# REFERRAL UNDER THE ENVIRONMENTAL PROTECTION ACT

# Wurrumiyanga residential subdivision

NORTHERN TERRITORY GOVERNMENT

**May 2024**

# DOCUMENT CONTROL RECORD

| | |
|---|---|
| **Job** | EZ23143 |
| **Document ID** | 232541-170 |
| **Author(s)** | B Crescentino, S Aylott |

**DOCUMENT HISTORY**

| Rev | Reviewed by | Approved by | Issued to | Date |
|---|---|---|---|---|
| A | E Lewis | E Lewis | DIPL (DRAFT) | 28/03/2024 |
| B | E Lewis | E Lewis | DIPL (DRAFT 2) | 12/06/2024 |
| 1 | E Lewis | R. Hall | Final NT EPA / DIPL | 09/07/2024 |

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# EXECUTIVE SUMMARY

This referral report was prepared to inform the Northern Territory Environment Protection Authority (NT EPA) of the proposed action by Department of Infrastructure Planning and Logistics (DIPL) (the proponent) to provide a new residential housing subdivision development (the proposal) at Wurrumiyanga (Nguiu).

***Proposal overview***

The proposal is to develop and construct a new residential housing subdivision at Wurrumiyanga (Nguiu), a community on Bathurst Island, 80 km north of Darwin. Wurrumiyanga is the largest community on the Tiwi Islands with approximately 2,000 residents, and the subdivision will provide much needed housing to address the overcrowding issues currently experienced in the township. The proposal is funded through the remote housing investment package: *Our Community. Our Future. Our Homes*. The overall objective is to improve Aboriginal housing in remote communities through investment of $1.1 billion from 2017-2018 to 2026-2027.

The proposal includes the design, development, and construction of the following components:

- Municipal infrastructure (roads and drainage)
- Utilities infrastructure (connection to existing town water, sewer, power, telecommunications services)
- Residential dwellings (a mix of dwelling types) – proposed 70 residential lots. 55 dwellings will be constructed as part of the initial works. Construction of dwellings on the remaining lots will be part of a future funding program.
- Realignment of existing water and power distribution services that traverse the southern portion of the proposed development area along Kerinauia Drive.

The proposal will require use of gravel and fill material, which is anticipated to be supplied from nearby existing gravel borrow pits (as is referred to in this document as 'borrow pits'). Whilst these borrow pits will be utilised to help facilitate this proposal, the areas have supplied gravel and fill for the last 10 -15 years for a range of historic, current, and proposed future maintenance uses in the area. The borrow pits are management by the Tiwi Island Regional Council (TIRC) and the management and use of these borrow pits are not directly related to the subdivision. As such, the impacts of the use of the borrow pits are not being considered as part of this referral.

***Stakeholder consultation and engagement***

Key stakeholders who have been communicated with across pre-submission of the referral directly by the proponent, the Housing Office and Office of Township Leasing (OTL), include:

- Housing Reference Group (HRG) members - refer to Section 3.1.1 for further background information.
- Wurrumiyanga community members – refer to Section 3.1.3 for further background information.
- First time Mums Program (as part of HRG meeting)
- Australian Red Cross (as part of HRG meeting)
- TIRC (as part of HRG meeting) - a remote local government body that has represented the peoples of Bathurst and Melville Island, including Wurrumiyanga, since 2001.
- National Indigenous Australian Agency (as part of HRG meeting)
- Tiwi Island Council
- NT Heritage Branch
- AAPA

Additional to the above key stakeholders, an Aboriginal Interpreter was present when deemed appropriate. Engagement with stakeholders has been conducted on country, face to face (preferred) and via video and phone link if necessary.

Overall, the consultation and engagement with key stakeholders has been positive, with key themes and concerns discussed during the early engagement. Ongoing discussions with TOs will be undertaken as required if any queries are raised prior to commencement of construction and throughout the construction phase until handover of the dwellings to DFTHC for management and leasing services. A summary of the key themes and concerns raised through the consultation process provided below:

- Loss of usability of area and unmaintained road during construction
- Areas of cultural or heritage importance
- Infrastructure requirements and design in comparison to previous developments in the township (stormwater drainage, street lighting etc)
- Dwellings designs (capacity of types of dwellings and internal design)
- Open public spaces important
- Local employment and services opportunities
- *Typhonium* species - abundance in proposed development area, connectedness and biological information known about the species
- Timeframe on availability of housing
- Current housing overcrowding issue
- Existing housing issues (renovations, unsuitable designs and incorporating the feedback into the new subdivision detailed design)
- Involvement of Traditional Owners (TO) in site selection process and design

Further details of consultation to date are provided in Section 3 of the referral report.

***Assessment of potential impacts***

Pre-referral screening of the proposal undertaken by EcOz Environmental Consultants (EcOz) determined that the proposal has may significantly impact one environmental factor, terrestrial ecosystems, in accordance with the NT EPA (2022) *Environmental Factors and Objectives* guidance (available here).

Desktop assessments and relevant targeted surveys were undertaken to identify the terrestrial ecosystems environmental values. Where important values were identified, work was undertaken by the proponent to identify measures that could be implemented to avoid and minimise impacts. These measures are documented in the referral report and were taken into consideration when assessing the residual impact to terrestrial ecosystem values. The outcomes of the impact assessment to terrestrial ecosystems summarised in the table below.

**Summary of terrestrial ecosystem values relevant to the proposal and residual impacts**

| Environmental values | Potential impacts and benefits | Avoidance and mitigation | Residual impact |
|---|---|---|---|
| • Vegetation and habitats<br>• Significant vegetation<br>• Threatened species | • Direct loss of vegetation and habitat from land clearing<br>• Degradation of vegetation and habitat through introduction of invasive weeds, introduced pest species, changed fire regimes, and increased human activity.<br>• Direct loss of significant vegetation from land clearing.<br>• Loss of threatened species habitat from land clearing.<br>• Direct mortality of threatened fauna and flora during land clearing activities. | • Development and implementation of a CEMP in accordance with DIPL *standard specification for environmental management 2.0,* including development of a vegetation clearance procedure.<br>• Conduct pre-clearance survey by suitably experienced person<br>• Engage fauna spotter catcher during clearing by suitably experienced person<br>• Erosion and Sediment Control Plan (ESCP)<br>• Weed management plan for construction and public open spaces and management of the subdivision. | **Low residual impact**<br><br>Assuming effective implementation of the mitigation measures outlined in Section 5.3, the proposal is unlikely to result in material significant impacts to terrestrial ecosystems and will meet the NT EPA's objective. |

A summary of all other factors excluded from further assessment are presented in Table 4-1 in the environmental impact assessment section. The detailed pre-referral screening document is provided at Appendix A and provides further justification of why the environmental factors were excluded from further assessment.

***Conclusion***

The results of studies and impact assessment presented in the referral report indicate that with appropriate avoidance and mitigation measures, the proposal is unlikely to result in a significant impact to the environment.

# TABLE OF CONTENTS

## Appendices



## Tables

## Figures

# ACRONYMS

| | |
|---|---|
| **AAPA** | Aboriginal Areas Protection Authority |
| ***ALRA*** | *Aboriginal Land Rights Act 1976* |
| **AOO** | Area of occupancy |
| **ASS** | acid sulfate soils |
| **CEMP** | Construction Environment Management Plan |
| **DCCEEW** | Department of Climate Change, Energy, the Environment and Water |
| **DENR** | Department of Environment and Natural Resources (Northern Territory) – formerly DLRM |
| **DIPL** | Department of Infrastructure, Planning and Logistics |
| **DTFHC** | Department of Territory Families, Housing and Communities |
| **EDTL** | Executive Director of Township Leasing |
| **EIA** | Environmental Impact Assessment |
| **EIS** | Environmental Impact Statement |
| **EOO** | Extent of occurrence |
| ***EP Act*** | *Environment Protection Act 2019* |
| ***EPBC Act*** | *Environment Protection and Biodiversity Conservation Act (1999)* (Commonwealth) |
| **ESCP** | Erosion and Sediment Control Plan |
| **FD** | Future Development |
| **HPO** | Housing Program Office |
| **HRG** | Housing Reference Group |
| **LOA** | likelihood of occurrence assessment |
| **MNES** | Matters of National Environmental Significance |
| **MSDS** | Material Safety Data Sheets |
| **NT** | Northern Territory |
| **NT EPA** | Northern Territory Environment Protection Authority |
| **NTPS** | Northern Territory Planning Scheme |
| **OCOFOH** | *Our Community. Our Future. Our Homes.* |
| **OTL** | Office of Township Lease |
| **PMST** | Protected Matters Search Tool |
| **PWC** | Power and Water Corporation |
| **RWA** | Restricted work area |
| **SOCS** | Site of Conservation Significance |
| **TIRC** | Tiwi Island Regional Council |
| **TLC** | Tiwi Land Council |
| **TO** | Traditional Owner |
| ***TPWC Act*** | *Territory Parks and Wildlife Conservation Act* (Northern Territory) |
| **WDL** | Waste discharge licence |

# PUBLICATION STATEMENT

This Referral has been prepared by EcOz Environmental Consultants (EcOz) on behalf of the Department of Planning, Infrastructure and Logistics. A listing of the key consultants, their qualifications and experience in the environmental field are provided below.

| Key consultant | Qualifications | Experience |
|---|---|---|
| Britanny Crescentino<br>*Senior Consultant – Impact Assessment and Approvals* | Bachelor of Environmental Science | 6 years |
| Emma Lewis<br>*Managing Consultant - Impact Assessment and Approvals* | Bachelor of Science | 13+ years |

Inputs from relevant technical consultants at EcOz have been provided throughout the development of this Referral. A listing of the key technical consultants, their qualifications and experience in the environmental field are provided below.

| Key technical specialist | Specialist area | Qualifications | Experience |
|---|---|---|---|
| Glen Ewers<br>*Managing Consultant – Ecology* | Land – Ecology<br>Terrestrial ecosystems | Bachelor of Science<br>Bachelor of Law (Environment)<br>Diploma of Arts (Environmental Studies)<br>Graduate Certificate in Ornithology | 15+ years |
| Simon Aylott<br>*Senior Consultant – Ecology* | Land - Ecology | Bachelor of Science | 2 years |

# 1 INTRODUCTION

This referral report has been prepared to inform the Northern Territory Environment Protection Authority (NT EPA) of the proposed action by the Department of Infrastructure, Planning and Logistics (DIPL) (the proponent) to construct and develop a new residential housing subdivision at Wurrumiyanga (Nguiu), a community on Bathurst Island, 80 km north of Darwin. The proposed action is known as the Wurrumiyanga residential subdivision (hereafter referred to as 'the proposal'). The location of the proposal is provided in Figure 1-1.

The proposal is being referred to the NT EPA to determine whether formal assessment is required pursuant to the NT *Environmental Protection Act 2019* (*EP Act*). This referral also gives consideration as to whether the proposal should be referred for assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*), see section 7.

## 1.1 About the proponent

The proponent is a public sector agency that was created in September 2016. It was established under the administrative arrangements order issued by the Administrator of the Northern Territory (NT).

The proponent aims to drive the sustainable, economic and social advancement of the NT through:

- Land use and transport planning
- Infrastructure investment
- Effective logistics supply chains.

## 1.2 About the Wurrumiyanga residential subdivision

The proponent has been engaged by the Department of Territory Families, Housing and Communities (DTFHC) to design, construct and develop a new residential subdivision with the capability of providing 70 housing lots in the remote community of Wurrumiyanga. The proposed development area is located east of the Bathurst Island Airport and adjacent to existing residential development.

The proposal is funded through the remote housing investment package: *Our Community. Our Future. Our Homes.* The overall objective is to improve Aboriginal housing in remote communities through investment of $1.1 billion from 2017-2018 to 2026-2027. It is proposed the objective will be achieved through:

- Reducing overcrowding and improving living conditions
- Local decision making and engagement with communities
- Developing Aboriginal Business Enterprises
- Sustainable local employment
- Economic development.

The proposed action includes the design, development, and construction of the following components:

- Municipal infrastructure (roads and drainage).
- Utilities infrastructure (connection to existing town water, sewer, power, telecommunications services).
- Residential dwelling (a mix of dwelling types) – proposed 70 residential lots. 55 dwellings will be constructed as part of the initial works. Construction of dwellings on the remaining lots will be part of future funding program.
- Realignment of existing water and power distribution services that traverse the southern portion of the proposed development area along Kerinauia Drive.

The proposal excludes an assessment of the use of existing gravel borrow pits (as is referred to in this document as 'borrow pits'). The borrow pits have been used for the past 10-15 years to supply gravel and fill material for local infrastructure projects and are managed by the Tiwi Island Regional Council (TIRC). The construction contractor will engage with the TIRC for the required permits/approvals to extract materials for

project use. The borrow pits will provide suitable gravel material for road base, trench backfill, select and standard fill material for buildings pads, fill material for road subgrade and general bulk earthworks

The borrow pits were included in the initial subdivision investigation area in the 2022 environmental assessment (provided at Appendix B) as it was proposed the borrow pits would be expanded. Material for the construction scope will be sourced from the existing disturbed areas.

## 1.3 Regulatory context

The proposal will adhere to all relevant NT and Commonwealth environment and heritage legislation and will be required to obtain all associated permits and approvals. The NT EPA will assess the information in this referral to determine if the proposal requires assessment under the *EP Act*. Relevant primary legislation is described in Table 1-1.

**Table 1-1. Relevant primary legislation**

| Legislation, policies & guidelines | Relevance | Responsible entity |
|---|---|---|
| *Aboriginal Land Rights Act 1976 (Cth)(ALRA)* | The proposed development area is declared under *ALRA* as Aboriginal Land held by the Tiwi Aboriginal Land Trust. | Tiwi Aboriginal Land Trust |
| *Environment Protection and Conservation Act 1999 (Cth) (EPBC Act)* | The *EPBC Act* is the Australian Government's key environmental legislation. Approval under the *EPBC Act* may be required for any proposed action likely to have a significant impact on a matter protected by that Act. The environment assessment and approvals process of the *EPBC Act* aims to protect Matters of National Environmental Significance (MNES), as well as the environment in general where actions proposed are on, or will affect Commonwealth land, and/or where Commonwealth agencies are proposing to take an action.<br>MNES relevant to this proposal is Threatened species - Endangered *Typhonium mirabile*. Further information on the status of this species in the proposed development area is provided in section 5.1.3. | Department of Climate Change, Energy, the Environment and Water (DCCEEW) |
| *Environment Protection Act 2019 (NT)* | On October 2019 the *Environment Protection Act 2019* (NT) (*EP Act*) replaced the *Environment Assessment Act* 1982 (NT). The *EP Act* and associated Environment Protection Regulations 2020 sets out referral triggers, which require the proponent of a proposal to refer the project to the NT EPA for assessment.<br>Pre-referral screening determined the proposal has potential to impact one environmental factor (terrestrial ecosystems) and is being referred to the NT EPA to determine whether formal assessment is required pursuant to the NT *EP Act*. The pre-referral screening document has been provided as Appendix A. | NT EPA |
| *Heritage Act 2011 (NT)* | All Aboriginal and Macassan sites are protected under the Act. On 07 June 2023, a search of the proposed development area for any declared heritage places and objects on the Heritage Register was undertaken. The Heritage Branch stated *no nominated, provisionally declared or declared heritage places or objects within the* proposed development area. *The likelihood of unrecorded Aboriginal or Macassan archaeological places existing is unlikely. No further work is required. If archaeological places are discovered over the course of the work, establish an exclusion zone around the site and contact the Heritage Branch immediately.* | DTFHC |

| Legislation, policies & guidelines | Relevance | Responsible entity |
|---|---|---|
| *Planning Act 1999 (NT)* | Under the *Planning Act* 1999 a Development Permit will be required for land clearing greater than 1 ha of vegetation for roads and enabling infrastructure. Development permits related to subdivision and development of the land will remain the responsibility of future developers. | DIPL |
| *Northern Territory Planning Scheme (2020)* | The subject land is zoned Future Development (FD) under the Northern Territory Planning Scheme (NTPS). The purpose of this zone is to identify areas that are intended for future rezoning and development in accordance with the Strategic Framework.<br>The Strategic Framework is made up of plans and policies that form part of the NTPS, describing how the government expects land to develop now and into the future. | DIPL |
| *Northern Territory Aboriginal Sacred Sites Act* and *Regulations 2004* | The most recent Aboriginal Areas Protection Authority (AAPA) certificate (C2016/062) was issued to Department of Housing on 20 June 2016 for the township of Wurrumiyanga, which includes the proposed development area. The certificate identified a number of restricted works areas (RWA) in the area, one (RWA13) relevant to the proposed development area is located within 100m of the proposed development area boundary.<br>This has been avoided by the proponent during the site selection process, it contains sacred site 5074-26, and therefore not triggered for further assessment under the *EP Act.*<br>For due diligence since the previous AAPA certificate was issued in 2016, an Abstract of Records under regulation 7 of the *Northern Territory Aboriginal Sacred Sites Regulations 2004* (NT) was requested and received on 05 March 2024 and identified no registered or recorded sacred sites, or restricted work areas within the proposed development area. | AAPA |
| *Territory Parks and Wildlife Conservation Act 1976* | Amongst other things, applies statutory obligations in relation to the protection of flora and fauna. Under the Act, the taking or interfering with wildlife that is listed as threatened requires approval at the Ministerial level. | DEPWS |
| *Waste Management and Pollution Control Act 1998 (NT)* | Wastewater from the proposed development area will be transferred into the township sewerage infrastructure network. Wastewater from Wurrumiyanga township is transferred to the Wurrumiyanga waste stabilisation ponds and treated under the existing Waste Discharge Licence (WDL) 223-01. The WDL is authorised under the *Waste Management and Pollution Control Act 1998.* | NT EPA |

**Table 1-2. Relevant policies and guidelines**

| Policies/guidelines | Relevance | Responsible entity |
|---|---|---|
| *Compact Urban Growth Policy (NT) (2015)* | A Key Performance Indicator of the Northern Territory's Compact Urban Growth Policy (May 2015) is that proposals are continuing an existing town planning zoning sequence or consistent with a future development outlined by an Area Plan or Policy within the NTPS. The proposal is adjacent to an existing residential subdivision and has also been identified as a future development area for residential use within the Wurrumiyanga Area Plan 2011, referred to below. | DIPL |
| *Wurrumiyanga Area Plan (NT) (2011)* | Provides the framework for the orderly development of Wurrumiyanga through identification of areas for appropriately located uses and compatible activities. This plan identifies the subject land as appropriate for residential use, incorporating, appropriate supporting land uses. The proposal is consistent with the strategic planning policies and applicable strategic land use plan embedded in the NTPS (Plan is available here). | DIPL |

## 1.4 Studies undertaken to inform this referral

The following studies have been undertaken to inform this referral:

- T21-2263 Wurrumiyanga Environmental Assessment undertaken by EcOz in May 2022 over a much larger broader subdivision area (includes the proposed development area) (refer to Appendix B and Figure 1-1 for the assessment report for the entire report and for spatial reference).
    - A review of the likelihood of occurrence assessment in the above report was undertaken as part of this referral, to identify any additional species or protected matters listings that may have been listed since the May 2022 report was prepared. This review included a new Protected Matters Search Tool Report being developed on 05 June 2024 (provided at Appendix C in Appendix B). A gap analysis of the 2022 species listings and the 2024 report was undertaken and identified eleven species that required a likelihood of occurrence assessment to be completed. This updated likelihood of occurrence assessment for these species is included at Appendix D in Appendix B.
    - No additional species were identified as high or medium likelihood of occurrence. Further information is provided in Section 5.1.
- Typhonium Survey Report undertaken by Connect Environmental on 13 June 2023 (provided as Appendix C).
- Report on Geotechnical Investigation for Wurrumiyanga Subdivision undertaken by Douglas Partners in November 2023 (provided as Appendix D).
- Report on Contamination Assessment for Wurrumiyanga Subdivision undertaken by Douglas Partners in December 2023 (provided as Appendix E).
- Darwin Cycad Survey Memo prepared by EcOz in January 2024 (provided as Appendix F). A Darwin Cycad density survey was undertaken in November 2023 to identify the density of the species within the proposed development area. Additional to the cycad density survey the memo provided information on the status of significant vegetation (old-growth forest) and weeds and feral animals in the proposed development area and surrounding environment. Further information is provided in Section 5.1.


