Vintage Energy

Vali Gas Field Project

Supporting Documentation for Site-Specific Application

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ERIAS

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Attachment A: Vali Field PL 1125 Ecological Assessment Report

Attachment B: Risk Assessment Approach

Attachment C: ERCE Emissions Forecast Report

Attachment D: Contaminated Land Register Search Results

Attachment E: Vali Gas Field Underground Water Impact Report



1. Project Description

The Vali Gas Field is located in ATP 2021 within the Cooper Basin, in the Shire of Bulloo in Queensland (Figure 1.1). Currently Environmental Authority BRPG005 authorises Non-Scheduled Petroleum Activity on Authority to Prospect ATP2021 (located on Lot plan 450 SP274333). Vintage Energy and their joint venture (JV) partners are seeking to partially convert the existing Authority to Prospect (ATP) 2021 into a Petroleum Lease (PL) 1125 (Vali Gas Field) in the Cooper Basin for conventional gas production.

The Vali Gas Field (Figure 1.2) currently includes the Vali-1, Vali-2 and Vali-3 wells and associated flowlines (authorised under ATP 2021 (environmental authority BRPG005)) and the Vali pipeline and Vali processing facility, permitted under Pipeline Licence (PPL) 2070 (environmental authority P-EA-100271494). The Vali pipeline exports gas from the Vali Gas Field to the Santos-operated Moomba gas plant in South Australia, however, this will not be part of this application. Vali-1, Vali-2 and Vali-3 and their associated flowlines have all been constructed.

There is the potential for two future exploration/production wells within the Vali field, Vali-4 and Vali-5 (Figure 1.1). However, the locations of these two wells and expected drilling timeline is not set. The locations included in this application are nominal locations at time of submission. If these additional wells are drilled, Vintage Energy will need to construct and operate associated infrastructure, potentially including laydowns, temporary accommodation camps and borrow pits. This infrastructure would be housed within the projected 200 x 200 m pads for Vali-4 and Vali-5. The proposed Vali-4 well lease will require a new access track to be created to connect it to the Vali-1 facility. The proposed Vali-5 well lease is within close proximity of the Kudnari bore operated by Vintage, it may require a short access track for connection to the existing road. Well stimulation at Vali-4 and Vali-5 is not included in this application.

In addition to Vali-4 and Vali-5, there may be future wells drilled in PL1125, although their locations and time of drilling is yet to be determined. These potential future wells are included in the greenhouse emissions forecast, but not mentioned elsewhere in this document or included in this application.

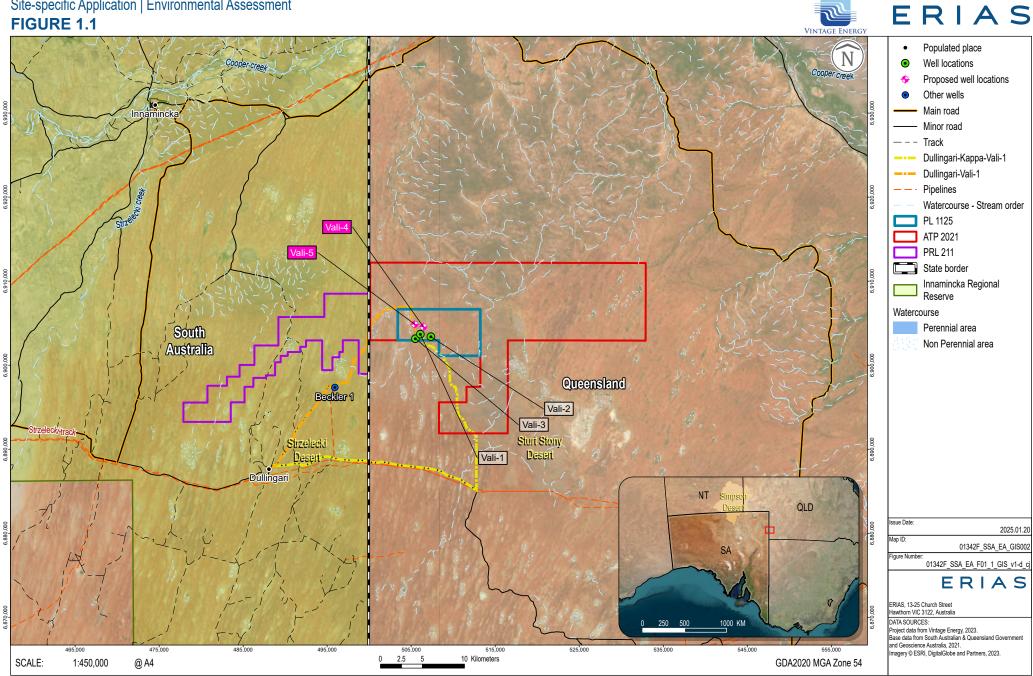
Currently there are two operational lined water storage ponds at the Vali-1 facility with capacities of 600 m³ and 1320 m³. These are not considered to be regulated structures as they have less than 2.5 ML of capacity. An additional holding pond may be required on the existing and cleared Vali-1 lease to increase water holding capacity during production. This additional pond will be less than 2.5 ML capacity.

The Vali Gas Field is unmanned with operators attending the site from Moomba as required. Consequently, there is no permanent accommodation on site. Vintage Energy plans to produce commercially viable quantities of gas from the existing and operating Vali Gas Field with gas to be exported to Moomba.



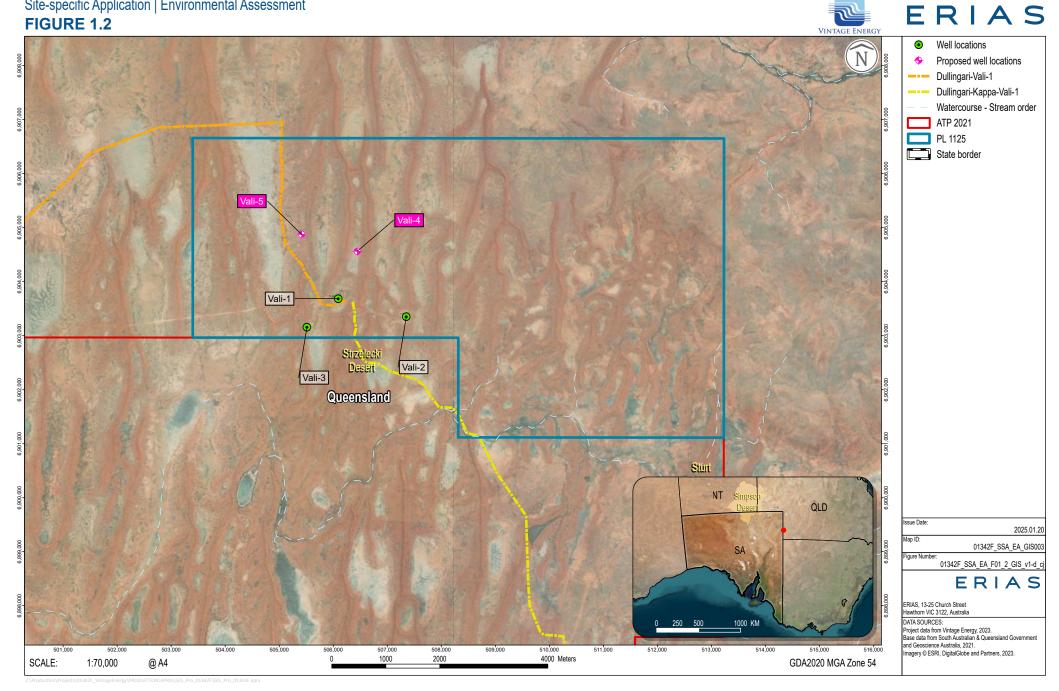
PROJECT LAYOUT

Site-specific Application | Environmental Assessment



Site-specific Application | Environmental Assessment

FIGURE 1.2





2. Description of Land Where the Activity/Activities Will Be Carried Out

2.1 Geology, Terrain and Soils

Geological mapping shows that the well sites are primarily situated on a surface geology formation of quartz sand forming dunes. The soil of the well pad area is mapped as red massive earths with the terrain described as plains with longitudinal sand dunes and clay pans (DNRME, 2019). Soils through the centre of the Vali Gas Field site, east of the well pads, are identified as earthy loams, within an undulating and low, hilly terrain (DNRME, 2019).

The Cooper Basin is a sedimentary geological basin (DNRME 2019), and is entirely overlain by the Eromanga Basin. The land type of the Project area is a mixture of dunefields and salt lakes, and is situated between the Strezlecki, Simpson and Sturt Stony deserts.

Mapping access from the Queensland Globe (DNRME, 2019) provides broad land systems across the site and are described below:

- Poongamulla: Characterised by dunes 5 to 12 m high, with steeply sloping (15 to more than 50%) mobile crests and sloping dune flanks (15 to 50%). The dunes are converging and diverging with flat claypans in the interdune area (DNRME, 2019). This is the dominant land system unit located in the eastern and western extent of the Vali Gas Field site (ATP2012), including the well pads.
- Epsilon: Described as flat claypans and seasonal lakes subject to periodic flooding, with low wind-blown rises (DNRME, 2019). Interspersed in small pockets throughout the Vali Gas Field.
- Nappamerry: Defined as undulating to gently undulating plains, occasionally slightly dissected, with slopes ranging from 1 to 5% (DNRME, 2019). Dominant land system through the centre of the license area, east of the well pads.
- Plevena: Characterised by gently undulating to undulating rolling plains, with slopes from 1 to 5% (DNRME, 2019). Interspersed as small pockets throughout the Vali Gas Field.
- Durham: Scarps and flat to gently undulating tops of dissected tablelands, mesas and buttes. Slopes range from less than 2% on the tops, varying to 20% on scarps and 5% to 8% on lower slopes (DNRME, 2019). This is only present to the far north of the Vali Gas Field.
- Clyde: Defined as flat to gently undulating sandplain with low dunes, frequently with eroded aprons. Poorly defined, well vegetated drainage lines connect the lower parts of the plains (DNRME, 2019). This is only present in a small corner of ATP 2021, northeast of the well pads.





While the majority of ATP 2021 is comprised of the Nappamerry land system, the well pads are located on the dunes and claypans of the Poongamulla system. Isolated pockets of Epsilon and Plevena land system units are interspersed throughout the area immediately adjacent to the well pads (DNRME, 2019).

2.2 Bioregion and Topography

The Project site is located within the Strzelecki Desert sub-region of the Simpson-Strzelecki Dunefields Interim Biogeographic Regionalisation of Australia. The main threats to this bioregion are overgrazing and trampling (from both stock and wild introduced herbivores such as camels, donkeys, horses and rabbits), introduced predators such as cats and foxes, uncontrolled fires and invasive weeds.

The terrain of the Cooper Basin is dominated by undulating dunefields (Wiltshire & Schmidt, 2003) although also comprises flat gibber plains, sandplains, floodplains and stony rises. Located within the Cooper Creek Basin and the Cooper Creek Sub-basin, drainage within the site flows into the Lake Eyre drainage division (DNRME, 2019), with Lake Eyre located approximately 370 km to the west.

The Vali-1 well site is adjacent to a clay pan depression and a dune rise (see Figure 1.2) and is 102 to 105 m above sea level (asl). The Vali-2 well site is also located adjacent to a clay pan albeit further away from the clay pan edge and from any dune rises (see Figure 1.2) at an elevation of approximately 107 m asl. Vali-3 is located between a clay pan edge and a north to south running dune at an elevation of 103 m asl (see Figure 1.2).

2.3 Cultural Heritage

PL1125 is found within an area with native title. The determination date was 3rd July 2024. The tribunal file number is QCD2024/004 and the name of the area is the Yandruwandha Yawarrawarrka and Wongkumara Peoples – Queensland Part B Area.

A Conjunctive Ancillary Agreement was executed by Metgasco with the Wongkumara applicants in 2018 as the 100% holders of ATP2021 at the time. Vintage Energy signed a Deed of Assumption for the Conjunctive agreement on 5 November 2019, with an effective date of 2 July 2019. Since then, as Operator, Vintage has held annual meetings with the Wongkumara giving details of proposed work. These meetings have been held in Dubbo, although the claimants travel into Dubbo from many locations including Echuca, Bourke, Walgett and Wentworth. Wongkumara have conducted on site cultural heritage clearances for all ground disturbance between 2019 and present day. These have been held in 2019, 2020, 2022, 2023 and 2024.

During surveys, representatives of the Wongkumara claimant group attended site and cleared all proposed ground disturbance areas prior to the commencement of works. In all cases , where requested by the group, Vintage modified locations to avoid areas identified to be of cultural significance. To avoid accidental disturbance contractors were provided with maps etc. indicating the location of areas to be avoided.

2.4 Native Flora and Fauna

Desktop searches of flora and fauna present in the study area were conducted by searching Queensland Globe for regional ecosystems, wetlands and groundwater dependant ecosystems,





and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) protected matters search tool (PMST) for threatened ecological communities and species.

The petroleum lease area, PL1125, contains the Vali Gas Field infrastructure including wells and pipelines. The desktop search of Queensland Globe was conducted within this lease area. The results show that all of the vegetation in the area is remnant vegetation. There were six regional ecosystems found in the desktop search, with all of these confirmed during the field survey. These are:

- 5.3.22 Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes;
- 5.6.4 Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes;
- 5.6.5 Variable sparse to open-herbland or *Triodia basedowii* hummock grassland on dune flanks, crests and sandy interdunes;
- 5.6.8 Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes;
- 5.9.3 Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments; and
- 5.9.4 *Aristida contorta* sparse tussock grassland on fresh Cretaceous sediments with dense gravel cover.

Wetlands and groundwater dependant ecosystems were also found in the desktop study:

- Eight lacustrine wetlands.
- Minor drainage lines.
- Potential for riverine wetlands of low significance in 78.84%.
- Potential for riverine wetlands of very high significance in 25.16%.
- Non-riverine wetlands of medium significance in 14.72%.
- Groundwater dependant ecosystem of regional ecosystem RE 5.3.22, identified as a regulated vegetation community in a wetland.

No palustrine wetlands, named waterways or springs were found in the desktop search.

The EPBC PMST desktop search was conducted within the PL1125 area with a 50 km buffer. The search found 3 flora and 13 fauna species considered threatened under the EPBC Act (see Attachment A for each species and its likelihood of presence). Threatened is inclusive of EPBC listed classifications of Critically Endangered (CR), Endangered (E) or Vulnerable (V).

Five migratory species were listed in the desktop search in addition to the threatened species.





Extending the search buffer to 100 km, an additional six species were identified. No threatened ecological communities (TECs) under the EPBC Act were identified even with the extended buffer.

2.5 Weeds and Pests

The field ecological survey undertaken in September 2024 identified one introduced species, paddy melon (*Citrullus amarus*). No species recorded are listed as Weeds of National Significance (WoNS) or Declared Pest Plants.

Pest animals that may occur within 10 km of the Project area (DoEE, 2019) include house sparrows, common starlings, camels, goats, cats, house mice, rabbits, feral pigs and foxes.

2.6 Surface Water and Watercourses

The following information sources were reviewed to describe the watercourses relevant to PL1125.

- Published mapping information:
 - o Queensland Wetland Information Nappamerry 100k (DESI, 2013).
 - Queensland Spatial Catalogue QSpatial (DoR, 2024).
- Smith et al. (2015) Lake Eyre Basin Bioregional Assessment.
- Smith (2024) site-specific desktop review and field survey for PL1125.

PL1125 (shown in Figure 2.1) is situated in the Cooper Creek Basin, approximately 38 km south of Cooper Creek (Figure 2.2) and within the Channel Country Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, and Simpson-Strezlecki Dunefields and Sturt Stony Desert sub-regions (Smith, 2024). Surface flows in the region are derived from runoff in the catchment headwaters. Cooper Creek originates in southwest Queensland and flows in a southwest direction into South Australia, through a network of braided channels before narrowing into a single channel flowing west toward Innamincka (DNRME, 2021). The system then drains out into a floodplain environment before discharging into Lake Eyre, located approximately 370 km to the west. Review of the hydrological information in Smith et al. (2015) indicates the closest surface water flow gauge to PL1125 is at Nappa Merrie on the Cooper Creek. Electrical conductivity (salinity) is also measured at this gauge station. Surface hydrology mapping (DESI 2013 and DoR 2024) shows Sandy Creek (Figure 2.2) located approximately 5 km to the north of PL1125 which drains into Cooper Creek.

Eight lacustrine¹ (non-riverine) wetlands were identified within PL1125 by the desktop review (Smith, 2024). Although these wetlands were dry at the time, their presence was confirmed during the field survey, with the correct regional ecosystems present to classify them as wetlands.



¹ Lacustrine wetlands are lakes that are typically larger than eight hectares located in topographic depressions or damned river channels that lack vegetation cover (Smith, 2024).



Wetland vegetation types (Regional Ecosystem² Identification (RE ID) reference number 5.3.22) associated with lacustrine wetlands are described as 'sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes'. The desktop review indicated that no palustrine³ wetlands, named waterways, or springs were present within PL1125. Minor drainage lines were also identified. The percent likelihood for wetlands of aquatic conservation significance to be associated with these drainage lines was assessed as follows:

- Riverine wetlands:
 - o of low significance (74%).
 - o of very high significance (25%).
- Non-riverine wetlands:
 - o of medium significance (14%).

Lacustrine and palustrine wetlands are ecosystems that have the potential to be groundwater dependent ecosystems (GDEs) where they rely on surface expression of groundwater. Regional ecosystems (RE) and riverine wetland systems (riverine) are ecosystems that have the potential to be GDEs where they rely on the presence of subsurface groundwater.

The largest lacustrine wetland is located to the west of the proposed Vali 5 well pad and the wetland adjacent to Vali 3, as well as the south-eastern section of PL1125 (Figure 2.1) are identified as being of state biodiversity significance (Smith, 2024). This is due to potential presence of a wide range of invertebrates and algae and the potential for providing habitat for waterbirds including migratory waders. Other areas of PL1125 were identified in the desktop review as being of regional or local significance. The eight lacustrine wetlands noted in the Biodiversity and Conservation Values (BCV) report presented in Smith (2024) were identified on the map of referable wetlands Matters of State Environmental Significance (MSES) regulated vegetation (defined watercourse). No wetlands of high ecological significance were identified within PL1125 and the biodiversity status of all areas within PL1125 were of 'No concern at present' (DESI 2024b, DESI 2024c cited in Smith, 2024).

³ Palustrine wetlands are generally non-tidal swamps and marshes dominated by vegetation (>30% cover), or where lacking vegetation they are smaller than eight hectares (Smith, 2024).



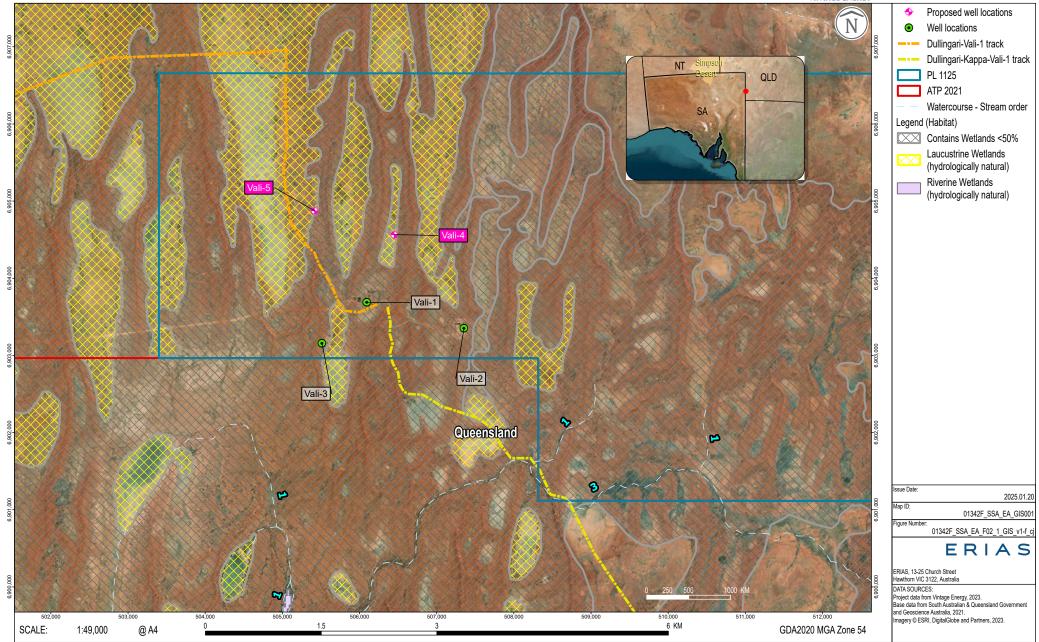
2-5

² Regional Ecosystems (RE) are vegetation communities in a bioregion that are consistently associated with particular combinations of geology, landform and soil (DESI, 2024a cited in Smith 2024).

MAPPED WATERCOURSES IN PL1125

Site-specific Application | Environmental Assessment FIGURE 2.1



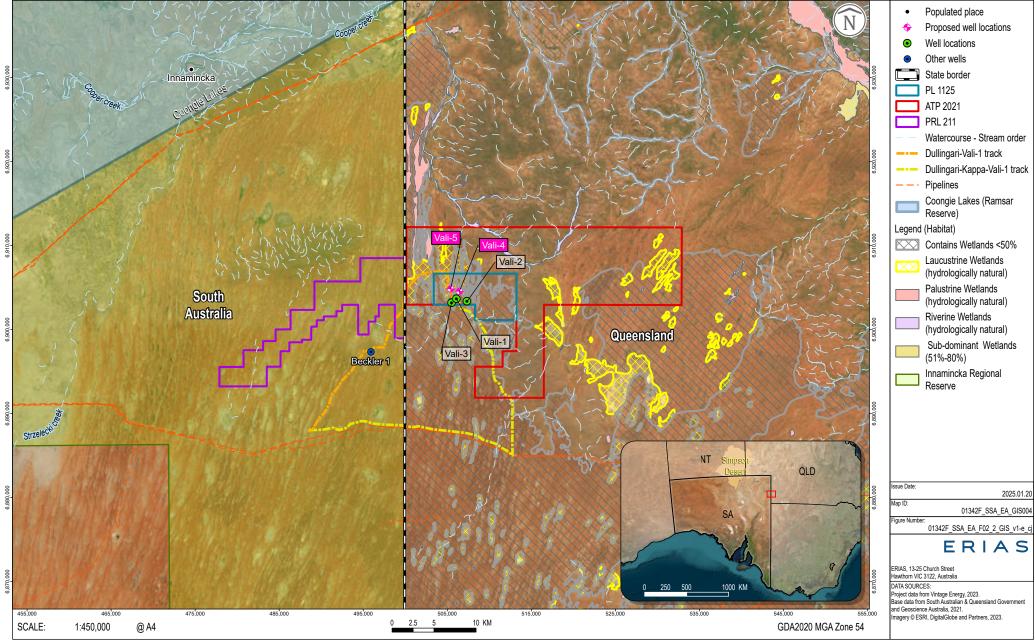


WATERCOURSES IN THE SOUTHWEST OF QUEENSLAND AND THE NORTHEAST OF SOUTH AUSTRALIA

Site-specific Application | Environmental Assessment

FIGURE 2.2

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The findings of the desktop review were ground-truthed during a field survey in September 2024 following rains in July 2024. The areas designated as very high significance of riverine wetlands were investigated in the field with no evidence found of waterholes or substantial drainage lines that would support riverine wetlands. The drainage lines present were shallow and sandy and restricted to the south-eastern and north-eastern sections of PL1125.

Based on the desktop review and field survey, PL1125 is characterised by a mosaic of shallow ephemeral lacustrine wetlands and claypans interspersed amongst undulating plains dissected by low sand dunes positioned in a north to south orientation (Figure 2.1). The lacustrine wetlands and clay pans occur in between the dunes and are narrow and elongated with drainage occurring from dune ridges to the lowest-lying areas of the lacustrine wetlands/claypan depressions. Dune rises are typically several metres higher in elevation than the adjacent lacustrine wetlands/claypans.

The topographic contours shown in Figure 2.1 indicate that PL1125 is generally flat with a slight slope towards the west and south. There are an increased number of lacustrine wetlands in the western portion of PL1125 and an ephemeral water course to the south of PL1125.

Flow between the lacustrine wetlands is only likely during flood events. When standing water is present in the lacustrine wetlands (during flood conditions) if water flows it will be slow-moving and is inferred to follow the topography i.e., in a generally westerly direction where there is passage between the north-south oriented dunes. No information was found during the review to confirm if, during extreme flood conditions, surface flows extend to Sandy Creek (approximately 5 km to the north of PL1125).

Following rain and flood events, ponded water will evaporate and infiltrate into the ground. Based on the closest weather station located at Moomba airport, the mean maximum temperatures range from 20°C in July to 39°C in January (Smith 2024). The hot and dry climatic conditions mean that there is generally a lack of standing water in the lacustrine wetlands due to hot and dry summers and cold, and dry winters (BOM, 2024). Rainfall in the Cooper Basin is highly variable and unpredictable; however, average total annual rainfall in the region is low and typically less than 200 mm annually (Smith et al, 2015). When rainfall does occur, events can be intense and localised, and the average annual rainfall can occur in a single extreme rainfall event. Consequently, watercourses and waterbodies in PL1125 area are ephemeral.





3. Assessment of the Environmental Impact

3.1 Description of Environmental Values Likely to be Affected by Each Relevant Activity

Environmental values that may be affected by the activity include:

- Local air quality; a reduction in local air quality triggered by project and vehicle emissions, harm to the health of native flora and fauna, livestock and humans.
- Flora and fauna; impacts may include land clearing for new wells and infrastructure, disturbance from existing Project activities, competition from invasive weeds or pests.
- Cultural heritage sites of significance; known or unknown sites of significance may be impacted during well construction and installation of associated infrastructure.
- Surface water (including waterways, wetlands, rivers and/or streams); contamination from hazardous material spills, loss of well integrity or well construction.
- Groundwater; contamination from hazardous material spills, inadequate well plugging or loss of well integrity.
- Long-term site stability; uncontrolled sediment release may impact vegetation regeneration or the site may fail to revegetate after decommissioning.
- Weeds and pests may become established at the site because of accidental introductions during construction or maintenance activity.

Other potential impacts:

- Noise (acoustics); increased noise and vibrations from project facilities disturbing native fauna, livestock or humans.
- Land use; reduced quality of vegetation present for livestock grazing due to contamination, uncontrolled sediment release and clearing.
- Site contamination from the handling or storing of chemicals and fuels on site.
- Site contamination from improper waste management.

Where MSES are identified you must demonstrate how the development avoids adverse impacts on MSES.

3.1.1 SRI Assessment

A significant residual impact (SRI) assessment was conducted based on results from the desktop and field surveys. The disturbance footprints of regional ecosystems in PL1125 were used





together with existing information to determine the significance of potential impacts to listed species that occur or potentially occur in the area. The impact assessment included eleven species, all of which are EPBC listed as threatened or migratory, that have a potential residual impact. Each of these eleven species is also listed under the Queensland *Nature Conservation Act 1992*, with the Dusky Hopping-mouse listed as Endangered instead of Vulnerable as per the national legislation.

Assessment was conducted for these eleven species based on the Significant Residual Impact Guidelines (DES, 2014) to determine whether the impact is likely to be significant. The guideline lists a number of outcomes that constitute significant impacts, including but not limited to long-term population decrease, fragmentation, or disease introduction. The assessment found that no species impacts are considered to be significant, as summarised below and discussed in full in Attachment A:

- Eight of the species are wetland species; Australian Painted Snipe (E), Curlew Sandpiper (CE, Migratory), Common Greenshank (E, Migratory), Sharp-tailed Sandpiper (V, Migratory), Pectoral Sandpiper (Migratory), Marsh Sandpiper (Migratory), Rednecked Stint (Migratory), and Common Sandpiper (Migratory). PL1125 is not considered to be an ecologically significant location to these species, due to the large extent of suitable habitat that remains in the region. It is unlikely that any of the impacts listed in the SRI Guidelines would occur as a result of infrastructure development within the disturbance footprint, and therefore potential impacts are not considered to be significant.
- Impacts to the Blue-winged Parrot (V, Migratory) are localised and, considering the extensive amount of habitat available to this species and their migratory nature, PL1125 (with an area of 4542.4 ha and a disturbance area of only 41.3 ha) is not considered to be an ecologically significant area for this species. It is unlikely that any disturbance would cause fragmentation or interfere with recovery of this species, and therefore the potential impacts are not considered significant.
- The Southern Whiteface (V) has suitable habitat in PL1125 area but was not observed in
 the field study, despite optimal conditions. While possible for the species to be resident
 in the area, populations are likely to be low and any impacts are likely to be localised to
 the disturbance footprint. These potential impacts are not considered significant due to
 the extent of the habitat remaining in the local area, the absence during the field survey
 and likely low population if it is present.
- Impacts to the Dusky Hopping-mouse (V) are localised to the disturbance area and are
 considered unlikely to be a barrier to movement. There is an extensive amount of
 suitable habitat for this species, which is capable of moving up to 400 m a night and can
 cross unsuitable habitats. Any potential residual impacts are not considered significant.

While no species impacts are considered to be significant, the following mitigation measures can be implemented to reduce the residual impacts.

Mark the areas to be cleared before clearing.





- Clearing should be supervised to ensure no 'out of bounds' clearing takes place.
- Clearing should be conducted directionally in a manner that allows fauna species the best opportunity to relocate to native habitat.
- Placing topsoil in uncompacted stockpiles to minimise loss of seed viability and soil biota.
- Vehicles and mobile equipment will be parked only in designated parking areas.
 Vegetated areas will not be used for parking.
- Maintain a 40-km/h speed limit on all access tracks, to reduce the risk of animal strike.

The SRI assessment identified one significant impact.

The disturbance footprint results in a residual impact to 8.6 ha of RE 5.3.22 (sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes) which lies within mapped wetlands but is not endangered or of concern. This is identified as a significant residual impact to RE 5.3.22 under Section 2.1 of the Significant Residual Impact Guideline due to Criteria 1 and Criteria 2 of being exceeded.

In order to mitigate this significant impact, the disturbance areas for Vali-4 and Vali-5 will be refined prior to their construction. As these wells have not been constructed yet, the location and layout of their well pads is still to be determined.

Both of the proposed wells, Vali-4 and Vali-5, are located within the extent of mapped non-perennial interdunal lacustrine wetlands. While likely to change prior to construction, the proposed well pads and access roads for Vali-4 and Vali-5 intersect lacustrine wetlands for the following areas:

- Vali-4 pad 2.02 ha.
- Vali-4 access road 0.67 ha.
- Vali-5 pad 1.93 ha.
- Vali-5 access road 0.36 ha.

The wells have been placed in their current locations for a number of reasons.

- Firstly, cultural heritage clearance surveys indicated that Vintage Energy should avoid dune habitat as this is more likely to hold cultural heritage significance.
- Secondly, constructing well pads in flat terrain requires less earthworks and area when compared to dune habitat.
- Thirdly, the placement of Vali-4 and Vali-5 close to existing roads and infrastructure will reduce the disturbance to greenfield areas of PL1125.





3.1.2 Surface Water Environmental Values

PL1125 is within the Lake Eyre Basin Program Area of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (the Policy). Schedule 1 of the Policy lists the Environmental Values (EV) and Water Quality Objectives (WQO) that apply to Program Areas. The Lake Eyre Basin is not listed in Schedule 1 of the Policy. Therefore, the EVs that are likely to apply to PL1125 are inferred considering the site-specific watercourses described in the surface water and watercourse section (see Section 2.6) and information on land use and conservation significance of fauna and flora presented in this application.

The following land uses apply to PL1125 and the immediate surrounds:

- · Cattle grazing.
- Oil and gas exploration and production.

While tourism occurs in the area, given the remoteness of the area and being located on an active pastoral lease with no public access, access by recreational visitors is unlikely to occur.

The desktop review by Smith (2024) identified the following numbers of flora or fauna of conservation significance within a 50km buffer of PL1125:

- No Environment Protection and Biodiversity Conservation Act 1999 (EPBC) listed threatened ecological communities (TEC).
- Three EPBC listed flora species. Of these, one plant species is listed as Endangered (E) and two as Vulnerable (V).
- 13 EPBC listed fauna species (11 bird and two mammals) which are considered threatened.
 - Of these two bird species are listed as Critically Endangered (CR); three bird species listed as Endangered (E) and the remaining species are listed as Vulnerable (V).
- Five species of birds are listed as Migratory under the EPBC Act.

The field survey completed in September 2024 recorded the following flora and fauna within PL1125:

- 131 flora species including one introduced species.
- No flora species listed under the EPBC Act or state legislation were recorded.
- 38 species of birds were recorded during the field survey none of which are listed species.
- A number of boom and bust bird species, including Budgerigar, Flock Bronzewing, and Little Buttonquail were common during the survey which reflects the good environmental conditions at the time.





During the infrequent wet periods, the surrounding ephemeral lakes and clay pans will provide temporary habitat for microalgae, aquatic invertebrates, riparian vegetation and foraging birds.

The EVs listed in Table 3.1 are inferred based on the available information on watercourses as described in the surface water and watercourse section (see Section 2.6) and considering the pastoral land use, and the flora and fauna identified within PL1125.

Table 3.1 - Environmental Values*

Environmental Value	EVs likely to apply
Environmental Values for Water	
Cultural and spiritual	✓
Aquatic ecosystems	✓
Agriculture use (livestock drinking water)	✓
Aquatic foods for human consumption	Х
Aquaculture	Х
Recreational use (swimming, wading, boating, fishing, aesthetic)	Х
Drinking water (raw water supply for humans)	Х
Industrial uses (mining and minerals refining/processing)	Х
Environmental Values for Wetland	
Health of the wetland ecosystem	✓
Wetland's natural state and biological integrity	✓
Presence of distinct or unique features endemic plants or animals and their habitats, including threatened wildlife and near threatened wildlife under the <i>Nature Conservation Act 1992</i>	✓
Wetland's natural hydrological cycle	✓
Natural interaction of the wetland with other ecosystems, including other wetlands	✓

^{*}Environmental values sourced from the Environmental Protection (Water and Wetland Biodiversity) Policy 2019.

The EV of stock watering is conservatively listed given stock drinking water is extracted groundwater pumped to watering points. Livestock will drink from clay pans when ponded water is present.

3.1.3 Water Quality Objectives

Schedule 1 of the Policy does not list Lake Eyre Basin, and therefore no WQOs are identified. Other than the flow gauge and EC monitoring station at Nappa Merrie, no background water quality information was identified in the literature search and review for PL1125 and surrounds. Furthermore, there are practical constraints to assessing water quality in remote areas that are subject to infrequent rainfall and inundation. When sufficient water is present to allow time to mobilise for monitoring, it is also likely that roads will be impassable to access the area to perform water quality monitoring.

There are no water quality guidelines published by Australian and New Zealand Governments (ANZG, 2018) for cultural or spiritual values. It is possible that existing water quality guidelines





designed for other water uses (such as for protection of aquatic ecosystems), may be acceptable to traditional owners.

Although ANZG (2018) provides aquatic ecosystem guidelines (national default guidelines values (DGVs) for toxicants, and regional physical-chemical stressor DGVs), these apply to steady state ecosystems, not ephemeral waters.

Water quality parameters in ephemeral lakes will vary with the wetting-drying hydrological cycle. For example, ephemeral waters will become increasingly saline with evaporation.

Select livestock drinking water values from Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (ANZECC and ARMCANZ, 2000) are listed below in Table 3.2. These parameters are selected based on a stressors potential to be associated with the activity and represent values at which drinking water should not be harmful, and therefore higher values may be tolerated.

Table 3.2 – Livestock Drinking Water

	3
Parameter (units)	Livestock Drinking Water*
Total dissolved solids (mg/L)	<4000#
Nitrate (mg/L)	<400
Nitrite (mg/L)	<30
Sulphate (mg/L)	<1,000
Calcium (mg/L)	<1,000
Mercury (mg/L)	0.002
Zinc (mg/L)	<20
Gross alpha (Bq/L)	<0.5
Gross beta (excluding K-40) (Bq/L)	<0.5

^{*} WQOs listed are to protect livestock (i.e., sheep, cattle, horses, pigs, poultry). Where WQOs specific to cattle are available, this is stated (see note*)
Beef cattle

3.1.4 Potential Impacts to Surface Water Environmental Values

Impacts to environmental values (cultural and spiritual values, aquatic ecosystems, livestock drinking water, wetlands) are possible if a spill or loss of containment occurs.

Spills or loss of containment could entail:

- 1. A burst or leaking pipe, hose, or tank on the well pad releasing <2,000 L of contaminated waters or fuel.
- 2. A flood event that inundates the well pads and/or evaporation ponds.

It is possible that a spill or release during dry conditions could have localised impacts to soils on, and surrounding the well pad, and/or sediment in a clay pan adjacent to a well pad. A spill or release when conditions are wet has the potential to transport contamination further away from the well pad, over a more extensive area. However, it is also likely that during wet conditions the increased volume of water will result in reduced concentrations of contaminants whereby the potential for adverse effects to environmental values is reduced. The potential for dispersion and





reduction in concentration along the flow path (particularly during a flood scenario) suggests the potential for adverse effects to EVs is unlikely, and would be of short term duration.

Using the risk assessment approach (Attachment B) included in this application, the potential impacts are assessed to be unlikely to occur, and with minor consequence with a risk rating of very low prior to controls being applied.

Several processes, procedures and controls will be in place to limit the potential for impacts on these environmental values if a spill or loss of containment occurred. Impacts from these possible release scenarios are likely to be temporary and can be managed.

The following controls, mitigation and management measures will assist in managing impacts:

- The well pad is elevated relative to surrounding land, and the elevated bunds surrounding the evaporation ponds are unlikely to be inundated during a flood event.
- Water storage ponds are inspected during site visits and their fluid levels are recorded.
 In-between site visits, fluid discharge to the ponds is metered and the change in level is calculated.
- During drilling, turkeys nests are under constant manual surveillance as there are personnel on site throughout this activity.
- If turkey nests or storage ponds are approaching their maximum capacity, fluid will be removed from site via a suction truck and then transported to an appropriate facility.
- Evaporation ponds are lined with impermeable plastic to prevent leaching of chemicals info the subsurface.
- Low hazard water storage ponds are designed, constructed, operated and maintained in accordance with acceptable engineering standards.
- Hazardous materials are stored in bunded areas and are handled and transported in accordance with applicable standards and guidelines.
- An emergency response plan is in place that includes the availability of spill kits including sorbent booms at all locations where hazardous materials are handled or stored.
- Staff are trained in emergency spill response procedures and responsibilities.
- Incidents resulting in loss of containment will result in clean up actions initiated as soon as reasonably practicable.

The pre-mitigation risk rating would not change post-mitigation. The potential for impact to EVs during upset conditions (loss of containment) are nevertheless summarised below in Table 3.3.





Table 3.3 – Residual Risk Ranking for Impacts on Environmental Values

Environmental Value	Risk Ranking (Loss of Containment)		
Environmental Values for Water			
Cultural and spiritual	Very Low		
Aquatic ecosystems	Very Low		
Agriculture use (livestock drinking water)	Very Low		
Environmental Values for Wetland			
Health of the wetland ecosystem	Very Low		
Wetland's natural state and biological integrity	Very Low		
Presence of distinct or unique features endemic plants or animals and their habitats, including threatened wildlife and near threatened wildlife under the Nature Conservation Act 1992	Very Low		
Wetland's natural hydrological cycle	Very Low		
Natural interaction of the wetland with other ecosystems, including other wetlands	Very Low		

3.2 Emissions or Releases

3.2.1 Air

Air contaminants:

- Dust the site is remotely operated with no permanent human presence, therefore there is minimal activity which can generate dust emissions. During standard Project operations, a light vehicle, used fortnightly to undertake monitoring activities, is the only dust generating vehicle on site. However, during the drilling of the proposed wells Vali-4 and Vali-5, there will be increased vehicle use to transport the drill rig and accommodation camp to site. During this period, dust suppression from water trucks may be used if dust emissions are difficult to contain. The three operational well sites (Vali-1, Vali-2 and Vali-3) are all clay capped to minimise dust emissions. The proposed wells Vali-4 and Vali-5 will also be clay capped.
- Odour no odour has been generated from previous petroleum activities in PL1125 and none is expected during the drilling of Vali-4 and Vali-5 wells.
- Light no lighting present on site during normal operations. If the Vali-4 and Vali-5 wells are drilled, then lighting will be required at night for a three week period for the safe operation of the drilling rig and around the accommodation camp.

Fugitive emissions:

• Estimated at 4.3 tCO₂e per year per active well in the greenhouse gas emissions forecast (Attachment C).

Venting or flaring emissions:





- There are no flares present in PL1125.
- Venting estimated at 81.2 tCO₂e to drill a new well, but once operational, the venting rate for all active wells in PL1125 has been fixed at the 2024 level of 30 tCO₂e (Attachment C).

Vehicle exhaust emissions:

- Fortnightly light vehicle monitoring activities on site will produce exhaust emissions (included in Attachment C modelling).
- The drilling of new wells will require trucks to deliver the drill rig and other Project components onto site. Diesel combustion emissions for this activity are included in Attachment C.

Point source air emissions:

- Within PL1125 there are no point sources from fuel burning equipment that are capable of burning 500 kg or more of fuel per hour.
- A diesel generator is the only piece of permanent fuel burning equipment that burns less than 500 kg of fuel per hour that is found at the PL1125 site.

3.2.2 Greenhouse Gas Emissions Inventory

A detailed emissions forecast is provided in Attachment C (ERCE, 2025). This forecast estimates yearly Scope 1 and Scope 3 emissions from 2025 to 2061. There are no estimated Scope 2 emissions as no electricity is purchased to support operations. Vali-3 is currently shut in and has not been included in the online wells and total well tallies.

Table 3.4 below presents the estimated Scope 1 greenhouse gas emissions for the drilling of a new well.

Emissions Emission Total Emissions (tonnes CO2e) Classification Source/Category CO₂e CO₂ CH₄ N₂O Scope 1 Flaring Venting 81.2 1.9 79.3 **Fugitive** 4.3 0.1 4.2 0.1 Combustion -94.8 0.3 94.4 diesel (drilling) Combustion -40.6 40.5 0.1 0.1 diesel (miscellaneous) Total Scope 1 221.0 136.9 83.7 0.4

Table 3.4 – Greenhouse Gas Emissions Inventory

Source: ERCE, 2025

3.2.3 Noise

The terrain is dominated by undulating dunefields (Wiltshire & Schmidt, 2003) although also comprises flat gibber plains, sandplains, floodplains and stony rises. The predominant wind





direction in the Cooper Basin is typically from the southeast, with lighter winds occurring more frequently in May to July, and stronger winds in September to January (Santos, 2017).

The existing noise environment is characteristic of a remote, unpopulated area with low levels of background noise. Regular natural sources of background noise include the wind and native animals, more infrequent background noise includes cattle and vehicle activities of the nearby landowners.

There are no sensitive receptors located within PL1125 and the closest sensitive residential receptor is the township of Innamincka which is located approximately 40 km away in a north westerly direction (see Figure 1.1). There is a closer industrial receptor, the Santos Dullingari gas hub (labelled Dullingari on Figure 1.1), which is located approximately 20 km away in a south westerly direction.

Due to the remote nature of PL1125 and the lack of nearby sensitive receptors, background noise monitoring has not been undertaken. In the absence of this data, the deemed background levels are as per the prescribing noise conditions for petroleum activities guideline (Table 3.5; DESI, 2024d).

 Time Period
 Deemed Background Noise Level (dB(A))

 7:00 am - 6:00 pm
 35

 6:00 pm - 10:00 pm
 30

 10:00 pm - 6:00 am
 25

 6:00 am - 7:00 am
 30

Table 3.5 – Deemed Background Noise Levels

The construction of three of the well pads, their associated flowlines and the Vali pipeline has already been undertaken. During normal operations there is no Project human presence within PL1125, other than regular monitoring which occurs once every two weeks at a maximum. A light vehicle is used to complete this regular monitoring. Typical noise emissions generated on site during operations include:

- Generator use at the workshop container at the Vali metering facility (located on the Vali1 pad). The LG9D1 diesel generator is used only when maintenance work occurs at the
 Vali facility, on average for 2 to 3 hours per month. This generator functions at 65 dBA at
 7 m. This generator is only used during daylight hours.
- The gas separator at the Vali metering facility with minor noise expected of gas flowing.
- Gas flowing in exposed flowlines and pipelines at the Vali metering facility (the large majority of flowlines and pipelines are buried in PL1125).
- Light vehicle use on site (once every two weeks).

The drilling of the Vali-4 and Vali-5 wells will result in heightened noise levels on site for a short period of time. While the expected date for the drilling of these wells is not known, it is anticipated





that each would take three weeks to drill. During this period, non-standard operational noise emissions would be expected from the following:

- Excavation of the well pad using earth moving machinery.
- Trucks delivering the accommodation camp and drill rig to site.
- Generator use at the accommodation camp (housed within the pad area).
- Drilling rig operations.
- Trucks providing supplies to drilling operations and accommodation camp.
- Trucks removing the accommodation camp and drill rig from the site.

3.2.4 Spill Response and Remote Detection

As the site is unmanned remote monitoring occurs 24/7 with pressure, temperature and flow information collected and displayed via a graphical interface to Vintage Energy personnel and maintenance contractors. Leaks from infrastructure would be manifested in pressure changes and in this case, valves automatically close to minimise any loss of containment. Leak detection for ponds is by visual inspection when personnel visit site. This is planned to be every two weeks and there are often additional ad hoc visits when maintenance is required.

In the event of a release of product the system is automated and subsequently the facility would be shut down immediately and maintenance team notified. Attendance at site for any manual work would depend on location of available personnel but would be between 3 hours and 36 hours.

3.3 Description of the Risk and Likely Magnitude of Impacts on the Environmental Values

Table 3.6 describes the risks, potential impacts and magnitudes of impacts for the relevant environmental values. Details on the risk assessment approach are provided in Attachment B.

3.4 Details of the Management Practices Proposed to be Implemented to Prevent or Minimise Adverse Impacts

Table 3.6 lists the management measures which will mitigate the potential adverse impacts of this activity and reduce their severity.





Table 3.6 – Natural Environmental Impacts and Risk Assessment

		Pre-		Risk Assessment		
Risk / Hazard	Potential Impact	mitigation Risk Rating	Mitigation and Management Measures	Likelihood	Consequence	Residual Risk Ranking
	Reduction in local air quality	Low	Use existing tracks, roads and/or seismic lines, where practicable, to prevent unnecessary dust emissions	Unlikely	Moderate	Very Low
Air emissions	Harm to health of native flora and/or fauna	Low	 Maintain a 40-km/h speed limit on all access tracks, to prevent unnecessary dust emissions Operate and maintain vehicles according to 	Unlikely	Minor	Very Low
Air emissions	Harm to health of livestock	Low	manufacturer specifications to prevent unnecessary exhaust emissions	Unlikely	Minor	Very Low
	Harm to human health	Low	 Undertake induction and training sessions for all site personnel, to ensure an understanding of air emission prevention 	Unlikely	Moderate	Very Low
Cultural heritage and sites of significance	Damage to sites of significance and/or removal of item of cultural significance	Medium	 Complete cultural heritage surveys with suitably qualified archaeologists and Wongkumara (Traditional Owners) prior to any additional works Mark known cultural heritage sites to prevent accidental access/damage. Stop all works immediately and implement a Chance Finds Procedure if suspected indigenous or non-indigenous culturally significant material or artefacts are identified within the Project area. Undertake induction and training sessions for all site personnel, to ensure an understanding of cultural heritage considerations Establish and maintain an exclusion zone around chance finds heritage items observed on site until authorisation granted for works to commence. Notify Vintage Energy Operations Manager immediately if potentially culturally significant items are found on site. Notifying the relevant government agency in Queensland 	Unlikely	Significant	Low



		Pre-		Risk Assessment		
Risk / Hazard	Potential Impact	mitigation Risk Rating	Mitigation and Management Measures	Likelihood	Consequence	Residual Risk Ranking
	Loss of native vegetation	Low	 Maintain and appropriately sign all fire-fighting equipment Fire access tracks will be maintained to ensure ease of access to site 	Unlikely	Moderate	Very Low
Fire or	Loss of infrastructure	Low	 Store all dangerous goods and hazardous substances in accordance with manufacturers recommendations and workplace health and safety requirements Design, construct and operate all equipment and infrastructure to reduce the potential for ignition 	Unlikely	Minor	Very Low
explosion	Disturbance, injury or death to fauna	Low	 Restrict smoking to areas clear of any vegetation and prohibit disposal of cigarette butts to land Monitor fire conditions, weather conditions, current fires in the area and high fire risk days 	Unlikely	Minor	Very Low
	Danger to the health and safety of humans	Low	 Develop an Emergency Response Plan, which includes procedures for response to fire Undertake induction and training sessions for all site personnel, to ensure an understanding of fire prevention and response procedures 	Unlikely	Moderate	Low
Groundwater contamination	Groundwater and soil contamination from inadequate well plugging	Medium	 Case and cement well, to prevent contamination Plug each hydrocarbon formation, groundwater aquifer intersected and well at the surface, with cement plugs 	Unlikely	Significant	Low
	Intersection of aquifers	Medium	 Monitor well fluid pressures and take remedial action immediately in the event of pressure decreases Fuel and oil storage facilities to be constructed in accordance with Australian Standard (AS) 1940-2004 	Unlikely	Significant	Low



		Pre-		Ri	isk Assessment	
Risk / Hazard	Potential Impact	mitigation Risk Rating	Mitigation and Management Measures	Likelihood	Consequence	Residual Risk Ranking
	Harm to health of native flora, fauna and ecosystems	Low	 Store produced water on site, in frac ponds, until completion of project activities when any remaining water will be transported offsite for appropriate disposal Residual drilling material will be placed into sumps for the duration of drilling activities, and buried once water has evaporated Manage sewage effluent and/or grey water in accordance with conditions of environmental authority Monitor sumps for overflow during periods of high rainfall 	Rare	Moderate	Very Low
Hazardous materials – storage, handling, spills/leaks	Site contamination (soil, surface water and/or groundwater)	Medium	 Store all dangerous goods and hazardous substances in accordance with manufacturers recommendations and workplace health and safety requirements Volume of chemicals stored onsite will not exceed those listed under Schedule 2 (Part 2 Section 8) of the <i>Environmental Protection Regulation 2008</i> Safety Data Sheets (SDS) to be available for all chemicals stored onsite Minimise fuel transfer where possible, and use drip trays at all times Store residual drilling material in sumps Drilling fluids will not be oil-based or synthetic oil-based Store spill response kits at all locations where hazardous materials are handled or stored Undertake induction and training sessions for all site personnel, to ensure an understanding of SDS application and spill prevention/response 	Unlikely	Significant	Low



		Pre-	Mitigation and Management Measures	Risk Assessment		
Risk / Hazard	Potential Impact	mitigation Risk Rating		Likelihood	Consequence	Residual Risk Ranking
	Disturbance to native fauna	Low	Operate and maintain lighting equipment according to manufacturer specifications	Unlikely	Minor	Very Low
Light emissions (during construction only)	Disturbance to livestock	Low	Remove infrastructure promptly following well drilling Develop Environmental Nuisance and Complaint Management Procedures according to the conditions of the environmental authority	Unlikely	Minor	Very Low
	Visual impact	Low		Unlikely	Minor	Very Low
Long-term site instability	Ongoing uncontrolled sediment release impacting vegetation regeneration and/or surface water quality	Medium	 Implement sediment and erosion control measures to prevent soil loss and deposition beyond Project sites Rehabilitate the site promptly following decommissioning, include the following: remove hardstand areas reshape disturbed areas to a stable landform re-profile contours to be re consistent with the 	Unlikely	Significant	Low
	Failure of site to recover/ revegetate following decommissioning	Medium	surrounding landform - re-establish surface draining lines - reinstate top soil • Monitor performance of rehabilitation activities until final acceptance criteria are met • Develop a rehabilitation report and submit to the administering authority	Unlikely	Significant	Low



		Pre- mitigation Risk Rating	Mitigation and Management Measures	Risk Assessment			
Risk / Hazard Pot	Potential Impact			Likelihood	Consequence	Residual Risk Ranking	
Loss of well integrity	Environmental contamination (soil, surface water and/or groundwater)	Medium	 Perform all activities in accordance with applicable industry and regulatory standards Assess well bore integrity prior to commencing drilling, and rectify any issues immediately Develop an Emergency Response Plan, which includes procedures for response to well issues (e.g. blow out) Undertake induction and training sessions for all site personnel, to ensure an understanding of emergency response procedures 	Unlikely	Significant	Low	
Noise and vibration emissions	Disturbance to native fauna	Low	Operate and maintain all equipment according to manufacturer specifications Undertake induction and training sessions for all site personnel, to ensure an understanding of noise and vibration emission prevention Develop Environmental Nuisance and Complaint	Unlikely	Minor	Very Low	
	Disturbance to livestock	Low		Unlikely	Minor	Very Low	
	Disturbance to humans	Low	Management Procedures according to the conditions of the environmental authority	Unlikely	Minor	Very Low	
Surface water contamination	Contamination to cultural and spiritual water values, aquatic ecosystems, livestock drinking water, wetlands and waterways	Very Low	 Implement sediment and erosion control measures to prevent soil loss and deposition beyond Project sites Undertake project activities to avoid watercourses Implement and maintain measures to minimise stormwater entry Store produced water on site, in ponds, until completion of project activities when any remaining water will be transported offsite for appropriate disposal 	Unlikely	Minor	Very Low	



		Pre- mitigation Impact Risk Rating	Mitigation and Management Measures	Risk Assessment		
Risk / Hazard	Potential Impact			Likelihood	Consequence	Residual Risk Ranking
			 Residual drilling material will be placed into sumps for the duration of drilling activities, and buried once water has evaporated 			
			 Manage sewage effluent and/or grey water in accordance with conditions of environmental authority 			
			 Monitor sumps for overflow during periods of high rainfall 			
			 Locate access tracks to avoid surface water features such as wetland areas and to maintain pre-existing water flows 			
			 Lower any artificially elevated area to original ground level following decommissioning 			
	Injury or death to native fauna and/or livestock	Low	 Use existing tracks, roads and/or seismic lines, where practicable, to prevent unnecessary dust emissions and habitat removal 	Unlikely	Minor	Very Low
			 Maintain a 40-km/h speed limit on all access tracks, to prevent unnecessary dust emissions 			
Vehicle movements			 Operate and maintain vehicles according to manufacturer specifications to prevent unnecessary exhaust emissions 			
	New or increased weed infestations	Low	 Inspect and certify vehicles as weed-free prior to accessing the Project site 	Unlikely	Minor	Very Low
,	weed intestations		 Monitor Project site for new or increased weed issues, and manage accordingly 			
			 Undertake induction and training sessions for all site personnel prior to working on site 			
Waste – storage, handling and disposal	Localised site contamination (soil, surface water and/or groundwater)	Low	Mange waste in accordance with the waste and resource management hierarchy and the waste and resource management principles	Unlikely	Minor	Very Low



		Pre-		Ri	Risk Assessment			
Risk / Hazard	Potential Impact	mitigation Risk Rating	Mitigation and Management Measures	Likelihood	Consequence	Residual Risk Ranking		
	Attraction of fauna	Low	 Segregate waste streams to maximise reuse and recycling No disposal or use of regulated waste General waste disposal will not exceed 10,000t/yr Transport waste, including fluids off site (Moomba) Label all waste bins clearly Cover all waste bins to prevent fauna intrusion, where practicable Manage sewage effluent and/or grey water in accordance with conditions of environmental authority Store produced water on site, in ponds, until completion of project activities when any remaining water will be transported offsite for appropriate disposal Residual drilling material will be placed into sumps for the duration of drilling activities, and buried once water has evaporated Transport hazardous waste through an approved operator and dispose of at a licenced facility Track all waste to ensure the correct volumes are delivered and received at waste disposal facility Undertake induction and training sessions for all site personnel prior to working on site 	Unlikely	Minor	Very Low		
Water use	Groundwater extraction affects other users and/or the environment	Medium	Keep extracted volumes of groundwater to a minimum Monitor and record all extraction volumes of groundwater Earthen embankment storage (e.g., turkey nests) will be used for water storage with fauna entrapment measures implemented	Unlikely	Significant	Low		



		Pre-		Risk Assessment			
Risk / Hazard	Potential Impact	mitigation Risk Rating Mitigation and Management Measures	Likelihood	Consequence	Residual Risk Ranking		
Water storage	Water storage pond failure resulting in sudden release of water	Medium	 Low hazard water storage ponds operated and maintained in accordance with accepted engineering standards appropriate for the purpose for which the pond is intended to be used Design pond floor and sides with material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during operation and decommissioning and rehabilitation Undertake an initial hazard assessment Monitor for early signs of loss of structural or hydraulic integrity as specified in the initial hazard assessment When no longer required, low hazard water storage ponds to be decommissioned to no longer accept inflow from petroleum activities and: Rehabilitated; or Agreed to in writing by the administering authority and landholder to remain in situ, with the contained water of a quality suitable for the intended ongoing uses(s) by the landholder 	Unlikely	Significant	Low	
Introduction of invasive flora and fauna	Harm to health of native flora, fauna and ecosystems	Low	 Inspect and certify earth moving equipment as weed-free prior to accessing the Project site Restrict traffic to established roads and tracks only Restrict the availability of domestic waste by covering bins to prevent access by scavenging species. 	Unlikely	Moderate	Low	
Land clearing	Direct loss or disturbance of native vegetation and/or fauna habitat.	Medium	 Mark the areas to be cleared before clearing. Clearing should be supervised to ensure no 'out of bounds' clearing takes place 	Possible	Moderate	Low	



Risk / Hazard		Pre- mitigation Risk Rating	Mitigation and Management Measures Clearing should be conducted directionally in a manner that allows fauna species the best opportunity to relocate to native habitat Placing topsoil in uncompacted stockpiles to minimise loss of seed viability and soil biota Vehicles and mobile equipment will be parked only in designated parking areas. Vegetated areas will not be used for parking Maintain a 40-km/h speed limit on all access tracks, to reduce the risk of animal strike	Risk Assessment		
	Potential Impact			Likelihood	Consequence	Residual Risk Ranking
	Reduction in native flora species abundance, density and diversity.	Medium		Possible	Moderate	Low
	Reduction in native fauna species abundance density and diversity as a result of habitat loss and fragmentation.	Medium		Possible	Moderate	Low



3.5 Rehabilitation

All rehabilitation of disturbed sites will be undertaken progressively through construction and operational phases where practicable. Currently no sites within PL1125 have been rehabilitated as all Project infrastructure is still in use.

The Vali pipeline has undergone rehabilitation after it was buried and photo point monitoring locations have been established in different vegetation types along its route. However, this pipeline falls under a different environmental authority (P-EA-100271494) and will not be considered further in this application.

During the next phase of the Project, the following sumps and turkey nests will be rehabilitated.

- Vali-1 one turkey nest.
- Vali-2 four turkey nests.
- Vali-3 the sump and four turkey nests.
- Vali-4 and Vali-5 no disturbance has occurred at these proposed sites, but after drilling the turkey nests and sumps will be rehabilitated.

This will occur through the backfilling of the sump or turkey nest with material excavated during their construction.

The drill sump will store the drill cuttings and biodegradable fluid and remain open to enable evaporation before material excavated to form the sump will be backfilled into the sump to cover the drill cuttings. There will be no mixing of drill cuttings with adjacent soils. The dried drilling material will be covered with clean excavated material.

Excavated top soil will be respread on top of turkeys nests if they are located on the edge of the drill pad. However, no top soil will be spread on the backfilled sump as it will form part of the operational area. If there is any hydrocarbon contamination this will be identified and removed before rehabilitation occurs. Photo point monitoring will be established at rehabilitated sump and turkey nest sites after reinstatement has occurred so that revegetation can be tracked. Monitoring will also be completed at these locations to ensure that soil profiles have correctly re-established.

Once the Projects operational life has expired, estimated at 20 years, the wells will be decommissioned and the well pads rehabilitated. Associated activities will include:

- Plugging and cement of the well, and cement testing.
- Removal of all program infrastructure, equipment and waste.
- Re-profiling of land contours to surrounding landform (unless agreed with the landowner).
- Re-establishment of surface drainage lines.
- Replacement of topsoil.





Any associated flowlines and access tracks will be rehabilitated once the Project no longer requires them.

In reference to the published guideline (DESI, 2024e) and rehabilitation hierarchy, the proponent seeks to reinstate the environment to the previous land use (grazing). Final acceptance criteria for the Vali field are as follows:

- All significantly disturbed land is reinstated to the pre-disturbed soil suitability class including remediation of contaminated land.
- The landform is safe for humans and fauna.
- The landform is stable with no subsidence or erosion gullies as evidenced by 3 years of monitoring.
- All significantly disturbed land is reinstated so that the distribution of vegetation communities represents the surrounding undisturbed environment.
- The water quality of water bodies constructed by the petroleum activity meets criteria for subsequent uses and does not have potential to cause environmental harm.
- There is no ongoing contamination to waters.
- There is no ongoing contamination to groundwater from water storage ponds (demonstrated via groundwater monitoring or bores).
- The maintenance requirements for rehabilitated land are no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activities.

A rehabilitation monitoring program will be established and will include the following:

- Monitoring of performance indicators will be carried out on rehabilitation activities until
 final acceptance criteria (see above) have been met for the rehabilitated area.
- Photo point monitoring will occur at the rehabilitated well pads as well as along previously buried pipeline and flowline routes.
- Analogue sites in areas of PL1125 not disturbed by the petroleum activity will be
 established so that final rehabilitation success can be compared to a site which hasn't
 directly been influenced by the Project. Given that there are a minimum of three well
 leases to be rehabilitated, a minimum of three analogue sites in the same vegetation
 type will be included in the rehabilitation monitoring program.
- During the operational phase of the Project, rehabilitation monitoring will occur once per year at sites which have already been rehabilitated. After the completion of the Project, monitoring will occur yearly during alternating seasons of autumn and spring. This will continue until final acceptance criteria have been met.
- A trained botanist will complete the rehabilitation monitoring with a focus on species richness, vegetation cover and native species composition when compared to the analogue sites.





4. Details of Waste and Wastewater Management

4.1 Site Management Plan

A search of the Environmental Management Register and the Contaminated Land Register found that PL1125 is not included in either register (see Attachment D). Therefore, a site management plan is not required for the tenure PL1125.

4.2 Residual Drilling Fluids Management

All residual drilling material (muds) and drilling fluids will be diverted to a sump and stored on-site for the duration of drilling activities. Drilling muds will be allowed to settle and water evaporate. At the conclusion of the drilling programs at Vali-4 and Vali-5, residual drilling material will be disposed of on-site by backfilling the sump with material excavated to construct the sump. There will be no mixing of drill cuttings with adjacent soils. The dried drill cuttings will be covered with clean excavated material.

4.3 Sewage and Grey Water

Domestic wastewater produced from the temporary accommodation camp, including both treated sewage effluent and grey water, will be temporarily stored on site prior to being disposed of offsite at a licensed waste facility in Moomba.

4.4 Produced Water and Flowback Fluids

During production testing activities at the proposed Vali-4 and Vali-5, produced water will require temporary on-site storage. During production testing, all produced water will be separated from gas, and directed to an above ground temporary holding pond (turkey nest) which is lined with impermeable plastic. If the produced water is considered contaminated, as per the livestock drinking water guidelines (ANZG, 2018), water will be allowed to evaporate before the solid residue and plastic liner will be transferred by a licensed waste handler to an appropriate facility (Moomba) for disposal.

Produced water from the already drilled wells, Vali-1, Vali-2 and Vali-3, is separated from the gas and then stored in the two operational lined water storage ponds at the Vali-1 facility. Since the reuse of produced water is desirable, Vintage Energy has commenced investigations into using it for future drilling campaigns, road construction and dust suppression. These investigations are ongoing. Currently, the produced water is contained in ponds and evaporated.

4.5 Solid Waste

All solid waste generated from domestic activities will be disposed of in designated and covered waste skips located next to the temporary camp, according to the waste classification. Skips for recyclable waste will be segregated from putrescible waste (food scraps) paper and cardboard. All domestic waste types will be stored on-site prior to transport and disposed at a licensed facility (Moomba).





4.6 Mitigation Measures

Mitigation measures to be implemented during the construction and operation phases of the Project to mitigate potential hazardous materials and waste impacts include:

- Installing, operating and maintaining all plant and equipment according to manufacturer specifications.
- Handling, storing and transporting fuel, oil and chemicals in accordance with applicable standards and guidelines e.g.AS 1940, ADG Code, EPA guidelines 080/07 Bunding and Spill Management.
- Developing and implementing an Emergency Response Plan.
- Providing training in emergency spill response procedures and responsibilities to relevant staff.
- Ensuring that incidents resulting in loss of containment are reported, recorded, and clean up actions initiated as soon as reasonably practicable.
- Maintaining a hazardous materials register.
- Maintaining a copy on site of Safety Data Sheets (SDS) for all chemicals present.
- Ensuring that spill response kits are provided at all locations where hazardous materials are handled or stored.
- Arranging for any waste streams to be segregated on site where appropriate.
- Labelling all waste bins clearly and covering all waste bins.
- Transporting off-site for lawful re-use, remediation, recycling or disposal, waste, including waste fluids unless the waste is specifically authorised by Standard Conditions.
- Transporting waste outside of the licence undertaken by an EPA licenced transport company and relevant waste transport certificates obtained.
- Transporting hazardous waste through an approved operator and dispose of at a licenced facility.
- Disposing of all sewage to a licensed facility in Moomba.
- Water storage ponds are inspected during site visits and their water levels are recorded.
 In-between site visits, water discharge to the ponds is metered and the change in level is calculated.
- During drilling, turkeys nests are under constant manual surveillance as there are personnel on site throughout this activity.
- If turkey nests or storage ponds are approaching their maximum capacity, water will be removed from site via a suction truck and then transported to an appropriate facility.





5. Exercising Underground Water Rights

Vintage Energy commissioned Australasian Groundwater and Environmental Consultants (AGE) to prepare an Underground Water Impact Report (UWIR) for PL1125. This document is included in this application as Attachment E.

5.1 Part A – A Statement that the Applicant Proposes to Exercise Underground Water Rights

Vintage Energy propose to exercise underground water rights.

5.2 Part B – A description of the Area/s in Which Underground Water Rights are Proposed to be Exercised

Water rights will be exercised in the proposed PL1125. This PL is found within ATP2021 and encompass the three existing wells Vali-1, Vali-2 and Vali-3 (see Figure 1.2, Table 5.1). There are also two proposed well locations (Vali-4 and Vali-5) within PL1125.

Well	Easting	Northing	Lithology 1	Lithology 2		
Existing						
Vali-1	141° 3' 48.71"E	27° 59' 32.90"S	Patchawarra	_		
Vali-2	141° 4'29.35"E	27° 59' 42.50"S	Toolachee	Patchawarra		
Vali-3	141° 3' 21.78"E	27° 59' 48.48"S	Toolachee	_		
Proposed						
Vail-4	141° 3' 56.1594"E	27° 59' 2.4"S	NA	NA		
Vali-5	141° 3' 18.36"E	27° 58' 52.32"S	NA	NA		

Table 5.1 - Well Locations

5.3 Part C – A Description of the Aquifer/s Affected or Likely to be Affected

Figure 5.1 summarises the stratigraphy of the Project area. The targets for gas production in PL1125 comprise the Toolachee and the Patchawarra Formations within the Cooper Basin. The surface geology of PL1125 is dominated by Quaternary sands and the total average thickness of the surface deposits is 850 m.

BASIN PERIOD **STRATIGRAPHY** Recent LAKE EYRE BASIN Tertiary Winton Formation MacKunda Formation Oodnadatta Formation CRETACEOUS Allaru Formation Coorikianna Sst < Toolebuc Formation **EROMANGA BASIN** Wallumbilla Formation **Bulldog Shale** Cadna-Owie Formation Murta Formation McKinlay Member Namur Sandstone Westbourne Formation Adori Sandstone **Birkhead Formation Hutton Sandstone** Nappamerri Group COOPER BASIN Toolachee Formation Daralingie Formation Roseneath Shale PERMIAN **Epsilon Formation** Murteree Shale Patchawarra Formation Tirrawarra Sandstone CARBON-**IFEROUS** Merrimelia Formation CAM.-ORD. WARBURTON BASIN

Figure 5.1 – Stratigraphy of the Eromanga Basin and Cooper Basin

Source: AGE, 2024



The Winton Formation is underlain by a series of sedimentary deposits which comprise the Eromanga Basin which represents the largest sub-basin within the Great Artesian Basin (GAB). The total sedimentary thickness of the Eromanga Basin at the site is approximately 1,050 metres. It comprises several stacked formations. The Hutton Sandstone is one of the major sandstone formations of the GAB and is present at the base of the Eromanga Basin in the Project area with a thickness averaging 105 metres. The base of the Eromanga Basin is approximately 2,000 metres below ground level (mbgl) at the Project area. A major unconformity at the base of the Eromanga Basin separates it from the underlying Cooper Basin.

The Eromanga Basin unconformably overlies the Cooper Basin. The Cooper Basin is a non-marine sedimentary pile and can be subdivided into three major geological groups:

- Triassic Nappamerri Group: which comprises the Tinchoo Formation (interbedded siltstone and sandstone, minor coal seams and intraclast conglomerate) and the Arraburry Formation (mudstone, siltstone and fine-grained sandstone). The total thickness of the Nappamerri Group is approximately 350 metres in the Project area.
- Permian Gilgealpa Group: which includes the two target formations for the Vali Gas Field (i.e. the Toolachee and the Patchawarra Formations).
 - The Toolachee Formation comprises interbedded fine to coarse-grained sandstone, siltstone and carbonaceous shale. It is approximately 160 metres thick in the Project area (between 2,400 and 2,550 metres below ground level) and unconformably overlies the mudstones and siltstones of the Daralingie Formation.
 - The Daralingie Formation, The Roseneath Shale, Epsilon Formation and Murteree Shale overlie the Patchawarra Formation. The cumulative thickness of these deposits in the Project area is around 350 metres which predominantly comprises interbedded mudstone, siltstone and shale.
 - The Patchawarra Formation predominantly comprises interbedded sandstone, siltstone, shale and coal. It is approximately 310 metres thick at the three existing production wells. Depths are approximately between 2,800 and 3,110 metres below ground level.
 - The underlying Tirrawarra Sandstone predominantly comprises fine to coarse-grained sandstone interbedded with conglomerate and minor carbonaceous siltstone, shale and coal.
- Late Carboniferous Group: which includes the Merrimelia Formation, it is of glacial origin.

The main aquifers for water extraction include the following:

- Shallow Quaternary and Tertiary sediments.
- The Winton Formation.
- The Great Artesian Basin (GAB) aquifers of the Eromanga Basin which include:
 Mackunda Formation, Wallumbilla Formation, Cadna-Owie Formation, Hooray and Hutton Sandstones.





 Other Cooper Basin aquifers including: Toolachee Formation, Epsilon Formation, Patchawarra Formation and Tirrawarra Sandstone.

It is considered unlikely that the impact of water extraction in the Cooper Basin aquifers could extend into the overlying Eromanga Basin. This is due to the geological discontinuity between the two basins, the thickness (approximately 350 m) of the Nappamerri Group and the low permeability of the Tinchoo Formation, a known regional aquitard (Lech et al. 2020), which sits immediately below the base of the Eromanga Basin. Modelling considered the aquifers which could be impacted by the Vali production wells and identified the following aquifers:

- Hutton Sandstone: typically, comprises fine to coarse-grained quartzose porous sandstones interbedded with minor finer-grained siltstones. It lies unconformably over the Cooper Basin. Thickness is approximately 105 metres (between 1,900 and 2,000 mbgl) and sits approximately 350 m above the Cooper Basin.
- Toolachee Formation: typically comprises porous sandstones interbedded with finergrained siltstones, mudstones and shales with thin coal seams and some conglomerates. It unconformably overlies older formations across the whole Cooper Basin. Thickness is around 160 metres (between 2,380 and 2,540 mbgl in Vali-1).
- Epsilon Formation: predominantly siltstone with minor coal and sandstones. The thickness averages 50 metres.
- Patchawarra Formation: consisting of variable porous sandstone interbedded with siltstone, mudstone and shale with thin coal seams. The thickness is 310 m at the project area (between 2,805 and 3,115 mbgl at Vali-1).
- The Tirrawarra Sandstone: consisting of fine to coarse-grained and pebbly sandstone interbedded with conglomerate, minor carbonaceous siltstone, shale and coal. The Tirrawarra Sandstone is on approximately 80 metres.

5.4 Part D – An Analysis of the Movement of Underground Water to and From the Aquifer

Figure 5.2 presents a hydrogeological conceptual model of the Vali Gas Field. Other local water supply bores in the Project area extend to less than 300 metres below ground level and are therefore thought to be extracting from the Winton or Glendower Formations. The Eromanga Basin unconformably overlies the Cooper Basin where the three production bores, Vali-1, Vali-2 and Vali-3 are extracting water from between 2,380 and 3,110 m below ground level (i.e. more than 2,080 m below local groundwater extractions). Vali-1 is screened within the deepest formation, the Patchawarra Formation. The production well Vali-3 is screened within the Toolachee Formation and the Vali-2 extracts gas from both the Toolachee and Patchawarra Formations. Adopted hydraulic conductivity and storativity values are based predominantly on values available for adjacent lease areas (Santos 2019; Beach Energy, 2020) which are shown in Figure 5.2.



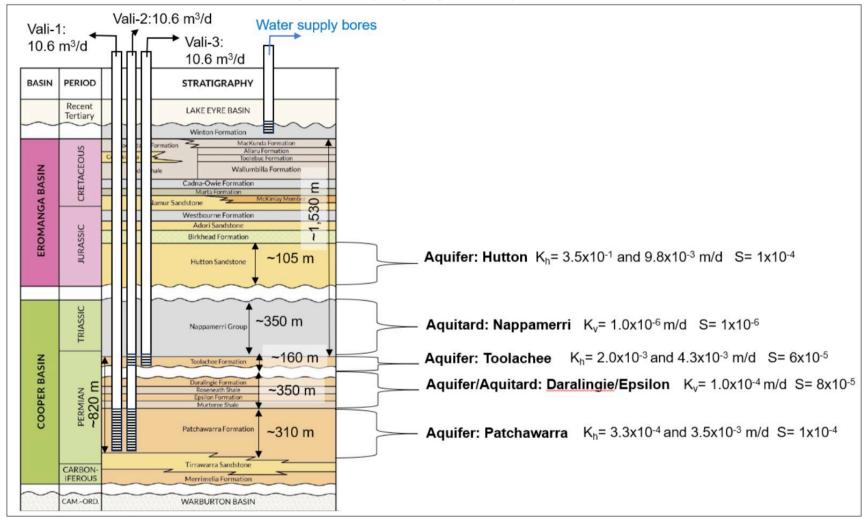


Figure 5.2 – Hydrogeological Conceptual Model

Source: AGE, 2024



As would be expected given the depth of the target formations in the Project area, information on groundwater levels and flow directions in the Toolachee and Patchawarra formations and the Cooper Basin in general are somewhat limited. Groundwater movement even within coarse sandstone units present at such depths is likely to be limited by its reduced capacity to transmit water as permeability tends to decrease with increasing depth. Similarly, groundwater recharge through the overlying 2,400 m thick sedimentary pile which includes significant thicknesses of aquitard material is likely to be negligible. Toolachee and Patchawarra formations are saline and likely to be relatively old, when compared to waters from the overlying GAB aquifers in the Eromanga Basin. The implication here is that the recharge of the Cooper Basin aguifers may be considered minimal to none (Keppel at al., 2016). In general, groundwater flow, if it occurs at all given the expected low permeability, follows the sedimentary bedding, towards lower-lying areas. Evidence gathered from drill stem testing showed "over-pressuring" in the Toolachee, Daralingie and Patchawarra Formations (i.e., pressures which increase with depth and are above the hydrostatic pressure line), which suggests the existence of highly effective seals (i.e. aquitards) within the Nappamerri Group (Lech et al., 2020). Movement of groundwater into and out of the Cooper Basin formations via the overlying Eromanga Basin aquifers is therefore only likely to occur where a connected pathway through the Nappamerri group exists or is subsequently established. Hypothesized pathways include locations where the unit abuts basement highs which could, in combination with localised faulting, create preferential pathways for vertical fluid migration.

5.5 Part E – A Description of the Area of the Aquifer Where the Water Level is Predicted to Decline Because of the Exercise of Underground Water Rights

A model was constructed to predict impacts on groundwater due to the exercise of underground water rights. For detail of the models construction, assumptions and limitations, refer to Attachment E.

Table 5.2 presents the maximum drawdown, the immediately affected area (IAA) and long-term affected area (LTAA), with five-metre drawdown contours.

Aquifer	Immediately Affected Area (Year 3)		Long-term Affected Area		
	Drawdown (m)	5 m Drawdown Extent Radius (km)	Maximum Drawdown (m) – Year 20	5 m Drawdown Extent Radius (km)	
Hutton	0.005	NA	0.03	NA	
Toolachee (Vali-2 58 and Vali-3)		1.65	68	4 (year 22)	
Patchawarra (Vali- 1 and Vali-2)	156	1.65	167	4 (year 22)	

Table 5.2 - Predicted Maximum Drawdown (Initial Scenario)

The predicted IAA area, i.e. the area where more than 5 m of drawdown is predicted during the 2023 to 2026 UWIR reporting period for the Toolachee and the Patchawarra formations is presented in Figure 5.3. The maximum drawdown predicted in the Hutton Sandstone during this period is 5 millimetres and hence there is no IAA for this aquifer. No drawdown impacts are



therefore predicted on any units overlying the Hutton Sandstone. The maximum predicted drawdown is 156 m at Vali-1 within the Patchawarra Formation.

As shown in Figure 5.3 and Table 5.2 the predicted IAA for the Toolachee and the Patchawarra formations are very similar (since the Vali-2 bore is screened in both formations and hence provides a location connection between the two units) and extend around 1.7 km from the production wells Vali-1, Vali-2 and Vali-3.

The predicted LTAA area, i.e. the area where more than 5 m of drawdown is predicted at any time in the future for the Toolachee and the Patchawarra formations is presented in Figure 5.4. Maximum predicted drawdown in the Hutton Sandstone at the end of the production period is 0.03 m and hence there is no LTAA for this aquifer. No drawdown impacts are therefore predicted on any units overlying the Hutton Sandstone. The maximum predicted drawdown is 167 m in Vali-1 within the Patchawarra Formation.

As shown in Figure 5.4 and Table 5.2 the predicted LTAA for the Toolachee and the Patchawarra formations are very similar (since the Vali-2 bore is screened in both formations and hence provides a location connection between the two units) and extend around 4 km from the production wells Vali-1, Vali-2 and Vali-3.

5.6 Part F – The Predicted Quantities of Water to be Taken or Interfered with Because of the Exercise of Underground Water Rights

Produced water totalled 3.49 ML for the Vali field between the period of February 21st and December 13th, 2023. It is expected that in the first year of production, 6.9 ML of water will be produced during the gas extraction process. From year two onwards, the quantity of water produced is expected to be 11.6 ML each year. This is an average of 10.6 m³/d per well. The estimated project life is 20 years.

5.7 Part G – Information on Predicted Impacts to the Quality of Groundwater that will, or may, Happen Because of the Exercise of Underground Water Rights

Water samples taken from the Toolachee and Patchawarra units in the Project area are highly saline with electrical conductivity ranging between 10,000 and 19,000 $\mu S/cm$. This range is well above the upper limits for drinking, stock watering or irrigation. Change in underground water quality may occur through inter-aquifer flow where higher salinity water is leaking into a low salinity aquifer. However, these potential changes are not expected above the top of the Cooper Basin which is around 2000 m below ground and at least 350 m below the Great Artesian Basin.

No impacts on water quality, water levels and flows are anticipated on any surficial aquatic ecosystems.



520000 LEGEND Place names Beach ▲ Vali wells Energy Registered bores ···· State Borders --- 5m drawdown contour (m) - Toolachee === 5m drawdown contour (m)- Patchawarra Authority to Prospect (ATP 2021) Authority to Prospect (ATPs) Petroleum Lease 1125
Santos Petroleum Leases Santos Exploration Permits for Petroleum Santos Cooper Basin Cultural Heritage Management Plan boundary Cultural Heritage Party boundaries Kungardutyi Punthamara People Wongkumara People Aquatic GDEs Low potential GDE - from national assessment Terrestrial GDEs Moderate potential GDE - from regional studies \$0551 14556 14587 23256 Vali Gas Field Underground Water Impact Report (VGF5000.001) 14555 IAA - Predicted groundwater impact drawdown - Toolachee and Patchawarra 20/06/2024 AGE FIGURE No: GDA2020, Zone 54 0 1 2 3 4 5km 4.3 1:210,000 C002 Autoratesian Groundwater and Environmental Consultants Pty. LE (ACE) - receivage consultants comised Source | 1 second SRTM Derived DEN-S - 0 Commonwealth of Australia (Geoscience Australia) (2011), GEODATATOPO (2014 Safes 3 - 0) Commonwealth of Australia (Geoscience Australia) (2011), GEOSCIA CONTROL (Commonwealth of Australia (2014)), GEOSCIA (2014), GEOSCIA (2014)), GEOSCIA (Commonwealth of Australia (2

Figure 5.3 – The Immediately Affected Area of Predicted Groundwater Impact Drawdown for the Toolachee and Patchawarra Formations

Source: AGE, 2024

520000 Place names ▲ Vali wells Energy A Registered bores ····· State Borders @ILH0006777 --- 5m drawdown contour (m) - Toolachee - 5m drawdown contour (m)- Patchawarra Authority to Prospect (ATP 2021) Authority to Prospect (ATPs) Petroleum Lease 1125 Santos Petroleum Leases Santos Exploration Permits for Petroleum Santos Cooper Basin Cultural Heritage Management Plan boundary **Cultural Heritage Party boundaries** Kungardutyi Punthamara People Wongkumara People Aquatic GDEs Low potential GDE - from national assessment Terrestrial GDEs Moderate potential GDE - from regional studies 14556 14537 23256 Vali Gas Field Underground Water Impact Report (VGF5000.001) 14555 10578 LTAA - Predicted groundwater impact drawdown - Toolachee and Patchawarra formations 20/06/2024 AGE FIGURE No. GDA2020, Zone 54 0 1 2 3 4 5 km 4.4 1:210,000 6004 Australasian Groundwater and Environmental Consultants Pty. Ltd (AGE) - www.ageconsultants.com.su. Source. I second SRTM Derived DEM-S - 6 Commonwealth of Australia (Geoscience Australia) 10-1; GECDATATIOPO 250K Series 3 - 0 Commonwealth

Figure 5.4 – The Long-term Affected Area of Predicted Groundwater Impact Drawdown for the Toolachee and Patchawarra Formations

Source: AGE, 2024

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G. Projects NGF 500,001 val. Gas Tield Underground Water in part Report D_GISNYCH/spaces/002_UM-R04_ID_VGF 5001_UM-Predicted groundwater impact are accommodisciples and Patchasiera formations_v2_qgz



5.8 Part H – Information on the Environmental Values that will, or may, be Affected by the Exercise of Underground Water Rights

There are no springs mapped within 15 km of the Project area. The nearest known GAB springs are located 100 km to the southwest in South Australia. The first mapped springs in Queensland are approximately 300 km to the east of PL1125.

