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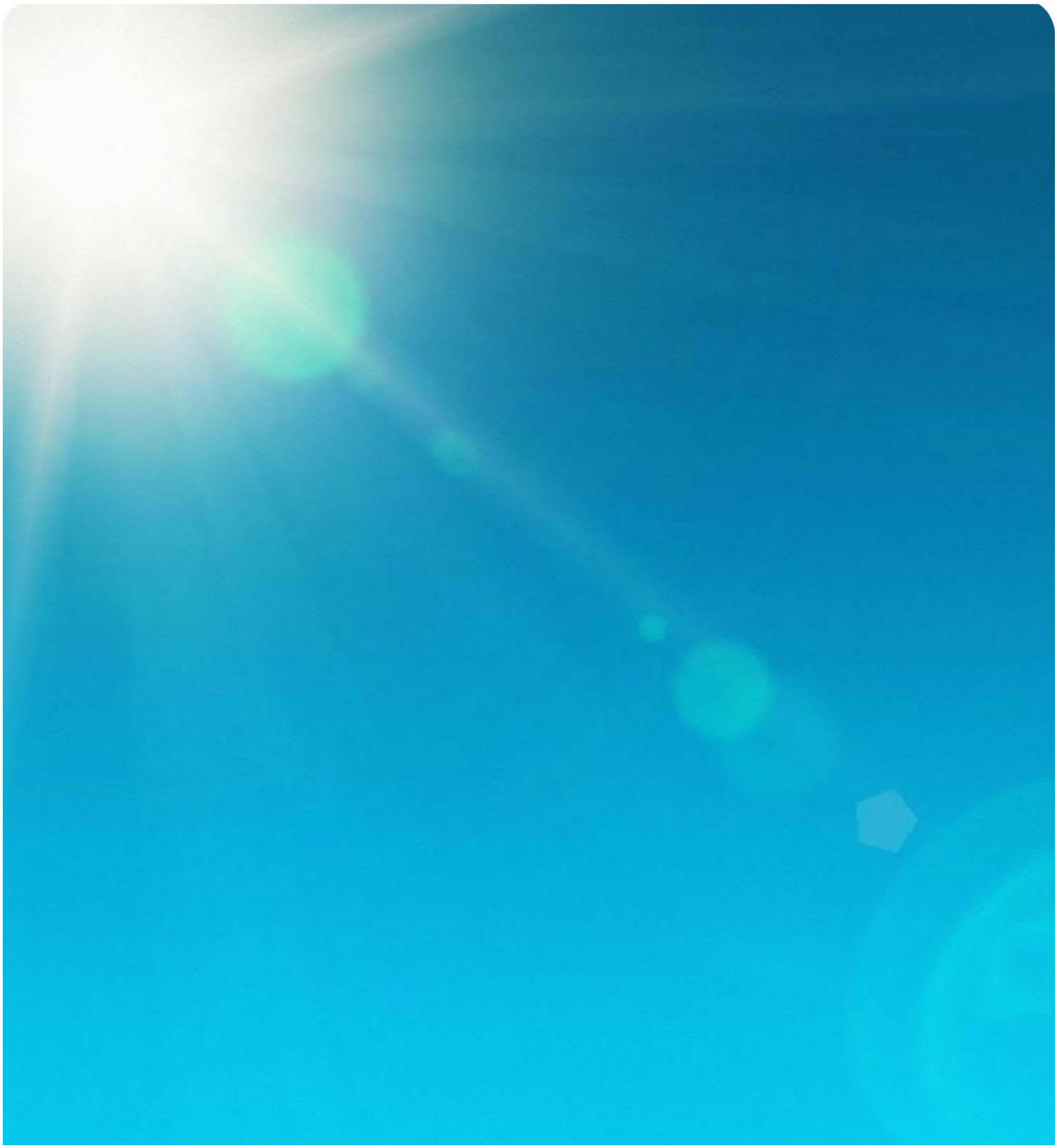
March 2022

Appendix O – Terrestrial Ecology Report – Solar Precinct

Australia-Asia PowerLink Environmental Impact Statement



Terrestrial ecological assessment – Solar Precinct

Australia – Asia PowerLink Project

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EXECUTIVE SUMMARY

Sun Cable is developing the Australia-Asia Power Link (AAPowerLink). The project is comprised of multiple components. This report covers the 12,000 ha Powell Creek Solar Precinct footprint and associated infrastructure – including the two proposed all-weather access roads – collectively referred to in this report as the *Solar Precinct*.

EcOz was engaged to provide a description of the environment within the Solar Precinct footprint and to identify ecological values to inform the Environmental Impact Statement. The focus is on the actual Solar Precinct because of its size, and because its location has been confirmed. Less detail is provided on the access roads because of their smaller footprints, and because their footprints are still indicative at this stage.

Pastoralism is the primary land use within the Solar Precinct footprint. Land type surveys within the Solar Precinct footprint identified that grazing pressure is low. No weeds or erosion issues (or other types of land degradation) were observed. Vegetation within the footprint has been exposed to numerous fires over the past 10 to 20 years. Fires in 2015 and 2017 burnt large portions of the footprint area, and only small pockets have not been burnt for 10 years.

Land type mapping was undertaken within the Solar Precinct footprint in November 2020 at a scale of 1:20,000. The mapping identified four land types. The majority of the footprint is a flat to gently sloping loamy plain that supports a patchy shrubland of Acacia species (with sandier areas supporting scattered *Corymbia opaca*). The western side of the footprint is a loamier area supporting mostly *Eucalyptus pruinosa*. Small, localised depressions are scattered throughout. These support species suited to episodic and ephemeral inundation. A small portion in the south-east of the footprint intersects lower alluvial flats associated with significant outflow events from westerly flowing drainages from the Ashburton Range. This land type has loamy surface soils. There are scattered, small, localised depressions within this land type that have a high clay content and moisture-holding capacity (and were often more densely vegetated). None of the land types are considered to support significant vegetation communities. No watercourses or drainage lines are present.

Very few migratory species have been recorded within the desert sandplains land system class, and there are no records within the Solar Precinct footprint; nor does it support habitat typically utilised by migratory species that can occur in central Australia.

Of the 41 threatened species assessed, only one species – Greater Bilby (*Macrotis lagotis*) – was considered to have a 'high' likelihood of occurrence within the Solar Precinct footprint. Subsequently, this species was subject to targeted field study using approved methodologies and following the key elements of the Commonwealth survey guidelines for the species in terms of tracking and species detection in areas of suitable habitat. Due to the large size of the Solar Precinct footprint, a helicopter survey in combination with ground-based track-plot sampling was employed. The approach was to visit known Greater Bilby sites for reference, and then the Solar Precinct. The survey occurred in November 2020, and did not find any Greater Bilby burrows within the Solar Precinct footprint; nor was there any evidence of previous occupation.

Regarding the two access roads – at the time of surveying only an indicative east-west access corridor had been identified. That corridor was inspected using a helicopter and was found to cross a variety of landforms – including low-lying plains; low rocky hills, ridges and slopes (with sandstone outcropping); plateaux; black soil plains; and minor drainages and tributaries supporting riparian vegetation that are considered to hold local to regional significance. The corridor is unlikely to support any restricted-range threatened species. The two threatened species that are likely to occur – Grey Falcon and Floodplain Monitor – are habitat generalists and there is no evidence that the corridor contains important habitat for them.

The sealed road has subsequently been located just to the south of that corridor; however, the area surveyed is considered representative of the landscape traversed by the sealed road. The all-weather unsealed road has not been surveyed. From a review of aerial imagery, there does not appear to be any significant vegetation types present, and it can be assumed that the threatened species assessment presented above also applies to the unsealed road.

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Acknowledgements

EcOz would like to give thanks to the Cultural Monitors (Raymond Dixon and Scott Henderson) who assisted us with the Greater Bilby survey during hot and harsh conditions. They are excellent and enthusiastic trackers and provided valuable input into the survey due to knowledge of the country. Thanks to Adam Thompson (NLC coordinator) for the organising Cultural Monitors.

Thanks to Heli-Muster and Newcastle Waters Pastoral Station for organising field access.

The survey team stayed at Renner Springs Desert Inn (Alan and Christine Revell), who provided us with great hospitality and delicious food during field surveys.

Huge thanks to Lauren Young (DEPWS) for advice on Greater Bilby survey methodology and provision of recent Greater Bilby records (on Murranji Station) that we could use as our ‘reference sites’.

Front cover photograph

Aerial photograph of Spinifex sandplains that are common within the proposed Solar Precinct footprint (image taken by Tom Ewers-Reilly, November 2020).