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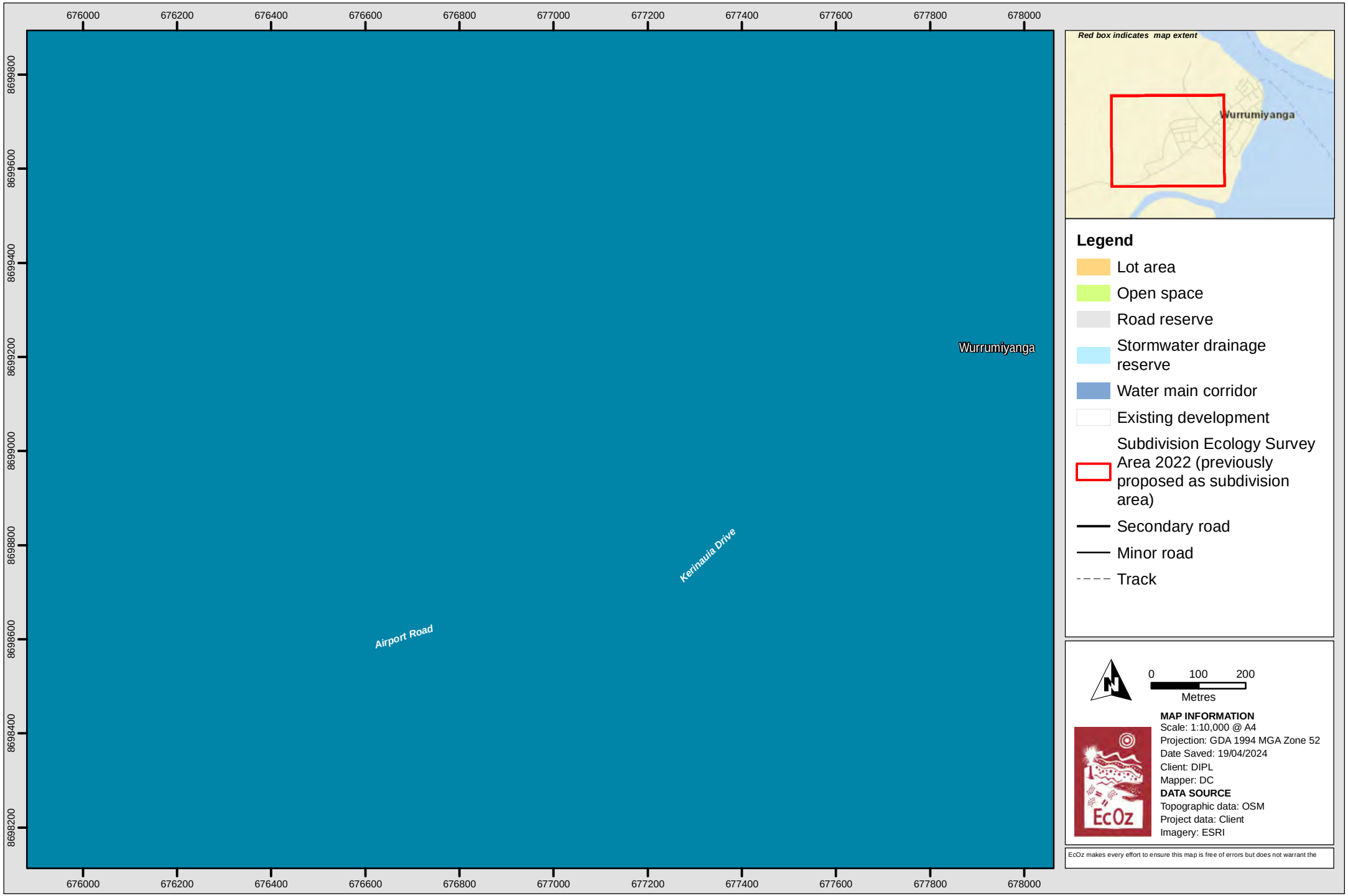
**Figure 1-1. Map of the proposal in a regional context**




Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ23143 - Wurrumiyanga Subdivision Referral\1. Project Files\2. Report Maps\Map of broader ecology survey area and proposed development area.mxd

**Figure 1-2. Map of broader ecology survey area (previously proposed subdivision in 2022) and proposed development area**

# 2 PROPOSAL DESCRIPTION

This section provides details of the proposal location and regional context, key activities and components of the proposal and their purpose, site selection and alternatives and other projects associated with the proposal, and how the principles of environmental protection and management are applied to the proposal.

## 2.1 Location and regional context

The proposal is located on the western boundary of Wurrumiyanga, Bathurst Island. Wurrumiyanga is approximately 80 km northwest of Darwin, within the TIRC area. The Tiwi Islands are owned in freehold by the Tiwi people, under the *ALRA*. There are eight landowner groups on the Tiwi Islands, with the proposed development area falling within the Mantiyupwi group. Table 2-1 provides a summary of the proposal location details, which are (for the purpose of the table) divided into subdivision area and stormwater infrastructure upgrade area as they are not connected by the proposed disturbance footprint of the construction works.

**Table 2-1. Summary of proposed development area**

| | Subdivision area | Stormwater infrastructure upgrade |
|---|---|---|
| **Latitude** | Full co-ordinates provided in Appendix G. | |
| **Longitude** | | |
| **Area** | The subdivision area covers approximately 14.9 ha, including a water/sewer mains corridor for services to be connected to existing PowerWater Corporation (PWC) services along Kerinauia Drive. | Upgrades to existing stormwater infrastructure to the north of the subdivision will disturb a total of approximately 0.35 ha. |
| **Street address** | Kerinauia Drive & Airport Road, Wurrumiyanga – Bathurst Island, NT | Timeapatua Circuit, Wurrumiyanga – Bathurst Island, NT |
| **Tenement details** | Freehold | |
| **Lot/Section number** | NT Portion 1640 | |
| **Town/Hundred** | Wurrumiyanga | |
| **Zoning** | Future Development (FD) under Wurrumiyanga Area Plan | |
| **Tenure** | Freehold | |
| **Nearest residential community/town** | Wurrumiyanga | |
| **Ownership of land** | Aboriginal Land (scheduled under *ALRA*) | |

## 2.2 Land use history

This section provides a summary of the land use history of the Wurrumiyanga township, proposed development area and surrounding adjacent areas.

### *Bioregion*

The proposed development area occurs within the Tiwi Coburg bioregion, which is characterised by its coastal vegetation and tall Eucalyptus open forests on sandy lateritic plains and rises. The Tiwi Islands are home to a

large number of endemic flora and fauna species. The Northern Territory Government (NTG) has identified the Tiwi Islands as a Site of Conservation Significance (SOCS), with a significance rating of International Significance for terrestrial and marine ecological values.

### *Wurrumiyanga township*

Wurrumiyanga was established as a Mission by the Catholic Church on Bathurst Island in 1911 (Owen Stanley, 1983). The Mission had given Wurrumiyanga the code name 'ARSY' during WWII. Prior to 2010, Wurrumiyanga was known as Nguiu, however it was altered in 2010 at the request of the Tiwi Land Council (TLC) on advice from Traditional Landowners (TOs). The name, Wurrumiyanga is significant for being the local Tiwi name for the area where the community is built and means "the place where the cycads grow" (BushTel, 2023).

### *Proposed development area*

The proposed development area is partially previously disturbed undeveloped vacant land, with moderately dense bushland. There is a presence of weeds primarily along the road corridors transversing through and around the area. There is evidence of historical clearing in the northern section of the area (Douglas Partners 2023b). The past land uses are known to include a community swimming hole from a man-made depression (C. Kerinaiua pers. Comms) waste rock stockpiles and small amounts of surface litter including steel parts and empty bottles (Doulgas Partners 2023b).

No known major or minor drainage lines occur in the proposed development area.

No gross contaminations were identified during geochemical investigations conducted in August 2023 by Douglas Partners (2023b). Total chromium concentrations were elevated in soils sampled during the contamination investigation. Additional analysis determined that the concentrations of the more toxic Hexavalent Chromium (CrVI) to which the NEPM HIL-A applies, were less than the limit of detection. The authors concluded that the high chromium most likely represented natural (background) soil concentrations (Douglas Partners 2023b).

The site has not been registered as a contaminated site under the *Waste Management and Pollution Control Act 1998.* There are no records of the area requiring assessment of site contamination in accordance with the National Environment Protection (Assessment of Site Contamination) Measure ('The NEPM'), nor has it been issued with a Pollution Abatement Notice by the NT EPA.

### *Surrounding areas*

The area surrounding the proposed development area is included in the Wurrumiyanga Area Plan, zoned for future use and development.

The land to the north-east of the proposed development area has already been developed and is used for residential housing. The land to the south-east is identified as a Recreation Use and Natural Area with part also identified for residential use. Geotechnical investigations have determined that the area is not suitable for development due to soil type, drainage and known issues with existing houses adjacent to the areas (i.e. foundation stability issues). This is discussed further in under the site selection and alternatives in Section 2.4.

Land to the immediate south-west is identified as a Commercial Use Area (aerodrome related facilities) and Industrial Use Area (Service Commercial airport related facilities and PWC laydown area). The Wurrumiyanga Airport boundary is approximately <400m from the proposed development area boundary.

The land to the north-west of the site is identified as a Residential Use Area, which also includes some area set aside for Recreation Use and Natural Area, including a small Development Constraint Area. Similarly to the land to the north-east, this area has been determined as not suitable for development due to due to soil type, drainage and the requirement for extensive engineering costs to be implemented during earthworks. This is discussed further in under the site selection and alternatives in Section 2.4. This area also includes the man-made swamp referenced in Appendix B, which is outside the current proposed development area.

## 2.3 Key activities and components

### 2.3.1 Key activities

The proposal involves the maximum disturbance extent of approximately 15.25 ha– see Figure 2-1.

General steps in development of the subdivision prior to subdividing the lots will consists of:

- Site clearing and stripping of topsoil, which is required for all areas in the proposed development area, excluding the middle public open space. No clearing or earthworks will occur in this public open space by the proponent (refer to Figure 2-1). The natural vegetation as is will be retained during the initial development. Sections of this public open space may by partially clearing post development of the subdivision for development of a future playground/park site[1].
- Undertake bulk earthworks (cutting and filling to reshape the site and facilitate drainage), and the installation of the new sewerage networks. No excavated material will be used for building of foundations pads or road construction due to the generally high plastic fines content and reactivity (Douglas Partners 2023a). Excess material will be subject to acceptance testing and if deemed suitable will be reused to backfill service trenches as general fill.
- Undertake the installation of enabling infrastructure, comprising sewerage, water supply, power, telecommunications, roads and stormwater drainage infrastructure (internal an on the subdivision perimeter), this includes but is not limited to:
    - Realignment of existing water and power distribution services that traverse the southern portion of the subdivision along Kerinauia Drive. Existing services that will be deemed redundant with the construction of the subdivision will be removed.
    - Construction of formalised site drainage infrastructure, which includes grading of the finished site levels and utilising suitable material in the top earthworks layers, to promote drainage of the finished surface and reduce risk of waterlogging. Surface runoff will be captured via table drains within the road reserves that convey stormwater to the existing downstream open drainage network.
    - In addition to the internal drainage, an open drain with an average depth of 1.5m will be provided around the perimeter of the subdivision, to intercept upslope surface runoff from the adjacent bushland catchment, and to intercept groundwater seepage in the topsoil strata to mitigate localised waterlogging of the soils within the subdivision area. This cut-off drain concept has been successfully utilised for the previous housing subdivision, which included the construction of a similar sized cut off drain to the rear of the housing lots along the western side of Kantilla Street.
- The internal infrastructure of the subdivision will include the construction of road pavements, kerbing and footpaths. Topsoil and grassing of the cleared public open space area where native vegetation is not being retained, road verges and drainage corridors.

Site clearing, stripping of soil, bulk earthworks, excavations and construction of enabling infrastructure will commence during the dry season between May and October (Douglas Partners 2023b), and any erosion and sediment control measures be implemented prior to 01 October. No staging of development works is proposed, all 70 lots will be delivered as a single development due to the large housing need in Wurrumiyanga.

Following the above works, the land will be subdivided, and the proponent will develop the lots, with the dwellings constructed by a third-party contractor. A mix of dwellings to be constructed have been selected based on the housing waitlist and the needs of the community.

[1] *This public open space area was identified during consultation with community stakeholders to be remain vacant, to allow for a future playground/park site to be developed, under the responsibility of the TIRC. Noting that the footprint of this public open space has been included in the maximum clearing extent for the purpose of this impact assessment as TIRC's plan to develop the area for the purpose of a future playground/park site has not yet been conceptualised or is understood.*

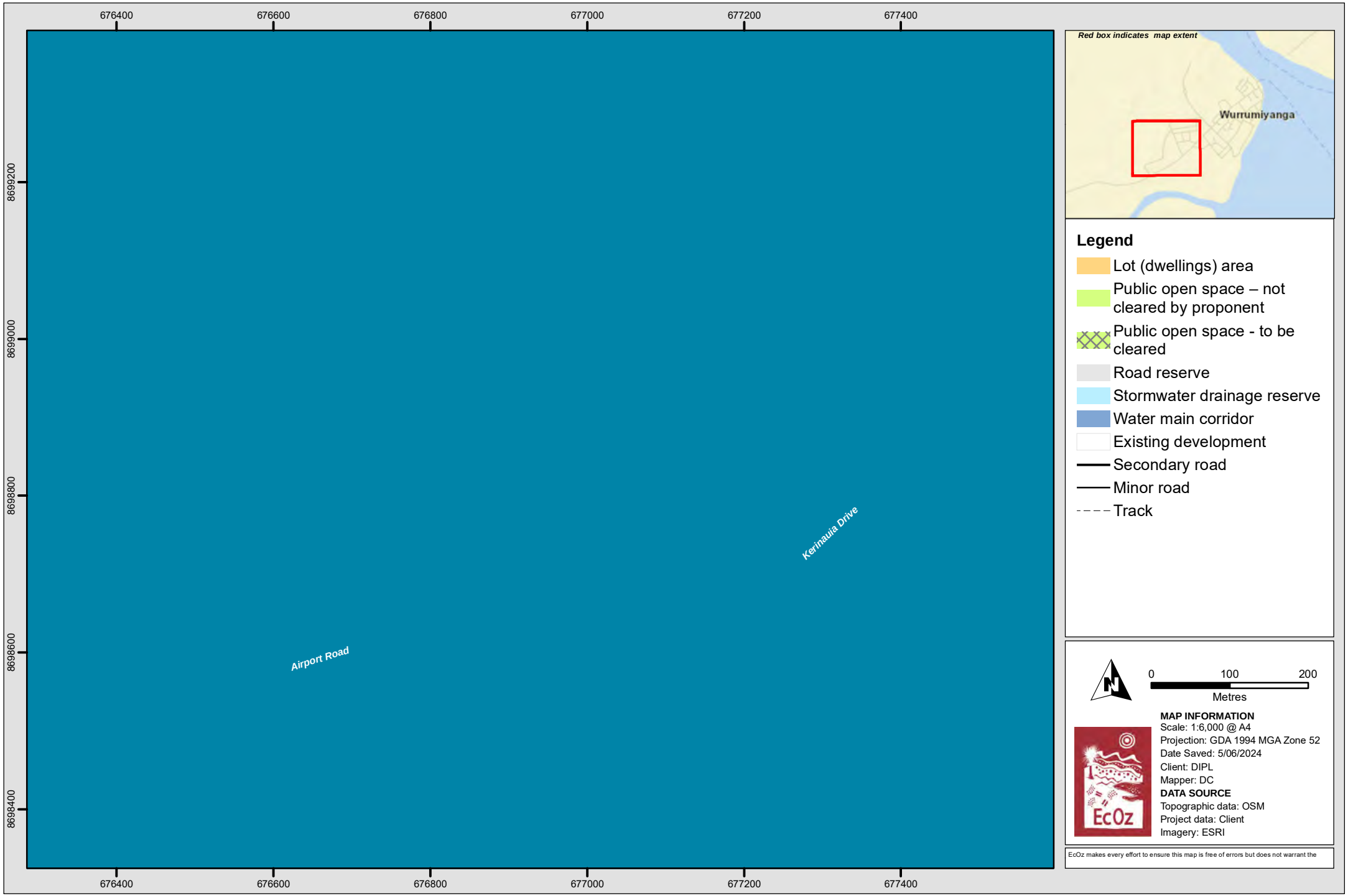



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**Figure 2-1. Map of proposal components**

There are 5 types of dwellings proposed:

- One bedroom quadplex (Type Q)
- Two bedroom duplex (Type A)
- Three bedroom duplex (Type A)
- Four bedroom single dwelling (Type B)
- Five bedroom single dwelling (Type AN)

Dwellings construction is to be delivered over a 1-to-2-year period, with the initial funding program to build 57 new dwellings. Dwelling construction on the remaining 13 lots will be part of future funding program when available. Dependant on the dwelling type, multiple dwellings may be built on single blocks (i.e. quadplex and duplexes).

Once complete, the dwellings will be leased to the community as per the waitlist and ongoing management of the dwellings will be managed by Department of Territory Families, Housing and Communities (DTFHC). All repairs and maintenance works will be commissioned and managed by the proponent in conjunction with DTFHC.

The proponent is seeking approval for the key activities outlined in Table 2-2.

**Table 2-2. Key proposal activities**

| Project phase | Key activities |
|---|---|
| **Pre-construction** | • Mobilisation to site including, installation of site fencing, temporary site infrastructure (i.e., site offices, crib rooms) and environmental controls (i.e. erosion and sediment controls). |
| **Construction** | • Clearing of vegetation and bulk earthworks<br>• Construction of roads<br>• Stormwater drainage installation<br>• Upgrading of existing stormwater drainage<br>• Installation/connection of services<br>• Realignment of services<br>• Removal of redundant services<br>• Dwelling construction works (site cuts, foundations, structural works, internal services, fit out, painting etc).<br>• Landscaping<br>• Provision and establishment of public open space areas<br>• Erosion and sediment control measures (as required) |
| **Operation** | • Residential living<br>• Maintenance and upkeep of built assets and services |

### 2.3.2 Key components

The key components and features of the proposal are presented in Table 2-3 and Table 2-4.

