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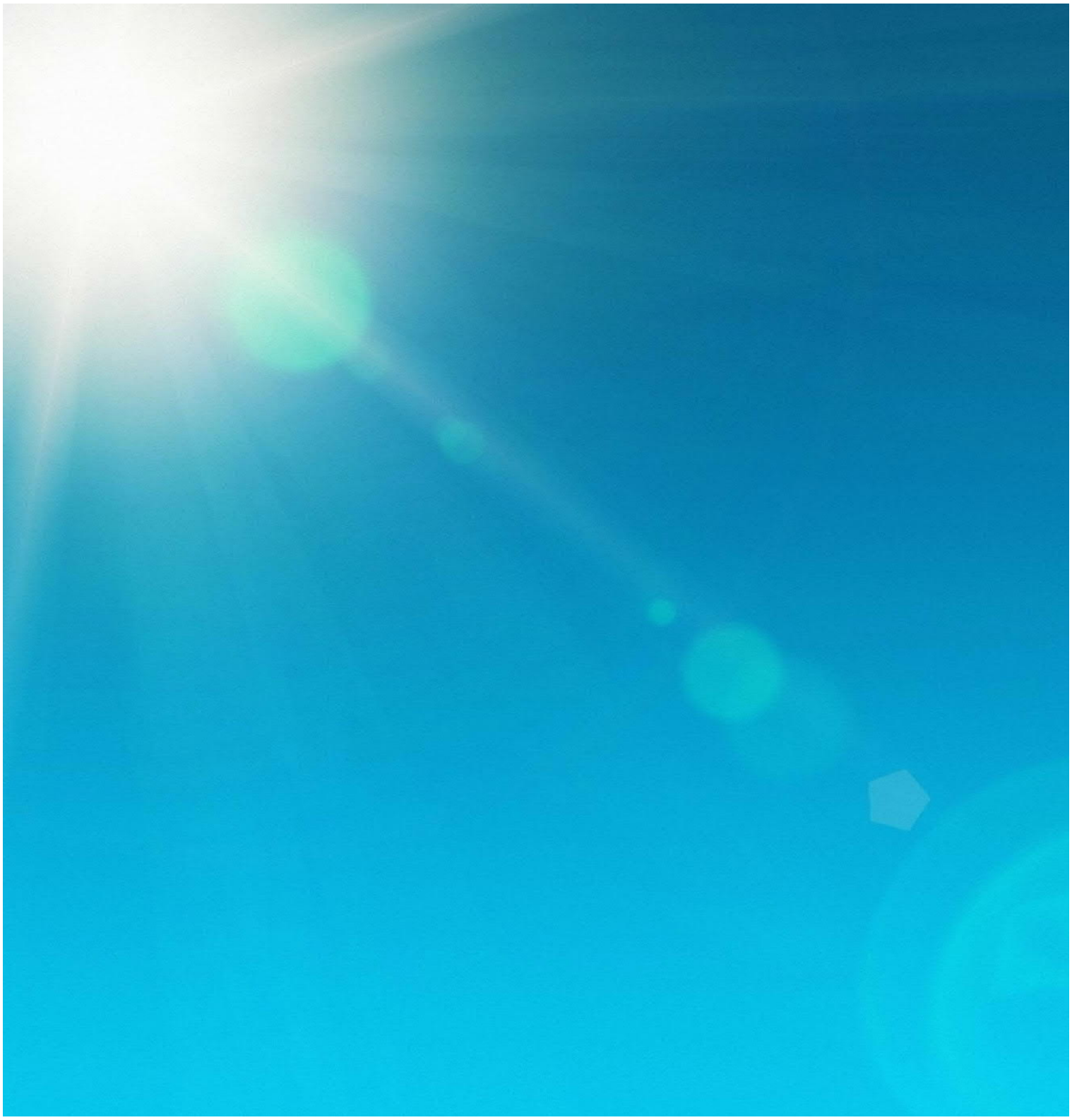
Chapter 16 – Matters of National Environmental Significance (MNES)

Australia-Asia PowerLink Environmental Impact Statement



Chapter 16 - Matters of National Environmental Significance (MNES)

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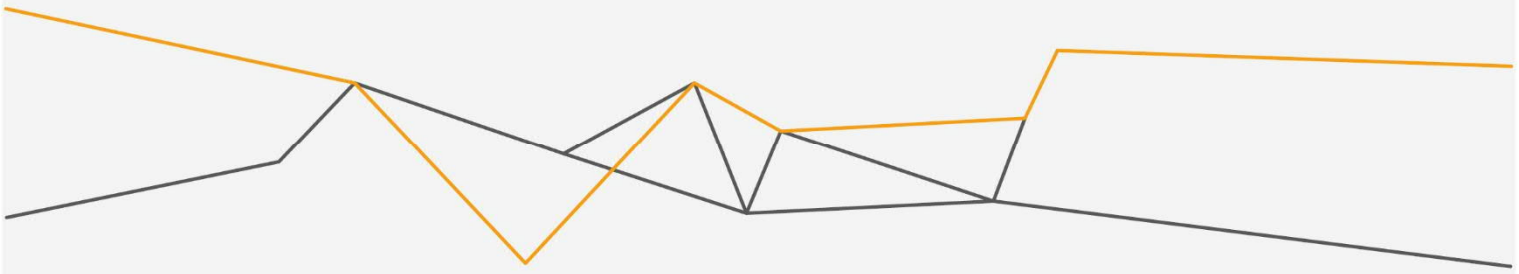
Revision history

Revision	Date	Purpose	Reviewed by	Approved by
0	23/03/22	Draft EIS submission	Joe Sheridan	Mark Branson



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There are nine Matters of National Environmental Significance (MNES) protected under the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act* (1999) (EPBC Act). The Commonwealth Department of the Agriculture, Water, and the Environment (DAWE) is responsible for administering the Act.

The AAPowerLink proposal was determined a controlled action on 30 November 2020, and the decision on assessment approach was made on 21 January 2021. The project will be assessed by accredited assessment under the *Environment Protection Act 2019* (Northern Territory) at the level of an environmental impact statement. The EIS TOR includes the Commonwealth assessment requirements following the accredited assessment approach.

The triggering MNES that are relevant to this proposal are:

- Listed threatened species and communities
- Listed marine and/or migratory species
- Commonwealth marine area.

This chapter addresses the information requirements for assessing whether the AAPowerLink is likely to have a significant impact upon these MNES as per the EIS TOR (Appendix A). It is to be read in conjunction with Chapter 2 Proposal Description, which provides details of the AAPowerLink footprint and activities associated with the construction and operations phases of the proposal. Much of the content of this chapter is derived from the assessment of impacts to terrestrial threatened species and the marine environment presented in Chapter 5 Terrestrial Ecosystems, Chapter 9 Marine Environmental Quality and Chapter 10 Marine Ecosystems.

This chapter assesses the potential impact to MNES from AAPowerLink activities. The purpose of this chapter is to demonstrate that Sun Cable has fully considered all of the impacts to MNES and there are strategies in place to ensure impacts are avoided or mitigated too As Low As Reasonably Practicable (ALARP). This chapter provides details of the:

- MNES known or likely to occur within the proposal area of influence.
- Potential impacts to MNES from AAPowerLink construction and operations activities, including consideration of cumulative impacts.
- Mitigation and management measures that will be implemented to address those potential impacts.
- Conclusions in relation to whether the proposal will have a significant impact on MNES, and whether there are any residual impacts that need to be offset and/or managed.

16.1 Information sources

The threatened, migratory and marine species listed under the EPBC Act that have the potential to be impacted upon by AAPowerLink proposal activities were primarily identified using the Protected Matters Search Tool (PMST) (https://www.awe.gov.au/environment/epbc/protected-matters-search-tool). The PMST is an online enquiry tool managed by DAWE which interrogates a range of existing flora and fauna data, as well as using predictive modelling, to speculate on the presence of species within a search area.

To determine the likelihood that these species are present and, if so, where important habitat for them occurs within the proposal footprint, desktop and field studies were undertaken of the terrestrial and marine

environments present. The terrestrial ecology studies are reported in Appendix O (for the Solar Precinct) and Appendix P (for the OHTL Utilities Corridor, Darwin Converter Site and Cable Transition Facilities), and the marine ecology study is reported in Appendix T.

Desktop studies analysed a wide range of spatial datasets – predominantly created by the NT and Commonwealth Governments – together with aerial imagery. Where relevant and possible, fieldwork was then undertaken to ground-truth these.

For terrestrial species, a Greater Bilby survey was undertaken across the Solar Precinct. The OHTL Utilities Corridor, Darwin Convertor Site and Cable Transition Facilities have all been surveyed to ground-truth land units and significant vegetation types and identify potentially suitable habitat for threatened species. Surveys targeting restricted range threatened species within the OHTL Railway and Utilities Corridors will be undertaken in early 2022 and results provided in the Supplementary EIS. Access permission issues precluded any field surveys of the OHTL (Railway Corridor). As above, threatened flora species surveys within that footprint will be undertaken in the first quarter of 2022, with the results to be presented in the Supplementary EIS.

For the marine environment, a geophysical and geotechnical survey of the proposed Subsea Cable System footprint undertaken by Guardian Geomatics in 2020 provided information on the seabed characteristics and habitat present within the footprint.

16.2 Relevant policies and guidelines

The impact assessment undertaken in this chapter is undertaken in accordance with the *EPBC Significant Impact Guidelines 1.1* produced by the Commonwealth Government (DEWHA 2013). In addition, the EIS Terms of Reference (TOR) requires this chapter to show how the proposal is consistent with the following documents (where relevant):

- The Biodiversity Convention
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- The Bonn Convention
- Marine Bioregional Plans for the North and North-West Marine Regions
- EPBC Act Policy Statement 3.21 – Industry Guidelines for Avoiding, Assessing and Mitigating Impacts on EPBC Act Listed Migratory Shorebird Species (DoE 2015)
- Survey Guidelines for Australia's Threatened Birds (Commonwealth of Australia 2010)
- Conservation Advice for:
    - Ghost Bat
    - Greater Bilby
    - Northern Brushtail Possum
    - *Stylidium ensatum*
    - Green Sawfish
    - Far Eastern Curlew
    - Lesser Sand Plover
    - Red Knot
    - Great Knot

  - Greater Sand Plover
  - Curlew Sandpiper
- Recovery Plans for:
  - Northern Quoll
  - Marine Turtles in Australia
  - Sawfish and River Sharks
  - Greater Bilby (draft)
- Threat Abatement Plans for:
  - Predation by feral cats
  - Predation by European red fox
  - Competition and land degradation by rabbits
  - Biological effects, including lethal toxic ingestion, caused by cane toads
  - Reducing the impacts on northern Australia's biodiversity by the five listed grasses.

16.3 Threatened species

16.3.1 Context

The construction, and to a lesser extent operation, of the AAPowerLink has the potential for impact on threatened species. In this section, both impacts from construction and operations are considered; however, the highest risks of potential impacts to terrestrial threatened species relate to the land clearing and development during the construction stage of the proposal and weed introduction/proliferation during both construction and operations. Likewise, habitat loss and degradation associated with laying the Subsea Cable System has the greatest potential for impacting marine threatened species.

Impact assessment for threatened species follows a different process to that for other ecological values. The *EPBC Significant Impact Guidelines 1.1* (DEWHA 2013) describe the process for determining the significance of impacts to threatened species. The process involves:

- Defining the proposal footprint.
- Determining which threatened species are likely to be present (using the Protected Matter Search Tool).
- Determining the importance of the *population* for each threatened species that is known, or likely, to occur.
- Determining whether proposal activities are likely to have a *significant impact* on important populations of any threatened species.

When assessing whether a project will have a significant impact on a threatened species known, or likely, to occur in the project footprint, it is necessary to first determine whether it does so in an important population – as defined in *EPBC Significant Impact Guidelines 1.1*. This is because, in most circumstances, by definition, a project's activities can only have a significant impact on an 'important population' of a threatened species.

The *EPBC Significant Impact Guidelines 1.1* defines any occurrence of a Critically Endangered or Endangered species within the project footprint as constituting a population, and all populations are 'important'. For threatened species that are listed as Vulnerable, an 'important population' is a population that is necessary

for a species' long-term survival and recovery. This may include populations identified in recovery plans and/or that are:

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity
- Populations that are near the limit of the species' range.

A 'population of a species' is defined under the *EPBC Act* as an occurrence of the species in a particular area – including (but not limited to):

- A geographically distinct regional population, or collection of local populations, or
- A population, or collection of local populations, that occurs within a particular bioregion.

For threatened species likely to occur as an important population within a project footprint, the final step is to determine whether project activities are likely to have a *significant impact* on that population. This is done using the criteria within *EPBC Significant Impact Guidelines 1.1*, which varies depending on the threatened category that has been assigned to the species.