1 INTRODUCTION

Sun Cable is developing the Australia-Asia PowerLink (AAPowerLink; 'the project') to generate, store, transmit and deliver renewable energy. Sun Cable is proposing to establish a large-scale Solar Precinct on Powell Creek Station in the Barkly region, approximately 70 km south-west of Elliott (the Powell Creek Solar Precinct). The electricity produced will be exported via a High-Voltage Direct Current (HVDC) Overhead Transmission Line (OHTL) to Darwin, and then on to Singapore via a Subsea Cable System.

The project is comprised of multiple components. This report covers the 12,000 ha Powell Creek Solar Precinct and associated infrastructure – including the two proposed all-weather access roads connecting the Solar Precinct to the Stuart Highway – collectively referred to in this report as the *Solar Precinct footprint* – see Figure 1-1.

EcOz Environmental Consultants (EcOz) was engaged by Sun Cable to provide a description of the environment within the Solar Precinct footprint, indicative access road corridor, and associated area of influence, and identify ecological values to inform the Environmental Impact Statement (EIS). The focus in Chapters 3 and 4 is on the actual Solar Precinct because of its size, and because its location has been confirmed. Addressed in Chapter 4, less detail is provided on the access roads because of their smaller footprints, and because their footprints are still indicative at this stage.

This report describes the terrestrial ecosystems, with detail on the following aspects:

a) Existing environment (i.e. land use, climate, bioregion, significant areas, native flora and fauna species, pest and weeds, migratory species).

b) Project-specific land type descriptions (mapped to a scale of 1:20,000).

c) Condition of habitat and vegetation communities, along with any existing threatening processes.

d) Species of regional and national significance (based on desktop research and targeted field surveys) as listed in the EIS Terms of Reference and from the project-specific desktop review.

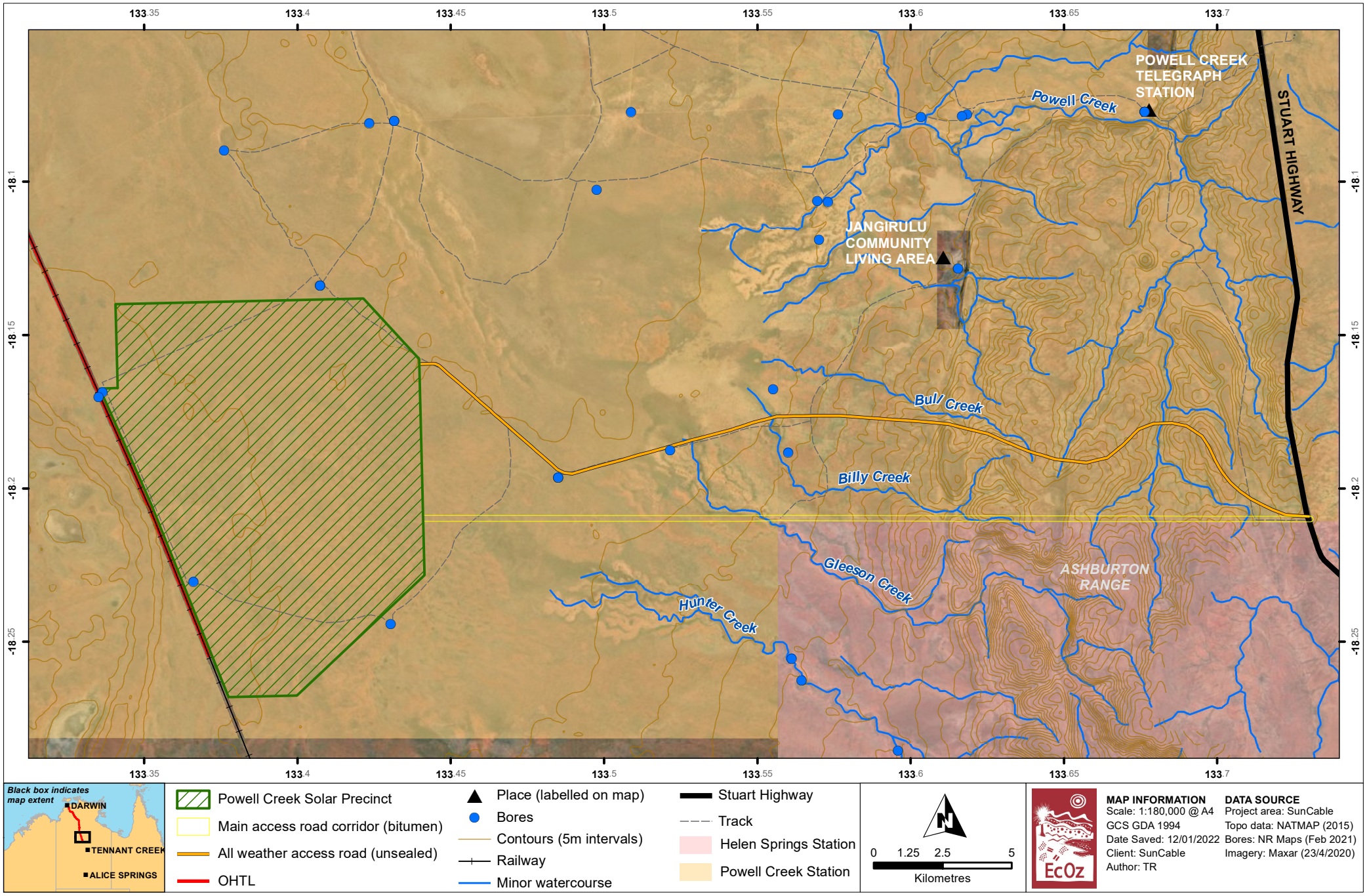


Figure 1-1. Map of the proposed Solar Precinct and access tracks

2 EXISTING ENVIRONMENT

This section uses desktop research and field data collected from a site visit in November 2020 to describe the existing environment of the Solar Precinct footprint and surrounding area of influence. Also referred to was a report on preliminary ecological assessments undertaken by Coffey to assist Sun Cable in selecting the Solar Precinct site.

The information in this section will be used to inform the threatened 'likelihood of occurrence' assessment (in Section 3), and as a basis for the design of targeted species' surveys.

2.1 Climate

The region experiences an arid to semi-arid climate, which is characterised by hot dry summers and cool dry winters, and a low average annual rainfall. The closest long-term Bureau of Meteorology weather station is Elliott (station number 015131) approximately 70 km north of the Solar Precinct footprint.

The mean average annual rainfall is 587.2 mm, with higher rainfall volumes typically occurring in the summer months associated with the northern monsoon – see Figure 2-1. Annual rainfall can be highly variable from year to year; for example, 2019 experienced 97.6 mm of rain, while 2015 experienced 806.6 mm of rain – see Figure 2-2. With the exception of 2020 – which exceeded the long-term average by approximately 200 mm – the previous three years were below average.

Temperatures follow the seasonal patterns typical of northern and central Australia, with the hottest daily maximums occurring in January. Evapo-transpiration is high, with an annual evaporation rate greatly exceeding annual rainfall.

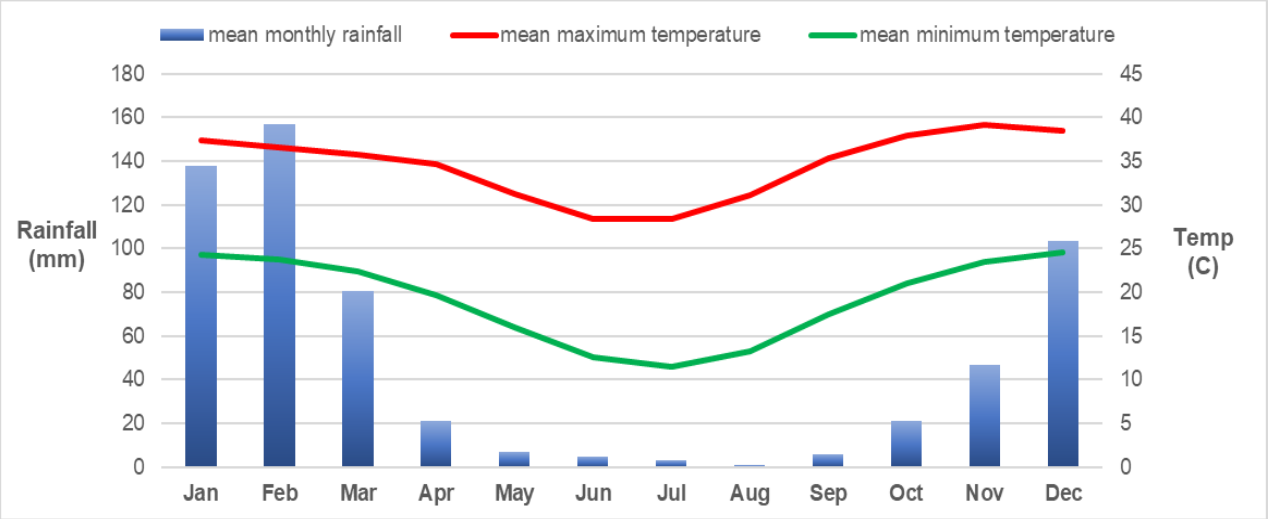


Figure 2-1. Long term monthly rainfall and temperature statistics at Elliott (Station 015131)

