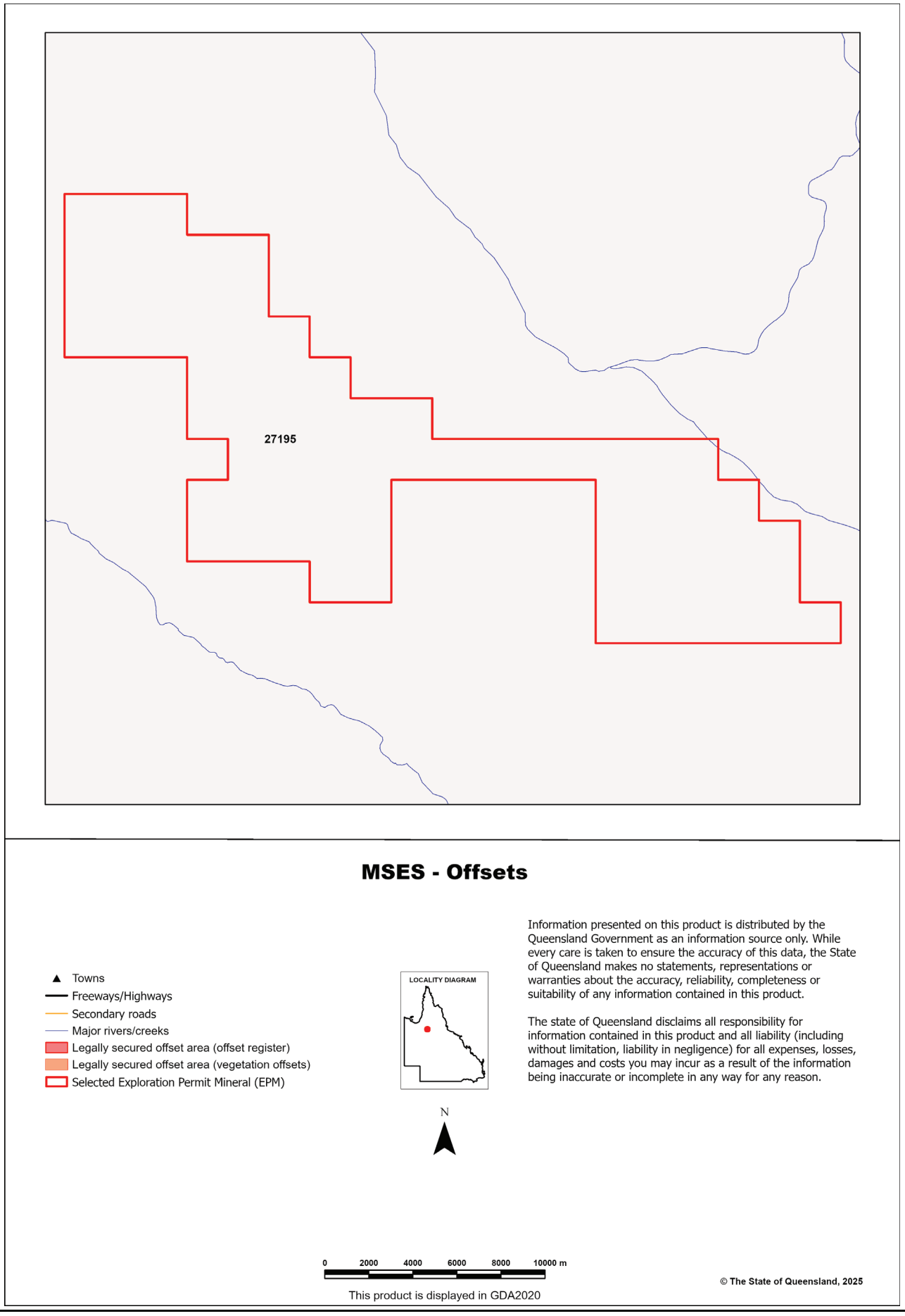
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Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

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Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	**current QSpatial data (http://qspatial.information.qld.gov.au)**
Protected Areas-Estates, Nature Refuges, Special Wildlife Reserves	- Protected areas of Queensland - Nature Refuges - Queensland - Special Wildlife Reserves- Queensland
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Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
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VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DETSI
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DETSI	- Department of the Environment, Tourism, Science and Innovation
EP Act	- Environmental Protection Act 1994
EPP	- Environmental Protection Policy
GDA2020	- Geocentric Datum of Australia 2020
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- Nature Conservation Act 1992
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- Vegetation Management Act 1999

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 03-Dec-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	13
Listed Migratory Species:	14

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Chloebia gouldiae listed as Erythrura gouldiae Gouldian Finch [90091]	Endangered	Species or species habitat known to occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area	In feature area
MAMMAL			
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Petauroides minor Greater Glider (northern), Greater Glider (north-eastern Queensland) [92008]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area	In buffer area only
REPTILE			
Varanus mertensi Mertens' Water Monitor [1568]	Endangered	Species or species habitat may occur within area	In feature area
SHARK			
Pristis pristis Largetooth Sawfish, Freshwater Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Endangered	Species or species habitat may occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Marine Species			
Pristis pristis Largetooth Sawfish, Freshwater Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Anseranas semipalmata			
Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Reptile			
Crocodylus johnstoni			
Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Esmeralda	Nature Refuge	QLD	In buffer area only
Littleton	Resources Reserve	QLD	In buffer area only
Tagalaka	National Park	QLD	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Esmeralda Graphite Project	2025/10140		Referral Decision	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix C. Aquatic species of conservation significance – desktop assessment records

Scientific name	Common name	EPBC Act status[1]	NC Act status[2]	PMST[3] report (50 km)	WildNet[4] (50 km)	ALA[5] (50 km)
Freshwater sharks						
Pristis pristis	Largetooth Sawfish	V, Mi	E	x	-	-

[1] Status may be: V – Vulnerable; Mi – Migratory. Listing status at time of referral decision (23 June 2025). This species is now listed as Endangered under the EPBC Act, however, this listing was gazetted on 20 August 2025, after the referral decision was made.
[2] Status may be: E– Endangered. Listing status at time of referral decision (23 June 2025).
[3] Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2025 - EPBC Act Protected Matters Search Tool.
[4] Atlas of Living Australia (ALA) 2025, Occurrence Records Search.
[5] Department of Environment and Science (DES) 2025, WildNet Wildlife Records.

Appendix D. Aquatic species of conservation significance – likelihood of occurrence assessment

Species	EPBC Act[1] status	NC Act[2] status	Description	Desktop likelihood of occurrence in the Project area[3]	Likelihood of occurrence and impact following field assessments[3]
Freshwater sharks					
Pristis pristis Largetooth Sawfish	V, Mi	E	**Distribution** At a global scale, there are four distinct subpopulations of this species, located in Eastern Atlantic, Western Atlantic, Eastern Pacific and Indo-West Pacific. Records outside of Australia are now rare. Northern Australia is considered the most significant stronghold for the species in the Indo-West Pacific region, with the species occurring from the Pilbara region (WA) to the Lakefield National Park in eastern Qld (DCCEEW 2026). **Habitat** Largetooth sawfish have a shift in habitat utilisation during their lifespan, from freshwater reaches of rivers and estuaries and to marine and estuarine environments. The Largetooth Sawfish is a euryhaline species, with pups born at the mouths of rivers, after which they travel up estuaries and into freshwater rivers, where they spend the first 4–5 years of their life. The species has been recorded up to 500 km inland. Some juveniles, mostly less than 150 cm TL, are isolated in waterholes for several years, between floods. As they reach maturity, Largetooth sawfish move into the marine environment where little is known about their movements and habitat use (DCCEEW 2026). **Foraging** Largetooth sawfish are predominantly benthic, feeding on fishes, crustaceans and molluscs over muddy or sandy seafloors (DCCEEW 2026). **Breeding** Little is known about the growth rates and breeding ecology of the species. It is presumed that like other large elasmobranch species that they have slow growth rates, are long lived and have low reproductive capacity (DCCEEW 2026).	**Unlikely** Potential habitat for the species has been identified occurring within 50 km of the Project area. The nearest record for the species is approximately 175 km north-west of the Project area (ALA 2025). Potential habitat for the species is unlikely to occur within the area due to the ephemeral nature of the waterways and lack of water holes within and surrounding the Project area. As such, the species is considered unlikely to occur in the Project area.	**Unlikely** Field assessments of the waterways in the Project area during the wet season did not identify the species and confirmed the absence of suitable habitat.

[1] Status may be: V – Vulnerable; Mi – Migratory. Listing status at time of referral decision (23 June 2025). This species is now listed as Endangered under the EPBC Act, however, this listing was gazetted on 20 August 2025, after the referral decision was made. [2] Status may be: E– Endangered. Listing status at time of referral decision (23 June 2025). [3] Refer to Section 4.1.2 for the methodology used when conducting the likelihood of occurrence assessment.

