Ecological Assessment

Santos
Petroleum Lease 1058 (Bearcat)

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Definitions

Term	Definition
Disturbance footprint	The area that is proposed to be impacted by the project.
The project	Bearcat (PL1058) petroleum activities.
Regional Ecosystem	A vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. Regional Ecosystems are described in the Regional Ecosystem Description Database, produced by the Queensland Herbarium.
Regulated vegetation	Vegetation that is mapped within the Regulated Vegetation Management Map produced by DNRME.
The PL	Petroleum Lease (PL) 1058 (Bearcat).
Suitable habitat	A species preferred environment required to sustain a viable population. Suitable habitat may include breeding, foraging and shelter resources for fauna or preferred environmental conditions of flora.
Threatened species	Extinct (EX), extinct in the wild (XW), critically endangered (CE), endangered (E), vulnerable (V) or conservation dependent (CD) under the *Environment Protection and Biodiversity Conservation Act 1999* or extinct in the wild (PE), Endangered, Vulnerable or Near Threatened (EVNT) under the *Nature Conservation Act 1992*.

Abbreviations

Abbreviation	Description
DAWE	Department of Agriculture, Water and the Environment (formerly Department of the Environment and Energy (DEE))
DES	Department of Environment and Science
DNRME	Department of Natural Resources, Mines and Energy
E2M	E2M Pty Ltd
EO Act	*Environmental Offsets Act 2014*
EO Regulation	*Environmental Offsets Regulation 2014*
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992*
RE	Regional Ecosystem
SEA	Strategic Environmental Area, defined under the EO Regulation
SRI	Significant Residual Impact

1 Introduction

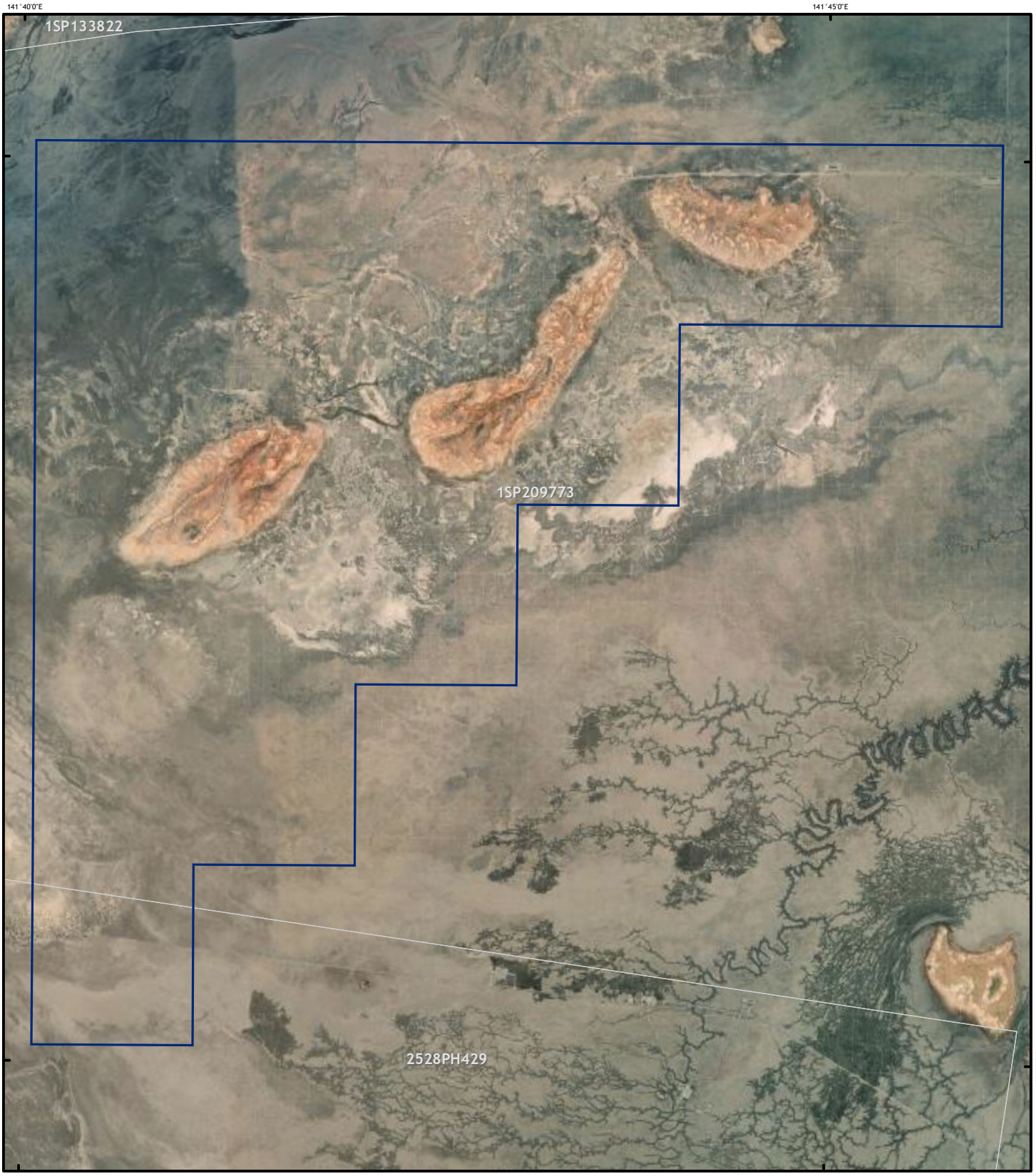
1.1 Project background and scope

Santos is proposing new petroleum activities within Petroleum Lease (PL) 1058 (Bearcat), herein referred to as 'the PL', and has engaged E2M to undertake an ecological assessment for the PL. The scope of this assessment is to:

- Conduct a review of Commonwealth and State Government environmental mapping, databases and legislative considerations
- Undertake a field assessment to ground-truth vegetation communities and habitat for species listed as Matters of National Environmental Significance (MNES) and/or Matters of State Environmental Significance (MSES) within the PL
- Provide a preliminary assessment of potential impacts of the proposed development on identified MNES and MSES
- Detail management strategies to avoid, minimise or mitigate potential impacts to MNES and MSES within the PL; and
- Undertake preliminary significant residual impact (SRI) assessments to determine potential offset requirements for identified MNES and MSES.

1.2 Site description

The PL is located within the Cooper Creek floodplain, approximately 40 km south of the Ballera gas plant. The PL is approximately 4,851 ha and is contained within Lot 1 on SP209773 and Lot 2528 on PH429. Land within the PL is predominately used for cattle grazing. The PL and surrounding environs are depicted in Figure 1.



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- Road
- Petroleum Lease
- Cadastre

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Coordinate System: GDA 1994 MGA Zone 54
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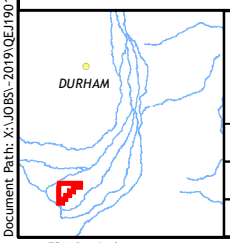

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FIGURE 1: SITE LOCATION - PL 1058

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2 Methods

2.1 Desktop assessment

A desktop assessment was undertaken to review Commonwealth and State Government environmental mapping and databases to identify potential MNES and MSES within the PL. The following legislation, associated triggers and databases were reviewed:

- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Report, for a search radius of 100 km from the approximate centre of the PL (-27.78389, 141.70621)
- Department of Environment and Science (DES) MSES mapping for the PL
- Department of Natural Resources, Mines and Energy (DNRME) Regulated Vegetation Management Map, Vegetation Management Supporting Map (Regional Ecosystem mapping) and Essential Habitat Map for the PL
- DES Protected Plants Flora Survey Trigger mapping for the PL
- DES WildNet Database, for a 100 km buffer around the boundaries of the PL
- DES Map of Environmentally Sensitive Areas for the PL
- Queensland Globe environmental mapping layers for the PL
- Atlas of Living Australia species records; and
- The latest available aerial photography.

2.2 Field assessment

A field assessment of the PL was conducted by two E2M ecologists (Brad Dreis and John van Osta) from 1 to 4 April 2019 and from 24 to 29 August 2019. Brad Dreis and John van Osta are suitably qualified persons for the purposes of undertaking ecological field surveys. The field assessment was undertaken in conjunction with field assessments of PL 1047 (Okotoko), PL 1055 (Bantam) PL 1060 (Jarrar) and Potential Commercial Area 251 (Greater Okotoko).

The following data were collected during the survey:

- Delineation of the ground-truthed extents of RE polygons, with a particular focus on delineating homogenous polygons of wetland REs. Ground-truthed Regional Ecosystems (GTREs) were delineated in accordance with Neldner *et al* (2019).
- Assessment of potential habitat for MNES and MSES fauna
- Targeted searches for grey grasswren (*Amytornis barbatus*) within areas of suitable habitat; and
- Opportunistic observations of fauna encountered throughout the PL.

Trimble TDC100 Global Positioning System (GPS) devices were used to delineate the extent of vegetation communities within the PL and record species and habitat data. Captured data was validated, mapped and assessed using a geographical information system, whereby the development footprint and observed features and extents were overlaid on the relevant regulatory mapping (GDA94/MGA zone 54).

2.3 Regional Ecosystem verification

To verify the extent of the vegetation communities in the field, a combination of Secondary, Tertiary and Quaternary type surveys using the CORVEG Methodology (outlined within *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*. 2019)) were used. Secondary surveys were conducted to collect detailed floristic and structural information, while Tertiary surveys were conducted in REs that had not been flooded and a detailed floristic composition could not be recorded. Quaternary surveys were conducted as a rapid assessment method to characterise the vegetation community.

Where possible, vegetation communities were verified to single homogenous RE polygons in accordance with the Regional Ecosystem Description Database (REDD) (Queensland Herbarium 2019a). However, in areas where multiple REs occurred on a fine scale over extensive areas, such as the floodplain matrix, heterogenous RE polygons were assigned, which included an estimate of the proportion of each RE within each polygon (Neldner *et al*. 2019).

Ground-truthed vegetation communities are used to determine:

- The presence of EPBC Act listed Threatened Ecological Communities (TEC), none of which occur within the PL; and
- Habitat for threatened species.

2.4 Likelihood of occurrence assessment

Threatened flora and fauna species identified in the desktop review were assessed for their likelihood of occurrence within the PL. This assessment considered the species distribution, habitat requirements and historical records in proximity to the PL as well as observations and evidence of occurrence, habitat suitability, threats and on-site conditions identified during the field survey.

The likelihood of occurrence of threatened, migratory and marine species were based on the following criteria:

- **Likely to occur**: suitable habitat to support the species is present and the species has previously been recorded within 100 km of the PL (the desktop search extent)
- **Possible occurrence**: The PL is within the species known distribution and suitable habitat to support the species is present; however
  - the species has not previously been recorded within the desktop search extent; and/or
  - suitable habitat is degraded or of limited extent, thereby reducing the likelihood of the species occurrence.
- **Unlikely to occur**: the PL does not comprise suitable habitat for the species, or is outside of the species known distribution.

2.5 Assumptions and limitations

Ecological surveys have a range of inherent limitations associated with seasonal timing of the survey, variable climate conditions and species behaviour. As such, the survey conducted only represents a "snapshot" in time and may not provide a true indication of presence or absence of flora and fauna species within the PL. In light of the identified limitations, precautionary principles were applied to assume presence where necessary for impact assessment purposes.

Preliminary impact assessments were based on design information that includes the disturbance assumptions identified within Section 5.1. The actual impact arising from the proposed works may differ to the preliminary assessment. The self-assessment has only considered impacts resulting from the proposed works and has not considered cumulative impacts.

3 Results

3.1 Desktop assessment

3.1.1 Commonwealth matters

A Protected Matters Report, generated by the DAWE, was generated to identify MNES that are predicted to occur within the PL (the search results have been included in Appendix A). Matters identified as potentially occurring within 100 km of the PL include:

- One wetland of International Importance (Coongie lakes)
- Nine threatened fauna species
- Two threatened flora species
- Nine migratory (marine, terrestrial, wetland) species; and
- 14 marine species.

A likelihood of occurrence assessment has been conducted for MNES flora and fauna species (Appendix C).

3.1.2 State matters

3.1.2.1 Vegetation Management Act 1999

The PL was mapped as entirely containing Category B (remnant) regulated vegetation. All Regional Ecosystems (REs) mapped within the PL by DNRME have a 'least concern' vegetation management class and 'no concern at present' biodiversity status (Queensland Herbarium 2019a).

3.1.2.2 Nature Conservation Act 1992

The Queensland Government WildNet database was searched within a 100 km buffer of the PL boundaries to identify the confirmed recorded presence of threatened flora and fauna species. The extract listed four bird, three mammal and four plant species (Appendix A). To determine potential presence within the PL, a likelihood of occurrence assessment has been conducted for these species (Appendix C).

3.1.2.2.1 NC Act Protected Plants

The *Nature Conservation Wildlife Regulation 2006* (NC Regulation) lists flora and fauna species considered to be extinct in the wild, Endangered, Vulnerable or Near Threatened (EVNT) or least concern in Queensland. Clearing of protected plants (i.e. EVNT species) is regulated by the NC Regulation. Furthermore, the State Government has produced a mapping layer which triggers a flora survey requirement if disturbance is proposed within a mapped high risk area. The PL does not contain mapped high risk areas.

3.1.3 Environmental Offsets Act 2014

The EO Act outlines the framework for environmental offsets within Queensland and how they should be provided. As defined within Section 7 of the EO Act, an environmental offset is an *activity undertaken to counterbalance a significant residual impact of a prescribed activity on a prescribed environmental matter*, such as matters of Commonwealth, State or local significance.

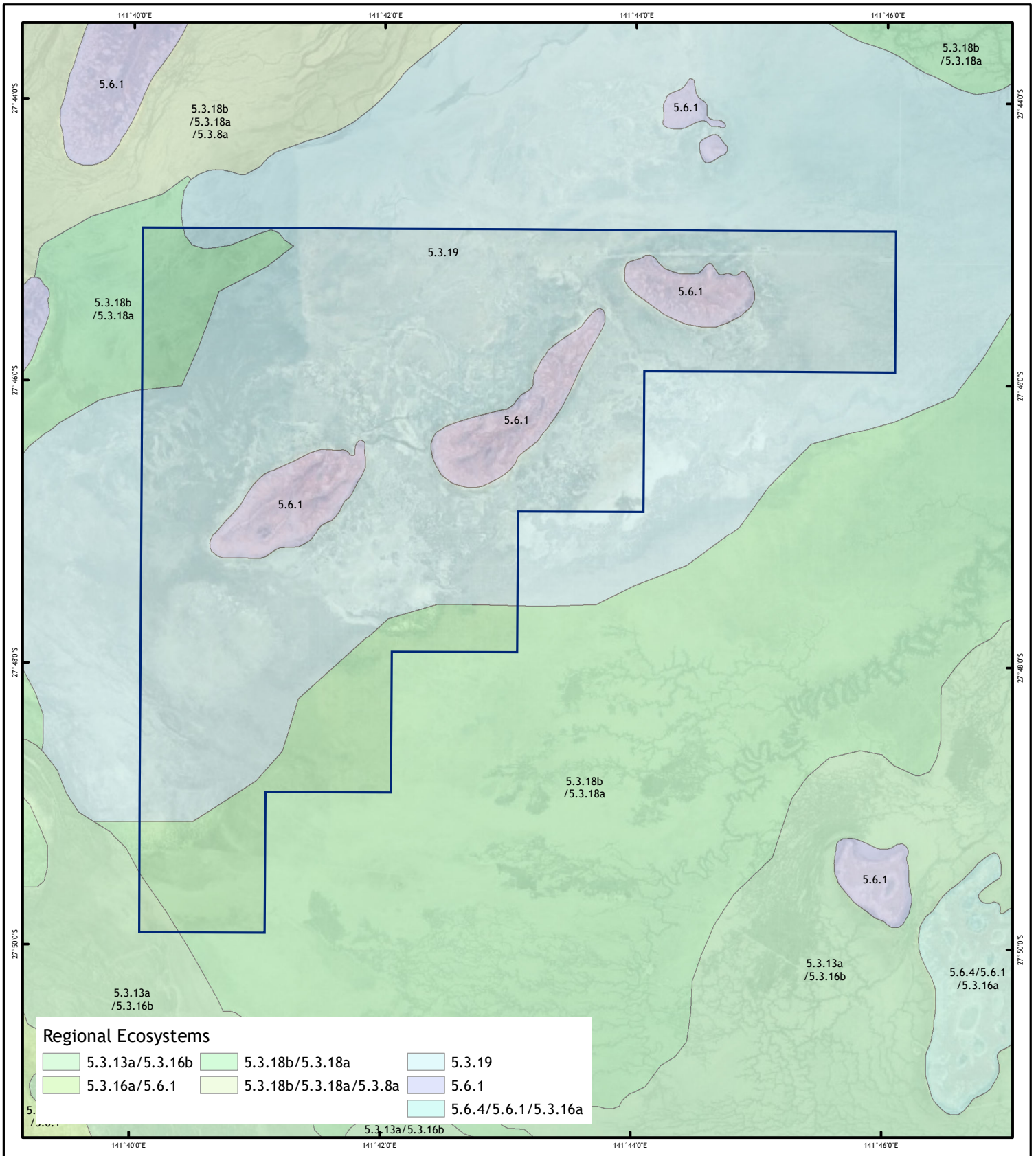
Environmental offsets are not an assessment trigger, but are imposed as a condition for a proposed activity. If a SRI on the prescribed environmental matter remains after the application of impact avoidance, minimisation and mitigation measures, an environmental offset may be required. MSES identified within the PL in the desktop assessment include:

- Threatened species listed under the NC Act
- Special least concern species listed under the NC Act
- Regulated vegetation – intersecting a watercourse
- Regulated vegetation – within 100 m of a Vegetation Management Wetland
- High Ecological Significance wetlands
- Connectivity areas; and
- Channel Country Strategic Environmental Area (SEA).

3.1.4 Environmental Protection Act 1994

No Category A, B or C ESAs are mapped to occur within the PL on the Map of Environmentally Sensitive Areas produced by the DES. Other matters mapped as occurring within the PL that are relevant to the PL include:

- Referable wetlands
- Dominant wetlands (51-100%); and
- Subdominant wetlands (0-50%).



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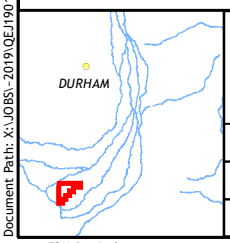

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FIGURE 2: DNRME MAPPED REGIONAL ECOSYSTEMS - PL 1058

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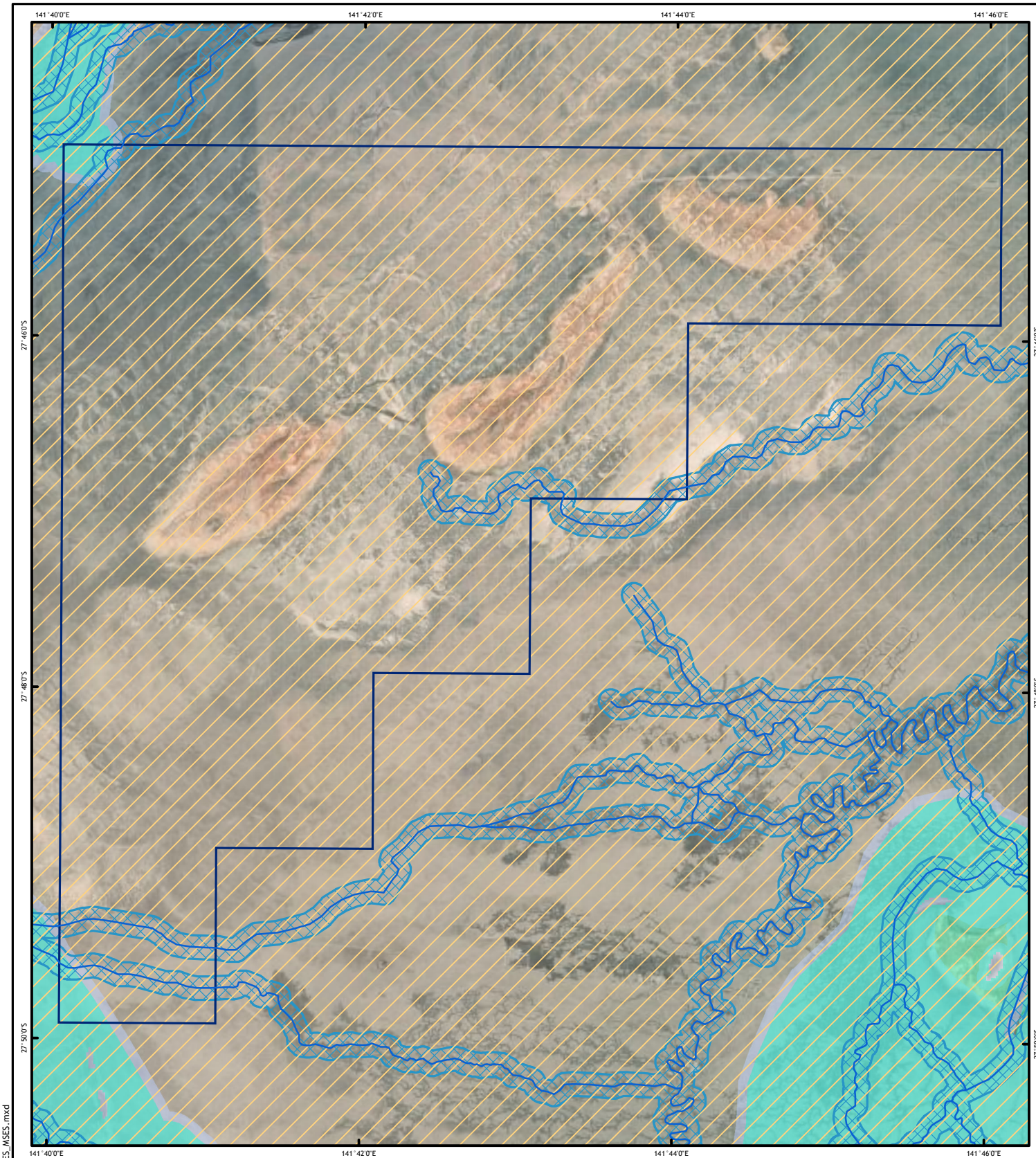

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- MSES - Watercourse
- MSES Regulated Vegetation – Intersecting a Watercourse
- MSES High Ecological Significance Wetlands
- MSES Regulated Vegetation – within 100m of a Vegetation Management Wetland
- Channel Country Stategic Environmental Area

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Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator

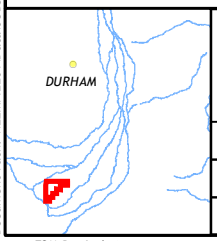

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FIGURE 3: QUEENSLAND GOVERNMENT MAPPED MSES - PL 1058

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4 Field assessment results

4.1 Matters of National Environmental Significance

Five MNES have been identified as likely to occur within the PL. These MNES comprise one species listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), grey grasswren (Section 4.1.1), and a further four species listed as migratory under the EPBC Act (Section 4.1.2). In addition, five bird species listed as marine were identified as known or likely to occur (Section 4.1.3). Marine species, while not a MNES are protected under the EPBC Act through their relationship with the Commonwealth marine environment. Habitat associations for MNES species likely to occur within the PL are summarised in Table 1.