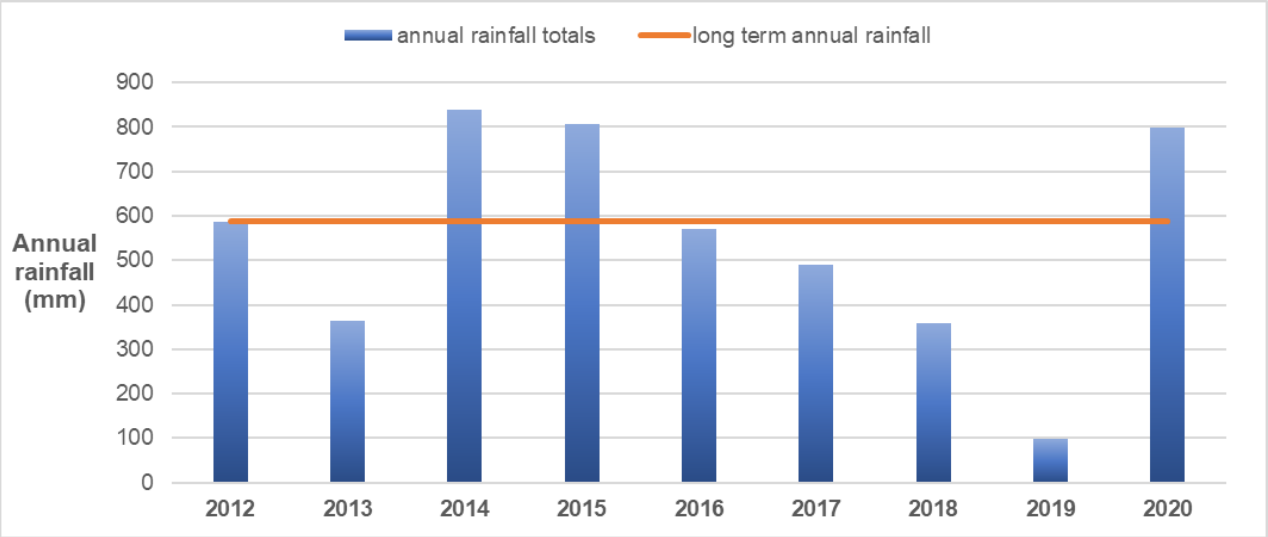


Figure 2-2. Annual rainfall at Elliott (Station 015131) between 2012 and 2020

2.2 Land use

Pastoralism is the primary land use within the Solar Precinct footprint. Recreational hunting by locals also occurs. The footprint occurs within Powell Creek Station, currently managed by Newcastle Waters Station (which adjoins it to the north). Together, the two stations support up to 65,700 head of cattle (CPC, n.d.).

Land type surveys within the Solar Precinct footprint identified that pastoral impacts (grazing pressure) are low – see Section 2.6. The soft spinifex land within which the Solar Precinct footprint occurs is considered to have a low stock carrying capacity (Stewart et al. 1970). Of note, three water bores were installed by the station in 2019 within the footprint (location shown in Figure 1-1). Two long-term bores exist adjacent to the northern and eastern edges of the Solar Precinct footprint. A higher level of pastoral activities (and associated grazing impacts) is present in these areas.

2.3 Bioregions

Bioregions are broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. They capture the large-scale geophysical patterns across Australia. These patterns in the landscape are often linked to fauna and flora assemblages and processes at the ecosystem scale, thus providing a useful means for simplifying and reporting on more complex patterns of biodiversity (Baker et al. 2005).

The Solar Precinct footprint occurs within the northern tip of the Tanami bioregion, but falls close to three other bioregions – Sturt Plateau, Davenport Murchison Ranges and Mitchell Grass Downs (see Figure 2-3):

- The Tanami bioregion comprises mainly of red sand-plains and low dune fields with underlying rock strata occasionally exposed as hills and ranges (Baker et al. 2005). The sandplains are vegetated with mixed shrubland of Acacia, Eucalyptus or Hakea over spinifex hummock grasslands. Alluvial and lacustrine calcareous deposits occur throughout, often associated with palaeo-drainage systems – which often hold high ecological significance. The bioregion is divided into three sub-regions – Tanami Desert, Wycliffe and Sandover. The Solar Precinct footprint is located within the Wycliffe subregion.
- The Sturt Plateau bioregion occurs to the north of the Solar Precinct footprint. This bioregion is comprised of flat to gently undulating plains of Eucalyptus woodlands or tall shrub lands and

woodlands of Bullwaddy (*Macropteranthes kekwickii*) and Lancewood (*Acacia shirleyi*) (Baker et al. 2005). In more open areas perennial grasses dominate. Soils are mainly lateritic, but deep sands occur in the south and cracking clays in the south-east.

- The Davenport Murchison Ranges bioregion occur to the east of the Solar Precinct and is crossed by the access tracks. This bioregion is characterised by a chain of rocky ranges surrounded by lowland plains (Baker et al. 2005). Vegetation is typically comprised of low open Eucalyptus woodland and sparse Acacia shrubland over hummock grassland and low, rugged rocky hills with hummock grasslands and/or low open woodland dominated by Acacia species.
- The Mitchell Grass Downs bioregion occurs to the north and is not crossed by the Solar Precinct footprint. This bioregion consists largely of treeless plains with some occasional ridges, rivers and gorges. The dominant vegetation type is Mitchell Tussock grasslands plains on cracking clay soils, with some intermittent lakes. Lake Woods is contained within the Mitchell Grass Downs bioregion.

2.4 Significant areas

2.4.1 Sites of Conservation Significance

Sites of Conservations Significance (SOCS) are areas identified by the Northern Territory Government as important sites for biodiversity conservation. These are described by Harrison et al. (2009). SOCS are not protected under legislation; however, their value is in highlighting areas that support important populations of significance species and/or habitat that may be protected under environmental legislation.

The Solar Precinct footprint does not fall within a SOCS; however, the Lake Woods SOCS is located approximately 12 km to the north (see Figure 2-3). Lake Woods is one of the largest temporary freshwater lakes in the Northern Territory and tropical Australia, and generally occupies an area of approximately 350 – 500 km^2 after wet season rains (SWE&S 2021). However, during periods of high rainfall, the lake can occupy up to 1,000 km^2, and can retain water for twelve consecutive months. The SOCS has international significance due to seasonal presence of large aggregations of waterbirds, and presence of important wetland habitat (BirdLife International 2021, Jaensch & Bellchambers 1997).

