Assessment Report 107

Assessment by Environmental Impact Statement (EIS)

AAPowerLink Australia Assets Pty Ltd

Australia-Asia PowerLink Project

24 June 2024

ntepa Northern Territory Environment Protection Authority

This assessment report has been prepared by the Northern Territory Environment Protection Authority (NT EPA) pursuant to section 64 of the *Environment Protection Act 2019* (EP Act) and in accordance with section 87 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It describes the outcomes of the NT EPA's assessment of the Australia-Asia Powerlink Project proposal.

The proposed action is a large-scale solar farm in the Barkly region, Northern Territory (NT), with power exported via a high-voltage direct current transmission network to Murrumujuk on Gunn Point Peninsula, north-east of Darwin, and then sub-sea cable through NT, national and international waters to Singapore. The proposed action has been assessed by the NT EPA at the level of Environmental Impact Statement.

The assessment report documents potential environmental impacts and risks identified during the environmental impact assessment process, focusing on those that could be significant, and the measures and recommended conditions required to address potentially significant impacts.

In accordance with section 65 of the EP Act, the assessment report is for the NT Minister for the Environment to consider when making a decision about whether to approve the action under the EP Act.

The assessment report will be provided to the Commonwealth Minister for the Environment to consider when making a decision about whether to approve the action under the EPBC Act.

Dr Paul Vogel AM
NT EPA Chairperson

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Summary

This assessment report has been prepared by the Northern Territory Environment Protection Authority (NT EPA) pursuant to section 64 of the *Environment Protection Act 2019* (EP Act) for the Australia-Asia PowerLink (AAPowerLink) Project (the proposed action).

AA Powerlink Australia Assets Pty Ltd (the proponent) proposes to establish:

- a large-scale (>12,000 hectare) solar farm on Powell Creek Station (NT Portion 2094), near Elliott in the Barkly region, Northern Territory (NT)
- a high-voltage direct current (DC) transmission network including approximately 800 km of overhead high voltage DC (HVDC) transmission lines, from the solar farm to Murrumujuk on Gunn Point Peninsula, north-east of Darwin
- a converter site and cable transition facility at Murrumujuk
- a sub-sea cable through NT, Commonwealth and international waters to Singapore.

The NT EPA assessed the proposed action by Environmental Impact Statement in accordance with the EP Act. The environmental impact assessment examined the potential for significant direct, indirect and cumulative environmental impacts on the environment.

The proposed action is a Controlled Action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is being assessed as an accredited assessment. The relevant controlling provisions are:

- Listed threatened species and ecological communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- Commonwealth marine areas (section 24).

The NT EPA identified and examined potential significant impacts on the following 10 environmental factors:

1. Terrestrial environmental quality
2. Terrestrial ecosystems
3. Hydrological processes
4. Inland environmental water quality
5. Aquatic ecosystem
6. Community and economy
7. Culture and heritage
8. Marine environmental quality
9. Marine ecosystems
10. Atmospheric processes.

To address potential significant impacts of the proposed action on the key environmental factors, the NT EPA has provided recommendations for the Australian Minister for the Environment and Water to consider in deciding whether to grant or refuse an approval under the EPBC Act, and recommended conditions for the NT Minister for Environment, Climate Change and Water Security to consider in deciding whether to grant or refuse an environmental approval under the EP Act. The proponent and statutory decision-makers were consulted on the draft environmental approval as required by regulation 160 of Environment Protection Regulations 2020.

The NT EPA's assessment concludes that the proposed action can be implemented and managed in a manner that is environmentally acceptable and therefore recommends that environmental approval be granted, subject to the recommendations and conditions detailed in the draft Environmental Approval (Appendix 1).

Contents

1. Introduction

This assessment report has been prepared by the Northern Territory Environment Protection Authority (NT EPA) pursuant to section 64 of the *Environmental Protection Act 2019* (EP Act), and as an accredited assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The report provides an evaluation of the potential significant environmental impacts of the Australia-Asia PowerLink (AAPowerLink) Project (the proposed action).

The proponent of the proposed action is AA Powerlink Australia Assets (Australian Business Number 99 653 396 948). The proponent is a wholly-owned subsidiary of Sun Cable Pty Ltd (Australian Business Number 623 991 006).

The NT EPA assessed the proposed action by Environmental Impact Statement (EIS) in accordance with the requirements of the EP Act and Environment Protection Regulations 2020 (EP Regulations).

The purpose of this assessment report is to:

- assess whether the proposed action is likely to meet the environmental objectives
- assess the potential significant environmental impacts of the proposed action
- make recommendations for avoiding, mitigating, managing and offsetting those impacts
- advise the NT Minister for Environment, Climate Change and Water Security as to the acceptability of the proposed action
- advise the Australian Minister for the Environment and Water as to the acceptability of the proposed action (including within Commonwealth waters).

The assessment report must assess the potential environmental impacts and risks of the proposed action and whether there are any significant residual impacts remaining after all reasonable measures to avoid and then mitigate and manage the risks have been taken. Matters identified in the EP Act which have taken into account during the assessment are tabulated in section 9.1.

This Assessment Report, and the draft Environmental Approval (Appendix 1) are provided to the Minister for Environment to consider in deciding whether to grant an environmental approval for the proposed action, and concludes the NT EPA's environmental impact assessment process. An environmental impact assessment timeline is provided at Appendix 2.

2. Proposed action

2.1. Overview

The proposed action comprises the following key components:

- solar precinct on Powell Creek station in the Barkly Region of the NT where electricity will be generated, stored, and transmitted
- overhead transmission line (OHTL) will transmit electricity from the solar precinct to the Darwin converter site (DCS)
- DCS comprising a voltage source converter, energy storage and an operations and maintenance facility
- cable transition facilities (CTF) at Murrumujuk and shore crossing at Gunn Point Beach to transition power cables between land and sea
- subsea cable system to transfer electricity from Darwin to Singapore.

Onshore and offshore construction will be conducted over approximately 60 months. Generation and transmission capacity will be built in stages in response to market demand, with the solar generation equipment, batteries, OHTL, voltage source converter and subsea cable systems to be installed progressively and operated as two or more independent power systems dispatching power offshore. Vegetation will be reinstated on part (approximately 16%) of the footprint following construction (**Table 1**). The project design life is 70 years.

Table 1 Proposed extent of project elements

Project component	Construction footprint	To be reinstated following construction	Operational footprints	
			Cleared ground & infrastructure	Vegetation management
Solar precinct	12,289 ha[1]	111 ha[1]	12,177 ha[1]	0 ha
OHTL	2,813 ha	2,266 ha[2]	546 ha	2,459 ha
DCS	60 ha	0 ha	60 ha	0 ha
CTF and shore crossing	45 ha	45 ha	0 ha	17 ha
Subsea cable system	6,400 ha	6,400 ha	0 ha	0 ha
Total land disturbance	15,206 ha	2,422 ha	12,783 ha	2,476 ha
Total sea disturbance	6,400 ha	6,400 ha	0 ha	0 ha

2.2. Location

The onshore proposed action infrastructure is wholly within the NT. The project extends across seven local government areas including the Barkly Region, Roper Gulf Region, Katherine Municipality, Victoria Daly Region, Unincorporated (Marrakai-Douglas Daly) Area, Coomalie Shire and Litchfield Municipality.

The solar precinct is located in the Barkly Region on Pastoral Lease 948 (part of NT Portion 2094) Powell Creek Station, approximately 65 km south west of Elliott. The OHTL will be approximately 800 km and within a transmission easement to be established predominantly in the AustralAsia Rail Corporation railway easement (operated over Crown Land and Aboriginal Freehold Land). A large portion of the OHTL footprint intersects areas of native title determinations, native title determination applications and Aboriginal Freehold Land. The northern 66 km of the OHTL from Livingstone through to the DCS follows a future utilities corridor designated in the Litchfield Subregional Land Use Plan 2023[3]. The DCS and CTF are located on Crown Land, zoned for future development (**Figure 1** to **Figure 3**).

[1] This figure has been corrected from the extent presented in the additional information (3 November 2023) to remove the proposed ground electrodes, which were removed from the project scope.

[2] This figure has been corrected from the extent presented in the additional information (3 November 2023) to reflect the construction footprint, which comprises 60m x 100m for each structure and is 22m wide between towers.

[3] NT Planning Commission (2023). Litchfield Subregional Land Use Plan 2016. Version 6.

The offshore subsea cable system extends approximately 895 km to the limit of the Commonwealth Marine Area as defined by section 24 of the EPBC Act (see **Figure 4**). Components beyond that limit are within the jurisdictions of Indonesia and Singapore.

2.3. Benefits of the proposed action

Benefits of the proposed action are described in the EIS. The Asia-Pacific region currently contributes 39% of the world's greenhouse gas emissions contributing to increased climate risk. The region has a rising electricity demand and limited infrastructure to meet increasing energy demands using locally produced renewable electricity.

Australia has some of the highest solar irradiation and most widespread solar resources in the world, and the proposed action involves building critical infrastructure to support a giga-scale renewable energy industry. The proposed action comprises generation and transmission of renewable solar energy to supply international markets with high volume, affordable, easily transported renewable electricity. The proposed action will have peak generation capacity of approximately 17-20 gigawatt (GW) of solar power for export to Singapore.

Australia's renewable energy resources can be commercialised to supply the growing Asia-Pacific energy demand, and to develop a significant renewable electricity export industry. The proposed action will contribute to the NT Government's target of achieving a $40 billion economy and has the potential to contribute to the NT Government's 50% renewable electricity by 2030 target.

The proposed action is forecast to generate approximately 350 long-term and 1,750 construction jobs, including in regional communities. Opportunities for provision of renewable energy to Australian markets are being investigated. The proposed action will contribute to reducing carbon dioxide (CO_2) emissions in the Asia-Pacific region (refer to section 8.1).

The proponent has committed to contributing to the renewable energy sector in the NT more broadly by developing a Centre of Excellence Energy to promote knowledge sharing and, to ensure long term benefits for Territorians.

2.4. Alternatives

At Pine Creek, alternatives were proposed by the proponent to address potential significant impacts on the Kohinoor Adit Ghost bat colony. A total of six alternate routes were evaluated to avoid potential impacts to Ghost bats and foraging habitat. The proponent has applied the precautionary principle given there is uncertainty as to whether (and to what degree) EMF influences Ghost bat movements, and the environmental decision-making hierarchy to first avoid, then minimise any impact before considering offsets as a last resort.

The proposal considered Middle Arm as an alternate location for the DCS (now at Murrumujuk). Middle Arm was not selected by the proponent due to potential conflict with its future development as an industrial precinct, and the site at Murrumujuk has been chosen due to having a favourable strategic land use planning framework under the Litchfield Sub-Regional Land Use Plan with access to an NT Government utilities corridor that could be utilised by the OHTL.

The proponent considered the use of underground transmission infrastructure, including in the Darwin rural residential area. Underground infrastructure is not preferred by the proponent for operational reasons and is likely to have increased environmental impacts.

To maintain operational noise emissions at the DCS to acceptable levels, and to mitigate against potential exceedances, operational noise modelling was completed to assess the options available to further mitigate (and minimise) operational noise impacts. The primary noise sources at the site are transformer and inverter skids, Voltage Source Converter (VSC) substation, and a Battery Energy Storage System (BESS). The proponent has evaluated and adopted the following measures:

- re-location of infrastructure within the DCS away from sensitive land use zones; and
- a reduction of certain componentry within the DCS (e.g., reduced units of equipment), which can provide more flexibility and the ability to apply improved noise controls.

Alternatives were considered for the subsea cable system route from Darwin to Singapore (within Australian waters). The initial selection of a route originating at Middle Arm was informed by desktop assessment, geophysical surveys and a geotechnical sampling program, and after relocation of the DCS to the Murrumujuk location, became redundant. A further two inshore route options were evaluated, and investigations (supported by marine and engineering studies) have identified the southern route as the preferred alignment which the proponent has been adopted.

2.5. Environmental context

The solar precinct is located in the Tanami Bioregion, with access roads also crossing the Davenport Murchison Ranges bioregion, on pastoral land (Powell Creek Station). The bioregional characteristics are described in **Table 2**. The solar precinct is within the Lake Woods catchment; the lake is an ephemeral freshwater lake important for breeding waterbirds, and is a site of conservation significance (SOCS). The solar precinct is approximately 10 km upstream of the SOCS boundary.

The OHTL crosses a variety of landforms and vegetation communities in the Tanami, Sturt Plateau, Daly Basin, Pine Creek and Darwin Coastal bioregions. The OHTL crosses the Howard Sand Plains SOCS, including ecologically sensitive sandsheets. In addition the OHTL crosses the Shoal Bay SOCS, although ecologically sensitive habitats within the SOCS (tidal flats, small freshwater wetlands and rainforest patches) do not occur within the OHTL corridor. The DCS and CTF are within the Darwin Coastal bioregion and the Shoal Bay SOCS.

Table 2 Bioregions crossed by the project

Bioregion	Infrastructure	Description[4]
Davenport Murchison Ranges	Solar precinct access roads, some ancillary infrastructure	The Davenport Murchison Ranges bioregion is characterised by a chain of rocky ranges surrounded by lowland plains. Vegetation is predominantly eucalypt low, open woodland and acacia-sparse shrubland over hummock grassland.
Tanami	Solar precinct, southern OHTL	Landscapes are mainly featureless sand plains with small areas of alluvial plains, low ridges and stony rises. Vegetation is predominantly spinifex hummock grassland with a tall-sparse shrub overstorey.
Sturt Plateau	Southern OHTL	The Sturt Plateau bioregion comprises flat to gently undulating plains with little local relief. The vegetation is mainly eucalypt forests and woodlands dominated by bloodwoods over perennial grasses.
Daly Basin	Mid-OHTL	The Daly Basin bioregion includes gently undulating plains with scattered low plateau remnants and some rocky hills and gorges along its western edge. The dominant

[4] Bastin G, and the Australian collaborative rangeland information system (ACRIS) Management Committee (2008). Rangelands 2008 - Taking the Pulse. Published on behalf of the ACRIS Management Committee by the National Land and Water Resources Audit, Canberra.

Bioregion	Infrastructure	Description[4]
		vegetation is Darwin woolybutt and stringybark open forests.
Pine Creek	Northern OHTL	Land types of the Pine Creek bioregion are mainly hilly to rugged ridges with undulating plains. Vegetation communities include eucalypt woodlands, with patches of monsoon forests.
Darwin Coastal	Northern OHTL, DCS, CTF	The Darwin Coastal bioregion is generally flat, low-lying country, drained by several large rivers. Vegetation communities include eucalypt forest and woodlands with tussock and hummock grass understorey.

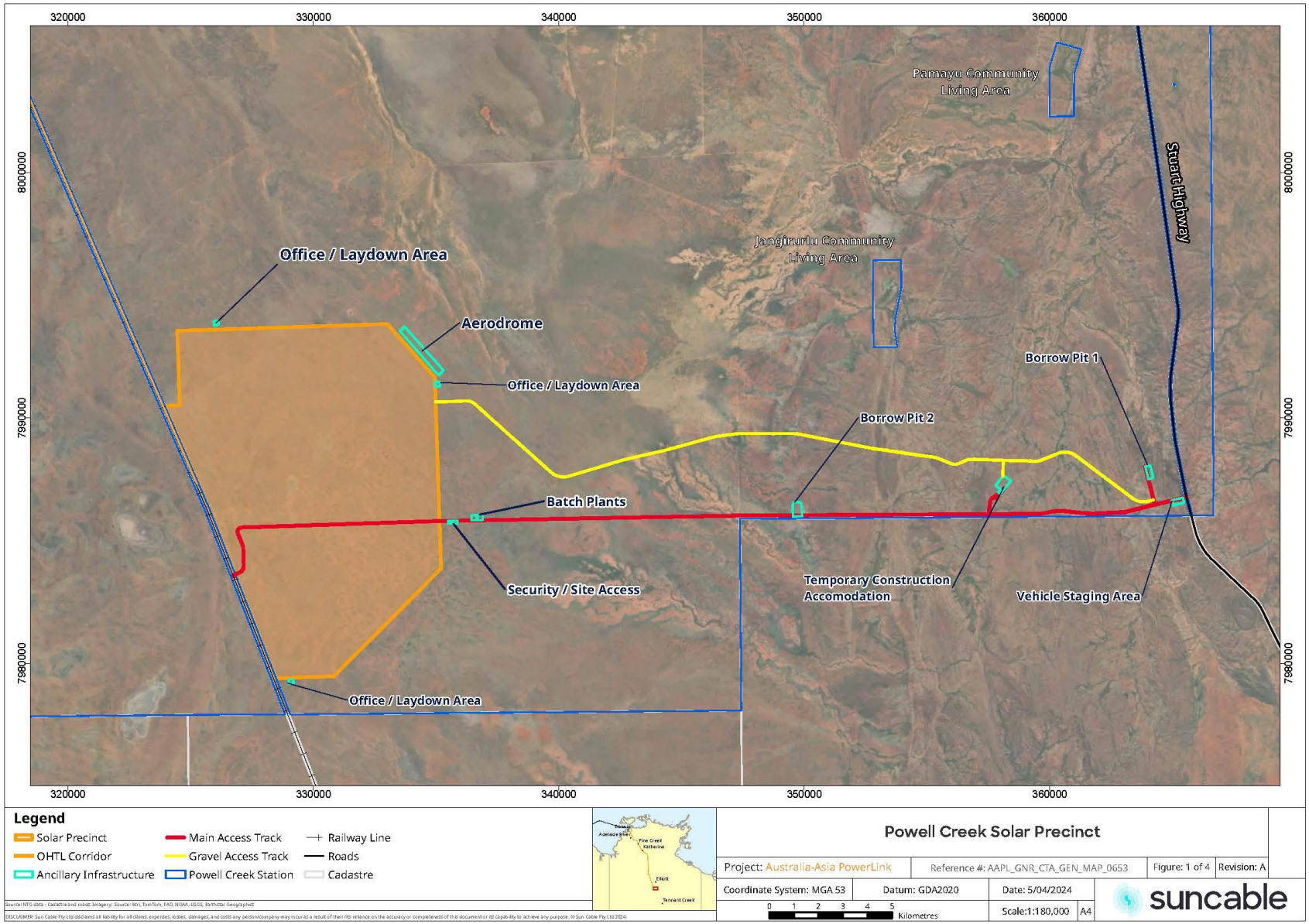

Figure 1 Solar precinct, southern electrode and ancillary infrastructure

Figure 2 OHTL corridor

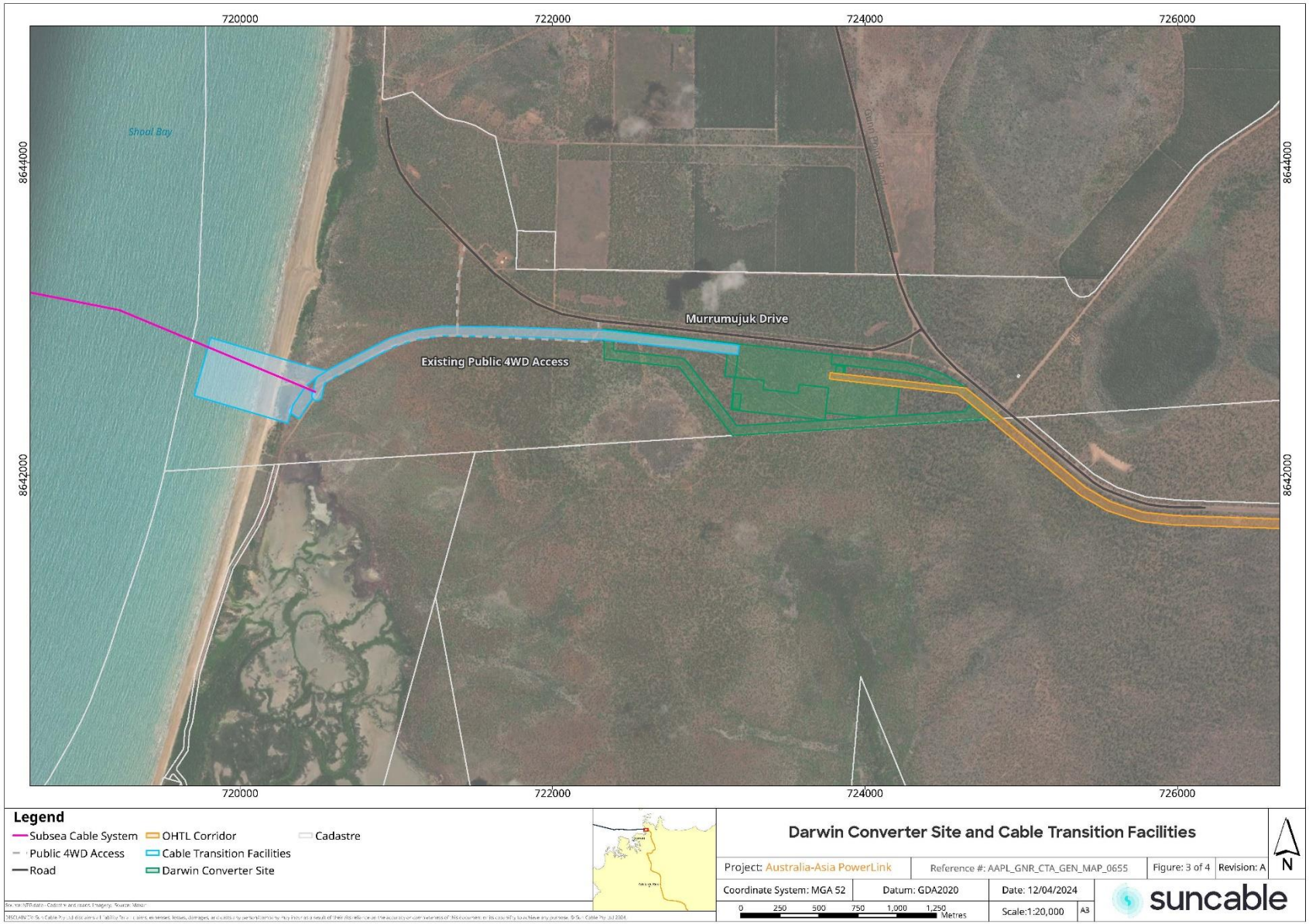

Figure 3 DCS and CTF

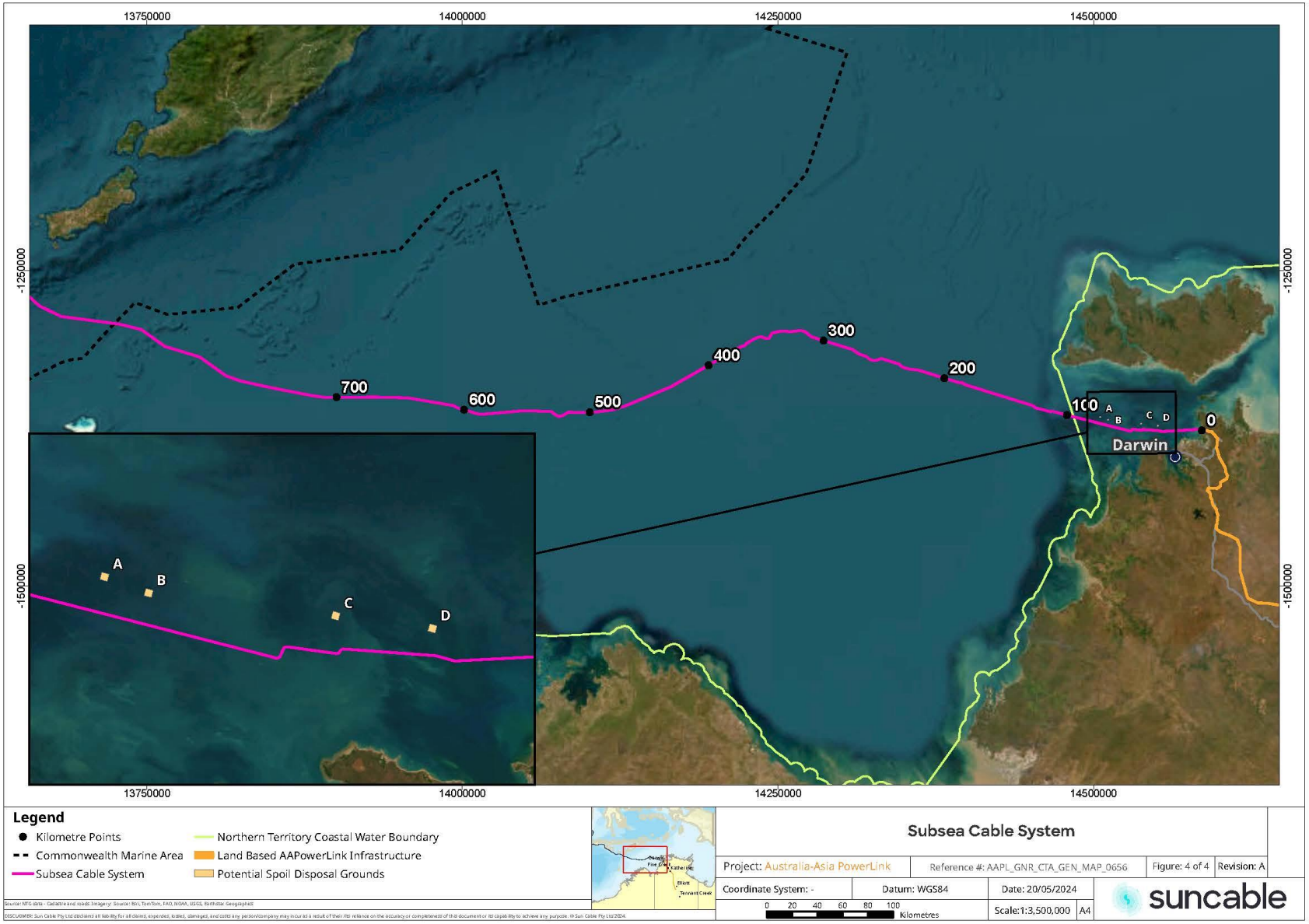

Figure 4 Subsea cable in NT and Commonwealth waters

3. Strategic context

The proposed action is largely consistent (with the exception of some limitations in the vicinity of the DCS) with the relevant NT government land use plans and strategies, and supports the NT Government's commitment to creating jobs and economic growth, and with strategic plans and initiatives including:

- Northern Territory Roadmap to Renewables - provides a roadmap to achieve the 50 percent renewable energy target by 2030 for the NT.
- Northern Territory Climate Change Response: Towards 2050 - provides a policy framework for the Government's strategic management of climate change risks and opportunities. A key objective of the policy is to achieve net zero emissions by 2050.
- The Territory's Economic Reconstruction – sets out a blueprint to diversify the NT's industry base and take advantage of global market trends to accelerate the growth of its economy and lead the national economic recovery.
- Darwin Regional Plan - identifies high level characteristics and needs that will shape development, management of growth and regional infrastructure.
- NT Economic Development Framework - establishes the directions and actions needed to accelerate the Territory's economic development, informs long term decision making and aims to deliver policy and regulatory certainty for investors.

4. Statutory context

4.1. Overview

4.1.1. Northern Territory

On 12 January 2021, the NT EPA decided that the proposed action required assessment under the EP Act. The Minister for the Environment, Climate Change and Water Security is the approval authority under the EP Act.

Pursuant to section 61 of the EP Act, the purpose of the environmental approval is to manage the potentially significant environmental impacts of a proposed action during all phases. This includes planning, design, construction or carrying out of works, operation, decommissioning, rehabilitation, and remediation and closure of the proposed action.

Pursuant to section 92 of the EP Act, if an environmental approval under the EP Act is granted, it will prevail over other statutory authorisations that the proponent may be required to obtain.

It is the responsibility of the proponent to obtain all relevant statutory authorisations, which may include, but not be limited to:

- development permit(s) under the *Planning Act 1999*
- native vegetation clearing permit(s) or consent(s) (under the *Planning Act 1999* and *Pastoral Land Act 1992* respectively)
- approval(s) to carry out work on a heritage place or object under the *Heritage Act 2011*
- licence for the discharge of waste, and for the take of water pursuant to the *Water Act 1992*
- licence to transport scheduled waste and approvals to dispose of waste in accordance with the *Waste Management and Pollution Control Act 1998* (WMPC Act)

- approval to lay the cable from the Director Marine Safety for Northern Territory waters under the *Marine Act 1981*
- generation, retail, network and/or system control licence(s) under the *Electricity Reform Act 2000*)
- environmental approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The project specific Solar Project (Australia-Asia Power Link) (Special Provisions) Bill 2022 would also apply[5].

The proponent is responsible for identifying and meeting its legislative obligations.

4.1.2. Commonwealth regulatory framework

On 29 November 2020, the proposed action was determined a controlled action that required assessment and approval under the EPBC Act (EPBC Number: 2020/8818). The relevant controlling provisions for the proposed action under the EPBC Act were:

- Listed threatened species and ecological communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- Commonwealth marine areas (section 24).

On 21 January 2021, the assessment approach was determined to be an accredited assessment at the level of an EIS. This assessment report will be provided to the Australian Government Minister for the Environment and Water who will decide whether or not to approve the proposed action under the EPBC Act. The relevant impacts of the action on the controlling provisions for the proposed action have been taken into account during the assessment and are tabulated in section 9.2.

4.1.3. Mandatory matters for consideration

In preparing this assessment report, the NT EPA considered the following information in accordance with regulation 157 of the EP Regulations:

- the proponent initiated EIS referral of the proposed action including a Statement of Reasons and draft Terms of Reference
- submissions received on the proponent initiated EIS referral of the proposed action
- the significant variation of the proposed action under section 51 of the EP Act
- submissions received on the significant variation of the proposed action
- the draft EIS
- submissions received on the draft EIS
- the supplement to the draft EIS
- submissions received on the supplement to the draft EIS
- additional information provided as directed under section 143 of the EP Regulations 2020

[5] The *Solar Project (Australia-Asia Power Link) (Special Provisions) Act* will commence on the day fixed by the Administrator by Gazette notice, or on 28 March 2027 if not gazetted earlier.

- submissions received on the additional information
- additional information provided as directed under section 83 of the EP Regulations 2020
- government authority submissions received on the additional information
- other information (advice from specialists).

The NT EPA took into account the purpose of the environmental impact assessment process under section 42 of the EP Act including consideration of:

- the objects (section 3, EP Act)
- the principles of ecologically sustainable development (Part 2 Division 1, EP Act)
- the environmental decision-making hierarchy (section 26, EP Act)
- the waste management hierarchy (section 27, EP Act)
- ecosystem-based management
- impacts of a changing climate.

Refer to section 9 for further detail about matters that the NT EPA has taken into account during its assessment.

5. Consultation

The proponent has consulted with stakeholders in accordance with the NT EPA Stakeholder Engagement and Consultation guidance[6], and has committed to ongoing consultation in line with the guidance.

The process for assessment by EIS under the EP Act allows for public and government authorities consultation throughout the process (**Table 3**), and in some cases, government authority and statutory decision-makers only. In preparing this assessment report, matters raised in submissions were considered in relation to the potential environmental impacts from the proposed action.

Table 3 Consultation for the AA Powerlink project

Assessment stage and consultation dates	Submissions received	
	Government authorities	Public
Consultation on the referral 19 October - 27 November 2020	7	5
Consultation on the significant variation 13 August – 24 September 2021	7	1
Consultation on the draft EIS 20 April – 15 July 2022	8	12

[6] Department of Environment, Parks and Water Security (2021). Stakeholder Engagement and Consultation.

Assessment stage and consultation dates	Submissions received	
	Government authorities	Public
Consultation on the Supplement to the draft EIS 7 December 2022 – 31 January 2023	9	1
Consultation on the additional information to the draft EIS 17 November – 8 December 2023	5	5
Consultation on the additional information to the draft EIS 11 March – 20 March 2024	3	N/A

The NT EPA consulted with, and invited submissions from the proponent and statutory decision-makers who may have a view on the draft environmental approval. Submissions were received from:

- the proponent
- Controller of Water Resources
- Department of Climate Change, Energy, the Environment and Water (DCCEEW)
- Pastoral Land Board.

The NT EPA considered these submissions in finalising its recommendations to the Minister.

6. Assessment of key environmental factors

6.1. Report structure

This Assessment Report presents the components of the proposed action, from south to north, and describes the relevant environmental values and potential impacts of each component. Recommended conditions are discussed for each component of the proposed action noting that some conditions apply across a number of project components.

6.2. Overview

The NT EPA identified that the proposed action has the potential to have a significant impact on environmental values associated with 10 key environmental factors[7] (**Table 4**).

Table 4 Key environmental factors

Theme	Factor	Environmental objective
LAND	Terrestrial environmental quality	Protect the quality and integrity of land and soils so that environmental values are supported and maintained.

[7] NT EPA Environmental Factors and Objectives

Theme	Factor	Environmental objective
	Terrestrial ecosystems	Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.
WATER	Hydrological processes	Protect the hydrological regimes of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.
	Inland water environmental quality	Protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.
	Aquatic ecosystems	Protect aquatic habitats to maintain environmental values including biodiversity, ecological integrity an ecological functioning.
SEA	Marine environmental quality	Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.
	Marine ecosystems	Protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.
AIR	Atmospheric processes	Minimise greenhouse gas emissions so as to contribute to the NT Government's goal of achieving net zero greenhouse gas emissions by 2050.
PEOPLE	Community and economy	Enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians.
	Culture and heritage	Protect culture and heritage.

The NT EPA considered other environmental factors during its environmental impact assessment; however, the impact on those factors was not considered to be significant.

In considering the key environmental factors and the recommended conditions in Appendix 1, the NT EPA took into account other statutory decision-making processes that can avoid or mitigate the potentially significant impacts of the proposed action on the environment.

6.3. Solar Precinct

6.3.1. Description

The proposed solar precinct is located approximately 65 km south west of Elliott on Powell Creek Station, an area historically used for low intensity cattle grazing. The 12,403 ha precinct comprises photovoltaic panels (and associated mounting systems), battery energy storage systems and electrical infrastructure. Ancillary infrastructure (access tracks, temporary construction accommodation, intermodal logistics facility, internal roads, construction waste disposal area) requires 124 ha temporary and 10 ha permanent clearing (**Figure 1**).