**Table 2-3. Key proposal components**

| | Component | Approximate footprint (ha) | Estimated clearing extent (ha) |
|---|---|---|---|
| ***Subdivision area*** | | | |
| **Development infrastructure** | Residential dwellings lot area (residential use) | 6.84 | |
| | Internal roads | 4.00 | |
| | Public open space[2] | 0.61 | |
| | Stormwater drainage reserves | 2.13 | |
| | Additional clearance area for development boundary | 0.72 | |
| **Total development infrastructure footprint** | | **14.3** | |
| ***Ancillary works*** | | | |
| **Enabling infrastructure (outside subdivision)** | Water main corridor (includes sewer/wastewater main pipeline) | 0.60 | 0.60 |
| | Widening existing internal stormwater drainage infrastructure | 0.35 | 0.18 |
| **Total ancillary area footprints** | | **0.95** | **0.78** |
| | | | |
| | | **Total clearing required for ancillary areas** | **0.78** |
| | | **Total proposed development area clearing required** | **15.08** |
| | | **Total proposed development area disturbance footprint** | **15.25** |

[2] *The maximum potential clearing extent has been used as it is uncertain how the middle public open space will be developed by TIRC for a future playground/park site. Generally, the purpose public open spaces is to provide amenity within the new housing development in accordance with the NT Planning Scheme requirements, however this public open space wil be utilised for a future playground/park site as per consultation with the community. The other public open space areas will provide corridors to manage stormwater drainage flow paths through the subdivision, as per the NT Subdivision Development Guidelines. Public open spaces are generally located around the perimeter of subdivisions, to align with stormwater drainage flow paths, and natural lower lying areas. The natural low-lying areas generally have soil and drainage conditions that are less suitable for housing development and make ideal parkland and recreation areas.*

**Table 2-4. Key proposal features**

| Proposal element | Component | Details |
|---|---|---|
| Schedule | Construction | *Latest potential schedule.*<br>Q4 2024 – Finalisation of detailed designs<br>Q2 2025 - Construction of enabling infrastructure and early development works (i.e. land clearing), will commence in the dry season and be delivered over a period of approximately 12 months.<br>Q3 2026 - Release of titled lots, construction works within subdivision.<br>*TBD – Construction of dwellings on remaining lots (dependant on funding program).* |
| | Operation | Q4 2027 onwards – occupancy to follow leasing of housing. |
| Workforce | Construction | • It is proposed the construction of the subdivision will support approximately 50 direct jobs and 90 indirect jobs over the infrastructure, subdivision and construction period of the proposal. The proponent is encouraging local community members to reach out to the housing office for employment opportunities. |
| | Operation | • As the subdivision purpose is for residential development, operational staff are not required. However, paid workers associated with management and leasing serviced by DFTHC, repairs and maintenance of the dwellings serviced by the proponent, road reserve and public open space will be serviced by TIRC and maintenance of enabling site infrastructure by PWC. |
| Transport | Construction | • Construction materials will be transported to site via the existing road network and will arrive on the island via the freight barge from Darwin. The barge will deliver material via the existing Wurrumiyanga Port.<br>• An existing unmaintained access track from Wurrumiyanga to the Bathurst Island Airport will be closed during construction, and access to the Airport through the subdivision will be opened once the internal roads are completed, connecting the subdivision to Kernauia Drive at the south of the subdivision.<br>• Construction workers would use existing transport options, including (but not limited to) public transport, pedestrian and cycle way, private vehicle. |
| | Operation | Local residents will use:<br>• Street footpaths – The proposal will provide street footpaths for residents to utilised.<br>• Private vehicle – The proposal also includes internal road network connecting to existing adjacent subdivisions of Wurrumiyanga and main road to the Airfield. |

| Proposal element | Component | Details |
|---|---|---|
| Water source | Construction | • Water required predominantly for dust suppression, earthworks and pavement construction, pipeline commissioning and concrete will be required for civil works, dwelling foundations and blockwork.<br>• To be sourced from existing PWC reticulated water mains, from the township bore field.<br>• Existing DN150 and DN250 water mains along unmaintained Airport Road and easement south of proposed development area, connecting from PWC operated Water Mains Pump Station to existing Wurrumiyanga township reticulated water mains will relocated via a new DN250 underground PVC reticulation (approximately 1.2km) installed adjacent to Kernauia Road. The existing services were master planned and have sufficient capacity to connect to the subdivision.<br>• Removal of redundant services as required |
| | Operation | • Connection to PWC reticulated water mains (as above), sourced from the township bore field.<br>• PWC through internal consultation with the proponent have confirmed that the existing bore field and supply mains have sufficient capacity to service the proposed 70 lots to be constructed and operated. |
| Energy source | Construction | • Diesel-powered generators and machinery, or battery-operated equipment as required. |
| | Operation | • Wurrumiyanga Power Station is powered by a combination of solar power (located west of the township) and diesel-powered generators.<br>• Subdivision will be connected to the existing PWC operated Power Station, no additional electrical infrastructure is required to be constructed or commissioned.<br>• The Wurrumiyanga Soil Infill and Energy Storage Pilot Project is currently underway and provides additional infrastructure to increase the solar power potential for renewable energy availability at Wurrumiyanga. Further information on the project is provided in section 2.5 as an associated project.<br>• The existing services were master planned and have sufficient capacity to connect to the subdivision. |
| Emissions | Construction | • Noise, dust and greenhouse gas emissions through general machinery use and vehicle movements.<br>• Appropriate mitigation measures are to be included in construction environmental management plans (CEMP) to minimise any impact.<br>• An estimate of scope 1 GHG emissions associated with land clearing, construction, and utilities work for the proposal was undertaken using the NR Maps Carbon Calculator. Scope 2 emissions are relevant for operations only, as energy source for construction will be limited to diesel generators if required. No relevant scope 3 emissions were |

| Proposal element | Component | Details |
|---|---|---|
| | | identified (see Pre-referral screening tool at Appendix A).<br>• The proposal does not trigger the land clearing thresholds outlined in the NT EPA's draft *Environmental factor guidance: Atmospheric processes* and as such greenhouse gas emissions is not a significant factor to consider in this referral. |
| | Operation | • The proposed action has been deemed suitable for residential land use through the development of the Wurrumiyanga Area Plan and has been developed in accordance with the NTPS Strategic Framework and is incorporated in Part 2 of the NTPS in 2011 and amended in 2020 to align with the NTPS amendments.<br>• The purpose of the proposal is to provide additional housing to reduce overcrowding and improving living conditions, not to directly allow population growth. With the additional dwellings it is assumed the greenhouse gas emissions for Wurrumiyanga will slightly increase through additional power consumption and vehicle movements from the subdivision within the township. However, as these emissions are directly related to additional dwellings locations and do not increase the population, the per capita estimates are not expected to increase.<br>• Scope 2 emissions will be captured and managed under PWC Operations requirements once operational. |
| Waste | Construction | • Portable ablution blocks will be utilised for the construction workforce and will be serviced by a licenced waste contractor as per the *Waste Management and Pollution Control Act 1998* (NT).<br>• Construction and putrescible waste generated through works will be stored in appropriate containers for disposal at a licenced waste management facility.<br>• Any wastes that cannot be recycled, reused or taken to the landfill will be disposed of off the Island to the mainland for appropriate disposal. This procedure will be included in the contractors CEMP.<br>• Waste generation through construction is anticipated to be manageable due to the nature of the works (i.e. trenching earthworks, roadworks and installation of service networks, general waste, sewage and waste oil) |

| Proposal element | Component | Details |
|---|---|---|
| | Operation | • Subdivision will be connected into the existing sewerage system infrastructure, with wastewater transferred to the Wurrumiyanga wastewater treatment ponds.<br>• The wastewater treatment ponds are currently operated under WDL 223-01, under the *Waste Management and Pollution Control Act.*<br>• No upgrades to the existing wastewater treatment ponds is required to service the subdivision, the existing infrastructure has been designed to have sufficient capacity for future development.<br>• General and recycling kerbside waste collection service provided to residents through the local Council authority and will be disposed of through existing waste procedures. |
| Stormwater and drainage | Construction | • Stormwater during the construction phase will be managed in line with project erosion and sediment control plans.<br>• Construction of formalised site drainage infrastructure, which includes grading of the finished site levels and utilising suitable material in the top earthworks layers, to promote drainage of the finished surface and reduce risk of waterlogging. Surface runoff will be captured via table drains within the road reserves that convey stormwater to the existing downstream open drainage network. The new internal drainage network discharges to the existing cut-off drain along the rear of the exiting housing lots that front Kantilla Street, which will be reshaped/reconstructed to match the new subdivision levels.<br>• In addition to the internal drainage, an open drain with an average depth of 1.5m will be provided around the perimeter of the subdivision, to intercept upslope surface runoff from the adjacent bushland catchment, and to intercept groundwater seepage in the topsoil strata to mitigate localised waterlogging of the soils within the subdivision area. This cut-off drain concept has been successfully utilised for the previous housing subdivision, which included the construction of a similar sized cut off drain to the rear of the housing lots along the western side of Kantilla Street. |
| | Operation | • Stormwater to be managed through a network designed to appropriate residential drainage infrastructure standards.<br>• The system will connect into existing drainage network, which has been designed to allow for the connection of the subdivision during the development of the Wurrumiyanga Area Plan 2011. |

| Proposal element | Component | Details |
|---|---|---|
| Hazardous substances | Construction | • Diesel, oils, lubricants, paints, solvents and other substances relevant to general building construction are likely to be used. It is not expected that any bulk quantities of materials will be stored on-site, and refuelling will occur off-site at appropriate facilities.<br>• Construction contractors will maintain a hazardous substance register for the site, including storage location, summary of hazardous/dangerous goods status and links to Material Safety Data Sheets (MSDSs).<br>• All hazardous substances, dangerous goods and other chemical products will be stored, used and managed in accordance with their MSDSs (including appropriate bunding requirements). |
| | Operation | • The proposed land use (residential and public open space) will not result in quantifiable volumes of hazardous substance storages in the proposed development area. |
| Decommissioning and rehabilitation | | • The final infrastructure will result in a paved and landscaped residential development.<br>• Public open spaces will be replanted with native vegetation species and maintained by TIRC to manage weeds and potential fire risks.<br>• All other areas of disturbance (such as service corridors) will be rehabilitated post construction to match pre-disturbance conditions. |

## 2.4 Site selection and alternatives

This section provides a high-level summary of the factors considered in the proponents internal site selection process of the proposed development area and alternative locations considered.

Additional to the below considered, consultation and discussions with TOs and family representatives of Wurrumiyanga have been undertaken since 2020 through the Housing Reference Group (HRG), have endorsed the current proposed development area location. Further information on the consultation through is provided in Section 3.

### 2.4.1 Proposed development area

The proposed development area location is considered by the proponent as the most suitable development area due to the following factors:

- In-situ soil conditions and topography - The in-situ soils are generally moderately reactive clays that are subject to seasonal waterlogging. The site soil constraints, whilst not ideal for housing development, can be mitigated with standard civil engineering design approaches that manage surface drainage and subsurface moisture conditions. The topography has favourable surface slopes for subdivision development of approximately 1-2% (<3 maximum in limited areas (Douglas Partners 2023a).
- Extensive power and sewer buffers and cultural exclusion zones excluding other potential areas to be developed for residential housing.
- Allows connectivity and accessibility to existing Wurrumiyanga township area – which was raised during consultation as important to the community (refer to Table 3-2).
- Proximity to existing road and services infrastructure - readily serviced by extension of the existing road and reticulated service networks, that are directly adjacent to the proposed development site (no headworks required to be constructed) and were designed during their installation with sufficient capacity to cater for the proposed development.
- The Wurrumiyanga Area Plan (provided as Figure 2-2) upon review indicates two suitable areas (Area A (proposed subdivision location) and Area B (discussed below) for residential developments.

### 2.4.2 Alternative areas considered

***Broader subdivision area***

As previously mentioned and subject of the 2022 Environmental Assessment, the suitability of a border subdivision area covering 60.3 ha was investigated during the early design phase by the proponent, refer to Figure 1-1. This area extended to the north and south of the proposed development area. The broader subdivision area was reduced to the proposed development area due to the following considerations:

- unsuitable ground conditions (i.e. in-situ soil condition, topography, drainage system land unit present north of the proposed development area and south of Kerinauia Drive[3]) for constructing a residential development.
- proximity to existing road and services infrastructure, requirements to construct new headwork infrastructure.
- avoiding the area zoned for recreation use and natural area in the 2011 Wurrumiyanga Area Plan
- avoiding a culturally sensitive area's:
    - A registered restricted work area (RWA) identified on the AAPA certificate - located north of the proposed development area (refer to Appendix I)

[3] *Drainage System' land unit, consist of flat terrain with surface slopes of less than 1%. The area generally consists of poorly drained clay soils that are subject to localised perched groundwater and can become waterlogged ephemeral swamps in the wet season. The clay soils are generally highly reactive and subject to large shrink-swell movement with changes in moisture conditions. These conditions are not considered suitable for development.*

- An area request through consultation with a TO to be avoided due to being culturally important and sensitive - located north of the proposed development area (refer to Appendix I and Table 3-2)
- limiting budget to develop such a large area.

***Area B***

Area B (refer to Figure 2-2) is considered as an unfeasible development area due to the below factors following internal assessment by the proponent:

- Natural drainage across site which potentially leads to poor soil properties and high cost of remediation works.
- The population of *Typhonium* is higher than proposed development area (confirmed following the result of 2023 *Typhonium* species survey)
- Extensive sewer extension work is required to service Area B.
- Area B is further way to the current community living area, in comparison to proposed development area.

## 2.5 Associated projects

This section provides details of other existing projects located in the immediate Wurrumiyanga area.

### 2.5.1 Renewable solar project

The NTG has committed to investing $6.1 million towards the Wurrumiyanga Solar Infill and Energy Storage Pilot Project. The project will replace some of the current diesel generated power supply with renewable technology, with works expected to be completed by April 2024. A design and construct tender for a pilot program in Wurrumiyanga was awarded in February 2023. The additional investment of solar panel infrastructure is expected to increase the percentage of renewable energy delivered to the community to almost 50 percent.

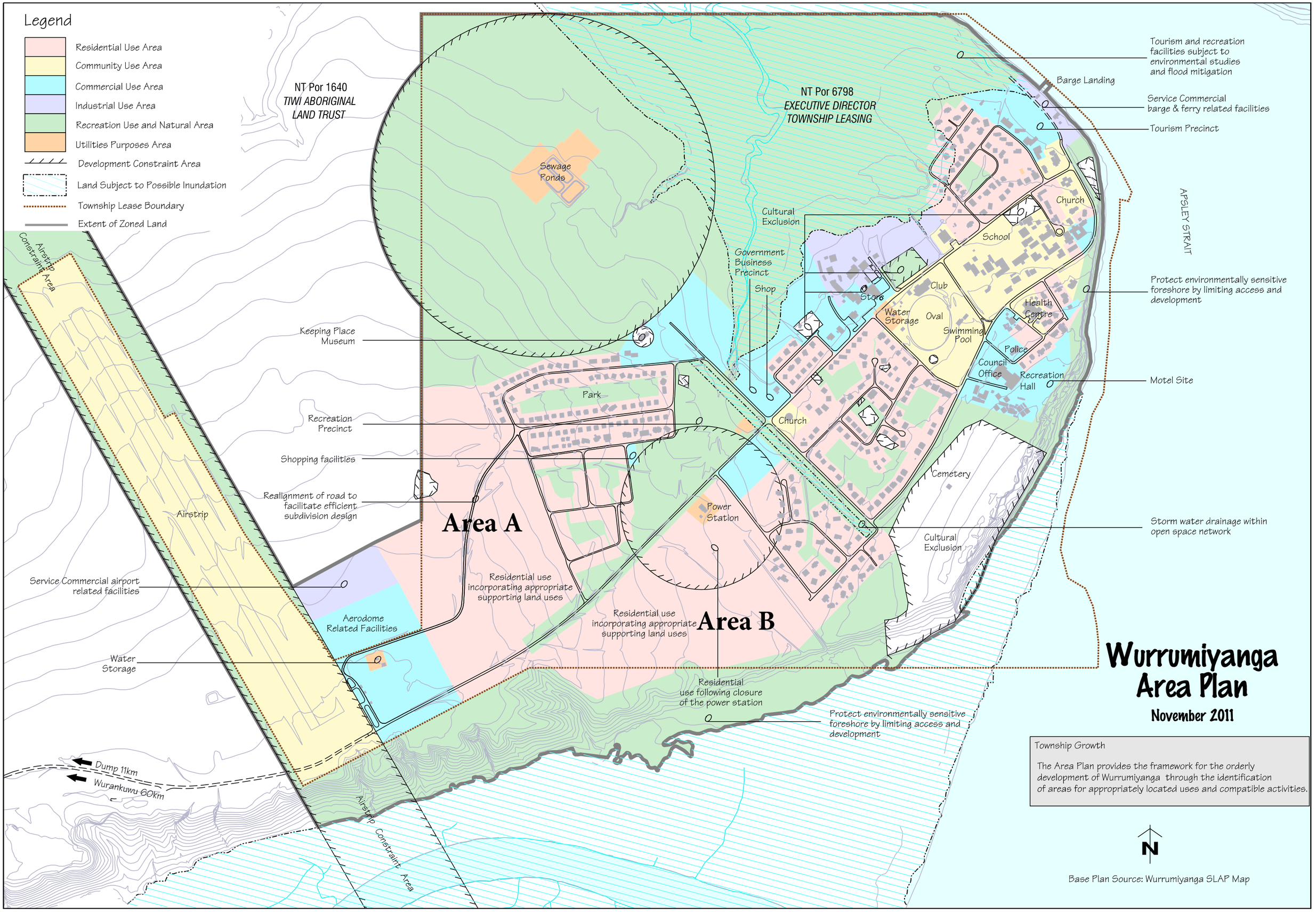



**Figure 2 2. Wurrumiyanga Area Plan**

## 2.6 Principles of environmental protection and management

The Proposal has applied the principles of environment protection and management (Part 2 of the *EP Act*), and section 43 general duty on proponents. Details of this are provided in Table 2-5.