Appendix E. Site descriptions

Site ID	W1
Site description	Site W1 was located on an unnamed tributary of Warrigal Creek upstream of the Project area, classified as stream order 2 waterway. The watercourse determination identified this section of the waterway as a drainage feature under the Water Act. The waterway is highly ephemeral, receiving breakout flows from the Warrigal Creek after heavy rains in the wet season, with a low potential to hold water after periods of rain. During the wet season, the site has been observed with narrow standing pools (February 2025) and under low flow conditions following heavy rains (January 2026). In December 2025, the site was recorded as dry. The site was characterised as a narrow drainage feature, with a channel width of 1 to 3 m and bank height of less than 1 m. The standing pool observed in February 2025 recorded a width of 1 m and depth of 0.2 m, with the width at the water mark as wide as 8 m. Habitat features include: • shallow pools; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low cover of overhanging and trailing bank vegetation fringing the edges; and • minimal variety of in-stream structure (no submerged woody debris, some edge habitat and pools). Surrounding land use included low intensity grazing, with evidence of pig disturbance. Banks were low (>1 m) and gently sloping, with some areas of erosion from stock access (evident at the site). The bank was moderately stable and, in some sections, absent, comprising of small flat flood plain zones. Riparian vegetation was scattered but continuous, with a width of 6 m. While the riparian zone was narrow, it did not show evidence of being heavily disturbed and was in fair condition. Vegetation comprised a sparse canopy dominated by native trees (*Melaleuca citrolens* with emergent *Corymbia polycarpa*) and grassy understorey. Some emergent macrophytes (*Cyperus* sp., *Juncus* sp.) were growing on the bank. No submerged or floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'poor'. The site had an overall lack of habitat diversity, specifically the absence of a variety of regimes, a lack of variable substrate types and minimal streamside vegetation cover. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. No aquatic fauna species were opportunistically observed at the site. Cast-net trapping was not completed at the site during the February 2025 survey, due to unsuitable in-stream conditions.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W2
Site description	Site W2 was located on an unnamed drainage feature within the proposed disturbance area for the Project, classified as stream order 1 waterway. The watercourse determination identified this section of the waterway as a drainage feature under the Water Act. The site was characterised as a narrow, highly ephemeral drainage feature that occasionally contains small pools of standing water following heavy rains in the wet season. The site has been observed dry (December 2025), with standing pools following rains (February 2025, January 2026). The site has not been observed flowing and is considered to have a low potential to hold water after periods of rain. The site has a channel width of 2.5 m and bank height of less than 1 m. The standing pools observed during the wet season were shallow, with a variable width of 0.15 to 2.5 m. Habitat features include: • shallow pools; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low cover of overhanging and trailing bank vegetation fringing the edges; and • minimal variety of in-stream structure (no submerged woody debris, some edge habitat and pools). Surrounding land use included low intensity grazing, with evidence of pig disturbance. Banks were low (>1 m) and slightly concave into a flat surrounding flood plain. The bank was fairly stable across the waterway, with some areas of erosion from stock access (evident at the site). Riparian vegetation was scattered but continuous, with a width of 2 m. While the riparian zone was narrow, it did not show evidence of being heavily disturbed and was in fair condition. Vegetation comprised a sparse canopy dominated by native trees (*Eucalyptus microtheca, Acacia* spp. and *Melaleuca* spp.) and a grassy understorey. Some emergent macrophytes (*Cyperus* sp., *Juncus* sp.) were growing on the bank. No submerged or floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'fair'. The site had minimal habitat diversity, specifically the absence of a variety of regimes, a lack of variable substrate types and minimal streamside vegetation cover. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. Unidentified frog tadpoles were opportunistically observed at the site. No additional aquatic fauna species were observed. Cast-net trapping was not completed at the site during the February 2025 survey, due to unsuitable in-stream conditions.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W3
Site description	Site W3 was located on an unnamed tributary of Warrigal Creek, classified as stream order 3 waterway, which flows east-west across the north section of the Project area. The site is located within the proposed disturbance area for the Project. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway was characterised as an ephemeral creek, with a sandy bed and vegetated, low banks. The banks along this waterway were somewhat more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was 15 m and bank height was 1 to 2 m. The waterway often receives breakout flows from the Warrigal Creek after heavy rains in the wet season, with a low potential to hold water after periods of rain. During the wet season, the site has been observed with shallow standing pools (February 2025) and under low flow conditions following heavy rains (January 2026). The waterway was dry when inspected in December 2025. Habitat features include: • large, shallow pools; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, edge habitat and pools). Riparian vegetation was continuous, with a width of 5 to 50 m (right and left banks, respectively). While the riparian zone was narrow in areas, it did not show evidence of being heavily disturbed and was in good condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland. The ground cover (including in the channel) was dominated by tussock grasses in the dry season, and sedges in the wet season, with abundant leaf litter and small branches around the Melaleuca trees. Some emergent and submerged macrophytes (*Cyperus* sp., *Juncus* sp.) were growing on the bank. No floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'fair'. The site had minimal habitat diversity, specifically the minimal variety of regimes, a lack of variable substrate types and fair bank vegetative stability. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. No aquatic fauna species were opportunistically observed at the site. Cast-net trapping was not completed at the site during the February 2025 survey, due to unsuitable in-stream conditions.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W4
Site description	Site W4 was located on an unnamed tributary of Warrigal Creek downstream of the Project area, classified as stream order 4 waterway. The watercourse determination identified this section of the waterway as a drainage feature under the Water Act. The waterway was characterised as an ephemeral creek, with a sandy bed and vegetated, low banks. The banks along this waterway were somewhat more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was 8 m and bank height was 1 to 2 m. The waterway often receives breakout flows from the Warrigal Creek after heavy rains in the wet season, with a low potential to hold water after periods of rain. During the wet season, the site has been observed with shallow standing pools (February 2025) and under low flow conditions following heavy rains (January 2026). The waterway was dry when inspected in December 2025. Habitat features include: • large, shallow pools; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, edge habitat and pools). Riparian vegetation was narrow but continuous, with a width of 2 m. Riparian vegetation was continuous, with a width of 5 to 50 m (right and left banks, respectively). While the riparian zone was narrow, it did not show evidence of being heavily disturbed and was in fair condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland. The ground cover (including in the channel) was dominated by tussock grasses in the dry season, and sedges in the wet season, with abundant leaf litter and small branches around the Melaleuca trees. Some emergent macrophytes (*Cyperus* sp., *Juncus* sp.) were growing on the bank. No submerged or floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'fair'. The site had minimal habitat diversity, specifically the minimal variety of regimes, a lack of variable substrate types and fair bank vegetative stability. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. No aquatic fauna species were opportunistically observed at the site. Cast-net trapping was not completed at the site during the February 2025 survey, due to unsuitable in-stream conditions.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W5
Site description	Site W5 was located on the main channel of Warrigal Creek downstream of the Project area, classified as stream order 5 waterway. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway was characterised as an ephemeral creek, with a sandy bed and vegetated, low banks. The banks along this waterway were more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was 12 m and bank height was 1 to 2 m. The waterway often flows after heavy rains in the wet season, with a low potential to hold water after periods of rain. During the wet season, the site has been observed with shallow standing pools (February 2025) and under low flow conditions following heavy rains (January 2026). The waterway was dry when inspected in December 2025. Habitat features include: • large, relatively deep pools, with occasional ripples; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, edge habitat and pools). Riparian vegetation was continuous, with a width of 2 to 5 m. While the riparian zone was narrow in areas, it did not show evidence of being heavily disturbed and was in good condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland, with a grassy understorey. Abundant leaf litter and small branches were recorded around the Melaleuca trees. Some emergent macrophytes (*Cyperus* sp.) were growing on the bank. No submerged or floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'fair'. The site had minimal habitat diversity, specifically the minimal variety of regimes, a lack of variable substrate types and fair bank vegetative stability. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. No aquatic fauna species were opportunistically observed at the site. Cast-net trapping was not completed at the site during the February 2025 survey, due to unsuitable in-stream conditions.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W6
Site description	Site W6 was located on the main channel of Warrigal Creek upstream of the Project area, classified as stream order 5 waterway. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway was characterised as an ephemeral creek, with a sandy bed that was distinctly wider than other waterways in the Project area. Several vegetated bars were present within this tributary. The vegetated banks along this waterway were more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was approximately 50 to 100 m, and bank height was 5 m. The waterway often flows after heavy rains in the wet season, with a low potential to hold water after periods of rain. During the wet season, the site has been observed with shallow standing pools (February 2025) and under low flow conditions following heavy rains (January 2026). The waterway was dry when inspected in December 2025. Habitat features include: • large, relatively deep pools; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • moderate variety of in-stream structure (vegetated bars, submerged woody debris, edge habitat and pools). Riparian vegetation was continuous, with a width of 5 to 10 m. While the riparian zone was narrow in areas, it did not show evidence of being heavily disturbed and was in fair condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland, with a grassy understorey. Abundant leaf litter and small branches were recorded around the Melaleuca trees. Some emergent macrophytes (*Cyperus* sp.) were growing on the bank. No submerged or floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'fair'. The site had minimal habitat diversity, specifically the occasional variety of regimes, a lack of variable substrate types and fair bank vegetative stability. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. No aquatic fauna species were opportunistically observed at the site. No fish were captured during cast-net trapping completed at the site during the February 2025 survey.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W7
Site description	Site W7 was located on an unnamed tributary of Warrigal Creek upstream of the Project area, classified as stream order 2 waterway. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway is highly ephemeral, receiving breakout flows from the Warrigal Creek after heavy rains in the wet season, with a low potential to hold water after periods of rain. During the wet season, the site has been observed with narrow standing pools (February 2025) and under low flow conditions following heavy rains (January 2026). In December 2025, the site was recorded as dry. The waterway was characterised as an ephemeral creek, with a sandy bed, some minor bar formation and undefined or low, wide banks. At the site, the channel width was approximately 20 m and bank height was 1 to 2 m. Habitat features include: • shallow pools; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, minor bar formation, edge habitat and pools). Surrounding land use included low intensity grazing, with evidence of pig disturbance. Banks were low (>1 m) and gently sloping, with some areas of erosion from stock access (evident at the site). The bank was somewhat stable and, in some sections, absent, comprising of small flat flood plain zones. Riparian vegetation was continuous, with a width of 2 m. While the riparian zone was narrow, it did not show evidence of being heavily disturbed and was in fair condition. The vegetation was characterised by *Melaleuca* sp. low woodlands, with occasional *Corymbia polycarpa*. The ground cover was recorded as tussock grasses and sedges when wet, with abundant leaf litter. Some emergent macrophytes (*Cyperus* sp.) were growing on the bank. No submerged or floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'fair'. The site had minimal habitat diversity, specifically the occasional variety of regimes and a lack of variable substrate types. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. Unidentified fish species and tadpoles were opportunistically observed at the site. Cast-net trapping was not completed at the site during the February 2025 survey, due to unsuitable in-stream conditions.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