6.3.2. Terrestrial ecosystems

6.3.2.1. Environmental values

The solar precinct predominantly occurs within the Redsan land system – a member of the desert sandplains group – which covers an extensive area of land (~2,770,000 ha) within the northern and north-eastern region of the Tanami Desert (**Figure 5**). The access tracks and some ancillary infrastructure cross the Gosse and Ashburton land systems. The proponent's Terrestrial Ecology Report identifies four land types within the solar precinct footprint. The footprint is largely made up of flat to gently sloping loamy plain that supports spinifex hummock grassland with a tall sparse shrub overstorey of *Hakea subarea*, desert bloodwoods, acacias, and grevilleas. Smaller areas of localised depressions occur throughout the footprint, however, it is expected that these support only ephemeral inundation events.

There are no drainage lines, sensitive and/or significant vegetation types, or threatened flora species listed under the *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act) or the EPBC Act, within the solar precinct.

The access road to the solar precinct traverses three land systems, including desert sandplains, sandstone hills and alluvial floodplains. The solar precinct access road intersects ephemeral creeks and tributaries that support riparian vegetation at some locations. No listed flora species have been recorded along the access road footprint.

The solar precinct is approximately 10 km south of Lake Woods. Lake Woods is the largest ephemeral freshwater lake in the NT and tropical Australia (covering an area of approximately 350 to 500 km^2). Lake Woods is a SOCS and is an important wetland habitat for breeding waterbirds and migrating shorebirds recognised as an Important Bird Area by Bird Life International. After significant rainfall events, the lake supports large aggregations of migratory waterbirds including Plumed whistling-ducks (*Dendrocygna eytoni*) (>27,000 individuals), Great egret (*Ardea alba*) (>3,000 individuals), and large numbers of Australian pelican (*Pelecanus conspicillatus*), Grey teal (*Anas gracilis*), Intermediate egret (*Egretta intermedia*), Glossy ibis (*Plegadis falcinellus*) and Freckled duck (*Stictonetta naevosa*).

The proponent identified 41 threatened species that potentially occur within the bioregions intersected by the solar precinct. Desktop assessment identified four threatened species considered to have a high or medium likelihood of occurring within the solar precinct (**Table 5**). Apart from these four species, no other threatened species were likely to occur at this location and no further consideration was given to other species.

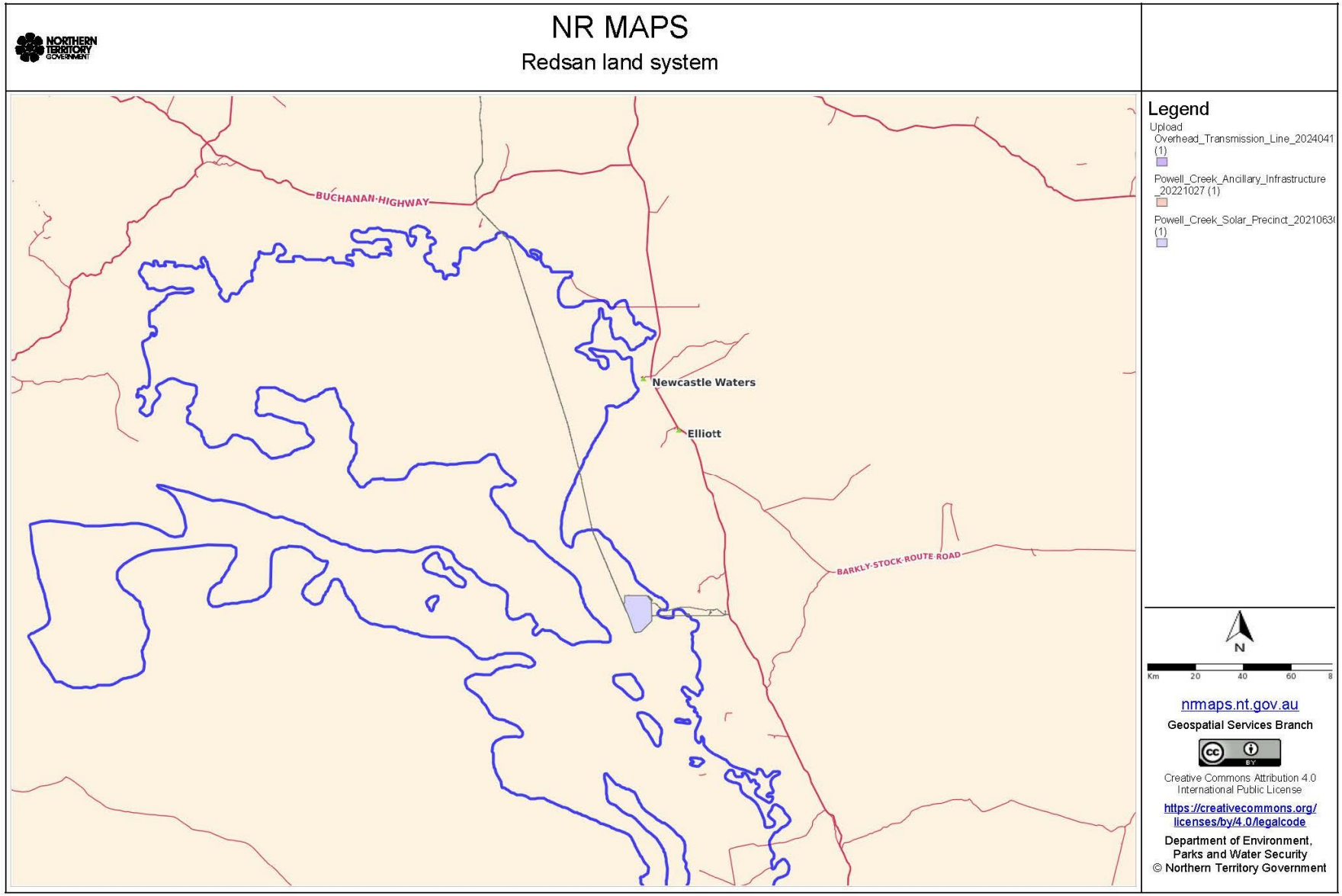

Figure 5 Redsan land system, solar precinct and OHTL

Table 5 Threatened species likely to occur at the solar precinct

Common name	Scientific name	TPWC Act	EPBC Act
Greater bilby	*Macrotis lagotis*	Vulnerable	Vulnerable
Grey falcon	*Falco hypoleucos*	Vulnerable	Vulnerable
Gouldian finch	*Erythrura gouldiae*	Vulnerable	Endangered
Yellow-spotted monitor	*Varanus panoptes*	Vulnerable	Not listed

The Greater bilby occurs in fragmented populations in the Tanami, Gibson and Great Sandy Deserts, the Pilbara and Kimberley, and the Mitchell Grasslands of southwest Queensland. Within the solar precinct, the species occurs in the Redsan desert sandplains. The species is nocturnal, and shelters during the day in burrows comprising extensive and deep tunnel systems. Individuals regularly use up to a dozen burrows, and there may be many active and disused burrows within an individual's home range (Moseby and O'Donnell, 2003[8]). A targeted Greater bilby survey confirmed the presence of active burrows at a site ~200 m from the western boundary of the solar precinct. No active burrows were identified within the solar precinct.

The Grey falcon is widespread in arid and semi-arid habitats, usually occurring at low densities. Suitable breeding habitat for the Grey falcon was recorded along creek lines within the eastern solar precinct, traversed by the access tracks.

The solar precinct is located ~20 km south of the southernmost records of the Gouldian finch. The sandplain habitat comprising most of the solar precinct does not support habitat for Gouldian finches. The access road and ancillary infrastructure were surveyed and found to contain foraging habitat and poor quality breeding habitat (fire affected Snappy Gums (*Eucalyptus leucophloia*), not associated with permanent waterholes).

The Yellow-spotted monitor is widespread across the north of Australia. The species has suffered significant declines where Cane toads occur. Cane toads are unlikely to occur as far south as the solar precinct.

6.3.2.2. Outcomes of consultation

Matters raised in submissions during the NT EPA's consultation relating to potentially significant impacts on terrestrial ecosystems include:

- information gaps and uncertainty relating to the potential risk to some listed threatened species
- information gaps and uncertainty relating to the potential risk to some EPBC listed migratory species
- concerns field studies for some threatened species were not carried out or were incomplete
- the need for adequate avoidance and mitigation measures for threatened species and migratory species

[8] Moseby, K. and E. O'Donnell (2003). Reintroduction of the Greater bilby, *Macrotis lagotis* (Reid) (Marsupialia: Thylacomyidae), to northern South Australia: survival, ecology and notes on reintroduction protocols. Wildlife Research 30, 15-27.

- information gaps and uncertainty relating to the potential risks of the solar arrays on migratory and waterbirds.

6.3.2.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented in **Table 6**.

6.3.2.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, and conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), the NT EPA considers that the proposed action can be conducted in such a manner that its objective for terrestrial environmental quality is likely to be met.

Table 6 Assessment for Terrestrial ecosystems and recommendations (solar precinct)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Clearing of 12,403 ha of native vegetation for construction and operation of the solar precinct, access roads and ancillary infrastructure will result in fragmentation, alteration and long term (>70 years) loss of habitat and displacement of fauna. The threatened Greater bilby, Grey falcon, Gouldian finch, and Yellow-spotted monitor may occur in suitable habitat within the solar precinct. Construction and operation of the solar precinct could cause direct impacts to threatened fauna including vehicle or equipment strike causing injury or mortality.	The constraints planning and field development procedure (CPFDP) includes commitments to survey for and avoid or minimise disturbance of threatened species and their habitats when locating infrastructure. The proponent acknowledges that there is limited opportunity to avoid and mitigate impact within the solar precinct by relocating infrastructure and construction activities and the CPFDP will largely apply to access tracks and auxiliary infrastructure. The proponent will implement a Greater bilby procedure. The procedure will include a commitment to survey suitable habitat and to avoid occupied burrows. Surveys will also allow for the identification and avoidance of *V. panoptes* burrows. The proponent has committed to avoid potential Gouldian finch foraging and nesting habitat to the greatest extent practicable through the use of the CPFDP. In addition, suitable breeding habitat will be surveyed during the species' breeding season to ascertain	Increased vehicle traffic (especially at night and use of heavy vehicles), presents a risk to all fauna, including threatened fauna. A condition to manage potential impacts to threatened species from traffic is recommended. There is marginal habitat for the Greater bilby present in the solar precinct and the species may occur. Disruption of an active Greater bilby burrow system would comprise a significant impact. The Flora and Fauna Division recommend that the proponent avoid active burrows by at least 50 m. Marginal Gouldian finch breeding habitat in the solar precinct is restricted to the east of the access roads and ancillary infrastructure (in the Ashburton Ranges). Significant impact to the species would only occur as a result of disturbance of active nests. The Floodplain monitor occurs in the solar precinct. The key risk to the species across its distribution (Cane toads) is not present, but	**Condition 1 Limitations and extent.** Condition 1 applies to all components of the proposed action and limits the location of long term clearing **Condition 3 Flora and fauna** Conditions 3-1(3) to 3-1(5) prohibit night driving on unformed roads, and require surveys for Greater bilby burrows within the Redsan land system. Any burrows must be buffered by 50 m. Conditions 3-1(7) and 3-1(8) identifies controls for avoidance of impacts to the Grey falcon. **Regulation by other statutory decision-makers** Pursuant to the *Planning Act 1999*, consent is required for the clearing of native vegetation of more than one hectare in aggregate of land on land subject to the Clearing of Native Vegetation overlay (the NT Planning Scheme Part 3 overlays). Pursuant to the *Pastoral Land Act 1992* consent to clear native vegetation on pastoral land.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	whether it is in use. Any breeding habitat confirmed as being in use by Gouldian finches will be avoided, buffered by 200 m, and disturbance will only commence once breeding has finished. The proponent has committed to manage impacts to the Grey falcon by conducting pre-clearance surveys in breeding habitat (tall trees in riparian vegetation that may occur in proximity to ancillary infrastructure and access tracks) and moving the disturbance away from any active nests. Vegetation will be reinstated across 124 ha post-construction. A traffic management plan will be implemented to minimise direct impacts.	disturbance of burrows must be avoided.	
There is uncertainty about the potential for the large-scale solar array to cause mortality of migratory and waterbirds (including listed migratory species) through avifauna collision with fixed infrastructure (e.g. panel arrays, towers, and transmission lines) or through the 'lake effect'. The lake effect occurs when waterbirds mistake the reflective surfaces of panels for	Design considerations to prevent impacts to birds from fixed infrastructure will be based on international best practice guidelines including the following: • guidelines on how to avoid or mitigate impact of electricity power grids on migratory birds	The potential for impact from 12,000 ha of solar panels on bird behaviour is largely unknown. Monitoring is required to determine if there is any residual impact. If impact occurs the proponent would be required to investigate mitigation measures (including visual deterrents). Other potential impacts to birds from infrastructure will be avoided	**Condition 4 Migratory and waterbird management plan** This condition requires monitoring of bird utilisation and fatalities (commencing prior to solar panel installation), and development of adaptive management plan including quantitative triggers for initiating investigative and/or adaptive management actions; and actions if required. To be reported

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
bodies of water and are injured due to collision with structures, or land and are unable to take off.	in the African- Eurasian region (Prinsen *et al*. 2011)[9]; • reducing avian collisions with powerlines (Avian Power Line Interaction Committee 2012)[10]; and • assessment and mitigation of impact of powerlines and guyed meteorological masts on birds (Scottish National Heritage 2016)[11]. No mitigation measures for the lake effect are proposed. The proponent has committed to monitoring bird mortality.	and mitigated by compliance with international best practice guidelines committed to by the proponent.	in an environmental performance report.

[9] Prinsen, H., Smallie, J., Boere, G. and Píres, N. (2012). Guidelines on how to avoid or mitigate impact of electricity power grids on migratory birds in the African-Eurasian region. AEWA Conservation Guidelines No. 14, CMS Technical Series No. 29, AEWA Technical Series No. 50, CMS Raptors MOU Technical Series No. 3, Bonn, Germany.

[10] Avian Power Line Interaction Committee (2012). Reducing avian collisions with power lines: The state of the art in 2012. Edison Electric Institute and APLIC. Washington, D.C

[11] SNH (2016). Guidance: Assessment and mitigation of impacts of power lines and guyed meteorological masts on birds. SNH. Battleby, UK.

6.3.3. Terrestrial environmental quality

6.3.3.1. Environmental values

The land and soils of the solar precinct are described as mostly gently sloping with localised shallow depressions, well drained red to brown-grey sand, sandy loam, and loam, with limited clay (tenosols and kandosols). There are no major surface drainage features present in the precinct area, and there is little evidence of land and soil impacts caused by cattle grazing within the solar precinct footprint, and no erosion was observed during field surveys. Proposed access tracks/roads from the Stuart Highway to the solar precinct will cross minor drainage lines.

6.3.3.2. Outcomes of consultation

No comments from public stakeholders or statutory authorities were received regarding this matter.

6.3.3.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented in **Table 7**.

6.3.3.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures and commitments, the recommendations, and conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and regulation under the WMPC Act, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for terrestrial environmental quality is likely to be met.

Table 7 Assessment for Terrestrial environmental quality and recommendations (solar precinct)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Large scale native vegetation clearing has the potential to cause reduction of soil integrity and land degradation through soil erosion: • from areas of exposed / cleared land and • from changes in surface flow (potentially leading to localised flooding or sedimentation and subsequent discharge of turbid water).	Vegetation clearing and deployment of solar modules and electrical infrastructure will occur in stages, with zones being deployed, connected, and commissioned sequentially. This will limit the amount of exposed cleared land. Implementation of erosion and sediment control practices and procedures aligned with the Best Practice Erosion and Sediment Control Guidelines[12] (International Erosion Control Association, 2008) during construction and operation, commensurate with the risk of erosion.	Clearing of 12,403 ha of native vegetation and placement of solar panels, ancillary infrastructure and access roads will increase the risk of localised flooding and soil erosion. An erosion and sediment control plan (ESCP) is required to avoid adverse effects beyond the proposed extent of the action from construction. The erosion and sediment plan must be periodically reviewed by a Certified professional in erosion and sediment control. A stormwater drainage system is required to avoid adverse effects beyond the proposed extent of the action during operation.	**Condition 7 Erosion and sediment control** Implement an erosion and sediment control plan in accordance with Best Practice Erosion and Sediment Control Guidelines. Compliance must be reported annually. **Condition 8 Stormwater drainage system** • Design and install a stormwater drainage will conform to the criteria set out in Australian Rainfall and Runoff Guidelines 2019[13].
	Decommissioning and rehabilitation will be undertaken according to a decommissioning and rehabilitation plan developed in consultation with pastoral leaseholders, traditional owners, and relevant government	The proposed action could impact a large area of land and soil quality, resulting in land degradation reduced capacity to reintroduce and maintain environmental values.	**Condition 13 Decommissioning and rehabilitation (DRP)** Prior to commencement of the action, develop and implement a DRP that:

[12] International Erosion Control Association (2008). Best practice erosion and sediment control. International Erosion Control Association (Australasia), Picton NSW.

[13] ARR Project Reports and Data

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	agencies. The plan would include procedures for decommissioning based on the following objectives: • The site rehabilitation post-operations is to return to a self-sustaining, free draining stable landform. • The solar precinct will be fully decommissioned and rehabilitated post operations with the intention of returning it to pastoral land use.	The proponent's measures will contribute to reducing land degradation post-closure, however, the project life is ~70 years and there is a risk of land degradation associated with unplanned decommissioning or dormancy of operation. Progressive rehabilitation and unplanned scenarios are recommended to be included in the decommissioning and rehabilitation plan (DRP) to avoid any significant residual impact on terrestrial environmental quality.	• sets defined closure objectives and agreed criteria developed in consultation with the pastoral lease holders and Traditional Owners and relevant government agencies, • demonstrates that the action will be progressively rehabilitated, non-polluting, consistent with best practice • demonstrates transition to the agreed end land use (pastoral land use) • accounts for unplanned and planned decommissioning or dormancy of operation.
The key e-waste streams produced by solar photovoltaic (PV) systems are solar panels, inverters and energy storage system batteries. Storage, recycling and disposal of this waste has the potential to contaminate terrestrial environmental quality (and impact groundwater and surface water quality) through leachate of hazardous materials. Other waste from PV systems including mounts, racks, and wiring,	The proponent's approach to managing e-waste is to: • develop an overall waste management plan with the objective of reducing waste throughout the project life. In instances where waste generation is unavoidable, the priority is transportation of waste materials to off-site licensed facilities, subject to further studies on the capacity of these existing facilities. Where this is not possible, use on-site landfill(s), to be located	The EIS indicates potential for a substantial quantity of future e-waste: • 55,000 TFE (20 foot equivalent) containers of solar panels and 9,000 (40 foot equivalent) containers of batteries and power storage equipment will be transported, predominantly via rail, to the solar precinct site • solar panels have an optimal design life of approximately 40 years	**Condition 12 Waste management** requires that no PV system e-waste components are to be disposed to landfill (including burial) in the NT, and requires the proponent to develop a Waste management plan that includes measures to manage waste according to the staging and trajectories of the number and volume of solar panels, inverters and energy storage system battery waste.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
can be managed along with other inert solid waste streams.	in previously disturbed borrow pit areas is proposed. • investigate an appropriate response to waste management in consultation with licensed facilities during construction and decommissioning phases. • establish a Renewable Energy Centre of Excellence in the Northern Territory of which recycling opportunities are anticipated to be an integral consideration of the Centre's objectives. • develop a DRP that includes addressing procedures for decommissioning based on the following objectives: o The objective of site rehabilitation post-operations is to return the sites to a self-sustaining, free draining stable landform. o The solar precinct will be fully decommissioned and rehabilitated post operations with the intention of returning it to pastoral land use. The proponent is committed to diverting e-waste from landfill and	• energy storage system batteries have an optimal design life of approximately 15 years • the design life of facilities at the solar precinct is 70 years. Inverters, energy storage system batteries and components of solar panels contain materials that are hazardous wastes (as classified under schedule 2 of the WMPC Act) and materials that may be recycled. Storage, recycling and disposal of PV e-waste has the potential to contaminate terrestrial environmental quality and impact groundwater and surface water quality through leachate of hazardous materials. The proposed action could contribute to these potential significant environmental impacts through storage (e.g. stockpiling, leaving in-situ), recycling (including stripping panels in accessing components for recycling/recovery/replacing) and disposal including burial. Risks associated with storage or disposal of PV e-waste will not be constant through the life of the	**Regulation by other statutory decision-makers** Transport of solar panel and e-waste must be managed in accordance with the WMPC Act.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	will further investigate options for disposal of solar panels throughout the life span of the solar precinct.	project. Periods of heightened risk may be: • during construction from damaged, non-functional panels • every 15 years (optimal life of the battery) e.g. at year 15, 30, 45 and 60 of operation • around year 40 (optimal life of solar panels) • unplanned event e.g. insolvency of the company, dormancy of the operation, not meeting requirements of an environmental approval, crash closure (no market or redundant technology in future) • planned decommissioning of the proposed action (e.g. remediation, rehabilitation, future use) at end of life of the project of 70 years. Commercial options for recycling of componentry, particularly PV e-waste, is expected to develop throughout the project life and present opportunities to repurpose	

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		materials that are currently difficult to dispose of and/or recycle[14]. A Waste Management Strategy including long term planning for waste management will be required. Long term storage or disposal of PV systems or energy storage system batteries to landfill, particularly at such a large scale, would be an unacceptable impact and a condition to manage this is recommended.	
Soil contamination from septic systems or waste disposal in landfills.	Waste management will be in accordance with best practice guidelines and the requirements of the WMPC Act. Landfill will comply with the Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites In the Northern	Listed waste will be managed in accordance with an Environment Protection Approval and/or Environment Protection licence under the WMPC Act. Landfill and septic systems will be required. No significant residual impact is anticipated if implemented in	No condition recommended. **Regulation under other statutory decision-making processes** Under the WMPC Act contamination must be reported to the NT EPA. The NT EPA will then determine under the WMPC Act

[14] While PV cells are generally recycled in Australia most panels are shredded and used in other products including bricks, concrete and road base. Remanufacturing, wherein high-quality materials are recovered and can be directly fed into the supply chain of the original product, reduces the environment impacts of PV production, as well as reducing waste volume and potential contamination from leachate (Deng et al. 2020). [Deng, R., Chang. N, Lunardi MM, Dias, P., Bilbao, J., Ji, J., and Chong, C.M. (2020). Remanufacturing end-of-life silicon photovoltaics: Feasibility and viability analysis. Progress in Photovoltaics: Research and Applications. 2020: 1–15.]

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	Territory[15] (NT EPA 2013). All listed waste will be disposed of at a licensed waste management facility. Septic systems to comply with technical requirements of the Code of Practice for Wastewater Management[16] (Department of Health 2020). No waste will be stored within 200 m of a watercourse. The project will require an Environment Protection Approval under the WMPC Act for landfill construction and an Environment Protection Licence under the WMPC Act for operation of landfill.	accordance with appropriate guidelines.	whether assessment, remediation, treatment or removal is required to manage the contamination.

[15] NT EPA (2013). Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory

[16] Department of Health (2020). Code of Practice for Wastewater Management

6.3.4. Hydrological processes, Inland water environmental quality and Aquatic ecosystems

6.3.4.1. Environmental values

The solar precinct is sited within the Lake Woods catchment and approximately 10 km to the south of Lake Woods. The lake is recharged by flows from the Newcastle Creek and Newcastle Waters catchments, and from rainfall directly onto Lake Woods.

The solar precinct lies within the Wiso Basin, and overlies the Cambrian Montijinni Limestone aquifer. Springs and groundwater dependent ecosystems (GDEs) are known to occur in sandstone hills of the Ashburton Range to the east of the precinct, which are crossed by the access tracks (along Bull Creek approximately 800 m downstream of the gravel access road). The next closest springs are several kilometres from the proposed action. The Georgina Wiso Water Allocation Plan 2023–2031 (GWWAP) has been declared by the Minister for Environment, Climate Change and Water Security under section 22B(1) of the *Water Act 1992*.

Appendix 6.1 of the Supplement to the Draft EIS identified 13 registered bores within 10 km of proposed infrastructure at the solar precinct site. One bore (approximately 5.6 km northwest of the solar precinct) is used for domestic water supply to the Jangirulu Outstation. Ten of the bores are used to supply water for cattle grazing on Powell Creek and Helen Springs Stations and two bores were drilled to supply water for construction of the Alice Springs to Darwin railway line.

The solar precinct is prone to heavy rainfall as a result of tropical depressions and storms. Direct rainfall and run-off on the site provides recharge to the underlying Montijinni Limestone Aquifer.

6.3.4.2. Outcomes of consultation

Matters raised during the NT EPA's consultation relating to potentially significant impacts on hydrological processes and inland water environmental quality include:

- the need to assess the impact of hydrological changes on groundwater-dependent ecosystems in the Ashburton Range and on threatened species.

6.3.4.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented below in **Table 8**.

6.3.4.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, the conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and regulation under the *Water Act 1992*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for hydrological processes, inland water environmental quality and aquatic ecosystems are likely to be met.

Table 8 Assessment for Hydrological processes, Inland water environmental quality, and Aquatic ecosystems and recommendations (solar precinct)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Altered surface water drainage Clearing of 12,403 ha of native vegetation for installation of solar panels, ancillary infrastructure and access roads within Powell Creek Station will change surface water flow in the catchment of the Lake Woods SOCs potentially reducing or concentrating overland flow into Lake Woods. Sedimentation of downstream receiving waters Surface water run-off and overland flows from the solar precinct could result in turbid waters and sedimentation impacting the downstream environment e.g. Lake Woods, without appropriate erosion and sediment controls.	The solar precinct stormwater management system is to be designed to discharge water at similar locations, velocity and volumes to pre-development conditions. During the construction phase, drainage, erosion, and sediment controls installed and maintained in accordance with an ESCP that aligns with the Best Practice Erosion and Sediment Control Guidelines[17] (International Erosion Control Association, 2008). During the operational phase, after disturbed soil surfaces have been stabilised and ESCs are no longer required, the permanent stormwater drainage system will be designed and installed to cater for minor and major storm events and	The surface area of the solar precinct is 0.35% of the Lake Woods catchment area. Clearing and replacement of native vegetation with solar panels will change surface flow in this part of the Lake Woods catchment. Subject to implementation of stormwater management measures, and erosion and sediment controls, impacts on water quality of the lake are not expected to be significant.	**Condition 7 Erosion and sediment control** (refer above to Table 7) **Condition 8 Stormwater drainage system** (refer above to Table 7)

[17] Implementation of erosion and sediment control practices and procedures aligned with the Best Practice Erosion and Sediment Control Guidelines (International Erosion Control Association, 2008) commensurate with the risk of erosion.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	will conform to the methods and criteria set out in Australian Rainfall and Runoff Guidelines 2019[18].		
<u>Groundwater drawdown impacting availability for other users</u> Groundwater extraction proposed for water supply at the solar precinct could have deleterious impact on groundwater levels at nearby receptors including existing groundwater users. Groundwater demand in the solar precinct is spread across nine consumption points and is estimated to be: • Cumulative 8,040 ML over 4 to 4.5 years during construction (equivalent to 2,010 ML/yr or 8.4% of total Wiso Basin estimated sustainable yield (ESY)); • 11.4 ML/year during operation of the solar precinct and ancillary infrastructure	Potable water supply is planned to be trucked in to site tanks or sourced from existing bores (if potable), under agreement with landowners. The estimated sustainable groundwater yield and the available water allocation to each of the beneficial uses for the Georgina Wiso Basin is defined in the GWWAP. This will inform the water extraction licensing process and statutory decisions under the *Water Act 1992*. The proponent will develop a groundwater management plan to monitor impacts from the proposed solar precinct extraction on neighbouring users and the broader aquifer system.	Groundwater drawdown is predicted at two stock supply bores within 500 m of the solar precinct during construction. No modelling of drawdown at the Jangirulu Outstation bore was included in the EIS, however the bore is approximately 5 km northeast from the 0.25 m drawdown contour, indicating no residual significant impact from construction on the community domestic water supply. Water Resources' submission on the supplement confirmed that the solar precinct falls within the Wiso Basin Water Management Zone of the GWWAP area. The WAP establishes the estimated sustainable yield and will inform water availability considerations in	No condition recommended. **Regulation by other regulatory processes** • Extraction of groundwater is through a licencing process regulated under the *Water Act 1992*. • Licensing under the *Water Act 1992* is required to consider the allocation of available water to the declared beneficial uses, including consumptive human uses and the environment.

[18] ARR Project Reports and Data

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
(equivalent to 0.05% of total Wiso Basin ESY) The estimated sustainable yield for the Georgina Basin is 186,154 ML/year, and 23,846 ML/year for the Wiso Basin. Groundwater drawdown modelling estimates the drawdown impact on the closest existing bores (within ~ 500 m of the solar precinct) during construction will range from 0.27 m to 0.84 m. This represents 0.5 – 14% of the available drawdown of water available for consumptive use in the Wiso Basin. No drawdown modelling for the operation was included.		making a water extraction licence decision. Extraction of groundwater would require a licence under the *Water Act 1992* and management in accordance with the relevant WAP. Licensing under the *Water Act 1992* requires the statutory decision maker to consider other users including the environment. The predicted impacts of groundwater extraction are not expected to be significant and will be managed through licencing and regulation under the *Water Act 1992*.	
The solar panel arrays, battery storage, transformers, fuels, hazardous chemicals, landfills etc. will be located in the upstream areas of the Lake Woods catchment and could pose a risk to inland water environmental quality. Contaminated run-off (resulting from inappropriate waste storage, hazardous materials, or uncontrolled spills or leaks etc. from construction equipment and machinery or operational infrastructure)	Maintenance of infrastructure, storage and disposal of listed wastes, and management of landfill according to the WMPC Act. The proponent will maintain dangerous goods and hazards management.	Storage, recycling and disposal of PV e-waste has the potential to contaminate groundwater and surface water quality through leachate of hazardous materials. Refer above to the NT EPA's assessment of Terrestrial environment quality and recommended conditions.	**Condition 12 Waste management** (refer above to Table 7) **Condition 13 DRP** (refer above to Table 7) **Regulation by other statutory decision-makers** WMPC Act

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
discharged from the site impacting water quality of groundwater and Lake Woods.			

6.3.5. Community and economy

6.3.5.1. Environmental values

The Aboriginal community of Jangirulu is a family outstation located approximately 6 km northeast of the accommodation facility. The town of Elliott, situated approximately 65 km north of the solar precinct on the Stuart Highway is the nearest regional centre. Elliott has a population of around 325 people (85% of who identify as Aboriginal and/or Torres Strait Islander), and supports a fuel station, community store and caravan park.

6.3.5.2. Outcomes of consultation

During the NT EPA's consultation on this proposed action, matters raised relating to potential significant impacts on community and economy include:

- a lack of stakeholder engagement
- concerns that the Social Impact Management Plan (Appendix J of the EIS) is deficient.

6.3.5.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented in **Table 9**.

6.3.5.4. Conclusion against the NT EPA objective

With the implementation of the recommended conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), the NT EPA considers that the proposed action can be conducted in such a manner that its objective for community and economy is likely to be met.

Table 9 Assessment for Community and economy and recommendations (solar precinct)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
The high and medium risk/opportunity impacts and benefits identified by the proponent that may impact communities near the solar precinct include: • housing affordability and availability exacerbated by an influx of workers; • provision of training, capacity-building, and employment for local and Aboriginal groups; • opportunities for social procurement[19], service, supply, and Aboriginal inclusion; and • protection of cultural heritage and values (addressed under Culture and heritage).	The proponent has developed a preliminary social impact management plan (SIMP) that identifies its approach to avoiding and mitigating impacts and enhancing benefits in the long and short term. The SIMP includes commitments to: • accommodate the construction workforce at the solar precinct to reduce potential pressures on regional housing stock • develop and implement a Territory Benefit Plan and Local Workforce Strategy (based on capability mapping developed in collaboration with the Industry Capability Network) to maximise local workforce participation and build local capacity • develop and implement a Regional (Aboriginal) Legacy Strategy to maximise local	A workforce of 1,000 is expected to be accommodated at the solar precinct for 30 months during construction. The operational workforce is expected to be ~100. Local communities have limited resources, services and infrastructure. Potential benefits of the proposed action will be facilitated through the proponent's commitment to provide opportunities for economic and skills growth. With the implementation of the SIMP, combined with ongoing improvement informed by consultation, the impacts of the solar precinct on communities resulting from the construction and operation of the solar precinct are not expected to be significant.	No condition recommended.

[19] Social procurement is when organisations use their buying power to generate social value above and beyond the value of the goods, services or construction being procured.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	industry participation, including Aboriginal-owned enterprises. The proponent has conducted consultation with stakeholders in accordance with the NT EPA Stakeholder Engagement and Consultation guidance[20], and has committed to ongoing consultation, and review of the SIMP throughout the project life as required.		

[20] Department of Environment, Parks and Water Security (2021) Stakeholder Engagement and Consultation,

6.3.6. Culture and heritage

6.3.6.1. Environmental values

The Heritage Branch of the Department of Territory Families, Housing and Communities (DTFHC) undertook a search of its database, which showed no records of heritage items or places, including those of archaeological significance within the solar precinct footprint. However, a field assessment undertaken by the proponent recorded 11 Aboriginal archaeological sites and 26 isolated artefacts in or close proximity to the solar precinct footprint.

The Aboriginal archaeological sites included minor lithic scatters, minor stone quarry, drainage depression/soaks and sites associated with the Powell Creek Telegraph Station. The representative site custodian on the archaeological survey advised of the spiritual importance of Powell Creek Telegraph Station as it holds sites of dreaming, dance grounds, campsites, quarries, ceremony places, resource sites and areas, and travel routes. Aboriginal people continue to access Powell Creek Station for hunting and fishing, particularly within the Lake Woods SOCS.

The Aboriginal Areas Protection Authority (AAPA) advised in its submission on the Supplement to the EIS that there are recorded and registered sites throughout the proposed action area, however it does not specify if the sites are within the solar precinct footprint or another area. AAPL has applied for AAPA Authority Certificates under the *Northern Territory Aboriginal Sacred Sites Act 1989*.

6.3.6.2. Outcomes of consultation

Matters raised during the NT EPA's consultation relating to potentially significant impacts on culture and heritage include:

- the AAPA advised that there are discrepancies between the spatial data provided in the supplement to the draft EIS and spatial data provided to AAPA for Authority Certificate applications
- the AAPA advised that there are recorded and registered sites throughout the proposed action area
- the DTFHC Heritage Branch advised that the Cultural Heritage Risk Areas identified by the proponent will require survey prior to commencement of works, and site protection measures may be required.