**Table 2-5. Checklist of the *EP Act* section 42 and 43 requirements**

| Section 43 General duty | Comment |
|---|---|
| *Have the following principles of ecologically sustainable development been taken into consideration in the design of the proposed action?* | |
| • Decision-making principle | **Yes** – the Proposal has considered both short- and long-term impacts and benefits – including impacts during construction and occupancy of the subdivision. There has also been extensive ongoing consultation and opportunity for involvement in the planning and development of the subdivision location (avoidance areas requested by TOs have been excluded from the proposed development area), dwelling capacity requirements and internal design layouts of the dwellings with key TOs and family representatives of Wurrumiyanga, as described in Section 3.3.<br>Ongoing discussions with TOs will be undertaken as required if any queries are raised prior to commencement of construction and throughout the construction phase until handover of the dwellings to DFTHC for management and leasing services. |
| • Precautionary principle | **Yes** – this assessment is based on both existing information and targeted ecology surveys undertaken specifically for the proposal and undertaken by suitably qualified professionals. As a precaution, ecology studies were undertaken early in the planning process to provide the necessary confidence to make an assessment of potential risks and impacts. |
| • Principle of evidence-based decision-making | **Yes** – the assessment is based on both existing information and targeted ecology surveys undertaken specifically for the proposal and undertaken by suitably qualified professionals. |
| • Principle of intergenerational and intergenerational equity | **Yes** – the proposal aims to benefit and improve access to housing and services for current and future generations of Territorians and reduce the overcrowding and poor living condition issues currently experienced in Wurrumiyanga. The proposal will also enable high paying skilled jobs to be located locally.<br>Consultation with relevant stakeholders has guided the detailed plans of the dwellings to maximise usability and suitability of the dwellings to residents life and family style. |
| • Principle of sustainable use | **Yes** – Existing services (power, water and wastewater) were master planned with the intention that the development of this proposal would occur in the future. Engagement with relevant stakeholders has confirmed there is sufficient capacity in the power, water and wastewater network to support the proposal. The Wurrumiyanga Solar Infill and Energy Storage Pilot Project is a current project underway with the aim to increase the percentage of renewable energy delivered to the community, including this proposal. |
| • Principle of conservation of biological diversity and ecological integrity | **Yes** - ecological assessments have been undertaken for the proposal to inform design and development; and to understand the biological diversity and ecological integrity of the wider area surrounding the proposed development area. Public open space areas in the proposed development area have been incorporated to retain and support habitat connectivity and reinstate natural native vegetation post construction of the residential dwellings. |
| • Principle of improved valuation, pricing and incentive mechanisms | **Yes** – Environmental outcomes are considered by the proponent when comparing design options for enabling infrastructure. |

| Section 43 General duty | Comment |
|---|---|
| | During the tendering process for earthworks and construction works environmental performance is considered by the proponent.<br>Environmental factors and desired environmental objectives for the development are outlined in the NTPS and land use plans prepared by the NT Planning Commission (NTPC).<br>Successful tender contractors selected by the proponent will generate manageable waste during the earthworks and construction phase of the proposal. For any waste generated, it will be of the responsibility of each contractor to treat the waste generated as part of their works, which will be typically through the disposal of waste in a legal manner to landfill and or through recycling activities through existing services established at Wurrumiyanga. Any wastes that cannot be recycled, reused or taken to the landfill will be disposed of off the Island to the mainland for appropriate disposal. This procedure will be included in the contractors CEMP.<br>Future residents of the subdivision will also be responsible waste they generate, which is collected by local TIRC for landfill and or recycling, the cost of which is recovered through council rates.<br>The TIRC will be responsible for removal of waste generated by residents of the subdivision, though existing waste removal and recycling systems at the waste facility established at Wurrumiyanga. |
| *Have the following management hierarchies been taken into consideration in the design of the proposed action?* | |
| • Environmental decision-making hierarchy | **Yes** – the proposal has applied the environmental decision-making hierarchy through the gaining valuable input through consultation with stakeholders for the importance of maintaining public open spaces and avoiding important cultural values.<br>Because of the proposed development area location, the detailed design enabled essential infrastructure (that will service the subdivision residents) to connect into existing power and water services, stormwater retention infrastructure and wastewater services, with the aim to minimise impacts to the environment surrounding the proposed development area. |
| • Waste management hierarchy | **Yes** - Construction and putrescible waste generated through works will be stored in accordance with Australian Standards and best practice in appropriate containers or in an assigned area prior to transportation for disposal at the existing licenced waste management facility at Wurrumiyanga. Waste generation through construction is anticipated to be manageable due to the nature of the works (i.e., trenching earthworks, roadworks and installation of service networks, general waste, sewage and waste oil). Any wastes that cannot be recycled, reused or taken to the landfill will be disposed of off the Island to the mainland for appropriate disposal. This procedure will be included in the contractors CEMP.<br>Future residents will have access to general waste and recycling services for household generated waste products, as arranged by the TIRC as part of their council services and paid for through council rates.<br>Contractors and prospective developers as awarded tenders by the proponent are encouraged to include details of sustainability commitments, including recycling and waste management, as part of their respective tender submissions for assessment prior to award of the works. Any commitments made by Contractors will form part of their respective contracts, against which their performance will be assessed. |
| *Other section 43 considerations* | |
| • Have communities that may be affected by the proposed action been provided with information and opportunities for consultation? | **Yes** – the proponent with assistance from DTFHC, HPO and OTL have undertaken consultation and engagement with key stakeholders and the community as part of seeking advice and consent on the location of the proposed development and developing the detailed design of the proposal. This has included ongoing targeted consultation through: |

| Section 43 General duty | Comment |
|---|---|
| | • the HRG with TOs and Wurrumiyanga family representatives since 2020<br>• one round of targeted engagement with the Wurrumiyanga Community on-country.<br>• The OTL with regular (quarterly) meetings with TO group regarding the developments occurring in the township lease area, which has included the proposed development area.<br>The Wurrumiyanga Area Plan was prepared under the NTPS Guidelines and the *Planning Act*, including the provision to conduct stakeholder engagement and public exhibition of the plan. Consultation and engagement with stakeholders were undertaken, through targeted face-to-face meetings and information letter drops. Details of the consultation and engagement conducted under this process is provided in Section 3.2.1. |
| • Has consultation with affected communities, including Aboriginal communities' been undertaken in a culturally appropriate manner? | **Yes** – a variety of consultation and engagement opportunities and methods have been undertaken throughout the HRG forums and the community on-country expo style forum to date, including face-to-face in a public setting and online. The expo style forum was suggested by the TIRC as a trial method of actively engaging with the community.<br>Visual material and verbal communication between stakeholders have been the key modes of communicating information regarding the proposal and environmental surveys undertaken.<br>The HPO also has an office front in Wurrumiyanga that is open to the community, to engage and raise questions or concerns. The HPO are in contact with the proponent.<br>The proponent is currently engaging with the TLC regarding the proposed development area, and this will be an ongoing iterative process for the duration of the development. |
| • Has community knowledge and understanding (including scientific and traditional knowledge and understanding) of the natural and cultural values of areas that may be impacted by the proposed action been sought and documented? | **Yes** – stakeholders through the HRG and community consultation expo style forum, were invited to provide any community knowledge or understanding of the proposed development area. |
| • Have Aboriginal values and the rights and interests of Aboriginal communities' been addressed in relation to areas that may be impacted by the proposed action? | **Yes** - Aboriginal values have been recognized through adherence and reinforcement of AAPA certification and retaining Abstract of Records over the proposed development area and compliance with the *Aboriginal Sacred Sites Act 1989*. Values have also been identified during engagement with TOs in the HRG forum, with the proposed development area design avoiding a culturally significant area (not recorded) north of the current proposed development area.<br>There is ongoing engagement with TOs and Wurrumiyanga family representatives regarding Place Names for the subdivision area, including naming of the subdivision area and themes for local road names. |

# 3 CONSULTATION

The *EP Act 2019* requires proponents to engage with stakeholders who may be affected by their proposal and to support these communities and the public to understand the potential impacts and benefits of a proposed action. The *NT EPA's Stakeholder Engagement and Consultation Guidance for Proponents (2021*) recognises that stakeholder consultation and engagement is an important component of social, cultural and health impact assessments, over and above formal opportunities for feedback on documents placed on public exhibition.

The proposed development area was identified in the 2011 Wurrumiyanga Area Plan to be used for the purpose of residential use, the plan is publicly available. Since the release of the area plan, additional information regarding the development of residential areas in Wurrumiyanga was released in 2017 when the NT Government announced the remote housing investment package: *Our Community. Our Future. Our Homes.*

## 3.1 Stakeholders

Key stakeholders who have been communicated with across pre-submission of the referral referral directly by the proponent, the Housing Office and Office of Township Leasing (OTL), include:

- HRG members - refer to Section 3.1.1 for further background information
- Wurrumiyanga community members – refer to Section 3.1.3 for further background information
- TOs with specific interest in the project
- TOs with general interests in developments in the township lease area
- First time Mums Program (as part of HRG meeting)
- Australian Red Cross (as part of HRG meeting)
- TIRC (as part of HRG meeting) - a remote local government body that has represented the peoples of Bathurst and Melville Island, including Wurrumiyanga, since 2001.
- National Indigenous Australian Agency (as part of HRG meeting)
- TILC
- NT Heritage Branch
- AAPA
- Wurrumiyanga community

Additional to the above key stakeholders, an Aboriginal Interpreter is present when deemed required.

The subsequent sections provide additional information of the stakeholders specifically engaged in the development of the Wurrumiyanga Area Plan, Housing Reference Group, Community Council meeting and the OTL.

### 3.1.1 Wurrumiyanga Area Plan

Direct consultation and engagement with select stakeholders to develop the Wurrumiyanga Area Plan commenced in 2007, with the establishment of a Consultative Forum by the Executive Director, Township Leasing[4]. The forum has been actively involved in the preparation of the Plan since it was established, to the inclusion of the Plan in the NTPS in 2011.

The Consultative Forum comprised of TOs and other key community members. In addition to the TOs, key Wurrumiyanga community and the appropriate council entities listed above, the following stakeholders have been consulted since 2007:

- Tiwi Islands Shire Council.
- Executive Director, Township Leasing through the NT Office of Township Leasing.

[4] *The Executive Director, Township Leasing holds a Section 19A whole of township long term lease over Wurrumiyanga on behalf of the Australian Government, The Tiwi Lound Council and the Tiwi Aboriginal Land Trust.*

- Mantiyupwi Pty Ltd.
- Tiwi Enterprises
- Power and Water Corporation
- Strategic Indigenous Housing and Infrastructure Programme
- Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA), now Department of Territory Families, Housing and Communities (DTFHC)
- Department of Housing, Local Government and Regional Services, now DTFHC
- Department of Education and Training, now Department of Education
- Department of Health and Families, now DTFHC
- Department of Natural Resources, Environment, The Arts and Sport, now DEPWS
- Northern Territory Police, Fire and Emergency Services

The methods and timeframes of engagement are provided in Section 3.2.1 below and the outcomes of the engagement in Section 3.3 below.

### 3.1.2 Housing reference group

Direct consultation and engagement with select stakeholders in the Wurrumiyanga community commenced in 2020 through the development of Housing Referencing Group (HRG). The HRG meet every two months and are chaired by DTFHC and the Housing Program Office (HPO) with assistance from the proponent. The HRG members for Wurrumiyanga include a combination of TOs of the land and representatives from each family living in the township and various other entities listed in Section 3.1. The group attempts to include a diverse mix of people that represent different cultural and family groups and interests in the community. Further information on this process is available here.

The HRG have been consulted on numerous other subdivision developments within Wurrumiyanga for the purpose of reducing the overcrowding issue. The proposed development area subject to this referral was first consulted with the HRG group September 2020 and have been included on the agenda to date. Engagement outcomes to date are provided in Section 3.2.1 below.

### 3.1.3 Community council meeting

The TIRC host community council meetings on a monthly basis, and the proponent and DTFHC have attended these to communicate status updates of housing delivery works. The delivery forum of these community council meetings vary and are targeted to focus on the general public in the Wurrumiyanga Community, which are predominantly Indigenous stakeholders. The engagement methods are provided in Section 3.2.3 below and the outcomes of the engagement in Section 3.3 below.

### 3.1.4 OTL

The Executive Director of Town Leasing (EDTL) is a statutory authority established under the *Aboriginal Land Rights (Northern Territory) Act 1976*. While it is a body sole, the wider division is often referred to as the Office of Township Leasing (OTL). The EDTL holds long-term township leases in the Tiwi Communities including Wurrumiyanga and provides landowner consents for projects (like the new subdivision) through subleases. The EDTL primarily engage with the Mantiyupwi, the TOs of Wurrumiyanga area.

## 3.2 Engagement methods

The following subsections provide a summary of the engagement methods and outcomes of consultation to date. Future engagement is provided in Section 3.4 below.

### 3.2.1 Wurrumiyanga Area Plan

The Wurrumiyanga Area Plan was prepared under the NTPS Guidelines. Consultation and engagement with stakeholders were undertaken, through targeted face-to-face meetings and information letter drops. The following consultation and engagement were conducted:

- 01 June 2011 - a draft Plan presented to the Tiwi Islands Shire Council at a Council meeting. The Council endorsed the draft Plan.
- 23 June 2011 - the final draft Plan was presented to the Wurrumiyanga Consultative Forum. The Consultative Forum endorsed the final draft Plan.
- 7 July 2011 - letters were sent out from the CE of the Department of Lands and Planning to the Executive Secretary, Tiwi Islands Land Council, CEO Tiwi Island Shire Council, and the Executive Director Township Leasing inviting their comment on the draft Plan for Wurrumiyanga before it was publicly exhibited under the *Planning Act* as a Planning Scheme Amendment in August 2011.
- 21 October 2011 to 18 November 2011 – the final Plan proposal was placed on public exhibition for a period of 28 days and was included in the Government Gazette on 26 October 2011. No public submissions were received at the close of exhibition, only minor recommendations from NTG Department Agencies, which are summarised in Table 3-1.

### 3.2.2 Housing reference group meetings

Methods used to provide information and seek feedback have been relatively consistent since the establishment of the HRG in 2020 and have been conducted on country face to face (preferred) and via video link if necessary. The meetings are scheduled quarterly, however out of session meetings have been arranged as required. An Aboriginal Interpreter was present when deemed required and appropriate.

From 2020 the HRG has discussed the development of multiple subdivision areas in Wurrumiyanga, a summary of the meetings held to date and the concerns and information raised by stakeholders is provided in Table 3-2 below.

### 3.2.3 Community council meeting

An exhibition style consultation forum and barbeque lunch was proposed as a consultation method to the proponent by the TIRC for the purpose of community consultation and engagement. The format was proposed to occur as a trial monthly over the next six months, with the purpose to encourage consultation, engagement and knowledge sharing of the role and services of NTG agencies, private and non-for-profit companies with the community (i.e. NT Catholic Care, Tiwi Island Training and Employment Services) on-country.

To date this type of forum has been conducted once, on Tuesday 05 March 2024. The forum was set up on-country in Wurrumiyanga under the community gathering trees next to the Nua Supermarket. No set end time period was proposed for the forum start and end time to allow for respectful active listening and information sharing. The proponent team was on-county from 10am to approximately 12:30pm once the number of community members reduced significantly. Forty people were recorded as being actively engaged with by the team. A summary of concerns and information raised by stakeholders is provided in Table 3-3 below.

A community engagement memo has been prepared and provides an details of the engagement undertaken, guiding frameworks, level of engagement, information provided and if the forum was cultural appropriate, this memo is provided at Appendix H.

### 3.2.4 OTL

The EDTL meet regularly (proposed quarterly) with the TOs group through consultative forums to seek advice and consents from the TO groups for developments occurring on the township lease area. This included the new subdivision. These meetings occur in person, generally at the Mantiyupwi Hotel, located on the south end of the community. The Mantiyupwi were advised of the *Typhonium* issue around the proposed

development area throughout the project and the survey results were shared formally with them at the 16 April 2024 Consultative Forum on the island.

The proponent was not present at the meeting where OTL shared the survey results with TOs. If required, out of session OTL meetings have occurred with TO stakeholders which have raise queries and concerns relating to the subdivision. These sessions have been over the phone consults as agreed by all parties involved. A summary of the known queries and information raised by stakeholders through the OTL is provided in Table 3-4 below.

### 3.2.5 Tiwi Island Regional Council

The TIRC were involved in the organisation of the community council meeting and are part of the HRG meetings. The proponent will continue to engage with the TIRC regarding the subdivision, and this will be an ongoing iterative process for the duration of the development.

### 3.2.6 AAPA

AAPA were initially engaged through the development of an AAPA certificate (C2011/219 now superseded) for the entirety of the Wurrumiyanga township area, in 2011 to the NTG Department of Housing. A variation to this AAPA certificate (C2016/062) was issued in 2016. The varied certificate identified a number of RWAs, one (RWA13) located within 100m of the proposed development area. This has been avoided by the proponent, it contains sacred site 5074-26. The AAPA certificate is provided at Appendix I[5].

More recently, for due diligence purposes An Abstract of Records was requested from AAPA through the online request system. The report was received on 05 March 2024 and identified no registered or recorded sacred sites, or restricted work areas within the proposed development area, this has been provided at Appendix I along with the AAPA certificate[5].

### 3.2.7 NT Heritage Branch

The NT Heritage Branch were consulted in May 2023, to advise if there were any known heritage listed values in the proposed development area. The NT Heritage branch advised *that no known Aboriginal or Macassan archaeological places within the subject site, and the likelihood of unrecorded Aboriginal or Macassan archaeological places existing is unlikely. No further work is required.* No nominated, provisionally declared or declared heritage places or object are found within the proposed development area.

### 3.2.8 Tiwi Land Council

The proponent is currently engaging with the TLC regarding the subdivision, and they are involved in the HRG meetings. Engagement with the TLC will be an ongoing iterative process for the duration of the development.

## 3.3 Addressing stakeholder concerns

A summary of the stakeholder engagement and key themes raised through the consultation phase is provided in the following tables. Feedback gathered during consultation has been considered in detail and has been considered to inform the final Land Use Plan, proposal design and development to date.