16.3.2 Impact assessment

The terrestrial and marine ecology reports (Appendix O, P and T) describe all of the Commonwealth-listed threatened species that could be present within the proposals terrestrial and marine footprints. The species examined were those listed in the PMST reports, supplemented by those listed in the EIS TOR.

16.3.2.1 Terrestrial

Of all the threatened species assessed for the Solar Precinct, only one species – Greater Bilby (*Macrotis lagotis*) – was considered to have a 'high' likelihood of occurrence within the Solar Precinct footprint. One other species – Grey Falcon (*Falco hypoleucos*) – is likely to occur within the access road corridors. These species are discussed below.

The OHTL corridor traverses 788 km. Consequently, it intersects a large number of habitat types, and therefore potentially impacts a considerable number of different threatened species. For the entire OHTL length, a 22 m wide corridor will be cleared for construction. In addition, every transmission pole will require a 60 x 100 m construction pad, which will be spaced between 300 and 450 m apart. Post-construction, the OHTL corridor and construction pads will be allowed to regrow, excepting a 6 m wide access track along the entire length, and a 12 x 6 m area around each pole foundation that will be maintained free of vegetation.

The physical disturbance footprint of the OHTL is – by design – narrow and localised, and there is some flexibility in the location of the poles. The transmission lines will span rivers such that clearing of riparian vegetation is unlikely to be required except for some select maintenance. Therefore, threatened species with general habitat requirements and/or wide ranges are inherently unlikely to be significantly impacted by the proposed development. Only species with a restricted-range or localised core habitat are discussed in this section. These species are listed in Table 16-1.

Based on fieldwork and desktop assessment, there are 11 threatened species with a reasonable likelihood of occurring within the Darwin Converter Site and Cable Transition Facilities footprints – 8 of which are shorebirds.

Table 16-1. Terrestrial threatened species with the potential to be impacted by the proposal

Species	Status	Location			
		Solar Precinct	Railway	Utilities	DCS & CTF*
FAUNA					
Red Goshawk (*Erythrotriorchis radiatus*)	VU	-	x	-	-
Grey Falcon (*Falco hypoleucos*)	VU	x	-	-	-
Gouldian Finch (*Erythrura gouldiae*)	EN	-	x	-	-
Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*)	VU	-	x	x	-
Ghost Bat (*Macroderma gigas)*	VU	x	x	-	-
Greater Bilby (*Macrotis lagotis*)	VU	-	x	-	-
Howard River Toadlet (*Uperoleia daviesae*)	VU	-	-	x	-
Shorebirds (see Table 16-4)	VU/CE	-	-	-	x
FLORA					
Stylidium ensatum	EN	-	x	x	-
Helicteres macrothrix	EN	-	x	-	-

* DCS = Darwin Converter Site; CTS = Cable Transition Facilities

Red Goshawk (Erythrotriorchis radiatus)

This Vulnerable species can have a home range of up to 200 km^2 (Czechura and Hobson 2000), but its preferred habitat is tall, open Eucalypt Forest and riparian areas. Red Goshawks forage across a broad range of Top End habitats but have much more specific breeding and roosting habitat requirements. The species nests in large trees – frequently the tallest and most massive in a tall stand – and invariably within 1 km of permanent water (Debus and Czechura 1988; Aumann and Baker-Gabb 1991). Core habitat for this species – and especially nesting habitat – is likely limited to the larger rivers intersected by the OHTL – nothing that, in these areas, the railway corridor already intersects these rivers.

General occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. The OHTL corridor may overlap with the territory of Red Goshawks, but the only way its development could materially impact upon the species would be collisions with powerlines or disruption to breeding success due to a disturbance of an active nest. As discussed in detail in Chapter 5 Terrestrial Ecosystems, the risk of collisions with powerlines is low because the transmission wires are further apart and bundled, and hence much more visible, than those associated with high numbers of collisions. Regarding breeding success, because nests are conspicuous, they will be easily detected once the (Railway Corridor) is open for surveying. In the unlikely event that an active nest is present within the corridor, mitigation measures – such as rescheduling the timing of works – can be adopted to avoid its disturbance.

Grey Falcon (Falco hypoleucos)

The Grey Falcon is a Vulnerable species known to occur in areas of lightly timbered lowland plains, typically on inland drainage systems, where the average annual rainfall is less than 500 mm (Ward 2012). This species occupies nests (often built by other bird species) in the tallest trees along watercourses (Garnett et al. 2011), as well as on telecommunications towers. Nesting is normally between June to November (Ward 2012). The Grey Falcon is generally a solitary bird, sometimes found in pairs or family groups.

The species is always found in low densities (Garnett et al. 2011). Most records are in the Tanami Desert and in the lower third of the Northern Territory. There are records along the Stuart Highway adjacent to Powell Creek Station.

The Grey Falcon has a high likelihood of occurrence in the region traversed by the access roads due to proximity of records, and the presence of potentially suitable nesting habitat along some of the large drainages that support Eucalyptus species. However, aerial observations noted that trees within the proposed access corridor are generally less than 10 m in height and, as such, are considered to be marginally suitable for nesting. The corridor could be used for general foraging /hunting by an individual Grey Falcon or a pair; however, there are no unique characteristics within the corridor that make it a preferred hunting area for the species and suitable foraging habitat is widespread in the surrounding region. As such, although this species has been given a high likelihood of occurrence, it is naturally sparse in the landscape and so an observation of a hunting/foraging individual would be considered to be rare. More frequent observations would only be expected if a nesting site is present within, or close to, the corridor. There is no current evidence of nest occurrence.

The disturbance footprint for the access tracks is long but narrow. Being a mobile species that can avoid road building machinery – the most substantive way individuals of this species could be negatively impacted by the proposal is if active nests are disturbed. These are conspicuous and can be avoided. Given that this species is listed as Vulnerable, construction of the access roads would need to negatively impact many individuals in order to constitute a significant impact. In contrast, the proposal can, and is likely to, avoid impacting upon any individual Grey Falcons.

Gouldian Finch (Erythrura gouldiae)

This species is listed as Endangered, although some sources believe that Gouldian Finch populations may have recently stabilised, and perhaps begun to increase and spread (Garnett et al. 2011). The critical components of suitable habitat for the Gouldian Finch vary seasonally. In the dry season, the critical components are hollow-bearing Eucalyptus trees with an understorey of the favoured annual grass and a nearby source of surface water.

In the Northern Territory, most known breeding populations occur in the Top End with some isolated records in the Barkly Tableland and in coastal areas of the Gulf of Carpentaria. A well-studied Gouldian Finch site intersected by the OHTL (Railway Corridor) is the Yinberrie Hills area north of Katherine. This is the location of the largest known breeding population of the Gouldian Finch in the Northern Territory. According to Dostine et al. (2001), that population undertake regular seasonal shifts from breeding areas in hill woodland in the dry season, to adjacent lowlands throughout much of the wet season, in response to seasonal changes in food availability.

The Gouldian Finch's status as Endangered means that any occurrence constitutes an important population. Construction of the OHTL could result in disruption of breeding, loss of breeding habitat and/or loss of core feeding habitat. An analysis has been undertaken for this proposal of the available foraging and roosting habitat within the OHTL (Railway Corridor). As shown in Chapter 5 Terrestrial Ecosystems, the OHTL (Railway Corridor) intersects with multiple patches of breeding and foraging habitat for Gouldian Finches in the Yinberrie Hills region – totalling 3.1 km of breeding habitat and 1.7 km of foraging habitat. There are also many records near to the OHTL (Railway Corridor) in the Yinberrie Hills SOCS.

Gouldian Finches feed on five grass species as the seeds of these species become seasonally available (Lewis 2007), and birds will move from area to area as the seeds from each species become available (Dostine and Franklin 2002; Dostine et al. 2001). Using the 1:100,000 spatial dataset entitled *Vegetation of the Daly River Catchment* (Cuff 2011), an analysis of the available foraging habitat within the Daly River region that is present

within the 60 m OHTL corridor and within a 20 km buffer of that footprint (a search area suggested by DEPWS) has led to the following conclusions:

- There is 11,412 ha of Gouldian Finch core foraging habitat within the 20 km buffer. Of this, 9.86 ha (0.09 %) is within the OHTL corridor. This may be an overestimate as some of that habitat may have been cleared for the construction and operation of the railway and associated infrastructure, where the OHTL is proposed.
- There is 7,043 ha of Gouldian Finch breeding habitat within the 20 km buffer. Of this, 12.45 ha (0.18 %) is within the OHTL corridor. As above, this may be an overestimate due to existing disturbance in the Railway Corridor.

Micro-siting for the placement of poles will be undertaken to avoid disturbing sensitive habitats where possible through adoption of a Flora and Fauna Management Plan as part of the Construction Environmental Management Plan (CEMP). Given the large area of similar habitat in the region, the clearing of such a small (and narrow) additional area of habitat cannot be considered likely to lead to a long-term decrease in the size of the Gouldian Finch population because of impacts on core foraging or breeding habitat.

Bare-rumped Sheathtail Bat (Saccolaimus saccolaimus nudicluniatus)

The Bare-rumped Sheathtail Bat (listed as Vulnerable) – has only been detected at 11 locations, all in coastal and adjacent areas. In the NT, specimens have been collected from Pandanus woodland fringing the sedgelands of the South Alligator River, and Eucalyptus tall open forests (Friend and Braithwaite 1986; Churchill 2008) with more recent records from Howard Springs (Milne et al. 2009). The species forages above the canopy and roosts in groups ranging from 10 to 100 individuals in large trees that have deep hollow pipes (Churchill 2008).

There are two Bare-rumped Sheathtail Bat records adjacent to the OHTL Utilities Corridor recorded by an unknown source in 2005. There are known areas with large hollow-bearing trees within the OHTL Utilities Corridor that may be roost sites for this species, and there could be similar such areas in the northern section of the OHTL (Railway Corridor).

Despite the Bare-rumped Sheathtail Bat's listing as Vulnerable, the paucity of recent records (noting that the species is difficult to detect) means that any occurrence of the species within the OHTL footprint should be considered important for maintaining a key source population (either for breeding or dispersal) and/or one that is necessary for maintaining genetic diversity.

The only way that proposal activities could materially impact the Bare-rumped Sheathtail Bat is through mortality of individuals or disruption to breeding success due to a disturbance of an active roost tree. The proponent will mitigate the impact of OHTL construction on this species by adopting procedures in a Flora and Fauna Management Plan as part of the CEMP to avoid clearing such trees (if possible) and pre-clearance survey of large trees with hollows.

Application of these measures will make it unlikely that the proposal will have a significant impact upon the Bare-rumped Sheathtail Bat.

Ghost Bat (Macroderma gigas)

The Ghost Bat is a Vulnerable species that has also been recorded in concentration around the Pine Creek region. The species has a broad distribution and generalist foraging requirements, but only 14 breeding sites are known (Worthington Wilmer 2012). Permanent roost sites are generally deep natural caves or disused mines; most breeding sites are caves with multiple entrances (TSSC 2016c). Ghost Bats near Pine Creek were found to forage over relatively small areas (mean 61 ha) within 2 km from the daytime roost, and in most cases

returned to the same roosting cave (Tidemann et al. 1985). The species moves between a number of caves seasonally or as dictated by weather conditions and require a range of cave sites (Hutson et al. 2001).

The Kohoonir Adit colony – the largest known maternity site for Ghost Bat – is located just south of Pine Creek, and approximately 400 m to the west of the OHTL (Railway Corridor). Ghost Bat populations are genetically distinct at both regional and local scales; the presence of a nearby maternity cave – and the species' high degree of female philopatry (i.e., faithfulness to a breeding site) – means the site is likely a key source population for breeding. The disturbance of breeding females has the potential to reduce the area of occupancy and population size significantly (TSSC 2016c). For these reasons, it is assumed that an important Ghost Bat population occurs very close to project footprint for at least part of the year.

Although the largest of micro-bats, this species is still too small (wingspan up to 60 cm) and agile to have a negative interaction with powerlines, so the only way that the proposal could have a negative impact is through noise disturbance during construction. The noise generated by machinery installing OHTL infrastructure will be temporary (each transmission tower will require only a few days to erect). No blasting is required, and the footprint is adjacent to an operating – and therefore periodically noisy – railway line. The placement of poles will be as far from the Kohoonir Adit colony as possible. Localised construction noise for a short duration is unlikely to have a significant impact on roosting Ghost Bats.