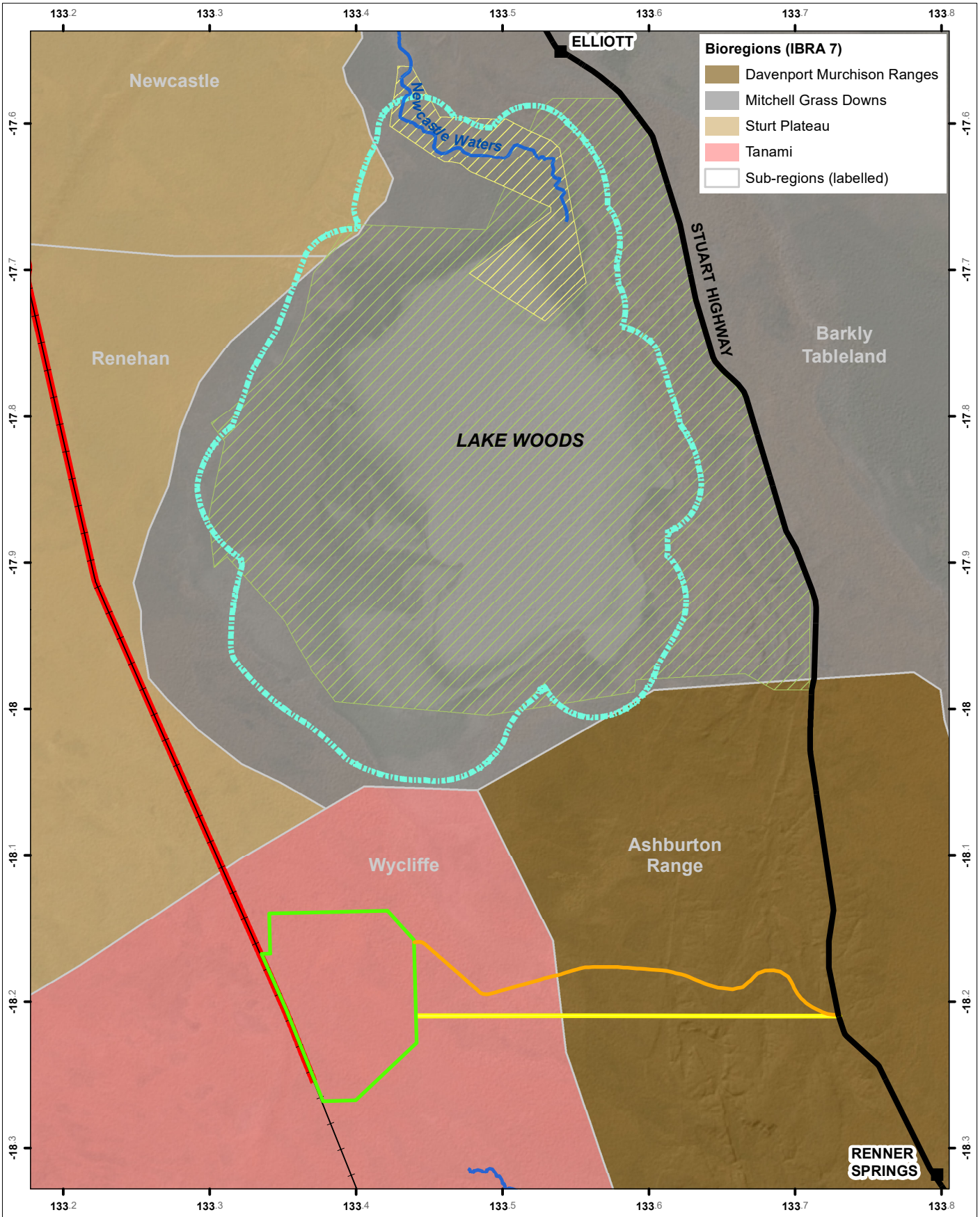
After significant rainfall events, Lake Woods SOCS can support very large numbers of waterbirds – including internationally-significant numbers of the Plumed Whistling-duck (>27,000 birds), nationally-significant numbers of Great Egret (>3,000 birds), and large numbers of Australian Pelican, Grey Teal, Intermediate Egret, Glossy Ibis and Freckled Duck. Sixty-seven species of waterbird have been recorded at Lake Woods – including the threatened Australian Painted Snipe – of which 23 species have been reported breeding (BirdLife International 2021, Jaensch & Bellchambers 1997).

NT Atlas records indicate that 24 listed migratory species have been recorded in the area. These species are described in Section 2.7.2.

2.4.2 National Parks and conservation reserves

The Lake Woods SOCS described above is covered by a conservation covenant, and a northern section has been fenced and is managed as the Longreach Waterhole Protected Area (approximately 7% of the Lake Woods SOCS) by NT Parks and Wildlife Commission in cooperation with Newcastle Waters pastoral management (see Figure 2-3).

No other parks or reserves occur in the close proximity to the Solar Precinct footprint.



Powell Creek Solar Precinct
Main access road corridor
All-weather access (unsealed)
OHTL
Stuart Highway
Railway
Town or roadhouse
Major watercourse
Lake Woods SOCS
Lake Woods Conservation Covenant
Longreach Waterhole Protected Area

0 2.5 5 10
Kilometres

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Figure 2-3. Map of bioregions and Lake Woods Site of Conservation Significance

2.5 Land systems

A land system is 'an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation' (Christian and Stewart 1968). Land systems have been mapped by across the NT at scales between 1:250,000 and 1:1,000,000 (i.e. at smaller scale than a bioregion). The Solar Precinct occurs in the 'Redsan' land system and falls close to the 'Atlas Ms14', 'Gosse', and 'Drylake' land systems. These have been mapped at a scale of 1:500,000 (Stewart et al. 1970; Northcoat 1960-68) – see Figure 2-4. Land systems relevant to the access tracks are discussed in Section 4.1.1.

The Redsan land system falls within the 'desert sandplains' group, and covers an extensive area of land within the northern and north eastern region of the Tanami Desert (see inset in Figure 2-4). Redsan is an area of gently undulating plain with deep sandy soil that supports an open Eucalyptus woodland (including (*Eucalyptus polycarpa, E. argillacea, E. setosa, E. pruinosa, E. microtheca, E. ferruginea*) over spinifex (mainly *Triodia pungens*) interspersed with areas of tussock grasses (i.e. *Aristida spp.*) (Stewart et al. 1970). The land system also supports standard / patches of Lancewood (*Acacia shirleyi*) and Bulwaddy (*Macropteranthes kekwickii*) along the south-eastern margin (Stewart et al. 1970).

The Atlas Ms14 land system occurs to the north-east of the project footprint and is part of the 'lateritic plains and rises' group. It supports plains and rises associated with deeply-weathered profiles (laterite) including sand sheets and other depositional products, as well as smaller areas with sandy and earth soils (Northcoat 1960-68). Vegetation is broadly defined to be Eucalyptus low open woodland (*Eucalyptus microtheca +/- Lophostemon grandifloras* and *Ventilago viminalis*) with Astrebla low tussock grassland (*Astrebla spp*., *Eulalia aurea, Chrysopogon fallax*), with a sparse Acacia shrubland (*Acacia holosericea, Atalaya hemiglauca, +/- Ventilago viminalis*) (Wilson et al. 1990).

The Drylake land system occurs to the north-east of the Solar Precinct (borders the western boundary of Lake Woods) and is part of the 'clay plains' group (Christian et al. 1954). It has flat to gently undulating lightly timbered plains that support shrubby woodland of Coolabah (*Eucalyptus microtheca*) and tussock grasses (*Sporobolus australacicus, Enneapogon spp*.) with heavy grey soils (known as Drylake heavy grey Pedocals) (Christian et al. 1954).

The Gosse land system occurs to the east of the Solar Precinct and is part of the 'alluvial floodplains' group. The area is associated with run-off from drainages including Powell Creek, Bull Creek, Gleeson Creek and Hunter Creek. It is sandy, seasonally flooded flats and drainages that support Eucalyptus woodlands (Christian et al. 1954). Vegetation typically includes a low open woodland of *E. microtheca, E. pruinosa, A. sericophylla, Coymbia opaca*), a mid-open shrubland (*Carissa lanceolate, Acacia holosericea, Gossypium australe*) over tussocks grass (*Chrysopogon fallax, Eragrostis eriopoda*) with occasional areas dominated by hummock grass (*Triodia pungens*) (Wilson et al. 1990).

Land unit mapping is not available within the Solar Precinct footprint; however, 1:250,000 land type mapping is available 10 km to the east of the footprint (DLRM 2017, data source called STHNT_250) and was used as a guide during site-specific land type mapping (discussed in Section 2.6).