6.3.6.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented in **Table 10**.

6.3.6.4. Conclusion against the NT EPA objective

With the implementation of the recommended conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and regulation under the *Aboriginal Land Rights (Northern Territory) Act 1976, Northern Territory Aboriginal Sacred Sites Act 1989* and the *Heritage Act 2011*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for culture and heritage is likely to be met.

Table 10 Assessment for Culture and heritage and recommendations (solar precinct)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Land clearing required to construct the solar precinct could have an impact on cultural values including sacred sites. Disturbance of unexpected archaeological places or objects, culturally significant features, and heritage features.	Negotiate Indigenous Land Use Agreements with native title holders. Apply for and comply with conditions of Authority Certificates and ensure conditions are made available to all authorised personnel. Complete surveys, and prepare a cultural heritage management plan (CHMP) in consultation with site custodians.	The proposed action area has not been comprehensively surveyed for the presence or absence of sacred sites under the *Northern Territory Aboriginal Sacred Sites Act 1989*. Therefore the presence of sacred sites is uncertain. The proposed action has the potential to cause irreversible damage to a sacred site (if present). The consequence of damaging a previously unrecorded sacred site is a potentially significant impact to culture and heritage. The AAPA is the body established under the *Northern Territory Aboriginal Sacred Sites Act 1989* with regulatory responsibility for the protection of sacred sites throughout the Territory. The process to obtain an AAPA Authority Certificate includes identification of custodians and culturally appropriate consultation with them to identify any sacred sites and measures to protect them. AAPL has applied to AAPA for AAPA Certificates for the proposed action and has committed to comply	**Condition 1 Limitations and extent**. Condition 1 limits the amount and location of vegetation clearing. **Condition 22 Cultural heritage management plan** Requires the proponent to development and implement a CHMP including procedures to mitigate risks to unexpected maritime heritage objects, including a stop work protocol. **Regulation by other regulatory processes** • Sacred sites are protected under the *Northern Territory Aboriginal Sacred Sites Act 1989* • Archaeological places or objects are protected under the *Heritage Act 2011*. The proponent has an obligation to report unexpected heritage finds to the Heritage Branch of the DTFHC.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		with conditions of the Authority Certificates. The potential for significant impacts to Aboriginal cultural values could be avoided or minimised by obtaining an AAPA Authority Certificate for all activities associated with the proposal. Implementation of the proposed action with the protection measures, including obtaining and complying with AAPA authority certificates and the CHMP, and in in recognition of regulation under the respective sacred sites heritage legislative frameworks, mitigates the environmental impacts to an acceptable likely to meet the NT EPA's objective. The management plans must be developed to meet the NT EPA's environmental objective to protect culture and heritage. Heritage Branch of the DTFHC and the AAPA are both supportive of the action if implemented with the identified avoidance and mitigation measures and did not identify the need for additional conditions.	

6.4. Overhead Transmission Line

6.4.1. Description

The OHTL is approximately 790 km in length from Powell Creek to Murrumujuk. The majority of the OHTL between Powell Creek and Livingstone is located within the existing railway corridor. At Livingstone, the OHTL enters the proposed NTG utilities corridor for approximately 66 km until it terminates at the DCS at Murrumujuk.

The OHTL will comprise up to 1,300 structures (lattice or steel monopole transmission line towers) carrying multiple conductors (**Figure 6**), with each structure between 44 and 60 m tall depending on constraints including wind loading, topography and location of adjacent infrastructure. Structures will be between 200 and 450 m apart, with the final location of each within the corridor yet to be determined.

During construction, disturbance will comprise:

- a 22 m construction corridor along the OHTL
- access tracks from the Stuart Highway as required
- a construction pad for each structure (60 m x 100 m)
- several 100 m x 100 m temporary construction camps for approximately 20 personnel, each in use for approximately 6 months (where existing accommodation isn't available)
- a series of staging areas at approximately 100 km intervals.

During operation, the OHTL will comprise a permanent pad for each structure (16 m x 16 m) and a 6 m wide permanent access track. Operational management of vegetation will be undertaken within a 38 m corridor which includes the permanent access track.

The OHTL will transmit HVDC electricity, which emits low-level static electric and magnetic fields that differ from the low frequency fields emitted by AC powerlines.

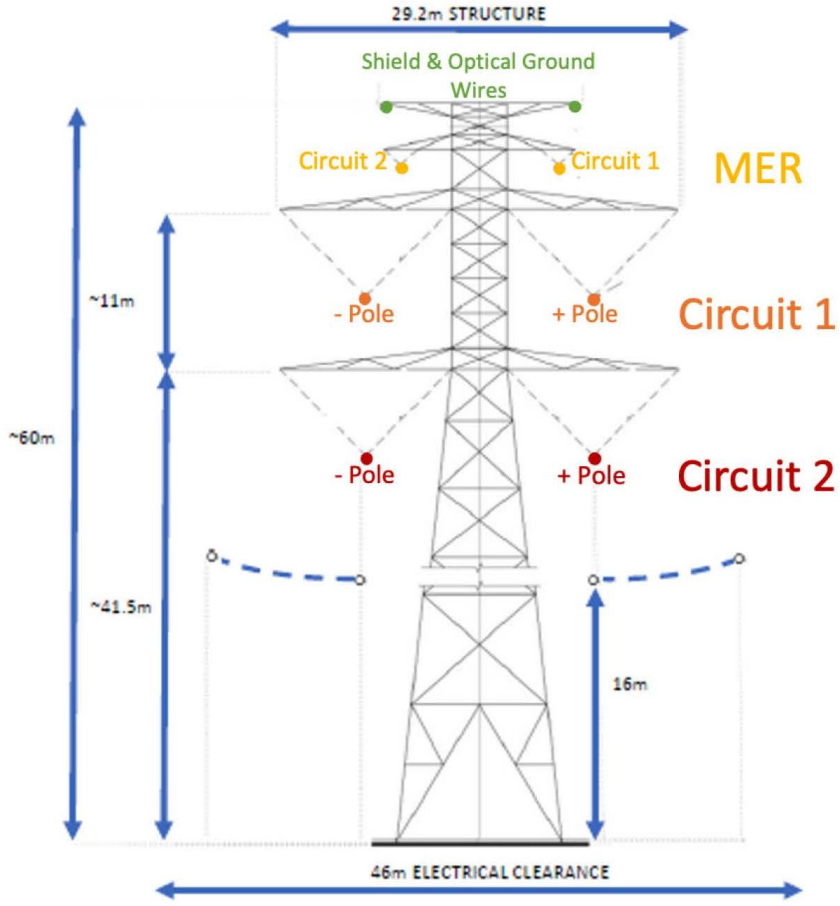

Figure 6 Typical OHTL structure configuration

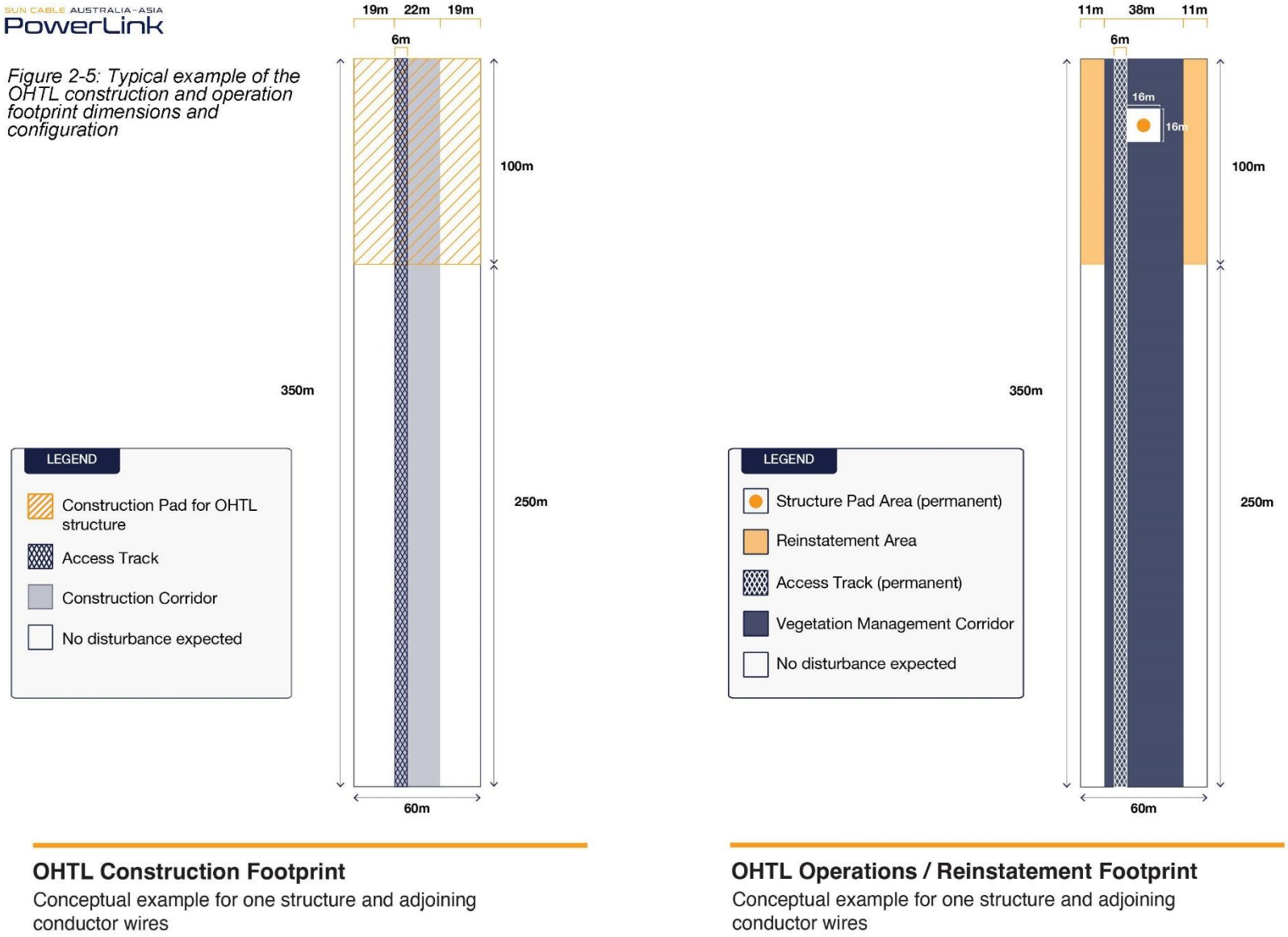

Figure 7 Schematic of OHTL construction and operations/reinstatement footprints

6.4.2. Terrestrial ecosystems

6.4.2.1. Environmental values

The OHTL footprint intersects a wide range of land systems between Elliott and Murrumujuk ranging from desert sandplains to alluvial floodplains. Terrestrial environmental values are discussed for the southern (closest to Elliot and the solar precinct), mid and northern sections (closest to Darwin) of the transmission corridor (each of which correspond to a different bioregion) below.

OHTL - Sturt Plateau bioregion

The southern section of the OHTL traverses the Sturt Plateau bioregion from the solar precinct to approximately 50 km northwest of Mataranka. The region largely comprises flat to gently undulating plains vegetated by eucalypt forests and woodlands dominated by bloodwoods, with an understorey of perennial grasses. There are no SOCS in the area.

Sensitive vegetation types including riparian vegetation, riparian rainforest, old-growth forest supporting hollow-bearing trees and groundwater-dependant ecosystems may occur in localised areas, and will be validated during pre-siting for the OHTL.

In its assessment of the potential impacts to threatened species from construction and operation of the OHTL, the proponent used a desktop assessment to identify all threatened species that potentially occur within the corridor. The proponent then identified species likely to be sensitive to impact within a narrow and localised footprint (i.e., species with a restricted range or that have localised core habitat within the OHTL). The presence of threatened species was validated by field surveys. In some cases, species were identified in field surveys which had not previously been considered. In each of the following sections, species that were considered likely to be sensitive to impact, and those that were recorded during field validation are listed.

In the southern section of the OHTL desktop and field studies identified four threatened fauna species and no threatened flora species (**Table 11**).

Table 11 Threatened species in the Sturt Plateau bioregion (southern section of OHTL)

Common name	Scientific name	TPWC Act	EPBC Act
Gouldian finch	*Erythrura gouldiae*	Vulnerable	Endangered
Greater bilby	*Macrotis lagotis*	Vulnerable	Vulnerable
Grey falcon	*Falco hypoleucos*	Vulnerable	Vulnerable
Red goshawk	*Erythrotriorchis radiatus*	Vulnerable	Endangered
Yellow-spotted monitor	*Varanus panoptes*	Vulnerable	Not listed

The southern end of the OHTL is located ~20 km south of the southernmost records of the Gouldian finch. Further north the OHTL traverses suitable, but not core, habitat. The species was not recorded by general fauna surveys.

Targeted threatened species surveys identified potential Greater Bilby sign along the rail corridor adjacent to the southern OHTL corridor. Potential Yellow-spotted monitor burrows were also recorded in close proximity to the OHTL. Suitable breeding habitat for the Grey falcon may occur in any suitable vegetation intersected by the OHTL, and the Yellow-spotted monitor may occur sparsely in grasslands and woodlands along the OHTL.

OHTL – Pine Creek bioregion

The OHTL traverses the Pine Creek bioregion from north of Mataranka to the crossing of the Edith River north of Katherine. The bioregion comprises mainly hilly to rugged ridges with undulating plains. Vegetation communities include eucalypt woodlands, with patches of monsoon forests. In this region the OHTL passes through the Yinberrie Hills SOCS and the Adelaide River SOCS. The key value for recognition of the Yinberrie Hills is the presence of significant Gouldian finch breeding and foraging habitat, and the Adelaide River SOCS regularly supports large numbers of waterbirds.

Sensitive vegetation types (including riparian vegetation, riparian and dry rainforest, sinkholes, old-growth forest supporting hollow-bearing trees and groundwater-dependant ecosystems) may occur in localised areas, and will be validated during constraints planning and field development for the OHTL.

In the middle section of the OHTL desktop and field studies identified seven threatened fauna species and four threatened flora species (**Table 12**).

Table 12 Threatened species considered by the proponent likely to be impacted in the Pine Creek bioregion (middle section of OHTL)

Common name	Scientific name	TPWC Act	EPBC Act
Threatened fauna			
Ghost bat	*Macroderma gigas*	Not listed	Vulnerable
Gouldian finch	*Erythrura gouldiae*	Vulnerable	Endangered
Grey falcon	*Falco hypoleucos*	Vulnerable	Vulnerable
Mitchell's water monitor	*Varanus mitchelli*	Vulnerable	Critically Endangered*
Mertens' water monitor	*Varanus mertensi*	Vulnerable	Endangered*
Pale field-rat	*Rattus tunneyi*	Vulnerable	Not listed
Victoria River land snail	*Trachiopsis victoriana*	Vulnerable	Not listed
Threatened flora			
Darwin cycad	*Cycas armstrongii*	Vulnerable	Not listed
N/A	*Helicteres macrothrix*	Endangered	Endangered
N/A	*Stylidium ensatum*	Endangered	Endangered
N/A	*Typhonium praetermissum*	Vulnerable	Not listed

* Mitchell's and Merten's water monitors were listed under the EPBC Act after the proponent's impact assessment

Surveys identified habitat for the Darwin cycad, Mertens' water monitor and Mitchell's water monitor. Potentially suitable habitat for the Red goshawk and the Gouldian finch was also identified within the OHTL footprint.

The Ghost bat is endemic to Australia and has a broad distribution across the northern Pilbara, Kimberly and northern NT and Queensland. The species has generalist foraging requirements.

Multiple roosts have been identified, however only 14 breeding sites are known[21]. These sites are concentrated around the Pine Creek and Katherine regions of the NT. The Kohinoor Adit roost near Pine Creek is the largest known maternity site. The OHTL is proposed to pass within ~8 km of the Kohinoor Adit.

OHTL - Darwin Coastal bioregion

The OHTL traverses the Darwin Coastal bioregion from the Edith River crossing to approximately 10 km east of Livingstone in the Darwin rural area. The Darwin Coastal bioregion is generally flat, low-lying country, drained by large rivers including the Adelaide River. Vegetation communities include eucalypt forest and woodlands with tussock and hummock grass understorey.

The OHTL passes through the Adelaide River Coastal Floodplain, Howard Sand Plains and Shoal Bay SOCS.

Sandsheet heath is a significant vegetation type Identified in the Northern Territory Planning Scheme[22] and only occurs in a small area in the Darwin region (56 km^2)[23] and a number of threatened species of flora and fauna are largely or entirely restricted to the habitat type. The proponent's survey multiple sandsheet heath communities were confirmed present in the OHTL between the Stuart Highway and Murrumujuk.

Table 13 Threatened species considered by the proponent likely to be impacted in the Darwin Coastal bioregion (northern section of OHTL)

Common name	Scientific name	TPWC Act	EPBC Act
Threatened fauna			
Bare-rumped sheath-tailed bat	*Saccolaimus saccolaimus nudicluniatus*	Not listed	Vulnerable
Gouldian finch	*Erythrura gouldiae*	Vulnerable	Endangered
Grey falcon	*Falco hypoleucos*	Vulnerable	Vulnerable
Howard River toadlet	*Uperoleia daviesae*	Vulnerable	Vulnerable
Mitchell's water monitor	*Varanus mitchelli*	Vulnerable	Critically Endangered*
Mertens' water monitor	*Varanus mertensi*	Vulnerable	Endangered*
Red goshawk	*Erythrotriorchis radiatus*	Vulnerable	Endangered
Threatened flora			
N/A	*Cleome insolata*	Vulnerable	Not listed
Darwin cycad	*Cycas armstrongii*	Vulnerable	Not listed
Darwin palm	*Ptychosperma macarthurii*	Endangered	Not listed

[21] Bullen, R. (2021). A review of Ghost bat ecology, threats and survey requirements. Report prepared for the Department of Agriculture, Water and Environment, Canberra.

[22] DEPWS (2001). Land Clearing Guidelines Northern Territory Planning Scheme

[23] Department of Environment and Natural Resource (2018). Sensitive Vegetation in the Northern Territory: Sandsheet Heath

Common name	Scientific name	TPWC Act	EPBC Act
N/A	*Stylidium ensatum*	Endangered	Endangered
N/A	*Typhonium praetermissum*	Vulnerable	Not listed
N/A	*T. taylorii*	Endangered	Endangered
N/A	*Utricularia dunstaniae*	Vulnerable	Not listed

* Mitchell's and Merten's water monitors were listed under the EPBC Act after the proponent's impact assessment

The Bare-rumped sheath-tailed bat is known from 11 locations in the NT, including adjacent to the Adelaide River and Howard Springs. The species forages above the canopy and roosts in groups ranging from 10 to 100 individuals in large trees that have deep hollows. The species is difficult to detect, and the proponent did not conduct targeted surveys.

The Howard River toadlet is restricted to shallow drainage systems that intersect sandsheet habitat in the Howard and Elizabeth River catchments. The proponent identified four sites suitable for the Howard River Toadlet.

Surveys identified habitat for the Mertens' water monitor and Mitchell's water monitor.

Cleome insolata is an annual herb which occurs in low open woodlands with key wetland plants on seasonally waterlogged sandy soils, and is closely associated with sandsheet heath. The species was not recorded by field surveys, although survey were conducted outside of the flowering and fruiting season for the species.

The Darwin cycad occurs in open grassy woodlands limited by adequate draining. It also occurs on rocky outcrops, undulating hills and plains. The species is endemic to the Top End, where it is abundant and often found in density stands.

The Darwin palm is known from eight populations in the Black Jungle region, the nearest known individual is within 500 m of the OHTL, the corridor and transects a drainage line upstream of this and other records.

Stylidium ensatum is endemic to the NT and inhabits margins of drainage areas in damp heavy clay or peaty soil. Six patches of *S. ensatum* were recorded within or in close proximity to the OHTL.

Typhonium praetermissum is a geophytic perennial herb that produces a single inflorescence and is found in open woodland habitats. The species is locally endemic and restricted to the Greater Darwin region. *Typhonium taylori* occurs at 11 sites within the Howard River catchment, 30 km east and was located in two sandsheet heath sites within the OHTL footprint. The proponent's targeted survey detected the species within the OHTL Corridor. The NT Government is preparing a *Typhonium* conservation strategy to identify priority areas for protection and to ensure that adequate spatial representation and genetic diversity of the population is maintained.

Utricularia dunstaniae is a small, annual, terrestrial bladderwort, flowering between March and May. In the NT, the species is associated with sandsheet heath. The species was not recorded during the proponent's survey.

6.4.2.2. Outcomes of consultation

Matters raised during the NT EPA's consultation relating to potentially significant impacts on terrestrial ecosystems include:

- information gaps and uncertainty relating to the potential risk to some threatened species and EPBC listed migratory species
- concerns field studies for some threatened species were not carried out or were incomplete
- the need for adequate avoidance and mitigation measures for threatened species and EPBC listed migratory species
- an assessment for EPBC listed migratory shorebirds was not undertaken in accordance with the '*Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*' (Former Australian Department of the Environment, Water, Heritage and Arts, 2013)
- uncertainty about the potential for the OHTL to impact Ghost bats, particularly the Kohinoor Adit colony
- the potential for residual impacts to MNES that would require offsets for *Stylidium ensatum*, *Helicteres macrothrix*, and the Gouldian finch
- uncertainty around how the power lines may impact birds moving across the landscape, in particular to and from Lake Woods.

6.4.2.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented below in **Table 14**.

6.4.2.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, and conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1**)**, and regulation under the *Pastoral Land Act 1992*, and the *Planning Act 1999*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for terrestrial ecosystems is likely to be met.

Table 14 Assessment for Terrestrial ecosystems and recommendations (OHTL)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Land clearing for construction of the OHTL could result in: • soil erosion impacting habitat and habitat-specific listed threatened species • degradation or destruction of sandsheet heath, medium and high value wetlands, wetlands that have threatened species records [24], and riparian vegetation which would impact habitat-specific listed threatened species including *T. praetermissum*, *T. taylori* and *U. dunstaniae*.	The proponent will implement the CPFDP which includes commitments to preferential use of existing cleared areas where possible for infrastructure and temporary construction requirements. Where waterways are intersected by the OHTL, infrastructure and temporary construction works will be located according to the buffers recommended in the Land clearing guidelines[25]. In addition, the OHTL will be accessed from existing roads rather than the permanent access track across the waterway. Implementation of erosion and sediment control practices and procedures aligned with the Best Practice Erosion and Sediment Control Guidelines[26] (International	The DEPWS Flora and Fauna Division is supportive of the proponent's commitment to avoid sandsheet heath habitat using the buffers identified in the Land clearing guidelines. The Division noted that any disturbance to sandsheet health may require offsets to compensate for impacts to threatened species. Direct and indirect impacts to sandsheet heath, medium and high value wetlands, wetlands that have threatened species records, and riparian vegetation will be avoided by locating pads, construction areas and tracks away from these areas by the distance specified in the Land clearing guidelines.	**Condition 9 Wetlands and of the Gunn Point Peninsula and Condition 10 Sandsheet heath of the Gunn Point Peninsula** Specifies that direct disturbance of high value wetlands and sand sheet heaths must be avoided. A 250 m buffer should be implemented to the maximum extent reasonably practicable. Where a 250 m buffer is not achievable, an environmental management plan must be developed in consultation with, and to the satisfaction of the Department of Environment, Parks and Water Security Flora and Fauna Division, and submitted to the Minister 90 business days prior to construction.

[24] Stokeld, D., Leiper, I., Cuff, N., Cowie, I., Lewis, D., and Einoder, L. (2020). Mapping the Future Project - Gunn Point. Biodiversity assessment of the Gunn Point area. Technical report 4/2020, Department of Environment and Natural Resources, Darwin, NT.

[25] DEPWS (2001). Land Clearing Guidelines Northern Territory Planning Scheme

[26] International Erosion Control Association Australasia (2008). Best practice erosion and sediment control. International Erosion Control Association (Australasia), Picton NSW.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	Erosion Control Association, 2008) during construction and operation, commensurate with the risk of erosion. Stabilisation of disturbed sites (e.g. roads, tracks, towers and mobile workforce accommodation camps), will be through progressive reinstatement with native species and implementing the appropriate erosion and sediment controls. The proponent has committed to reinstatement of 2,267 ha of vegetation in the OHTL (80% of the footprint) post-construction with native vegetation.		**Condition 7 Erosion and sediment control** Implement an erosion and sediment control plan in accordance with Best Practice Erosion and Sediment Control Guidelines. Compliance must be reported annually.
The clearing of a corridor for construction of the OHTL, and post construction for the access track would provide a pathway and mechanism for the spread of weeds. 'Ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by introduced Gamba grass (*Andropogon gayanus*), Para grass (*Urochloa mutica*), Olive hymenachne (*Hymenachne amplexicaulis*), Mission grass (*Pennisetum polystachion*) and Annual mission grass (*Pennisetum pedicellatum*)' is recognised as a key	The proponent has committed to reinstatement of 80% of the vegetation in the footprint post-construction with native vegetation. Regular inspection and management of weeds will follow.	The grassy weed species listed as a key threatened process are all likely to occur adjacent, upstream or within the OHTL, and there is a risk the spread of these species will be facilitated by the proposed action. Progressive reinstatement of vegetation, followed by regular inspection and remediation where required is critical to prevent the spread of weeds. The proponent is obligated to manage weeds in accordance with the *Weeds Management Act 2001*.	**Condition 5 Vegetation management** Requires reinstatement of vegetation as disturbed land becomes available and ongoing monitoring and remediation where weeds occur. **Regulation by other regulatory processes** Under the *Weeds Management Act 2001* owners and occupies of land are required to prevent the land becoming infested with a declared weed, and to prevent a declared weed spreading to other land.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
threatening process under the EPBC Act.			
Construction of the OHTL could result in clearing or disturbance of significant vegetation including large and very large trees, riparian vegetation, and associated habitats.	The proponent has committed to implement the CPFDP including using buffers recommended in the Fact Sheet 'Vegetation management in the Northern Territory: Native vegetation buffers and corridors[27]'. Design and construction of OHTL access tracks to avoid major drainages, and low level crossing of minor drainages are to be installed during the dry season only.	The proponent has committed to reinstatement of vegetation in the OHTL. Implementation of the CPFDP is required to minimise impacts to significant vegetation to the greatest extent possible by applying buffers to and not disturbing these habitats. Large and very large trees must be avoided to the maximum extent reasonably practicable.	**Condition 3-1(2) Flora and fauna** Requires the proponent to avoid clearing large and very large trees to the maximum extent reasonably practicable.
Impacts to Greater bilby resulting from disturbance of occupied burrows.	The proponent proposed the development and implementation of a Greater bilby procedure, developed in consultation with DEPWS Flora and Fauna Division. The procedure will include commitment to survey suitable habitat and avoid occupied burrows.	The Greater bilby is likely to occur in the southern OHTL corridor, and any disruption of an active burrow system could comprise a significant impact. The Flora and Fauna Division recommend that the proponent avoid active burrows by at least 50 m.	**Conditions 3-1(3) and 3-1(5)** limit speeds for vehicle travel after dark in the Redsan land system and require any active burrows to be buffered by 50 m.

[27] Department of Environment and Natural Resources (2018). Vegetation management in the Northern Territory: Native vegetation buffers and corridors.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
The OHTL passes close by the Kohinoor Adit Ghost Bat colony near Pine Creek (the largest known maternity site for Ghost bats) and other known roost sites include the Union Reef complex and Spring Hill complex. The effects of electromagnetic fields (EMF) on bat behaviour are poorly understood and may include disruption of foraging behaviour and dispersal of individuals between roosts.	The proponent has committed to avoid the Kohinoor Adit colony by re-routing the OHTL to minimise the potential impacts to the Ghost bat. The route proposed by the proponent (route D2) increases the distance of the OHTL from roost sites and the isolation of individual roosts from each other, with particular attention given to the Kohinoor Adit colony. Route D2 provides a buffer of 8 km from the Kohinoor Adit colony, approximately 6.3 km from the Union Reef complex and 1 km from Spring Hill complex. The proponent has committed to implement a monitoring program to study the interactions between the Ghost bat and the OHTL. This monitoring may support future understanding of the potential impacts of EMF on Ghost bats.	Based on the best information available, the Flora and Fauna Division has advised that route D2 provides an adequate buffer to the Kohinoor Adit Ghost bat colony and impacts to the Ghost bat are not likely to be significant. Route D2 also minimises disruption to connectivity between roosts.	**Condition 3-1(6) Ghost bat** Requires that the OHTL is located a minimum of 8 km from the Kohinoor Adit Ghost bat roost[28] (i.e., the proposed route D2).

[28] Coordinates of Kohinoor Adit are held by the DEPWS Flora and Fauna Division

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
The Red goshawk and the Grey falcon are sensitive to disturbance of breeding habitat, which may occur where the OHTL intersects larger rivers. Construction activity including the clearing of large trees in and around riparian zones, which may disrupt nesting, could have a significant impact.	The proponent has committed to: • conduct pre-clearance surveys in breeding habitat • move all sources of disturbance as far away as possible from any active nests • use of helicopters or sudden noise sources such as pile-driving or blasting within 100 m of the nest will be undertaken outside of breeding period • in the event that there are any Red goshawk nests within the corridor, then all attempts will be made to retain the nest. If retaining a nest tree is not possible because of land tenure or engineering reasons, the proponent has committed to clearing only in the late wet season, prior to egg-laying (mid-July and late August).	Impacts to breeding Red Goshawks and Grey Falcons could result from construction activities. The Flora and Fauna Division is supportive of the proponent's commitment to avoid active Grey falcon and Red goshawk nests, and recommend • a buffer of 300 m (for helicopters and sudden noise sources) • a 100 m buffer from all other construction activities. Where options for avoiding nest trees have been exhausted, clearing trees in the late wet season, prior to egg-laying (mid-July and late August), outside of the breeding season is an acceptable (but not preferred) measure.	**Conditions 3-1(7) and 3-1(8) Grey falcon (*Falco hypoleucos*) and Red goshawk (*Erythrotriorchis radiatus*)** Require the proponent to survey for nests in suitable habitat, confirm if nests are being used by either of these species, and to avoid occupied nests by specified buffer distances.
Up to 3,100 ha of habitat supporting grasses that Gouldian finches feed on, and up to 30 ha of Gouldian finch potential breeding habitat is within the OHTL footprint, and would be partly cleared.	Any suitable habitat will be managed according to the CPFDP. OHTL towers would preferentially be placed to avoid breeding habitat. Where this is not possible, trees/termite mounds will be checked to determine whether they are currently in use by Gouldian finches. Any breeding habitat in use	Disturbance of active Gouldian finch nests must be avoided, and clearing of potential breeding habitat must be minimised, The maximum amount of habitat that would be cleared comprises 0.02% of breeding habitat and 0.11% of foraging habitat available within 20 km of the OHTL. While	**Conditions 3-1(9) to 3-1(11) Gouldian Finch** Requires the proponent to survey for, and avoid breeding habitat that is in use by 200 m.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	will be avoided, buffered by 200 m, and disturbance will only commence once breeding has finished. To maximise the likelihood that foraging grass species will return following disturbance, temporarily disturbed topsoil will be stored to maintain seed viability for when it is re-spread. Weed control will be undertaken.	the disturbance of active nests would be unacceptable, the impact of habitat loss is not likely to be significant.	
The Darwin palm is known from eight populations in the Black Jungle region, the nearest known, recorded individual is within 500 m of the OHTL. The OHTL corridor transects the drainage line upstream of this record.	The proponent provided a draft weed management plan developed to minimise introduction and proliferation of weeds within the proposal area of influence for the life of the proposal.	The Flora and Fauna Division consider that weeds, including gamba grass and mission grass, are a key threat to rainforest vegetation that supports the Darwin Palm. The Division supports the proponent's commitment to update and implement the weed management plan.	**Condition 5 Vegetation management** Requires reinstatement of vegetation as disturbed land becomes available and ongoing monitoring and remediation where weeds occur.
Up to 8.1 ha of *S. ensatum* habitat is within the OHTL and would be partly cleared. 3.9 ha of this habitat has not been surveyed for the species. Within the area that has been surveyed for *S. ensatum*, the proponent has identified one area where the distribution of plants is such that they cannot be avoided. In this area of Noonamah up to 12 of	The proponent has committed to avoiding all plants outside of the identified Noonamah area, and buffering them by 50 m.	Within 1 km of the OHTL, 1,038.8 ha of modelled *S. ensatum* habitat occurs. A maximum of 0.78% of this habitat would be cleared (comprising validated and unsurveyed modelled habitat). This clearing amounts to 0.02% of the total modelled habitat for the species. The potential loss of 12 plants in the Noonamah region represents a	**Conditions 3-1(15) and 3-1(16) *Stylidium ensatum*** Require that the proponent does not clear any *S. ensatum*. **Condition 9 Wetlands and sandsheet heath** Specifies that sandsheet heath (*S. ensatum* habitat), must be avoided by 250 m. In the event that avoidance is not possible, a

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
the 420 reported plants (2.86%) may be lost.		loss of less than 0.01% of the total known population. The Flora and Fauna Division have provided advice that the risk to *S. ensatum*, even with uncertainty about their occurrence in the unsurveyed area, is considered low.	biodiversity offset plan would be required.
The proponent has conducted targeted surveys for *H. macrothrix* across ~27 ha of modelled habitat however, surveys were conducted following a fire that potentially reduced the detectability of plants. 13.1 ha of habitat modelled as suitable for *H. macrothrix* within the OHTL has not been surveyed.	The proponent committed to avoiding any disturbance to *H. macrothrix* except where spanning distance limitations unavoidably require some loss of plants, in which case the aim will be to minimise how many plants are lost and to ensure connectivity of the patch.	1,980.5 ha of *H. macrothrix* modelled habitat occurs within 1 km of the OHTL. A maximum of 13.1 ha of unsurveyed habitat would be cleared. This clearing amounts to 0.01% of the total modelled habitat for the species. Disturbance of any *H. macrothrix* must be avoided to the greatest extent possible, where there are clear reasons requires clear reasons that avoidance options have been fully exhausted, impacts to the species must be minimised (i.e., by clearing the minimum number of plants possible). The Flora and Fauna Division has advised that the risk to *H. macrothrix*, even with uncertainty about their occurrence in the unsurveyed area, is considered low.	No condition recommended.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
The proponent's targeted survey did not identify any *Cleome insolata* in suitable habitat that was accessible. An additional 0.8 ha of modelled *C. insolata* habitat has not been surveyed.	Following initial field surveys the proponent reassessed *C. insolata* as unlikely to occur within the OHTL and did not commit to any protection measures outside of implementation of the CFPDP, and avoidance of sandsheet heath vegetation communities.	316.9 ha of modelled *C. insolata* habitat occurs within 1 km of the OHTL. A maximum of 0.25 % of this habitat would be cleared (comprising validated and unsurveyed modelled habitat). This clearing amounts to 0.02% of the total modelled habitat for the species. The Flora and Fauna Division has provided advice that the risk to *C. insolata*, even with uncertainty about their occurrence in the unsurveyed area, is considered low.	**Condition 9 Wetlands of the Gunn Point Peninsula** Requires that the proponent avoid *C. insolata* habitat (sandsheet heath habitat).
The proponent's survey for Howard River toadlet (*Uperoleia daviesae*) habitat identified four sites considered suitable for the species.	The Proponent has committed to not disturbing the four sites considered suitable for the Howard River toadlet, and buffering them by 50 m.	The Flora and Fauna division, based on the recommendation of Stokeld *et al*. (2020[29]), recommend a buffer of 250 m for this species.	**Condition 9 Wetlands of the Gunn Point Peninsula** Requires the proponent to retain a minimum buffer of 250 m around high value wetlands, and wetland systems with known records of threatened species and sandsheet health vegetation communities to the maximum extent reasonably practicable.