Table 1 MNES species likely to occur within the PL

Species	EPBC Act status	Regional Ecosystem (RE) associations	Area within the PL (ha)
Fork-tailed swift (*Apus pacificus*)	Marine and migratory	All REs	4,851.1
Glossy ibis (*Plegadis falcinellus*)	Marine and migratory	REs associated with riverine and palustrine wetlands, including: 5.3.13a and 5.3.18a	818.3
Grey grasswren (*Amytornis barbatus*)	Endangered	REs containing lignum (*Duma florulenta*) and swamp canegrass (*Eragrostis australasica*) thickets, which solely comprises 5.3.13a within the PL	224.3
Gull-billed tern (*Gelochelidon nilotica*)	Marine and migratory	REs associated with riverine and palustrine wetlands, including: 5.3.13a and 5.3.18a	818.3
Sharp-tailed sandpiper (*Calidris acuminata*)	Marine and migratory	REs associated with riverine and palustrine wetlands, including: 5.3.13a and 5.3.18a	818.3

4.1.1 Threatened species

While no EPBC Act listed threatened species were identified within the PL during the field assessment, the likelihood of occurrence assessment (Appendix C) identified that the PL is likely to provide habitat for one threatened species listed under the NC Act, namely grey grasswren. The Cooper Creek floodplain is known to support grey grasswren; however, the subspecies status of this population is uncertain (Black *et al.* 2011; DEE 2019). The Cooper Creek population may comprise either the Bulloo subspecies (*Amytornis barbatus barbatus*), listed as endangered under the EPBC Act; or the Diamantina subspecies (*Amytornis barbatus diamantina*), not listed under the EPBC Act. In light of this uncertainty, for the purposes of this report, the grey grasswren population has been assumed to comprise the endangered Bulloo subspecies. Habitat for grey grasswren within the PL is mapped within Figure 5.

A further seven threatened species listed under the EPBC Act are considered to have the possibility of occurrence within the PL; however, these species are not considered likely, primarily due to the absence of previous records within 100 km of the PL or the marginal quality of potential habitat for each species within the PL (Appendix C).

Fauna habitat mapping is based on GTRE mapping (Figure 4), which includes mixed RE polygons. Where a species habitat is associated with any of the REs that comprise a mixed polygon, the entire polygon was mapped as habitat. As such, the mapped fauna habitat depicted (Figure 5) may include areas of RE that are not habitat for the species.

4.1.2 Migratory species

While no migratory species were recorded within the PL during the field assessment, the likelihood of occurrence assessment identified that the PL is likely to provide habitat for four migratory species, including:

- fork-tailed swift – marine and migratory
- sharp-tailed sandpiper – marine and migratory
- glossy ibis – marine and migratory; and
- gull-billed tern – marine and migratory.

A project is required to seek approval under the EPBC Act for actions that are likely to have 'significant impact' on listed migratory species. 'Important habitat' for migratory species is a key factor for determining whether an action will result in a significant impact. Important habitat is defined in the significance criteria (DoE 2013) as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- habitat that is of critical importance to the species at particular life-cycle stages, and/or
- habitat utilised by a migratory species which is at the limit of the species range, and/or
- habitat within an area where the species is declining.

The PL does not comprise important habitat for any migratory species listed under the EPBC Act and is therefore not likely to have a significant impact on listed migratory species.

4.1.3 Marine species

Three marine bird species, listed under the EPBC Act were identified within the PL during the field assessment. In addition, the likelihood of occurrence assessment identified that the PL is likely to provide habitat for a further six marine bird species.

A project is required to seek approval under the EPBC Act for actions that are likely to have 'significant impact' on the Commonwealth marine environment, which includes resulting in a '*substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution*'.

Impact to listed marine species resulting from the proposed disturbance is likely to be minimal. As such, the project will not have a significant impact on listed marine species.

4.2 State matters

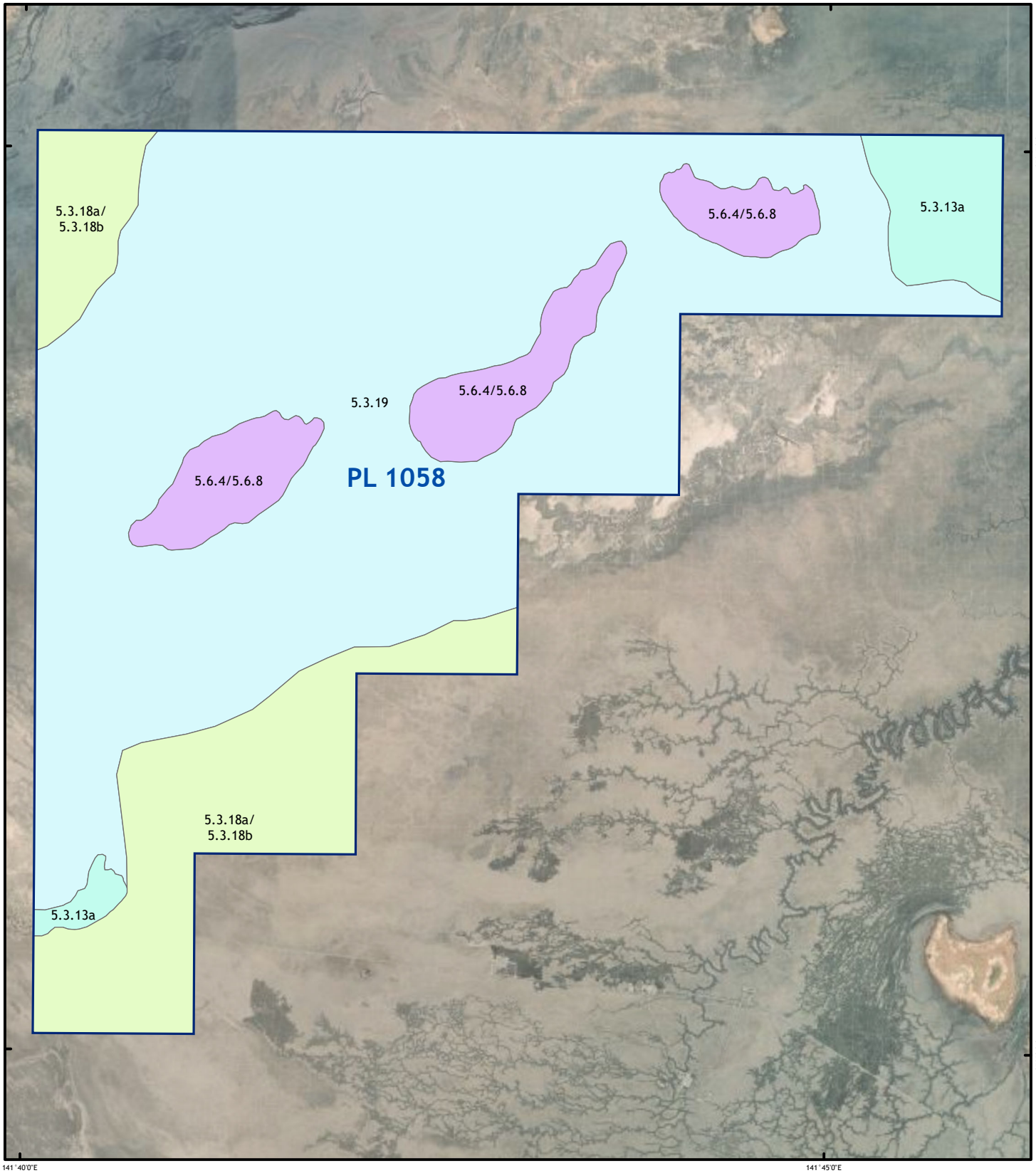
4.2.1 Ground-truthed Regional Ecosystems

GTREs within the PL entirely comprise Category B regulated vegetation under the *Vegetation Management Act 1999* and have a 'least concern' vegetation management class and 'no concern at present' biodiversity status (Queensland Herbarium 2019a). The distribution of all GTREs within the PL is described in Table 2 and is depicted in Figure 4.

Table 2 E2M Ground-truthed Regional Ecosystems (GTREs)

RE Code	Short Description	VM Class/BD Status	Structural category	Area within the PL (ha)[1]
5.3.13a	*Duma florulenta* open shrubland in depressions on flood plains, interdune flats, clay pans and clay plains	Least concern / No concern at present	Very sparse	224.3
5.3.18a	*Chenopodium auricomum* open shrubland on braided channel complex of major alluvial plains.	Least concern / No concern at present	Sparse	594
5.3.18b	Variable sparse to open-herbland on braided channel complex of major alluvial plains.	Least concern / No concern at present	Sparse	254.6
5.3.19	Variable sparse to open herbland on frequently flooded alluvial plains	Least concern / No concern at present	Sparse	3,379
5.6.4	*Atalaya hemiglauca* +/- *Acacia aneura* +/- *Acacia* spp. +/- *Corymbia terminalis* low open woodland on reticulate sand dunes	Least concern / No concern at present	Sparse	359.3
5.6.8	*Zygochloa paradoxa* and/or *Crotalaria eremaea* +/- *Triodia basedowii* open tussock grassland and herbland on mobile crests and slopes of sand dunes	Least concern / No concern at present	Grassland	39.9

[1] GTRE mapping for the PL includes polygons with multiple REs (heterogenous polygons). Area calculations used the approximate proportion of REs within each heterogenous polygon.



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Petroleum Lease

Ground-truthed Regional Ecosystem

5.3.13a | 5.3.18a/5.3.18b | 5.3.19 | 5.6.4/5.6.8

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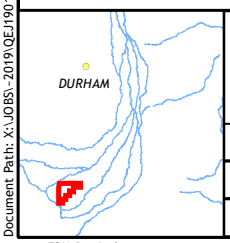

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FIGURE 4: GROUND-TRUTHED REGIONAL ECOSYSTEMS - PL 1058

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4.2.2 Threatened and special least concern species

While no NC Act listed threatened species were identified within the PL during the field assessment, the likelihood of occurrence assessment (Appendix C) identified that the PL is likely to provide habitat for one threatened species listed under the NC Act. Namely, grey grasswren, listed as endangered/near threatened under the NC Act.

As discussed within Section 4.1.1, the subspecies status of grey grasswren within the Cooper Creek floodplain is uncertain (Black *et al.* 2011; DEE 2019). The Cooper Creek population may comprise either the Bulloo subspecies (*Amytornis barbatus barbatus*), listed as endangered under the NC Act; or the Diamantina subspecies (*Amytornis barbatus diamantina*), listed as near threatened under the NC Act. In light of this uncertainty, for the purposes of this report, the grey grasswren population has been assumed to comprise the Bulloo subspecies, listed as endangered under the EPBC Act and NC Act.

Habitat for grey grasswren within the PL is mapped within Figure 5. As identified in Section 4.1.1, fauna habitat mapping is based on GTRE mapping (Figure 4), which includes mixed RE polygons. As such, where a species habitat is associated with any of the REs that comprise a mixed polygon, the entire polygon was mapped as habitat. Consequently, the mapped fauna habitat depicted (Figure 5) may include areas of RE that are not habitat for the species. Associated extent of habitat within the mixed polygon is dependent on the percentage of REs identified as suitable habitat within the polygon.

A further five species listed under the NC Act as special least concern are considered likely to occur (Appendix C), including:

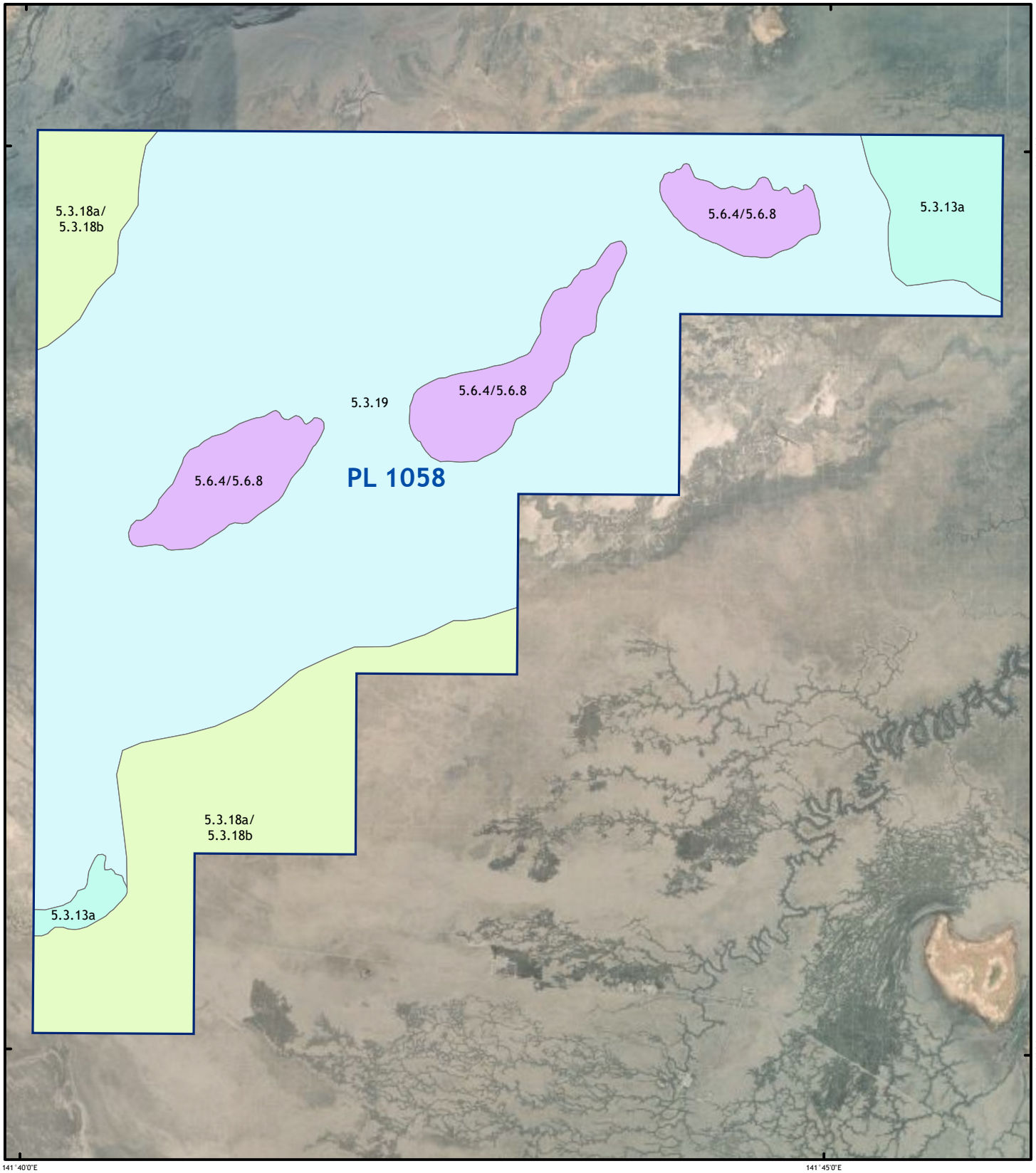
- fork-tailed swift
- sharp-tailed sandpiper
- glossy ibis
- gull-billed tern; and
- short-beaked echidna.

Of these special least concern species, only short-beaked echidna is listed as a MSES under the EO Regulation. Habitat associations for MSES and other special least concern species likely to occur within the PL are summarised in Table 3.

A further 10 species listed under the NC Act as threatened or special least concern are considered to have the possibility of occurrence within the PL; however, the likelihood of these species occurring has been reduced primarily due to the absence of previous records within 100 km of the PL or the marginal quality of potential habitat for each species within the PL (Appendix C).

Table 3 Threatened and special least concern species likely to occur within the PL

Species	NC Act status	RE associations	Area within the PL (ha)
Fork-tailed swift (*Apus pacificus*)	Special least concern	All REs	4,851.1
Glossy ibis (*Plegadis falcinellus*)	Special least concern	REs associated with riverine and palustrine wetlands, including: 5.3.13a and 5.3.18a	818.3
Grey grasswren (*Amytornis barbatus*)	Endangered or near threatened	REs containing lignum (*Duma florulenta*) and swamp canegrass (*Eragrostis australasica*) thickets, which solely comprises 5.3.13a within the PL	224.3
Gull-billed tern (*Gelochelidon nilotica*)	Special least concern	REs associated with riverine and palustrine wetlands, including: 5.3.13a and 5.3.18a	818.3
Sharp-tailed sandpiper (*Calidris acuminata*)	Special least concern	REs associated with riverine and palustrine wetlands, including: 5.3.13a and 5.3.18a	818.3
Short-beaked echidna (*Tachyglossus aculeatus*)	Special least concern	All REs	4,851.1



Legend

Petroleum Lease

Ground-truthed Regional Ecosystem

5.3.13a | 5.3.18a/5.3.18b | 5.3.19 | 5.6.4/5.6.8

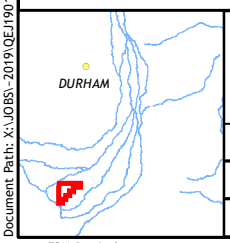
N

Scale 1:55,000 (A4)

0 1 2 3

Kilometres

Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator



Notes:
Aerial Imagery: © ESRI 2019
Cadastre: © DNRME 2019
Petroleum Lease: © DNRME 2019
MSES: © DNRME 2017

Rev	Description	Drawn	Approved	Date
2	Issued for Use	DL	JVO	26/02/2021
1	Issued for Use	DL	JVO	19/02/2021

FIGURE 4: GROUND-TRUTHED REGIONAL ECOSYSTEMS - PL 1058

Ecological Assessment Report
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Map Number	Job Number	Rev
1 of 1	QEJ19010	2

Document Path: X:\JOBS\-2019\QEJ19010\GIS\QEJ19010_EAR_GTRE.mxd

4.2.3 Wetlands

The majority of the PL is located on alluvial soils within the Cooper Creek floodplain. Vegetation communities within these alluvial soils may be seasonally inundated, with the frequency of inundation playing a large role in the distribution of REs present (Queensland Herbarium 2019a). Wetland values identified within the PL include REs listed within the REDD (Queensland Herbarium 2019a), to contain:

- palustrine wetland; and
- floodplain (other than floodplain wetlands).

The August 2019 survey was undertaken following a major flooding event. Areas flooded typically corresponded to REs listed as containing palustrine wetland in the REDD (Queensland Herbarium 2019a), while areas not flooded occurred on higher ground, or outside of the floodplain (Photograph 1).

Photograph 1 RE 5.3.18a that was recently flooded and listed as a wetland RE (left) and RE 5.3.19, that had not been recently flooded and is not listed as a wetland RE (right)

4.2.4 Waterways

The field assessment and analysis of high-resolution satellite imagery identified that all watercourse channels and drainage features within the PL are minor, with a size that is reflective of a stream order 1 (Photograph 2).