Greater Bilby (Macrotis lagotis)

The Greater Bilby is listed as Vulnerable and, in the NT, occurs in a wide range of habitats. Vegetation within these habitats predominantly consists of spinifex shrublands and open woodlands. A mosaic of different post-fire ages is preferred (Southgate & Carthew 2007). Fire seems to maintain the sparse vegetation the species favours, and promotes ephemeral plants used as primary and secondary food sources (Southgate & Carthew 2006; Southgate & Carthew 2007; Johnson 1989). However, large-scale burns may restrict breeding, impede dispersal, and reduce food options/availability (Southgate & Carthew 2006).

The Greater Bilby lives in deep burrows excavated in sand. An individual may utilise over a dozen regularly used burrows within its home range, and multiple burrows may be visited in a single night (Pavey 2006). Foraging distance from a burrow can range between 200 to 600 m (Johnston 1989). Greater Bilbies move over a wide area according to available food and vegetation cover conditions (associated with seasons and fires) (Southgate & Carthew 2006; Southgate & Carthew 2007; Southgate 1987; Johnson 1989), and the long-term seasonal home range may be large (up to hundreds of square kilometres) (Southgate 1987).

There are recent records (from 2020) of the Greater Bilby approximately 100 km to the north on Murranji Station (and on the same Redsan land system upon which the Solar Precinct is located), and historic reports to the north, south and west of the Solar Precinct. Consequently, this species was subject to an intensive, targeted, field study within the Solar Precinct using a sign-based survey based on approved methodologies. The survey was undertaken in November 2020 and did not find any Greater Bilby burrows within the Solar Precinct; nor was there any evidence of previous occupation.

Given that no bilbies were detected (i.e., no burrows), it is unlikely that the Solar Precinct contains core habitat or supports a persistent /regular occurrence of the species. Occupancy modelling in the NT indicates that paleo-drainage lines remain more persistently suitable for Greater Bilby than other habitats such as sand plains and dune fields (Southgate et al. 2018). Nevertheless, the Redsan land system within which the Solar Precinct is located has records of Greater Bilbies to the north (2020), west (circa 1982) and south (2001). Under better

climatic conditions – i.e., during a boom[1] season – Greater Bilby may occasionally utilise the area. However, the likelihood of this is reduced by the very low availability of viable food resources and high fire frequency within the Solar Precinct which results in habitat suitability being 'marginal', at best. Moreover, the survey was undertaken in a year that had above average rainfall.

The southernmost 150 km of the OHTL (Railway Corridor) area supports areas of suitable habitat for Greater Bilby, and there has been numerous recent (and historic) records of the species on the western side of the Railway Corridor on Murranji Station. A helicopter survey for the presence of Greater Bilby within the OHTL (Railway Corridor) was undertaken in late 2020, adopting methods supported by NT Department of Environment, Parks and Water Service. The survey method is presented in Section 3.2 of Appendix O. Due to access issues, the OHTL (Railway Corridor) could not be inspected on the ground. Although no signs within the OHTL (Railway Corridor) were confirmed as Greater Bilby, it is still considered likely that the species will occasionally occur within certain sections of the OHTL (Railway Corridor) – those within the Redsan land system near Murranji station – due to presence of suitable habitat and its close proximity to a current colony. To verify presence/absence, a follow-up targeted, ground survey will be undertaken within the OHTL corridor for the Supplementary EIS.

The general occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. However, the known Murranji colony is at the northernmost extent of the species current distribution – i.e., near the limit of the species' range – and therefore qualifies as being an important population.

This species has not been surveyed to confirm presence, or delineate extent of occurrence, within the OHTL corridor. The Greater Bilby is well studied – regionally – and known from many locations. Presence/absence of the species will be verified with a targeted field survey in 2022. The OHTL corridor runs along the eastern limit of the species range, and therefore any records of this Vulnerable species within the OHTL footprint would likely constitute an 'important population' near the limit of the species' range, and therefore necessary for maintaining genetic diversity (as per the criteria in Section 16.3.1).

Table 16-2 presents a preliminary significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA 2013). The assessment uses the preliminary aerial survey results and desktop and is based on the assumption that some habitat within the proposal footprint contains Greater Bilby, but so does immediately adjacent habitat that is outside the footprint – in other words, any occurrences of the species are not confined to the proposal footprint. Because the OHTL footprint is so narrow, only small areas of foraging habitat will be disturbed – therefore, the focus on the significant impact assessment is on disturbances to burrows used for day-time refuge and breeding.

The significant impact assessment will be updated for the Supplementary EIS to include the results of the targeted survey. For now, the conclusion is that it is unlikely that AAPowerLink will have a significant impact upon the Greater Bilby. Even if this species is present within the OHTL footprint, there are likely aspects of the proposal's design that can be altered to avoid or minimise impacts to it.

[1] Rainfall in the arid region is unpredictable and unreliable – with floods and droughts both possible. In response, many arid flora and fauna species experience 'boom and bust' cycles. Populations of fauna species such as the Greater Bilby can disperse after good rainfall into areas not usually known to support the species, and then contract back to core refugial habitat during droughts.

Table 16-2. Preliminary significant impact assessment for the Greater Bilby

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	Greater Bilbies utilise numerous burrows across their home range. The OHTL footprint is very narrow and will therefore, at most, only intersect with a few burrows within individuals' home ranges. The only potential cause for a long-term decrease in the size of a local Greater Bilby population would be if burrows within the OHTL are occupied during construction, and mortality occurs as a result of construction activities. Inherently, this risk is low because Greater Bilbies are generally a solitary species, in the very worst case this would result in mortality of a few individuals. To further reduce this potential impact, if burrows are found within the OHTL footprint, pre-construction clearance activities will be detailed in the Flora and Fauna Management Plan as part of the CEMP. If active burrows are identified, procedures will be adopted to allow the occupants to vacate safely, and the burrows will then be destroyed to prevent re-inhabitation. This should ensure that mortality of Greater Bilby is very unlikely to occur, and therefore there will not be a long-term decrease in the size of a Greater Bilby population.
Reduce the area of occupancy of an important population	Determining area of occupancy is based on the IUCN 2 x 2 km grid cell method. If active Greater Bilby burrows are recorded within the OHTL footprint – and their loss cannot be avoided – the only way that can lead to a reduced area of occupancy is if they are entirely confined to within the OHTL footprint. In other words, if the burrows lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced area of occupancy. There is no reason to suspect that burrows will only occur within the OHTL footprint, and so it is very unlikely that this scenario will eventuate.
Fragment an existing important population into two or more populations	The clearing of a narrow corridor (22 m reducing to 6 m post-construction) to construct the OHTL will not present a barrier to Greater Bilby movement and will therefore not lead to any fragmentation of a population (if present). Even the existing railway infrastructure is unlikely to have had that effect on this mobile species.
Disrupt the breeding cycle of a population	This impact could only occur if active burrows are present within the OHTL corridor and construction works are undertaken during breeding season, the timing of which depends on seasonal conditions and food availability (TSSC 2016a). Infant bilbies spend ~75 to 80 days in their mother's pouch, and then another two weeks in a burrow (Woinarski et al. 2014). Therefore, the actual time within which breeding success could be impacted by construction works is limited to a few weeks.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss of, or decrease in quality of, habitat because of proposal activities will cause a decline in the species.
Adversely affect critical habitat	Although not formally designated as such, it is arguable that in the NT, critical habitat for the Greater Bilby is the palaeo-drainage lines in the Tanami Desert (Bradley et al. 2015). This habitat does not occur within the OHTL area of influence or Solar Precinct.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Predation by Feral Cats and Foxes is a known threat to the Greater Bilby. Whilst linear clearings are known to assist cat movements (see, e.g., Wysong et al. 2020), the OHTL (Railway Corridor) already contains a linear clearing for railway infrastructure, and so this proposal will not facilitate this impact. Creation of water-points can also assist in the spread and proliferation of cats and foxes; however, these are not a feature of this proposal. Altered fire regimes are another threatening process. This could occur if the environmental weed Buffel Grass (*Cenchrus ciliaris*) is introduced into area by construction

Criterion	Summary of mitigation measures and significant impact assessment
	or operations activities. The proposal's Weed MP (Appendix Q) has been developed to minimise the likelihood of this occurring.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Greater Bilby. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of the species	The Conservation Advice (TSSC 2016a) lists a number of priority conservation actions, none of which will be interfered with by the activities of this proposal.

Howard River Toadlet (Uperoleia daviesae)

Howard River Toadlet is an endemic Vulnerable species that was only formally described in 2005 and listed under the *EPBC Act* in late 2021. The species is highly restricted to shallow drainage systems that intersect sandsheet habitat of the Darwin region (Young et al. 2005; Fisher et al. 2011). Sandsheet heath is only found in patches within the greater Darwin region.

The Howard River Toadlet only occurs in the Howard and Elizabeth River catchments, and there are many records proximate to the southern and central sections of the OHTL Utilities Corridor. The species was only recorded at four sites (during a below average wet season) in the Gunn Point region by Stokeld et al. (2020), who noted that presence of the species at a site was associated with the occurrence of debil-debil microrelief, higher proportion of sand in the soil to a depth of 60 cm, and larger patches of sandsheet heath.

This species has not been surveyed to confirm presence, or delineate extent of occurrence, within the OHTL corridor. The Howard River Toadlet is well studied – regionally – and known from many locations. Presence/absence of the species will be verified with a targeted field survey in 2022. The OHTL corridor runs along the eastern limit of the species range, and therefore any records of this Vulnerable species within the OHTL footprint would likely constitute an 'important population' near the limit of the species' range, and therefore necessary for maintaining genetic diversity (as per the criteria in Section 16.3.1).

Table 16-3 presents a preliminary significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA 2013). The assessment uses desktop information only, based on the assumption that sandsheet habitat within the proposal footprint contains Howard River Toadlet, but so does immediately adjacent habitat that is outside the footprint – in other words, any occurrences of the species are not confined to the proposal footprint. The significant impact assessment will be updated for the Supplementary EIS to include the results of the targeted survey. For now, the conclusion is that it is unlikely that proposal activities will have a significant impact upon Howard River Toadlet. Even if this restricted-range species is present within the OHTL footprint, its occurrence will almost certainly be very localised and therefore the proposal's design can be altered to avoid or minimise impacts to it.

Table 16-3. Preliminary significant impact assessment for Howard River Toadlet

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	The number of mature Howard River Toadlets is estimated to be approximately 17,250 (TSSC 2021). If this species is present within the OHTL footprint, it is likely that some of its habitat will be cleared and it is possible there is some direct mortality of toadlets. Depending on the location of this habitat, there may be some capacity to modify the design locally to minimise, or even avoid, these impacts. Because of the narrowness of the footprint, the proportion of habitat and individuals that will be destroyed is likely to very small compared with that available in adjacent areas, as well as regionally. Loss of individual Howard River Toadlets within narrow swathes is unlikely to result in a long-term decrease in the size of the species' population. Potential impacts associated with surface water quality and hydrology are discussed below.
Reduce the area of occupancy of an important population	According to TSSC (2021), the area of occupancy for the Howard River Toadlet is 216 km^2. Determining area of occupancy is based on the IUCN 2 x 2 km grid cell method. If the Howard River Toadlet is recorded within the OHTL footprint – and its loss cannot be avoided – the only way that loss can lead to a reduced area of occupancy is if it is entirely confined to within the OHTL footprint. In other words, if the toadlets lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced area of occupancy. It is unlikely that this scenario will eventuate.
Fragment an existing important population into two or more populations	It is possible that construction of the OHTL could clear a swathe through an existing patch of the Howard River Toadlet. The maximum width of habitat that would be lost is 22 m, reducing to 6 m post-construction (assuming construction pads and pole sites are chosen to avoid disturbing this species). The species is mobile, and so as long as there are no physical barriers – e.g., walls – in place, it seems unlikely that such minor additional gaps in its habitat will cause fragmentation into more populations.
Disrupt the breeding cycle of a population	Breeding can occur from December to March (TSSC 2021), with actual breeding activity apparently associated with specific conditions that result in flows of shallow water across sandsheet heath areas. According to TSSC (2021), it is likely that few, if any, males survive one breeding season, and movement between sites is likely to be rare because of the small size of the species. Consequently, if construction activity within or adjacent Howard River Toadlet habitat alters surface water flows in that habitat, breeding may not occur, and the population may be severely impacted. Reynolds and Grattidge (2013) report an instance where a Howard River Toadlet population was divided by a road development which had a drain that intercepted flows across the breeding area, making part of it no longer suitable for the Howard Toadlet. In addition to the measures described in the next row regarding ensuring flows to Howard River Toadlet habitat are not altered, care will be taken will any unavoidable disturbance within toadlet habitat not to create any barriers to movement.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	The Howard River Toadlet occurs in habitats that are subject to seasonal inundation. If this species is present within the OHTL area of influence, individuals could be lost, habitat degraded, and/or area of occupancy reduced if there are significant changes (i.e., beyond natural variation) to surface run-off quantity and/or quality because of the development of the OHTL. As detailed in Chapter 6 Hydrological processes, OHTL poles will not be placed in watercourses or drainage lines, or in areas where surface drainage could be affected. Only minor drainage lines that do not support threatened species will be crossed by the OHTL access track. All other drainages will be approached from either side to avoid the need for constructing crossings. Watercourse crossings will be installed during the dry

Criterion	Summary of mitigation measures and significant impact assessment
	season when no flow present. Drainage, erosion, and sediment controls will be installed and maintained in accordance with Erosion and Sediment Control Plans (ESCPs). For the reasons given in this table, it is unlikely that the loss of, or decrease in quality of, habitat because of proposal activities will cause a decline in the species.
Adversely affect critical habitat	Critical habitat has not been identified for the Howard River Toadlet. This concept is arguably not relevant for rare species with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Potential impacts to such habitat are assessed under previous criteria.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	TSSC (2021) identifies invasive flora and fauna species as plausible threats to the Howard River Toadlet, with their impact unknown. Throughout this chapter, it has been explained how the proposal will not exacerbate existing introduced animal populations. The Weed Management Plan presented in Appendix Q has been developed to minimise introduction and proliferation of weeds within the proposal area of influence for the life of the proposal.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Howard River Toadlet. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species (Chytridiomycosis is not known or predicted to occur in the NT).
Interfere with the recovery of a species	There is no Recovery Plan for this species. In DEPWS (2021), it is stated that 'current knowledge is insufficient to provide much guide to management beyond protecting known localities from development and sand mining.' The OHTL is designed to minimise clearing of suitable habitat for the Howard River Toadlet.