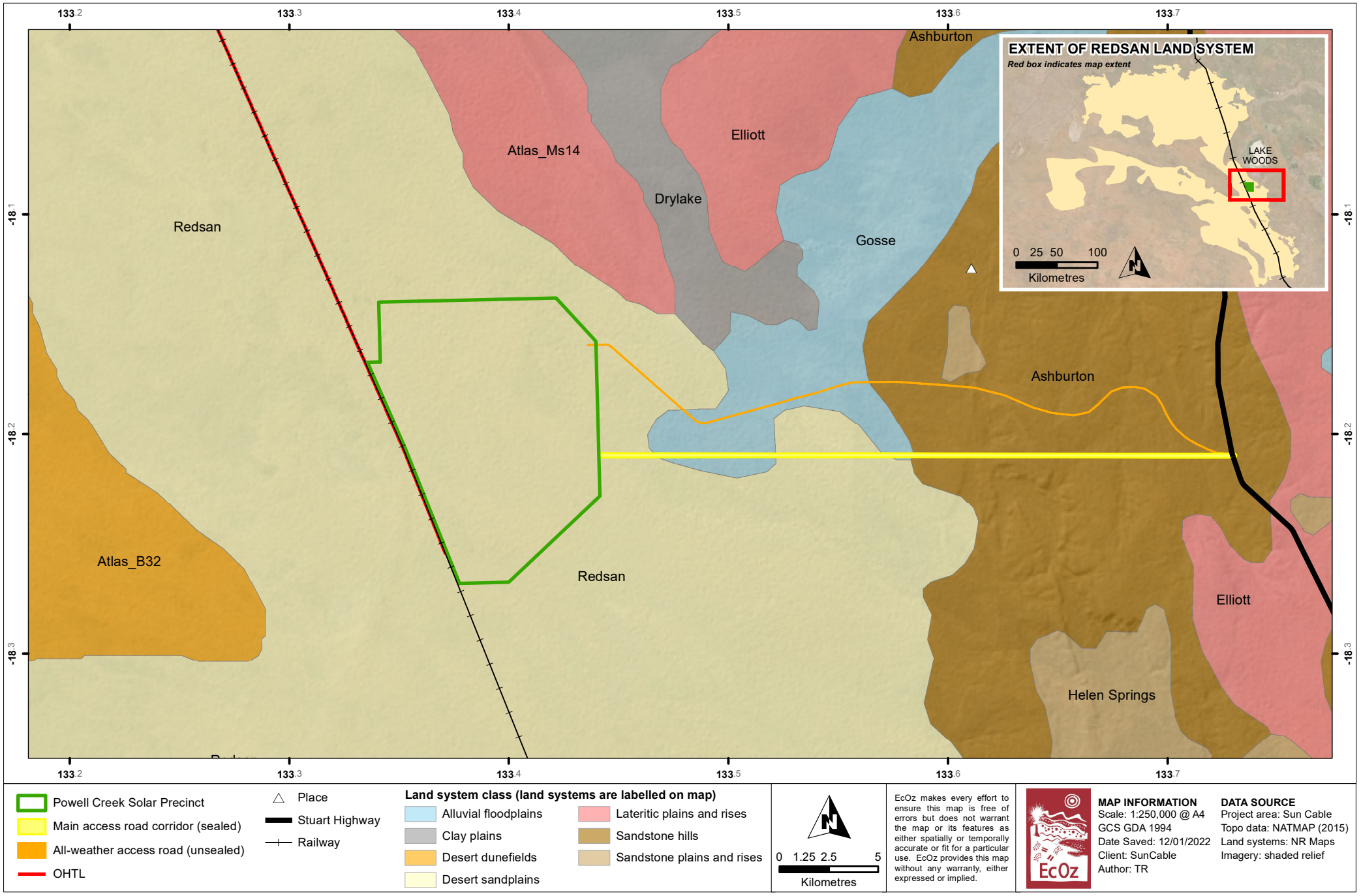

Figure 2-4. Map of land systems in the region of the Solar Precinct footprint

2.6 Land types

A *land type* is a unit of land that incorporates 'a reasonably homogenous part of a land surface, distinct from surrounding terrain with consistent properties in landform, soils or vegetation' (Hooper 1970). They provide a finer level of detail than other types of regional mapping data – such as land systems and the National Vegetation Information System (NVIS) and land units (where that exists). In this report, land types are used for the basis of the threatened species 'likelihood of occurrence' assessment. The land type mapping will also be used to inform future land clearing applications.

Land type mapping was undertaken within the Solar Precinct footprint (but not for the access roads) in November 2020 by experienced ecologist, Tom Reilly, at a scale of 1:20,000. This was the scale required by the Land Assessment Branch of Department of the Environment, Parks and Water Security. The survey is provided in Appendix A and results are summarised below.

Four land types occur within the Solar Precinct footprint (described in Table 2-1 and mapped in Figure 2-5). The majority of the footprint is a flat to gently sloping loamy plain that supports a patchy shrubland of *Acacia spp*. (mainly *Acacia lysiphloia*) over *Triodia pungens*; with sandier areas supporting scattered *Corymbia opaca* (land type A); and loamier areas supporting *Eucalyptus pruinosa* and, to a lesser extent, *Corymbia flavescens* and *Bauhinia cunninghamii* (land type B).

Small localised depressions (land type D) are scattered throughout land types A and B that support species suited to episodic and ephemeral inundation (i.e. *Melaleuca veridiflora, M. nervosum*, *Acacia sericophylla, Eulalia aurea*). Eight depressions have been mapped and are generally less than 10 ha in size; however, the largest depression equates to approximately 46 ha (located in the central part of the footprint). Although these depressions are run-on drainage features, they are not considered to be wetlands because they have loamy rather than clayey soils, and inundation events are only expected to be episodic and short-lived.

A small portion in the south-east of the footprint intersects lower alluvial flats (land type C) associated with significant outflow events from westerly flowing drainages from the Ashburton Range (namely Hunter Creek and, to a lesser extent, Burke Creek). This land type has loamy surface soils that supports *Triodia pungens*, scattered *Corymbia opaca* (which has been reduced to mallee form due to repeat fire events) and *Melaleuca glomerata*. There are scattered, small, localised depressions within this land type that have a high clay content and moisture-holding capacity (and were often more densely vegetated).

None of the land types within the Solar Precinct footprint are considered to support significant vegetation communities. No watercourses or drainage lines are present.

Vegetation within the footprint has been exposed to numerous fires over the past 10 to 20 years (see Section 2.8). Much of the vegetation pattern apparent on aerial imagery is associated with fire scars rather than different land types. Fires in 2016 and 2018 burnt large portions of the footprint area, and only small pockets have not been burnt for 10 years. There are no long unburnt patches of vegetation present within the footprint.

It is noted that drought conditions experienced between 2017 and 2019 has resulted in mortality of large areas of Acacia shrubs (mainly *Acacia lysiphloia*) that avoided recent fire events in 2016 and 2018.

Pastoral impacts within the footprint are currently minor. It is apparent that this area is not currently grazed by high cattle numbers.

No weeds or erosion issues (or other types of land degradation) were observed.

Table 2-1. Land type summaries – Solar Precinct footprint

Land type	Photograph	Vegetation
A **Sandplain with Bloodwood, Turpentine over Soft Spinifex**		**Upper strata:** Scattered trees. *Corymbia opaca,* occasional *Owenia reticulata* **Mid strata:** Patchy shrubland (associated with fire scars) dominated by *Acacia lysiphloia* (mostly dead due to prolonged dry conditons). Other main species – *Petalostigma pubescens, Croton aridus, Brachychiton multicaulis* **Ground strata:** Hummock grassland dominated by *Triodia pungens*. Low cover of forbs/grasses.
B **Sandy loam plain with Silver Box (+/- Bauhinia and Dogwood), Turpentine over Soft Spinifex**	 	**Upper strata:** Open to sparse low woodland of *Eucalyptus pruinosa*. Other common species – *Corymbia opaca, Corymbia flavescens, Bauhinia cunninghamii, Acacia sericophylla.* Note that the northern parts of this land type support less *Eucalyptus pruinosa* and more *Bauhinia cunninghamii* and *Acacia sericophylla (depicted in lower aerial image to the left).* **Mid strata:** Patchy shrubland (associated with fire scars) dominated by *Acacia lysiphloia* (mostly dead due to prolonged dry conditons). Other main species - *Carissa spicatum, Melaleuca spp. Petalostigma pubescens, Hakea arborescens* **Ground strata:** Hummock grassland dominated by *Triodia pungens*. Low cover of forbs/grasses.
C **Alluvial flats with Bloodwood (malleed), Melaleuca shrubs over Soft Spinifex**		**Upper strata:** Absent **Mid strata:** Scattered *Corymbia opaca* (mallee form due to high fire frequency) and *Melaleuca glomerata*. Sparse to patchy *M. viridiflora*, *M. nervosum* and *Acacia lysiphloia.* **Ground strata:** Hummock grassland dominated by *Triodia pungens*. Low cover of forbs/grasses. *Cassytha filiformis* relatively common in area.
D **Depression with scattered Melaleuca shrubs, Dogwood, Bloodwood over tussocks and forbs**		**Upper strata:** Scattered / patchy *Corymbia opaca, Bauhinia cunninghamii, Acacia sericophylla* **Mid strata:** Open to sparse shrubland typically supporting *Melaleuca viridiflora* and/or *M. nervosum*. Other species - *Hakea arborescens, Acacia lysiphloia, Ehretia saligna, Atalaya hemiglauca, Carissa spicatum.* **Ground strata:** Tussock grasses and forbs. *Chrysopogon fallax, Eulalia aurea, Aristida holathera, A. hygrometrica*,*Cleome viscosa, Bonamia media, Fimbristylis dichotoma.*