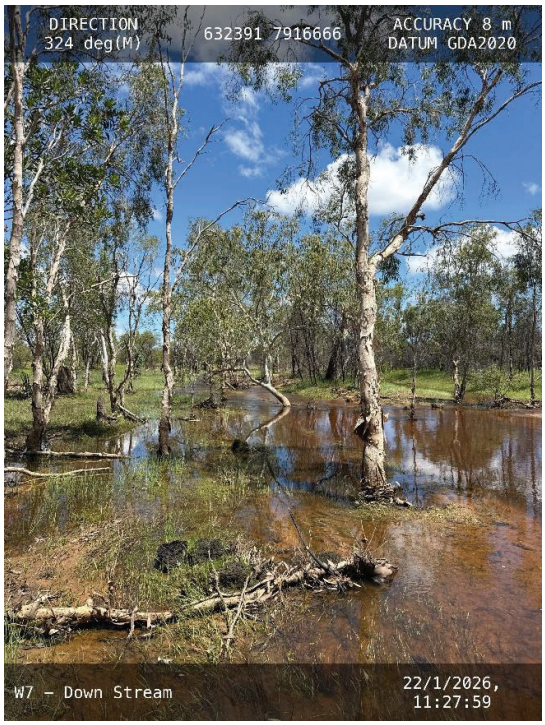
Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W8
Site description	Site W8 was located on an unnamed tributary of Warrigal Creek, classified as stream order 3 waterway, which flows east-west across the north section of the Project area. The site is located upstream of the proposed disturbance area for the Project. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway was characterised as an ephemeral creek, with a sandy bed and vegetated, low banks. The banks along this waterway were somewhat more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was approximately 18 m and bank height was 2 to 5 m. The waterway often receives breakout flows from the Warrigal Creek after heavy rains in the wet season, with a low potential to hold water after periods of rain. During the wet season, the site has been observed with shallow standing pools (February 2025) and under low flow conditions following heavy rains (January 2026). The waterway was dry when inspected in December 2025. Habitat features include: • large, shallow pools; • substrate dominated by sand; • low cover of in-stream submerged and emergent macrophytes; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, vegetated bar formation, edge habitat and pools). Riparian vegetation was continuous, with a width of 3 to 10 m (right and left banks, respectively). While the riparian zone was narrow in areas, it did not show evidence of being heavily disturbed and was in good condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland. The ground cover (including in the channel) was dominated by tussock grasses in the dry season, and sedges in the wet season, with abundant leaf litter and small branches around the Melaleuca trees. Some emergent macrophytes (*Cyperus* sp.) were growing on the bank. No submerged or floating macrophytes were recorded. The site recorded a habitat bioassessment score of 'fair'. The site had minimal habitat diversity, specifically the minimal variety of regimes, a lack of variable substrate types and fair bank vegetative stability. Any aquatic habitat potentially provided at the site would be limited to short periods after seasonal rainfall and would only support aquatic flora and fauna adapted to the harsh ephemeral conditions. The site was not considered suitable for listed aquatic species. No aquatic fauna species were opportunistically observed at the site. No fish were captured during cast-net trapping completed at the site during the February 2025 survey.
Site photographs	
Upstream – February 2025 	Downstream – February 2025 

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W9
Site description	Site W9 was located within a mapped palustrine wetland in the north-east of the Project area (outside the proposed disturbance area). The site was characterised as a large, discrete area of remnant vegetation within a seasonal depression that is not located on or adjacent to a defined waterway. Water has not been observed in this area during survey efforts, however, indicators of water presence during the wet season have been observed, including crab exoskeletons, the presence of sedge species, and water inundation markings on large trees. The conditions and length of time that the wetland retains water is not known. Features that would provide habitat in periods of inundation comprised: • small and large woody debris and tree roots; • substrate dominated by sand, with some silt and clay; • overhanging and trailing bank vegetation; and • macrophyte beds. The area is subject to moderate intensity grazing with evidence of cattle and pig disturbance, including cattle pugging and pig diggings. Wetland vegetation was scattered but continuous, characterised as a *Melaleuca viridiflora* woodland with *Corymbia polycarpa* and *Grevillea striata*, and a grassy understorey. Several sedge species have also been recorded from the site. No live aquatic fauna species were opportunistically observed at the site (crab exoskeletons were recorded from the site during the February 2025 survey). Cast-net trapping was not completed at the site during the February 2025 survey, due to unsuitable conditions.
Site photographs	
North orientation – February 2025 	East orientation – February 2025 

South orientation – February 2025



West orientation – February 2025



North orientation – December 2025



North-east orientation – December 2025



South orientation – December 2025	North-west orientation – December 2025
	

Site ID	W10
Site description	Site W10 was located on an unnamed tributary of Warrigal Creek, classified as stream order 3 waterway, which flows east-west across the north section of the Project area. The site is located upstream of the proposed disturbance area for the Project. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway was characterised as an ephemeral creek, with a sandy bed and vegetated, low banks. The banks along this waterway were somewhat more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was approximately 10 m and bank height was 1.5 m. The waterway often receives breakout flows from the Warrigal Creek after heavy rains in the wet season, with some potential to hold water after periods of rain. During the wet season, the site has been under low flow conditions following heavy rains (January 2026). The site has been observed with shallow standing pools during the December 2025 survey. Habitat features include: • large, shallow pools; • substrate dominated by sand; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, vegetated bar formation, edge habitat and pools). Riparian vegetation was scattered but continuous. It did not show evidence of being heavily disturbed and was in fair condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland. The ground cover (including in the channel) with a grassy understorey. No aquatic fauna species were opportunistically observed at the site.

Site photographs

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026



Right bank – January 2026



Site ID	W11
Site description	Site W11 was located on an unnamed tributary of Warrigal Creek, classified as stream order 3 waterway, which flows east-west across the north section of the Project area. The site is located upstream of the proposed disturbance area for the Project. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway was characterised as an ephemeral creek, with a sandy bed and vegetated, low banks. The banks along this waterway were somewhat more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was approximately 18 m and bank height was 1.5 m. The waterway often receives breakout flows from the Warrigal Creek after heavy rains in the wet season, with some potential to hold water after periods of rain. During the wet season, the site has been under low flow conditions following heavy rains (January 2026). The site has been observed with shallow standing pools during the December 2025 survey. Habitat features include: • small, shallow pools; • substrate dominated by sand; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, edge habitat and pools). Riparian vegetation was scattered but continuous. It did not show evidence of being heavily disturbed and was in fair condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland. The ground cover (including in the channel) with a grassy understorey. No aquatic fauna species were opportunistically observed at the site.

Site photographs

Upstream – December 2025



Downstream – December 2025



Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026



Downstream – January 2026



Left bank – January 2026	Right bank – January 2026
	

Site ID	W12
Site description	Site W12 was located on an unnamed tributary of Warrigal Creek, classified as stream order 3 waterway, which flows east-west across the north section of the Project area. The site is located upstream of the proposed disturbance area for the Project. The watercourse determination identified this section of the waterway as a watercourse under the Water Act. The waterway was characterised as an ephemeral creek, with a wide sandy bed and vegetated, low banks. The banks along this waterway were somewhat more defined than at stream order 1 and 2 waterways in the Project area, however, they remained low and gentle. At the site, the channel width was approximately 60 m and bank height was 2 m. The waterway often receives breakout flows from the Warrigal Creek after heavy rains in the wet season, with some potential to hold water after periods of rain. During the wet season, the site has been under low flow conditions following heavy rains (January 2026). The waterway was dry when inspected in December 2025, with some damp patches of the creek bed. Habitat features include: • small, shallow pools (likely); • substrate dominated by sand; • low-moderate cover of overhanging and trailing bank vegetation fringing the edges; and • some variety of in-stream structure (occasional submerged woody debris, edge habitat and pools). Riparian vegetation was scattered but continuous. It did not show evidence of being heavily disturbed and was in fair condition. The area is subject to low intensity grazing with evidence of pig disturbance. The vegetation is characterised by *Eucalyptus camaldulensis* and *Melaleuca fluviatilis* woodland. The ground cover (including in the channel) with a grassy understorey. No aquatic fauna species were opportunistically observed at the site.