There are 8 registered water bores within 15 km of the Vali production wells. Details of each are provided in Table 5.3. The majority of the bores are screened within the Winton Formation at depths up to 294 m below ground. This is at least 1,600 m above the top of the Hutton Sandstone and hence based on the model results of the UWIR, these registered bores are not expected to experience any Project related drawdown. Therefore, there are no expected changes in water quality in the registered bores outlined in Table 5.3 resulting from extraction of groundwater from the Vali production wells.

Table 5.3 – Queensland Registered Water Bores Within 15 km of Vali Wells

RN	Bore Name	Easting	Northing	Ground elevation (mAHD)	Year Drilled	Formation	Top Screen (mbgl)	Bottom Screen (mbgl)	Bore Depth (mbgl)
14556	Watties bore	527944	6904365	80.5	1960	Glendower Formation or Winton Formation	NA	81.1	NA
16700	Christmas Yard bore	506583	6902489	96.3	1966	Winton Formation	125	154.2	NA
50551	Watties No 2	527944	6904365	NA	1980	Winton Formation	NA	81.1	NA
116616	Kudnari	505108	6904981	NA	2023	Winton Formation	145.9	148.2	150.2
116394	NA	503380	6916450	NA	2013	_	NA	76	77
116560	Anakin bore	504101	6916428	NA	2013	Winton Formation?	260	272	294
50695	NA	508297	6915261	122	1990	Winton Formation	NA	NA	125
14587	Roundhill bore	519404	6900298	76.5	1961	Winton Formation	NA	168.6	168.6

Source: AGE, 2024

A moderate potential terrestrial GDE has been identified by the Bureau of Meteorology (BOM) along the ephemeral Sandy Creek to the north of the Project area. Any groundwater flow to GDE's in this area will be provided by aquifers at or close to the ground surface. Therefore, potentially significant drawdown impacts of more than 0.2 m drawdown are not expected to extend beyond the top of the Cooper Basin at more than 2,000 m below ground. No qualitative and quantitative impacts of this or any other terrestrial GDEs present in the area are predicted.

Several lacustrine and palustrine intermittent wetlands are present within the project area, with claypans adjacent to the well sites. As no groundwater level impacts are expected above the top





of the Cooper Basin which is around 2000 m below ground, no impacts on quality, water levels and flows are anticipated on any surficial aquatic ecosystems.

The three production wells are within the traditional lands of the Wongkumara People. There are no known mound springs or other similar features within 300 km of the Project area and subsequently no predicted impacts on any water dependent cultural or spiritual features. There is no known use of groundwater for aquaculture purposes within 15 km of the Project area. There are also no known primary or secondary recreational waters within the same area.

5.9 Part I – Information on strategies for avoiding, mitigating or managing the predicted impacts on environmental values or predicted impacts on the quality of groundwater

Strategies for avoiding, mitigating or managing the predicted impacts on the environmental values or predicted impacts on the quality of groundwater could include:

- Case and cement well, to prevent contamination.
- Plug each hydrocarbon formation, groundwater aquifer intersected and well at the surface, with cement plugs.
- Monitor well fluid pressures and take remedial action immediately in the event of pressure decreases.
- Construct bunds around fuel and oil storage facilities according to Australian Standard (AS) 1940-2004.
- Store produced water on site, in ponds, until completion of project activities when any remaining water will be transported offsite for appropriate disposal.
- Residual drilling material will be placed into sumps for the duration of drilling activities, and buried once water has evaporated.
- Earthen embankment storage (e.g., turkey nest) will be used for water storage.
- Manage sewage effluent and/or grey water in accordance with conditions of environmental authority.
- Monitor sumps for overflow during periods of high rainfall.
- Store all dangerous goods and hazardous substances in accordance with manufacturers recommendations and workplace health and safety requirements.
- Volume of chemicals stored onsite will not exceed those listed under Schedule 2 (Part 2 Section 8) of the *Environmental Protection Regulation 2008*.
- Display Safety Data Sheets (SDS) for all chemicals present onsite.
- Minimise fuel transfer where possible, and use drip trays at all times.





- Drilling fluids will not be oil-based or synthetic oil-based.
- Store spill response kits at all locations where hazardous materials are handled or stored.
- Undertake induction and training sessions for all site personnel, to ensure an understanding of SDS application and spill prevention/response.
- Perform all activities in accordance with applicable industry and regulatory standards.
- Assess well bore integrity prior to commencing drilling, and rectify any issues immediately.
- Develop an Emergency Response Plan, which includes procedures for response to well issues (e.g. blow out).
- Undertake induction and training sessions for all site personnel, to ensure an understanding of emergency response procedures.
- Transport hazardous waste through an approved operator and dispose of at a licenced facility.
- Track all waste to ensure the correct volumes are delivered and received at waste disposal facility.
- Keep extracted volumes of groundwater to a minimum.
- Monitor and record all extraction volumes of groundwater.



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Attachment A: Vali Field PL 1125 Ecological Assessment Report

Vintage Energy Vali Field (PL 1125) Ecological Assessment Report

January 2025

Prepared for: ERIAS

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Citation

Smith, G. B. 2025. Vintage Energy Vali Field (PL 1125) Ecological Assessment, Report to ERIAS, GBS Consulting, Adelaide.

Executive Summary

Vintage Energy is seeking to begin gas production from its Vali gas field within the Cooper Basin, in the Shire of Bulloo in Queensland. Vintage Energy and their joint venture (JV) partners are seeking to partially convert the existing Authority to Prospect (ATP) 2021(environmental authority BRPG005)) into a Petroleum Lease (PL) 1125 (Vali Gas Field) in the Cooper Basin for conventional gas production.

ERIAS, on behalf of Vintage Energy, has prepared an Environmental Authority (EA) application for the Vali Field and submitted this to the Queensland Department of Environment, Science and Innovation (DESI). This EA application is the first step in procuring a Petroleum Lease for the Vali field (PL 1125) which has an area of 4542.41 ha. DESI has provided feedback on the EA application with several key issues relating to the ecological assessment to be resolved prior to a re-submission of the application including ecological. GBS Consulting was engaged to undertake a desktop assessment followed by a field survey of PL 1125 of groundwater dependant ecosystems, surface water values and protected flora and fauna followed by a significant residual impact (SRI) assessment for PEM listed within Schedule 2 of the Environmental Offsets Regulation 2014 to contribute to a re-submission of the EA application.

The Vali gas field infrastructure that has already been constructed includes the Vali-1, Vali-2 and Vali- 3 wells and associated flowlines and infrastructure which is the disturbance footprint assessed within this report. It is proposed to construct two more wells, Vali 4 and Vali 5 and associated infrastructure. The area of the disturbance footprint for all elements of the project including infrastructure constructed and that which is proposed is 41.3 hectares.

PL 1125 consists of 100 % remnant vegetation (DESI 2024c) and contains six regional ecosystems (RE) which are mapped within the Queensland Globe website and were ground-truthed during the field survey. The are as follows:

- 5.3.22 Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes;
- 5.6.4 Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes;
- 5.6.5 Variable sparse to open-herbland or *Triodia basedowii* hummock grassland on dune flanks, crests and sandy interdunes;
- 5.6.8 Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes;
- 5.9.3 Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments; and
- 5.9.4 *Aristida contorta* sparse tussock grassland on fresh Cretaceous sediments with dense gravel cover.

Desktop survey results relevant to the presence of wetlands and groundwater

dependant ecosystems within PL 1125 included the following; eight Lacustrine wetlands, no palustrine wetlands, no named waterways but some minor drainage lines, potential for riverine wetlands of low significance in 3,399.59 ha (74.84%) and very high in 1,142.83 ha (25.16%), non-riverine wetlands of medium significance in 652.71 ha (14.37%) and no springs present within PL 1125. The areas designated as very high significance for riverine wetlands is based on the potential presence of 'Permanent water holes' that 'never go dry over 100+ year timeframes and are critically important as refugia for aquatic species in arid landscapes (DESI 2024a). No permanent waterholes or substantial drainage lines which would support them were observed during the field survey and none are identified for PL 1125 in any of the desktop sources reviewed. One vegetation community (RE 5.3.22) was identified as a groundwater dependant ecosystem within a wetland and this is identified as a regulated vegetation community.

The EPBC protected matters searches (PMS) did not identify any threatened ecological communities (TECs) listed under the EPBC Act 1999 as potentially present within the desktop survey 50 km buffer zone or within a 100 km buffer zone (DCCEEW 2024); Appendix 1 and Appendix 2). The PMS results for PL 1125 with a 50 km buffer identified three listed flora species and 13 EPBC listed fauna species (11 bird and two mammals) which are considered threatened (DCCEEW 2024a). Of these two bird species are listed as Critically Endangered (CR); three bird species and one plant species are listed as Endangered (E), and the remaining 11 species are listed as Vulnerable (V) (Appendix 1). An additional five species of birds listed as Migratory under the EPBC Act were also identified in the results (Appendix 1). When the buffer radius from PL 1125 was extended from 50 km to 100 km an additional six species, two birds, two mammals and two plants were included in the results (Appendix 2).

A total of 131 flora species were recorded within PL 1125 during the field survey. The only introduced species recorded was *Citrullus amarus* (Paddy Melon) which was recorded at a number of locations, primarily in dunes. No flora species listed under the EPBC Act or state legislation were recorded during the survey. A total of 38 species of birds were recorded during the field survey none of which are listed species. A number are boom and bust species, such as Budgerigar, Flock Bronzewing, and Little Buttonquail were common during the survey which reflects the good environmental conditions at the time.

The Significant Residual Impact Assessment identified the following residual impacts:

- The disturbance footprint results in a residual impact to 8.6 ha of RE 5.3.22 which lies within mapped wetlands but is not endangered or of concern. This is identified as a significant residual impact to RE 5.3.22 under Section 2.1 of the Significant Residual Impact Guideline due to Criteria 1 and Criteria 2 of being exceeded.
- A residual loss of 8.6 ha of habitat for EPBC Endangered species Curlew Sandpiper, Common Greenshank and Australian Painted Snipe is identified. An assessment of the residual impact against the significant impact criteria for endangered wildlife (Section 5.1 of the SRI guideline) found that the loss of habitat was not a significant impact.

- A residual loss of habitat (8.6 ha of RE 5.3.22, 13.0 ha of RE 5.9.3/RE 5.9.4, and 8.7 ha of RE 5.6.5/RE 5.6.8) for three EPBC Vulnerable species; Sharp-tailed Sandpiper, Blue-winged Parrot, and Dusky Hopping-mouse. An assessment of the residual impact against the significant impact criteria for vulnerable wildlife (Section 5.1 of the SRI guideline) found that the loss of habitat was not a significant impact.
- A residual loss of 11.0 ha of habitat (RE 5.6.4) for Southern Whiteface EPBC: Vulnerable species that could result in a local impact to the species. An assessment of the residual impact against the significant impact criteria for endangered wildlife (Section 5.1 of the SRI guideline) found that the impact was not significant as the impact is unlikely to:
 - o lead to a long-term decrease in the size of a local population,
 - o reduce the extent of occurrence of the species; or
 - o fragment an existing population.
- A residual loss of 8.6 ha of habitat (RE 5.3.22) for four EPBC Migratory species; Common Sandpiper, Pectoral Sandpiper, Marsh Sandpiper and Red-necked Stint. An assessment of the residual impact against the significant impact criteria for vulnerable wildlife (Section 5.1 of the SRI guideline) found that the loss of habitat was not a significant impact.

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1.Introduction

1.1. Background

Vintage Energy Limited (Vintage Energy), and its joint venture (JV) partners Metgasco Limited (Metgasco) and Bridgeport (Cooper Basin), are the joint licence holders of Authority to Prospect (ATP) 2021 within the Cooper Basin, in the Shire of Bulloo in Queensland, in which the Vali gas field is located. Currently Environmental Authority BRPG005 authorises Non-Scheduled Petroleum Activity - Authority to Prospect (ATP) on ATP2021 (located on Lot plan 450SP274333). Vintage Energy and their joint venture (JV) partners are seeking to partially convert the existing Authority to Prospect (ATP) 2021 into a Petroleum Lease (PL) 1125 (Vali Gas Field) in the Cooper Basin for conventional gas production. PL 1125 is 4542.41 ha and currently includes the Vali-1, Vali-2 and Vali-3 wells and associated flowlines (authorised under ATP 2021 and Vali pipeline and Vali processing facility, permitted under Pipeline Licence (PPL) 2070 (environmental authority P-EA-100271494). All this infrastructure has already been constructed. Two additional wells, Vali 4 and Vali 5 are proposed to be constructed along with tracks and other associated infrastructure.

In order to procure a Petroleum Lease for the Vali field (PL 1125) ERIAS, on behalf of Vintage Energy, prepared an Environmental Authority (EA) application for the Vali Field and submitted this to the Queensland Department of Environment, Science and Innovation (DESI). Several key issues in the application were identified by the DESI in their feedback to the EA application including issues relating to ecological description on PL 1125 and impact assessment. The identified issues are as follows:

- Section 125(1)(I)(A) of the EP Act requires the application material to provide a
 description of the environmental values likely to be affected by each relevant
 activity;
- The application provides general information about waterways present within the Cooper Creek Basin, however, does not provide site-specific information on the watercourses within PL 1125, nor their associated surface water environmental values and water quality objectives as per section 9 of the EP Act and the Environmental Protection (Water and Wetland Biodiversity) Policy 2019.
- The application states that there are no groundwater dependant ecosystems (GDE) present within ATP2021. However, Queensland Globe mapping indicates PL 1125 to have 81-100% Derived GDE moderate confidence. It is not clear in the application material whether there was any ground-truthing undertaken to confirm there are no GDE values on the tenure.
- The application does not seem to identify a number of environmental values for protected flora and fauna species. The application states, "No federal or state listed flora and fauna species were recorded on site during the ecological field surveys, and an assessment of potential impacts to Environment Protection and Biodiversity Conservation Act 1999 (EPBC)-listed species determined no referral under the EPBC Act is required for the Project."

Protected wildlife habitat may not be mapped directly over the project area and requires ground-truthing to determine its presence. However, neither the referenced ecological field survey report nor assessment of EPBC species was provided.

These and other issues are required by DESI to be addressed prior to a re-submission of the application. The tasks required to address the identified issues include a desktop assessment to be completed prior to a site survey being conducted.

1.2. Objectives of this study

This report addresses the requirements identified in the PL 1125 EA application feedback from DESI. The specific objectives of the desktop assessment are to:

- Complete a desktop investigation on the presence or absence of Groundwater dependent ecosystems (GDEs) within PL 1125 and provide a clear explanation of the methodology utilised.
- Complete a comprehensive desktop assessment for the tenure area with a buffer distance from the tenure set to 100 km which includes the Atlas of Living Australia, the Birdlife Atlas, Wildnet, Species Profile and Threats (SPRAT) databases and associated Recovery Plans.
- The Vegetation management regional ecosystem map data under the Vegetation Management Act 1999.
- The Queensland Wetland Data mapping.
- Watercourse and drainage features mapping in QGlobe.
- The DESI threatened species search tool.
- An EPBC Act Protected Matters Searches for PL 1125with a 50 km buffer and a 100 km buffer.
- Provide results of the desktop study, including a discussion on the likely presence or absence of each protected matter/species identified in the search.
- Undertake ground truthing to confirm the desktop investigation results for vegetation communities and GDEs in PL 1125.
- Documentation of any temporary or permanent waterbodies or watercourses found within the PL 1125 tenure.
- Undertake infield searches for listed species identified in the desktop study.

1.3. Location and Site Description

The Vali field is located within the Cooper-Eromanga Basin in southwest Queensland approximately 1,100 km west of Brisbane, Queensland and approximately 80 km east of the Moomba gas processing facility operated by Santos in South Australia. The nearest population centre is the Innamincka township, approximately 35 km west of the Vali Field in South Australia, which has a population of 44 (ABS, 2020). The closest Queensland town is Thargomindah, which has a population of 270 people (ABS, 2020) and is located approximately 250 km east of the site.

The Vali Field sits within PL 1125 (Figure 1) located within the Channel Country biogeographic region on Crown Land under a rolling term Pastoral Holding lease (Lot plan 450SP274333) on native pastures currently operated for cattle grazing by the Nappamerry (or Nappa Merrie) and Orientos cattle stations. Access to the site is from the Moomba Road and off-road dirt tracks. The Cooper-Eromanga Basin is Australia's largest onshore oil and gas exploration and production area. As such, the existing commercial interest in the land to date is largely related to oil and gas operations, with numerous explorations and producing wells and facilities existing in the area. Recreation and tourism in the area is predominantly focussed on the natural and cultural values of the Innamincka area across the border in South Australia, including the Burke and Wills Dig Tree, the Malkumba- Coongie Lakes National Park, the Cooper Creek and the Innamincka Regional Reserve.

The survey area has limited topographical relief and is dominated by undulating plains dissected by low sand dunes and shallow ephemeral wetlands. The area has been used for pastoral activities for more than 100 years.

1.4. Climate and Rainfall

The Moomba Airport weather station is approximately 80 km west and is the closest to the survey area as Innamincka does not have a weather station. It has weather records for the previous 28 years. Moomba has an annual mean rainfall of 173.9 mm with the highest mean monthly rainfall occurring in February. Rainfall is however highly erratic and strongly influenced by heavy episodic rainfall events storm and extensive periods of little to no rainfall. Moomba experiences a mean maximum temperature of 38.9 °C in January, with overnight mean minimum temperatures of 24.9 °C. July is the coolest month with a mean maximum and minimum temperatures with 19.8 °C and 6.4 °C respectively.

1.5. Bioregions

PL 1125 is located in the Channel Country IBRA Bioregion and Simpson - Strzelecki Dunefields and Sturt Stony Desert subregions. The Channel Country Bioregion is characterised by vast braided, flood and alluvial plains surrounded by gravel or gibber plains, dunefields and low ranges. The Simpson - Strzelecki Dunefields Bioregion is characterised by dunes with variable interdune corridors and plains; clay pans and ephemeral drainage lines. Sturt Stony Desert subregions is characterised by stoney gibber plains

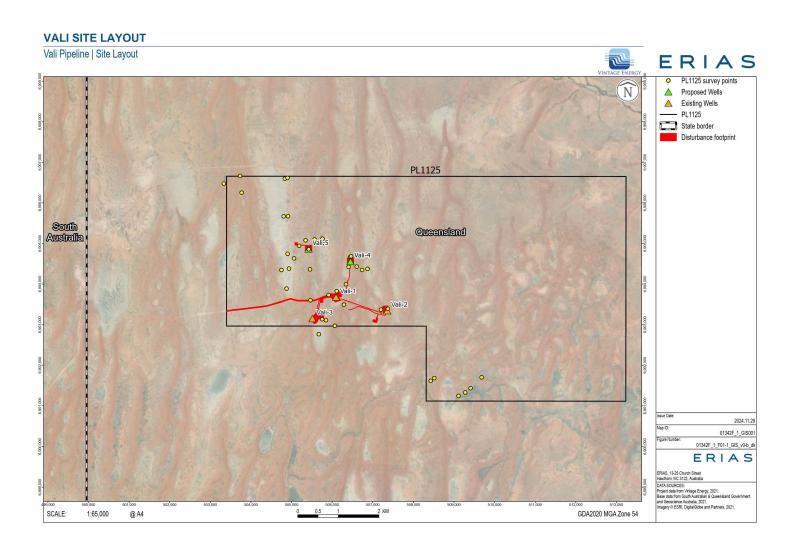


Figure 1 – Location of the survey area

2. Methodology

2.1. Desktop Assessment

The desktop assessment was conducted using the following sources:

- Queensland Government, Department of Environment, Science and Innovation, Environmental Reports accessed online PL 1125 (17 June 2024) for PL 1125 at
 https://www.gld.gov.au/environment/management/environmental/envi
 - https://www.qld.gov.au/environment/management/environmental/environmental-reports-online:
 - Matters of State Environmental Significance Report (Appendix 1);
 - Biodiversity and Conservation Values, Biodiversity Planning Assessments and Aquatic Conservation Assessments Report (Appendix 2);
 - o Regional Ecosystems Report (Appendix 3);
 - o WildNet Species Records Report (Appendix 4);
 - o WildNet Conservation Significant Species Report (Appendix 5).
- Environmental Protection and Biodiversity Act (EPBC) Protected Matters Search Tool (PMST) for potentially occurring EPBC listed species and Threatened Ecological Communities (TECs) occurring within the survey area and a 50 km (Appendix 6) and a 100 km buffer (Appendix 7).
- QGlobe web-based Tool.
- Atlas of Living Australia (ALA) Area Records Report for PL 1125 (Appendix 8).
- Atlas of Living Australia (ALA) Area records for the survey area with a 50 km buffer and a 100 km buffer which include Birdlife Australia records, Queensland WildNet records and records from many other sources (provided under separate cover).

2.1.1. Biodiversity Planning Assessment

The Queensland Department of Environment, Science and Innovation (DESI) uses Biodiversity Planning Assessments (BPAs) to attribute biodiversity significance on a bioregional scale (DESI 2024a). A BPA involves the integration of ecological criteria using the Biodiversity Assessment and Mapping Methodology (BAMM) and is developed using: 1) diagnostic criteria, and 2) expert panel criteria. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion (DESI 2024a).

The BAMM methodology identifying areas with various levels of biodiversity significance such as threatened ecosystems or taxa, large tracts of habitat in good

condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat which are important for the maintenance of biodiversity or ecological processes. Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

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

2.1.2. Surface Water Value

Conservation values for wetlands are determined in Queensland using DESI's Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM). It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area (DESI 2024a).

The AquaBAMM, assesses eight criteria to derive an overall conservation value of a wetland. The criteria have a variable number of indicators and measures and may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature (similar to the Biodiversity Assessment and Mapping Methodology). These are, are:1

- Criteria 1: Naturalness (aquatic),
- Criteria 2: Naturalness (catchment),
- Criteria 3: Diversity and richness,
- Criteria 4: Threatened species and ecosystems,
- Criteria 5: Priority species and ecosystems,
- Criteria 6: Special features,
- Criteria 7: Connectivity and
- Criteria 8: Representativeness.

The criteria are described in Appendix 2.

Results of this assessment can be accessed by generating a *Biodiversity and Conservation Values: Biodiversity Planning Assessments and Aquatic Conservation*

Assessments report via the Online Environmental Reports web page (https://www.qld.gov.au/environment/management/environmental/environmental-reports-online).

Wetlands are categorised as either Riverine Wetlands (including fringing riverine wetlands) or Non-riverine Wetlands. Riverine wetlands are defined as 'all wetlands and deepwater habitats within an open non-vegetated channel' which are 'naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water' (DESI 2024a). Non-riverine Wetlands include both lacustrine and palustrine wetlands. Lacustrine wetlands are lakes which are typically larger than 8 hectares situated in a topographic depression or damned river channel and lack vegetation cover. Palustrine wetlands are generally non-tidal swamps and marshes which are dominated by vegetation (greater than 30 % cover) or if lacking vegetation they are smaller than 8 hectares.

When applied to riverine wetlands AquaBAMM uses a discrete spatial unit termed a subsection. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. In an Aquatic Conservation Assessment (ACA), an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such (DESI 2024a).

2.1.3. Vegetation assessment

The desktop assessment was conducted by generating and reviewing the reports listed in 2.1 above and producing vegetation maps in QGlobe.

In Queensland, vegetation has been mapped across the state by the Queensland Herbarium using broad vegetation groups (BVGs) and regional ecosystems (vegetation communities) which communicate higher-level ecological groupings (DESI 2024c). Broad vegetation groups are the first aggregation in the hierarchical classification and are determined on the basis of vegetation structure (cover, height and growth form) of the ecologically dominant layer. BVGs are ordered broadly to reflect the vegetation structure along a mesic gradient from wet closed forests (rainforests) of the coast and northeast to the arid spinifex hummock grasslands of the south west of Queensland but may also consider other factors such as water salinity and landscape situation (Neldner et al 2023).

Regional ecosystems (RE) are vegetation communities in a bioregion that are consistently associated with particular combinations of geology, landform and soil (DESI 2024c). Hierarchically, regional ecosystems sit within broad vegetation groups. Regional ecosystem descriptions are contained in the Regional Ecosystem Description Database (REDD) at

(https://www.qld.gov.au/environment/management/environmental/environmental-reports-online) and have been mapped by the Queensland Herbarium. The classification system uses floristic, structural functional, biogeographic and landscape attributes to determine broad vegetation groups (DESI 2024c). Descriptions are

compiled from a broad range of information sources including vegetation, land system and geology survey and mapping and detailed vegetation site data.

Vegetation communities present within PL 1125 were identified from the Regional Ecosystems; Biodiversity Status report via the DESI Online Environmental Reports web page. These included vegetation associations associated with wetlands as well as non-wetland communities.

2.1.4. Groundwater dependant ecosystems

The Groundwater Dependant Ecosystems: EIS information guideline (DESI 2024e) identified three types of GDEs as follows:

- Aquifer and cave ecosystems;
- Ecosystems dependent on the surface expression of groundwater; and
- Ecosystems dependent on the subsurface presence of groundwater.

Aquifer and cave ecosystems include subterranean wetlands such as karst aquifer systems, fractured rock, or saturated sedimentary rock that may host stygofauna, troglofauna or other biota (Table 1).

Ecosystems dependent on the surface expression of groundwater include typical wetland systems such as wetlands, lakes, seeps, springs, mound springs, river baseflow, coastal areas and estuaries and marine ecosystems where pressure brings groundwater above the surface of rocks, soils or sediments (Table 1). Palustrine, lacustrine and riverine water bodies are included in this category.

Ecosystems dependent on the subsurface presence of groundwater where groundwater is not visible on the surface but the water table is permanently or episodically within the root zone of plants (Table 1). These include some regional ecosystems and riverine wetland systems.

Table 1. Types and subtypes of GDEs

Туре	Subtype
Aquifer and cave ecosystems	Wetland system (subterranean wetland-aquifer)
Aquiler and cave ecosystems	Wetland system (subterranean wetland-cave)
	Wetland system (lacustrine)
	Wetland system (palustrine)
Ecosystems dependent on the surface expression of groundwater	Wetland system (riverine waterbody)
surface expression of groundwater	Wetland system (estuarine)
	Wetland system (near-shore marine)
Ecosystems dependent on the	Regional ecosystem
subsurface presence of groundwater	Wetland system (riverine regional ecosystem)

A desktop assessment to obtain information about potential GDEs in the impact area was undertaken using the following sources:

- Aquatic conservation assessments (ACA) and AquaBAMM
- Biodiversity planning assessments
- National groundwater dependent ecosystems atlas
- Queensland groundwater dependent ecosystem mapping
- Queensland springs database
- Regional ecosystem mapping
- WetlandMaps.

GDEs identified within the PL 1125 were designated as one of the subtypes listed in Table 1 above and the regional ecosystem was identified as described in the regional ecosystem description database (DESI 2024). The GDE's attributes and environmental values were described as far as possible from information available in sources used. The habitat value of each GDE for wildlife and threatened or listed wildlife was identified. GDEs are also assessed to determine whether they are matters of state environmental significance and/or matters of national environmental significance.

2.1.5. Protected flora and fauna species

The desktop assessment of listed species used relevant data obtained from the sources listed in 2.1 above.

The collated desktop information was used to conduct an assessment of the 'likelihood of occurrence' within PL 1125 for protected flora, fauna and ecological communities. The criteria used to define 'likelihood of occurrence' are outlined in Table 2. Some ecological notes are provided for species listed as Highly Likely/Known or Likely to occur.

An assessment of the likelihood of occurrence within PL 1125 of flora and fauna species listed as threatened under the *EPBC Act 1999* and the *Queensland NC Act 1992*, migratory fauna species and Threatened Ecological Communities (TECs).

Table 2. Criteria Used to Define Likelihood of Occurrence in PL 1125.

Likelihood of Occurrence	Criteria
Highly Likely/Known	Recorded in the last 10 years, the preferred habitat is present and falls within the known range of the species distribution and/or the species was recorded as part of field surveys.
Likely	Recorded within the desktop study area (with a 50km buffer) within the last 20 years, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.
Possible	Records that are 20 - 50 years old for the desktop study area (with a 100 km buffer), the area falls inside the known distribution of the species, but the area provides limited habitat or feeding resources for the species.
Unlikely	Either no records or records that are older than 50 years within the study area (with a 100 km buffer); the area provides no or very limited preferred habitat or feeding resources.

2.1.6. Significant residual impact (SRI) assessment

Feedback provided by DESI on the EA Application included the following requirement: 'Using the Queensland Environmental Offsets Policy Significant Residual Impact Guideline, undertake a significant residual impact (SRI) assessment for PEM listed within Schedule 2 of the Environmental Offsets Regulation 2014, including, but not limited to:

- Matters of State Environmental Significance (MSES) Protected Wildlife habitat for species identified as 'confirmed, likely or possible'.
- 'Connectivity Area' MSES trigger, by providing the results from the Environmental Offset Landscape Connectivity Assessment Tool.
- MSES Regulated vegetation within the defined distance of the defining banks of a watercourse. Information should address how this area was calculated in relation to defined distance of a watercourse.
- MSES Regulated vegetation within the defined distance of the defining banks of a drainage line (drainage line mapped under the Water Act 2000).'

A significant residual impact is described as: 'an adverse impact, whether direct or indirect, of a prescribed activity on all or part of a prescribed environmental matter that:

- a) remains, or will or is likely to remain, (whether temporarily or permanently) despite on-site avoidance and mitigation measures for the prescribed activity; and
- b) is, or will or is likely to be, significant.' (DEHP 2014).

A significant residual impact (SRI) assessment was conducted in accordance with the Queensland Environmental Offsets Policy: Significant Residual Impact Guideline

(2014) with consideration of Prescribed Environmental Matters identified above as well as other Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES) identified in the Environmental Offsets Regulation as considered in the SRI process.

Matters of National Environmental Significance include the following as defined by relevant sections of the EPBC Act 1999:

- a declared World Heritage property;
- a National Heritage place;
- a declared Ramsar wetland;
- a threatened species;
- a threatened ecological community;
- a migratory species;
- a Commonwealth marine area;
- the Great Barrier Reef Marine Park;
- a water resource.

In Queensland matters of state environmental significance as defined in Schedule 2 of the Environmental Offsets Regulation 2014 (DES 2024) include:

- 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.

The SRI guideline provides a test and or criteria for determining a significant impact for each of the MSES categories listed above with MNES categories incorporated into the assessment in relevant sections (DEHP 2014).

2.2. Field Survey

The field survey was composed of the following elements:

- Undertake infield searches for listed species and protected matters including assessment of potential habitats for relevant listed species (as determined by the desktop assessment).
- Documentation of any temporary or permanent waterbodies or watercourses found within the PL 1125 tenure, and
- Ground truth vegetation communities mapped for PL 1125.

The ecological assessment consists of:

- Targeted searches for species listed under the EPBC Act 1999 and NC Act 1992 identified as Highly Likely or Likely to occur in PL 1125 by the desktop assessment.
- Documentation of habitats for target listed species where present.
- Vegetation rapid assessment surveys.
- Structured bird surveys.
- Opportunistic recording all fauna species observed.

These methods are described further below.

2.2.1. Flora

Flora was surveyed using a rapid assessment approach which:

- identified dominant species,
- compiled a list of plants within an approximate area of 30 x 30 m,
- searched for the presence of listed species, and
- determined the regional ecosystem at the survey location.

Plant species were identified in the field wherever possible. Where plants could not

be identified, detailed photographs were taken for identification at a later stage where necessary. Location details were recorded and GPS points logged at each site. Opportunistic fauna observations were also recorded.

2.2.2. Fauna surveys and opportunistic observations

Fauna surveys were undertaken adjacent to Vali field infrastructure and throughout accessible areas of PL 1125 to cover the range of regional ecosystems present (Figure 1). This included ecologically significant areas observed such as areas identified in the desktop survey as potentially having high fauna diversity (for example RE 5.6.4, DESI 2024b) as well as surface water bodies and ecotones where two regional ecosystems meet. Surveys consisted of observational surveys that systematically searched the target area for fauna. The time the survey commenced was recorded and each species was recorded as either heard or with the number seen. Opportunistic observations were also recorded with the species, number and location (eastings and northings) noted.

2.2.3. Target searches for listed species

The desktop assessment identified a range of listed species including EPBC Act 1999 and NC Act 1992 threatened and migratory fauna and flora as highly likely/Known or Likely to occur in the PL 1125. Targeted searches for these species were conducted in PL 1125 within appropriate habitats identified in the desktop assessment.

Observations of target species were recorded including the number observed and location. Preferred habitats for these species were also recorded when observed.

3. Desktop Survey Results

3.1. Regional Ecosystems (RE) - Vegetations communities

PL 1125 consists of 100 % remnant vegetation (Figure 2, DESI 2024c). Six Regional Ecosystems (RE) (vegetation communities) have been mapped for PL 1125 (QGlobe 2024) as follows:

- RE 5.3.22 Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes; 945.22 ha (20.81 % of PL 1125). This RE is contained within Broad Vegetation Group 34a. Lacustrine wetlands. Lakes, ephemeral to permanent. Includes fringing woodlands and sedgelands.
- RE 5.6.4 Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes; 66.91 ha (1.47 % of PL 1125). This RE is contained within Broad Vegetation Group 23a Woodlands to low woodlands dominated by Acacia aneura on red earth plains or sandplains (soft mulga).
- RE 5.6.5 Variable sparse to open-herbland or *Triodia basedowii* hummock grassland on dune flanks, crests and sandy interdunes; 2,011.35 ha (44.28 % of PL 1125). This RE is contained within Broad Vegetation Group 33a Hummock grasslands dominated by *Triodia basedowii* (hard spinifex) or *Zygochloa paradoxa* (sandhill canegrass) associations on dunefields or sandplains.
- RE 5.6.8 Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes; 140.19 ha (3.09 % of PL 1125). This RE is contained within Broad Vegetation Group 33a Hummock grasslands dominated by Triodia basedowii (hard spinifex) or Zygochloa paradoxa (sandhill canegrass) associations on dunefields or sandplains.
- RE 5.9.3 Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments; 818.97 ha (18.03 % of PL 1125). This RE is contained within Broad Vegetation Group 30b Tussock grasslands dominated by Astrebla spp. (mitchell grass) or Dichanthium spp. (bluegrass) often with Iseilema spp. on undulating downs or clay plains.
- RE 5.9.4 Aristida contorta sparse tussock grassland on fresh Cretaceous sediments with dense gravel cover. 559.78 ha (12.32 % of PL 1125). This RE is contained within Broad Vegetation Group 31b Short grass / forb associations on stony downs.

Mapping of the broad vegetation groups (BVGs) is provided in Figure 2 as the regional ecosystems are intermixed at a scale that makes mapping difficult. The regional ecosystems are described in more detail in Appendix 9.

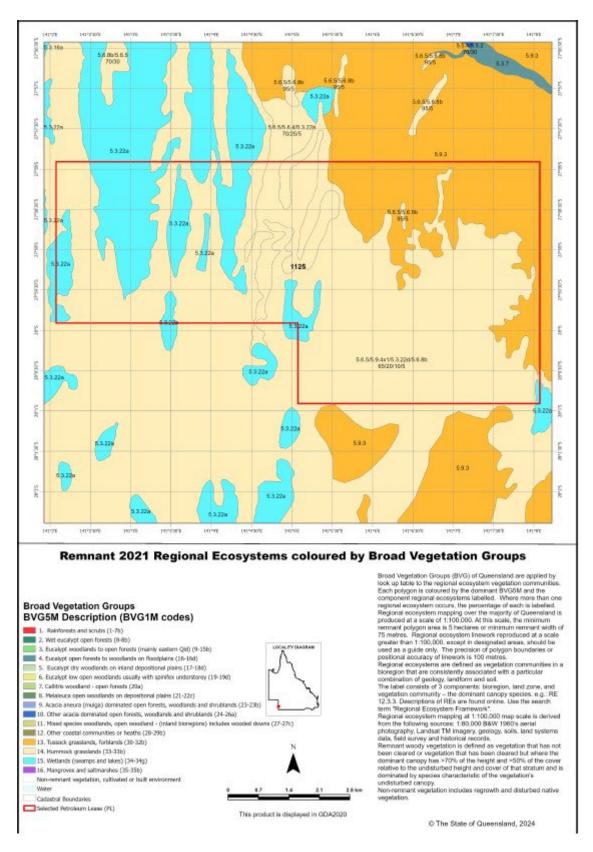


Figure 2. Broad Vegetation Groups mapped within PL 1125 (DESI 2024c).

3.2. Wetlands and Groundwater Dependant Ecosystems

The PL 1125 area of interest is covered within the Biodiversity Planning Assessments (BPAs) for the Channel Country (v1.1) and by the Aquatic Conservation Assessment (riverine and non-riverine) for Lake Eyre and Bulloo Basins (v1.1).

The Biodiversity and Conservation Values: Biodiversity Planning Assessments and Aquatic Conservation Assessment (BCV) Report for PL 1125 (Appendix 2, DESI 2024b) identifies the following results relevant to the presence of wetlands and groundwater dependant ecosystems:

- Eight Lacustrine wetlands (Non-riverine wetland types intersecting the area of interest) present identified within PL 1125.
- No palustrine wetlands are mapped for PL 1125.
- No named waterways intersecting with PL 1125.
- Aquatic conservation significance (riverine wetlands) (Figure 3):
 - o Low: 3,399.59 ha (74.84% of PL 1125)
 - o Very High: 1,142.83 ha (25.16% of PL 1125)
- Aquatic conservation significance (non-riverine) (Figure 4):
 - o Medium: 652.71 ha (14.37% of PL 1125).
- No springs identified within the Queensland Springs Database are present within PL 1125.

Mapping layers within Queensland Globe identify groundwater dependant ecosystems described as non-perennial interdunal lacustrine wetlands and some minor unnamed non-perennial drainage lines present in the southern and northeastern sections of PL 1125 (Figure 5, DESI 2024a).

The largest of the lacustrine wetlands, to the north of the pipeline and west of the proposed Vali 5 well along with the wetland adjacent to Vali 3 and south-eastern section of PL 1125 are identified as being of state biodiversity significance (Figure 6). This is due to potential presence of a wide range of invertebrates and algae and its potential habitat for waterbirds including migratory waders (expert decision number chc_I_16, DESI 2024a). Other areas of PL 1125 are identified as being of regional or local significance. The eight lacustrine wetlands identified in the BCV report (Figure 4) are identified on the map of referable wetlands MSES regulated vegetation (defined watercourse). No wetlands of high ecological significance are identified within PL 1125 and the biodiversity status of all areas within PL 1125 is 'No concern at present' (DESI 2024a, DESI 2024b).

One wetland of National significance, Cooper Creek Swamps - Nappa Merrie (Wetland Identification: QLD026) is located approximately 37 kms northeast of PL 1125.

The are no groundwater dependant ecosystems (GDEs) identified within PL1125 by the Groundwater Dependant Ecosystems Atlas with the closest approximately 2 km

north of the north-east corner of PL1125 (Figure 5). The only GDE identified by the desktop survey within PL 1125 (DESI 2024b) are ephemeral wetlands categorised as Broad Vegetation group 34a Lacustrine wetlands. Lakes, ephemeral to permanent, fresh to brackish; water bodies with ground water connectivity including fringing woodlands and sedgelands. Within this broad vegetation group one vegetation community was identified within desktop survey results as a wetland: RE 5.3.22 Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes.

This community was mapped for a number of interdunal areas where surface water is present following rainfall events (Figure 5) which was confirmed during the field survey (see section 5.1). It is identified as providing wetland habitat for flora and fauna. It has a biodiversity status of no concern at present although it has a low representation within the conservation estate (DESI 2024c).

Vegetation community 5.3.22 is split into a number of sub communities of which only one is present within PL 1125; 5.3.22a, which is within BVG 34a, and is associated with lacustrine wetlands. This is described as follows (Neldner et al. 2023):

• 5.3.22a: Bare areas, water or scattered ephemeral vegetation of variable floristic and structural composition. Locally *Eleocharis pallens* and/or *Eragrostis setifolia* may predominate. An ephemeral herbland will often dominate bare areas exposed by receding water. Very occasional low shrubs such as *Chenopodium auricomum, Duma florulenta and Tecticornia* spp. may be present. Occurs on lakes and larger clay pans (area generally greater than 8 ha) in interdunes or on sandplains or less frequently on clay plains. Soils very deep, grey cracking clays. Lacustrine. (BVG1M: 34a).

The Queensland Springs Database did not identify any springs in PL 1125, ATP2021 or Nappamerry Station and hence none are depicted in Figure 5 which included the Queensland springs dataset.

3.2.1. Riverine Wetlands

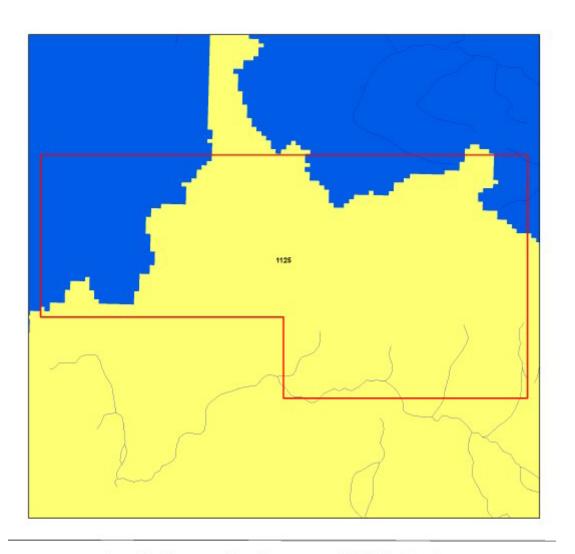
The BCV report for PL 1125 (DESI 2024b) identifies that 1,142.83 hectares (25.16 %) have a riverine aquatic significance of 'very high' and 3,399.59 hectares (74.84%) have a low significance (Figure 3).

The aquatic conservation significance is identified as being based on expert panel decision cp_r_fa_07 identifying potential special features of 'Permanent water holes' that 'never go dry over 100+ year timeframes and are critically important as refugia for aquatic species in arid landscapes (DESI 2024a).

No permanent waterholes or substantial drainage lines which would support them are identified for PL 1125 in any of the desktop sources reviewed and this was confirmed during the field survey. Drainage lines present within PL 1125 (Figure 5) are shallow and sandy and are restricted to the south-eastern and north-eastern sections of PL 1125. The basis of identifying 25 % of PL1125 as being very high significance for riverine wetlands is therefore not clear.

3.2.2. Non-riverine wetlands

The Biodiversity Planning Assessments and Aquatic Conservation Assessment Report (BCV report) for PL 1125 (DESI 2024a) identified 652.71 hectares (14.37 %) of PL 1125 as being of medium conservation significance for non-riverine wetlands (Figure 4). The aquatic conservation significance is identified as being based on expert panel decision cp_nr_ec_02 identifying potential special features of "Temporary claypan wetlands'. The description associated with this decision is: 'temporary claypan wetlands not fed by rivers have different biota adapted to different desiccation cycles e.g. fairy shrimp. For the majority of their time they are dry and are susceptible to cattle damage and woody debris removal. The REs associated with this decision are: 4.3.12b, d; 5.3.13b; 5.3.15a, b; 5.3.16a; 5.3.22a; 5.3.8b; 6.3.11; 6.3.11b.



Aquatic Conservation Assessment (ACA) - riverine

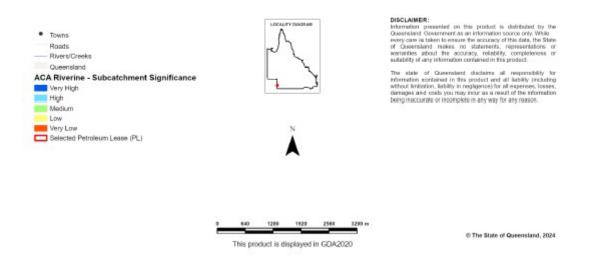
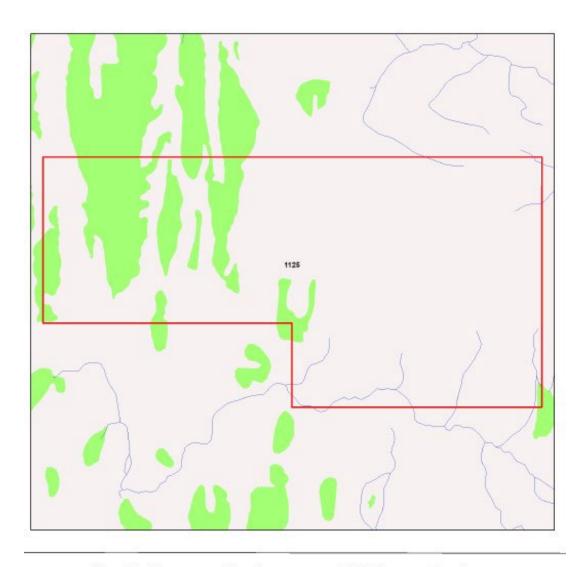


Figure 3. Aquatic Conservation Assessment for riverine wetlands within PL 1125 (DESI 2024b)



Aquatic Conservation Assessment (ACA) - nonriverine

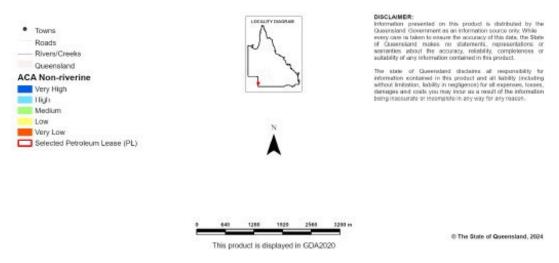


Figure 4. Aquatic Conservation Assessment for non-riverine wetlands within PL 1125 (DESI 2024b)

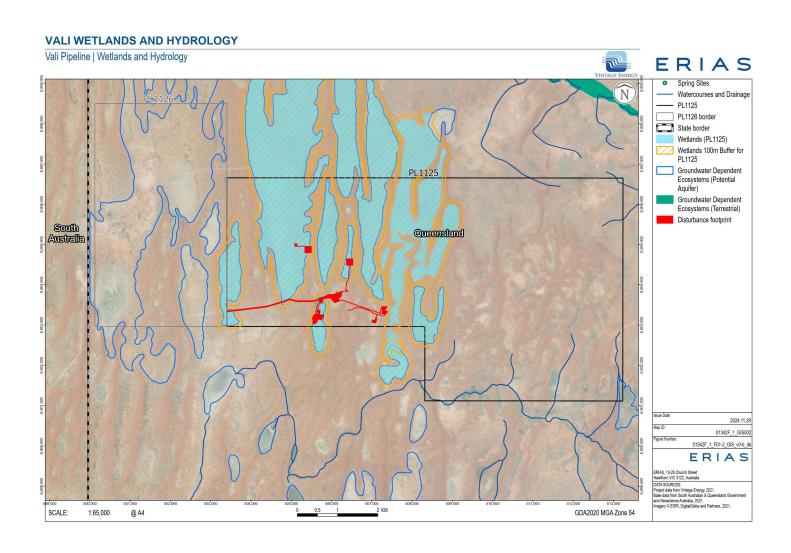
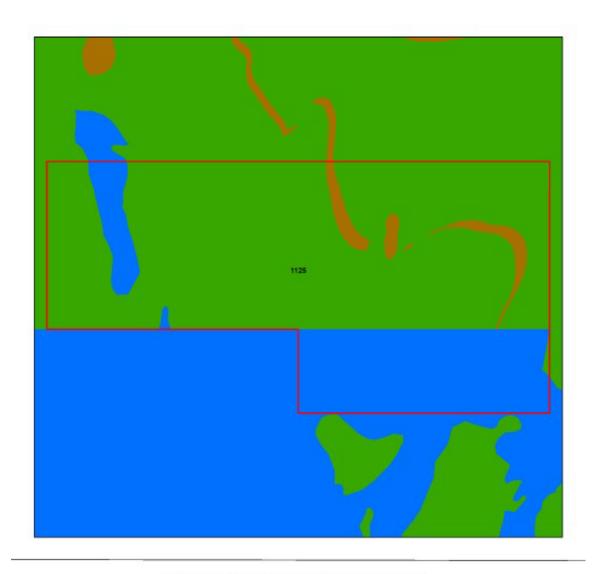


Figure 5. Wetlands and hydrology of PL 1125



Biodiversity Planning Assessments

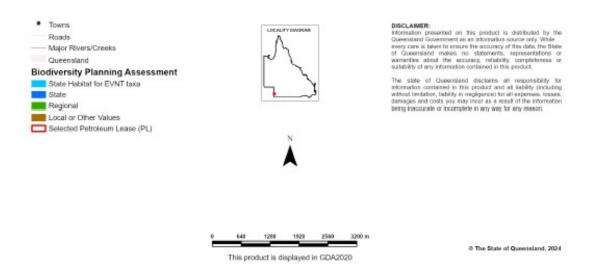


Figure 6. Biodiversity Planning Assessment significance areas for PL1125 (DESI 2024b)

3.3. Biodiversity Value

The Biodiversity and Conservation Values: Biodiversity Planning Assessments and Aquatic Conservation Assessment Report (BCV report) for PL 1125 identifies that the biodiversity status the whole of PL 1125 is 'No concern at present' (DESI 2024a) and that the area is not within any protected areas including:

- National Parks,
- Regional Parks,
- Nature Refuges,
- Conservation Park Zones,
- Preservation Zones,
- Legally Secured Offset Areas (offset register areas or vegetation offsets through a Property Map of Assessable Vegetation); or
- any other state conservation area (DESI 2024a).

The BCV Report identified the biodiversity significance of PL 1125 as follows (DESI 2024a):

- Local or Other Values: 132.33 ha (2.91% of PL 1125);
- Regional: 3,344.93 ha (73.64% of PL 1125);
- State: 1,065.16 ha (23.45% of PL 1125);

A biodiversity status of 'No concern at present' was given for the entire area of PL 1125. Identified biodiversity values for regional ecosystems present in PL 1125 include the following (DESI 2024c):

- 5.3.22: Provides wetland habitat for flora and fauna.
- 5.6.4: High fauna diversity.
- 5.6.5: High reptile diversity. Potential habitat for threatened fauna species including Mulgara *Dasycerus cristicauda*.
- 5.6.8: Habitat for the endemic Eyrean Grasswren *Amytornis goyderi* and threatened fauna species including the Dusky Hopping mouse *Notomys fuscus*, Mulgara *Dasycercus cristicauda* and plant and flora species.
- 5.9.4: Habitat for threatened fauna species including Kowari *Dasyuroides* byrnie.

The biodiversity values identified above are values attributed to the regional ecosystems on a statewide basis and do not necessarily reflect existing values for these habitats within PL 1125. This will be discussed further in the residual impact section below.

3.4. Matters of State Significance

The Matters of State Environmental Significance Report for PL 1125 identified two categories of MSES values were identified as being present within PL 1125:

- Regulated Vegetation intersecting a watercourse: 10.2 km; and
- Regulated Vegetation within 100m of a Vegetation Management Wetland: 1041.48 ha.

The MSES report also found that none of the following MSES values are present within PL 1125 (Table 2 in DESI 2024b):

- Protected Areas;
- State Marine Parks endangered or of concern regional ecosystems;
- Fish habitat areas (A and B);
- Strategic environmental area (SEA);
- High Ecological Significance wetlands on the Map of Queensland;
- High Ecological Value (HEV) wetlands;
- High Ecological Value (HEV) waterways;
- Threatened (endangered and vulnerable) wildlife;
- Special least concern animals;
- Wetland Environmental Values;
- Koala habitat;
- Sea turtle nesting areas;
- Regulated Vegetation Endangered/Of concern in Category B (remnant);
- Regulated Vegetation Endangered/Of concern in Category C (regrowth);
- Regulated Vegetation Category R (GBR riverine regrowth);
- Regulated Vegetation Essential habitat;
- Legally Secured Offset Areas offset register areas;
- Legally Secured Offset Areas vegetation offsets through a Property Map of Assessable Vegetation).

In addition, the MSES report found that there were no records of protected fauna or special least concern animal species and that shorebird habitat from critically endangered, endangered, vulnerable or least concern species has not been mapped for PL 1125 (DESI 2024b).

3.5. Threatened Ecological Communities

The EPBC protected matters searches did not identify any threatened ecological communities (TECs) listed under the EPBC Act 1999 as potentially present within the desktop survey 50 km buffer zone or within a 100 km buffer zone (DCCEEW 2024); Appendix 1 and Appendix 2).

3.6. EPBC Threatened species

Six fauna species (five birds and one mammal) are identified in the EPBC PMST results as 'Known' to occur in the 50 km radius area and all have records from within 50 km of the project area (ALA 2024, DCCEEW 2024a):

- Grey Falcon Falco hypoleucos, EPBC Vulnerable, 14 records within 50 km, 35 records within 100 km;
- Blue-winged Parrot *Neophema chrysostoma*, EPBC Vulnerable, 10 records within 50 km, 19 records within 100 km;
- Sharp-tailed Sandpiper *Calidris acuminata*, EPBC Vulnerable, 2 records within 50 km, 13 records within 100 km;
- Southern Whiteface *Aphelocephala leucopsis*, EPBC Vulnerable, 45 records within 50 km, 115 records within 100 km;
- Painted Honeyeater Grantiella picta, EPBC Vulnerable, 1 record within 50 km, 5 records within 100 km; and
- Dusky Hopping-mouse Notomys fuscus, EPBC Vulnerable, 14 records within 50 km, 77 records within 100 km.

A further three fauna bird species are identified in the EPBC PMST results as 'Known' to occur in the 100 km radius area (DCCEEW 2024b) but not the 50 km radius area. There are desktop records for only two of these species:

- Curlew Sandpiper *Calidris ferruginea*, EPBC Critically Endangered, 1 record within 50 km, 3 records within 100 km;
- Bulloo Grey Grasswren Amytornis barbatus barbatus, EPBC Endangered, no records within 50 km, 10 records within 100 km; and
- Latham's Snipe Gallinago hardwickii, EPBC Vulnerable, no records within 100 km.

An additional two bird species and three plant species were identified in the EPBC PMST results as 'Likely' to occur in the 50 km or 100km radius areas (DCCEEW 2024a, DCCEEW 2024b) however there are desktop records within 100 km for only one species:

- Common Greenshank *Tringa nebularia* EPBC Endangered, no records within 50 km, 5 records within 100 km;
- Night Parrot Pezoporus occidentalis, EPBC Endangered, no records within 100

km;

- Frankenia plicata EPBC Endangered, no records within 100 km;
- Sclerolaena walkeri EPBC Vulnerable, no records within 100 km; and
- Xerothamnella parvifolia, EPBC Vulnerable, no records within 100 km.

Eight species were identified in the results as 'May' occur in either the 50 km or 100km radius areas (DCCEEW 2024a, DCCEEW 2024b):

- Australian Painted Snipe Rostratula australis EPBC Endangered, 1 record within 50 km, 1 record within 100 km;
- Major Mitchell's Cockatoo Lophochroa leadbeateri EPBC Endangered, no records within 50 km, 7 records within 100 km;
- Plains Wanderer Pedionomus torquatus, EPBC Critically Endangered, no records within 100 km;
- Greater Bilby Macrotis lagotis EPBC Vulnerable, no records within 100 km;
- Kowari Dasyuroides bynei EPBC Vulnerable, no records within 100 kms;
- Plains Mouse Pseudomys australis, EPBC Vulnerable, 1 record within 50 km, 2 records within 100 km;
- Flame Spider-flower *Grevillea kennedyana* EPBC Vulnerable, no records within 100 kms; and
- Slender Swainson-pea *Swainsona murrayana* EPBC Vulnerable, no records within 100 kms.

3.6.1. EPBC Migratory Species records

The desktop searches identified eight additional migratory or marine bird species potentially or recorded as occurring within 50 or 100 km of the project:

- Common Sandpiper Actitis hypoleucos, 3 records within 50 km, 7 records within 100 km;
- Pectoral Sandpiper Calidris melanotos, 1 record within 50 km, 1 record within 100 km;
- Marsh Sandpiper Tringa stagnatilis, 4 records within 100 km;
- Red-necked Stint Calidris ruficollis, 2 records within 100 km;
- Oriental Plover Charadrius veredus, 1 record within 100 km;
- Fork-tailed Swift Apus pacificus, 2 records within 50 km, 4 records within 100 km;
- Grey Wagtail Motacilla cinerea; and
- Yellow Wagtail Motacilla flava.

There are records within the Atlas of Living Australia database for the first six of these

species listed above in either the 50 km or 100 km radiuses. Yellow Wagtail is considered as Known to occur within the 50 km PMS results although there are no desktop records for this species within 100 km of the project area. Another species Grey Wagtail is returned as 'May' occur in the 50 km PMS results and there are no ALA records for this species.

3.7. State (NC Act 1992) Listed Species

In addition to EPBC listed species there are desktop records within 100 km for one fauna species:

• Yellow Chat *Epthianura crocea crocea* NC Act Vulnerable;1 record from within 50 km and 4 records from within 100 km.

4. Field Survey Results

The survey area was in good condition following successive rainfall events over the previous 12 months including one in July 2024. Much vegetation growth was evident and many plant species were in flower. Bird abundances were high, and many species showed evidence of breeding.

4.1. Flora

A total of 131 flora species were recorded within PL 1125 during the field survey (Appendix 10). The only introduced species recorded was *Citrullus amarus* (Paddy Melon) which was recorded at a number of locations, primarily in dunes. No flora species listed under the EPBC Act or state legislation were recorded during the survey. A full species list is presented in Appendix 10.

Regional ecosystems (REs) recorded during the field survey were consistent with vegetation mapping in QGlobe. The field survey confirmed that the six Regional Ecosystem Description Database (REDD) vegetation communities mapped for PL 1125 were present:

- 5.3.22 Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes;
- 5.6.4 Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes;
- 5.6.5 Variable sparse to open-herbland or *Triodia basedowii* hummock grassland on dune flanks, crests and sandy interdunes;
- 5.6.8 Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes;
- 5.9.3 Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments; and
- 5.9.4 *Aristida contorta* sparse tussock grassland on fresh Cretaceous sediments with dense gravel cover.

Regional ecosystems have been mapped for areas of PL 1125 where infrastructure has been and is planned to be located as shown in Figure 7.

RE 5.3.22 was present in interdunal areas identified in vegetation mapping as ephemeral lacustrine wetlands including at the Vali 3 well pad area, adjacent to the Vali 2 well pad area and some areas of the pipeline. A total of 59 species were recorded in RE 5.3.22 during the survey which mostly consisted of herbs and grasses without a shrublayer however in some locations a shrublayer consisting of *Chenopodium auricomum* was present. *Duma florulenta* was also present to a lesser degree and in a few locations dominated the shrublayer. Most ephemeral wetlands had some areas which contained such a shrublayer and it is likely that these are the areas which hold water for the longest period of time. In some locations, such as the wetland just south of Vali 3, small stands of *Eucalyptus coolabah* (Coolibah) were

present at the edge of this community. Coolibah is not identified as part of RE 5.3.22 and is identified as being associated with regional ecosystem RE 5.3.16 which is not mapped for PL 1125. RE 5.3.16 is defined by the presence of *Eragrostis australasica* which was not recorded within the survey area but otherwise has some floristic similarities with RE 5.3.22. Areas with Coolibah are consequently included within 5.3.22.

RE 5.6.4 was widespread on dune flanks and benches as well as open plains where neither ephemeral wetlands nor dunes were present. It was recorded in the southern section of PL 1125 along, and adjacent to, the mapped drainage line. It was also present in elevated interdunal sandy flats in the northern section of PL 1125. It appeared to be much more widespread than indicated in the Regional Ecosystems report which stated that PL 1125 contains 66.91 (1.47 %) of this regional ecosystem. This was the most species diverse community surveyed with 76 species recorded. It was mostly dominated by *Atalaya hemiglauca* often with *Hakea leucoptera* as a major component. *Acacia aneura* was dominant to a much lesser extent either with or without other *Acacia* species. *Corymbia terminalis* was present on flat sandy plans as a scattered tree with or without other canopy trees. Grasses and herbs were prevalent throughout this community with the ground layer dominated by a mixture of these, or by grasses in some areas and herbs and larger shrubs in other areas.

RE 5.6.5 and RE 5.6.8 were prevalent and intermixed on dunes with RE 5.6.8 probably more widespread of the two communities. These two communities often merged with no clear line of delineation. The species diversity of these communities was lumped due to the difficulties in delineating them and 29 species were recorded. RE 5.6.8 were dominated by *Crotalaria eremea* and *Crotalaria cunninghamii* as well as a range of other shrubs such as *Acacia ligulata*, *Lechenaultia divaricata*, *Scaevola depauperata* and *Cullen pallidum*. *Zygochloa paradoxa* was a minor component of this community within PL 1125. Triodia was present in both communities but 5.6.5 was dominated by this species with less prevalence of shrubs.

RE 5.9.3 and RE 5.9.4 were present throughout PL 1125 apart from on dunes and 36 species were recorded in the former and 13 species recorded in the later community. The low species diversity for RE 5.9.4 reflects few sites where it was clearly the vegetation community. It was surveyed on a clay pan at Vali1 just to the east of the ponds and was dominated by *Astrebla pectinata*, *Sclerolaena* spp., various daisy species and a range of grasses. The delineation of these communities from RE 5.6.4 and at time from RE 5.3.22 was not always clear with communities merging into one another in some areas.

4.1.1. Propose Vali 4 and Vali 5 infrastructure

Vegetation at the proposed Vali 4 well pad is located within an ephemeral wetland between two dunes. It was confirmed as being primarily within RE 5.3.22 Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes which was dominated by a diversity of native herbs (19 recorded species) and native grasses (nine recorded species) of with no introduced species recorded.

Patches of *Chenopodium auricomum* (Golden Goosefoot) were present. A proportion of Vali 4 extends onto a dune flank with RE 5.6.4 *Atalaya hemiglauca* low open woodland over chenopod shrubland. This is consistent with Queensland Government vegetation mapping as contained in the Queensland Globe (DESI 2024b).

The proposed Vali 5 infrastructure was confirmed as being located within three regional ecosystems RE 5.3.22, RE 5.9.3 and RE 5.6.4. The existing pond and water bore is located within RE 5.3.22 at the edge of the wetland area and is dominated by herbs and grasses with no larger shrubs present. The planned track to the well pad is within RE 5.9.3 Astrebla spp., Aristida spp. and Enneapogon spp. open tussock grassland with diverse forbs. Some sparse larger shrubs (Senna spp. and Maireana spp.) were also present. The Vali 5 well pad is located within RE 5.6.4 which has a an overstorey of Atalya hemiglauca with a shrublayer of Senna spp., Acacia tetragonophylla and Maireana astrotricha as well as diverse grasses and forbs in the ground layer.

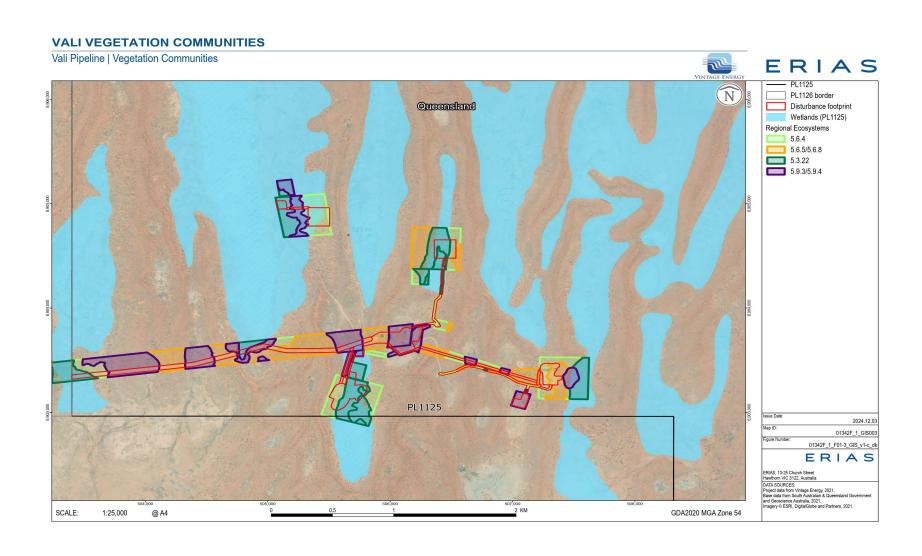


Figure 7. Vegetation associations previously mapped within PL 1125.

4.2. Fauna

A total of 38 species of birds were recorded during the field survey within PL 1125 (Table 3). Common species included Budgerigar, Brown Songlark, Australian Pratincole, Crimson Chat, White-winged Wren, Little Buttonquail, Masked Woodswallow, Zebra Finch and Flock Bronzewing. These species are typical of arid areas of Australia. A number are boom and bust species, such as Budgerigar, Flock Bronzewing, and Little Buttonquail were common during the survey which reflects the good environmental conditions at the time. One Little Buttonquail nest with 4 eggs was discovered adjacent to Vali 4 and Flock Bronzewing was observed performing display flights on a number of occasions. Many young birds were observed and several other species were also suspected to be breeding during the survey.

The sites with the highest recorded diversity were the drainage line in the south-west corner of PL 1125, Vali 1 and the ephemeral wetland site identified as RE 5.3.22 which had 18, 16 and 15 recorded species respectively (Table 3). This is likely to be influenced by survey effort as well as habitat diversity as these sites were all surveyed twice compared to once for most other sites.

No listed species were recorded during the field survey.

Table 3. Fauna species recorded at survey sites in PL 1125.

	PL						PL 1125 Drainage Line	PL 1125	PL 1125 North Dune
Location	1125	Vali 1	Vali 2	Vali 3	Vali 4	Vali 5	SW Corner	RE 5.3.22	RE 5.6.4
		141.062	141.073	141.056	141.066	141.053	141.094	141.05	141.038
		-27.992	-27.995	-27.997	-27.983	-27.981	-28.013	-27.986	-27.965
Species diversity	38	16	9	11	11	10	18	15	13
Australian Magpie	1			1					
Australian Pipit	1						1	1	
Australian Pratincole	1	1		1		1		1	
Australian Raven	1		1		1	1	1	1	1
Banded Lapwing	1	1	1						1
Black-faced Woodswallow	1		1		1	1	1		1
Black Falcon	1							1	
Black Kite	1						1		
Brown Falcon	1	1						1	1
Bluebonnet	1			1			1		
Brown Songlark	1				1			1	1
Budgerigar	1	1	1	1	1	1	1		1
Cockatiel	1	1		1	1				
Crested Pigeon	1						1		
Crimson Chat	1	1	1		1	1	1		1
Diamond Dove	1	1	1						
Fairy Martin	1	1		1					
Flock Bronzewing	1	1			1			1	
Galah	1			1			1		
Gull-billed Tern	1	1						1	

	PL						PL 1125 Drainage Line	PL 1125	PL 1125 North Dune
Location	1125	Vali 1	Vali 2	Vali 3	Vali 4	Vali 5	SW Corner	RE 5.3.22	RE 5.6.4
Horsfield's Bushlark	1							1	
Horsfield's Bronze-cuckoo	1	1							
Little Buttonquail	1			1	1	1	1	1	1
Masked Woodswallow	1		1		1		1	1	
Nankeen Kestrel	1					1	1		
Orange Chat	1							1	
Pied Honeyeater	1	1	1		1	1			1
Red-backed Kingfisher	1	1							
Rufous Songlark	1	1					1		1
Singing Honeyeater	1						1		
Spotted Harrier	1						1	1	
Straw-necked Ibis	1							1	
White-fronted Honeyeater	1								1
White-winged Triller	1						1		
White-winged Wren	1	1	1	1					1
Willie Wagtail	1						1		
Yellow-throated Miner	1			1					
Zebra Finch	1	1		1	1	1	1	1	1

5. Significant residual impact (SRI) assessment

5.1. Disturbance Footprint

The total footprint for the Vali application is 41.3 hectares which represents 0.91% of PL1125. The disturbance footprint areas for each regional ecosystem are provided in Table 4. Regional ecosystem 5.6.5 and 5.6.8 are lumped due to difficulties in delineating these and therefore mapping these at the scale required. Regional ecosystems 5.9.3 and 5.9.4 are lumped due to similar difficulties. Regional ecosystem 5.3.22 is a groundwater dependant ecosystem and hence is a MSES regulated vegetation (defined watercourse) and is within the disturbance footprint at five locations, Vali 3, Vali 4, Vali 5 and two locations along the pipeline corridor (Figure 7). None of the other regional ecosystems are designated as regulated vegetation.

Table 4. Disturbance footprint areas for each Regional Ecosystems (REs).

Regional Ecosystem ID	Regional Ecosystem (RE) Description	Disturbance Area ha (% of RE in PL1125)	RE Area ha (%) in PL1125
5.3.22	Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes.	8.6 (0.91%)	945.22 (20.81%)
5.6.4	Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes.	11.0 (16.44%)	66.91 (1.47%)
5.6.5 or 5.6.8	Variable sparse to open-herbland or Triodia basedowii hummock grassland on dune flanks, crests and sandy interdunes; or Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes.	8.7 (0.40%)	2151.54 (47.37%
5.9.3 or 5.9.4	Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments; or Aristida contorta sparse tussock grassland on fresh Cretaceous sediments with dense gravel cover.	13.0 (0.94%)	1378.75 (30.35%)
Total		41.3 (0.91%)	4542.42

5.2. Listed Species Impact Assessment

An assessment of potential impacts to listed species from vegetation clearance within the disturbance footprint (Figure 8) identified above is presented here. This impact assessment considers the following:

- Results of the EPBC Protected Matters Search (PMS);
- Matters of State Environmental Significance, Biodiversity and Conservation Value, Regional Ecosystem and WildNet reports for PL 1125;
- Desktop records obtained for Atlas of Living Australia, Birdlife Australia, WildNet;
- Field observations;
- Extent and location of the disturbance footprint; and
- Documented ecology of listed species.

The impact assessment covers the species which were identified in is sections 3.7 and 3.8 above and the results of the listed species impact assessment are provided in Table 5. For each species a likelihood of occurrence within PL 1125 and a potential for a residual impact occurring from development of the project footprint is provided.

Table 5. EPBC Act and NC Act Listed species that potentially occur within the desktop search areas of PL 1125 with a 50km buffer and a 100 km buffer. The number and year of last record from the Atlas of Living Australia data set is given for each species.

Species	NC Act	EPBC Act	Number of records	Year of last record	EPBC PMST Likelihood	Preferred habitats and distribution	Impact assessment for activities within PL 1125.					
	EPBC Act Threatened Species											
Birds		1	1	T								
Amytornis barbatus barbatus	NT	EN	50km: 0	2012	50km: Likely	Occurs in southwestern Qld, north-east SA and north-western NSW. Within Queensland it is found in the drainage basin of the Bulloo River and the Cooper Creek system as well the Diamantina and Eyre Creek systems near Birdsville.	Likelihood of Occurrence: Unlikely. There are no records within 50 kms and Lignum Duma florulenta is limited to small patches within the survey area with no connectivity to known populations of this species. This species is sedentary and only undertakes local movements (Higgins et al. 2001).					
Bulloo Grey Grasswren, Grey Grasswren (Bulloo)			100km: 10		100km: Known	This species typically occurs in Lignum Duma florulenta shrubland on periodically inundated swampy floodplains, waterholes and channels (Black and Gower 2017). It has also been recorded in surrounding samphire Tecticornia sp shrublands and Swamp Canegrass Eragrostis australasica and/or clumps of Atriplex nummularia. Not recorded during the field survey.	Potential for residual impact: Unlikely.					

Aphelocephala leucopsis			50km: 45		50km: Known	Its range is across most of mainland Australia south of the tropics in a wide variety of open woodlands and shrublands where there is an understorey of grasses and, or shrubs.	Likelihood of Occurrence: Possible
Southern Whiteface	V	VU	100km: 115	2017	100km: Known	It occurs in habitats dominated by Acacia or eucalypts on ranges, foothills and plains (Higgins & Peter 2002, cited in DCCEEW 2023b). Prefers habitat with low tree densities and an herbaceous understory litter cover which provides essential foraging habitat. Living and dead trees with hollows and crevices are used for roosting and nesting (DCCEEW 2023b). Not recorded during the field survey although a related species Banded Whiteface was observed.	Potential for residual impact: Possible. Area of potential impact: 11.0 hectares (RE 5.6.4)

Calidris acuminata			50km: 2		50km: Known	This species is a non-breeding migratory shorebird that occurs in coastal and inland areas of Australia.	Likelihood of Occurrence : Possible following large rainfall events
Sharp-tailed Sandpiper	-	VU, MW	100km: 13	2017	100km: Known	It prefers non-tidal fresh or brackish wetlands with exposed mud. It will also use damp grassland and shrubland areas as well as artificial wetland habitats such as dams and sumps. It also uses tidal flats in coastal areas to a lesser extent (Geering et al. 2008, Simpson and Day 2019, Mehkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.6 hectares (RE 5.3.22)
Calidris ferruginea	CR	CE, MW	50km: 1	2018	50km: May	A non-breeding migrant wader with a widespread distribution across Australia, in spring and summer (Geering et al. 2008, ALA 2024). This species has suffered a dramatic decline in abundance over the last 20 years due to loss of migrating habitat. Juveniles may remain in Aus for first Austral Winter (2 years old) (Menkhorst et al. 2017).	Likelihood of Occurrence : Possible following large rainfall events
Curlew Sandpiper		(100km: 3	-0.0	100km: Known	Prefers coastal or inland mudflats but will also visit artificial dams and inland water habitats, freshwater and brackish wetlands (Simpson & Day 2010, Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.6 hectares (RE 5.3.22)

Falco hypoleucos	V	VU	50km: 14	2020	50km: Known	The species has a widespread, but sparse distribution across Australia (ALA 2024).	Likelihood of Occurrence: Possible There are records of this within 50 kms and it is possible that this species may occur in PL1125 however its preferred habitat of wooded watercourses is not present within the disturbance footprint.
Grey Falcon			100km: 35		100km: Known	Preferred habitat includes treed watercourses and open plains in arid inland areas. When not actively hunting roosts in shady trees or communications towers (Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Unlikely. Preferred habitat of wooded watercourses is not present within the area of disturbance and is very limited within PL 1125. Area of potential impact: 0 hectares

Gallinago hardwickii			50km: 0		50km: May	The species has a widespread distribution throughout eastern Australia (ALA 2024). This species breeds in Japan and migrates to eastern and southern Australia. South-west Queensland is not considered part of its normal range.	Likelihood of Occurrence: Unlikely. The project is not within its normal range and there are no records within 100km.
Latham's Snipe	-	VU, M	100km: 0	-	100km: Known	Prefers tussock grass and low dense sedges surrounding freshwater wetland, including marshes and flooded grassland. In dense cover by day, forage dawn dusk or at night. (Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Unlikely.

Grantiella picta			50km: 1		50km: Known	This species is sparsely distributed in semi-arid and arid areas of eastern Australia including western Queensland. It is most common west of the Great Dividing Range but is considered irregular to the channel country of southwest Queensland. The Queensland population is augmented in winter by migrants from southern areas (Blakers et al. 1984; Storr 1984; Garnett 1992b; Higgins et al. 2001).	Likelihood of Occurrence: Unlikely The modelled habitat map for this species does not show any habitat. or records for the project area (Appendix 11).
Painted Honeyeater	V	VU	100km: 5	2020	100km: Known	The painted honeyeater lives in dry, open forests and woodlands (box, ironbark, yellow gum, melaleuca, casuarina, callitris, acacia). The species usually occurs in areas with flowering and fruiting mistletoe and flowering eucalypts. (Eddy 1961; Stewart 1988; Pizzey & Knight 1997; Higgins et al. 2001; Oliver et al. 2003). Not recorded during the field survey.	Potential for residual impact: Unlikely. This species primarily relies on trees containing mistletoe. The project infrastructure is primarily located in grassland and shrubland with minimal loss of trees.

Lophochroa leadbeateri leadbeateri			50km: 0		50km: No likelihood returned	The eastern subspecies of Major Mitchell's Cockatoo occurs in the Murray-Darling, Eyre and Bulloo River basins, from Isisford and Roma in the north, through western New South Wales to north-west Victoria and west to eastern South Australia (Higgins 1999). There are no records from within 50 km of the survey area and the records from within 100 km are from the Bulloo drainage basin.	Likelihood of Occurrence: Unlikely The modelled habitat map for this species does not show any habitat or records for the project area (Appendix 11). There are no records within 50 km.
Major Mitchell's Cockatoo (eastern)	EN	EN	100km: 7	1988	100km: May	This species inhabits a wide range of plant communities, mostly in arid and semi-arid woodlands, always within easy reach of surface water. Habitat critical to the survival of the Eastern Major Mitchell's cockatoo consist of arid and semi-arid woodlands dominated by mulga (Acacia aneura), mallee and box eucalypts, slender cypress pine (Callitris gracilis) or belah (Casuarina pauper/cristata). Large mature trees with suitable hollows are critical for breeding and corridors of suitable habitat are important for dispersal across the landscape (DCCEEW 2023b).	Potential for residual impact: Unlikely.

Neophema chrysostoma	V	VU	50km: 10	2021	50km: Known	Blue-winged parrots breed on mainland Australia south of the Great Dividing Range in southern Victoria, and sometimes in the far southeast of South Australia, and the northwestern, central and eastern parts of Tasmania. During the non-breeding period, from autumn to early spring, birds are migratory and recorded from northern Victoria, eastern South Australia, southwestern Queensland and western New South Wales (Higgins 1999 cited in DCCEEW 2023d). The project area occurs within the species occasional range.	Likelihood of Occurrence: Likely
Blue-winged Parrot			100km: 19		100km: Known	This species occurs in a range of habitats from coastal, subcoastal and inland areas, through to semi-arid zones. It favours grasslands and grassy woodlands and are often found near wetlands both near the coast and in semi-arid zones (Higgins 1999). The species can also be seen in altered environments such as airfields, golf-courses and paddocks. Not recorded during the field survey however this species is primarily present in winter months.	Potential for residual impact: Possible. Area of potential impact: 21.6 ha in total consisting of 8.6 ha of RE 5.3.22 and 13.0 ha of RE 5.93 / RE 5.94 combined.

Pedionomus torquatus			50km: 0		50km: May	This species occurs in very localised scattered in Qld, NSW, Vic and SA areas in eastern however there are no records within 100 km of the survey area.	Likelihood of Occurrence: Unlikely There are no records within 100 km and PL 1125 is not modelled as habitat for the species (Appendix 11).
Plains-wanderer	CR	CE	100km: 0	-	100km: May	Plains Wanderer occurs in sparsely vegetated tree-less plains dominated by sparse native grasses and chenopods (Marchant and Higgins 1993, Bellchambers and Baker-Gabb 2006). Typical habitat contains approximately 50% bare ground, with most vegetation less than 5 cm in height and some widely spaced plants up to 30 cm high (Garnett et al., 2011). It does not occur in cultivated areas (Garnett et al., 2011).	Potential for residual impact: Unlikely.
Pezoporus occidentalis	Е	EN	50km: 0	-	50km: Likely	Night Parrot was though extinct for more than 50 years until a population was rediscovered in south-west Queensland in the Diamantina basin.	Likelihood of Occurrence: Unlikely The modelled habitat map for this species does not show any habitat or records for the project area or for the Bulloo Shire region (Appendix 11). There are no records within 100 km. Open plains in the project area primarily consist of grasses such as Astrebla, Aristida and Enneapogon which are not preferred habitats for Night Parrot.

Night Parrot			100km: 0		100km: Likely	It lives in spinifex (<i>Triodia</i>) grasslands or shrubby samphire and chenopod associations in arid and semi-arid regions of Australia (Higgins 1999). It is primarily active a night and is known to roost in dense clumps of spinifex during the day. Not recorded during the field survey.	Potential for residual impact: Unlikely.
Rostratula australis	E	EN	50km: 1	Unkno wn	50km: May	Australian Painted Snipe has a widespread distribution across eastern and northern Australia (ALA 2024).	Likelihood of Occurrence: Possible The modelled habitat map shows very limited habitat for the project area but records to the south-east and north- west (Appendix 11). Habitat within PL 1125 is considered sub-optimal.
Australian Painted Snipe			100km: 1		100km: May	It occurs in freshwater wetland habitats with dense reeds and rushes/ well vegetated margins (Simpson and Day 2019, Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Possible Area of potential impact: 8.6 ha (RE 5.3.22)

Tringa nebularia			50km: 0		50km: No likelihood returned	Common Greenshank is a migratory shorebird that has a widespread distribution throughout Australia, in summer (Geering et al. 2008, ALA 2024).	Likelihood of Occurrence: Possible There are no records within 50 km and this species but may potentially be present following large rainfall events.
Common Greenshank	-	EN, MW	100km: 5	2008	100km: Likely	It occurs in intertidal mudflats, fresh and saltwater wetlands along the coast or inland (Geering et al. 2008). Also occupies artificial habitats. Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.6 ha (RE 5.3.22)

Mammals	lammals										
Dasyuroides bynei			50km: 0		50km: No likelihood returned	The Crest-tailed Mulgara occurs in scattered populations in sparsely vegetated stony deserts of the Lake Eyre drainage basin (Menkhorst and Knight 2017).	Likelihood of Occurrence: Unlikely There are no records within 100 km with the nearest records from north-west NSW.				
Crest-tailed Mulgara, Kowari	Е	EN	100km: 0	-	100km: May	It inhabits crests and slopes of sand ridges, or around salt lakes in inland Australia. During the day it shelters in burrows which are located at the base of sandhill canegrass (<i>Zygochloa paradoxa</i>) clumps or Nitre bush (<i>Nitraria billardieri</i>) growing around the edges of salt lakes (ALA 2024). Not recorded during the field survey.	Potential for residual impact: Unlikely.				
Macrotis lagotis	Е	VU	50km: 0	-	50km: No likelihood returned	Bilbies were once widespread across semi-arid and arid Australia but are now reduced to scattered populations in arid parts of Western Australia, northern Territory and south-west Queensland. They are primarily found in <i>Acacia</i> shrubland and spinifex grassland but also in clay and stony downs in the channel country of SW Queensland (Menkhorst and Knight 2001).	Likelihood of Occurrence: Unlikely The modelled habitat map does not show any habitat or records for the project area (Appendix 11). There are no records within 100 kms with records from south-west Queensland occurring north of Birdsville in the Diamantina River Catchment.				