[29] Stokeld, D., Leiper, I., Cuff, N., Cowie, I., Lewis, D., and Einoder, L. (2020). Mapping the Future Project - Gunn Point. Biodiversity assessment of the Gunn Point area. Technical report 4/2020, Department of Environment and Natural Resources, Darwin, NT

6.4.3. Hydrological processes, Inland water environmental quality and Aquatic ecosystems

6.4.3.1. Environmental values

The OHTL will traverse 154 waterways (rivers, creeks and drainage lines) including the Katherine, Edith, Fergusson, Cullen, Adelaide and Elizabeth Rivers.

Aquatic habitats in perennial sections of the Adelaide and Elizabeth Rivers proximate to OHTL crossings are known or likely to support threatened aquatic species (**Table 15**) and the northern section of the OHTL corridor occurs within or adjacent to sensitive habitats such as sandsheet heath, which support highly habitat-specific listed threatened species discussed under Terrestrial ecosystems above.

Table 15 Threatened species likely to occur in perennial sections of the Adelaide and Elizabeth Rivers

Common name	Scientific name	TPWC Act	EPBC Act
Freshwater sawfish	*Pristis pristis*	Vulnerable	Vulnerable
Northern river shark	*Glyphis garricki*	Endangered	Endangered
Speartooth shark	*Glyphis glyphis*	Vulnerable	Critically Endangered

6.4.3.2. Outcomes of consultation

No comments from stakeholders or statutory authorities were received regarding this matter.

6.4.3.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented below in **Table 16**.

6.4.3.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, the conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1) the NT EPA considers that the proposed action can be conducted in such a manner that its objective for hydrological processes and inland water environmental quality is likely to be met.

Table 16 Assessment for Hydrological processes, Inland water environmental quality, and Aquatic ecosystems and recommendations (OHTL)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Vegetation clearing and ongoing use of infrastructure including access tracks along the OHTL have the potential to cause erosion, sedimentation and increase in turbidity resulting in decreased water quality in rivers and streams / aquatic habitats (particularly in perennial sections of the Adelaide and Elizabeth Rivers).	The OHTL will span watercourses. Disturbance in the vicinity of watercourses will be minimised through implementation of the CPFDP. Final route selection and application of the CPFDP will ensure riparian vegetation and aquatic vegetation are avoided where possible. Implementation of an ESCP during construction that complies with the International Erosion Control Association 2008 Best Practice Erosion and Sediment Control. Road design and construction to comply with Austroads Guide to Road Design standards.	The proponent must implement appropriate erosion and sediment controls to maintain the water quality of rivers and streams, and to protect the aquatic ecosystems and aquatic habitats for threatened species.	**Condition 7 Erosion and sediment control** Requires the proponent to implement an erosion and sediment control plan in accordance with Best Practice Erosion and Sediment Control Guidelines. Compliance must be reported annually.

6.4.4. Community and economy

6.4.4.1. Environmental values

From the solar precinct to its termination at the DCS, the proposed OHTL will pass close to the major populated centres of Elliott, Katherine, and Pine Creek.

The Aboriginal communities of Jangirulu and Murranji (near Elliot), Malpiri, Miali Brumby and Rockhole (Katherine area), and Acacia Larrakia (near Manton Dam) are located within 5 km of the OHTL corridor.

The section of the OHTL corridor between Livingstone on the Stuart Highway and the DCS at Murrumujuk passes by the southern and eastern edge of greater Darwin's rural residential areas.

The proponent identified 127 dwellings and communities occur within 5 km of the OHTL, including 39 within 500 m (the closest is ~115 m from the OHTL).

6.4.4.2. Outcomes of consultation

During the NT EPA's consultation on this proposed action, matters raised relating to potential significant impacts on community and economy include:

- lack of stakeholder engagement, particularly with property owners
- concerns that the OHTL has the potential to impact the visual amenity of a large expanse of undeveloped land
- concerns that the towers being used may increase the risk of lightning strikes posing safety and financial risks
- concerns that noise during construction and operation may impact on sensitive receptors such as the Murrumujuk future urban area and existing recreational users
- concerns the OHTL will negatively affect nearby property value
- concerns the OHTL will affect communications signal to residential premises
- concerns the Social Impact Management Plan (Appendix J of the EIS) is deficient.

6.4.4.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings, recommendations, and conditions of approval are presented below in **Table 17**.

6.4.4.4. Conclusion against the NT EPA objective

With the implementation of the recommended conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and the *Planning Act 1999*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for community and economy is likely to be met.

Table 17 Assessment for Community and economy and recommendations (OHTL)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
The section of the OHTL corridor between Livingstone on the Stuart Highway and the Darwin Converter Site at Murrumujuk passes through southern and eastern greater Darwin's rural residential area. The presence of structures (44 – 60 m in height) will create visual impact to residents and travellers throughout the life of the project.	The proponent minimised the visual impacts of the OHTL as far as possible, and mitigated future cumulative impact of additional infrastructure, by locating the route in the future utilities corridor designated in the Litchfield Subregional Land Use Plan 2023[30]. The proponent has identified mitigation measures that will be implemented in sensitive locations based on the Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands[31] (United States Department of the Interior, Bureau of Land Management, 2013), including: • reinstatement of local vegetation	Structures between 44 and 60 m tall will be located 200 - 450 m apart, through Darwin's rural residential areas. The location is consistent with long term land use planning for the region and all practicable mitigations will be applied.	No conditions recommended. **Regulation by other statutory decision-makers** Pursuant to the *Planning Act 1999*, development permit(s) may be required.

[30] NT Planning Commission (2023). Litchfield Subregional Land Use Plan 2016. Version 6.

[31] United States Department of the Interior (2013). Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands. Bureau of Land Management. Cheyenne, Wyoming.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	• road crossings designed to transect the road at an appropriate angle • preferred use of monopoles where sensitive receptors are closer than 800m • context specific colouring.		
Exposure to low frequency EMF can cause biological responses, through the central nervous system, including perception of faint flickering light in the periphery of the visual field (phosphenes), or surface electric-charge effects ranging from perceptible to annoying. The static magnetic field generated by the OHTL is modelled to be in the order of 60 to 70 µT at ground level directly below the powerlines. The modelled strength of the Static electric field generated by	The proponent has committed to manage EMF in accordance with applicable standards and regulations and relevant EMF guidelines (including the *Australian Radiation Protection and Nuclear Safety Agency* (ARPANSA 2015) and *International Commission for Non-ionizing Protection*) to ensure safety for all persons is maintained. Prior to construction the proponent will model the EMF associated with the final design to ensure that the recommended exposure limit for the public (ICNIRP, 2010[32]) is met at the edge of the corridor. Once the OHTL	There is uncertainty about the magnitude of EMF generated by bipole High Voltage Direct Current (HVDC) transmission lines, and the impact of fields on human health. The area of influence related to EMF is 15 m either side of the OHTL (within the corridor). Design parameters for the OHTL are to meet the recommended exposure limit for the public (ICNIRP, 2010) at the edge of the corridor (10 kV/m). Within the OHTL corridor the occupational limit will be met and so there are no health impacts predicted from passing through the corridor.	**Condition 15 Human exposure to electro-magnetic fields** That the design, construction and operation of the OHTL is managed to comply with the applicable electric and magnetic fields (EMF) limits in ICNIRP, 2010. Monitoring must be conducted at the highest power loading that has been achieved. Mitigation must be applied if ICNIRP (2010) limits are exceeded.

[32] International commission on non-ionizing radiation protection (2010). Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz). Health Physics, 99(6):818-836.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
the OHTL is 20 Kv/m directly below the powerlines.	has been constructed, monitoring will occur to demonstrate and validate the modelling results. The proponent concludes that EMF associated with the OHTL that could impact human health is not expected.	Monitoring is required to ensure EMF modelling is accurate and that human health limits are not exceeded.	

6.4.5. Culture and heritage

6.4.5.1. Environmental values

A search of the Heritage Branch database showed records of 27 archaeological and historic sites within and in close proximity to the proposed OHTL alignment.

During consultation with the proponent Traditional Owners indicated that there are a number of sites along the OHTL corridor that have cultural significance (such as dreaming sites and dreaming corridors). Additionally, during consultation AAPA indicated that there are recorded and registered sacred sites within the project footprint. The proponent has applied for an AAPA Authority Certificate which is currently pending approval.

6.4.5.2. Outcomes of consultation

During the NT EPA's consultation on this proposed action, matters raised relating to potential significant impacts on culture and heritage include:

- The AAPA advised that there are discrepancies between the spatial data provided in the supplement to the draft EIS and spatial data provided to AAPA for Authority Certificate applications
- The AAPA advised that there are recorded and registered sites within the footprint of the proposed action
- The Heritage Branch of DTFHC noted that 'cultural Heritage Risk Areas' identified by the proponent will be surveyed prior to commencement of works and site protection measures will be included in a Cultural Heritage Management Plan.

6.4.5.3. Factor assessment and recommendations

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings, recommendations, and conditions of approval are presented below in **Table 18**.

6.4.5.4. Conclusion against the NT EPA objective

With the implementation of the recommended conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and regulation under the *Aboriginal Land Rights (Northern Territory) Act 1976*, *Northern Territory Aboriginal Sacred Sites Act 1989*, and the *Heritage Act 2011*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for culture and heritage is likely to be met.

Table 18 Assessment for Culture and heritage, recommendations and conditions of approval (OHTL)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Land clearing required to construct the OHTL could have an impact on cultural values including sacred sites. Disturbance of unexpected archaeological places or objects, culturally significant features, and heritage features.	The conditions required to avoid significant residual impacts to culture and heritage to the solar precinct also apply to the OHTL (see **Table 10**).		

6.5. Darwin Converter Site and Cable Transition Facility

6.5.1. Description

The DCS is on a 124 ha site located at Murrumujuk, where within the site approximately 10 ha of land will be disturbed. The DCS will comprise a voltage converter, battery systems, substation and switchyard, an operations and maintenance facility and ancillary infrastructure, including but not limited to lay down, warehousing, staff offices, communications tower and ablutions.

The CTF includes the underground cable corridor, land sea joint station and the shore crossing site. Power leaving the DCS will be transmitted via underground HVDC cables along a cable corridor for 2.7 km to the land sea joint station where the onshore and offshore cables will be connected.

Three shore crossing trench footprints (each 500 m long x 9.5 m wide x 2 m deep) are proposed. For each trench, approximately 10,000 m^3 of marine sediments will be excavated and left exposed for up to three weeks.

6.5.2. Terrestrial environmental quality

6.5.2.1. Environmental values

The DCS and CTF will be located partly within the Shoal Bay SOCS, and near the Tree Point Conservation Area and the Shoal Bay Coastal Reserve. The CTF will be located on the foreshore of Gunn Point beach which is a public recreation area with beach access.

The land and soils of the DCS and CTF are typically well drained and gently undulating upland plains, and swamps, billabongs and closed depressions that are poorly drained. The CTF also extends across the foreshore and intertidal zone.

The land and soils support habitat for a range of flora and fauna, and foraging habitat for migratory bird species/shorebirds, and threatened and migratory turtles. The impacts on those values are discussed in the Terrestrial ecosystems section.

6.5.2.2. Outcomes of consultation

No comments received.

6.5.2.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented below in **Table 19**.

6.5.2.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, and conditions for avoidance, monitoring, and mitigation of impacts identified in the draft Environmental Approval (Appendix 1), the NT EPA considers that the proposed action can be conducted in such a manner that its objective for terrestrial environmental quality is likely to be met.

Table 19 Assessment for Terrestrial environmental quality and recommendations

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Excavation for the CTF shore crossing has the potential to expose reactive acid sulfate soils (ASS).	The potential for exposure of PASS at the shore crossing is addressed under Subsea cable (see **Table 24**).		

6.5.3. Terrestrial ecosystems

6.5.3.1. Environmental values

Twelve land units intersect the DSC and CTF footprint, and land form classes include rises, plains, and drainage systems.

Gunn Point Beach is located within the North Darwin Shorebird Area, is listed in the Directory of Important Habitat for Migratory Shorebirds in Australia, and is known to support an internationally significant number of Great knot and nationally significant numbers of Bar-tailed godwit, Black-tailed godwit, Greater sand plover, Grey plover, Lesser sand plover, Red knot, Ruddy turnstone, Sharp-tailed sandpiper, Terek sandpiper, and Whimbrel. The most important habitat for shorebirds is between Lee Point and Tree Point, south of the shore crossing (Chatto, 2003)[33].

A wetland community supporting *Melaleuca* and *Grevillea* spp. occurs in the south west corner of the DSC. Significant vegetation types occur within the CTF, including riparian vegetation, rainforest and large hollow-bearing trees.

The proponent identified two threatened flora species and two threatened fauna species considered to have a high to medium likelihood of occurring within the DSC, CTF and shore crossing, including the Darwin cycad (*C. armstrongii*), *T. praetermissum*, Northern brushtail possum (*Trichosurus vulpecula arnhemensis*) and the Yellow spotted monitor (*V. panoptes*). The DEPWS Flora and Fauna Division recommended that a further three additional threatened fauna species classified as high value species for the Gunn Point area also be considered. These species included the Black-footed tree-rat (*Mesembriomys gouldii gouldii*), Fawn antechinus (*Antechinus bellus*) and Masked owl (*Tyto novaehollandiae kimberli)* (**Table 20**).

High density stands of the Darwin cycad (*Cycas armstrongii*) are known to occur within and adjacent to the DCS footprint (Stokeld *et al*. 2020[34]). Surveys undertaken by the proponent identified the threatened *C. armstrongii*.

The proponent's survey also identified *T. praetermissum*. Other flora and fauna species considered highly likely to occur within the footprint were not detected during the survey.

DEPWS has identified Gunn Point including the DCS and part of the CTF footprint as highly suitable habitat for *T. praetermissum* (Stokeld *et al*. 2020[24]). The proponent's survey recorded 197 *T. praetermissum* plants within the DCS and CTF footprints, and recorded a similar density of plants in adjacent habitat to the south.

[33] Chatto, R. (2003). The distribution and status of shorebirds around the coast and coastal wetlands of the Northern Territory. Parks and Wildlife Commission of the Northern Territory, Technical Report 73.

[34] Stokeld, D., Leiper, I., Cuff, N., Cowie, I., Lewis, D., and Einoder, L. (2020). Mapping the Future Project - Gunn Point. Biodiversity assessment of the Gunn Point area. Technical report 4/2020, Department of Environment and Natural Resources, Darwin, NT

Table 20 Threatened terrestrial flora and fauna species considered by the proponent as likely to be impacted by the DCS, CTF and shore crossing

Common name	Scientific name	TPWC Act	EPBC Act
Threatened fauna			
Black-footed tree rat	*Mesembriomys gouldii gouldii*	Endangered	Endangered
Fawn antechinus	*Antechinus bellus*	Endangered	Vulnerable
Masked owl	*Tyto novaehollandiae kimberli*	Vulnerable	Vulnerable
Northern brushtail possum	*Trichosurus vulpecula arnhemensis*	Not listed	Vulnerable
Yellow spotted monitor	*Varanus panoptes*	Vulnerable	Not listed
Threatened fauna			
Darwin cycad	*Cycas armstrongii*	Vulnerable	Not listed
	Typhonium praetermissum	Vulnerable	Not listed

6.5.3.2. Outcomes of consultation

Matters raised during the NT EPA's consultation relating to potentially significant impacts on terrestrial ecosystems include:

- information gaps and uncertainty relating to the potential risk to some threatened species and EPBC listed migratory species
- concerns field studies for some threatened species were not carried out or were incomplete
- the need for adequate avoidance and mitigation measures for threatened species
- the need for adequate avoidance and mitigation measures for EBPC listed migratory species
- an assessment for EPBC listed migratory shorebirds has not been adequately undertaken.

6.5.3.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings, recommendations, and recommended conditions of approval are presented below in **Table 21**.

6.5.3.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, and conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), the NT EPA considers that the proposed action can be conducted in such a manner that its objective for terrestrial environmental quality is likely to be met.

Table 21 Assessment for Terrestrial ecosystems and recommendations (DCS and CTF)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Clearing for the DCS is predicted to remove ~197 *T. praetermissum* plants.	There are no mitigation measures proposed for *T. praetermissum* in the DCS and CTF footprints. The proponent states the residual impact is certain, but is not considered to be significant for the species or any important sub-population.	The Flora and Fauna Division support the proponent's conclusions that because the species is locally abundant and the number of plants to be removed is proportionally small there is unlikely to be a residual significant impact to *T. praetermissum* as a whole, or to any important sub-population.	No condition recommended.
Cumulative impacts in the Gunn Point region from loss of *C. armstrongii.*	The proponent proposed the following mitigation measures: • avoid disturbance of high density stands. • where avoidance is not possible, the species would be salvaged and translocated for replanting into the re-instated areas of the project footprint.	The Darwin Cycad is locally abundant within its restricted range, therefore the focus for conservation is on the areas that contain very high density stands of *C. armstrongii* (>700 mature stems per ha). High density stands of *C. armstrongii* are known to occur within and adjacent to the DSC footprint (Stokeld *et al*. 2020[35]) and surveys undertaken by the proponent confirmed the presence of the species within the DCS footprint. Impacts to *C. armstrongii* would be mitigated to an acceptable level by	**Conditions 3-1(12), 3-1(13) and 3-1(14) *Cycas armstrongii*** Preclearance surveys in suitable habitat for C. *armstrongii* must be conducted by a qualified person to identify very high density stands of *C. armstrongii.* Clearing very high-density stands of *C. armstrongii* is avoided to the maximum extent reasonably practicable within the approved extent of the CTF, and within the approved extent of the OHTL and DCS *C. armstrongii* should be salvaged and translocated.

[35] Stokeld, D., Leiper, I., Cuff, N., Cowie, I., Lewis, D., and Einoder, L. (2020). Mapping the Future Project - Gunn Point. Biodiversity assessment of the Gunn Point area. Technical report 4/2020, Department of Environment and Natural Resources, Darwin, NT

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		avoiding disturbance of very high density stands of mature individuals and where avoidance is not possible within the DCS, salvaging and translocating the species in accordance with the translocation guideline the Management Program for Cycads in the Northern Territory of Australia 2009-2014[36] (Liddle, 2009).	
The behaviour of foraging threatened and/or migratory (terrestrial and marine) fauna may be directly impacted by light, noise and vibration from cable installation equipment, or from construction and operation of the DCS and CTF. Clearing of shorebird foraging habitat and trenching across the beach crossing during construction of the shore crossing may reduce the availability of habitat and prey for recently migrated birds, leading	The EIS indicates that construction works within the shoreline crossing could be scheduled and completed during the Australian winter (end of May through to end of August), when the majority of migratory shorebirds are transiting to or from the Northern Territory coast, or in their northern hemisphere breeding sites. Commitment to undertake works at night in accordance with the National Light Pollution Guidelines for Wildlife (May 2023)[37].	The proponent will consider the timing of construction and excavation works at the DCS to avoid or minimise impacts to threatened shorebird species and disturbance of foraging habitat. Proposed works including excavations to bury cables, avoid the most high value habitat (which occurs south of the shore crossing) and are likely to be temporary or short term in nature and will be scheduled to be completed with minimal impact to receptors.	No condition recommended.

[36] Liddle, D.T. (2009). Management Program for Cycads in the Northern Territory of Australia 2009-2014. Northern Territory Department of Natural Resources, Environment, the Arts and Sport, Darwin.

[37] DCCEEW (2023). National Light Pollution Guidelines for Wildlife. Department of Climate Change, Energy, the Environment and Water, Canberra.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
to significant impacts on populations.			

6.5.4. Hydrological processes, Inland water environmental quality and Aquatic ecosystems

6.5.4.1. Environmental values

The DCS is located in the Darwin Coastal bioregion with a monsoonal climate. The DCS is within two catchment areas, the Leaders Creek and Fly Creek catchments, both draining north into the ocean. The CTF intersects one first order stream (Fly Creek) and one second order stream (Leaders Creek). There are no streams within the DCS footprint.

The DCS and CTF are situated within the Howard groundwater system and overlay two main aquifers, an upper (shallow) seasonal aquifer and a lower productive aquifer.

There is a seasonal swamp in the southwest of the DCS footprint which fills during the wet season and discharges to the south west into a minor drainage line that continues into the coastal floodplains and the Tree Point Conservation Area.

The site is also within or adjacent to habitats including sandsheet heath, which support highly habitat-specific listed threatened species including the Howard River toadlet, *T. taylori* and *Utricularia dunstaniae* (Endangered under the TPWC and EPBC Act).

6.5.4.2. Outcomes of consultation

Matters raised during the NT EPA's consultation relating to potentially significant impacts on hydrological processes and inland water environmental quality include:

- the need to assess the impact of hydrological changes on groundwater-dependent ecosystems (e.g., sandsheet heath) and threatened species.

6.5.4.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings, recommendations, and conditions of approval are presented below in **Table 22**.

6.5.4.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, the conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and regulation under the *Water Act 1992*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for hydrological processes and inland water environmental quality is likely to be met.

Table 22 Assessment for Hydrological processes and inland water environmental quality and recommendations (DCS and CTF)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Disturbance to hydrological processes, particularly surface flows, in proximity to sandsheet heath habitat may impact the quality of available threatened species habitat.	The proponent will implement the CPFDP which includes commitments to survey for and avoid or minimise disturbance of sensitive vegetation, threatened species and their habitats when locating infrastructure. This includes maintaining hydrological regimes that support threatened species habitat including wetland and sandsheet heaths.	The Flora and Fauna Division and NT EPA support the proponent's intent to maintain the existing hydrology of wetlands and watercourses.	**Conditions 9 and 10 Wetlands and sandsheet heath** of the **Gunn Point Peninsula** The conditions required to avoid significant residual impacts to terrestrial ecosystems (see Table 14) also apply to hydrological processes and inland water environmental quality.
The proposed action and clearing of the site at the DCS would result in altered local surface flows and drainage, and result in likely erosion/sedimentation impact on the seasonal swamp in the southwest of the footprint. The DCS and CTF sites have a high erosion hazard rating due to the high erosion potential of soils, and the monsoonal climate. Erosion and sedimentation would disturb the seasonal swamp, or cause erosion of sensitive foreshore and beach areas.	Infrastructure locations within the DCS site have been designed to avoid sensitive/significant vegetation including the seasonal swamp. Staged clearing and reinstatement is proposed for DCS construction and underground cable laying to limit the potential for erosion. Disturbed soils will be stabilised and an ESCP will be implemented including in the foreshore and beach areas. The proponent has committed to reinstatement of disturbed land that has been cleared for construction	Clearing for the DCS, and installation of the underground cable have the potential to cause erosion. The DCS and CTF sites will be prone to erosion risk without adequate controls. The remediation and rehabilitation of disturbances is required immediately following construction to mitigate against the high erosion hazard potential of soils and monsoonal climate.	**Condition 7 Erosion and sediment control** Implement an erosion and sediment control plan in accordance with Best Practice Erosion and Sediment Control Guidelines. Compliance must be reported annually. **Condition 5 Vegetation management** Requires reinstatement of vegetation as soon as practicable after disturbed land becomes available. **Condition 8 Stormwater drainage system** Design and install stormwater drainage system so that flows from

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	and not required for operations e.g. the underground cable corridors.		the site are attenuated to not exceed the pre-development flow.
The proposed development is likely to alter local overland flow reporting to the seasonal swamp. An increase in sedimentation and turbidity would negatively impact water quality of the swamp.	Proponent has committed to minimise impacts to surface water features, including avoiding development near the seasonal swamp. During construction, drainage, erosion, and sediment controls will be implemented, and works will be completed over a short period of time and in the dry season where practicable. Proponent has identified that the local run-off reporting to the seasonal swamp are likely to be altered as a result of the proposed DCS development, and the stormwater drainage system will be designed so environmental flows are similar in nature to pre-construction conditions.	Proponent has committed to implement appropriate erosion and sediment control and stormwater management. The Howard River toadlet is highly habitat specific. Any occurring within the DCS and OHTL footprint would comprise an 'important population' and any impact would be significant.	**Condition 7 Erosion and sediment control**

6.5.5. Community and economy

6.5.5.1. Environmental values

The DCS is adjacent to the proposed future Murrumujuk Township (identified in the revised Litchfield Subregional Land Use Plan[38]). The township could eventually accommodate a population of up to approximately 36,000 residents. However, the establishment of the township would be contingent upon actual and substantial demand for housing, intended to provide accommodation of a workforce related to a potential deep water port and strategic industry at Glyde Point.

The CTF and shore crossing extend from the DCS to Gunn Point beach which is a public recreation area with beach access.

6.5.5.2. Outcomes of consultation

During the NT EPA's consultation on this proposed action, matters raised relating to potential significant impacts on community and economy include:

- potential impacts on access and recreational use of Gunn Point beach during construction
- impacts of noise from the DCS on the proposed Murrumujuk township.

6.5.5.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings, recommendations, and conditions of approval are presented below in **Table 23**.

6.5.5.4. Conclusion against factor heading

With the implementation of the proponent's proposed management measures, commitments, recommendations, the conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), the NT EPA considers that the proposed action can be conducted in such a manner that its objective for community and economy is likely to be met.

[38] NT Planning Commission (2023). Litchfield Subregional Land Use Plan 2016. Version 6.

Table 23 Assessment for Community and economy recommendations (DCS and CTF)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Operation of the DCS could expose part of the proposed Murrumujuk township to ambient noise exceeding the assigned amenity noise levels for the relevant land use identified in the Northern Territory Noise Management Framework Guideline[39] (2018).	The proponent has committed to avoidance and mitigation measures that include locating infrastructure within the DCS away from sensitive receptors and mitigations including enclosure and shielding of noisy equipment.	The changes made to the project design and the addition of mitigating measures have reduced the area within which ambient noise is predicted to exceed the assigned amenity noise levels to a level that will not have a significant impact.	**Condition 16 Human exposure to noise** Requires the proponent to model noise emissions from the final design of the DCS, and ensure they do not exceed the project specific assigned noise levels by more than stated in the EIS. Post-energisation monitoring must be conducted and additional mitigation applied if the project specific assigned noise level is exceeded.

[39] NTEPA (2018). Northern Territory Noise Management Framework Guideline.

6.5.6. Culture and heritage

6.5.6.1. Environmental values

The proponent's field survey did not identify any Aboriginal archaeological sites in the DCS project footprint. The survey of the CTF location identified three archaeological features comprising middens and shell scatters. Two of these features were already recorded on the DTFHC database.

A seasonal swamp in the south west corner of the DCS area was identified during field surveys conducted by the proponent's consultants with representative Larrakia and Tiwi Traditional Owners, as a cultural feature with a high potential for isolated artefacts or culturally modified trees.

The low hills and sand dunes near the foreshore are identified as having a moderate and high cultural heritage risk rating (presence of burials and shell middens, subsurface heritage features, and small creek/resource area).

A (confidential) Abstract of Authority's Records provided to the proponent by AAPA identified a Registered sacred site, and a burial site (and associated restricted works areas) nearby, but not within the DCS and CTF footprints.

6.5.6.2. Outcomes of consultation

During the NT EPA's consultation on this proposed action, matters raised relating to potential significant impacts on culture and heritage include:

- the AAPA advised that there are recorded and registered sites within the footprint of the proposed action
- the AAPA advised that there are discrepancies between the spatial data provided in the supplement to the draft EIS and spatial data provided to AAPA for Authority Certificate applications.

6.5.6.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings, recommendations, and conditions of approval are presented below in **Table 24**.

6.5.6.4. Conclusion against the NT EPA objective

With the implementation of the recommended conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and regulation under the *Aboriginal Land Rights (Northern Territory) Act 1976*, *Northern Territory Aboriginal Sacred Sites Act 1989* and the *Heritage Act 2011*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for culture and heritage is likely to be met.

Table 24 Assessment for Culture and heritage and recommendations (DCS and CTF)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Change in surface hydrology and associated increased levels of sediment supply to the swamp area as a result of the proposed disturbances could impact the character (and cultural significance) of the seasonal swamp. Potential for construction works to disturb burial sites and middens.	Monitor ground disturbance activities within 250 m of swamp. Avoid creek systems associated with cultural values e.g. the creek/resource area. The site erosion and sediment controls and stormwater drainage system will be designed so environmental flows are similar in nature to pre-construction conditions.	The DCS site that includes the seasonal swamp, low lying hills, dunes and creeks, is recognised as an area with high cultural significance. The sites of cultural significance that have been identified must be avoided with an established buffer zone. Proponent must implement erosion and sediment controls and stormwater drainage on the site to achieve pre-construction environmental flows. The sites must be protected, and monitoring is required as part of proponents cultural heritage management plan. Heritage Branch of the DTFHC and AAPA are both supportive of the action if implemented with the identified avoidance and mitigation measures and did not identify the need for additional conditions.	**Condition 7 Erosion and sediment control** • Implement an erosion and sediment control plan in accordance with Best Practice Erosion and Sediment Control Guidelines. Compliance must be reported annually. • Implement stormwater management. Compliance with the ESCP including discharge water quality and quantity must be continuously monitored discharging from the solar precinct stormwater management system. **Regulation by other regulatory processes** • Sacred sites are protected under the *Northern Territory Aboriginal Sacred Sites Act 1989* • the *Heritage Act 2011* for protection of Heritage places or objects
Land clearing required to construct and operate the OHTL	The conditions required to avoid significant residual impacts to culture and heritage to the solar precinct also apply to the OHTL (see **Table 10**).		

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
could have an impact on cultural values including sacred sites. Disturbance of unexpected archaeological places or objects, culturally significant features, and heritage features			

6.6. Subsea Cable

6.6.1. Description

A HVDC subsea cable system will be installed to transfer electricity over approximately 4,200 km from Darwin to Singapore. The section of the subsea cable system that is in NT coastal waters extends seaward from the Shore crossing site at Gunn Point Beach for approximately 100 km (the NT coastal waters limit, is three nautical miles (NM) seaward of the territorial sea straight baseline). The subsea cable then continues in Commonwealth waters to the limit of the Commonwealth marine area[40] at the boundary of the Australian Exclusive Economic Zone (200 NM limit) (**Figure 4**).

The subsea cable system could be installed in either a standard spaced, or standard bundled configuration. The spaced cable configuration (where individual cables are laid and spaced at least 50 m apart) is a configuration consisting of Pole 1 HVDC (single) cable and Pole 2 cable, separated by the metallic return cable. Cable spacing is dependent on water depth and for water depths >100 m, could range up to 200 m.

The bundled cable configuration is a standard configuration where the Pole 1 HVDC cable would be bundled with the metallic return cable, and Pole 2 would be installed separately. A separation distance of at least 50 m is required between the bundled cable (Pole 1 and metallic return cable) and the separate Pole 2 cable to effectively minimise the electromagnetic and thermal interaction between adjacent HVDC cables.

The subsea cable system configured as spaced or bundled may be either individually laid on the seafloor (protected with rock armouring or matting), or buried to a depth of up to 3 m, and could comprise an array of up to six cables. The spacing of the cables will also be dependent on the characteristics of the sea floor, and the disturbance footprint for burial of each cable will be approximately 12 m wide.

The seabed of Shoal Bay and the Beagle Gulf has geomorphological features that include low-profile sandbanks and shallow rocky outcrops, flat sandy sediment plains, shore-perpendicular depressions and channels, as well as simple to complex soft sediment bedforms including occasional mega ripples (sand waves). Irregular hardgrounds are also present.

Three subsea cables will be constructed, with an additional three cables proposed to be laid at a later stage. The proponent has indicated that a range of different techniques (e.g. mass flow excavator, jet trenching and ploughing) are likely to be applied to achieve the required depth of burial for the cable causing disturbance of the seabed. The offshore cable laying/burial activities will primarily be via jet trenching methods moving at a rate of up to 600 m per hour.

The proponent has indicated that the subsea cable would ideally be buried below the non-mobile reference level, or below the competent seabed to address the risk of anchor and trawl gear hook-ups and other anthropogenic hazards. If seabed features such as bed waves or sand waves (large dunes) exist, pre sweeping activities such as dredging are required to smooth out the slopes for cable burial machines to pass over, and in some cases, to avoid free spans of the cable. Dredged material will be disposed at spoil disposal locations shown in **(Figure 8)**.