The *vegetation management watercourse and drainage feature map* identifies 7.0 km of stream order 8 watercourses and drainage features within the PL. The location of defining banks for Vegetation Management Watercourses was estimated by buffering the centreline of Vegetation Management Watercourses by 25 m on each side i.e. this assumes a typical watercourse channel width of 50 m. Assessment of the MSES regulated vegetation – intersecting a watercourse is discussed in Section 5.3.2.

No watercourse was considered to comprise the MSES 'waterway providing for fish passage'. The EO Regulation states that '*waterway providing for passage of fish is a matter of State environmental significance only if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway*'. As the proposed development will not limit fish passage within the Cooper Creek floodplain, this MSES does not apply.

Note: ground-truthing of watercourse and drainage feature centrelines and high-banks was not conducted, due to the high density of braided channels making ground-truthing unfeasible.

Photograph 2 Typical drainage feature within the PL (left) and view of braided channel complex within the PL (right)

4.2.5 Corridors and connectivity

The PL entirely contains remnant RE, with unimpeded habitat connectivity to adjacent contiguous habitats, particularly the Cooper Creek floodplain surrounding the PL. The entire the PL is located within the Channel Country SEA and partially contains a state-wide terrestrial biodiversity corridor. The PL contains environmental attributes characteristic of the Channel Country SEA, as identified within the *Regional Planning Interests (RPI) Regulation 2014*, including:

- natural, unrestricted flows in and along stream channels and the channel network in the area
- overflow from stream channels and the channel network onto the flood plains of the area, or the other way
- natural flow paths of water across flood plains connecting waterholes, lakes and wetlands in the area
- the natural water quality in the stream channels and aquifers and on flood plains in the area; and
- the beneficial flooding of land that supports flood plain grazing and ecological processes in the area.

The MSES 'connectivity areas' includes all remnant vegetation that is required for ecosystem functioning. As the entire PL contains remnant RE and is connected to extensive areas of adjacent remnant vegetation, the entire PL is considered to comprise the MSES connectivity areas.

4.2.6 Introduced/non-native flora

No introduced/non-native flora species listed as Weeds of National Environmental Significance (WONS) or under the Queensland *Biosecurity Act 2014*, were recorded within the PL.

4.2.7 Fauna habitat

Incidental fauna observations recorded during the field survey are provided within Appendix B. Fauna species observed predominantly comprised bird species recorded opportunistically. In addition to habitat for threatened fauna discussed in the 'threatened species' section above, the PL contained a diversity of fauna habitat features for least concern (NC Act) fauna, including:

- extensive alluvial soils forming deep cracks, which provide habitat for cryptic reptiles and small mammals
- decorticating bark, which provide potential habitat for microchiropteran bats and arboreal reptiles
- dense leaf litter for cryptic reptiles and small mammals; and
- bird nests.

4.2.8 Matters of State Environmental Significance

Seven MSES have been identified as known or likely to occur within the PL (Table 4). These MSES are associated with habitat for threatened and special least concern species, regulated vegetation, connectivity areas and the Channel Country SEA.

Table 4 MSES summary

MSES	Report section	Area within the PL (ha)
Regulated vegetation: • within 100 m of a Vegetation Management Wetland • intersecting a watercourse	Section 4.2.3 Section 4.2.4	54.7 7.0 km of DNRME mapped vegetation management watercourses and drainage features. A maximum estimated area of regulated vegetation - intersecting a watercourse was 174.2 ha (refer to Section 4.2.4)
Connectivity areas	Section 4.2.5	4,851.1
Wetlands and watercourses - High Ecological Significance wetlands	Section 4.2.3	35.9
Designated precinct in the Channel Country SEA	Section 4.2.5	4,851.1
Protected wildlife habitat for: grey grasswren, listed as endangered Short-beaked echidna, listed as special least concern. A further four special least concern bird species are considered likely to occur within the PL; however, only short-beaked echidna is listed as a MSES under the EO Regulation	Section 4.2.2	 224.3 4,851.1
Protected areas	N/a	0
Highly protected zones of State marine parks	N/a	0
Fish habitat areas	N/a	0
Waterway providing for fish passage	Section 4.2.4	0
Marine plants	N/a	0
Legally secured offset areas	N/a	0

5 Impacts and mitigation

5.1 Potential impacts

The proposed works are for the construction of ten petroleum well leases and associated infrastructure including borrow pits, pipeline right of ways and access tracks. The location and extent of disturbance footprints are under investigation and are preliminary in nature. The preliminary disturbance footprints for each of the ten wells and associated infrastructure are identified within Table 5.

The preliminary disturbance footprint comprises a total area of 115.5 ha, which includes 39 ha to be rehabilitated post-construction and 76.5 ha to be rehabilitated at the end of the asset's life. Preliminary disturbance footprints are conservative and, for the purposes of impact assessment, a large proportion of the proposed disturbance footprint has been located within 'high constraint' areas, where appropriate (refer to Section 5.2 and 5.3). As such, the assessment of impacts within this report takes a precautionary approach and simulates a conservative disturbance scenario.

Potential impacts arising from the proposed works include:

- removal of native vegetation
- removal of fauna habitat for native species, including potentially suitable habitat for threatened species
- potential injury and death of native fauna associated with vegetation removal and operational activities
- modification of overland flow/hydrology
- sedimentation and erosion, particularly during flood events; and
- introduction and spread of pest species.

Table 5 Proposed disturbance footprint assumptions per well

Infrastructure type	Surface disturbance (ha)	Area rehabilitated post-construction (ha)	Area for final rehabilitation at end of life (ha)
Well pad	1.6	0	1.6
Flowline	4.8 (16 m flowline disturbance width)	3.9	0.9
Access track	3.9 (13 m unsealed access track width)	0	3.9
Borrow pits	1.25	0	1.25
Total per well	**11.55**	**3.9**	**7.65**

5.2 Significant residual impact assessment

5.2.1 Matters of National Environmental Significance

The field assessment identified that the PL contains habitat for grey grasswren. In light of the uncertainty regarding the subspecies status of the Cooper Creek population (refer to Section 4.1.1), it has been assumed to comprise the EPBC Act listed endangered bulloo subspecies. The Australian Government has produced the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (2013) (MNES Referral Guidelines) to assist in determining if residual impacts associated with a proposed development requires referral. An assessment against the MNES Referral Guidelines is provided in Appendix D. In summary it was determined that the PL is likely to provide habitat for the grey grasswren. The proposed works are considered unlikely to result in a significant impact to the species as:

- The proposed works will require the clearing of approximately 11.55 ha of grey grasswren habitat, which represents 5.2% of the grey grasswren habitat identified within the PL. Given suitable habitat for the species is widely available within the PL and the surrounding Cooper Creek floodplain, the proposed works are unlikely to impact the local population of the species.
- Lignum, which is the key habitat feature for the species, rapidly re-establishes within disturbed areas following flood events (Dawson *et al*. 2017; Higgisson, Briggs & Dyer 2018). Approximately 3.9 ha of the disturbance footprint is proposed for rehabilitation, which includes pipeline right of ways, sump pits and a proportion of the lease areas. These areas are expected to re-establish to suitable habitat for grey grasswren.
- Management measures have been identified to mitigate impacts on the species habitat (Section 5.3.3).

In addition, habitat for four migratory bird species was identified within the PL. Significant impact for these species is unlikely as the PL is not considered to meet the definition of 'important habitat' for these species (Section 4.1.2).

5.2.2 Matters of State Environmental Significance

Assessments against the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (SRI Guideline) (DES 2014) were conducted to determine if offsets are likely to be required for impacts to MSES (Appendix E). SRI assessments determined that SRI to all MSES known or likely to occur within with PL is unlikely. In summary it was determined that the proposed works will require the clearing of up to approximately:

- 11.55 ha of grey grasswren habitat, which represents 5.2% of the species habitat identified within the PL. A SRI to the species is unlikely for the reasons identified within Section 5.2.1.
- 115.5 ha of echidna habitat, which represents 2.4% of the species habitat identified within the PL. A SRI to the species is unlikely as:
  - The proposed clearing comprises a negligible proportion of the species habitat, which is widely available within and surrounding the PL.
  - Management measures have been identified to mitigate impacts on the species habitat (Section 5.3).
  - The proposed clearing will not increase fragmentation of the species habitat.
- 1.3 ha of MSES regulated vegetation – within 100 m of a Vegetation Management Wetland, which represents 2.4% of this MSES identified within the PL. This disturbance area is based on an assumed maximum disturbance of this MSES. The proposed disturbance is less than the residual impact criteria

for both linear and non-linear infrastructure (refer to Section 5.3.2). As such, a SRI to this MSES is unlikely.

- 0.9 ha of High Ecological Significance wetland, which represents 2.4% of this MSES identified within the PL. This disturbance area is based on an assumed maximum disturbance of this MSES. A significant residual impact to this MSES is unlikely as:
  - During detailed design stages, infrastructure will be micro-sited to minimise impacts to HES wetlands.
  - Construction and rehabilitation works will be timed to occur outside of flood periods, which will minimise impacts on wetland values.
  - Approximately 0.3 ha of disturbed area will be immediately rehabilitated post-disturbance, which includes pipeline Right of Ways and a portion of disturbance for well leases and sump pits. Rehabilitation is expected to rapidly reinstate a vegetation community consistent with the pre-disturbance vegetation.
  - Vegetation communities within the disturbance footprint contain no to very limited woody vegetation, which minimises impact to soil stability.
  - The proposed works are unlikely to affect the hydrological processes or water quality of the wetland.
- 115.5 ha of a 'designated precinct' within the Channel Country Strategic Environmental Area, which represents 2.4% of this MSES identified within the PL. The proposed works are unlikely to have a SRI on any environmental attribute of the Channel Country SEA. Environmental attributes associated with the Channel Country SEA are largely associated with water quality, hydrologic and geomorphic processes and beneficial flooding, which are unlikely to be significantly affected by the proposed works. Furthermore, the proposed works will not impact the suitability of land in the area to be used for grazing, which is the primary land use for the PL.
- 115.5 ha of a connectivity area, which represents 2.4% of this MSES identified within the PL. While the Landscape Fragmentation and Connectivity Tool (DES 2018) could not be used as the location of disturbance has not been confirmed, the scale of the disturbance in relation to the extensive areas of remnant regional ecosystem in the surrounding region result in an unlikely SRI on Connectivity.

In addition, areas of regulated vegetation – intersecting a watercourse may require clearing. The project will avoid the placement of non-linear infrastructure within the defined distance of the defining bank of regulated vegetation intersecting a watercourse (refer to Section 5.3.2), where practicable. Where disturbance occurs within the defined distance of a Vegetation Management Watercourses and Drainage Features and within 5 m of the defining bank, it will comply with SRI clearing limits. As such, a SRI to this MSES is unlikely.

5.3 Mitigation measures

The EPBC Act Environmental Offsets Policy (DSEWPC 2012) and Queensland Environmental Offsets Policy (DES 2019) require proponents to take all reasonable avoidance and mitigation measures to remove or reduce potential impact to MNES and MSES. The following section identifies measures to avoid, minimise and mitigate potential ecological impacts associated with the proposed petroleum infrastructure. Application of these measures is likely to avoid significant residual impact to MNES and MSES.

5.3.1 Impact avoidance

A risk-based approach has been used to identify environmentally constrained areas within the PL (Figure 6). Where possible, avoidance of disturbance to environmentally constrained areas is preferred. The level of environmental constraint has been determined using the following framework.

High constraint

The proposed petroleum activities within high constraint areas have substantial potential to result in a SRI. High constraint areas require targeted impact avoidance, minimisation and mitigation measures to be implemented to avoid a SRI, which are in addition to the typical ecological management measures employed. Targeted management measures to avoid a SRI are identified within Sections 5.3.2 and 5.3.3. High constraint areas within the PL have been identified as areas that:

- Are located within Queensland Government mapped MSES regulated vegetation – within 100 m of a Vegetation Management Wetland; and
- Provide habitat for threatened species listed under the EPBC Act and/or NC Act. Of relevance to the PL, this includes grey grasswren, which inhabit REs dominated by lignum (*Duma florulenta*) and swamp canegrass (*Eragrostis australasica*).

Areas that meet these criteria are shown in Figure 6. High constraint areas also provide habitat for non-threatened MNES and special least concern fauna species, including the sharp-tailed sandpiper, glossy ibis and gull-billed tern.

Moderate constraint

The proposed petroleum activities are unlikely to result in an SRI within moderate constraint areas provided general ecological management measures, typical for the petroleum activities, are employed. Moderate constraint areas within the PL have been identified as areas containing Queensland Government mapped regulated vegetation – within 100 m of a Vegetation Management Wetland (Section 4.2.3), which have not already been included in the 'high constraint' areas; or, provide habitat for a threatened MNES/MSES species, which have not already been included in the 'high constraint' areas.

Low constraint

The proposed petroleum activities within low constraint areas have limited potential to result in a SRI. Of relevance to the PL, these areas include all other REs that provide habitat for MNES/MSES species, including fork-tailed swift and short-beaked echidna.

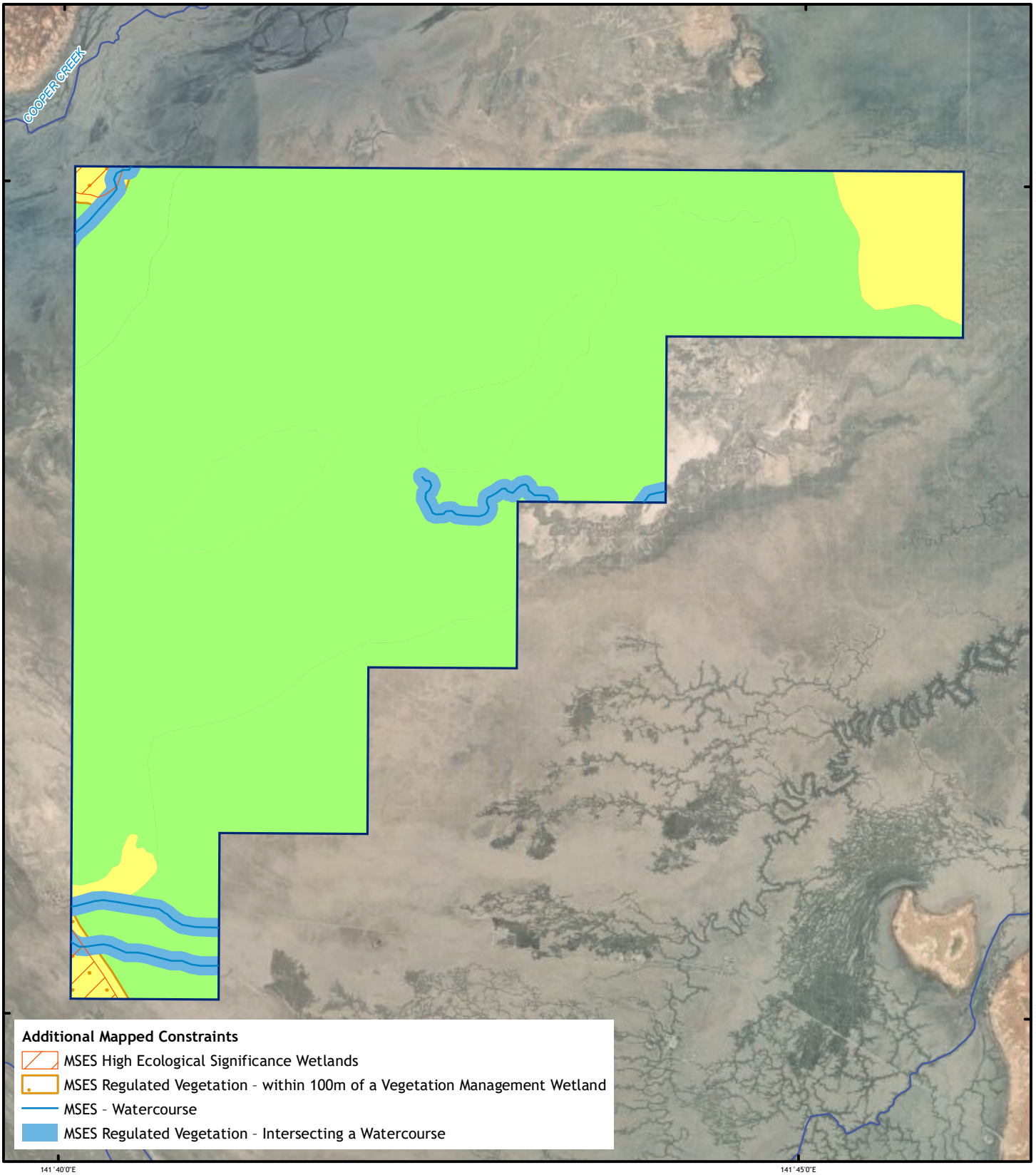
Additional mapped constraints

The high, moderate and low constraint areas discussed above are based on ecological values ground-truthed within the PL. In addition to ground-truthed values, the PL is mapped to contain environmental constraints that represent legislative 'triggers'. Should works be proposed in these mapped legislative trigger areas, additional assessment may be required to demonstrate the mapped environmental values

are not present and/or inform an assessment by the relevant regulatory agency. The mapped additional legislative considerations within the PL include:

- MSES High Ecological Significance wetlands; and
- MSES regulated vegetation - intersecting a watercourse, which due to the nature of braided river channels throughout the Cooper Creek floodplain are likely to be inaccurate in their location.

In addition, the PL is entirely mapped within the Channel Country SEA. A SRI to a SEA may arise where a resource activity impacts a feature, quality, characteristic or other attribute of the area or the land use suitability (i.e. for grazing). Any future resource activity within the SEA will require a regional interest development approval (RIDA) issued under section 53 of the RPI Act. The RIDA application would assess the impacts of the proposed resource activity on the environmental attributes associated with the Channel Country SEA and consider suitable measures to avoid, minimise or mitigate impacts to the SEA such that a SRI does not occur.



Legend

- Road
- Major Watercourse
- Petroleum Lease

Constraint Areas

- High
- Moderate
- Low

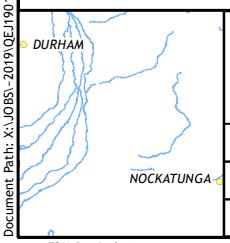
N

Scale 1:59,800 (A4)

0 1 2

Kilometres

Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator



Notes:
Aerial Imagery: © ESRI 2019
Petroleum Leases: © DNRME 2019
MSES Regulated Vegetation: DNRME 2017
MSES High Ecological Significance: © DNRME 2017
Watercourse: © Geoscience Australia 2018
MSES Regulated Vegetation wetlands: © DNRME 2019

Rev	Description	Drawn	Approved	Date
2	Issued for Use	DL	JVO	26/02/2021
1	Issued for Use	DL	JVO	19/02/2021

FIGURE 6: ENVIRONMENTAL CONSTRAINTS - PL 1058

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Map Number	Job Number	Rev
1 of 1	QEJ19010	2

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5.3.2 Impact minimisation

Significant Residual Impact Guideline Clearing Limits – Regulated Vegetation

The **SRI Guideline** (DEHP 2014) provides criteria for identifying when an impact to a MSES may be deemed to be significant. The SRI guideline contains tests and criteria that provide a trigger for when Environmental Offsets may be required.

The SRI Guideline provides test criteria for two MSES occurring within the PL, namely:

- Regulated vegetation:
    - within 100 m of a Vegetation Management Wetland; and
    - intersecting a watercourse.

Section 2.1 of the SRI Guideline states that for an SRI to occur for these MSES, proposed disturbance must exceed clearing area and width limits (refer to Table 6), and clearing must occur within a specific distance of the 'defining bank' of the wetland or watercourse.

For the purposes of this SRI assessment, the following rules and assumptions have been applied:

<u>For clearing in the portion of a regional ecosystem that lies within a mapped wetland:</u>

1. Vegetation Management Wetlands are as per the Regulated Vegetation Management Map to the extent the regional ecosystem contains remnant vegetation.
2. The 'defining bank' of a VMA wetland is as per the map (i.e. the defining bank is the mapped polygon edge of the wetland).

<u>For clearing in a regional ecosystem that is within the defined distance of a watercourse:</u>

1. Vegetation Management Watercourses are as per the Vegetation Management Watercourse and Drainage Feature Map (as per Section 20AA of the VMA) to the extent the regional RE contains remnant vegetation.
2. Defined distance from the defining banks of Vegetation Management Watercourses is as per the Queensland Environmental Offsets Policy V1.9 (DES 2020) using stream order as per the Vegetation Management Watercourse and Drainage Feature Map.
3. The location of defining banks for Vegetation Management Watercourses was estimated by buffering the centreline of Vegetation Management Watercourses by 25 m on each side (i.e. this assumes a typical watercourse channel width of 50 m).