Site photographs

Upstream – December 2025



Downstream – December 2025

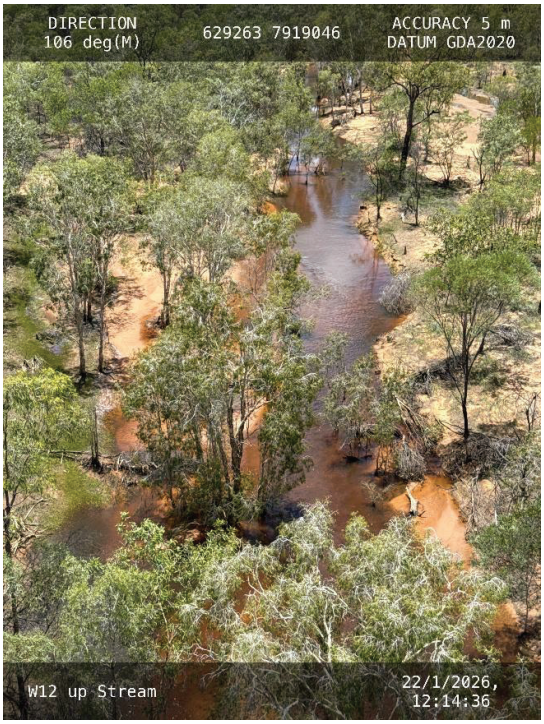


Left bank (facing downstream) – December 2025



Right bank (facing downstream) – December 2025



Upstream – January 2026	Downstream – January 2026
	

Appendix F. Surface water laboratory certificate – February 2025

CERTIFICATE OF ANALYSIS

Work Order	: **ET2500864**	Page	: 1 of 18
Client	: **AARC ENVIRONMENTAL SOLUTIONS PTY LTD**	Laboratory	: Environmental Division Townsville
Contact	: Ron Gardiner	Contact	: Customer Services EB
Address	: BRISBANE	Address	: 13 Carlton Street, Kirwan Townsville QLD Australia 4815
Telephone	: ----	Telephone	: +61 7 3243 7222
Project	: Richmond Water & Sed Samples (Graphinex)	Date Samples Received	: 17-Feb-2025 09:35
Order number	: J887	Date Analysis Commenced	: 17-Feb-2025
C-O-C number	: ----	Issue Date	: 24-Feb-2025 16:21
Sampler	: JASON RAGUSE, Ron Gardiner		
Site	: ----		
Quote number	: EB25AUSRESCON0001		
No. of samples received	: 11		
No. of samples analysed	: 11		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe		Townsville Inorganics, Townsville, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Narelle Drummond	Laboratory Manager	Townsville Inorganics, Townsville, QLD
Tatijana Markoska	Senior Chemist - Organics	Brisbane Organics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- It is recognised that EG020T (Total Metals by ICP-MS) is less than EG020F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	W1	W2	W3	W4	W5
			Sampling date / time	14-Feb-2025 08:00	14-Feb-2025 11:41	14-Feb-2025 13:40	14-Feb-2025 13:40	15-Feb-2025 08:10
Compound	CAS Number	LOR	Unit	ET2500864-001	ET2500864-002	ET2500864-003	ET2500864-004	ET2500864-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.31**	**6.59**	**6.39**	**6.55**	**6.56**
EA006: Sodium Adsorption Ratio (SAR)								
^ Sodium Adsorption Ratio	----	0.01	-	**3.35**	**3.59**	**3.35**	**1.08**	**1.32**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**93**	**191**	**85**	**78**	**84**
EA016: Calculated TDS (from Electrical Conductivity)								
Total Dissolved Solids (Calc.)	----	1	mg/L	**60**	**124**	**55**	**51**	**55**
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	<1	**13**	<1	**13**	**13**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**13**	**24**	**12**	**18**	**23**
Total Alkalinity as CaCO3	----	1	mg/L	**13**	**24**	**12**	**18**	**23**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	<1	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**18**	**32**	**16**	**10**	**12**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	**2**	<1	**2**	**2**
Magnesium	7439-95-4	1	mg/L	<1	**2**	<1	**2**	**2**
Sodium	7440-23-5	1	mg/L	**14**	**30**	**14**	**9**	**11**
Potassium	7440-09-7	1	mg/L	**1**	**3**	**2**	**3**	**3**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.34**	**0.63**	**0.25**	**0.09**	**0.06**
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L	**0.026**	**0.024**	**0.014**	**0.038**	**0.033**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	14-Feb-2025 08:00	14-Feb-2025 11:41	14-Feb-2025 13:40	14-Feb-2025 13:40	15-Feb-2025 08:10
Compound	CAS Number	LOR	Unit		ET2500864-001	ET2500864-002	ET2500864-003	ET2500864-004	ET2500864-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	**0.002**	<0.001	**0.001**	**0.001**
Manganese	7439-96-5	0.001	mg/L		**0.004**	**0.045**	**0.009**	**0.059**	**0.017**
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.002**	<0.001	**0.001**	**0.002**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L		**0.13**	**0.86**	**0.22**	**0.28**	**0.33**
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**4.66**	**3.33**	**1.87**	**1.13**	**1.04**
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.001**	<0.001	**0.001**	**0.001**
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L		**0.063**	**0.043**	**0.026**	**0.052**	**0.044**
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		**0.001**	**0.002**	<0.001	**0.002**	<0.001
Chromium	7440-47-3	0.001	mg/L		**0.002**	**0.003**	**0.002**	**0.002**	**0.002**
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.003**	**0.002**	**0.002**	**0.002**
Manganese	7439-96-5	0.001	mg/L		**0.017**	**0.063**	**0.020**	**0.074**	**0.028**
Nickel	7440-02-0	0.001	mg/L		**0.001**	**0.002**	**0.001**	**0.002**	**0.002**
Lead	7439-92-1	0.001	mg/L		**0.002**	**0.002**	**0.001**	**0.001**	**0.001**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	14-Feb-2025 08:00	14-Feb-2025 11:41	14-Feb-2025 13:40	14-Feb-2025 13:40	15-Feb-2025 08:10
Compound	CAS Number	LOR	Unit		ET2500864-001	ET2500864-002	ET2500864-003	ET2500864-004	ET2500864-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L		**3.34**	**2.96**	**2.00**	**1.89**	**2.13**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		**0.01**	**0.02**	<0.01	<0.01	<0.01
EG094T: Total metals in Fresh water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		**0.04**	**0.04**	**0.03**	**0.02**	**0.02**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.1**	<0.1	<0.1	<0.1
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	**0.23**	**0.34**	**0.25**	<0.01
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	<0.01	<0.01	**0.02**	**0.09**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	<0.01	**0.02**	**0.09**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.4**	**1.3**	**0.8**	**0.8**	**0.8**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.4**	**1.3**	**0.8**	**0.8**	**0.9**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	14-Feb-2025 08:00	14-Feb-2025 11:41	14-Feb-2025 13:40	14-Feb-2025 13:40	15-Feb-2025 08:10
Compound	CAS Number	LOR	Unit		ET2500864-001	ET2500864-002	ET2500864-003	ET2500864-004	ET2500864-005
					Result	Result	Result	Result	Result
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	**0.10**	**0.07**	**0.05**	**0.04**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**0.77**	**1.38**	**0.69**	**0.64**	**0.80**
ø Total Cations	----	0.01	meq/L		**0.63**	**1.65**	**0.66**	**0.73**	**0.82**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	14-Feb-2025 08:00	14-Feb-2025 11:41	14-Feb-2025 13:40	14-Feb-2025 13:40	15-Feb-2025 08:10
Compound	CAS Number	LOR	Unit		ET2500864-001	ET2500864-002	ET2500864-003	ET2500864-004	ET2500864-005
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**107**	**109**	**110**	**114**	**115**
Toluene-D8	2037-26-5	2	%		**92.7**	**96.2**	**95.3**	**95.2**	**95.6**
4-Bromofluorobenzene	460-00-4	2	%		**104**	**110**	**106**	**108**	**111**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	W6	W7	W8	W9	Duplicate
			Sampling date / time	15-Feb-2025 09:50	15-Feb-2025 12:10	15-Feb-2025 14:15	15-Feb-2025 16:15	14-Feb-2025 00:00
Compound	CAS Number	LOR	Unit	ET2500864-006	ET2500864-007	ET2500864-008	ET2500864-009	ET2500864-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.56	6.46	6.62	6.22	6.28
EA006: Sodium Adsorption Ratio (SAR)								
^ Sodium Adsorption Ratio	----	0.01	-	1.32	2.15	2.02	0.07	3.59
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	84	116	98	37	94
EA016: Calculated TDS (from Electrical Conductivity)								
Total Dissolved Solids (Calc.)	----	1	mg/L	55	75	64	24	61
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	13	13	9	9	<1
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	24	22	16	12	15
Total Alkalinity as CaCO3	----	1	mg/L	24	22	16	12	15
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	<1	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12	22	18	2	18
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	2	2	2	<1
Magnesium	7439-95-4	1	mg/L	2	2	1	1	<1
Sodium	7440-23-5	1	mg/L	11	18	14	<1	15
Potassium	7440-09-7	1	mg/L	3	2	2	6	2
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.07	0.36	0.29	0.07	<0.01
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L	0.032	0.031	0.018	0.008	0.024