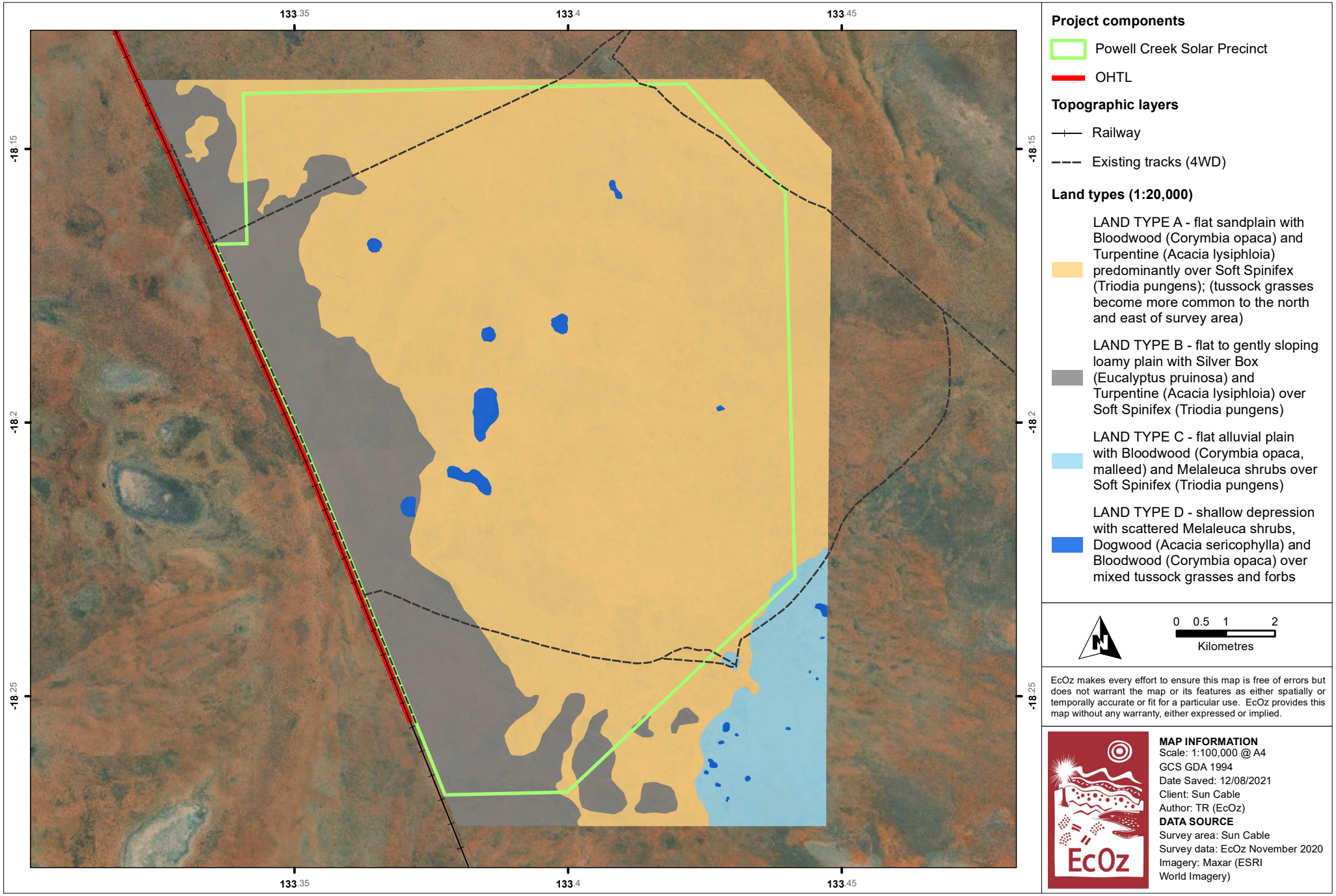

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Figure 2-5. Map of land types within solar precinct footprint

2.7 Flora and fauna

2.7.1 Native species

The International Union for the Conservation of Nature (IUCN) nominates a set of criteria used to identify species at risk of extinction. These criteria are used to define categories of risk (see Figure 2-6) which are used by the NT Government to determine which threatened species are listed under the *Territory Parks and Wildlife Conservation Act* (*TPWC Act*), and by the Commonwealth Government to determine which threatened species are listed under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). This section of the report focusses on species that are not listed as threatened under either Act. Threatened species are covered in Section 3.

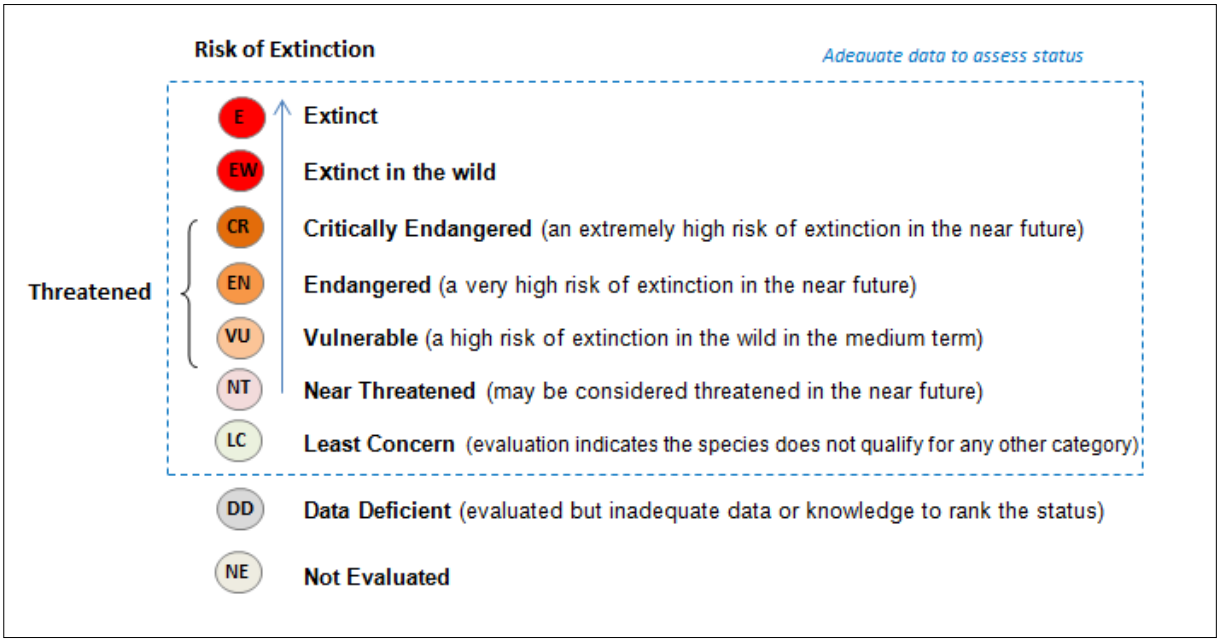


Figure 2-6. The IUCN categories of risk for species

The NT Flora and Fauna Atlas was used to generate a list of native species known to occur in the area, with a specific focus on species within the desert sandplains land system group within which the Solar Precinct footprint lies. The dataset was clipped to all records within the desert sandplains within a 100 km radius of the Solar Precinct footprint, which resulted in a total of 3,478 records of 628 species. The species list is provided in Appendix B (Fauna) and Appendix C (Flora), and Table 2-2 provides a summary of records per group. Of note, very few records have occurred within or adjacent to the proposed footprint, which is indicative of low survey effort in the local area.

The following is a list of Near Threatened species recorded within a 100 km radius of the Solar Precinct footprint:

- Bush Stone-curlew (*Burhinus grallarius*)
- Letter-winged Kite (*Elanus scriptus*)
- Square-tailed Kite (*Lophoictinia isura*)
- Australian Bustard (*Ardeotis australis*)
- Pictorella Mannikin (*Heteromunia pectoralis)*
- Emu (*Dromaius novaehollandiae*)
- Flock Bronzewing (*Phaps histrionica*)
- Freckled Duck (*Stictonetta naevosa*)
- Central Pebble-mouse (*Pseudomys johnsoni*)
- Western Chestnut Mouse (*Pseudomys nanus*)
- Northern Nailtail Wallaby (*Onychogalea unguifera*)
- Spectacled Hare-wallaby (*Lagorchestes conspicillatus*)
- Woma (*Aspidites ramsayi*)
- Mulga Snake (*Pseudechis australis*)
- a tree (*Terminalia aridicola subsp. aridicola*)
- a herb (*Bergia diacheiron*)

Whilst not a classification protected under legislation, Near Threatened is an indication that a species may be considered threatened in the near future – see Figure 2-6. The ecologies of the abovementioned species vary considerably, but for none of them does the Solar Precinct footprint represent important or core habitat, nor are any likely to be present in an ecologically-significant population.