[5] *Note this has been redacted in the public available version due to public exhibition purposes.*

**Table 3-1. Wurrumiyanga Area Plan consultation key themes raised and engagement outcomes**

| Key themes and engagement outcomes | When/where raised | Response/outcomes[6] |
|---|---|---|
| **Development Constraints** | | |
| **Cultural values**<br>Recommended that the Plan be amended to show a range of cultural sites as "Development Constraint" areas in accordance with data obtained from AAPA. | NTG Department Response Report | Zone H (Heritage) has been applied to limit development in these areas, on the Plan. |
| **Sewerage ponds**<br>Recommended that the Plan be amended to apply Zone PS (Public Open Space) to the buffer surrounding the sewerage ponds. | NTG Department Response Report | Zone PS (residential use ad natural area) has been applied to the buffer zone area surrounding the sewerage ponds to prevent any future development. |

**Table 3-2. HRG consultation process timeline, key themes raised and engagement outcomes**

| Key themes and engagement outcomes | When/ where raised | Response/outcomes |
|---|---|---|
| **Overall proposed subdivision area** | | |
| • Provided the context plan and concept plan, and highlighted the potential area for future subdivision and provided an overview of the road network. | 30 September 2020 | • A proponent representative explained that the Public Open Space would be needed to be rezoned to support housing. |
| • 3 Options (A, B and C) were presented for the proposed development area for the HRG to consider. **Option C (now Area A in Figure 2-2)** was identified as most preferred considering the connectivity and accessibility to existing Wurrumiyanga township (70 lots) (refer to Section 2.4 for further details).<br>• General support of location of the proposed development area, rezoning application to support residential housing, and layout of subdivision (housing types mix). | 15 September 2021<br>30 September 2021 | • Option C (now termed as Area A - proposed development area) has been used to develop the detailed design. |
| • Detailed design of subdivision layout (housing types of mix) | 04 July 2022 | • HRG provided input into the decisions to confirm the layouts of proposed new subdivisions. |
| **Roads** | | |
| • Group supported alternative route in subdivision with the unmaintained access road to Airport will be removed once subdivision developed. | 15 September 2021 | • Option C (Area A -proposed development area) has been used to develop the detailed design. |

[6] *The proposed alterations were minor and thus did not warrant the re-exhibition of the proposal, for public comment. The option taken up was to - alter the proposal and amend the NTPS in accordance with the altered proposal without re-exhibition process.*

| Key themes and engagement outcomes | When/ where raised | Response/outcomes |
|---|---|---|
| **Areas of cultural or heritage importance** | | |
| • HRG member raised concerns about an area of cultural importance (buried belongings of passed family member) | 15 September 2021 | • Area has been identified by surveyor (with assistance of HRG member) and was excluded from the proposed development area.<br>• Additional avoidance measures including flagging and fencing constructed around area, this will be undertaken by the construction contractor and included as a requirement in the Construction Environmental Management Plan (CEMP). |
| **Stormwater drainage infrastructure** | | |
| • Concerns raised with existing stormwater drainage infrastructure. Water is not draining and is sitting in the drains. | 30 September 2021 | • DTFHC advised to investigate the drainage network and look into the drainage network for potential solutions and incorporate in the development of proposed development area. |
| **Dwelling designs** | | |
| • Raised concerns regarding the old houses and not having storerooms.<br>• General support of mix dwelling designs within subdivision. | 30 September 2021 | • DTFHC advised that all new houses will have storerooms and the laundry inside the house |
| **Open Public Spaces** | | |
| • Raised importance of a playground/park in the proposed development area and proposed that area kept as a park space and preservation of *Typhonium* be considered. | 12 October 2023 | • The proponent advised that we would have to check with the NT EPA to see if this is a possible option and then we will provide an update once we hear back. |
| **Street light infrastructure** | | |
| • Raised concerns regarding the streetlights on main road for safety- walk from club to forestry. Walk from Shop to airport. | 12 October 2023 | • Informed that HPO is not responsible for this, the Council is and they will need to raise this with them. |
| **Local employment and services (other projects that could be applied to the proposal)** | | |
| • Querying award of tenders and services (i.e. construction camps meals sourced locally) | 12 October 2023 | • HPO provided an overview that the tender is a public tender and that anyone is able to quote on these works however HPO have very specific targets in regard to indigenous employment, providing opportunities to local people, local content/ territory enterprises, material supply etc.<br>• Were advised that all meals for workers will be sourced locally through the community once the replacement contract is in place. |

| Key themes and engagement outcomes | When/ where raised | Response/outcomes |
|---|---|---|
| **Typhonium abundancy** | | |
| • Wet season required to study Typhonium plant properly and assess how rare it is and what impact the new subdivision will have on the plant. | 06 December 2022 | • Still unsure when this will be resolved – the proponent need at least one more wet season to further the study on these plants as they only come out of their bulb and flower from approx. Jan to March. |
| • Initially the findings from the Australian Government surveys were that there was 200 Typhonium plants in the proposed development area. An investigation commissioned by the Land Services Team found over 700 plants in proposed development area and surrounding area which suggests it is not as endangered as first thought. | 22 March 2023 | |
| • The proponent has a project in Milikapiti where the plant was found in the gravel pit the proponent are proposing to use. | 12 October 2023 | • Suggests it could be common on all of the Tiwi Islands area |
| **Timeframes on when houses available** | | |
| • Timeframes for subdivision to be developed | 06 December 2022 | • Subdivision plans are still being worked through. |
| | 22 March 2023 | |
| | 12 October 2023 | • Subdivision consultations are now complete, and the proponent engineers are currently at the detailed design stage which is finalising the finer details of the layout and overall subdivision. This stage of final detailed design is anticipated for completion by the end of next year which is dependent on if and when the environmental plan is signed off for the *Typhonium* management. |

Through the ongoing consultation and engagement between the HRG, DTFHC, HPO, the HRG member have supported the following:

- Location of the proposed development area, subject of this referral.
- Supported the rezoning application to support residential housing.
- Layout of the proposed development area.
- Proceeding with the subdivision proposal.

**Table 3-3. Community council meeting key themes raised and engagement outcomes**

| Key themes and engagement outcomes | Proponent Response/outcomes |
|---|---|
| **Housing overcrowding** | |
| More housing required to address overcrowding issue was raised by most community residents. | 57 new houses are proposed to be initially built in the new subdivision.<br>Ensure names are on the housing wait list, if yourself or family wants housing. |
| Family members have been on the waitlist for a house for 5 years. | |
| **Existing housing issues (not related to proposed development)** | |
| Renovations required on existing dwellings | As part of the wider Wurrumiyanga housing project (not subject to the Wurrumiyanga subdivision), 44 of the oldest dwellings will be removed and rebuilt. |
| Some existing older dwellings are extremely run down and sinking from lack of soil stability. | As part of the wider Wurrumiyanga housing project (not subject to the Wurrumiyanga subdivision), 44 of the oldest dwellings will be removed and rebuilt.<br>The location of the house with lack of soil stability will not be rebuilt as not suitable for development. |
| **Dwelling designs** | |
| 1-bedroom dwellings for older single residents are required. | Broad range of housing mix will be constructed including 1-bedroom dwellings. Ensure names are on the housing wait list, if yourself or family wants housing. |
| Are the designs of the new houses going to be the same as the last round of houses built in Forestry suburb? | Layout designs of houses are similar to the newest houses built, not the older design. The design incorporates more open plan living space, with more space in communal areas such as the living/dining room. Split system air conditioners will be installed in the living/dining rooms, with available PowerPoints in bedrooms for box air conditioners to be installed in bedrooms by residents at a later date.<br>Outside storage rooms are not provided, however, there are limited designs which include an external storeroom to the dwelling (within the dwelling footprint – NOT a separate shed). All laundries in the new homes are internal |
| Air conditioning in the houses | Air conditioning split systems will be installed in the communal living/dining areas, with the option for box air conditioners to be installed in bedrooms post completion of construction.<br>If stakeholders think of any further questions/concerns, they are able to direct these queries directly to the Housing Office on the island or HRG representative for their family. |
| What will be the housing mix for the subdivision? | Proposed for 1-bedroom ranging to 5-bedroom dwellings will be constructed. Housing Program Office will undertake community consultation on this topic in the future. |
| **Employment opportunities** | |
| What will the employment opportunities associated with the early works and construction of the subdivision be? | Proponent is able to assist with employment opportunities with construction contractors<br>Part of tender requirement is for 40% of workforce to be Aboriginal " |
| **Timeframes on when houses available** | |
| What will the subdivision commence? It has been waiting for long time. | Proposed construction to commence Q2 (dry season) 2025.<br>Ensure names are on the housing wait list, if yourself or family wants housing. |

| Key themes and engagement outcomes | Proponent Response/outcomes |
|---|---|
| **General development of subdivision** | |
| Unaware there was a plan for subdivision development to commence. | Generally interested in the subdivision and the work both environmental approvals, construction and environmental that the proponent were undertaking |
| How will the names of roads be decided upon? | The HRG (consisting of TOs and family representatives) will be consulted and names will be decided through this consultation phase closer to development. |
| Could a new service station to be included in the subdivision? | Housing Program Office is only responsible for housing development. The new service station would have to request through TIRC or Tiwi Land Council. |
| **TO involvement** | |
| Have TOs been approached/consulted in regard to location of the subdivision, and have they approved the area. | TOs of Wurrumiyanga (and one representative from each family) are on the Housing Reference Group (HRG) board, which have been consulted by Territory Families and the proponent since 2020 in regard to the location, design and other inputs into the subdivision. |
| **Loss unmaintained Airport Road** | |
| Loss of unmaintained Airport Road.<br>Residents use this track as a walking track to access land around the Airstrip. | Will be an impact to this area during early works and construction.<br>Once subdivision is completed, roads will be able to be used to walk to and from the Airstrip area via the subdivision that will connect to remaining section of the Airport Road.<br>Driving to the Airport via Kerinauia Drive (sealed road) will not be impacted. |
| What will happen to the dirt road/Airport Road (from airport to Wurrumiyanga) that would be cut off by future subdivision? | The subdivision will provide a formalised road that will provide a better and safer access for Wurrumiyanga people. |
| ***Typhonium mirabile*** | |
| Are there opportunity to translocate *Typhonium mirabile* | The success rate of translocating the species is underdeveloped and not very well understood. Trials are being undertaken currently to determine the success for translocating the species on the mainland (for *Typhonium praetermissum* subspecies). |
| Not aware of *Typhonium mirabile* in the proposed development area | 651 individual *Typhonium sp*. plants present in proposed development area, over 8,000 in wider surrounding environment.<br>As determined from targeted surveys by environmental consultants. |
| Not concerned with presence of species in proposed development area. | Noted that the people engaged during this engagement forum were not concerned with the proposed development area and the localised impact to the species. |

**Table 3-4. OTL key themes raised and engagement outcomes**

| Key themes and engagement outcomes | When/ where raised | The proponent response/outcomes |
|---|---|---|
| *Typhonium mirabile* related queries and concerns listed in 17 May 2024 out of session meeting | 16 April 2024 - | Arrange out of session meeting with TO to discuss specific |
| No objections to the proposed development | | N/A – general information |
| ***Typhonium mirabile*** | | |
| Specific targeted *Typhonium sp*. data and other available information on Tiwi Islands for public view, including:<br>• connectiveness of the individual plants to surrounding plants,<br>• chemical composition and of the species and healing/medical properties<br>• general biological genetic make-up of the species. | 17 May 2024 – out of session meeting with TO | Proponent to work with stakeholder to investigate permissions to provide available information.<br>Limited information is known about *Typhonium sp.* from a scientific and biological genetic perspective.<br>Advised to discuss with Herbarium, as the subject matter experts. |
| Naming conventions and taxonomy of Tiwi Island specific *Typhonium sp*. | | Advised to discuss with Herbarium, as the subject matter experts. |

The general consensus of the engagement and consultation with the community was positive, supportive of the proposal and overall interested in the subdivision and the work both in environmental approvals and construction that the proponent were undertaking.

## 3.4 Future engagement

The proponent recognises the importance of ongoing communication and engagement throughout development of the proposal. The key objectives of ongoing consultation will be to keep the public and relevant stakeholders informed and aware of proposal progress, works that may affect them, and provide clear communication channels for people to use to direct any queries or concerns throughout all phases of the proposal development. The subsequent sections below provide information on how the stakeholders listed in Section 3.1 and residents of Wurrumiyanga who will be leased the dwellings and nearby neighbours to the proposed development area will continue to be consulted.

### 3.4.1 Referral consultation

Key stakeholders will be contacted directly by the proponent and advised this Referral is available for public consultation in accordance with *EP Regulation* 52. The proponent is open to receiving any questions or feedback during this time and encourages submission to the NT EPA's consultation hub. Key stakeholders will include:

- The Wurrumiyanga HRG
- TIRC who will assist in notifying residents and providing notifications on community notice boards etc.
- TLC
- Wurrumiyanga community members

The referral will be advertised on the NT Government *Have Your Say* page. This will include a summary of the referral, notification that a referral has been submitted to the NT EPA and is available for public comment, and

links to assist people to access the referral documents on the NT EPA's website. The proponent will work closely with the TIRC, TLC and Housing Development Office in Wurrumiyanga to ensure that all communication regarding the referral will be conducted in a culturally appropriate matter and in accordance with the NTG initiative *Remote Engagement and Coordination Strategy* (available here).

### 3.4.2 Ongoing proposal development and construction

Post the referral consultation process, stakeholder groups will be informed during delivery of the proposal through standard remote housing communication pathways used for previous developments, such as:

- Updates to the HRG and Housing Stakeholder meetings on planned delivery milestones, followed by progress updates during construction.
- Obtaining construction approvals from the TIRC (as the local road authority), providing progress updates and organising inspections during construction, providing updates to stakeholders at council meetings (where requested by council technical staff).
- DTFHC will inform nearby residents of the planned commencement and completion of the works.
- The construction contractor will provide additional notifications to nearby residents during construction delivery where required (due to temporary closure of roads, shutdown of services etc.).
- Inputs from HRG regarding Place Names for the subdivision area, including naming of the subdivision area and themes for local road names

### 3.4.3 Operation of the subdivision

As previously stated in Section 2.3 once the subdivision is completed and leasing of the dwellings to residents commence, the management services will be managed by DFTHC, repairs and maintenance of the dwellings serviced by the proponent, road reserve and public open space will be serviced by TIRC and maintenance of enabling site infrastructure by PWC. All contact pathways will be communicated to the residents on leasing of the dwellings, through the Housing Office.

# 4 ENVIRONMENTAL IMPACT ASSESSMENT

The NT EPA has developed a framework for the assessment of environmental impact. The framework uses 14 environmental factors to provide a systematic approach to organising environmental information and to establish environmental objectives against which proposals will be assessed, categorised under five themes of Land, Water, Sea, Air and People.

Environmental factors are broad divisions of the environment that may be impacted by a proposed action. Factors and factor objectives offer a system for organising environmental information for the purpose of environmental impact assessment and allow for the identification of values (the important components of a factor); the assessment of the significance of potential impacts to those values, and the setting of benchmarks to protect those values.

This section provides an assessment of the potential environmental impact of the proposal in regard to the NT EPA's environmental factors and corresponding factor objectives. A pre-referral screening (refer to Appendix A) undertaken by EcOz determined that the proposal has potential to impact the one environmental factor, terrestrial ecosystems. This factor was triggered based on the presence of a number of threatened species and vegetation and habitat that support these species and the requirement to assess the potential for significant impact on these values.

A summary of all other factors excluded from further assessment are presented in Table 4-1. The detailed pre-referral screening document is provided at Appendix A and provides further justification of why the factors were excluded from further assessment.

**Table 4-1. Environmental factors not assessed and brief justification**

| Factor | Justification for exclusion from assessment |
|---|---|
| **Factors excluded from further assessment** | |
| **LAND** | |
| Landforms | There are no distinct natural landforms present in the proposed development area will be impacted by the proposal. |
| Terrestrial Environmental Quality | No terrestrial environmental quality values or sensitivities have been identified in the proposed development area. The proposed development area is vacant land with no specific development land use history, no gross contamination was identified in the contamination assessment across the test pits (Douglas Partners 2023b).<br>Standard construction mitigation measures provided in Appendix A will be implemented through a CEMP and are expected to be effective. |
| **WATER** | |
| Hydrological processes | No hydrological values or sensitives have been identified in the proposed development area, as no major, minor or stream type drainage lines transverse through the area (NR Maps 2023). There is a swimming hole (man-made) present in a previously disturbed area of the proposed development area. The area contains standing water collected during the wet season from incidental rainfall and dries up during the dry season.<br>The use of groundwater as a water source for the subdivision, will be managed by PWC. PWC propose sufficient capacity to service the proposed subdivision (pers comms DIPL).<br>Standard construction and civil engineering design mitigation measures and standards provided in Appendix A will be implemented for the duration of the development (as required) and are expected to be effective. |

| Factor | Justification for exclusion from assessment |
|---|---|
| **Factors excluded from further assessment** | |
| Inland water environmental quality | No inland water environmental quality values or identified in the proposed development area, as no major, minor or stream type drainage lines transverse through the area (NR Maps 2023). The area vacant land with no specific development land use history and no gross contamination was identified in the contamination assessment across the test pits (Douglas Partners 2023b).<br>Standard construction and civil engineering design mitigation measures and standards provided in Appendix A will be implemented for the duration of the development (as required) and are expected to be effective. |
| Aquatic ecosystems | No freshwater ecosystems within or directly adjacent to the proposed development area, and no major or minor streams present in or adjacent to the proposed development area. |
| **SEA** | |
| Coastal processes | The proposed development area does not contain any values associated with the Sea factors and proposal activities are not expected to impact the marine environment based on the distance of activities from the marine environment. |
| Marine environmental quality | |
| Marine ecosystems | |
| **AIR** | |
| Air quality | The proposed activities include vegetation and land clearing over a small footprint (~15.25ha), with these works being short-term and temporary during pre-construction and construction works. Potential impacts of noise and dust on nearby residents' amenity will be temporary and can be managed through standard mitigation measures in accordance with a site-specific CEMP, which are known to be effective. The CEMP developed under the DIPL *standard specification for environmental management 2.0* |
| Atmospheric processes | The proposed activities include vegetation and land clearing over a small footprint (~15.25ha), with these works being short-term and temporary during pre-construction and construction works. The subdivision dwellings will be connected to existing Wurrumiyanga power network, which includes solar generated energy and diesel generators. Construction of the Wurrumiyanga Solar Infill and Energy Storage Pilot Project has commenced. On completion of the solar project, it is expected that the renewable energy delivered to the township will include to almost 50% of the towns requirements (DITT 2023). |
| **PEOPLE** | |
| Communities and economy | No significant community issues have been raised during the engagement process, and TOs have been engaged with the project for since 2020.<br>Overall support of the proposal by the community. |
| Culture and heritage | No identified cultural or heritage values have been identified in the proposed development area, by AAPA or the Heritage Branch. Areas of avoidance outside the proposed development area boundary have been flagged and will be fenced off as a precautionary measure prior to the commencement of earthworks. In addition, an unexpected finds procedure, as standard for DIPL projects, will be included in the site-specific CEMP. |
| Human health | The proposed development area is vacant land, no specific development land use history, no gross contamination was identified in the contamination assessment (Douglas Partners 2023b). Vegetation, land clearing and initial construction activities (including installation of stormwater infrastructure to connect to existing infrastructure) is proposed to occurring during the dry season.<br>Biting insects are known within the wider area associated with known wetland areas adjacent and within Wurrumiyanga (Medical Entomology 2021). For ongoing use of the areas as a subdivision, Wurrumiyanga township is included in the standard Medical Entomology part of Centre for Disease Control (NT Health), annual monitoring program undertaken throughout the NT. Which investigate any mosquito borne disease cases. |

For the terrestrial ecosystems factor selected for further assessment, the approach outlined in Figure 4-1 was undertaken to identify and assess environmental impacts from the proposal on the factor. Definitions for residual impact ratings are provided in Table 4-2, while further detail/definitions are provided in Appendix J.