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W9	Duplicate
				Sampling date / time	15-Feb-2025 09:50	15-Feb-2025 12:10	15-Feb-2025 14:15	15-Feb-2025 16:15	14-Feb-2025 00:00
Compound	CAS Number	LOR	Unit		ET2500864-006	ET2500864-007	ET2500864-008	ET2500864-009	ET2500864-010
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.001**	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.001**	**0.001**	<0.001	**0.002**	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.009**	**0.076**	**0.009**	**0.022**	**0.004**
Nickel	7440-02-0	0.001	mg/L		**0.001**	**0.003**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.015**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L		**0.42**	**0.27**	**0.23**	**0.74**	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.93**	**1.52**	**2.58**	**0.10**	**4.57**
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L		**0.044**	**0.049**	**0.027**	**0.008**	**0.066**
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.002**	<0.001	<0.001	**0.001**
Chromium	7440-47-3	0.001	mg/L		**0.002**	**0.002**	**0.002**	<0.001	**0.002**
Copper	7440-50-8	0.001	mg/L		**0.004**	**0.002**	**0.002**	**0.001**	**0.002**
Manganese	7439-96-5	0.001	mg/L		**0.022**	**0.131**	**0.025**	**0.025**	**0.018**
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.002**	**0.001**	<0.001	**0.002**
Lead	7439-92-1	0.001	mg/L		**0.001**	**0.001**	<0.001	<0.001	**0.002**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W9	Duplicate
				Sampling date / time	15-Feb-2025 09:50	15-Feb-2025 12:10	15-Feb-2025 14:15	15-Feb-2025 16:15	14-Feb-2025 00:00
Compound	CAS Number	LOR	Unit		ET2500864-006	ET2500864-007	ET2500864-008	ET2500864-009	ET2500864-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L		**2.08**	**2.44**	**1.69**	**0.94**	**3.20**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		<0.01	**0.01**	<0.01	<0.01	<0.01
EG094T: Total metals in Fresh water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		**0.02**	**0.02**	**0.02**	**0.01**	**0.02**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.42**	**0.13**	<0.01	**0.02**	<0.01
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.04**	<0.01	<0.01	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.04**	<0.01	<0.01	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.4**	**0.9**	**0.4**	**2.3**	**0.8**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.4**	**0.9**	**0.4**	**2.3**	**0.8**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W9	Duplicate
				Sampling date / time	15-Feb-2025 09:50	15-Feb-2025 12:10	15-Feb-2025 14:15	15-Feb-2025 16:15	14-Feb-2025 00:00
Compound	CAS Number	LOR	Unit		ET2500864-006	ET2500864-007	ET2500864-008	ET2500864-009	ET2500864-010
					Result	Result	Result	Result	Result
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.06**	**0.03**	**0.17**	**0.08**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	**0.02**	<0.01
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**0.82**	**1.06**	**0.83**	**0.30**	**0.81**
ø Total Cations	----	0.01	meq/L		**0.82**	**1.10**	**0.84**	**0.34**	**0.70**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	**120**	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	**120**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	**150**	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	**150**	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W9	Duplicate
				Sampling date / time	15-Feb-2025 09:50	15-Feb-2025 12:10	15-Feb-2025 14:15	15-Feb-2025 16:15	14-Feb-2025 00:00
Compound	CAS Number	LOR	Unit		ET2500864-006	ET2500864-007	ET2500864-008	ET2500864-009	ET2500864-010
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**111**	**110**	**113**	**115**	**109**
Toluene-D8	2037-26-5	2	%		**95.7**	**93.5**	**93.7**	**94.3**	**96.0**
4-Bromofluorobenzene	460-00-4	2	%		**108**	**106**	**106**	**107**	**107**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BLANK	----	----	----	----
			Sampling date / time	16-Feb-2025 08:10	----	----	----	----
Compound	CAS Number	LOR	Unit	ET2500864-011	---------	---------	---------	---------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.35**	----	----	----	----
EA006: Sodium Adsorption Ratio (SAR)								
^ Sodium Adsorption Ratio	----	0.01	-	**0.12**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	<1	----	----	----	----
EA016: Calculated TDS (from Electrical Conductivity)								
Total Dissolved Solids (Calc.)	----	1	mg/L	<1	----	----	----	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	<1	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**2**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**2**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BLANK	----	----	----	----
			Sampling date / time	16-Feb-2025 08:10	----	----	----	----
Compound	CAS Number	LOR	Unit	ET2500864-011	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BLANK	----	----	----	----
				Sampling date / time	16-Feb-2025 08:10	----	----	----	----
Compound	CAS Number	LOR	Unit		ET2500864-011	---------	---------	---------	---------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	----	----	----	----
Uranium	7440-61-1	0.001	mg/L		<0.001	----	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		<0.01	----	----	----	----
EG094T: Total metals in Fresh water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		<0.01	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BLANK	----	----	----	----
				Sampling date / time	16-Feb-2025 08:10	----	----	----	----
Compound	CAS Number	LOR	Unit		ET2500864-011	---------	---------	---------	---------
					Result	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**0.04**	----	----	----	----
ø Total Cations	----	0.01	meq/L		<0.01	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BLANK	----	----	----	----
				Sampling date / time	16-Feb-2025 08:10	----	----	----	----
Compound	CAS Number	LOR	Unit		ET2500864-011	---------	---------	---------	---------
					Result	----	----	----	----
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**110**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**94.6**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**106**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry / Biology).

(WATER) EG035F: Dissolved Mercury by FIMS
(WATER) EG020F: Dissolved Metals by ICP-MS
(WATER) EP080/071: Total Petroleum Hydrocarbons
(WATER) EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions
(WATER) EP080S: TPH(V)/BTEX Surrogates
(WATER) EG035T: Total Recoverable Mercury by FIMS
(WATER) EG020T: Total Metals by ICP-MS
(WATER) EK067G: Total Phosphorus as P by Discrete Analyser
(WATER) EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser
(WATER) EN055: Ionic Balance
(WATER) EK061G: Total Kjeldahl Nitrogen By Discrete Analyser
(WATER) ED093F: Dissolved Major Cations
(WATER) EA065: Total Hardness as CaCO3
(WATER) EA006: Sodium Adsorption Ratio (SAR)
(WATER) EG094T: Total metals in Fresh water by ORC-ICPMS
(WATER) EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS
(WATER) EP080: BTEXN