Migratory shorebirds

The Directory of Important Habitat for Migratory Shorebirds in Australia (Weller et al. 2020) lists the North Darwin region as one of the 15 important shorebird sites in the NT. Gunn Point Beach is within the North Darwin region, to the north of all the regularly surveyed shorebird sites. Threatened shorebirds have been recorded along Gunn Point Beach area, as reported in Palmer and Smit (2020). This information was collected from past aerial and ground surveys, national volunteer-based programs, and targeted scientific studies. Eight shorebird species recorded from the Gunn Point Beach area are listed as threatened under the *EPBC Act* – see Table 16-4.

Table 16-4. Threatened shorebird species recorded on Gunn Point Beach

Species	Status
Bar-tailed Godwit (western Alaskan subspecies) (*Limosa lapponica baueri*)	VU
Bar-tailed Godwit (northern subspecies) (*Limosa lapponica menzbieri*)	CE
Curlew Sandpiper (*Calidris ferruginea*)	VU
Far Eastern Curlew (*Numenius madagascariensis*)	VU
Great Knot (*Calidris tenuirostris*)	VU
Greater Sand Plover (*Charadrius leschenaultii*)	VU
Lesser Sand Plover (*Charadrius mongolus*)	VU
Red Knot (*Calidris canutus*)	VU

CE = Endangered, EN = Endangered, VU = Vulnerable

Shorebird species inhabit the coastal zone where they typically feed on invertebrates within the intertidal zone, and roost in the surrounding beaches, reefs, and mangroves. Aerial surveys and site visits conducted by Chatto (2003) confirmed that the southern Shoal Bay area has one of the highest numbers of shorebird sightings within the Gunn Point region, with the Great Knot being the most abundant species in this area – see Figure 16-1. The most important part of this survey block for shorebirds was the coast between Lee Point and Tree Point, followed by Bare Sand Island and the associated chain of islands to the south-east. Within the Gunn Point peninsula, the most records were for the southern Shoal Bay (including southern Gunn Point Beach) – see Chapter 5 Terrestrial Ecosystems.

Species abundances could be significantly lower than observed by Chatto (2003) due to habitat loss in Asian migratory stopover sites (Palmer and Smit 2020). It has been reported by Lilleyman (2020); however, that overall migratory shorebird numbers have increased in Darwin Harbour, indicating further site-specific investigations may be required. The area surrounding the proposal has high recreation use which also likely impacts on shorebird presence, as they would be regularly disturbed by recreational users when foraging or resting (Palmer and Smit 2020).

Observations during field investigations for Project Sea Dragon found few shorebirds using the intertidal zone along the adjacent beach, potentially due to a lower abundance of invertebrates due to coarse sandy substrates, and high levels of disturbance by vehicles, people, and pets along the beach.

There are only a few shorebird surveys recorded in the NT Fauna Atlas. Of those that recorded abundance, a February 1984 survey of 755 individual shorebirds was the largest. This was mostly comprised of Greater Sand Plover (320), Great Knot (250) and Red Knot (100). The count of Greater Sand Plover exceeds 0.1 % of the flyway population (which is 200). Palmer and Smit (2020) note that further studies are required to understand shorebird abundance (season, duration, and frequency) and habitat use for feeding and roosting.

It is unlikely that proposal activities will have a significant impact on the migratory shorebirds present within Shoal Bay. The section of the Cable Transition Facility that crosses shorebird habitat is a ~500 m long and 500 m wide corridor where up to 6 trenches, each up to 5 m wide, will be excavated. In comparison, the total length of Gunn Point Beach is ~13.5 km. Installation should only take 1 to 2 months, after which the corridor will be reinstated; no permanent footprint will be maintained.

There is nothing to suggest that the part of the AAPowerLink footprint that intersects Gunn Point Beach is of particular importance to shorebirds. Such a small and temporary loss of habitat cannot reasonably be considered a significant habitat, especially given that section of the beach is already regularly frequented by recreational users – including use of quad bikes and vehicles on the beach. Whilst it is likely that the short-term noise and movement from construction activity on Gunn Point Beach will deter shorebirds from using that end of the beach, as mentioned above, that particular section of the beach is already regularly subject to use of quad bikes and vehicles on the beach. Consequently, during construction, one disturbance will temporarily replace another. Finally, it should be noted that the location of the AAPowerLink footprint is adjacent to the Project Sea Dragon water supply and disposal pipelines – construction of which is at a similar scale to that of the AAPowerLink infrastructure – and which were recently approved.

Neither construction nor operation of the AAPowerLink involves actions that would cause direct mortality of shorebirds, not disrupt breeding, because these species breed in the northern hemisphere.

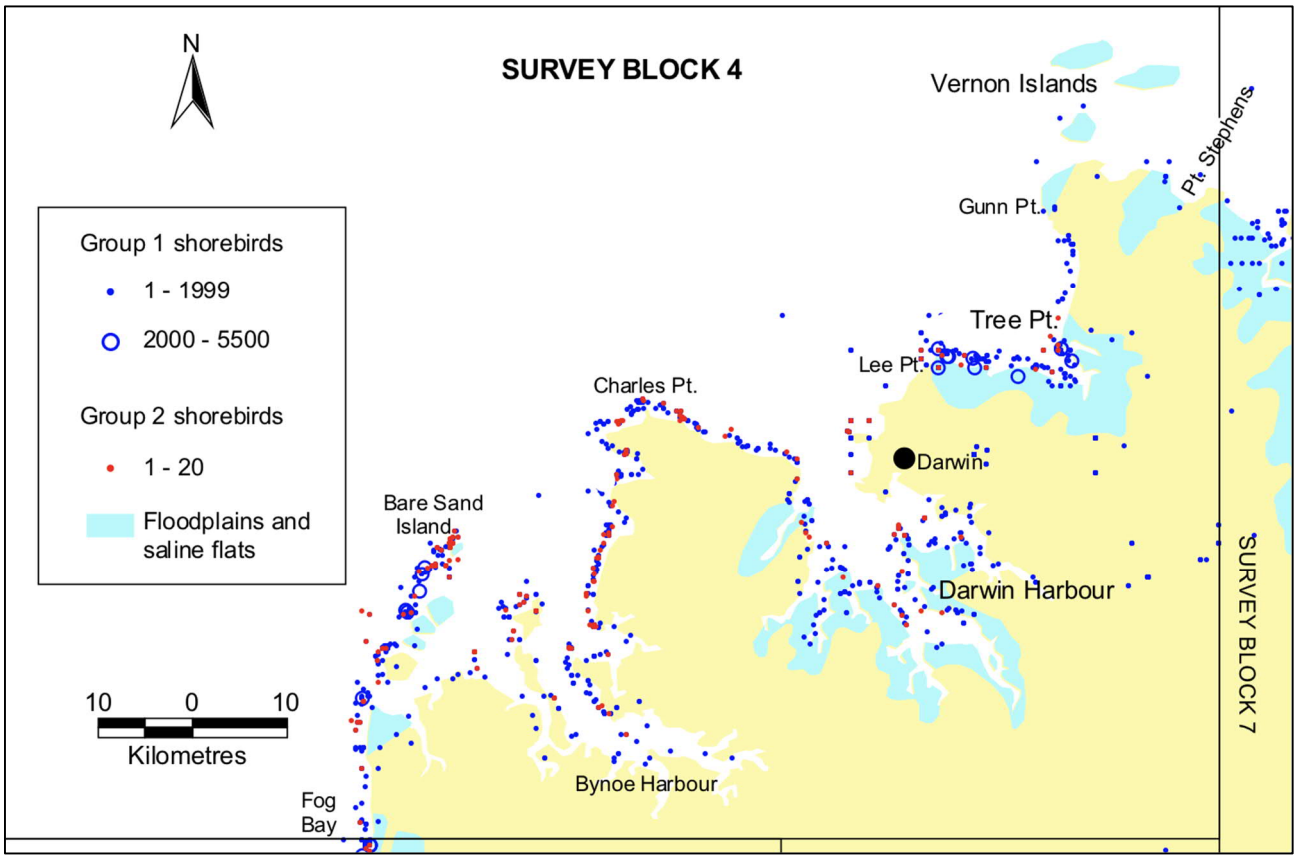


Figure 16-1. Map of Chatto (2003) shorebird survey results for the Darwin and Bynoe Harbour region

Stylidium ensatum

The trigger plant, *Stylidium ensatum*, is endemic to the NT and inhabits margins of drainage areas in damp heavy clay or peaty soil (Cowie and Westaway 2012). An Endangered species, at the time that the approved Commonwealth's Conservation Advice (TSSC 2016b) for this species was written there were only two known sub-populations – Hayes Creek (150 km south of Darwin) and the Howard River. Since then, discovery of multiple occurrences within the Gunn Point has significantly increased the abundance and extent of the total known population.

Stokeld et al. (2020) identified more than 4,000 ha with a moderate or high likelihood of habitat suitability for *Stylidium ensatum* within Gunn Point peninsula and, in the field, found this species to be widespread and locally abundant, recorded at 12 discrete sites in the Gunn Point, many close to the OHTL Utilities Corridor.

The proposal footprint does not disturb any known occurrences of *Stylidium ensatum*. There are two habitat models available for this species – a coarse whole-of-range dataset (NTG 2016) and a more refined dataset for the Gunn Point region (Stokeld et al. 2020). Desktop assessment and field observations identified 20 locations of suitable habitat for *Stylidium ensatum* within the OHTL Utilities Corridor – see Chapter 5. These assessments were based on preferred habitat characteristics, and proximity to existing locations. There are also areas of high likelihood habitat modelled for this threatened flora species within the OHTL (Railway Corridor) in small patches near Acacia Hills and around Adelaide River township, noting that disturbance associated with construction of the railway may mean the species is not present.

Presence/absence surveys for this species within the proposal's area of influence are yet to be undertaken and are scheduled for mid-2022. Given this species Endangered status, a loss of a single individual – through direct disturbance or downstream impacts associated with surface water – could be considered a significant impact. Table 16-5 presents a preliminary significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA 2013). The assessment uses desktop information only, based on the assumption that some of the modelled habitat within the proposal footprint contains *Stylidium ensatum*, but so does immediately adjacent habitat that is outside the footprint – in other words, any occurrences of the species are not confined to the proposal footprint. Surveys may detect *Stylidium ensatum* within the Utilities Corridor because that region's habitat modelling has been refined. The habitat modelling for this species elsewhere is coarse, and it is the author's experience during previous surveys for this species that the species is seldom detected in modelled high likelihood habitat. Consequently, it is unlikely that the modelled habitat within the Railway Corridor footprint will contain *Stylidium ensatum*.

The significant impact assessment will be updated for the Supplementary EIS to include the results of the targeted survey. For now, the conclusion is that it is unlikely that proposal activities will have a significant impact upon *Stylidium ensatum*. Even if this restricted-range species is present within the OHTL footprint, its occurrence will almost certainly be very localised, and therefore the proposal's design can be altered to avoid or minimise impacts to it.