**Table 4-2. Residual impact ratings**

| Minor | Moderate | High |
|---|---|---|
| A minor residual impact is unlikely to be significant and generally has two or more of the following characteristics:<br><br>**Scale**: limited/localised<br>**Magnitude**: low<br>**Duration**: short-term/ medium-term/reversible.<br><br>OR<br><br>There are no sensitive receptors or land uses present, and the environment does not contain any aspects that are valuable or otherwise important or unique, and there is moderate to high degree of certainty about the likelihood and intensity of the impact, and the effectiveness of proposed mitigation measures. | A moderate residual impact has potential to be significant. The significance depends on the acceptability of the impacts and the effectiveness of mitigation measures. A moderate impact generally has two or more of the following characteristics:<br><br>**Scale**: localised<br>**Magnitude**: moderate<br>**Duration**: medium-term.<br><br>AND/OR<br><br>There are sensitive receptors or land uses present, or environmental aspects that are valuable or otherwise important or unique and there is a low degree of certainty about the impact, and the effectiveness of proposed mitigation measures. | A high residual impact is likely to be significant. The level of acceptability will depend on offsets or benefits compensating for the impact.<br>A high impact generally has two or more of the following characteristics:<br><br>**Scale**: regional/ widespread<br>**Magnitude**: high<br>**Duration**: long-term/permanent.<br><br>AND<br><br>There are sensitive receptors or land uses present, or environmental aspects that are valuable or otherwise important or unique. |

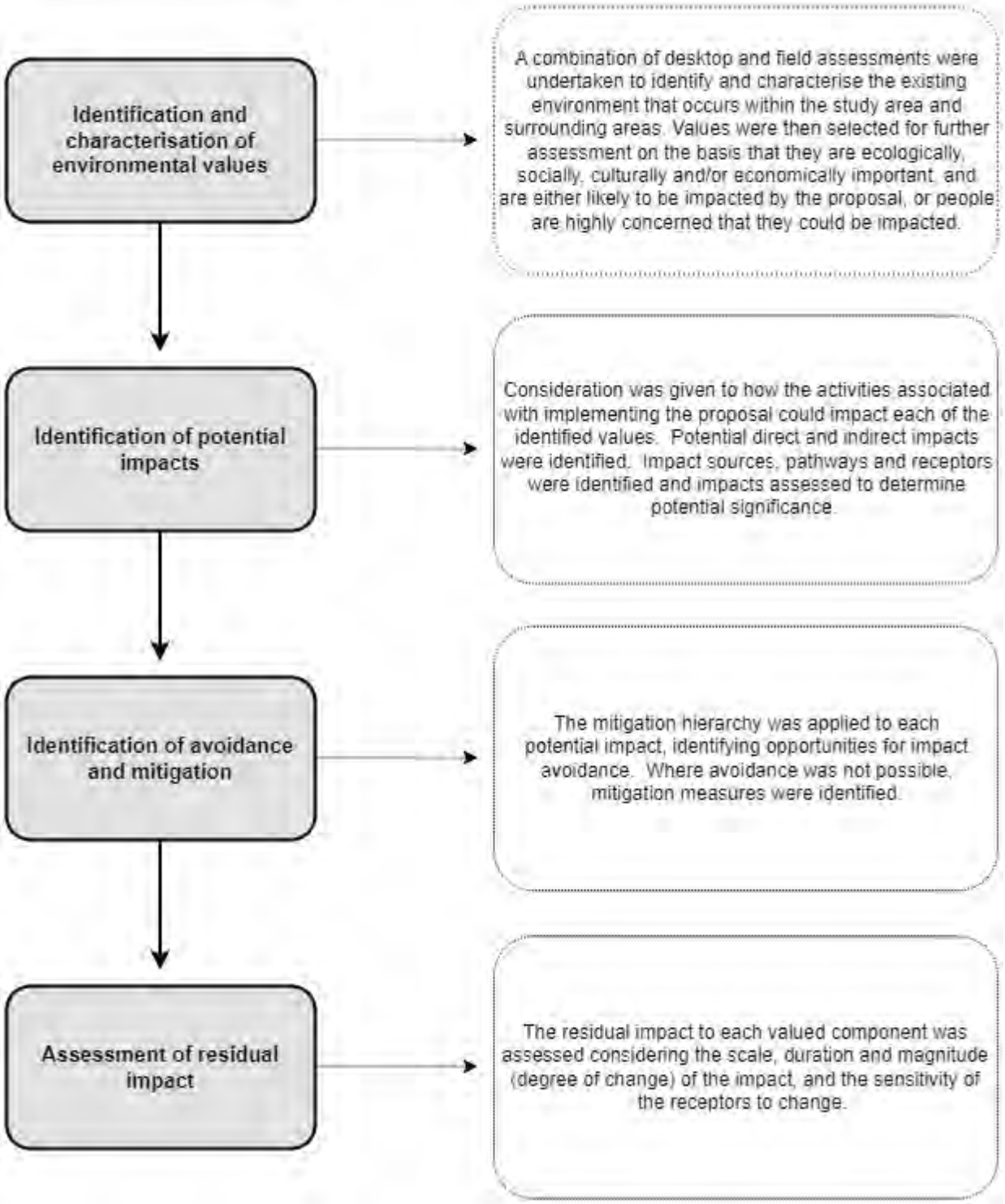



**Figure 4-1. Impact assessment process**

# 5 TERRESTRIAL ECOSYSTEMS

The NT EPA's objective for terrestrial ecosystems is to:

***Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.***

This section identifies the terrestrial ecosystem values that occur within and surrounding the proposed development area and assesses the potential impacts of the proposal on these values and against the NT EPA's objective.

**Biodiversity** refers to the variety of animal and plant life within a region. Areas with a range of habitats that organisms can occupy support higher biodiversity.

**Ecological integrity** refers to the quality of ecosystems (such as extent, condition and connectivity of habitats), and their capacity to adapt to change.

**Ecological functioning** is defined here as the role that ecology has in maintaining other environmental values in the region. For instance, the presence of intact vegetation stabilises the soil and thereby reduces erosion, which could cause reduced soil and surface water quality. Some ecological functions can be replaced with technological ones.

## 5.1 Presence of environmental values

The environmental values associated with biodiversity, ecological integrity and ecological functioning identified for assessment under the terrestrial ecosystems factor are:

- **Vegetation and habitats** – most of the proposed development area contains relatively-intact vegetation that provides habitat for threatened and non-threatened fauna and flora.
- **Significant vegetation** – old-growth trees have been identified within the proposed development area.
- **Threatened flora** – which are vulnerable to extinction in the near future and are important due to the role they play in a health and functioning ecosystem, as well as having high social value. Darwin Cycad (*Cycad armstrongii*) and *Typhonium mirabile* are present in the proposed development area.
- **Threatened fauna** – which are vulnerable to extinction in the near future and are important due to the role they play in a health and functioning ecosystem, as well as having high social value. No threatened fauna species are known to occur within the proposed development area, with the potential for six to occur based on the presence of suitable habitat.

### 5.1.1 Information sources

Each of these environmental values are discussed in detail below, and each section was informed by the following information sources:

- NR Maps: Natural Resource Maps NT (DEPWS 2023)
- *Wurrumiyanga Environmental Assessment Report*, 2022 (EcOz 2022)[7]– see Appendix B
- *Typhonium Survey Report 2023 (*Connect Environmental 2023) – see Appendix C
- *Memorandum Darwin Cycad Survey - Wurrumiyanga (Nugui)* (EcOz 2024a) – see Appendix F.

[7] *The terrestrial environmental assessment has been updated accordingly based on the refinement of the proposed development area and any additional species or protected matters listings in the PMST, which was re-generated in June 2024 for the purpose of this report. Refer to Section 3.1.3 of Appendix B. At a high level, the gap analysis of the PTMS report, identified eleven additional species that required a likelihood of occurrence assessment. The assessment determined the species had either no likelihood or a low likelihood of occurrence within the refined proposed development area – they are therefore not considered further and no changes to the original likelihood of occurrence summary in the terrestrial environmental assessment was required.*

In early 2022, EcOz prepared a terrestrial environmental assessment (provided at Appendix B) for a then broader proposed subdivision area (which also included three potential gravel pits that were then in consideration at the time the 2022 surveys were conducted), using desktop and field collected data. This area was significantly larger (60.3 ha) than the proposed development area subject of this referral (15.25 ha). As a result of this investigation and genetic testing, it was determined that the threatened *Typhonium mirabile* was present within a broader proposed subdivision area. Further surveys were undertaken by Connect Environmental in 2023 to ascertain the presence of *Typhonium* beyond the broader proposed subdivision area to contextualise the occurrence of this species within the Wurrumiyanga area. Additionally, a targeted flora density survey for the Darwin Cycad (*Cycas armstrongii*) along the western boundary of Wurrumiyanga was undertaken by EcOz in 2023, in the broader proposed subdivision area to remain consistent with the previous terrestrial environmental assessment.

As the detailed designs for the proposal have developed, the proposed development area has been refined from the broader proposed subdivision area that was the subject of the terrestrial environmental assessment (including the targeted species survey footprint) to the area that is the subject of this referral report.

A comparison of the broader previously proposed subdivision area and the proposed development area in this referral is provided at Figure 1-1.

All surveys used in assessing this proposal were undertaken in accordance with NT guidelines, including:

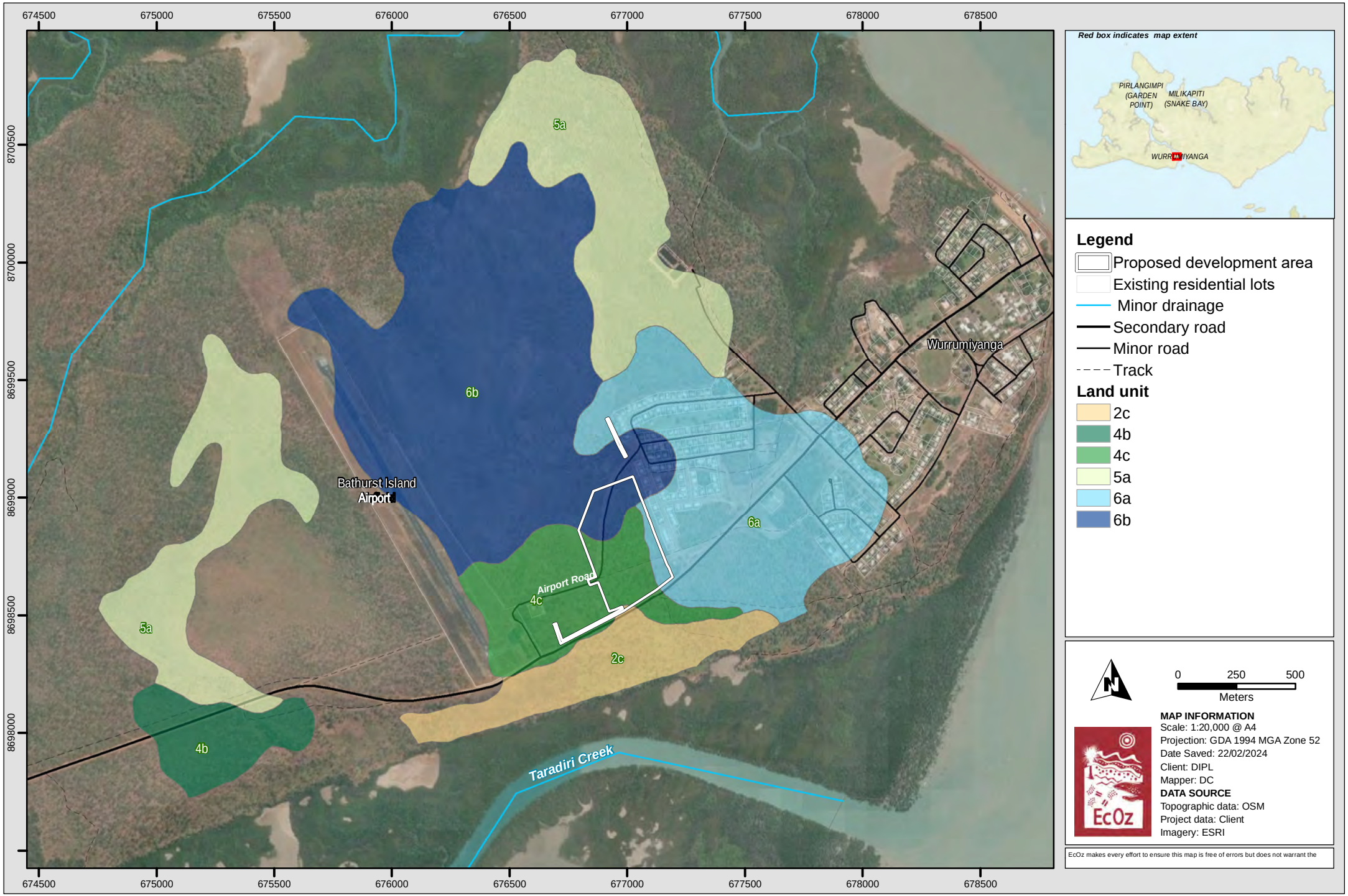
- *Northern Territory Threatened Plant Survey Guidelines – Supplement 1: Typhonium Field Surveys* (Bickerton et al. 2020)
- *Weed Data Collection – A Field Guide for Collecting Weed Data for the NT* (WMB 2015)
- *Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping* (Brocklehurst et al. 2007).

### 5.1.2 Vegetation and habitat

The proposed development area consists largely of intact Eucalypt woodland with minor clearing and dirt tracks. There is some surface rubbish and patches of exotic weeds in the south-west of the area. Land unit mapping of the region was undertaken by Olsen (1980) at a scale of 1:50,000 and ground-truthed by EcOz (2022). The results are reproduced in Table 5-1 and are mapped in Figure 5-1.

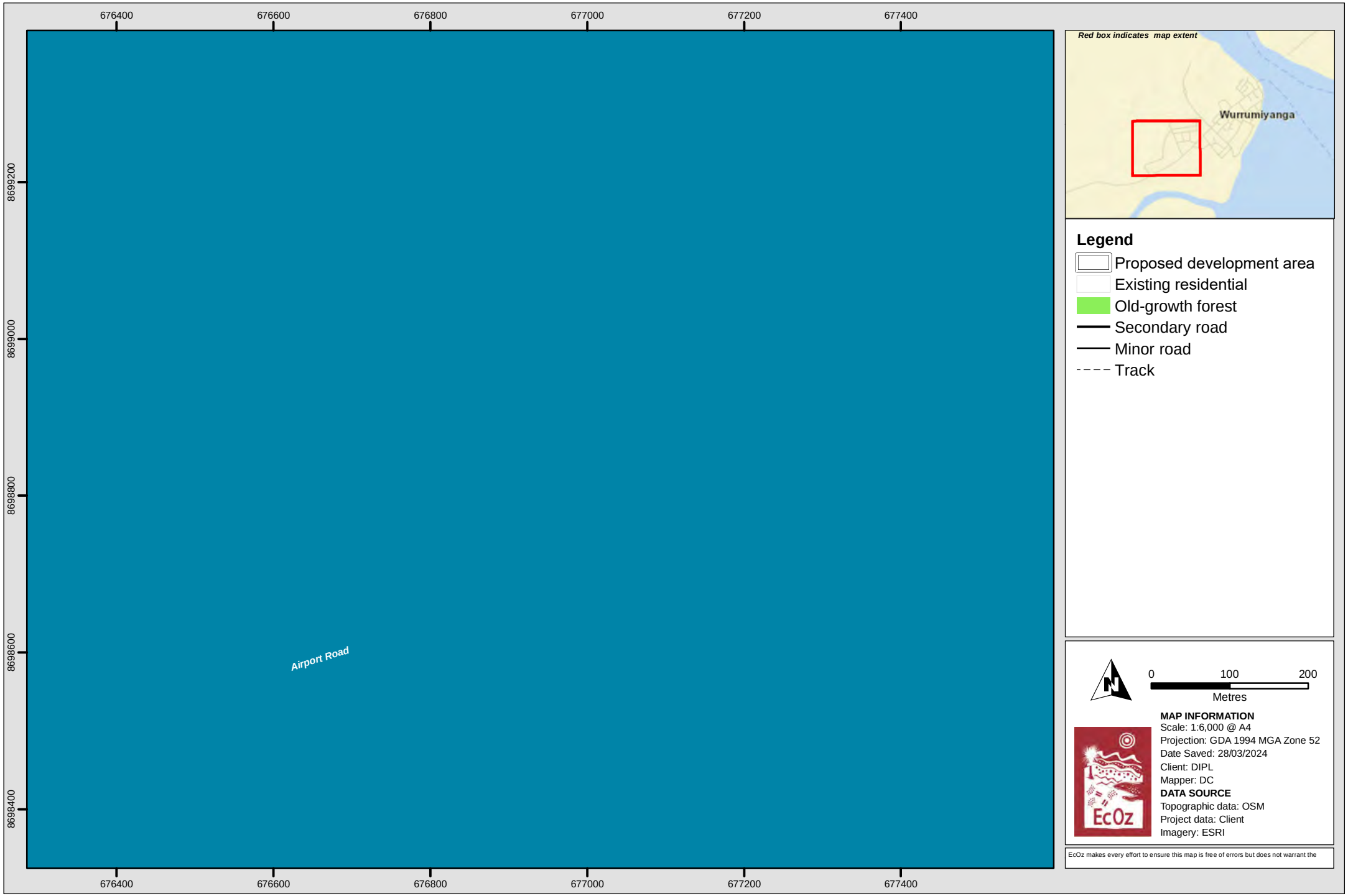
**Table 5-1. Summary of land units relevant to the proposed development area**

| No. | Landform | Vegetation |
|---|---|---|
| 2c | Low hills | Woodland with *Eucalyptus oligantha* as the dominant tree species, with occasional *Corymbia nesophila* and *Eucalyptus tetrodonta*. Other species include *Erythrophleum chlorostachys* and *Acacia sp*.<br>Shrubs include *Planchonia careya, Brachychiton paradoxum* and *Grevillea spp*.<br>Grasses include *Bothriochloa bladhii, Imperata cylindrica, Mnesithea rottboellioides* and *Chrysopogon latifolius*. |
| 4c | Plains | Woodland with *Eucalyptus oligantha* dominant, with *Corymbia papuana*, *Eucalyptus grandifolia* and *Corymbia foelscheana*.<br>Understorey of *Brachychiton paradoxum, Cochlospermum fraseri* and *Planchonia careya*.<br>Common grasses are *Mnesithea rottboellioides*, *Imperata cylindrica, Alloteropsis semialata, Bothriochloa bladhii, Chrysopogon fallax, Chrysopogon latifolius* and *Sorghum plumosum.* |
| 6a | Drainage systems | Woodland with *Melaleuca viridiflora* dominant, with *Corymbia nesophila* and *Corymbia papuana* emergent as tall trees.<br>Shrubs are rare except for *Pandanus spp.*<br>The grasses are *Eragrostis sp. Eriachne sp*. and *Chrysopogon sp*. |
| 6b | Drainage systems | Low open shrubland, dominated by *Melaleuca viridiflora*. Other species include *Brachychiton paradoxum*, *Eucalyptus sp* suckers are common, as are *Acacia sp*.<br>*Chrysopogon fallax, Themeda australis, Cymbopogon bombycinus* and *Eriachne spp* are the main grasses. |




Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ23143 - Wurrumiyanga Subdivision Referral\1. Project Files\2. Report Maps\Map of land units within project footprint.mxd

**Figure 5-1. Map of land units within the proposed development area**




Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ23143 - Wurrumiyanga Subdivision Referral\1. Project Files\2. Report Maps\Map showing significant vegetation types in project footprint.mxd

**Figure 5-2. Map of significant vegetation within the proposed development area**

### 5.1.3 Significant vegetation

In the NT, certain vegetation types are considered significant under the *Land Clearing Guidelines* (DENR 2019) due to their unique and/or inherently high biodiversity values. They are rainforest, vine thicket, closed forest, riparian vegetation, mangroves, monsoon vine forest, sandsheet heath and vegetation containing large trees with hollows suitable for fauna (also called *old-growth forest*). The only sensitive and significant vegetation type occurring within the survey area is approximately 2 ha of old-growth forest (EcOz 2022 and 2024a).