Appendix G. Surface water laboratory certificate – January 2026

CERTIFICATE OF ANALYSIS

Work Order	: **ET2600499**	Page	: 1 of 13
Client	: **QLD AUS Graphite Pty Ltd**	Laboratory	: Environmental Division Townsville
Contact	: DAMIAN HILLS	Contact	: Customer Services ET
Address	: Level 4, 10 Eagle Street Brisbane 4000	Address	: 13 Carlton Street, Kirwan Townsville QLD Australia 4815
Telephone	: ----	Telephone	: +61 7 4773 0000
Project	: Esmeralda Project	Date Samples Received	: 23-Jan-2026 14:50
Order number	: ----	Date Analysis Commenced	: 28-Jan-2026
C-O-C number	: ----	Issue Date	: 03-Feb-2026 16:20
Sampler	: DAMIAN HILLS		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 10		
No. of samples analysed	: 10		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Beatriz Llarinas	Senior Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe		Townsville Inorganics, Townsville, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Narelle Drummond	Laboratory Manager	Townsville Inorganics, Townsville, QLD
Tatijana Markoska	Senior Chemist - Organics	Brisbane Organics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- It is recognised that EG094-AgT (Low-level Total Silver in Fresh Water) is less than EG094-AgF (Low-level Dissolved Silver in Fresh Water) for some samples. However, the difference is within experimental variation of the methods.
- It is recognised that EG020T (Total Metals by ICP-MS) is less than EG020F (Dissolved Metals by ICP-MS) for 'W20' (ET2600499-010). However, the difference is within experimental variation of the methods.
- It is recognised that EG094-AgT (Low-level Total Silver in Fresh Water) is less than EG094-AgF (Low-level Dissolved Silver in Fresh Water) for some samples. This was confirmed by re-digestion and re-analysis.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	W1	W2	W3	W4	W5
			Sampling date / time	22-Jan-2026 11:45	22-Jan-2026 10:45	22-Jan-2026 10:20	22-Jan-2026 09:30	22-Jan-2026 09:00
Compound	CAS Number	LOR	Unit	ET2600499-001	ET2600499-002	ET2600499-003	ET2600499-004	ET2600499-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.93**	**7.09**	**6.85**	**6.72**	**6.90**
EA006: Sodium Adsorption Ratio (SAR)								
^ Sodium Adsorption Ratio	----	0.01	-	**0.33**	**1.43**	**0.41**	**0.55**	**1.59**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**45**	**101**	**54**	**53**	**71**
EA016: Calculated TDS (from Electrical Conductivity)								
Total Dissolved Solids (Calc.)	----	1	mg/L	**29**	**66**	**35**	**34**	**46**
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	**16**	**18**	**18**	**16**	**9**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**21**	**33**	**19**	**20**	**21**
Total Alkalinity as CaCO3	----	1	mg/L	**21**	**33**	**19**	**20**	**21**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	<1	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**4**	**23**	**5**	**5**	**23**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**3**	**4**	**4**	**3**	**2**
Magnesium	7439-95-4	1	mg/L	**2**	**2**	**2**	**2**	**1**
Sodium	7440-23-5	1	mg/L	**3**	**14**	**4**	**5**	**11**
Potassium	7440-09-7	1	mg/L	**3**	**3**	**3**	**3**	**3**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.23**	**0.15**	**0.22**	**0.27**	**0.11**
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L	**0.014**	**0.018**	**0.025**	**0.026**	**0.032**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	W1	W2	W3	W4	W5
			Sampling date / time	22-Jan-2026 11:45	22-Jan-2026 10:45	22-Jan-2026 10:20	22-Jan-2026 09:30	22-Jan-2026 09:00
Compound	CAS Number	LOR	Unit	ET2600499-001	ET2600499-002	ET2600499-003	ET2600499-004	ET2600499-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.002**	**0.002**	**0.018**	**0.011**	**0.005**
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L	**0.27**	**0.37**	**0.72**	**0.53**	**0.68**
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.47**	**0.74**	**0.55**	**0.56**	**0.65**
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L	**0.016**	**0.024**	**0.031**	**0.029**	**0.039**
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	**0.002**
Copper	7440-50-8	0.001	mg/L	**0.002**	**0.002**	**0.001**	**0.001**	**0.002**
Manganese	7439-96-5	0.001	mg/L	**0.008**	**0.019**	**0.044**	**0.033**	**0.017**
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.001**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	22-Jan-2026 11:45	22-Jan-2026 10:45	22-Jan-2026 10:20	22-Jan-2026 09:30	22-Jan-2026 09:00
Compound	CAS Number	LOR	Unit		ET2600499-001	ET2600499-002	ET2600499-003	ET2600499-004	ET2600499-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Selenium	7782-49-2	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L		**0.40**	**1.05**	**1.34**	**1.17**	**1.58**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		**0.14**	**0.01**	**0.01**	<0.01	<0.01
EG094T: Total metals in Fresh water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		**0.01**	<0.01	<0.01	<0.01	**0.01**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.1**	<0.1	<0.1	<0.1
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.01**	<0.01	**0.03**	**0.02**	<0.01
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	**0.04**	**0.03**	**0.07**	**0.19**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	**0.04**	**0.03**	**0.07**	**0.19**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.9**	**0.7**	**0.8**	**0.7**	**0.4**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**0.9**	**0.7**	**0.8**	**0.8**	**0.6**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	22-Jan-2026 11:45	22-Jan-2026 10:45	22-Jan-2026 10:20	22-Jan-2026 09:30	22-Jan-2026 09:00
Compound	CAS Number	LOR	Unit		ET2600499-001	ET2600499-002	ET2600499-003	ET2600499-004	ET2600499-005
					Result	Result	Result	Result	Result
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.03**	**0.05**	**0.05**	**0.04**	**0.03**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**0.53**	**1.31**	**0.52**	**0.54**	**1.07**
ø Total Cations	----	0.01	meq/L		**0.52**	**1.05**	**0.61**	**0.61**	**0.74**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	**100**	**120**	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	**100**	**120**	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	22-Jan-2026 11:45	22-Jan-2026 10:45	22-Jan-2026 10:20	22-Jan-2026 09:30	22-Jan-2026 09:00
Compound	CAS Number	LOR	Unit		ET2600499-001	ET2600499-002	ET2600499-003	ET2600499-004	ET2600499-005
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**88.1**	**94.7**	**90.9**	**90.2**	**93.1**
Toluene-D8	2037-26-5	2	%		**99.5**	**104**	**99.9**	**98.0**	**103**
4-Bromofluorobenzene	460-00-4	2	%		**101**	**103**	**105**	**97.5**	**106**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	W6	W7	W8	W8_01	W20
			Sampling date / time	22-Jan-2026 10:00	22-Jan-2026 11:30	22-Jan-2026 11:10	22-Jan-2026 11:10	22-Jan-2026 08:30
Compound	CAS Number	LOR	Unit	ET2600499-006	ET2600499-007	ET2600499-008	ET2600499-009	ET2600499-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.90**	**6.95**	**6.97**	**6.96**	**7.43**
EA006: Sodium Adsorption Ratio (SAR)								
^ Sodium Adsorption Ratio	----	0.01	-	**1.87**	**0.41**	**0.41**	**0.41**	**1.64**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**73**	**53**	**56**	**56**	**168**
EA016: Calculated TDS (from Electrical Conductivity)								
Total Dissolved Solids (Calc.)	----	1	mg/L	**47**	**34**	**36**	**36**	**109**
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	**9**	**18**	**18**	**18**	**34**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**21**	**19**	**22**	**23**	**36**
Total Alkalinity as CaCO3	----	1	mg/L	**21**	**19**	**22**	**23**	**36**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	<1	**7**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**24**	**5**	**5**	**5**	**26**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**2**	**4**	**4**	**4**	**7**
Magnesium	7439-95-4	1	mg/L	**1**	**2**	**2**	**2**	**4**
Sodium	7440-23-5	1	mg/L	**13**	**4**	**4**	**4**	**22**
Potassium	7440-09-7	1	mg/L	**3**	**3**	**3**	**3**	**1**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.15**	**0.23**	**0.26**	**0.22**	<0.01
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L	**0.034**	**0.026**	**0.024**	**0.024**	**0.008**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W8_01	W20
				Sampling date / time	22-Jan-2026 10:00	22-Jan-2026 11:30	22-Jan-2026 11:10	22-Jan-2026 11:10	22-Jan-2026 08:30
Compound	CAS Number	LOR	Unit		ET2600499-006	ET2600499-007	ET2600499-008	ET2600499-009	ET2600499-010
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.005**	**0.013**	**0.018**	**0.017**	**0.012**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.006**
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L		**0.73**	**0.61**	**0.73**	**0.71**	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**1.11**	**0.47**	**0.48**	**0.53**	<0.01
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L		**0.043**	**0.028**	**0.026**	**0.026**	**0.008**
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.001**	<0.001	**0.001**	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.025**	**0.021**	**0.027**	**0.024**	**0.013**
Nickel	7440-02-0	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W8_01	W20
				Sampling date / time	22-Jan-2026 10:00	22-Jan-2026 11:30	22-Jan-2026 11:10	22-Jan-2026 11:10	22-Jan-2026 08:30
Compound	CAS Number	LOR	Unit		ET2600499-006	ET2600499-007	ET2600499-008	ET2600499-009	ET2600499-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Selenium	7782-49-2	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L		**2.07**	**0.89**	**1.03**	**1.04**	<0.05
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**9.62**
EG094T: Total metals in Fresh water by ORC-ICPMS									
Silver	7440-22-4	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**11.0**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	**0.03**	<0.01	**0.03**	<0.01
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.03**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.23**	**0.04**	**0.05**	**0.11**	**0.48**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.23**	**0.04**	**0.05**	**0.11**	**0.51**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.5**	**0.7**	**0.8**	**0.7**	<0.1
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**0.7**	**0.7**	**0.8**	**0.8**	**0.5**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W8_01	W20
				Sampling date / time	22-Jan-2026 10:00	22-Jan-2026 11:30	22-Jan-2026 11:10	22-Jan-2026 11:10	22-Jan-2026 08:30
Compound	CAS Number	LOR	Unit		ET2600499-006	ET2600499-007	ET2600499-008	ET2600499-009	ET2600499-010
					Result	Result	Result	Result	Result
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.04**	**0.05**	**0.02**	**0.03**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.01**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**1.10**	**0.52**	**0.58**	**0.60**	**1.60**
ø Total Cations	----	0.01	meq/L		**0.82**	**0.61**	**0.61**	**0.61**	**1.66**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	**110**	**110**	**110**	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	**110**	**110**	**110**	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	W6	W7	W8	W8_01	W20
				Sampling date / time	22-Jan-2026 10:00	22-Jan-2026 11:30	22-Jan-2026 11:10	22-Jan-2026 11:10	22-Jan-2026 08:30
Compound	CAS Number	LOR	Unit		ET2600499-006	ET2600499-007	ET2600499-008	ET2600499-009	ET2600499-010
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**93.6**	**93.0**	**94.9**	**91.2**	**88.3**
Toluene-D8	2037-26-5	2	%		**105**	**98.2**	**101**	**102**	**97.0**
4-Bromofluorobenzene	460-00-4	2	%		**109**	**103**	**105**	**103**	**95.5**

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry / Biology).

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EG094T: Total metals in Fresh water by ORC-ICPMS

(WATER) EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS

(WATER) EG035F: Dissolved Mercury by FIMS

(WATER) EP080/071: Total Petroleum Hydrocarbons

(WATER) EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions

(WATER) EP080: BTEXN

(WATER) EP080S: TPH(V)/BTEX Surrogates

(WATER) EG035T: Total Recoverable Mercury by FIMS

(WATER) EN055: Ionic Balance

(WATER) ED093F: Dissolved Major Cations

(WATER) EA065: Total Hardness as CaCO3

(WATER) EA006: Sodium Adsorption Ratio (SAR)