[40] The Commonwealth marine area is defined in Section 24 of the *Environment Protection and Biodiversity Conservation Act 1999*

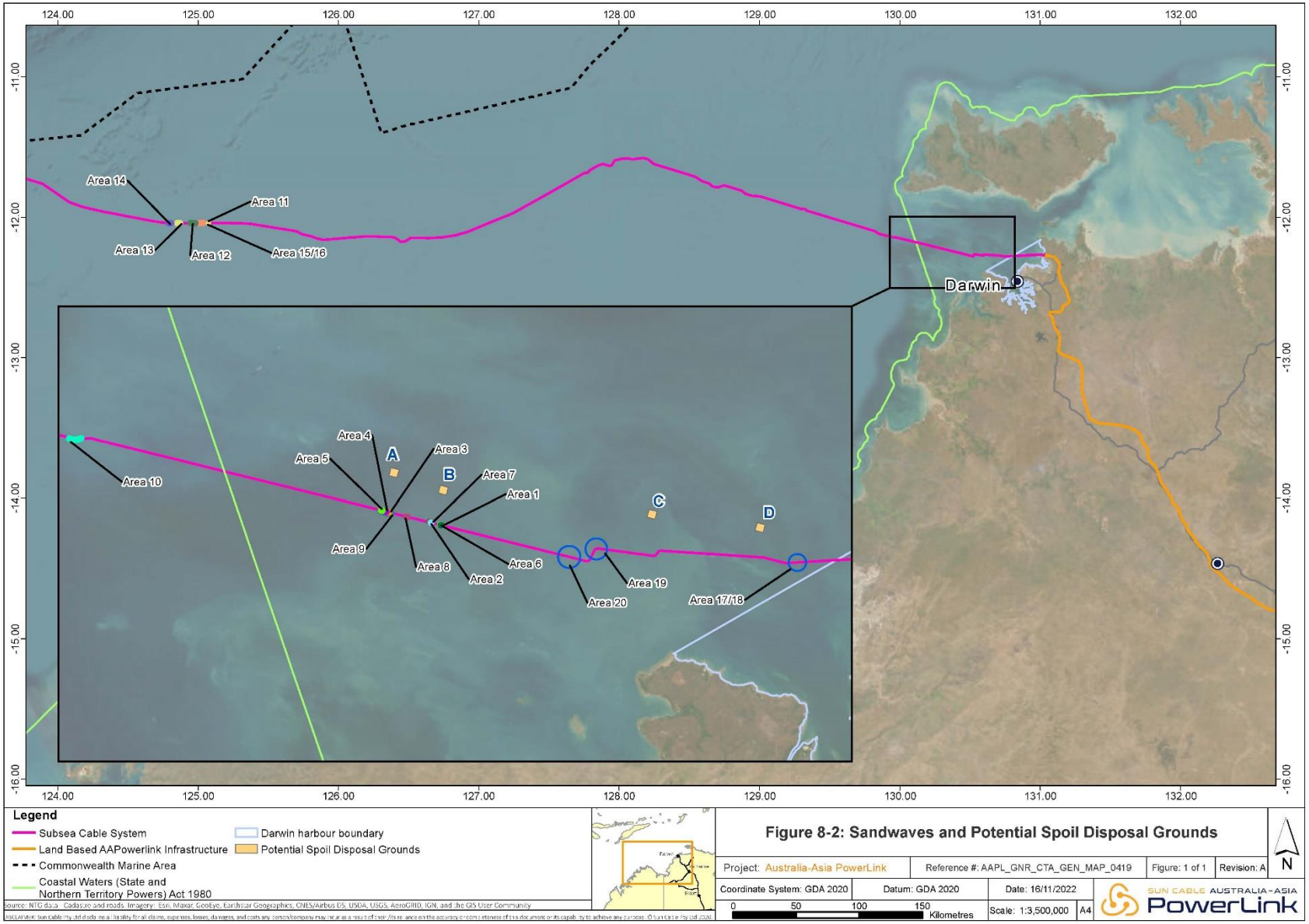

Figure 8 Sandwaves and potential spoil disposal grounds

6.6.2. Marine environmental quality

6.6.2.1. Environmental values

The subsea cable system extends through the NT coastal waters[41] of Shoal Bay (nearshore), and the Beagle Gulf (inshore waters), where the detailed bathymetric data[42] compiled for the hydrodynamic and sediment transport model indicates the depth of water in inshore and nearshore areas is typically less than 40 m. The cable system then continues into the deeper waters of the Timor Sea (offshore Commonwealth waters). Desktop assessments and limited bathymetric surveys were completed by the proponent in 2020 and 2022 to map and sample the seabed, and to identify anthropogenic features such as shipwrecks, and seabed features.

The features that were the subject of surveys included the sub-marine sand dunes, megaripples and sandwaves with amplitudes of 1 m to 5 m and wavelengths in the order of 30 m to 100 m. Up to 20 sand waves along the subsea cable system were identified within NT coastal waters and the Commonwealth marine area. These environmental features support marine communities including benthic primary producers.

Offshore in Commonwealth waters, the subsea cable system will traverse through the Van Diemen Rise, the Bonaparte Depression, the Sahul Shelf and the distal Arafura Shelf sections of the Oceanic Shoals Commonwealth Marine Park[43]. These are four bioregions (each with distinct Key Ecological Features), that form part of the North Marine Parks Network in the Timor Sea.

Within the Oceanic Shoals Marine Park, seabed features include seabed boulders up to >5 m in diameter, pockmarks (ellipsoid depressions in seabed) with diameters ranging from 1 m to 50 m, and hard irregular seabed including escarpment features with slopes in excess of 10°.

The park supports a range of species and has biologically important areas including foraging and nesting habitat for marine turtles, and at the western edge, the final section of the subsea cable intersects the migration corridor and biologically important area for the Indo Australian Pygmy Blue Whale[44] (endangered under the EPBC Act, and listed as data deficient under the TPWC Act). The whales utilise this area for calving, foraging, resting, or migration.

The waters of Shoal Bay and the Beagle Gulf are specifically designated as critical habitats and biologically important areas for dolphins and the Flatback turtle, and are known to be foraging

[41] NT coastal waters generally comprise the belt of water between the NT coast and a line 3 nautical miles (5.5 km) seaward. However, a straight baseline is applied between mainland Australia and the Tiwi Islands, and the subsea cable intersects the boundary approximately 45 NM (85 km) northwest of Darwin.

[42] Siwabessy, J., Tran, M., Howard, F.J.F., Smit, N., Williams, D.K., Dando, N., Atkinson, I., Harries, S., 2016. Outer Darwin Harbour Marine Survey 2015: High resolution bathymetry grid. Geoscience Australia, Canberra. http://pid.geoscience.gov.au/dataset/ga/100093

[43] The Oceanic Shoals Marine Park is part of the eight Australian Marine Parks off the coast of the Northern Territory and Queensland. These marine parks cover 157,480 square kilometres. The parks are managed under the North Marine Parks Network Management Plan that came into effect 1 July 2018.

[44] Commonwealth of Australia (2015). Conservation Management Plan for the Blue Whale—A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999.

habitat for species including sea snakes, elasmobranchs, estuarine crocodiles, whale sharks, and the Green, Hawksbill and Loggerhead turtles[45].

Within Shoal Bay filter-feeding biota such as sponges and octo-corals are abundant, with lesser known occurrences of (higher value) benthic primary producer habitats including corals, macro-algae, seagrass, and seaweed (also called macro-algae), or a mixture of these communities (e.g. see Siwabessy *et. al.*[46] (2019), Galaiduk *et.al.*[47] (2019) and Palmer and Smit[48] (2020)).

6.6.2.2. Outcomes of consultation

Matters raised during the NT EPA's consultation relating to potentially significant impacts on marine environmental quality include:

- any action undertaken in proximity to the seabed, has potential to cause adverse impact to underwater cultural heritage so consideration must be given to obligations under the *Underwater Cultural Heritage Act 2018*
- avoidance measures to reduce impacts to the marine park values, including turtle habitat, the potential biodiversity hotspots that are regularly found on hard substrates at euphotic depths <60 m, and Key Ecological Features have not been adequately demonstrated
- the proponent's assessment of the existing environment of Shoal Bay is incomplete and must include a comparison of sediment samples taken from marine surveys with modelled sediment grainsize data
- that site specific baseline water quality data has not been collected
- that model input data from Darwin Harbour cannot be reliably applied to modelling Shoal Bay, Beagle Gulf and the Timor Sea, and site specific information on the existing environment of Shoal Bay (i.e. data such as: total suspended solids, particulate inorganic matter, particulate organic matter, and the colour of dissolved organic matter) must be derived
- the need to complete a hydrodynamic model and associated plume/sediment transport model in 3D.

6.6.2.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented below in **Table 25**.

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[45] Commonwealth of Australia (2017). Recovery plan for marine turtles in Australia.

[46] Siwabessy, J, Smit, N, Nicholas, W, Atkinson, I, Brinkman, R, Dando, N, Harries, S, Howard, F, Huang, Z, Li, J, Picard, K, Potter, A, Radke, L, Tran, M, Williams, D, Thiteway, T., and Potter A. (2019). Seabed Mapping Darwin Harbour Region (including Bynoe Harbour). Final Report. Department of Environment and Natural Resources. Darwin, Northern Territory, Australia.

[47] Galaiduk, R, Radford, B, Harries S, Case, M, Williams, D, Low Choy, D, and Smit, N. (2019). Technical Report: Darwin - Bynoe Harbours predictive mapping of benthic communities. Australian Institute of Marine Science. Perth, Western Australia.

[48] Palmer, C. and Smit, N., (2020) Mapping the Future Project - Gunn Point Marine and Coastal Biodiversity of Gunn Point Area Technical Report 6/2020 Department of Environment and Natural Resources, Darwin, NT.

6.6.2.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, and conditions for avoidance, environmental monitoring, and mitigation of impacts identified in the draft Environmental Approval (Appendix 1), the NT EPA considers that the proposed action can be conducted in such a manner that its objective for marine environmental quality is likely to be met.

The implementation of recommendations and concurrent regulation under the EPBC Act and *Environment Protection (Sea Dumping) Act 1981* will ensure protection of the environment is consistent with the NT EPA's objective for marine environmental quality.

Table 25 Assessment for Marine environmental quality and recommendations (Subsea Cable)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Trenching and cable laying (Gunn Point Beach and Shoal Bay) The proposed shore work including trenching in the intertidal zones and shallow waters of Gunn Point beach could disturb and expose Potential Acid Sulfate Soils (PASS) resulting in the generation of acid waters, and liberation of metal and metalloids. Reduction of water and sediment quality in the shore and marine environment e.g. through generation of acid waters (and release of metals), and increased turbidity could impact foraging/feeding habitat for shorebirds, dugong, turtle, and other marine megafauna.	Testing and assessment of PASS will be undertaken for the trench excavation footprints prior to works to determine the presence/absence of PASS material and associated management requirements. If testing identifies acid sulfate soil (ASS), an ASS management plan (ASSMP) will be developed that stipulates handling methodologies in accordance with applicable standards and guidelines, including: • Queensland Acid Sulfate Soil Technical Manual (Dear *et al*. 2014[49]).	The beach and foreshore environments of Gunn Point (intertidal zone) have been mapped in soil surveys (Hill and Edmeades 2008[52]) as having a high probability of occurrence of ASS. Trenching/digging and burial of cable infrastructure along the beach and foreshore environments could result in disturbance of ASS. This could result in acid generation (acid run-off) and liberation of metal and metalloids (contaminants) and nutrients impacting water and soil/sediment quality, and poses a risk of damage to foraging habitat e.g. for dugong and turtles, shorebirds, and to infrastructure.	**Condition 18-1(1) and 18-2 Acid sulfate soils management plan (ASSMP)** To protect marine environmental quality: • The ASSMP must be prepared by an independent qualified person. • The plan must demonstrate presence/absence of ASS and managed according to National and Queensland guidance.

[49] Dear, S-E., Ahern, C., O'Brien, L., Dobos, S., McElnea, A., Moore, N., and Watling, K. (2014). Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government

[52] Hill, J. and Edmeades, B. (2008). Acid Sulfate Soils of the Darwin Region. Land and Water Division. Department of Natural Resources, Environment the Arts and Sport, NT. Technical Report No. 09/2008D

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	• National Acid Sulfate Soils Guidance (Sullivan et al 2018[50]) and • National Acid Sulfate Soils Guidance - Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management (Simpson *et al*. 2018[51]).	Test work to assess ASS must be completed in time to inform development of the ASSMP.	
Pre sweeping and dredging, and subsea cable burial (Shoal Bay Beagle Gulf and Timor Sea) Dredging activity (e.g. dredging sand waves), dredge spoil disposal and cable laying operations to enable cable burial could have a significant impact on marine environmental quality. Sea bed levelling of at least 5 sand waves and dredging will be required to install the subsea cables at the	Proponent has indicated that dredging and dredge spoil disposal will follow best management practices and comply with relevant legislation e.g. National Assessment Guidelines for Dredging 2009. Monitoring both baseline conditions for marine environmental quality and the impact zone, and reporting will occur as required. Proponent has committed to undertake additional hydrodynamic	In both NT and Commonwealth waters, up to twenty sand wave areas have been identified along the subsea cable system route that may need to be disturbed to allow for cable laying and cable burial below the competent seabed. A preliminary cable burial risk assessment was conducted with limited bathymetric surveys using sidescan sonar and sediment sampling and analysis to characterise a small number of the	**Condition 18-1(2) and 18-3 Dredging, environmental monitoring and spoil disposal management plan** • The plan (prepared by an independent qualified person) must describe the dredging activity, spoil disposal grounds and operations and establish the required sampling and monitoring program for baseline and operational monitoring.

[50] Sullivan, L.A., Clay, C., Ward, N.J., Baker, A.K.M., and Shand, P. (2018). National Acid Sulfate Soils Guidance: A Synthesis. Department of Agriculture and Water Resources, Canberra, ACT

[51] Simpson, SL, Mosley, L, Batley, GE and Shand, P (2018). National Acid sulfate soils guidance: Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management. Department of Agriculture and Water Resources, Canberra.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
design depth beneath the competent sea floor. Dredge spoil disposal is proposed currently at 4 potential disposal locations in the Beagle Gulf. Impacts from dredge spoil disposal may include: • direct dredging impacts is via habitat removal or alteration impacting benthic communities, or • indirectly due to increased turbidity, suspended (and re-suspended) sediment, deposited sediment, and reduced light availability to the sea floor (a reduction of water quality), and • cumulative impacts as a result of cable laying and dredging occurring at the same time in Darwin Harbour, Shoal Bay and Beagle Gulf. The proponent has completed sediment sampling and dredge plume modelling to allow for: • assessing the behaviour of sediment plumes that result from cable laying and dredging operations for nearshore and	and sediment plume modelling to refine impact zones.	sand waves. The aim of these investigations was to identify potential spoil disposal grounds and presence of sensitive receptors. Four sites close to the subsea cable have been identified in the nearshore waters of Shoal Bay and Beagle Gulf. The proponent's as-constructed hydrodynamic and sediment transport 3D model has been developed to determine transport, extents and dispersion of suspended sediment plumes that could occur as a result of the proposed submarine cable laying operations. The model is currently limited to predicting SSC in the water column integrating: • a nearshore model of Shoal bay and the Beagle Gulf (includes Darwin Harbour), and • an offshore model covering the proposed subsea cable system in the Timor Sea. The model is considered preliminary (i.e. does not currently define zones of influence or impact), and refinement of the model must	**Condition 18-3(3) and 18-4 Hydrodynamic and sediment transport model** • The plan must include development of a hydrodynamic and sediment transport model to assess the behaviour of sediment plumes, to identify the zones of impact and influence, and to establish locally relevant (site specific) management trigger values, and thresholds. **Condition 18-1(3), 18-6 and 18-7 Marine environment management plan** The approval holder must complete ecological assessments, conduct benthic habitat mapping and ground truth areas where sensitive receptors are likely to occur. The hydrodynamic and sediment transport modelling must provide modelling outputs that: • identify the zones of impact and influence, • assess whether the elevated total suspended sediments or suspended sediment concentrations, sedimentation and reduced light availability at

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
offshore conditions and scenarios, and • defining plume impact zones and area of influence. Acknowledging limitations of the proponent's model and uncertainties, sediment plumes nearshore are predicted (for a worst case scenario) to persist for up to five days with 95th percentile suspended sediment concentrations (SSC): • 200 mg/L near the coast • >50 mg/L in Shoal Bay • <20 mg/L in Darwin Harbour. The 95th percentile suspended sediment plumes offshore (in the Oceanic Shoals Marine Park) are predicted to be: • <3 mg/L within 1 km of the subsea cable route • <2 mg/L in a spread up to 20 km from the subsea cable.		include site specific information on the existing environment of Shoal Bay and the Beagle Gulf. Currently as constructed, the model utilises input data from Darwin Harbour which cannot be reliably applied to areas outside Darwin Harbour (Shoal Bay, the Beagle Gulf and Timor Sea). Prior to construction works for the subsea cable system the proponent is required to: • complete ecological assessments including sampling and monitoring to establish baseline environmental conditions along the subsea cable route to identify sensitive receptors, and • conduct benthic habitat mapping and ground truth areas where sensitive receptors are likely to occur within the zone of influence or areas where changes in environmental quality is anticipated or predicted to occur. The model must be refined using contemporary approaches developed by the Western Australian Marine Science	the seafloor will be a risk to sensitive receptors, • provide specific monitoring programs to ensure an appropriate baseline is established, and • identify thresholds, triggers and management actions. **Regulation by other regulatory processes** • EPBC Act • *Environment Protection (Sea Dumping) Act 1981*.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		Institution (WAMSI) dredging science node[53], and a peer review of the model and report prepared by an independent qualified person. The model outputs should be dynamic and fit-for-purpose to: • inform dredge and dredge disposal operations, and cable burial in NT waters through simulation of sediment plume dispersion and behaviour • identify the zones of impact and influence, and • establish the appropriate baselines, sampling and monitoring programs that can manage the risk of harm to sensitive receptors, and to inform water quality triggers, thresholds, limits, and adaptive management measures.	
Subsea cable system siting and burial (Shoal Bay Beagle Gulf and Timor Sea)	The proposed depth of burial for the cable will be at a minimum 0.6 m below the seabed, and to a	Management plans for dredging and cable laying operations are recommended to include:	**Condition 18-3 Dredging, environmental monitoring and spoil disposal management plan** and

[53] Sun, C., Branson, P; and Mills, D. (2020). Guideline on Dredge Plume Modelling for Environmental Impact Assessment. WAMSI Dredging Science Node Themes 2/3. WAMSI.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
Disturbance of the seabed as a result of cable burial operations especially in areas of critical habitats and biologically important areas, has the potential to have a significant impact on productivity of benthic primary producers. Indirect impacts on threatened and migratory marine species may result from marine cable installation (burial) operations e.g. from light, noise/vibration, and disruption of food source. The dredging or pre-sweeping operations will disturb sediments which interferes with productivity of benthic primary producers.	maximum depth of 3.0 m primarily to avoid anthropogenic hazards (e.g. anchor hook-ups). Where burial of the cable is not possible, cables will be protected with rock berms or armoured shells/mattresses. The proponent commits to minimising impacts (e.g. minimising habitat changes at the dredge spoil disposal areas, or increased sediment in the water column (turbidity), smothering, and decreased light availability at the seabed) through e.g. limiting the depth of cable burial, and the rate of cable laying and burial. For areas of the seabed that are not sufficiently flat for cable burial machines such as trenchers e.g. sand waves, or to avoid free spans of the cable, pre-sweeping about 260,000 m^3 of material from the sand waves with a trailing suction hopper dredger (including tolerances), or dredging is proposed. Measures include completing dredging and cable burial operations when seas are calm, and avoiding	• avoidance and mitigation measures for all significant and listed marine species • avoiding disruption of food sources, and • addressing the potential significant impacts to species from light, noise/vibration. Management plans must include requirement to address timing of dredging operations and spoil disposal, and potential impact to benthic communities and habitat. Local studies and the Flora and Fauna Division of DEPWS have confirmed that the wet season is the preferred or recommended time for dredging operations in Darwin Harbour, Shoal Bay and the Beagle Gulf. If dry season dredging is required, then enhanced monitoring and management of water quality is required. If possible, cable laying is restricted to the late wet season, when monsoonal activity is at its greatest, where water quality is at its poorest (seagrass/macro-algal habitats remain dormant until light availability at the seafloor improves	**Condition 18-1(3), 18-6 and 18-7 Marine environment management plan** Compliance with an approved Dredging, environmental monitoring and spoil disposal management plan (DEMSDMP) and marine environment management plan (MEMP) that is prepared by an independent qualified person. The DEMSDMP must address: • seabed levelling operations • dredging operations and method of dredge spoil disposal • modelling (hydrodynamic and sediment transport) and predicting levels (zones) of impact • baseline and management trigger values that are locally relevant e.g. for turbidity (NTU) • impacts to sensitive receptors during any critical windows of environmental sensitivity • sampling and monitoring for compliance, adaptive management, and to meet the NT EPA's environmental objectives (includes monitoring

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
	significant habitat/benthic biota (e.g. seagrass, macroalgae and corals).	at the start of the dry season and triggers regeneration, and anecdotal evidence points towards this being a period of reproduction for corals).	environmental variables in impact zones e.g. tides, current, water and sediment quality), and • vessel strikes and entrainment of marine megafauna.

6.6.3. Marine ecosystems

6.6.3.1. Environmental values

The proponent has identified 44 listed migratory species that are known, or likely to occur proximate to the subsea cable infrastructure. Eighteen of these species are also listed as threatened including sea turtles, sawfish, sharks, shorebirds, and whales.

The subsea cable passes through critical habitat for the Flatback turtle[54] (*Natator depressus*), and foraging habitat for the Olive Ridley *(Lepidochelys olivacea)*, Loggerhead *(Caretta caretta)* and Flatback turtle. Along the subsea cable route in the areas of the Oceanic Shoals Marine Park (OSMP), the subsea cable passes through Whale shark (*Rhincodon typus)* foraging areas and benthic communities and habitat related to geomorphic features and seascapes.

The subsea cable also intersects, or is near to biologically important areas[55] for dolphins (in NT waters), the Flatback turtle (in NT and Commonwealth waters), and the Pygmy blue whale *(Balaenoptera musculus brevicauda)* (in Commonwealth waters). The subsea cable system will also traverse to within 10 km south of the Fenton Patches (artificial reefs and fish aggregating devices and artificial habitat comprising up to 15 shipwrecks).

6.6.3.2. Outcomes of consultation

Matters raised during the NT EPA's consultation relating to potentially significant impacts on marine ecosystems include:

- concern that the impacts to benthic habitat has not been appropriately surveyed for, or assessed
- a marine environment management plan is required for NT and Commonwealth listed, significant marine species, and Key Ecological Features, and must include adequate avoidance, mitigation and monitoring measures
- scientific uncertainty remains regarding behavioural impacts resulting from EMF to values of the Commonwealth marine environment.

6.6.3.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented below in **Table 26.**

6.6.3.4. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, and conditions for avoidance, monitoring, and mitigation of impacts identified in the draft Environmental Approval (Appendix 1), and recommendations for regulation under the EPBC Act and *Environment Protection (Sea Dumping) Act 1981*, the NT EPA considers that the

[54] Habitat critical to the survival of each species of marine turtle has been identified by consensus of a panel of experts in marine turtle biology. Dataset.

[55] Biologically important areas comprise area and times used by protected marine species (listed threatened species, migratory species, and all cetaceans) for carrying out critical life functions, such as reproduction, feeding, migration or resting.

proposed action can be conducted in such a manner that its objective for marine ecosystems is likely to be met.

Table 26 Assessment for Marine ecosystems and recommendations (subsea cable)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
<u>Subsea cable system installation (siting and burial)</u> Cable laying and burial operations are activities carried out for the purpose of installing the subsea cable system including but not limited to marine surveys, boulder clearance, trenching, pre-sweeping, sea bed levelling, dredging activity, and dredge spoil disposal. Methods for subsea cable installation include: • jetting to fluidise the seabed to allow cables to sink into the sediment • burial via a plough towed by the cable lay vessel, or • mechanical trenching (cutting of a trench using a wheel or chain cutter. The cable laying/burial process could result in habitat loss and degradation, and will increase suspended sediment concentration in the water column causing a reduction in water quality i.e. increasing turbidity and potentially	Surveys to characterise the benthic environment, and to verify and ground truth benthic habitat model predictions has been completed for nearshore areas (NT waters). The proponent has committed to avoid areas of seagrass meadows, seaweed communities and hard corals (high value marine habitat) as much as possible. The proponent has also committed to: • conducting turbidity monitoring in impact zones and baseline/reference sites during the cable installation process, and • completing additional sediment transport modelling to assess water quality impacts, and to identify mitigation measures.	Disturbance of benthic habitats will occur as a result of subsea cable installation, and can be minimised through choice of burial method. Cable laying and burial activities will generate sediment plumes that are likely to impact sensitive receptors and marine environmental quality both directly and indirectly. The zones of high impact will be close to the activities where serious (irreversible) damage is expected to occur. In more distal zones of moderate impact, the predicted level of damage to sensitive receptors and marine environmental quality are possibly recoverable. The proponent will be required to measure, monitor and report against baseline environmental conditions and the modelled predictions of plume behaviour. Impacts or disturbances to benthic habitat including seagrass meadows and seaweed is expected to be relatively short term. However, hard corals may take years to recolonise and should be avoided.	**Conditions 18-1(2), 18-1(3), 18-3, 18-6, and 18-7 Dredging, environmental monitoring and spoil disposal management plan** and **marine environment management plan** The DEMSDMP and MEMP (prepared by an independent qualified person) must address: • seabed levelling operations • dredging operations and method of dredge spoil disposal • development of a hydrodynamic and sediment transport model to assess the behaviour of sediment plumes, to identify the zones of impact and influence, and to establish locally relevant management trigger values, and thresholds. • impacts to sensitive receptors during any critical windows of environmental sensitivity • sampling and monitoring for compliance, adaptive management, and to meet

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
also decreasing light concentration at the sea floor. The cable laying/burial process and elevated turbidity could directly impact benthic habitat and communities e.g. seagrass and macroalgae and corals in Shoal Bay through smothering or burial.		In the offshore areas, and in the OSMP where specific surveys have been completed, benthic communities have been mapped (Miller *et. al.* 2016[56]), then modelled according to substrate types. Marine megafauna could be impacted by cable laying and burial activities through reduced water quality, noise and light emissions and potential vessel strikes. In the siting of the subsea cable, the zone of impact must be identified and any adverse impacts on the environment and sensitive receptors avoided or mitigated to the maximum extent reasonably practicable. The EIS asserts that the generated EMF poses a low risk to EMF sensitive species, and that burial of the subsea cable is primarily for the purpose of asset protection. • The proposed depth of burial for the cable in the EIS is a minimum	the NT EPA's environmental objectives (includes monitoring environmental variables in impact zones e.g. tides, current, water and sediment quality), and • exclusion zones, vessel strikes and entrainment of marine megafauna. **Condition 18-8** requires the approval holder to conduct ecological assessments to: • describe the existing marine environment, and where benthic primary producers and habitat occur within the impact zone of impact, and • identify where sensitive receptors are likely to occur, and • avoid sensitive receptors.

[56] Miller, K., Puotinen, M., Przeslawski, R., Huang, Z., Bouchet, P., Radford, B., Li, J., Kool, J., Picard, K., Thums, M., Nichol, S. (2016)., Ecosystem understanding to support sustainable use, management and monitoring of marine assets in the north and north-west regions: Final report for NESP D1 2016e, Australian Institute of Marine Science, pp 146.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		0.6 m below the seabed, and a maximum depth of 3.0 m primarily to avoid anthropogenic hazards that may cause damage to the subsea cable system, e.g. anchor hook-ups from shipping and fishing activities in NT waters.	**Condition 18-1(4) and 19-1 Subsea cable construction and management plan** Requires: • defining the extent of the subsea cable system impact zone of influence • a subsea cable siting and laying procedure (**Condition18-1(3)**) that has measures for avoidance and mitigation of adverse impacts on the environment associated with the placement of subsea cables. **Condition 19 Subsea cable system siting and burial** A subsea cable construction and management plan (SCCMP) required including: • a subsea cable siting procedure that has measures for avoidance and mitigation of adverse impacts on the environment associated with the placement of subsea cables, and • a subsea cable laying and burial procedure for cable

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
			laying and burial of the subsea cable system. **Condition 19-2** ensures the procedures for cable siting and burial supports the achievement of the environmental objectives of Condition **17-1**, including application of best available techniques and best environmental practice. **Condition 19-2(4) Best available techniques and best environmental practice**. The approval holder must apply Best available techniques (BAT) and best environmental practice (BEP), and ensure compliance with relevant industry guidelines and the Code of Practice for Offshore Cable Laying in the Renewable Energy Industry[57]. **Regulation by other regulatory processes** • EPBC Act

[57] International marine contractors association (IMCA) (2023). IMCA code of practice for offshore cable laying in the renewable energy industry. IMCA M264 Rev. 0.1.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
			• Environment *Protection (Sea Dumping) Act 1981*.
<u>Generated electro-magnetic fields (EMF) and heat</u> The subsea cable system will traverse through NT coastal waters and Commonwealth waters where bathymetric data compiled for the hydrodynamic and sediment transport model in the EIS has shown the depth of water in NT coastal waters extends from lowest astronomical tide (LAT) level at Shoal Bay to a depth of 40 m. The cable system then continues into the deeper Commonwealth waters of the Timor Sea. The placement of the subsea cable beneath or on the seafloor as proposed, and energising the cable would generate EMF, and heat that would be centred and localised around the cable system. Electro-receptive and magneto-receptive species are able to derive ecologically important information from natural EMF. These EMF effects could impact the marine environment and	Proposed EMF avoidance and mitigation is directly through design (cable design/sheathing and insulation), cable circuit configuration (e.g. bundled cables), and indirectly by cable protective measures (burial, or rock covers, or mattresses). Where sandwaves are encountered, the subsea cable will be buried below the seabed by pre-sweeping/dredging the sandwaves. Where cable burial is not possible, the cable system will be laid on the sea floor with protective armouring/cover. The proponent has modelled the subsea cable EMF in various configurations (e.g. buried, bundled and spaced) to predict potential EMF emissions and strength of the emissions. The proponent considers that: • the residual EMF impact will be limited in extent (and magnitude), and localised around the subsea cable – especially if the cable is buried	There is uncertainty regarding pressures/impacts on species due to EMF that are likely to be generated by the subsea cable system. The relatively shallow NT coastal waters (up to 40 m depth of water) host migratory and other EMF sensitive species and their habitat. EMF may impact these species through changes to foraging, resting and migration, feeding and breeding patterns, dispersal of individuals and behaviour. The subsea cable generated EMF intensity will vary according to cable configuration (spacing, bundled and non-bundled), depth of burial, and variability in power transfer (current and voltage). The EMF strength drops/attenuates with distance from the cable (source). Relevant industry guidelines including the Code of Practice for Offshore Cable Laying in the Renewable Energy	**Condition 19-3** Specifies the requirement for siting and burial of the subsea cable system to: • bury cables to a minimum depth of 1.0 m beneath the seabed in coastal waters that are less than 40 m below lowest astronomical tide; or • cover cables with rock/mattresses to a minimum thickness 1.0 m in coastal waters that are less than 40 m below lowest astronomical tide. **Regulation by other regulatory processes** • EPBC Act • *Environment Protection (Sea Dumping) Act 1981*.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
marine EMF-sensitive species by modifying important habitat (due to its presence) or disrupting lifecycle behaviour of species e.g. breeding, feeding, migration or resting behaviour e.g. Hutchinson *et. al.* 2021[58].	• cables placed at specific spacings, and in a bundled configuration with opposing current flow can result in some cancelling of EMF. • exposure of fauna to generated EMF's will likely be short duration.	Industry[59] defines the minimum requirements for safely laying offshore submarine power cables, but does not address any potential impacts to the environment from laying, energising, or operating subsea HVDC cables. Any exposure of EMF sensitive species to EMF is reduced by increasing the distance of the animals to the EMF source. The EIS included modelled EMF strength emitted from a subsea cable placed on the floor of the sea and modelled EMF strength emitted from a subsea cable buried at a depth of 1 m. This depth is also consistent with the installation/burial depth of the (bundled) HVDC Basslink cable. Appendix E of the additional information provides an assessment of EMF impacts on marine fauna including a comparison of modelled EMF from a cable on the seafloor to	

[58] Hutchison, Z. L., P. Sigray, A. B. Gill, T. Michelot, and J. King, (2021). Electromagnetic field impacts on American eel movement and migration from direct current cables. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2021-83.

[59] International marine contractors association (IMCA) (2023). IMCA code of practice for offshore cable laying in the renewable energy industry. IMCA M264 Rev. 0.1.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		modelled EMF from a cable buried to 1 m depth. The predicted EMF intensity of 4,800 µT at the cable surface is at the top range compared to existing HVDC cables (range 2,300 to 3,700 µT). Results of the modelling indicates that: • the EMF magnetic intensity decreases (non-linear) with distance from the subsea cable/source • burial of the subsea cable to 1 m depth reduces the EMF magnetic intensity measured at the seabed by at least a factor of 10 (or two orders of magnitude) depending on configuration • the EMF magnetic intensity is almost an order of magnitude lower if cables are bundled and not spaced • there is a 77 % reduction in EMF (magnetic) intensity when the subsea cable is buried to 1.0 m compared to burial to 0.6 m (bundled configuration example) • the proponent's modelling suggests that the calculated	

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		background magnetic field (46 uT) will be achieved at a distance of about 10 m from the subsea cable source. Mitigation and minimisation measures Measures to mitigate are limited to cable design (use of sheathing), configuration (bundled or spaced), or covering cables with rock/mattresses or burial. In any depth of water, the use of concrete mattress offers least protection, and cable laid on the seabed offers no protection. Cable burial below the seabed or rock armour is the optimal mitigation measure against potential adverse effects from EMF. The proponent proposed subsea cable burial depth of 0.6 m can provide some protection against the potential impacts of EMF exposure. A precautionary approach is recommended to bury the subsea cable to a minimum of 1 m in NT coastal waters. In addition to monitoring the impacts of EMF, adaptive management measures must be implemented to address possible future significant	

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		impacts to EPBC Act threatened and migratory species and EPBC Act and NT protected marine species. Environmental (physico-chemical) factors can also affect EMF include e.g. water temperature, salinity, current. The cables will also generate heat increasing the temperature of the surrounding sediment and water (expected to be localised). This could have ecological/biological impacts primarily to benthic habitat/species. The proponent must complete pre and post energisation surveys: • to measure the background (static) electro-magnetic field intensity, • to assess the generated electro-magnetic field strengths and temperature/heating effects of the HVDC cable on the marine environment, and • to assess effectiveness of proposed mitigation measures e.g. cable sheathing, depth of burial or use of protective covers. The EMF model (reflecting final design) and assumptions need to be	

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		verified. The model must be validated/peer reviewed noting that there will be an additional three cables proposed to be laid at a later stage.	
<u>Noise and light impacts</u> Artificial light and noise produced by the cable laying vessels and equipment could alter behaviour of marine fauna. Anthropogenic (acute and chronic) noise impacts to cetacean species is a concern where elevated noise level effects are known to occur. These effects include avoidance, behaviour, tissue rupture, hearing loss, disruption of echo-location, masking the inability of species (e.g. whales) to detect the sounds important to it, habitat abandonment, aggression, calf abandonment, and behavioural disturbance. High intensity signals with high peak pressures received at very	The cable laying activities will progress at up to 600 m per hour and will limit the duration of noise emissions in any given area. Lighting used will be energy efficient and designed to minimise hard contrasts, without compromising navigation safety and security. Proponent's marine environmental management plan will include underwater noise thresholds and mitigation measures, visual marine mammal observations, maintaining records, and reporting any signs of changes in the behaviour of marine fauna. The use of lights at night will be minimised to reduce light emissions and to maintain dark skies, and where possible, lights will be shielded with	There is uncertainty about the levels of noise that would result in the (significant) behavioural responses of listed threatened whales and marine turtles, and the implications of this disturbance for species recovery. To address this, protection measures are required to minimise the likelihood of injury or hearing impairment to species. To minimise effect on susceptible wildlife such as marine turtles, seabirds, and migratory shorebirds, all night works must be completed in accordance with the National Light Pollution[60] Guidelines for Wildlife.	**Condition 18-1(2) and 18-3 Dredging, environmental monitoring and spoil disposal management plan** • A noise management plan is required to address anthropogenic (construction) noise impacts, and to minimise the likelihood of injury or hearing impairment to species including dolphins and whales. • In accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW, 2023), best, practice lighting must be used to reduce light pollution and minimise effect on susceptible wildlife (i.e.