The survey techniques used for the targeted Greater Bilby survey conducted within the Solar Precinct footprint in November 2020 – as detailed in Section 3.2 – recorded the presence of numerous common and widespread native species (species list is provided in Appendix H). None of the species identified are species of conservation significance under the *TPWC Act*.

Table 2-2. Number of species recorded within 100 km of the Solar Precinct footprint in desert sandplain land system class (using NT Atlas dataset, extracted February 2021)

Group	LC	DD	NT	VU	EN	CR	NE / NL	Total
Amphibians	0	0	0	0	0	0	0	0
Birds	158	0	8	1	0	0	1	168
Reptiles	53	1	2	0	0	0	1	57
Mammals	16	0	4	3	0	0	0	23
Flora	305	9	2	0	0	0	21	337

Status key: *LC – Least Concern; DD – Data Deficient; NT – Near Threatened; VU – Vulnerable; EN – Endangered; CR – Critically Endangered; NE – Not evaluated; NL – Not Listed*

2.7.2 Migratory species

The EPBC Protect Matters Search Tool report identified 12 listed migratory species that are known, or have potential, to occur in the region (see Appendix D). However, very few migratory species have been recorded within the desert sandplains land system class as it does not support habitat typically utilised by migratory species that can occur in central Australia. There are no records of migratory species within the Solar Precinct footprint.

However, as discussed in Section 2.4.1, the Solar Precinct footprint is located in relatively close proximity to Lake Woods, which is an area known to support migratory species, including populations that are considered to be internationally significant. An NT Fauna Atlas clip of Lake Woods indicated that 24 migratory species have been recorded, as listed in Table 2-3. The highest abundances were recorded by Jaensch in 1993 and 1994. For context, 1991 and 1993 had above average rainfall, rainfall for 1992 was slightly below average and 1994 was significantly below average.

When assessing if a project will significantly impact upon a migratory species, the key considerations under the *EPBC Significant Impact Guidelines 1.1* (DOE 2013) are whether an important habitat for a migratory species or an ecologically-significant population of a migratory species is involved. For migratory shorebirds, the *EPBC Act Policy Statement 3.21* (DEWHA 2009a) defines the criteria for important habitat as sites that support any of the following:

- At least 0.1 per cent of the flyway population – as defined in Hansen et al. (2016) – of a single species
- At least 2,000 migratory shorebirds
- At least 15 migratory shorebird species.

At least 0.1 per cent of the flyway population of two species – Little Curlew and Oriental Pratincole – have been recorded at Lake Woods by Jaensch (in 1993/94) who, at the time, also counted more than 2,000 migratory shorebirds in total.

Table 2-3. Migratory species relevant to Lake Woods

Migratory species	NT Listing	NT Atlas	EPBC PMST	Comment
Marine birds				
Fork-tailed Swift (*Apus pacificus*)	LC	✓	✓	No counts recorded. Non-breeding visitor recorded throughout Australia. Highly mobile, aerial feeder.
White-winged Black Tern (*Chlidonias leucopterus*)	LC	✓	-	Highest count is 4. Common visitor to waterbodies.
Caspian Tern (*Hydroprogne caspia*)	LC	✓	-	Highest count is 18. Common visitor to waterbodies.
Terrestrial species				
Red-rumped Swallow (*Cecropis daurica*)	NE	-	✓	No records for the region. Annual non-breeding visitor to northern Australia, generally in small numbers.
Barn Swallow (*Hirundo rustica*)				
Grey Wagtail (*Motacilla cinerea*)				
Yellow Wagtail (*Motacilla flava*)				
White-bellied Sea-eagle (*Haliaeetus leucogaster*)	LC	✓	-	Highest count is 18. Regional visitor – requires large areas of open water.
Little Curlew (*Numenius minutus*)	LC	✓	-	Highest count is 628 (Jaensch 1994). Annual non-breeding migrant to northern Australia, feeding in short, dry grassland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated.
Rainbow Bee-eater (*Merops ornatus*)	LC	✓	-	Highest count is 30. Widely distributed, uses range of habitat types – including woodlands, shrublands, and various cleared and semi-cleared habitats.
Wetland species				
Common Sandpiper (*Actitis hypoleucos*)	LC	✓	✓	Highest count is 1. Annual non-breeding migrant to coastal habitats and inland wetlands; rarely found in groups.
Garganey (*Spatula querquedula*)	NE	✓	-	Highest count is 1. Rare non-breeding vagrant to Australia.
Swinhoe's Snipe (*Gallinago megala*)	DD	✓	-	Highest count is 25 (Jaensch 1993). Annual non-breeding migrant preferring grassy margins of wetlands
Wood Sandpiper (*Tringa glareola*)	LC	✓	-	Highest count is 20. Annual non-breeding migrant to well-vegetated, shallow, freshwater wetlands.
Black-tailed Godwit (*Limosa limosa*)	NT	✓	-	Highest count is 6. Annual non-breeding migrant using coastal habitat and inland wetlands.
Australian Painted-snipe (*Rostratula australis*)	VU (EN Cwlth)	✓	-	Highest count is 2. Nomadic and scattered across Australia with no predictable occurrence, but could occur at any wetland or inundated grassland across its distribution.
Red-necked Stint (*Calidris ruficollis*)	LC	✓	-	Highest count is 3. Annual non-breeding migrant using coastal habitat and inland wetlands.
Oriental Plover (*Charadrius veredus*)	LC	✓	✓	Highest count is 103. Annual non-breeding migrant usually inhabiting flat, open, grasslands, where short grass is interspersed with hard, bare ground.

Migratory species	NT Listing	NT Atlas	EPBC PMST	Comment
Great Egret (*Ardea alba*)	LC	✓	-	Highest count is 600 (Jaensch 1993). Cosmopolitan, commonly occur on a variety of habitat types including flooded pastures, dam edges, mudflats and open wetlands.
Cattle Egret (*Bubulcus ibis*)	LC	✓	-	Highest count is 6. Cosmopolitan, commonly occur on a variety of habitat types including flooded pastures, dam edges, mudflats and open wetlands.
Sharp-tailed Sandpiper (*Calidris acuminata*)	LC	✓	-	Highest count is 50. Annual non-breeding migrant, common along the coast and inland wetlands.
Curlew Sandpiper (*Calidris ferruginea*)	VU (CR Cwlth)	✓	-	Highest count is 4. Annual non-breeding migrant, predominately using mudflats and sheltered coastal areas, also recorded inland around lakes and dams.
Pectoral Sandpiper (*Calidris melanotos*)	LC	✓	-	Highest count is 1. Annual non-breeding migrant; uncommon, preferring freshwater wetlands.
Oriental Pratincole (*Glareola maldivarum*)	LC	✓	✓	Highest count is 5,000. Annual non-breeding migrant, usually inhabiting open plains, floodplains or short grassland, often with extensive bare areas and near inland water.
Glossy Ibis (*Plegadis falcinellus*)	LC	✓	-	Highest count is 3,000. Cosmopolitan, commonly occur on a variety of habitat types including flooded pastures, dam edges, mudflats and open wetlands.
Common Greenshank (*Tringa nebularia*)	LC	✓	-	Highest count is 10. Annual non-breeding migrant preferring freshwater or brackish wetlands.
Marsh Sandpiper (*Tringa stagnatilis*)	LC	✓	-	Highest count is 40. Annual non-breeding migrant to coastal habitats and inland wetlands.

Key: *CR = Critically Endangered, DD = Data Deficient, EN = Endangered, LC = Least Concern. NE = Not Evaluated, NT = Near Threatened, VU = Vulnerable*

2.7.3 Introduced species

Weeds

The Solar Precinct footprint falls within the ambit of the *Barkly Regional Weed Management Plan 2015-2020* (DLRM 2015). That document prioritises the management of key weed species for the region (as presented in Table 2-4). The NT Weed Management Branch (and NT Flora Atlas) dataset indicates that several of these species have been recorded within 50 km of the Solar Precinct footprint – in particular Parkinsonia and Rubber Bush. Those records are predominantly restricted to around bores, Lake Woods, and its associated floodplains and waterholes.

There is no record of previous or current weed infestations within the Solar Precinct footprint (based on an NT Weed Management Branch dataset review, and recent land type surveys of the footprint conducted in November 2020 – see Appendix A). The datasets indicate there are very few records of weed occurrence in the desert sandplains land system class. It is also noted that all priority weeds highlighted in Table 2-4 typically occur in habitat that is not supported within the Solar Precinct footprint.