Table 16-5. Preliminary significant impact assessment for Stylidium ensatum

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of the population	In TSSC (2016b), the population size estimated for *Stylidium ensatum* is 11,000 individuals; however, Stokeld et al. (2020) detected thousands of additional plants at multiple Gunn Point sites, noting that 'records were often located along narrow ecotones, often only tens of metres wide'. If *Stylidium ensatum* is present within the OHTL footprint, it is likely that some of its habitat will be cleared and there is some mortality of *Stylidium ensatum* plants. Depending on the location of this habitat, there may be some capacity to modify the design locally to minimise, or even avoid, these impacts. Because of the narrowness of

Criterion	Summary of mitigation measures and significant impact assessment
	the footprint, and the fact that it is likely that the OHTL corridor will cross *Stylidium ensatum* habitat (i.e., drainage lines) perpendicularly, the proportion of habitat and individuals that will be destroyed is very small compared with that available in adjacent areas, as well as regionally. Loss of individual *Stylidium ensatum* within narrow swathes is unlikely to result in a long-term decrease in the size of the species' population.
Reduce the area of occupancy	According to Stokeld et al. (2021), the area of occupancy for *Stylidium ensatum* is 92 km^2, of which 72% is within the Gunn Point region. Determining area of occupancy is based on the IUCN 2 x 2 km grid cell method. If *Stylidium ensatum* is recorded within the OHTL footprint – and its loss cannot be avoided – the only way that loss can lead to a reduced area of occupancy is if it is entirely confined to within the OHTL footprint. In other words, if the plants lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced area of occupancy. Because the OHTL corridor will cross *Stylidium ensatum* habitat perpendicularly, it is very unlikely that this scenario will eventuate.
Fragment the existing population into two or more populations	Because the species often occurs along a linear ecotone – the margins of drainage areas – it is possible that construction of the OHTL could clear a swathe through an existing patch. The maximum width of habitat that would be lost is 22 m, reducing to 6 m post-construction (assuming construction pads and pole sites are chosen to avoid disturbing this species). Across its range, *Stylidium ensatum* occurs in patches separated by areas of unsuitable habitat. It seems unlikely that such minor additional gaps in its habitat will cause fragmentation into more populations.
Disrupt the breeding cycle of a population	Stylidium is a genus of trigger plants that are pollinated by insects. Whilst the relevant insect pollinator species for *Stylidium ensatum* are not known, it seems unlikely that clearing a narrow corridor through a patch would disrupt pollination of that patch.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss of, or decrease in quality of, habitat because of proposal activities will cause a decline in the species. Moreover, the OHTL will be constructed such that changes to existing surface hydrology are minimal – see Chapter 6 Hydrolgical processes.
Adversely affect critical habitat	Critical habitat has not been identified for *Stylidium ensatum*. This concept is arguably not relevant for rare species with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Potential impacts to such habitat are assessed under previous criteria.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The Conservation Advice (TSSC 2016b) identifies weeds as being a potential threat to *Stylidium ensatum*. The Weed Management Plan presented in Appendix Q has been developed to minimise introduction and proliferation of weeds within the proposal area of influence for the life of the proposal.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for *Stylidium ensatum*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of a species	There is no Recovery Plan for this species. In the Conservation Advice (TSSC 2016b), the primary conservation action is identified as being to 'protect extant sites from habitat loss and hydrology changes due to urban development and early dry season burning in the Darwin regional area.' The OHTL is designed to minimise changes to the surface

Criterion	Summary of mitigation measures and significant impact assessment
	hydrology of watercourses and drainage line it intersects. Neither construction nor operation of the AAPowerLink will result in an increase in bushfire.

Helicteres macrothrix

Helicteres macrothrix is an Endangered plant associated with Eucalyptus woodland on clayey soils derived from siltstone or sandier soils derived from the granite-like rock syenite. This species has been recorded from three populations – near Mt Bundey, near Batchelor and in the Lake Bennett area. The NT Government has mapped the extent of occurrence of *Helicteres macrothrix* based on known recorded locations (DLRM 2016). The OHTL (Railway Corridor) crosses just over 10 km of habitat – most of which is between Darwin River Dam and Adelaide River (see Chapter 5 Terrestrial Ecosystems) – noting that disturbance associated with construction of the railway may mean the species is not present. There has been little survey effort for this species in the south of its projected distribution, and the only records from that region happen to be near to the OHTL (Railway Corridor) just south of where it crosses Crater Lake Rd near the Batchelor turn-off.

Presence/absence surveys for this species within the proposal's area of influence are yet to be undertaken and are scheduled for mid-2022. Given this species Endangered status, the presence a single individual can be considered an 'important population'. Table 16-6 presents a preliminary significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA 2013). The assessment uses desktop information only, based on the assumption that some of the modelled habitat within the proposal footprint contains *Helicteres macrothrix*, but so does immediately adjacent habitat that is outside the footprint – in other words, any occurrences of the species are not confined to the proposal footprint. Surveys may detect *Helicteres macrothrix* within the Utilities Corridor because that region's habitat modelling has been refined. The habitat modelling for this species elsewhere is coarse, and it is the author's experience during previous surveys for this species that the species is seldom detected in modelled high likelihood habitat. Consequently, it is unlikely that the modelled habitat within the (Railway Corridor) footprint will contain *Helicteres macrothrix*.

The significant impact assessment will be updated for the Supplementary EIS to include the results of the targeted survey. For now, the conclusion is that it is unlikely that proposal activities will have a significant impact upon *Helicteres macrothrix*. Even if this restricted-range species is present within the OHTL footprint, its occurrence will almost certainly be very localised, and therefore the proposal's design can be altered to avoid or minimise impacts to it.

Table 16-6. Preliminary significant impact assessment for Helicteres macrothrix

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of the population	According to TSSC (2008) and Cowie et al. (2012), the current estimated total number of individuals of this species is in the 100,000s. If *Helicteres macrothrix* is present within the OHTL footprint, it is likely that some of its habitat will be cleared and there is some mortality of *Helicteres macrothrix* plants. Depending on the location of this habitat, there may be some capacity to modify the design locally to minimise, or even avoid, these impacts. Because of the narrowness of the footprint, the proportion of habitat and individuals that will be destroyed is likely to very small compared with that available in adjacent areas, as well as regionally. Loss of individual *Helicteres macrothrix* within narrow swathes is unlikely to result in a long-term decrease in the size of the species' population.

Criterion	Summary of mitigation measures and significant impact assessment
Reduce the area of occupancy	*Helicteres macrothrix* occurs in three populations across an extent of 915 km^2, although the total area of occupancy is only ~0.14 km^2 (TSSC 2008). There remain large areas of habitat for this species that are yet to be surveyed, so this is likely an underestimate. Determining area of occupancy is based on the IUCN 2 x 2 km grid cell method. If *Helicteres macrothrix* is recorded within the OHTL footprint – and its loss cannot be avoided – the only way that loss can lead to a reduced area of occupancy is if it is entirely confined to within the OHTL footprint. In other words, if the plants lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced area of occupancy. Where *Helicteres macrothrix* is known to occur, it is usually in patches larger than what could be encapsulated entirely within the OHTL footprint. Consequently, it is very unlikely that this scenario will eventuate.
Fragment the existing population into two or more populations	It is possible that construction of the OHTL could clear a swathe through an existing patch of *Helicteres macrothrix*. The maximum width of habitat that would be lost is 22 m, reduced to 6 m post-construction (assuming construction pads and pole sites are chosen to avoid disturbing this species). It seems unlikely that such minor additional gaps in its habitat will cause fragmentation into more populations.
Disrupt the breeding cycle of a population	Helicteres is a genus of flowering plants. It is no known how *Helicteres macrothrix* is pollinated, but presumably it is by insects. Regardless, it seems unlikely that clearing a narrow corridor through a *Helicteres macrothrix* patch would disrupt pollination of that patch.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss of, or decrease in quality of, habitat because of proposal activities will cause a decline in the species.
Adversely affect critical habitat	Critical habitat has not been identified for *Helicteres macrothrix*. This concept is arguably not relevant for rare species with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Potential impacts to such habitat are assessed under previous criteria.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The Conservation Advice (TSSC 2008) identifies weed invasion by Gamba Grass (*Andropogon gayanus*) and Mission Grass (*Pennisetum polystachion*) as a major threat to *Helicteres macrothrix.* These weeds may alter fire frequency and intensity, as well as out-competing individual plants. The Weed Management Plan presented in Appendix Q has been developed to minimise introduction and proliferation of weeds within the proposal area of influence for the life of the proposal.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for *Helicteres macrothrix*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of a species	There is no Recovery Plan for this species. In the Conservation Advice (TSSC 2008), the main identified threats are land clearing for development and weed invasion by Gamba Grass and Mission Grass. The OHTL is designed to minimise clearing of suitable habitat for *Helicteres macrothrix*. The Weed Management Plan has been developed to minimise introduction and proliferation of weeds within the proposal area of influence.

16.3.2.2 Marine

The Subsea Cable System traverses a large area of marine habitat, and therefore intersects with suitable habitat for many threatened marine species. However, given that proposal activities within the marine environment occur within a very localised footprint – and over a short time frame in any one location – the likelihood that most of these species will be affected is very low. To narrow down which threatened species are at most risk of being negatively impacted by proposal activities, the *Marine Ecology Report* (Appendix T) determined for which species there is important habitat – i.e., critical for feeding, nesting, breeding and/or migrating – within the proposal footprint. Those species are presented in Table 16-7.

The Subsea Cable route passes through habitat for numerous species of significant marine mammals, marine turtles, and elasmobranchs. Construction and operation of the Subsea Cable could have an impact on these species through direct mortality, loss of habitat and/or disruption to behaviour because of light, electromagnetic frequencies (EMF) or noise.

Direct mortality due to collisions between marine mega-fauna and large, slow-moving ships such as will be used for cable-laying are rare and will be mitigated against through reduced vessel speeds in high-risk areas. Regarding permanent loss of habitat, the very narrow proposal footprint (12 m wide disturbance per cable) means that the seabed within the Subsea Cable System does not constitute core or important habitat for any significant marine species. Instead, the route passes through large regions of important nesting, inter-nesting, migrating and/or foraging habitat. This is an important distinction, as it dramatically reduces the potential impact laying and operating the HVDC cables within a narrow footprint could have on the habitat of these species.

The presence of cable-laying ships, the generation of noise and production of light during construction, and heat and EMF during operations will – at most – have a very spatially- and temporally-limited impact on individual sensitive species.

Table 16-7. Marine threatened species with the potential to be impacted by development of the proposal

Species	Status	Presence		Comment
		Nearshore	Offshore	
Flatback Turtle *Natator depressus*	VU	x	x	The first 175 km of the Subsea Cable System footprint coincides with critical[2] nesting and inter-nesting[3] habitat (i.e., within a 60 km buffer of the coastline from Anson Bay south-west of Darwin to the Tiwi Islands). A biologically important inter-nesting zone overlaps the critical nesting habitat. Individuals that nest on the Pilbara coast disperse to feeding areas extending from Exmouth Gulf to the Tiwi Islands. In particular, the species has been recorded foraging on the carbonate banks of the Joseph Bonaparte Gulf and around the pinnacles of the Bonaparte Basin.
Loggerhead Turtle *Caretta caretta*	EN	-	x	Midway along the route, the Subsea Cable System footprint crosses a biologically important foraging area on the carbonate banks of the Joseph Bonaparte Gulf and around the pinnacles of the Bonaparte Depression for these two species. For Olive Ridley Turtles there are two such areas. All of these species nest along the coastline either to the east and/or west of the footprint (i.e., not to the south).
Olive Ridley Turtle *Lepidochelys olivacea*	EN	-	x	
Freshwater or Largetooth Sawfish *Pristis pristis*	VU	x	-	Based on proximate records, these three species of threatened elasmobranchs[4] could occur within the Shoal Bay region. The species inhabit tropical marine and estuarine habitats, entering estuarine or fresh waters to breed during the wet season, and moving into marine waters following the wet season
Green Sawfish *Pristis zijsron*	VU	x	-	
Dwarf Sawfish *Pristis clavata*	VU	x	-	
Pygmy Blue Whale *Balaenoptera musculus brevicauda*	EN	-	x	The final section of the Subsea Cable System footprint in Australian waters crosses a biologically important area for migration. The sub-species migrates annually through Australian waters along the WA coast from their feeding grounds in the Antarctic to tropical breeding locations, and back again. The Pygmy Blue Whale tends to pass through a broad migration corridor along the edge of the continental shelf at depths of 500 to 1000 m.
Whale Shark *Rhincodon typus*	VU	-	x	The 200 m isobath[5] along the northern part of the Western Australian coast is an important migration route, with migration occurring mainly between July and November. Consequently, the WA offshore waters from Shark Bay northwards are considered biologically important foraging areas. The Subsea Cable System footprint crosses the northernmost section of those waters.