(WATER) EG020F: Dissolved Metals by ICP-MS

Appendix H. Stream sediment laboratory certificate – February 2025

CERTIFICATE OF ANALYSIS

Work Order	: **EB2505705**	Page	: 1 of 6
Client	: **AARC ENVIRONMENTAL SOLUTIONS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: Ron Gardiner	Contact	: Customer Services EB
Address	: BRISBANE	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3243 7222
Project	: Richmond Water & Sed Samples (Graphinex)	Date Samples Received	: 17-Feb-2025 09:35
Order number	: ----	Date Analysis Commenced	: 19-Feb-2025
C-O-C number	: ----	Issue Date	: 28-Feb-2025 16:26
Sampler	: J R, R G		
Site	: ----		
Quote number	: EB25AUSRESCON0001		
No. of samples received	: 10		
No. of samples analysed	: 10		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Beatriz Llarinas	Senior Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Soil Preparation, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the work order ET2500864 and the remainder of analysis will be shown on this workorder. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	W1	W2	W3	W4	W5
			Sampling date / time	14-Feb-2025 08:00	14-Feb-2025 11:41	14-Feb-2025 13:40	14-Feb-2025 16:07	15-Feb-2025 08:40
Compound	CAS Number	LOR	Unit	EB2505705-001	EB2505705-002	EB2505705-003	EB2505705-004	EB2505705-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	20.5	20.8	23.2	14.5	25.1
EA150: Particle Sizing								
+75µm	----	1	%	93	99	95	99	74
+150µm	----	1	%	74	96	82	99	32
+300µm	----	1	%	38	80	58	88	7
+425µm	----	1	%	24	56	47	70	4
+600µm	----	1	%	14	39	38	54	3
+1180µm	----	1	%	3	14	24	27	2
+2.36mm	----	1	%	<1	4	14	11	1
+4.75mm	----	1	%	<1	1	8	3	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	4	<1	2	<1	10
Silt (2-60 µm)	----	1	%	2	1	2	1	13
Sand (0.06-2.00 mm)	----	1	%	93	92	79	83	76
Gravel (>2mm)	----	1	%	1	7	17	16	1
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.64	2.69	2.68	2.69	2.55
EG005(ED093)T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	4	2	3	<2	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	14-Feb-2025 08:00	14-Feb-2025 11:41	14-Feb-2025 13:40	14-Feb-2025 16:07	15-Feb-2025 08:40
Compound	CAS Number	LOR	Unit		EB2505705-001	EB2505705-002	EB2505705-003	EB2505705-004	EB2505705-005
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		<5	<5	<5	<5	<5
EG020T: Total Metals by ICP-MS									
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	W6	W7	W8	W9	Duplicate
			Sampling date / time	15-Feb-2025 09:50	15-Feb-2025 12:30	15-Feb-2025 14:40	15-Feb-2025 16:30	14-Feb-2025 00:00
Compound	CAS Number	LOR	Unit	EB2505705-006	EB2505705-007	EB2505705-008	EB2505705-009	EB2505705-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	19.4	11.1	18.8	12.2	19.6
EA150: Particle Sizing								
+75µm	----	1	%	100	98	99	88	94
+150µm	----	1	%	99	95	95	72	79
+300µm	----	1	%	89	77	69	44	36
+425µm	----	1	%	73	60	52	27	22
+600µm	----	1	%	55	43	39	16	14
+1180µm	----	1	%	27	20	16	3	3
+2.36mm	----	1	%	14	10	4	<1	<1
+4.75mm	----	1	%	8	5	2	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	<1	<1	<1	9	4
Silt (2-60 µm)	----	1	%	<1	1	1	4	1
Sand (0.06-2.00 mm)	----	1	%	82	86	91	86	93
Gravel (>2mm)	----	1	%	18	13	8	1	2
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.71	2.63	2.69	2.65	2.66
EG005(ED093)T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	2	4	2	2	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	W6	W7	W8	W9	Duplicate
				Sampling date / time	15-Feb-2025 09:50	15-Feb-2025 12:30	15-Feb-2025 14:40	15-Feb-2025 16:30	14-Feb-2025 00:00
Compound	CAS Number	LOR	Unit		EB2505705-006	EB2505705-007	EB2505705-008	EB2505705-009	EB2505705-010
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		<5	<5	<5	<5	<5
EG020T: Total Metals by ICP-MS									
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Appendix I. Stream sediment laboratory certificate – December 2025

CERTIFICATE OF ANALYSIS

Work Order	: **EB2545063**	Page	: 1 of 8
Client	: **QLD AUS Graphite Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: DAMIAN HILLS	Contact	: Customer Services EB
Address	: Level 4, 10 Eagle Street Brisbane 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3552-8685
Project	: ----	Date Samples Received	: 17-Dec-2025 09:00
Order number	: ----	Date Analysis Commenced	: 18-Dec-2025
C-O-C number	: ----	Issue Date	: 07-Jan-2026 11:40
Sampler	: DAMIAN HILLS		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 13		
No. of samples analysed	: 13		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Soil Preparation, Stafford, QLD
Layla Hafner	Acid Sulphate Soils - Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA150H: Soil particle density results fell outside the scope of AS1289.3.6.3. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	W1	W2	W3	W4	W5
			Sampling date / time	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00
Compound	CAS Number	LOR	Unit	EB2545063-001	EB2545063-002	EB2545063-003	EB2545063-004	EB2545063-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	10.3	7.4	15.8	0.4	17.8
EA150: Particle Sizing								
+75µm	----	1	%	96	99	96	100	100
+150µm	----	1	%	84	97	92	97	99
+300µm	----	1	%	12	85	74	78	59
+425µm	----	1	%	3	62	49	55	29
+600µm	----	1	%	1	41	30	39	15
+1180µm	----	1	%	<1	8	8	14	2
+2.36mm	----	1	%	<1	<1	1	3	<1
+4.75mm	----	1	%	<1	<1	<1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	4	1	4	<1	<1
Silt (2-60 µm)	----	1	%	<1	<1	<1	<1	<1
Sand (0.06-2.00 mm)	----	1	%	96	96	93	94	99
Gravel (>2mm)	----	1	%	<1	3	3	6	1
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.62	2.76	2.72	2.69	2.66
EG005(ED093)T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	5	3	3	<2	2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	W1	W2	W3	W4	W5
				Sampling date / time	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00
Compound	CAS Number	LOR	Unit		EB2545063-001	EB2545063-002	EB2545063-003	EB2545063-004	EB2545063-005
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		<5	<5	<5	<5	<5
EG020T: Total Metals by ICP-MS									
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	W6	W7	W8	W9	PW_10
				Sampling date / time	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00
Compound	CAS Number	LOR	Unit		EB2545063-006	EB2545063-007	EB2545063-008	EB2545063-009	EB2545063-010
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		5.6	0.4	18.1	8.1	11.0
EA150: Particle Sizing									
+75µm	----	1	%		99	99	99	86	99
+150µm	----	1	%		98	98	99	77	99
+300µm	----	1	%		83	88	88	54	93
+425µm	----	1	%		66	68	54	36	82
+600µm	----	1	%		49	46	23	24	63
+1180µm	----	1	%		20	13	2	8	21
+2.36mm	----	1	%		5	3	<1	4	2
+4.75mm	----	1	%		2	2	<1	2	<1
+9.5mm	----	1	%		<1	<1	<1	<1	<1
+19.0mm	----	1	%		<1	<1	<1	<1	<1
+37.5mm	----	1	%		<1	<1	<1	<1	<1
+75.0mm	----	1	%		<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		1	1	<1	6	<1
Silt (2-60 µm)	----	1	%		<1	<1	<1	7	<1
Sand (0.06-2.00 mm)	----	1	%		90	93	99	82	92
Gravel (>2mm)	----	1	%		9	6	1	5	8
Cobbles (>6cm)	----	1	%		<1	<1	<1	<1	<1
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3		2.50	2.71	2.66	2.22	2.66
EG005(ED093)T: Total Metals by ICP-AES									
Antimony	7440-36-0	5	mg/kg		<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		2	3	2	3	6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	W6	W7	W8	W9	PW_10
				Sampling date / time	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00
Compound	CAS Number	LOR	Unit		EB2545063-006	EB2545063-007	EB2545063-008	EB2545063-009	EB2545063-010
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		<5	**9**	<5	**8**	<5
EG020T: Total Metals by ICP-MS									
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	PW_11	PW_11_01	PW_12	----	----
			Sampling date / time	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	----	----
Compound	CAS Number	LOR	Unit	EB2545063-011	EB2545063-012	EB2545063-013	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	18.5	17.3	5.9	----	----
EA150: Particle Sizing								
+75µm	----	1	%	97	97	99	----	----
+150µm	----	1	%	94	93	99	----	----
+300µm	----	1	%	48	53	81	----	----
+425µm	----	1	%	27	32	53	----	----
+600µm	----	1	%	18	22	32	----	----
+1180µm	----	1	%	10	13	7	----	----
+2.36mm	----	1	%	6	8	1	----	----
+4.75mm	----	1	%	5	4	<1	----	----
+9.5mm	----	1	%	<1	<1	<1	----	----
+19.0mm	----	1	%	<1	<1	<1	----	----
+37.5mm	----	1	%	<1	<1	<1	----	----
+75.0mm	----	1	%	<1	<1	<1	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	<1	2	<1	----	----
Silt (2-60 µm)	----	1	%	2	<1	<1	----	----
Sand (0.06-2.00 mm)	----	1	%	91	88	97	----	----
Gravel (>2mm)	----	1	%	7	10	3	----	----
Cobbles (>6cm)	----	1	%	<1	<1	<1	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.70	2.70	2.67	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	----	----
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	3	3	2	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	PW_11	PW_11_01	PW_12	----	----
				Sampling date / time	12-Dec-2025 00:00	12-Dec-2025 00:00	12-Dec-2025 00:00	----	----
Compound	CAS Number	LOR	Unit		EB2545063-011	EB2545063-012	EB2545063-013	--------	--------
					Result	Result	Result	----	----
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Copper	7440-50-8	5	mg/kg		<5	<5	<5	----	----
Lead	7439-92-1	5	mg/kg		<5	<5	<5	----	----
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	----	----
Zinc	7440-66-6	5	mg/kg		<5	<5	<5	----	----
EG020T: Total Metals by ICP-MS									
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	----	----

Appendix J. Stream sediment laboratory certificate – January 2026

CERTIFICATE OF ANALYSIS

Work Order	: **EB2542063**	Page	: 1 of 8
Client	: **QLD AUS Graphite Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: DAMIAN HILLS	Contact	: Customer Services EB
Address	: Level 4, 10 Eagle Street Brisbane 4000	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +81-6-3552-7875
Project	: ----	Date Samples Received	: 27-9an-2028 07:30
Order number	: ----	Date Analysis Commenced	: 30-9an-2028
C-O-C number	: ----	Issue Date	: 0J-/ eb-2028 11:44
Sampler	: DAMIAN HILLS		
Site	: ----		
Quote number	: EN(333		
No. of samples received	: J		
No. of samples analysed	: J		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report)sw x ith this reference. Results apply to the sample)sw as submitted, unless the sampling x as conducted by ALS. This document shall not be reproduced, eGcept in full.