The maximum area of regulated vegetation - intersecting a watercourse was estimated by buffering the Vegetation Management Watercourse and Drainage Feature Map by the defined distance as per the Queensland Environmental Offsets Policy V1.9 (DES 2020), using stream order as per the Vegetation Management Watercourse and Drainage Feature Map.

Other MNES and MSES do not have prescribed clearing area test criteria within the SRI Guideline (DEHP 2014) or the Commonwealth MNES Significant Impact Guidelines (DotE 2013).

Table 6 Significant Residual Impact test criteria and impact minimisation measures

MSES	Infrastructure type	SRI test criteria (DEHP 2014)	Impact minimisation for the project
Regulated vegetation - within 100 m of a Vegetation Management Wetland	Linear	20 m wide in a sparse or very sparse RE; or 25 m wide in a grassland RE. Clearing must also occur within the wetland or within 50 m of the defining bank to trigger a SRI (as described in Section 5.3.2).	Linear infrastructure will be located outside Vegetation Management Wetlands, and greater than 50 m from the defining bank, where practicable. Where disturbance occurs in Vegetation Management Wetlands and within 50 m of the defining bank, it will comply with SRI clearing limits.
	Non-linear	2 ha within a sparse or very sparse RE; or 5 ha within in a grassland RE. Clearing must also occur within the wetland or within 50 m of the defining bank to trigger a SRI (as described in Section 5.3.2).	Non-linear infrastructure will be located outside Vegetation Management Wetlands, and greater than 50 m from the defining bank, where practicable. Where disturbance occurs in Vegetation Management Wetlands and within 50 m of the defining bank, it will comply with SRI clearing limits.
Regulated vegetation - intersecting a watercourse	Linear	20 m wide in a sparse or very sparse RE; or 25 m wide in a grassland RE. Clearing must also occur within the defined distance or within 5 m of the defining bank to trigger a SRI (as described in Section 5.3.2).	Linear infrastructure will be located outside the defined distance from the defining banks of Vegetation Management Watercourses and Drainage Features, where practicable. Where disturbance occurs within the defined distance of Vegetation Management Watercourses and Drainage Features and within 5 m of the defining bank, it will comply with SRI clearing limits.
	Non-linear	2 ha within a sparse or very sparse RE; or 5 ha within a grassland RE. Clearing must also occur within the defined distance or within 5 m of the defining bank to trigger a SRI (as described in Section 5.3.2).	Non-linear infrastructure will be located outside the defined distance from the defining banks of Vegetation Management Watercourses and Drainage Features, where practicable. Where disturbance occurs within the defined distance of Vegetation Management Watercourses and Drainage Features and within 5 m of the defining bank, it will comply with SRI clearing limits.

Siting and co-location of linear infrastructure

Co-location of linear infrastructure including access tracks and flowlines, potentially reduces the total disturbance footprint and reduces habitat fragmentation. When assessing route optimisation Santos may consider combining access track and flowlines into a single disturbance footprint and/or co-locating linear infrastructure within existing disturbed areas, where possible. The sparse nature of vegetation may also enable areas of woody vegetation to be avoided by linear infrastructure.

5.3.3 Impact mitigation

Management measures to further mitigate ecological impacts and avoid SRI resulting from the proposed development are identified within Table 7.

Table 7 Impact mitigation measures

Impact mitigation measures
During construction
Vegetation to be retained adjacent to proposed disturbance areas will be suitably demarcated where required (e.g. using marker pegs, flagging tape).
Clearing of vegetation is to be undertaken by a suitably qualified contractor.
Disturbance activities will be excluded from areas of retained vegetation.
Erosion and sediment control measures implemented where appropriate.
Hygiene protocols implemented as appropriate to minimise the introduction, spread and persistence of weeds, pest plants, animals and pathogens.
Measures implemented to reduce risks to fauna from entrapment and injury in pipes and excavations, including: • Use of a qualified fauna spotter/catcher where required. • Pipes capped to prevent fauna entrapment during construction or after abandonment. • Facilities (e.g. borrow pits, well cellars) are designed and constructed as far as practicable to minimise impacts to fauna. • Borrow pits are not established in locations which pose an unacceptable hazard to livestock. • Sumps, mud pits and other pits holding fluid are fenced as appropriate to minimise fauna (medium to large) and livestock access. • Minimising the period trenches remain open to as short as reasonably practicable. • Regular inspections of open excavations / trenches and prior to backfilling. • Provision of escape ramps and refuge material for fauna that do enter trenches. • Hollow logs (located on ground) within disturbance areas retained and shifted to adjacent undisturbed areas.

Impact mitigation measures

Post construction

Flowline Right of Ways will be reinstated as soon as practicable following gathering line / pipeline installation. The rehabilitation works are expected to mitigate the majority of impacts resulting from disturbance for flowline construction. Rehabilitation aims to reshape and stabilise disturbed areas to provide appropriate site conditions to facilitate natural revegetation processes, and will include the following activities (where appropriate):

- ripping of areas of compacted soil (except on sensitive soils / environments).
- respreading of stockpiled topsoil, vegetation and seed stock (where available) to facilitate natural revegetation; and
- restoration of natural landform contours.

Final rehabilitation of disturbed areas would be undertaken to achieve the final rehabilitation criteria conditions specified in the relevant Environmental Authority.

Threatened species specific mitigation measures

- Where threatened species nests are identified to be present, disturbance should be avoided.
- If disturbance cannot be avoided, clearing of the nest and a surrounding area should be postponed until after the relevant breeding season and/or incubation period.
- Clearing must not occur while the nest is active, with adults, eggs or nestlings.

Grey grasswren:

- Field and desktop based assessments will be undertaken to preferentially place infrastructure/disturbance outside of areas that are likely to represent grey grasswren habitat (where practicable).
- Disturbance of areas that are likely to represent grey grasswren habitat will be preferentially timed to occur outside of the breeding season for the species where practical (breeding behaviour is poorly known but is thought to occur from late July to August (DEE 2019)).
- Typical characteristics of grey grasswren nests are semi-domed nests that are lined with soft grass, plant down, rootlet and sometimes a few feathers (DEE 2019). The species typically nests in lignum and less commonly swamp canegrass (DotE 2014; DEE 2019).
- The DEE (2019) identifies the likely incubation period of eggs to be about 13 to 15 days and a nestling period to be about 12 to 14 days.

Wetland specific mitigation measures

Time construction and rehabilitation activities to occur outside of flood periods.

Where possible, areas to be rehabilitated should be immediately rehabilitated post-disturbance. Rehabilitation areas may include pipeline Right of Ways and a portion of disturbance for well leases and sump pits.

Rehabilitation activities will reinstate natural landform contours to ensure natural surface water flows are not impacted.

Topsoil stockpiles separated from subsoil and maintained to preserve the seedbank (where practicable).

Compaction of topsoil stockpiles avoided.

The topsoil contains an existing seed bank, which will accelerate rehabilitation following a flood event after landform reinstatement.

A topsoil stripping depth of up to 200 mm is generally appropriate to retain the seed bank.

Soils should be replaced in order of excavation wherever practicable to restore subsurface soil horizons.

Impact mitigation measures
No drilling is proposed in waterway channels. Activities to be located away from watercourses and wetlands (GES/HES) wherever practicable. Where activities are to be undertaken in or near HES/GES wetlands, appropriate review, assessment and mitigation measures are implemented to ensure surface water flows are maintained.
Access tracks, infrastructure and seismic lines located, prepared and constructed to maintain pre-existing surface water flows. Culverts and floodways installed where required.
Fuel, oil and chemical storage and handling undertaken in accordance with Australian standards and guidelines (i.e. in bunded areas) and in small volumes wherever practicable. Spill response equipment and materials kept on site and in operational vehicles (where appropriate). In the event of expected flooding, non-essential items/facilities such as chemicals, fuel and oil storages and waste receptacles removed from areas at risk of inundation (where appropriate / safe to do so).
Where possible, restrict the width of linear infrastructure corridors (access tracks and pipeline Right of Ways) to the minimum width practicable at waterway channel crossings. Preferentially select dry crossing sites for linear infrastructure with minimal earthworks requirements. Pre-existing areas of disturbance used to place infrastructure or seismic lines wherever practicable.

5.4 Cumulative impacts

For the purposes of undertaking a cumulative impact assessment, disturbances within the PL have been defined according to:

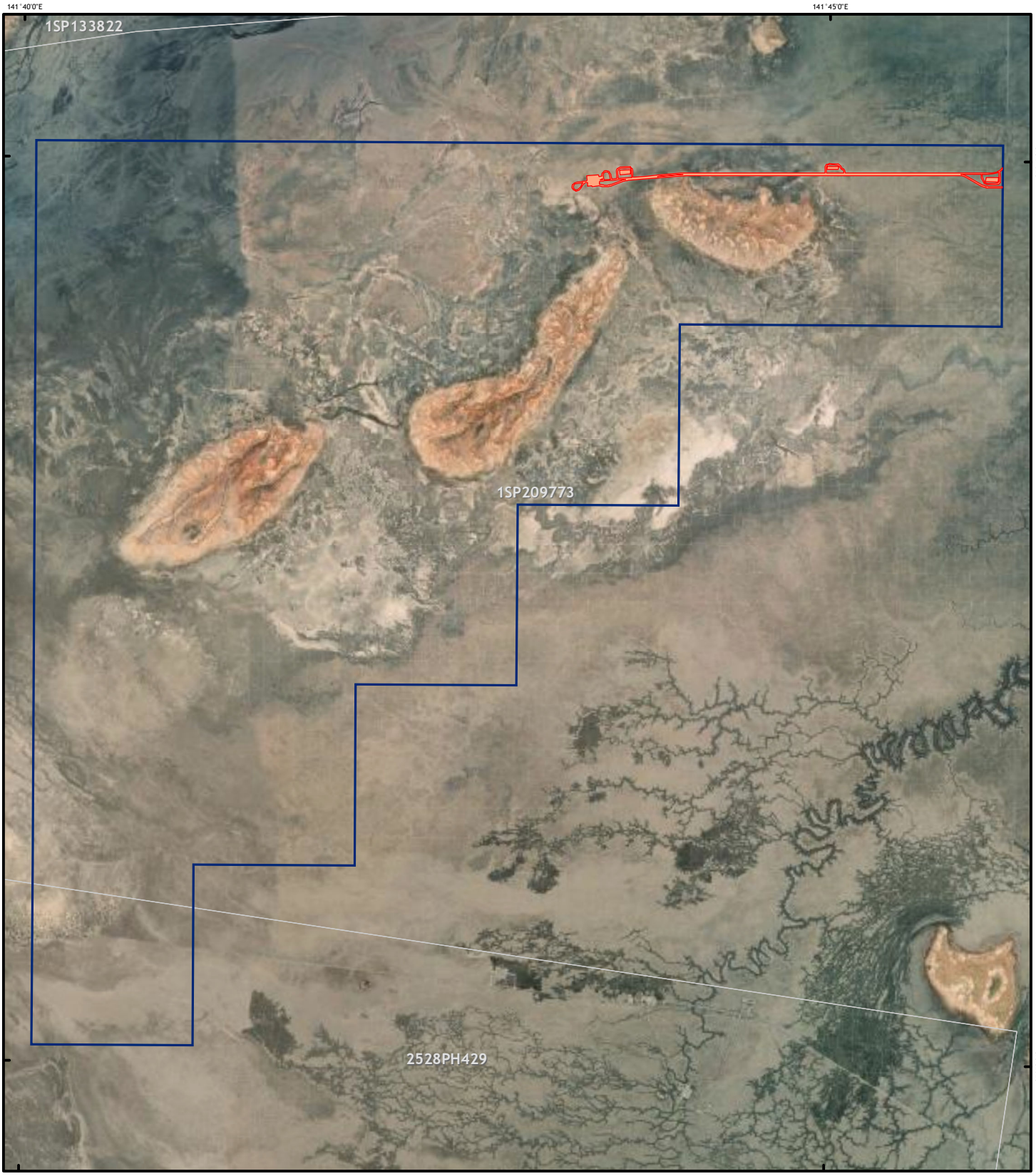
1. **Existing disturbance**: comprises a total area of 16.4 ha, which includes existing well leases, access tracks, flowlines, borrow pits and other disturbance footprints for supporting infrastructure[2].
2. **Proposed disturbance**: comprises a total area of 115.5 ha. Approximately 39 ha of this area is proposed to be rehabilitated immediately post-construction and 76.5 ha to be rehabilitated at the end of the asset's life.

The existing disturbance and proposed disturbance areas for each MNES and MSES identified within the PL are summarised within Table 8 and depicted within Figure 7.

[2] Existing disturbance footprints are based on data supplied by Santos on 28 November 2019. Where supplied disturbance feature data comprised point, or line information, a disturbance polygon was created by assuming a 16m wide corridor for pipelines, 6m wide corridor for access tracks and 1.6 ha disturbance area for well leases.

Table 8 MNES and MSES cumulative impact disturbance area

MNES/MSES	Existing disturbance (ha)	Proposed disturbance (ha)
MNES		
Grey grasswren habitat, listed as endangered	4.9	11.55
MSES		
Regulated vegetation: • Intersecting a watercourse • Within 100 m of a Vegetation Management Wetland	 0 0	 N/A 1.3
Connectivity areas	16.4	115.5
Wetlands and watercourses - High Ecological Significance wetlands	0	0.9
Designated precinct in the Channel Country SEA	16.4	115.5
Protected wildlife habitat for: • Grey grasswren, listed as endangered • Short-beaked echidna, listed as special least concern. A further four special least concern bird species are considered likely to occur within the PL; however, only short-beaked echidna is listed as a MSES under the EO Regulation.	 4.9 16.4	 11.55 115.5
Protected areas	0	0
Highly protected zones of State marine parks	0	0
Fish habitat areas	0	0
Waterway providing for fish passage	0	0
Marine plants	0	0
Legally secured offset areas	0	0



Legend

- Petroleum Lease
- Cadastre
- Existing Disturbance

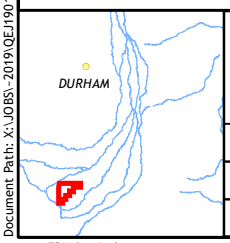
N

Scale 1:55,000 (A4)

0 1 2 3

Kilometres

Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator



Notes:
Aerial Imagery: © ESRI 2019
Cadastre: © DNRME 2019
Petroleum Lease: © DNRME 2019
MSES: © DNRME 2017

Rev	Description	Drawn	Approved	Date
2	Issued for Use	DL	JVO	26/02/2021
1	Issued for Use	DL	JVO	19/02/2021

FIGURE 7: CUMULATIVE IMPACT - PL 1058

Ecological Assessment Report
Santos

Map Number	Job Number	Rev
1 of 1	QEJ19010	2

Document Path: X:\JOBS\-2019\QEJ19010\GIS\QEJ19010_EAR_Disturbance.mxd

6 Legislative compliance

6.1 Summary

6.2 Commonwealth legislation

6.2.1 Environment Protection and Biodiversity Conservation Act 1999

Preliminary assessments against the Australian Government MNES Referral Guidelines (DotE 2013) were conducted to assist in determining if residual impacts associated with a proposed development requires referral. In summary, it was determined that the proposed works are unlikely to result in a significant impact to MNES. Based on the findings of the preliminary assessment against the MNES Referral Guidelines, the proposed development is unlikely to require a referral to the DAWE. Significant Impact assessments are summarised within Section 5.2.1 and provided in detail in Appendix D.

6.3 State legislation

6.3.1 Environmental Offsets Act 2014

Assessments against the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DES 2014) were conducted to determine if offsets are likely to be required for impact to MSES. In summary, SRI assessments determined that SRI to all MSES known or likely to occur within with the PL is unlikely. As such, environmental offsets under the EO Act are unlikely to be required for the project. SRI assessments are summarised within Section 5.2.2 and provided in detail in Appendix E.

6.3.2 Environmental Protection Act 1994

No Category A, B or C ESAs were identified within the PL during the desktop and field assessments. Ground-truthing of watercourses as defined under the EP Act was not conducted (Section 4.2.4).

6.3.2.1 NC Act Protected Plants

The PL does not contain mapped 'high risk' areas, and as such the provisions of the *Flora Survey Guidelines - Protected Plants* do not apply. However, any threatened plant occurring 'in the wild' cannot be knowingly cleared or impacted without a clearing permit. If a protected plant is identified within the disturbance footprint and requires removal, a clearing permit will be needed.

7 Conclusion

Santos is proposing new petroleum activities within PL 1058 (Bearcat). Desktop and field assessments were conducted to identify environmental values that are known, or are likely, to occur within the PL.

MNES identified within the PL include:

- One species, grey grasswren, listed as endangered under the EPBC Act; and
- Four species listed as migratory under the EPBC Act.

MSES identified within the PL include:

- One species, grey grasswren, listed as endangered under the NC Act
- One species, echidna, listed as special least concern under the NC Act
- Regulated vegetation – within 100 m of a Vegetation Management Wetland
- Regulated vegetation – intersecting a watercourse
- High Ecological Significance wetlands
- Channel Country SEA; and
- Connectivity areas.

No Category A, B or C ESAs under the EP Act occur within the PL. Referable wetlands (High Ecological Significance Wetlands) under the EP Act were identified within the PL.

Commonwealth and Queensland Government legislative frameworks require proponents to take all reasonable avoidance and mitigation measures to remove or reduce potential impact to MNES and MSES (DSEWPC 2012; DES 2019). The mitigation hierarchy of avoid, minimise, mitigate and offset is to be applied in the design process for the proposed petroleum infrastructure. After the application of avoidance, minimisation and mitigation measures it was determined that the proposed development is unlikely to have a significant residual impact on MNES and MSES occurring within the PL.

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Appendix A Database search results

WildNet Records supplied by the Department of Environment and Science (2019)

Kingdom	Family	Scientific name	Common name	NC Act	EPBC Act	Record Date	Locality	Latitude	Longitude
Animalia	Cacatuidae	Lophochroa leadbeateri	Major Mitchell's cockatoo	V	<Null>	1/09/1919	Nappa Merrie HS area	-27.59833	141.1025
Animalia	Laridae	Gelochelidon nilotica	gull-billed tern	SL	<Null>	12/06/1976	LAKE PURE; 80 MLS NORTH OF NAPPA MERRIE	-27.02349	141.17623
Animalia	Laridae	Gelochelidon nilotica	gull-billed tern	SL	<Null>	1/06/1976	LAKE PURE-COOPER CREEK-KARMONA MIDDLE	-27.20682	141.66789
Animalia	Scolopacidae	Calidris acuminata	sharp-tailed sandpiper	SL	<Null>	25/08/1994	Coothero Waterhole- Nockatunga Station	-27.72628	142.71652
Animalia	Tachyglossidae	Tachyglossus aculeatus	short-beaked echidna	SL	<Null>	3/09/2011	QSN3 Wallumbilla - Ballera	-27.14302	142.50749
Animalia	Threskiornithidae	Plegadis falcinellus	glossy ibis	SL	<Null>	1/06/1976	COOPER CREEK - NAPPA MERRIE - MIDDLE	-27.58182	141.2929
Animalia	Threskiornithidae	Plegadis falcinellus	glossy ibis	SL	<Null>	28/10/2012	Wilson River Campground, Noccundra Waterhole, Noccundra, SWQ.	-27.8214	142.58994
Plantae	Asteraceae	Rhodanthe rufescens	<Null>	NT	<Null>	11/08/1987	Noccundra about 130km WNW of Thargomindah.	-27.80681	142.59289

Queensland Government

Department of Environment and Science

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest
pl: 1058

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 1994). 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: Planning.Support@des.qld.gov.au