[60] DCCEEW (2023). National Light Pollution Guidelines for Wildlife. Department of Climate Change, Energy, the Environment and Water, Canberra.

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
short range can cause acute impacts such as injury and death. Anthropogenic noise that is received further away from the source but that occurs continuously can include hearing impairment, masking of communication, displacement, and other significant behavioural changes including changes to vocal behaviour.	exterior cut-off fixtures to limit light emissions at a vertical angle of no more than 90 degrees from straight down.		marine turtles, seabirds, and migratory shorebirds).

6.6.4. Culture and heritage

6.6.4.1. Environmental values

The subsea cable traverses the OSMP, part of the Australian Marine Parks North Network. The OSMP has cultural and heritage values.

The subsea cable is proposed approximately 100 km north of Ashmore Reef (part of the Australian Marine Parks north-west Network). Cultural values of the network include marine animals that are totems for Indigenous people, songlines passing through the Marine Park, and spiritual corridors with cultural and heritage significance extending from terrestrial areas into nearshore and offshore waters.

The EIS outlines that there are no declared Indigenous Protected Areas or Native Title Determinations within the OSMP area. Additionally the EIS states that there are no known heritage values or shipwrecks present within the park or proximate to the Subsea Cable System.

The proponent has applied for an AAPA Authority Certificate for the protection of sacred sites in NT coastal waters, which is currently pending approval.

6.6.4.2. Outcomes of consultation

During the NT EPA's consultation on this proposed action, matters raised relating to potential significant impacts on culture and heritage include:

- the AAPA advised that there are discrepancies between the spatial data provided in the supplement to the draft EIS and spatial data provided to AAPA for Authority Certificate applications
- the AAPA advised that there are recorded and registered sites within the footprint of the proposed action.

6.6.4.3. Factor assessment and recommended regulation

In assessing whether the residual impacts of the proposed action will meet the NT EPA environmental factor and objective, and whether reasonable and appropriate regulatory conditions can be imposed, the assessment findings and recommendations are presented below in **Table 27**.

6.6.4.4. Conclusion against the NT EPA objective

With the implementation of the recommended conditions for avoidance, monitoring, and mitigation of impacts identified in the draft environmental approval (Appendix 1), and regulation under the *Heritage Act 2011*, *Northern Territory Aboriginal Sacred Sites Act 1989*, EPBC Act and the *Underwater Cultural Heritage Act 2018*, the NT EPA considers that the proposed action can be conducted in such a manner that its objective for culture and heritage is likely to be met.

Table 27 Assessment for Culture and heritage and recommendations (Subsea Cable)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
No potential significant impacts were identified by the proponent in the EIS. Along the Subsea Cable System corridor, the zone of high impact will be very localised, and area of influence in terms of sediment deposition is predicted to be spread over a wide area and therefore is unlikely to impact marine heritage features. The Supplement identified and assessed the following impacts: • direct impact to heritage features, including aboriginal sacred sites, aboriginal archaeological places and objects, historic heritage features and culturally significant landscape features • indirect impact to heritage features listed above, and • direct or indirect impact to unrecorded heritage features.	• Comply with conditions of Authority Certificates and ensure conditions are made available to all authorised personnel. • The proponent commits to undertake a desktop maritime assessment including an underwater cultural heritage survey, and a geophysical survey to confirm presence/absence of heritage features the subsea cable system route prior to cable laying. • The CHMPs will provide standard measures (appropriate) for managing heritage features. • For unexpected finds in NT waters, consultation on management with Heritage Branch and DCCEEW if in Commonwealth waters.	Heritage Branch's submission is that the proponent has clarified and formally committed to further consideration of maritime heritage issues in the documentation. The NT EPA's assessment findings for the subsea cable are similar to that of the solar precinct. As above for the solar precinct, the proposed action area has not been comprehensively surveyed for the presence or absence of sacred sites under the *Northern Territory Aboriginal Sacred Sites Act 1989*. Therefore the presence of sacred sites is uncertain. The AAPA is the body established under the *Northern Territory Aboriginal Sacred Sites Act 1989* with regulatory responsibility for the protection of sacred sites throughout the Territory. The process to obtain an AAPA Authority Certificate includes identification of custodians and culturally appropriate consultation with them to identify any sacred sites and measures to protect them.	**Condition 22 Cultural heritage management plan** Requires the proponent to development and implement a CHMP, including procedures to mitigate risks to unexpected maritime heritage objects, including a stop work protocol. **Regulation by other regulatory processes** • *Heritage Act 2011* • *Northern Territory Aboriginal Sacred Sites Act 1989* for the protection of Aboriginal sacred sites • EPBC Act • *Underwater Cultural Heritage Act 2018*

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		AAPA's submission on the Supplement confirmed that the proponent has applied for an AAPA Authority Certificate for the Subsea Cable in NT waters but that there are discrepancies in spatial extent/subject land that has been applied for and recommended disposal sites identified by the proponent in NT territorial waters should be included in the current Subsea Authority Certificate application. The potential for significant impacts to Aboriginal cultural values could be avoided or minimised by obtaining an AAPA Authority Certificate for all activities associated with the proposal.	

7. Matters of National Environmental Significance

The project was referred under the EPBC Act. The delegate of the Australian Government Minister for the Environment and Water decided under section 75 of the EPBC Act that the proposed action is a controlled action and, as such, requires assessment and an approval decision due to the potential for significant impact on Matter of National Environmental Significance (MNES). It was determined that the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- Listed threatened species and ecological communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- Commonwealth marine areas (section 24).

These matters have been further detailed below in Sections 7.1 to 7.3.

The NT EPA has assessed the controlled action on behalf of the Commonwealth as an accredited assessment under the EPBC Act.

7.1. Listed threatened species and ecological communities

Impacts to the environment relating to MNES are also covered under the assessment of key environmental factor terrestrial ecosystems in sections 6.3.2, 6.4.2 and 6.5.3 of this report.

A number of EPBC Act listed threatened flora and fauna species have the potential to occur within or in proximity to the project footprint. These species were subject to a significant impact assessment as part of the EIS.

The Gouldian finch is listed as Vulnerable under the TPWC Act and Endangered under the EPBC Act. In the NT, the most known breeding populations occur within the Top End. The Yinberrie Hills region north of Katherine is the largest known breeding population of Gouldian finch in the NT. The OHTL project footprint intersects this region. In total there is approximately 31 km^2 of foraging habitat for the Gouldian finch and 0.3 km^2 of breeding habitat mapped within the project footprint.

The Ghost bat is listed as Vulnerable under the EPBC Act. The Kohinoor Adit colony near Pine Creek is the largest known maternity site for Ghost bat, and the OHTL passes to within 8 km of the colony.

Stylidium ensatum is listed as Endangered under both the TPWC Act and EPBC Act. During the field survey, six *S. ensatum* patches were recorded within, or proximate to the OHTL project footprint. This project is expected to affect less than 0.01% of the known population.

Typhonium taylori is listed as Endangered under both the TPWC Act and EPBC Act. The species was observed during the field survey within two separate sandsheet heath habitats. All other sandsheet heath patches surveyed in the OHTL footprint were determined to have a low likelihood of occurrence of *Typhonium taylori*.

There is one threatened ecological community (TEC) in the NT, the Arnhem Plateau Sandstone Shrubland Complex. The OHTL project footprint intersects land classed as possibly supporting this TEC in three locations, northwest and southeast of Katherine.

7.2. Listed migratory species

Migratory species under the EPBC Act are those species that migrate to Australia, or pass through Australia (or Australian waters) during migratory events. A number of EPBC Act listed migratory species have the potential to occur within or within proximity to the project footprint. These species were subject to a significant impact assessment as part of the EIS.

Gunn Point Beach supports internationally-significant numbers of migratory shorebirds. Shorebird species on Gunn Point Beach inhabit coastal zones where they typically feed on invertebrates within the intertidal zone, and roost on the surrounding beaches. Subsea cable systems will be installed through Gunn Point Beach and into Shoal Bay. The total construction footprint within the identified shoreline crossing is approximately, 1.9 ha.

In addition to Gunn Point Beach, many of these species are routinely found across other parts of Australia as well as inland areas within potentially suitable habitat. Lake Woods is one of the largest temporary freshwater lakes in the NT. Migratory shorebird species are likely to fly over Lake Woods and the solar precinct during migration.

7.3. Commonwealth marine area

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 OSMP.

The OSMP covers the North Marine Bioregion and North West Bioregion. The subsea cable system transects the OSMP for approximately 300 km. The sections of the OSMP which are traversed by the Subsea Cable System are zoned Special Purpose Zone (Trawl) and Multiple Use Zone. Structure and works activities including excavation and erection of structures (which will be undertaken to construct the Subsea Cable System) are allowable, subject to assessment and authorisation. Currently, the zones within the OSMP proximate to the Subsea Cable System support Commonwealth fishing activities, Defence exercise areas and shipping movements.

The Subsea Cable systems traverses three Key Ecological Features within the OSMP. These include:

- carbonate bank and terrace system of the Van Diemen Rise
- pinnacles of the Bonaparte Basin
- carbonate banks and terrace systems of Sahul Shelf.

The OSMP provides habitat for threatened and migratory species under the EPBC Act. There is biologically important areas of foraging habitat for the Olive Ridley, Flatback and Loggerhead sea turtle as well as critical habitat for the Flatback turtle.

Initially, three cables are proposed to be laid, with an additional three cables to be laid at a later stage. The disturbance footprint for each cable is 12 m wide for the length of approximately 300 km through the OSMP. Within the OSMP, the Subsea Cable System will mostly be buried, however, there are some locations where the cable will be laid on the sea bed. Where the sea bed is soft, the method of jet trenching will be used for cable burial, whereas where the sea bed is hard, trenching may be achieved by mechanical trenching.

8. Whole of environment considerations

The NT EPA has considered connections and interactions between the key environmental factors together with other environmental factors in its consideration of impacts to the whole of environment.

The NT EPA considers that environmental performance reporting is required from the proponent within twelve months of substantial implementation of any component of the action of each component of the action (the solar precinct, the OHTL, DCS, CTF, subsea cable), and every five years thereafter. The purpose of the environmental performance reports is to provide the proponent and the Minister with an evaluation of the performance of the proposal with respect to actual impacts on environmental values over the life of the action compared to those predicted during the environmental impact assessment process.

When the separate environmental factors of the proposed action were considered together in a whole of environment assessment, the NT EPA formed the view that the impacts from the proposed action would not alter its views about whether the proposed action could meet its factor objectives.

8.1. Atmospheric processes

8.1.1. Environmental values

The causal link between Greenhouse Gas (GHG) emissions and climate change is well established. Climate change impacts are being experienced globally and across the Northern Territory.

There has been a significant increase in the number of extremely hot days, in both the Top End and central Australia, and climate modelling indicates that these trends will continue.

8.1.2. Outcomes of consultation

No comments from stakeholders or statutory authorities were received regarding this matter.

8.1.3. Conclusion against the NT EPA objective

With the implementation of the proponent's proposed management measures, commitments, recommendations, and conditions for avoidance, monitoring, and mitigation of impacts identified in the draft Environmental Approval (Appendix 1), the NT EPA considers that the proposed action can be conducted in such a manner that its objective for atmospheric processes is likely to be met.

Table 28 Assessment for Atmospheric processes recommendations (whole of environment)

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
The project is estimated to produce ~4.4 MT of CO_2-e scope 1 emissions over the life of the project, largely from land clearing and construction emissions. The proponent has provided a Greenhouse Gas Abatement Plan (GGAP). The GGAP highlights that the project would emit CO_2 during construction and the initial four years of operation. Following this the project remain significantly carbon negative for the remainder of the operational life of 70 years.	The proponent proposed that greenhouse gas emission resulting from land clearing across the project footprint will be offset by renewable energy produced during operation. The proponent has committed to supplying the power needs of the project, including construction transport, using use self-generated solar energy where practicable.	The project would avoid ~485 MT CO_2-e emissions from electricity and power generation in Singapore, and potentially the NT. This would deliver significant benefit to the decarbonisation plans of Singapore, and the NT and Australia.	**Condition 20-2 Greenhouse gas abatement plan** Requires that the proponent implements and complies with the GGAP including identified targets, and reporting requirements.

8.2. Decommissioning and closure

Planned decommissioning, closure, and rehabilitation at the end of project life would occur after approximately 70 years of operation. However, a range of scenarios could necessitate earlier decommissioning or closure (e.g., insolvency of the company, dormancy of the operation, or not meeting requirements of an environmental approval).

As discussed in section 6.3.3, key e-waste streams of solar photovoltaic (PV) systems are solar panels, inverters and energy storage system batteries. PV system e-waste (energy storage system batteries, inverters and solar panels) will comprise a significant amount of project waste which will vary over time and with different stages of the proposed action. This waste must be appropriately removed and processed for reuse, recycling or disposal at several points during project life (including when components need to be replaced) and as part of closure.

DCCEEW released a discussion paper, 'Wired for Change' for public consultation in June 2023. The discussion paper indicated that to drive investment in recycling, reduce waste, and encourage repair and re-use of products including large PV systems, the Australian Government is committed to developing a mandatory product stewardship scheme (DCCEEW, 2023[61]). Under the proposed scheme, large scale PV system owners would be required to either pay scheme fees (used to manage the costs of collection, transport, processing, recycling, disposal, education, compliance, reporting and governance), or to provide a bond amount to cover commitments made by the operator in an accepted DRP.

It is anticipated that a mandatory product stewardship scheme for e-waste and PV systems declared under Chapter 3 of the *Recycling and Waste Reduction Act 2020* (Cth) should provide solutions for end-of-life panels and batteries from large-scale commercial solar farm projects in the Territory, provided the scheme is designed and implemented taking into consideration the Territory context. There is currently no provision for an environment protection bond under Chapter 3 of *Recycling and Waste Reduction Act 2020*.

It is anticipated that the product stewardship scheme and Commonwealth and NT government regulation and policies relating to PV system waste will continue to develop and mature during the development and life of the project.

[61] DCCEEW (2023). Wired for Change: Regulation for small electrical products and solar photovoltaic systems waste Department of Climate Change, Energy, the Environment and Water, Canberra, June 2023.

Table 29 Assessment decommissioning and closure

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
The project will generate a large volume of PV system e-waste (solar panels, inverters and battery waste) through its life and at closure. Storage, recycling and disposal of PV system e-waste has the potential to contaminate terrestrial environmental quality (and impact groundwater and surface water quality) through hazardous material leachate. There is currently no product stewardship scheme or readily available market solution, and there are logistical issues associated with a remote site. The project will also generate a large volume of power poles, footings, OHTL conductors and inverters and subsea cable.	Decommissioning and rehabilitation will be undertaken according to a DRP developed in consultation with pastoral leaseholders, traditional owners, and relevant government agencies. The proponent anticipates that advances in recycling technology will result in commercially viable panel recycling / remanufacturing (or other technologies) being available prior to the expected end of the project life of approximately 70 years. The proponent also identified the potential market for partially degraded panels for other uses. The proponent has committed to establishing a Renewable Energy Centre of Excellence in the NT. The investigation of recycling opportunities will be an integral objective of the centre.	It is recommended that prior to commencement of the proposed action, a DRP is developed. As per the proponent's measures, the DRP is recommended to be developed in consultation with pastoral leaseholders, traditional owners, and relevant government agencies. The DRP must include the next land uses / uses for the whole of proposed action, methods for decommissioning of project infrastructure (including PV system e-waste, removal of power poles and OHTL if not being repurposed), and remediation and rehabilitation of disturbed areas. PV system e-wastes have a finite life. There is currently no mandatory scheme in place to ensure large PV system operators are incentivised to reduce waste, and facilitate development of commercial scale remanufacturing options. The NT EPA recommends that an environment protection bond is held in trust for the NT government to secure payment of reasonable costs in relation to solar precinct PV	**Condition 12 Decommissioning and rehabilitation (DRP)** Prior to commencement of the action, develop a DRP. **Condition 22 Environment protection bond** Requires the proponent to provide an environment protection bond to the Minister. The NT EPA recommends that installation of a solar panel, inverter or battery (whichever is first) at the solar precinct must not occur until the Minister's requirements and decisions under Part 7 of the EP Act are made. To inform the Minister's requirements and decisions the proponent is required to develop an environment protection bond proposal. The proposal must include reasonable costs and expenses associated with • logistics and transport to remove and process solar precinct e- waste

Potentially significant impact	Proponent measures to avoid and mitigate impacts	Assessment finding	Recommended conditions and regulation by other statutory decision-makers
		system e-waste management, and associated environmental risks and impacts from contamination of the terrestrial environment, and impacts to groundwater and surface water quality from hazardous material leachate throughout the life of action. The NT EPA supports the proponent's commitment to development of a Centre of Excellence.	• rehabilitation and remediation caused by the action at the solar precinct • staging of the action and associated risks and impacts that may relate to staging of the environment protection bond The environment protection bond proposal must also include details of how applicable government policy has been taken into consideration and application of contemporary best practice and environmental management in development of the proposal. It is recommended the environmental approval holder engages an independent qualified reviewer in the development of the proposal. The independently reviewed environment protection bond proposal must be submitted to the Minister at least 12 months prior to installation of any component of the PV system at the solar precinct.

9. Matters taken into account during the assessment

9.1. EP Act

The NT EPA's assessment also took into account the purpose of environmental impact assessment process (section 42 of the EP Act) (**Table 30**).

Table 30 Purpose of environmental impact assessment process

Matters taken into account during the assessment	Consideration
Objects of the EP Act	
To protect the environment of the Territory	The proponent's referral and EIS and this assessment report, including the NT EPA's recommended conditions for an environmental approval, provide detail about how the environment of the Northern Territory would be protected from potentially significant environmental impacts that could occur as a result of implementation of the proposed action. Where mitigation measures are necessary to protect the environment, the NT EPA has recommended conditions of approval.
To promote ecologically sustainable development so that the wellbeing of the people of the Territory is maintained or improved without adverse impact on the environment of the Territory	The NT EPA is satisfied the development can be carried out in a manner consistent with the principles of ecologically sustainable development (ESD) (refer below for further detail on how individual ESD principles have been taken into account).
To recognise the role of environmental impact assessment and environmental approval in promoting the protection and management of the environment of the Territory	The NT EPA recognises the importance of the environmental impact assessment and approval processes in the protection and management of the environment of the Territory. The proponent has recognised the role of environmental impact assessment and the requirement to plan, design and implement the proposed action in a manner that promotes the protection of the environment. Throughout the environmental impact assessment process, the proposed action has been amended to better protect some values of the environment. The OHTL near Pine Creek was initially within 500 m of the Kohinoor Adit Ghost bat colony (the world's largest known maternal roost for the listed threatened species). The potential for impacts to Ghost bat behaviour resulting from exposure to EMF is uncertain and there was a high level of uncertainty about the acceptability of that impact. The proposed action has been amended so

Matters taken into account during the assessment	Consideration
	the OHTL is ~7.9 km from the Kohinoor Adit colony, providing a much greater certainty that potential impacts will be minimised based on best available information and considering the precautionary principle (see below). The type and location of noise emitting electrical infrastructure at the DCS was modified, and additional mitigation measures introduced to reduce potentially unacceptable impacts to the future township of Murrumujuk. The NT EPA has assessed the potential environmental impacts of the proposed action to inform an environmental approval decision by the Minister that, in the NT EPA's view, promotes the protection and management of the Territory. The NT EPA's assessment concludes that with the imposition of conditions of approval and implementation of all recommended mitigation measures any potentially significant environmental impacts would be adequately avoided, mitigated or managed.
To provide for broad community involvement during the process of environmental impact assessment and environmental approval	The referral and EIS indicated that the proponent undertook consultation and engagement with a wide array of stakeholders during preparation of the referral and EIS and that feedback (including submissions received during the NT EPA consultation) was considered in development of the proposed action. There were five opportunities for interested persons to make submissions to the NT EPA during statutory consultation periods. The NT EPA recognised that an extended consultation period was required to allow interested persons sufficient time to consider the sizable Supplement to the EIS over the Christmas / new year period. The statutory consultation periods amount to approximately 25% of the overall EIA timeframe (recognising that an additional step of consulting on a significant variation is included in the timeframe). The NT EPA's consultation undertaken during its assessment of the proposed action provides for public and Australian and NT government authorities submission to be considered during the environmental impact assessment process. The NT EPA has given due consideration to public submissions and the technical expertise and comments provided by government authorities in its assessment of the proposed action.
To recognise the role that Aboriginal people have as stewards of their country as conferred under their traditions and recognised in law, and the importance of	The NT EPA recognises the role of Aboriginal people as stewards of their country and the importance of participation by Aboriginal people and communities in environmental decision-making. The proponent's EIA documents included discussion of consultation with key stakeholders and the public was guided by stakeholder mapping and a consultation strategy.

Matters taken into account during the assessment	Consideration
participation by Aboriginal people and communities in environmental decision-making processes.	A range of materials were used throughout the consultation process that assisted with explaining the proposal to Aboriginal and non-Aboriginal audiences. The NLC coordinated several meetings with Native Title Holders and Traditional Owners and consultation with Aboriginal people included cultural managers working with ecological and cultural heritage survey teams, engagement with the AAPA and custodians, site visits and meetings with individuals, families, and Aboriginal organisations throughout the Territory. The public consultation process provided an opportunity for interested persons to make a submission in relation to the proposed action. The NT EPA's assessment concludes that compliance with the recommended conditions of approval and implementation of the proposed mitigation measures is necessary to manage potential significant impacts on Aboriginal cultural heritage values.
Principles of ecologically sustainable development	
Decision-making principle 1) Decision-making processes should effectively integrate both long-term and short-term environmental and equitable considerations. 2) Decision-making processes should provide for community involvement in relation to decisions and actions that affect the community.	The NT EPA has considered the decision-making principle in its assessment and has had particular regard to this principle in its assessment of: terrestrial environmental quality, terrestrial ecosystems, inland environmental water quality, aquatic ecosystem, marine environmental quality, marine ecosystems, atmospheric processes, community and economy, culture and heritage and human health. The NT EPA considers that its environmental impact assessment and recommended conditions have identified and mitigated both short-term and long-term environmental impacts. The community has been provided the opportunity for involvement in the environmental impact assessment process during public consultation on the proposed action, and the submissions received have been taken into account in the preparation of this report and the recommended conditions to inform the Minister's decision on environmental approval.

Matters taken into account during the assessment	Consideration
Principle of proportionality Decision-making processes should ensure that decisions or actions directed at minimising harm or a risk of harm or impact to the environment are proportionate to the harm or risk of harm or impact that is being addressed.	The NT EPA has considered the potential significant impacts of the action and recommended environmental approval conditions which are proportionate to the risk of harm or impact of each activity on each receptor, The NT EPA recognises that other regulatory processes also account for minimising harm or risk of a harm to the environment.
Precautionary principle 1) If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. 2) Decision-making should be guided by: (a) careful evaluation to avoid serious or irreversible damage to the environment wherever practicable; and (b) an assessment of the risk-weighted consequences of various options.	This principle was considered when assessing the impacts of the proposed action on the key environmental factors. The proponent has identified measures to avoid or minimise impacts on the environment in relation to each environmental factor. The proponent was directed to specifically demonstrate how the precautionary principle had been applied to the assessment of potential significant impact to the Ghost bat resulting from exposure to EMF in close proximity to the Kohinoor Adit roost. The EIA process also included consideration of the EPBC Act significant impact criteria[62]. Flora and Fauna Division provided a (confidential) summary of the findings of recent research on Ghost bat ecology. Using the best available information the proponent applied a precautionary approach and proposed locating the OHTL ~7.9 km from the Kohinoor Adit. There is uncertainty regarding pressures/impacts on species due to EMF generated by the subsea cable system within coastal waters (up to 40 m depth of water), and mitigating this impact can be through burial of the subsea cable/EMF source. The proponent has proposed a subsea cable burial depth of 0.6 m. The results of the proponent's EMF modelling indicate that the EMF magnetic intensity decreases exponentially with increasing distance from the subsea cable/source, and at a 1.0 m depth of burial, the EMF (magnetic) intensity is reduced or attenuated from 4845 uT to 137 uT (measured at the sea floor). Compared to a 0.6 m depth of burial, the depth of burial to 1.0 m achieves an order of magnitude reduction in EMF (magnetic) intensity. The NT EPA

[62] Department of the Environment, Water, Heritage and the Arts (2013). Significant Impact Guidelines 1.1 - Matters of National Environmental Significance

Matters taken into account during the assessment	Consideration
	has considered the precautionary principle in recommending a minimum 1.0 m depth of burial for the subsea cable system. The management of PV system e-waste is an emerging issue globally, and there is significant uncertainty about what commercial scale waste management options will be available when required by the project. The NT EPA has recommended conditions consistent with the intent of national regulatory reforms currently underway. The NT EPA has considered these measures during its assessment, and has concluded that the environmental values will be protected provided its recommended conditions and the proponent's commitments are implemented.
Principle of evidence-based decision-making Decisions should be based on the best available evidence in the circumstances that is relevant and reliable.	The NT EPA has considered the available evidence during the course of its assessment of the proposed action, and this scientific evidence provides the foundation for its decision-making and recommended conditions, including the confidential research finding provided by Flora and Fauna regarding the Ghost bat. The approach to managing PV system e-waste is consistent with the intent of national regulatory reforms currently underway. In its assessment of the proposed action, where the NT EPA considered that further evidence is required to inform the management of potentially significant impacts on terrestrial environmental quality, terrestrial ecosystems, marine environmental quality, marine ecosystems, atmospheric processes, community and economy, the NT EPA has recommended conditions requiring the proponent to undertake additional work to provide further evidence about how the impact would be effectively avoided and/or mitigated.
Principle of intergenerational and intragenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of present and future generations.	It is important to minimise adverse impacts to all environmental factors for the benefit of future generations. The NT EPA considers that the recommended conditions for an environmental approval would provide an appropriate degree of protection for these values. The NT EPA has considered the principle of intergenerational equity and intragenerational equity in its assessment. From the assessment of this proposed action the NT EPA has concluded that the environmental values will be protected and that the health, diversity and productivity of the environment will be maintained for the benefit of future generations.
Principle of sustainable use Natural resources should be used in a manner that is sustainable, prudent, rational, wise and appropriate.	The NT EPA has considered the importance of sustainable development and use of resources and this principle during the environmental impact assessment process. The NT EPA considers that this principle is closely linked to the principles of intergeneration and intragenerational equity, and conservation of biological diversity and ecological integrity.

Matters taken into account during the assessment	Consideration
Principle of conservation of biological diversity and ecological integrity Biological diversity and ecological integrity should be conserved and maintained.	This principle was considered when assessing the impacts of the proposed action on the environmental values, particularly in relation to terrestrial ecosystems and the marine environment. The assessment of these impacts is provided in this report. Biological diversity and ecological integrity are likely to be conserved due to the avoidance, minimisation and mitigation measures that will be implemented by the proponent and the conditions recommended by the NT EPA.
Principle of improved valuation, pricing and incentive mechanisms 1) Environmental factors should be included in the valuation of assets and services. 2) Persons who generate pollution and waste should bear the cost of containment, avoidance and abatement. 3) Users of goods and services should pay prices based on the full life cycle costs of providing the goods and services, including costs relating to the use of natural resources and the ultimate disposal of wastes. 4) Established environmental goals should be pursued in the most cost-effective way by establishing incentive structures, including market mechanisms, which enable persons best placed to maximise benefits or minimise costs to develop solutions and responses to environmental problems.	This principle was considered by the NT EPA when assessing the impacts of the proposed action. Of particular note, the proponent will generate large amounts of e-waste including faulty and end of life inverters, batteries and solar panels. The proponent has committed to, and the NT EPA has recommended conditions of approval, not to dispose e-waste to landfill/s; and that recycling of componentry particularly solar arrays, is expected to be developed by the proponent throughout the life of the project.
Environmental decision-making hierarchy	
1) In making decisions in relation to actions that affect the environment, decision-makers, proponents and approval holders must apply the following hierarchy of approaches in order of priority:	The extent to which the proponent has applied the environmental decision-making hierarchy in its design of the proposed action and the proposed measures to avoid and then mitigate significant impacts has been considered. Where the NT EPA was not satisfied that this hierarchy had been applied, it has recommended conditions requiring that the proponent take reasonable measures to avoid and/or mitigate impacts.

Matters taken into account during the assessment	Consideration
(a) ensure that actions are designed to avoid adverse impacts on the environment; (b) identify management options to mitigate adverse impacts on the environment to the greatest extent practicable; (c) if appropriate, provide for environmental offsets in accordance with this Act for residual adverse impacts on the environment that cannot be avoided or mitigated.	The NT EPA has had regard to this hierarchy during the assessment of the proposed action and identified that residual adverse impacts to terrestrial environmental quality, terrestrial ecosystems, inland environmental water quality, marine environmental quality, marine ecosystems, atmospheric processes, community and economy and culture and heritage would be managed through the conditions of the environmental approval which includes the requirement of several management plans. The NT EPA has had regard to this hierarchy during the assessment of the proposed action and did not identify any significant residual impacts that would require offsetting.
1) In making decisions in relation to actions that affect the environment, decision-makers, proponents and approval holders must ensure that the potential for actions to enhance or restore environmental quality is identified and provided for to the extent practicable.	The proposed action is largely located within areas outlined in NT government land use plans and strategies. The OHTL is predominantly in the AustralAsia Rail Corporation railway easement, the northern 66 km of the OHTL is within a designated future utilities corridor (Litchfield Subregional Land Use Plan 2016), and the DCS and CTF are located on crown land zoned for future development. The proposed action will also produce solar power for export to Singapore, contributing to the NT Government's target of achieving a $40B economy from 50% renewable electricity by 2030 [63].
Waste management hierarchy	
1) In designing, implementing and managing an action, all reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	The proponent has considered the waste management hierarchy and committed to not disposing of e-waste to landfill (that will unavoidably be generated by the proposed action). However, there is uncertainty about whether the waste management hierarchy can practicably, and satisfactorily, be implemented for e-waste. Numerous studies exist documenting the difficulty of separating and extracting recyclable component from e-waste (particularly solar panels), and there are no operating recycling facility in Australia of a scale suitable to accept the amount of waste expected to be generated by the project in the short

[63] Northern Territory climate change response: Towards 2050 Office of climate change, Department of Environment and natural Resources Northern Territory Government July 2020.

Matters taken into account during the assessment	Consideration
2) For subsection (1), waste should be managed in accordance with the following hierarchy of approaches in order of priority: (d) avoidance of the production of waste; (e) minimisation of the production of waste; (f) re-use of waste; (g) recycling of waste; (h) recovery of energy and other resources from waste; (i) treatment of waste to reduce potentially adverse impacts; (j) disposal of waste in an environmentally sound manner.	and long-term. Victoria, South Australia and the ACT have banned the disposal of solar panels in landfills, requiring them to be taken to e-waste drop-off points for recovery at some point in the future. The proponent has committed to establishing a Renewable Energy Centre of Excellence in the NT. The investigation of recycling opportunities will be an integral objective of the centre. The NT EPA has recommended conditions about a waste management plan including continued application of the waste management hierarchy throughout the proposed action, recognising that over the 70 year life of the project, new technology, policies and regulatory frameworks will evolve and apply. There is still some uncertainty about when recycling and recovery options will be available, and any potential significant impacts associated with waste from the proposed action, therefore the NT EPA has recommended conditions of approval about waste management and an environment protection bond.
Ecosystem-based management	
Management that recognises all interactions in an ecosystem, including ecological and human interactions.	The NT EPA considered the importance of ecosystem-based management for achieving both sustainable development and biodiversity protection goals. With consideration of the link between terrestrial environmental quality, terrestrial ecosystems, inland environmental water quality, marine environmental quality, marine ecosystems, atmospheric processes, community and economy and culture and heritage, the NT EPA assessed the connections and interactions between parts of the environment to inform a holistic view of impacts to the whole environment. The NT EPA formed the view that the impacts from this proposed action can be managed to be consistent with the NT EPA's environmental factors and objectives.
The impacts of a changing climate	
The effects of a changing climate on the proposed action and resilience of the proposed action to a changing climate	The NT EPA considered the working design life of the proposed action (70 years) in the context of resilience to climate change, and how climate change may impact the proposed action. The effects of a changing climate may impact on the proposed action by exacerbating land degradation due to increasing frequency and intensity of extreme weather events like droughts and floods. The DCS and CTF have a high erosion hazard rating due to the high

Matters taken into account during the assessment	Consideration
	erosion potential of soils, and the monsoonal climate. The NT EPA recommended conditions to protect sites with a high erosion hazard rating increasing resilience to climate change impacts. Additionally, the NT EPA considered the impacts of a changing climate through its assessment of GHG emissions.