This Certificate of Analysis contains the follox ing information:

- z eneral Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authoriFed signatories belox . Electronic signing is carried out in compliance x ith procedures specified in 21 C/ R Part 11.

Signatories	*Position*	*Accreditation Category*
BeatriF Llarinas	Senior Chemist	Brisbane Inorganics, Stafford, QLD
BeatriF Llarinas	Senior Chemist	Brisbane Soil Preparation, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Layla Hafner	Acid Sulphate Soils - Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry x eight basis.

Where a reported less than)<wresult is higher than the LOR, this may be due to primary sample eGract(digestate dilution and(or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample)reduced x eight employedwor matriGinterference.

When sampling time information is not provided by the client, sampling dates are shox n x ithout a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-MatriQ: SOIL -MatriQ: SOILM			Sample ID	W3	W2	W)	W(	W1
			Sampling date / time	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00
Compound	CAS Number	LOR	Unit	EB2542063@43	EB2542063@42	EB2542063@4)	EB2542063@4(	EB2542063@41
				Result	Result	Result	Result	Result
EA411: ° oisture Content -Dried 7 341@348CM								
° oisture Content	----	0.1	%	2(.(	25.z	) 4.2	36.4	23.z
EA314: Particle Si9ing								
+01µm	----	1	%	6z	6(	60	344	z0
+314µm	----	1	%	61	z4	z6	66	z0
+) 44µm	----	1	%	) 5	) 6	3(	51	00
+(21µm	----	1	%	z	23	2	2z	12
+544µm	----	1	%	2	32	<1	34	25
+33z4µm	----	1	%	<1	(	<1	3	3
+2.) 5mm	----	1	%	<1	<1	<1	<1	<1
+(.01mm	----	1	%	<1	<1	<1	<1	<1
+6.1mm	----	1	%	<1	<1	<1	<1	<1
+36.4mm	----	1	%	<1	<1	<1	<1	<1
+) 0.1mm	----	1	%	<1	<1	<1	<1	<1
+01.4mm	----	1	%	<1	<1	<1	<1	<1
EA314: Soil Classification based on Particle Si9e								
Clay -<2 µmM	----	1	%	3	(	)	<1	3)
Silt -2@4 µmM	----	1	%	<1	<1	<1	<1	<1
Sand -4.45@.44 mmM	----	1	%	66	6(	60	344	z0
Gravel ->2mmM	----	1	%	<1	2	<1	<1	<1
Cobbles ->5cmM	----	1	%	<1	<1	<1	<1	<1
EA312: Soil Particle Density								
Soil Particle Density -Clay/Silt/SandM	----	0.01	g(cm3	2.5)	2.50	2.5)	2.5z	2.50
EG441-ED46) MT: Total ° etals by ICP@ES								
Antimony	6440-38-0	5	mg(kg	<5	<5	<5	<5	<5
Arsenic	6440-37-2	5	mg(kg	<5	<5	<5	<5	<5
Cadmium	6440-43-J	1	mg(kg	<1	<1	<1	<1	<1
Chromium	6440-46-3	2	mg(kg	(	)	)	<2	<2

Analytical Results

Sub-MatriQ: SOIL -MatriQ: SOILM			Sample ID	W3	W2	W)	W(	W1
			Sampling date / time	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00
Compound	CAS Number	LOR	Unit	EB2542063@43	EB2542063@42	EB2542063@4)	EB2542063@4(	EB2542063@41
				Result	Result	Result	Result	Result
EG441-ED46) M: Total ° etals by ICP@ES @Continued								
Copper	6440-50-7	5	mg(kg	<5	<5	<5	<5	<5
Lead	643J-J2-1	5	mg(kg	<5	<5	<5	<5	<5
Nickel	6440-02-0	2	mg(kg	<2	<2	<2	<2	<2
Zinc	6440-88-8	5	mg(kg	<5	<5	<5	<5	<5
EG424T: Total ° etals by ICP@S								
Silver	6440-22-4	0.1	mg(kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG4)1T: Total Recoverable ° ercury by FI° S								
° ercury	643J-J6-8	0.1	mg(kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-MatriQ: SOIL -MatriQ: SOILM			Sample ID	W5	W0	Wz	Wz_43	[illegible]
			Sampling date / time	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	----
Compound	CAS Number	LOR	Unit	EB2542063@45	EB2542063@40	EB2542063@4z	EB2542063@46	[illegible]
				Result	Result	Result	Result	----
EA411: ° oisture Content -Dried 7 341@348CM								
° oisture Content	----	0.1	%	2(.4	36.3	35.)	3z.z	[illegible]
EA314: Particle Si9ing								
+01µm	----	1	%	66	66	6z	6z	[illegible]
+314µm	----	1	%	60	60	6(	z6	[illegible]
+) 44µm	----	1	%	14	1(	50	15	[illegible]
+(21µm	----	1	%	22	2)	((	) (	[illegible]
+544µm	----	1	%	33	z	2(	23	[illegible]
+33z4µm	----	1	%	)	<1	)	1	[illegible]
+2.) 5mm	----	1	%	<1	<1	<1	3	[illegible]
+(.01mm	----	1	%	<1	<1	<1	<1	[illegible]
+6.1mm	----	1	%	<1	<1	<1	<1	[illegible]
+36.4mm	----	1	%	<1	<1	<1	<1	[illegible]
+) 0.1mm	----	1	%	<1	<1	<1	<1	[illegible]
+01.4mm	----	1	%	<1	<1	<1	<1	[illegible]
EA314: Soil Classification based on Particle Si9e								
Clay -<2 µmM	----	1	%	3	3	2	2	[illegible]
Silt -2@4 µmM	----	1	%	<1	<1	<1	<1	[illegible]
Sand -4.45@.44 mmM	----	1	%	6z	66	60	65	[illegible]
Gravel ->2mmM	----	1	%	3	<1	3	2	[illegible]
Cobbles ->5cmM	----	1	%	<1	<1	<1	<1	[illegible]
EA312: Soil Particle Density								
Soil Particle Density -Clay/Silt/SandM	----	0.01	g(cm3	2.53	2.55	2.55	2.55	[illegible]
EG441-ED46) MT: Total ° etals by ICP@ES								
Antimony	6440-38-0	5	mg(kg	<5	<5	<5	<5	[illegible]
Arsenic	6440-37-2	5	mg(kg	<5	<5	<5	<5	[illegible]
Cadmium	6440-43-J	1	mg(kg	<1	<1	<1	<1	[illegible]
Chromium	6440-46-3	2	mg(kg	2	2	<2	2	[illegible]

Analytical Results

Sub-MatriQ: SOIL -MatriQ: SOILM			Sample ID	W5	W0	Wz	Wz_43	[illegible]
			Sampling date / time	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	22-9an-2028 00:00	----
Compound	CAS Number	LOR	Unit	EB2542063@45	EB2542063@40	EB2542063@4z	EB2542063@46	[illegible]
				Result	Result	Result	Result	----
EG441-ED46) M: Total ° etals by ICP@ES @Continued								
Copper	6440-50-7	5	mg(kg	<5	<5	<5	<5	[illegible]
Lead	643J-J2-1	5	mg(kg	<5	<5	<5	<5	[illegible]
Nickel	6440-02-0	2	mg(kg	<2	<2	<2	<2	[illegible]
Zinc	6440-88-8	5	mg(kg	<5	<5	<5	<5	[illegible]
EG424T: Total ° etals by ICP@S								
Silver	6440-22-4	0.1	mg(kg	<0.1	<0.1	<0.1	<0.1	[illegible]
EG4)1T: Total Recoverable ° ercury by FI° S								
° ercury	643J-J6-8	0.1	mg(kg	<0.1	<0.1	<0.1	<0.1	[illegible]

Appendix K. Macroinvertebrate species list

Class/Order	Family/Sub-family	W1		W2	W3	W4	W5	W6	W7	W8
		Bed	Edge							
Acarina	sp.				1				3	
Cladocera	sp.		22		7	1	4		3	1
Coleoptera	Dytiscidae		3	1		1			4	
Coleoptera	Gyrinidae	1							1	
Coleoptera	Hydrophilidae	1	7	1	4	1			8	1
Coleoptera	Spercheidae		1							
Coleoptera	Scirtidae				1					
Coleoptera	Brentidae								1	
Coleoptera	Hydrochidae		14	1	2	2			6	1
Conchostraca	sp.		5						2	
Copepoda	sp.	7	7		28	1	1		9	3
Decapoda	Gecarcinucidae						1	1		
Diptera	Culicidae		4	2		2				
Diptera	Ceratopogonidae		2	1	1					
Diptera	Tanypodinae				6	1	1		1	1
Diptera	Chironominae	1	7	5	6			2	1	2
Ephemeroptera	Leptophlebiidae				1	2	2	10		
Ephemeroptera	Caenidae					1		1		
Hemiptera	Veliidae					1				
Hemiptera	Micronectidae	5	1	3	9	6	6	2		20
Hemiptera	Notonectidae								2	
Hemiptera	Pleidae		6	1	1	1	1			1
Nematoda	sp.				3					
Odonata	Isostictidae				4	1	1			1
Odonata	Libellulidae	1	2	1	1					
Oligochaeta	sp.	1			3					
Ostracoda	sp.	2	4	1			1			1