A total of 48 old-growth trees were recorded within the proposed development area, comprising 25 stems between 40 – 50 cm DBH and 23 stems with DBH of 50 cm or greater – see Figure 5-2. Two patches of old-growth trees occur in the south-west area within a 2 ha area. This area is classified as significant because it contains five or more stems greater than 50 cm DBH per hectare. Due to time constraints, the south-eastern corner of the proposed development area was not comprehensively surveyed; satellite imagery suggests old-growth forest is likely to occur here also

### 5.1.4 Threatened species

In early 2022, EcOz prepared a terrestrial environmental assessment a broader proposed subdivision area (which also included three potential gravel pits that were then in consideration), using desktop and field collected data. The survey methods and results are detailed in the *Wurrumiyanga Sub-division Ecological Assessment* report presented in Appendix B. Further studies for *Typhonium praetermissum* (by Connect Environmental in 2023) and the Darwin Cycad (by EcOz in 2023) are detailed in Appendix C and Appendix F, respectively.

Based on the results of the abovementioned surveys and the Protected Matters Search Tool (PMST), the *Wurrumiyanga Sub-division Ecological Assessment* report contains a likelihood of occurrence assessment (LOA) which identified and discussed eight species which are either known, or highly likely, to occur within the proposed development area. These are listed in Table 5-2.

**Table 5-2. Threatened species 'likelihood of occurrence' assessment summary**

| Likelihood | Species | Class | Status | |
|---|---|---|---|---|
| | | | EPBC | TPWC |
| KNOWN | Darwin Cycad *(Cycas armstrongii)* | Plant | - | VU |
| | *Typhonium mirabile* | | EN | EN |
| HIGH | Red Goshawk *(Erythrotriorchis radiatus)* | Bird | EN | VU |
| | Partridge Pigeon (*Geophaps smithii smithii)* | | VU | VU |
| | Masked Owl *(Tyto novaehollandiae melvillensis)* | | EN | EN |
| | Brush-tailed Rabbit-rat *(Conilurus penicillatus)* | Mammal | VU | EN |
| | Butler's Dunnart *(Sminthopsis butleri)* | | VU | VU |
| | Northern Brushtail Possum *(Trichosurus vulpecula arnhemensis)* | | VU | - |

*CR = Critically Endangered; EN = Endangered; VU = Vulnerable*

***Red Goshawk (Erythrotriorchis radiatus)***

The preferred nesting habitat for Red Goshawks does not occur in the proposed development area, where trees have a maximum height of 10-12 m. The Tiwi Land Rangers are responsible for annual survey and monitoring of Red Goshawk nests on Bathurst Island. The most recent nest found within 4 km of the proposed development area was in 2008 on Melville Island (TLC 2022). Senior Tiwi Land Ranger, Willie Rioli, confirmed there were no active Red Goshawk nests within the proposed development area and no new nests had been found in the 2021 season (EcOz 2022). Field observations in March 2022 confirmed the absence of Red

Goshawk nests within the area. No new nests within 20 km of the proposed development area have been recorded since then.

Records of nesting locations for Red Goshawks are reliable because their basket-shaped nests are conspicuous and are often re-used by established breeding pairs in successive years (DCCEEW 2023). The lack of recorded nests near the Wurrumiyanga townsite is also supported by research by Baker-Gabb (2013) which has shown that breeding success declines when more than 25% of forest is cleared within 4 km of the nest site. The fact that the proposed development area is immediately adjacent to an existing township and active Airport – and distant from known nests – reduces the likelihood that it is used as foraging habitat by Red Goshawks.

Red Goshawks can have a home range of up to 200 $km^2$ (Czechura and Hobson 2000). They forage across a broad range of Top End habitats. However, they have much more specific nesting habitat requirements. The species nests in large trees (>14 m) – frequently the tallest and most massive in a tall stand – and invariably within 1 km of permanent water (Debus and Czechura, 1988; Aumann and Baker-Gabb, 1991). The area of open forest and woodland on Bathurst Island available for foraging and nesting by the Red Goshawk is 111,559 ha. The primary threats to the Red Goshawk are large-scale vegetation clearance leading to habitat loss, fragmentation, and degradation (DCCEEW 2023a).

### *Partridge Pigeon (Geophaps smithii smithii)*

It is highly likely that Partridge Pigeons use the proposed development area because they are known to forage in Eucalypt woodland with an open ground layer (10.6 ha of which exists within the proposed development area). They were also 'easily observed' in woodland and open forest habitat during ecological assessments of the wider area (EcOz 2022). However, the proposed development area does not contain dense, unburnt grasses preferred for nesting by Partridge Pigeons, and the overall habitat quality has been reduced by weeds and altered fire regimes.

### *Tiwi Masked Owl (Tyto novaehollandiae melvillensis)*

It is likely that the Tiwi Masked Owl occurs, at least on occasion, within the proposed development area. The Tiwi Masked Owl sub-species is restricted to Bathurst and Melville Islands, where its occurrence is widespread but of higher densities in the wetter tall forests of the north of both Islands. Although their preferred habitat of tall Eucalypt forests is not present, suitable foraging habitat exists, as does 2 ha of large trees that may support hollows for nesting. While to date there has been no records of the species nesting within the proposed development area, the area is the known estimated home range of the species (5 to 10 $km^2$ (Kavanagh & Murray 1996)). A survey for the species on the Island in March 2022 recorded the presence of an individual 7 km west of area. Given the presence of tall Eucalypt forest nearby, it is more likely that the birds would choose to nest there and use the more open vegetation of the proposed development area for foraging (Woinarski et al. 2003).

The primary threat to Tiwi Masked Owl populations is loss of tall open Eucalypt forest (optimal habitat) particularly large hollow-bearing trees used for nesting (Garnett & Crowley 2000). Other threats include invasive weeds, changed fire regimes and feral herbivores, which adversely affect the vegetation structure and reduce the abundance of native mammals.

### *Brush-tailed Rabbit-rat (Conilurus penicillatus)*

Brush-tailed Rabbit-rat are likely to occur within the proposed development area because multiple records of the species exist on Bathurst Island and large hollow-bearing trees suitable for nesting occur within the proposed subdivision area. The NT Fauna Atlas has 242 records of the Brush-tailed Rabbit rat on Bathurst Island, including in the south-east as recently as 2018. The total number of Brush-tailed Rabbit-rats is estimated to be 50,000 (Woinarski et al. 2017).

This species' preferred habitat is tall open Eucalypt forests (Firth et al 2006b), but the Brush-tailed Rabbit-rat is also known to occur in grasslands and woodlands. Modelling analysis of survey records (from a total of 351 sample sites) on the Tiwi Islands (Firth et al., 2006a) showed that the Brush-tailed Rabbit-rat prefers tall Eucalypt forests away from wet areas in sites that had not been exposed to recent severe fires.

Major threats to the Brush-tailed Rabbit-rat are increased fire frequency and late-season burns, habitat loss and predation by Feral Cats. Other threats include invasive weeds, competition with Black Rats and degradation of habitat through feral herbivores.

### *Butler's Dunnart (Sminthopsis butleri)*

It is considered highly likely that Butlers Dunnarts occur within the proposed development area because there is a record from the last decade within 9 km of the area, and because preferred habitat for this species exists within and surrounding the area. Butler's Dunnarts are thought to occur at low densities (DCCEEW 2023b) across both Tiwi Islands in a range of habitats.

Their preferred habitats are tall Eucalyptus open forests and woodlands (DEPWS 2021b). This habitat type covers approximately 6,500 km$^2$ of the Tiwi Islands. Records of Butler's Dunnarts on the Tiwi Islands have mostly occurred in tall forests dominated by *Eucalyptus miniata*, *E. tetrodonta* and/or *Corymbia nesophila* (Woinarski et al., 2003; Firth et al., 2006b). On Bathurst Island, there is potentially 128,317 ha of available habitat for Butler's Dunnarts (DEPWS 2000).

The main threats are loss of habitat from land clearing, altered fire regimes, increased spread of weeds, habitat changes from feral herbivores and predation by feral cats (DEPWS 2021e).

### *Northern Brushtail Possum (Trichosurus vulpecula arnhemensis)*

It is highly likely that the Northern Brushtail Possum is present because of the high density of records nearby, the proximity of the proposed development area to the semi-urban areas, and presence of 2 ha of large hollow-bearing trees within the proposed development area. There are 5,613 records on Bathurst Island for Northern Brushtail Possums, including detections as recently as 2018 in south-eastern Bathurst Island. Targeted live trapping mammal surveys in 2013 detected over 500 instances of possums within 12 km of the proposed development area (DEPWS 2020). Davies et all (2022) found that possums on Bathurst Island occurred at a significantly higher density than on Melville Island – 1.06 per ha and 0.32 per ha respectively. The proposed development area is adjacent to existing residential dwellings and is connected to substantial areas of Eucalypt woodland to the north and north-west. The large hollow-bearing trees within the proposed development area would provide potential nesting habitat for this species.

The broadscale decline of the sub-species' populations in Australia's Top End and reduction of its home range across the NT – an estimated 72 % decrease in the species' historical geographic range in north-western Australia between 1993 and 2019 – is largely attributed to frequent extensive fires, which reduces shelter sites and shrub density, thereby increasing risk of feral cat predation, as well as habitat modification from invasive grasses, namely Gamba Grass and Mission Grass (Stobo-Wilson et al. 2019; DCCEEW 2021). The Northern Brushtail Possum and suitable habitat – forests and woodlands with large hollow-bearing tress with fruiting mid storey – is widely available on the Tiwi Islands. Populations of the Brushtail Possum remain healthy there, with the Bathurst Island density higher than Kakadu National Park after the species' decline there (Davies 2021).

### *Darwin Cycad (Cycas armstrongii)*

Cycads are known to be present in low densities throughout the proposed development area. A targeted cycad survey was undertaken in 2023, using a basal sweep method to identify dense or high-density stands of Darwin Cycads – see Appendix F. This survey found that Darwin Cycads were sparsely populated throughout the proposed development area and that no high or very high-density patches occurred within it nor in the wider area (EcOz 2024a).

### *Typhonium mirabile*

In 2022, the proponent engaged EcOz to conduct an environmental survey for a broader residential subdivision footprint in Wurrumiyanga, refer to Figure 1-1. This survey detected a total of 730 *T. mirabile* plants, most of which occurred along the western boundary of the township. A further *Typhonium* survey was then commissioned by the proponent in 2023 within the wider Bathurst Island area. This survey, by Connect Environmental, found a total of 8,450 *Typhonium* plants – see Figure 5-3. Genetic analysis and expert opinion of samples from both surveys confirmed the plants were *T. mirabile.*

By clipping the data from these two surveys to the proposed development area, it is estimated that there are 482 known *Typhonium mirabile* plants within the proposed development area. It is possible that more plants exist within the survey areas than were counted because of reduced visibility in long grass, time constraints and lack of refined habitat modelling. However, given the survey effort, it is unlikely that any significant patches of *Typhonium* have been missed.

Threatening processes for this species include the clearing of habitat for development; habitat degradation by feral buffalo, cattle and horses; and the invasion of exotic plants through increased activity, clearing, road development in the area around known populations (DCCEEW 2024).

*Typhonium mirabile* is restricted to the Bathurst Island and the western half of Melville Island. Targeted surveys on Melville Island have resulted in low numbers of new records. An estimate of the number of sub-populations on the Tiwi Islands is between 15 to 30 (DENR 2018) however, this is a conservative estimate based on the difficulties in delineating sub-populations due to uncertainties surrounding the pollination and seed dispersal syndromes for the species and specific vectors involved. Prior to the surveys discussed in below, the total number of records (consisting of one or more plants) held by the NT Flora Atlas was approximately 210.

## 5.2 Potential impacts

The potential impacts to vegetation and habitat, significant vegetation (old-growth forest) and to threatened species from the proposal activities are:

- Direct loss of vegetation and habitat from land clearing
- Degradation of vegetation and habitat surrounding the proposed development area through introduction of invasive weeds, introduced pest species, changed fire regimes, and increased human activity.
- Direct loss of significant vegetation from land clearing.
- Loss of threatened species habitat from land clearing.
- Direct mortality of threatened fauna and flora during land clearing activities.

## 5.3 Environmental protection and management

A summary of the potential impacts and mitigation measures proposed to be implemented is provided in Table 5-3, a description of each mitigation measure proposed is provided in the sections below.

**Table 5-3. Summary of potential impacts and proposed mitigation measures**

| Potential impact | Mitigation measure/s |
|---|---|
| Direct loss of vegetation and habitat from land clearing | Vegetation Clearing Plan and Pre-clearing surveys |
| Degradation of vegetation and habitat through introduction of invasive weeds, introduced pest species, changed fire regimes, and increased human activity. | Weed and fire management<br>Erosion and sediment control plan |
| Direct loss of significant vegetation from land clearing. | Vegetation Clearing Plan and Pre-clearing surveys |
| Loss of threatened species habitat from land clearing. | Vegetation Clearing Plan and Pre-clearing surveys |
| Direct mortality of threatened fauna and flora during land clearing activities. | Vegetation Clearing Plan and Pre-clearing surveys |

***Vegetation clearing plan and pre-clearing surveys***

A pre-clearance survey will be conducted prior to the clearing and construction by a suitably experience person to identify any potential habitat for wildlife. This will include surveying for nests or breeding activity by the Red

Goshawk and Masked Owl. Red Goshawk nests are easily identifiable and visible, due to their distinctive shape and size. Masked Owls nest in tree hollows which can be difficult to detect, as such targeted nest surveys may be required within the proposed development area. If a tree with an active nest is found, appropriate actions as per included in the vegetation clearing plan will be taken. The vegetation clearing plan is to include appropriate actions for managing active nests as advised by an ecologists and/or DEPWS.

Prior to any land clearing being undertaken, management procedures will be developed which will stipulate controls to be implemented to minimise impacts to threatened species, and fauna in general, as a result of clearing. Measures should include:

- Pre-clearance surveys by an suitably experience person (ecologist/local ranger or experienced fauna spotter-catcher), prior to clearing and each morning before clearing commences.
- Checking any trenches/pits/excavations prior to works each morning and removing and relocating any trapped wildlife.
- Ensuring a suitably experienced person is present during clearing to relocate wildlife found, or provide aid as required.
- Steps to be followed in the event a threatened species is identified during clearing activities.

***Weed and fire management***

During construction, the introduction and/or spread of weeds will be managed through a Weed Management Plan within the CEMP, prepared in accordance with relevant guidance documents. This plan will include hygiene and quarantine measures to prevent the introduction of new species to the site, prevent the spread of weeds within the site, and will detail control measures for existing weed infestations. Weed management will be in line with the *Weeds Management Act 2001*.

Ongoing maintenance of the habitat values of the passive public open spaces will be critical to minimising the impact of the proposal on all the threatened species considered likely to be present. This will include weed and fire management. Management of weeds post-development for the road reserve and public open space areas will be serviced by TIRC.

***Erosion and sediment control plan***

In the event that earthworks and stormwater infrastructure is not implemented prior to the wet season, a ESCP will be developed as part of the CEMP to establish the minimum requirements and detail the guiding principles for the site-specific ESCPs required as the development progresses. Use of a ESCP will minimise loss of soil; drainage design and management will ensure that impacts to rainfall run-off and recharge regimes are minimal.

As is standard for any development involving clearing of land this size, a site-specific ESCP aligning with the *International Erosion and Sediment Control Guidelines 2008* will be developed by a Certified Professional in Erosion and Sediment Control or suitably qualified person prior to clearing and implemented during clearing and construction. An ESCP will not be required after construction as stormwater drainage management will be implemented into the design and landscape plans.

## 5.4 Residual impacts

This section assesses whether this proposal is likely to have a significant impact on the values identified in Section 5.1.

### 5.4.1 Impacts to vegetation and habitat

***Biodiversity***

The proposed development area has had some degradation, probably due to its proximity to the township of Wurrumiyanga - weeds are present in some parts, there is evidence of human disturbance and changes to fire regimes. These are likely to have reduced fauna diversity compared to the surrounding native woodland.

The proposed development area consists mostly of Eucalypt woodland – one of the dominant vegetation types of the Tiwi Islands. The loss of approximately 0.01% of this habitat type will not lead to a significant loss of biodiversity.

***Ecological integrity***

Parts of the proposed development area contain remnant vegetation that is weed free and contiguous with similar vegetation to the north, west and south. Construction associated with the proposal will be a short-term temporary barrier to wildlife passage; however, the impact of this on wildlife is low because of reduced biodiversity value (see above) and the presence of contiguous vegetation surrounding the proposed development area on three sides, allowing movement of wildlife.

Clearing of the proposed development area and subsequent development of housing will reduce habitat connectivity but due to the availability of similar, contiguous habitat adjacent to the proposed development area the impact is not significant.

***Ecological functioning***

The remnant bushland within the proposed development area provides ecological functions such as soil stability and groundwater recharge. The former will be replaced with hardstand and/or erosion and sediment controls.

The ecological functions of the proposed development area – soil stability, groundwater recharge and supply of surface water to surrounding habitats – will not be significantly altered. Use of a ESCP will minimise loss of soil; drainage design and management will ensure that impacts to rainfall run-off and recharge regimes are minimal.

### 5.4.2 Impacts to significant vegetation

The loss of approximately 2 ha of old-growth forest within the proposed development area has the potential to impact on any fauna that may be making use of the hollows. However, the habitat does not include the tall *Eucalyptus tetradonta* and *E. miniata* trees found in the higher rainfall areas of the north of the Tiwi Islands – species that are known for higher proportion of hollows. The area of old-growth trees is also small compared to the area on Bathurst Island that could support old-growth trees - approximately 132,196 ha. Given this large area of available vegetation surrounding the proposed development area, the loss of 2 the area is not considered significant, particularly if mitigation measures (pre-clearance survey to identify any potential hollow bearing trees and presence of a suitably qualified fauna spotter catcher during clearing) are fully implemented.

### 5.4.3 Impacts to threatened species

The following section assesses the potential impact to all of the threatened species known, or likely, to occur within the proposed development area, that were identified in Section 5.1.3.

***Red Goshawk***

There are no Red Goshawk nests recorded in the vicinity of the proposed development area. There is some foraging habitat, the quality of which is reduced due to its vicinity to the township and the Airport.