Greater Bilby			100km: 0		100km: May	Bilbies are active at night and shelter during the day in long deep burrows that they dig. Bilbies are solitary animals and can breed all year round if conditions are favourable. Not recorded during the field survey.	Potential for residual impact: Unlikely.
Notomys fuscus			50km: 14		50km: Known	Dusky Hopping-mouse is a boom and bust species and consequently it is uncommon and difficult to locate in most years but abundant in years when populations are booming (Van Dyck and Strahan 2008).	Likelihood of Occurrence: Likely The habitat model for this species shows habitat and records within the PL 1125 area (Appendix 11).
Dusky Hopping- mouse	E	VU	100km: 77	2012	100km: Known	It primarily lives in sandy habitats such as sand dunes which are limited and isolated in the survey area; however, in good conditions when populations are booming it can be found temporarily in a range of other habitats (Van Dyck and Strahan 2008). Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.7 ha (RE 5.6.5 / RE 5.6.8 combined))

Pseudomys australis			50km: 1		50km: May	The Plains Rat was once widely distributed across central Australia however it now primarily occurs in central-northern and north-east South-Australia. There are scattered records in south-west Queensland and a reestablished population in north-west NSW. It is a boom and bust species and can disperse widely following good rainfall.	Likelihood of Occurrence: Possible The project area is not within the normal range for this species however there is one record within 50 km. It is possible that this species may occur in PL1125 however its preferred habitat of gibber plains is not present within the disturbance footprint.
Plains Mouse	V	VU	100km: 2	1957	100km: May	Historically, the plains rat was widely distributed across a broad range of habitats including river flats, grasslands, sand ridges and lowland shrubs. The current assumed distribution of the plains rat is limited to the gibber (stonecovered) plains characterised by cracking clay, productive depressions and minor drainage lines which support low open scrublands and ephemeral grass or herb lands. Similarly, during times of high rainfall, populations may move into surrounding habitat types. Habitat degradation due to grazing, introduced predators and drought have contributed to its decline. Not recorded during the field survey.	Potential for residual impact: Unlikely. Its preferred habitat of gibber plains is not present within PL 1125 disturbance area. Area of potential impact: 0 ha

Flora						
			50km: 0	50km: Likely	Frankenia plicata occurs in South Australia, from north of Port Augusta along the Stuart Highway to the Northern Territory border and from Port Augusta north-east to Maree (Barker et al., 2005; State Herbarium of South Australia, 2024). It is likely that the species has been under reported due to difficulty of identification of Frankenia spp. (Kutsche & Lay, 2003).	Likelihood of Occurrence : Unlikely There are no records within 100 km.
Frankenia plicata	-	EN	100km: 0	100km: Likely	Frankenia plicata grows in a range of habitats, including on small hillside channels, which take the first run-off after rain been found predominantly from swales of loamy sands to clay (Neagle, 2002). This species is found in a wide range of vegetation communities that have good drainage (Neagle, 2002). This species occurs within the South Australian Arid Lands Natural Resource Management Region. Not recorded during the field survey.	Potential for residual impact: Unlikely.

Grevillea kennedyana		50km: 0		50km: No likelihood returned	Grevillea kennedyana has a restricted distribution in the northwest corner of New South Wales and the southwest corner of Queensland (ALA 2024). As of 2000, the plant was found in six geographic locations. Ninety per cent of the populations are found in the Sturt National Park and are highly fragmented with a natural range of less than 100 km (ALA 2024).	Likelihood of Occurrence: Unlikely There are no records within 100 km. The habitat model map for this species does not show any habitat or records for the project area (Appendix 11).
Flame Spider- flower	VU	100km: 0	-	100km: May	Grevillea kennedyana mostly grows in arid areas in clusters on rocky jump-ups and colluvial slopes of rocky mesas with weathered silcrete rocks and loamy soils but can sometimes be found in dry and rocky watercourses. It grows on slopes between 10° and 75° (ALA2024). The most dense populations of this species are found on the lower slopes that have high water retention. It is often found with species such as spiny fan-flower (Scaevola spinescens), whitewood (Atalaya hemiglauca), Acacia and Eremophila species, and occasionally black oak (Casuarina pauper) often with a low ground cover of chenopods (ALA 2024). Not recorded during the field survey.	Potential for residual impact: Unlikely.

Sclerolaena walkeri		VU	50km: 0		50km: Not Returned	Sclerolaena walkeri is known from central Queensland, including the Diamantina River-Mackunda Creek Channels, the Paroo River area and in the Norley Range area near the Bulloo River north of Thargomindah (DCCEEW).	Likelihood of Occurrence : Unlikely There are no records within 100 km.
			100km: 0	-	100km: Likely	It occurs on saline river flats (Wilson, 1984), channels and flats with Soda Bush (Neobassia proceriflora) and on floodplains in Queensland Bluebush (Chenopodium auricomum) and Yapunyah (Eucalyptus ochrophloia). Not recorded during the field survey.	Potential for residual impact: Unlikely.
Swainsona murrayana			50km: 0		50km: May	Slender Darling-pea is found on the western slopes and plains of New South Wales, in Northern and western Victoria and southern Queensland with an outlier in South Australia.	Likelihood of Occurrence : Unlikely There are no records within 100 km.
Slender Swainson- pea	V	VU	100km: 0	-	100km: May	It is uncommon and grows on heavy clay and clay loam soils in <i>Atriplex vesicaria</i> shrublands and grasslands and is also found in seasonally wet areas and near lakes. Not recorded during the field survey.	Potential for residual impact: Unlikely.

Xerothamnel la parvifolia			50km: 0		50km: May	The species is found in the Channel Country IBRA bioregion, in south-western Queensland, Mount Poole in northwestern New South Wales and in South Australia (ALA 2024).	Likelihood of Occurrence: Unlikely There is no suitable habitat and no records within 100 km habitat.
	-	VU	100km: 0	-	100km: Likely	It grows in low chenopod shrubland and low open woodland, in thin sandy clay soils, along the ridgetops and slopes of sandstone ranges (ALA 2024).	Potential for residual impact: Unlikely.
						Not recorded during the field survey.	
EPBC Act Mig	ratory	Bird Sp	ecies				
Actitis hypoleucos			50km: 3		50km: Known	Common Sandpiper is a migratory shorebird that has a widespread distribution across Australia. It is typically present between late July and March (Simpson and Day 2019).	Likelihood of Occurrence: Possible at ponds and sumps containing water and in ephemeral wetlands following large rainfall events.
Common Sandpiper	-	М	100km: 7	1999	100km: Known	It occurs in a variety of habitats including a wide range of coastal and inland wetlands mostly around muddy margins or rocky shores and rarely on intertidal mudflats. The species also occurs on steep sided sewage ponds, dams, and other artificial wetland habitats. It is tolerant of a wide variety of salinities. Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.6 ha (RE 5.3.22)

Apus pacificus	-	М	50km: 2	2007	50km: Likely	Fork-tailed Swift has a widespread distribution across Australia. It is migratory and only occurs in Australia from October to March (ALA 2024).	Likelihood of Occurrence: Possible While it is possible that this species may occur over PL1125 including the disturbance footprint this species has no interaction with terrestrial habitats while in Australia as it feeds exclusively on airborne invertebrates. No impact to this species is therefore considered to be plausible from this project.
Fork-tailed Swift			100km: 4		100km: Likely	This species is highly mobile, almost entirely aerial, and rarely recorded on the ground. It feeds on aerial invertebrates which are caught while flying. Not recorded during the field survey.	Potential for residual impact: Unlikely. This species has no interaction with terrestrial habitats in Australia. Area of potential impact: 0 ha

Calidris melanotos			50km: 1		50km: May	Pectoral Sandpiper is widespread across southeast Australia (ALA 2024) but is only sporadically recorded in arid areas. (Geering et al. 2008; Menkhorst et al. 2017).	Likelihood of Occurrence: Unlikely There are no records within 50 km however this species could potentially be present following large rainfall events.
Pectoral Sandpiper	-	М	100km: 1	1998	100km: Known	It occurs in freshwater or brackish wetlands, grassy or lightly vegetated swamps (Geering et al. 2008). Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.6 ha (RE 5.3.22)
Calidris ruficollis			50km: 0		50km: No likelihood returned	Red-necked Stint is widespread and common across southeast Australia (ALA 2024) but less commonly recorded in arid areas (Geering et al. 2008; Menkhorst et al. 2017).	Likelihood of Occurrence: Possible There are no records within 50 km however this species could potentially be present following large rainfall events.
Red-necked Stint	ı	М	100km: 2	2019	100km: No likelihood returned	It occurs in freshwater or brackish wetlands, grassy or lightly vegetated swamps (Geering et al. 2008; Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.6 ha (RE 5.3.22)

Charadrius veredus	-	М	50km: 0	1992	50km: No likelihood returned	This species is a migratory wader which primarily occurs in Northern and Central Australia from the Kimberly's WA to the Gulf country and Central Queensland (Menkhorst et al. 2017). It was not included in the EPBC Protected Maters search results for 50km or 100 km buffer zones. There is one ALA record from 1992 within 100 km buffer zone but none within 50 km.	Likelihood of Occurrence: Unlikely This species was not included in either the 50 km or 100 km PMST search results. There is one record from 30+ years ago within 50 - 100 km from PL 1125.
Oriental Plover			100km: 1		100km: No likelihood returned	It prefers open grasslands and thinly vegetated plains including recently burnt areas and heavily grazed paddocks (Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Unlikely.
Motacilla cinerea			50km: 0		50km: May	This migratory species is a scarce but regular visitor to Australia with most records from the Kimberly, WA, Top End, NT and Wet Tropics, Qld (Menkhorst et al. 2017). There are no records from within 100 km for the survey area.	Likelihood of Occurrence: Unlikely There are no records from within 100 km.
Grey Wagtail	-	Δ	100km: 0	-	100km: May	It is usually found close to water including beaches and rock pools. It favours lowland watercourses, warterfalls and fast-flowing streams and rivers (Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Unlikely.

Motacilla flava	-	М	50km: 0	-	50km: Known	This migratory wagtail occurs in Australia between late September and April mostly in northern Australia from the Kimberly region, WA, to the Top End, NT and Wet Tropics, Qld (Menkhorst et al. 2017). It is identified as 'Known' to ocurr in the EPBC PMST desktop results however no records were returned from within 100 km for the survey area.	Likelihood of Occurrence: Unlikely There are no records from within 100 km.
Yellow Wagtail			100km: 0		100km: Known	Occurs in a variety of damp or wet habitats including marshes and bogs. Forages in damp grassland or on bare ground at the edge of rivers, lakes and other wetlands (Menkhorst et al. 2017). Not recorded during the field survey.	Potential for residual impact: Unlikely.

Tringa stagnatilis		50km: 0		50km: No likelihood returned	This is a migratory shorebird which is widespread across Australia. It was not included in the EPBC PMST desktop results however there are four records in the BirdLife data within 100 km.	Likelihood of Occurrence: Possible There are no records within 50 km however this species could potentially be present following large rainfall events.
Marsh Sandpiper	MW	100km: 4	2001	100km: No likelihood returned	It mainly occurs in fresh and brackish inland wetlands but also occurs along the coast on intertidal mudflats (Geering et al. 2008, Menkhorst et al. 2017). Also occupies artificial habitats. Not recorded during the field survey.	Potential for residual impact: Possible. Area of potential impact: 8.6 ha (RE 5.3.22)

NC Act (Qld) Species	NC Act (Qld) Listed Species						
Flora	Flora						
Acacia peuce			50km: 0		50km: N/A	Acacia peuce is restricted to two sites near Boulia and Birdsville in Queensland and a third site Mac Clark (Acacia peuce) Conservation Reserve in the Northern Territory (ALA 2024). The total population is approximately 76,000 individuals spread over a total area of 74,000 square kilometres but with a total area of occupancy of only 400 km2.	Likelihood of Occurrence : Unlikely. This is a large characteristic species known from just three sites.
Waddy	V	-	100km: 0	-	100km: N/A	The tree is found in open arid plains that usually receive less than 150 millimetres (5.9 in) of rain per annum. They grow on shallow sand aprons overlaying gibber or clay slopes and plains and between longitudinal dunes or on alluvial flats between ephemeral watercourses. The soils can be saline or contain high levels of gypsum (ALA 2024). Not recorded during the field survey.	Potential for residual impact: Unlikely.
Eremophila stenophylla			50km: 0		50km: N/A	This Eremophila occurs from central Queensland south to near Yowah and Thylungra,	Likelihood of Occurrence : Unlikely There are no records from within 100 km.
-	V	-	100km: 0	-	100km: N/A	This species usually occurs in <i>Acacia</i> woodland on skeletal soil in rocky places or along watercourses.	Potential for residual impact: Unlikely.
						Not recorded during the field survey.	

Birds	Birds						
Epthianura crocea crocea	>		50km: 1	2012	50km: N/A	Yellow chat occurs from north-west WA across the NT to south-west and coastal Qld. In south-west Qld it is sparsely scattered to the north and east of Birdsville mostly in the Diamantina River and central Coppers creek drainage basins (Higgins et al. 2001).	Likelihood of Occurrence: Unlikely, There is no suitable habitat of permanent wetlands with adjacent saltmarsh area within PL 1125.
Yellow Chat (gulf)	V	-	100km: 4	2012	100km: N/A	It occurs in low vegetation surrounding wetlands, occasionally grassland and other areas of low vegetation such as saltbush. Often found around the interface of grasslands and saltmarsh. Not recorded during the field survey.	Potential for residual impact: Unlikely.

The outcomes of the listed species impact assessment resulted in 11 species which are all EPBC listed as either threatened and or migratory. They are considered as having a potential residual impact from the development due to a 'likely' or 'possible' likelihood of occurrence within PL 1125 and suitable habitat occurring within the project footprint. These species are:

- Australian Painted Snipe Rostratula australis, EPBC Endangered
- Sharp-tailed Sandpiper Calidris acuminata, EPBC Vulnerable and Migratory;
- Curlew Sandpiper Calidris ferruginea, EPBC Critically Endangered and Migratory;
- Common Greenshank Tringa nebularia EPBC Endangered and Migratory;
- Blue-winged Parrot *Neophema chrysostoma*, EPBC Vulnerable and Migratory (within Australia);
- Southern Whiteface Aphelocephala leucopsis, EPBC Vulnerable;
- Dusky Hopping-mouse Notomys fuscus, EPBC Vulnerable;
- Common Sandpiper Actitis hypoleucos, EPBC Migratory;
- Pectoral Sandpiper Calidris melanotos, EPBC Migratory;
- Marsh Sandpiper Tringa stagnatilis, EPBC Migratory; and
- Red-necked Stint Calidris ruficollis, EPBC Migratory.

Species identified above are further assessed in Table 6 to determine if the impact is likely to be significant. This is based on the impact criteria provided in section 5.1 of the Significant Residual Impact (SRI) guideline for endangered and vulnerable wildlife habitat (including essential habitat) (DEHP 2014). The guideline states that 'An action is likely to have a significant impact on endangered and vulnerable wildlife if the impact on the habitat is likely to:

- lead to a long-term decrease in the size of a local population; or
- reduce the extent of occurrence of the species; or
- fragment an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation;
 or
- result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or
- introduce disease that may cause the population to decline, or
- interfere with the recovery of the species; or
- cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

5.3. Prescribed Environmental Matters and Matters of State Environmental Significance (MSES) Impact Assessment

An assessment of potential impacts was conducted against all Prescribed environmental matter (PEMs) identified in the Biodiversity 10 condition of the *Guideline Environmental Protection Act 1994, Streamlined model conditions for petroleum activities*. These are the same Matters of Environmental Significance identified in the MSES report generated for PL 1125 (DESI 2024a). Each matter is assessed to determine if a potential impact may occur along with the associated disturbance area (ha) and location. The Significant Residual Impact Guideline (DEHP 2014) has been used as a guide where appropriate. This assessment is provided in Table 6.

Table 6: Significant residual impacts to prescribed environmental matters (as per Streamlined model conditions for petroleum activities - Biodiversity 10 condition). The location of the impact is provided in Figure 8.

Prescribed environmental matter	Assessment	Maximum extent of impact	SRI Assessment finding
Regulated Vegetation			
Endangered regional ecosystem	No endangered regional ecosystems are present in PL 1125, see Appendix 12 Figure 1- PL 1125 - MSES - Regulated Vegetation (from MSES Report for PL 1125 - Table 2, Map 4 (Appendix 1)).	0 ha	No residual impact
Of concern regional ecosystem (not within an urban area)	No 'of concern' regional ecosystems (including categories B and C) are present in PL 1125, see Appendix 12 Figure 1- PL 1125 - MSES - Regulated Vegetation (from MSES Report for PL 1125 - Table 2, (Appendix 1)).	0 ha	No residual impact
Regional ecosystems (not within an urban area) that intersect a wetland on the vegetation management wetlands map: RE 5.3.22 Sparse herbland,	RE 5.3.22 is not endangered or of concern and no areas constitute a defined watercourse however areas of RE 5.3.22 within PL1125 lie within mapped wetlands (Category 8f) and therefore an assessment of the three criteria of section 2.1 of the SRI guideline is required.	Area impacted: 8.6 ha of RE 5.3.22	The disturbance footprint results in a residual impact to 8.6 ha of RE 5.3.22.
open water or bare areas on flood plain lakes and interdune clay pans and lakes	Criteria 1: The flowline is consistent with 'linear infrastructure'. It is 40 meters in width which exceeds the 20 m wide threshold for a sparse (structural category) regional ecosystem (RE		This is identified as a significant residual impact to RE 5.3.22 due to Criteria 1 and
Broad Vegetation Groups: • 34a Lacustrine wetlands. Lakes, ephemeral to permanent. Includes fringing woodlands	5.3.22) that lies within a mapped wetland. Other areas of the disturbance footprint include greater than 2 hectares of clearance of 5.3.22. Criteria 1 is therefore exceeded.		Criteria 2 being exceeded.
and sedgelands. This impact is assessed in	Criteria 2: Clearance of 5.3.22 is within 50 m of the defining bank (the high water point of flooding) of a vegetation management wetland community that lies within a mapped		

accordance with Section 2 of the SRI guideline.	wetland. All clearance of RE 5.3.22 within 50 m of the defining bank is also considered within Criteria 1. Criteria 3: Not applicable as there is no defined watercourse. In accordance with the first note of the SRI guideline section 2.1 a significant residual impact on the regional ecosystem that lies within the mapped wetland (RE 5.3.22) occurs when Criteria 1 and Criteria 2 are exceeded. The disturbance footprint results in a total clearance area of 8.6 ha of RE 5.3.22. This disturbance area represents 0.9 % of RE 5.3.22 within PL 1125.		
Essential habitat (not in an urban area) for endangered wildlife	No essential habitat for endangered wildlife is identified within PL 1125 see Appendix 12 Figure 2- PL 1125 - MSES - Species Threatened (Endangered or Vulnerable) wildlife and species least concern animals (from MSES Report for PL 1125 - Table 2, Map 3a (Appendix 1)).	0 ha	No residual impact
Essential habitat (not in an urban area) for vulnerable wildlife	No essential habitat for vulnerable wildlife is identified within PL 1125 see Appendix 12 Figure 2- PL 1125 - MSES - Species Threatened (Endangered or Vulnerable) wildlife and species least concern animals (from MSES Report for PL 1125 - Table 2, Map 3a (Appendix 1))	0 ha	No residual impact
Connectivity areas			
Connectivity area that is a regional ecosystem (not in urban area) Impacts to connectivity were assessed using section 3.2 of the	PL 1125 is not within a Terrestrial or Riparian Bioregional Corridor see Appendix 12, Figure 3. There is no fragmentation of habitat within PL 1125 which has	0 ha	No residual impact
SRI guideline: A development	remnant vegetation of 100%. The regional scale extent of core		

impact on connectivity areas is determined to be significant if either of the following tests are true: 1. The change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale (see table below); or 2. Any core area that is greater than or equal to 1 hectare is lost or reduced to patch fragments (core to non-core).	remnant ecosystem is therefore greater than 90% and a change threshold of 50 % for local core scale remnant ecosystem would represent a significant impact. The local scale area is the project footprint with a 5km buffer which is 41.3 ha plus a buffer area of 10,000 ha. The change in the core remnant ecosystem extent at the local scale (post impact) is 0.41% (41.3 ha divided by 10,033 ha of the disturbance footprint (41.3 ha) with a 5 km buffer). This is substantially lower than the 50 % change threshold for a >90 % core remnant ecosystem extent.		
Wetlands and watercourses			
A wetland in a wetland protection area shown on the Map of referable wetlands (HES wetlands in GBR)	No wetland protection areas shown on the Map of referable wetlands (HES wetlands in GBR) are present in PL 1125, see Appendix 12 Figure 4 - PL 1125 - MSES - Wetlands and waterways (from MSES Report for PL 1125 - Table 2, Map 2 (Appendix 1)).	0 ha, none identified within PL 1125	No residual impact
A wetland of high ecological significance shown on the Map of referable wetlands	No wetlands of high ecological significance shown on the Map of referable wetlands are present in PL 1125, see Appendix 12 Figure 4 - PL 1125 - MSES - Wetlands and waterways (from MSES Report for PL 1125 - Table 2, Map 2 (Appendix 1)).	0 ha	No residual impact

Designated precincts in strategic environment	onmental areas		
Designated precinct in a strategic environmental area	No Designated precinct in a strategic environmental area are present in PL 1125, see MSES Report for PL 1125 - Table 2 (Appendix 1).	0 ha	No residual impact
Protected wildlife habitat			
An area shown as a high-risk area on the flora survey trigger map that contains plants that are endangered or vulnerable wildlife	There are no high-risk areas on the flora survey trigger map that contain plants that are endangered or vulnerable wildlife that are present in PL 1125, see Appendix 12 Figure 4 and Figure 5.	0 ha	No residual impact
An area not shown as a high risk area on the flora survey trigger map that contains plants that are endangered or vulnerable wildlife	No plants that are endangered or vulnerable wildlife have been recorded within PL 1125, see Appendix 11 WildNet Records: Conservation Significant Species List.	0 ha	No residual impact
A non-juvenile koala habitat tree located in an area shown as a bushland habitat, high value rehabilitation habitat or medium value rehabilitation habitat in the 'Map of Assessable Development Area Koala Habitat Values'	No Koala habitat trees have been recorded within PL 1125, see Appendix 12 Figure 6- PL 1125 - MSES - Species Koala habitat area (SEQ) (from MSES Report for PL 1125 - Table 2, Map 3b (Appendix 1)).	0 ha	No residual impact
 Habitat for an animal that is endangered wildlife as follows: Curlew Sandpiper Calidris ferruginea, EPBC Critically Endangered; Common Greenshank Tringa nebularia EPBC Endangered and Migratory; Australian Painted Snipe Rostratula australis, EPBC Endangered. 	No habitat for endangered wildlife is identified within desktop reports as occurring in PL 1125, see Appendix 12 Figure 2- PL 1125 - MSES - Species Threatened (Endangered or Vulnerable) wildlife and species least concern animals (from MSES Report for PL 1125 - Table 2, Map 3a (Appendix 1)). The desktop review identified records for Curlew Sandpiper, Common Greenshank and Australian Painted Snipe within 50 km and suitable habitat for these species has been identified within PL 1125 as RE 5.3.22.	8.6 ha of RE 5.3.22	A residual loss of 8.6 ha of habitat for these species is identified. This is not assessed to be a significant impact.

This impact is assessed in accordance with Section 5 of the SRI guideline.

Australian Painted Snipe is a nomadic wetland species which could possibly be present during favourable conditions. The remaining two species are international migrants and only present in Australia between September and March. The preferred habitats for these species differ slightly but they would all potentially use ephemeral wetlands identified as RE 5.3.22 on a temporary basis when water is present. The area of RE 5.3.22 within the disturbance footprint is 8.6 hectares which is 0.91 % of RE 5.3.22 that is mapped within PL 1125 (945.22 ha).

Consequently Section 5.1 of the SRI guideline is relevant and identifies eight significant residual impact criteria for endangered wildlife habitat as follows:

- lead to a long-term decrease in the size of a local population; or
- reduce the extent of occurrence of the species; or
- fragment an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation; or
- result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or
- introduce disease that may cause the population to decline, or
- interfere with the recovery of the species; or

 cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

Clearance of 8.6 hectares of RE 5.3.22 is not considered likely to have a significant impact on any of the identified endangered species as none of criteria identified above would be triggered due to the following:

- There are a few records (0 3) of these species within 50 km the project area and none within the project area.
- Their prime habitat is ephemeral, and they are all transient hence it is considered that there is no local population within and surrounding PL 1125.
- The area of potential habitat that is impacted is less than 1% in PL1125.
- Curlew Sandpiper and Common Greenshank do not breed in Australia and Australian Painted Snipe is not known to breed in the region.
- The project area is not considered to represent ecologically significant locations to these species.
- The project is unlikely to introduce any diseases or invasive species to the area that may cause a population to decline.
- The project would not interfere with the recovery of any of the species.

	It is therefore considered unlikely that any of the impacts listed in the SRI Guideline would occur as a result of infrastructure development within the disturbance footprint. It is considered that the impacts of the project are not significant on any of these species due to the limited area impacted and the large extent of suitable habitat that remains in the immediate area and the region.		
 Habitat for an animal that is vulnerable wildlife: Sharp-tailed Sandpiper Calidris acuminata; EPBC Vulnerable; Blue-winged Parrot Neophema chrysostoma, EPBC Vulnerable; Southern Whiteface Aphelocephala leucopsis, EPBC Vulnerable; Dusky Hopping-mouse Notomys fuscus, EPBC Vulnerable; This impact is assessed in accordance with Section 5 of the SRI guideline. 	No habitat for vulnerable wildlife is identified within desktop reports as occurring in PL 1125, see Appendix 12 Figure 2- PL 1125 - MSES - Species Threatened (Endangered or Vulnerable) wildlife and species least concern animals (from MSES Report for PL 1125 - Table 2, Map 3a (Appendix 1)). The desktop review identified records for Sharp-tailed Sandpiper, Blue-winged Parrot, Southern Whiteface and Dusky Hopping-mouse within 50 km and suitable habitat for all species has been identified within PL 1125. Suitable habitats are: RE 5.3.22 for Sharp-tailed Sandpiper and Blue-winged Parrot; RE 5.6.5 and RE 5.6.8 for Dusky Hopping-mouse; and RE 5.9.3 and RE 5.9.4 for Blue-winged Parrot. This disturbance area results in habitat loss for these species as follows: 8.6 ha of 5.3.22 which is equivalent to 0.91% of this	8.6 ha of RE 5.3.22 11.0 ha of RE 5.6.4 8.7 ha of RE 5.6.5 / RE 5.6.8 (combined) 13.0 ha of RE 5.93 / RE 5.94 (combined)	A residual loss of habitat for Sharptailed Sandpiper, Blue-winged Parrot, and Dusky Hoppingmouse. A residual loss of habitat for Southern Whiteface that could result in a localised impact to the species. An assessment of significant residual impact criteria in section 5.1 of the SRI Guideline found that the loss of habitat is not a significant residual impact to these species.

community as mapped within PL 1125;

- 11.0 ha of RE 5.6.4 which is equivalent to 16.44% of this community as mapped for PL 1125;
- 8.7 ha of RE 5.6.5/RE 5.6.8 which is equivalent to 0.40% of this community as mapped for PL 1125;
- 13.0 ha of RE 5.93/RE 5.94 (combined) which is equivalent to 0.94% of this community as mapped for PL 1125.

Sharp-tailed Sandpiper Calidris acuminata

The impact assessment detailed above for endangered wildlife against the criteria contained within the SRI guideline is relevant in all aspects for Sharp-tailed Sandpiper. Consequently, no significant impact is considered to occur to this species either.

Blue-winged Parrot Neophema chrysostoma

The impact assessment for Blue-winged Parrot considers the following:

- Blue-winged parrots inhabit a range of grasslands, shrublands and grassy woodlands often found near wetlands where they forage near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs (DCCEEW 2023c, Higgins 1999).
- This species may potentially use any habitats within PL 1125 which all contain a variety of grasses and herbs however RE 5.3.22, RE 5.9.3 and RE 5.9.4 are

likely to be the most suitable for this species.

- The area of RE 5.3.22 within the disturbance footprint is approximately 8.6 ha (0.91 % of 5.3.22 within PL1125). The area of RE 5.9.3 and RE 5.9.4 combined which is within the disturbance footprint is 13.0 ha (0.94% of RE 5.9.3 / RE 5.9.4 within PL 1125).
- During the non-breeding period, from autumn to early spring, birds migrate to arid and semi-arid arid areas. (Higgins 1999). This species is therefore migratory to the project and does not breed in the region.
- There are 10 records of this species within 50 km the project area and none within the project area. It is therefore considered that there is no local population within and surrounding PL 1125.

Assessment of SRI Criteria for Blue-winged Parrot:

- The impact of the project to this species is localised and the area of potential habitat that is impacted is less than 1% in PL1125.
- Given that the migratory nature of this species the disturbance is unlikely to cause fragmentation or result in genetically distinct populations.
- PL 1125 is not considered to be an ecologically significant area for the species.
- The project is unlikely to introduce any diseases or

- invasive species to the area that may cause a population to decline.
- The project would not interfere with the recovery of any of the species.

No significant impact is considered to occur to this species.

Southern Whiteface Aphelocephala leucopsis

Southern Whiteface lives in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both (DCCEEW 2023d). These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains (Higgins & Peter 2002). Southern Whiteface forages almost exclusively on the ground for insects, spiders, and seeds favouring habitat with low tree densities and an herbaceous understorey litter cover. It is sedentary or resident with local movements undertaken by young and unpaired birds (Higgins & Peter 2002). The only habitat for this species within PL 1125 is RE 5.6.4 which has trees with an open understorey of shrubs, grasses and herbs. Atalaya woodlands were surveyed at a number of locations on PL 1125 on the flanks of a number of dunes and on sandy plains, especially in the southern section and northern sections of PL 1125. There appeared to be more extensive areas of habitat in within PL1125 than mapped given that it is present on the flanks of many or most dunes and along drainage lines surveyed in the south-western section of PL 1125. The impact assessment for Southern Whiteface considers the following:

- The area of 5.6.4 mapped within the disturbance footprint is 11.0 ha which constitutes 16.44 % of this RE within PL 1125. It was clear during the site visit that this RE is much more widespread throughout PL1125 than mapped.
- There are 45 records from within 50 km of the PL 1125 however this species was not recorded during the field survey despite it being one of the target survey species and environmental conditions being good at the time of survey.
- It is possible that the species is resident in the area however it is considered that any existing population would likely be low considering it was not observed or recorded on songmeters.
- There is more extensive habitat in adjacent areas to the north, east and west where significant waterways support large areas of woodland.

Assessment of SRI Criteria for Southern Whiteface:

• The presence of a local population in the project area has not been confirmed although it is known to occur regionally. Given that this species is sedentary or resident it is likely that it is either not present or in low abundance. Clearance of 11.0 hectares of 5.6.4 could possibly have an impact on the size of a local population should it exist however the impact is likely to be minor considering the lack of records in

the project area.

- It is possible that the project could reduce the area
 of extent at a local scale if the species is present. It is
 not considered to have a significant impact at
 regional scale.
- The project is not considered to lead to fragmentation or genetic isolation of an existing population due to the small scale of the project; the habitat being naturally linear and fragmented; and an existing population not being established.
 Suitable habitat adjacent to the disturbance area is retained and the connectivity of habitat retained is consistent with the area as a whole.
- The project is unlikely to introduce any diseases or invasive species to the area that may cause a population to decline.
- The project would not interfere with the recovery of any of the species.
- The area is not considered to be an ecologically significant area for the species even though it contains some suitable habitat.

A residual loss of habitat from the project for Southern Whiteface could result in a localised impact to the species however the impact is not considered to be significant.

Dusky Hopping-mouse Notomys fuscus

Dusky Hopping-mouse is a boom and bust species and consequently it is uncommon and difficult to locate in most years but abundant in years when populations are booming. It primarily lives in sandy habitats such as dunes; however, in good conditions when populations are booming it can be found temporarily in a range of other habitats (Van Dyck and Strahan 2008).

The impact assessment for Southern Whiteface considers the following:

- Dunes with RE 5.6.5 and RE 5.6.8 provide potential habitat for Dusky Hopping-mouse within PL 1125.
 The area of RE 5.6.5 and RE 5.6.8 which is within the disturbance footprint is 8.7 ha (combined) which is 0.40% of the area mapped within PL 1125 (2151 ha).
- The habitat model map for this species shows potential habitat in the project area at a large scale (Appendix 11) but PL 1125 is not identified as important habitat for this species in the MSES report.
- There are no records of this species from PL 1125 but there are 14 records from within 50 km of the PL 1125. It was not recorded during the field survey and no tracks of this species were observed in sand dunes however this species is nocturnal and difficult to detect, and it is possible that this species is present within PL 1125 at times.

Assessment of SRI Criteria for Dusky Hopping-mouse:

- The presence of a local population in the project area has not been confirmed although it is known to occur regionally. Given that this species is a boom and bust species and is highly nomadic it is possible that it will occur in the project area at times.

 Clearance of 8.7 hectares of 5.6.5 / 5.6.8 combined could possibly have a temporary impact on the size of a local population should it exist however the impact is likely to be temporary and minor considering the boom and bust nature of the species and the limited extent of the impact.
- It is possible that the project could reduce the area
 of extent at a local scale if the species is present. The
 small scale of the impact is localised and is
 considered unlikely to have an impact on the extent
 of occurrence of this species in PL 1125 considering
 the extensive amount of habitat that remains
 available to this species.
- The project is not considered to lead to fragmentation or genetic isolation of an existing population. The disturbance footprint in the sand dunes is mostly from a 25 meter wide pipeline corridor. The pipeline is buried and does not present a barrier to movement as this species is known to move up to 400 m per night in search of food and is able to cross unsuitable habitats (ALA 2024). The habitat being naturally linear and fragmented. Suitable habitat adjacent to the

	disturbance area is retained and the connectivity of		
	habitat retained is consistent with the area as a		
	whole.		
	 The project is unlikely to introduce any diseases or invasive species to the area that may cause a population to decline. 		
	 The project would not interfere with the recovery of any of the species. 		
	 The area is not considered to be an ecologically significant area for the species even though it contains some suitable habitat. 		
	A residual loss of habitat from the project for Dusky Whiteface could result in a localised impact to the species however the impact is not considered to be significant.		
Habitat for an animal that is special least	No habitat for a special wildlife of least concern is	8.6 ha of RE	A residual loss of 8.6
concern wildlife.	identified within desktop reports as occurring in PL 1125,	5.3.22	ha of habitat for these
No wildlife have been identified as	see Appendix 12 Figure 2- PL 1125 - MSES - Species		species is identified.
species least concern however EPBC	Threatened (Endangered or Vulnerable) wildlife and		
listed migratory species which are not	species least concern animals (from MSES Report for PL		This is not assessed
threatened are included here.	1125 - Table 2, Map 3a (Appendix 1)). No such species		to be a significant
 Common Sandpiper Actitis 	were identified within the field survey.		impact.
hypoleucos, EPBC Migratory;			
Pectoral Sandpiper Calidris			
···			
EPBC Migratory;			
 hypoleucos, EPBC Migratory; Pectoral Sandpiper Calidris melanotos, EPBC Migratory; Marsh Sandpiper Tringa stagnatilis, EPBC Migratory; 	The desktop review identified records for Common Sandpiper, Pectoral Sandpiper, Marsh Sandpiper and Red-necked Stint within 50 km and suitable habitat has been identified within PL 1125 as RE 5.3.22. This disturbance area results in a loss of 8.6 ha which is equivalent to 0.91% of RE 5.3.22 within PL 1125.		

Red-necked Stint Calidris ruficollis, EPBC Migratory. This impact is assessed in accordance with Section 5 of the SRI guideline.	An assessment of the impact against criteria contained within the SRI guideline to determine a significant impact on endangered wildlife found that the impact was not significant. This finding is appropriate for these species also.		
Protected areas			
National park	PL 1125 is not located in a National Park, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1))	0 ha	No residual impact
Regional park	PL 1125 is not located in a Regional Park, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1))	0 ha	No residual impact
Nature refuge	PL 1125 is not located in a Nature Refuge, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1)).	0 ha	No residual impact
Highly protected zones of State marir	e parks		
Conservation park zone	PL 1125 is not located in a Conservation park zone, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1)).	0 ha	No residual impact
Marine national park zone	PL 1125 is not located in a Marine national park zone, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1)).	0 ha	No residual impact
Preservation zone	PL 1125 is not located in a Preservation zone, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1)).	0 ha	No residual impact

Other zones	PL 1125 is not located in any other protected zone, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1)).	0 ha	No residual impact
Fish habitat areas			
A declared fish habitat area	PL 1125 is not located in a declared fish habitat area, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1)).	0 ha	No residual impact
Waterway providing for fish passage			
Fish passage (not in an urban area)	PL 1125 does not contain any waterways providing for fish passage, see Appendix 12 Figure 7 PL 1125 - MSES - State Conservation Areas (from MSES Report for PL 1125 - Table 2, Map 1 (Appendix 1)).	0 ha	No residual impact
Marine plants			
Marine plant (not in an urban area)	PL 11255 is not coastal or marine and therefore does not contain any marine plants.	0 ha	No residual impact
Legally secured offset area			
secured offset area	PL 1125 does not contain any secured offset areas see Appendix 12 Figure 8 - PL 1125 - MSES - Offset Areas (from MSES Report for PL 1125 - Table 2, Map 5 (Appendix 1))	0 ha	No residual impact

5.4. Residual Impacts

The Significant Residual Impact Assessment identified the following residual impacts:

- The disturbance footprint results in a residual impact to 8.6 ha of RE 5.3.22 which lies within mapped wetlands but is not endangered or of concern. This is identified as a significant residual impact to RE 5.3.22 under Section 2.1 of the Significant Residual Impact Guideline due to Criteria 1 and Criteria 2 of being exceeded.
- A residual loss of 8.6 ha of habitat for EPBC Endangered species Curlew Sandpiper, Common Greenshank and Australian Painted Snipe is identified. An assessment of the residual impact against the significant impact criteria for endangered wildlife (Section 5.1 of the SRI guideline) found that the loss of habitat was not a significant impact.
- A residual loss of habitat (8.6 ha of RE 5.3.22, 13.0 ha of RE 5.9.3/RE 5.9.4, and 8.7 ha of RE 5.6.5/RE 5.6.8) for three EPBC Vulnerable species; Sharp-tailed Sandpiper, Blue-winged Parrot, and Dusky Hopping-mouse. An assessment of the residual impact against the significant impact criteria for vulnerable wildlife (Section 5.1 of the SRI guideline) found that the loss of habitat was not a significant impact.
- A residual loss of 11.0 ha of habitat (RE 5.6.4) for Southern Whiteface EPBC: Vulnerable species that could result in a local impact to the species. An assessment of the residual impact against the significant impact criteria for endangered wildlife (Section 5.1 of the SRI guideline) found that the impact was not significant as the impact is unlikely to:
 - o lead to a long-term decrease in the size of a local population,
 - o reduce the extent of occurrence of the species; or
 - o fragment an existing population.
- A residual loss of 8.6 ha of habitat (RE 5.3.22) for four EPBC Migratory species; Common Sandpiper, Pectoral Sandpiper, Marsh Sandpiper and Red-necked Stint. An assessment of the residual impact against the significant impact criteria for vulnerable wildlife (Section 5.1 of the SRI guideline) found that the loss of habitat was not a significant impact.

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Appendix 1: Matters of State Environmental Significance Report for PL1125



Department of Environment, Science and Innovation

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest

PL: 1125

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 coordinate system.

Figures in tables may be affected by rounding.

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

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

Please direct queries about these reports to: Planning.Support@des.qld.gov.au

Disclaimer

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



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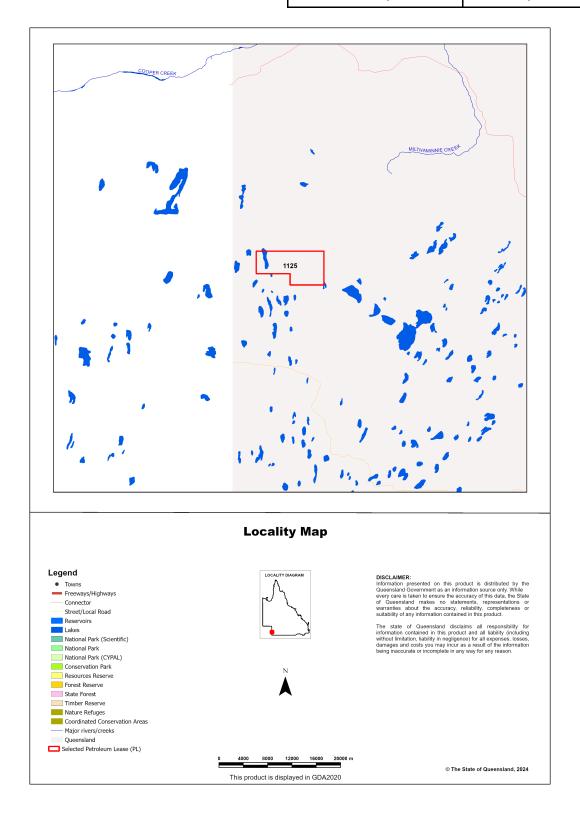
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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI: PL: 1125, with area 4542.41 ha

Local Government(s)	Catchment(s)	Bioregion(s)	Subregion(s)
Bulloo Shire	Cooper Creek	Channel Country	Strzelecki Desert
		Channel Country	Sturt Stony Desert



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the Nature Conservation Act 1992;
- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the Marine Parks Act 2004:
- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;
- Threatened wildlife under the Nature Conservation Act 1992 and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;
- Regulated vegetation under the Vegetation Management Act 1999 that is:
 - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
 - Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
 - Category R areas on the regulated vegetation management map;
 - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;
 - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;
- Strategic Environmental Areas under the Regional Planning Interests Act 2014;
- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;
- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;
- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0 ha	0.0%
1b Protected Areas- nature refuges	0 ha	0.0%
1c Protected Areas- special wildlife reserves	0 ha	0.0%
2 State Marine Parks- highly protected zones	0 ha	0.0%
3 Fish habitat areas (A and B areas)	0 ha	0.0%
4 Strategic Environmental Areas (SEA)	0 ha	0.0%
5 High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values	0 ha	0.0%
6a High Ecological Value (HEV) wetlands	0 ha	0.0%
6b High Ecological Value (HEV) waterways	0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	0 ha	0.0%
7b Special least concern animals	0 ha	0.0%
7c i Koala habitat area - core (SEQ)	0 ha	0.0%
7c ii Koala habitat area - locally refined (SEQ)	0 ha	0.0%
7d Sea turtle nesting areas	0 km	Not applicable
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	0 ha	0.0%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	0 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	0 ha	0.0%
8d Regulated Vegetation - Essential habitat	0 ha	0.0%
8e Regulated Vegetation - intersecting a watercourse	10.2 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	1041.48 ha	22.9%
9a Legally secured offset areas- offset register areas	0 ha	0.0%
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0 ha	0.0%

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(No results)

1b. Protected Areas - nature refuges

(No results)

Matters of State Environmental Significance	17/06/2024 18:57:00
1c. Protected Areas - special wildlife reserves (No results)	
2. State Marine Parks - highly protected zones (No results)	
3. Fish habitat areas (A and B areas) (No results)	
Refer to Map 1 - MSES - State Conservation Areas for an overview of the relevant MSES.	
MSES - Wetlands and Waterways	
4. Strategic Environmental Areas (SEA) (No results)	
5. High Ecological Significance wetlands on the Map of Queensland Wetland Environment	al Values
(no results)	
6a. Wetlands in High Ecological Value (HEV) waters	
(no results)	
6b. Waterways in High Ecological Value (HEV) waters	
(no results)	
Refer to Map 2 - MSES - Wetlands and Waterways for an overview of the relevant MSES.	
MSES - Species	
7a. Threatened (endangered or vulnerable) wildlife	
Not applicable	
7b. Special least concern animals	
Not applicable	
7c i. Koala habitat area - core (SEQ)	
Not applicable	

Page 7

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

7d. Wildlife habitat (sea turtle nesting areas)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii	Keys boronia	V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	Е	None
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Euastacus bindal	Mount Elliot crayfish	CR	None
Euastacus binzayedi		CR	None
Euastacus eungella		Е	None
Euastacus hystricosus		Е	None
Euastacus jagara	Jagara hairy crayfish	CR	None
Euastacus maidae		CR	None
Euastacus monteithorum		Е	None
Euastacus robertsi		Е	None
Taudactylus pleione	Kroombit tinkerfrog	E	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Macadamia integrifolia		V	None
Melaleuca irbyana	swamp tea-tree	E	None
Macadamia ternifolia		V	None
Macadamia tetraphylla	bopple nut	V	None
Petrogale penicillata	brush-tailed rock-wallaby	V	None
Petrogale coenensis	Cape York rock-wallaby	V	None
Petrogale purpureicollis	purple-necked rock-wallaby	V	None
Petrogale sharmani	Sharmans rock-wallaby	V	None
Petrogale xanthopus celeris	yellow-footed rock-wallaby (Qld subspecies)	V	None
Petaurus gracilis	Mahogany Glider	Е	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	Е	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Xeromys myoides	Water Mouse	V	None

^{*}For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.

Threatened (endangered or vulnerable) wildlife species records (No results)

Special least concern animal species records

(No results)

Shorebird habitat (critically endangered/endangered/vulnerable)

Not applicable

Shorebird habitat (special least concern)

Not applicable

*Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals and Map 3b - MSES - Species - Koala habitat area (SEQ) and Map 3c - MSES - Wildlife habitat (sea turtle nesting areas) for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:

https://environment.ehp.gld.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
В	7141
В	7142

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

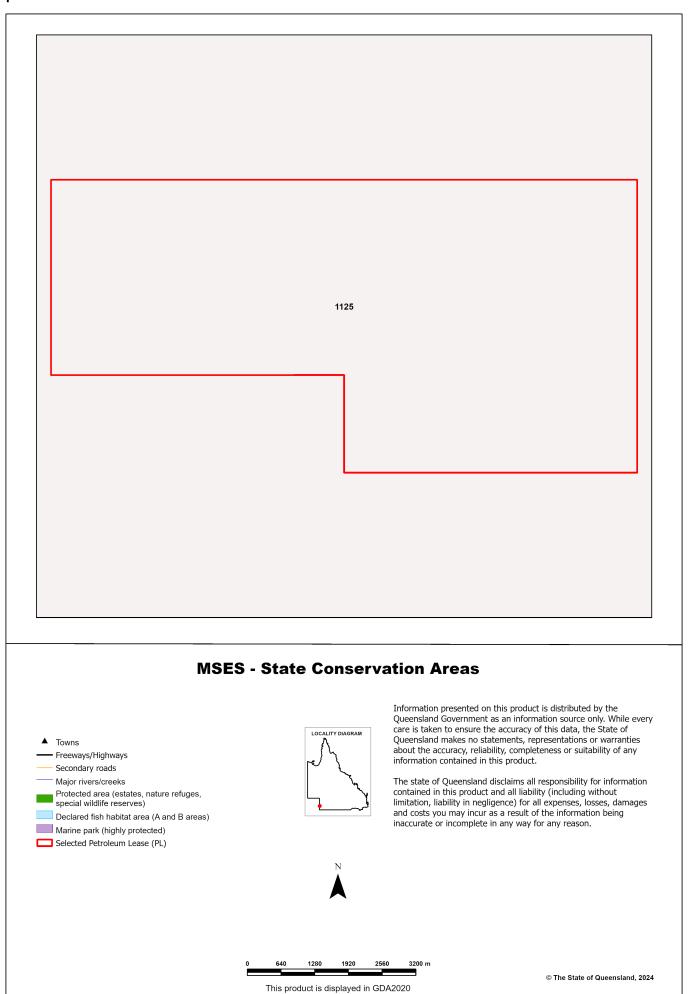
MSES - Offsets

9a. Legally secured offset areas - offset register areas (No results)

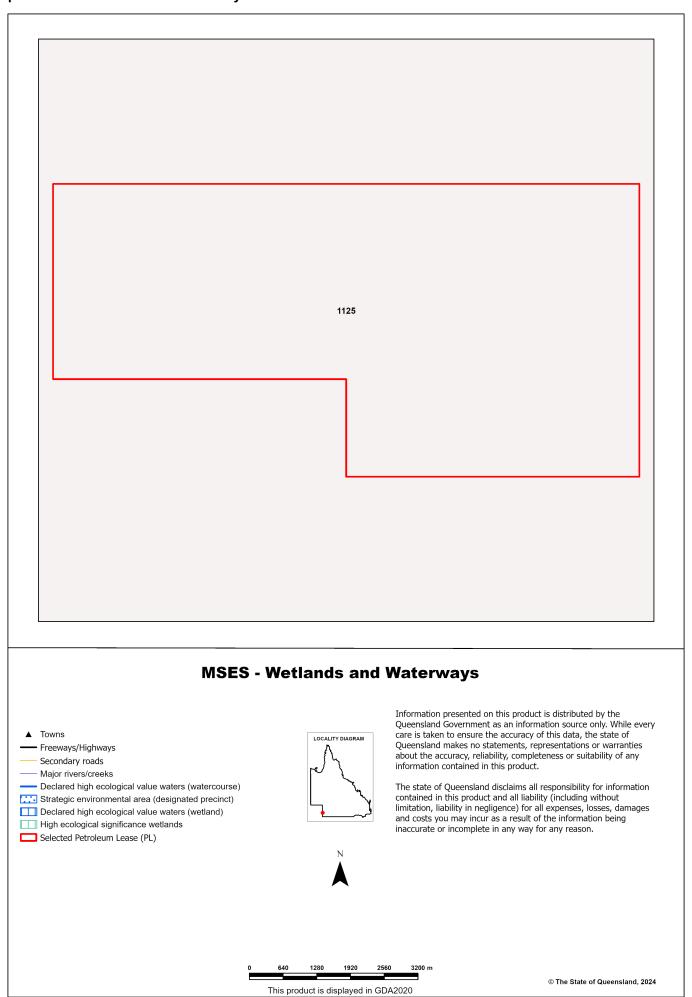
9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation (No results)

Refer to Map 5 - MSES - Offset Areas for an overview of the relevant MSES.

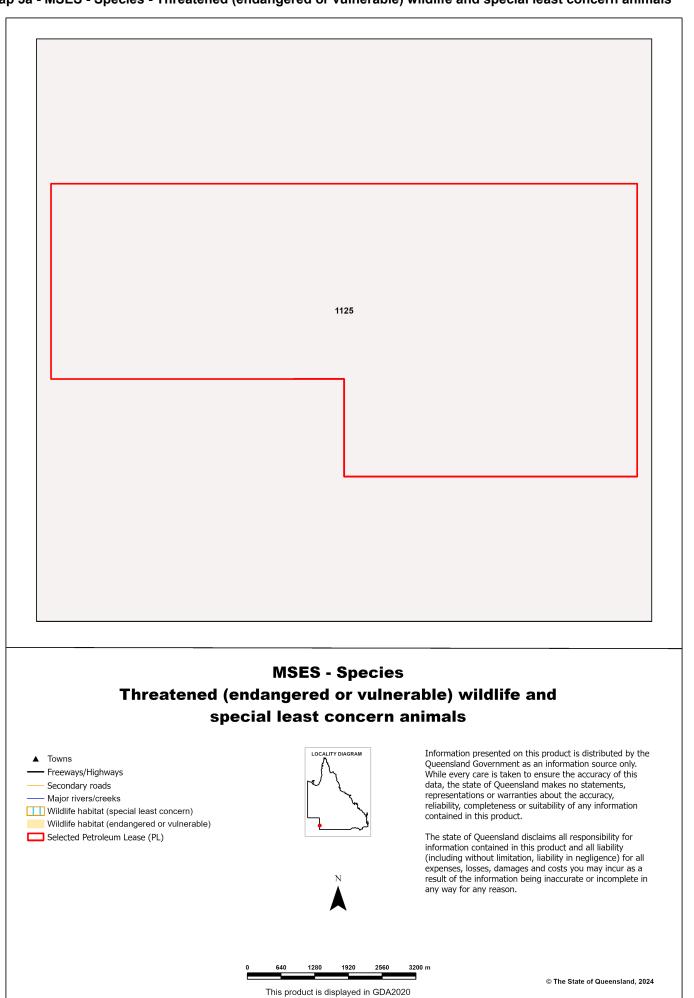
Map 1 - MSES - State Conservation Areas



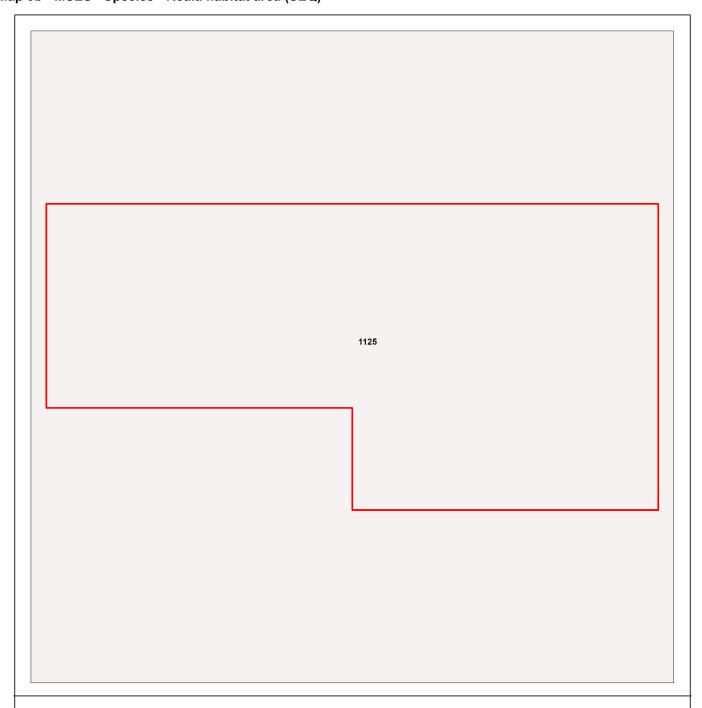
Map 2 - MSES - Wetlands and Waterways



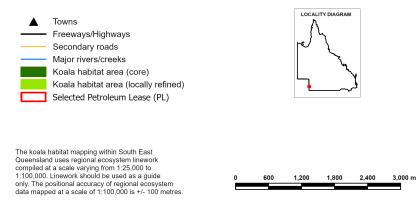
Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



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



MSES - Species Koala habitat area (SEQ)

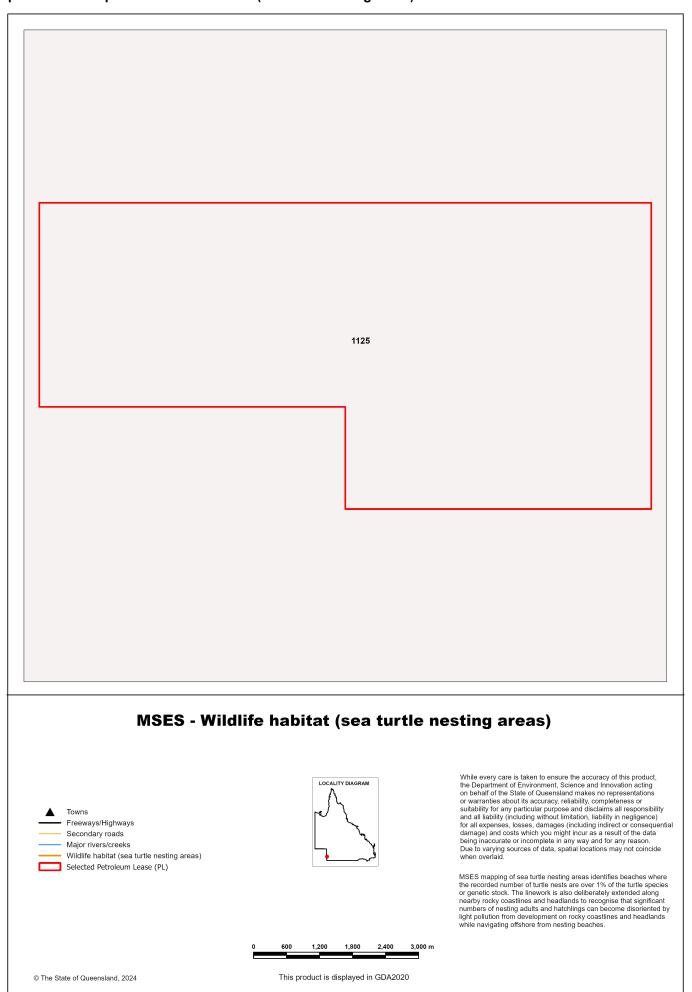


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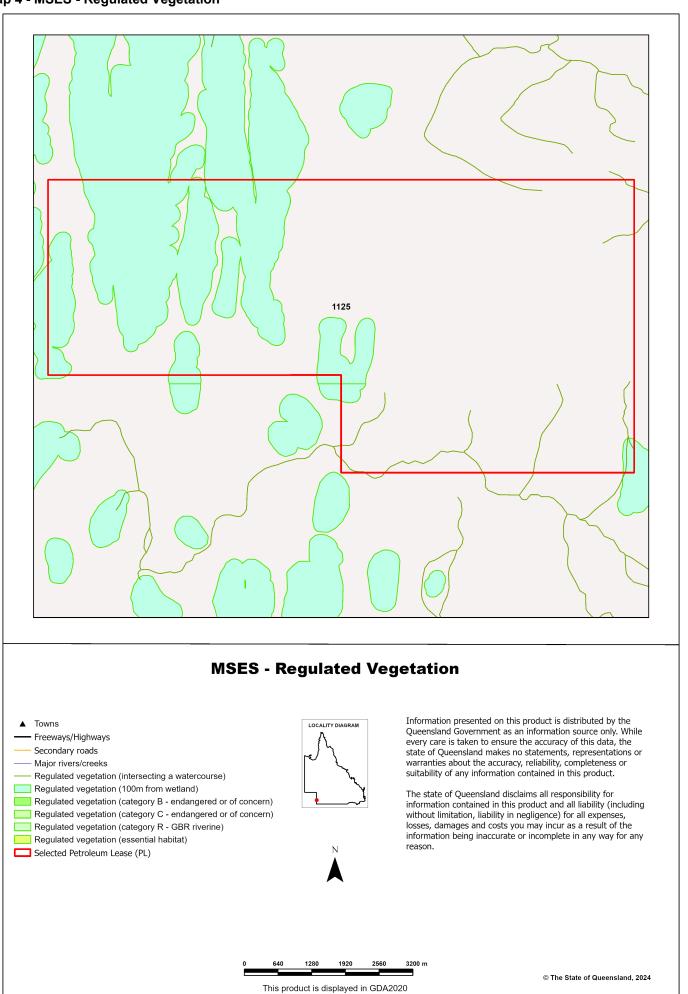
The represented layers for SEQ 'koala habitat area-core' and 'koala habitat area- locally refined' in MSES are sourced directly from the regulatory mapping under the Nature Conservation (Koala) Conservation Plan 2017. Whilst every effort is made to ensure the information remains current, there may be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

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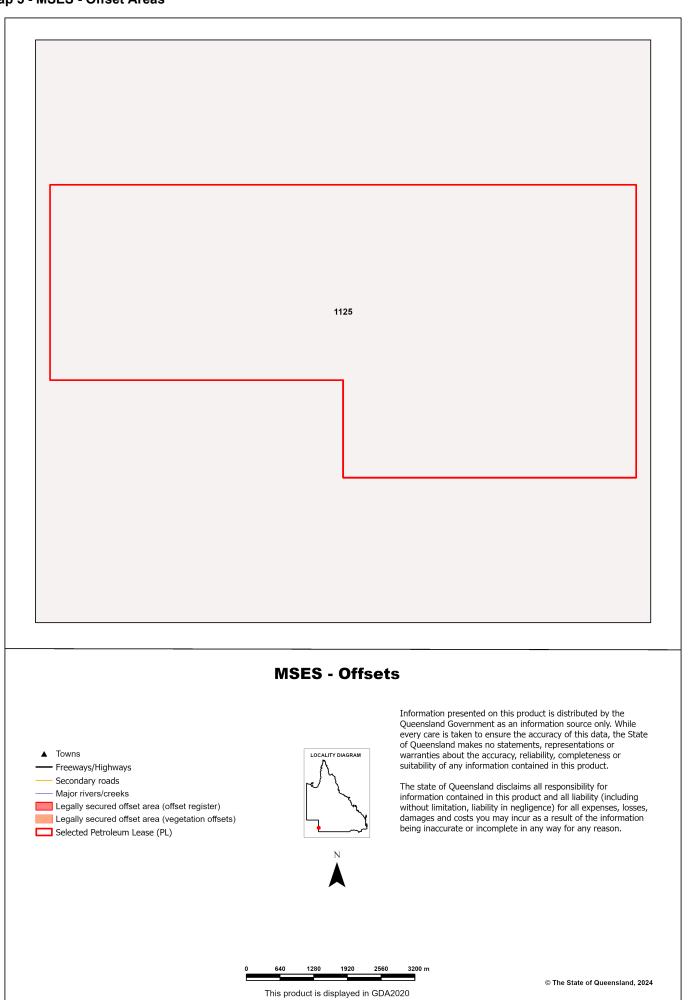
Map 3c - MSES - Species - Wildlife habitat (sea turtle nesting areas)



Map 4 - MSES - Regulated Vegetation



Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). Its primary purpose is to support implementation of the SPP biodiversity policy.

MSES mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations.

MSES mapping does not determine whether state or local development assessment is required. For state assessment triggers refer to the Development Assessment Mapping System (DAMS). For local assessment triggers, refer to the relevant local planning scheme.

The Queensland Government's "Method for mapping - matters of state environmental significance can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

Appendix 2 - Source Data

The datasets listed below are available on request from:

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

· Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	current QSpatial data (http://qspatial.information.qld.gov.au)
Protected Areas-Estates, Nature Refuges, Special Wildlife Reserves	- Protected areas of Queensland - Nature Refuges - Queensland - Special Wildlife Reserves- Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Queensland Wetland Environmental Values
Wetlands in HEV waters	HEV waters: - EPP Water intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 5) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000)
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various) - SEQ koala habitat areas under the Koala Conservation Plan 2019
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map
VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DES
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI - Area of Interest

DESI - Department of Environment, Science and Innovation

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

Appendix 2: Biodiversity and Conservation Values: Biodiversity Planning Assessments and Aquatic Conservation Assessments Report for PL1125.



Department of Environment, Science and Innovation

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest

PL: 1125

Environmental Reports - General Information

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

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

Figures in tables may be affected by rounding.

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

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

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

Disclaimer

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



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Summary Information

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

Table 1: Details for area of interest: PL: 1125, with area 4542.41 ha

Local Government(s)
Bulloo Shire
Bioregion(s)
Channel Country
Channel Country
Subregion(s)
Strzelecki Desert
Sturt Stony Desert
Catchment(s)
Cooper Creek

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

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Biodiversity Planning Assessment(s)	Aquatic Conservation Assessment(s) (riverine)	Aquatic Conservation Assessment(s) (non-riverine)
Channel Country v1.1	Lake Eyre and Bulloo Basins v1.1	Lake Eyre and Bulloo Basins v.1.1

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

Biodiversity Status	Area (Ha)	% of AOI
Endangered	0.00	0.00
Of concern	0.00	0.00
No concern at present	4,542.41	100.00

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

Table 4: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
Local or Other Values	132.33	2.91
Regional	3,344.93	73.64
State	1,065.16	23.45

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
Number of Lacustrine wetlands	8

Total number of non-riverine wetlands 8

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

Table 6: Named waterways intersecting the AOI

(No Records)

Refer to Map 1 for general locality information.

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

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

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Low	3,399.59	74.84
Very High	1,142.83	25.16

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

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Medium	652.71	14.37

Biodiversity Planning Assessments

Introduction

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

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

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

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

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

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

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

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

Table 9: Summary table, biodiversity significance

Biodiversity Status	Area (Ha)	% of AOI
State	1,065.16	23.45
Regional	3,344.93	73.64
Local or Other Values	132.33	2.91

Refer to Map 2 for further information.

Diagnostic Criteria

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

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

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

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

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

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

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

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

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

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

Biodiversity significance	Description	Area (Ha)	% of AOI
Local or Other Values	Refer to diagnostic data for additional information	2,885.83	63.53
Regional	Remnant contains an RE that is one of the largest of its type in the subregion (D2)	761.17	16.76
State	Remnant contains an RE that is one of the largest of its type in the bioregion (D1) & Remnant has Ecosystem diversity in the top quartile (F)	895.41	19.71

Assessment of diagnostic criteria with respect to the AOI

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

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

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	0.00	0.00	0.00	0.00	895.41	19.71	3,647.00	80.29
B1: Ecosystem Value (Bioregion)	0.00	0.00	0.00	0.00	1,792.69	39.47	2,749.73	60.53
B2: Ecosystem Value (Subregion)	0.00	0.00	0.00	0.00	1,031.52	22.71	3,510.89	77.29
C: Tract Size	0.00	0.00	4,542.41	100.00	0.00	0.00	0.00	0.00
D1: Relative RE Size (Bioregion)	895.41	19.71	0.00	0.00	0.00	0.00	3,647.00	80.29

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
D2: Relative RE Size (Subregion)	1,656.58	36.47	0.00	0.00	0.00	0.00	2,885.83	63.53
F: Ecosystem Diversity	899.97	19.81	3,642.44	80.19	0.00	0.00	0.00	0.00
G: Context and Connection	4,542.41	100.00	0.00	0.00	0.00	0.00	0.00	0.00

Other Essential Criteria

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

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

Biodiversity significance	Description	Area (Ha)	% of AOI
	No information	1,053.56	23.19
Regional	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	3,319.11	73.07
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	169.74	3.74

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

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

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

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

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

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

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
la: Centres of Endemism	169.74	3.74	0.00	0.00	0.00	0.00	0.00	0.00
lb: Wildlife Refugia	169.74	3.74	0.00	0.00	0.00	0.00	0.00	0.00
lc: Disjunct Populations	0.00	0.00	169.74	3.74	0.00	0.00	0.00	0.00
ld: Limits of Geographic Ranges	3,484.29	76.71	4.56	0.10	0.00	0.00	0.00	0.00
le: High Species Richness	169.74	3.74	3,319.11	73.07	0.00	0.00	0.00	0.00
If: Relictual Populations	0.00	0.00	169.74	3.74	0.00	0.00	0.00	0.00
Ig: Variation in Species Composition	3,488.85	76.81	0.00	0.00	0.00	0.00	0.00	0.00
Ih: Artificial Wetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
li: Hollow Bearing Trees	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
lj: Breeding or Roosting Site	169.74	3.74	0.00	0.00	0.00	0.00	0.00	0.00
lk: Climate Refugia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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

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

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

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:
 - Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;
 - Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;

- Maintaining large scale seasonal/migratory species processes and movement of fauna;
- Maximising connectivity between large tracts/patches of remnant vegetation;
- · Identifying key areas for rehabilitation and offsets; and
- Riparian Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

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

- Terrestrial
 - Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);
 - Follow major watershed/catchment and/or coastal boundaries;
 - Incorporate major altitudinal/geological/climatic gradients;
 - Include and maximise connectivity between large tracts/patches of remnant vegetation:
 - Include and maximise connectivity between remnant vegetation in good condition; and
- Riparian
 - Located on the major river or creek systems within the bioregion in question.

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

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

Biodiversity Significance	Area (Ha)	% of AOI
	4,542.41	100.00

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

Refer to Map 3 for further information.

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

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

Special Area Decisions

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

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

Decision Number	Description	Panel Recommended Significance	Criteria Values
chc_I_06	Southern Simpson Desert	Regional	Id (geographic range limit): VERY HIGH Ie (high species diversity): HIGH Ig (RE's show distinct variation in species composition): VERY HIGH

Decision Number	Description	Panel Recommended Significance	Criteria Values
chc_I_16	Ephemeral wetlands	State	la (centre of endemism): VERY HIGH lb (wildlife refugia): VERY HIGH lc (disjunct populations): HIGH ld (geographic range limit): HIGH le (high species diversity): VERY HIGH lf (relictual populations): HIGH lg (RE's show distinct variation in species composition): VERY HIGH lj (breeding or roosting sites): VERY HIGH

Expert panel decision descriptions:

Decision Number	Description
chc_I_06	Habitat for EVR taxa including: woma and the dusky hopping-mouse. Supports high species richness, especially reptiles and birds with moderate richness of arid zone endemics and threatened taxa. Likely habitat for kowaris. Known periodic habitat for night parrots. *There is a different mix of geologies and a different rainfall pattern- negligible rainfall. The area is regarded as being more Strezleckie (IBRA) rather than Simpson. Unique river systems typified by a lack of connectivity. *Likely to contain more values but as yet the area is poorly surveyed and hence remains largely unknown.
chc_I_16	Habitat for a wider range of invertebrates and algae than permanent and semi-permanent waterholes, including species such as fairy shrimp and shield shrimp which do not occur in more permanent waterholes where fish predation is higher. Support waterbird populations estimated systematically to be in the millions of individuals and breeding colonies or dispersed waterbird breeding numbering tens of thousands of pairs (for multiple species) (Reid and Jaensch in Costelloe et al 2004); among the most important recruitment areas for waterbirds in Australia (Jaensch 2009); include the most important sites in Australia for a suite of waterbird species in terms of numbers (supporting >1% of total population size). Many of the wetlands, at several scales, can be demonstrated to meet criteria for international importance. Includes areas outside of floodplains that may fill from local runoff. Includes salt pan systems which have their own unique suit of species. These wetlands go dry every year or nearly every year. They will go dry by end of the year in average seasons but last during good seasons or after very large floods and when clusters of good flood seasons occur.

Aquatic Conservation Assessments

Introduction

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

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

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

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

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

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

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

https://gldspatial.information.gld.gov.au/catalogue/custom/index.page

Explanation of Criteria

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

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

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

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

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

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

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

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

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

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

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

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

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

Riverine Wetlands

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

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

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

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Low	3,399.59	74.84
Very High	1,142.83	25.16

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

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

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
Naturalness aquatic	3,399.59	74.84	0.00	0.00	1,142.83	25.16	0.00	0.00
2. Naturalness catchment	3,399.59	74.84	0.00	0.00	0.00	0.00	1,142.83	25.16
3. Diversity and richness	0.00	0.00	1,142.83	25.16	0.00	0.00	3,399.59	74.84
4. Threatened species and ecosystems	0.00	0.00	1,142.83	25.16	3,399.59	74.84	0.00	0.00
5. Priority species and ecosystems	1,142.83	25.16	0.00	0.00	0.00	0.00	0.00	0.00
6. Special features	1,142.83	25.16	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	1,142.83	25.16	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativen ess	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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

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

Decision number	Special feature	Catchment	Criteria/Indica tor/Measure	Conservation rating (1-4)
cp_r_fa_07	Permanent waterholes — long term	Cooper	6.3.1	4

4 is the highest rating/value

Expert panel decision descriptions:

Decision Number	Description
cp_r_fa_07	Ecological processes in the LEBB work over vast timeframes of centuries or 1000's of years. The permanent waterholes (100% permanent >100 years) that never go dry over these longer timeframes are critically important to aquatic species persistence in these arid landscapes. They have a major influence on the genetic diversity and gene flow between river catchments. These waterholes act as refugia (Hamilton et al. 2005), e.g. metapopulation and genetics of the Cooper Creek turtle requires long time frames of persistence to sustain populations and species. However, the panel cautioned that care is required for broad application of this decision as some wetlands have been modified through water extraction (Bunn et al. 2006).

Non-riverine Wetlands

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

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

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Medium	652.71	14.37

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

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

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
Naturalness aquatic	290.56	6.40	0.00	0.00	362.16	7.97	0.00	0.00
2. Naturalness catchment	290.56	6.40	362.16	7.97	0.00	0.00	0.00	0.00
3. Diversity and richness	0.00	0.00	362.16	7.97	0.00	0.00	290.56	6.40
4. Threatened species and ecosystems	0.00	0.00	0.00	0.00	652.71	14.37	0.00	0.00
5. Priority species and ecosystems	0.00	0.00	652.71	14.37	0.00	0.00	0.00	0.00
6. Special features	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Connectivity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Representativene ss	302.11	6.65	0.00	0.00	195.95	4.31	154.65	3.40

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

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

Decision number	Special feature	Catchment	Criteria/Indicator/ Measure	Conservation rating (1-4)
cp_nr_ec_02	Temporary claypan wetlands	Cooper	5.2.1	3

4 is the highest rating/value

Expert panel decision descriptions:

Decision Number	Description
cp_nr_ec_02	A number of temporary claypan wetlands not fed by rivers have different biota adapted to different desiccation cycles e.g. fairy shrimp. For the majority of their time they are dry and are susceptible to cattle damage and woody debris removal. The REs associated with this decision are: 4.3.12b, d; 5.3.13b; 5.3.15a, b; 5.3.16a; 5.3.22a; 5.3.8b; 6.3.11; 6.3.11b.

Threatened and Priority Species

Introduction

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

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

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

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

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

Threatened Species

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

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

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

(No Records)

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

*JAMBA - Japan-Australia Migratory Bird Agreement; CAMBA - China-Australia Migratory Bird Agreement; ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement; CMS - Convention on the Conservation of Migratory Species.

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

BPA Priority Species

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

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

(No Records)

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

ACA Priority Species

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

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

(No Records)

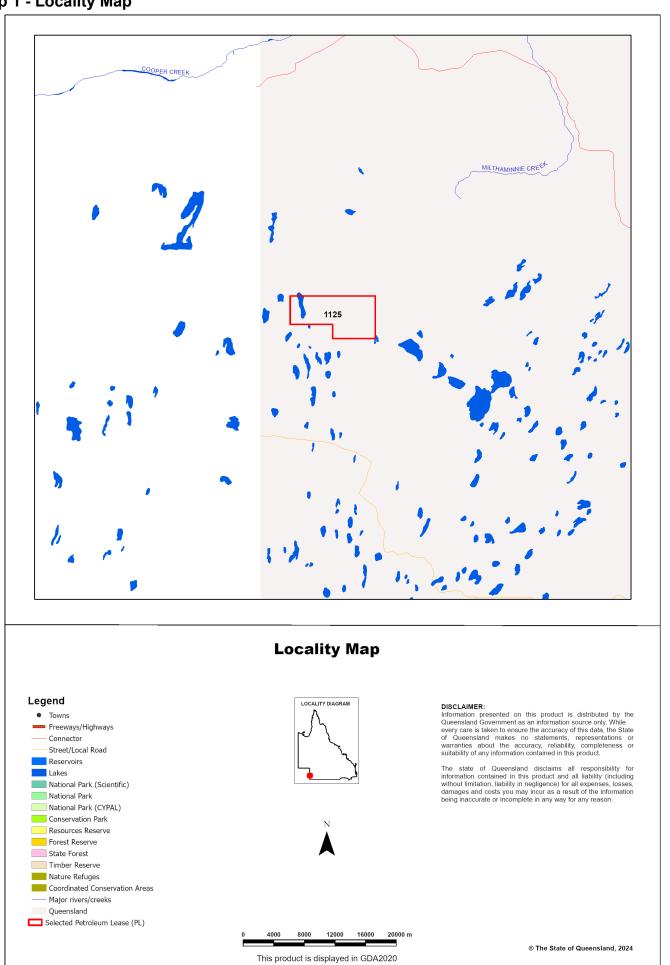
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

(No Records)

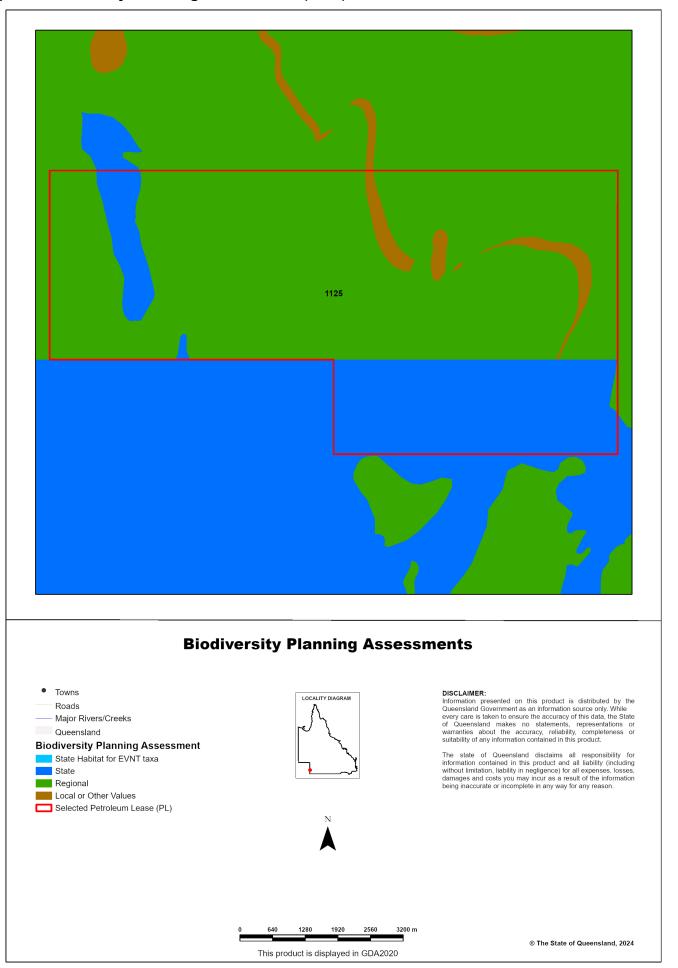
NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details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

Maps

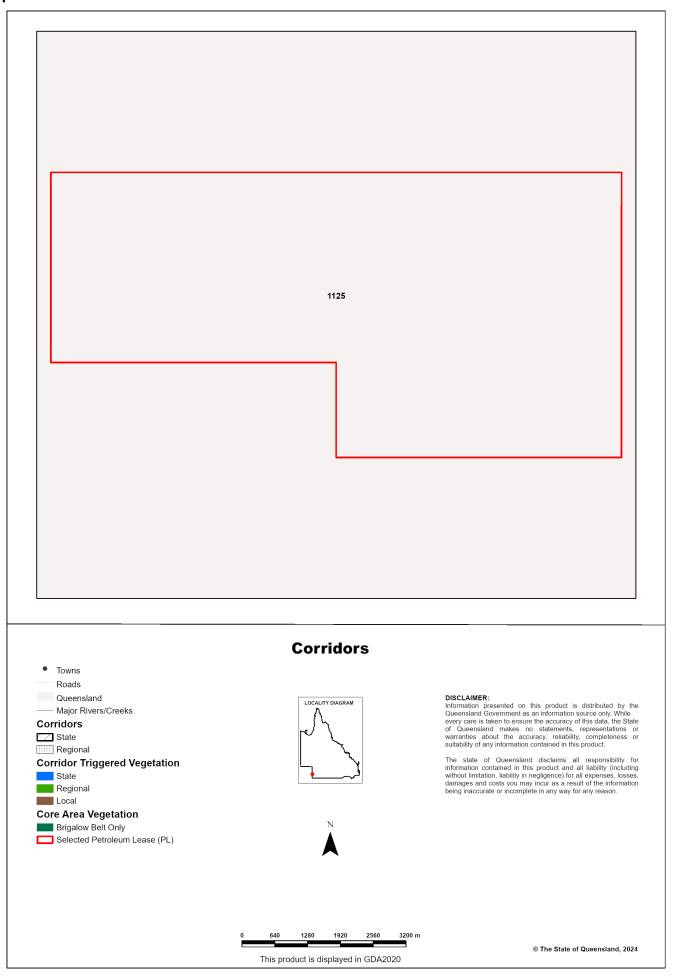
Map 1 - Locality Map



Map 2 - Biodiversity Planning Assessment (BPA)

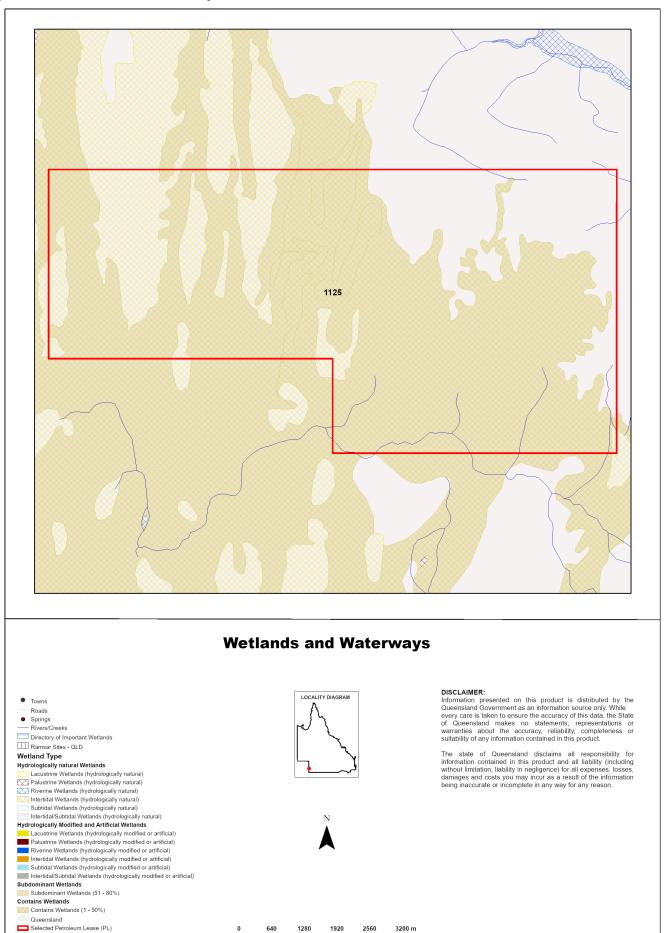


Map 3 - Corridors



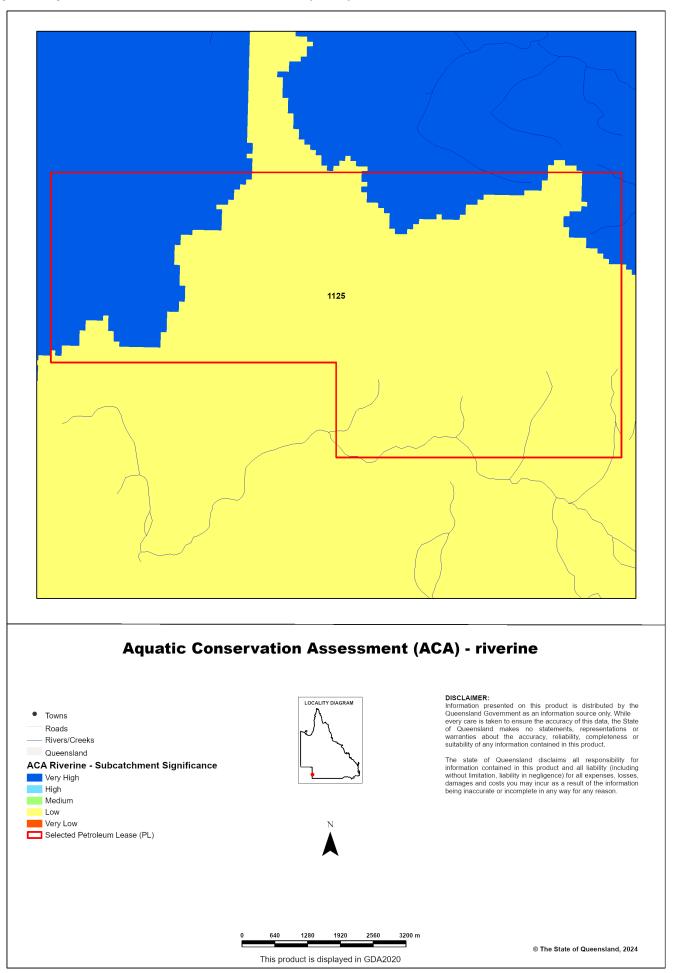
© The State of Queensland, 2024

Map 4 - Wetlands and waterways

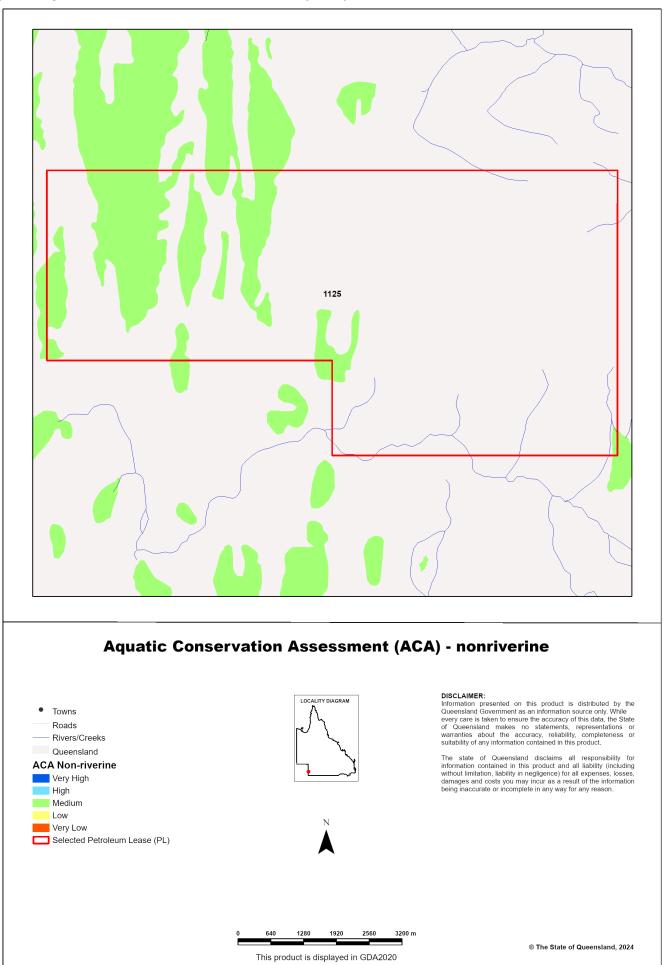


This product is displayed in GDA2020

Map 5 - Aquatic Conservation Assessment (ACA) - riverine



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



References

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

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

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

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

Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDBB Non-riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1 Southern Gulf Catchments Non-riverine ACA v1.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDBB Riverine ACA v2.1 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1 Southern Gulf Catchments Riverine ACA v1.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v2.3 Northwest Highlands v1.1 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.6
Threatened Species	An internal DESI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DESI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DESI database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

These datasets are available at:

 $\underline{http:/\!/dds.information.qld.gov.au/DDS}$

Appendix 2 - Acronyms and Abbreviations

AOI - Area of Interest

ACA - Aquatic Conservation Assessment

AQUABAMM - Aquatic Biodiversity Assessment and Mapping Methodology

BAMM - Biodiversity Assessment and Mapping Methodology

BoT - Back on Track

BPA - Biodiversity Planning Assessment

CAMBA - China-Australia Migratory Bird Agreement

DESI - Department of Environment, Science and Innovation

EPBC - Environment Protection and Biodiversity Conservation Act 1999

EVNT - Endangered, Vulnerable, Near Threatened

GDA2020 - Geocentric Datum of Australia 2020

GIS - Geographic Information System

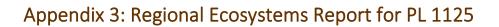
JAMBA - Japan-Australia Migratory Bird Agreement

NCA - Nature Conservation Act 1992

RE - Regional Ecosystem

REDD - Regional Ecosystem Description Database

ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement





Department of Environment, Science and Innovation

Environmental Reports

Regional Ecosystems Biodiversity Status

For the selected area of interest PL: 1125

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 input coordinates.