[2] Under the EPBC Act, habitat critical to the survival of the threatened marine turtle species must be identified in the *Recovery Plan for Marine Turtles* (DoE 2017). In addition, the marine bioregional planning program led to the identification and mapping of biologically important areas (BIA's) for Commonwealth protected species.

[3] Female marine turtles generally lay several clutches of eggs each nesting season, and rest and forage in the time between laying clutches (the inter-nesting period) in the waters off the nesting beach.

[4] A collective term for sharks, skates, and rays

[5] An imaginary line connecting all points of a certain depth, in this case – 200 m

16.4 Migratory species

16.4.1 Context

Australia is a signatory to three bilateral migratory bird agreements with Japan, China, and the Republic of Korea. These agreements provide a basis for cooperation on activities for the conservation of migratory birds that move between each country. Species listed on the annexes to these agreements are a Matter of National Environmental Significance under the *EPBC Act* as listed migratory species.

The EIS Terms of Reference identify fauna species listed as 'migratory' under *EPBC Act* that may be present within the Solar Precinct and/or OHTL (Railway Corridor) footprint. When assessing if a proposal will significantly impact upon a migratory species, the key considerations under the *EPBC Significant Impact Guidelines 1.1* (are whether an important habitat for a migratory species or an ecologically significant proportion of a population of a migratory species is involved.

For migratory shorebirds, the *EPBC Act Policy Statement 3.21* (DOE 2015) defines the criteria for important habitat as sites that support any of the following:

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

16.4.2 Impact assessment

16.4.2.1 Terrestrial

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. Migratory woodland species could occur in any suitable habitat within the OHTL footprint, and sections where it crosses wetlands and riparian could support migratory shorebirds.

The migratory species relevant to the Solar Precinct, OHTL and Darwin Converter Site footprints have very different habitats and ecologies. However, they are all similar in that the footprints neither contain important habitat for them, nor are ecologically significant proportions of populations likely to be present within them. All the species are likely to occur – seasonally – across the footprints in abundances commensurate with elsewhere in the region. Habitat for these species is widespread in the region, including within the footprints. Consequently, the inherent likelihood of a significant impact to migratory species because of proposal activities within the Solar Precinct and OHTL footprints is low, and so impacts to migratory species are only assessed for the Cable Transition Facilities. 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. However, the usual extent of Lake Woods is over 10 km away. This distance, and the design and mitigation measures detailed in Chapters 6 Hydrological Processes and Chapter 7 Inland Water Environmental Quality, mean that Lake Woods is not considered to be within the proposal's area of influence. The 'lake effect hypothesis' – posited to explain why some species of aquatic-habitat birds have been recorded colliding with solar panels in some locations (as detailed in Chapter 5 Terrestrial Ecosystems) – has not been noted as affecting the types of migratory birds that occur in the NT.

Construction of the Cable Transition Facilities will impact upon Gunn Point Beach. There are 18 migratory shorebird species known from the Gunn Point Beach area – eight of which are also threatened species. The area qualifies as important habitat for migratory species because there is a count of Greater Sand Plover that exceeds 0.1 % of the flyway population – see Migratory Shorebirds under Section 16.3.2.1 for detail.

Table 16-8 presents a list of the actions identified in *EPBC Act Policy Statement 3.21 – Industry guidelines for Avoiding, Assessing and Mitigating Impacts on EPBC Act Listed Migratory Shorebird Species* (DOE 2015) that may constitute a significant impact on migratory shorebirds, and uses that list to show that the activities associated with this proposal's activities will not surpass any of those thresholds, and hence will not result in a significant impact to migratory shorebirds.

Table 16-8. Thresholds of significant impacts on migratory shorebirds

Significant impact	Comment
Loss of habitat	The section of the Cable Transition Facility that crosses shorebird habitat is a ~500 m long and 500 m wide corridor where up to 6 trenches, each up to 5 m wide, will be excavated. Installation should only take 1 to 2 months Such a small and temporary loss of habitat cannot reasonably be considered a significant, especially given that section of the beach is already regularly frequented by recreational users – including use of quad bikes and vehicles on the beach.
Degradation of habitat leading to a *substantial reduction* in migratory shorebird numbers	As detailed in Chapter 9 Marine Environmental Quality, neither construction nor operation of the AAPowerLink will lead to reduced marine water or sediment quality that could degrade the shorebird habitat within Shoal Bay.
Increased **disturbance** leading to a *substantial reduction* in migratory shorebird numbers	The noise and movement from construction activity on Gunn Point Beach may deter shorebirds from using that end of the beach. However, as mentioned above, that particular section of the beach is already regularly subject to use of quad bikes and vehicles on the beach. Consequently, during construction activities (which will likely preclude public access to the beach), one disturbance will replace another, with no increase in disturbance.
Direct mortality of birds leading to a *substantial reduction* in migratory shorebird numbers	Neither construction nor operation of the AAPowerLink involves actions that would cause direct mortality of shorebirds.

16.4.2.2 Marine

The PMST Report for the Subsea Cable System (provided in Appendix T) identified 25 listed migratory species (excluding those that are also listed threatened species, and so discussed in Section 16.3.2.2) that could occur within the proposal's marine footprint. These are presented in Table 16-9.

Eleven of the species are birds – three wetland shorebird species, six pelagic (open ocean) species and two species that occur over both land and sea. The previous section presents an assessment justifying why there will be no significant impact to shorebirds; it also applies to the two marine species that occur both on land and at sea. The depth of the Subsea Cables means that pelagic bird species cannot be impacted.

The whales and sharks in Table 16-9 prefer deeper marine waters. The remaining migratory species prefer nearshore habitats. The three species of dolphins have been recorded around the Gunn Point peninsula; however, the Shoal Bay region is not identified in North Region Marine Plan as being biologically important for foraging, provisioning of young, feeding or breeding. Estuarine Crocodiles are likely to be common in the higher orders rivers and creeks traversed by the OHTL corridor as far south as Mataranka. Estuarine Crocodiles also occur in Shoal Bay; however, the species is highly mobile, and more frequently inhabits rivers as opposed to the ocean. The preferred sea grass habitat for Dugongs is present within Shoal Bay, and Dugongs have been

recorded in the area. Important areas for Dugong in the region include Gunn Point Reef and Shoal Bay (north of Tree Point). Finally, Narrow Sawfish has been recorded at the mouth of Buffalo Creek, in southern Shoal Bay. From what little is known about this species, its general ecology appears to be similar to the three threatened species of sawfish assessed in Section 16.3.2.2.

As detailed in Chapter 10 Marine Ecosystems, construction and operation of the Subsea Cable System could have an impact on these species through direct mortality, loss of habitat and/or disruption to behaviour because of light or noise. However, none of these impacts are likely to have a significant impact on any of these species. Collisions between marine mega-fauna and large, slow-moving ships such as will be used for cable-laying are rare and will be mitigated against. Regarding permanent loss of habitat, the very narrow proposal footprint means that – apart from seagrass in Shoal Bay (discussed below) – the seabed within the Subsea Cable System does not constitute core or important habitat for any marine migratory species. This dramatically reduces the potential impact laying and operating the Subsea Cable System within a narrow footprint could have on the habitat of these species.

The only known area of important threatened species habitat that will be disturbed – directly and by sediment re-suspension – is some patches of seagrass meadows utilised by Dugongs in Shoal Bay. The proportion of seagrass habitat within Shoal Bay that will be directly disturbed during cable-laying is small – 0.054%[6] – and will likely recover quickly, limiting the impact both spatially and temporally.

The presence of cable-laying ships, the generation of noise and production of light during construction, and heat and EMF during operations will – at most – have a very spatially- and temporally-limited impact on individual sensitive species. It is highly unlikely that a significant number of any of these species would be impacted at a particular point or time.

No important habitat or ecologically significant proportions of populations of migratory species have been identified within the marine footprint of this proposal. The Subsea Cable System traverses a large area of marine habitat, and therefore intersects with suitable habitat for many migratory marine species. Consequently, given that proposal activities within the marine environment occur within a very localised footprint – and over a short time frame in any one location – the likelihood that any migratory marine species will be affected is very low.

Table 16-9. Migratory marine species that could occur within the proposal's marine footprint

Common name	Scientific name
Migratory bird species	
Fork-tailed Swift	*Apus pacificus*
Streaked Shearwater	*Calonectris leucomelas*
Lesser Frigatebird	*Fregata ariel*
Great Frigatebird	*Fregata minor*
White-tailed Tropicbird	*Phaethon lepturus*
Brown Booby	*Sula leucogaster*
Red-footed Booby	*Sula sula*

[6] Calculated using the area of modelled seagrass habitat in Route A (which contains the most of the two routes) and the assumption that 6 cable-laying footprints that are each 22 m wide will run through all of the modelled habitat in the corridor.

Common name	Scientific name
Migratory marine species	
Narrow Sawfish	*Anoxypristis cuspidate*
Bryde's Whale	*Balaenoptera edeni*
Oceanic Whitetip Shark	*Carcharhinus longimanus*
Estuarine Crocodile	*Crocodylus porosus*
Dugong	*Dugong dugon*
Shortfin Mako	*Isurus oxyrinchus*
Longfin Mako	*Isurus paucus*
Reef Manta Ray	*Manta alfredi*
Giant Manta Ray	*Manta birostris*
Australian Snubfin Dolphin	*Orcaella heinsohni*
Killer Whale	*Orcinus orca*
Sperm Whale	*Physeter macrocephalus*
Indo-Pacific Humpback Dolphin	*Sousa chinensis*
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	*Tursiops aduncus*
Migratory wetland species	
Common Sandpiper	*Actitis hypoleucos*
Sharp-tailed Sandpiper	*Calidris acuminata*
Pectoral Sandpiper	*Calidris melanotos*
Osprey	*Pandion haliaetus*

16.5 Commonwealth marine area

16.5.1 Context

Protected under section 24 of the *EPBC Act*, the Commonwealth marine area is the area of sea extending from the NT coastal water limits to the edge of the Continental Shelf.

A proportion of the Commonwealth marine area relevant to the Subsea Cable System footprint is within the Oceanic Shoals Marine Park (OSMP) – a 72,000 km^2 protected area spanning the eastern and western extents of the North and North-west Marine Regions, respectively – see Figure 16-2. The OSMP is part of the National Reserve System of Marine Protected Areas and was proclaimed in 2012. The Subsea Cable System transects the OSMP for approximately 300 km to avoid Defence training areas.