A Weed of National Significance (WONS) species – Parkinsonia – is subject to a weed control program within the station that is overseen by the pastoralist. This program covers over 1,000 km^2 of Lake Woods and its catchment, and was launched in 2011. The most common control method has been basal bark treatment of individual plants, which ensures only the target species is treated, particularly along the watercourses and the lake itself. Since the inception of the program, over 95% of all plants have been controlled, including nearly all mature seeding plants. Current control is now concentrated on the large number of seedlings and juvenile plants that emerge following death of parent plants.

Table 2-4. Key weed species for the region (as per Barkly Regional Weed Management Plan 2015-20)

Common name	Botanical name	Class*	WoNS**	Status in management plan	Weed records within 100 km
Bellyache Bush	*Jatropha gossypiifolia*	A	Yes	Priority	2
Mesquite	*Prosopis spp.*	A	Yes	Priority	12
Prickly Acacia	*Vachellia nilotica*	A	Yes	Priority	13
Parkinsonia	*Parkinsonia aculeata*	B	Yes	Priority	1,042
Rubber Bush	*Calotropis procera*	B	-	Priority	300
Athel Pine	*Tamarix aphylla*	A	Yes	Priority	17
Cacti	*Opuntia* and *Cylindropuntia*	B/not declared	Yes	Opportunistic	0
Neem	*Azadirachta indica*	B	-	Opportunistic	3
Noogoora Burr	*Xanthium strumarium*	B	-	Opportunistic	15
Mossman River Grass	*Cenchrus echinatus*	B	-	Opportunistic	3
Grader Grass	*Themeda quadrivalvis*	B	-	Opportunistic	0
Buffel Grass	*Cenchrus ciliaris*	-	-	Significant threat	22

** As per the NT Weeds Management Act. Class A – to be eradicated by land owners and occupiers. Class B – growth and spread controlled by land owners and occupiers.*

*** WoNS – Weeds of National Significance (Commonwealth listing).*

Pest fauna

Introduced fauna species (i.e. pests) that have been recorded within the region of the Solar Precinct footprint are listed and described in Table 2-5 (based on a 100 km NT Fauna Atlas clip). No pest fauna was observed within the Solar Precinct footprint as part of animal tracking surveys conducted for threatened species assessments. However, Feral Cats (*Felis catus*) were observed in a few surrounding locations during aerial transects.

Table 2-5. Pest species known to occur in the region of the Solar Precinct footprint

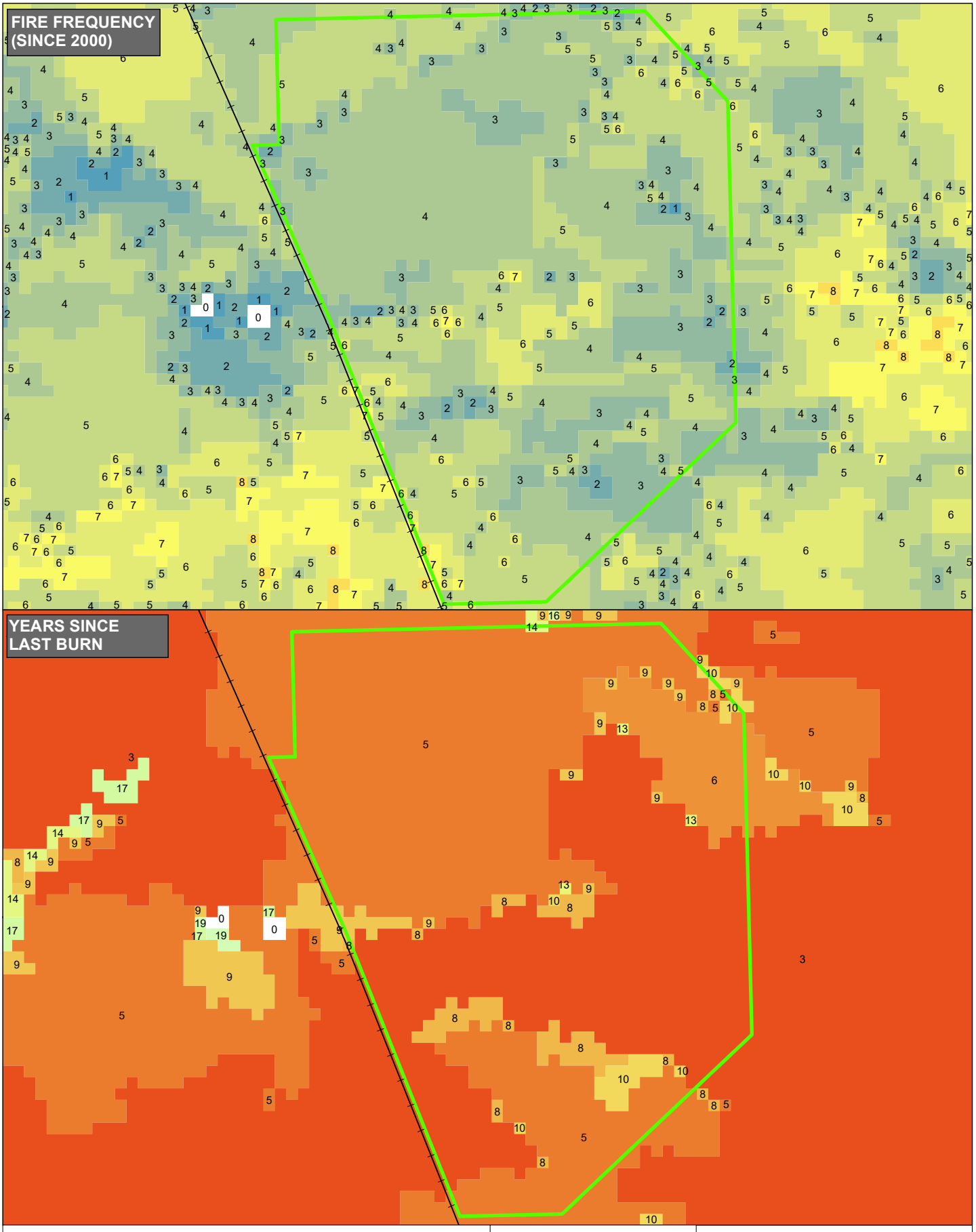
Pest species	Atlas records	Comment
Cane Toad *(Rhinella marina)*	20	• Footprint occurs at southern limit of species distribution. • Responsible for significant declines in numerous species; lethal to carnivorous native animals if consumed. • Species requires constant access to moisture (water, dew or moist sand) to survive.
Feral Cat (*Felis catus*)	35	• Known to occur in the region; widespread. • Occurs in a wide variety of different habitats. • Major pest (predator); has contributed to the decline of native fauna.
Feral Horse (*Equus caballus*)	4	• Occurs in a wide variety of different habitats • Prefers grassland and shrubland with plentiful water and pasture. • Can cause severe degradation to vegetation and water sources.
One-humped Camel (*Camelus dromedarius*)	5	• Northern edge of distribution • Utilises most habitats within the arid zone. • Can cause severe degradation to vegetation and water sources.

Pest species	Atlas records	Comment
Fox (*Vulpes vulpes*)	11	• Northern edge of range. A few records to the south, but not expected to occur in the region of the Solar Precinct footprint. • Major pest (predator), especially affecting small and medium sized mammals, reptiles and ground dwelling birds.
House mouse (*Mus musculus*)	13	• Widespread, higher numbers generally found close to human. Impacts on biodiversity is uncertain.
Donkey (*Equus asinus*)	3	• Uncommon in the area, populations are higher in the ranges to the south-east of the footprint. • Can have localised impacts on water sources and vegetation.

2.8 Fire history

Fire history and fire scar mapping over the last 20 years was obtained through the Northern Australia and Rangelands Fire Information (NAFI) website. The fire history within the footprint is mapped in Figure 2-8, which shows 'fire frequency' (i.e. number of burns) and 'years since last burn' (using NAFI fire scar data). Landsat Quicklook imagery was also viewed to check for any potential 'fire shadow' areas that are undetected by NAFI hotspot mapping – see Appendix A. This confirmed that all areas within the footprint have burnt at least once in the past 20 years, the majority of the Solar Precinct has been burnt within the past 3 to 5 years, and the oldest patches of spinifex within the footprint are between 10 to 13 years since last burn (see photographs of 10-year-old areas in Figure 2-7).

Figure 2-7. Photograph of the oldest spinifex hummocks (*Triodia pungens*) currently present within the Solar Precinct footprint (i.e. last burnt in 2011)



Path: C:\Users\tom.reilly.ECOZ\OneDrive - Ecoz\Documents\01. EcOz GIS Projects (TR) - new\EZ20220 (Tom) - SunCable Baseline Ecology\01 Project Files\Report_Fire_SolarFarm.mxd

Figure 2-7. Map of fire history within the solar precinct