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

Figures in tables may be affected by rounding.

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

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

Important Note to User

Information presented in this report is based upon the Queensland Herbarium & Biodiversity Science's Regional Ecosystem framework. The Biodiversity Status has been used to depict the extent of "Endangered", "Of Concern" and "No Concern at Present" regional ecosystems in all cases, rather than the classes used for the purposes of the *Vegetation Management Act 1999* (VMA). Mapping and figures presented in this document reflect the Queensland Herbarium & Biodiversity Science's Remnant and Pre-clearing Regional Ecosystem Datasets, and not the certified mapping used for the purpose of the VMA.

For matters relevant to vegetation management under the VMA, please refer to the Department of Resources website https://www.resources.qld.gov.au/

Please direct queries about these reports to: Queensland.Herbarium@qld.gov.au

Disclaimer

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



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Summary Information

The following table provides an overview of the AOI with respect to selected topographic and environmental themes. Refer to **Map 1** for locality information.

Table 1: Details for area of interest:

PL: 1125, with area 4542.41 ha

Local Government(s)	Catchment(s)	Bioregion(s)	Subregion(s)
Bulloo Shire	Cooper Creek	Channel Country	Strzelecki Desert
		Channel Country	Sturt Stony Desert

The table below summarizes the extent of remnant vegetation classed as "Endangered", "Of concern and "No concern at present" regional ecosystems classified by Biodiversity Status within the area of interest (AOI).

Table 2: Summary table, biodiversity status of regional ecosystems within the AOI

Biodiversity Status	Area (Ha)	% of AOI
Endangered	0.00	0.00
Of concern	0.00	0.00
No concern at present	4,542.41	100.00
Total remnant vegetation	4,542.41	100.00

Refer to Map 2 for further information.

Regional Ecosystems

1. Introduction

Regional ecosystems are vegetation communities in a bioregion that are consistently associated with particular combinations of geology, landform and soil (Sattler and Williams 1999). Descriptions of Queensland's Regional ecosystems are available online from the Regional Ecosystem Description Database (REDD). Descriptions are compiled from a broad range of information sources including vegetation, land system and geology survey and mapping and detailed vegetation site data. The regional ecosystem classification and descriptions are reviewed as new information becomes available. A number of vegetation communities may form a single regional ecosystem and may be distinguished by differences in structure or sub-dominant species in the ecologically dominant layer. Vegetation communities with different dominant species in the ecologically dominant layer may be amalgamated in to a regional ecosystem if they are not mappable and predictable in the landscape at 1:100 000 scale. Vegetation communities may be mappable at a scale larger than 1:100 000. Vegetation communities within a regional ecosystem are denoted by a letter following the regional ecosystem code (e.g. a, b, c). Vegetation communities and regional ecosystems are amalgamated into a higher level classification of broad vegetation groups (BVGs).

A published methodology for survey and mapping of regional ecosystems across Queensland (Neldner et al 2023) provides further details on regional ecosystem concepts and terminology.

This report provides information on the type, status, and extent of vegetation communities, regional ecosystems and broad vegetation groups present within a user specified area of interest. Please note, for the purpose of this report, the Biodiversity Status is used. This report has not been developed for application of the *Vegetation Management Act 1999* (VMA). Additionally, information generated in this report has been derived from the Queensland Herbarium & Biodiversity Science's Regional Ecosystem Mapping, and not the regulated mapping certified for the purposes of the VMA. If your interest/matter relates to regional ecosystems and the VMA, users should refer to the Department of Resources website https://www.resources.qld.gov.au/.

With respect to the Queensland Biodiversity Status,

"Endangered" regional ecosystems are described as those where:

- remnant vegetation is less than 10 per cent of its pre-clearing extent across the bioregion; or 10-30% of its pre-clearing extent remains and the remnant vegetation is less than 10,000 hectares, or
- less than 10 per cent of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss*,
 or
- 10-30 percent of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss and the remnant vegetation is less than 10,000 hectares; or
- it is a rare** regional ecosystem subject to a threatening process.***

"Of concern" regional ecosystems are described as those where:

- the degradation criteria listed above for 'Endangered' regional ecosystems are not met and,
- remnant vegetation is 10-30 per cent of its pre-clearing extent across the bioregion; or more than 20 per cent of its pre-clearing extent remains and the remnant extent is less than 10,000 hectares, or
- 10-30 percent of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss.****

and "No concern at present" regional ecosystems are described as those where:

- remnant vegetation is over 30 percent of its pre-clearing extent across the bioregion, and the remnant area is greater than 10,000 hectares, and
- the degradation criteria listed above for 'Endangered' or 'Of concern' regional ecosystems are not met.

*Severe degradation and/or biodiversity loss is defined as: floristic and/or faunal diversity is greatly reduced but unlikely to recover within the next 50 years even with the removal of threatening processes; or soil surface is severely degraded, for example, by loss of A horizon, surface expression of salinity; surface compaction, loss of organic matter or sheet erosion.

**Rare regional ecosystem: pre-clearing extent (<1000 ha); or patch size (<100 ha and of limited total extent across its range).

***Threatening processes are those that are reducing or will reduce the biodiversity and ecological integrity of a regional ecosystem. For example, clearing, weed invasion, fragmentation, inappropriate fire regime or grazing pressure, or infrastructure development.

****Moderate degradation and/or biodiversity loss is defined as: floristic and/or faunal diversity is greatly reduced but unlikely to recover within the next 20 years even with the removal of threatening processes; or soil surface is moderately degraded.

2. Remnant Regional Ecosystems

The following table identifies the remnant regional ecosystems and vegetation communities mapped within the AOI and provides their short descriptions, Biodiversity Status, and remnant extent within the selected AOI. Please note, where heterogeneous vegetated patches (mixed patches of remnant vegetation mapped as containing multiple regional ecosystems) occur within the AOI, they have been split and listed as individual regional ecosystems (or vegetation communities where present) for the purposes of the table below. In such instances, associated area figures have been generated based upon the estimated proportion of each regional ecosystem (or vegetation community) predicted to be present within the larger mixed patch.

Table 3: Remnant regional ecosystems, description and status within the AOI

Regional Ecosystem	Short Description	BD Status	Area (Ha)	% of AOI
5.3.22a	Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes	No concern at present	665.33	14.65
5.3.22d	Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes	No concern at present	279.89	6.16
5.6.4	Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes	No concern at present	66.91	1.47
5.6.5	Variable sparse to open-herbland or Triodia basedowii hummock grassland on dune flanks, crests and sandy interdunes	No concern at present	2,011.35	44.28
5.6.8b	Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes	No concern at present	140.19	3.09
5.9.3	Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments	No concern at present	818.97	18.03
5.9.4x1	Aristida contorta sparse tussock grassland on fresh Cretaceous sediments with dense gravel cover	No concern at present	559.78	12.32

Refer to **Map 2** for further information. **Map 3** also provides a visual estimate of the distribution of regional ecosystems present before clearing.

Table 4 provides further information in regards to the remnant regional ecosystems present within the AOI. Specifically, the extent of remnant vegetation remaining within the bioregion, the 1:1,000,000 broad vegetation group (BVG) classification, whether the regional ecosystem is identified as a wetland, and extent of representation in Queensland's Protected Area Estate. For a description of the vegetation communities within the AOI and classified according to the 1:1,000,000 BVG, refer to **Table 6**.

Table 4: Remnant regional ecosystems within the AOI, additional information

5.3.22a Pre-clearing 594000 ha; Remnant 2021 34a Lacustrine Low	Regional Ecosystem	Remnant Extent	BVG (1 Million)	Wetland	Representation in protected estate
	5.3.22a		34a	Lacustrine	Low

Regional Ecosystem	Remnant Extent	BVG (1 Million)	Wetland	Representation in protected estate
5.3.22d	Pre-clearing 594000 ha; Remnant 2021 594000 ha	34b	Palustrine	Low
5.6.4	Pre-clearing 1087000 ha; Remnant 2021 1087000 ha	23a	Not a Wetland	Low
5.6.5	Pre-clearing 2464000 ha; Remnant 2021 2464000 ha	33a	Not a Wetland	High
5.6.8b	Pre-clearing 379000 ha; Remnant 2021 378000 ha	33a	Not a Wetland	High
5.9.3	Pre-clearing 3389000 ha; Remnant 2021 3383000 ha	30b	Not a Wetland	Low
5.9.4x1	Pre-clearing 940000 ha; Remnant 2021 939000 ha	31b	Not a Wetland	Low

Representation in Protected Area Estate: High greater than 10% of pre-clearing extent is represented; Medium 4 - 10% is represented; Low less than 4% is represented, No representation.

The distribution of mapped wetland systems within the area of interest is displayed in **Map 6**.

The following table lists known special values associated with a regional ecosystem type.

Table 5: Remnant regional ecosystems within the AOI, special values

Regional Ecosystem	Special Values
5.3.22a	5.3.22: Provides wetland habitat for flora and fauna. 5.3.22a: Provides wetland habitat for flora and fauna. 5.3.22b: Provides wetland habitat for flora and fauna. 5.3.22d: Provides wetland habitat for flora and fauna.
5.3.22d	5.3.22: Provides wetland habitat for flora and fauna.5.3.22a: Provides wetland habitat for flora and fauna.5.3.22b: Provides wetland habitat for flora and fauna.5.3.22d: Provides wetland habitat for flora and fauna.
5.6.4	5.6.4: High fauna diversity.
5.6.5	5.6.5: High reptile diversity. Potential habitat for threatened fauna species including mulgara Dasycerus cristicauda.5.6.5a: High reptile diversity. Potential habitat for threatened fauna species including mulgara Dasycerus cristicauda.
5.6.8b	 5.6.8: Habitat for the endemic eyrean grass wren Amytornis goyderi and threatened fauna species including the dusky hopping mouse Notomys fuscus, mulgara Dasycercus cristicauda and plant species including Acacia peuce. 5.6.8a: Habitat for the endemic eyrean grass wren Amytornis goyderi and threatened fauna species including the dusky hopping mouse Notomys fuscus, mulgara Dasycercus cristicauda and flora species. 5.6.8b: Habitat for the endemic eyrean grass wren Amytornis goyderi and threatened fauna species including the dusky hopping mouse Notomys fuscus, mulgara Dasycercus cristicauda and flora species.
5.9.3	None

Regional Ecosystem	Special Values
5.9.4x1	5.9.4: Habitat for threatened fauna species including kowari Dasyuroides byrnei. 5.9.4x2: Habitat for threatened fauna species including kowari Dasyuroides byrnei.

3. Remnant Regional Ecosystems by Broad Vegetation Group

BVGs are a higher-level grouping of vegetation communities. Queensland encompasses a wide variety of landscapes across temperate, wet and dry tropics and semi-arid climatic zones. BVGs provide an overview of vegetation communities across the state or a bioregion and allow comparison with other states. There are three levels of BVGs which reflect the approximate scale at which they are designed to be used: the 1:5,000,000 (national), 1:2,000,000 (state) and 1:1,000,000 (regional) scales.

A comprehensive description of BVGs is available at: https://publications.gld.gov.au/dataset/redd/resource/

The following table provides a description of the 1:1,000,000 BVGs present and their associated extent within the AOI.

Table 6: Broad vegetation groups (1 million) within the AOI

BVG (1 Million)	Description	Area (Ha)	% of AOI
23a	Woodlands to low woodlands dominated by Acacia aneura on red earth plains or sandplains (soft mulga).	66.91	1.47
30b	Tussock grasslands dominated by Astrebla spp. (mitchell grass) or Dichanthium spp. (bluegrass) often with Iseilema spp. on undulating downs or clay plains.	818.97	18.03
31b	Short grass / forb associations on stony downs.	559.78	12.32
33a	Hummock grasslands dominated by Triodia basedowii (hard spinifex) or Zygochloa paradoxa (sandhill canegrass) associations on dunefields or sandplains.	2,151.54	47.37
34a	Lacustrine wetlands. Lakes, ephemeral to permanent. Includes fringing woodlands and sedgelands.	665.33	14.65
34b	Palustrine wetlands. Generally intermittent swamps/claypans (non floodplains) in inland areas dominated by chenopods e.g. Chenopodium auricomum (Queensland blue bush) or Tecticornia spp. (samphire) or herbs.	279.89	6.16

Refer to **Map 4** for further information. **Map 5** also provides a representation of the distribution of vegetation communities as per the 1:5,000,000 BVG believed to be present prior to European settlement.

4. Technical and BioCondition Benchmark Descriptions

Technical descriptions provide a detailed description of the full range in structure and floristic composition of regional ecosystems (e.g. 11.3.1) and their component vegetation communities (e.g. 11.3.1a, 11.3.1b). See: http://www.gld.gov.au/environment/plants-animals/plants/ecosystems/technical-descriptions/

The descriptions are compiled using site survey data from the Queensland Herbarium & Biodiversity Science's QBEIS database. Distribution maps, representative images (if available) and the pre-clearing and remnant extent (hectares) of each vegetation community derived from the regional ecosystem mapping data are included. The technical descriptions should be used in conjunction with the fields from the regional ecosystem description database (REDD) for a full description of the regional ecosystem.

Technical descriptions include data on canopy height, canopy cover and native plant species composition of the predominant layer, which are attributes relevant to assessment of the remnant status of vegetation under the *Vegetation Management Act 1999*. However, as technical descriptions reflect the full range in structure and floristic composition across the climatic, natural disturbance and geographic range of the regional ecosystem, local reference sites should be used for remnant assessment where possible (Neldner et al. 2023 (PDF)* section 3.3 of: https://www.gld.gov.au/ data/assets/pdf file/0033/459186/methodology-mapping-surveying-v7.pdf

The technical descriptions are subject to review and are updated as additional data becomes available.

When conducting a BioCondition assessment, these technical descriptions should be used in conjunction with BioCondition benchmarks for the specific regional ecosystem, or component vegetation community. http://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks/

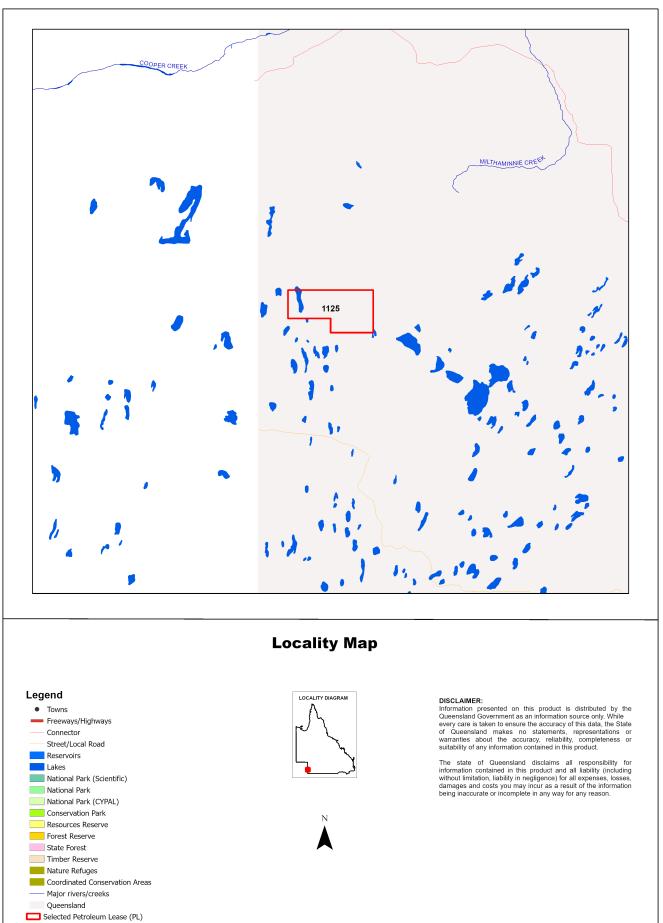
Benchmarks are based on a combination of quantitative and qualitative information and should be used as a guide only. Benchmarks are specific to one regional ecosystem vegetation community, however, the natural variability in structure and floristic composition under a range of climatic and natural disturbance regimes has been considered throughout the geographic extent of the regional ecosystem. Local reference sites should be used for this spatial and temporal (seasonal and annual) variability.

Table 7: List of remnant regional ecosystems within the AOI for which technical and biocondition benchmark descriptions are available

Regional ecosystems mapped as within the AOI	Technical Descriptions	Biocondition Benchmarks
5.3.22a	Not currently available	Not currently available
5.3.22d	Not currently available	Not currently available
5.6.4	Not currently available	Not currently available
5.6.5	Not currently available	Not currently available
5.6.8b	Not currently available	Not currently available
5.9.3	Not currently available	Not currently available
5.9.4x1	Not currently available	Not currently available

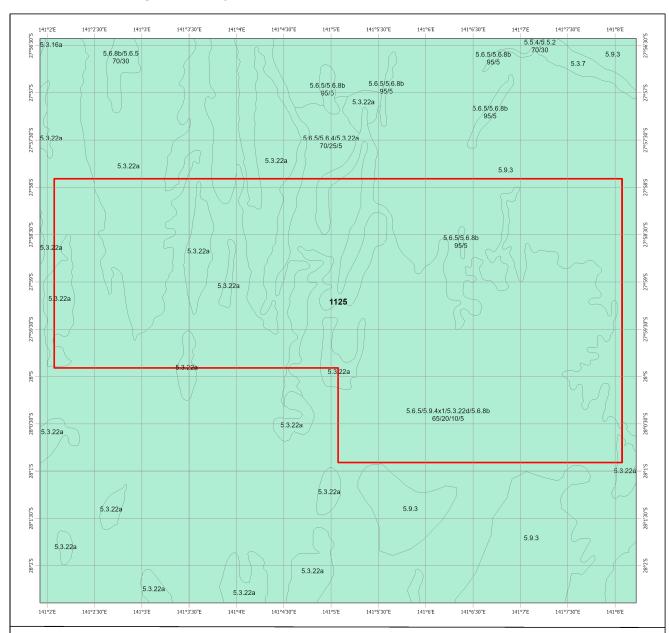
Maps

Map 1 - Location



This product is displayed in GDA2020

Map 2 - Remnant 2021 regional ecosystems



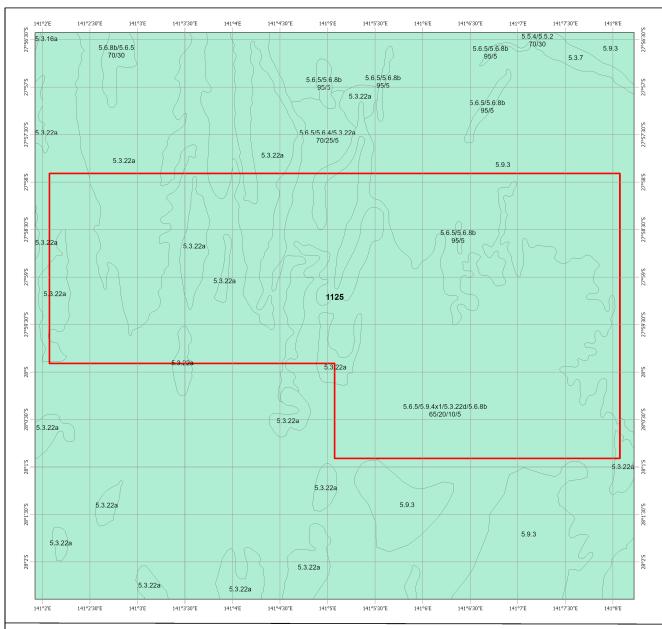
Remnant 2021 Regional Ecosystems

Biodiversity Status Endangered - Dominant vegetation Endangered - Sub-dominant Of Concern - Dominant Of Concern - Sub-dominant No concern at present Non-remnant vegetation, cultivated or built environment Plantation Water Cadastral Boundaries Selected Petroleum Lease (PL)

Regional ecosystem mapping over the majority of Queensland is produced at a scale of 1:100,000. At this scale, the minimum remnant polygon area is 5 hectares or minimum remnant width of 75 metres. Regional ecosystem linework reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only. The precision of polygon boundaries or positional accuracy of linework is 100 metres. Regional ecosystems are defined as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The polygons are labelled by regional ecosystem (RE); where more than one RE occurs, the percentage of each is labelled. The label consists of 3 components: bioregion, land zone, and vegetation community – the dominant canopy species. e.g.: RE 12.3.3. Descriptions of REs are found online. Use the search term "Regional Ecosystem Framework".

Regional ecosystem mapping at 1:100,000 map scale is derived from the following sources: 1:80,000 B&W 1960's aerial photography, Landsat TM imagery, geology, soils, land systems data, field survey and historical records.

Map 3 - Pre-clearing regional ecosystems



Pre-clearing Regional Ecosystems

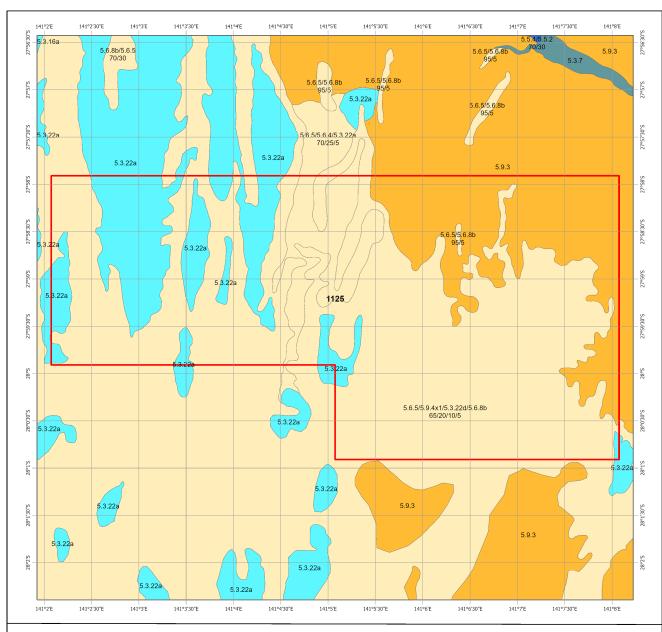
Endangered - Dominant vegetation Endangered - Sub-dominant Of Concern - Dominant No concern at present Water Cadastral Boundaries Selected Petroleum Lease (PL) This product is displayed in GDA2020

Regional ecosystem mapping over the majority of Queensland is produced at a scale of 1:100,000. At this scale, the minimum remnant polygon area is 5 hectares or minimum remnant width of 75 metres. Regional ecosystem linework reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only. The precision of polygon boundaries or positional accuracy of linework is 100 metres. Regional ecosystems are defined as vegetation

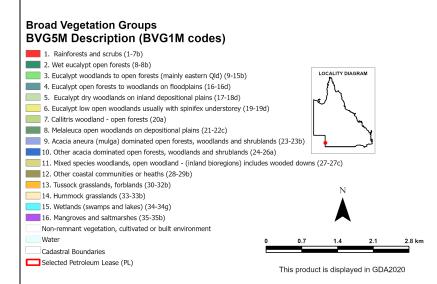
Regional ecosystems are defined as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The polygons are labelled by regional ecosystem (RE); where more than one RE occurs, the percentage of each is labelled. The label consists of 3 components: bioregion, land zone, and vegetation community – the dominant canopy species. e.g.: RE 12.3.3. Descriptions of REs are found online. Use the search term "Regional Ecosystem Framework".

Regional ecosystem mapping at 1:100,000 map scale is derived from the following sources: 1:80,000 B&W 1960's aerial photography, Landsat TM imagery, geology, soils, land systems data, field survey and historical records.

Map 4 - Remnant 2021 regional ecosystems by BVG (5M)



Remnant 2021 Regional Ecosystems coloured by Broad Vegetation Groups



Broad Vegetation Groups (BVG) of Queensland are applied by look up table to the regional ecosystem vegetation communities. Each polygon is coloured by the dominant BVG5M and the component regional ecosystems labelled. Where more than one control of the component regional ecosystems labelled. regional ecosystem occurs, the percentage of each is labelled. Regional ecosystem mapping over the majority of Queensland is produced at a scale of 1:100,000. At this scale, the minimum remnant polygon area is 5 hectares or minimum remnant width of remnant polygon area is 5 nectates or minimum remnant woth or 75 metres. Regional ecosystem linework reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only. The precision of polygon boundaries or positional accuracy of linework is 100 metres. Regional ecosystems are defined as vegetation communities in a historical but are considerable accessed with a continuour.

bioregion that are consistently associated with a particular

bioregion that are consistently associated with a particular combination of geology, landform and soil.

The label consists of 3 components: bioregion, land zone, and vegetation community — the dominant canopy species. e.g.; RE 12.3.3. Descriptions of REs are found online. Use the search term "Regional Ecosystem Framework".

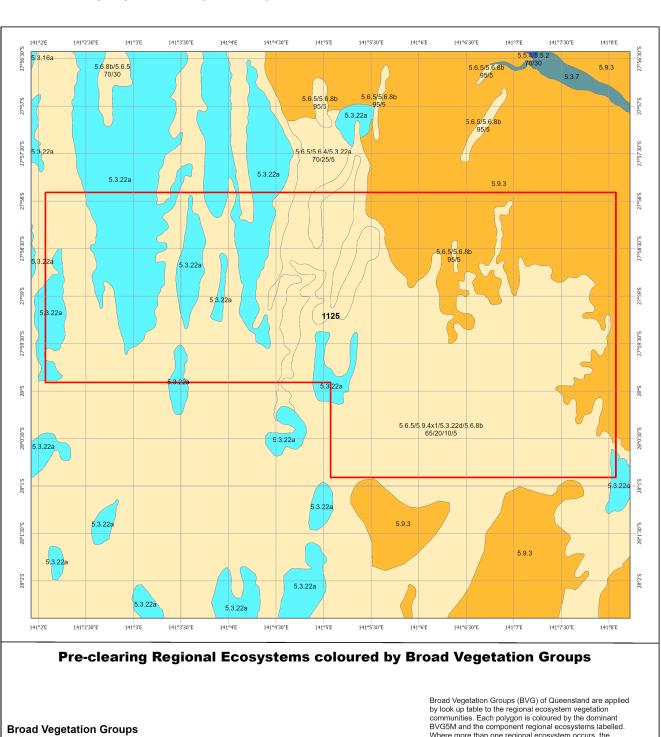
Regional ecosystem mapping at 1:100,000 map scale is derived from the following sources: 1:80,000 B&W 1960's aerial photography, Landsat TM imagery, geology, soils, land systems data, field survey and historical records.

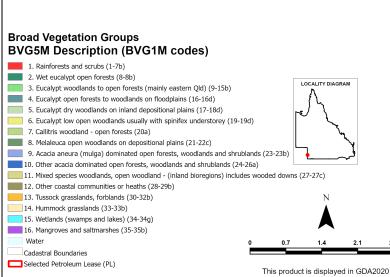
Remnant woody vegetation is defined as vegetation that has not

Remnant woody vegetation is defined as vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

Non-remnant vegetation includes regrowth and disturbed native vegetation.

Map 5 - Pre-clearing regional ecosystems by BVG (5M)



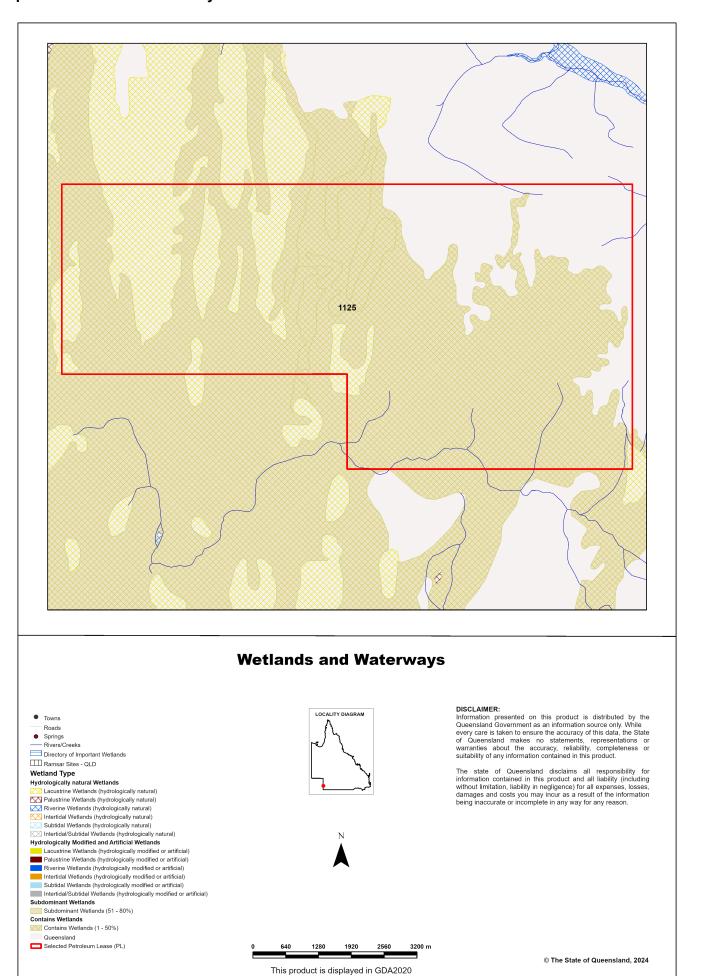


Broad Vegetation Groups (BVG) of Queensland are applied by look up table to the regional ecosystem vegetation communities. Each polygon is coloured by the dominant BVGSM and the component regional ecosystems labelled. Where more than one regional ecosystem occurs, the percentage of each is labelled.

Regional ecosystem mapping over the majority of Queensland is produced at a scale of 1:100,000. At this scale, the minimum remnant polygon area is 5 hectares or minimum remnant width of 75 metres. Regional ecosystem linework reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only. The precision of polygon boundaries or positional accuracy of linework is 100 metres.

Regional ecosystems are defined as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The label consists of 3 components: bioregion, land zone, and vegetation community – the dominant canopy species e.g.: RE 12.3.3. Descriptions of REs are found online. Use the search term "Regional Ecosystem Framework". Regional ecosystem mapping at 1:100,000 map scale is derived from the following sources: 1:80,000 B&W 1960's aerial photography. Landsat TM imagery, geology, soils, land systems data, field survey and historical records.

Map 6 - Wetlands and waterways



Links and Other Information Sources

The Department of Environment, Science and Innovation's Website -

http://www.qld.gov.au/environment/plants-animals/plants/ecosystems/ provides further information on the regional ecosystem framework, including access to links to the Regional Ecosystem Database, Broad Vegetation Group Definitions, Regional Ecosystem and Land zone descriptions.

Descriptions of the broad vegetation groups of Queensland can be downloaded from: https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/broad-vegetation

The methodology for mapping regional ecosystems can be downloaded from: https://www.qld.gov.au/__data/assets/pdf_file/0033/459186/methodology-mapping-surveying-v7.pdf

Technical descriptions for regional ecosystems can be obtained from: http://www.gld.gov.au/environment/plants-animals/plants/ecosystems/technical-descriptions/

Benchmarks can be obtained from: http://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks/

For further information associated with the remnant regional ecosystem dataset used by this report, refer to the metadata associated with the Biodiversity status of pre-clearing and Remnant Regional Ecosystems of Queensland dataset (version listed in **Appendix 1**) which is available through the Queensland Spatial Catalogue, <u>Queensland Spatial Catalogue</u>: <u>Queensland Government (information.qld.gov.au)</u>

The Queensland Globe is a mapping and data application. As an interactive online tool, Queensland Globe allows you to view and explore Queensland maps, imagery (including up-to-date satellite images) and other spatial data, including regional ecosystem mapping. To further view and explore regional ecosystems over an area of interest, access the Biota Globe (a component of the Queensland Globe). The Queensland Globe can be accessed via the following link: https://gldglobe.information.gld.gov.au/

References

Neldner, V.J., Niehus, R.E., Wilson, B.A., McDonald, W.J.F., Ford, A.J. and Accad, A. (2023). The Vegetation of Queensland. Descriptions of Broad Vegetation Groups. Version 6.0. Queensland Herbarium, Department of Environment and Science.

(https://publications.gld.gov.au/dataset/redd/resource/78209e74-c7f2-4589-90c1-c33188359086)

Neldner, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T.S., Butler, D.W., McDonald, W.J.F, Richter, D., Addicott, E.P. and Appelman, C.N. (2023) Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland. Version 7.0. Updated December 2023. Queensland Herbarium, Queensland Department of Environment, Science and Innovation, Brisbane.

(https://www.gld.gov.au/ data/assets/pdf_file/0033/459186/methodology-mapping-surveying-v7.pdf).

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

Appendices

Appendix 1 - Source Data

The dataset listed below is available for download from:

http://www.qld.gov.au/environment/plants-animals/plants/ecosystems/download/

• Regional Ecosystem Description Database

The datasets listed below are available for download from:

<u>Queensland Spatial Catalogue: Queensland Government (information.qld.gov.au)</u>

- Biodiversity status of pre-clearing and 2021 remnant regional ecosystems of Queensland
- Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland
- · Queensland Wetland Data Version Wetland lines
- Queensland Wetland Data Version Wetland points
- Queensland Wetland Data Version Wetland areas
- Pre-clearing broad vegetation groups of Queensland
- Remnant 2021 broad vegetation groups of Queensland

Appendix 2 - Acronyms and Abbreviations

AOI - Area of Interest

GIS - Geographic Information System

RE - Regional Ecosystem

REDD - Regional Ecosystem Description Database

VMA - Vegetation Management Act 1999



WildNet Records Species List

For the selected area of interest 4542.41 PL: 1125 Current as at 17/06/2024 WildNetSpeciesList

Summary Information

The following table provides an overview of the area of interest: PL: 1125

Table 1. Area of interest details

Size (ha)	
4,542.41	
Local Government(s)	
Bulloo Shire	
Catchment(s)	
Cooper Creek	
Bioregion(s)	Subregion(s)
Channel Country	Strzelecki Desert
Channel Country	Sturt Stony Desert

Protected Area(s)

No estates or reserves are located within the area of interest.

World Heritage Area(s)

No World Heritage Areas are located within the area of interest.

Ramsar Area(s)

No Ramsar Areas are located within the area of interest.

Introduction

This WildNet report is derived from a spatial layer that is generated from the <u>WildNet database</u>, managed by the Department of Enviornment, Science and Innovation. The layer, which is generated weekly, contains a subset of WildNet wildlife records that are not classed as erroneous or duplicate, that have a location precision equal to or less than 10000 metres and do not have a count of zero. It does not include aspatial data such as some baseline species lists created for some protected areas.

The WildNet dataset is constantly being enhanced and the taxonomic and status information revised. If a species is not listed in this report, it does not mean it doesn't occur there and listed species may also no longer inhabit the area. It is recommended that you also access other internal and external data sources for species information in your area of interest.

The Species List Application may provide additional information on species occurence within your area of interest.

Species data

Contextual location information is presented in Map 1.

Table 2 lists the animals recorded within the area of interest and its one kilometre buffer.

Table 3 lists the plants recorded within the area of interest and its one kilometre buffer.

Table 4 lists the fungi recorded within the area of interest and its one kilometre buffer.

Table 5 lists the other species recorded within the area of interest and its one kilometre buffer.

Map 1. Locality Map

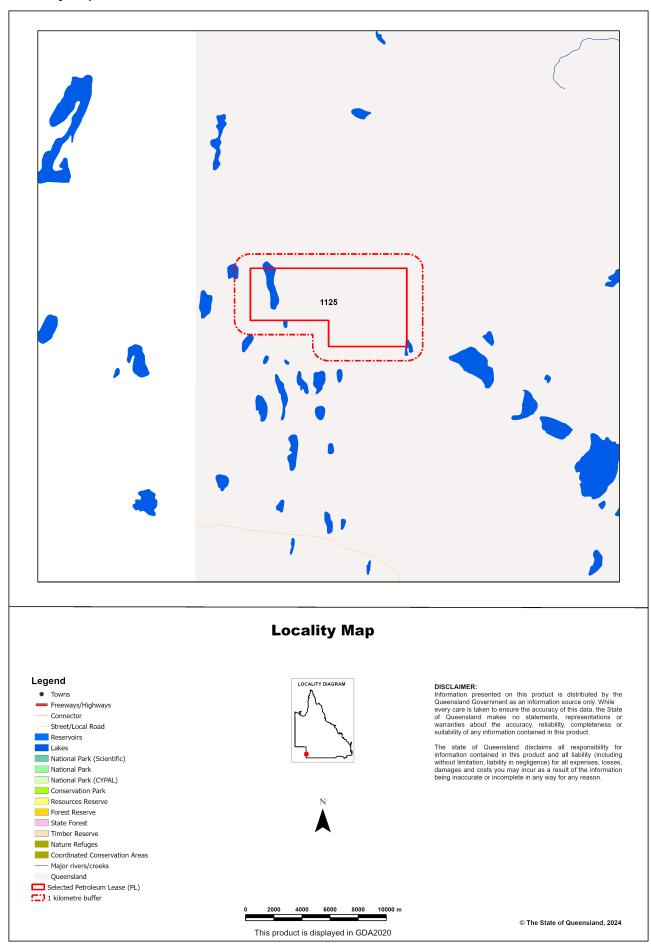


Table 2. Animals recorded within the area of interest and its one kilometre buffer

No species found within the area of interest and its one kilometre buffer.

Table 3. Plants recorded within the area of interest and its one kilometre buffer

No species found within the area of interest and its one kilometre buffer.

Table 4. Fungi recorded within the area of interest and its one kilometre buffer

No species found within the area of interest and its one kilometre buffer.

Table 5. Other species recorded within the area of interest and its one kilometre buffer

No species found within the area of interest and its one kilometre buffer.

Species table headings and codes

Taxon Id: Unique identifier of the taxon from the WildNet database.

NCA: Queensland conservation status of the taxon under the *Nature Conservation Act 1992* (Least Concern (C), Critically Endangered (CR), Endangered (E), Extinct (EX), Near Threatened (NT), Extinct in the Wild (PE), Special Least Concern (SL), and Vulnerable (V)).

EPBC: Australian conservation status of the taxon under the *Environment Protection and Biodiversity Conservation Act* 1999 (Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Vulnerable (V), and Extinct in the Wild (XW)).

Specimens: The number of specimen-backed records of the taxon.

Records: The total number of records of the taxon. **Last record:** Date of most recent record of the taxon.

Links and Support

Other sites that deliver species information from the WildNet database include:

- <u>Species profile search</u> access species information approved for publication including species names, statuses, notes, images, distribution maps and records
- <u>Species lists</u> generate species lists for Queensland protected areas, forestry areas, local governments and areas defined using coordinates
- Biomaps view biodiversity information, including WildNet records approved for publication, and generate reports
- Queensland Globe view spatial information, including WildNet records approved for publication
- <u>Qld wildlife data API</u> access WildNet species information approved for publication such as notes, images and records etc.
- Wetland Maps view species records, survey locations etc. approved for publication
- <u>Wetland Summary</u> view wildlife statistics, species lists for a range of area types, and access WildNet species profiles
- WildNet wildlife records published Queensland spatial layer of WildNet records approved for publication generated weekly
- <u>Generalised distribution and densities of Queensland wildlife</u> Queensland species distributions and densities generalised to a 10 km grid resolution
- Conservation status of Queensland wildlife access current lists of priority species for Queensland including nomenclature and status information
- Queensland Confidential Species the list of species flagged as confidential in the WildNet database.

Please direct queries about this report to the WildNet Team WildNet@des.gld.gov.au.

Other useful sites for accessing Queensland biodiversity data include:

- Useful wildlife resources
- Queensland Government Data
- Atlas of Living Australia (ALA)
- Online Zoological Collections of Australian Museums (OZCAM)
- Australia's Virtual Herbarium (AVH)
- Protected Matters Search Tool

Disclaimer

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

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Appendix 5: WildNet Records: Conservation Significant Species List Report for PL 1125



WildNet Records Conservation Significant Species List

For the selected area of interest PL: 1125 Current as at 17/06/2024 WildNetCSSpeciesList

Summary Information

The following table provides an overview of the area of interest: PL: 1125

Table 1. Area of interest details

Size (ha)	
4,542.41	
Local Government(s)	
Bulloo Shire	
Catchment(s)	
Cooper Creek	
Bioregion(s)	Subregion(s)
Channel Country	Strzelecki Desert
Channel Country	Sturt Stony Desert

Protected Area(s)

No estates or reserves are located within the area of interest.

World Heritage Area(s)

No World Heritage Areas are located within the area of interest.

Ramsar Area(s)

No Ramsar Areas are located within the area of interest.

Introduction

This WildNet report is derived from a spatial layer that is generated from the <u>WildNet database</u>, managed by the Department of Enviornment, Science and Innovation. The layer, which is generated weekly, contains a subset of WildNet wildlife records that are not classed as erroneous or duplicate, that have a location precision equal to or less than 10000 metres and do not have a count of zero. It does not include aspatial data such as some baseline species lists created for some protected areas.

The WildNet dataset is constantly being enhanced and the taxonomic and status information revised. If a conservation significant species is not listed in this report, it does not mean it doesn't occur there and listed species may also no longer inhabit the area. It is recommended that you also access other internal and external data sources for species information in your area of interest.

The Species List Application may provide additional information on species occurrence within your area of interest.

Conservation significant species are species listed:

- as threatened or near threatened under the Nature Conservation Act 1992;
- as threatened under the Environment Protection and Biodiversity Conservation Act 1999 or
- migratory species protected under the following international agreements:
 - Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
 - China-Australia Migratory Bird Agreement
 - Japan-Australia Migratory Bird Agreement
 - Republic of Korea-Australia Migratory Bird Agreement

Table 2 lists the species recorded within the area of interest and its one kilometre buffer.

Map 1. Locality Map

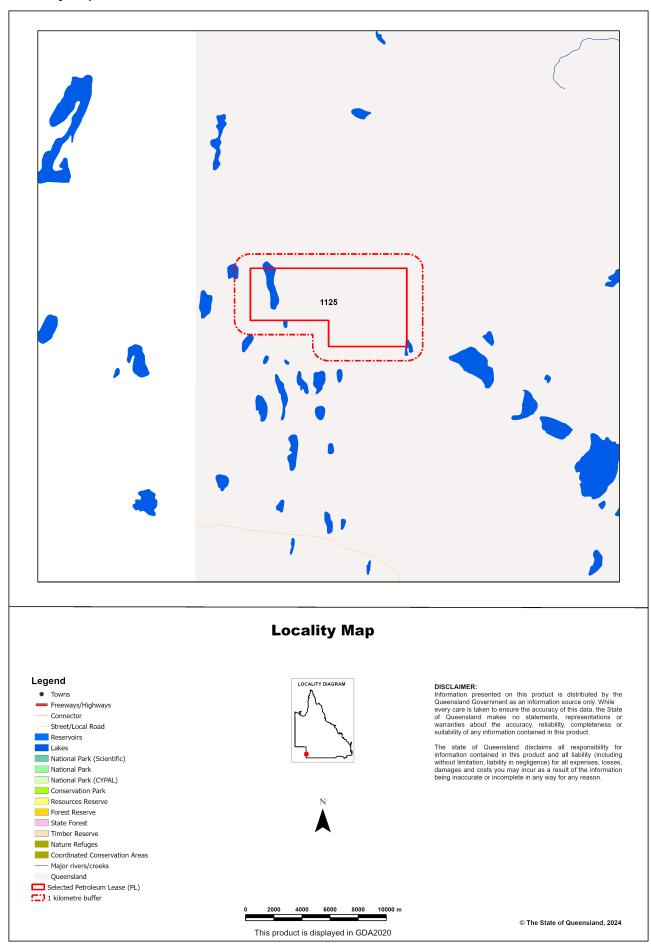


Table 2. Conservation significant species recorded within the area of interest and its one kilometre buffer

(No Records)

Taxon Id: Unique identifier of the taxon from the WildNet database.

NCA: Queensland conservation status of the taxon under the *Nature Conservation Act 1992* (Least Concern (C), Critically Endangered (CR), Endangered (E), Extinct (EX), Near Threatened (NT), Extinct in the Wild (PE), Special Least Concern (SL), and Vulnerable (V)).

EPBC: Australian conservation status of the taxon under the *Environment Protection and Biodiversity Conservation Act 1999* (Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Vulnerable (V), and Extinct in the Wild (XW)).

Specimens: The number of specimen-backed records of the taxon.

Records: The total number of records of the taxon. **Last record:** Date of most recent record of the taxon.

Links and Support

Other sites that deliver species information from the WildNet database include:

- Species profile search access species information approved for publication including species names, statuses, notes, images, distribution maps and records
- <u>Species lists</u> generate species lists for Queensland protected areas, forestry areas, local governments and areas defined using coordinates
- Biomaps view biodiversity information, including WildNet records approved for publication, and generate reports
- Queensland Globe view spatial information, including WildNet records approved for publication
- <u>Qld wildlife data API</u> access WildNet species information approved for publication such as notes, images and records etc.
- Wetland Maps view species records, survey locations etc. approved for publication
- Wetland Summary view wildlife statistics, species lists for a range of area types, and access WildNet species profiles
- <u>WildNet wildlife records published Queensland</u> spatial layer of WildNet records approved for publication generated weekly
- <u>Generalised distribution and densities of Queensland wildlife</u> Queensland species distributions and densities generalised to a 10 km grid resolution
- <u>Conservation status of Queensland wildlife</u> access current lists of priority species for Queensland including nomenclature and status information
- Queensland Confidential Species the list of species flagged as confidential in the WildNet database.

Please direct queries about this report to the WildNet Team WildNet@des.qld.gov.au.

Other useful sites for accessing Queensland biodiversity data include:

- Useful wildlife resources
- Queensland Government Data
- Atlas of Living Australia (ALA)
- Online Zoological Collections of Australian Museums (OZCAM)
- Australia's Virtual Herbarium (AVH)
- Protected Matters Search Tool

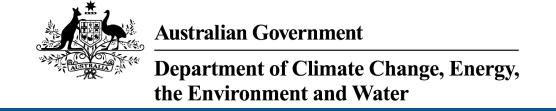
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Appendix 6: EPBC Act (1999) Protected Matters Search for PL 1125 with a 50 km buffer zone



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 17-Jun-2024

Summary

Details

Matters of NES
Other Matters Protected by the EPBC Act
Extra Information

Caveat

Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the <u>Administrative Guidelines on Significance</u>.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	16
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A <u>permit</u> may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	13
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Nationally Important Wetlands:	3
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	1

Details

Matters of National Environmental Significance

National Heritage Places		[Res	source Information
Name	State	Legal Status	Buffer Status
Historic			
The Burke, Wills, King and Yandruwandh	a National QLD	Listed place	In buffer area only
Heritage Place			
Wetlands of International Importance	(Ramsar Wetlands)	[Res	source Information
Ramsar Site Name		Proximity	Buffer Status
Coongie lakes		Within Ramsar site	In feature area
Listed Threatened Species		[Res	source Information
Status of Conservation Dependent and E	xtinct are not MNFS un	•	
Number is the current name ID.	All lot all of hot limited at	1401 110 21 20 7101.	
Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Amytornis barbatus barbatus			
Bulloo Grey Grasswren, Grey	Endangered	Species or species	In buffer area only
Grasswren (Bulloo) [67065]		habitat likely to occur	
		within area	
Aphelocephala leucopsis			
Southern Whiteface [529]	Vulnerable	Species or species	In feature area
Codinom Winterdoo [020]	Valiforable	habitat known to	in roataro aroa
		occur within area	
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species	In feature area
		habitat known to occur within area	
		occui williin area	
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species	In feature area
	, 0	habitat may occur	
		within area	
Falco hypoleucos	V 1 1 1		
Grey Falcon [929]	Vulnerable	Species or species habitat known to	In feature area
		occur within area	
		ooda. mamada	
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species	In feature area
		habitat may occur	
		within area	

Scientific Name	Threatened Category	Presence Text	Buffer Status
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Notomys fuscus Dusky Hopping-mouse, Wilkiniti [125]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pseudomys australis Plains Rat, Palyoora, Plains Mouse [108]	Vulnerable	Species or species habitat may occur within area	In feature area
PLANT			
Frankenia plicata [4225]	Endangered	Species or species habitat likely to occur within area	In feature area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Xerothamnella parvifolia [3141]	Vulnerable	Species or species habitat may occur within area	In feature area
Listed Migratory Species		I Res	source Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds	5 1		

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species		[R	esource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osc	<u>:ulans</u>		
Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma			
Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula bengha	<u>lensis (sensu lato)</u>		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Innamincka	Regional Reserve	SA	In buffer area only
Nationally Important Wetlands			[Resource Information]
Wetland Name		State	Buffer Status
Coongie Lakes		SA	In buffer area only
Cooper Creek Swamps - Nappa Merrie		QLD	In buffer area only
Strzelecki Creek Wetland System		SA	In buffer area only

Str 20100Ki Orock Wolland Oyotom		37 (111 .	sanor area erny
EPBC Act Referrals			[Resour	<u>rce Information]</u>
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
QSN3 Project, expand 935km gas pipeline and supporting infrastructure	2009/5072	Not Controlled Action	Completed	In buffer area only
Thoar 3D seismic survey at Cooper Creek-Wilson River floodplain	2003/1178	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manne	er)			
QSN Underground Gas Pipeline	2008/4043	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular mann	er)			

Bioregional Assessments			[Resource Information]
SubRegion	BioRegion	Website	Buffer Status
Cooper	Lake Eyre Basin	BA website	In feature area

Geological and Bioregiona	l Assessments		[Resource Information]
Name	State	Website	Buffer Status
Cooper GBA region	QLD, SA, NSW	GBA website	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- · listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- · some recently listed species and ecological communities;
- · some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- -Office of Environment and Heritage, New South Wales
- -Department of Environment and Primary Industries, Victoria
- -Department of Primary Industries, Parks, Water and Environment, Tasmania
- -Department of Environment, Water and Natural Resources, South Australia
- -Department of Land and Resource Management, Northern Territory
- -Department of Environmental and Heritage Protection, Queensland
- -Department of Parks and Wildlife, Western Australia
- -Environment and Planning Directorate, ACT
- -Birdlife Australia
- -Australian Bird and Bat Banding Scheme
- -Australian National Wildlife Collection
- -Natural history museums of Australia
- -Museum Victoria
- -Australian Museum
- -South Australian Museum
- -Queensland Museum
- -Online Zoological Collections of Australian Museums
- -Queensland Herbarium
- -National Herbarium of NSW
- -Royal Botanic Gardens and National Herbarium of Victoria
- -Tasmanian Herbarium
- -State Herbarium of South Australia
- -Northern Territory Herbarium
- -Western Australian Herbarium
- -Australian National Herbarium, Canberra
- -University of New England
- -Ocean Biogeographic Information System
- -Australian Government, Department of Defence
- Forestry Corporation, NSW
- -Geoscience Australia
- -CSIRO
- -Australian Tropical Herbarium, Cairns
- -eBird Australia
- -Australian Government Australian Antarctic Data Centre
- -Museum and Art Gallery of the Northern Territory
- -Australian Government National Environmental Science Program
- -Australian Institute of Marine Science
- -Reef Life Survey Australia
- -American Museum of Natural History
- -Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
- -Tasmanian Museum and Art Gallery, Hobart, Tasmania
- -Other groups and individuals

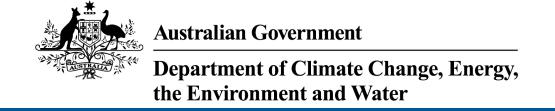
The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix 7: EPBC Act (1999) Protected Matters Search for PL 1125 with a 100 km buffer zone



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 22-Jul-2024

Summary

Details

Matters of NES
Other Matters Protected by the EPBC Act
Extra Information

Caveat

Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the <u>Administrative Guidelines on Significance</u>.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	22
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 https://www.dcceew.gov.au/parks-heritage/heritage

A <u>permit</u> may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	4
EPBC Act Referrals:	8
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	1

Details

Matters of National Environmental Significance

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

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

Listed Threatened Species

Latham's Snipe, Japanese Snipe [863]

[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act. Number is the current name ID.

Number is the current name ib.		
Scientific Name	Threatened Category	Presence Text
BIRD		
Amytornis barbatus barbatus Bulloo Grey Grasswren, Grey Grasswren (Bulloo) [67065]	Endangered	Species or species habitat known to occur within area
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Gallinago hardwickii		

Vulnerable

Species or species habitat known to occur within area

Scientific Name Threatened	d Category Presence Text
Grantiella picta Painted Honeyeater [470] Vulnerable	Species or species habitat known to occur within area
Lophochroa leadbeateri leadbeateri Major Mitchell's Cockatoo (eastern), Endangere Eastern Major Mitchell's Cockatoo, Pink Cockatoo (eastern) [82926]	Species or species habitat may occur within area
Neophema chrysostoma Blue-winged Parrot [726] Vulnerable	Species or species habitat known to occur within area
Pedionomus torquatus Plains-wanderer [906] Critically E	ndangered Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350] Endangere	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037] Endangere	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank Endangere [832]	Species or species habitat likely to occur within area
MAMMAL	
<u>Dasyuroides byrnei</u>	
Kowari, brushy-tailed marsupial rat, Endangere Byrne's crest-tailed marsupial rat [329]	Species or species habitat may occur within area
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 known to occur within area
Pseudomys australis Plains Rat, Palyoora, Plains Mouse [108] Vulnerable	Species or species habitat may occur within area
PLANT	

Scientific Name	Threatened Category	Presence Text
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
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat may occur within area
Xerothamnella parvifolia		
[3141]	Vulnerable	Species or species habitat likely to occur within area
Listed Migratory Species		[Resource Information]
Listed Migratory Species Scientific Name	Threatened Category	[Resource Information] Presence Text
Scientific Name	Threatened Category	[Resource Information] Presence Text
Scientific Name Migratory Marine Birds	Threatened Category	
Scientific Name	Threatened Category	
Scientific Name Migratory Marine Birds Apus pacificus	Threatened Category	Presence Text Species or species habitat likely to occur
Scientific Name Migratory Marine Birds Apus pacificus Fork-tailed Swift [678]	Threatened Category	Presence Text Species or species habitat likely to occur
Scientific Name Migratory Marine Birds Apus pacificus Fork-tailed Swift [678] Migratory Terrestrial Species	Threatened Category	Presence Text Species or species habitat likely to occur
Scientific Name Migratory Marine Birds Apus pacificus Fork-tailed Swift [678] Migratory Terrestrial Species Motacilla cinerea Grey Wagtail [642]	Threatened Category	Species or species habitat likely to occur within area Species or species habitat may occur
Scientific Name Migratory Marine Birds Apus pacificus Fork-tailed Swift [678] Migratory Terrestrial Species Motacilla cinerea	Threatened Category	Species or species habitat likely to occur within area Species or species habitat may occur
Scientific Name Migratory Marine Birds Apus pacificus Fork-tailed Swift [678] Migratory Terrestrial Species Motacilla cinerea Grey Wagtail [642] Motacilla flava	Threatened Category	Species or species habitat likely to occur within area Species or species habitat may occur within area Species or species habitat known to
Scientific Name Migratory Marine Birds Apus pacificus Fork-tailed Swift [678] Migratory Terrestrial Species Motacilla cinerea Grey Wagtail [642] Motacilla flava Yellow Wagtail [644]	Threatened Category	Species or species habitat likely to occur within area Species or species habitat may occur within area Species or species habitat known to

Calidris acuminata Sharp-tailed Sandpiper [874] Vulnerable Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		<u> [Resource Information]</u>
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species
		habitat known to
		occur within area
Anus posificus		
Apus pacificus Fork-tailed Swift [678]		Species or species
		habitat likely to occur
		within area overfly
		marine area
Bubulcus ibis as Ardea ibis		0 '
Cattle Egret [66521]		Species or species
		habitat may occur within area overfly
		marine area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species
		habitat known to occur within area
		Occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species
	,	habitat known to
		occur within area
		overfly marine area

Scientific Name	Threatened Category	Presence Text		
Calidris melanotos	Threatened Category	1 10301100 TOXE		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area		
Chalcites osculans as Chrysococcyx oscu Black-eared Cuckoo [83425]	<u>ulans</u>	Species or species habitat known to occur within area overfly marine area		
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area overfly marine area		
Merops ornatus				
Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area		
Motacilla cinerea				
Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area		
Motacilla flava				
Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area		
Neophema chrysostoma				
Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area		
Rostratula australis as Rostratula benghalensis (sensu lato)				
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area		
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area		

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	
Innamincka	Regional Reserve	SA	
Malkumba-Coongie Lakes	National Park	SA	
Strzelecki	Regional Reserve	SA	

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	
Coongie Lakes	SA	
Cooper Creek Swamps - Nappa Merrie	QLD	
Cooper Creek - Wilson River Junction	QLD	
Strzelecki Creek Wetland System	SA	

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Ballera Lateral Gas Pipeline	2006/2563	Controlled Action	Completed
Expansion of the Olympic Dam	2005/2270	Controlled Action	Post-Approval
copper, uranium, gold and silver mine, processing plant and			
<u>associated</u>			
Not controlled action			
Gas Pipeline from Psyche to Winninia	2002/797	Not Controlled	Completed
		Action	
Improving rabbit biocontrol: releasing	2015/7522	Not Controlled	Completed
another strain of RHDV, sthrn two	2013/1322	Action	Completed
thirds of Australia			
QSN3 Project, expand 935km gas	2009/5072	Not Controlled	Completed
pipeline and supporting infrastructure		Action	

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Thoar 3D seismic survey at Cooper Creek-Wilson River floodplain	2003/1178	Not Controlled Action	Completed
Not controlled action (particular manne	er)		
QSN Underground Gas Pipeline	2008/4043	Not Controlled Action (Particular Manner)	Post-Approval
Texas Tickalara Holdings Petroleum Production Project	2021/9088	Not Controlled Action (Particular Manner)	Post-Approval

Bioregional Assessments			[Resource Information]
SubRegion	BioRegion	Website	
Cooper	Lake Eyre Basin	BA website	
Geological and Bioregional Assessments			[Resource Information]

State

QLD, SA, NSW

Name

Cooper GBA region

Website

GBA website

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- · listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- · some recently listed species and ecological communities;
- · some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- -Office of Environment and Heritage, New South Wales
- -Department of Environment and Primary Industries, Victoria
- -Department of Primary Industries, Parks, Water and Environment, Tasmania
- -Department of Environment, Water and Natural Resources, South Australia
- -Department of Land and Resource Management, Northern Territory
- -Department of Environmental and Heritage Protection, Queensland
- -Department of Parks and Wildlife, Western Australia
- -Environment and Planning Directorate, ACT
- -Birdlife Australia
- -Australian Bird and Bat Banding Scheme
- -Australian National Wildlife Collection
- -Natural history museums of Australia
- -Museum Victoria
- -Australian Museum
- -South Australian Museum
- -Queensland Museum
- -Online Zoological Collections of Australian Museums
- -Queensland Herbarium
- -National Herbarium of NSW
- -Royal Botanic Gardens and National Herbarium of Victoria
- -Tasmanian Herbarium
- -State Herbarium of South Australia
- -Northern Territory Herbarium
- -Western Australian Herbarium
- -Australian National Herbarium, Canberra
- -University of New England
- -Ocean Biogeographic Information System
- -Australian Government, Department of Defence
- Forestry Corporation, NSW
- -Geoscience Australia
- -CSIRO
- -Australian Tropical Herbarium, Cairns
- -eBird Australia
- -Australian Government Australian Antarctic Data Centre
- -Museum and Art Gallery of the Northern Territory
- -Australian Government National Environmental Science Program
- -Australian Institute of Marine Science
- -Reef Life Survey Australia
- -American Museum of Natural History
- -Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
- -Tasmanian Museum and Art Gallery, Hobart, Tasmania
- -Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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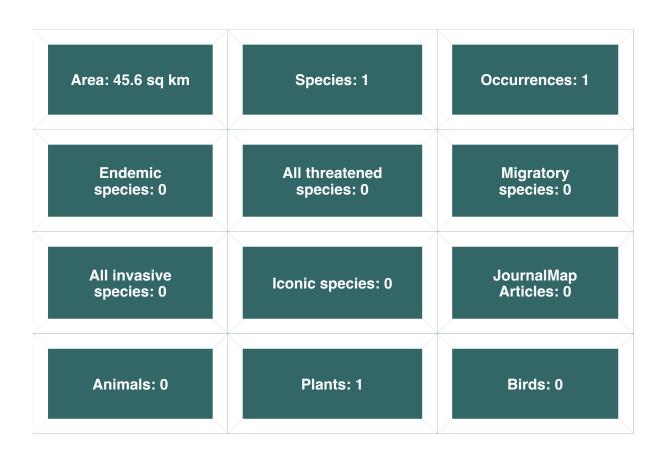
Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix 8: Atlas of Living Australia area report for PL 1125



AREA REPORT

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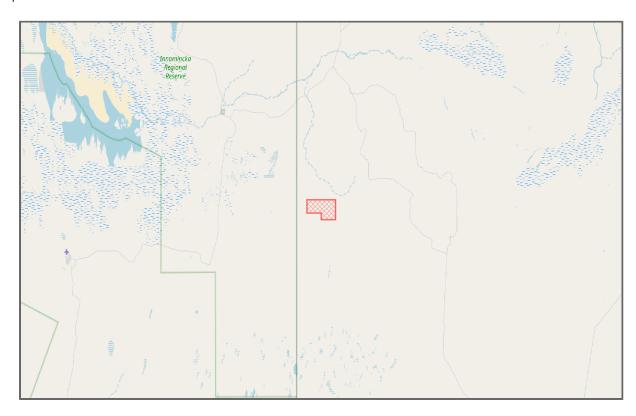


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Area: 45.6 sq km



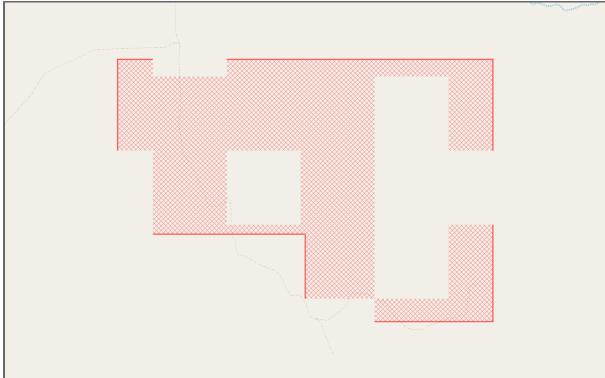


Figure 1 : Map of PL1125.zip

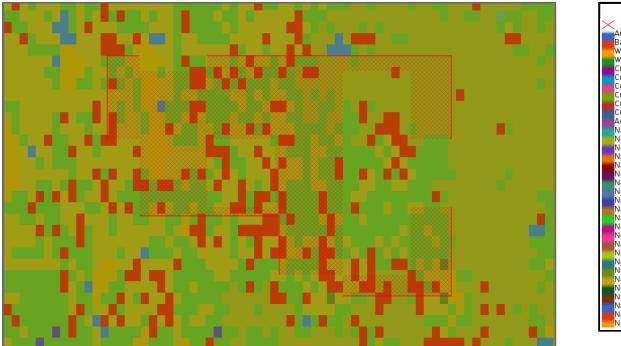
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National Dynamic Land Cover

The Dynamic Land Cover Dataset is the first nationally consistent and thematically comprehensive land cover reference for Australia. It provides a base-line for reporting on change and trends in vegetation cover and extent. Information about land cover dynamics is essential to understanding and addressing a range of national challenges such as drought, salinity, water availability and ecosystem health. The data is a synopsis of land cover information for every 250m by 250m area of the country from April 2000 to April 2008. The classification scheme used to describe land cover categories in the Dataset conforms to the 2007 International Standards Organisation (ISO) land cover standard (19144-2). The Dataset shows Australian land covers clustered into 34 ISO classes. These reflect the structural character of vegetation, ranging from cultivated and managed land covers (crops and pastures) to natural land covers such as closed forest and open grasslands. [Ref1]

Australia's Dynamic Land Cover: http://www.ga.gov.au/earth-observation/landcover.html

National Dynamic Land Cover layer: Classification: Vegetation; Type: Contextual (polygonal); Metadata contact organisation: Geoscience Australia (GA). https://spatial.ala.org.au/ws/layers/view/more/dlcmv1



Artificial surfaces Bare areas Water Water brine Cultiv herb irrigated Cultiv herb irr pasture Cultiv herb irr sugar Cultiv herb rainfed Cultiv herb rainfed pasture Cultiv herb rainfed sugar Aquatic vegetation Nat herb forbs open Nat herb forbs sparse Nat herb closed tussock grass Nat herb open alpine Nat herb open hummock grass Nat herb open sedge Nat herb open tussock grass Nat herb scattered Nat herb scattered tussock grass Nat herb sparse Nat herb sparse hummock grass Nat herb sparse tussock grass Nat shrubs closed Nat shrubs open Nat shrubs open chenopods Nat shrubs scattered Nat shrubs scattered chenopod Nat shrubs sparse Nat shrubs sparse chenopod Nat trees closed Nat trees open Nat trees scattered Nat trees sparse

Figure 2: Map of National Dynamic Land Cover

Table 1: National Dynamic Land Cover

Class/Region	Area (sq km)	% of total area
Primarily Vegetated Natural & Semi-Natural Terrestrial Vegetation Woody Shrubs Sparse Chenopods	0.07	0.14
Primarily Vegetated Natural & Semi-Natural Terrestrial Vegetation Herbaceous Graminoids Sparse Hummock Grasses	19.83	39.46
Primarily Non-Vegetated Waterbodies Water Brine	1.71	3.40
Primarily Vegetated Natural & Semi-Natural Terrestrial Vegetation Woody Shrubs Sparse	20.79	41.36
Primarily Vegetated Natural & Semi-Natural Terrestrial Vegetation Herbaceous Graminoids Open Hummock Grasses	7.79	15.51
Primarily Vegetated Natural & Semi-Natural Terrestrial Vegetation Herbaceous Graminoids Scattered	0.07	0.14

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Global Context Ecoregions

Terrestrial Ecoregions of the World (TEOW)

Terrestrial Ecoregions of the World (TEOW) is a biogeographic regionalisation of the Earth's terrestrial biodiversity. Our biogeographic units are ecoregions, which are defined as relatively large units of land or water containing a distinct assemblage of natural communities sharing a large majority of species, dynamics, and environmental conditions. There are 867 terrestrial ecoregions, classified into 14 different biomes such as forests, grasslands, or deserts. Ecoregions represent the original distribution of distinct assemblages of species and communities. [Ref2]

TEOW: https://worldwildlife.org/biome-categories/terrestrial-ecoregions

Terrestrial Ecoregional Boundaries layer: Classification: Biodiversity - Region; Type: Contextual (polygonal); Metadata contact organisation: The Nature Conservancy (TNC). https://spatial.ala.org.au/ws/layers/view/more/1053

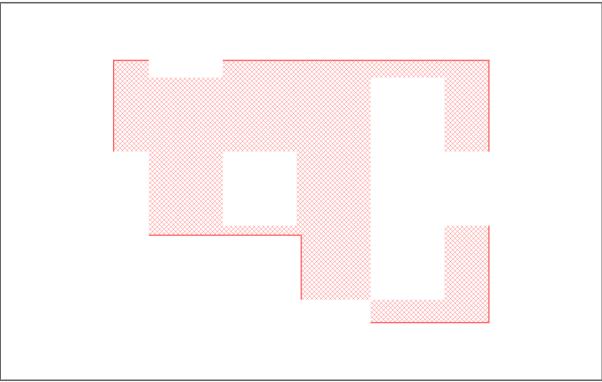


Figure 3: Map of Global Context Ecoregions

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Freshwater Ecoregions of the World (FEOW)

Freshwater Ecoregions of the World (FEOW) is a collaborative project providing the first global biogeographic regionalization of the Earth's freshwater biodiversity, and synthesizing biodiversity and threat data for the resulting ecoregions. We define a freshwater ecoregion as a large area encompassing one or more freshwater systems that contains a distinct assemblage of natural freshwater communities and species. The freshwater species, dynamics, and environmental conditions within a given ecoregion are more similar to each other than to those of surrounding ecoregions and together form a conservation unit. [Ref5]

FEOW: https://worldwildlife.org/biome-categories/freshwater-ecoregions

Freshwater Ecoregions of the World layer: Classification: Biodiversity - Region; Type: Contextual (polygonal); Metadata contact organisation: TNC. https://spatial.ala.org.au/ws/layers/view/more/1052

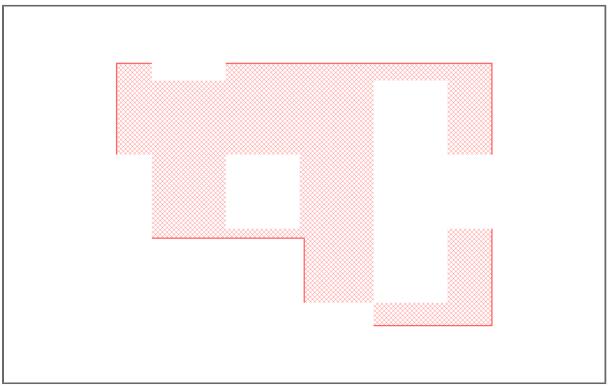


Figure 4: Map of Freshwater Ecoregions of the World (FEOW)

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Occurrences

Occurrences: 1

Spatially valid records are considered those that do not have any type of flag questioning their location, for example a terrestrial species being recorded in the ocean. [Ref6]

Number of occurrences (spatially valid only): 1

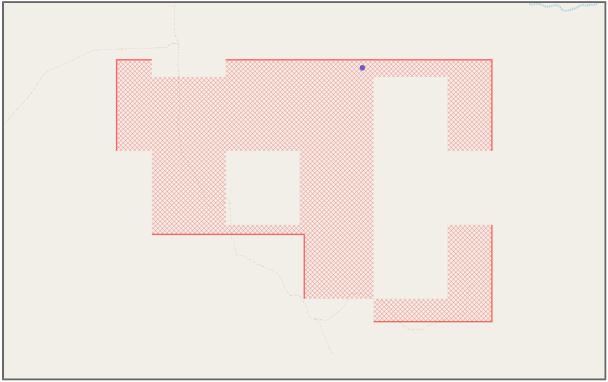


Figure 5 : Map of Occurrences

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Species

Species: 1

Spatially valid records are considered those that do not have any type of flag questioning their location, for example a terrestrial species being recorded in the ocean. [Ref6]

Number of species (spatially valid only): 1

Table 4: Species

Family	Scientific Name	Common Name	No. Occurrences
Scrophulariaceae	Eremophila macgillivrayi	Dog-bush	1

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Endemic Species

Endemic Species: 0

Spatially valid records are considered those that do not have any type of flag questioning their location, for example a terrestrial species being recorded in the ocean. [Ref6]

Number of endemic species (spatially valid only): 0

Table 5: Endemic Species

Family Scientific Name Common Name No. Occurrences
--

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All threatened species

Number of threatened species: 0

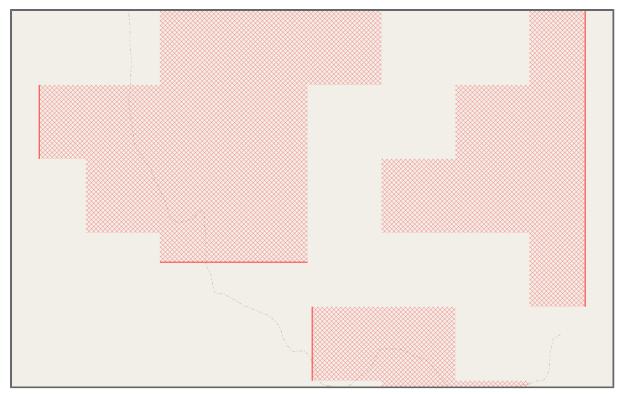


Figure 6 : Map of All threatened species

Table 6: All threatened species (Link to full list)

Family Scientific Name Common Name No. Occurrences

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All invasive species

Number of invasive species: 0

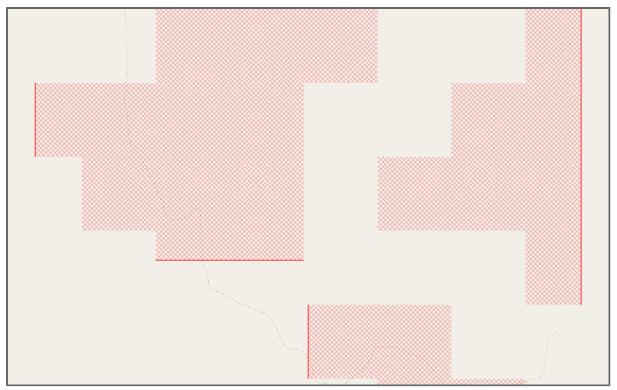


Figure 7: Map of All invasive species

Table 7: All invasive species (Link to full list)

Family Scientific Name Common Name No. Occurrences

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Iconic species

Number of iconic species: 0

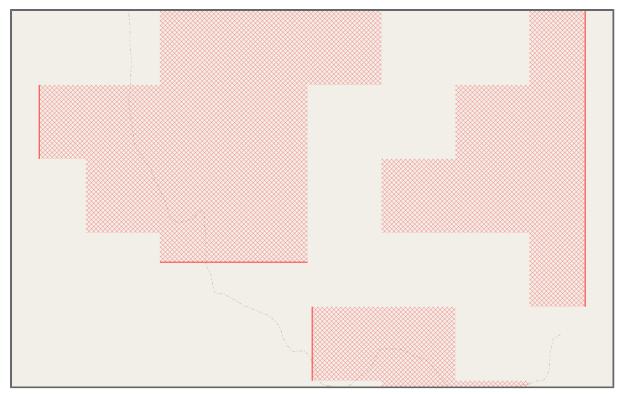


Figure 8 : Map of Iconic species

Table 8: Iconic species (Link to full list)

	A		
Family	Scientific Name	Common Name	No. Occurrences

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Migratory species

Number of migratory species: 0

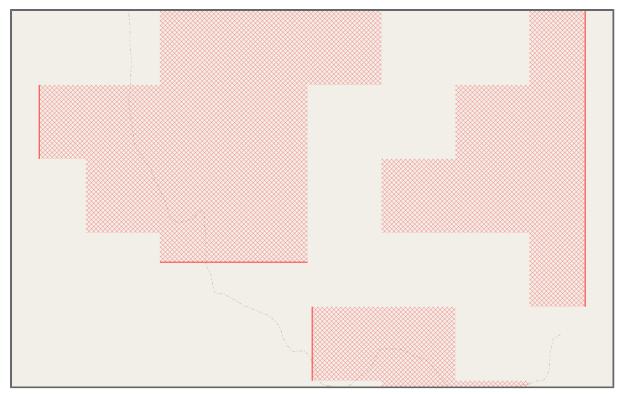


Figure 9 : Map of Migratory species

Table 9: Migratory species (Link to full list)

Family	Scientific Name	Common Name	No. Occurrences	
. alliniy	Coloniano Hame	Common Name	110. 000411011000	

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<u>Lifeform - Amphibians</u>

Number of Amphibians 0

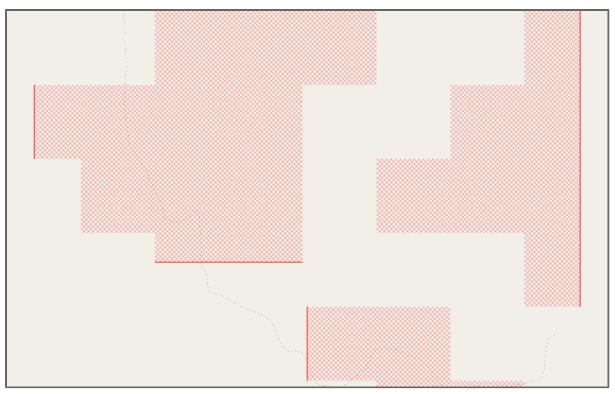


Figure 10 : Map of Lifeform - Amphibians

Table 10: Lifeform - Amphibians (Link to full list)

Family Scientific Name Common Name No. Occurrences

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<u>Lifeform - Angiosperms</u>

Number of Angiosperms 0

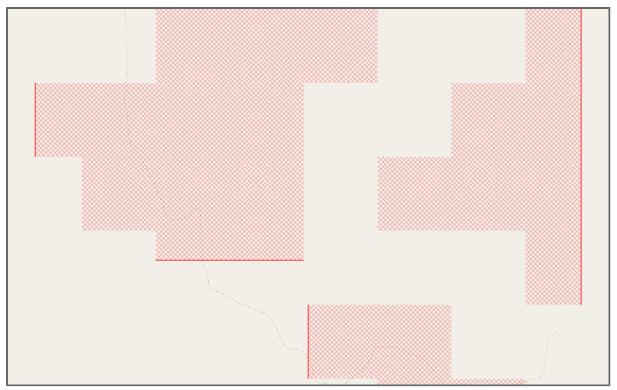


Figure 11 : Map of Lifeform - Angiosperms

Table 11: Lifeform - Angiosperms (Link to full list)

Family Scientific Name Common Name No. Occurrences

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Lifeform - Animals

Number of Animals 0

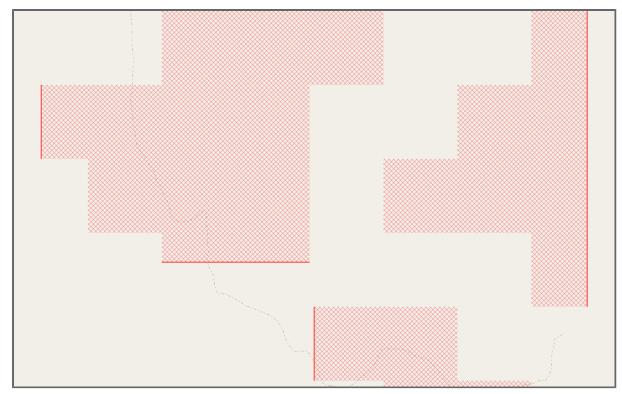


Figure 12 : Map of Lifeform - Animals

Table 12: Lifeform - Animals (Link to full list)

Family Scientific Name Common Name No. Occurrences

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<u>Lifeform - Birds</u>

Number of Birds 0

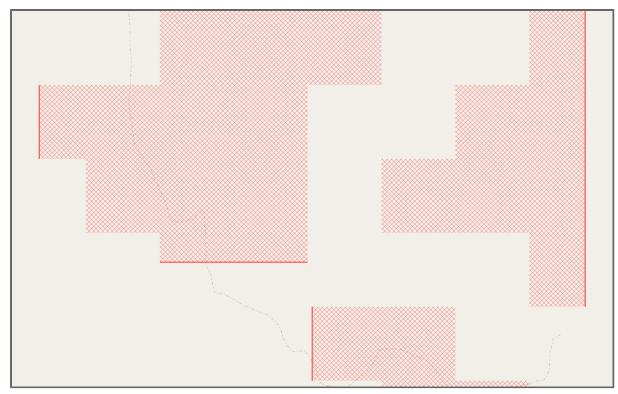


Figure 13 : Map of Lifeform - Birds

Table 13: Lifeform - Birds (Link to full list)

Family	Scientific Name	Common Nome	No. Occurrences	
Family	Scientific Name	Common Name	No. Occurrences	

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Lifeform - Dicots

Number of Dicots 1

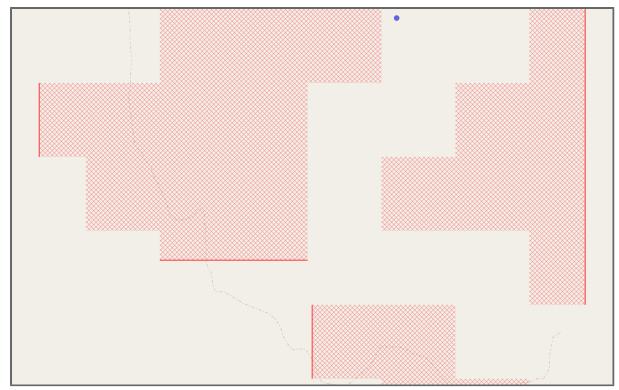


Figure 14 : Map of Lifeform - Dicots

Table 14: Lifeform - Dicots (Link to full list)

Family	Scientific Name	Common Name	No. Occurrences
Scrophulariaceae	Eremophila macgillivrayi	Dog-bush	1

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<u>Lifeform - FernsAndAllies</u>

Number of FernsAndAllies 0

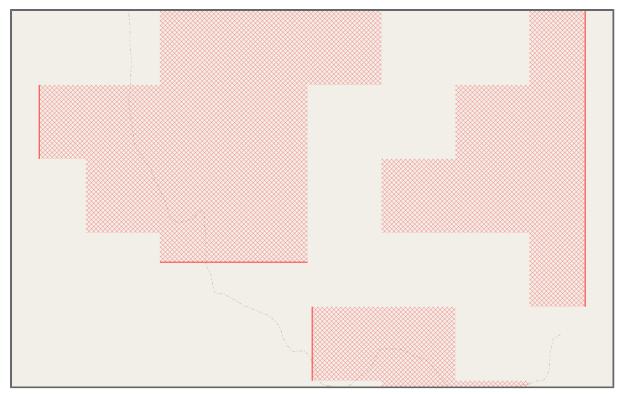


Figure 15 : Map of Lifeform - FernsAndAllies

Table 15: Lifeform - FernsAndAllies (Link to full list)