Disclaimer

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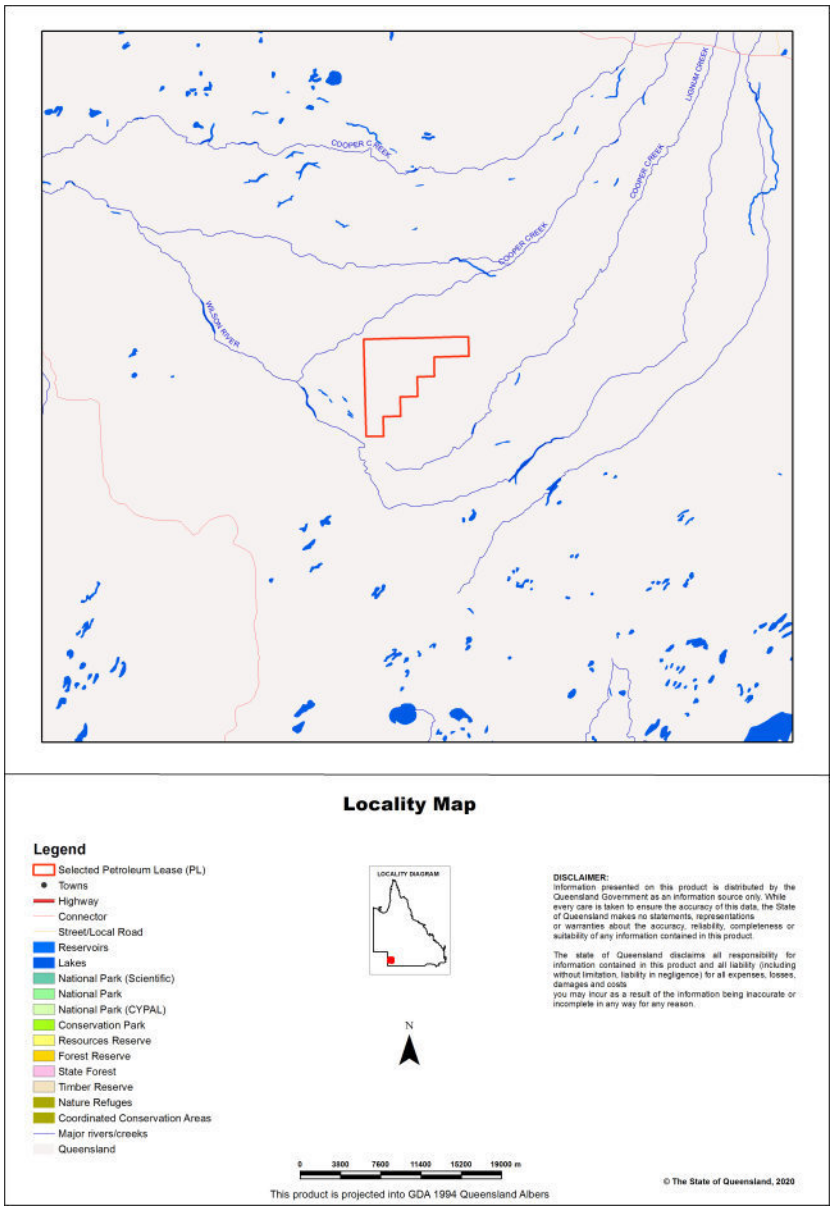
Table of Contents

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 pl: 1058

Size (ha)	4,854.4
Local Government(s)	Bulloo Shire
Bioregion(s)	Channel Country
Subregion(s)	Cooper - Diamantina Plains
Catchment(s)	Cooper Creek



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 planning and development assessment decision-making. Its primary purpose is to support 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. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts 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	0.0 ha	0.0 %
1b Protected Areas- nature refuges	0.0 ha	0.0 %
2 State Marine Parks- highly protected zones	0.0 ha	0.0 %
3 Fish habitat areas (A and B areas)	0.0 ha	0.0 %
4 Strategic Environmental Areas (SEA)	4854.4 ha	100.0%
5 High Ecological Significance wetlands on the map of Referable Wetlands	35.83 ha	0.7%
6a High Ecological Value (HEV) wetlands	0.0 ha	0.0 %
6b High Ecological Value (HEV) waterways **	0.0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	0.0 ha	0.0 %
7b Special least concern animals	0.0 ha	0.0 %
7c i Koala habitat area - core (SEQ)	0.0 ha	0.0 %
7c ii Koala habitat area - locally refined (SEQ)	0.0 ha	0.0 %
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	0.0 ha	0.0 %
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	0.0 ha	0.0 %
8c Regulated Vegetation - Category R (GBR riverine regrowth)	0.0 ha	0.0 %
8d Regulated Vegetation - Essential habitat	0.0 ha	0.0 %
8e Regulated Vegetation - intersecting a watercourse **	7.0 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	54.7 ha	1.1%
9a Legally secured offset areas- offset register areas	0.0 ha	0.0 %
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0.0 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)

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)

Regional planning interest type	Region	Status
Strategic Environmental Area - Designated Precinct	Channel Country	Current - June 2014

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

Natural wetlands that are 'High Ecological Significance' (HES) on the Map of Queensland Wetland Environmental Values are present.

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

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii		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
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Melaleuca irbyana		E	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	V	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Taudactylus pleione	Kroombit tinkerfrog	E	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)

**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)** 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	RVM rule
B	7242	2

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

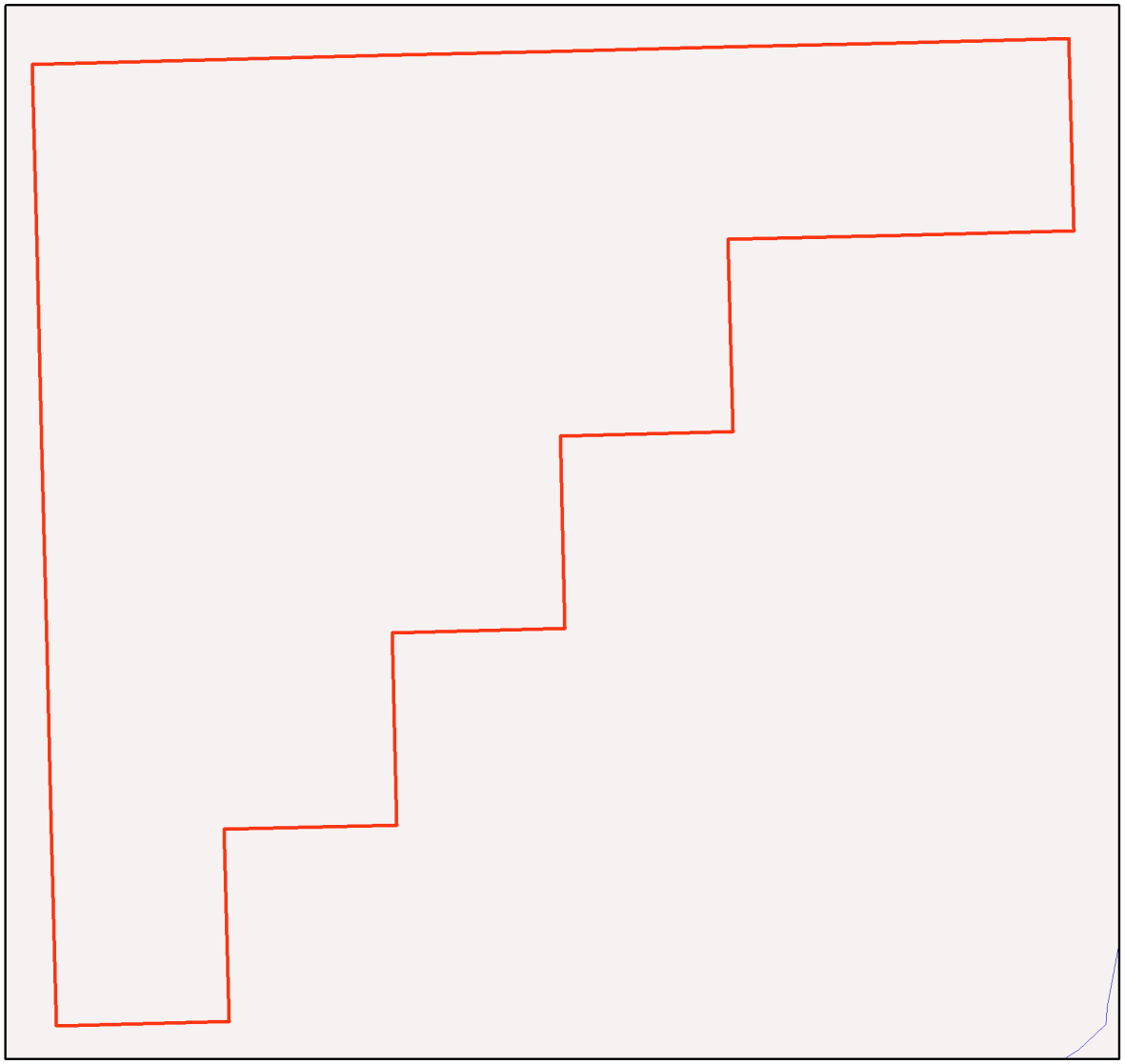
(no results)

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

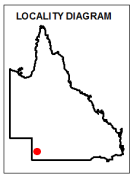


MSES - State Conservation Areas

Area of Interest

- Selected Petroleum Lease (PL)
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)

LOCALITY DIAGRAM

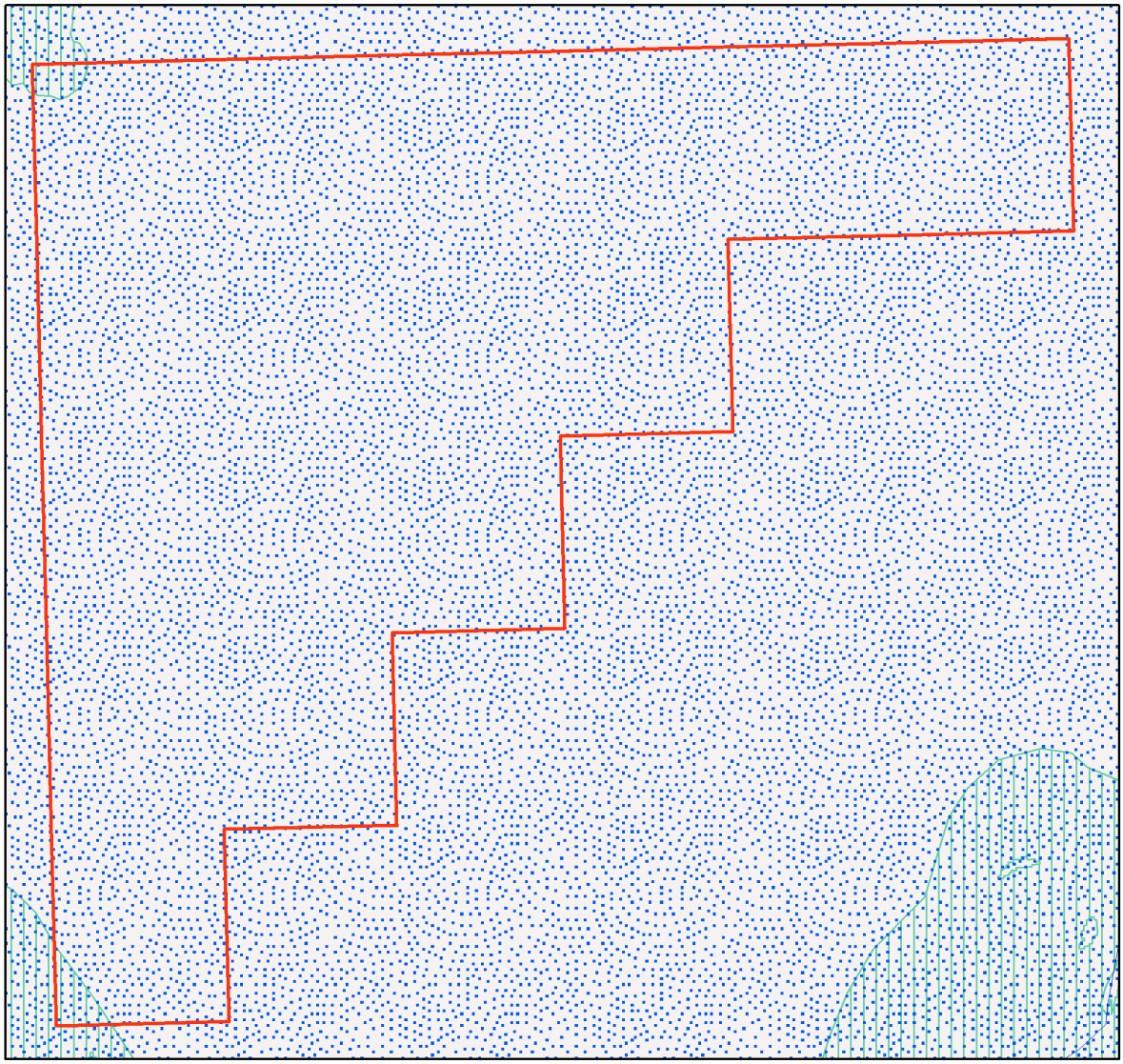


N

0 575 1150 1725 2300 2875 m

This product is projected into GDA 1994 Queensland Albers

Map 2 - MSES - Wetlands and Waterways

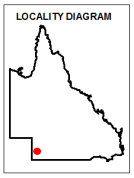


MSES - Wetlands and Waterways

Area of Interest

- Selected Petroleum Lease (PL)
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Declared high ecological value waters (watercourse)
- Strategic environmental area (designated precinct)
- Declared high ecological value waters (wetland)
- High ecological significance wetlands

LOCALITY DIAGRAM



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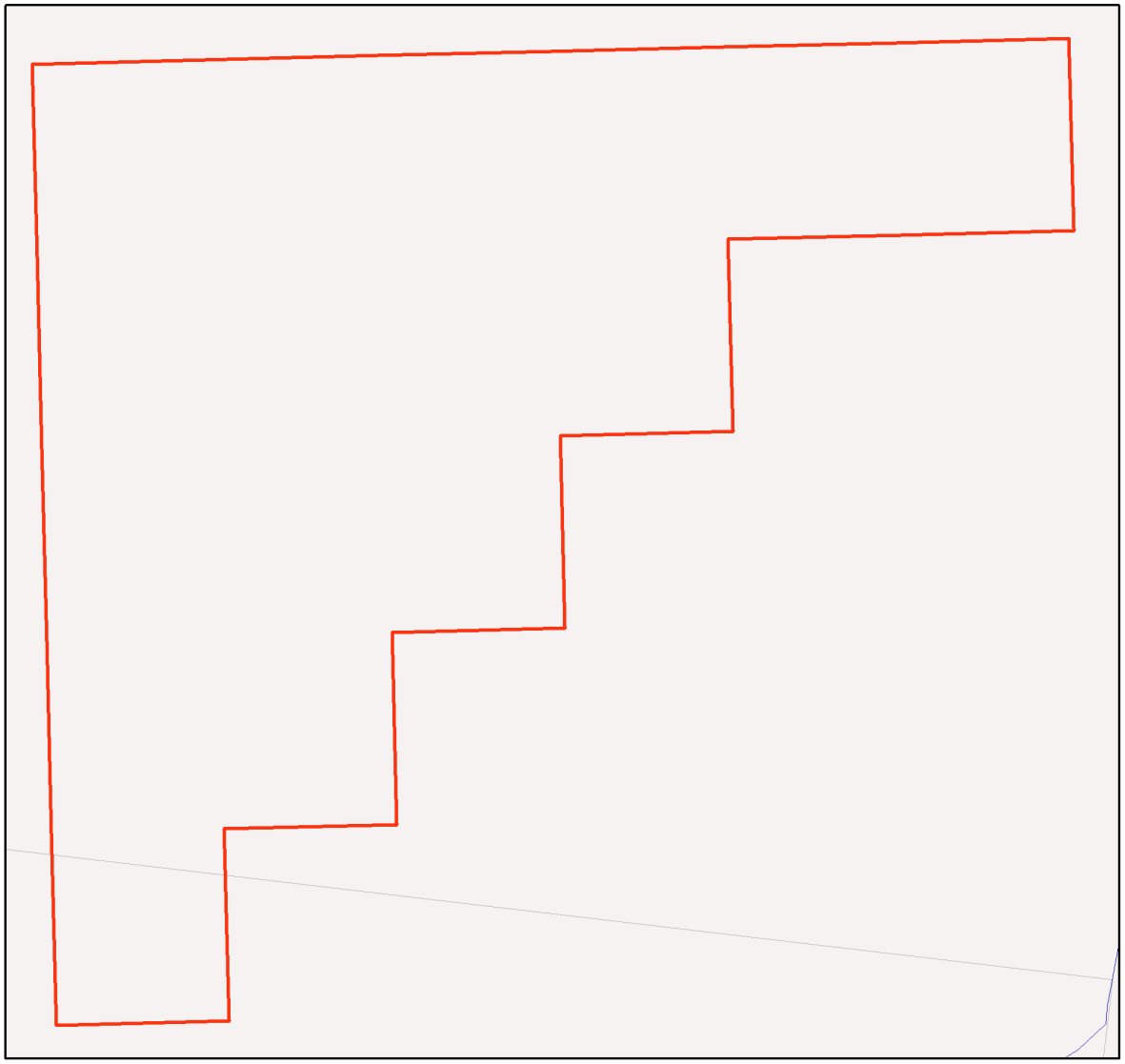
0 575 1150 1725 2300 2875 m

This product is projected into GDA 1994 Queensland Albers

Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals

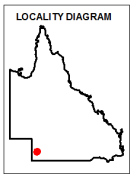


MSES - Species
Threatened (endangered or vulnerable) wildlife and special least concern animals

Area of Interest

- Selected Petroleum Lease (PL)
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (special least concern)
- Wildlife habitat (endangered or vulnerable)

LOCALITY DIAGRAM



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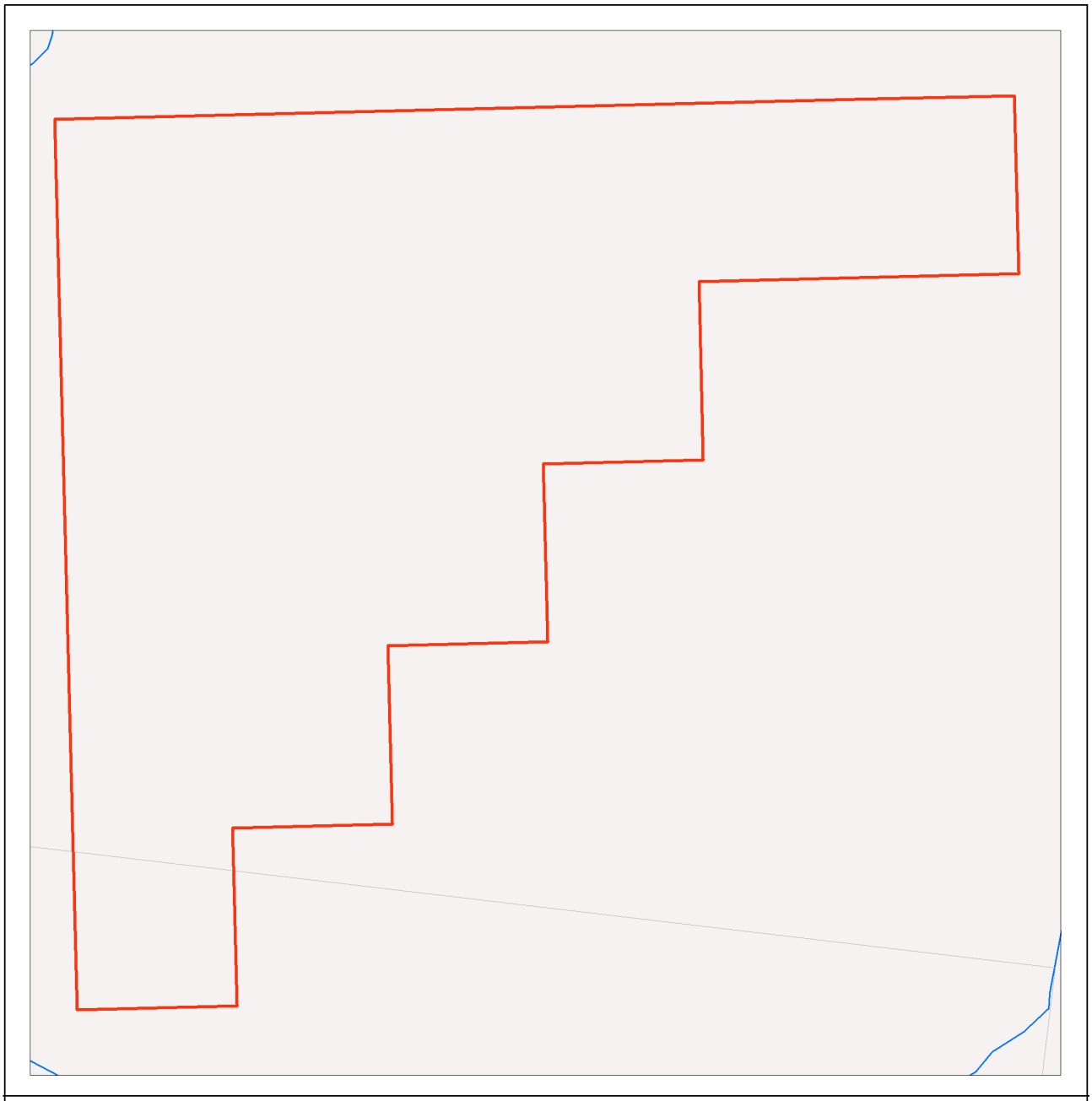
This product is projected into GDA 1994 Queensland Albers

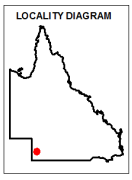
Map 3b - MSES - Species - Koala habitat area (SEQ)



MSES - Species
Koala habitat area (SEQ)

Area of Interest
- Selected Petroleum Lease (PL)
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Koala habitat area (core)
- Koala habitat area (locally refined)