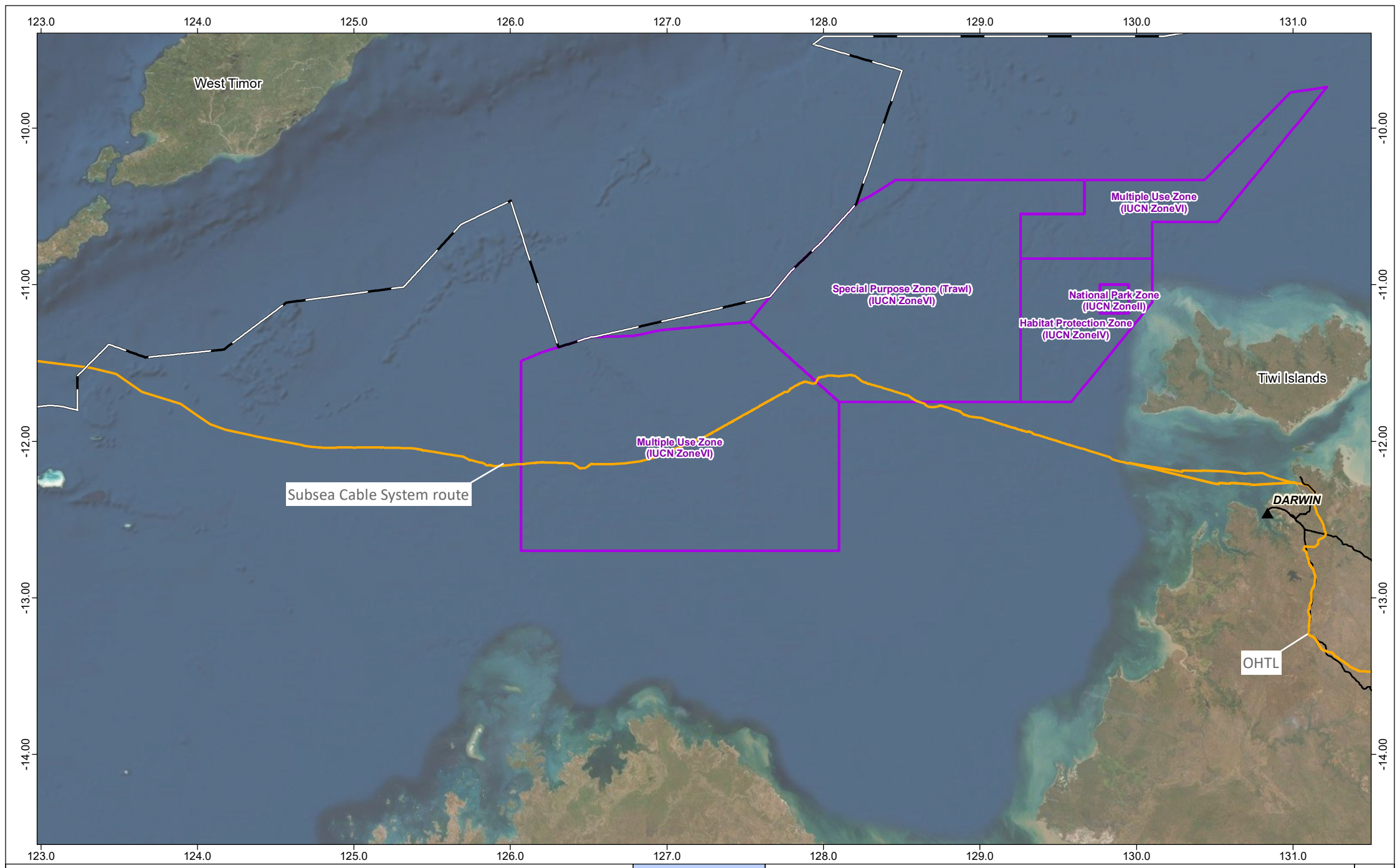
In addition to the benthic habitats of the outer shelf and the shelf slope – which are not relevant to the Subsea Cable System footprint – the OSMP is characterised by a chain of biohermic banks/shoals and atolls along the shelf edge rising from the continental slope, and by several platform reefs rising from the seafloor of the outer shelf.

The OSMP comprises four different International Union for Conservation of Nature (IUCN) protected area management zones (categories). The Subsea Cable System transects approximately 84 km of the Special Purpose zone and 220 km of the Multiple Use zone (both IUCN VI), which allows vessel transiting and recreational fishing, but no commercial fishing, tourism, or mining unless with approval (see Figure 16-2).

Listed marine species are protected under the *EPBC Act*. The PMST Report for the Subsea Cable System (provided in Appendix T) identifies which Commonwealth-listed marine species may be present, within a 5 km buffer as stipulated in the EIS TOR. The PMST report identified 24 threatened species (assessed in Section 16.3.2.2), 44 species listed as Migratory under the *EPBC Act* (assessed in Section 16.4.2.2), 27 other cetaceans, and 82 species listed as Marine under the *EPBC Act*. These totals include species that fall within more than one category – e.g., are threatened and a cetacean.

The Subsea Cable System traverses a large area of marine habitat, and therefore intersects with suitable habitat for many significant marine species. However, given that proposal activities within the marine environment occur within a very localised footprint – and over a short time frame in any one location – the likelihood that most of these species will be affected is very low. To narrow down which significant species are at most risk of being negatively impacted by proposal activities, the *Marine Ecology Report* (Appendix T) identified for which marine species there is important habitat – i.e., critical for feeding, nesting, breeding and/or migrating – within the proposal footprint.

All of the threatened and migratory species and cetaceans were assessed. However, a large proportion of the listed marine species in the PMST report are pipefish, seahorses, and sea snakes, about which very little is known. These species were also not included in the large list of species requiring consideration in the Terms of Reference. There is inadequate information available to assess the likelihood of occurrence of these species in the Commonwealth marine area traversed by the Subsea Cable System, except that it is likely to be low because these species tend to be associated with shallow waters (less than 20 m deep).



Legend

- AAPowerLink Infrastructure
- Commonwealth Marine Area
- Oceanic Shoals Marine Park

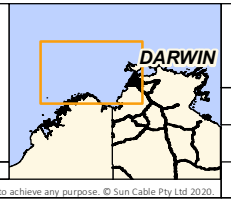


Fig 16-2: Map of Oceanic Shoals Marine Park

N

Project: Australia-Asia PowerLink	Reference #: Document 210767	Revision: 1
Coordinate System: GDA2020	Date: 10/03/2022	
0 30 60 90 120 Kilometers	Scale: 1:3,350,000	A4

SUN CABLE

Source: Sun Cable, EcOz, NTG (NR Maps)

16.5.2 Impact assessment

Potential impacts to the Commonwealth marine area are associated with installation and maintenance of the Subsea Cable System. The AAPowerLink EIA, identified and assessed the following potential impacts relevant to the Commonwealth marine area:

Direct habitat loss and degradation on the seabed of the Commonwealth marine area through:

- Pre-sweeping
- Boulder clearance
- UXO clearance
- Route clearance and PLGR activities which may dig and remove debris buried at shallow depths within the seabed
- Side-casting or disposal of dredged seabed material in the Commonwealth marine area
- Accidental, unauthorised release of controlled materials[7] from installation vessels
- Impacts to the water column of the Commonwealth marine area through:
- Increased sediment dispersion
- Increased light, noise, and vibration
- Accidental, unauthorised release of controlled materials from installation vessels
- Accidental, unauthorised release of ballast waters transported into the Commonwealth marine area from outside the Australian jurisdiction, leading to the introduction of harmful aquatic organisms
- Impacts to sea-life within the Commonwealth marine area through:
- Introduction of marine pests
- Direct fauna mortality/collision with vessels.
- Changes to fauna behaviour as a result of additional noise, light, vibration sedimentation, and temperature
- Changes to fauna behaviour as a result of and changed seabed conditions, such as through the placement of rocks/rock bags/concrete mattresses/cast iron shells/polyurethane shells to cover the Subsea Cable System where:
- The seabed consists of rocks or hard sediments which cannot be jet trenched, or
- It is necessary to cross an existing subsea cable, or
- The Subsea Cable System was inadequately buried during initial installation attempt

[7] As per Section 4 of the *Environment Protection (Sea Dumping Act) 1981 (Cwth)*, controlled materials include: dredged material; fish wastes; inert, organic geological material; specific bulky items; sewage sludge; vessels and platforms or other manmade structures at sea; organic material of natural origin; carbon dioxide CO2 streams from carbon dioxide capture processes, as well as well as a vessel, aircraft or platform. This is in line with the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972*.

- Localised changes to fauna behaviour where legacy subsea cable systems are de-buried and cut in order to facilitate placement of the proposal's Subsea Cable System (as disused subsea cables may have become microhabitat for marine fauna)
- Localised changes to fauna behaviour where debris which have become fauna microhabitat are removed during PLGR activities
- Accidental, unauthorised releases of controlled materials from installation vessels
- Accidental, unauthorised release of ballast waters transported into the Commonwealth marine area from outside the Australian jurisdiction, leading to the introduction of harmful aquatic organisms.

The following impacts could occur during the operation phase:

- Seabed and water column disturbance from cable repairs, including the placement of side-castings and the disposal of dredged seabed material in the Commonwealth marine area
- Changes to fauna behaviour due to localised EMF activity
- Impacts to the water column and fauna behaviour as a result of localised heating of the environment surrounding the cables (i.e., in the sediment for buried cables or in water within the interstitial spaces of rock armouring)
- Accidental, unauthorised releases of controlled materials from installation vessels
- Accidental, unauthorised release of ballast waters transported into the Commonwealth marine area from outside the Australian jurisdiction, leading to the introduction of harmful aquatic organisms.

These impacts are discussed in Chapter 9 Marine Environmental Quality and Chapter 10 Marine Ecosystems. The information presented in those chapters has been used to inform the assessment of impacts to the Commonwealth marine area as summarised below.

The *EPBC Significant Impact Guidelines 1.1* (DEWHA 2013) describe the process for determining the significance of impacts to the Commonwealth marine area. Table 16-10 presents the circumstances under which an action is likely to have a significant impact on the environment in a Commonwealth marine area. For all situations, the conclusion is that it is unlikely that the proposed action will have a significant impact on the Commonwealth marine area.

Table 16-10. Significant impact assessment for the Commonwealth marine area

An action is likely to have a significant impact on a Commonwealth marine area if there is a real chance or possibility that the action will:	Assessment
Result in a known or potential pest species becoming established in the Commonwealth marine area	**Unlikely.** All vessels used during construction will comply with relevant national guidelines to minimise risks of bio-fouling and avoid the introduction of marine pests into Australian waters. This is discussed in Chapter 10. Where required, permits will be obtained, and appropriate management systems, record-keeping practices and notification procedures will be followed, as per the relevant legislation.
Modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area	**Unlikely.** As discussed in detail in Chapter 10, benthic habitat will be directly impacted within the disturbance footprint of each cable. Some significant benthic habitat is likely to be impacted, including seagrass, seaweed, and hard coral habitat. Recovery after disturbance may take years for some habitat (e.g., coral), but seagrass and seaweed will recover quickly. Impacts to benthic

An action is likely to have a significant impact on a Commonwealth marine area if there is a real chance or possibility that the action will:	Assessment
	habitat will be more likely, and more pronounced, in the nearshore marine environment (i.e., outside of Commonwealth waters). Suspended sediment concentrations (SSC) will be elevated for a number of days in the region surrounding the construction footprint. Benthic habitats rely on light penetration, and so benthic habitat is likely to be impacted by decreased light penetration for a number of days. Used to natural fluctuation in turbidity, most values should recover quickly (within days /weeks) and fully. Some – such as hard corals – may take longer but should still recover fully. This impact will be very limited in time and space in deep offshore waters (see Appendix R Marine Modelling report and Appendix S Marine Environmental Quality).
Have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution	**Unlikely.** As discussed in detail in Chapter 10, the fact that all impacts associated with proposal activities are spatially and/or temporally restricted, means that no population of a marine species listed as Marine and occurring within the Commonwealth marine area are likely to be significantly impacted upon.
Result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity, social amenity, or human health	**Unlikely.** As discussed in detail in Chapter 9, there are a few pathways for water quality to be impacted, but these can be easily mitigated. Temperature changes will occur, but only in very close proximity to the cables (within 1 m), hence not a substantial change. The extent or duration of these is unlikely to warrant a significant impact.
Result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity, or human health may be adversely affected, or	**Unlikely.** Construction and operations of the Subsea Cable System does not require the use of any such chemicals.
Have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.	**Unlikely.** The Subsea Cable area of influence does not intersect any known heritage values.

16.6 Avoidance, mitigation, and monitoring

Sun Cable is committed to applying the environmental decision-making hierarchy. Consistent with Section 26 of the *EP Act* this involves applying the following approaches in order of priority:

1. Avoid – Ensure that actions are designed to avoid adverse impacts on the environment.
2. Mitigate – Identify management options to mitigate adverse impacts on the environment to the greatest extent practicable.
3. Offset – If appropriate, provide for environmental offsets for residual adverse impacts on the environment that cannot be avoided or mitigated.

The environmental management framework that will be adopted for the construction and operation of the AAPowerLink is detailed in Chapter 17 Environmental Management. The framework comprises a Construction Environmental Management Plan (CEMP) and Operations Environmental Management Plan (OEMP) that sit within an overarching Environmental Management System (EMS).

For each of the impacts to MNES discussed in this chapter, Table 16-11 summarises the actions that will be taken to avoid environmental impacts (through site selection and design) and actions proposed to minimise impacts during construction and operation of the proposal. The proposed controls are routine for the installation of Subsea Cables, and assuming proper implementation and adaptive management, will be effective in ensuring no unacceptable impacts to MNES. The proposed avoidance, mitigation and management measures are aligned with the requirements of all *EPBC Act* relevant policy and guidance. The measures provided in this chapter, along with any additional measures required to address conditions of approvals, permits and licences, will be integrated into the CEMP and OEMP prepared for the AAPowerLink as described in Chapter 17 Environmental Management.