Family Scientific Name Common Name No. Occurrences

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<u>Lifeform - Fishes</u>

Number of Fishes 0

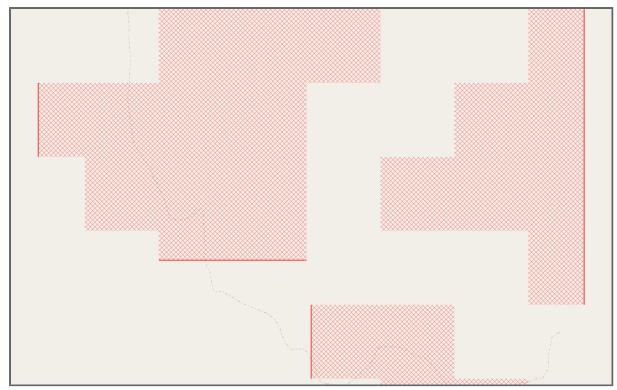


Figure 16 : Map of Lifeform - Fishes

Table 16: Lifeform - Fishes (Link to full list)

Family	Scientific Name	Common Nome	No. Occurrences	
Family	Scientific Name	Common Name	No. Occurrences	

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<u>Lifeform - Gymnosperms</u>

Number of Gymnosperms 0

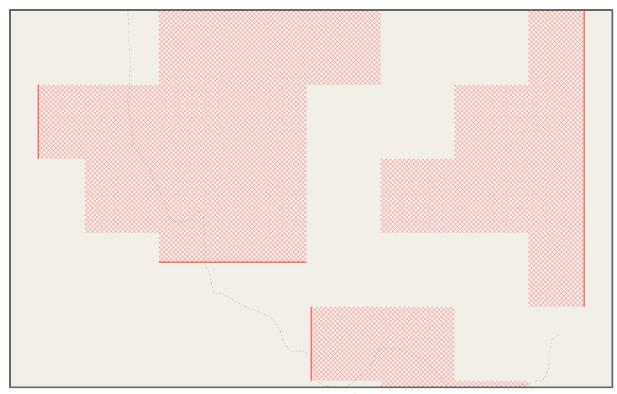


Figure 17 : Map of Lifeform - Gymnosperms

Table 17: Lifeform - Gymnosperms (Link to full list)

Family Scientific Name Common Name No. Occurrences

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<u>Lifeform - Mammals</u>

Number of Mammals 0

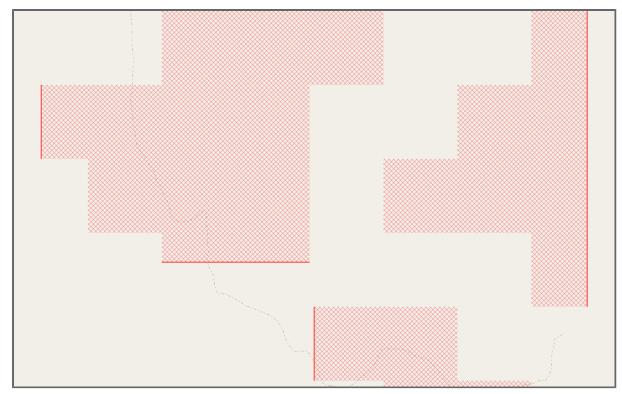


Figure 18 : Map of Lifeform - Mammals

Table 18: Lifeform - Mammals (Link to full list)

Family Scientific Name Common Name No. Occurrences

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<u>Lifeform - Monocots</u>

Number of Monocots 0

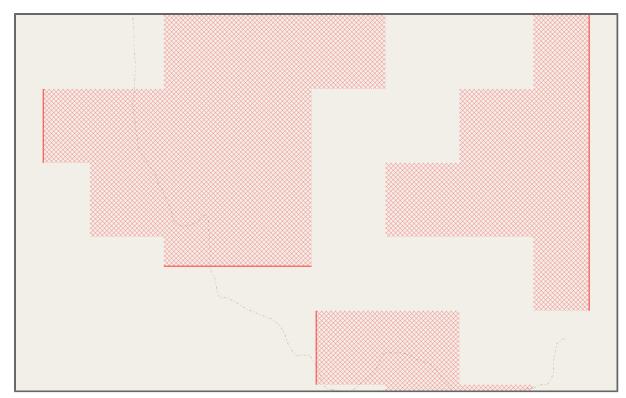


Figure 19: Map of Lifeform - Monocots

Table 19: Lifeform - Monocots (Link to full list)

Family Scientific Name Common Name No. Occurrences

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Lifeform - Plants

Number of Plants 1

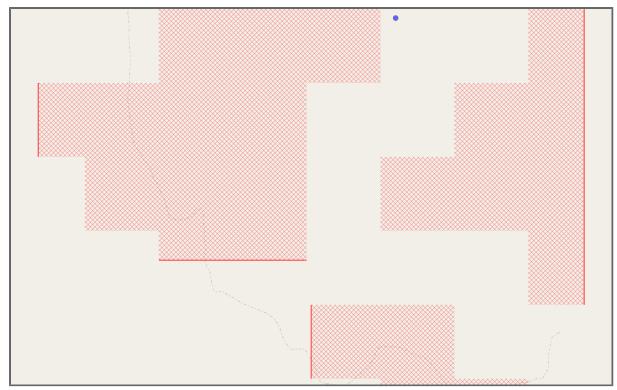


Figure 20 : Map of Lifeform - Plants

Table 20: Lifeform - Plants (Link to full list)

Family	Scientific Name	Common Name	No. Occurrences
Scrophulariaceae	Eremophila macgillivrayi	Dog-bush	1

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<u>Lifeform - Reptiles</u>

Number of Reptiles 0

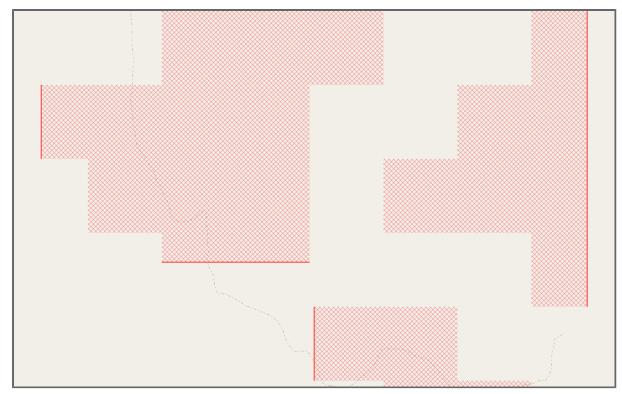


Figure 21 : Map of Lifeform - Reptiles

Table 21: Lifeform - Reptiles (Link to full list)

Family Scientific Name Common Name No. Occurrences

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Expert Distributions

Number of expert distributions: 179

Table 22: Expert Distributions

CORVIDAE Corvus bennetti Little Crow Expert distribution Corvus bennetti 5705338.98 CLIMACTERIDAE Dilmacteris (Climacteris) Brown Trecerceper Expert distribution Climacteris picumnus Ground Corvus bennetti 5705338.98 CAMPEPHAGIDAE Corturis (Coturinis) pectoralis ARTAMIDAE Coturis (Coturinis) pectoralis Subbble Quail Expert distribution Caturitx pectoralis GAB561.61 ARTAMIDAE Coturis (Coturinis) pectoralis Subbble Quail Expert distribution Caturitx pectoralis GAB561.61 THRESKIORNITHIDAE Platalea (Platatis) flavipes Spoonbill Expert distribution Cracticus torquatus Grey Butcherbird Expert distribution Cracticus torquatus Grey Butcherbird Expert distribution Cracticus torquatus GAB561.61 CAMPEPHAGIDAE Coraciona (Coracina) Black-faced Spoonbill Expert distribution Cracticus and Coraciona novaehollandiae Cuckoo-ehrike Coraciona novaehollandiae Cuckoo-ehrike Coraciona novaehollandiae Cuckoo-ehrike Coraciona novaehollandiae Cuckoo-ehrike Coraciona progularis Platatis Raven Expert distribution Cracticus nigrogularis Platatis Raven Expert distribution Cracticus nigrogularis Platatis Raven Expert distribution Cracticus nigrogularis Platatis Cuckoo Expert distribution Cracticus nigrogularis Platatis Cuckoo Expert distribution Cracticus nigrogularis Platatis Cuckoo Expert distribution Cracticus nigrogularis Platatis Plat	Family	Scientific Name	Common Name	Min Depth	Max Depth	Area Name	Area sq km
CLIMACTERIDAE Climacteris (Climacteris) plcumnus 2277553.50 CAMPEPHAGIDAE Coracina (Peropodocys) anaxima (Ouckoo-shrike Quale Expert distribution Coracina maxima 6417009.57 PHASIANIDAE Coturnix (Coturnix) pectoralis Stubble Qual Expert distribution Coturnix pectoralis 6348551.61 ARTAMIDAE Cracicus torquatus Grey Butcherbird Expert distribution Cracicus torquatus 428212.34 THRESKIORNITHIDAE Platalea (Platabls) flavipes Spoonbill Expert distribution Cracicus torquatus 428212.34 THRESKIORNITHIDAE Platalea (Platabls) flavipes Spoonbill Expert distribution Cracicus torquatus 4277240.77 CAMPEPHAGIDAE Coracina (Coracina) Black-faced Expert distribution Cracicus and Expert distribution Cracicus and Coracina (Coracina) and Expert distribution Cracicus and Expert distribution Cracicus and Expert distribution Cracicus and Expert distribution Cracicus and Expert Guidatinum Cracicus and Expert distribution Cracicus and Expert Guidatinum Cracicus and Expert Gui	MELIPHAGIDAE	Certhionyx niger	Black Honeyeater			Expert distribution Certhionyx niger	5462673.98
CAMPEPHAGIDAE Coracina (Pteropodocys) Groud maxima Cuckoo-shrike Expert distribution Coracina maxima 6417008.57 PHASIANIDAE Cotunix (Cotumix) pectoralis Subble Quali Expert distribution Coracina maxima 6417008.57 PHASIANIDAE Cotunix (Cotumix) pectoralis Subble Quali Expert distribution Cotunix pectoralis 6348551.61 ARTAMIDAE Cracicus torquatus Grey Butcherbird Expert distribution Cracicus torquatus 6428212.31 PHASIANIDAE Platalea (Platibis) flavipes Sponobili Expert distribution Cracicus torquatus 6428212.31 PHASIANIDAE Platalea (Platibis) flavipes Sponobili Expert distribution Cracicus torquatus 6428212.31 PHASIANIDAE Coracina (Coracina) Black-faced Expert distribution Coracina novaehollandiae Cuckoo-shrike Coracina (Coracina) Phasia	CORVIDAE	Corvus bennetti	Little Crow			Expert distribution Corvus bennetti	5705338.98
DAMPEPHAGIANIDAE Coturnix (Coturnix) pectoralis Stubble Qual Expert distribution Coturnix pectoralis 6348551 61 ARTAMIDAE Cracticus torquatus Grey Butcherbird Expert distribution Coturnix pectoralis 6348551 61 ARTAMIDAE Cracticus torquatus Grey Butcherbird Expert distribution Cracticus torquatus 6428212.34 THRESKIORNITHIDAE Platales (Platibis) flavipes Sponobil Expert distribution Platales flavipes 4717240.77 CAMPEPHAGIDAE Coracina Coracina Coracina Coracina Coracina novaehollandriae Cuckoo-shrike novaehollandriae Cuckoo-shrike novaehollandriae Report distribution Cracticus organization of the Coracina novaehollandriae Cuckoo-shrike Expert distribution Cracticus organization of the Coracina novaehollandriae Report Coracina novaehollandriae Report Coracina (Coracina novaehollandriae Report Coracina novaehollandriae	CLIMACTERIDAE		Brown Treecreeper			Expert distribution Climacteris picumnus	2277553.59
ARTAMIDAE Cracticus torquatus Grey Butcherbird Expert distribution Cracticus torquatus 6428212.34 THRESKIORNITHIDAE Platalea (Platibis) flavipes Sponobil Expert distribution Platalea flavipes 4717240.77 CAMPEPHAGIDAE Coracina (Coracina) Black-faced Expert distribution Coracina 672672.64 CORVIDAE Corvus coronoides Australian Raven Expert distribution Coracina 672572.64 ARTAMIDAE Cracticus nigrogularis Plad Butcherbird Expert distribution Coracina 672572.64 ARTAMIDAE Cracticus nigrogularis 672572.64 CUCUUDAE Cuculus pallidus Palid Cuckoo Expert distribution Corcus nigrogularis 672572.64 ARTAMIDAE Dicaeum (Dicaeum) Mistletoebird Expert distribution Dicaeum hirundinaceum 604923.75 NECTARINIIDAE Placarum (Dicaeum) Mistletoebird Expert distribution Dicaeum hirundinaceum 604923.75 PELECANIDAE Placarum (Corapbellomis) Supercilicus Voodewallow Expert distribution Artamus supercilicus 7195470.64 ARTAMIDAE Artamus (Campbellomis) Whodewallow Expert distribution Artamus supercilicus 7195470.64 ARTAMIDAE Childonias (Pelodes) hybrida White-browed Expert distribution Childonias hybrida 1766691.33 RALLIDAE Childonias (Pelodes) hybrida Eurasian Coot Expert distribution Childonias hybrida 402135556.61 Mesophoyx intermedia Expert distribution Fulica atra Eurasian Coot Expert distribution Fulica atra Mesophoyx intermedia Expert distribution Mesophoyx intermedia Expert distribution Placlacroorax 8881748.39 ARDEIDAE Ardaa (Ardaa) pacifica White-necked Haron Expert distribution Ardaa pacifica 752467.66 ARDEIDAE Nyctorax caledonicus Narkeen Night-haron Expert distribution Arcaa pacifica 752467.66 ARDEIDAE Apus pacificus Fork-taled Swift Expert distribution Childonias reparticus 8782747.68 ARDEIDAE Anas (Araca) pacificus Pork-taled Swift Expert distribution Childonias reparticus 6850159.42 ARDEIDAE Anas (Araca) pacificus Pork-taled Swift Expert distribution Childorian Marca 8782781.87 ARDEIDAE Anas (Araca) susperciliosa Royal Pork-taled Swift Pork-taled Swift Pork-taled Swift Pork-taled Swift Pork-taled Swift Pork-taled Swift Pork-taled	CAMPEPHAGIDAE					Expert distribution Coracina maxima	6417009.57
THRESKIORNITHIDAE Platalea (Platibis) flavipes Spoorbill Spoorbill Spoorbill CAMPEPHAGIDAE Coracina (Coracina) Black-faced Cuckoo-shrike Coroval Coracina (Coracina) Coracina (Coracina) Cuckoo-shrike Shrike	PHASIANIDAE	Coturnix (Coturnix) pectoralis	Stubble Quail			Expert distribution Coturnix pectoralis	6348551.61
THRESKIORNITHIDAE Platalea (Platables) flavipes Spoonbill Expert distribution Platalea flavipes 4717240.77 CAMPEPHAGIDAE Coracina (Coracina) Black-faceed Expert distribution Coracina novaehollandiae Cuckoo-shrike novaehollandiae Cuckoo-shrike novaehollandiae Cuckoo-shrike novaehollandiae Cuckoo-shrike novaehollandiae Cuckoo-shrike novaehollandiae Cuckoo-shrike novaehollandiae R275248.68 CORVIDAE Corcuius pallidus Palid Cuckoo Expert distribution Corcuius pallidus 778647.90 CUCULIDAE Cuculus pallidus Palid Cuckoo Expert distribution Cuculus pallidus 778647.90 NECTAFINIIDAE Nicundinacoum Misteletoebird Expert distribution Dicaeum hirundinacoum 6604923.75 PELECANIDAE Pelecanus conspicillatus Australian Pelican Expert distribution Pelecanus conspicillatus 6627953.98 ARTAMIDAE Artamus (Campbellornis) White-browed Expert distribution Artamus superciliosus 90046wallow Expert distribution Artamus superciliosus 90046wallow Expert distribution Childonias hybrida 31766691.33 FAILLIDAE Childonias (Pelodes) hybrida Whiskered Tern Expert distribution Fulica atra 40213555.61 Fulica atra Eurasian Coot Expert distribution Fulica atra 40213555.61 Mesophoyx intermedia Expert distribution Mesophoyx intermedia Expert distribution Mesophoyx intermedia Expert distribution Mesophoyx intermedia Expert distribution Mesophoyx intermedia 28849005.81 Phalacrocorax melanoleucos Rankeen Night-heron Expert distribution Ardea pacifica 752467.68 APOEIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Ardea pacifica 752467.68 APOEIDAE Nyctorax caledonicus Nankeen Night-heron Expert distribution Cacatus asmguinea 5339700.99 APOEIDAE Nyctorax caledonicus Nankeen Night-hero Expert distribution Cacatus asmguinea 5339700.99 APOEIDAE Nyctorax caledonicus Nankeen Night-hero Expert distribution Cacatus asmguinea 5339700.99 APOEIDAE Aras (Nettion) gracilis Grey Teal Expert distribution Charamoeca 1235941.71 Expert distribution Charamoeca 1235941.71 Expert distribution Charamoeca 1235941.71 Expert distribution Charamoeca 1	ARTAMIDAE	Cracticus torquatus	Grey Butcherbird			Expert distribution Cracticus torquatus	6428212.34
CAMPEPHAGIDAE novaehollandiae Cuckoo-shrike novaehollandiae 8752748.68 CORVIDAE Corvus cornoides Australian Raven Expert distribution Corovus cornoides 4821723.12 ARTAMIDAE Cracticus nigrogularis Pied Butcherbird Expert distribution Cracticus nigrogularis 67352726 CUCULIDAE Cuculus pallidus Paid Cuckoo Expert distribution Cuculus pallidus 7788647.90 NECTARINIIDAE Dicaeum (Dicaeum (Dicaeum) NECTARINIIDAE Dicaeum (Dicaeum) NECTARINIIDAE Pelecanus conspicillatus Australian Pelecan Expert distribution Dicaeum hirundinaceum 6504923.75 NECTARINIIDAE Pelecanus conspicillatus Australian Pelecan Expert distribution Pelecanus conspicillatus 6627953.98 ARTAMIDAE Artamus (Campbellomis) White-browed Supercilicus Woodswallow Woodswallow Expert distribution Artamus supercilicus Woodswallow Woodswallow Expert distribution Childonias hybrida 31766991.31 ARALIDAE Childonias (Pelodes) hybrida Whiskored Tern Expert distribution Childonias hybrida 31766991.31 ARALIDAE Fulica atra Eurasian Coot Expert distribution Tringa stagnatilis Mesophoyx intermedia Expert distribution Mesophoyx intermedia 28849005.81 Mesophoyx intermedia Expert distribution Mesophoyx intermedia 28849005.81 Phalacrocorax melanoleucos Expert distribution Ardea pacifica 7532467.66 CACATUIDAE Ardea (Acidea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467.66 CACATUIDAE Ardea (Acidea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467.66 CACATUIDAE Nycticorax caledonicus Nankeen Night-heron Expert distribution Nycticorax caledonicus 7827813 18 Apodidae Apus pacificus Fork-tailed Switt Expert distribution (New Phalacrocorax melanoleucos Profita Apus pacificus Fork-tailed Switt Expert distribution (New Phalacrocorax Pacifica Swallow Phalacrocorax Caledonicus 7827813 18 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Cheramoeca 1235941.71 RECURVIROSTRIDAE Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus 1295039.34 ANATIDAE Anas (Nettion) gracilis Sacred Kingfisher Expert distribution P	THRESKIORNITHIDAE	Platalea (Platibis) flavipes				Expert distribution Platalea flavipes	4717240.77
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NECTARINIDAE Dicaeum (Dicaeum) hirundinaceum Mistletoebird Expert distribution Dicaeum hirundinaceum 6504923.75 PELECANIDAE Pelecanus conspicillatus Australian Pelican Expert distribution Pelecanus conspicillatus 6627953.98 ARTAMIDAE Artamus (Campbellornis) Superciliosus White-browed Woodswallow Expert distribution Artamus superciliosus 7195470.64 ARIDAE Chidonias (Pelodes) hybrida Whiskered Tern Expert distribution Childonias hybrida 31766991.33 RALLIDAE Fulica atra Eurasian Coot Expert distribution Fulica atra 40213555.68 SCOLOPACIDAE Tringa (Rhyacophilus) stagnatilis Marsh Sandpiper Expert distribution Fulica atra 40213555.68 SCOLOPACIDAE Tringa (Rhyacophilus) stagnatilis Marsh Sandpiper Expert distribution Fulica atra 40213555.68 SCOLOPACIDAE Ardea (Ardea) pacifica Expert distribution Problem Expert distribution Problem 28849005.88 Expert distribution Problem 28849005.88 Expert distribution Problem 28849005.88 Expert distribution Ardea pacifica 7532467.66 ARDEIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467.66 ARDEIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Acaetaus anguinea Expert distribution Ardea pacifica 7532467.66 APDEIDAE Nyctocrax caledonicus Narkeen Night-heron Expert distribution Cacataus anguinea Saryono.99 ARDEIDAE Apus pacificus Fork-tailed Swift Expert distribution Chearamoeca Pacifica 7827891.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution Chearamoeca Pacifica 7827891.87 APDEIDAE Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus Pacificus Swallow Pacifica Phase Ardea (Ardea) pacificus Phase Ardea (Ardea) pacificus Sanctus Phase Ardea (Ardea) pacificus Phase Ardea (Ardea) pacificus Phase Ardea (Ardea) pacificus Phase Ardea (Ardea) pacificus Phase Ardea (Ardea) Phase Ardea (ARTAMIDAE	Cracticus nigrogularis	Pied Butcherbird			Expert distribution Cracticus nigrogularis	6375272.64
NECI AHINIDAE hirundinaceum Mistelcebird Expert distribution Dicaeum Inrundinaceum 6504923,78 PELECANIDAE Pelecanus conspiciliatus Australian Pelican Expert distribution Pelecanus conspiciliatus 6627953,88 ARTAMIDAE Artamus (Campbellornis) White-browed Expert distribution Pelecanus conspiciliatus 6627953,88 ARTAMIDAE Childonias (Pelodes) hybrida Woodswallow Expert distribution Pelecanus conspiciliatus 7195470,64 LARIDAE Fulica atra Eurasian Coot Expert distribution Fulica atra 40213555,68 SCOLOPACIDAE Tringa (Rhyacophilus) stagnatilis Marsh Sandpiper Expert distribution Tringa stagnatilis 32002835,93 Mesophoyx intermedia Expert distribution Mesophoyx intermedia 28849005,81 Phalacrocorax melanoleucos Expert distribution Mesophoyx intermedia 28849005,81 Phalacrocorax melanoleucos Expert distribution Phalacrocorax melanoleucos Expert distribution Ardea pacifica 7532467,66 CACATUIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467,66 CACATUIDAE Qacatua (Licmetis) sanguinea Little Corella Expert distribution Nycticorax caledonicus Nankeen Night-heron Expert distribution Nycticorax caledonicus 7827831,87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution Cheramoeca 6850159,42 HIRUNDINIDAE Cheramoeca leucosterna White-backed Expert distribution Cheramoeca 5235941,71 RECURVIROSTRIDAE Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus leucosterna 6235941,71 RECURVIROSTRIDAE Churinix (Synoticus) ypsilophora Brown Quali Expert distribution Coturnix ypsilophora 867666,03 ALCEDINIDAE Anas (Nation) gracilis Grey Teal Expert distribution Todiramphus 8854807,76 RALIDAE Anas (Anas) supercillosa Pacific Black Duck Expert distribution Poratana tabuensis 2328613,11 MELIPHAGIDAE Porana (Porzana) tabuensis Spotless Crake Expert distribution Phaps histrionica 752096,19 POMATOSTOMIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 752096,19 POMATOSTOMIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution A	CUCULIDAE	Cuculus pallidus	Palid Cuckoo			Expert distribution Cuculus pallidus	7788647.90
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SCOLOPACIDAE Tringa (Rhyacophilus) stagnatilis Marsh Sandpiper Expert distribution Tringa stagnatilis 2002835.93 Mesophoyx intermedia Expert distribution Mesophoyx intermedia 28849005.84 Phalacrocorax melanoleucos Expert distribution Phalacrocorax melanoleucos melanoleucos melanoleucos melanoleucos melanoleucos melanoleucos melanoleucos melanoleucos melanoleucos 7532467.66 CACATUIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467.66 CACATUIDAE Cacatua (Licmetis) sanguinea Little Corella Expert distribution Oxeatua sanguinea 5339700.99 ARDEIDAE Nycticorax caledonicus Nankeen Night-heron Expert distribution Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution (Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution (Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution (Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus White-backed Expert distribution Cheramoeca 18235941.71 RECURVIROSTRIDAE Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus 1295039.34 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Phaps histrionica 2328613.11 MELIPHAGIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Phaps (Histriophaps) Histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 ANATIDAE Sitctonetta naevosa Freckled Duck Expert distribution Anas rhynchotis 4469444.80 ANATIDAE Cincloramphus (Cincloramphus) Cin	LARIDAE	Chlidonias (Pelodes) hybrida	Whiskered Tern			Expert distribution Chlidonias hybrida	31766691.37
Mesophoyx intermedia Expert distribution Mesophoyx intermedia 28849005.88 Phalacrocorax melanoleucos Expert distribution Phalacrocorax melanoleucos 5881748.39 ARDEIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467.66 CACATUIDAE Cacatua (Licmetis) sanguinea Little Corella Expert distribution Cacatua sanguinea 5339700.99 ARDEIDAE Nycticorax caledonicus Nankeen Night-heron Expert distribution Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution (likely) Apus pacificus 6850159.42 HIRUNDINIDAE Cheramoeca leucosterna Swallow Expert distribution Cheramoeca leucosterna leucosterna leucosterna leucosterna leucosterna RECURVIROSTRIDAE Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus leucocephalus 1295039.34 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) Cincloramphus Cincloramphus Coruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	RALLIDAE	Fulica atra	Eurasian Coot			Expert distribution Fulica atra	40213555.69
Phalacrocorax melanoleucos ARDEIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467-66 CACATUIDAE Cacatua (Licmetis) sanguinea Little Corella Expert distribution Ardea pacifica 7532467-66 CACATUIDAE Nycticorax caledonicus Nankeen Night-heron Expert distribution Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution (Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution (Nycticorax caledonicus 6850159.42 HIRUNDINIDAE Cheramoeca leucosterna White-backed Swallow Expert distribution Cheramoeca leucosterna 8940low Expert distribution Cheramoeca leucosterna 1295039.34 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Epthianura (Aurepthianura) Yellow Chat Expert distribution Epthianura crocea 2190499.15 COLUMBIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Pornatostomus superciliosus Babbler Superciliosus Superciliosus Superciliosus Superciliosus Babbler Expert distribution Pomatostomus 3752096.19 POMATOSTOMIDAE Anas (Spatula) rhynchotis Autsrlasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	SCOLOPACIDAE	Tringa (Rhyacophilus) stagnatilis	Marsh Sandpiper			Expert distribution Tringa stagnatilis	32002835.93
ARDEIDAE Ardea (Ardea) pacifica White-necked Heron Expert distribution Ardea pacifica 7532467.66 CACATUIDAE Cacatua (Licmetis) sanguinea Little Corella Expert distribution Ardea pacifica 7532467.66 CACATUIDAE Nycticorax caledonicus Nankeen Night-heron Expert distribution Cacatua sanguinea 5339700.98 ARDEIDAE Nycticorax caledonicus Nankeen Night-heron Expert distribution Cacatua sanguinea 6850159.42 Apodidae Apus pacificus Fork-tailed Swift Expert distribution Cheramoeca 6850159.42 HIRUNDINIDAE Cheramoeca leucosterna White-backed Swallow Expert distribution Cheramoeca 19253941.71 Expert distribution Cladorhynchus 1925093.34 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Cladorhynchus 1925039.34 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) Sacred Kingfisher Expert distribution Anas superciliosa 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Anas superciliosa 8865221.53 RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Epthianura (Aurepthianura) crocea 219049.15 COLUMBIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Pomatostomus (Morganornis) Spotless Crake Expert distribution Pomatostomus superciliosus Superciliosus Rabbler Superciliosus Superciliosus Superciliosus Superciliosus Superciliosus Superciliosus Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) cruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53		Mesophoyx intermedia				Expert distribution Mesophoyx intermedia	28849005.88
CACATUIDAE Cacatua (Licmetis) sanguinea Little Corella Expert distribution Cacatua sanguinea 5339700.99 ARDEIDAE Nycticorax caledonicus Nankeen Night-heron Expert distribution Nycticorax caledonicus 7827831.87 Apodidae Apus pacificus Fork-tailed Swift Expert distribution (likely) Apus pacificus 6850159.42 HIRUNDINIDAE Cheramoeca leucosterna Swallow Expert distribution Cheramoeca leucosterna Swallow leucocephalus Leucocephalus Banded Stilt Expert distribution Cladorhynchus leucocephalus ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) sanctus Sacred Kingfisher Expert distribution Anas superciliosa 885221.53 RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Stitchnetta naevosa Freckled Duck Expert distribution Stitconetta naevosa 2088858.97 ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) Sporteralis Expert distribution Cincloramphus cruralis 6413759.53		Phalacrocorax melanoleucos				•	5881748.39
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Apodidae Apus pacificus Fork-tailed Swift Expert distribution (likely) Apus pacificus 6850159.42 HIRUNDINIDAE Cheramoeca leucosterna White-backed Swallow Expert distribution Cheramoeca 15235941.71 RECURVIROSTRIDAE Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus 1295039.34 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Anas superciliosa 8885221.53 RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Epthianura (Aurepthianura) Crocea Yellow Chat Expert distribution Epthianura crocea 2190499.15 COLUMBIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Stictonetta naevosa Freckled Duck Expert distribution Pomatostomus 4638332.32 ANATIDAE Stictonetta naevosa Freckled Duck Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) Cruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	CACATUIDAE	Cacatua (Licmetis) sanguinea	Little Corella			Expert distribution Cacatua sanguinea	5339700.99
HIRUNDINIDAE Cheramoeca leucosterna Swallow Expert distribution Cheramoeca leucosterna Swallow leucosterna Expert distribution Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus leucocephalus leucocephalus Phasia leucocephalus leucocephalus leucocephalus leucocephalus leucocephalus leucocephalus leucocephalus RANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Anas superciliosa 8885221.53 RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Epthianura (Aurepthianura) Yellow Chat Expert distribution Epthianura crocea 2190499.15 Crocea COLUMBIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Stictonetta naevosa Freckled Duck Expert distribution Stictonetta naevosa 2088858.97 ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Cincloramphus cruralis 6413759.53 Cruralis		Nycticorax caledonicus	Nankeen Night-heron			Expert distribution Nycticorax caledonicus	7827831.87
HIHUNDINIDAE Cheramoeca leucosterna Swallow leucosterna 5235941.71 RECURVIROSTRIDAE Cladorhynchus leucocephalus Banded Stilt Expert distribution Cladorhynchus leucocephalus 1295039.34 ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Anas superciliosa 8885221.53 RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Epthianura (Aurepthianura) Yellow Chat Expert distribution Portana tabuensis 2328613.11 MELIPHAGIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Pomatostomus (Morganornis) Superciliosus Babbler Superciliosus Superciliosus Babbler Superciliosus Superciliosus Superciliosus RANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Cincloramphus cruralis 6413759.53	Apodidae	Apus pacificus	Fork-tailed Swift			Expert distribution (likely) Apus pacificus	6850159.42
ANATIDAE Anas (Nettion) gracilis Grey Teal Expert distribution Anas gracilis 8854807.76 PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) sanctus Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Anas superciliosa 8885221.53 RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Pomatostomus (Morganornis) White-browed Expert distribution Pomatostomus superciliosus Babbler Superciliosus Superciliosus Spotles Superciliosus Superciliosus Superciliosus Superciliosus Superciliosus Superciliosus Superciliosus Superciliosus Expert distribution Pomatostomus 4638332.32 ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) cruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	HIRUNDINIDAE	Cheramoeca leucosterna				•	5235941.71
PHASIANIDAE Coturnix (Synoicus) ypsilophora Brown Quail Expert distribution Coturnix ypsilophora 5867626.03 ALCEDINIDAE Todiramphus (Todiramphus) sanctus Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 ANATIDAE Anas (Anas) superciliosa Pacific Black Duck Expert distribution Anas superciliosa 8885221.53 RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Epthianura (Aurepthianura) Yellow Chat Expert distribution Epthianura crocea 2190499.15 COLUMBIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Stictonetta naevosa Freckled Duck Expert distribution Stictonetta naevosa 2088858.97 ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) cruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	RECURVIROSTRIDAE	Cladorhynchus leucocephalus	Banded Stilt				1295039.34
ALCEDINIDAE Todiramphus (Todiramphus) sanctus ANATIDAE Anas (Anas) superciliosa RALLIDAE Porzana (Porzana) tabuensis MELIPHAGIDAE COLUMBIDAE Pomatostomus (Morganornis) superciliosus Babbler Pomatostomus (Morganornis) superciliosus ANATIDAE Anas (Spatula) rhynchotis MEGALURIDAE Todiramphus (Todiramphus) sanctus Sacred Kingfisher Expert distribution Todiramphus sanctus 8251815.38 Expert distribution Anas superciliosa 8885221.53 Expert distribution Porzana tabuensis 2328613.11 Expert distribution Epthianura crocea 2190499.15 Expert distribution Phaps histrionica 3752096.19 Expert distribution Pomatostomus 4638332.32 4638332.32 Expert distribution Stictonetta naevosa Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis Expert distribution Anas rhynchotis Expert distribution Anas rhynchotis Expert distribution Cincloramphus cruralis Expert distribution Cincloramphus cruralis	ANATIDAE	Anas (Nettion) gracilis	Grey Teal			Expert distribution Anas gracilis	8854807.76
ANATIDAE Sanctus ANATIDAE Anas (Anas) superciliosa Anas (Anas) superciliosa Pacific Black Duck Expert distribution Anas superciliosa Expert distribution Porzana tabuensis Spotless Crake Expert distribution Porzana tabuensis Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE COLUMBIDAE Phaps (Histriophaps) histrionica Pomatostomus (Morganornis) Superciliosus Babbler ANATIDAE Anas (Spatula) rhynchotis MEGALURIDAE Sincoloramphus (Cincloramphus) Cincloramphus (Cincloramphus) Concloramphus (Ci	PHASIANIDAE	Coturnix (Synoicus) ypsilophora	Brown Quail			Expert distribution Coturnix ypsilophora	5867626.03
RALLIDAE Porzana (Porzana) tabuensis Spotless Crake Expert distribution Porzana tabuensis 2328613.11 MELIPHAGIDAE Epthianura (Aurepthianura) crocea Yellow Chat Expert distribution Epthianura crocea 2190499.15 COLUMBIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Expert distribution Phaps histrionica 3752096.19 POMATOSTOMIDAE Pomatostomus (Morganornis) White-browed Expert distribution Pomatostomus superciliosus Babbler superciliosus Superciliosus Superciliosus Expert distribution Stictonetta naevosa 208858.97 ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) cruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	ALCEDINIDAE		Sacred Kingfisher			Expert distribution Todiramphus sanctus	8251815.38
MELIPHAGIDAE Epthianura (Aurepthianura) rocea COLUMBIDAE Phaps (Histriophaps) histrionica Flock Bronzewing Pomatostomus (Morganornis) White-browed superciliosus ANATIDAE ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler MEGALURIDAE Expert distribution Epthianura crocea 2190499.15 Expert distribution Phaps histrionica 3752096.19 Expert distribution Pomatostomus superciliosus Expert distribution Phaps histrionica 3752096.19 Expert distribution Pomatostomus superciliosus Expert distribution Stictonetta naevosa 2088858.97 Expert distribution Anas rhynchotis 4469444.80 Expert distribution Cincloramphus cruralis 6413759.53	ANATIDAE	Anas (Anas) superciliosa	Pacific Black Duck			Expert distribution Anas superciliosa	8885221.53
COLUMBIDAE Crocea Phaps (Histriophaps) histrionica Flock Bronzewing Pomatostomus (Morganornis) Superciliosus ANATIDAE ANATIDAE Anas (Spatula) rhynchotis MEGALURIDAE Crocea Yellow Chat Expert distribution Eptnianura crocea Expert distribution Phaps histrionica Flock Bronzewing Expert distribution Phaps histrionica Flock Bronzewing Expert distribution Phaps histrionica Freckled Duck Expert distribution Phaps histrionica Freckled Duck Expert distribution Stictonetta naevosa Freckled Duck Expert distribution Stictonetta naevosa Cincloramphus (Cincloramphus) Cruralis Brown Songlark Expert distribution Cincloramphus cruralis Expert distribution Cincloramphus cruralis	RALLIDAE	Porzana (Porzana) tabuensis	Spotless Crake			Expert distribution Porzana tabuensis	2328613.11
POMATOSTOMIDAE Pomatostomus (Morganornis) White-browed Expert distribution Pomatostomus superciliosus Babbler superciliosus ANATIDAE Stictonetta naevosa Freckled Duck Expert distribution Stictonetta naevosa 2088858.97 ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) Cruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	MELIPHAGIDAE		Yellow Chat			Expert distribution Epthianura crocea	2190499.15
ANATIDAE superciliosus Babbler superciliosus ANATIDAE Stictonetta naevosa Freckled Duck Expert distribution Stictonetta naevosa 2088858.97 ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	COLUMBIDAE	Phaps (Histriophaps) histrionica	Flock Bronzewing			Expert distribution Phaps histrionica	3752096.19
ANATIDAE Anas (Spatula) rhynchotis Australasian Shoveler Expert distribution Anas rhynchotis 4469444.80 MEGALURIDAE Cincloramphus (Cincloramphus) Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	POMATOSTOMIDAE						4638332.32
MEGALURIDAE Cincloramphus (Cincloramphus) cruralis Brown Songlark Expert distribution Cincloramphus cruralis 6413759.53	ANATIDAE	Stictonetta naevosa	Freckled Duck			Expert distribution Stictonetta naevosa	2088858.97
MEGALURIDAE Brown Songlark Expert distribution Cincioramphus cruralis 6413759.53	ANATIDAE	Anas (Spatula) rhynchotis	Australasian Shoveler			Expert distribution Anas rhynchotis	4469444.80
Cincloramphus (Maclennania) Expert distribution Cincloramphus	MEGALURIDAE		Brown Songlark			Expert distribution Cincloramphus cruralis	6413759.53
		Cincloramphus (Maclennania)				Expert distribution Cincloramphus	

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MEGALURIDAE	mathewsi	Rufous Songlark	mathewsi	6703622.88
MALURIDAE	Malurus (Leggeornis) lamberti	-	Expert distribution Malurus lamberti	5949897.59
Rostratulidae	Rostratula benghalensis (sensu	Painted Snipe	Expert distribution (maybe) Rostratula	4290580.99
DOITTACIDAE	lato)	Dudanina	benghalensis (sensu lato)	F04F00F F7
PSITTACIDAE Thylosomyidae	Melopsittacus undulatus	Budgerigar	Expert distribution Melopsittacus undulatus	
Thylacomyidae	Macrotis lagotis	Greater Bilby	Expert distribution (maybe) Macrotis lagotis	634419.35
CLIMACTERIDAE	Climacteris (Climacterobates) affinis	White-browed Treecreeper	Expert distribution Climacteris affinis	2639678.68
ANATIDAE	Biziura lobata	Musk Duck	Expert distribution Biziura lobata	2745184.89
ANATIDAE	Oxyura australis	Blue-billed Duck	Expert distribution Oxyura australis	2220865.40
PSITTACIDAE	Psephotus (Psephotus) haematonotus	Red-rumped Parrot	Expert distribution Psephotus haematonotus	1494396.43
ARDEIDAE	Ardea alba	Great White Egret	Expert distribution Casmerodius albus	75783095.10
SCOLOPACIDAE	Calidris (Erolia) acuminata	Sharp-tailed Sandpiper	Expert distribution Calidris acuminata	12325741.41
ARDEIDAE	Egretta garzetta	Little Egret	Expert distribution Egretta garzetta	40036024.12
LARIDAE	Gelochelidon nilotica	Gull-billed Tern	Expert distribution Sterna nilotica	17427456.75
LARIDAE	Hydroprogne caspia	Caspian Tern	Expert distribution Sterna caspia	13971242.26
PHALACROCORACIDAE	Phalacrocorax (Phalacrocorax)	Great Cormorant	Expert distribution Phalacrocorax carbo	29810439.37
THALACHOOCHAOIDAL	carbo	Great Commorant	Expert distribution i malacrocorax carbo	29010409.07
THRESKIORNITHIDAE	Plegadis falcinellus	Glossy Ibis	Expert distribution Plegadis falcinellus	28613832.12
RALLIDAE	Porphyrio (Porphyrio) porphyrio	Purple Swamphen	Expert distribution Porphyrio porphyrio	18612466.94
SCOLOPACIDAE	Steganopus tricolor	Wilson's Phalarope	Expert distribution Steganopus tricolor	43981867.07
TYTONIDAE	Tyto alba	Barn Owl	Expert distribution Tyto alba	63421904.27
ACCIPITRIDAE	Circus assimilis	Spotted Harrier	Expert distribution Circus assimilis	7850851.09
PACHYCEPHALIDAE	Colluricincla (Colluricincla) harmonica	Grey Shrike-thrush	Expert distribution Colluricincla harmonica	6948277.29
THRESKIORNITHIDAE	Platalea (Platalea) regia	Royal Spoonbill	Expert distribution Platalea regia	6253990.16
PODARGIDAE	Podargus strigoides	Tawny Frogmouth	Expert distribution Podargus strigoides	7706572.49
ACCIPITRIDAE	Elanus scriptus	Letter-winged Kite	Expert distribution Elanus scriptus	4311293.02
CACATUIDAE	Eolophus roseicapillus roseicapillus	Galah	Expert distribution Cacatua roseicapilla	7705836.89
MELIPHAGIDAE	Epthianura (Aurepthianura) aurifrons	Orange Chat	Expert distribution Epthianura aurifrons	5633073.89
MELIPHAGIDAE	Epthianura (Parepthianura) tricolor	Crimson Chat	Expert distribution Epthianura tricolor	5508389.08
FALCONIDAE	Falco (Hierofalco) subniger	Black Falcon	Expert distribution Falco subniger	5935857.83
COLUMBIDAE	Phaps (Phaps) chalcoptera	Common Bronzewing	Expert distribution Phaps chalcoptera	5913133.12
Ardeidae	Ardea ibis	Cattle Egret	Expert distribution (maybe) Ardea ibis	6474803.97
ANATIDAE	Anas (Nettion) castanea	Chestnut Teal	Expert distribution Anas castanea	3142293.12
ANATIDAE	Dendrocygna (Leptotarsis) eytoni	Plumed Whistling-duck	Expert distribution Dendrocygna eytoni	4799859.70
MELIPHAGIDAE	Phylidonyris albifrons	White-fronted Honeyeater	Expert distribution Phylidonyris albifrons	4042343.39
CHARADRIIDAE	Charadrius (Eupoda) australis	Inland Dotterel	Expert distribution Charadrius australis	2566074.29
PSITTACIDAE	Psephotus (Psephotus) varius	Mulga Parrot	Expert distribution Psephotus varius	3341400.38
ACANTHIZIDAE	Acanthiza (Geobasileus) uropygialis	Chestnut-rumped Thornbill	Expert distribution Acanthiza uropygialis	4806634.16
MELIPHAGIDAE	Certhionyx (Certhionyx) variegatus	Pied Honeyeater	Expert distribution Certhionyx variegatus	5142828.18
CHARADRIIDAE	Charadrius (Charadrius) ruficapillus	Red-capped Plover	Expert distribution Charadrius ruficapillus	4830132.20
STRIGIDAE	Ninox (Hieracoglaux) connivens	Barking Owl	Expert distribution Ninox connivens	2486340.95
PSOPHODIDAE	Cinclosoma (Samuela) cinnamomeum	Cinnamon Quail-thrush	Expert distribution Cinclosoma cinnamomeum	833783.67
CUCULIDAE	Chrysococcyx osculans	Black-eared Cuckoo	Expert distribution Chrysococcyx osculans	7071593.02
COOLIDAL	Omyggggggy gagara	Diagn Garda Gudhoo	Expert distribution Malacorhynchus	7071000.02

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ANATIDAE	Malacorhynchus membranaceus	Pink-eared Duck	membranaceus	7027203.52
ACANTHIZIDAE	Acanthiza (Acanthiza) apicalis	Inland Thornbill Expert distribution Acanthiza apicalis		4140081.56
MELIPHAGIDAE	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	Expert distribution Acanthagenys rufogularis	6000053.87
THRESKIORNITHIDAE	Threskiornis spinicollis	Straw-necked Ibis	Expert distribution Threskiornis spinicollis	6591872.02
ACROCEPHALIDAE	Acrocephalus (Acrocephalus) australis	Australian Reed-warbler	Expert distribution Acrocephalus australis	3900510.52
ANHINGIDAE	Anhinga novaehollandiae	Australasian Darter	Expert distribution Anhinga novaehollandiae	7220532.85
PSITTACIDAE	Barnardius zonarius	Australian Ringneck	Expert distribution Barnardius zonarius	5326116.85
ACANTHIZIDAE	Calamanthus (Calamanthus) campestris	Rufous Fieldwren	Expert distribution Calamanthus campestris	1884126.72
CACATUIDAE	Nymphicus hollandicus	Cockatiel	Expert distribution Nymphicus hollandicus	6490031.09
ANATIDAE	Aythya (Nyroca) australis	Hardhead	Expert distribution Aythya australis	8179872.96
ANATIDAE	Tadorna (Casarca) tadornoides	Australian Shelduck	Expert distribution Tadorna tadornoides	3310144.12
APODIDAE	Apus (Apus) pacificus	Fork-tailed Swift	Expert distribution Apus pacificus	25317218.87
ARTAMIDAE	Cracticus tibicen	Australian Magpie	Expert distribution Gymnorhina tibicen	6938575.86
CHARADRIIDAE	Elseyornis melanops	Black-fronted Dotterel	Expert distribution Elseyornis melanops	7384843.66
CAPRIMULGIDAE	Eurostopodus (Eurostopodus) argus	Spotted Nightjar	Expert distribution Eurostopodus argus	7043900.66
PHALACROCORACIDAE	Phalacrocorax (Phalacrocorax) varius	Pied Cormorant	Expert distribution Phalacrocorax varius	4427211.02
GLAREOLIDAE	Stiltia isabella	Australian Pratincole	Expert distribution Stiltia isabella	5241998.56
PODICIPEDIDAE	Tachybaptus novaehollandiae	Australasian Grebe	Expert distribution Tachybaptus novaehollandiae	8158001.38
Meropidae	Merops ornatus	Rainbow Bee-eater	Expert distribution (maybe) Merops ornatus	7784899.62
MELIPHAGIDAE	Lichenostomus (Gavicalis) virescens	Singing Honeyeater	Expert distribution Lichenostomus virescens	7337047.11
MELIPHAGIDAE	Lichenostomus (Ptilotula) penicillatus	White-plumed Honeyeater	Expert distribution Lichenostomus penicillatus	4941855.61
MELIPHAGIDAE	Lichenostomus (Ptilotula) plumulus	Grey-fronted Honeyeater	Expert distribution Lichenostomus plumulus	5391385.45
FALCONIDAE	Falco (leracidea) berigora	Brown Falcon	Expert distribution Falco berigora	8309376.46
FALCONIDAE	Falco (Tinnunculus) cenchroides	Nankeen Kestrel	Expert distribution Falco cenchroides	8092779.67
RECURVIROSTRIDAE	Himantopus himantopus leucocephalus	Banded Stilt	Expert distribution Himantopus leucocephalus	8909101.48
CAMPEPHAGIDAE	Lalage tricolor	Australian White-winged Triller	Expert distribution Lalage tricolor	7665912.79
PETROICIDAE	Microeca (Microeca) fascinans	Jacky Winter	Expert distribution Microeca fascinans	5323897.16
ALAUDIDAE	Mirafra (Mirafra) javanica	Horsfield's Bushlark	Expert distribution Mirafra javanica	6688389.55
MELIPHAGIDAE	Manorina (Myzantha) flavigula	Yellow-throated Miner	Expert distribution Manorina flavigula	6844527.43
PETROICIDAE	Melanodryas (Melanodryas) cucullata	Hooded Robin	Expert distribution Melanodryas cucullata	6386250.78
ACCIPITRIDAE	Circus approximans	Swamp Harrier	Expert distribution Circus approximans	5155720.31
MOTACILLIDAE	Anthus (Anthus) novaeseelandiae	Australasian Pipit	Expert distribution Anthus novaeseelandiae	6504213.91
STRIGIDAE	Ninox (Ninox) novaeseelandiae	Southern Boobook	Expert distribution Ninox novaeseelandiae	8080194.91
PETROICIDAE	Petroica (Petroica) goodenovii	Red-capped Robin	Expert distribution Petroica goodenovii	6577525.66
RALLIDAE	Tribonyx ventralis	Black-tailed Native-hen	Expert distribution Gallinula ventralis	4636120.02
CHARADRIIDAE	Vanellus (Lobipluvia) miles	Masked Lapwing	Expert distribution Vanellus miles	5298978.32
CHARADRIIDAE	Vanellus (Lobivanellus) tricolor	Banded Lapwing	Expert distribution Vanellus tricolor	5665395.23
FALCONIDAE	Falco (Falco) longipennis	Australian Hobby	Expert distribution Falco longipennis	8298592.48
RALLIDAE	Gallinula (Gallinula) tenebrosa	Dusky Moorhen	Expert distribution Gallinula tenebrosa	3818628.75
ACCIPITRIDAE	Haliastur sphenurus	Whistling Kite	Expert distribution Haliastur sphenurus	5610016.45
ACCIPITRIDAE	Hieraaetus (Hieraaetus) morphnoides	Little Eagle	Expert distribution Hieraaetus morphnoides	7295760.24

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RHIPIDURIDAE	Rhipidura (Sauloprocta) leucophrys	Willie Wagtail Expert distribution Rhipidura leucophrys		8437314.02
THRESKIORNITHIDAE	Threskiornis molucca	Australian White Ibis	Expert distribution Threskiornis molucca	5606446.57
TYTONIDAE	Tyto (Megastrix) novaehollandiae	Masked Owl	Expert distribution Tyto novaehollandiae	5149773.71
PSITTACIDAE	Pezoporus occidentalis	Night Parrot	Expert distribution Pezoporus occidentalis	2693415.16
PSOPHODIDAE	Psophodes (Sphenostoma) cristatus	Chirruping Wedgebill	Expert distribution Psophodes cristatus	1159210.85
Pedionomidae	Pedionomus torquatus	Plains-wanderer	Expert distribution (maybe) Pedionomus torquatus	1062025.31
MALURIDAE	Malurus (Musciparus) leucopterus	White-winged Fairy-wren	Expert distribution Malurus leucopterus	5635255.97
AEGOTHELIDAE	Aegotheles (Aegotheles) cristatus	Australian Owlet-nightjar	Expert distribution Aegotheles cristatus	7734887.23
ACANTHIZIDAE	Aphelocephala leucopsis	Southern Whiteface	Expert distribution Aphelocephala leucopsis	3771465.98
Frankeniaceae	Frankenia plicata		Expert distribution (maybe) Frankenia plicata	419550.50
Muridae	Notomys fuscus	Dusky Hopping-mouse, Wilkiniti	Expert distribution (maybe) Notomys fuscus	132041.73
ACCIPITRIDAE	Elanus axillaris	Black-shouldered Kite	Expert distribution Elanus axillaris	7680926.93
ACCIPITRIDAE	Hamirostra melanosternon	Black-breasted Buzzard	Expert distribution Hamirostra melanosternon	5322195.01
COLUMBIDAE	Geopelia cuneata	Diamond Dove	Expert distribution Geopelia cuneata	5729437.59
COLUMBIDAE	Geopelia striata placida	Peaceful Dove	Expert distribution Geopelia placida	5604983.01
ESTRILDIDAE	Taeniopygia guttata	Zebra Finch	Expert distribution Taeniopygia guttata	6384312.10
PODICIPEDIDAE	Podiceps cristatus	Great Crested Grebe	Expert distribution Podiceps cristatus	30644062.36
SCOLOPACIDAE	Actitis hypoleucos	Common Sandpiper	Expert distribution Actitis hypoleucos	61323916.68
ACCIPITRIDAE	Milvus migrans	Black Kite	Expert distribution Milvus migrans	64724141.77
ACCIPITRIDAE	Accipiter (Leucospiza) fasciatus	Brown Goshawk	Expert distribution Accipiter fasciatus	8215601.74
ACCIPITRIDAE	Aquila (Uroaetus) audax	Wedge-tailed Eagle	Expert distribution Aquila audax	7711600.67
Ardeidae	Ardea alba	Great Egret, White Egret	Expert distribution (likely) Ardea alba	7998335.02
OTIDIDAE	Ardeotis australis	Australian Bustard	Expert distribution Ardeotis australis	6747155.01
ARTAMIDAE	Artamus (Angroyan) cinereus	Black-faced Woodswallow	Expert distribution Artamus cinereus	7455889.31
ARTAMIDAE	Artamus (Angroyan) minor	Little Woodswallow	Expert distribution Artamus minor	6541794.28
ARTAMIDAE	Artamus (Campbellornis) personatus	Masked Woodswallow	Expert distribution Artamus personatus	7602300.12
ARTAMIDAE	Artamus (Artamus) leucorynchus	White-breasted Woodswallow	Expert distribution Artamus leucorynchus	7668178.65
ANATIDAE	Chenonetta jubata	Australian Wood Duck	Expert distribution Chenonetta jubata	6020637.70
GRUIDAE	Grus (Mathewsia) rubicunda	Brolga	Expert distribution Grus rubicunda	3576758.72
FALCONIDAE	Falco (Hierofalco) hypoleucos	Grey Falcon	Expert distribution Falco hypoleucos	5390602.21
MELIPHAGIDAE	Ashbyia lovensis	Gibberbird	Expert distribution Ashbyia lovensis	858589.65
ACANTHIZIDAE	Aphelocephala nigricincta	Banded Whiteface	Expert distribution Aphelocephala nigricincta	1626240.03
ARTAMIDAE	Artamus (Angroyan) cyanopterus	Dusky Woodswallow	Expert distribution Artamus cyanopterus	3910611.37
MONARCHIDAE	Grallina cyanoleuca	Magpie-lark	Expert distribution Grallina cyanoleuca	6774362.21
CASUARIIDAE	Dromaius novaehollandiae	Emu	Expert distribution Dromaius novaehollandiae	6759542.46
RECURVIROSTRIDAE	Recurvirostra novaehollandiae	Red-necked Avocet	Expert distribution Recurvirostra novaehollandiae	3550921.74
CUCULIDAE	Chrysococcyx basalis	Horsfield's Bronze Cuckoo	Expert distribution Chrysococcyx basalis	7963191.79
CHARADRIIDAE	Erythrogonys cinctus	Red-kneed Dotterel	Expert distribution Erythrogonys cinctus	5131877.29
HIRUNDINIDAE	Hirundo ariel	Fairy Martin	Expert distribution Hirundo ariel	5393670.79

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ACCIPITRIDAE	Lophoictinia isura	Square-tailed Kite	Expert distribution Lophoictinia isura	5787193.90
MEGALURIDAE	Megalurus gramineus	Little Grassbird Expert distribution Megalurus gramineus		3287342.46
HIRUNDINIDAE	Hirundo (Hirundo) neoxena	Welcome Swallow Expert distribution Hirundo neoxena		6051281.36
COLUMBIDAE	Ocyphaps lophotes	Crested Pigeon Expert distribution Ocyphaps lophotes		7413153.51
PACHYCEPHALIDAE	Oreoica gutturalis	Crested Bellbird	Expert distribution Oreoica gutturalis	4977501.18
PACHYCEPHALIDAE	Pachycephala (Alisterornis) rufiventris	Rufous Whistler	Expert distribution Pachycephala rufiventris	7241012.34
PARDALOTIDAE	Pardalotus (Pardalotinus) rubricatus	Red-browed Pardalote	Expert distribution Pardalotus rubricatus	5215172.69
PARDALOTIDAE	Pardalotus (Pardalotinus) striatus	Striated Pardalote	Expert distribution Pardalotus striatus	6172513.14
PODICIPEDIDAE	Poliocephalus poliocephalus	Hoary-headed Grebe	Expert distribution Poliocephalus poliocephalus	7076105.52
RALLIDAE	Porzana (Porzana) fluminea	Australian Spotted Crake	Expert distribution Porzana fluminea	1982268.46
RHIPIDURIDAE	Rhipidura (Rhipidura) fuliginosa	New Zealand Fantail	Expert distribution Rhipidura fuliginosa	5840029.33
Rostratulidae	Rostratula australis	Australian Painted Snipe	Expert distribution (maybe) Rostratula australis	4290580.99
CORCORACIDAE	Struthidea cinerea	Apostlebird	Expert distribution Struthidea cinerea	2511273.32
ALCEDINIDAE	Todiramphus (Cyanalcyon) pyrrhopygius	Red-backed Kingfisher	Expert distribution Todiramphus pyrrhopygius	7466637.09
TURNICIDAE	Turnix (Alphaturnia) velox	Little Button-quail	Expert distribution Turnix velox	7007734.60
HIRUNDINIDAE	Petrochelidon (Hylochelidon) nigricans nigricans	Australian Tree Martin	Expert distribution Hirundo nigricans	8367826.45
ANATIDAE	Cygnus (Chenopis) atratus	Black Swan	Expert distribution Cygnus atratus	7281302.88
ARDEIDAE	Egretta novaehollandiae	White-faced Heron	Expert distribution Egretta novaehollandiae	7554193.63
PSITTACIDAE	Neophema (Neonanodes) chrysostoma	Blue-winged Parrot	Expert distribution Neophema chrysostoma	1396422.54
PSITTACIDAE	Northiella haematogaster	Blue Bonnet	Expert distribution Northiella haematogaster	1741101.14
POMATOSTOMIDAE	Pomatostomus (Morganornis) ruficeps	Chestnut-crowned Babbler	Expert distribution Pomatostomus ruficeps	1078317.05
POMATOSTOMIDAE	Pomatostomus (Pomatostomus) halli	Hall's Babbler	Expert distribution Pomatostomus halli	489446.68

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Checklist Areas

Number of checklist areas: 0

Table 23: Checklist Areas

Family Scientific Name Common Name Area	a Name Area sq km
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JournalMap Articles

Number of JournalMap articles: 0

Table 24: JournalMap Articles

Author/s	Year	Title	Publication	DOI	URL

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Further Links

Geoscience Australia: http://www.ga.gov.au/

Global Biodiversity Information Facility: https://www.gbif.org/

Threatened Species & Ecological Communities: https://www.environment.gov.au/topics/threatened-species-ecological-communities

WWF Ecoregions: https://worldwildlife.org/biomes

Environmental Resources Information Network (ERIN): https://www.environment.gov.au/topics/science-and-research/databases-and-maps/erin

Australian National Fish Expert Distributions: https://collections.ala.org.au/public/show/dr803

Lists of Australian endemic species: http://lntreasures.com/australia.html

Federal

Department of the Environment: https://www.environment.gov.au/

State/Territory

Australian Capital Territory

Environment and Sustainable Development Directorate: https://www.environment.act.gov.au/

New South Wales

Office of Environment and Heritage: http://www.environment.nsw.gov.au/

Northern Territory

Department of Land Resource Management: https://www.lrm.nt.gov.au/

Queensland

Department of Environment and Heritage Protection: https://www.ehp.qld.gov.au/

South Australia

Department of Environment, Water and Natural Resources: https://www.environment.sa.gov.au/Home

Tasmania

Department of Primary Industries, Parks, Water and Environment: http://www.dpiw.tas.gov.au/

Western Australia

Department of Parks and Wildlife: https://www.dpaw.wa.gov.au/

Victoria

Department of Environment and Primary Industries: http://www.depi.vic.gov.au/

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Appendix 9: Regional Ecosystem Descriptions

5.3.22 Sparse herbland, open water or bare areas on flood plain lakes and interdune clay pans and lakes

Regional

5.3.22

ecosystem

Vegetation

Management Act Least concern

class

Short description

Sparse herbland, open water or bare areas on flood plain lakes and

interdune clay pans and lakes

Structure \category

Other

Structure code

Sparse Herbland

Open water, bare areas or sparse herbland of variable floristic and structural composition. Locally Eleocharis pallens and/or Eragrostis setifolia may predominate. An ephemeral herbland will often dominate bare areas exposed by receding water. Very occasional low shrubs such as Chenopodium auricomum, Duma florulenta and Tecticornia spp. may be present. Bare areas, water or scattered ephemeral vegetation of variable floristic and structural composition. Locally Eleocharis pallens and/or Eragrostis setifolia may predominate. An ephemeral herbland will often dominate bare areas exposed by receding water. Very occasional low shrubs such as Chenopodium auricomum, Duma florulenta and Tecticornia spp. may be present. Occurs on or fringing lakes and clay pans on flood plains, within interdunes or on sandplains minor occurrences on clay plains. Soils very deep, grey cracking clays. Lacustrine. (BVG1M: 34a).

Description

Vegetation communities in this regional ecosystem include: 5.3.22a: Bare areas, water or scattered ephemeral vegetation of variable floristic and structural composition. Locally Eleocharis pallens and/or Eragrostis setifolia may predominate. An ephemeral herbland will often dominate bare areas exposed by receding water. Very occasional low shrubs such as Chenopodium auricomum, Duma florulenta and Tecticornia spp. may be present. Occurs on lakes and larger clay pans (area generally greater than 8 ha) in interdunes or on sandplains or less frequently on clay plains. Soils very deep, grey cracking clays. Lacustrine. (BVG1M: 34a).

5.3.22b: Bare areas, open water or scattered ephemeral vegetation of variable floristic and structural composition. An ephemeral herbland will often dominate bare areas exposed by receding water. Very occasional low shrubs such as Chenopodium auricomum, Duma florulenta and Tecticornia spp. may be present. Occurs on or fringing lakes on flood plains. Soils very deep, grey cracking clays. Lacustrine.

Vintage Energy Ecological Assessment Report

(BVG1M: 34a).

5.3.22c: [RE not in use]²: This vegetation community is now mapped as 5.3.22a, 5.3.22b. Scattered ephemeral vegetation of variable floristic and structural composition. Bare areas, water, sedges or grasses may predominate. Occurs on lakes usually fed by drainage lines. Lacustrine. (BVG1M: 34a).

5.3.22d: Bare areas, water or scattered ephemeral vegetation of variable floristic and structural composition. Locally Eleocharis pallens and/or Eragrostis setifolia may predominate. An ephemeral herbland will often dominate bare areas exposed by receding water. Very occasional low shrubs such as Chenopodium auricomum, Duma florulenta and Tecticornia spp. may be present. Occurs on smaller clay pans (area generally less than 8 ha) in interdunes or on sandplains or less frequently on clay plains. Soils very deep, grey cracking clays. Palustrine. (BVG1M: 34b).

5.6.4 Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes

Regional ecosystem

5.6.4

Vegetation Management Act class

Least concern

Short description

Atalaya hemiglauca +/- Acacia aneura +/- Acacia spp. +/- Corymbia terminalis low open woodland on reticulate sand dunes

Structure category

Sparse

Structure code Tall Shrubland

Description

Various trees and tall shrubs occur forming a distinct but discontinuous canopy. Acacia aneura usually predominates, but in places Atalaya hemiglauca, Hakea leucoptera and Ventilago viminalis may be codominant. Usually there is no well defined, low shrub layer, but in places, dense stands of Dodonaea viscosa subsp. angustissima and Eremophila sturtii may occur. The ground layer is seasonally variable and composed of grasses and forbs. The composition and structural formation of this association varies considerably. Occurs on low dunes with sloping flanks (less than 3%). The dunes are frequently reticulate and usually overlie recent clay alluvia. Often concentrated in areas fringing large lakes or flood plains. Soils are reddish-brown, coarse sands, or deep red, earthy to siliceous sands. Ferruginous hardpans are often present. Not a Wetland. (BVG1M: 23a).

Vegetation communities in this regional ecosystem include: 5.6.4a: [RE not in use]²: This vegetation community is now mapped as 5.6.4. Atalaya hemiqlauca +/- Acacia aneura +/- Acacia spp. +/-Corymbia terminalis tall open shrubland on sand dunes. Occurs on low dunes with sloping flanks (less than 3%). The dunes are frequently reticulate and usually overlie recent clay alluvia. Often concentrated in areas fringing large lakes or floodplains. Soils are reddish-brown, coarse sands, or deep red, earthy to siliceous sands. Ferruginous hardpans are often present. Not a Wetland. (BVG1M: 23a).

5.6.5 Variable sparse to open-herbland or Triodia basedowii hummock grassland on dune flanks, crests and sandy interdunes

Regional ecosystem 5.6.5

Vegetation Management Act Least concern class

Short description Variable sparse to open-herbland or Triodia basedowii hummock grassland on dune flanks, crests and sandy interdunes

Structure category

Woody grassland

Hummock Grassland Structure code

Description

Triodia basedowii hummock grassland predominates but where absent Aristida holathera +/- Eragrostis eriopoda may predominate forming a sparse to open tussock grassland, and/or forbs may predominate forming a sparse to open forbland. Isolated trees and tall shrubs are usually present. Usually low shrubs occur and may form a well defined layer in some situations. Fire frequency can affect density of woody species and Triodia basedowii. Occurs on low sloping flanks, non-mobile crests and sandy interdune areas of Quaternary sand dunes. Soils deep to very deep, red, yellow and white earthy sands, occasionally red siliceous sands. Not a Wetland. (BVG1M: 33a).

Triodia basedowii hummock grassland predominates but where absent Aristida holathera +/- Eragrostis eriopoda may predominate forming a sparse to open tussock grassland, and/or forbs may predominate forming a sparse to open forbland. Isolated trees and tall shrubs are usually present. Usually low shrubs occur and may form a well defined layer in some situations. Fire frequency can affect density of woody species and Triodia basedowii. Occurs on low sloping flanks, non-mobile crests and sandy interdune areas of

Quaternary sand dunes. Soils deep to very deep, red, yellow and white earthy sands, occasionally red siliceous sands. Not a Wetland. (BVG1M: 33a).

5.6.5b: [RE not in use]²: This vegetation community has moved to 5.6.2x1. Acacia ramulosa low open woodland. A lower shrub layer is well defined in places with Acacia ligulata common, but in other situations consists only of scattered shrubs. Ground cover is variable and composed of grasses and forbs +/- Triodia basedowii. Fire frequency can affect density of woody species and Triodia basedowii. Occurs on low dunes and sandplains of low relief associated with dunefields. Soils moderately deep red texture contrast soils with sandy loams overlying the sandy clays. Not a Wetland. (BVG1M: 33a).

5.6.8 Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes

Regional ecosystem

5.6.8

Vegetation Management Act class

Least concern

Short description

Zygochloa paradoxa and/or Crotalaria eremaea +/- Triodia basedowii open tussock grassland and herbland on mobile crests and slopes of sand dunes

Structure category

Woody grassland

Structure code Open Tussock Grassland

Description

Zygochloa paradoxa open tussock grassland and/or Crotalaria eremaea sparse herbland usually both with Triodia basedowii. Sparsely scattered low shrubs may be present. The ground between the tussocks/ hummocks and shrubs is usually bare, excepting when ephemeral herbs become seasonally abundant. Occurs on mobile crests and loose sandy slopes of Quaternary sand dunes. Soils very deep, white, yellow and red siliceous sands. Not a Wetland. (BVG1M: 33a).

Vegetation communities in this regional ecosystem include: 5.6.8a: Zygochloa paradoxa predominates forming an open tussock grassland. Scattered hummocks of Triodia basedowii may be frequent. Sparsely scattered low shrubs and tall forbs are usually present with Crotalaria cunninghamii, Crotalaria eremaea. Acacia ligulata, Lechenaultia divaricata and Calotis erinacea being the most frequent. The ground between the hummocks and shrubs is variable

in cover and floristics depending on seasonal conditions with Aristida holathera var. holathera, Euphorbia wheeleri and Cullen pallidum common. Occurs on mobile crests and slopes of Quaternary sand dunes. Soils very deep, white, yellow and red siliceous sands. Not a Wetland. (BVG1M: 33a).

5.6.8b: Crotalaria eremaea sparse to open herbland commonly with Eragrostis eriopoda. Cover and floristic composition dependent on seasonal conditions large areas may be devoid of vegetation, includes Tribulus terrestris, Aristida holathera, Eriachne aristidea, Eragrostis basedowii, Glinus lotoides, Blennodia pterosperma, Nicotiana velutina. Occasional scattered trees or shrubs such as Atalaya hemiglauca Grevillea stenobotrya, Acacia ligulata, Acacia murrayana, Acacia tetragonophylla or Clerodendrum floribundum may occur. Occurs on mobile crests and slopes of Quaternary sand dunes. Soils very deep, white, yellow and red siliceous sands. Not a Wetland. (BVG1M: 33a).

5.9.3 Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland on Cretaceous sediments

Regional ecosystem

5.9.3

Vegetation Management Act class

Least concern

Short description

Astrebla spp. +/- short grasses +/- forbs open tussock grassland to

herbland on Cretaceous sediments

Structure category

Grassland

Structure code

Open Tussock Grassland

Description

Astrebla spp. +/- short grasses +/- forbs open tussock grassland to herbland. Astrebla pectinata typically predominates but locally Astrebla lappacea may dominate, a Sclerolaena spp. sparse-forbland may at times predominate, other tussock grasses may be present occupying the spaces between the tussocks of Astrebla spp. Dactyloctenium radulans, Brachyachne convergens and Iseilema spp. may predominate in some areas. Forbs such as Atriplex spp., Sclerolaena spp., Trianthema triquetra, *Portulaca oleracea and Salsola australis occur and in less favourable seasons tend to predominate forming a sparse ground cover (<10%). Isolated shrubs including Senna artemisioides subsp. oligophylla, Senna phyllodinea and Acacia victoriae may be conspicuous, but trees are absent. Occurs on flat to gently undulating plains with slopes usually less than 3%

(sometimes up to 5%). Soils stony, deep to moderately deep, red and brown cracking clays, or rarely desert loams. Occurs on mantled pediments and fresh Cretaceous sediments. Not a Wetland. (BVG1M: 30b).

Vegetation communities in this regional ecosystem include: 5.9.3a: Astrebla lappacea and/or Sclerolaena spp. open tussock grassland/herbland. Either Astrebla lappacea open tussock grassland or an open to sparse-forbland of Sclerolaena bicornis and/or Sclerolaena calcarata and/or Sclerolaena lanicuspis and/or Sclerolaena spp. may be dominant depending on seasonal conditions. Dactyloctenium radulans, Brachyachne convergens and Iseilema spp. may predominate in some areas. Other forbs such as Atriplex spp., Trianthema triquetra, *Portulaca oleracea and Salsola australis are common. Occurs on flat to gently undulating plains with shallow to moderately deep alkaline self mulching cracking clay soils, fresh Cretaceous sediments. Not a Wetland. (BVG1M: 30b). 5.9.3b: Variable herbland on fresh Cretaceous sediments. Dominant species varies considerably depending on seasonal conditions and may include variable combinations of; Astrebla spp., Aristida latifolia, Dactyloctenium radulans, Iseilema vaginiflorum, Atriplex spp., Sclerolaena spp. A large number of forb species may occur, many of them ephemeral and seasonally abundant. In less favourable seasons ground cover can be very sparse with Dactyloctenium radulans and Iseilema vaginiflorum dominating, especially in areas with significant grazing. Occurs on flat to gently undulating plains (< 1%) of fresh Cretaceous sediments. Shallow to moderately deep brown cracking clay soils with self-mulching surface. Not a Wetland. (BVG1M: 30b). 5.9.3c: [RE not in use]²: This vegetation community is now mapped as 5.3.9x1. Acacia cyperophylla var. cyperophylla low woodland with Acacia cambagei sometimes co-dominant. Scattered Atalaya hemiglauca may be present while in some areas Senna artemisioides subsp. Oligophylla and Eremophila freelingii for a prominent low shrub layer. The ground layer is generally sparse and comprising a variety of grass and forb species such as Eriachne mucronata, Salsola australis or Zygophyllum ammophilum. Occurs on drainage lines within stony plains. Soils are generally deep gravelly massive to weakly structured sandy loams to sandy clay loams. Not a Wetland. (BVG1M: 24a).

5.9.3x1: [RE not in use]²: This vegetation community is now mapped as 5.9.3b. Astrebla squarrosa usually predominates with Astrebla pectinata being codominant, and together form a tussock grassland. Iseilema vaginiflorum and Aristida latifolia are frequent and abundant in heavily grazed areas. Shrubs are very sparse and infrequent. A number of forbs occur and may become abundant after winter rain. Occurs on flat clay plains of Winton plateau. Associated soils are moderately deep grey cracking clays, strongly self-mulching surface. Not a Wetland. (BVG1M: 30b).

5.9.3x2: Astrebla pectinata and/or Astrebla lappacea and/or Aristida latifolia open herbland. In some areas Dactyloctenium radulans, Brachyachne convergens and Iseilema spp. may be seasonally

common. Forbs such as Atriplex spp. and Sclerolaena spp. occur, and in less favourable seasons tend to predominate. Isolated shrubs of Acacia tetragonophylla or Senna spp. may occur. Occurs on level to gently undulating plains formed by superficial Cainozoic clay deposits overlying a range of geologies. Soils shallow to deep, crusted red and minor brown medium to heavy clays. Small to moderate amounts of ironstone, chalcedony, laterite, and silcrete gravel occur in the profile and on the surface. Not a Wetland. (BVG1M: 30b). 5.9.3x3: Seasonally variable sparse to open tussock grassland/herbland, dominant grasses include Astrebla pectinata, Aristida spp., Enneapogon avenaceus and Sporobolus actinocladus. Annual grasses such as Dactyloctenium radulans, Iseilema vaginiflorum and Brachyachne ciliaris may be seasonally abundant. Forbs such as Atriplex spp., Sclerolaena spp., Osteocarpum acropterum, Maireana spp., *Portulaca oleracea, Salsola australis and Neobassia proceriflora are common and in less favourable seasons tend to predominate forming a sparse ground cover (<10%). Isolated shrubs may be conspicuous, but trees are absent. Occurs on flat to gently undulating plains with abundant ironstone surface gravel cover. Soils moderately deep to deep, may be weakly gilgaied or strongly gilgaied with depressions parallel to the contour, crusted, red cracking clays. Ground cover always sparse, varies with amount of stone cover and seasonal conditions. Not a Wetland. (BVG1M: 30b).

5.9.4 Aristida contorta sparse tussock grassland on fresh Cretaceous sediments with dense gravel cover

Regional ecosystem

5.9.4

Vegetation Management Act class

Least concern

Short description

Aristida contorta sparse tussock grassland on fresh Cretaceous

sediments with dense gravel cover

Structure category

Grassland

Structure code Sparse Tussock Grassland

Description Aristida contorta usually predominates forming an open to sparse

tussock grassland. Other short grasses including Oxychloris scariosa, Enneapogon avenaceus, Sporobolus actinocladus and Tripogon loliiformis are common. Annual grasses such as Brachyachne prostrata and Eriachne pulchella occur frequently, while the perennial Aristida

latifolia and Eragrostis xerophila may be locally common. Forbs such as Gnephosis arachnoidea, Rhodanthe floribunda, Maireana dichoptera and Sclerolaena lanicuspis may predominate after winter rain. Sparsely scattered shrubs may occur in places. Short grasses build up after wet summers, while forbs common after winter rainfall. Occurs on flat to gently undulating plains with abundant surface gravel cover of ironstone, chalcedony, laterite, silcrete or silicified sandstone. Soils shallow to deep, desert loams, with gravelly, sandy clay loams overlying structured medium clays. Ground cover always sparse, varies with amount of stone cover and seasonal conditions. Not a Wetland. (BVG1M: 31b).

Vegetation communities in this regional ecosystem include: 5.9.4x1: Aristida contorta sparse to open tussock grassland +/-Oxychloris scariosa +/- Enneapogon avenaceus +/- Sporobolus actinocladus. Ephemeral forbs may predominate after winter rain. Sparsely scattered shrubs such as Senna spp. And Acacia tetragonophylla may occur in places. Local shallow deposits of windblown sand support ephemeral forbs such as Calotis plumulifera, Gnephosis eriocarpa, Rhodanthe moschata and Polycalymma stuartii, and less commonly isolated patches of Senna spp. Shrubland. Sparsely scattered trees, such as Corymbia terminalis, Hakea eyreana, and Grevillea striata may occur in places. Floristic composition varies with seasonal conditions, density of stone pavement and gilgai micro relief. Occurs on level to gently undulating plains formed by Cainozoic colluvial and residual deposits overlying deeply weathered Cretaceous sediments. Associated soils shallow to deep gravely to sandy desert loams. Not a Wetland. (BVG1M: 31b). 5.9.4x2: Astrebla pectinata sparse to open herbland commonly with Sporobolus actinocladus, Brachyachne ciliaris, Atriplex spp., Sclerolaena spp., Salsola australis and Osteocarpum spp. Mosaic of sparse to open tussock grassland in gilgai depressions dominated by Astrebla pectinata, and sparse herbland on benches and dense gravels dominated by Sporobolus actinocladus, Brachyachne ciliaris, Enneapogon avenaceus, Sclerolaena spp., Atriplex spp., Salsola australis, Osteocarpum spp., *Portulaca oleracea. Occurs on level to gently undulating plains formed by Cainozoic colluvial and residual deposits overlying deeply weathered Cretaceous sediments. Deep stony often gilgaied soils with depressions sometime parallel to contour, soils range from desert loams to moderately deep crusted red-brown cracking clays. Moderate to large amounts of ironstone gravel on surface. Not a Wetland. (BVG1M: 30b).