LOCALITY DIAGRAM



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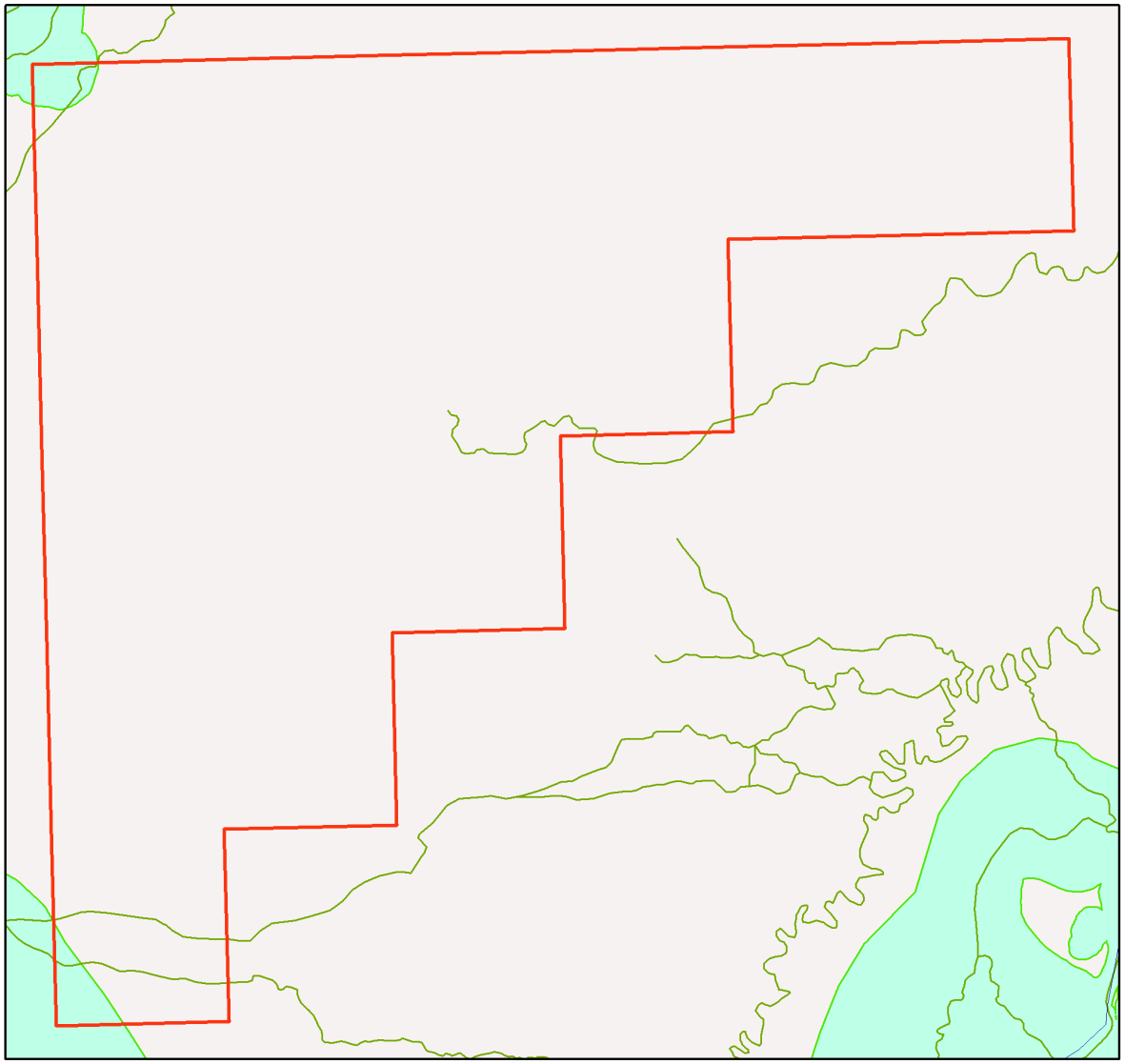
The represented layers for SEQ 'koala habitat area-core' and 'koala habitat area- locally refined' in MSES are sourced directly from the regulatory mapping under the Nature Conservation (Koala) Conservation Plan 2017. Whilst every effort is made to ensure the information remains current, there may be 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.

0 550 1,100 1,650 2,200 2,750 m

This product is projected into GDA 1994 Queensland Albers

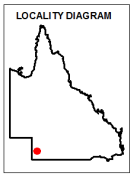
Map 4 - MSES - Regulated Vegetation

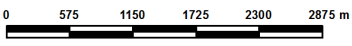


MSES - Regulated Vegetation

Area of Interest

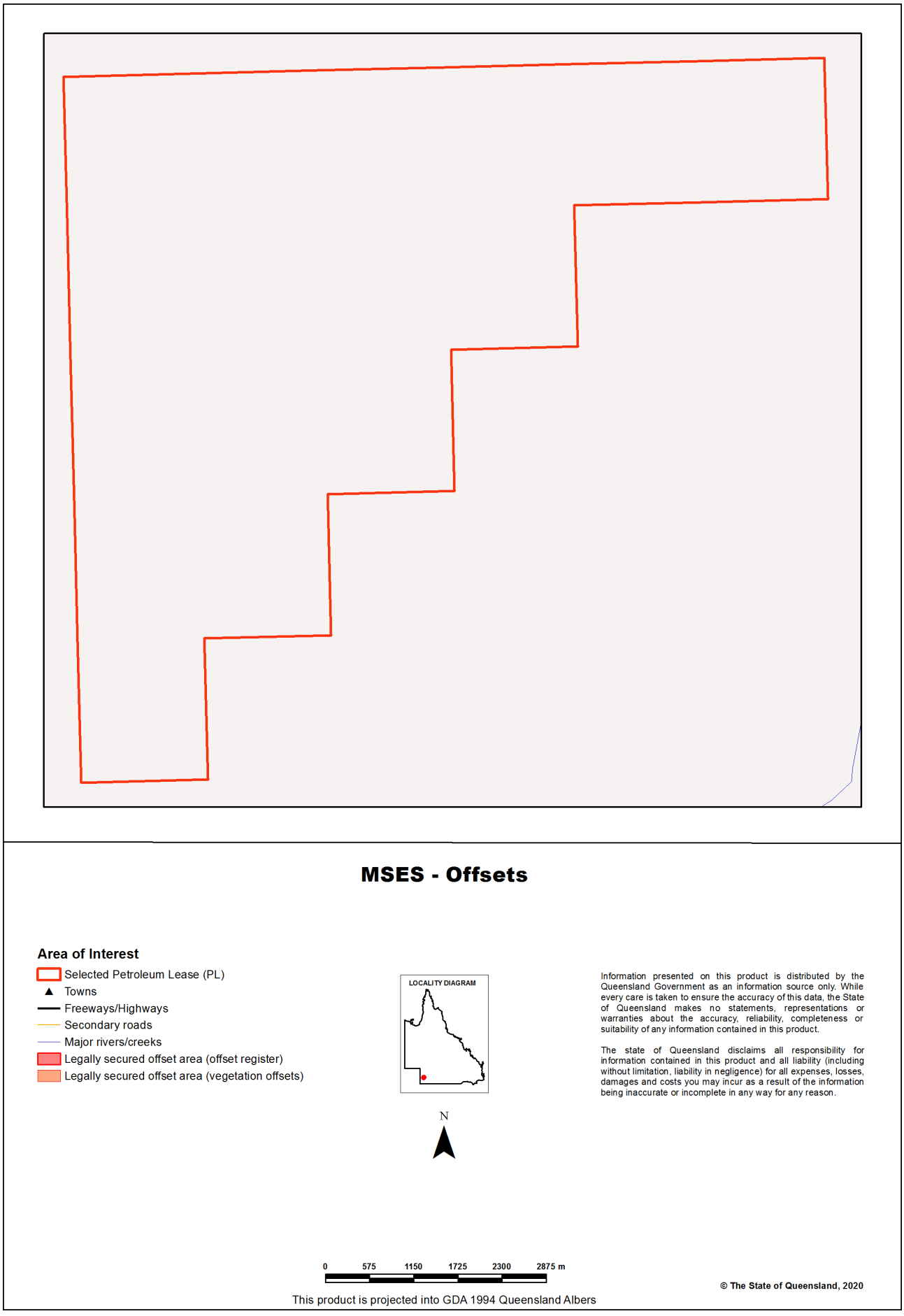
- Selected Petroleum Lease (PL)
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)





This product is projected into GDA 1994 Queensland Albers

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). The compiled MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support 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. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The Queensland Government's "Method for mapping - matters of state environmental significance for use in land use planning and development assessment" 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

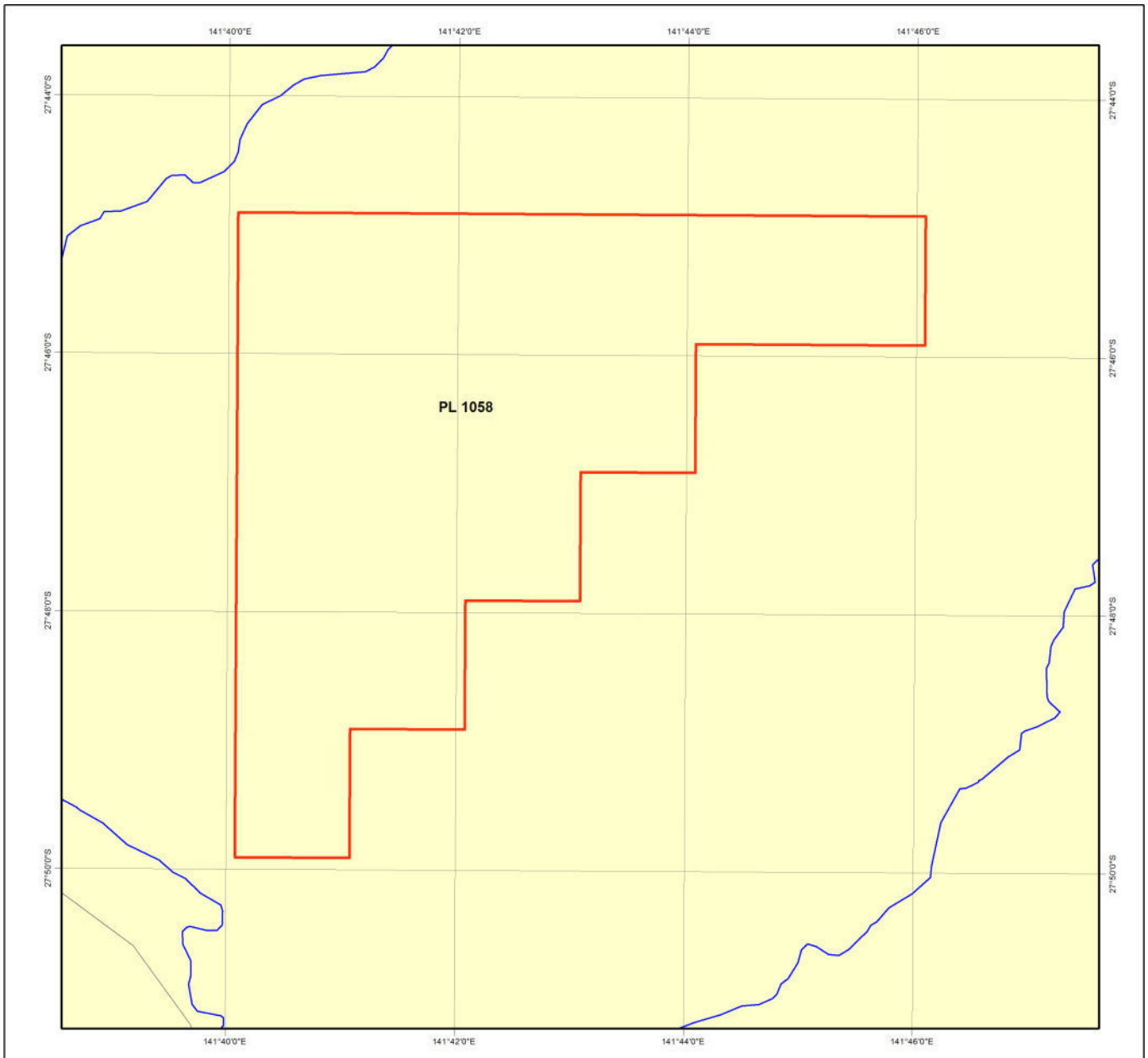
Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying 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 and Nature Refuges	- Protected areas of Queensland - Nature Refuges - 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 (multiple locations) intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 4, 2015) 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 DES
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DES	- Department of Environment and Science
EP Act	- *Environmental Protection Act 1994*
EPP	- Environmental Protection Policy
GDA94	- Geocentric Datum of Australia 1994
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*



ENVIRONMENTALLY SENSITIVE AREAS - non-mining resource activities (EP Act)

- Selected Petroleum Lease (PL)

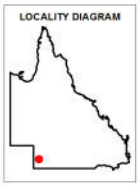
CATEGORY A
- National Parks
- Conservation Parks
- Forest Reserves
- Special Wildlife Reserve
- Wet Tropics World Heritage Area
- Great Barrier Reef Marine Park Area
- Marine Parks other than General Use Zones

CATEGORY B
- Queensland Heritage Register Places
- Ramsar Sites
- Cultural Heritage Registered Areas and DLA's other than Stanbroke
- Special Forestry Areas
- Seaward Side of Highest Astronomical Tide
- Fish Habitat Areas
- Coordinated Conservation Areas
- Endangered Regional Ecosystems - regrowth and remnant (Biodiversity Status)
- General Use Zones of Marine Parks
- Marine Plants

CATEGORY C
- Essential Habitat
- Koala Plan
- Nature Refuges
- Resources Reserve
- State Forests
- Timber Reserves
- Of Concern Regional Ecosystems (remnant biodiversity status)

OTHERS
- Towns
- Roads
- Rivers
- Springs
- Queensland

LOCALITY DIAGRAM



NOTE TO USER: Themes presented in this map are indicative only. Field survey may be required to verify the 'true' spatial extent and value. Not all environmentally sensitive areas are presented in this map. A user should refer to the particular circumstances relevant to their situation to assess the 'completeness' of themes provided.

The user should note that some boundaries and indicated values are ambient or subject to change over time (e.g. regional ecosystem boundaries and conservation status, watercourse mapping etc).

The user should be aware that due to multiple overlapping themes present, some themes/layers may be obscured by others. Ordering in the Legend does not accurately reflect the order by which themes are displayed.

N

0 810 1620 2430 3240 4050 m

This product is projected into GDA 1994 MGA Zone 54

Australian Government

Department of Agriculture, Water and the Environment

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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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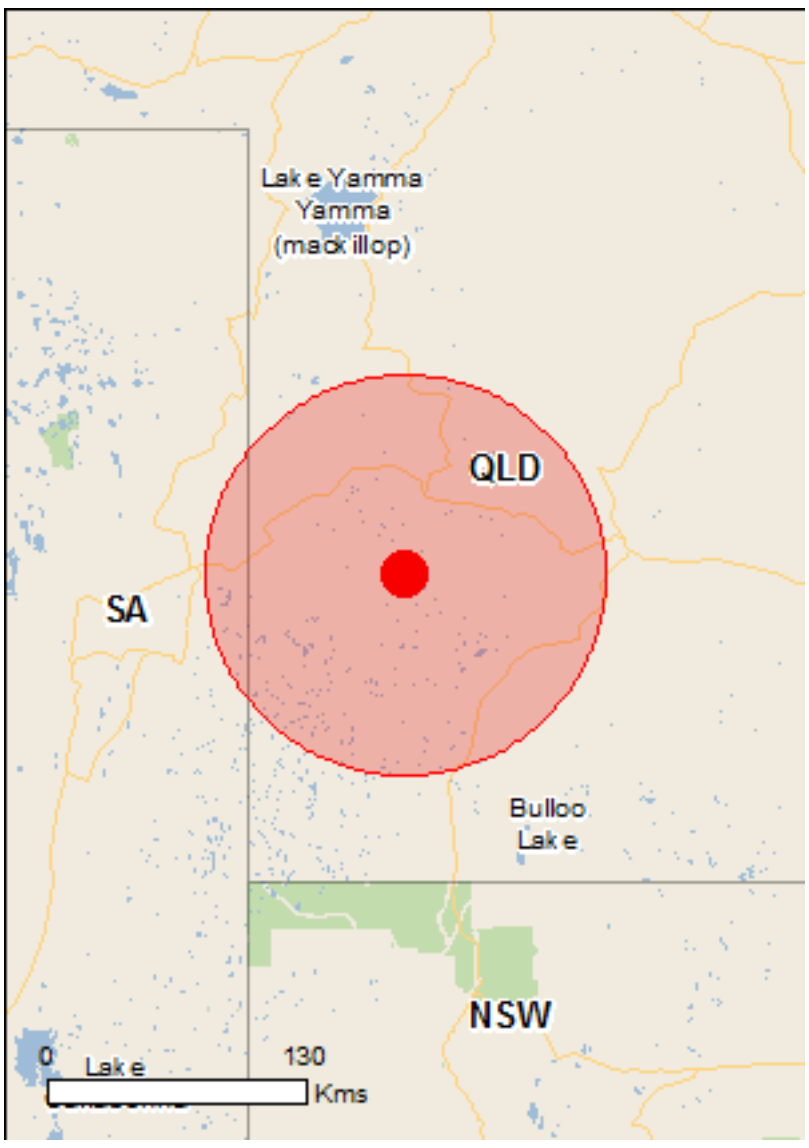
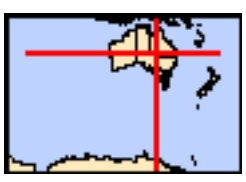


Coordinates

Buffer: 100.0Km



Summary

Matters of National Environmental 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:	2
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	13
Listed Migratory Species:	9

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 http://www.environment.gov.au/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 Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Historic		
The Burke, Wills, King and Yandruwandha National Heritage Place	QLD	Listed place
The Burke, Wills, King and Yandruwandha National Heritage Place	SA	Listed place

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Coongie lakes	Within Ramsar site

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Amytornis barbatus barbatus		
Bulloo Grey Grasswren, Grey Grasswren (Bulloo) [67065]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Grantiella picta		
Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Pedionomus torquatus		
Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Macrotis lagotis		
Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
Notomys fuscus		
Dusky Hopping-mouse, Wilkiniti [125]	Vulnerable	Species or species habitat likely to occur within area
Petrogale xanthopus celeris		
Yellow-footed Rock-wallaby (central-western Queensland) [87608]	Vulnerable	Species or species habitat may occur within area
Plants		

Name	Status	Type of Presence
Frankenia plicata [4225]	Endangered	Species or species habitat likely to occur within area
Grevillea kennedyana Flame Spider-flower [6974]	Vulnerable	Species or species habitat may occur within area
Sclerolaena walkeri [16152]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Innamincka	SA

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within

Name	Status	Type of Presence
		area

Nationally Important Wetlands [Resource Information]

Name	State
Coongie Lakes	SA
Cooper Creek - Wilson River Junction	QLD
Cooper Creek Swamps - Nappa Merrie	QLD

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-27.78389 141.70621

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.

Department of Agriculture Water and the Environment
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Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix B Species lists

B.2 Species lists

Opportunistic fauna observations

Common name	Scientific name	NC Act Status	EPBC Act Status
Birds			
Australasian pratincole	*Stiltia isabella*	Least concern	Marine
Australian raven	*Corvus coronoides*	Least concern	-
Brown falcon	*Falco berigora*	Least concern	-
Brown songlark	*Cincloramphus cruralis*	Least concern	-
Budgerigar	*Melopsittacus undulatus*	Least concern	-
Chestnut-crowned babbler	*Pomatostomus ruficeps*	Least concern	-
Emu	*Dromaius novaehollandiae*	Least concern	-
Galah	*Eolophus roseicapilla*	Least concern	-
Masked woodswallow	*Artamus personatus*	Least concern	-
Nankeen kestrel	*Falco cenchroides*	Least concern	Marine
Orange chat	*Epthianura aurifrons*	Least concern	-
Spotted harrier	*Circus assimilis*	Least concern	-
Tree martin	*Petrochelidon nigricans*	Least concern	Marine
Wedge-tailed eagle	*Aquila audax*	Least concern	-

Appendix C Likelihood of occurrence assessments

Likelihood of Occurrence for Matters of National Environmental Significance

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Flora				
Frankenia plicata	E	LC	The species grows in a range of habitats, including on small hillside channels, which take the first run-off after rain (DEWHA 2008a). In the Simpson Desert, the species has been recorded predominantly from swales of loamy sands to clay (DEWHA 2008a). This species is found in a wide range of vegetation communities that have good drainage (DEWHA 2008a).	**Unlikely to occur** The PL is outside of the current known distribution of the species. The species has not been recorded within Queensland (Queensland Herbarium 2019b).
Sclerolaena walkeri	V	LC	The species is known to occur on saline river channels, flats and floodplains (Department of the Environment, Water, Heritage and the Arts 2008b).	**Possible occurrence** The PL contains broadly suitable habitat for the species. The nearest records of the species, which are approximately 120 km south-west of the PL are from the Bulloo River Floodplain (ALA 2019). The nearest record of the species within the Cooper Creek floodplain are from approximately 280 km to the north-east.
Birds				
Common sandpiper *Actitis hypoleucos*	Marine, Migratory	SLC	The species has been recorded from a wide range of wetland habitats, of varying levels of salinity (DEE 2019). The species typically forages in shallow water and on bare soft mud at the edges of wetlands (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Grey falcon *Falco hypoleucos*	V	V	Habitat for the species is generally timbered lowland plains that are crossed by tree-lined watercourses, and adjacent to treeless areas, grasslands and open woodlands that are used for foraging (Garnett, Szabo & Dutson 2011). Key habitat is identified as Acacia shrublands that are crossed by tree-lined watercourses (Garnett, Szabo & Dutson 2011).	**Unlikely to occur** The PL is not mapped to contain Acacia shrublands, which are the preferred habitat for the species. In addition, the species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Grey grasswren (bulloo) *Amytornis barbatus barbatus*	E	E	The species occurs on periodically-inundated swampy floodplains (DEE 2019). It inhabits patches of dense vegetation that are comprised of lignum thickets, 1.0 to 2.5 m tall, with clumps of *Eragrostis australasica*, about 1 or 2 m tall, and/or clumps of *Atriplex nummularia* (DEE 2019). It also sometimes occurs in areas of *Halosarcia pergranulata* that lie adjacent to more typical habitat (DEE 2019).	**Likely to occur** The Cooper Creek floodplain is known to support grey grasswren; however, the subspecies status of this population is uncertain (Black *et al*. 2011; DEE 2019). The Cooper Creek population may comprise either the Bulloo subspecies (*Amytornis barbatus barbatus*), listed as endangered under the EPBC Act; or the Diamantina subspecies (*Amytornis barbatus diamantina*), not listed under the EPBC Act. In light of this uncertainty, for the purposes of this report, the grey grasswren population has been assumed to comprise the endangered Bulloo subspecies.
Fork-tailed swift *Apus pacificus*	Marine, Migratory	SLC	The species is predominantly aerial and occurs over inland areas and occasionally above the foothills in coastal areas with dry and open habitat (DEE 2019). The species can also occur over low scrub, heathland, saltmarsh and riparian woodlands and are associated with low pressure systems that favour the occurrence of insect prey (DEE 2019).	**Likely to occur** The species is a wide-ranging and nomadic aerial feeder. The species is likely to occur within the airspace above the PL while foraging. The species does not breed in Australia (DEE 2019).