Table 16-11. Matters of National Environmental Significance - Avoidance, mitigation, monitoring and reporting commitments

Impact	Avoidance	Mitigation	Monitoring	Reporting
Commitments relevant to Terrestrial Matters of National Environmental Significance				
Loss of vegetation and habitat **Loss of significant vegetation**	Solar Precinct footprint does not contain any significant vegetation types. Micro-siting of transmission towers to avoid significant vegetation where possible. Preferential use of existing cleared areas where possible for temporary construction requirements such as access tracks, laydown areas and construction camps.	Clearing will be conducted in accordance with a Land Clearing and Disturbance Procedure which will ensure clearance only within the boundaries approved in licences obtained to clear native vegetation as per the *Planning Act* and/or the *Pastoral Land Act*. Develop and implemented a Re-instatement Plan for post-construction reinstatement of all temporary construction footprints and follow-up weed control post-construction. Post-operations rehabilitation of cleared areas as per the Decommissioning and Rehabilitation Plan (refer Chapter 2 Section).	Visual inspections during clearing to ensure clearing is within approved boundaries. Results recorded, along with any photographs. Rehabilitation inspections following first wet season post-construction or until vegetation is established and sites are stable.	Records of clearing undertaken.
Introduction and spread of weeds and pests	Avoid introducing new weeds into proposal footprint by implementing weed hygiene, as per the Weed Management Plan (Appendix Q)	Implementation of Weed Management Plan (Appendix Q) that has been developed in accordance with the requirements of the *Weeds Management Act* and relevant statutory weed management plans.	As per the Weed Management Plan (Appendix Q)	As per the Weed Management Plan (Appendix Q
Changes in fire regimes	Observe fire bans.	Develop and implement a Bushfire Management Plan, including first response capability.	Visual monitoring for fires Monitoring NAFI website for proximate fires which may impact proposal. Monitoring conditions for fire risk.	Any fires reported to Bushfires NT or appropriate authority.
Direct fauna mortality	Avoiding clearing large hollow-bearing trees where possible.	Clearing will be conducted in accordance with a Land Clearing and Disturbance Procedure. Procedural controls will include:	Record any fauna encounters, injuries, or death as result of works for the duration of works.	Internal record keeping of incidents of fauna mortality.

Impact	Avoidance	Mitigation	Monitoring	Reporting
		Clearing in a single direction, allowing any fauna to move out of way of clearing activities. If fauna is spotted in immediate clearing area and are in danger, clearing will be stopped until safe to continue. Clearing in a progressive manner to allow wildlife to natural disperse from the area as clearing undertaken. Site inductions will ensure that all personnel are aware of their obligations and know the correct procedures for fauna encounters. Traffic Management Plans will incorporate vehicle speed restrictions as required for high-risk locations and conditions to minimise the risk of fauna collisions.		External reporting in accordance with environmental approval conditions
Habitat degradation and fragmentation	The OHTL will fragment habitat; the majority of the OHTL route has been located in the railway corridor where habitat fragmentation has already occurred.	Develop and implemented a Re-instatement Plan for post-construction reinstatement of all temporary construction footprints and follow-up weed control post-construction.	Nil	Nil
Bird collisions with panels	Location of Solar Precinct at a distance from waterbodies.	Nil	Incidental observations of carcasses, including during routine infrastructure inspections	Internal incident reporting. External reporting in accordance with environmental approval conditions
Bird collisions with transmission wires	Use of electrodes removes the need for a top earth wire (which is the wire associated with most birds' collision).	Powerlines will be marked with diverting devices at major river crossings and where they transect important wetland areas on Gunn Point peninsula. Installing diverting devices in response to any collision hotspots identified during operations.	Incidental observations of carcasses, including during routine infrastructure inspections Public reports of carcasses	Internal incident reporting. External reporting in accordance with

Impact	Avoidance	Mitigation	Monitoring	Reporting
				environmental approval conditions
Threatened species (restricted range)	Micro-siting of transmission towers and access tracks to avoid identified local occurrences (if present). Re-routing the access track to avoid local occurrences (if present).	Clearing will be conducted in accordance with a Land Clearing and Disturbance Procedure to ensure clearance only within the boundaries approved in licences obtained to clear native vegetation as per the *Planning Act* and/or the *Pastoral Land Act*. Develop and implemented a Re-instatement Plan for post-construction reinstatement of all temporary construction footprints and follow-up weed control post-construction. Post-operations rehabilitation of cleared areas as per the Decommissioning and Rehabilitation Plan (refer Chapter 2 Section).	Visual inspections during clearing to ensure clearing is within approved boundaries. Results recorded, along with any photographs. Rehabilitation inspections following first wet season post-construction or until vegetation is established and sites are stable.	Records of clearing undertaken. Records of rehabilitation inspections. External reporting in accordance with environmental approval conditions
Commitments relevant to Marine Matters of National Environmental Significance				
Habitat loss and degradation (marine)	Route design, where possible, has avoided topographical areas along the sea floor which are associated with areas of higher habitat value.	Nil	Turbidity monitoring in impact zone and baseline/reference site during cable installation in high-risk area (shallow, <10m depth).	Internal reporting on environmental performance. External reporting in accordance with environmental approval conditions
Introduction of marine pests	Manage vessels in accordance with *National Biofouling Guidelines* to avoid establishment of marine pests on vessels.	Marine Environment Management Plan to provide controls for ensuring vessels comply with the appropriate marine pest management guidelines/requirements.	Monitoring in accordance with the Marine Environment Management Plan	External reporting of any marine pest incursion.

Impact	Avoidance	Mitigation	Monitoring	Reporting
Direct fauna mortality/collision with vessels	Nil	Marine Environment Management Plan to the following controls: Cable-laying vessels will move slowly (up to 600m/hr). Support vessels will adhere to low speeds, particularly in high-risk areas (shallow waters and migration and foraging zones). If marine fauna is spotted, vessels will reduce speeds to below 6 knots until fauna has passed. No marine fauna will actively be approached by vessels.	Visual observation for marine fauna activity in accordance with the Marine Environment Management Plan	Internal incident reporting. Fauna strikes recorded and reported to the Marine Wildwatch Hotline 1800 453 941
Changes to fauna behaviours due to noise, light, and other disturbances	Route selection avoids important turtle breeding beaches. Cable laying activities move up to 500m per day which limits the duration of noise emissions in any given area.	Nil	Nil	Nil
Storage and handling of HAZMAT	Besides marine fuel oil, no HAZMAT materials will be used on vessels during construction	Marine Environment Management Plan to provide controls for ensuring compliance with MARPOL requirements regarding refuelling and spill prevention. HAZMAT will be stored and handled in accordance with Australian and International standards and guidelines. Prepare and implement an Environmental Emergency and Spill Response Plan.	Visual inspections of land-based storages and during refuelling activities for early spill detection. Spill response and follow-up monitoring in accordance with a Marine Environment Management Plan.	Internal records of volumes used and stored in accordance with Workplace Health and Safety Regulations. Internal inspection records and notes. Incidents of off-site pollution or nuisance reported to the NT EPA within 24 hours.

Impact	Avoidance	Mitigation	Monitoring	Reporting
Impacts to threatened/significant species	Impact avoidance measures as per to minimise habitat loss, degradation and direct fauna mortality and spills.	Mitigations as per above to minimise habitat loss, degradation and direct fauna mortality and spills.	Nil	Nil

16.7 Summary

This section presents a summary of the impacts (direct, indirect, and cumulative) on the relevant MNES. The conclusion is that it is unlikely that the construction and operation of the AAPowerLink will have a significant impact on any MNES. The impact assessment has considered the Conservation Advice available of each EPBC-listed species that is likely to impacted and concludes that the proposal is consistent with any Threat Abatement Plans, Bioregional Plans or Recovery Plans.

16.7.1 Threatened species

Most of the threatened species that could occur within the AAPowerLink footprint have been assessed as unlikely to be subject to a significant impact because of proposal activities. The proposal footprint traverses a large area of terrestrial and marine habitat, and therefore intersects with suitable habitat for many threatened species – with the notable exception that the Solar Precinct footprint has been surveyed for threatened species and none were found. However, given that proposal activities within the remaining footprint will occur within a very localised footprint – and substantive disturbance will only occur over a short time frame in any one location – the likelihood that most of the species that could be present will be affected is very low.

It is noted that there are still some knowledge gaps pertaining to the presence and extent of some listed threatened flora and fauna species within the OHTL corridor. That information will be collected in first quarter of 2022, for inclusion in the Supplementary EIS. However, it is expected that if these restricted-range species are present, it will be very locally, and therefore the proposal's design can be altered to avoid or minimise impacts to those species through adoption of suggested mitigations or recovery advice.

16.7.2 Migratory species

The conclusion for migratory species mirrors that of threatened species. A significant impact to migratory species is unlikely because they are either unlikely to be present within some components of the proposal – particularly the Solar Precinct – or because the area of influence associated with proposal activities is very restricted in space and time.

No important habitat or ecologically significant proportions of populations of migratory species have been identified within the marine footprint of this proposal. There are 18 migratory shorebird species known from the Gunn Point Beach area, which qualifies it as important habitat for migratory species. However, an assessment under EPBC guidelines has concluded that proposal activities will not result in a significant impact to migratory shorebirds, and therefore this environmental value will be maintained.

16.7.3 Commonwealth marine area

The restricted Subsea Cable System footprint means that it is unlikely that the proposed action will have a significant impact on the Commonwealth marine area.

16.7.4 Cumulative impacts

The framework used to assess cumulative impacts from the AAPowerLink is described in Chapter 3 Impact Assessment. The process involves considering the cumulative or combined associated with the residual impacts from the AAPowerLink, residual impacts from existing activities, and impacts associated with reasonably foreseeable developments described in Chapter 3. Potential cumulative impacts to terrestrial ecosystems and marine ecosystems identified through the EIA process are discussed in Chapter 5 and Chapter 10 respectively.

Chapter 5 Terrestrial Ecosystems discusses the potential for incremental loss of biodiversity to occur in the Barkly region, associated with the cumulative impacts from the AAPowerLink, mining and Beetaloo Sub-Basin onshore gas developments, and on the Gunn Point Peninsula associated with the AAPowerLink, Sea Dragon Hatchery, and future development of residential areas, and/or a Renewable Energy Hub. In relation to MNES, there is potential for cumulative impacts to migratory bird species on Gunn Point Beach, which is an important habitat, associated with increased development of the Gunn Peninsula. The AAPowerLink is unlikely to contribute to cumulative impacts to EPBC Listed threatened species as the assessment documented in this chapter indicates there will be no residual impact to these species.

Chapter 10 Marine Ecosystems indicates that there is unlikely to be cumulative impacts to marine ecosystems either in NT waters or the Commonwealth marine area. For almost its entire route through the Commonwealth marine area, the Subsea Cable System lies on a seabed that is not subject to any other major disturbance. The EIA did consider potential for cumulative impacts associated with the Darwin Pipeline Duplication Project proposed to be constructed by Santos in 2023; however, concluded that cumulative impacts are unlikely because even if the construction phases overlapped, the impacts to marine water quality associated with the AAPowerLink subside within days of the cable burial activities being completed at any given location. The presence of Subsea Cable System and associated protection zone will exclude fishing and other activities that disturbed the seabed in the locality, potentially having the effect of creating a de facto marine reserve.

In the nearshore region, where MNES marine species could occur, potential cumulative impacts could be from pipe-laying works associated with the proposed Sea Dragon aquaculture project by Sea Farms, and future use of the INPEX dredge disposal area located approximately 300 m north of cable route A. As the marine environment in the region is dynamic cumulative impacts would only manifest if multiple projects were disturbing the seabed in Shoal Bay at the same time as the AAPowerLink cable-laying. To minimise this risk, Sun Cable will liaise with Sea Farms and the relevant authorities responsible for dredging in regard to timing and location of works.

16.8 Offsets

The EIA did not identify any significant residual impacts to MNES that require offsets.

16.9 References

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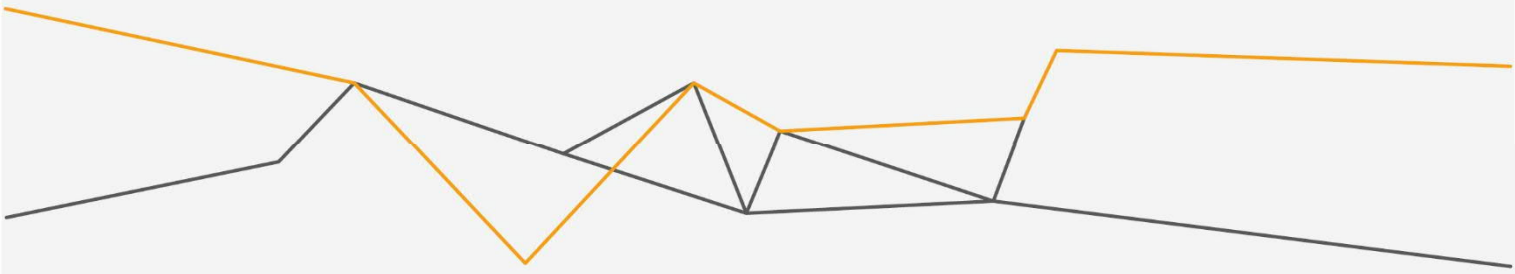

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