Appendix 10: Flora List

Family	Species Name	Vernacular Name	PL1125	RE 5.3.22	RE 5.6.4	RE 5.6.5 / RE 5.6.8	RE 5.9.3	RE 5.9.4
_			131	59	76	29	36	13
Aizoaceae	Tetragonia moorei	New Zealand Spinach	1					
Aizoaceae	Tetragonia tetragonoides	New Zealand Spinach	1	1	1			
Aizoaceae	Trianthema pilosum	Trianthema	1	1	1			
Amaranthaceae	Alternanthera denticulata	Lesser Joyweed	1	1	1		1	
Amaranthaceae	Amaranthus sp.	Amaranth	1	1				
Amaranthaceae	Ptilotus latifolius	Tangled Mulla Mulla	1		1			
Amaranthaceae	Ptilotus obovatus	Silver Tails	1		1			
Amaranthaceae	Ptilotus polystachyus	Long Tails	1		1			
Apiaceae	Daucus glochidiatus	Native Carrot	1			1		
Asphodelaceae	Bulbine alata	Desert Leek-lily	1	1			1	
Asteraceae	Brachyscome ciliaris	Variable Daisy	1		1		1	
Asteraceae	Calocephalus platycephalus	Yellow Billybuttons	1		1		1	
Asteraceae	Calotis hispidula	Bogan Flea	1	1			1	
Asteraceae	Gnaphalium diamantinense	Diamantina Cudweed	1	1				
Asteraceae	Gnephosis arachnoidea	Spidery Button-flower	1	1				1
Asteraceae	Leiocarpa websteri	Narrow Plover-daisy	1					
Asteraceae	Millotia greevesii	Woolly Sand Daisy	1	1				
Asteraceae	Pluchea dunlopii	Pink Plains-bush	1		1			
Asteraceae	Polycalymma stuartii	Poached Egg Daisy	1		1	1		
Asteraceae	Pterocaulon sphacelatum	Fruit Salad Plant	1	1	1			·

F24	Cura dia a Nama	V	DI 440E	RE	RE	RE 5.6.5 /	DE E O O	RE
Family	Species Name	Vernacular Name	PL1125	5.3.22	5.6.4	RE 5.6.8	RE 5.9.3	5.9.4
Asteraceae	Pycnosorus eremaeus	Golden Billy-buttons	1	1				1
Asteraceae	Rhodanthe floribunda	Large White Sunray	1	1	1	1	1	1
Asteraceae	Rhodanthe moschata	Musk Daisy	1		1			
Asteraceae	Senecio gregorii	Fleshy Groundsel	1	1				
Asteraceae	Streptoglossa adscendens	Desert Daisy	1	1				
Boraginaceae	Halgania cyanea	Blue Halgania	1		1			
Boraginaceae	Trichodesma zeylanicum	Camel Bush	1		1	1		
Brassicaceae	Harmsiodoxa blennodioides	Hairypod Cress	1	1				
Brassicaceae	Lepidium phlebopetalum	Veined Peppercress	1		1	1	1	
Campanulaceae	Wahlenbergia tumidifructa	Swollen-fruit Bluebell	1		1			
Celastraceae	Macgregoria racemigera	Snowflake	1		1			
Chenopodiaceae	Atriplex holocarpa	Pop Saltbush	1	1			1	
Chenopodiaceae	Atriplex spongiosa	Small Pop Saltbush	1	1	1		1	
Chenopodiaceae	Atriplex stipitata	Kidney Saltbush	1	1			1	
Chenopodiaceae	Chenopodium cristatum	Crested Goosefoot	1	1	1			
Chenopodiaceae	Einadia nutans	Climbing Saltbush	1		1			
Chenopodiaceae	Enchylaena tomentosa	Ruby Saltbush	1		1			
Chenopodiaceae	Maireana astrotricha	Low Bluebush	1		1		1	
Chenopodiaceae	Maireana coronata	Crown Fissure-plant	1	1				
Chenopodiaceae	Maireana georgei	Satiny Bluebush	1		1			
Chenopodiaceae	Maireana spongiocarpa	Spongy-fruit Bluebush	1	1				
Chenopodiaceae	Rhagodia spinescens	Hedge Saltbush	1		1			
Chenopodiaceae	Salsola australis	Coast Saltwort	1	1	1	1	1	
Chenopodiaceae	Sclerolaena bicornis	Bassia Burr	1	1	1		1	

				RE	RE	RE 5.6.5 /		RE
Family	Species Name	Vernacular Name	PL1125	5.3.22	5.6.4	RE 5.6.8	RE 5.9.3	5.9.4
Chenopodiaceae	Sclerolaena decurrens	Green Copper Burr	1		1		1	
Chenopodiaceae	Sclerolaena diacantha	Grey Copperburr	1	1	1		1	1
Chenopodiaceae	Sclerolaena divaricata	Tangled Bindyi	1	1			1	1
Chenopodiaceae	Sclerolaena intricata	Tangled Poverty Bush	1	1				1
Chenopodiaceae	Sclerolaena lanicuspis	Woolly Copper Burr	1	1			1	1
Chenopodiaceae	Sclerolaena patenticuspis	Spear-fruit Bindyi	1	1				
Chenopodiaceae	Sclerolaena uniflora	Small-spine Bindyi	1	1	1	1		
Convolvulaceae	Convolvulus erubescens	Blushing Bindweed	1	1	1		1	
Cucurbitaceae	Citrullus amarus	Paddy Melon	1		1	1		
Euphorbiaceae	Euphorbia drummondii	Mat Spurge	1			1		
Euphorbiaceae	Euphorbia tannensis	Bottle Tree Caustic	1	1	1			1
Fabaceae	Acacia aneura	Broad-leaf Mulga	1		1			
Fabaceae	Acacia ligulata	Small Cooba	1		1	1		
Fabaceae	Acacia murrayana	Murray's Wattle	1			1		
Fabaceae	Acacia tetragonophylla	Dead Finish	1		1			
Fabaceae	Acacia victoriae	Acacia Bush	1		1			
Fabaceae	Crotalaria novae- hollandiae	New Holland Rattlepod	1		1			
Fabaceae	Cullen australasicum	Native Scurf-pea	1	1				
Fabaceae	Cullen graveolens	Native Lucerne	1	1				
Fabaceae	Cullen pallidum	Woolly Scurf-pea	1			1		
Fabaceae	Lotus cruentus	Pink-flower Tefoil	1	1			1	
Fabaceae	Senna artemisioides	Desert Cassia	1		1			
Fabaceae	Senna phyllodinea	Silver Cassia	1		1			
Fabaceae	Senna pleurocarpa	Chocolate Bush	1			1		
Fabaceae	Swainsona campylantha	Gilgai Darling Pea	1	1	1			

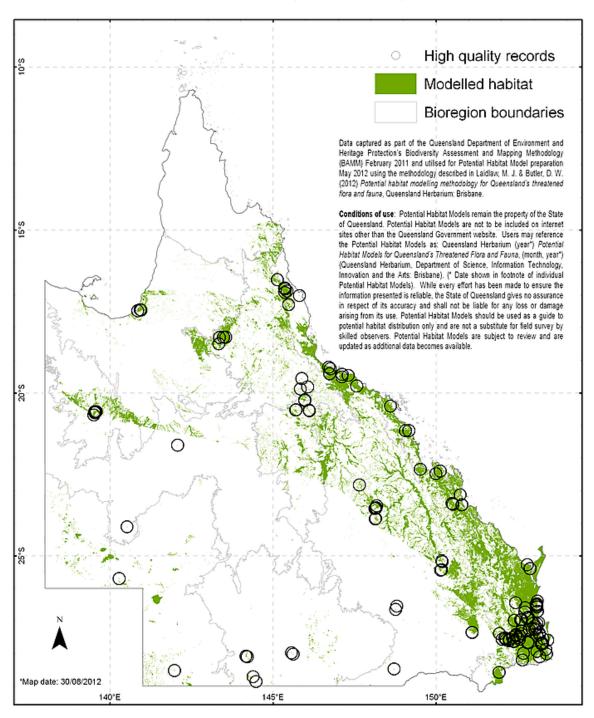
		_		RE	RE	RE 5.6.5 /		RE
Family	Species Name	Vernacular Name	PL1125	5.3.22	5.6.4	RE 5.6.8	RE 5.9.3	5.9.4
Fabaceae	Swainsona phacoides	Woodland Swainsona	1	1				
Frankeniaceae	Frankenia serpyllifolia	Thyme Sea-heath	1	1				
Geraniaceae	Erodium cygnorum	Erodium	1	1				
Goodeniaceae	Goodenia cycloptera	Serrated Goodenia	1	1				
Goodeniaceae	Goodenia fascicularis	Silky Goodenia	1		1		1	
Goodeniaceae	Lechenaultia divaricata	Tangled Lechenaultia	1			1		
Goodeniaceae	Scaevola depauperata	Skeleton Fanflower	1			1		
Goodeniaceae	Scaevola spinescens	Spiny Fanflower	1		1			
Lamiaceae	Teucrium racemosum	Grey Germander	1	1				
Loranthaceae	Amyema maidenii	Pale-leaf Mistletoe	1		1			
Malvaceae	Abutilon leucopetalum	Desert Lantern-bush	1		1			
Malvaceae	Abutilon otocarpum	Desert Lantern	1		1	1		
Malvaceae	Hibiscus brachysiphonius	Low Hibiscus	1	1				
Malvaceae	Hibiscus krichauffianus	Velvet-leaf Hibiscus	1		1	1		
Malvaceae	Sida ammophila	Sand Sida	1			1		
Malvaceae	Sida fibulifera	Pin Sida	1	1	1		1	
Marsileaceae	Marsilea drummondii	Clover Fern	1	1	1			
Meliaceae	Owenia acidula	Sour Apple	1		1			
Myrtaceae	Corymbia terminalis	Northern Bloodwood	1		1			
Myrtaceae	Eucalyptus coolabah	Coolabah	1	1				
Nyctaginaceae	Boerhavia dominii	Tar Vine	1		1			
Plantaginaceae	Plantago drummondii	Dark Plantain	1	1	1		1	
Plantaginaceae	Stemodia florulenta	Blue-rod	1	1	1			
Poaceae	Aristida anthoxanthoides	Yellow Three-awn	1	1		1		
		Bunched Kerosene						
Poaceae	Aristida contorta	Grass	1	1	1			1

Family	Species Name	Vernacular Name	PL1125	RE 5.3.22	RE 5.6.4	RE 5.6.5 / RE 5.6.8	RE 5.9.3	RE 5.9.4
Poaceae	Aristida holathera	Erect Kerosene Grass	1	1	3.0.4	RE 5.0.6	KE 3.7.3	3.7.4
Poaceae	Astrebla pectinata	Barley Mitchell Grass	1 1	<u> </u>	1		1	·
	<u> </u>	-	•			1	l	
Poaceae	Dactyloctenium radulans	Button Grass	1			l		
Poaceae	Digitaria brownii	Cotton Panic-grass	1				1	
Poaceae	Enneapogon avenaceus	Bottlewashers	1	1	1		1	
Poaceae	Enneapogon polyphyllus	Leafy Bottle-washers	1		1		1	
Poaceae	Eragrostis dielsii	Lovegrass	1		1	1		
Poaceae	Eragrostis parviflora	Lovegrass	1				1	
Poaceae	Eragrostis setifolia	Lovegrass	1	1	1		1	
Poaceae	Eriachne aristidea	Three-awn Wanderrie	1		1	1		
Poaceae	Eriachne helmsii	Woollybutt Wanderrie	1	1			1	
Poaceae	Iseilema membranaceum	Small Flinders-grass	1	1				
Poaceae	Iseilema vaginiflorum	Red Flinders-grass	1				1	1
Poaceae	Panicum decompositum	Stargrass	1	1			1	1
Poaceae	Paractaenum refractum	Bristle-brush Grass	1			1		
Poaceae	Sporobolus actinocladus	Ray Grass	1	1	1		1	1
Poaceae	Triodia basedowii	Hard Spinifex	1		1	1		
Poaceae	Zygochloa paradoxa	Sandhill Cane-grass	1			1		
Polygonaceae	Duma florulenta	Tangled Lignum	1	1				
Portulacaceae	Calandrinia balonensis	Broad-leaf Parakeelya	1		1	1		
Portulacaceae	Portulaca intraterranea	Buttercup Purslane	1	1				
Portulacaceae	Portulaca oleracea	Munyeroo	1	1		1		
Proteaceae	Grevillea juncifolia	Honeysuckle Spider Flower	1		1			
Proteaceae	Grevillea stenobotrya	Rattle-pod Grevillea	1		1	1		
Proteaceae	Grevillea striata	Beefwood	1		1			

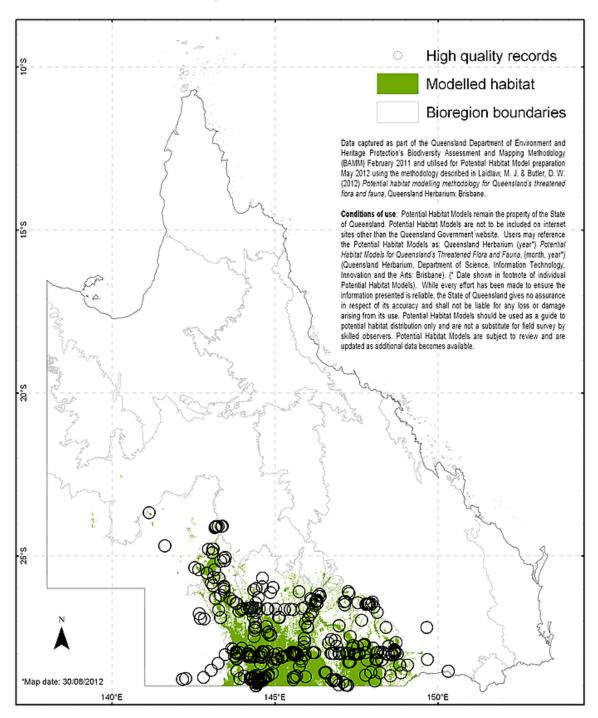
Family	Species Name	Vernacular Name	PL1125	RE 5.3.22	RE 5.6.4	RE 5.6.5 / RE 5.6.8	RE 5.9.3	RE 5.9.4
Proteaceae	Hakea eyreana	Fork-leaf Corkwood	1		1	112 01010		
Proteaceae	Hakea leucoptera	Needle Hakea	1		1			
Sapindaceae	Atalaya hemiglauca	Whitewood	1		1			
Sapindaceae	Dodonaea viscosa	Sticky Hop-bush	1		1			
Scrophulariacea								
е	Eremophila longifolia	Dogwood	1		1			
Scrophulariacea								
е	Eremophila macgillivrayi	Dog-bush	1		1			
Scrophulariacea								
е	Eremophila obovata	Eremophila	1		1			
Solanaceae	Solanum ellipticum	Potato Bush	1				1	
Thymelaeaceae	Pimelea simplex	Pimelea	1				1	
Zygophyllaceae	Roepera ammophila	Sand Twinleaf	1		1	1		
Zygophyllaceae	Roepera howittii	Clasping Twinleaf	1				1	
Zygophyllaceae	Roepera similis	White Twinleaf	1	1			1	

Appendix 11: Listed Species Habitat Models

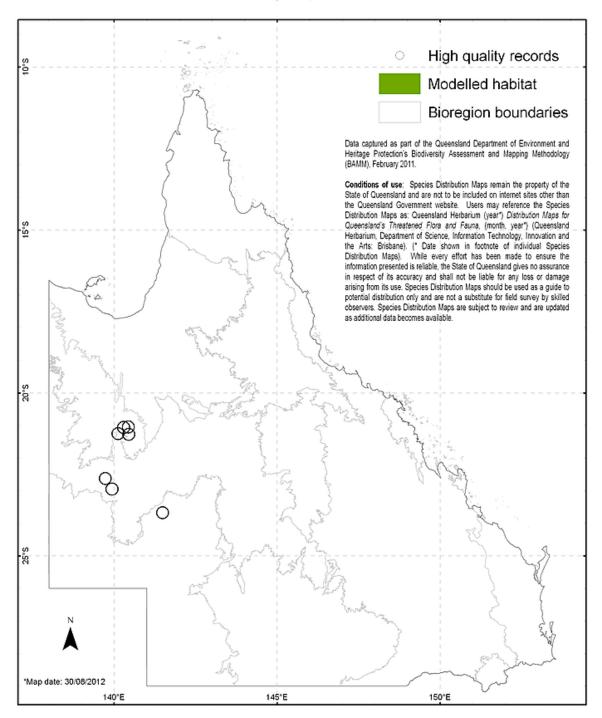
Potential habitat model for Rostratula australis Australian painted snipe



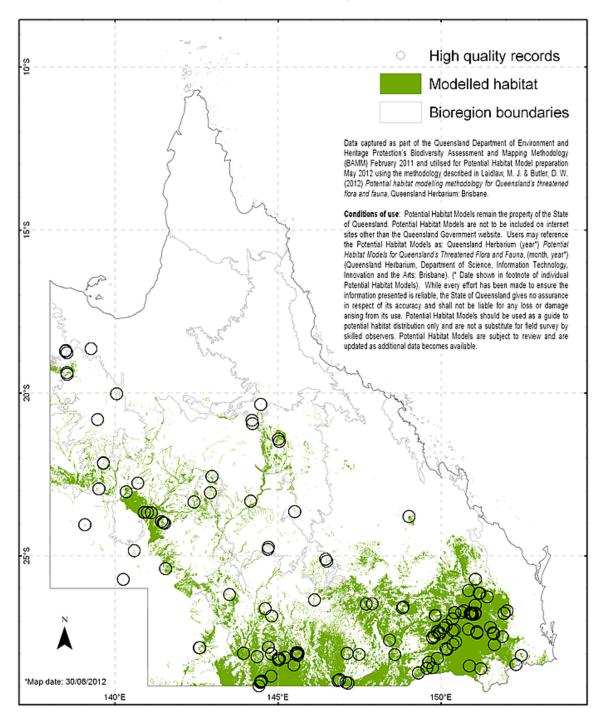
Potential habitat model for Lophochroa leadbeateri Major Mitchell's cockatoo



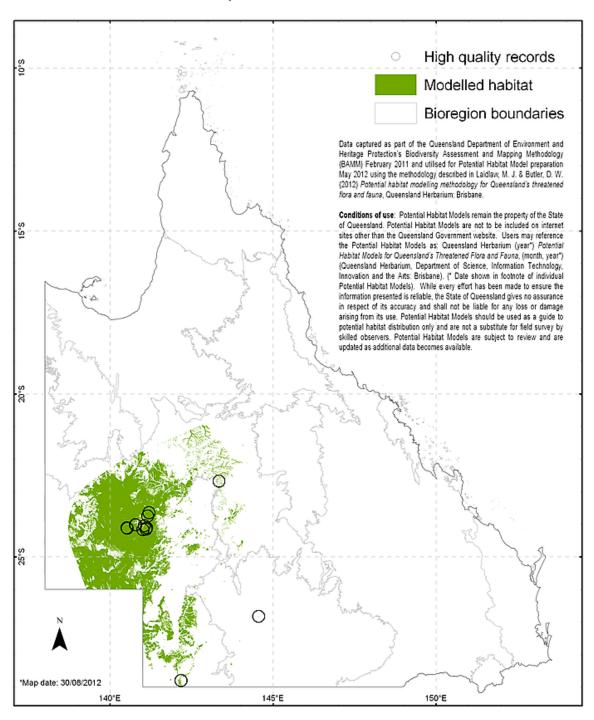
Distribution map for Pezoporus occidentalis night parrot



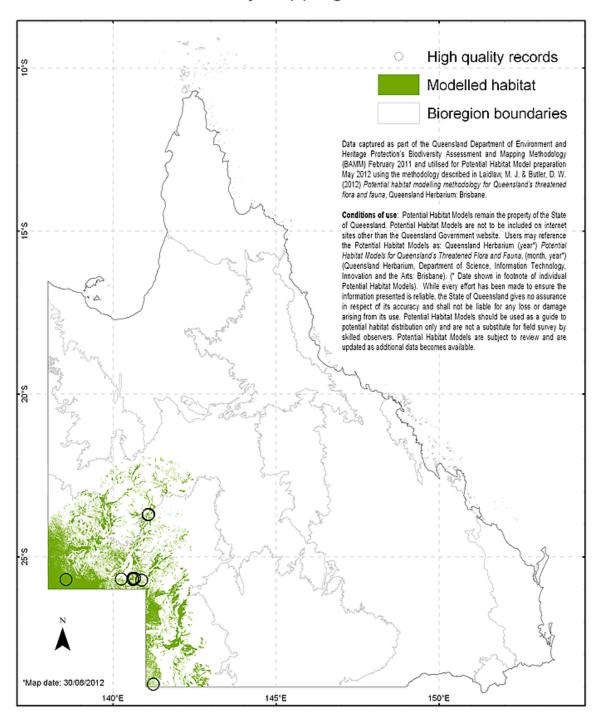
Potential habitat model for Grantiella picta painted honeyeater



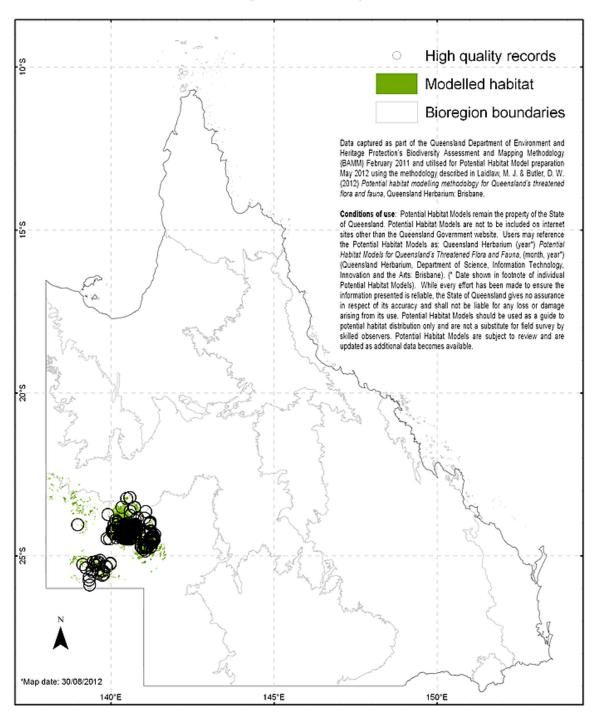
Potential habitat model for Pedionomus torquatus plains-wanderer



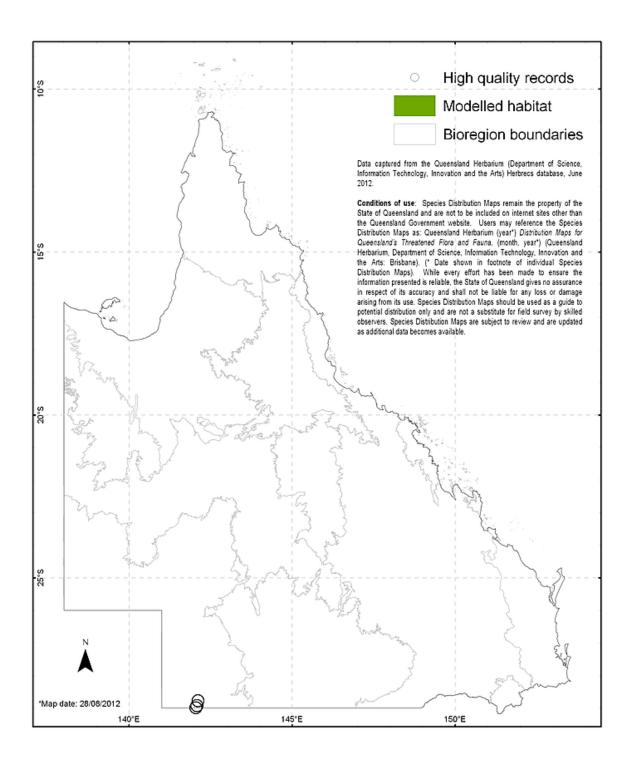
Potential habitat model for Notomys fuscus dusky hopping-mouse



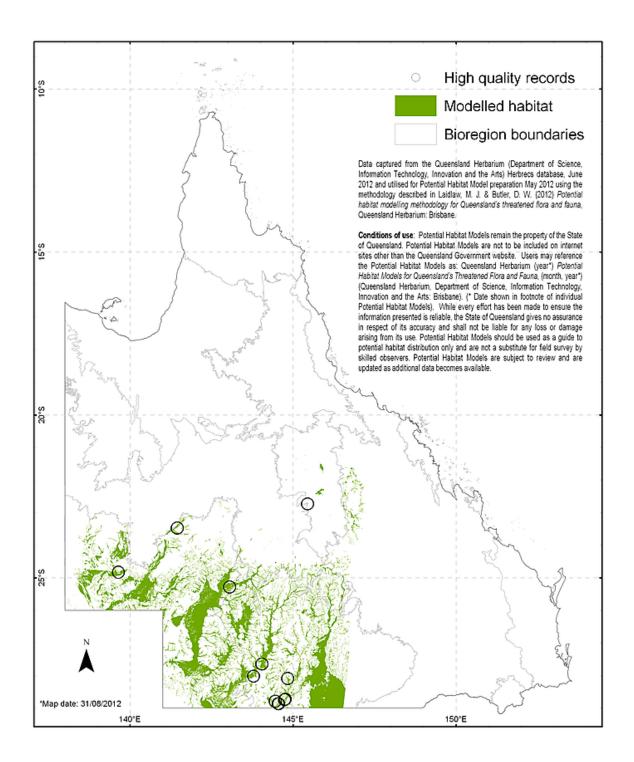
Potential habitat model for Macrotis lagotis greater bilby



Distribution map for Grevillea kennedyana



Potential habitat model for Sclerolaena walkeri



Appendix 12: Significant Residual Impact Assessment Figures

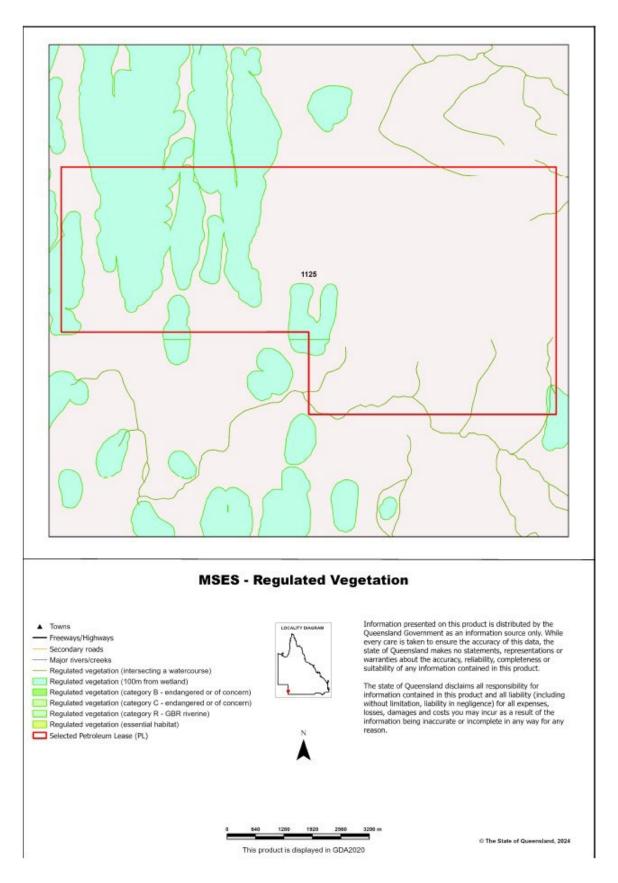


Figure 1. MSES - Regulated Vegetation within PL 1125

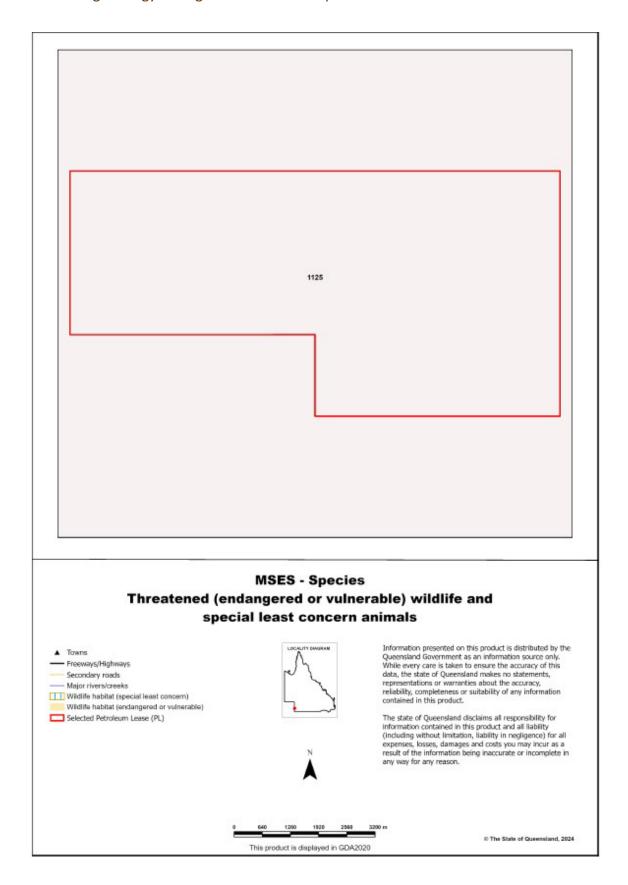


Figure 2. MSES Threatened (endangered and vulnerable) wildlife and special least concern animals within PL 1125

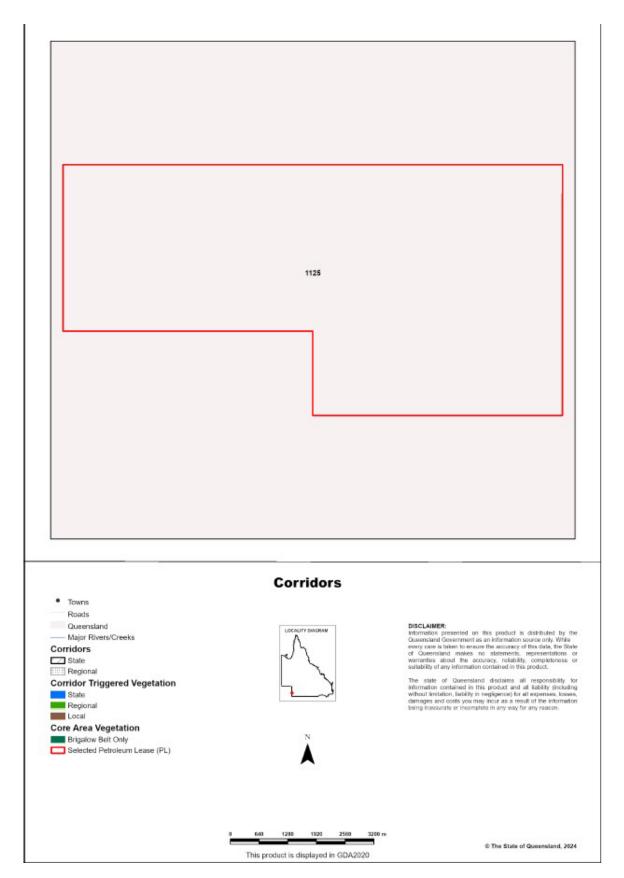


Figure 3. MSES Corridors within PL 1125

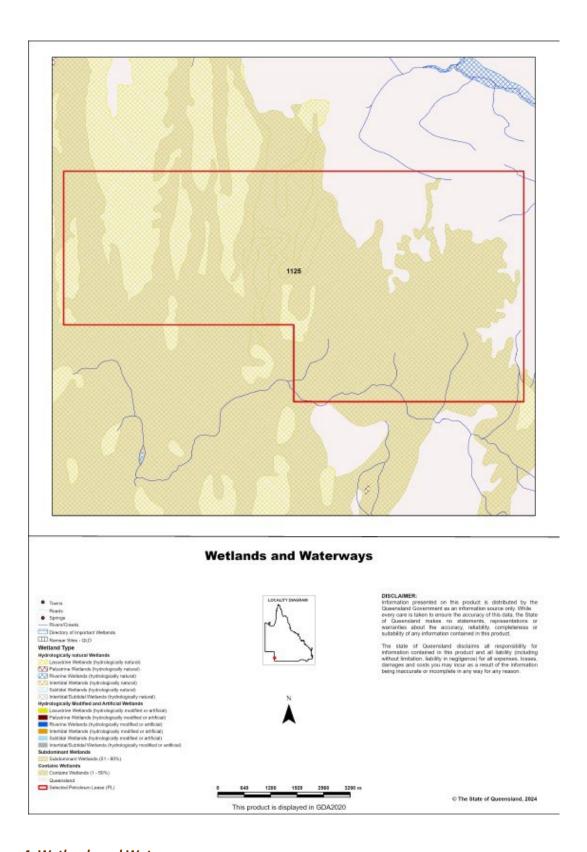


Figure 4. Wetlands and Waterways

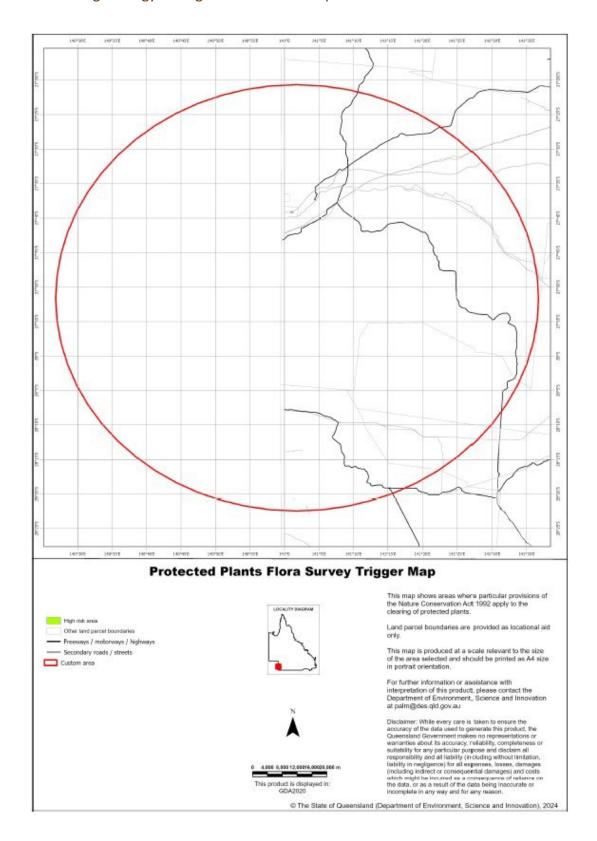


Figure 5. MSES Protected Plants Flora Survey Trigger Map for PL 1125 with 50 km buffer

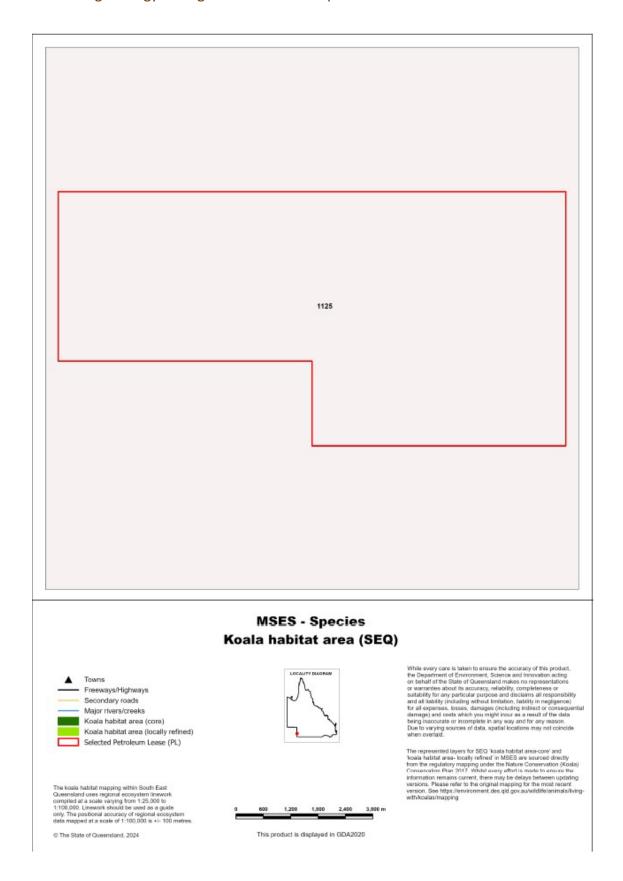


Figure 6. MSES - Koal habitat area within PL 1125

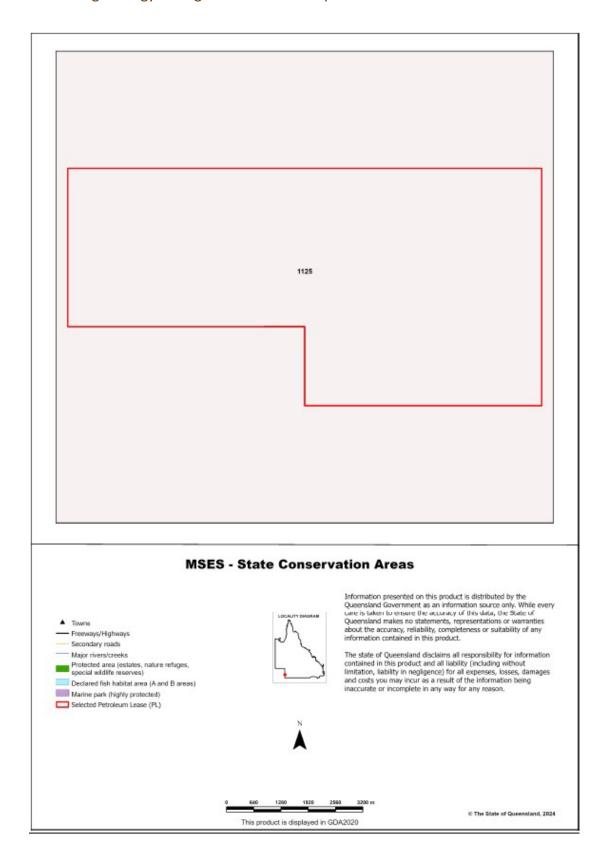


Figure 7. MSES - State Conservation Areas within PL 1125

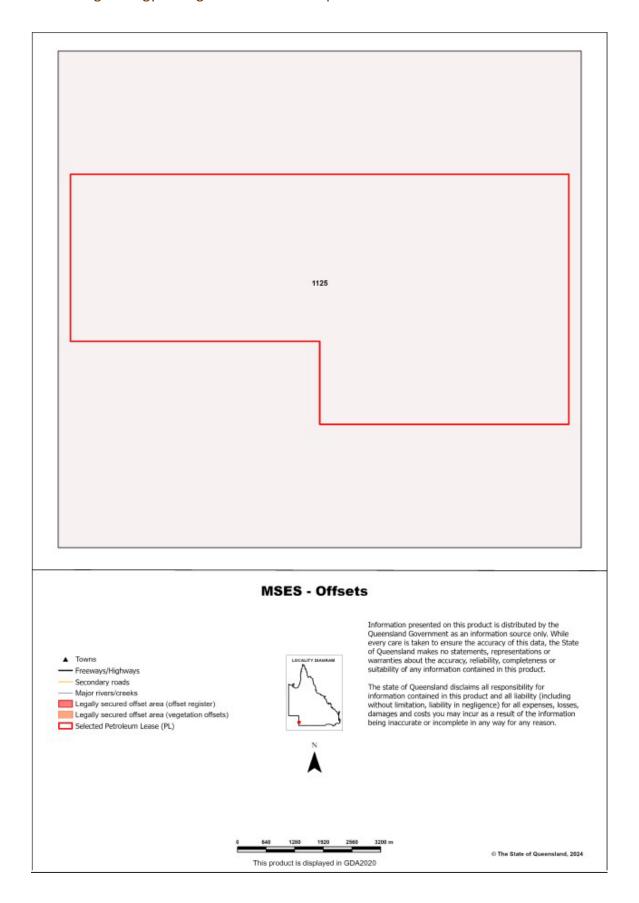


Figure 8. MSES Offsets within PL 1125

Attachment B: Risk Assessment Approach

Risk Assessment Approach

Impact Identification

Vintage Energy and ERIAS have determined potential environmental and social impacts of the Project based on knowledge of the existing environment, current Project planning, and experience in undertaking similar projects. The impact assessment was a three-step process:

- 1 Review of all Project activities that could impact on the environment.
- 2 Assessment of the potential risks or hazards that those activities might pose to the physical, biological or social/cultural environment.
- 3 Assessment of the potential impacts of those hazards.

Risk Treatments

For each identified potential impact of the Project, specific management measures have been developed to avoid, minimise or mitigate that impact to the maximum extent possible. Risk treatments, hereafter described as mitigation and management measures, are designed to reduce the likelihood and/or consequence of the residual risk.

Likelihood and Consequence

Potential impacts from Project activities were assessed in terms of both their likelihood and the potential consequence if that impact were to occur before and after the implementation of specific management measures.

Tables 1 and 2 contain the descriptors used to classify the likelihood and consequence of impacts. In the context of this risk assessment, likelihood refers not to the probability of a particular impact occurring as a result of Project activities, but rather to the probability of a particular consequence ensuing due to that impact. There are five levels of likelihood, from rare to almost certain. The consequences of potential project impacts are assessed in terms of the following four aspects – environment, health and safety, reputation and financial. For the purposes of this document, impacts to the environment are the key concern. The severity, extent and duration of potential impacts, along with the sensitivity of receptor/s, contribute to five consequence ratings, from minor to critical.

Table 1 - Impact Likelihood Definitions

Likelihood Rating	Description
A. Almost certain	Expected to occur regularly in most circumstances or is of a continuous nature
B. Likely	Will likely occur in most circumstances
C. Possible	Might occur at some point
D. Unlikely	May occur, but is not expected
E. Rare	It is conceivable that this could happen, but it is more likely that it wont

Table 2 - Impact Consequence Definitions

Table 2 – Impact Consequence Definitions								
Consequence		Aspect	<u> </u>					
Rating	Environment	Health and Safety	Reputational	Financial (AUD)				
1. Minor	Possible incidental impact to flora/fauna, no ecological consequence, no contact with aquifer	Near miss / no injury	Isolated complaint	Greater than \$100k				
2. Moderate	Reduction in biomass in affected environmental setting, contact with aquifer, but no danger to receptors. No changes to biodiversity or exposed ecological system	First aid treatment	Multiple community complaints. Short- term local media coverage. Minimal brand damage	Greater than \$0.5 million				
3. Significant	Reduction in biomass and/or temporary aquifer contamination. Limited impact to local biodiversity	Medical treatment	Community action possible project delays. Adverse regional media coverage. Short lived but significant brand damage	Greater than \$2 million				
4. Major	Detrimental impact, eventual partial recovery of ecosystem and/or aquifer possible	Serious injury / lost time injury	Community action severely delays project. Adverse international/ national media coverage. Sustained brand damage	Greater than \$5 million				
5. Critical	Significant irreversible environmental harm to ecosystem	Major extensive injury (permanent disability) or fatality	Global and long lasting reputational disaster	Greater than market cap				

Risk Assessment

This risk assessment approach was adopted from the Australian and New Zealand Standards (AS/NZS) Risk management principles and guidelines (AS/NZS ISO 3100:2018) along with the AS/NZS handbook for Managing environment-related risk (HB 203:2012).

The level of risk for each potential environmental or social/cultural impact was determined by combining likelihood and severity of consequence using the matrix in Table 3:

- Very low (green) and low risks (yellow) are considered minor and acceptable and will be managed by Vintage Energy's standard operating procedures.
- Medium risks (orange) are considered tolerable but require management attention to mitigate the level of risk to as low as reasonably practicable.
- High risks (red) require immediate action and must be mitigated or managed to reduce the risk to tolerable (medium or low) levels.

A pre-mitigation risk rating is determined prior to the implementation of the proposed mitigation measures; with a residual risk rating calculated assuming the effective implementation of these measures.

Table 3 – Risk Assessment Matrix

	Consequence Rating								
Likelihood Rating	5. Critical	4. Major	3. Significant	2. Moderate	1. Minor				
A. Almost Certain	High	High	High	Medium	Medium				
B. Likely	High	High	Medium	Medium	Low				
C. Possible	High	Medium	Medium	Low	Low				
D. Unlikely	Medium	Medium	Low	Low	Very Low				
E. Rare	Medium	Low	Low	Very Low	Very Low				

Attachment C: ERCE Emissions Forecast Report

Disclaimer

ERCE has made every effort to ensure that the interpretations, conclusions and recommendations presented in this report are accurate and reliable in accordance with good industry practice. ERCE does not, however, guarantee the correctness of any such interpretations and shall not be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation or recommendation made by any of its officers, agents or employees.

ERCE has used guidance provided by relevant institutions in the preparation of this report, including guidance provided by the GHG Protocol, Australia National and Energy Reporting and API Compendium. ERCE reserves the right to review all calculations referred to or included in this report and to revise the estimates in light of erroneous data supplied or information existing but not made available which becomes known subsequent to the preparation of this report. No site visits were undertaken in the preparation of this report.

ERCE has prepared an emissions forecast based on the current operational strategy, development plans, fuel forecast and historical emissions. Actual emissions are subject to change.



Vali emissions forecast - 14 January 2025

The forecast includes Kyoto Protocol Greenhouse gases typical to the upstream oil and gas industry CO2, CH4 and N2O. The 100-year global warming potentials (GWPs) quoted in IPCC AR5 have been used.

ERCE has prepared an emissions forecast based on the current operational strategy, development plans, fuel forecast and historical emissions. Actual emissions are subject to change.

	Emission Source/			FY										
Asset	Category	Units	Assumptions	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	Flaring	tCO2e	Zero flaring	0	0	0	0	0	0	0	0	0	0	0
	Venting (new wells)	tCO2e	Water-based mud, 12 days of drilling per well, no hydraulic fracturing, Vali-2 MDT Gas Sample composition, P50 Reserves Development scenario (Vintage internal view for Year-End June 2024 reserves reporting updated 10 Jan 2025)	0	81	162	0	162	0	162	162	0	0	162
	Venting (operational)	tCO2e	Fixed, at FY24 level for Vali-3	30	30	30	30	30	30	30	30	30	30	30
	Fugitive	tCO2e	Vali-2 MDT Gas Sample composition. Emissions from wellheads	9	13	22	22	30	30	35	43	43	39	48
	Combustion - diesel	tCO2e	15,000 litres diesel annually for adhoc use. Additional 35,000 litres diesel per well drilled, Australia National Greenhouse Accounts Factors 2024 for diesel oil	41	135	230	41	230	41	230	230	41	41	230
Vali	Total Scope 1 emissions Vali	tCO2e	Operational Control	80	260	445	93	453	101	458	466	114	110	471
	Vali production	MMscf	P50 Reserves Development scenario (Vintage internal view for Year-End June 2024 reserves reporting updated 10 Jan 2025)	528	1,378	3,087	3,677	3,992	4,320	4,416	6,105	5,971	4,457	4,291
	Vali emissions intensity (Scope 1)	kgCO2e/MMs cf	Operational Control	151	189	144	25	114	23	104	76	19	25	110
	Scope 2 emissions	tCO2e	No purchased electricity	0	0	0	0	0	0	0	0	0	0	0
	Scope 3 emissions (use of sold products only)	tCO2e	65 tCO2e/MMscf gas produced assuming all gas is combusted and the combustion efficiency is 98%	34,354	89,714	200,955	239,356	259,881	281,257	287,456	397,465	388,732	290,169	279,352

Inputs

Asset	Metric	Units	FY										
ASSEL	Metric	Offits	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	Wells Online	#	2	3	5	5	7	7	8	10	10	9	11
	New Wells drilled	#		1	2		2		2	2			2
Vali	Total Wells	#	2	3	5	5	7	7	9	11	11	11	13
Vali	Wells taken offline	#						1			1		
	Total Wells offline	#	0	0	0	0	0	0	1	1	1	2	2

Vali - scope 3 emission factor	65	tCO2e/MMscf gas produced

Made by ERCE (ISO 14064-3 certified verifiers and validators) based on data provided by Vintage Energy Checked and approved by Vintage Energy

Emission Source/																			
Category	Units	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Flaring	tCO2e	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Venting (new wells)	tCO2e	0	244	0	244	0	0	244	162	0	162	0	162	0	244	0	162	0	0
Venting (operational)	tCO2e	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Fugitive	tCO2e	48	61	61	74	69	61	74	74	74	74	61	69	56	65	52	61	61	48
Combustion - diesel	tCO2e	41	325	41	325	41	41	325	230	41	230	41	230	41	325	41	230	41	41
Total Scope 1 emissions Vali	tCO2e	119	660	132	673	140	132	673	497	145	497	132	492	127	664	123	484	132	119
Vali production	MMscf	4,611	4,524	5,230	4,860	5,432	4,237	4,190	5,411	5,464	4,620	4,329	4,155	3,976	4,181	4,640	4,317	4,256	3,041
Vali emissions intensity (Scope 1)	kgCO2e/MMs cf	26	146	25	138	26	31	161	92	26	107	30	118	32	159	26	112	31	39
Scope 2 emissions	tCO2e	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scope 3 emissions (use of sold products only)	tCO2e	300,196	294,488	340,498	316,412	353,608	275,799	272,784	352,232	355,675	300,748	281,809	270,481	258,847	272,159	302,094	281,035	277,058	197,945

Inputs

Asset	Metric																		
ASSEL	MEUIC	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
	Wells Online	11	14	14	17	16	14	17	17	17	17	14	16	13	15	12	14	14	11
	New Wells drilled		3		3			3	2		2		2		3		2		
\ /al:	Total Wells	13	16	16	19	19	19	22	24	24	26	26	28	28	31	31	33	33	33
Vali	Wells taken offline				1	2		2		2	3		3	1	3			3	2
	Total Wells offline	2	2	2	2	3	5	5	7	7	9	12	12	15	16	19	19	19	22

Emission Source/	11-7-									
Category	Units	2054	2055	2056	2057	2058	2059	2060	2061	Cumulative
Flaring	tCO2e	0	0	0	0	0	0	0	0	0
Venting (new wells)	tCO2e	0	0	0	0	0	0	0	0	2,517
Venting (operational)	tCO2e	30	30	30	30	30	30	30	30	1,121
Fugitive	tCO2e	39	39	30	30	22	22	9	9	1,670
Combustion - diesel	tCO2e	41	41	41	41	41	41	41	41	4,444
Total Scope 1 emissions Vali	tCO2e	110	110	101	101	93	93	80	80	9,752
Vali production	MMscf	2,272	1,811	1,344	1,087	763	589	266	187	132,014
Vali emissions intensity (Scope 1)	kgCO2e/MMs cf	48	61	75	93	121	157	299	426	
Scope 2 emissions	tCO2e	0	0	0	0	0	0	0	0	0
Scope 3 emissions (use of sold products only)	tCO2e	147,878	117,901	87,482	70,757	49,690	38,368	17,301	12,153	8,594,087

Inputs

Asset	Metric								
Asset	Metric	2054	2055	2056	2057	2058	2059	2060	2061
	Wells Online	9	9	7	7	5	5	2	2
	New Wells drilled								
Vali	Total Wells	33	33	33	33	33	33	33	33
vali	Wells taken offline		2		2		3		2
	Total Wells offline	24	24	26	26	28	28	31	31

Vali Field

Emissions Classification	Emission source/category	Total Emissions (tonnes CO2e)						
		CO ₂ e	CO ₂	CH₄	N ₂ O			
	Flaring	-	-	-	-			
	Venting	81.2	1.9	79.3	-			
Direct GHG Emissions	Fugitive	4.3	0.1	4.2	-			
Scope 1	Combustion - diesel (drilling)	94.8	94.4	0.1	0.3			
	Combustion - diesel (miscellaneous)	40.6	40.5	0.1	0.12			
	Total Scope 1 (tonnes)	221.0	136.9	83.7	0.4			

Inputs	
Diesel consumption (litres)	35,000
Petrol consumption (litres)	0
Total flared volume (MMSCF)	0.00
No. of dilling days	12
No. of wells drilled	1
Mud degassing volume (MMSCF)	0.034
Well drilling vent volume (MMSCF)	0.003
Well testing vent volume (MMSCF)	0.047
Well completion vent volume (MMSCF)	0.111
Operational vent volume (MMSCF)	0.000
Total vented volume (MMSCF)	0.20
Total fuel gas volume (MMSCF)	0

Component	Composition Gas fraction	Carbon Count	Molecular Weight	GWP
H_2	0.000%	0	2.0	
H ₂ S	0.000%	0	34.1	
Nitrogen	0.270%	0	28.0	
Methane	75.440%	1	16.0	28
Ethane	4.330%	2	30.1	
Propane	0.780%	3	44.1	
i-Butane	0.150%	4	58.1	
n-Butane	0.160%	4	58.1	
i-Pentane	0.060%	5	72.1	
n-Pentane	0.050%	5	72.1	
C6*	0.070%	6	86.2	
C7*	0.130%	7	100.2	
C8*	0.080%	8	114.2	
C9*	0.050%	9	128.3	
C10*	0.020%	10	142.3	
C11*	0.010%	11	156.3	
C12+*	0.020%	12	170.3	

CO ₂	18.380%	1	44.0	1
Total	100.000%			
			7	
Conversion (using n=PV/RT)	1.197	mol/scf	<u> </u>	
Venting - Gas				
Methodology: API GHG Compendium 2021				
Methodology: API GHG Compendium 2021 g of CH ₄ per scf of gas vented	14.491			

Emission source	Comments	Gas Wellheads	Equipment Hours	Total Emissions (tonnes CO 2 e)					
		No.	Hrs	CO ₂ e	CO ₂	CH₄	N ₂ O		
Fugitive Emissions									
	Using Australia National Greenhouse								
Onshore natural gas wellheads	and Energy Reporting (Measurement)	1	8,760	4.3	0.101	4.2	-		
	Determination 2008, 3.73B Method 2								
				4.3	0.1	4.2	-		

9.685

Emission source	Volume (litres)		Emissions (to	onnes CO2e)	
		CO₂e	CO ₂	CH₄	N ₂ O
Diesel consumption - drilling	35,000	94.8	94.4	0.1	0.3
Diesel consumption - miscellaneous	15,000	40.6	40.5	0.1	0.1

g of CO2 per scf of gas vented

- 1. Flare gas and vent gas volumes provided by Vintage.
- 2. ERCE has used the Vali-2 MDT Gas Sample composition and applied the relative conversion factors to calculate emissions produced from the total flare and vent gas volumes. This is in accordance with the API GHG Compendium.
- 3. There was no diesel or petrol consumed during this period.
- 4. Fugitive emissions are estimated using the method described in Section 3.73B of the National Greenhouse and Energy Reporting (Measurement) Determination 2008.
- 5. The 100-year global warming potentials (GWPs) quoted in IPCC AR5 have been used.

References

Australia National and Energy Reporting (Measurement) Determination 2008 Australia National Greenhouse Accounts Factors 2024

Federal Register of Legislation - National Greenhouse and Energy Reporting (Measurement) Determination 2008 National Greenhouse Accounts Factors: 2024 - DCCEEW

Fuel	Source of Factor	Unit	kg CO2e	kg CO2e of CO2 per unit		kg CO2e of N2O per unit
Diesel oil	Australia National Greenhouse Accounts Factors 2024	litres	2.70972	2.69814	0.00386	0.00772

	Energy Content factor	Scope 1 Emission Factor	Scope 1 Emission Factor	Scope 1 Emission Factor	Scope 1 Emission Factor	Scope 3 Emission Factor
Fuel combusted	(GJ per unit of fuel)	(kg CO ₂ -e/GJ)	(kg CO2-e/GJ)	(kg CO2-e/GJ)	(kg CO2-e/GJ)	(kg CO2-e /GJ)
	GJ/kL	CO2	CH4	N2O	Combined gases	
Diesel oil	38.6	69.9	0.1	0.2	70.2	17.3

Fugitive - gas

Equipment	Source of Factor	Unit	kg CO2	kg CH4	kg N2O
	Australia National and Energy Reporting	kg CO2e /			
Gas Wellheads	(Measurement) Determination 2008	component /	0.00125	0.504	0
Gas Welliteaus	3.73B Method 2	equipment-	0.00123	0.304	U
	3.73B Metriod 2	hour			

Onshore mud degassing

Mud type	Whole gas emissions factor
	scf/drilling day
Water-based mud	2,857

Natural gas well drilling

Vented emissions source	Whole gas emissions factor
	scf/well
Gas well drilling	3,353

Well testing

Source	Whole gas emissions factor
	scf/well
Gas Well Testing – Vented to Atmosphere	46,625

Onshore well completions

Source	Whole gas emissions factor
	scf/completion
Gas Well Completions without Hydraulic Fracturing: Vented	111,173

Production Forecas	t for Vali Field										
Revised 10/1/2025		Forecast is based	on P50 Reserves D	evelopment scer	nario (Vintage	internal view	for Year-End J	une 2024 res	serves rep	orting)	
	Production this month	Production this	Production this					Net		Figure	Total
	with	month with		Ave Daily Raw	Net	Net	Net	production		Financial	production
Month	Composition	Composition 2	Composition 3	Gas Production				Condensate	\M∕ells	Year	MMscf
commencing	•	(raw MMscf)	(raw MMscf)		Sales Gas (TJ)	•	LPG (T)	(bbl)	online		
1/7/2024	0	,	0	1.306	26.716	1.615	10.328	146.793	1	2025	40
1/8/2024	0		0	1.213	24.815	1.500	9.593	136.347	1	2025	37
1/9/2024	0		0	0.796	16.295	0.985	6.299	89.533	2	2025	24
1/10/2024	0		0	1.150	23.531	1.423	9.097	129.294	2	2025	35
1/11/2024	0		0	0.936	19.156	1.158	7.405	105.255		2025	29
1/12/2024	0		0	0.907	18.551	1.122	7.172	101.932	1	2025	28
1/1/2025	0		0	0.874	17.879	1.081	6.912	98.238	1	2025	27
1/2/2025	0	23	0	0.756	15.459	0.935	5.976	84.943	1	2025	23
1/3/2025	0	72.99390625	0	2.398	49.063	2.967	18.967	269.579	2	2025	73
1/4/2025	0	72.80832724	0	2.392	48.938	2.959	18.919	268.894	2	2025	73
1/5/2025	0	71.45710076	0	2.348	48.030	2.904	18.567	263.904	2	2025	71
1/6/2025	0	68.83899618	0	2.262	46.270	2.798	17.887	254.234	2	2025	69
1/7/2025	0	67.45283539	0	2.216	45.338	2.742	17.527	249.115	2	2026	67
1/8/2025	0	65.49749021	0	2.152	44.024	2.662	17.019	241.894	2	2026	65
1/9/2025	0	63.27187992	0	2.079	42.528	2.572	16.441	233.674	2	2026	63
1/10/2025	0	62.07496896	0	2.039	41.724	2.523	16.130	229.254	2	2026	62
1/11/2025	0	59.90576473	0	1.968	40.266	2.435	15.566	221.242	2	2026	60
1/12/2025	0	58.86331551	0	1.934	39.565	2.392	15.295	217.393	2	2026	59
1/1/2026	0		0	1.940	39.688	2.400	15.343	218.070	2	2026	59
1/2/2026	0		0	6.585	134.721	8.146	52.081	740.235	3	2026	200
1/3/2026	0		0	6.411	131.165	7.931	50.706	720.695	3	2026	195
1/4/2026	0		0	6.176	126.347	7.640	48.843	694.223	3	2026	188
1/5/2026	0		0	5.993	122.605	7.414	47.397	673.661	3	2026	182
1/6/2026	0		0	5.783	118.312	7.154	45.737	650.071	3	2026	176
1/7/2026	0		0	5.611	114.799	6.942	44.379	630.769	3	2027	171
1/8/2026	0		0	5.441	111.315	6.731	43.032	611.630		2027	166
1/9/2026	0	160.0568331	0	5.259	107.582	6.505	41.589	591.118	3	2027	160

1/10/2026	0	4== 6466=5:									
, -,	0	155.6166584	0	5.113	104.598	6.325	40.435	574.720	3	2027	156
1/11/2026	0	150.5770093	0	4.947	101.210	6.120	39.126	556.107	3	2027	151
1/12/2026	0	146.5256151	0	4.814	98.487	5.955	38.073	541.145	3	2027	147
1/1/2027	0	142.3511499	0	4.677	95.681	5.786	36.988	525.728	3	2027	142
1/2/2027	0	426.4993953	0	14.012	286.672	17.334	110.822	1575.137	5	2027	426
1/3/2027	0	412.5017364	0	13.552	277.263	16.765	107.184	1523.441	5	2027	413
1/4/2027	0	398.3509037	0	13.088	267.752	16.190	103.507	1471.180	5	2027	398
1/5/2027	0	385.5952544	0	12.668	259.178	15.672	100.193	1424.071	5	2027	386
1/6/2027	0	372.3875825	0	12.234	250.300	15.135	96.761	1375.293	5	2027	372
1/7/2027	0	360.7846662	0	11.853	242.502	14.664	93.746	1332.441	5	2028	361
1/8/2027	0	349.2468678	0	11.474	234.746	14.195	90.748	1289.830	5	2028	349
1/9/2027	0	338.237781	0	11.113	227.347	13.747	87.888	1249.171	5	2028	338
1/10/2027	0	327.8239171	0	10.770	220.347	13.324	85.182	1210.711	5	2028	328
1/11/2027	0	318.074427	0	10.450	213.794	12.928	82.648	1174.705	5	2028	318
1/12/2027	0	308.5608538	0	10.138	207.399	12.541	80.176	1139.569	5	2028	309
1/1/2028	0	299.6569118	0	9.845	201.415	12.179	77.863	1106.685	5	2028	300
1/2/2028	0	290.3382891	0	9.539	195.151	11.800	75.441	1072.270	5	2028	290
1/3/2028	0	282.8824716	0	9.294	190.140	11.497	73.504	1044.735	5	2028	283
1/4/2028	0	274.3685841	0	9.014	184.417	11.151	71.292	1013.291	5	2028	274
1/5/2028	0	267.2772484	0	8.781	179.651	10.863	69.449	987.102	5	2028	267
1/6/2028	0	259.4904553	0	8.525	174.417	10.547	67.426	958.344	5	2028	259
1/7/2028	0	252.9914493	0	8.312	170.048	10.282	65.737	934.342	5	2029	253
1/8/2028	0	246.0646245	0	8.084	165.392	10.001	63.937	908.760	5	2029	246
1/9/2028	0	239.6954305	0	7.875	161.111	9.742	62.282	885.237	5	2029	240
1/10/2028	0	233.4702873	0	7.670	156.927	9.489	60.665	862.247	5	2029	233
1/11/2028	0	227.4765081	0	7.474	152.898	9.245	59.107	840.111	5	2029	227
1/12/2028	0	221.602229	0	7.281	148.950	9.007	57.581	818.416	5	2029	222
1/1/2029	0	217.4363455	0	7.144	146.150	8.837	56.499	803.031	5	2029	217
1/2/2029	0	500.8247044	0	15.000	306.879	18.556	118.633	1686.165	7	2029	501
1/3/2029	0	485.2986238	0	15.000	306.879	18.556	118.633	1686.165	7	2029	485
1/4/2029	0	469.9506578	0	15.000	306.879	18.556	118.633	1686.165	7	2029	470
1/5/2029	0	455.6288946	0	15.000	306.879	18.556	118.633	1686.165	7	2029	456
1/6/2029	0	441.5857831	0	15.000	306.879	18.556	118.633	1686.165	7	2029	442
1/7/2029	0	428.0870229	0	15.000	306.879	18.556	118.633	1686.165	7	2030	428

1/8/2029 0 407.0135299 0 14.752 301.805 18.249 116.672 1658.288 7 2030 407 1/9/2029 0 383.883606 0 12.990 257.961 15.598 99.723 1417.384 7 2030 395 1/10/2029 0 383.7847185 0 12.609 257.961 15.598 99.723 1417.384 7 2030 384 1/11/2029 0 373.0712537 0 12.257 250.760 15.163 96.939 1377.818 7 2030 363 1/1/2029 0 362.6189876 0 11.914 243.735 147.389 94.223 139.915 7 2030 363 1/1/2030 0 352.8010977 0 11.591 237.135 14.339 94.223 1339.915 7 2030 353 1/1/2030 0 342.592745 0 11.256 230.274 130.2956 7 2030 343 1/3/2030 0 342.0707992 0 10.976 224.546 13.578 86.805 1233.782 7 2030 334 1/4/2030 0 325.0138886 0 10.678 218.458 13.210 84.452 120.333 7 2030 325 1/6/2030 0 316.2354298 0 10.390 212.558 12.853 82.171 116.913 7 2030 316 1/6/2030 0 299.7084824 0 9.847 201.449 12.181 77.876 1106.876 7 2030 300 1/8/2030 0 284.9420601 0 9.603 196.456 118.79 75.946 1079.442 7 2031 292 1/8/2030 0 284.9420601 0 9.603 196.456 118.79 75.946 1079.442 7 2031 285 1/9/2030 0 277.5786445 0 9.120 186.575 11.882 72.126 1025.147 7 2031 278 1/10/2030 0 278.866579 0 8.899 182.069 11.009 70.384 100.393 7 2031 278 1/10/2030 0 278.866579 0 8.8681 177.596 10.738 10.66.655 97.5815 7 2031 258 1/1/2031 0 251.7060316 0 8.270 169.184 10.986 67.039 92.845 7 2031 258 1/1/2031 0 251.7060316 0 8.270 169.184 10.886 67.039 92.845 7 2031 258 1/1/2031 0 543.8786766 0 15.000 306.879 18.556 118.633 1686.165 9 2031 518 1/1/2031 0 437.3241684 0 15.000 306.879 18.556 118.633 1686.165 9 2031 459 1/1/2031 0 433.8489341 0 15.000 306.879 18.556 118.633													
1/10/2029	1/8	3/2029	0	407.0135299	0	14.752	301.805	18.249	116.672	1658.288	7	2030	407
1/11/2029	1/9	9/2029	0	395.3883606	0	12.990	265.760	16.070	102.738	1460.238	7	2030	395
1/12/2029	1/10)/2029	0	383.7847185	0	12.609	257.961	15.598	99.723	1417.384	7	2030	384
1/1/2030	1/11	L/2029	0	373.0712537	0	12.257	250.760	15.163	96.939	1377.818	7	2030	373
1/2/2030	1/12	2/2029	0	362.6189876	0	11.914	243.735	14.738	94.223	1339.215	7	2030	363
1/3/2030 0 334.0707992 0 10.976 224.546 13.578 86.805 1233.782 7 2030 334 1/4/2030 0 325.0138886 0 10.678 218.488 13.210 84.452 1200.333 7 2030 325 1/5/2030 0 236.235498 0 10.390 212.588 32.171 116.793 7 2030 316 1/6/2030 0 299.7084824 0 9.847 201.449 12.181 77.876 1106.876 7 2030 300 1/7/2030 0 292.2803367 0 9.603 196.456 11.879 75.946 1079.442 7 2031 292 1/8/2030 0 284.9420601 0 9.362 191.524 11.881 74.039 1052.447 7 2031 285 1/9/2030 0 270.8765679 0 8.899 182.069 11.009 70.384 1000.393 7 2031 274 <	1/2	L/2030	0	352.8010977	0	11.591	237.135	14.339	91.672	1302.956	7	2030	353
1/4/2030 0 325.0138886 0 10.678 218.458 13.210 84.452 1200.333 7 2030 325 1/5/2030 0 316.2354298 0 10.390 212.558 12.853 82.171 1167.913 7 2030 316 1/6/2030 0 299.7084824 0 9.847 201.449 12.181 77.876 1106.876 7 2030 300 1/7/2030 0 292.2803367 0 9.603 196.456 11.879 75.946 1079.442 7 2031 292 1/8/2030 0 284.9420601 0 9.362 191.524 11.581 74.039 1052.341 7 2031 285 1/9/2030 0 277.5786445 0 9.120 186.575 11.282 72.126 1025.147 7 2031 285 1/10/230 0 264.2211673 0 8.681 177.596 10.739 68.655 975.815 7 2031	1/2	2/2030	0	342.5927245	0	11.256	230.274	13.924	89.019	1265.255	7	2030	343
1/5/2030 0 316.2354298 0 10.390 212.558 12.853 82.171 1167.913 7 2030 316 1/6/2030 0 299.7084824 0 9.847 201.449 12.181 77.876 1106.876 7 2030 300 1/7/2030 0 292.2803367 0 9.603 196.456 11.879 75.946 1079.442 7 2031 292 1/8/2030 0 284.9420601 0 9.362 191.524 11.581 74.039 1052.341 7 2031 285 1/9/2030 0 277.5786445 0 9.120 186.575 11.282 72.126 1025.147 7 2031 278 1/10/2030 0 264.2211673 0 8.899 182.069 11.009 70.384 100.033 7 2031 273 1/1/2030 0 258.016703 0 8.476 173.416 10.486 67.039 952.845 7 2031	1/3	3/2030	0	334.0707992	0	10.976	224.546	13.578	86.805	1233.782	7	2030	334
1/6/2030 0 299.7084824 0 9.847 201.449 12.181 77.876 1106.876 7 2030 300 1/7/2030 0 292.2803367 0 9.603 196.456 11.879 75.946 1079.442 7 2031 292 1/8/2030 0 284.9420601 0 9.362 191.524 11.581 74.039 1052.341 7 2031 292 1/9/2030 0 277.5786445 0 9.120 186.575 11.282 72.126 1025.147 7 2031 278 1/10/2030 0 270.8760579 0 8.899 182.069 11.009 70.384 1000.393 7 2031 271 1/1/2030 0 264.2211673 0 8.681 177.596 10.739 68.655 978.815 7 2031 254 1/1/2031 0 251.7060316 0 8.270 169.184 10.230 65.403 929.5845 7 2031	1/4	1/2030	0	325.0138886	0	10.678	218.458	13.210	84.452	1200.333	7	2030	325
1/7/2030	1/5	5/2030	0	316.2354298	0	10.390	212.558	12.853	82.171	1167.913	7	2030	316
1/8/2030 0 284.9420601 0 9.362 191.524 11.581 74.039 1052.341 7 2031 285 1/9/2030 0 277.5786445 0 9.120 186.575 11.282 72.126 1025.447 7 2031 278 1/10/2030 0 270.8760579 0 8.899 182.069 11.009 70.384 1000.393 7 2031 271 1/1/2030 0 264.2211673 0 8.681 177.596 10.739 68.655 975.815 7 2031 251 1/1/2031 0 258.0016703 0 8.476 173.416 10.486 67.039 952.845 7 2031 258 1/1/2031 0 251.7060316 0 8.270 169.184 10.230 65.403 929.594 7 2031 252 1/2/2031 0 534.876756 0 15.000 306.879 18.556 118.633 1686.165 9 2031	1/6	5/2030	0	299.7084824	0	9.847	201.449	12.181	77.876	1106.876	7	2030	300
1/9/2030	1/7	7/2030	0	292.2803367	0	9.603	196.456	11.879	75.946	1079.442	7	2031	292
1/10/2030 0 270.8760579 0 8.899 182.069 11.009 70.384 1000.393 7 2031 271 1/11/2030 0 264.2211673 0 8.681 177.596 10.739 68.655 975.815 7 2031 264 1/12/2030 0 258.0016703 0 8.476 173.416 10.486 67.039 952.845 7 2031 258 1/1/2031 0 251.7060316 0 8.270 169.184 10.230 65.403 929.594 7 2031 252 1/2/2031 0 534.8796756 0 15.000 306.879 18.556 118.633 1686.165 9 2031 535 1/3/2031 0 518.3535071 0 15.000 306.879 18.556 118.633 1686.165 9 2031 538 1/4/2031 0 502.4196757 0 15.000 306.879 18.556 118.633 1686.165 9 2031 <td>1/8</td> <td>3/2030</td> <td>0</td> <td>284.9420601</td> <td>0</td> <td>9.362</td> <td>191.524</td> <td>11.581</td> <td>74.039</td> <td>1052.341</td> <td>7</td> <td>2031</td> <td>285</td>	1/8	3/2030	0	284.9420601	0	9.362	191.524	11.581	74.039	1052.341	7	2031	285
1/11/2030	1/9	9/2030	0	277.5786445	0	9.120	186.575	11.282	72.126	1025.147	7	2031	278
1/12/2030 0 258.0016703 0 8.476 173.416 10.486 67.039 952.845 7 2031 258 1/1/2031 0 251.7060316 0 8.270 169.184 10.230 65.403 929.594 7 2031 252 1/2/2031 0 534.8796756 0 15.000 306.879 18.556 118.633 1686.165 9 2031 535 1/3/2031 0 518.3535071 0 15.000 306.879 18.556 118.633 1686.165 9 2031 518 1/4/2031 0 502.4196757 0 15.000 306.879 18.556 118.633 1686.165 9 2031 518 1/6/2031 0 487.1258749 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/6/2031 0 487.02544684 0 15.000 306.879 18.556 118.633 1686.165 9 203	1/10	0/2030	0	270.8760579	0	8.899	182.069	11.009	70.384	1000.393	7	2031	271
1/1/2031 0 251.7060316 0 8.270 169.184 10.230 65.403 929.594 7 2031 252 1/2/2031 0 534.8796756 0 15.000 306.879 18.556 118.633 1686.165 9 2031 535 1/3/2031 0 518.3535071 0 15.000 306.879 18.556 118.633 1686.165 9 2031 518 1/4/2031 0 502.4196757 0 15.000 306.879 18.556 118.633 1686.165 9 2031 502 1/5/2031 0 487.1258749 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/6/2031 0 473.2241684 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/7/2031 0 459.070551 0 15.000 306.879 18.556 118.633 1686.165 9 203	1/11	L/2030	0	264.2211673	0	8.681	177.596	10.739	68.655	975.815	7	2031	264
1/2/2031 0 534.8796756 0 15.000 306.879 18.556 118.633 1686.165 9 2031 535 1/3/2031 0 518.3535071 0 15.000 306.879 18.556 118.633 1686.165 9 2031 518 1/4/2031 0 502.4196757 0 15.000 306.879 18.556 118.633 1686.165 9 2031 502 1/5/2031 0 487.1258749 0 15.000 306.879 18.556 118.633 1686.165 9 2031 487 1/6/2031 0 473.2241684 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/7/2031 0 459.076551 0 15.000 306.879 18.556 118.633 1686.165 9 2032 459 1/8/2031 0 446.0245605 0 15.000 306.879 18.556 118.633 1686.165 9	1/12	2/2030	0	258.0016703	0	8.476	173.416	10.486	67.039	952.845	7	2031	258
1/3/2031 0 518.3535071 0 15.000 306.879 18.556 118.633 1686.165 9 2031 518 1/4/2031 0 502.4196757 0 15.000 306.879 18.556 118.633 1686.165 9 2031 502 1/5/2031 0 487.1258749 0 15.000 306.879 18.556 118.633 1686.165 9 2031 487 1/6/2031 0 473.2241684 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/7/2031 0 459.070551 0 15.000 306.879 18.556 118.633 1686.165 9 2032 459 1/8/2031 0 446.0245605 0 15.000 306.879 18.556 118.633 1686.165 9 2032 446 1/9/2031 0 433.8489341 0 15.000 306.879 18.556 118.633 1686.165 9	1/2	L/2031	0	251.7060316	0	8.270	169.184	10.230	65.403	929.594	7	2031	252
1/4/2031 0 502.4196757 0 15.000 306.879 18.556 118.633 1686.165 9 2031 502 1/5/2031 0 487.1258749 0 15.000 306.879 18.556 118.633 1686.165 9 2031 487 1/6/2031 0 473.2241684 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/7/2031 0 459.070551 0 15.000 306.879 18.556 118.633 1686.165 9 2032 459 1/8/2031 0 446.0245605 0 15.000 306.879 18.556 118.633 1686.165 9 2032 446 1/9/2031 0 433.8489341 0 15.000 306.879 18.556 118.633 1686.165 9 2032 434 1/10/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 <td< td=""><td>1/2</td><td>2/2031</td><td>0</td><td>534.8796756</td><td>0</td><td>15.000</td><td>306.879</td><td>18.556</td><td>118.633</td><td>1686.165</td><td>9</td><td>2031</td><td>535</td></td<>	1/2	2/2031	0	534.8796756	0	15.000	306.879	18.556	118.633	1686.165	9	2031	535
1/5/2031 0 487.1258749 0 15.000 306.879 18.556 118.633 1686.165 9 2031 487 1/6/2031 0 473.2241684 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/7/2031 0 459.070551 0 15.000 306.879 18.556 118.633 1686.165 9 2032 459 1/8/2031 0 446.0245605 0 15.000 306.879 18.556 118.633 1686.165 9 2032 446 1/9/2031 0 433.8489341 0 15.000 306.879 18.556 118.633 1686.165 9 2032 434 1/10/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 2032 422 1/11/2031 0 410.3739257 0 15.000 306.879 18.556 118.633 1686.165 9 2032 410 1/1/2/2031 0 399.5134377 0 15.000 <td>1/3</td> <td>3/2031</td> <td>0</td> <td>518.3535071</td> <td>0</td> <td>15.000</td> <td>306.879</td> <td>18.556</td> <td>118.633</td> <td>1686.165</td> <td>9</td> <td>2031</td> <td>518</td>	1/3	3/2031	0	518.3535071	0	15.000	306.879	18.556	118.633	1686.165	9	2031	518
1/6/2031 0 473.2241684 0 15.000 306.879 18.556 118.633 1686.165 9 2031 473 1/7/2031 0 459.070551 0 15.000 306.879 18.556 118.633 1686.165 9 2032 459 1/8/2031 0 446.0245605 0 15.000 306.879 18.556 118.633 1686.165 9 2032 446 1/9/2031 0 433.8489341 0 15.000 306.879 18.556 118.633 1686.165 9 2032 434 1/10/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 2032 422 1/11/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 2032 422 1/1/2031 0 410.3739257 0 15.000 306.879 18.556 118.633 1686.165 9 <t< td=""><td>1/4</td><td>1/2031</td><td>0</td><td>502.4196757</td><td>0</td><td>15.000</td><td>306.879</td><td>18.556</td><td>118.633</td><td>1686.165</td><td>9</td><td>2031</td><td>502</td></t<>	1/4	1/2031	0	502.4196757	0	15.000	306.879	18.556	118.633	1686.165	9	2031	502
1/7/2031 0 459.070551 0 15.000 306.879 18.556 118.633 1686.165 9 2032 459 1/8/2031 0 446.0245605 0 15.000 306.879 18.556 118.633 1686.165 9 2032 446 1/9/2031 0 433.8489341 0 15.000 306.879 18.556 118.633 1686.165 9 2032 434 1/10/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 2032 422 1/11/2031 0 410.3739257 0 15.000 306.879 18.556 118.633 1686.165 9 2032 410 1/1/2031 0 399.5134377 0 15.000 306.879 18.556 118.633 1686.165 9 2032 400 1/1/2032 0 389.1006448 0 14.898 304.791 18.430 117.826 1674.695 9 2032 389 1/2/2032 0 668.1665759 0 15.000	1/5	5/2031	0	487.1258749	0	15.000	306.879	18.556	118.633	1686.165	9	2031	487
1/8/2031 0 446.0245605 0 15.000 306.879 18.556 118.633 1686.165 9 2032 446 1/9/2031 0 433.8489341 0 15.000 306.879 18.556 118.633 1686.165 9 2032 434 1/10/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 2032 422 1/11/2031 0 410.3739257 0 15.000 306.879 18.556 118.633 1686.165 9 2032 410 1/12/2031 0 399.5134377 0 15.000 306.879 18.556 118.633 1686.165 9 2032 400 1/1/2032 0 389.1006448 0 14.898 304.791 18.430 117.826 1674.695 9 2032 389 1/2/2032 0 668.1665759 0 15.000 306.879 18.556 118.633 1686.165 11 2032 668 1/3/2032 0 647.7288841 0 15.000 </td <td>1/6</td> <td>5/2031</td> <td>0</td> <td>473.2241684</td> <td>0</td> <td>15.000</td> <td>306.879</td> <td>18.556</td> <td>118.633</td> <td>1686.165</td> <td>9</td> <td>2031</td> <td>473</td>	1/6	5/2031	0	473.2241684	0	15.000	306.879	18.556	118.633	1686.165	9	2031	473
1/9/2031 0 433.8489341 0 15.000 306.879 18.556 118.633 1686.165 9 2032 434 1/10/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 2032 422 1/11/2031 0 410.3739257 0 15.000 306.879 18.556 118.633 1686.165 9 2032 410 1/12/2031 0 399.5134377 0 15.000 306.879 18.556 118.633 1686.165 9 2032 400 1/1/2032 0 389.1006448 0 14.898 304.791 18.430 117.826 1674.695 9 2032 389 1/2/2032 0 668.1665759 0 15.000 306.879 18.556 118.633 1686.165 11 2032 668 1/3/2032 0 647.7288841 0 15.000 306.879 18.556 118.633 1686.165 11 2032 648 1/4/2032 0 628.1675038 0 15.000<	1/7	7/2031	0	459.070551	0	15.000	306.879	18.556	118.633	1686.165	9	2032	459
1/10/2031 0 421.7093039 0 15.000 306.879 18.556 118.633 1686.165 9 2032 422 1/11/2031 0 410.3739257 0 15.000 306.879 18.556 118.633 1686.165 9 2032 410 1/12/2031 0 399.5134377 0 15.000 306.879 18.556 118.633 1686.165 9 2032 400 1/1/2032 0 389.1006448 0 14.898 304.791 18.430 117.826 1674.695 9 2032 389 1/2/2032 0 668.1665759 0 15.000 306.879 18.556 118.633 1686.165 11 2032 668 1/3/2032 0 647.7288841 0 15.000 306.879 18.556 118.633 1686.165 11 2032 648 1/4/2032 0 628.1675038 0 15.000 306.879 18.556 118.633 1686.165 11 2032 628	1/8	3/2031	0	446.0245605	0	15.000	306.879	18.556	118.633	1686.165	9	2032	446
1/11/2031 0 410.3739257 0 15.000 306.879 18.556 118.633 1686.165 9 2032 410 1/12/2031 0 399.5134377 0 15.000 306.879 18.556 118.633 1686.165 9 2032 400 1/1/2032 0 389.1006448 0 14.898 304.791 18.430 117.826 1674.695 9 2032 389 1/2/2032 0 668.1665759 0 15.000 306.879 18.556 118.633 1686.165 11 2032 668 1/3/2032 0 647.7288841 0 15.000 306.879 18.556 118.633 1686.165 11 2032 648 1/4/2032 0 628.1675038 0 15.000 306.879 18.556 118.633 1686.165 11 2032 628	1/9	9/2031	0	433.8489341	0	15.000	306.879	18.556	118.633	1686.165	9	2032	434
1/12/2031 0 399.5134377 0 15.000 306.879 18.556 118.633 1686.165 9 2032 400 1/1/2032 0 389.1006448 0 14.898 304.791 18.430 117.826 1674.695 9 2032 389 1/2/2032 0 668.1665759 0 15.000 306.879 18.556 118.633 1686.165 11 2032 668 1/3/2032 0 647.7288841 0 15.000 306.879 18.556 118.633 1686.165 11 2032 648 1/4/2032 0 628.1675038 0 15.000 306.879 18.556 118.633 1686.165 11 2032 628	1/10	0/2031	0	421.7093039	0	15.000	306.879	18.556	118.633	1686.165	9	2032	422
1/1/2032 0 389.1006448 0 14.898 304.791 18.430 117.826 1674.695 9 2032 389 1/2/2032 0 668.1665759 0 15.000 306.879 18.556 118.633 1686.165 11 2032 668 1/3/2032 0 647.7288841 0 15.000 306.879 18.556 118.633 1686.165 11 2032 648 1/4/2032 0 628.1675038 0 15.000 306.879 18.556 118.633 1686.165 11 2032 628	1/13	L/2031	0	410.3739257	0	15.000	306.879	18.556	118.633	1686.165	9	2032	410
1/2/2032 0 668.1665759 0 15.000 306.879 18.556 118.633 1686.165 11 2032 668 1/3/2032 0 647.7288841 0 15.000 306.879 18.556 118.633 1686.165 11 2032 648 1/4/2032 0 628.1675038 0 15.000 306.879 18.556 118.633 1686.165 11 2032 628	1/12	2/2031	0	399.5134377	0	15.000	306.879	18.556	118.633	1686.165	9	2032	400
1/3/2032 0 647.7288841 0 15.000 306.879 18.556 118.633 1686.165 11 2032 648 1/4/2032 0 628.1675038 0 15.000 306.879 18.556 118.633 1686.165 11 2032 628	1/2	L/2032	0	389.1006448	0	14.898	304.791	18.430	117.826	1674.695	9	2032	389
1/4/2032 0 628.1675038 0 15.000 306.879 18.556 118.633 1686.165 11 2032 628	1/2	2/2032	0	668.1665759	0	15.000	306.879	18.556	118.633	1686.165	11	2032	668
	1/3	3/2032	0	647.7288841	0	15.000	306.879	18.556	118.633	1686.165	11	2032	648
1/5/2032 0 609.7188541 0 15.000 306.879 18.556 118.633 1686.165 11 2032 610	1/4	1/2032	0	628.1675038	0	15.000	306.879	18.556	118.633	1686.165	11	2032	628
	1/5	5/2032	0	609.7188541	0	15.000	306.879	18.556	118.633	1686.165	11	2032	610