9.2. EPBC Act and Regulations

The NT EPA's assessment also took into account the controlling provisions for the proposed action under the EPBC Act (**Table 31**).

Table 31 Controlling provisions taken into account in the environmental impact assessment process

Controlling provisions and matters to be addressed taken into account during the assessment	Consideration
Listed threatened species and ecological communities (sections 18 & 18A), and Listed migratory species (sections 20 & 20A)	The proponent has described relevant impacts of construction, operation and decommissioning of the action in the draft EIS, supplement to the draft EIS, and in additional information provided as directed by the NT EPA, and has considered the relevant impacts to listed threatened species and ecological communities and listed migratory species. The NT EPA has considered these matters in completing its assessment of the action.
Commonwealth marine areas (section 24)	The proponent has described relevant impacts of construction, operation and decommissioning of the action in the draft EIS, supplement to the draft EIS, and in additional information provided as directed by the NT EPA, and has considered the relevant impacts to the environment in Commonwealth marine areas. The NT EPA has considered these matters in completing its assessment of the action.
Schedule 4 - Matters to be addressed by draft public environment report and environmental impact statement	The proponent has provided a checklist addressing Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 that includes the background and description of the action, the relevant impacts and proposed safeguards and mitigation measures. Information about other approvals and conditions that may apply to the action, and the environmental record of the person proposing to take the action has been provided, as well as source and reliability of relevant information.

Appendix 1 – Draft Environmental Approval

ntepa Northern Territory Environment Protection Authority

Draft Environmental Approval

PURSUANT TO SECTION *69* OF THE *ENVIRONMENT PROTECTION ACT 2019*

Approval number	EP2020/002-001
Approval holder	AAPowerlink Australia Assets Pty Ltd
Australian business number (ABN)	99 653 396 948
Registered business address	Sun Cable Australia Services Pty Ltd Level 31, 85 Castlereagh Street Sydney NSW 2000
Action	Australia-Asia Powerlink Project

Action overview

Establish, operate and decommission a large-scale solar farm, energy storage and energy transmission facility, with major components located in the Barkly and Litchfield local government areas (LGA), connected by a high-voltage direct current transmission network. A sub-sea cable through Northern Territory, National and International waters would supply energy from the facility to Singapore.

- A large-scale (>12,000 hectare) solar farm, with ancillary infrastructure and energy storage facility on Powell Creek Station (NT Portion 2094) (**Figure 1**), near Elliot in the Barkly LGA
- A high-voltage direct current transmission network (**OHTL)** including approximately 800 km of overhead transmission lines (**Figure 2**), from the solar farm to the Darwin converter site (**DCS**)
- The **DCS** (**Figure 3**) incorporating up to four voltage source converters, batteries, alternating current substations and ancillary infrastructure, at Murrumujuk on Gunn Point Peninsula, north-east of Darwin in the Litchfield LGA
- The cable transition facility (**CTF**) adjacent to the **DCS** comprising an underground cable corridor, permanently fenced land sea joint station and shore crossing site including the beachfront and intertidal zone (**Figure 3**)
- The section (approximately 100 km) of the **Subsea cable system** that is within NT coastal waters (**Figure 4**).

The action is described in full in the Environmental Impact Statement (EIS) (comprising the Draft EIS, the Supplement to the Draft EIS, and additional information dated 17 November 2023, and 8 March 2024). The action includes implementation of the environmental management measures, commitments and safeguards documented in the EIS. If there is an inconsistency between the EIS and this environmental approval, the requirements of this environmental approval prevail.

Advisory notes

i. Approval is granted under section 69 of the *Environment Protection Act 2019* for the action to be undertaken in the manner described, including with implementation of the environmental management measures, commitments and safeguards documented in the Environmental Impact Statement (EIS) (comprising the Draft EIS, the Supplement to the Draft EIS, and additional information dated 17 November 2023, and 8 March 2024).

ii. If there is an inconsistency between the EIS and this environmental approval, the requirements of this environmental approval prevail.

iii. All statutory authorisations as required by law must be obtained and maintained as required for the action. No condition of this environmental approval removes any obligation to obtain, renew or comply with such statutory authorisations.

iv. Notification of environmental incidents must be in accordance with Part 9 Division 8 of the **EP Act** 2019 and Part 10 of the Environment Protection Regulations 2020. In an emergency, the NT EPA Pollution Response Hotline should be notified by telephoning 1800 064 567.

v. Submission of all notices, reports, documents or other correspondence required as a condition of this approval, including notification to the **CEO** or **Minister**, must be provided in electronic form by emailing environmentalregulation@nt.gov.au. All documents should be in electronic form suitable for on-line publication.

Address of action	**Solar precinct** - Pastoral Lease 948 (part of NT Portion 2094) Powell Creek Station. **OHTL** – multiple addresses (as per shapefile 'Overhead_Transmission_Line_20240412'). **DCS** and **CTF** – 3820 Gunn Point Rd, Koolpinyah (NT Portion 2626).
NT EPA Assessment Report number	107
Person authorised to make decision	Hon Kathryn (Kate) Worden MLA, Minister for Environment, Climate Change and Water Security
Signature	NOT FOR SIGNING
Date of decision	NOT FOR APPROVING

Recommended environmental approval conditions

1 Limitations and extent

1-1 All activities must be carried out within the **approved extent** (**Figures 1** to **3**).

1-2 Activities must not exceed the limitations in **Table 1**.

Table 1 Limitations and extent

Action element	Figure	Limitation or maximum extent
Solar precinct including **ancillary infrastructure**	Figure 1	• No more than 12,403 ha of vegetation to be cleared. • All clearing must be within the **approved extent**.
Overhead transmission lines (**OHTL**)	Figure 2	• No more than 2,813 ha of vegetation to be cleared. • Clearing must be within the **approved extent**.
Darwin converter site (**DCS**)	Figure 3	• No more than 60 ha of vegetation to be cleared. • Clearing must be within the **approved extent**.
Cable transition facility (**CTF**) and **shore crossing**	Figure 3	• Clearing must be within the **approved extent**. • No more than 45 ha of vegetation to be cleared.
Subsea cable system in NT coastal waters	N/A	• No more than 260,000 m^3 of marine sediment material to be dredged.

Terrestrial ecosystems

2 Environmental objectives

2-1 The approval holder must ensure the action achieves the following environmental objectives:

(1) Protect terrestrial habitats to maintain environmental values.

(2) Protect **listed threatened species**, **migratory** species and their habitats.

(3) Protect vegetation quality.

2-2 To support achievement of the environmental objectives required by condition **2-1**, the approval holder must comply with conditions **3, 4 and 5.**

3 Flora and fauna

3-1 Throughout the life of the action, the approval holder must:

(1) ensure all flora and fauna surveys are conducted by a **qualified ecologist**;

(2) avoid clearing **large and very large trees** to the maximum extent reasonably practicable;

(3) prohibit driving between sunset and sunrise in the **redsan landsystem** (**Figure 5**) unless:

(a) it is on a formed road, with a cleared verge for good visibility; and

(b) speed does not exceed 25 km/h.

(4) ensure Greater bilby surveys are conducted by a **qualified ecologist** who has experience detecting sign of Greater bilbies, immediately prior to any clearing within the **redsan land system**;

(5) avoid any active Greater bilby burrows and buffer by maintaining a 50 m buffer between the active burrow and **construction activities** or roads;

(6) locate the OHTL to maintain a minimum of 8 km between any conductor and the **Kohinoor Adit** Ghost bat roost;

(7) conduct a Red goshawk and Grey falcon nest survey where:

(a) work will be conducted in the late dry season (July to September); and

(b) trees greater than 20 m tall occur within 1 km of a **river**; and

(c) trees greater than 20 m tall are within 300 m of proposed disturbance.

(8) avoid any nests in use by Red goshawks or Grey falcons by adopting:

(a) a 100 m buffer between a nest in use and **construction activities;** and

(b) a 300 m buffer between a nest in use and activities involving use of helicopters or sudden noise sources.

(9) survey to identify **potential Gouldian finch nesting trees** within 300 m either side of the construction centreline, in any area potentially comprising **Gouldian finch breeding habitat** where **construction activities** will occur during the Gouldian finch breeding season (January to April);

(10) survey **potential Gouldian finch nesting trees** (identified by the survey required by Condition **3-1(9)**) to identify any nests in use immediately prior to disturbance;

(11) avoid clearing any nest in use by Gouldian finches and buffer by 200 m while in use;

(12) survey for *Cycas armstrongii* in suitable habitat to identify **very high density stands of *Cycas armstrongii***;

(13) avoid clearing **very high-density stands of *Cycas armstrongii* is** to the maximum extent reasonably practicable within the **approved extent** of the **CTF**;

(14) **salvage and translocate** *Cycas armstrongii* plants within the **approved extent** of the **OHTL** and **DCS** to the maximum extent reasonably practicable;

(15) conduct surveys for *Stylidium ensatum* in **suitable habitat for *Stylidium ensatum*** during appropriate environmental conditions in the mid-late dry season;

(16) avoid clearing *Stylidium ensatum*.

4 Migratory and waterbird management plan

4-1 The approval holder must develop, implement and comply with a **migratory** and waterbird management plan for the **solar precinct**. The plan must:

(1) include a program for monitoring bird utilisation and fatalities across the **solar precinct**, commencing at the start of solar panel installation;

(2) identify adaptive management actions to respond to any emerging issues (including any impacts of solar panels on bird behaviour and/or mortality); and

(3) require annual reporting of monitoring effort, monitoring outcomes and any management actions implemented to the **Minister.**

5 Vegetation management

5-1 The approval holder must ensure that local, native vegetation species are reinstated as soon as reasonably practicable, and at a maximum within one year, following any vegetation clearing in the absence of permanent infrastructure.

5-2 The approval holder must conduct annual monitoring of erosion, weeds and vegetation condition in reinstated vegetation areas, and conduct remediation where required as soon as reasonably practicable and at a maximum within one year**.**

Hydrological processes, Inland water environmental quality, and Aquatic ecosystems

6 Environmental objectives

6-1 The approval holder must ensure that the action achieves the following environmental objectives:

(1) Protect aquatic habitats to maintain environmental values.

(2) Protect the quality of surface and ground water so that the environmental values of Lake Woods are maintained.

(3) Protect aquatic and riparian habitats associated with rivers and streams, including perennial sections of the Adelaide and Elizabeth rivers.

(4) Protect wetlands, and sandsheet heath habitats of the **Gunn Point Peninsula**.

7 Erosion and sediment control

7-1 The approval holder must develop, implement and comply with an erosion and sediment control plan (**ESCP**) prior to the commencement of any ground disturbance, to minimise erosion and the release of sediment to the receiving environment and contamination of stormwater during construction.

7-2 The **ESCP** must:

(1) be prepared by a certified professional in erosion and sediment control (**CPESC**) in accordance with the International Erosion Control Association Best Practice Erosion and Sediment Control Guideline[1].

(2) demonstrate how erosion and sediment control measures will adequately minimise the release of sediment to receiving waters and must include at least the following:

(a) assessment of all catchment areas;

(b) assessment of soil types, including sodic dispersive soils; and

(c) specify design criteria for all erosion and sediment control structures, including sediment basins.

(3) detail the locations and descriptions of all erosion and sediment control measures; and

(4) provide an inspection and monitoring schedule to ensure erosion and sediment controls are being maintained.

7-3 The approval holder must submit a report on compliance with the **ESCP** to the **Minister** by 31 May each year. The review must:

(1) assess the plan against the requirements under condition **7-2**;

(2) include recommended actions to ensure actual and potential environmental impacts are effectively managed;

(3) provide details of the actions to be taken and timelines for their completion; and

(4) identify any amendments made to the **ESCP**.

8 Stormwater drainage system

8-1 The operational stormwater drainage system at the **solar precinct** and at the **DCS** must be designed and installed to:

(1) cater for both minor (5% annual exceedance probability) and major (1% annual exceedance probability) storm events; and

(2) conform to the methods and criteria set out in Australian Rainfall and Runoff Guidelines 2019.

9 Wetlands of the Gunn Point Peninsula

9-1 The approval holder must:

(1) avoid all **high value wetlands**, and wetland systems with known records of threatened species, on the **Gunn Point Peninsula**;

[1] IECA Australasia 2008. Best practice erosion and sediment control. International erosion control association (Australasia), Picton NSW.

(2) retain a minimum buffer of 250 m around **high value wetlands**, and wetland systems with known records of threatened species, on the **Gunn Point Peninsula**, to the maximum extent reasonably practicable;

(3) ensure, where the buffer required by condition **9-1(2)** cannot be achieved, that:

(a) **high value wetlands**, and wetland systems with known records of threatened species are buffered by the maximum amount reasonably practicable;

(b) construction in buffers around **high value wetlands**, and wetland systems with known records of threatened species is undertaken in the dry season;

(c) rehabilitation of buffer around **high value wetlands**, and wetland systems with known records of threatened species is completed prior to the wet season;

(d) any other site specific avoidance and mitigation measures have been implemented to the maximum extent reasonably practicable.

(4) document the methods to achieve the requirements of condition **9-1(3)** in a wetland environmental management plan, developed in consultation with, and to the satisfaction of the Department of Environment, Parks and Water Security Flora and Fauna Division;

(5) submit the wetland environmental management plan required by condition **9-1(4)** to the **Minister** 90 business days prior to **construction activities**; and

(6) ensure that the wetland environmental management plan required by condition **9-1(4)** is adhered to at all times during construction and operation.

(7) retain a minimum buffer of 100 m around **medium value wetlands**, on the **Gunn Point Peninsula** to the maximum extent reasonably practicable;

(8) retain a minimum buffer of 50 m around low value wetlands on the **Gunn Point Peninsula** to the maximum extent reasonably practicable;

10 Sandsheet heath of the Gunn Point Peninsula

10-1 The approval holder must:

(1) avoid all **high value sandsheet heath vegetation communities** on the **Gunn Point Peninsula**;

(2) retain a minimum buffer of 250 m around **high value sandsheet heath vegetation communities**, on the **Gunn Point Peninsula**, to the maximum extent reasonably practicable;

(3) ensure where the buffer required by condition **9-1(2)** cannot be achieved, that:

(a) **high value sandsheet heath vegetation communities** are buffered by the maximum amount reasonably practicable;

(b) construction in buffers around **high value sandsheet heath vegetation communities** is undertaken in the dry season;

(c) rehabilitation of **high value sandsheet heath vegetation communities** is completed prior to the wet season;

(d) any other site specific avoidance and mitigation measures have been implemented to the maximum extent reasonably practicable.

(4) document the methods to achieve the requirements of condition **9-1(3)** in a sandsheet heath environmental management plan, in consultation with, and to the satisfaction of the Department of Environment, Parks and Water Security Flora and Fauna Division;

(5) submit the sandsheet heath environmental management plan required by condition **10-1(4)** to the Minister 90 business days prior to construction activities; and

(6) ensure that the sandsheet heath environmental management plan required by condition **9-1(4)** is adhered to at all times during construction and operation; and

(7) retain a minimum buffer of 100 m around medium value sandsheet heath vegetation communities on the **Gunn Point Peninsula** to the maximum extent reasonably practicable;

(8) retain a minimum buffer of 50 m around low value sandsheet heath vegetation communities on the **Gunn Point Peninsula** to the maximum extent reasonably practicable;

Terrestrial environmental quality

11 Environmental objectives

11-1 The approval holder must ensure the action achieves the following environmental objectives:

(1) Protect the quality of land and soils such that the environmental values of the terrestrial environment are preserved.

11-2 To support achievement of the environmental objectives required by condition **11-1**, the approval holder must comply with conditions **12** and **13**.

12 Waste management

12-1 No **e-waste**, in part or whole, is to be disposed to landfill in the NT.

12-2 The approval holder must develop, implement and comply with a waste management plan (**WMP**).

12-3 The **WMP** required by condition **12-2** must:

(1) include an inventory of all waste streams types that will be generated throughout the life of the action;

(a) the inventory of waste required by condition **12-3(1)** must be based on Schedule 2 of the NT Waste Management and Pollution Control (Administration) Regulations 1998 and the NSW Waste classification guidelines;

(2) include estimates of annual and total volumes of each waste stream for the life of the action;

(3) identify onsite and offsite waste treatment and management for each waste stream, including reuse, recycling and remanufacturing targets;

(4) demonstrate continued application of the waste management hierarchy; and

(5) include the framework for annual reporting on actual waste streams and volumes generated, and comparison against waste generation estimates and reuse, recycling and remanufacturing targets required by conditions **12-3(2)** and **12-3(3)**.

12-4 The **WMP** must be submitted to the **Minister** at least six months before **substantial implementation**.

12-5 A waste management report, consistent with the framework required by condition **12-3(5)**, must be provided to the **Minister** annually.

13 Decommissioning and rehabilitation

13-1 The approval holder must develop, implement, and comply with a decommissioning and rehabilitation plan (**DRP**).

13-2 The **DRP** required by condition **13-1** must:

(1) define closure objectives and criteria which have been developed in consultation with pastoral lease holders, Traditional Owners and relevant government agencies;

(2) describe the methodology and staging for dismantling and removal of infrastructure, rehabilitation and remediation;

(3) be consistent with the waste management strategies and targets including recycling, reuse and remanufacturing targets identified in the **WMP** required by condition **12-2;**

(4) include the approach for post-decommissioning monitoring and remediation;

(5) be reviewed by an **independent qualified person** to ensure it is consistent with achievement of the environmental objective at conditions **2-1, 6-1,11-1, 14-1, 17-1, 20-1** and **21-1**; and

(6) be submitted to the **Minister** with the independent review required by condition **13-2(5)** and a statement from the approval holder addressing how the reviewer's findings have been addressed, at least three months before **substantial implementation**.

13-3 The DRP required by condition **13-1** must be revised by the approval holder, and submitted to the **Minister,** every five years to account for new conditions, technologies, regulations or knowledge that could be relevant to decommissioning.

13-4 Any part of the project infrastructure that will not, or will no longer, be required for use must be decommissioned by the approval holder as soon as reasonably practicable after completion of its use.

Community and economy

14 Environmental objectives

14-1 The approval holder must ensure the action achieves the following environmental objective:

(1) Protect the health, welfare and amenity of current and future generations of Territorians.

14-2 To meet the environmental objective at condition **14-1**, the approval holder must comply with conditions **15** and **16**.

15 Human exposure to electro-magnetic fields

15-1 Prior to **substantial implementation** of **OHTL** construction, the approval holder must model predicted electro-magnetic fields (**EMF**) of the final design and ensure that the recommended exposure limit for the public (ICNIRP, 2010[2]) will be met at the boundary of the **approved extent**.

15-2 The approval holder must complete pre and post-energisation monitoring of **EMF** at the maximum power loading achievable; to ensure that ICNIRP (2010) limits are not exceeded at the boundary of the **approved extent**.

16 Human exposure to noise

16-1 Prior to commencement of **construction activities** at the **DCS**, the approval holder must model predicted noise emissions associated with the final design and ensure that the noise levels predicted by preliminary modelling[3, 4] are not exceeded at the boundary of the **approved extent**.

16-2 The approval holder must complete pre- and post- commissioning monitoring of audible noise generated by the **DCS** and apply mitigation measures to the maximum extent reasonably practicable if monitoring indicates that the noise levels predicted by modelling are exceeded at the boundary of the **approved extent**.

Marine environmental quality, Marine ecosystems

17 Environmental objectives

17-1 The approval holder must ensure the action achieves the following environmental objectives:

(1) No **material environmental harm** to the waters, sediment and biota of Shoal Bay, the Beagle Gulf, and the Timor Sea beyond the **zone of influence** of the **subsea cable system**.

(2) No **material environmental harm** to sensitive receptors, and marine environmental quality beyond the **zone of impact.**

(3) Physical injury, mortality, behavioural changes and health impacts on cetaceans and other marine megafauna are avoided.

(4) The risk of disrupting the **critical lifecycle behaviour** of marine **EMF**-sensitive species from generated **EMF** and heat is minimised.

[2] International commission on non-ionizing radiation protection (2010). Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz). Health Physics, 99(6):818-836.

[3] Hatch (2023). Community operational noise technical assessment. Appendix D - Additional information to the EIS dated 17 November 2023.

[4] Hatch (2024). Darwin converter site operational noise model – Additional modelling for noise mitigation scenarios. Appendix B - Response to NT EPA Direction to Provide Additional Information received 10 January 2024.

17-2 To support achievement of the environmental objectives required by condition **17-1** the approval holder must comply with condition **18** and **19**.

18 Marine environment management plans

18-1 The approval holder must develop, implement, and comply with the following environmental management plans:

(1) **acid sulfate soils** (**ASS**) management plan (**ASSMP**);

(2) dredging, environmental monitoring and **dredge spoil disposal** management plan (**DEMSDMP)**;

(3) marine environment management plan (**MEMP**); and

(4) subsea cable construction and management plan.

18-2 The **ASSMP** required by condition **18-1(1)** must:

(1) demonstrate presence/absence and management of (**ASS**) and potential acid sulfate soils (**PASS**) within the **approved extent** of the **shore crossing**; and

(2) be prepared by an **independent qualified person** in accordance with national[5] and Queensland[6] guidelines for the management of **ASS** and **PASS** and be submitted to the **Minister** 90 business days prior to **substantial implementation** of the **shore crossing** or **subsea cable system**.

18-3 The **DEMSDMP** required by condition **18-1(2)** must include:

(1) a description of **dredging activity, dredge spoil disposal**, spoil disposal grounds and operations;

(2) a sampling and monitoring program for baseline and operational monitoring to ensure compliance and allow for adaptive management and reporting. The sampling and monitoring program must include:

(a) establishing the water quality baseline, management **trigger values**, and **limit values** that are locally relevant e.g. for turbidity (**NTU**);

(b) monitoring the environmental variables in the predicted **zone** of **impact** and **zone of influence** e.g. tides, current, water and sediment quality;

(c) an assessment of impacts to sensitive receptors during any **critical windows of environmental sensitivity**;

(d) sediment plume prediction validation by comparisons between the predicted and actual spatial extent and characteristics of sediment plumes generated by the **dredging activity**; and

[5] Simpson, S., Mosley, L, Batley, G. and Shand, P. (2018). National Acid sulfate soils guidance: Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management, Department of Agriculture and Water Resources, Canberra, ACT.

[6] Dear, S., Ahern, C., O'Brien, L., Dobos, S., McElnea, A., Moore, N. and Watling, K. (2014). Queensland acid sulfate soil technical manual: soil management guidelines. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government.

(e) development of operating protocols and procedures to manage vessel strikes and entrainment of cetaceans and other marine megafauna.

(3) A revised and refined fit-for-purpose (calibrated and validated) hydrodynamic and sediment transport model to predict and describe the characteristics (extent, severity, and duration) of sediment plumes, and the potential impacts of **dredging activity** to the receiving environment**.** The hydrodynamic and sediment transport model must provide modelling outputs that:

(a) simulate dredge plume dispersion in the **near-field zone and far-field zone**;

(b) identify the zones of impact and influence;

(c) assess whether the elevated total suspended sediments or suspended sediment concentrations, sedimentation and reduced light availability at the seafloor will be a risk to sensitive receptors;

(d) provide for targeted sampling and monitoring programs to ensure appropriate baselines are established; and

(e) identify water quality triggers, thresholds, limits and actions for management.

18-4 The hydrodynamic and sediment transport model required by condition **18-3(3)** must utilise contemporary approaches developed by the Western Australian Marine Science Institution (WAMSI) dredging science node[7], and a peer review of the model and report prepared by an **independent qualified person**.

18-5 The **DEMSDMP** required by condition **18-3** must be prepared by an **independent qualified person** and submitted to the **Minister** 90 business days prior to **substantial implementation** of the **subsea cable system**.

18-6 The **MEMP** required by condition **18-1(3)** must**:**

(1) include a marine megafauna noise management plan to address construction noise impacts, and to minimise the likelihood of injury or hearing impairment to species including dolphins and whales;

(2) require the approval holder to implement the protocols and procedures required by condition **18-3(2)(e)** for cetaceans and other marine megafauna including, but not limited to:

(a) appropriate exclusion or buffer zones and protocols for marine megafauna sightings;

(b) vessel speed limits and marine megafauna approach distances for all vessels used for construction and operation of the action;

(c) night and low visibility marine megafauna observation procedures

(d) trained marine megafauna observers on duty during subsea **cable laying** activities;

[7] Sun, C., Paul Branson, P., Mills, D. (2020). Guideline on dredge plume modelling for environmental impact assessment. WAMSI Dredging Science Node Themes 2/3. Western Australian Marine Science Institution (WAMSI).

(e) quantitative triggers for initiating investigative and/or adaptive management actions; and

(f) reporting of any incidents related to marine megafauna injury or mortality to the relevant regulators.

(3) ensure compliance with the Recovery Plan for Marine Turtles in Australia 2017–2027[8], the Conservation Management Plan for the Blue whale[9], and the National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna[10];

(4) include best practice lighting to reduce light pollution and minimise effect on susceptible wildlife (i.e. marine turtles, seabirds, and **migratory** shorebirds), biological and light monitoring and auditing. Night works must be completed in accordance with the National Light Pollution Guidelines[11]; and

(5) be consistent with objectives of the North Marine Parks Network Management Plan 2018[12].

18-7 The **MEMP** required by condition **18-1(3)** must be prepared by an **independent qualified person**, and submitted to the **Minister** 90 business days prior to **substantial implementation** of the **subsea cable system**.

18-8 Prior to commencement of **construction activities** for the **subsea cable system**, the approval holder must:

(1) survey the existing marine environment within the **zone of impact** (direct and indirect), and identify and map where benthic primary producers, habitat and other sensitive receptors occur;

(2) locate the **subsea cable system** to avoid sensitive receptors to the maximum extent reasonably practicable;

(3) establish marine environmental baselines and monitoring to effectively evaluate, monitor and manage environmental impacts from subsea **cable laying** activities;

(4) complete pre and post-energisation **EMF** and temperature measurements to calibrate and validate the **EMF** model,[13] and to accurately predict the **EMF** and heat generated by the **subsea cable system**.

[8] Commonwealth of Australia (2017). Recovery Plan for Marine Turtles in Australia.

[9] Commonwealth of Australia (2015).Conservation Management Plan for the Blue Whale - A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999.

[10] Commonwealth of Australia (2017). National Strategy for reducing Vessel Strike on Cetaceans and Other Marine Megafauna 2017.

[11] DCCEEW (2023). National Light Pollution Guidelines for Wildlife.

[12] Director of National Parks (2018). North Marine Parks Network Management Plan 2018.

[13] Notman, D. (2022) Sun Cable influence study: EMF calculations at 21 different locations along the subsea cable systems route from Darwin to Singapore. Engineering report ER1254. Prepared by Cable Consulting International Ltd for Sun Cable. Appendix E(2) - Additional information to the EIS dated 17 November 2023.

19 Subsea cable system siting and burial

19-1 The Subsea cable construction and management plan (**SCCMP**) required by condition **18-1(4)** must:

(1) define the location and maximum size of the **subsea cable system** impact **zone of influence**;

(2) include a subsea cable siting procedure that has measures for avoidance and mitigation of adverse impacts on the environment associated with the placement of subsea cables; and

(3) include a subsea cable laying and burial procedure for cable laying and burial of the **subsea cable system**.

19-2 The approval holder must ensure the subsea cable siting procedure required by condition **19-1(2),** and the subsea cable laying and burial procedure required by condition **19-1(3**) support the achievement of condition **17-1** through:

(1) consideration of biologically important areas for Australia snubfin, Indo-Pacific humpback and Indo-Pacific spotted bottlenose dolphins, the Pygmy blue whale, Flatback, Olive ridley and Loggerhead turtle, and the Oceanic Shoals Marine Park and key ecological features;

(2) route selection and cable placement that avoids any sensitive/high value habitat and communities;

(3) ensuring cable laying and burial is conducted outside any **critical windows of environmental sensitivity**;

(4) application of **best available techniques** and **best environmental practice**, and compliance with relevant industry guidelines and the Code of Practice for Offshore Cable Laying in the Renewable Energy Industry[14]; and

(5) adopting **EMF** avoidance and mitigation measures that are directly through design (cable design/sheathing and insulation), cable circuit configuration (e.g. bundled cables), and indirectly by cable protective measures (burial, or rock covers, or mattresses).

19-3 The approval holder must:

(1) ensure laying and burial of the **subsea cable system** is in accordance with the burial procedure required by condition **19-1(3**); and

(a) bury cables to a minimum depth of 1.0 m beneath the seabed in coastal waters that are less than 40 m below lowest astronomical tide; or

(b) cover cables with rock/mattresses to a minimum thickness of 1.0 m in coastal waters that are less than 40 m below lowest astronomical tide.

19-4 The subsea cable siting procedure required by condition **19-1(2)**, and the subsea cable laying and burial procedure required by condition **19-1(3)** must be reviewed by an **independent qualified person**, and submitted to the **Minister** prior to commencement of **construction activities**.

[14] International marine contractors association (IMCA) (2023). IMCA code of practice for offshore cable laying in the renewable energy industry. MCA M264 Rev. 0.1.

Atmospheric processes

20 Environmental objectives

20-1 The approval holder must ensure the action achieves the following environmental objectives:

(1) Minimise greenhouse gas emissions.

20-2 To support achievement of the environmental objective required by condition **20-1** the approval holder must implement and comply with the greenhouse gas abatement plan[15] including identified targets, and reporting requirements.

Culture and heritage

21 Environmental objectives

21-1 The approval holder must ensure the action achieves the following environmental objectives:

(1) Protect Aboriginal sacred sites.

(2) Protect Aboriginal cultural values.

(3) Protect maritime heritage, including shipwrecks**.**

21-2 To support the achievement of the environmental objectives required by condition **21-1** the approval holder must comply with condition **22**.

22 Cultural heritage management plan

22-1 The approval holder must develop and implement a cultural heritage management plan (**CHMP**).

22-2 The CHMP required by condition **22-1** must:

(1) include a register documenting known cultural and heritage values, including maritime culture and heritage sites;

(2) identify the actions that will be implemented to avoid or minimise impacts to known sites;

(3) include procedures to mitigate impacts to unexpected maritime heritage objects, including a stop work protocol, developed in consultation with, and to the satisfaction of, the Heritage Branch of the Department of Territory Families, Housing and Communities; and

(4) require ongoing consultation and engagement on cultural heritage values with stakeholders.

[15] Xodus (2022). Carbon Emissions Study, Greenhouse Gas Abatement Plan. Appendix H - Australia-Asia PowerLink Environmental Impact Statement.

General conditions

23 Environment protection bond

23-1 The approval holder must provide an environment protection bond as determined by the **Minister**.

23-2 To assist the **Minister** to determine the environment protection bond required by condition **23-1**, the approval holder must submit to the **Minister** an environment protection bond proposal, independent review of the proposal, and a statement addressing how the reviewer's findings have been addressed, at least 12 months prior to installation of any photovoltaic system component at the **solar precinct**.

23-3 The environment protection bond proposal required by condition **23-2** must include:

(1) estimated costs to remove and process or transport for reuse, recycling or disposal (excluding any anticipated salvage value) all **solar precinct** e-waste including the assumptions and calculation method used;

(2) any proposed staging of the environment protection bond taking into account staging of the action and related changes in project risk; and

(3) details of how costings and proposed management are in accordance with industry best-practice and contemporary regulatory requirements.

23-4 The environment protection bond proposal required by condition **23-2** must be reviewed by an **independent qualified person**.

23-5 A terms of reference for the review of the bond proposal required by condition **23-4** must be prepared by the approval holder and submitted to the **Minister** at least 30 business days prior to commencement of the review.

23-6 The environment protection bond proposal required by condition **23-2** must be revised by the approval holder every five years and account for new conditions, technologies, and knowledge that could be relevant to decommissioning.

23-7 The revised environment protection bond proposal must be submitted to the **Minister** for consideration under Part 7 of the **EP Act**.

24 Revision of plans

24-1 The approval holder may review and revise any management plan required by this approval and must provide the following to the **Minister** at least one month prior to any material amendment(s) being implemented:

(1) the revised plan(s);

(2) a tabulated summary of the amendment(s) with document references;

(3) reasons for the amendment(s);

(4) an assessment of environmental risks and potential impacts associated with the amendment(s); and

(5) if the **DEMSDMP** required by condition **18-1(2),** the **MEMP** required by condition **18-1(3**), or the **SCCMP** required by condition **18-1(4),** is updated - a written review and endorsement from an **independent qualified person**.

24-2 The approval holder must implement the action to comply with the latest revision of management plans required by this approval.

25 Environmental performance reporting

25-1 The approval holder must submit an Environmental performance report (**EPR**) that demonstrates the environmental performance of the action, and compliance with the conditions of this environmental approval.

25-2 The **EPR** required by condition **25-1** must be endorsed by the approval holder or a person delegated to sign on the approval holder's behalf.

25-3 The **EPR** required by condition **25-1** must:

(1) be completed within twelve months of **substantial implementation** of any component of the action (the solar precinct, the **OHTL**, **DCS**, **CTF**, subsea cable) and every five years thereafter;

(2) be reviewed and endorsed by an **independent qualified person** and submitted to the **Minister** within 30 days of its completion; and

(3) include a statement as to whether the approval holder has complied with the conditions of this approval.

25-4 The **EPR** required by condition **25-1** must:

(1) provide an interpretation of all monitoring data required by the conditions of this approval;

(2) provide an analysis and interpretation of monitoring data to demonstrate whether compliance with the requirements of conditions has been achieved;

(3) identify all non-compliances and describe corrective and preventative actions taken; and

(4) include an assessment of the effectiveness of monitoring, management, and adaptive management measures implemented to comply with the requirements of condition **17-1(1), 17-1(2), 17-1(3)** and **17-1(4)**.

25-5 The assessment required by condition **25-4(4)** must include:

(1) a comparison of the predicted impacts from **dredging activity**, **dredge spoil disposal** and **cable laying** with the actual impacts of the action, with verification by reporting the results of environmental monitoring data (e.g. water quality, turbidity levels and TSS concentrations) compared against the baseline survey data; and

(2) a review of the spatial extent and characteristics of sediment plumes generated by **dredging activity**, **dredge spoil disposal** and **cable laying** activity.

26 Provision of environmental data

26-1 All environmental monitoring data required to be collected or obtained under this environmental approval must be retained by the approval holder for a period of not less than 10 years commencing from the date that the data is collected or obtained.