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Eastern great egret *Ardea alba modesta*	Marine	LC	The species occurs in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial) (DEE 2019). These include swamps, marshes, margins of rivers and lakes, damp or flooded grasslands, pastures or agricultural lands; reservoirs, sewage treatment ponds, drainage channels, salt pans, salt lakes, salt marshes, estuarine mudflats, tidal streams, mangrove swamps, coastal lagoons and offshore reefs (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Cattle egret *Ardea ibis*	Marine	LC	Typical habitat for the species comprises tropical and temperate grasslands, wooded lands and terrestrial wetlands (DEE 2019). High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures (DEE 2019). It has been recorded on earthen dam walls and ploughed fields (DEE 2019). It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer (DEE 2019). It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora (DEE 2019). They have sometimes been observed in swamps with tall emergent vegetation (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Sharp-tailed sandpiper *Calidris acuminata*	Marine, Migratory	SLC	The species typically inhabits muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation (DEE 2019). This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland (DEE 2019). The species may use flooded paddocks, sedgelands and other ephemeral wetlands, but vacate these habitats during dry conditions (DEE 2019). Marine habitats for the species include intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves (DEE 2019). Sometimes occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996).	**Likely to occur** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has previously been recorded within 100 km of the PL.
Curlew sandpiper *Calidris ferruginea*	CE, Marine, Migratory	E	In Australia, this species usually forages and roosts in intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Pectoral sandpiper *Calidris melanotos*	Marine, Migratory	SLC	Typical habitat for the species comprises shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DEE 2019). The species is usually found in coastal or near coastal habitat but occasionally further inland (DEE 2019). Also recorded in swamp overgrown with lignum (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Black-eared cuckoo *Chrysococcyx osculans*	Marine	LC	The species inhabits drier woodlands and scrublands, including mallee, mulga, lignum, saltmarsh and riverside thickets (Pizzey & Knight 2007).	**Likely to occur** The PL is likely to contain suitable habitat for the species, including lignum thickets. While the species has not been recorded within 100 km of the PL within the Queensland Government WildNet database, the PL is within the species distribution and a public record of the species occurs within the Cooper Creek Floodplain at Innamincka Road (ALA 2019).
Latham's snipe, japanese snipe *Gallinago hardwickii*	Marine, Migratory	SLC	In Australia the species typically occurs in permanent and ephemeral wetlands up to 2000 m above sea-level (DEE 2019). They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) (DEE 2019). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity (DEE 2019). Various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Painted honeyeater *Grantiella picta*	V	V	The species forages on mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes (DEE 2019).	**Unlikely to occur** Mapped vegetation within the PL is largely unsuitable for the species as it is primarily dominated by lignum, ephemeral grassland, ephemeral forbland and sand dunes containing scattered trees. In addition, the species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Rainbow bee-eater *Merops ornatus*	Marine	LC	Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water (DEE 2019). The species is known to occur in a wide variety of other habitats, including mangroves, grasslands, wetlands, vine thickets and heathlands (DEE 2019).	**Likely to occur** The PL contains suitable habitat for the species and the species has been previously recorded within 100 km of the PL (ALA 2019).
Grey wagtail *Motacilla cinerea*	Marine, Migratory	SLC	Near running water in disused quarries, sandy and rocky streams in escarpments and rainforests, sewage ponds, ploughed fields, airfields (Pizzey & Knight 2007).	**Unlikely to occur** The species is an uncommon vagrant to Australia. In addition, the PL is unlikely to contain suitable habitat for the species.
Yellow wagtail *Motacilla flava*	Marine, Migratory	SLC	The species typically inhabits short grass and bare ground; swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land and town lawns (Pizzey & Knight 2007). The species is regularly recorded as a summer migrant to coastal northern Australia (Pizzey & Knight 2007).	**Unlikely to occur** The species is an uncommon vagrant to Australia. In addition, the PL is unlikely to contain suitable habitat for the species.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Plains-wanderer *Pedionomus torquatus*	CE	V	The species typically occurs within sparse, treeless, lowland native grasslands which usually occur on hard red-brown clay soils (Department of the Environment (DotE) and the Department of Environment, Water and Natural Resources (DEWNR) 2016). Grassland structure is much more important than floristic composition with the species showing a strong preference for sites with approximately 50% bare ground and most vegetation less than 5 cm in height and some widely-spaced plants up to 30 cm (DotE & DEWNR 2016). The species occasionally occurs in other types of habitat such as in stubble; amongst low cereal crops; and in low, sparse chenopod shrubland (DotE & DEWNR 2016).	**Possible occurrence** Vegetation within the PL is likely to include sparsely treed native grasslands; however, the soil composition of the PL is marginally suitable for the species and the species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Night parrot *Pezoporus occidentalis*	E	E	Queensland records for the species are typically associated with *spinifex triodia hummock* grasslands, *Astrebla spp.* grasslands, shrubby samphire and chenopod associations and occasional areas with *Acacia cambagei* or *A. aneura* (TSSC 2016). Roosting and nesting sites are consistently reported as within clumps of dense vegetation, primarily old and large Spinifex clumps, but sometimes other vegetation types (TSSC 2016).	**Possible occurrence** The PL is likely to contain suitable foraging habitat for the species, particularly *Astrebla* spp. grasslands. While the species has not been recorded within 100 km of the PL, the species is highly cryptic with an uncertain present day distribution.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Glossy ibis *Plegadis falcinellus*	Marine, Migratory	SLC	The species typically inhabits freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation (DEE 2019). The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons (DEE 2019). Sometimes recorded in wooded swamps, artificial wetlands (such as irrigated fields), and in mangroves for breeding (DEE 2019). Feeds in very shallow water (DEE 2019).	**Likely to occur** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has previously been recorded within 100 km of the PL.
Australian painted snipe *Rostratula australis*	E, Marine	V	Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DEE 2019). They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (DEE 2019). The species has been recorded to sometimes utilise areas that are lined with trees, or that have some scattered fallen or washed-up timber (Marchant & Higgins 1993). Breeding occurs in shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby, typically from or near small islands in fresh water wetlands (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Gull-billed tern *Gelochelidon nilotica*	Marine, Migratory	SLC	The species inhabits beaches, mudflats, brackish wetlands, including inland wetlands, grasslands, crops, ploughed fields and airfields (Pizzey and Knight 2007). The species usually breeds in small colonies on islands in inland lakes (Pizzey and Knight 2007).	**Likely to occur** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has previously been recorded within 100 km of the PL.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Common greenshank *Tringa nebularia*	Marine, Migratory	SLC	The species occurs in all types of wetlands (Higgins & Davies 1996). Typical habitat for this species a wide variety of inland wetlands and sheltered coastal habitats of varying salinity (DEE 2019), including sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass, both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Mammals				
Ghost bat *Macroderma gigas*	V	E	The species occurs across a range of habitats, from arid Pilbara to tropical savanna woodlands and rainforests (DEE 2019). During the daytime they roost in caves, rock crevices and old mines (DEE 2019). Roost sites used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C and a moderate to high relative humidity of 50–100 percent (DEE 2019). The average foraging distance is approximately 2 km from the daytime roost (DEE 2019).	**Unlikely to occur** The PL is unlikely to support suitable roosting habitat for the species. In addition, suitable roosting habitat is unlikely to occur within the foraging distance of the PL.
Greater bilby *Macrotis lagotis*	V	E	The remaining populations of the greater bilby occupy three main habitats: open tussock grassland on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas (TSSC 2016b).	**Unlikely to occur** The PL is outside of the current known distribution of the species (TSSC 2016b).

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Dusky hopping-mouse, wilkiniti *Notomys fuscus*	V	E	This species inhabits a variety of soft sandy habitats, preferring sand dunes, hills and ridges with cane grass (*Ophiuros exaltatus*), sandhill wattle (*Acacia ligulata*), nitrebush (*Nitraria billardiera*), sticky hopbush (*Dodonea viscose*) and other annual and perennial shrubs (DEWHA 2008b).	**Possible occurrence** While the PL is outside of the current known distribution of the species (DEWHA 2008d; ALA 2019), suitable habitat is likely to occur within the PL.
Yellow-footed rock-wallaby *Petrogale xanthopus celeris*	V	V	The yellow-footed rock-wallaby (central-western Queensland) is mostly nocturnal, and shelters during the day in caves and rock crevices (TSSC 2016). It is closely associated with rugged rocky areas, along the edges of low sandstone tablelands and hills, typically with low Acacia woodlands or shrublands (TSSC 2016c).	**Unlikely to occur** The PL is unlikely to support suitable rocky habitat for the species.

[1] EPBC Act = Environment Protection and Biodiversity Conservation Act 1999; NC Act = Nature Conservation Act 1992. E-Endangered, V-Vulnerable, NT-Near Threatened, SLC-Special Least Concern

[2] **Known** to occur: species were recorded during field surveys. **Likely** to occur: suitable habitat to support the species is present and the species has previously been recorded within the desktop search extent. **Possible** occurrence: The PL is within the species known distribution and suitable habitat to support the species is present; however, the species has not previously been recorded within the desktop search extent; and/or, suitable habitat is degraded or of limited extent, thereby reducing the likelihood of the species occurrence. **Unlikely** to occur: the PL does not comprise suitable habitat for the species, or is outside of the species known distribution.

Likelihood of Occurrence for Matters of State Environmental Significance

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Flora				
Rhodanthe rufescens	-	NT	Occurrence records for the species have identified habitat to include *Acacia aneura* and *A. cambagei* woodland, with soil types including pale brown clay, red loamy soil and on a low ridgetop (ALA 2019).	**Unlikely to occur** The PL does not contain suitable habitat for the species. The species has not been previously recorded within similar alluvial floodplain habitat (ALA 2019).
Birds				
Common sandpiper *Actitis hypoleucos*	Marine, Migratory	SLC	The species has been recorded from a wide range of wetland habitats, of varying levels of salinity (DEE 2019). The species typically forages in shallow water and on bare soft mud at the edges of wetlands (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Grey grasswren (bulloo) *Amytornis barbatus barbatus*	E	E	The species occurs on periodically-inundated swampy floodplains (DEE 2019). It inhabits patches of dense vegetation that are comprised of lignum thickets, 1.0 to 2.5 m tall, with clumps of *Eragrostis australasica*, about 1 or 2 m tall, and/or clumps of *Atriplex nummularia* (DEE 2019). It also sometimes occurs in areas of *Halosarcia pergranulata* that lie adjacent to more typical habitat (DEE 2019).	**Likely to occur** The Cooper Creek floodplain is known to support grey grasswren; however, the subspecies status of this population is uncertain (Black *et al*. 2011; DEE 2019). The Cooper Creek population may comprise either the Bulloo subspecies (*Amytornis barbatus barbatus*), listed as endangered under the NC Act; or the Diamantina subspecies (*Amytornis barbatus diamantina*), listed as near threatened under the NC Act. In light of this uncertainty, for the purposes of this report, the grey grasswren population has been assumed to comprise the endangered Bulloo subspecies.
Fork-tailed swift *Apus pacificus*	Marine, Migratory	SLC	The species is predominantly aerial and occurs over inland areas and occasionally above the foothills in coastal areas with dry and open habitat (DEE 2019). The species can also occur over low scrub, heathland, saltmarsh and riparian woodlands and are associated with low pressure systems that favour the occurrence of insect prey (DEE 2019).	**Likely to occur** The species is a wide-ranging and nomadic aerial feeder. The species is likely to occur within the airspace above the PL while foraging. The species does not breed in Australia (DEE 2019).

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Sharp-tailed sandpiper *Calidris acuminata*	Marine, Migratory	SLC	The species typically inhabits muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation (DEE 2019). This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland (DEE 2019). The species may use flooded paddocks, sedgelands and other ephemeral wetlands, but vacate these habitats during dry conditions (DEE 2019). Marine habitats for the species include intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves (DEE 2019). Sometimes occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996).	**Likely to occur** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has previously been recorded within 100 km of the PL.
Curlew sandpiper *Calidris ferruginea*	CE, Marine, Migratory	E	In Australia, this species usually forages and roosts in intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Pectoral sandpiper *Calidris melanotos*	Marine, Migratory	SLC	Typical habitat for the species comprises shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DEE 2019). The species is usually found in coastal or near coastal habitat but occasionally further inland (DEE 2019). Also recorded in swamp overgrown with lignum (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Grey falcon *Falco hypoleucos*	V	V	Habitat for the species is generally timbered lowland plains that are crossed by tree-lined watercourses, and adjacent to treeless areas, grasslands and open woodlands that are used for foraging (Garnett, Szabo & Dutson 2011). Key habitat is identified as Acacia shrublands that are crossed by tree-lined watercourses (Garnett, Szabo & Dutson 2011).	**Unlikely to occur** The PL is not mapped to contain Acacia shrublands, which are the preferred habitat for the species. In addition, the species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Latham's snipe, japanese snipe *Gallinago hardwicki*i	Marine, Migratory	SLC	In Australia the species typically occurs in permanent and ephemeral wetlands up to 2000 m above sea-level (DEE 2019). They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) (DEE 2019). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity (DEE 2019). Various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Painted honeyeater *Grantiella picta*	V	V	The species forages on mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes (DEE 2019).	**Unlikely to occur** Mapped vegetation within the PL is largely unsuitable for the species as it is primarily dominated by lignum, ephemeral grassland, ephemeral forbland and sand dunes containing scattered trees. In addition, the species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Major Mitchell's cockatoo *Lophochroa leadbeateri*	-	V	The species prefers semi-arid and arid regions, typically occurring in dry woodlands dominated by *Eucalyptus, Callitris* and *Casuarina spp.* (Curtis & Dennis 2012).	**Possible occurrence** Mapped vegetation within the PL is largely unsuitable for the species as it is primarily dominated by lignum, ephemeral grassland and ephemeral forbland. Areas mapped as containing *Eucalyptus coolabah* dominated vegetation occur adjacent to the least. As such, there is potential for the species to intermittently traverse the lease.
Grey wagtail *Motacilla cinerea*	Marine, Migratory	SLC	Near running water in disused quarries, sandy and rocky streams in escarpments and rainforests, sewage ponds, ploughed fields, airfields (Pizzey & Knight 2007).	**Unlikely to occur** The species is an uncommon vagrant to Australia. In addition, the PL is unlikely to contain suitable habitat for the species.
Yellow wagtail *Motacilla flava*	Marine, Migratory	SLC	The species typically inhabits short grass and bare ground; swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land and town lawns (Pizzey & Knight 2007). The species is regularly recorded as a summer migrant to coastal northern Australia (Pizzey & Knight 2007).	**Unlikely to occur** The species is an uncommon vagrant to Australia. In addition, the PL is unlikely to contain suitable habitat for the species.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Plains-wanderer *Pedionomus torquatus*	CE	V	The species typically occurs within sparse, treeless, lowland native grasslands which usually occur on hard red-brown clay soils (Department of the Environment (DotE) and the Department of Environment, Water and Natural Resources (DEWNR) 2016). Grassland structure is much more important than floristic composition with the species showing a strong preference for sites with approximately 50% bare ground and most vegetation less than 5 cm in height and some widely-spaced plants up to 30 cm (DotE & DEWNR 2016). The species occasionally occurs in other types of habitat such as in stubble; amongst low cereal crops; and in low, sparse chenopod shrubland (DotE & DEWNR 2016).	**Possible occurrence** Vegetation within the PL is likely to include sparsely treed native grasslands; however, the soil composition of the PL is marginally suitable for the species and the species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Night parrot *Pezoporus occidentalis*	E	E	Queensland records for the species are typically associated with *spinifex triodia hummock* grasslands, *Astrebla spp.* grasslands, shrubby samphire and chenopod associations and occasional areas with *Acacia cambagei* or *A. aneura* (TSSC 2016). Roosting and nesting sites are consistently reported as within clumps of dense vegetation, primarily old and large Spinifex clumps, but sometimes other vegetation types (TSSC 2016).	**Possible occurrence** The PL is likely to contain suitable foraging habitat for the species, particularly *Astrebla spp.* grasslands. While the species has not been recorded within 100 km of the PL, the species is highly cryptic with an uncertain present day distribution.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Glossy ibis *Plegadis falcinellus*	Marine, Migratory	SLC	The species typically inhabits freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation (DEE 2019). The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons (DEE 2019). Sometimes recorded in wooded swamps, artificial wetlands (such as irrigated fields), and in mangroves for breeding (DEE 2019). Feeds in very shallow water (DEE 2019).	**Likely to occur** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has previously been recorded within 100 km of the PL.
Australian painted snipe *Rostratula australis*	E, Marine	V	Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DEE 2019). They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (DEE 2019). The species has been recorded to sometimes utilise areas that are lined with trees, or that have some scattered fallen or washed-up timber (Marchant & Higgins 1993). Breeding occurs in shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby, typically from or near small islands in fresh water wetlands (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Gull-billed tern *Gelochelidon nilotica*	Marine, Migratory	SLC	The species inhabits beaches, mudflats, brackish wetlands, including inland wetlands, grasslands, crops, ploughed fields and airfields (Pizzey and Knight 2007). The species usually breeds in small colonies on islands in inland lakes (Pizzey and Knight 2007).	**Likely to occur** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has previously been recorded within 100 km of the PL.

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Common greenshank *Tringa nebularia*	Marine, Migratory	SLC	The species occurs in all types of wetlands (Higgins & Davies 1996). Typical habitat for this species a wide variety of inland wetlands and sheltered coastal habitats of varying salinity (DEE 2019), including sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass, both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats (DEE 2019).	**Possible occurrence** The PL is likely to contain ephemeral wetlands within channels of the Cooper Creek floodplain, primarily following flood events. The species may temporarily use these ephemeral wetlands while present. The species has not been recorded within 100 km of the PL within the Queensland Government WildNet database.
Mammals				
Ghost bat *Macroderma gigas*	V	E	The species occurs across a range of habitats, from arid Pilbara to tropical savanna woodlands and rainforests (DEE 2019). During the daytime they roost in caves, rock crevices and old mines (DEE 2019). Roost sites used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23˚–28˚C and a moderate to high relative humidity of 50–100 percent (DEE 2019). The average foraging distance is approximately 2 km from the daytime roost (DEE 2019).	**Unlikely to occur** The PL is unlikely to support suitable roosting habitat for the species. In addition, suitable roosting habitat is unlikely to occur within the foraging distance of the PL.
Greater bilby *Macrotis lagotis*	V	E	The remaining populations of the greater bilby occupy three main habitats: open tussock grassland on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas (TSSC 2016b).	**Unlikely to occur** The PL is outside of the current known distribution of the species (TSSC 2016b).