1/6/2032
1/8/2032 0 558.9888254 0 15.000 306.879 18.556 118.633 1686.165 11 2033 559 1/9/2032 0 543.5524069 0 15.000 306.879 18.556 118.633 1686.165 11 2033 544 1/10/2032 0 528.6797202 0 15.000 306.879 18.556 118.633 1686.165 11 2033 529 1/11/2032 0 514.6318725 0 15.000 306.879 18.556 118.633 1686.165 11 2033 515 1/12/2032 0 500.9728504 0 15.000 306.879 18.556 118.633 1686.165 11 2033 501 1/2/2033 0 487.869263 0 15.000 306.879 18.556 118.633 1686.165 11 2033 452 1/2/2033 0 445.300122 0 15.000 306.879 18.556 118.633 1686.165 11
1/9/2032 0 543.5524069 0 15.000 306.879 18.556 118.633 1686.165 11 2033 544 1/10/2032 0 528.6797202 0 15.000 306.879 18.556 118.633 1686.165 11 2033 529 1/12/2032 0 514.6318725 0 15.000 306.879 18.556 118.633 1686.165 11 2033 515 1/12/2032 0 500.9728504 0 15.000 306.879 18.556 118.633 1686.165 11 2033 515 1/1/2033 0 487.869263 0 15.000 306.879 18.556 118.633 1686.165 11 2033 488 1/2/2033 0 445.34065862 0 15.000 306.879 18.556 118.633 1686.165 11 2033 446 1/4/2033 0 445.8918739 0 15.000 306.879 18.556 118.633 1686.165 11
1/10/2032
1/11/2032 0 514.6318725 0 15.000 306.879 18.556 118.633 1686.165 11 2033 515 1/12/2032 0 500.9728504 0 15.000 306.879 18.556 118.633 1686.165 11 2033 501 1/1/2033 0 487.869263 0 15.000 306.879 18.556 118.633 1686.165 11 2033 488 1/2/2033 0 475.3901122 0 15.000 306.879 18.556 118.633 1686.165 11 2033 488 1/3/2033 0 463.4065862 0 15.000 306.879 18.556 118.633 1686.165 11 2033 452 1/4/2033 0 451.8918739 0 15.000 306.879 18.556 118.633 1686.165 11 2033 452 1/5/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2033
1/12/2032 0 500.9728504 0 15.000 306.879 18.556 118.633 1686.165 11 2033 501 1/1/2033 0 487.869263 0 15.000 306.879 18.556 118.633 1686.165 11 2033 488 1/2/2033 0 475.3901122 0 15.000 306.879 18.556 118.633 1686.165 11 2033 475 1/3/2033 0 463.4065862 0 15.000 306.879 18.556 118.633 1686.165 11 2033 451 1/4/2033 0 451.8918739 0 15.000 306.879 18.556 118.633 1686.165 11 2033 452 1/5/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2033 441 1/6/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2034
1/1/2033 0 487.869263 0 15.000 306.879 18.556 118.633 1686.165 11 2033 488 1/2/2033 0 475.3901122 0 15.000 306.879 18.556 118.633 1686.165 11 2033 475 1/3/2033 0 463.4065862 0 15.000 306.879 18.556 118.633 1686.165 11 2033 463 1/4/2033 0 451.8918739 0 15.000 306.879 18.556 118.633 1686.165 11 2033 463 1/5/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2033 442 1/6/2033 0 430.0706617 0 15.000 306.879 18.556 118.633 1686.165 11 2033 430 1/7/2033 0 419.8191166 0 15.000 306.879 18.556 118.633 1686.165 11
1/2/2033 0 475.3901122 0 15.000 306.879 18.556 118.633 1686.165 11 2033 475 1/3/2033 0 463.4065862 0 15.000 306.879 18.556 118.633 1686.165 11 2033 463 1/4/2033 0 451.8918739 0 15.000 306.879 18.556 118.633 1686.165 11 2033 452 1/5/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2033 441 1/6/2033 0 430.0706617 0 15.000 306.879 18.556 118.633 1686.165 11 2033 441 1/6/2033 0 419.8191166 0 15.000 306.879 18.556 118.633 1686.165 11 2034 420 1/8/2033 0 409.9460346 0 15.000 306.879 18.556 118.633 1686.165 11
1/3/2033 0 463.4065862 0 15.000 306.879 18.556 118.633 1686.165 11 2033 463 1/4/2033 0 451.8918739 0 15.000 306.879 18.556 118.633 1686.165 11 2033 452 1/5/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2033 441 1/6/2033 0 430.0706617 0 15.000 306.879 18.556 118.633 1686.165 11 2033 430 1/7/2033 0 419.8191166 0 15.000 306.879 18.556 118.633 1686.165 11 2034 420 1/8/2033 0 409.9460346 0 15.000 306.879 18.556 118.633 1686.165 11 2034 410 1/9/2033 0 400.4323983 0 15.000 306.879 18.556 118.633 1686.165 11
1/4/2033 0 451.8918739 0 15.000 306.879 18.556 118.633 1686.165 11 2033 452 1/5/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2033 441 1/6/2033 0 430.0706617 0 15.000 306.879 18.556 118.633 1686.165 11 2033 430 1/7/2033 0 419.8191166 0 15.000 306.879 18.556 118.633 1686.165 11 2034 420 1/8/2033 0 409.9460346 0 15.000 306.879 18.556 118.633 1686.165 11 2034 410 1/9/2033 0 400.4323983 0 15.000 306.879 18.556 118.633 1686.165 11 2034 400 1/10/2033 0 391.2603985 0 15.000 306.879 18.556 118.633 1686.165 11
1/5/2033 0 440.7209976 0 15.000 306.879 18.556 118.633 1686.165 11 2033 441 1/6/2033 0 430.0706617 0 15.000 306.879 18.556 118.633 1686.165 11 2033 430 1/7/2033 0 419.8191166 0 15.000 306.879 18.556 118.633 1686.165 11 2034 420 1/8/2033 0 409.9460346 0 15.000 306.879 18.556 118.633 1686.165 11 2034 410 1/9/2033 0 400.4323983 0 15.000 306.879 18.556 118.633 1686.165 11 2034 400 1/10/2033 0 391.2603985 0 15.000 306.879 18.556 118.633 1686.165 11 2034 400 1/12/2033 0 382.4133417 0 15.000 306.879 18.556 118.633 1686.165 11
1/6/2033 0 430.0706617 0 15.000 306.879 18.556 118.633 1686.165 11 2033 430 1/7/2033 0 419.8191166 0 15.000 306.879 18.556 118.633 1686.165 11 2034 420 1/8/2033 0 409.9460346 0 15.000 306.879 18.556 118.633 1686.165 11 2034 410 1/9/2033 0 400.4323983 0 15.000 306.879 18.556 118.633 1686.165 11 2034 400 1/10/2033 0 391.2603985 0 15.000 306.879 18.556 118.633 1686.165 11 2034 391 1/11/2033 0 382.4133417 0 15.000 306.879 18.556 118.633 1686.165 11 2034 382 1/12/2033 0 373.875566 0 15.000 306.879 18.556 118.633 1686.165 11 2034 374 1/2/2034 0 365.6323639 0 15.
1/7/2033 0 419.8191166 0 15.000 306.879 18.556 118.633 1686.165 11 2034 420 1/8/2033 0 409.9460346 0 15.000 306.879 18.556 118.633 1686.165 11 2034 410 1/9/2033 0 400.4323983 0 15.000 306.879 18.556 118.633 1686.165 11 2034 400 1/10/2033 0 391.2603985 0 15.000 306.879 18.556 118.633 1686.165 11 2034 391 1/11/2033 0 382.4133417 0 15.000 306.879 18.556 118.633 1686.165 11 2034 382 1/12/2033 0 373.875566 0 15.000 306.879 18.556 118.633 1686.165 11 2034 374 1/1/2034 0 365.6323639 0 15.000 306.879 18.556 118.633 1686.165 11
1/8/2033 0 409.9460346 0 15.000 306.879 18.556 118.633 1686.165 11 2034 410 1/9/2033 0 400.4323983 0 15.000 306.879 18.556 118.633 1686.165 11 2034 400 1/10/2033 0 391.2603985 0 15.000 306.879 18.556 118.633 1686.165 11 2034 391 1/11/2033 0 382.4133417 0 15.000 306.879 18.556 118.633 1686.165 11 2034 382 1/12/2033 0 373.875566 0 15.000 306.879 18.556 118.633 1686.165 11 2034 374 1/1/2034 0 365.6323639 0 15.000 306.879 18.556 118.633 1686.165 11 2034 366 1/2/2034 0 357.6699125 0 15.000 306.879 18.556 118.633 1686.165 11
1/9/2033 0 400.4323983 0 15.000 306.879 18.556 118.633 1686.165 11 2034 400 1/10/2033 0 391.2603985 0 15.000 306.879 18.556 118.633 1686.165 11 2034 391 1/11/2033 0 382.4133417 0 15.000 306.879 18.556 118.633 1686.165 11 2034 382 1/12/2033 0 373.875566 0 15.000 306.879 18.556 118.633 1686.165 11 2034 374 1/1/2034 0 365.6323639 0 15.000 306.879 18.556 118.633 1686.165 11 2034 366 1/2/2034 0 357.6699125 0 15.000 306.879 18.556 118.633 1686.165 11 2034 358 1/3/2034 0 349.975209 0 15.000 306.879 18.556 118.633 1686.165 11
1/10/2033 0 391.2603985 0 15.000 306.879 18.556 118.633 1686.165 11 2034 391 1/11/2033 0 382.4133417 0 15.000 306.879 18.556 118.633 1686.165 11 2034 382 1/12/2033 0 373.875566 0 15.000 306.879 18.556 118.633 1686.165 11 2034 374 1/1/2034 0 365.6323639 0 15.000 306.879 18.556 118.633 1686.165 11 2034 366 1/2/2034 0 357.6699125 0 15.000 306.879 18.556 118.633 1686.165 11 2034 358 1/3/2034 0 349.975209 0 15.000 306.879 18.556 118.633 1686.165 11 2034 350 1/4/2034 0 342.5360123 0 15.000 306.879 18.556 118.633 1686.165 11
1/11/2033 0 382.4133417 0 15.000 306.879 18.556 118.633 1686.165 11 2034 382 1/12/2033 0 373.875566 0 15.000 306.879 18.556 118.633 1686.165 11 2034 374 1/1/2034 0 365.6323639 0 15.000 306.879 18.556 118.633 1686.165 11 2034 366 1/2/2034 0 357.6699125 0 15.000 306.879 18.556 118.633 1686.165 11 2034 358 1/3/2034 0 349.975209 0 15.000 306.879 18.556 118.633 1686.165 11 2034 350 1/4/2034 0 342.5360123 0 15.000 306.879 18.556 118.633 1686.165 11 2034 343 1/5/2034 0 335.3407889 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335 1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 328
1/12/2033 0 373.875566 0 15.000 306.879 18.556 118.633 1686.165 11 2034 374 1/1/2034 0 365.6323639 0 15.000 306.879 18.556 118.633 1686.165 11 2034 366 1/2/2034 0 357.6699125 0 15.000 306.879 18.556 118.633 1686.165 11 2034 358 1/3/2034 0 349.975209 0 15.000 306.879 18.556 118.633 1686.165 11 2034 350 1/4/2034 0 342.5360123 0 15.000 306.879 18.556 118.633 1686.165 11 2034 343 1/5/2034 0 335.3407889 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335 1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335
1/1/2034 0 365.6323639 0 15.000 306.879 18.556 118.633 1686.165 11 2034 366 1/2/2034 0 357.6699125 0 15.000 306.879 18.556 118.633 1686.165 11 2034 358 1/3/2034 0 349.975209 0 15.000 306.879 18.556 118.633 1686.165 11 2034 350 1/4/2034 0 342.5360123 0 15.000 306.879 18.556 118.633 1686.165 11 2034 343 1/5/2034 0 335.3407889 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335 1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 328
1/2/2034 0 357.6699125 0 15.000 306.879 18.556 118.633 1686.165 11 2034 358 1/3/2034 0 349.975209 0 15.000 306.879 18.556 118.633 1686.165 11 2034 350 1/4/2034 0 342.5360123 0 15.000 306.879 18.556 118.633 1686.165 11 2034 343 1/5/2034 0 335.3407889 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335 1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 328
1/3/2034 0 349.975209 0 15.000 306.879 18.556 118.633 1686.165 11 2034 350 1/4/2034 0 342.5360123 0 15.000 306.879 18.556 118.633 1686.165 11 2034 343 1/5/2034 0 335.3407889 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335 1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 328
1/4/2034 0 342.5360123 0 15.000 306.879 18.556 118.633 1686.165 11 2034 343 1/5/2034 0 335.3407889 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335 1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 328
1/5/2034 0 335.3407889 0 15.000 306.879 18.556 118.633 1686.165 11 2034 335 1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 328
1/6/2034 0 328.3786638 0 15.000 306.879 18.556 118.633 1686.165 11 2034 328
1/7/2034 0 321.6393748 0 15.000 306.879 18.556 118.633 1686.165 11 2035 322
1/8/2034 0 315.1132313 0 15.000 306.879 18.556 118.633 1686.165 11 2035 315
1/9/2034 0 308.7910753 0 12.041 246.342 14.896 95.231 1353.544 11 2035 309
1/10/2034 0 302.6642465 0 9.944 203.436 12.301 78.644 1117.792 11 2035 303
1/11/2034 0 296.7245496 0 9.749 199.444 12.060 77.101 1095.856 11 2035 297
1/12/2034 0 290.964224 0 9.559 195.572 11.826 75.604 1074.582 11 2035 291
1/1/2035 0 285.375916 0 9.376 191.816 11.599 74.152 1053.943 11 2035 285
1/2/2035 0 279.9526532 167.5310198 15.000 306.389 14.688 82.818 1518.567 13 2035 447
1/3/2035 0 274.6878203 165.8423448 14.766 301.620 14.495 81.857 1496.446 13 2035 441

1 /4 /2025	0	200 5754275	164 2010141	14242	202.040	14112	70.013	1454 057	12	2025	424
1/4/2035	0	269.5751375	164.2019141	14.342	292.949	14.112	79.813	1454.857	13	2035	434
1/5/2035	0	264.6086394	162.6077777	13.999	285.965	13.807	78.204	1421.532	13	2035	427
1/6/2035	0	259.7826566	161.0580846	13.671	279.251	13.513	76.646	1389.448	13	2035	421
1/7/2035	0	255.0917973	159.5510763	13.354	272.792	13.229	75.139	1358.538	13	2036	415
1/8/2035	0	250.5309314	158.0850821	13.050	266.575	12.954	73.678	1328.743	13	2036	409
1/9/2035	0	246.0951751	156.6585134	12.756	260.587	12.689	72.263	1300.004	13	2036	403
1/10/2035	0	241.7798763	155.2698593	12.474	254.816	12.433	70.891	1272.270	13	2036	397
1/11/2035	0	237.5806015	153.917682	12.201	249.250	12.185	69.560	1245.489	13	2036	391
1/12/2035	0	233.4931237	152.6006129	11.938	243.881	11.945	68.268	1219.617	13	2036	386
1/1/2036	0	229.5134102	151.3173483	11.684	238.697	11.712	67.015	1194.609	13	2036	381
1/2/2036	0	225.6376124	150.0666459	11.439	233.690	11.487	65.798	1170.424	13	2036	376
1/3/2036	0	221.862055	148.8473214	11.202	228.852	11.268	64.616	1147.026	13	2036	371
1/4/2036	0	218.1832273	147.6582455	10.973	224.174	11.056	63.467	1124.376	13	2036	366
1/5/2036	0	214.5977738	146.4983403	10.751	219.649	10.851	62.351	1102.443	13	2036	361
1/6/2036	0	211.102486	145.3665772	10.537	215.270	10.652	61.265	1081.193	13	2036	356
1/7/2036	0	207.6942947	144.2619738	10.329	211.030	10.458	60.210	1060.597	13	2037	352
1/8/2036	0	204.3702628	143.1835915	10.128	206.924	10.270	59.182	1040.627	13	2037	348
1/9/2036	0	201.1275781	140.7216142	9.933	202.945	10.088	58.182	1021.256	13	2037	342
1/10/2036	0	197.9635471	98.63497507	9.745	199.088	9.910	57.209	1002.459	13	2037	297
1/11/2036	0	194.8755892	96.14754277	9.561	195.347	9.738	56.261	984.212	13	2037	291
1/12/2036	0	191.8612305	93.75303178	9.384	191.718	9.570	55.338	966.492	13	2037	286
1/1/2037	0	188.9180986	91.44687083	9.211	188.196	9.407	54.438	949.278	13	2037	280
1/2/2037	0	186.0439178	288.7404067	15.000	306.053	12.028	58.186	1403.301	16	2037	475
1/3/2037	0	183.2365043	286.9237923	15.000	306.058	12.066	58.530	1404.912	16	2037	470
1/4/2037	0	180.4937613	285.142676	15.000	306.062	12.102	58.868	1406.492	16	2037	466
1/5/2037	0	177.8136756	283.3961375	15.000	306.067	12.138	59.199	1408.042	16	2037	461
1/6/2037	0	175.1943126	281.6832817	15.000	306.071	12.173	59.524	1409.563	16	2037	457
1/7/2037	0	172.6338134	280.0032386	15.000	306.076	12.207	59.843	1411.055	16	2038	453
1/8/2037	0	170.1303909	278.3551626	15.000	306.080	12.241	60.156	1412.518	16	2038	448
1/9/2037	0	167.6823264	279.5424996	15.000	306.084	12.274	60.463	1413.955	16	2038	447
1/10/2037	0	165.2879666	280.7809706	15.000	306.088	12.307	60.764	1415.365	15	2038	446
1/11/2037	0	162.9457203	279.2644448	15.000	306.092	12.339	61.060	1416.749	15	2038	442
1/12/2037	0	160.6540561	277.77581	15.000	306.096	12.370	61.350	1418.108	15	2038	438
1/1/2038	0	158.4114991	276.3143635	15.000	306.100	12.401	61.635	1419.443	15	2038	435

1/2/2038	0	156.2166288	274.8794231	15.000	306.104	12.431	61.915	1420.753	15	2038	431
1/3/2038	0	154.0680765	273.4703266	15.000	306.108	12.461	62.190	1422.040	15	2038	428
1/4/2038	0	151.9645231	272.0864309	15.000	306.111	12.490	62.461	1423.304	15	2038	424
1/5/2038	0	149.9046968	270.7271119	14.554	297.010	12.146	60.860	1382.173	15	2038	421
1/6/2038	0	147.8873712	269.3917636	12.312	251.252	10.298	51.697	1170.222	15	2038	417
1/7/2038	0	145.9113633	268.0797979	12.062	246.159	10.111	50.855	1147.453	15	2039	414
1/8/2038	0	143.9755314	261.3183242	11.820	241.233	9.930	50.035	1125.408	15	2039	405
1/9/2038	0	137.2961083	210.5897738	11.430	233.252	9.560	47.994	1086.391	15	2039	348
1/10/2038	0	130.876256	205.563236	11.053	225.573	9.204	46.032	1048.853	13	2039	336
1/11/2038	0	129.145512	200.7167443	10.837	221.165	9.042	45.299	1029.129	13	2039	330
1/12/2038	0	127.4494358	196.0417134	10.628	216.896	8.885	44.585	1010.004	13	2039	323
1/1/2039	0	125.7870946	191.5300678	10.425	212.758	8.732	43.889	991.453	13	2039	317
1/2/2039	0	124.1575867	358.7238902	15.000	305.892	10.756	46.408	1348.185	16	2039	483
1/3/2039	0	122.560041	357.4433031	15.000	305.896	10.784	46.666	1349.391	16	2039	480
1/4/2039	0	120.9936154	356.1814075	15.000	305.899	10.812	46.920	1350.580	16	2039	477
1/5/2039	0	119.4574955	354.9378591	15.000	305.902	10.839	47.170	1351.752	16	2039	474
1/6/2039	0	117.9508939	353.7123182	15.000	305.906	10.865	47.417	1352.906	16	2039	472
1/7/2039	0	116.4730489	352.5044505	15.000	305.909	10.892	47.660	1354.044	16	2040	469
1/8/2039	0	115.0232233	351.3139265	15.000	305.912	10.917	47.900	1355.166	16	2040	466
1/9/2039	0	104.0353725	357.1501533	15.000	305.896	10.791	46.725	1349.667	16	2040	461
1/10/2039	0	93.51725759	363.2383585	15.000	305.880	10.658	45.499	1343.931	14	2040	457
1/11/2039	0	92.32933897	362.2455815	15.000	305.882	10.680	45.699	1344.867	14	2040	455
1/12/2039	0	91.164073	361.2666887	15.000	305.885	10.701	45.896	1345.789	14	2040	452
1/1/2040	0	90.02088361	360.3014221	15.000	305.888	10.722	46.090	1346.698	14	2040	450
1/2/2040	0	88.899213	359.3495282	15.000	305.890	10.743	46.282	1347.595	14	2040	448
1/3/2040	0	87.79852103	358.4107586	15.000	305.893	10.763	46.471	1348.480	14	2040	446
1/4/2040	0	86.71828445	357.4848697	15.000	305.895	10.783	46.657	1349.352	14	2040	444
1/5/2040	0	85.65799635	356.5716226	15.000	305.898	10.803	46.841	1350.212	14	2040	442
1/6/2040	0	84.61716551	355.6707829	15.000	305.900	10.823	47.022	1351.061	14	2040	440
1/7/2040	0	83.5953158	354.7821214	15.000	305.903	10.842	47.201	1351.898	14	2041	438
1/8/2040	0	82.59198569	353.9054131	15.000	305.905	10.861	47.378	1352.724	14	2041	436
1/9/2040	0	81.60672764	338.3592721	14.376	293.187	10.428	45.575	1297.253	14	2041	420
1/10/2040	0	80.63910762	272.0948715	11.589	236.342	8.420	36.871	1046.347	14	2041	353
1/11/2040	0	79.68870464	266.0980195	11.361	231.689	8.268	36.273	1026.340	14	2041	346

1/12/2040	0	78.75511026	260.3025257	11.139	227.182	8.121	35.691	1006.949	14	2041	339
1/1/2041	0	77.83792815	254.6992767	10.925	222.814	7.977	35.125	988.147	14	2041	333
1/2/2041	0	76.93677363	249.279678	10.718	218.581	7.838	34.574	969.909	14	2041	326
1/3/2041	0	76.05127332	244.0356187	10.516	214.475	7.703	34.037	952.213	14	2041	320
1/4/2041	0	75.18106468	238.9594385	10.321	210.492	7.572	33.514	935.034	14	2041	314
1/5/2041	0	74.32579567	234.0438976	10.131	206.627	7.444	33.004	918.353	14	2041	308
1/6/2041	0	73.48512438	229.2821489	9.947	202.875	7.320	32.507	902.149	14	2041	303
1/7/2041	0	72.65871865	224.6677125	9.768	199.230	7.199	32.023	886.402	14	2042	297
1/8/2041	0	71.8462558	220.194452	9.595	195.690	7.082	31.550	871.096	14	2042	292
1/9/2041	0	61.48209092	215.8565523	9.112	185.820	6.579	28.603	820.886	14	2042	277
1/10/2041	0	51.57437071	211.6484997	8.648	176.343	6.096	25.783	772.718	12	2042	263
1/11/2041	0	50.98392797	207.565063	8.494	173.213	5.995	25.390	759.304	12	2042	259
1/12/2041	0	50.40357848	203.6012759	8.345	170.169	5.897	25.008	746.256	12	2042	254
1/1/2042	0	49.83309323	199.7524211	8.200	167.210	5.801	24.634	733.561	12	2042	250
1/2/2042	0	49.27224968	412.7394594	15.000	305.743	9.582	35.532	1297.292	13	2042	462
1/3/2042	0	48.72083153	412.0841874	15.000	305.745	9.596	35.664	1297.910	13	2042	461
1/4/2042	0	48.17862855	411.4366761	15.000	305.747	9.610	35.795	1298.520	13	2042	460
1/5/2042	0	47.6454363	410.7968187	15.000	305.749	9.624	35.923	1299.123	13	2042	458
1/6/2042	0	47.12105602	410.1645081	15.000	305.751	9.638	36.051	1299.718	13	2042	457
1/7/2042	0	46.60529439	409.5396372	15.000	305.752	9.651	36.176	1300.307	13	2043	456
1/8/2042	0	46.09796336	408.9220991	15.000	305.754	9.665	36.301	1300.889	13	2043	455
1/9/2042	0	45.59888002	408.3117872	15.000	305.756	9.678	36.424	1301.464	13	2043	454
1/10/2042	0	45.10786635	407.7085958	15.000	305.757	9.691	36.545	1302.032	13	2043	453
1/11/2042	0	44.62474915	407.1124194	15.000	305.759	9.704	36.665	1302.594	13	2043	452
1/12/2042	0	44.14935983	388.5778138	14.338	292.263	9.288	35.160	1245.624	13	2043	433
1/1/2043	0	43.68153428	350.2860558	12.943	263.842	8.396	31.842	1124.960	13	2043	394
1/2/2043	0	43.22111274	421.5827157	15.000	305.719	9.390	33.752	1288.961	13	2043	465
1/3/2043	0	42.76793964	421.0518065	15.000	305.721	9.401	33.859	1289.461	13	2043	464
1/4/2043	0	42.32186347	420.5260477	15.000	305.722	9.413	33.964	1289.956	13	2043	463
1/5/2043	0	41.88273669	420.005393	15.000	305.723	9.424	34.069	1290.447	13	2043	462
1/6/2043	0	41.45041553	419.4897949	15.000	305.725	9.435	34.173	1290.932	13	2043	461
1/7/2043	0	41.02475998	418.9792053	15.000	305.726	9.446	34.276	1291.413	13	2044	460
1/8/2043	0	40.60563357	418.4735748	15.000	305.728	9.457	34.378	1291.890	13	2044	459
1/9/2043	0	30.627572	426.5529902	15.000	305.705	9.282	32.751	1284.278	13	2044	457

1/10/2043	0	21.09889715	434.9669555	15.000	305.682	9.099	31.057	1276.350	11	2044	456
1/11/2043	0	20.88061174	434.6900991	15.000	305.683	9.105	31.113	1276.611	11	2044	456
1/12/2043	0	20.6656964	434.4157741	15.000	305.684	9.111	31.168	1276.870	11	2044	455
1/1/2044	0	20.45408211	434.1439556	15.000	305.685	9.116	31.223	1277.126	11	2044	455
1/2/2044	0	20.24570162	433.8746186	15.000	305.685	9.122	31.277	1277.379	11	2044	454
1/3/2044	0	20.04048937	433.6077378	15.000	305.686	9.128	31.331	1277.631	11	2044	454
1/4/2044	0	19.83838145	433.3432879	15.000	305.687	9.134	31.384	1277.880	11	2044	453
1/5/2044	0	19.63931557	433.0812434	15.000	305.688	9.140	31.437	1278.127	11	2044	453
1/6/2044	0	19.44323098	432.821579	15.000	305.688	9.145	31.489	1278.372	11	2044	452
1/7/2044	0	19.25006844	394.0005603	13.663	278.436	8.335	28.729	1164.624	11	2045	413
1/8/2044	0	19.05977019	339.7371037	11.788	240.231	7.196	24.827	1005.008	11	2045	359
1/9/2044	0	9.306948543	332.7320135	11.237	228.986	6.667	21.883	949.718	11	2045	342
1/10/2044	0	0	325.9534662	10.709	218.193	6.161	19.068	896.698	9	2045	326
1/11/2044	0	0	319.3914041	10.493	213.801	6.036	18.684	878.646	9	2045	319
1/12/2044	0	0	313.036337	10.285	209.547	5.916	18.313	861.163	9	2045	313
1/1/2045	0	0	306.8793039	10.082	205.425	5.800	17.952	844.225	9	2045	307
1/2/2045	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	9	2045	457
1/3/2045	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	9	2045	457
1/4/2045	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	9	2045	457
1/5/2045	0	0	453.715638	14.906	303.717	8.575	26.542	1248.172	7	2045	454
1/6/2045	0	0	417.0352257	13.701	279.163	7.882	24.397	1147.264	7	2045	417
1/7/2045	0	0	407.1624617	13.377	272.555	7.695	23.819	1120.104	7	2046	407
1/8/2045	0	0	397.6643052	13.065	266.196	7.516	23.263	1093.975	7	2046	398
1/9/2045	0	0	388.5209098	12.765	260.076	7.343	22.728	1068.821	7	2046	389
1/10/2045	0	0	379.7137816	12.475	254.180	7.177	22.213	1044.593	7	2046	380
1/11/2045	0	0	371.2256671	12.196	248.498	7.016	21.717	1021.242	7	2046	371
1/12/2045	0	0	363.0404518	11.927	243.019	6.861	21.238	998.724	7	2046	363
1/1/2046	0	0	355.1430686	11.668	237.733	6.712	20.776	976.999	7	2046	355
1/2/2046	0	0	347.5194145	11.417	232.629	6.568	20.330	956.026	7	2046	348
1/3/2046	0	0	340.1562753	11.176	227.701	6.429	19.899	935.770	7	2046	340
1/4/2046	0	0	333.0412576	10.942	222.938	6.294	19.483	916.196	7	2046	333
1/5/2046	0	0	326.1627263	10.716	218.333	6.164	19.081	897.274	7	2046	326
1/6/2046	0	0	319.5097481	10.497	213.880	6.039	18.691	878.971	7	2046	320
1/7/2046	0	0	313.0720396	10.286	209.570	5.917	18.315	861.261	7	2047	313

1/8/2046 O O 306.8399204 10.081 205.399 5.799 17.950 844.117 7 2047 307												
1/10/2046	1/8/2046	0	0	306.8399204	10.081	205.399	5.799	17.950	844.117	7	2047	307
1/11/2046 0	1/9/2046	0	0	300.8042698	9.883	201.358	5.685	17.597	827.513	7	2047	301
1/12/2046 0 0 0 283.7925114 9.324 189.971 5.364 16.602 780.713 7 2047 284 1/1/2047 0 0 0 278.4614063 9.149 186.402 5.263 16.290 766.047 7 2047 278 1/1/2047 0 0 0 451.9868501 14.850 302.560 8.543 16.290 766.047 7 2047 452 1/1/2047 0 0 0 440.9390853 14.487 295.165 8.334 25.795 1213.023 7 2047 441 1/1/2047 0 0 0 440.9390853 14.487 295.165 8.334 25.795 1213.023 7 2047 441 1/1/2047 0 0 0 480.9390853 12.904 26.991 7.423 22.976 1808.473 4 2047 393 1/5/2047 0 0 0 392.7562956 12.904 26.991 7.423 22.976 1808.473 4 2047 393 1/6/2047 0 0 0 383.2701666 12.592 256.561 7.244 22.421 1054.376 4 2047 383 1/7/2047 0 0 0 374.1535275 12.293 250.458 7.072 21.888 1029.296 4 2048 374 1/9/2047 0 0 365.3862251 12.004 244.590 6.906 21.375 1005.178 4 2048 376 1/9/2047 0 0 0 365.3862251 12.004 244.590 6.906 21.375 1005.178 4 2048 376 1/9/2047 0 0 0 364.8259665 11.404 244.590 6.906 21.375 1005.178 4 2048 349 1/11/2047 0 0 0 348.8259665 11.404 233.504 6.593 20.406 959.620 4 2048 349 1/11/2047 0 0 0 348.8259665 11.400 233.504 6.593 20.406 959.620 4 2048 349 1/11/2047 0 0 0 340.9993035 11.203 228.265 6.445 19.948 938.809 4 2048 349 1/11/2047 0 0 0 336.4769499 10.716 218.343 6.1655 19.948 938.809 4 2048 333 1/1/2048 0 0 0 316.1769499 10.716 218.343 6.1655 19.981 89.333 4 2048 333 1/1/2048 0 0 0 316.1769499 10.716 218.343 6.1655 19.981 89.333 4 2048 333 1/1/2048 0 0 0 316.3752715 10.263 209.102 5.904 18.274 859.337 4 2048 319 1/9/2048 0 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048 329 1/9/2048 0 0 0 299.4898669 9.840 20.479 5.660 17.520 823.897 4 2048 329 1/9/2048 0 0 0 299.4898669 9.840 20.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 0 299.4898669 9.840 20.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048 299 1/9/2048 0 0 0 255.5725276 8.725 17.7774 5.019 15.536 73.0590 4 2049 266 1/1/2049 0 0 0 255.623846 8.398 171.133 4 4.831 14.954 70.3214 4 2049 266 1/1/2049 0 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/9/2049 0 0 0 456.5625 15.000 305.623 8.629 26.7	1/10/2046	0	0	294.9564874	9.691	197.444	5.575	17.255	811.425	7	2047	295
1/1/2047 0	1/11/2046	0	0	289.2884565	9.504	193.650	5.468	16.923	795.833	7	2047	289
1/2/2047 0 451,9868501 14,850 302,560 8,543 26,441 1243,416 7 2047 452 1/3/2047 0 0 440,9390853 14,487 295,165 8,334 25,795 1213,023 7 2047 441 1/4/2047 0 0 448,6820875 13,755 280,266 7,913 24,493 1151,794 7 2047 4419 1/5/2047 0 0 392,7562956 12,904 262,911 7,423 22,976 1080,473 4 2047 393 1/6/2047 0 0 374,1535275 12,293 256,561 7,244 22,421 1054,376 4 2047 383 1/8/2047 0 0 365,3862251 12,004 244,590 6,906 21,375 1005,178 4 2048 365 1/9/2047 0 0 348,8259665 11,406 23,504 6,906 21,375 1005,178 4 2048 365	1/12/2046	0	0	283.7925114	9.324	189.971	5.364	16.602	780.713	7	2047	284
1/3/2047 0	1/1/2047	0	0	278.4614063	9.149	186.402	5.263	16.290	766.047	7	2047	278
1/4/2047 0 418.6820875 13.755 280.266 7.913 24.493 1151.794 7 2047 419 1/5/2047 0 0 392.7562956 12.904 262.911 7.423 22.976 1080.473 4 2047 393 1/6/2047 0 0 383.2701666 12.592 256.561 7.244 22.421 1054.376 4 2047 383 1/6/2047 0 0 374.1535275 12.293 256.458 7.072 21.888 1029.296 4 2048 374 1/8/2047 0 0 365.3862251 12.004 244.590 6.906 21.375 1005.178 4 2048 365 1/9/2047 0 0 356.94952 11.727 238.942 6.766 20.832 981.968 4 2048 357 1/10/2047 0 0 348.8259665 11.400 233.504 6.593 20.406 959.620 4 2048 341	1/2/2047	0	0	451.9868501	14.850	302.560	8.543	26.441	1243.416	7	2047	452
1/5/2047 0 0 392.7562956 12.904 262.911 7.423 22.976 1080.473 4 2047 393 1/6/2047 0 0 383.2701666 12.592 256.561 7.244 22.421 1054.376 4 2047 383 1/7/2047 0 0 374.1535275 12.293 250.488 7.072 21.888 1029.296 4 2048 374 1/8/2047 0 0 365.3862251 12.004 244.590 6.906 21.375 1005.178 4 2048 365 1/9/2047 0 0 356.94952 11.272 238.942 6.746 20.882 981.968 4 2048 357 1/10/2047 0 0 348.8259665 11.460 233.504 6.593 20.406 959.620 4 2048 341 1/12/2047 0 0 349.999 10.716 218.343 6.165 19.948 938.099 4 2048 <t< td=""><td>1/3/2047</td><td>0</td><td>0</td><td>440.9390853</td><td>14.487</td><td>295.165</td><td>8.334</td><td>25.795</td><td>1213.023</td><td>7</td><td>2047</td><td>441</td></t<>	1/3/2047	0	0	440.9390853	14.487	295.165	8.334	25.795	1213.023	7	2047	441
1/6/2047 0 0 383.2701666 12.592 256.561 7.244 22.421 1054.376 4 2047 383 1/7/2047 0 0 374.1535275 12.293 250.488 7.072 21.888 1029.296 4 2048 374 1/8/2047 0 0 365.3862251 12.004 244.590 6.906 21.375 1005.178 4 2048 365 1/9/2047 0 0 355.94952 11.727 238.942 6.746 20.882 981.968 4 2048 357 1/10/2047 0 0 348.8259665 11.460 233.504 6.593 20.406 959.620 4 2048 349 1/11/2047 0 0 343.453566 10.955 232.214 6.302 19.507 917.333 4 2048 341 1/1/2048 0 0 326.1769499 10.716 218.343 6.165 19.081 897.313 4 2048	1/4/2047	0	0	418.6820875	13.755	280.266	7.913	24.493	1151.794	7	2047	419
1/7/2047 0 0 374.1535275 12.293 250.458 7.072 21.888 1029.296 4 2048 374 1/8/2047 0 0 365.3862251 12.004 244.590 6.906 21.375 1005.178 4 2048 365 1/9/2047 0 0 356.94952 11.727 238.942 6.746 20.882 981.968 4 2048 357 1/10/2047 0 0 348.8259665 11.460 233.504 6.593 20.406 959.620 4 2048 349 1/11/2047 0 0 340.9993035 11.203 228.265 6.445 19.948 938.089 4 2048 341 1/12/2047 0 0 326.1769499 10.716 218.343 6.165 19.981 897.313 4 2048 326 1/2/2048 0 0 319.1538295 10.486 213.642 6.032 18.670 877.992 4 2048	1/5/2047	0	0	392.7562956	12.904	262.911	7.423	22.976	1080.473	4	2047	393
1/8/2047 0 0 365.3862251 12.004 244.590 6.906 21.375 1005.178 4 2048 365 1/9/2047 0 0 356.94952 11.727 238.942 6.746 20.882 981.968 4 2048 357 1/10/2047 0 0 348.8259665 11.460 233.504 6.593 20.406 959.620 4 2048 349 1/11/2047 0 0 340.9993035 11.203 228.265 6.445 19.948 938.089 4 2048 341 1/12/2047 0 0 333.4543566 10.955 223.214 6.302 19.507 917.333 4 2048 333 1/1/2048 0 0 319.1538255 10.466 213.642 6.032 18.670 877.992 4 2048 312 1/3/2048 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048	1/6/2047	0	0	383.2701666	12.592	256.561	7.244	22.421	1054.376	4	2047	383
1/9/2047 0 0 356.94952 11.727 238.942 6.746 20.882 981.968 4 2048 357 1/10/2047 0 0 348.8259665 11.460 233.504 6.593 20.406 959.620 4 2048 349 1/12/2047 0 0 340.9993035 11.203 228.265 6.445 19.948 938.089 4 2048 341 1/12/2047 0 0 333.4543566 10.955 223.214 6.302 19.507 917.333 4 2048 333 1/2/2048 0 0 326.1769499 10.716 218.343 6.165 19.081 897.313 4 2048 326 1/2/2048 0 0 319.1538255 10.486 213.642 6.032 18.670 877.992 4 2048 319 1/3/2048 0 0 319.38255 10.048 204.717 5.780 17.891 841.315 4 2048 <td< td=""><td>1/7/2047</td><td>0</td><td>0</td><td>374.1535275</td><td>12.293</td><td>250.458</td><td>7.072</td><td>21.888</td><td>1029.296</td><td>4</td><td>2048</td><td>374</td></td<>	1/7/2047	0	0	374.1535275	12.293	250.458	7.072	21.888	1029.296	4	2048	374
1/10/2047 0 0 348.8259665 11.460 233.504 6.593 20.406 959.620 4 2048 349 1/11/2047 0 0 340.9993035 11.203 228.265 6.445 19.948 938.089 4 2048 341 1/12/2048 0 0 333.4543566 10.955 223.214 6.302 19.507 917.333 4 2048 333 1/1/2048 0 0 326.1769499 10.716 218.343 6.165 19.081 897.313 4 2048 326 1/2/2048 0 0 319.1538255 10.486 213.642 6.032 18.670 877.992 4 2048 319 1/3/2048 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048 319 1/4/2048 0 0 305.8215559 10.048 204.717 5.780 17.891 841.315 4 2048	1/8/2047	0	0	365.3862251	12.004	244.590	6.906	21.375	1005.178	4	2048	365
1/11/2047 0 0 340.9993035 11.203 228.265 6.445 19.948 938.089 4 2048 341 1/12/2047 0 0 333.4543566 10.955 223.214 6.302 19.507 917.333 4 2048 333 1/1/2048 0 0 326.1769499 10.716 218.343 6.665 19.081 897.313 4 2048 326 1/2/2048 0 0 319.1538255 10.486 213.642 6.032 18.670 877.992 4 2048 319 1/3/2048 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048 319 1/4/2048 0 0 305.8215559 10.048 204.717 5.780 17.891 841.315 4 2048 306 1/5/2048 0 0 299.4898669 9.840 200.479 5.660 17.520 823.897 4 2048 <	1/9/2047	0	0	356.94952	11.727	238.942	6.746	20.882	981.968	4	2048	357
1/12/2047 0 0 333.4543566 10.955 223.214 6.302 19.507 917.333 4 2048 333 1/1/2048 0 0 326.1769499 10.716 218.343 6.165 19.081 897.313 4 2048 326 1/2/2048 0 0 319.1538255 10.486 213.642 6.032 18.670 877.992 4 2048 319 1/3/2048 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048 312 1/4/2048 0 0 305.821559 10.048 204.717 5.780 17.891 841.315 4 2048 306 1/5/2048 0 0 299.4898669 9.840 200.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048	1/10/2047	0	0	348.8259665	11.460	233.504	6.593	20.406	959.620	4	2048	349
1/1/2048 0 0 326.1769499 10.716 218.343 6.165 19.081 897.313 4 2048 326 1/2/2048 0 0 319.1538255 10.486 213.642 6.032 18.670 877.992 4 2048 319 1/3/2048 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048 312 1/4/2048 0 0 305.8215559 10.048 204.717 5.780 17.891 841.315 4 2048 306 1/5/2048 0 0 299.4898669 9.840 200.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048 293 1/7/2048 0 0 287.444101 9.444 192.415 5.433 16.815 790.759 4 2049 287 1/8/2048 0 0 281.7113357 9.255 188.578	1/11/2047	0	0	340.9993035	11.203	228.265	6.445	19.948	938.089	4	2048	341
1/2/2048 0 0 319.1538255 10.486 213.642 6.032 18.670 877.992 4 2048 319 1/3/2048 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048 312 1/4/2048 0 0 305.8215559 10.048 204.717 5.780 17.891 841.315 4 2048 306 1/5/2048 0 0 299.4898669 9.840 200.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048 293 1/7/2048 0 0 287.444101 9.444 192.415 5.433 16.815 790.759 4 2049 287 1/8/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276	1/12/2047	0	0	333.4543566	10.955	223.214	6.302	19.507	917.333	4	2048	333
1/3/2048 0 0 312.3725715 10.263 209.102 5.904 18.274 859.337 4 2048 312 1/4/2048 0 0 305.8215559 10.048 204.717 5.780 17.891 841.315 4 2048 306 1/5/2048 0 0 299.4898669 9.840 200.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048 293 1/7/2048 0 0 287.444101 9.444 192.415 5.433 16.815 790.759 4 2049 287 1/8/2048 0 0 281.7113357 9.255 188.578 5.324 16.480 774.988 4 2049 282 1/9/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276<	1/1/2048	0	0	326.1769499	10.716	218.343	6.165	19.081	897.313	4	2048	326
1/4/2048 0 0 305.8215559 10.048 204.717 5.780 17.891 841.315 4 2048 306 1/5/2048 0 0 299.4898669 9.840 200.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048 293 1/7/2048 0 0 287.444101 9.444 192.415 5.433 16.815 790.759 4 2049 287 1/8/2048 0 0 281.7113357 9.255 188.578 5.324 16.480 774.988 4 2049 282 1/9/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276 1/10/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266<	1/2/2048	0	0	319.1538255	10.486	213.642	6.032	18.670	877.992	4	2048	319
1/5/2048 0 0 299.4898669 9.840 200.479 5.660 17.520 823.897 4 2048 299 1/6/2048 0 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048 293 1/7/2048 0 0 287.444101 9.444 192.415 5.433 16.815 790.759 4 2049 287 1/8/2048 0 0 281.7113357 9.255 188.578 5.324 16.480 774.988 4 2049 282 1/9/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276 1/10/2048 0 0 270.7833575 8.896 181.262 5.118 15.841 744.925 4 2049 271 1/11/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266<	1/3/2048	0	0	312.3725715	10.263	209.102	5.904	18.274	859.337	4	2048	312
1/6/2048 0 293.3672585 9.638 196.380 5.545 17.162 807.053 4 2048 293 1/7/2048 0 0 287.444101 9.444 192.415 5.433 16.815 790.759 4 2049 287 1/8/2048 0 0 281.7113357 9.255 188.578 5.324 16.480 774.988 4 2049 282 1/9/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276 1/10/2048 0 0 270.7833575 8.896 181.262 5.118 15.841 744.925 4 2049 271 1/11/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266 1/12/2048 0 0 260.5207893 8.559 174.393 4.924 15.240 716.693 4 2049 256	1/4/2048	0	0	305.8215559	10.048	204.717	5.780	17.891	841.315	4	2048	306
1/7/2048 0 0 287.444101 9.444 192.415 5.433 16.815 790.759 4 2049 287 1/8/2048 0 0 281.7113357 9.255 188.578 5.324 16.480 774.988 4 2049 282 1/9/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276 1/10/2048 0 0 270.7833575 8.896 181.262 5.118 15.841 744.925 4 2049 271 1/11/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266 1/12/2048 0 0 260.5207893 8.559 174.393 4.924 15.240 716.693 4 2049 261 1/1/2049 0 0 255.6213846 8.398 171.113 4.831 14.954 703.214 4 2049 256 1/2/2049 0 0 456.5625 15.000 305.623	1/5/2048	0	0	299.4898669	9.840	200.479	5.660	17.520	823.897	4	2048	299
1/8/2048 0 0 281.7113357 9.255 188.578 5.324 16.480 774.988 4 2049 282 1/9/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276 1/10/2048 0 0 270.7833575 8.896 181.262 5.118 15.841 744.925 4 2049 271 1/11/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266 1/12/2048 0 0 260.5207893 8.559 174.393 4.924 15.240 716.693 4 2049 261 1/1/2049 0 0 255.6213846 8.398 171.113 4.831 14.954 703.214 4 2049 256 1/2/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623	1/6/2048	0	0	293.3672585	9.638	196.380	5.545	17.162	807.053	4	2048	293
1/9/2048 0 0 276.1604336 9.073 184.862 5.219 16.155 759.717 4 2049 276 1/10/2048 0 0 270.7833575 8.896 181.262 5.118 15.841 744.925 4 2049 271 1/11/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266 1/12/2048 0 0 260.5207893 8.559 174.393 4.924 15.240 716.693 4 2049 261 1/1/2049 0 0 255.6213846 8.398 171.113 4.831 14.954 703.214 4 2049 256 1/2/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/7/2048	0	0	287.444101	9.444	192.415	5.433	16.815	790.759	4	2049	287
1/10/2048 0 0 270.7833575 8.896 181.262 5.118 15.841 744.925 4 2049 271 1/11/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266 1/12/2048 0 0 260.5207893 8.559 174.393 4.924 15.240 716.693 4 2049 261 1/1/2049 0 0 255.6213846 8.398 171.113 4.831 14.954 703.214 4 2049 256 1/2/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/3/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/8/2048	0	0	281.7113357	9.255	188.578	5.324	16.480	774.988	4	2049	282
1/11/2048 0 0 265.5725276 8.725 177.774 5.019 15.536 730.590 4 2049 266 1/12/2048 0 0 260.5207893 8.559 174.393 4.924 15.240 716.693 4 2049 261 1/1/2049 0 0 255.6213846 8.398 171.113 4.831 14.954 703.214 4 2049 256 1/2/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/3/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/9/2048	0	0	276.1604336	9.073	184.862	5.219	16.155	759.717	4	2049	276
1/12/2048 0 0 260.5207893 8.559 174.393 4.924 15.240 716.693 4 2049 261 1/1/2049 0 0 255.6213846 8.398 171.113 4.831 14.954 703.214 4 2049 256 1/2/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/3/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/10/2048	0	0	270.7833575	8.896	181.262	5.118	15.841	744.925	4	2049	271
1/1/2049 0 0 255.6213846 8.398 171.113 4.831 14.954 703.214 4 2049 256 1/2/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/3/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/11/2048	0	0	265.5725276	8.725	177.774	5.019	15.536	730.590	4	2049	266
1/2/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/3/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/12/2048	0	0	260.5207893	8.559	174.393	4.924	15.240	716.693	4	2049	261
1/3/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457 1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/1/2049	0	0	255.6213846	8.398	171.113	4.831	14.954	703.214	4	2049	256
1/4/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 4 2049 457	1/2/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	4	2049	457
	1/3/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	4	2049	457
1/5/2049 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2049 457	1/4/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	4	2049	457
	1/5/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	1	2049	457

1/6/2049												
1/8/2049	1/6/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	1	2049	457
1/9/2049	1/7/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	1	2050	457
1/10/2049 0 0 399.5905944 13.128 267.486 7.552 23.376 1099.274 1 2050 400 1/11/2049 0 0 388.7771553 12.773 260.247 7.348 22.743 1069.526 1 2050 389 1/12/2049 0 0 379.5941791 12.471 254.100 7.174 22.206 1044.264 1 2050 380 1/1/2050 0 0 370.7554144 12.181 248.184 7.007 21.689 1019.948 1 2050 371 1/2/2050 0 0 362.2430521 11.901 242.485 6.846 21.191 996.531 1 2050 362 1/3/2050 0 0 354.0404557 11.632 236.995 6.691 20.711 973.965 1 2050 354 1/4/2050 0 0 346.1320682 11.372 231.701 6.542 20.249 952.209 1 2050 346 1/5/2050 0 0 338.5033273 11.121 226.594 6.398 19.802 931.223 1 2050 339 1/6/2050 0 0 331.1405886 10.879 221.666 6.259 19.372 910.968 1 2050 331 1/7/2050 0 0 324.0310556 10.646 216.906 6.124 18.956 891.409 1 2051 324 1/8/2050 0 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 317 1/9/2050 0 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 311 1/10/2050 0 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 304 1/11/2050 0 0 0 297.8953111 9.987 1199.411 5.630 17.402 836.593 1 2051 304 1/11/2050 0 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 304 1/11/2050 0 0 0 297.8953111 9.987 199.411 5.630 17.402 836.593 1 2051 304 1/11/2050 0 0 0 346.666669 9.938 19.493 5.407 16.735 786.969 1 2051 298 1/12/2051 0 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/1/2051 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/1/2051 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/1/2051 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/1/2051 0 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/1/2051 0 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/1/2051 0 0 0 362.4053079 13.994 13.949 7.327 22.678 1066.443 1 2052 397 1/1/2051 0 0 0 370.54388 12.474 248.04 7.603 21.203 199.384 1 2052 397 1/1/2051 0 0 0 370.54388 1 2.774 28.994 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 0 370.54388 1 2.774 248.04 7.603 21.03 997.086 1 2052 379 1/1/2051 0 0 0 370.54388 1 2.774 248.04 7.603 21.03 997.086 1 2052 3	1/8/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	1	2050	457
1/11/2049	1/9/2049	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	1	2050	457
1/12/2049	1/10/2049	0	0	399.5905944	13.128	267.486	7.552	23.376	1099.274	1	2050	400
1/1/2050	1/11/2049	0	0	388.7771553	12.773	260.247	7.348	22.743	1069.526	1	2050	389
1/2/2050 0 362.2430521 11.901 242.485 6.846 21.191 996.531 1 2050 362 1/3/2050 0 0 354.0404557 11.632 236.995 6.691 20.711 973.965 1 2050 354 1/4/2050 0 0 346.1320682 11.372 231.701 6.542 20.249 952.209 1 2050 346 1/5/2050 0 0 338.5033273 11.121 226.594 6.398 19.802 931.23 1 2050 339 1/6/2050 0 0 331.405886 10.879 221.666 6.259 19.372 910.968 1 2050 331 1/7/2050 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 324 1/9/2050 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 331	1/12/2049	0	0	379.5941791	12.471	254.100	7.174	22.206	1044.264	1	2050	380
1/3/2050 0 0 354.0404557 11.632 236.995 6.691 20.711 973.965 1 2050 354 1/4/2050 0 0 346.1320682 11.372 231.701 6.542 20.249 952.209 1 2050 346 1/5/2050 0 0 338.3033273 11.121 226.594 6.398 19.802 931.233 1 2050 346 1/5/2050 0 0 331.1405886 10.879 221.666 6.259 19.372 910.968 1 2050 331 1/7/2050 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 3317 1/8/2050 0 0 317.5242836 10.020 207.865 5.869 18.166 854.252 1 2051 311 1/9/2050 0 0 304.1051449 9.991 203.588 5.748 17.790 886.593 1 2051 <th< td=""><td>1/1/2050</td><td>0</td><td>0</td><td>370.7554144</td><td>12.181</td><td>248.184</td><td>7.007</td><td>21.689</td><td>1019.948</td><td>1</td><td>2050</td><td>371</td></th<>	1/1/2050	0	0	370.7554144	12.181	248.184	7.007	21.689	1019.948	1	2050	371
1/4/2050 0 346.1320682 11.372 231.701 6.542 20.249 952.209 1 2050 346 1/5/2050 0 0 338.5033273 11.121 226.594 6.398 19.802 931.223 1 2050 339 1/6/2050 0 0 331.1405886 10.879 221.666 6.259 19.372 910.968 1 2050 331 1/7/2050 0 0 324.0310556 10.646 216.906 6.124 18.956 891.409 1 2051 324 1/8/2050 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 317 1/9/2050 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 317 1/10/2050 0 0 297.8953111 9.781 199.411 5.630 17.427 819.510 1 2051 298	1/2/2050	0	0	362.2430521	11.901	242.485	6.846	21.191	996.531	1	2050	362
1/5/2050 0 0 338.5033273 11.121 226.594 6.398 19.802 931.223 1 2050 339 1/6/2050 0 0 331.1405886 10.879 221.666 6.259 19.372 910.968 1 2050 331 1/7/2050 0 0 324.0310556 10.646 216.906 6.124 18.956 891.409 1 2051 324 1/8/2050 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 317 1/9/2050 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 311 1/10/2050 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 334 1/12/2050 0 0 291.8853731 9.590 195.388 5.517 17.0755 802.977 1 2051 <t< td=""><td>1/3/2050</td><td>0</td><td>0</td><td>354.0404557</td><td>11.632</td><td>236.995</td><td>6.691</td><td>20.711</td><td>973.965</td><td>1</td><td>2050</td><td>354</td></t<>	1/3/2050	0	0	354.0404557	11.632	236.995	6.691	20.711	973.965	1	2050	354
1/6/2050 0 0 331.1405886 10.879 221.666 6.259 19.372 910.968 1 2050 331 1/7/2050 0 0 324.0310556 10.646 216.906 6.124 18.956 891.409 1 2051 324 1/8/2050 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 317 1/9/2050 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 311 1/10/2050 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 304 1/11/2050 0 0 297.8953111 9.787 199.411 5.630 17.427 819.510 1 2051 298 1/12/2051 0 0 286.0664609 9.398 191.493 5.407 16.735 786.969 1 2051 <td< td=""><td>1/4/2050</td><td>0</td><td>0</td><td>346.1320682</td><td>11.372</td><td>231.701</td><td>6.542</td><td>20.249</td><td>952.209</td><td>1</td><td>2050</td><td>346</td></td<>	1/4/2050	0	0	346.1320682	11.372	231.701	6.542	20.249	952.209	1	2050	346
1/7/2050 0 324.0310556 10.646 216.906 6.124 18.956 891.409 1 2051 324 1/8/2050 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 317 1/9/2050 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 311 1/10/2050 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 394 1/11/2050 0 0 297.8953111 9.787 199.411 5.630 17.427 819.510 1 2051 298 1/12/2050 0 0 297.8953111 9.787 199.411 5.630 17.427 819.510 1 2051 298 1/1/2051 0 0 286.0664609 9.398 191.493 5.407 16.735 786.969 1 2051 256	1/5/2050	0	0	338.5033273	11.121	226.594	6.398	19.802	931.223	1	2050	339
1/8/2050 0 0 317.162716 10.420 212.309 5.994 18.554 872.515 1 2051 317 1/9/2050 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 311 1/10/2050 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 304 1/11/2050 0 0 297.8953111 9.787 199.411 5.630 17.427 819.510 1 2051 298 1/12/2050 0 0 291.8853731 9.590 195.388 5.517 17.075 802.977 1 2051 292 1/1/2051 0 0 286.0664609 9.398 191.493 5.407 16.735 786.969 1 2051 286 1/2/2051 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2051 45	1/6/2050	0	0	331.1405886	10.879	221.666	6.259	19.372	910.968	1	2050	331
1/9/2050 0 0 310.5242836 10.202 207.865 5.869 18.166 854.252 1 2051 311 1/10/2050 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 304 1/11/2050 0 0 297.8953111 9.787 199.411 5.630 17.427 819.510 1 2051 298 1/12/2050 0 0 291.8853731 9.590 195.388 5.517 17.075 802.977 1 2051 298 1/1/2051 0 0 286.0646409 9.398 191.493 5.407 16.735 786.969 1 2051 286 1/2/2051 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2051 457 1/3/2051 0 0 456.205376 14.345 292.274 8.252 25.542 1201.143 1 2051 4	1/7/2050	0	0	324.0310556	10.646	216.906	6.124	18.956	891.409	1	2051	324
1/10/2050 0 0 304.1051449 9.991 203.568 5.748 17.790 836.593 1 2051 304 1/11/2050 0 0 297.8953111 9.787 199.411 5.630 17.427 819.510 1 2051 298 1/12/2050 0 0 291.8853731 9.590 195.388 5.517 17.075 802.977 1 2051 292 1/1/2051 0 0 286.0664609 9.398 191.493 5.407 16.735 786.969 1 2051 286 1/2/2051 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2051 457 1/3/2051 0 0 456.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/4/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 <th< td=""><td>1/8/2050</td><td>0</td><td>0</td><td>317.162716</td><td>10.420</td><td>212.309</td><td>5.994</td><td>18.554</td><td>872.515</td><td>1</td><td>2051</td><td>317</td></th<>	1/8/2050	0	0	317.162716	10.420	212.309	5.994	18.554	872.515	1	2051	317
1/11/2050 0 0 297.8953111 9.787 199.411 5.630 17.427 819.510 1 2051 298 1/12/2050 0 0 291.8853731 9.590 195.388 5.517 17.075 802.977 1 2051 292 1/1/2051 0 0 286.0664609 9.398 191.493 5.407 16.735 786.969 1 2051 286 1/2/2051 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2051 457 1/3/2051 0 0 450.2073948 14.7191 301.369 8.509 26.337 1238.521 1 2051 457 1/4/2051 0 0 436.6205376 14.345 292.274 8.252 25.542 1201.143 1 2051 437 1/5/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 446 1/6/2051 0 0 445.8760102 13.663 278.387 <td>1/9/2050</td> <td>0</td> <td>0</td> <td>310.5242836</td> <td>10.202</td> <td>207.865</td> <td>5.869</td> <td>18.166</td> <td>854.252</td> <td>1</td> <td>2051</td> <td>311</td>	1/9/2050	0	0	310.5242836	10.202	207.865	5.869	18.166	854.252	1	2051	311
1/12/2050 0 291.8853731 9.590 195.388 5.517 17.075 802.977 1 2051 292 1/1/2051 0 0 286.0664609 9.398 191.493 5.407 16.735 786.969 1 2051 286 1/2/2051 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2051 457 1/3/2051 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/4/2051 0 0 436.6205376 14.345 292.274 8.252 25.542 1201.143 1 2051 437 1/5/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 426 1/6/2051 0 0 415.8760102 13.663 278.387 7.860 24.329 1144.075 1 2051 416 <td>1/10/2050</td> <td>0</td> <td>0</td> <td>304.1051449</td> <td>9.991</td> <td>203.568</td> <td>5.748</td> <td>17.790</td> <td>836.593</td> <td>1</td> <td>2051</td> <td>304</td>	1/10/2050	0	0	304.1051449	9.991	203.568	5.748	17.790	836.593	1	2051	304
1/1/2051 0 0 286.0664609 9.398 191.493 5.407 16.735 786.969 1 2051 286 1/2/2051 0 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2051 457 1/3/2051 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/4/2051 0 0 436.6205376 14.345 292.274 8.252 25.542 1201.143 1 2051 437 1/5/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 426 1/6/2051 0 0 415.8760102 13.663 278.387 7.860 24.329 1144.075 1 2051 416 1/7/2051 0 0 406.1045134 13.342 271.846 7.675 23.757 1117.194 1 2052	1/11/2050	0	0	297.8953111	9.787	199.411	5.630	17.427	819.510	1	2051	298
1/2/2051 0 456.5625 15.000 305.623 8.629 26.709 1256.003 1 2051 457 1/3/2051 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/4/2051 0 0 436.6205376 14.345 292.274 8.252 25.542 1201.143 1 2051 437 1/5/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 426 1/6/2051 0 0 415.8760102 13.663 278.387 7.860 24.329 1144.075 1 2051 416 1/7/2051 0 0 406.1045134 13.342 271.846 7.675 23.757 1117.194 1 2052 406 1/8/2051 0 0 396.7046268 13.033 265.554 7.498 23.207 1091.334 1 2052 397	1/12/2050	0	0	291.8853731	9.590	195.388	5.517	17.075	802.977	1	2051	292
1/3/2051 0 0 450.2073948 14.791 301.369 8.509 26.337 1238.521 1 2051 450 1/4/2051 0 0 436.6205376 14.345 292.274 8.252 25.542 1201.143 1 2051 437 1/5/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 426 1/6/2051 0 0 415.8760102 13.663 278.387 7.860 24.329 1144.075 1 2051 416 1/7/2051 0 0 406.1045134 13.342 271.846 7.675 23.757 1117.194 1 2052 406 1/8/2051 0 0 396.7046268 13.033 265.554 7.498 23.207 1091.334 1 2052 397 1/9/2051 0 0 387.65656 12.736 259.497 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 378.941878 12.450 253.66	1/1/2051	0	0	286.0664609	9.398	191.493	5.407	16.735	786.969	1	2051	286
1/4/2051 0 0 436.6205376 14.345 292.274 8.252 25.542 1201.143 1 2051 437 1/5/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 426 1/6/2051 0 0 415.8760102 13.663 278.387 7.860 24.329 1144.075 1 2051 416 1/7/2051 0 0 406.1045134 13.342 271.846 7.675 23.757 1117.194 1 2052 406 1/8/2051 0 0 396.7046268 13.033 265.554 7.498 23.207 1091.334 1 2052 397 1/9/2051 0 0 387.65656 12.736 259.497 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 378.941878 12.450 253.664 7.162 22.168 1042.469 1 2052 379 1/11/2051 0 0 370.5433881 12.174 248.0	1/2/2051	0	0	456.5625	15.000	305.623	8.629	26.709	1256.003	1	2051	457
1/5/2051 0 0 426.0403879 13.997 285.191 8.052 24.923 1172.037 1 2051 426 1/6/2051 0 0 415.8760102 13.663 278.387 7.860 24.329 1144.075 1 2051 416 1/7/2051 0 0 406.1045134 13.342 271.846 7.675 23.757 1117.194 1 2052 406 1/8/2051 0 0 396.7046268 13.033 265.554 7.498 23.207 1091.334 1 2052 397 1/9/2051 0 0 387.65656 12.736 259.497 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 378.941878 12.450 253.664 7.162 22.168 1042.469 1 2052 379 1/11/2051 0 0 370.5433881 12.174 248.042 7.003 21.677 1019.365 1 2052 371 1/12/2051 0 0 362.4450379 11.908 242.	1/3/2051	0	0	450.2073948	14.791	301.369	8.509	26.337	1238.521	1	2051	450
1/6/2051 0 0 415.8760102 13.663 278.387 7.860 24.329 1144.075 1 2051 416 1/7/2051 0 0 406.1045134 13.342 271.846 7.675 23.757 1117.194 1 2052 406 1/8/2051 0 0 396.7046268 13.033 265.554 7.498 23.207 1091.334 1 2052 397 1/9/2051 0 0 387.65656 12.736 259.497 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 378.941878 12.450 253.664 7.162 22.168 1042.469 1 2052 379 1/11/2051 0 0 370.5433881 12.174 248.042 7.003 21.677 1019.365 1 2052 371 1/12/2051 0 0 362.4450379 11.908 242.621 6.850 21.203 997.086 1 2052 362 1/1/2052 0 0 354.6318235 11.651 237.3	1/4/2051	0	0	436.6205376	14.345	292.274	8.252	25.542	1201.143	1	2051	437
1/7/2051 0 0 406.1045134 13.342 271.846 7.675 23.757 1117.194 1 2052 406 1/8/2051 0 0 396.7046268 13.033 265.554 7.498 23.207 1091.334 1 2052 397 1/9/2051 0 0 387.65656 12.736 259.497 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 378.941878 12.450 253.664 7.162 22.168 1042.469 1 2052 379 1/11/2051 0 0 370.5433881 12.174 248.042 7.003 21.677 1019.365 1 2052 371 1/12/2051 0 0 362.4450379 11.908 242.621 6.850 21.203 997.086 1 2052 362 1/1/2052 0 0 354.6318235 11.651 237.391 6.703 20.746 975.592 1 2052 355 1/2/2052 0 0 347.0897056 11.403 232.34	1/5/2051	0	0	426.0403879	13.997	285.191	8.052	24.923	1172.037	1	2051	426
1/8/2051 0 396.7046268 13.033 265.554 7.498 23.207 1091.334 1 2052 397 1/9/2051 0 0 387.65656 12.736 259.497 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 378.941878 12.450 253.664 7.162 22.168 1042.469 1 2052 379 1/11/2051 0 0 370.5433881 12.174 248.042 7.003 21.677 1019.365 1 2052 371 1/12/2051 0 0 362.4450379 11.908 242.621 6.850 21.203 997.086 1 2052 362 1/1/2052 0 0 354.6318235 11.651 237.391 6.703 20.746 975.592 1 2052 355 1/2/2052 0 0 347.0897056 11.403 232.342 6.560 20.305 954.844 1 2052 347	1/6/2051	0	0	415.8760102	13.663	278.387	7.860	24.329	1144.075	1	2051	416
1/9/2051 0 0 387.65656 12.736 259.497 7.327 22.678 1066.443 1 2052 388 1/10/2051 0 0 378.941878 12.450 253.664 7.162 22.168 1042.469 1 2052 379 1/11/2051 0 0 370.5433881 12.174 248.042 7.003 21.677 1019.365 1 2052 371 1/12/2051 0 0 362.4450379 11.908 242.621 6.850 21.203 997.086 1 2052 362 1/1/2052 0 0 354.6318235 11.651 237.391 6.703 20.746 975.592 1 2052 355 1/2/2052 0 0 347.0897056 11.403 232.342 6.560 20.305 954.844 1 2052 347	1/7/2051	0	0	406.1045134	13.342	271.846	7.675	23.757	1117.194	1	2052	406
1/10/2051 0 0 378.941878 12.450 253.664 7.162 22.168 1042.469 1 2052 379 1/11/2051 0 0 370.5433881 12.174 248.042 7.003 21.677 1019.365 1 2052 371 1/12/2051 0 0 362.4450379 11.908 242.621 6.850 21.203 997.086 1 2052 362 1/1/2052 0 0 354.6318235 11.651 237.391 6.703 20.746 975.592 1 2052 355 1/2/2052 0 0 347.0897056 11.403 232.342 6.560 20.305 954.844 1 2052 347	1/8/2051	0	0	396.7046268	13.033	265.554	7.498	23.207	1091.334	1	2052	397
1/11/2051 0 0 370.5433881 12.174 248.042 7.003 21.677 1019.365 1 2052 371 1/12/2051 0 0 362.4450379 11.908 242.621 6.850 21.203 997.086 1 2052 362 1/1/2052 0 0 354.6318235 11.651 237.391 6.703 20.746 975.592 1 2052 355 1/2/2052 0 0 347.0897056 11.403 232.342 6.560 20.305 954.844 1 2052 347	1/9/2051	0	0	387.65656	12.736	259.497	7.327	22.678	1066.443	1	2052	388
1/12/2051 0 0 362.4450379 11.908 242.621 6.850 21.203 997.086 1 2052 362 1/1/2052 0 0 354.6318235 11.651 237.391 6.703 20.746 975.592 1 2052 355 1/2/2052 0 0 347.0897056 11.403 232.342 6.560 20.305 954.844 1 2052 347	1/10/2051	0	0	378.941878	12.450	253.664	7.162	22.168	1042.469	1	2052	379
1/1/2052 0 0 354.6318235 11.651 237.391 6.703 20.746 975.592 1 2052 355 1/2/2052 0 0 347.0897056 11.403 232.342 6.560 20.305 954.844 1 2052 347	1/11/2051	0	0	370.5433881	12.174	248.042	7.003	21.677	1019.365	1	2052	371
1/2/2052 0 0 347.0897056 11.403 232.342 6.560 20.305 954.844 1 2052 347	1/12/2051	0	0	362.4450379	11.908	242.621	6.850	21.203	997.086	1	2052	362
	1/1/2052	0	0	354.6318235	11.651	237.391	6.703	20.746	975.592	1	2052	355
1/3/2052 0 0 339.8055342 11.164 227.466 6.422 19.879 934.805 1 2052 340	1/2/2052	0	0	347.0897056	11.403	232.342	6.560	20.305	954.844	1	2052	347
	1/3/2052	0	0	339.8055342	11.164	227.466	6.422	19.879	934.805	1	2052	340

1/4/2052	0	0	321.1126309	10.550	214.953	6.069	18.785	883.381	1	2052	321
1/5/2052	0	0	298.5652458	9.809	199.860	5.643	17.466	821.353	0	2052	299
1/6/2052	0	0	292.2844793	9.603	195.655	5.524	17.099	804.075	0	2052	292
1/7/2052	0	0	286.21175	9.403	191.590	5.409	16.743	787.369	0	2053	286
1/8/2052	0	0	280.3375464	9.210	187.658	5.298	16.400	771.209	0	2053	280
1/9/2052	0	0	274.6529136	9.024	183.853	5.191	16.067	755.570	0	2053	275
1/10/2052	0	0	269.1494125	8.843	180.169	5.087	15.745	740.430	0	2053	269
1/11/2052	0	0	263.8190849	8.668	176.600	4.986	15.433	725.766	0	2053	264
1/12/2052	0	0	258.6544191	8.498	173.143	4.889	15.131	711.558	0	2053	259
1/1/2053	0	0	253.6483202	8.333	169.792	4.794	14.838	697.787	0	2053	254
1/2/2053	0	0	248.7940817	8.174	166.543	4.702	14.554	684.433	0	2053	249
1/3/2053	0	0	244.0853593	8.019	163.391	4.613	14.279	671.479	0	2053	244
1/4/2053	0	0	231.7465815	7.614	155.131	4.380	13.557	637.535	0	2053	232
1/5/2053	0	0	216.8159405	7.123	145.137	4.098	12.684	596.461	0	2053	217
1/6/2053	0	0	212.7093572	6.988	142.388	4.020	12.443	585.163	0	2053	213
1/7/2053	0	0	208.7228095	6.857	139.719	3.945	12.210	574.196	0	2054	209
1/8/2053	0	0	204.8515137	6.730	137.128	3.872	11.984	563.547	0	2054	205
1/9/2053	0	0	201.0909288	6.607	134.610	3.801	11.764	553.201	0	2054	201
1/10/2053	0	0	197.4367406	6.487	132.164	3.732	11.550	543.148	0	2054	197
1/11/2053	0	0	193.8848489	6.370	129.787	3.664	11.342	533.377	0	2054	194
1/12/2053	0	0	190.4313536	6.256	127.475	3.599	11.140	523.877	0	2054	190
1/1/2054	0	0	187.0725439	6.146	125.226	3.536	10.944	514.637	0	2054	187
1/2/2054	0	0	183.8048863	6.039	123.039	3.474	10.753	505.647	0	2054	184
1/3/2054	0	0	180.6250149	5.934	120.910	3.414	10.567	496.899	0	2054	181
1/4/2054	0	0	177.5297215	5.833	118.838	3.355	10.385	488.384	0	2054	178
1/5/2054	0	0	174.5159466	5.734	116.821	3.298	10.209	480.093	0	2054	175
1/6/2054	0	0	171.5807712	5.637	114.856	3.243	10.037	472.019	0	2054	172
1/7/2054	0	0	168.7214089	5.543	112.942	3.189	9.870	464.153	0	2055	169
1/8/2054	0	0	165.9351985	5.452	111.077	3.136	9.707	456.488	0	2055	166
1/9/2054	0	0	163.2195975	5.362	109.259	3.085	9.548	449.017	0	2055	163
1/10/2054	0	0	160.5721752	5.275	107.487	3.035	9.393	441.734	0	2055	161
1/11/2054	0	0	157.9906071	5.191	105.759	2.986	9.242	434.632	0	2055	158
1/12/2054	0	0	155.4726692	5.108	104.073	2.938	9.095	427.705	0	2055	155
1/1/2055	0	0	153.0162327	5.027	102.429	2.892	8.951	420.948	0	2055	153

1/2/2055	0	0	150.619259	4.948	100.825	2.847	8.811	414.354	0	2055	151
1/3/2055	0	0	148.2797952	4.872	99.258	2.802	8.674	407.918	0	2055	148
1/4/2055	0	0	138.2264036	4.541	92.529	2.612	8.086	380.261	0	2055	138
1/5/2055	0	0	125.5011704	4.123	84.010	2.372	7.342	345.254	0	2055	126
1/6/2055	0	0	123.5236879	4.058	82.687	2.335	7.226	339.814	0	2055	124
1/7/2055	0	0	121.5933971	3.995	81.395	2.298	7.113	334.503	0	2056	122
1/8/2055	0	0	119.708784	3.933	80.133	2.262	7.003	329.319	0	2056	120
1/9/2055	0	0	117.8683956	3.872	78.901	2.228	6.895	324.256	0	2056	118
1/10/2055	0	0	116.0708372	3.813	77.698	2.194	6.790	319.311	0	2056	116
1/11/2055	0	0	114.3147692	3.756	76.522	2.161	6.687	314.480	0	2056	114
1/12/2055	0	0	112.598905	3.699	75.374	2.128	6.587	309.760	0	2056	113
1/1/2056	0	0	110.9220081	3.644	74.251	2.096	6.489	305.146	0	2056	111
1/2/2056	0	0	109.2828896	3.590	73.154	2.065	6.393	300.637	0	2056	109
1/3/2056	0	0	107.6804065	3.538	72.081	2.035	6.299	296.229	0	2056	108
1/4/2056	0	0	106.1134592	3.486	71.032	2.006	6.208	291.918	0	2056	106
1/5/2056	0	0	104.5809895	3.436	70.007	1.977	6.118	287.702	0	2056	105
1/6/2056	0	0	103.0819789	3.387	69.003	1.948	6.030	283.579	0	2056	103
1/7/2056	0	0	101.6154468	3.338	68.021	1.921	5.945	279.544	0	2057	102
1/8/2056	0	0	100.1804486	3.291	67.061	1.893	5.861	275.596	0	2057	100
1/9/2056	0	0	98.77607427	3.245	66.121	1.867	5.778	271.733	0	2057	99
1/10/2056	0	0	97.40144676	3.200	65.201	1.841	5.698	267.951	0	2057	97
1/11/2056	0	0	96.05572063	3.156	64.300	1.815	5.619	264.249	0	2057	96
1/12/2056	0	0	94.73808062	3.113	63.418	1.791	5.542	260.624	0	2057	95
1/1/2057	0	0	93.44774035	3.070	62.554	1.766	5.467	257.075	0	2057	93
1/2/2057	0	0	92.18394113	3.029	61.708	1.742	5.393	253.598	0	2057	92
1/3/2057	0	0	90.94595074	2.988	60.879	1.719	5.320	250.192	0	2057	91
1/4/2057	0	0	81.96349618	2.693	54.866	1.549	4.795	225.482	0	2057	82
1/5/2057	0	0	70.27977579	2.309	47.045	1.328	4.111	193.340	0	2057	70
1/6/2057	0	0	69.31544372	2.277	46.400	1.310	4.055	190.687	0	2057	69
1/7/2057	0	0	68.37095563	2.246	45.768	1.292	4.000	188.088	0	2058	68
1/8/2057	0	0	67.44576725	2.216	45.148	1.275	3.946	185.543	0	2058	67
1/9/2057	0	0	66.53935297	2.186	44.541	1.258	3.893	183.050	0	2058	67
1/10/2057	0	0	65.65120507	2.157	43.947	1.241	3.841	180.606	0	2058	66
1/11/2057	0	0	64.78083296	2.128	43.364	1.224	3.790	178.212	0	2058	65

1/12/2058												
1/2/2058	1/12/2057	0	0	63.92776252	2.100	42.793	1.208	3.740	175.865	0	2058	64
1/3/2058	1/1/2058	0	0	63.09153544	2.073	42.233	1.192	3.691	173.565	0	2058	63
1/4/2058	1/2/2058	0	0	62.27170854	2.046	41.685	1.177	3.643	171.309	0	2058	62
1/5/2058 0 0 59.9064124 1.968 40.101 1.132 3.505 164.803 0 2058 60 1/6/2058 0 0 59.14803748 1.943 39.594 1.118 3.460 162.716 0 2058 59 1/7/2058 0 0 58.8040543 1.919 39.996 1.104 3.417 160.670 0 2059 58 1/8/2058 0 0 57.67409899 1.895 38.607 1.090 3.374 158.661 0 2059 58 1/9/2058 0 0 56.95781917 1.871 38.128 1.077 3.332 156.691 0 2059 56 1/10/2058 0 0 56.25487349 1.848 37.657 1.063 3.291 154.757 0 2059 56 1/11/2058 0 0 55.56493127 1.826 37.195 1.050 3.251 152.859 0 2059 56 1/11/2058 0 0 54.88767204 1.803 36.742 1.037 3.121 150.996 0 2059 55 1/1/2059 0 0 54.2278522 1.781 36.297 1.025 3.172 149.167 0 2059 54 1/2/2059 0 0 53.56996972 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 2059 53 1/4/2059 0 0 24.28384902 0.798 16.256 0.459 1.421 66.805 0 2059 24 1/5/2059 0 0 23.37705088 0.788 16.050 0.453 1.403 65.961 0 2059 24 1/5/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 24 1/8/2059 0 0 22.28621055 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/9/2059 0 0 22.28621055 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/9/2059 0 0 22.28621055 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/1/2059 0 0 22.28621055 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/1/2059 0 0 22.28621055 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/1/2050 0 0 22.28621055 0.688 14.047 0.415 1.286 64.320 0 2060 23 1/1/2050 0 0 22.28625065 0.740 15.080 0.426 1.318 61.972 0 2060 22 1/1/2060 0 0 20.24861848 0.660 13.860 0.391 1.211 56.967 0 2	1/3/2058	0	0	61.46785323	2.019	41.147	1.162	3.596	169.098	0	2058	61
1/6/2058	1/4/2058	0	0	60.67955491	1.994	40.619	1.147	3.550	166.929	0	2058	61
1/7/2058 0 0 58.4040543 1.919 39.096 1.104 3.417 160.670 0 2059 58 1/8/2058 0 0 57.67409899 1.895 38.607 1.090 3.374 158.661 0 2059 58 1/9/2058 0 0 56.95781917 1.871 38.128 1.077 3.332 156.661 0 2059 58 1/10/2058 0 0 56.25487349 1.848 37.657 1.063 3.291 154.757 0 2059 56 1/12/058 0 0 55.56493127 1.826 37.195 1.050 3.251 152.859 0 2059 56 1/12/2059 0 0 54.82767204 1.803 36.742 1.037 3.211 150.60 2059 55 1/2/2059 0 0 54.82767204 1.803 36.297 1.025 3.172 149.167 0 2059 54 1/2/2	1/5/2058	0	0	59.9064124	1.968	40.101	1.132	3.505	164.803	0	2058	60
1/8/2058 0 0 57.67409899 1.895 38.607 1.090 3.374 158.661 0 2059 58 1/9/2058 0 0 56.95781917 1.871 38.128 1.077 3.332 156.691 0 2059 57 1/10/2058 0 0 56.52487349 1.884 37.657 1.063 3.291 154.757 0 2059 56 1/12/2058 0 0 55.56493127 1.826 37.195 1.050 3.251 152.859 0 2059 56 1/12/2058 0 0 54.88767204 1.803 36.742 1.037 3.211 150.996 0 2059 55 1/1/2059 0 0 53.56996972 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 20.259 53	1/6/2058	0	0	59.14803748	1.943	39.594	1.118	3.460	162.716	0	2058	59
1/9/2058 0 0 56.95781917 1.871 38.128 1.077 3.332 156.691 0 2059 57 1/10/2058 0 0 56.25487349 1.848 37.657 1.063 3.291 154.757 0 2059 56 1/12/2058 0 0 55.56493127 1.826 37.195 1.050 3.251 152.889 0 2059 56 1/12/2058 0 0 54.88767204 1.803 36.742 1.037 3.211 150.996 0 2059 55 1/1/2059 0 0 54.22278522 1.781 36.297 1.025 3.172 149.167 0 2059 54 1/2/2059 0 0 53.5699672 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.2893388 1.739 35.431 1.000 3.096 145.607 0 2059 54 <t< td=""><td>1/7/2058</td><td>0</td><td>0</td><td>58.4040543</td><td>1.919</td><td>39.096</td><td>1.104</td><td>3.417</td><td>160.670</td><td>0</td><td>2059</td><td></td></t<>	1/7/2058	0	0	58.4040543	1.919	39.096	1.104	3.417	160.670	0	2059	
1/10/2058 0 0 56.25487349 1.848 37.657 1.063 3.291 154.757 0 2059 56 1/11/2058 0 0 55.56493127 1.826 37.195 1.050 3.251 152.859 0 2059 56 1/12/2058 0 0 54.82767204 1.803 36.742 1.037 3.211 150.996 0 2059 55 1/1/2059 0 0 54.2278522 1.781 36.297 1.025 3.172 149.167 0 2059 54 1/2/2059 0 0 53.56996972 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 2059 53 1/4/2059 0 0 24.82884902 0.793 16.256 0.459 1.421 66.805 0 2059 24 <t< td=""><td>1/8/2058</td><td>0</td><td>0</td><td>57.67409899</td><td>1.895</td><td>38.607</td><td>1.090</td><td>3.374</td><td>158.661</td><td>0</td><td>2059</td><td>58</td></t<>	1/8/2058	0	0	57.67409899	1.895	38.607	1.090	3.374	158.661	0	2059	58
1/11/2058 0 0 55.56493127 1.826 37.195 1.050 3.251 152.859 0 2059 56 1/12/2058 0 0 54.88767204 1.803 36.742 1.037 3.211 150.996 0 2059 55 1/12/2059 0 0 54.22278522 1.781 36.297 1.025 3.172 149.167 0 2059 54 1/2/2059 0 0 53.56996972 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 2059 53 1/4/2059 0 0 40.64504447 1.335 27.208 0.768 2.378 11.1815 0 2059 24 1/5/2059 0 0 23.97705088 0.788 16.256 0.459 1.421 66.805 0 2059 24 <	1/9/2058	0	0	56.95781917	1.871	38.128	1.077	3.332	156.691	0	2059	57
1/12/2058 0 0 54.88767204 1.803 36.742 1.037 3.211 150.996 0 2059 55 1/1/2059 0 0 54.22278522 1.781 36.297 1.025 3.172 149.167 0 2059 54 1/2/2059 0 0 53.5696972 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 2059 53 1/4/2059 0 0 40.64504447 1.335 27.208 0.768 2.378 111.815 0 2059 41 1/5/2059 0 0 24.28384902 0.798 16.256 0.459 1.421 66.805 0 2059 24 1/6/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.33 0 2069 23	1/10/2058	0	0	56.25487349	1.848	37.657	1.063	3.291	154.757	0	2059	
1/1/2059 0 54.22278522 1.781 36.297 1.025 3.172 149.167 0 2059 54 1/2/2059 0 0 53.56996972 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 2059 53 1/4/2059 0 0 40.64504447 1.335 27.208 0.768 2.378 111.815 0 2059 41 1/5/2059 0 0 24.28384902 0.798 16.256 0.459 1.421 66.805 0 2059 24 1/6/2059 0 0 23.97705088 0.788 16.050 0.453 1.403 65.961 0 2059 24 1/7/2059 0 0 23.6760307 0.778 15.849 0.447 1.385 65.133 0 2060 23 1/8/2059<	1/11/2058	0	0	55.56493127	1.826	37.195	1.050	3.251	152.859	0	2059	56
1/2/2059 0 0 53.56996972 1.760 35.860 1.012 3.134 147.371 0 2059 54 1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 2059 53 1/4/2059 0 0 40.64504447 1.335 27.208 0.768 2.378 111.815 0 2059 41 1/5/2059 0 0 24.28384902 0.798 16.256 0.459 1.421 66.805 0 2059 24 1/6/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.133 0 2060 23 1/7/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.133 0 2060 23 1/9/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 23	1/12/2058	0	0	54.88767204	1.803	36.742	1.037	3.211	150.996	0	2059	55
1/3/2059 0 0 52.92893358 1.739 35.431 1.000 3.096 145.607 0 2059 53 1/4/2059 0 0 40.64504447 1.335 27.208 0.768 2.378 111.815 0 2059 41 1/5/2059 0 0 24.28384902 0.798 16.256 0.459 1.421 66.805 0 2059 24 1/6/2059 0 0 23.97705088 0.788 16.050 0.453 1.403 65.961 0 2059 24 1/7/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.133 0 2060 23 1/8/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 23 1/9/2059 0 0 23.0907495 0.759 15.457 0.436 1.351 63.523 0 2060 23	1/1/2059	0	0	54.22278522	1.781	36.297	1.025	3.172	149.167	0	2059	
1/4/2059 0 40.64504447 1.335 27.208 0.768 2.378 111.815 0 2059 41 1/5/2059 0 0 24.28384902 0.798 16.256 0.459 1.421 66.805 0 2059 24 1/6/2059 0 0 23.97705088 0.788 16.050 0.453 1.403 65.961 0 2059 24 1/7/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.133 0 2060 24 1/8/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 23 1/9/2059 0 0 23.0907495 0.759 15.457 0.436 1.351 63.523 0 2060 23 1/10/2059 0 0 22.80621425 0.749 15.266 0.431 1.334 62.740 0 2060 23 1/12/2059 </td <td>1/2/2059</td> <td>0</td> <td>0</td> <td>53.56996972</td> <td>1.760</td> <td>35.860</td> <td>1.012</td> <td>3.134</td> <td>147.371</td> <td>0</td> <td>2059</td> <td></td>	1/2/2059	0	0	53.56996972	1.760	35.860	1.012	3.134	147.371	0	2059	
1/5/2059 0 0 24.28384902 0.798 16.256 0.459 1.421 66.805 0 2059 24 1/6/2059 0 0 23.97705088 0.788 16.050 0.453 1.403 65.961 0 2059 24 1/7/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.133 0 2060 24 1/8/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 23 1/9/2059 0 0 22.80621425 0.759 15.457 0.436 1.351 63.523 0 2060 23 1/10/2059 0 0 22.80621425 0.749 15.266 0.431 1.334 62.740 0 2060 23 1/11/2059 0 0 22.525690605 0.740 15.080 0.426 1.318 61.917 0 2060 23	1/3/2059	0	0	52.92893358	1.739	35.431	1.000	3.096	145.607	0	2059	53
1/6/2059 0 0 23.97705088 0.788 16.050 0.453 1.403 65.961 0 2059 24 1/7/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.133 0 2060 24 1/8/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 23 1/9/2059 0 0 23.0907495 0.759 15.457 0.436 1.351 63.523 0 2060 23 1/10/2059 0 0 22.80621425 0.749 15.266 0.431 1.334 62.740 0 2060 23 1/11/2059 0 0 22.52690605 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/12/2059 0 0 22.25269764 0.731 14.896 0.421 1.302 61.217 0 2060 22	1/4/2059	0	0	40.64504447	1.335	27.208	0.768	2.378	111.815	0	2059	41
1/7/2059 0 0 23.67603027 0.778 15.849 0.447 1.385 65.133 0 2060 24 1/8/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 23 1/9/2059 0 0 23.0907495 0.759 15.457 0.436 1.351 63.523 0 2060 23 1/10/2059 0 0 22.80621425 0.749 15.266 0.431 1.334 62.740 0 2060 23 1/11/2059 0 0 22.52690605 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/12/2059 0 0 22.52690605 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/12/2060 0 0 21.98346563 0.722 14.716 0.415 1.286 60.477 0 2060 22	1/5/2059	0	0	24.28384902	0.798	16.256	0.459	1.421	66.805	0	2059	24
1/8/2059 0 0 23.38064305 0.768 15.651 0.442 1.368 64.320 0 2060 23 1/9/2059 0 0 23.0907495 0.759 15.457 0.436 1.351 63.523 0 2060 23 1/10/2059 0 0 22.80621425 0.749 15.266 0.431 1.334 62.740 0 2060 23 1/11/2059 0 0 22.52690605 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/12/2059 0 0 22.25269764 0.731 14.896 0.421 1.302 61.217 0 2060 22 1/1/2060 0 0 21.98346563 0.722 14.716 0.415 1.286 60.477 0 2060 22 1/2/2060 0 0 21.71909032 0.714 14.539 0.410 1.271 59.749 0 2060 22	1/6/2059	0	0	23.97705088	0.788	16.050	0.453	1.403	65.961	0	2059	24
1/9/2059 0 0 23.0907495 0.759 15.457 0.436 1.351 63.523 0 2060 23 1/10/2059 0 0 22.80621425 0.749 15.266 0.431 1.334 62.740 0 2060 23 1/11/2059 0 0 22.52690605 0.740 15.080 0.426 1.318 61.972 0 2060 23 1/12/2059 0 0 22.25269764 0.731 14.896 0.421 1.302 61.217 0 2060 22 1/1/2060 0 0 21.98346563 0.722 14.716 0.415 1.286 60.477 0 2060 22 1/2/2060 0 0 21.71909032 0.714 14.539 0.410 1.271 59.749 0 2060 22 1/3/2060 0 0 21.45945559 0.705 14.365 0.406 1.255 59.035 0 2060 21 1/4/2060 0 0 21.20444878 0.697 14.194 0.401 1.	1/7/2059	0	0	23.67603027	0.778	15.849	0.447	1.385	65.133	0	2060	
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1/7/2060 0 0 20.46611843 0.672 13.700 0.387 1.197 56.302 0 2061 20 1/8/2060 0 0 20.22856146 0.665 13.541 0.382 1.183 55.649 0 2061 20	1/5/2060	0	0	20.95396055	0.688	14.027	0.396	1.226	57.644	0	2060	
1/8/2060 0 0 20.22856146 0.665 13.541 0.382 1.183 55.649 0 2061 20	1/6/2060	0	0	20.70788478	0.680	13.862	0.391	1.211	56.967	0	2060	21
	1/7/2060	0	0	20.46611843	0.672	13.700	0.387	1.197	56.302	0	2061	20
1/9/2060 0 0 19.99511671 0.657 13.385 0.378 1.170 55.007 0 2061 20	1/8/2060	0	0	20.22856146	0.665	13.541	0.382	1.183	55.649	0	2061	20
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1/10/2060	0	0	19.76568982	0.649	13.231	0.374	1.156	54.375	0	2061	20
1/11/2060	0	0	19.54018911	0.642	13.080	0.369	1.143	53.755	0	2061	20
1/12/2060	0	0	19.31852551	0.635	12.932	0.365	1.130	53.145	0	2061	19
1/1/2061	0	0	19.10061245	0.628	12.786	0.361	1.117	52.546	0	2061	19
1/2/2061	0	0	18.88636578	0.620	12.643	0.357	1.105	51.956	0	2061	19
1/3/2061	0	0	18.67570373	0.614	12.502	0.353	1.093	51.377	0	2061	19
1/4/2061	0	0	10.69898063	0.352	7.162	0.202	0.626	29.433	0	2061	11
1/5/2061	0	0	0	0.000	0.000	0.000	0.000	0.000	0	2061	0
1/6/2061	0	0	0	0.000	0.000	0.000	0.000	0.000	0	2061	0

Attachment D: Contaminated Land Register Search Results



Department of Environment, Science and Innovation (DESI) ABN 46 640 294 485 GPO Box 2454, Brisbane QLD 4001, AUSTRALIA www.des.qld.gov.au

SEARCH RESPONSE

ENVIRONMENTAL MANAGEMENT REGISTER (EMR) CONTAMINATED LAND REGISTER (CLR)

Andrew Todd-Weckmann Suite 9 13/25 Church St Hawthorn VIC 3122

Transaction ID: 50957862 EMR Site Id: 02 September 2024

Cheque Number: Client Reference:

This response relates to a search request received for the site:

Lot: 450 Plan: SP274333 18376 INNAMINCKA RD DURHAM

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated. The EMR/CLR does NOT include:-

- 1. land which is contaminated land (or a complete list of contamination) if DESI has not been notified
- 2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DESI has not been notified

If you have any queries in relation to this search please email emr.clr.registry@des.qld.gov.au

Administering Authority

Attachment E: Vali Gas Field Underground Water Impact Report



Report on

Vali Gas Field Underground Water Impact Report

Prepared for Erias Group



ageconsultants.com.au

ABN 64 080 238 642



Document details and history

Document details

Project number	VGF5000.001
Document title	Vali Gas Field Underground Water Impact Report
File name	VGF5000.001 Vali Gas Field UWIR_V03.01.docx

Document status and review

Edition	Comments	Author	Authorised by	Date
v01.01	Draft report – Internal review in progress	AL	KP	14/06/2024
v01.02	Draft report-internal review completed	AL	KP	21/06/2024
v02.01	Final report _discussion about the monitoring strategy	AL	DH	29/08/2024
v02.02	Final Report_external review	AL	DH	23/10/2024
v03.03	Final Report	AL	AL	29/10/2024

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Australasian Groundwater and Environmental Consultants Pty Ltd

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Vali Gas Field Underground Water Impact Report

1 Introduction

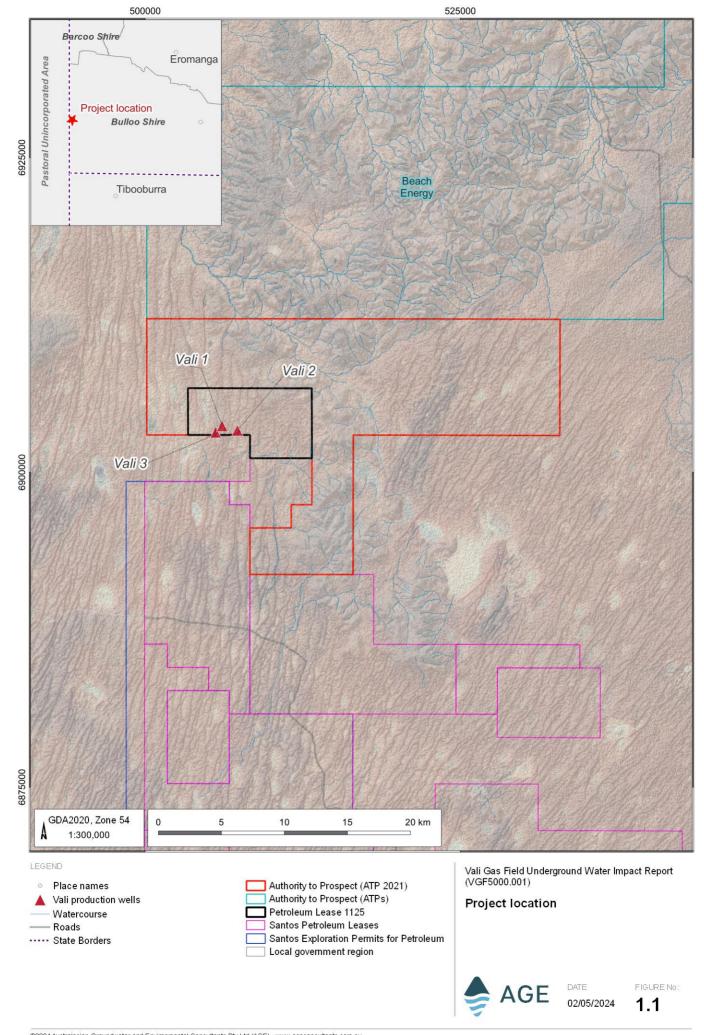
ERIAS Group (ERIAS) is supporting Vintage Energy (Vintage) in converting Authority to Prospect (ATP) 2021 to a Petroleum Lease (PL) for the Vali Gas Project (the Project). The Water Act 2000 places a number of requirements on petroleum tenure holders including a requirement to assess and manage the impacts of underground water extraction associated with the extraction of coal seam gas (CSG), and/or other petroleum or mineral resources. Since December 2010, the Water Act 2000 has been amended to include (among other requirements) provisions for the preparation, consultation and submission of an Underground Water Impact Report (UWIR) summarising the results of these assessments. ERIAS has engaged Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to prepare the UWIR for the Project.