26-2 The approval holder must, as and when directed by the **Minister**, provide any environmental data (including sampling design, sampling methodologies, empirical data and derived information products such as maps) relevant to the assessment of the action and implementation of this environmental approval, to the **Minister** in the form and manner and at the intervals specified in the direction.

27 Change of contact details

27-1 The approval holder must notify the **Minister** in writing of any change of its name, physical address or postal address for the serving of notices or other correspondence within 10 business days of such change.

28 Commencement of action

28-1 This approval expires five years after the date on which it is granted, unless there is **substantial implementation** on or before that date.

28-2 The approval holder must provide notification in writing to the **Minister,** at least two months prior to **substantial implementation**.

Acronyms

Term	Definition
ASS	Acid sulfate soils
ASSMP	Acid sulfate soils management plan
CEO	Chief Executive Officer
CHMP	Cultural heritage management plan
CPESC	Certified professional in erosion and sediment control
CTF	Cable transition facility
DCS	Darwin converter site
DEPWS	Department of Environment, Parks and Water Security
DEMSDMP	Dredging, environmental monitoring and spoil disposal management plan
DRP	Decommissioning and rehabilitation plan
EMF	Electromagnetic field
EP Act	*Environment Protection Act 2019*
EPR	Environmental performance report
ESCP	Erosion and sediment control plan
MEMP	Marine environment management plan
NT EPA	Northern Territory Environment Protection Authority
NTU	Nephelometric turbidity units as a standard measure of turbidity.
OHTL	Overhead transmission line
PASS	Potential acid sulfate soils
SCCMP	Subsea cable construction and management plan
WMP	Waste management plan

Definitions

The terms used in this approval have the same meaning as the terms defined in the *Environment Protection Act 2019* and Environment Protection Regulations 2020.

Term	Definition
acid sulfate soils (**ASS**)	Soils or sediments containing iron sulfides.
ancillary infrastructure	Access tracks, temporary construction accommodation, intermodal logistics facility, internal roads, construction waste disposal area associated with the **solar precinct.**
approved extent	The extent identified in Figures 1, 2 and 3 of this approval. Also defined by: • Cable_Transition_Facilities_20240411.shp • Darwin_Converter_Site_20240411.shp • Overhead_Transmission_Line_20240412.shp • Powell_Creek_Ancillary_Infrastructure_20221027.shp • Powell_Creek_Solar_Precinct_20210630.shp
best available techniques	The latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste.
best environmental practice	The application of the most appropriate combination of environmental control measures and strategies.
cable laying	Activities carried out for the purpose of installing the subsea cable system including but not limited to marine surveys, boulder clearance, trenching, pre sweeping, sea bed levelling, **dredging activity**, and **dredge spoil disposal**.
Cable transition facility (CTF)	The extent identified in Figure 3 of this approval. Also defined by Cable_Transition_Facilities_20240411.shp
Chief Executive Officer (CEO)	Has the same meaning as in section 4 of the **EP Act**.
construction activities	Works and activities undertaken to establish the action including land clearing, earthworks, infrastructure installation, trenching, dredging and spoil disposal.
critical lifecycle behaviour	The behaviour of species that is critical during their lifecycle and includes breeding, feeding, migration or resting behaviour.

Term	Definition
critical windows of environmental sensitivity	Critical windows of environmental sensitivity are specific times of the year or particular sites where key species or ecological communities or critical processes (e.g. breeding cycles, timing and routes for migration, coral spawning, peak growth period for seagrass) may be particularly vulnerable to pressures from anthropogenic activity such as dredging.
Darwin converter site (DCS)	The extent identified in Figure 3 of this approval.
dredging activity	Dredging activity includes, but is not limited to: seabed levelling, pre-sweeping, dredging and dredge spoil disposal.
dredge spoil disposal	The loading of barges or similar vessels with dredged material (spoil), and movement of barges or similar vessels from the dredge footprint and disposal.
e-waste	Solar panels, inverters and energy storage system batteries.
Gouldian finch breeding habitat	Gouldian Finch breeding habitat as mapped in **Figure 6** of this approval. Also defined by Gouldian_Finch_breeding_habitat.shp
Gunn Point Peninsula	As defined in the Litchfield Subregional Land Use Plan 2016. Version 6. (NT Planning Commission, 2023).
high value sandsheet heath vegetation communities	Sandsheet heath habitat mapped and classified by the proponent as high or very high habitat quality.
high value wetlands	Wetland vegetation communities identified by Stokeld *et al*. (2020) as 'high value areas'. Stokeld, D., Leiper, I., Cuff, N., Cowie, I., Lewis, D., and Einoder, L. (2020). Mapping the Future Project - Gunn Point. Biodiversity assessment of the Gunn Point area. Technical report 4/2020, Department of Environment and Natural Resources, Darwin, NT
independent qualified person	A qualified person, to be engaged by the approval holder, as defined under section 4 of the **EP Act**; and who also meets the following requirements: a) was not involved in the preparation of the approval holder's **referral**, **EIS,** supplement or additional information; b) is independent of the personnel involved in the design and implementation of the action; and c) has obtained written approval from the **CEO** to satisfy the **independent qualified person** reporting requirements under this approval.
Kohinoor Adit	Kohinoor Adit is approximately 2 km south of Pine Creek. Coordinates are held by **DEPWS**.

Term	Definition
landfill	Disposal of waste by burial.
large and very large trees	Large (diameter at breast height >40cm) and very large (diameter at breast height >50cm) trees with the potential to support tree hollows.
limit value(s)	Values of monitored environmental parameters that represent the limit of acceptable impact beyond which the environmental values and objectives are not being met.
listed threatened species	Species listed as critically endangered, endangered, or vulnerable under the *Territory Parks and Wildlife Conservation Act 1976* or the *Environment Protection and Biodiversity Conservation Act 1999*
medium value wetlands	Has the same meaning as in the Land clearing guidelines: Northern Territory Planning Scheme
migratory	Species listed as migratory under the *Environment Protection and Biodiversity Conservation Act 1999*
material environmental harm	Has the same meaning as in section 8 of the *Environment Protection Act 2019*
Minister	The Minister responsible for administering the **EP Act**.
near-field zone and far-field zone	The zone where the sediment plume is dynamic is called the near-field zone where acute impacts to sensitive receptors are expected. The dynamic plume weakens and eventually transitions to a passive plume with low suspended sediment concentration at the far-field.
Overhead transmission line (OHTL)	The extent identified in Figure 2 of this approval.
potential acid sulfate soils (**PASS**)	Soils containing iron sulfides (commonly pyrite) which have the potential to produce sulfuric acid if they are drained or excavated.
potential Gouldian finch nesting trees	Hollow bearing *Eucalyptus leucophloia* and *E. tintinnans*.
qualified ecologist	Person who has professional qualifications, training, skills and/or experience related to the potential impact using the relevant protocols, standards, and methods, and who has obtained written approval from the **CEO**, on the advice of the Executive Director, of the NT **DEPWS** Flora and Fauna Division to be the qualified ecologist.
redsan land system	The Redsan land system is identified in the 'Northern Territory Land Systems' dataset held by the **DEPWS** Geospatial Services Branch, see **Figure 5** of this approval
referral	The approval holder's **referral** to the **NT EPA** under section 48 of the **EP Act**

Term	Definition
river	A waterway with a Strahler stream order of 5 or greater
salvage and translocate	Salvage and translocation of *Cycas armstrongii* must be conducted in accordance with the translocation guideline in the Management Program for Cycads in the Northern Territory of Australia 2009-2014 (Liddle, 2009). [Liddle, D.T. (2009). Management Program for Cycads in the Northern Territory of Australia 2009-2014. Northern Territory Department of Natural Resources, Environment, the Arts and Sport, Darwin.]
shore crossing	The extent identified in Figure 3 of this approval. Also defined by Cable_Transition_Facilities_20240411.shps
solar precinct	The extent of Figure 1 in this approval. Also defined by Powell_Creek_Solar_Precinct_20210630.shp and Powell_Creek_Ancillary_Infrastructure_20221027.shp
subsea cable system	The cable system laid and buried in the seabed for the transmission of high voltage direct current (DC) power between Darwin and Singapore. Subsea_Cable_Route_20220706.shp
substantial implementation	The commencement of any ground disturbing activity undertaken to carry out the action.
suitable habitat for *Stylidium ensatum*	Known occurrences (records) of *Stylidium ensatum* and modelled high likelihood habitat mapped in Cuff, N. and Green, C. (2016) Threatened Species Distribution in the Greater Darwin Region – *Stylidium ensatum*. Northern Territory Government.
trigger value(s)	The values of monitored environmental parameters that indicate when response actions are required to prevent exceedance of limit values.
very high density stand of *Cycas armstrongii*	Stands supporting >700 mature stems of *C. armstrongii* per hectare. Mature stems are considered all of those greater or equal to 50 cm in height.
zone of impact	The zones within which sensitive receptors and marine environmental quality can be directly and indirectly impacted by a particular event or action comprising the zone of high impact, and zone of moderate impact. The zone of high impact is the area where serious damage to sensitive receptors and marine environmental quality is predicted or where impacts are considered to be irreversible, and the zone of moderate impact is the area within which predicted impacts to sensitive receptors and marine environmental quality is sub-lethal, and/or the impacts are recoverable.
zone of influence	The zone of influence is the area which the marine environmental quality would be affected as a result of the action, but the effects would not result in detectable impacts to benthic habitat and communities.

Location and extent of action

Spatial data is held by **DEPWS** as follows:

- Powell_Creek_Solar_Precinct_20210630
- Powell_Creek_Ancillary_Infrastructure_20221027
- Overhead_Transmission_Line_20240412
- Darwin_Converter_Site_20240411
- Cable_Transition_Facilities_20240411 (including CTF and shore crossing)
- Gouldian_Finch_breeding_habitat
- Spatial coordinates of the **Redsan land system** are identified in the Northern Territory Land Systems dataset held by the **DEPWS** Geospatial Services Branch
- Spatial coordinates of Kohinoor Adit held by the **DEPWS** Flora and Fauna Division

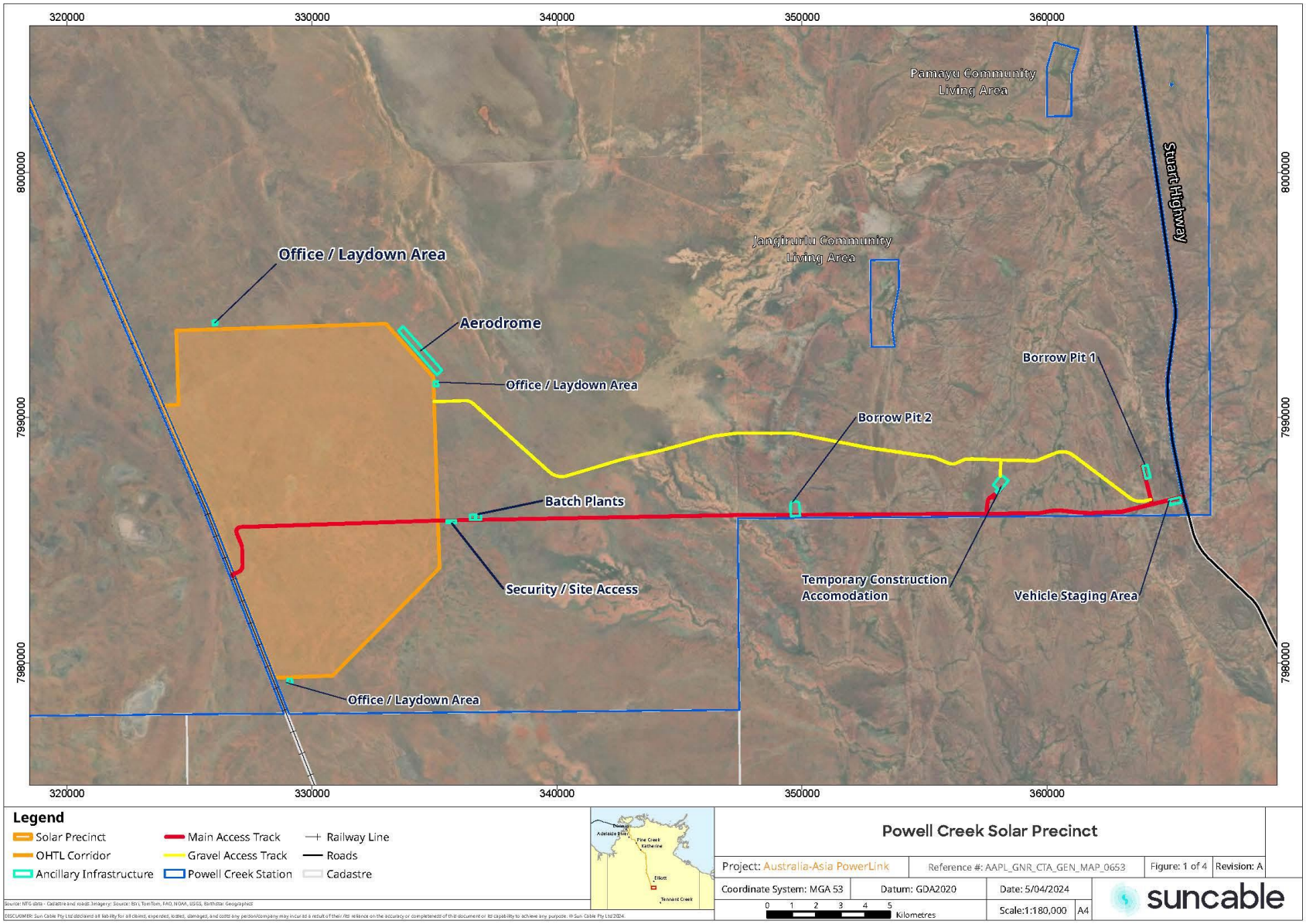

Figure 1: Solar precinct

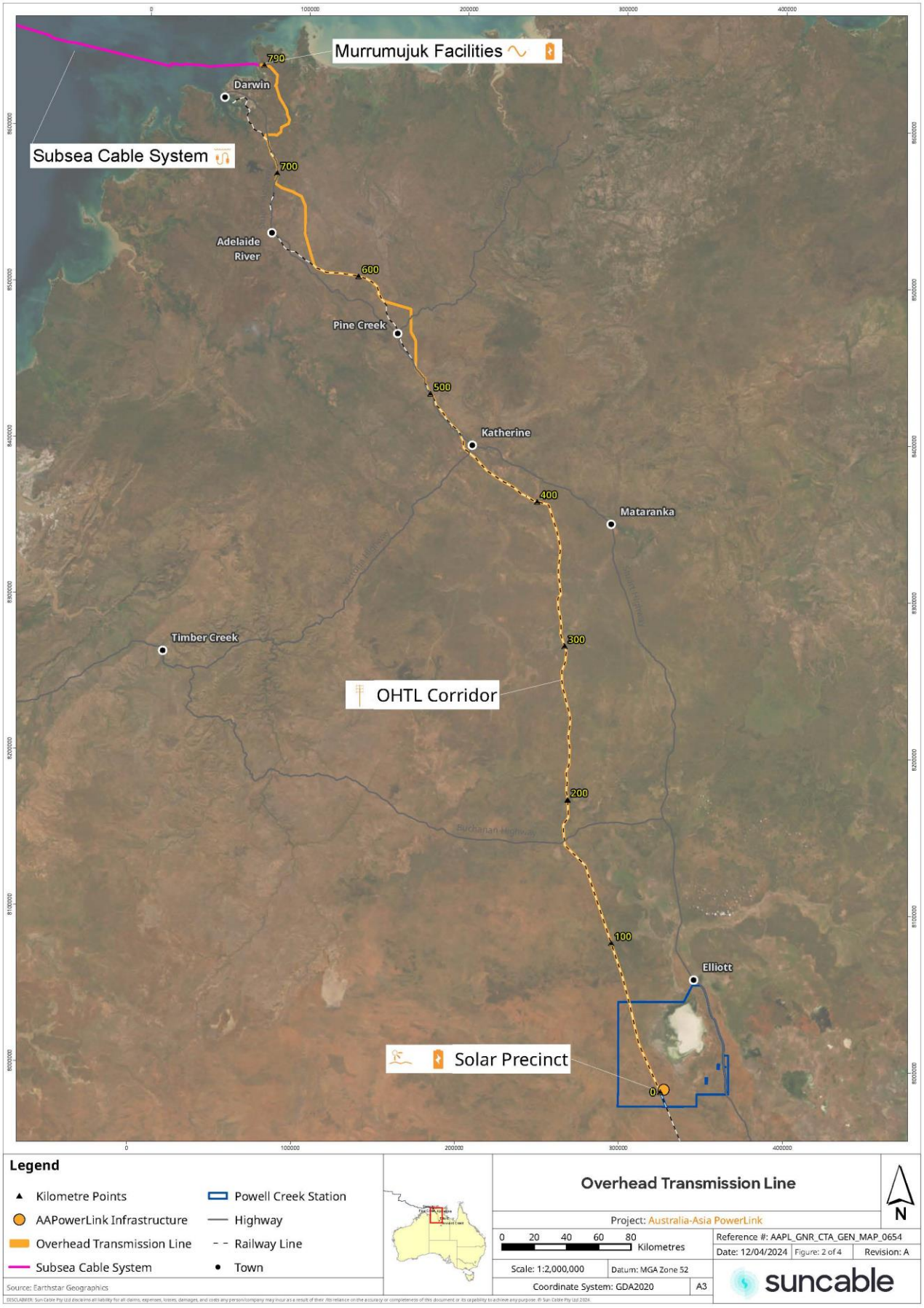

Figure 2 Overhead transmission line

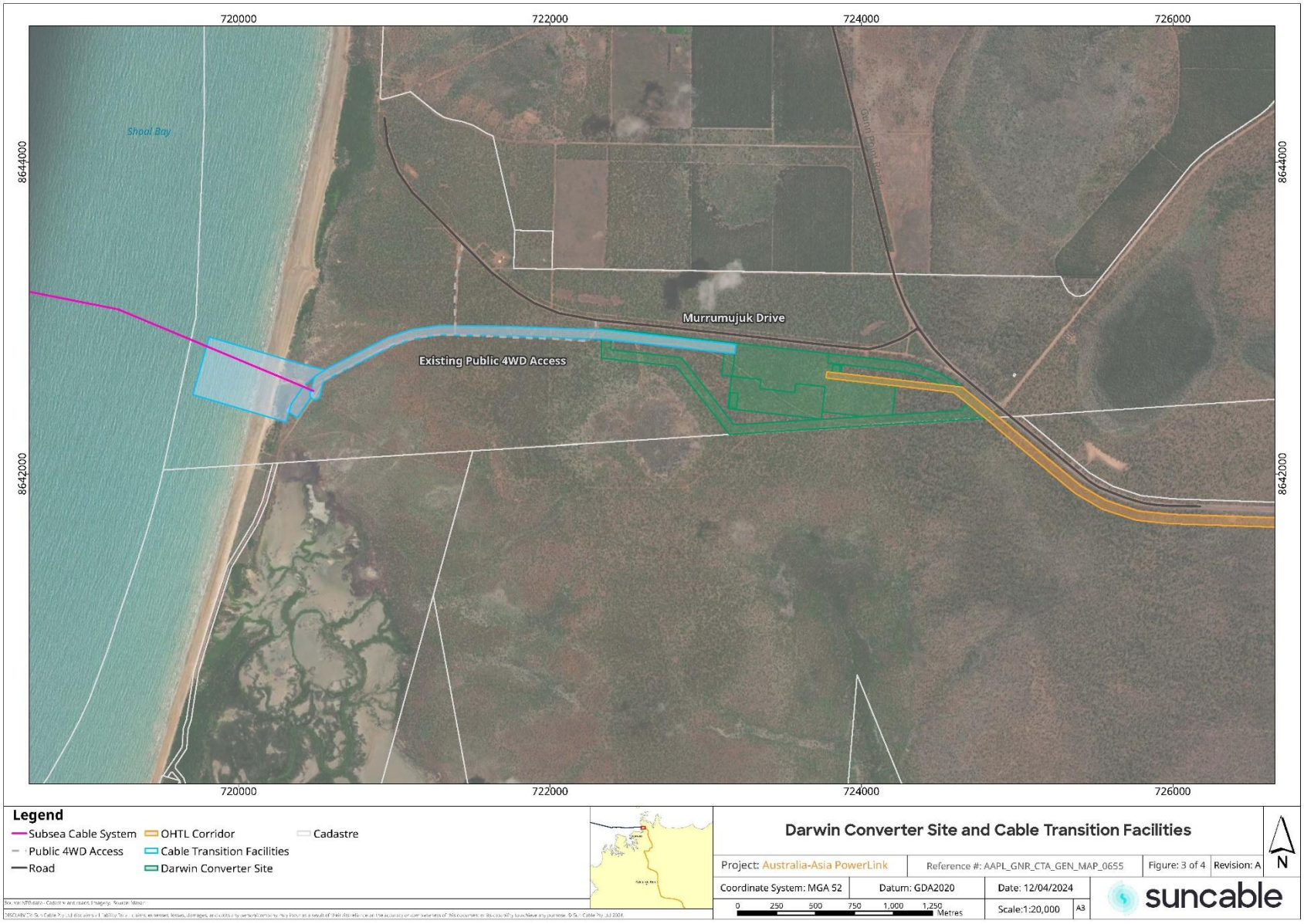

Figure 3 Darwin converter site, cable transmission facilities and shore crossing

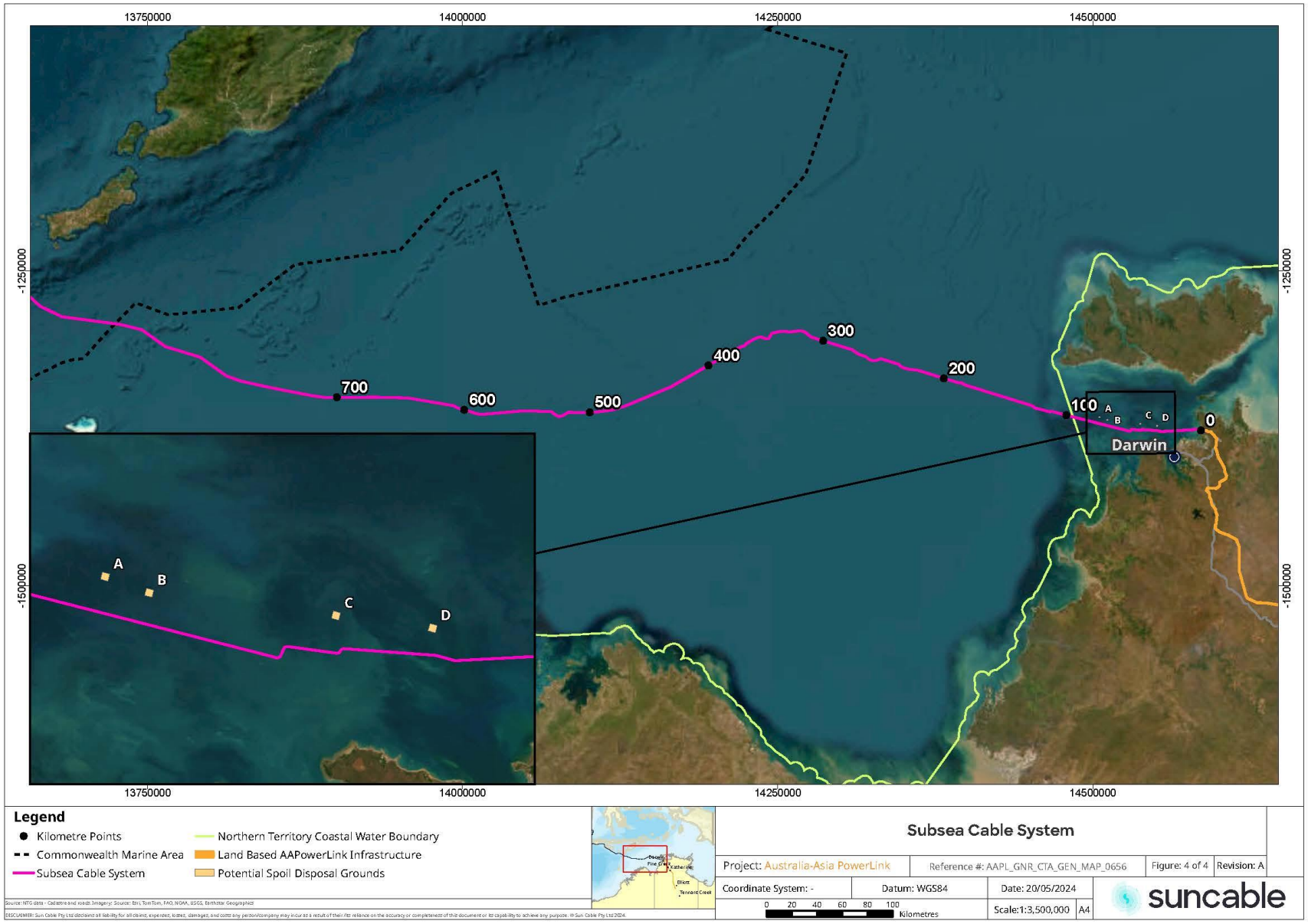

Figure 4 Subsea cable and spoil disposal grounds

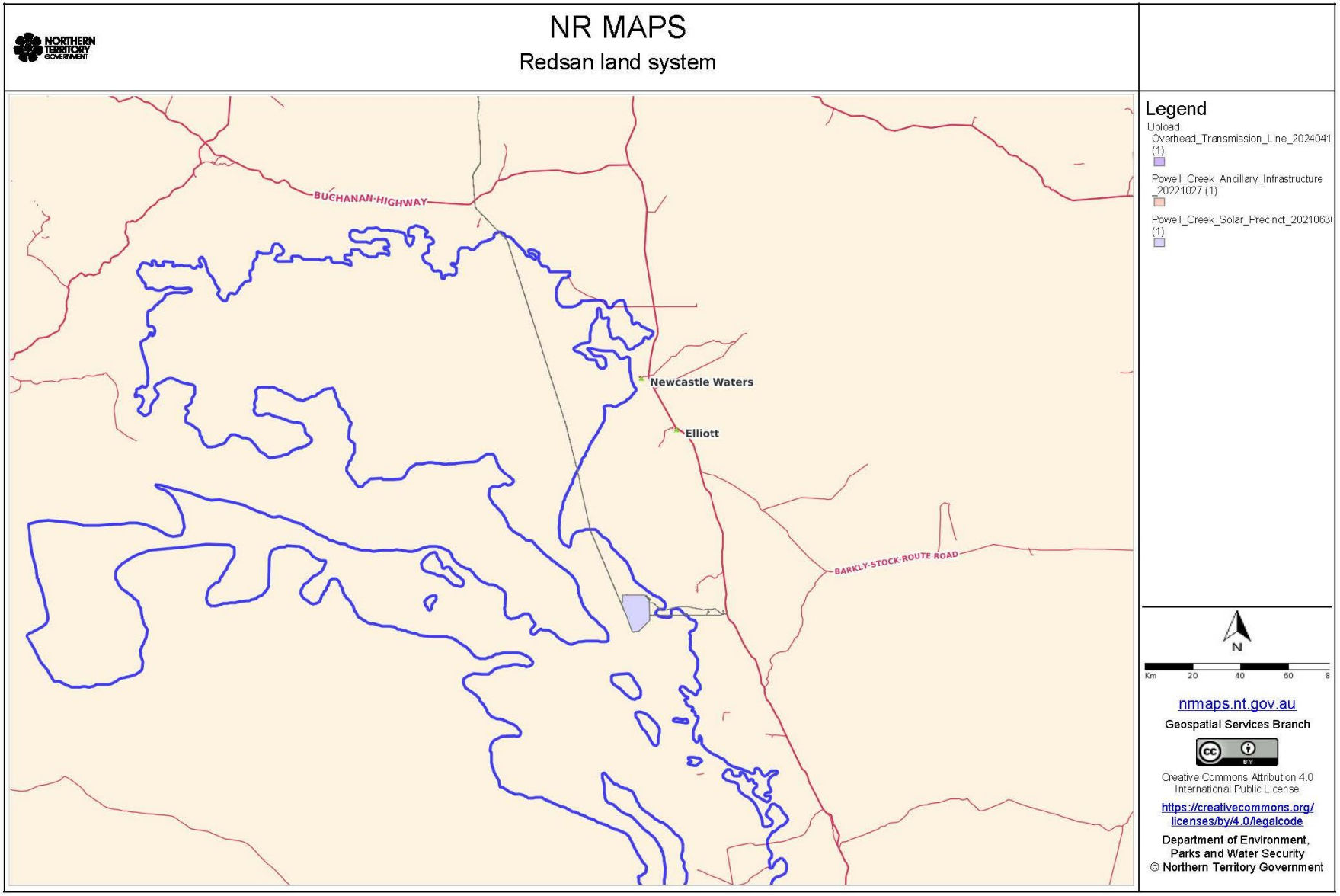

Figure 5 Redsan land system, solar precinct and OHTL

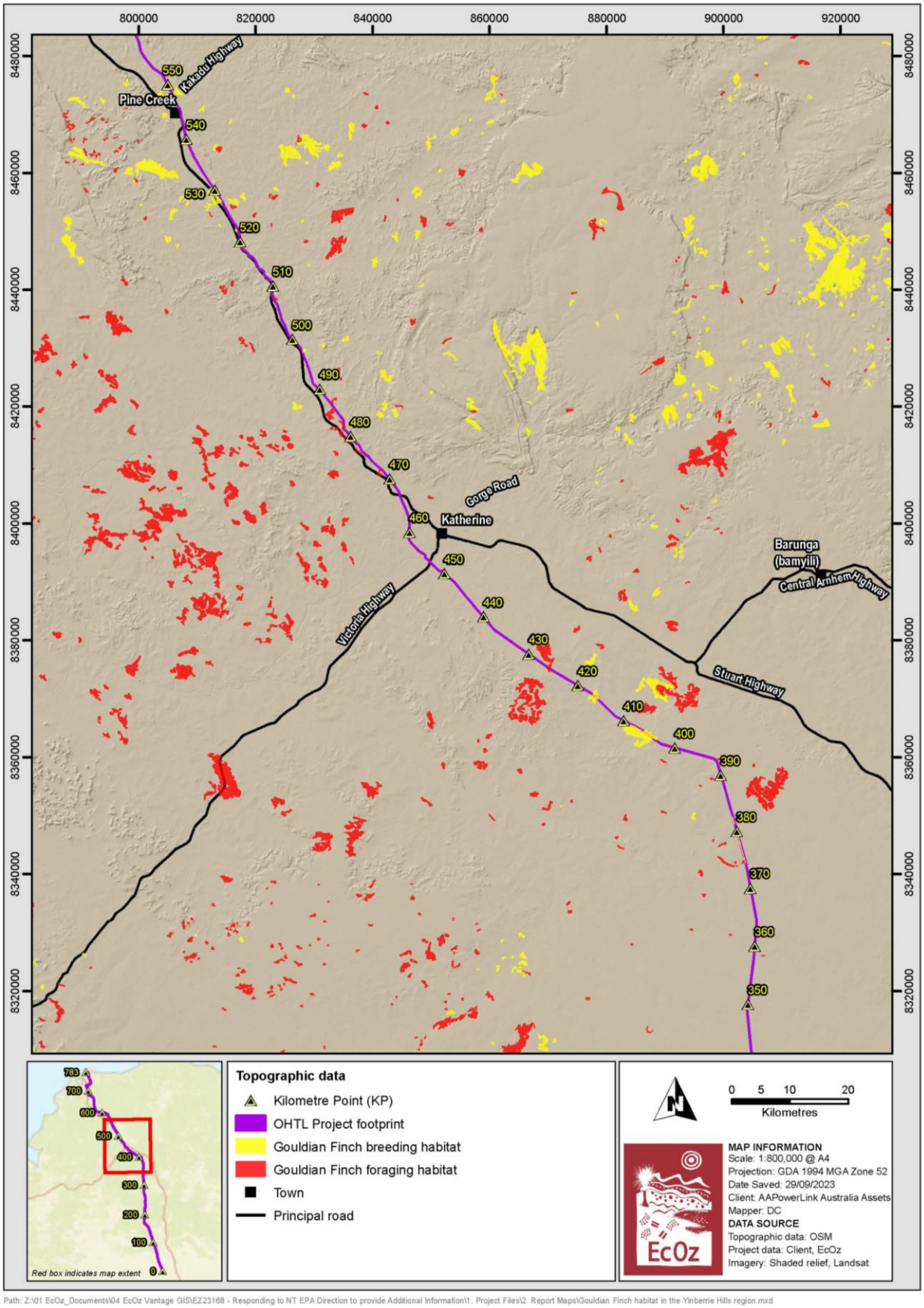

Figure 6 Gouldian finch habitat mapped in the OHTL corridor

Appendix 2 – Environmental impact assessment timeline

Date	Assessment stage
16 October 2020	NT EPA accepted proponents initiated EIS referral for the proposed action.
19 October - 27 November 2020	Public consultation on the referral including the draft ToR.
12 January 2021	NT EPA decided that environmental impact assessment by EIS is required.
11 August 2021	NT EPA accepted notice of significant variation for the proposed action.
13 August – 24 September 2021	Public consultation on the significant variation.
5 October 2021	NT EPA decided that the assessment could continue with the existing assessment method (EIS) with amended ToR.
20 April – 15 July 2022	Public consultation on the draft EIS.
28 September 2022	NT EPA directs the proponent to: • prepare a supplement to the draft environmental impact statement; • address the submissions made on the draft environmental impact statement in accordance with regulations 135 and 136(1)(a); • provide additional information as detailed in accordance with regulation 136(1)(b); and • ensure that the NT EPA has sufficient information to complete the environmental impact assessment process.
December 2022	NT EPA decided to extend the specified period for consultation on the supplement to the draft EIS by 21 business days.
7 December 2022 – 31 January 2023	Public consultation on the Supplement to the draft EIS.
19 March 2023	NT EPA directed the proponent to provide additional information to the draft EIS.
17 November 2023 – 8 December 2023	Public consultation on the additional information to the draft EIS.
10 January 2024	NT EPA directed the proponent to provide additional information to the Supplement to the draft EIS.
29 April to 27 May 2024	Consultation on draft environmental approval (regulation 160 of Environment Protection Regulations 2020).
24 June 2024	NT EPA completed its assessment.
Within 30 business days after receiving the NT EPA's assessment report	Minister's decision on the environmental approval. (If the Minister does not make a decision within 30 business days the Minister is taken to have accepted the NT EPA's recommendation for approval.