Species	EPBC Act Status[1]	NC Act Status[1]	Habitat	Likelihood of occurence[2]
Dusky hopping-mouse, wilkiniti *Notomys fuscus*	V	E	This species inhabits a variety of soft sandy habitats, preferring sand dunes, hills and ridges with cane grass (*Ophiuros exaltatus*), sandhill wattle (*Acacia ligulata*), nitrebush (*Nitraria billardiera*), sticky hopbush (*Dodonea viscose*) and other annual and perennial shrubs (DEWHA 2008b).	**Possible occurrence** While the PL is outside of the current known distribution of the species (DEWHA 2008d; ALA 2019), suitable habitat is likely to occur within the PL.
Yellow-footed rock-wallaby *Petrogale xanthopus celeris*	V	V	The yellow-footed rock-wallaby (central-western Queensland) is mostly nocturnal, and shelters during the day in caves and rock crevices (TSSC 2016). It is closely associated with rugged rocky areas, along the edges of low sandstone tablelands and hills, typically with low Acacia woodlands or shrublands (TSSC 2016c).	**Unlikely to occur** The PL is unlikely to support suitable rocky habitat for the species.
Short-beaked echidna *Tachyglossus aculeatus*	-	SLC	The species occurs throughout Australia in a wide variety of habitats; wherever there is a supply of ants and termites, upon which it feeds (Van Dyck & Strahan 2008). The species usually seeks shelter under thick bushes, in hollow logs, under piles debris, or occasionally in a rabbit burrow (Van Dyck & Strahan 2008).	**Likely to occur** The PL contains suitable habitat for the species and the species has been previously recorded within 100 km of the PL.

[1] EPBC Act = Environment Protection and Biodiversity Conservation Act 1999; NC Act = Nature Conservation Act 1992. E-Endangered, V-Vulnerable, NT-Near Threatened, SLC-Special Least Concern

[2] **Known** to occur: species were recorded during field surveys. **Likely** to occur: suitable habitat to support the species is present and the species has previously been recorded within the desktop search extent. **Possible** occurrence: The PL is within the species known distribution and suitable habitat to support the species is present; however, the species has not previously been recorded within the desktop search extent; and/or, suitable habitat is degraded or of limited extent, thereby reducing the likelihood of the species occurrence. **Unlikely** to occur: the PL does not comprise suitable habitat for the species, or is outside of the species known distribution.

Appendix D MNES significant impact assessment

D.2 MNES significant impact assessment

Definitions and terminology

Term	Definition under the EPBC Act
Important population	A population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: key source populations either for breeding or dispersal populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species range.
Habitat critical to the survival of the species	Areas that are necessary: for activities such as foraging, breeding, roosting, or dispersal for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) to maintain genetic diversity and long term evolutionary development, or for the reintroduction of populations or recovery of the species or ecological community. Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.
Invasive species	An introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.

MNES significant impact assessment for grey grasswren

MNES Significant Impact Guideline criteria for endangered species	Response
Lead to a long-term decrease in the size of a population	**No significant impact** The proposed disturbance will require the clearing of approximately 11.55 ha of grey grasswren habitat, which represents 5.2% of the grey grasswren habitat identified within the PL. The proposed disturbance is unlikely to lead to a long-term decrease in the size of a population as: • Suitable habitat for the species is widely available within the PL and the surrounding Cooper Creek floodplain • Lignum, which is the key habitat feature for the species, rapidly re-establishes within disturbed areas following flood events (Dawson et al. 2017; Higgisson et al. 2018). Approximately 3.9 ha of the disturbance footprint is proposed for rehabilitation, which includes pipeline right of ways, sump pits and a proportion of the lease areas. These areas are expected to re-establish to suitable habitat for grey grasswren • Management measures have been identified to mitigate impacts on the species habitat (Section 5.3.3)
Reduce the area of occupancy of the species	**No significant impact** The proposed clearing comprises a minimal proportion of the overall area of occupancy of the species and will not impact connectivity of suitable habitat.
Fragment an existing population into two or more populations	**No significant impact** The project is unlikely to impact the movement of grey grasswren individuals among habitat areas within and surrounding the PL.

MNES Significant Impact Guideline criteria for endangered species	Response
Adversely affect habitat critical to the survival of a species	**No significant impact** Habitat critical to the survival of the grey grasswren is identified as swampy floodplains dominated by lignum (*Duma florulenta*) and swamp canegrass (*Eragrostis australasica*), where these plants form dense thickets of 1 m or greater in diameter and 1-2 m in height (DotE 2014). The precautionary principle was applied to consider all grey grasswren habitat mapped within the PL to be habitat critical to the survival of the species. The project is unlikely to significantly affect habitat critical to the survival of the species as: • Suitable habitat for the species is widely available within the PL and the surrounding Cooper Creek floodplain • Lignum, which is the key habitat feature for the species, rapidly re-establishes within disturbed areas following flood events (Dawson et al. 2017; Higgisson et al. 2018). Approximately 3.9 ha of the disturbance footprint is proposed for rehabilitation, which includes pipeline right of ways, sump pits and a proportion of the lease areas. These areas are expected to re-establish to suitable habitat for grey grasswren • Management measures have been identified to mitigate impacts on the species habitat (Section 5.3.3)
Disrupt the breeding cycle of a population	**No significant impact** Given the small area of suitable habitat to be impacted by the proposed works in comparison to the large extent of suitable habitat within and surrounding the PL, the proposed works will not disrupt the breeding cycle of a population of the species. In addition, management measures have been identified to mitigate impacts on the species habitat (Section 5.3.3).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**No significant impact** Given suitable habitat for the species is widely available within the PL and the surrounding region the proposed vegetation clearing is unlikely to lead to a long-term decrease in the size of the local grey grasswren population.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	**No significant impact** Feral predators (cats and foxes), pigs and rabbits are listed as threatening processes to the species (DotE 2014). The project is unlikely to increase the abundance of these invasive species above their current levels or result in the introduction of new invasive species.
Introduce disease that may cause the species to decline	**No significant impact** Disease is not listed as a potential threat to the species (DotE 2014; DEE 2019). The project is unlikely to introduce a disease that may cause the species to decline.

MNES Significant Impact Guideline criteria for endangered species	Response
Interfere with the recovery of the species	**No significant impact** The proposed works are unlikely to interfere with the recovery of the species due to the minimal impact on the grey grasswren population. No actions proposed are in contrast to the specific recovery actions for the species (DotE 2014; DEE 2019).

Appendix E MSES significant residual impact assessment

E.2 MSES significant residual impact assessment

Definitions and terminology

Term	Definition under the EO Act
Habitat	An area occupied, or periodically or occasionally occupied, by any species, population or ecological community and includes all the different aspects (both biotic and abiotic) used by species during the different stages of their life cycles.
Long-term decrease	Any decline in a local population that is greater than which would be apparent without the action being present.
Population	An occurrence of the species in a particular area. In relation to *Endangered*, *Vulnerable* and *Special Least Concern* species, occurrences include but are not limited to: • a geographically distinct regional population, or collection of local populations; or • a population, or collection of local populations, that occurs within a particular bioregion.

Significant residual impact assessment for grey grasswren

MSES Significant Residual Impact Guideline criteria. The action is likely to:	Response
Lead to a long-term decrease in the size of a local population	**No significant impact** The proposed disturbance will require the clearing of approximately 11.55 ha of grey grasswren habitat, which represents 5.2% of the grey grasswren habitat identified within the PL. A SRI to the species is unlikely as: • Suitable habitat for the species is widely available within the PL and the surrounding Cooper Creek floodplain • Lignum, which is the key habitat feature for the species, rapidly re-establishes within disturbed areas following flood events (Dawson et al. 2017; Higgisson et al. 2018). Approximately 3.9 ha of the disturbance footprint is proposed for rehabilitation, which includes pipeline right of ways, sump pits and a proportion of the lease areas. These areas are expected to re-establish to suitable habitat for grey grasswren • Management measures have been identified to mitigate impacts on the species habitat (Section 5.3.3)
Reduce the extent of occurrence of the species	**No significant impact** The proposed clearing comprises a minimal proportion of the overall extent of occurrence of the species and will not impact connectivity of suitable habitat.
Fragment an existing population	**No significant impact** The project is unlikely to impact the movement of grey grasswren individuals among habitat areas within and surrounding the PL and is unlikely to fragment the local grey grasswren population.
Result in genetically distinct populations forming as a result of habitat isolation	**No significant impact** The project is unlikely to impact the movement of grey grasswren individuals among habitat areas within and surrounding the PL.
Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat	**No significant impact** Feral predators (cats and foxes), pigs and rabbits are listed as threatening processes to the species (DotE 2014). The project is unlikely to increase the abundance of these invasive species above their current levels or result in the introduction of new invasive species.
Introduce disease that may cause the population to decline	**No significant impact** Disease is not listed as a potential threat to the species (DotE 2014; DEE 2019). The project is unlikely to introduce a disease that may cause the species to decline.

MSES Significant Residual Impact Guideline criteria. The action is likely to:	Response
Interfere with the recovery of the species.	**No significant impact** The proposed works are unlikely to interfere with the recovery of the species due to the minimal impact on the grey grasswren population. No actions proposed are in contrast to the specific recovery actions for the species (DotE 2014; DEE 2019).
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	**No significant impact** The precautionary principle was applied to consider all grey grasswren habitat mapped within the PL to represent ecologically significant locations for the species as this habitat predominantly comprises lignum dominated communities that are used at all stages of the grey grasswren lifecycle. The project is unlikely to cause disruption to ecologically significant locations as: • Suitable habitat for the species is widely available within the PL and the surrounding Cooper Creek floodplain • Lignum, which is the key habitat feature for the species, rapidly re-establishes within disturbed areas following flood events (Dawson et al. 2017; Higgisson et al. 2018). Approximately 3.9 ha of the disturbance footprint is proposed for rehabilitation, which includes pipeline right of ways, sump pits and a proportion of the lease areas. These areas are expected to re-establish to suitable habitat for grey grasswren • Management measures have been identified to mitigate impacts on the species habitat (Section 5.3.3)

Significant residual impact assessment for echidna

MSES Significant Residual Impact Guideline criteria. The action will result in:	Short-beaked echidna
A long-term decrease in the size of a local population	**No significant impact** The proposed disturbance will require the clearing of approximately 115.5 ha of echidna habitat. As the species is widely distributed and has no particular habitat preferences, except for the supply of ants and termites (Van Dyck & Strahan 2008), the project is unlikely to lead to a long-term decrease in the local population of the species.
A reduced extent of occurrence of the species	**No significant impact** As the species is widely distributed and has no particular habitat preferences, except for the supply of ants and termites (Van Dyck & Strahan 2008), the project is unlikely to reduce the extent of occurrence of the species.
Fragmentation of an existing population	**No significant impact** The project will have negligible impact on the species local and regional movement.
Reduced gene flow among populations	**No significant impact** The project will have negligible impact on the species local and regional movement.
Disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species	**No significant impact** The proposed disturbance will require the clearing of approximately 115.5 ha of echidna habitat, which is likely to include breeding, feeding and nesting habitat. However, as the species is widely distributed and has no particular habitat preferences, except for the supply of ants and termites (Van Dyck & Strahan 2008), the project is unlikely to lead to a long-term decrease in the local population of the species.

Significant residual impact assessment for regulated vegetation within the PL

MSES	Disturbance type	Residual impact criteria	Significant residual impact assessment
Regulated vegetation - within 100 m of a Vegetation Management Wetland	Linear	20 m wide in a sparse or very sparse RE; or 25 m wide in a grassland RE. Clearing must also occur within the wetland or within 50 m of the defining bank to trigger an SRI (as described in Section 5.3.2).	**No significant impact** As discussed in Section 5.3.2 (Table 6), where disturbance occurs in Vegetation Management Wetlands and within 50 m of the defining bank, it will comply with SRI clearing limits. Flowline Right of Ways (RoW) will cause temporary disturbance of up to 16 m in width. 13 m of the flowline RoW width will be reinstated as soon as practicable following installation (inclusive of reinstatement of trenches where flowlines are buried). Access tracks will be up to 13 m wide.
	Non-linear	2 ha within a sparse or very sparse RE; or 5 ha within in a grassland RE. Clearing must also occur within the wetland or within 50 m of the defining bank to trigger an SRI (as described in Section 5.3.2.	**No significant impact** As discussed in Section 5.3.2 (Table 6), where disturbance occurs in Vegetation Management Wetlands and within 50 m of the defining bank, it will comply with SRI clearing limits. Well pads will be up to 1.6 ha.

Regulated vegetation - intersecting a watercourse	Linear	20 m wide in a sparse or very sparse RE; or 25 m wide in a grassland RE. Clearing must also occur within the defined distance or within 5 m of the defining bank to trigger an SRI (as described in Section 5.3.2.	**No significant impact** As discussed in Section 5.3.2 (Table 6), where disturbance occurs within the defined distance of Vegetation Management Watercourses and Drainage Features and within 5m of the defining bank, it will comply with SRI clearing limits Flowline Right of Ways (RoW) will cause temporary disturbance of up to 16 m in width. 13m of the flowline RoW width will be reinstated as soon as practicable following installation (inclusive of reinstatement of trenches where flowlines are buried). Access tracks will be up to 13 m wide. Flowlines and access tracks will be restricted as much as practicable at watercourse crossings.
	Non-linear	2 ha within a sparse or very sparse RE; or 5 ha within a grassland RE. Clearing must also occur within the defined distance or within 5 m of the defining bank to trigger an SRI (as described in Section 5.3.2.	**No significant impact** As discussed in Section 5.3.2 (Table 6), where disturbance occurs within the defined distance of Vegetation Management Watercourses and Drainage Features and within 5m of the defining bank, it will comply with SRI clearing limits. Well pads will be up to 1.6 ha.

Significant residual impact assessment for high ecological significance wetlands

The PL contains High Ecological Significance (HES) wetlands mapped within the map of Queensland wetland environmental values under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*. Areas of HES wetland have been deemed present where wetland values, primarily wetland REs were ground-truthed within the site (refer to Section 4.2.3). The proposed works will result in disturbance up to approximately 0.9 ha of Queensland Government Mapped HES wetlands.

Assessment against the SRI criteria for wetlands and watercourses within the SRI Guideline is provided within the below table.

Environmental attribute	Significant residual impact (SRI) assessment
Areas of the wetland or watercourse being destroyed or artificially modified	**SRI unlikely** While the proposed works will result in the clearing of vegetation in up to approximately 0.9 ha of Queensland Government mapped HES wetlands, a SRI is unlikely as: • During detailed design stages, infrastructure will be micro-sited to minimise impacts to HES wetlands. • Construction and rehabilitation works will be timed to occur outside of flood periods, which will minimise impacts on wetland values. • Approximately 0.3 ha of disturbed area will be immediately rehabilitated post-disturbance, which includes pipeline Right of Ways and a portion of disturbance for well leases and sump pits. • Pipeline reinstatement will retain the topsoil profile and existing seed bank wherever practicable. Vegetation communities that will be disturbed include an abundance of ephemeral herbs and grasses, which naturally remain dormant within the soil and germinate following flood events. As such, natural rehabilitation processes will typically lead to the reinstatement of a vegetation community consistent with the pre-disturbance vegetation. • The success and timing of natural rehabilitation will largely depend on the occurrence of rainfall and flooding processes i.e. extended periods of natural drought (i.e. el Niño events) followed by periods of high rainfall / flooding (i.e. la Nina events) are characteristic of the region. • Vegetation communities within which the clearing will occur contain limited woody vegetation, which minimises impact to soil stability. • The proposed works are unlikely to affect the hydrological processes of the wetland as: – no drilling is proposed in waterway channels – the small extent of disturbance is unlikely to significantly affect water movement, erosion and sedimentation processes – rehabilitation of pipelines will be completed when no surface water is expected to be present on site and outside of flood events/inundation periods – all non-essential infrastructure will be decommissioned and rehabilitated prior to the onset of flood events/inundation periods (wherever practicable and safe to do so); and – access tracks, infrastructure and seismic lines located, prepared and constructed to maintain pre-existing surface water flows. Culverts and floodways installed where required.

Environmental attribute	Significant residual impact (SRI) assessment
A measurable change in water quality of the wetland or watercourse—for example a change in the level of the physical and/or chemical characteristics of the water, including salinity, pollutants, or nutrients in the wetland or watercourse, to a level that exceeds the water quality guidelines for the waters	**No significant impact** The proposed works are unlikely to affect the water quality of wetlands within the PL as: • no drilling is proposed in waterway channels • the small extent of disturbance in unlikely to affect water movement, erosion and sedimentation processes • rehabilitation of pipelines will be completed when no surface water is expected to be present on site and outside of flood events/inundation periods • all non-essential infrastructure will be decommissioned and rehabilitated prior to the onset of flood events/inundation periods (wherever practicable and safe to do so) • no activities proposed involve the discharge of water (point or diffuse sources) or the construction or operation of regulated dams and other major infrastructure (i.e. separator ponds, permanent camps); and • Fuel, oil and chemical storage and handling undertaken in accordance with Australian standards and guidelines (i.e. in bunded areas) and in small volumes wherever practicable.
The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected	**No significant impact** The proposed works will be scheduled to be completed when no surface water is expected to be present within the PL and outside of flood events/inundation periods. The Cooper Creek floodplain wetlands undergo natural boom-bust cycles after, during and following flood events. The possible diversion or interception of overland flow from surface infrastructure and area of cleared vegetation is negligible in the context of surrounding habitats and is unlikely to impact habitat or lifecycle of native species.
A substantial and measurable change in the hydrological regime or recharge zones of the wetland, e.g. a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland	**No significant impact** The proposed works will be scheduled to be completed when no surface water is expected to be present within the PL and outside of flood events/inundation periods. The possible diversion or interception of overland flow from surface infrastructure is negligible when considering the small footprint of proposed works compared to the catchment area and water movement. Groundwater modelling and assessment has identified groundwater dependent ecosystems are unlikely to be affected.
An invasive species that is harmful to the environmental values of the wetland being established (or an existing invasive species being spread) in the wetland	**No significant impact** The project is unlikely to increase the abundance of invasive species above their current levels or result in the introduction of new invasive species. Weed management measures have been identified within Section 5.3.

Significant residual impact assessment for Strategic Environmental Area

The majority of the PL is located within a 'designated precinct' of the Channel Country SEA. The proposed works will result in disturbance to approximately 115.5 ha of SEA. Under the *Regional Planning Interests Act 2014*, a resource activity is determined to have an 'impact' on a SEA if the impact affects:

- a feature, quality, characteristic or other attribute of the area; or
- the suitability of land in the area to be used for a particular purpose.

Assessment against the SRI criteria for SEAs within the SRI Guideline is provided within the below table.

Significant residual impact assessment for Channel Country SEA environmental attributes

Environmental attribute	Significant residual impact (SRI) assessment
The natural hydrologic processes of the area characterised by: • natural, unrestricted flows in and along stream channels and the channel network in the area; and • overflow from stream channels and the channel network onto the flood plains of the area, or the other way; and • natural flow paths of water across flood plains connecting waterholes, lakes and wetlands in the area; and • groundwater sources, including the Great Artesian Basin and springs, that support waterhole persistence and ecosystems in the area.	**SRI unlikely** The proposed development is unlikely to significantly affect natural hydrologic processes as: • no drilling is proposed in waterways • the small extent of disturbance in unlikely to affect water movement, erosion and sedimentation processes • rehabilitation of pipelines will be completed when no surface water is expected to be present on site and outside of flood events/inundation periods • all non-essential infrastructure will be decommissioned and rehabilitated prior to the onset of flood events/inundation periods (wherever practicable and safe to do so) • possible diversion or interception of overland flow from surface infrastructure (i.e. borrow pits) is negligible when considering the small footprint of proposed works compared to the catchment area and water movement; and • access tracks, infrastructure and seismic lines located, prepared and constructed to maintain pre-existing surface water flows. Culverts and floodways installed where required.

Environmental attribute	Significant residual impact (SRI) assessment
The natural water quality in the stream channels and aquifers and on flood plains in the area.	**SRI unlikely** The proposed development is unlikely to significantly affect natural water quality as, typically: • proposed drilling locations are set back from the surrounding Cooper Creek channels • drilling will be scheduled to be completed when no surface water is expected to be present on site and outside of flood events/inundation periods • the width of linear infrastructure corridors through waterway crossings has been restricted to the minimum width practicable, which is below the maximum width of SRI to regulated vegetation – intersecting a watercourse • no activities proposed involve the discharge of water (point or diffuse sources) or the construction or operation of regulated dams and other major infrastructure (i.e. separator ponds, permanent camps) • groundwater modelling and assessment has identified groundwater dependent ecosystems are unlikely to be affected; and • additional management and contingency measures for fuels/chemicals and unplanned releases of contaminants are identified within the Regional Interests Development Application Assessment Report.
The beneficial flooding of land that supports flood plain grazing and ecological processes in the area.	**SRI unlikely** The proposed development is unlikely to significantly affect the hydrological processes and flooding in the area as: • possible diversion or interception of overland flow from surface infrastructure (i.e. borrow pits) is negligible when considering the small footprint of proposed works compared to the catchment area and water movement; and • construction activities will be temporary in nature and will be scheduled to be completed when no surface water is expected to be present on site and outside of flood events/inundation periods.