1.1 Project area

The Project is currently operating within the ATP2021 in the Shire of Bulloo in Queensland. There are three production wells, Vali-1, Vali-2 and Vali-3, located on separate pads, between 700 and 1,700 metres apart and covering an area of approximately 1.2 km². The Vali gas field is limited to the three production wells; no additional drilling is planned. Figure 1.1 shows the extent of this Project area and the associated PL area (PL1125).

The broader Project includes a second gas field named Odin located across Queensland and South Australia. The production well Odin 1 is approximately six kilometres west of Vali-3, in South Australia. Odin gas field Project is excluded from this UWIR.





1.2 Legislation and guidelines

The primary legislative requirements related to the extraction of groundwater from deep aquifers and management of produced water for Vali Gas Field activities are summarised below.

1.2.1 Petroleum and Gas (Production and Safety) Act 2004 (QLD)

Under the Petroleum and Gas (Production and Safety) Act 2004 (Qld), the petroleum tenure holder may take or interfere with underground water in the area of the tenure if this happens during the course of, or results from, the carrying out of another authorised activity for the tenure. The Act also requires tenure holders to comply with underground water obligations specified in the Water Act 2000 (Qld).

1.2.2 Water Act 2000 (QLD)

Management of underground water impacts as a result of the exercise of underground water rights by petroleum tenure holders for petroleum or CSG projects is detailed in Chapter 3 of the Water Act 2000. The Act provides a framework that requires the petroleum tenure holder to prepare an Underground Water Impact Report (UWIR) which establishes obligations for monitoring and managing impacts on aquifers and springs. More specifically it also provides for trigger levels for establishing the significance of impact on an aquifer in the event of a decline in water levels. These trigger thresholds are:

- a 5 m decline in water levels within a consolidated aguifer;
- a 2 m decline in water levels within an unconsolidated aquifer; and
- a 0.2 m decline in water levels associated with active springs.

Areas where the expected decline in groundwater levels exceeds the relevant trigger level, within the next three years are defined as Immediately Affected Areas (or IAA). Areas where the expected declines in groundwater level exceed the trigger threshold in the longer term (i.e. sometime after three years) are defined as Long-term Affected Areas (or LTAA).

1.2.3 Underground Water Impact Report (UWIR)

The overall purpose of an Underground Water Impact Report (UWIR) is to provide a summary of the predicted groundwater impacts of a Project and set out how these expected impacts are to be monitored and managed. The relevant guideline (Queensland government, 2021) recommends specific methods for making predictions about the impacts of underground water extractions and for the preparation of UWIRs.

A UWIR must contain the following information:

- Part A: Information about underground water extractions resulting from operators exercising their underground water rights.
- Part B: Information about aquifers affected, or likely to be affected either in the short or longer term to assist with management of impacts of the exercise of water rights by tenure holders.
- Part C: Maps showing the area of affected aquifer(s) where underground water levels are expected to decline by more than the relevant trigger thresholds.
- Part D: A water monitoring strategy.
- Part E: A spring impact management strategy.

1.2.4 Environmental Protection Act 1994 (QLD)

The Environmental Protection Act 1994 and the related Environmental Protection (Water) Policy (EPP Water) provides a framework to protect and/or enhance the suitability of Queensland waters for various beneficial uses.

Surface waters are managed under the Cooper Creek water plan which is a component of the Lake Eyre Basin. The Lake Eyre Basin extends across Queensland, South Australia, New South Wales and the Northern Territory and the governments are signatories of the Lake Eyre Basin Intergovernmental Agreement (IGA).



Groundwater resources in the Project area are managed under the Great Artesian Basin and Other Regional Aquifer (GABORA) Water Plan (Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017). The Water Plan is divided into groundwater units listed in Schedule 2 of the Water Plan and the geological formations are listed in Schedule 3 of the Water Plan. Although the geological formations of the Eromanga Basin are listed in Schedule 3 of the Water Plan, the groundwater resources from the Cooper Basin are not mentioned in the Water Plan. Therefore, there are no environmental values and water quality objectives listed in Schedule 1 of the Water Plan for the groundwater resources extracted from Vali Gas production wells.

1.3 Report structure

The structure of this UWIR is in accordance with requirements of the Environmental Protection Act 1994 (section 126A and 227AA) and Water Act 2000 (section 376) and with associated Queensland Government guidelines (Queensland Government, 2021), and includes the following sections:

- Part A: Information about underground water extractions resulting from the exercise of underground water rights (Section 2).
- Part B: Information about aquifers affected, or likely to be affected; underground water flow description (Section 3).
- Part C: Predicted changes to water levels in the affected aguifer(s) (Section 4).
- Part D: An assessment of the impacts on environmental values from the exercise of underground water rights (Section 5).
- Part E: A water monitoring strategy (Section 6).
- Part F: A spring impact management strategy (Section 7).



2 Underground water extraction (Part A)

2.1 Quantity of water already extracted

There are three production wells located within ATP2021. Production testing started in Q1 2023 from the Patchawarra and Toolachee Formations which form part of the Cooper Basin. Information on the stratigraphic units screened in each of these three wells is provided in Table 2.1. The Vali-1 well was completed in 2020 and Vali-2 and Vali-3 were completed in 2021. Vali-1 is the main testing production well with 135 days of production from late February to July 2023.

Table 2.1 Production wells, production dates and stratigraphy

Bore name Start of production		Stratigraphic unit(s)	Comments	
Vali-1	21 February 2023	Patchawarra Formation	135 days of testing production	
Vali-2	March 2023	Toolachee and Patchawarra Formations	16 days of testing production. Well flowing from Patchawarra only from 4 May 2023	
Vali-3	March 2023	Toolachee Formation	11 days of testing production	

In total 3,493 kL of water was extracted from the three wells between 21 February 2021 and 13 December 2023. The most productive period was between February and July 2023 with the net flow of water returned to the wells for hydraulic stimulation purposes is shown in Table 2.2.

Table 2.2 Monthly water extraction 2023

	Water extraction* (kL)					
Months	Vali-1 (Patchawarra)	Vali-2^ (Patchawarra)	Vali-2 (Toolachee)	Vali-3 (Toolachee)	Total	
February 2023	161.30	0.00	0.00	0.00	161.30	
March 2023	379.67	0.00	96.82	211.69	688.18	
April 2023	275.99	0.00	99.36	193.79	569.15	
May 2023	198.39	530.38	12.08	0.00	740.85	
June 2023	231.65	541.98	0.00	0.00	773.62	
July 2023	263.99	62.00	0.00	0.00	325.99	
Total	1510.99	1134.35	208.26	405.48	3259.09	

 $\textbf{Notes: } \hbox{*cumulated water extraction to facility and to flare/vent/blowdown.}$

^Well flowing from Patchawarra only from 4th May 2023.



2.2 Quantity of water to be extracted in the next three years

Expected total water extraction from the three wells for the next three years is summarised in Table 2.3. Groundwater extraction from the three wells is expected to be for a duration of 20 years with a total of 11,600kL per year.

Table 2.3 Total predicted water extraction volumes

Financial Year	Date	Total water extraction (kL)	Total water extraction (m³/d)	Average per well (m³/d)
2023/2024	1 July to 30 June	6,900	19	6.3
2024/2025	1 July to 30 June	11,600	32	10.6
2025/2026	1 July to 30 June	11,600	32	10.6
2026/2027	1 July to 30 June	11,600	32	10.6
2027/2028	1 July to 30 June	11,600	32	10.6



3 Existing environment and aquifer information (Part B)

3.1 Climate

The Scientific Information for Landowners (SILO) database provides interpolated rainfall and evaporation data from available climate stations for a selected location. The monthly patched point SILO rainfall data for the Project site (longitude 141.13, latitude -28.01) were obtained from the Long Paddock website on 9 January 2024 (Queensland Government, 2024). Interpolated climatic information was obtained for the period January 2000 and December 2023.

According to the Köppen major classification system (BOM, 2005) the Project area experiences a desert climate. Figure 3.1 summarises observed monthly average temperature ranges and precipitation between 2000 and 2023. As shown monthly precipitation is limited, typically less than 10 mm/month in winter rising slightly in the summer to up to 26 mm on average in January. Average annual rainfall over the period analysed was 174 mm. Average maximum temperature in January is 39°C falling to 20°C on average in July.

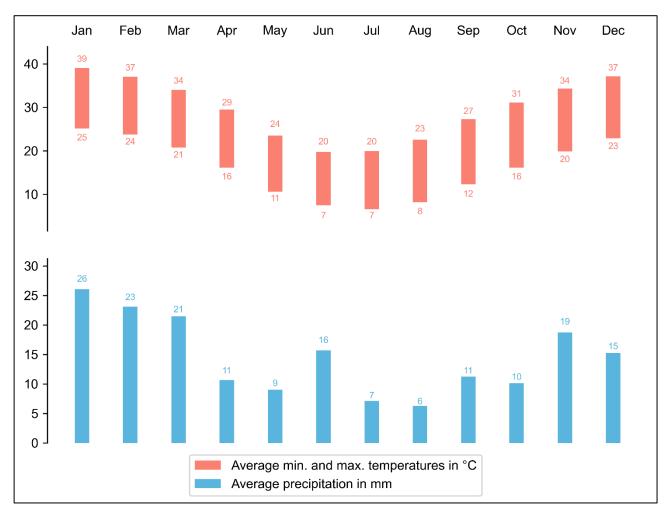


Figure 3.1 Average temperatures and precipitations between 2000 and 2023

The monthly Cumulative Rainfall Departure (CRD) was calculated for the period January 2000 to January 2024 and shows the area has experienced distinct cycles of above and below-average rainfall (Figure 3.2). The CRD method (Weber and Stewart, 2004) represents a summation of the monthly departure of rainfall from the long-term average monthly rainfall. A rising trend in the CRD plot therefore indicates periods of above-average rainfall, whilst a negative slope indicates periods of below-average rainfall.



The first part of the graph shows the millennium drought until 2010, then a wet period between 2010 and 2012. Between 2013 and 2020 rainfall totals were below average for the most part, with relatively short periods of above average rainfall. Since 2020 rainfall has been close to average.

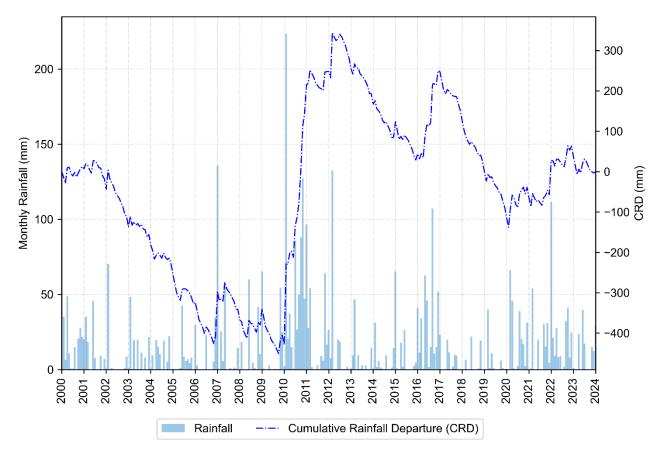


Figure 3.2 Monthly SILO rainfall and CRD (2000-2024)

3.2 Topography and drainage

Figure 3.3 shows the topography and drainage of the Project area.

3.2.1 Topography

The Vali gas field site is located between the Simpson, Strzelecki and Sturt Stony deserts. The terrain in the area is dominated by undulating dune fields. It also comprises flat gibber plains, sand plains and flood plains.

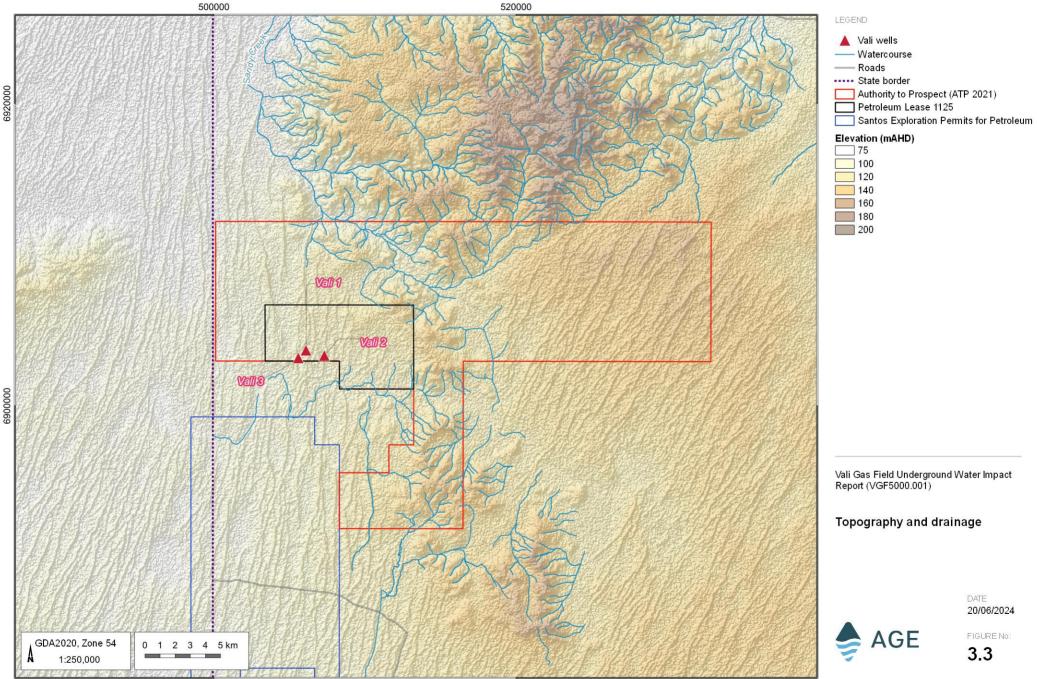
Ground elevation at the Vali-1 well site is between 102 and 105 metres Australian Height Datum (mAHD). It is adjacent to a clay depression and a dune. Ground elevation at the Vali-2 pad is approximately 107 mAHD and 103 mAHD at the Vali-3 well pad.

3.2.2 Drainage

The site is located in a sub-basin of the Cooper Creek. Local drainage lines flow towards Lake Eyre, which is located approximately 370 km to the west of the Project area.

There are no springs from the Queensland Springs Database mapped within or near the Project area. The nearest mapped spring is approximately 300 km to the east of the Project area. The closest Great Artesian Basin springs in South Australia are approximately 100 km south west of the Project area.





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3.3 Geology

A review of the geological and hydrogeological features that occur beneath ATP2021 are described below and have been used to develop the hydrogeological conceptualisation of the groundwater regime beneath the Project area and surrounds. This understanding forms the basis for the analytical groundwater flow model. As mentioned previously the targets for gas production at PL1125 comprise the Toolachee and the Patchawarra Formations within the Cooper Basin. There are no regional faults mapped in the Project area.

Figure 3.4 summarises the stratigraphy of the project area.

3.3.1 Surface deposits

Figure 3.5 shows the surface geology at the Vali Gas field which is dominated by Quaternary sands. The older Tertiary age Glendower Formation outcrops to the east of the PL1125 and the Winton Formation (Cretaceous) outcrops to the northeast of ATP2021. The Glendower Formation is a fluvial deposit comprising sandstone, siltstone, conglomerate and mudstone. The Winton formation comprises interbedded, fine to coarse sandstone, siltstone, shale and coal seams deposited in fluvio-lacustrine environments. The total average thickness of the surface deposits (Quaternary, Tertiary and Cretaceous) is 850 metres.

3.3.2 Eromanga Basin

The Winton Formation is underlain by a series of sedimentary deposits with comprise the Eromanga Basin which represents the largest sub-basin within the Great Artesian Basin (GAB). The total sedimentary thickness of the Eromanga Basin at the site is approximately 1,050 metres. It comprises several stacked formations. The Hutton Sandstone is one of the major sandstone formations of the GAB and is present at the base of the Eromanga Basin in the Project area with a thickness averaging 105 metres. The base of the Eromanga Basin is approximately 2,000 metres below ground level (mbgl) at the Project area. A major unconformity at the base of the Eromanga Basin separates it from the underlying Cooper Basin.

3.3.3 Cooper Basin

The Eromanga Basin unconformably overlies the Cooper Basin. The Cooper Basin is a non-marine sedimentary pile and can be subdivided into three major geological groups:

- Triassic Nappamerri Group: which comprises the Tinchoo Formation (interbedded siltstone and sandstone, minor coal seams and intraclast conglomerate) and the Arraburry Formation (mudstone, siltstone and fine-grained sandstone). The total thickness of the Nappamerri Group is approximately 350 metres in the Project area.
- Permian Gilgealpa Group: which includes the two target formations for the Vali gas field (i.e. the Toolachee and the Patchawarra Formations).
 - The Toolachee Formation comprises interbedded fine to coarse-grained sandstone, siltstone and carbonaceous shale. It is approximately 160 metres thick in the Project area (between 2,400 and 2,550 metres below ground level) and unconformably overlies the mudstones and siltstones of the Daralingie Formation.
 - The Daralingie Formation, The Roseneath Shale, Epsilon Formation and Murteree Shale overlie the Patchawarra Formation. The cumulative thickness of these deposits in the Project area is around 350 metres which predominantly comprises interbedded mudstone, siltstone and shale.
 - The Patchawarra Formation predominantly comprises interbedded sandstone, siltstone, shale and coal. It is approximately 310 metres thick at the three existing production wells. Depths are approximately between 2,800 and 3,110 metres below ground level.
 - The underlying Tirrawarra Sandstone predominantly comprises fine to coarse-grained sandstone interbedded with conglomerate and minor carbonaceous siltstone, shale and coal.
- Late Carboniferous Group: which includes the Merrimelia Formation, it is of glacial origin.



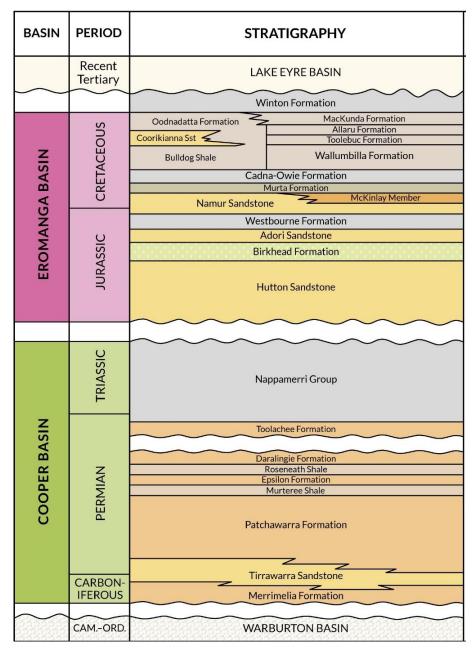
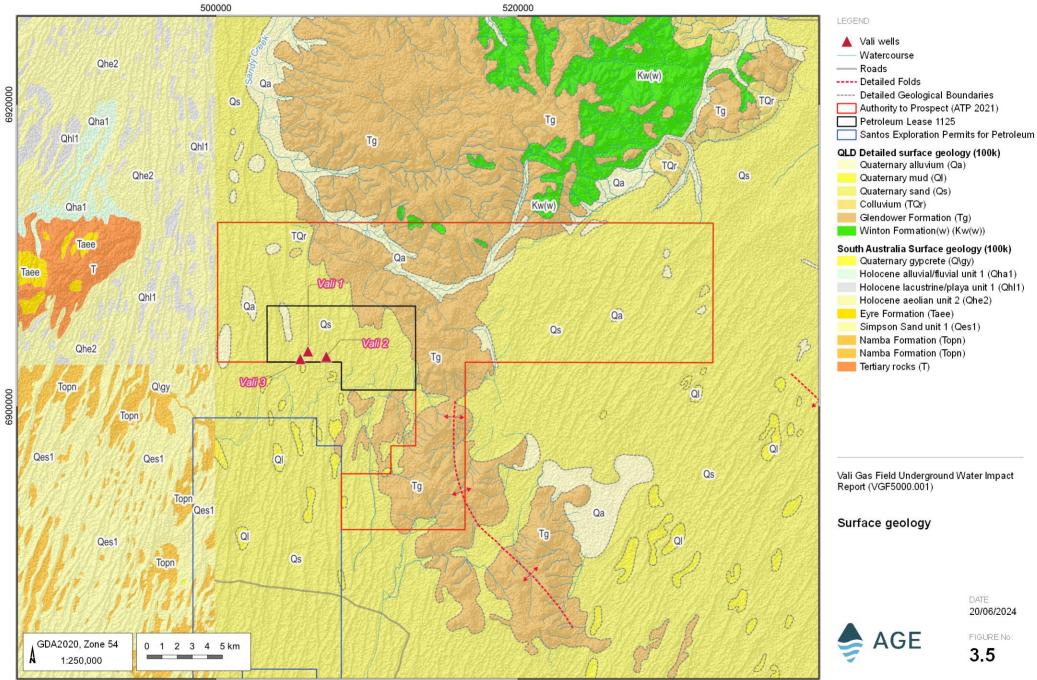


Figure 3.4 Stratigraphy of the Eromanga and Cooper basins





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3.4 Hydrogeology

As would be expected significant groundwater resources are generally only consistently intersected in those stratigraphic units which are sandstone dominated. Other units which are dominated by siltstone, mudstone and shale formations tend to act as aquitards. The main aquifers for water extraction include the following:

- Shallow Quaternary and Tertiary sediments.
- The Winton Formation.
- The Great Artesian Basin (GAB) aquifers of the Eromanga Basin which include: Mackunda Formation,
 Wallumbilla Formation, Cadna-Owie Formation, Hooray and Hutton Sandstones.
- Other Cooper Basin aquifers including: Toolachee Formation, Epsilon Formation, Patchawarra Formation and Tirrawarra Sandstone.

The Winton and Mackunda aquifers are the primary targets for groundwater extraction in the project area because they are relatively shallow and consequently easier and cheaper to drill into. Groundwater from Cadna-Owie, Hooray systems and other Eromanga Basin aquifers are rarely targeted for extraction locally due to drilling depths exceeding 1,000 metres. Petroleum exploration bores that intersect these deeper aquifers are sometimes repurposed for water supply purposes, however as discussed in Section 5.1, the deepest existing water supply bore within 15 km of the Project Area is less than 300 m deep. The aquifers of the Cooper Basin are present at ever greater depth (base of the Toolachee is approximately 2,550 mbgl and base of the Patchawarra is 3,110 mbgl) and only accessed for gas production.

It is considered unlikely that the impact of water extraction in the Cooper Basin could extend far beyond the top of the Cooper Basin into the overlying Eromanga Basin due to the geological discontinuity between the two basins and the thickness and the anticipated low permeability of the Tinchoo Formation, which sits immediately below the base of the Eromanga Basin. Based on this assertion, the aquifers which could be impacted by the three Vali project production wells include:

- Hutton Sandstone: typically, comprises fine to coarse-grained quartzose porous sandstones interbedded with minor finer-grained siltstones. It lies unconformably over the Cooper Basin. Thickness is approximately 105 metres (between 1,900 and 2,000 mbgl). Estimated hydraulic conductivities are between 9.8 x 10⁻³ and 3.5x10⁻¹ m/d (Santos, 2019) and storativity is estimated at 1 x 10⁻⁴.
- Toolachee Formation: typically comprises porous sandstones interbedded with finer-grained siltstones, mudstones and shales with thin coal seams and some conglomerates. It unconformably overlies older formations across the whole Cooper Basin. Thickness is around 160 metres (between 2,380 and 2,540 mbgl in Vali-1). Estimated hydraulic conductivities are between 2 x 10⁻³ and 4.3 x 10⁻³ m/d (Santos, 2019) and storativity is 5.5 x 10⁻⁵.
- Epsilon Formation: predominantly siltstone with minor coal and sandstones. The thickness averages 50 metres. There are no hydraulic properties estimated in the surrounding existing UWIR.
- Patchawarra Formation: consisting of variable porous sandstone interbedded with siltstone, mudstone and shale with thin coal seams. The thickness is 310 m at the project area (between 2,805 and 3,115 mbgl at Vali-1). Estimated hydraulic conductivities are between 3.3 x 10⁻⁴ and 3.5 x 10⁻³ m/d (Santos, 2019) and storativity is 1.1 x 10⁻⁴.
- The Tirrawarra Sandstone: consisting of fine to coarse-grained and pebbly sandstone interbedded with conglomerate, minor carbonaceous siltstone, shale and coal. The Tirrawarra Sandstone is on approximately 80 metres. No estimated hydraulic conductivities were provided in other UWIR reports.

3.5 Groundwater quality

Single groundwater results are available for four locations within the project area: two mixed samples from Vali-1, Vali-2 and Vali-3 production bores (taken from two different locations within the gas/water collection network) and samples from two landowner bores (the Watties and Christmas bores) collected during baseline assessment data collation activities. Table 3.1 summaries the formations screen in each bore as well as sampling dates.



Table 3.1 Water sample information

Sample name	Date	Lithology
Top Pond (mixed sample from Vali-1, 2 and 3)	22/09/2023	Toolachee and Patchawarra Formations
Overflow Pond (mixed sample from Vali-1, 2 and 3)	22/09/2023	Toolachee and Patchawarra Formations
Watties Bore	05/04/2022	Glendower or Winton Formations
Christmas Bore	05/04/2022	Glendower or Winton Formations

Salinity can be described by total dissolved solid (TDS) concentrations or electrical conductivity (EC¹). TDS concentrations are commonly classified on a scale ranging from fresh to extremely saline. The Queensland Government released science notes (Queensland Government, 2018) about salinity limits for water to provide an overview of the typical salinity characteristics of water (Table 3.2).

Table 3.2 Guide to typical salinity limits for waters (Queensland Government, science notes L137)

Туре	EC (µS/cm)	TDS (mg/l)		
Distilled water	1	0.67		
Rainfall	30	20		
Freshwater	0 to 1500	0 to 1000		
Great Artesian Basin Water	700 to 1000	470 to 670		
Brackish water	1500 to 15000	1000 to 10050		
Upper limit recommended for drinking	1600	1070		
Seawater	55000	36850		
Tolerances of livestock to salinity in drinking water drink, but stock should adapt without loss of proc	er (at these values, animals may duction)	have an initial reluctance to		
Beef cattle	5970 to 7460	4000 to 5000		
Dairy cattle	3730 to 5970	2500 to 4000		
• Sheep	7460 to 14925	5000 to 10000		
• Horses	5970 to 8955	4000 to 6000		
• Poultry	2985 to 4475	2000 to 3000		
General limits for irrigation				
Salt sensitive crops	650	435		
Moderately salt sensitive crops	1300	870		
Salt tolerant crops	5200	3485		
Generally, too saline for crops	8100	5430		

¹ Electrical conductivity is a measure of the saltiness of the water and is measured on a scale from 0 to 50,000 μS/cm. Electrical conductivity is measured in micro siemens per centimetre (μS/cm).



The samples taken from the Watties and Christmas bores suggest that groundwater is brackish with electrical conductivity ranging between 2,220 and 7,560 μ S/cm (i.e. towards the upper end of the limits for stock watering and irrigation uses (Table 3.2). Given the depth of the Toolachee and Patchawarra units in the Project area, data for the gas production bores points are highly saline conditions with EC ranging between 10,000 and 19,000 μ S/cm and well above the upper limits for drinking, stock watering or irrigation (Table 3.2).

A piper plot (Figure 3.6) and a Durov diagram (Figure 3.7) were generated for the four water samples collected. As shown in Figure 3.6, all boreholes can be classified as a sodium-chloride water type. As would be expected, given the higher salinity values discussed above water drawn from the production bores is characterised by substantially higher chloride concentrations (between 3,300 and 7,200 mg/L) than the groundwater drawn from the local water supply bores (between 810 and 1,800 mg/L).

The pH is close to neutral for three samples, ranging between 6.8 and 7.5 (Figure 3.7). On the other hand, water sampled from the overflow pond is basic with a pH of 8.5. This may be related to chemical changes occurring within the pond.

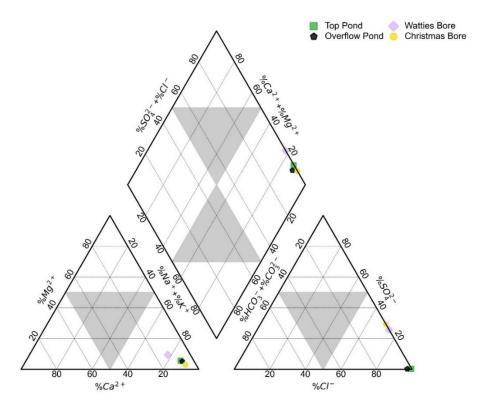


Figure 3.6 Piper plot



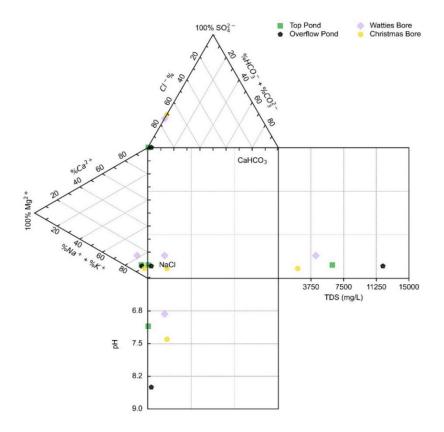


Figure 3.7 Durov diagram

3.6 Hydrogeological conceptual model

Figure 3.8 presents a hydrogeological conceptual model of Vali gas field based on the data available. Other local water supply bores in the Project area extend to less than 300 metres below ground level and are therefore thought to be extracting from the Winton or Glendower Formations. The Eromanga Basin unconformably overlies the Cooper Basin where the three production bores, Vali-1, Vali-2 and Vali-3 are extracting water from between 2,380 and 3,110 m below ground level (i.e. more than 2,080 m below local groundwater extractions). Vali-1 is screened within the deepest formation, the Patchawarra Formation. The production well Vali-3 is screened within the Toolachee Formation and the Vali-2 extracts gas from both the Toolachee and Patchawarra Formations. Adopted hydraulic conductivity and storativity values are based predominantly on values available for adjacent lease areas (Santos 2019; Beach Energy, 2020) which are shown in Figure 3.8. Sections 3.6.1 and 3.6.2 below describe the estimated water levels and potential groundwater flow and recharge mechanisms within the Cooper Basin.

3.6.1 Underground water flow and aquifer interactions

As would be expected given the depth of the target formations in the Project area, information on groundwater levels and flow directions in the Toolachee and Patchawarra formations and the Cooper Basin in general are somewhat limited. Groundwater movement even within coarse sandstone units present at such depths is likely to be limited by its reduced capacity to transmit water as permeability tends to decrease with increasing depth. Similarly, groundwater recharge through the overlying 2,400 m thick sedimentary pile which includes significant thicknesses of aquitard material is likely to be negligible. Hence consistent with the water quality data described above (Section 3.5) Toolachee and Patchawarra formations are saline and likely to be relatively old, when compared to waters from the overlying GAB aquifers in the Eromanga Basin. The implication here is that the recharge of the Cooper Basin aquifers may be considered minimal to none (Keppel at al., 2016). In general groundwater flow, if it occurs at all given the expected low permeability, generally follows the sedimentary bedding, towards lower-lying areas.



Evidence gathered from DST testing during drilling showed "over-pressuring" in the Toolachee, Daralingie and Patchawarra Formations (i.e. pressures which increase with depth and are above the hydrostatic pressure line), which suggests the existence of highly effective seals (i.e. aquitards) within the Nappamerri Group (Lech et al., 2020). Movement of groundwater into and out of the Cooper Basin formations via the overlying Eromanga Basin aquifers is therefore only likely to occur where a connected pathway through the Nappamerri group exists or is subsequently established. Hypothesized pathways include locations where the unit abuts basement highs which could, in combination with localised faulting, create preferential pathways for vertical fluid migration.

3.6.2 Underground water level trend analysis

There is limited groundwater level information in the Cooper Basin within the Vali gas field. Short post-production and production shut-in pressure tests were provided for two production wells, Vali-1 and Vali-2, in August 2023. The estimated water levels at Vali-1 from the pressure tests vary between 190 and 1,500 metres (not stabilised) below ground level. The shut-in pressure test at Vali-2 was not stabilised and the pressure measured was equivalent to 1,140 metres below ground level at the time of the test. It is likely there is a depressurisation in the production wells above 1,500 metres of water depletion however it is unlikely the depressurisation extends to the overlaying Eromanga Basin. The Winton Formation is likely locally depressurised from the water users' bores.



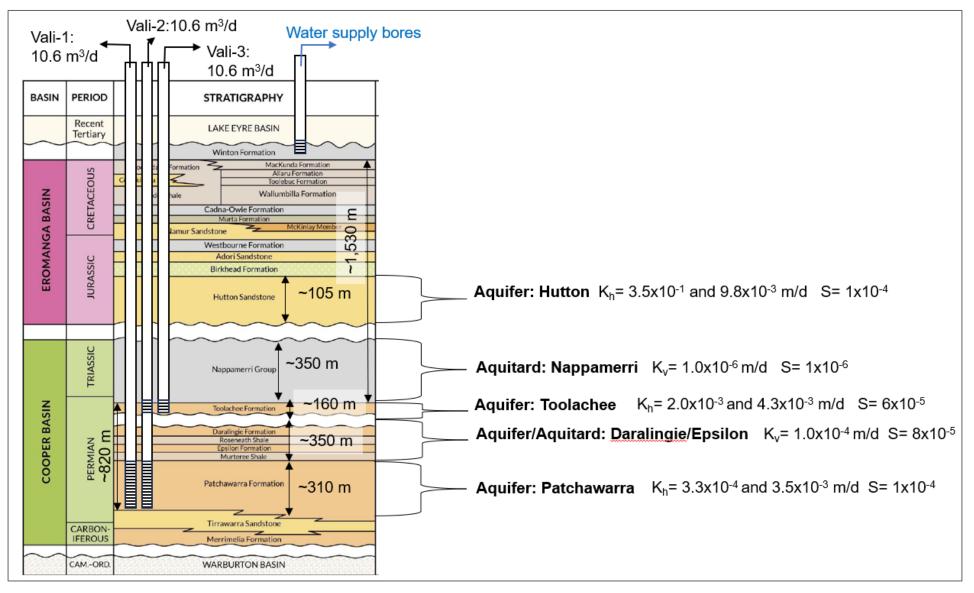


Figure 3.8 Hydrogeological conceptual model



4 Predictions of groundwater impacts (Part C)

For the purposes of this UWIR, the affected area in the Cooper Basin and the Hutton Sandstone is considered to be the area where observed or predicted groundwater level drawdown, caused by the removal of water to allow efficient gas extraction, exceeds five metres (Section 1.2.2). The drawdown threshold for potential impact on springs and groundwater dependent ecosystems (GDEs) is 0.2 m.

4.1 Model approach

A relatively simple analytical modelling approach has been adopted for the study on the basis that the risk to existing water users and GDEs are expected to be relatively low, since:

- The proposed development is limited to continued extraction from three existing wells located on a small 1.2 km2 PL area (PL1125).
- The volume of water extracted from the wells is relatively minor, 11.6 ML per year over the next 20 years (Section 2), an extraction rate which is likely to be similar to other existing stock & domestic extractions in the area
- There is a significant (1,530 m) vertical separation of the target formations (the Toolachee and Patchawarra formations) from potential receptors (existing water supply bores screened into the Winton Formation and terrestrial GDEs potentially partially sourced by near surface aquifer units).
- The existence of a number of regional scale aquitards in the zone between the target formations and potential receptors, including in particular the Nappamerri Group which is known to form a highly effective seal at the top of the Cooper Basin in the area (Lech et al., 2020).
- There are no mapped major faults which might form vertical impact propagation pathways or mound springs which might provide evidence of actual pathways, within 100 km of the Project area.

Due to the existence of a geological discontinuity between the Eromanga and the Cooper Basins and the thickness of the Nappamerri Group aquitard above the Toolachee Formation, it is considered unlikely that the impact of water extraction in the Cooper Basin will propagate into the overlying Eromanga Basin. Nevertheless, the Hutton Sandstone has been simulated to quantify potential drawdown at the base of the Eromanga Basin from the Vali gas field

Predictive modelling was undertaken using the MLU software (version 2.25.78). This is a relatively sophisticated quasi 3D analytical modelling tool which unlike other analytical tools allows simulation of multiple aquifer systems and intervening aquitards and can easily be set up to provide predictions in each aquifer based on ongoing extraction from a number of extraction wells.

The primary objective of the predictive modelling was to provide estimates of the decline in water level in response to the ongoing removal of water from the Toolachee and Patchawarra formations over a three-year period (i.e. identify the IAA area) and in the long-term (i.e. the LTAA area). Given the relative positions of the target formation and the receptors this primarily involved assessing the degree to which extraction impacts propagate vertically through the overlying material.

4.1.1 Model construction

For analytical modelling purposes as summarised in Table 4.1 the conceptual model shown in Figure 3.8 was simplified slightly such that material present between the two target formations (the Toolachee and the Patchawarra Formations) which includes the Epsilon Formation aquifer and surrounding aquitards was simulated using a single layer. As shown each of the three remaining aquifers (i.e. the Hutton Sandstone and the Toolachee and the Patchawarra Formations) were simulated using dedicated layers and consistent with the conceptual model were modelled as being separated by significant thicknesses of intervening aquitard material.

Adopted hydraulic parameters used for modelling purposes are also provided in Table 4.1 and were sourced from existing UWIR surrounding the Project area.



Table 4.1 Initial scenario - hydrogeological parameters

Layer	Thickness (m)	K (m/d)	s	Lithology	Aquifer
1	105	3.5x10 ⁻¹	1.0x10 ⁻⁴	Hutton Sandstone	Aquifer
2	350	*1.0x10 ⁻⁶	1.0x10 ⁻⁶	Nappamerri Group	Aquitard
3	160	2.0x10 ⁻³	5.5x10 ⁻⁵	Toolachee Formation	Aquifer
4	350	*2.0x10 ⁻⁴	8.0x10 ⁻⁵	Daralingie Formation/Roseneath Shale/Epsilon Formation/Murteree Shale	Aquifer/Aquitard
5	310	3.3x10 ⁻⁴	1.1x10 ⁻⁴	Patchawarra Formation	Aquifer

Note: *Vertical hydraulic conductivity.

Modelled water extraction rates and layer attributions for each of the simulated extraction wells are summarised in Table 4.2.

Table 4.2 Production wells

Well name	Easting	Northing	Modelling layer	Pumping rate (m3/d)	IAA	LTAA
Vali 1	506107.8	6903682.8	5	10.6	3 years	20 years
Vali 2	507322.8	6903329.1	3,5	10.6	3 years	20 years
Vali 3	505599.3	6903174.4	3	10.6	3 years	20 years

Note: Coordinates system: GDA 2020.

4.1.2 Assumptions and limitations

The assumptions and limitations of the analytical modelling include:

- Predictive production rates provided by Vintage were equally divided between the Vali-1, Vali-2 and Vali-3 bores while the current production rates are mainly from Vali-1.
- Estimated aquifer parameters (hydraulic conductivity and storativity) are based on literature review or based on UWIRs for adjacent production leases (Santos, 2019; Beach Energy 2020). No hydrogeological parameter measurements were available for the Vali gas field.
- Project life of Vali gas field is estimated at 20 years.
- Like other similar tools MLU neglects the effects of the storage term within aquitard units and hence
 does not predict any lag between stresses applied to the target formations (Toolachee and Patchawarra
 formations). As such the predicted impacts are expected to be conservative especially with regard to
 the timing of any impacts in the Hutton Sandstone. In practice, impacts would likely take hundreds if not
 thousands of years to migrate through the underlying 350 m thick aquitard and would therefore be
 significantly delayed.

4.2 Model results

Figure 4.1 and Figure 4.2 present the predicted drawdown for the initial scenario in the production wells Vali-1, Vali-2 and, Vali-3 in the Cooper Basin and the Hutton Sandstone. Table 4.3 presents the maximum drawdown, the IAA and LTAA, with five-metre drawdown contours.



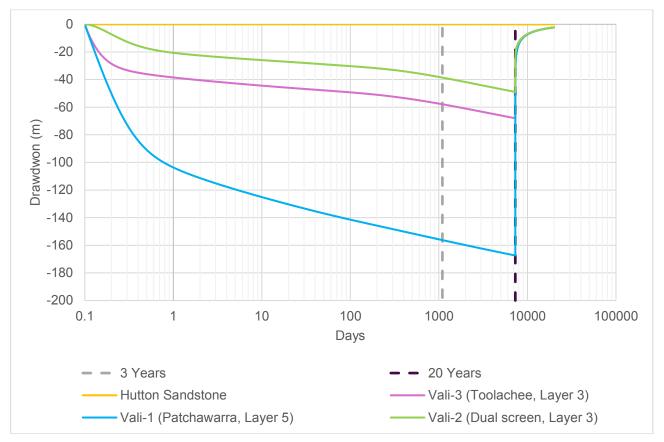


Figure 4.1 Predicted drawdown – initial scenario

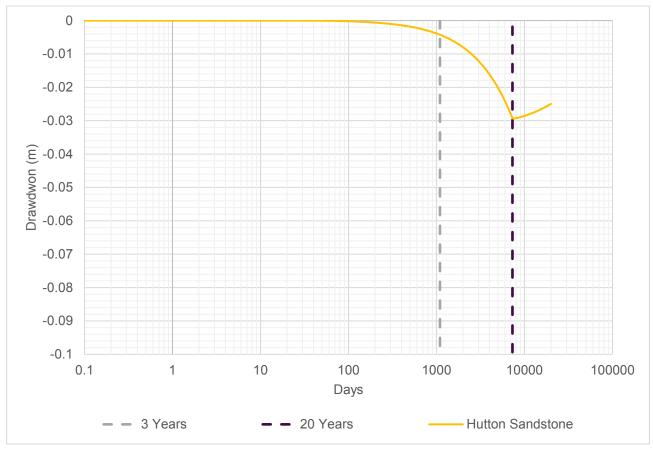


Figure 4.2 Predicted drawdown – initial scenario - Hutton Sandstone



Table 4.3 Predicted maximum drawdown – initial scenario

	IAA (y	vear 3)	LTAA*			
Aquifer	Drawdown (m) 5 m Drawdown Extent radius (km)		Maximum Drawdown (m) – year 20	5 m Drawdown extent radius (km)		
Hutton	0.005	NA	0.03	NA		
Toolachee (Vali-2 and Vali-3)	58	1.65	68	4 (year 22)		
Patchawarra (Vali-1 and Vali-2)	156	1.65	167	4 (year 22)		

4.2.1 Immediately affected area (IAA)

The predicted IAA area, i.e. the area where more than 5 m of drawdown is predicted during the 2023 to 2026 UWIR reporting period for the Toolachee and the Patchawarra formations (Layers 3 and 5) is presented in Figure 4.3. The maximum drawdown predicted in the Hutton Sandstone during this period (Figure 4.2) is 5 millimetres and hence there is no IAA for this aquifer. No drawdown impacts are therefore predicted on any units overlying the Hutton Sandstone. The maximum predicted drawdown is 156 m at Vali-1 within the Patchawarra Formation.

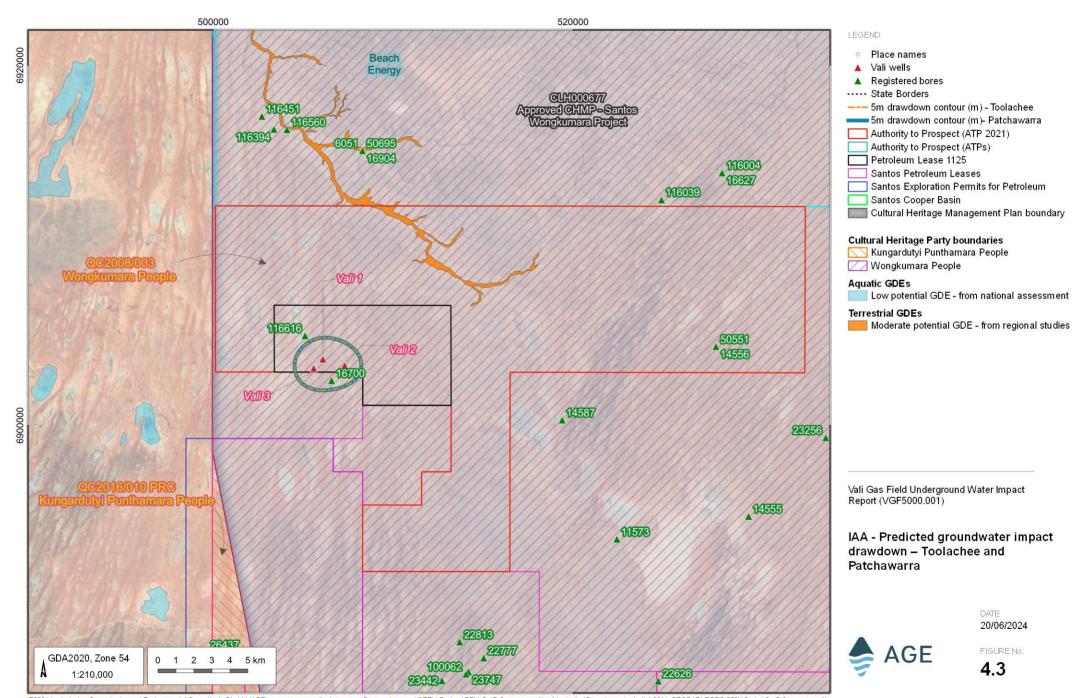
As shown in Figure 4.3 and Table 4.3 the predicted IAA for the Toolachee and the Patchawarra formations are very similar (since the Vali-2 bore is screened in both formations and hence provides a location connection between the two units) and extend around 1.7 km from the production wells Vali-1, Vali-2 and Vali-3.

4.2.2 Long-term affected area (LTAA)

The predicted LTAA area, i.e. the area where more than 5 m of drawdown is predicted at any time in the future for the Toolachee and the Patchawarra formations (Layers 3 and 5) is presented in Figure 4.4. Maximum predicted drawdown in the Hutton Sandstone at the end of the production period (Figure 4.2) is 0.03 m and hence there is no LTAA for this aquifer. No drawdown impacts are therefore predicted on any units overlying the Hutton Sandstone. The maximum predicted drawdown is 167 m in Vali-1 within the Patchawarra Formation.

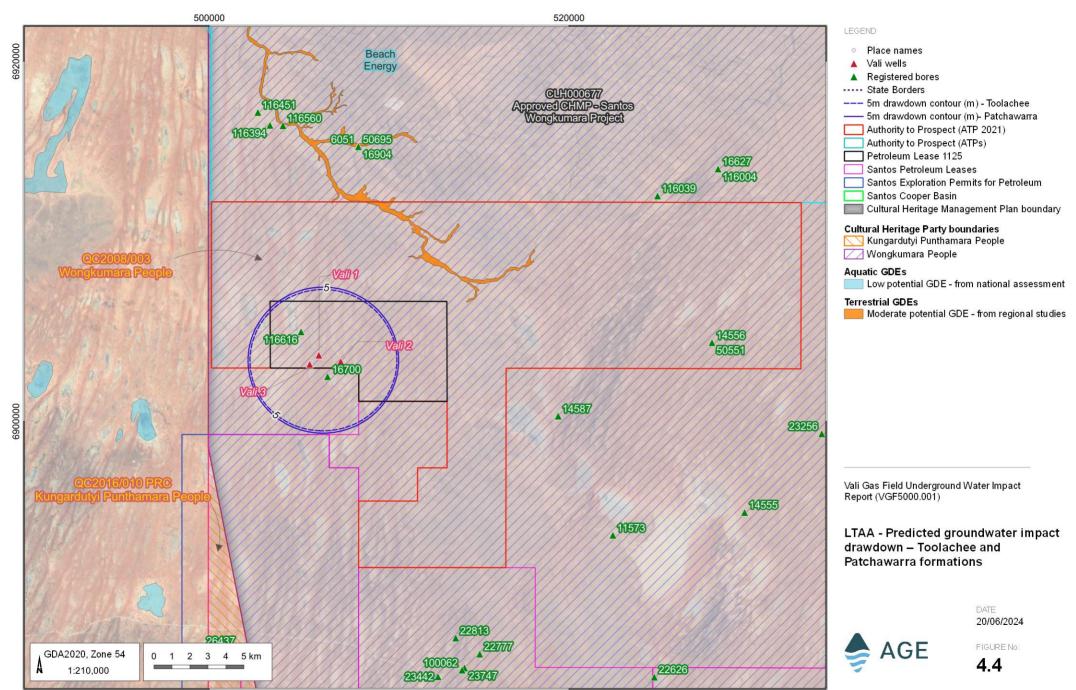
As shown in Figure 4.4 and Figure 4.3 the predicted LTAA for the Toolachee and the Patchawarra formations are very similar (since the Vali-2 bore is screened in both formations and hence provides a location connection between the two units) and extend around 4 km from the production wells Vali-1, Vali-2 and Vali-3.





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4.2.3 Sensitivity

Nine scenarios were run for sensitivity analysis with hydraulic conductivities and storativity of one order of magnitude higher and lower than the initial scenario (scenario 5). Table 4.4 and Table 4.5 present the hydraulic parameters for the nine scenarios.

Figure 4.5, Figure 4.6, Figure 4.7 and Figure 4.8 present the predicted drawdown in each production well and the Hutton Sandstone for the nine sensitivity scenarios. The maximum predicted drawdown in the Hutton Sandstone is 4.24 m (Scenario 10) after 20 years of production. The maximum predicted drawdown after three years is 565.42 m and 1,630 m at the end of life of the project in the well Vali-1 (Scenario 9).

Figure 4.9 and Figure 4.10 present the IAA and LTAA. The groundwater depletion in scenarios 1 and 2 are lower than five metres in any of the analytical model layers therefore there are no IAA and LTAA identified for those sensitivity scenarios. Groundwater drawdown exceeding five meters is predicted after 20 years from scenario 3. Scenarios 4, 6, 7, 8, 9 and 10 show a predicted drawdown exceeding 5 metres within 3 years and at the end of life of the project. The largest predicted IAA in the Patchawarra and Toolachee is approximately 5 km radius and 10 km radius for the LTAA (scenario 6).

There is no groundwater drawdown greater than five metres predicted in the Eromanga Basin (Hutton Sandstone) in any sensitivity scenarios. There are no impacted registered water bores screened in the Cooper Basin and no environmental receptors identified within the IAA and LTAA.

Existing petroleum wells Kappa 1, Kappa 3, Kappa 4 and Chef 1 from Santos's Petroleum Lease are within the LTAA of sensitivity scenarios 6 and 9, within a radius of eight kilometres.



Table 4.4 Sensitivity scenarios 1 to 4

Scenarios #	1		2		3		4	
Layer	K (m/d)	S						
1	3.5x10 ⁻¹	1.0x10 ⁻³	3.5x10 ⁻¹	1.0x10 ⁻⁴	3.5x10 ⁻¹	1.0x10 ⁻⁵	3.5x10 ⁻¹	1.0x10 ⁻³
2	1.0x10 ⁻⁶							
3	2.0x10 ⁻²	6.0x10 ⁻⁴	2.0x10 ⁻²	6.0x10 ⁻⁵	2.0x10 ⁻²	5.5x10 ⁻⁶	2.0x10 ⁻³	6.0x10 ⁻⁴
4	2x10 ⁻⁴	8.0x10 ⁻⁴	2.0x10 ⁻⁴	8.0x10 ⁻⁵	2.0x10 ⁻⁴	8.0x10 ⁻⁶	2.0x10 ⁻⁴	8.0x10 ⁻⁴
5	3.3x10 ⁻³	1.0x10 ⁻³	3.3x10 ⁻³	1.0x10 ⁻⁴	3.3x10 ⁻³	1.1x10 ⁻⁵	3.3x10 ⁻⁴	1.0x10 ⁻³

Table 4.5 Sensitivity scenarios 6 to 10

Scenarios #	6		7		8		9		10	
Layer	K (m/d)	S								
1	3.5x10 ⁻¹	1.0x10 ⁻⁵	3.5x10 ⁻²	1.0x10 ⁻³	3.5x10 ⁻²	1.0x10 ⁻⁴	3.5x10 ⁻²	1.0x10 ⁻⁵	3.5x10 ⁻²	1.0x10 ⁻⁵
2	1.0x10 ⁻⁶	1.0x10 ⁻⁵	1.0x10 ⁻⁶							
3	2.0x10 ⁻³	5.5x10 ⁻⁶	2.0x10 ⁻⁴	5.5x10 ⁻⁴	2.0x10 ⁻⁴	5.5x10 ⁻⁵	2.0x10 ⁻⁴	5.5x10 ⁻⁶	2.0x10 ⁻⁴	5.5x10 ⁻⁶
4	2.0x10 ⁻⁴	8.0x10 ⁻⁶	2.0x10 ⁻⁵	8.0x10 ⁻⁴	2.0x10 ⁻⁵	8.0x10 ⁻⁵	2.0x10 ⁻⁵	8.0x10 ⁻⁶	2.0x10 ⁻⁵	8.0x10 ⁻⁶
5	3.3x10 ⁻⁴	1.1x10⁻⁵	3.3x10 ⁻⁵	1.1x10 ⁻³	3.3x10 ⁻⁵	1.1x10 ⁻⁴	3.3x10⁻⁵	1.1x10 ⁻⁵	3.3x10 ⁻⁵	1.1x10 ⁻⁵



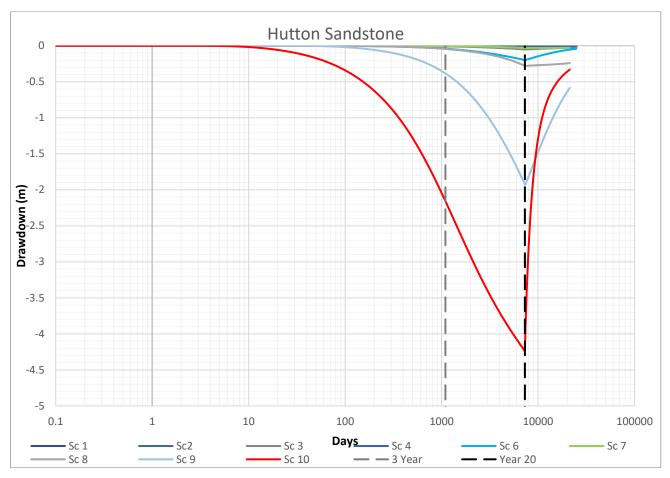


Figure 4.5 Sensitivity analysis – predicted drawdown – Hutton Sandstone

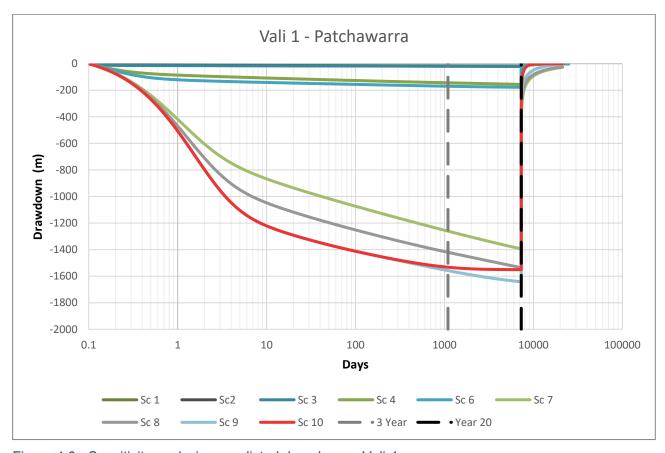


Figure 4.6 Sensitivity analysis – predicted drawdown – Vali-1



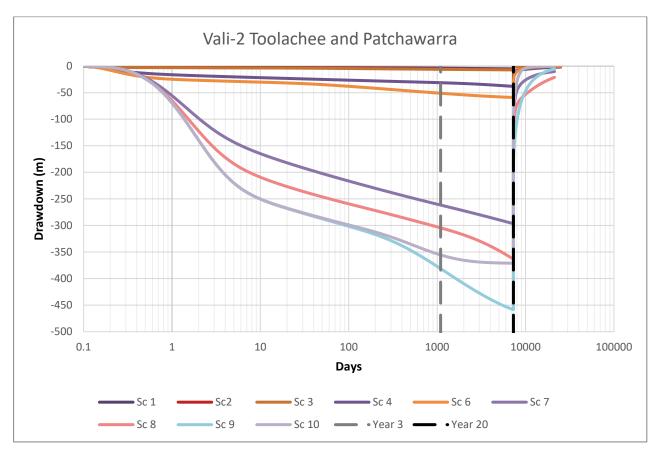


Figure 4.7 Sensitivity analysis – predicted drawdown – Vali-2

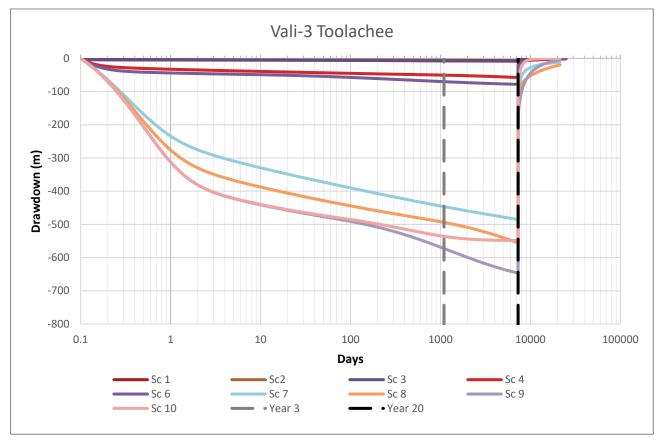
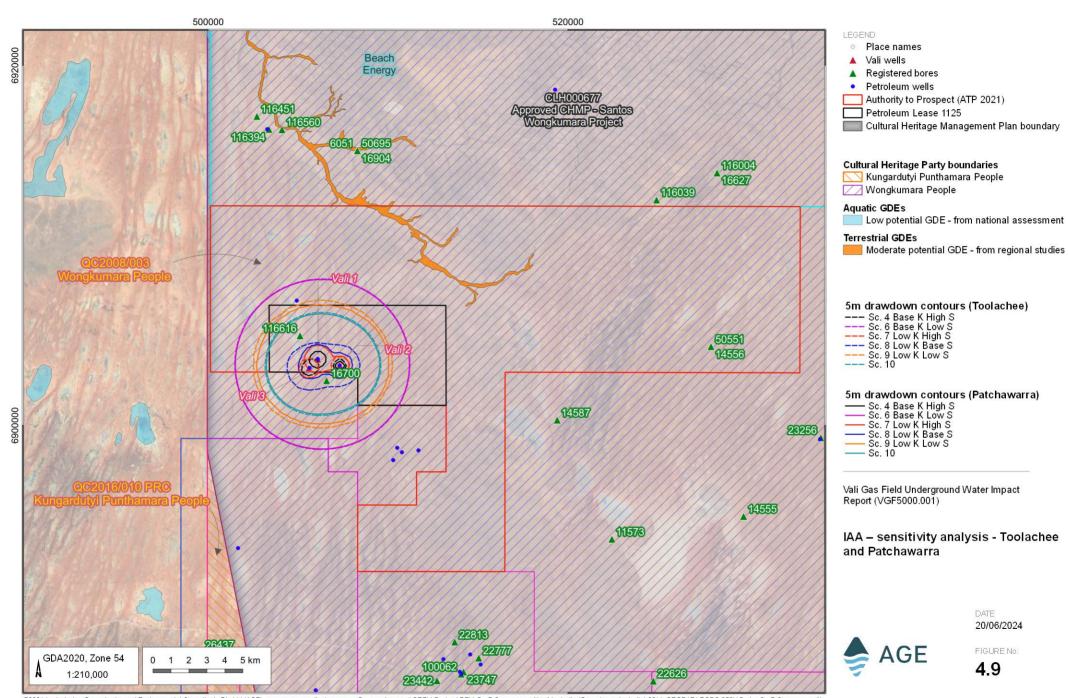


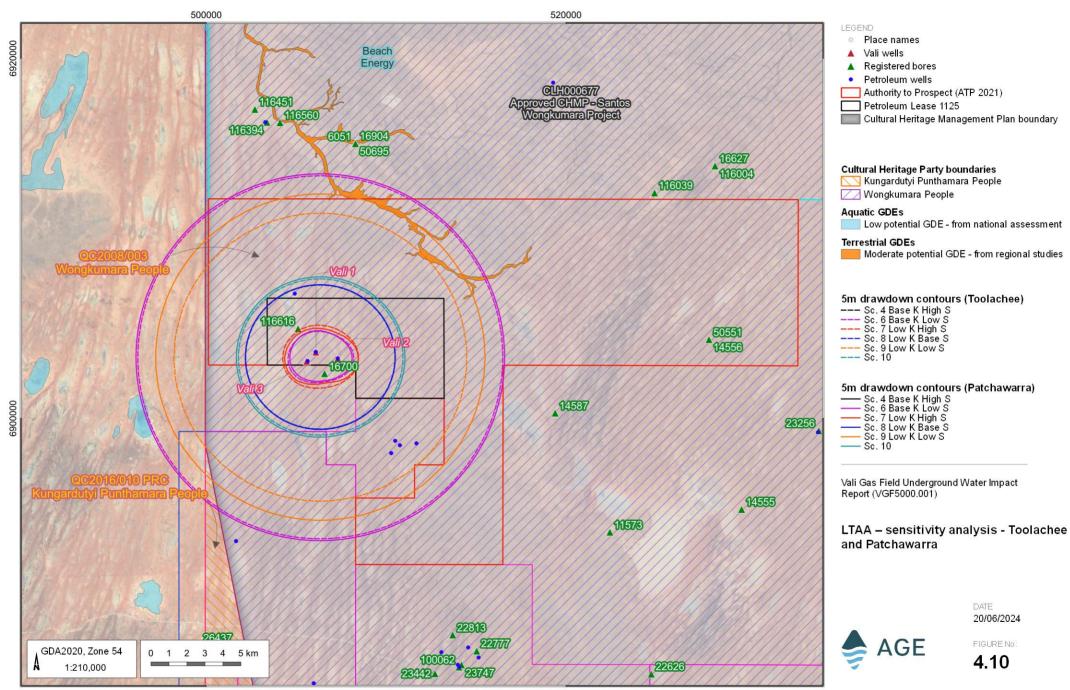
Figure 4.8 Sensitivity analysis – predicted drawdown – Vali-3





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5 Impact on environmental values (Part D)

According to the Water Act 2000 Guideline (Queensland Government, 2021), by default the environmental values may include (Section 1.2.4):

- aquaculture uses and human consumption of aquatic food;
- irrigation, farm supply/use, stock water uses;
- drinking water uses;
- aquatic ecosystems;
- · recreational uses;
- · industrial uses; and
- cultural and spiritual values.

Figure 5.1 presents the environmental values and existing registered groundwater bores identified within 15 km radius of the Vali gas field.

5.1 Irrigation, farm supply/use and drinking water

There are eight existing registered water bores within fifteen kilometres of Vali production wells. Further details relating to each of these existing bores is provided in Table 5.1. As shown, the majority of the bores are screened into the Winton Formation at depths of up to 294 m below ground and at least 1,600 m above the top of the Hutton Sandstone and hence based on the model results presented above (Section 4.2) are not expected to experience any Project related drawdown. Therefore, there are no expected changes in water quality in the registered bores listed in Table 5.1 resulting from the decline of groundwater levels.

Table 5.1 Queensland registered water bores within 15 km radius

RN	Bore name	Easting*	Northing*	Ground elevation (mAHD)	Year drilled	Formation	Top Screen (mbgl)	Bottom Screen (mbgl)	Bore depth (mbgl)
14556	Watties bore	527944	6904365	80.5	1960	Glendower Formation or Winton Formation	NA	81.1	NA
16700	Christmas Yard bore	506583	6902489	96.3	1966	Winton formation	125	154.2	NA
50551	Watties No 2	527944	6904365	NA	1980	Winton formation	NA	81.1	NA
116616	Kudnari	505108	6904981	NA	2023	Winton formation	145.9	148.2	150.2
116394	NA	503380	6916450	NA	2013	-	NA	76	77
116560	Anakin Bore	504101	6916428	NA	2013	Winton formation?	260	272	294
50695	NA	508297	6915261	122	1990	Winton formation	NA	NA	125
14587	Roundhill Bore	519404	6900298	76.5	1961	Winton formation	NA	168.6	168.6

Notes: Coordinate system GDA 2020.

NA: Not Available.



5.2 Groundwater dependent ecosystems (incl. springs)

5.2.1 Springs

There are no springs mapped within 15 km of the Project area. The nearest known GAB springs are located around 100 km to the southwest in South Australia. In Queensland, the nearest springs are 300 km to the east of the area, outside the Cooper Basin. No information is currently available on the source aquifer for these springs in Queensland.

5.2.2 Groundwater Dependent Ecosystems (GDE)

No GDE are present within the PL1125. As shown in Figure 5.1 a moderate potential terrestrial GDE has been identified by the Bureau of Meteorology (BOM) along the ephemeral Sandy Creek to the north of the Project area. Hence any groundwater support to this area will be provided by aquifers at or close to the ground surface. Therefore, potentially significant drawdown impacts of more than 0.2 m drawdown are not expected to extend beyond the top of the Cooper Basin at more than 2,000 m below ground. No qualitative and quantitative impacts of this or any other terrestrial GDEs present in the area are predicted.

5.3 Aquatic ecosystem

Several lacustrine and palustrine intermittent wetlands are present within the project area, with claypans adjacent to the well sites observed on aerial photographs. Low potential aquatic GDE associated with lacustrine wetland are mapped in South Australia, to the west of the project area (Aquatic GDEs). The closest aquatic GDE is more than 10 km from the Vali gas field. As no groundwater level impacts are expected above the top of the Cooper Basin which is around 2000 m below ground, no impacts on quality, water levels and flows are anticipated on any surficial aquatic ecosystems.

5.4 Aquaculture

There is no known use of groundwater for aquaculture purposes within 15 km radius of the Project area.

5.5 Recreational waters

There are no known primary or secondary recreational waters within 15 km radius of the Project area.

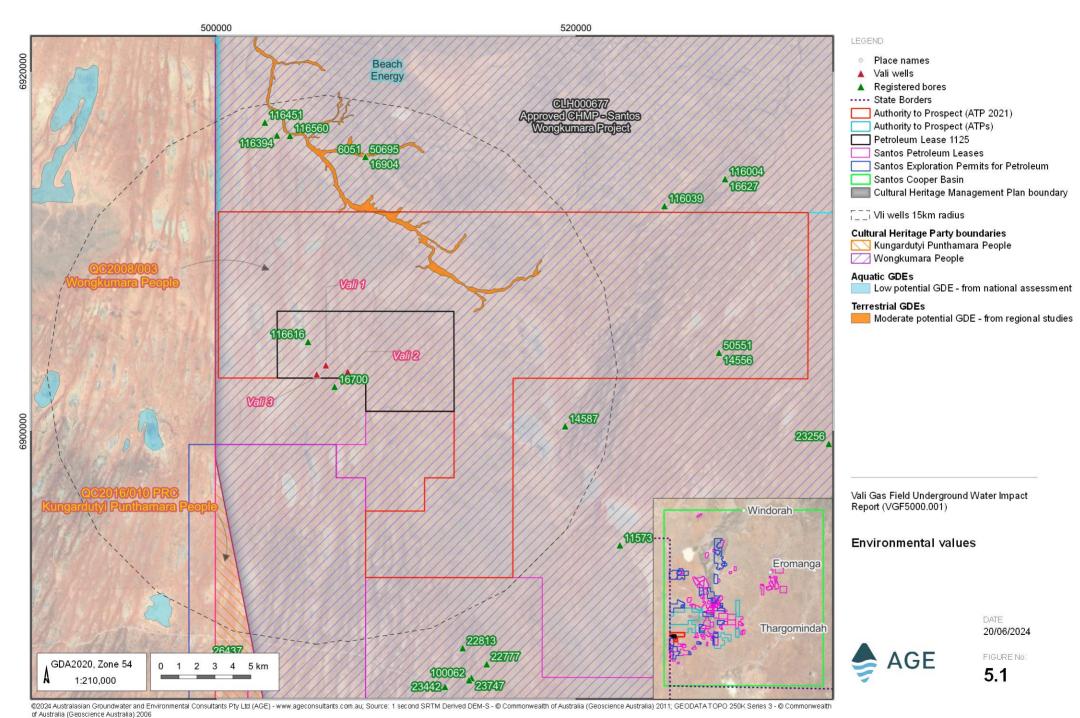
5.6 Industrial

Figure 1.1 shows the petroleum leases and exploration leases adjacent to Vali Gas Project. Santos Petroleum leases are directly adjacent to the south of the Project area. However, no existing Santo's production bores are within 15 km radius of the Project area (Figure 4.10). No qualitative and quantitative impacts are anticipated on industrial users.

5.7 Cultural and spiritual values

The three production wells are within the cultural heritage area of the Wongkumara People. In the absence of any known mound springs or other similar features within 300 km of the Project area and no predicted impact on groundwater levels above the top Cooper Basin, no qualitative and quantitative impacts are anticipated on any water dependent cultural or spiritual features.





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6 Water monitoring strategy (Part E)

6.1 Objectives

Under section 376(f) of the Water Act, responsible tenure holders are required to develop an appropriate underground water monitoring strategy to keep track of the quantity of water produced or taken because of the exercise of relevant underground water rights. Responsible tenure holders are also required to monitor any changes in underground water levels and the underground water quality.

The monitoring rationale should include (but not be restricted to):

- an assessment of changes in water levels and water quality because of the exercise of relevant underground water rights;
- · supplementation of existing monitoring programs to fill any critical gaps in data; and
- an explanation about how it will improve the understanding about the impacts of underground water extractions on aquifers.

6.2 Monitoring strategy

Whilst no impacts on environmental values in either the IAA or LTAA (Part D) are expected, groundwater monitoring is proposed to confirm these predictions. In addition to the monitoring of the three gas production wells (Vali-1, Vali-2 and Vali-3), monitoring of the two nearby registered bores (RN 16700 and RN 116616) is proposed to confirm the absence of any project impacts at these existing bores.

As the water supply bore RN16700 (Christmas Yard Bore) is outside of PL1125, an agreement between the landowner and Vintage will be necessary prior to including this bore in the monitoring program. Registered bore RN116616 (Kudnari bore) is located within PL1125 and is occasionally used for water supply by Vintage.

A monitoring program is recommended to record the following parameters for both the production wells and the two water supply bores:

- Total extraction volumes of the targeted gas reservoir (Toolachee and Patchawarra Formations) and the water supply aquifer (Winton Formation).
- Pressure of the targeted gas reservoir and water levels in the Winton Formation; and
- Water quality of the gas reservoir and in the Winton Formation.

Monitoring parameters and frequency are presented in Table 6.1 for the three production wells and Table 6.2 for the two registered bores.

The tenure holder will maintain the current monthly monitoring of the water production rates from each gas production well. The quality of combined water drawn from the production wells will be monitored biannually from the separator to identify any changes in groundwater chemistry which might be indicative of water being drawn from different sources. In addition, a minimum of one shut-in test will be recorded annually to estimate the reservoir pressure in the Toolachee and Patchawarra Formations to assess the change in reservoir pressure during the project.

The monitoring of groundwater levels, groundwater quality and total extraction volumes will be undertaken biannually at Kudnari bore (RN 116616). Following an agreement with the landowner, the Christmas Yard Bore (RN 16700) might also be included in the monitoring program with proposed groundwater quality, total extraction volume and groundwater level² monitored biannually.

² Pending on the access – submerged pump might prohibit the installation of a data logger or taking manual water level measurements.



Table 6.1 Production wells - groundwater monitoring parameters and frequency

Well name	name PL Easting¹ Northing	PL	PL	PL	PL	Easting ¹	Northing ¹	Water level	Volume extracted	Water q	uality
			Frequency*	Frequency	Parameters	Frequency					
Vali-1	1125	506107.8	6903682.8	Annually	Monthly	pH, EC, TRH, cations and anions	Biannual				
Vali-2	1125	507322.8	6903329.1	Annually	Monthly	pH, EC, TRH, cations and anions	Biannual				
Vali-3	1125	505599.3	6903174.4	Annually	Monthly	pH, EC, TRH, cations and anions	Biannual				

Notes: 1 Coordinate system GDA2020.

Table 6.2 Registered bores - groundwater monitoring parameters and frequency

RN	Well name PL		Well name PL Easting¹ Northing¹		Water level	Volume extracted	Water quality		
					Frequency	Frequency	Parameters	Frequency	
RN116616	Kudnari	1125	505108	6904981	Biannual	Biannual	pH, EC, TRH, cations and anions	Biannual	
² RN16700	Christmas Yard bore	-	506583	6902489	Biannual*	Biannual	pH, EC, TRH, cations and anions	Biannual	

Notes: ¹ Coordinate system GDA2020.

6.3 Reporting

Monitoring data will be provided to the Office of Groundwater Impact Assessment (OGIA) where possible biannually or at least once a year (Guideline Water Act 200, 2021).



^{*}One pressure test annually for one bore.

² Proposed: awaiting agreement between Vintage and the landowner to be included in the monitoring program.

7 Spring impact management strategy (Part F)

As discussed in Section 5.2.1 the nearest mapped GAB spring is more than 100 km away from the Project area, in South Australia. The nearest springs in Queensland are 300 km east outside the Cooper Basin boundaries. No impact from the Vali gas field was predicted beyond the Cooper Basin. As such a spring monitoring program is not required for this UWIR.



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