The Red Goshawk is listed as Vulnerable under the *TPWC Act* and Endangered under the *EPBC Act*. The federal threatened status of the species was updated from Vulnerable in 2023 due to a decline in population size (DCCEEW 2023a). For Endangered species, any population occurring within an area is considered an ‘important population’ for the long-term survival of the species. Moreover, according to the species’ Conservation Advice (DCCEEW 2023a), all suitable nesting and foraging habitat is considered to be ‘critical habitat’.

Table 5-4 presents an assessment of whether proposal activities are likely to have a significant impact on the Red Goshawk, using the criteria contained within the *EPBC Significant Impact Guidelines 1.1* (DEWHA, 2013).

It concludes that the proposed development area that will be lost is a small area of habitat of low-quality foraging habitat, coupled with mitigation measures to prevent mortality of individuals and ensure breeding is not disrupted (implementation of Vegetation Clearing Plan pre-clearance surveys and suitably experienced fauna spotter-catcher during clearing), means it is unlikely there will be a significant impact to the species.

**Table 5-4. Significant impact assessment for the Red Goshawk**

| Criterion | Comment | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in population size** | It has been estimated that approximately 15% of the Australian population, or 100 pairs of Red Goshawks are present on the Tiwi Islands (DERM 2012). The Tiwi population is important not only because of the large Red Goshawk population it supports, but because the population has not contracted in range as the mainland population has done over the past several decades (Garnett 2021).<br>Suitable Red Goshawk foraging habitat occurs within the proposed development area, but there have been no records of Red Goshawk nesting within 4 km since 2008.<br>Given the mobile nature of the species and their highly visible nests, there is unlikely to be any direct mortality of individual Red Goshawks caused by interactions with clearing machinery. Any risk of interruption to the breeding cycle (in the unlikely event a breeding pair nests within the proposed development area) can be mitigated through the use of a suitably experienced fauna spotter catcher.<br>The only other way in which this proposal could potentially lead to a long-term decrease in the size of the Red Goshawk population is through substantial loss of critical habitat. This is discussed and discounted below. | No |
| **Reduce the area of occupancy of the species** | Garnett et al. (2021) state that the area of occupancy (AOO) of the Red Goshawk is between 90,000 and 140,000 $km^2$ (but likely an under-estimate).<br>There is foraging habitat for the Red Goshawk within the proposed development area, but the only way the loss of that habitat can lead to a reduced AOO is if they are entirely confined to within the 25.25 ha footprint. This is because determining AOO is based on the IUCN 2 x 2 km grid cell method. Consequently, if the habitat lost constitutes the entire local occurrence of that habitat, and there are no other nearby occurrences of that habitat, then this could lead to a reduced AOO. However, within the species' range, foraging habitat is widespread and breeding habitat – whilst more limited – is still abundant. Consequently, the loss of a small area of habitat for development of the subdivision will not result in a reduced AOO for the Red Goshawk. | No |
| **Fragment an existing population into two or more populations** | The Red Goshawk is a mobile animal with a capacity for large-scale movement. Research by MaColl et al. (2021) on the species' mobility found it is far greater than previously realised, with some instances of Red Goshawks migrating 1,000 km. The clearing a small area of habitat adjacent to an existing township will not fragment the existing population. | No |
| **Adversely affect habitat critical to the survival of the species** | The Conservation Advice for Red Goshawk (DCCEEW 2023a) states that all foraging and breeding habitat is considered critical to the survival of the species due to the species small population size. | No |

| Criterion | Comment | Significant impact identified (Yes/No) |
|---|---|---|
| | The proposed development area does not support nesting habitat. Although there is 10.6 ha of potential foraging habitat within the area, the fact that it is immediately adjacent to an existing township and active Airport – and distant from known nests – reduces the likelihood that it is used as foraging habitat by Red Goshawks.<br>Given the small area of habitat that will be lost and the reduced likelihood of use due to proximate clearing of land, the development is not likely to affect critical habitat. | |
| **Disrupt the breeding cycle of a population** | The only way the proposal would disrupt the breeding cycle of Red Goshawks would be if there were active nests in the proposed development area, or if nests nearby were disturbed by the proposal activities.<br>There are unlikely to be any nests because the proposed development area does not contain preferred nesting habitat of Red Goshawks and no nests have been observed. Moreover, the location of the proposed development area within an wider area that has undergone substantial previous clearing reduces the likelihood of a nest being established in the interim. | No |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | Given there is 111,559 ha of suitable open forest and woodland habitat on Bathurst Island, the clearing of such a small proportion of lower quality habitat for the proposal (<0.01%) is unlikely to result in a loss, or decrease in quality, of habitat to the extent that it will cause a decline in the species. | No |
| **Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat** | Neither the Conservation Advice nor the Recovery Plan for Red Goshawk identify any invasive species that are threats to the species. Alterations to fire regimes is a known threat, and this can be exacerbated by proliferation of grassy weeds such as Gamba Grass. Altered fire regimes can lower the availability of prey because woodland thickening hinders hunting efficiency (Czechura & Hobson 2000; Czechura et al. 2011; DERM 2012). Both species of Mission Grass have been recorded in parts of the site and are common along the Kerinauia Highway between Wurrumiyanga township and the Aerodrome. A Weed Management Plan will be developed as part of the CEMP to minimise the introduction and spread of invasive weeds during all phases of the proposal. The CEMP will be developed under the DIPL *standard specification for environmental management 2.0* (available here) prior to commencement of works. | No |
| **Introduce disease that may cause the species to decline** | Disease is not listed as a threatening process for the Red Goshawk. EcOz ecologists are not aware of any literature on diseases that could be introduced by the proposal and that would detrimentally affect this species. | No |
| **Interfere with the recovery of the species** | The only potentially-relevant specific objective within *The National Recovery Plan for the Red Goshawk* (DERM, 2012) is to protect and appropriately-manage important habitat areas to ensure long-term survival of the Red Goshawk. As discussed above, the area of habitat lost through this proposal will not interfere with the recovery of the species because it represents <0.01% of available habitat on Bathurst Island and it is located in an area that already has substantial disturbance, through fire, weeds and development. | No |

### *Partridge Pigeon*

There are no Partridge Pigeon records within the proposed development area, but the species has been recently recorded in the vicinity. There is foraging and breeding habitat within the proposed development area. The quality of this which is reduced due weeds, altered fire regimes and its vicinity to a township and Airport.

The Partridge Pigeon is listed as Vulnerable under both *EPBC* and *TPWC Act*s. The Tiwi sub-population of Partridge Pigeon is considered an 'important population' because there is historic range contraction on the mainland, whereas the Tiwi population has remained stable (Garnett 2021).

A significant impact assessment as per the *EPBC Significant Impact Guidelines 1.1* has been undertaken in Table 5-5. It concludes that the species is unlikely to be significantly impacted by the proposal because the disturbance footprint is small, with only a small number of birds likely to be present at any time. The only way this proposal could materially impact upon the species would be mortality or disruption to breeding success due to a disturbance of an active nest. The risk of mortality from clearing is low because the birds are mobile and able to access contiguous habitat to the north and south of the proposed development area. Moreover, limiting the construction works to the duration of one breeding cycle (1 dry season) and engaging a suitably experienced fauna spotter-catcher during the land clearing phase would adequately mitigate these risks.

**Table 5-5. Significant impact assessment for the Partridge Pigeon**

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in the size of an important population** | The Partridge Pigeon is mobile and can move up to 10 km in response to resource availability, which lowers the likelihood of direct mortality during land-clearing activities for the proposal. Furthermore, the proponent will mitigate the impact of construction on this sub-species through a pre-clearance survey of suitable habitat. Other ways that could lead to a long-term decline in the population are described below. | No |
| **Reduce the area of occupancy of an important population** | The AOO of the Partridge Pigeon is estimated to be 9,600 $km^2$; however, this is likely to be an underestimate (Garnett and Baker, 2021). It was calculated using a 2 x 2 km grid cell method, based on the IUCN *Guidelines for Using the IUCN Red List Categories and Criteria* (2019).<br>Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the proposed development area. In other words, if the nesting/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Partridge Pigeons general habitat requirements are quite broad within its distribution, they are known to undertake large local movements in response to resource availability and their habitat is not restricted to the proposed development area. Therefore, its loss will not result in a reduced AOO. | No |
| **Fragment an existing important population into two or more populations** | The Partridge Pigeon population will not be fragmented by this proposal because it is a mobile animal, and contiguous habitat exists to the north and south of the proposed development area. The clearing of a small area of habitat adjacent to an existing township will not fragment the existing population. | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Disrupt the breeding cycle of an important population** | Partridge Pigeons have a low nest success rate due to predation (Fraser 2000) and are thought to be multi-brooding. The loss of a nest due to vegetation clearing works will not be of significant impact, with the parent likely able to re-nest throughout the dry season. Limiting the vegetation clearing to one breeding cycle (1 dry season), would reduce the impact to the breeding cycle of the Partridge Pigeons that include the proposed development area within their range. All land clearing and earthworks will be undertaken in 1 dry season, with earthworks and construction of initial infrastructure to follow immediately. | No |
| **Adversely affect habitat critical to the survival of the species** | Critical habitat for the Partridge Pigeon has not been formally defined. In lieu of such, the most limiting of the sub-species' habitat requirements could be considered 'critical'. For the Partridge Pigeon, this would be seed food resources and diversity of habitat within their home range – namely dense, unburnt grasses for nesting and open (typically burnt) areas for feeding. The habitat within the proposed development area is open, likely as a result of frequent burning and at least two weed species have been recorded in parts of area. Therefore, while the area has some value as foraging habitat, it is not considered 'critical' habitat for Partridge Pigeons. | No |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | The habitat requirements for Partridge Pigeons are broad – Eucalypt woodlands and forests. There is approximately 126,737 ha of this vegetation type available on Bathurst Island. The clearing of 10.6 ha (the portion of the 15.25 ha proposed development area that contains woodland habitat) represents a loss of approximately 0.008% of this potential habitat, which is a small area and unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the sub-species is likely to decline | No |
| **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** | Two threats to the Partridge Pigeon are predation by Feral Cats, and changes to forest structure and fire regimes by invasive grasses such as Gamba and Mission Grass (DCCEEW 2015c).<br>Feral Cats are unlikely to present a major threat within the proposed development area. A recent survey (Davies et al. 2021) concluded that the density on Bathurst Island is much lower than on neighbouring Melville Island. In any case, the development of the proposal is unlikely to lead to any substantial change in Feral Cat occurrence.<br>The *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses* (DSEWPaC 2012) is listed as the *EPBC* plan for the Partridge Pigeon. Of the five listed grasses, both species of Mission Grass are present and established on the Tiwi Islands, including within parts of the proposed development area.<br>A Weed Management Plan within the CEMP will prevent the introduction of new weeds and the spread of existing weeds across the site during the clearing and construction phases of development. Ongoing control of weeds is critical to preventing the spread of weeds into the wider area and will | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| | be managed by the Tiwi Islands Regional Council. With these immediate and on-going controls, the impact of weeds can be avoided. A Weed Management Plan will be developed as part of the CEMP to minimise the introduction and spread of invasive weeds during all phases of the proposal. The CEMP will be developed under the DIPL *standard specification for environmental management 2.0* (available here) prior to commencement of works. | |
| **Introduce disease that may cause the species to decline** | Disease is not listed as a threatening process for the Partridge Pigeon. The Ecoz ecologists are not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species. | No |
| **Interfere with the recovery of the species** | There is no Recovery Plan for this sub-species. Instead, the Conservation Advice (DCCEEW 2015c) describes conservation actions to address threats to the species – appropriate fire management, Feral Cat control and weed management strategies. The proposed actions will not interfere with any of these conservation actions or the recovery of the Partridge Pigeon. | No |

***Tiwi Masked Owl (Tyto novaehollandiae melvillensis)***

It is unlikely that the impact to the Tiwi Masked Owls from the proposal activities will be significant, because the proportion of Tiwi Masked Owl habitat within the proposed development area is very small – combined with mitigation (implementation of Vegetation Clearing Plan, pre-clearance surveys and use of a suitably experienced fauna spotter-catcher) measures. Table 5-6 provides the assessment as defined in *EPBC Significant Impact Guidelines 1*.

Tiwi Masked Owls are listed as Endangered both federally and within the Territory. For Endangered species, any population occurring within an area is considered an 'important population' for the long-term survival of the species. Although not recorded during a targeted survey, based on current distribution and habitat suitability, the Tiwi Masked Owl could be present within the proposed development area.

**Table 5-6. Significant impact assessment for the Tiwi Masked Owl**

| Criterion | Summary of impacts | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in population size** | The Tiwi Masked Owl is a mobile species, which lowers the likelihood of direct mortality during land-clearing activities for the Project. Suitable habitat – areas with large hollow-bearing trees suitable for breeding – are known to occur within a 2 ha area in the south-west corner of the proposed development area. However, there are no recent records of the sub-species within 7 km.<br>A potential cause for a long-term decrease in the size of a local population would be if nest trees are occupied during clearing and the occupants are killed as a result of clearing activities. To mitigate any impact and avoid mortality of nesting individuals, during pre-clearing surveys, vegetation will be checked for hollows and a fauna spotter catcher employed to assist any individuals prior to clearing. If nesting | No |

| Criterion | Summary of impacts | Significant impact identified (Yes/No) |
|---|---|---|
| | young are found, clearing should be re-scheduled until after fledging and dispersal. | |
| **Reduce in the area of occupancy of the species** | Determining area of occupancy is based on the IUCN 2 x 2 km grid cell method (IUCN 2021). The proposed development area is entirely within the existing AOO of the Tiwi Masked Owl (which include the results of the 2022 survey, which increased the AOO of the species).<br>NT Fauna Atlas records show that the Tiwi Masked Owl occurs across both islands and is not restricted to the proposed development area.<br>The only way that can lead to a reduced area of occupancy for the Tiwi Masked Owl is if they were entirely confined to within the proposed development area. In other words, if any individuals lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced AOO. There is no reason to suspect that Tiwi Masked Owls only occur within the proposed development area, and so it is very unlikely that this scenario will eventuate. | No |
| **Fragment an existing population into two or more populations** | Because the Tiwi Masked Owl is a mobile species with a home range of up to 1,200 ha, clearing 15.25 ha of habitat adjacent to an existing township will not fragment the existing population. A very large area would need to be cleared to split the population and prevent recolonisation by the remaining individuals. | No |
| **Adversely affect habitat critical to the survival of the species** | Critical habitat for the Tiwi Masked Owl has not been formally defined. In lieu of such, the most limiting of the sub-species habitat requirements could be considered 'critical.' For the Tiwi Masked Owl, this is breeding and roost sites – large hollow-bearing trees with large hollows.<br>An area with large hollow-bearing trees suitable for breeding occurs within the south-west corner of the proposed development area, covering approximately 2 ha (see Figure 5-2). While Tiwi Masked Owls have been recorded in a range of habitats, the likelihood of the sub-species using this area for breeding is lowered because no birds were recorded in the area during a recent survey, it is not the preferred habitat and there is higher quality habitat nearby (5.4 ha of tall open Eucalypt forest with large hollow-bearing trees was mapped by EcOz within 7 km of the proposed development area (2022)).<br>Given the small area of potential breeding habitat to be cleared, the absence of optimal habitat in the proposed development area, and the presence of higher quality habitat nearby, the likelihood of the sub-species declining as a result of this clearing is low. | No |

| Criterion | Summary of impacts | Significant impact identified (Yes/No) |
|---|---|---|
| **Disrupt the breeding cycle of a population** | Tiwi Masked Owls begin nesting towards the end of the wet season and continues throughout the dry with fledging around August. The female will remain on the nest and the male delivers food during this time (Smith et al. 2008a). Nest hollows may be used for multiple years and the hollow size required for nesting is uncommon on the islands (Smith et al. 2008b, Woinarski & Westaway 2008).<br>There is an inherently low likelihood that Tiwi Masked Owls will be breeding within the very small proportion of suitable habitat within the very small proposed development area. Nevertheless, the implementation of a pre-clearance survey by a suitably experienced person, combined with fauna spotter-catcher engaged during land clearing, will minimise direct mortality and reduce the likelihood of disruption to the breeding cycle of Tiwi Masked Owls that may be breeding or roosting within the proposed development area. | No |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | The foraging habitat requirements for the Tiwi Masked Owl are broad – woodlands, forests, and grasslands on the Tiwi Islands. Such habitat occurs within the proposed development area. However, it is also the dominant vegetation type across the population's entire range.<br>The proportion of suitable habitat present within the proposed development area compared to the available 132,196 ha on Bathurst Island is 0.01%. The loss of such a small area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the sub-species is likely to decline. | No |
| **Result in invasive species that are harmful to the species becoming established in the species' habitat** | The spread of invasive weeds and changed fire regimes may have reduced the abundance of native mammals for Tiwi Masked Owls (Firth et al., 2006b; Garnett & Crowley, 2000; Woinarski, 2004). While Feral Cats may also be having impacts on the availability of prey, a recent survey (Davies et al. 2021) concluded that the density on Bathurst Island is much lower than on neighbouring Melville Island.<br>Invasive grasses were found to be present within the some of the proposed development area and control will be required to mitigate any impact to Tiwi Masked Owls. A Weed Management Plan will be developed as part of the CEMP to minimise the introduction and spread of invasive weeds during all phases of the proposal. The CEMP will be developed under the DIPL *standard specification for environmental management 2.0* (available here) prior to commencement of works. | No |
| **Introduce disease that may cause the species to decline** | Disease is not listed as a threatening process for the Tiwi Masked Owl. EcOz ecologists are not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species. | No |
| **Interfere with the recovery of the species** | The Conservation Advice for this species does not contain recovery actions (DCCEEW 2015d). However, the Conservation Actions within the Advice include to *'…Prevent, or minimise the extent of additional land clearing. Where land clearing does occur, implement protocols to reduce impacts as much as possible…'* (DCCEEW 2015d).<br>If avoidance of the 2 ha of potential breeding habitat within the proposed development area is not possible, surveys for | No |

| Criterion | Summary of impacts | Significant impact identified (Yes/No) |
|---|---|---|
| | Tiwi Masked Owl nest trees, retention of active nest trees and the use of a suitably experienced fauna spotter-catcher will mitigate the risk of mortality to individuals as well as any disruption to the breeding cycle. | |

***Brush-tailed Rabbit-rat (Conilurus penicillatus)***

It is unlikely that the impact to the Brush-tailed Rabbit-rat from the proposal activities will be significant, because the proportion of Brush-tailed Rabbit-rat habitat within the proposed development area is very small – combined with mitigation (implementation of Vegetation Clearing Plan, pre-clearance surveys and use of a suitably experienced fauna spotter-catcher) measures. Table 5-7 provides the assessment as defined in *EPBC Significant Impact Guidelines 1*.

The Brush-trailed Rabbit-rat is listed as Vulnerable federally and Endangered in the NT. For Endangered species, any population occurring within an area is considered an 'important population' for the long-term survival of the species.

Due to recent nearby records and suitable habitat, the Brush-tailed Rabbit-rat is likely to occur within the proposed development area, including within the previously disturbed areas and invasive grass-dominated areas. Suitable tall, hollow-bearings trees that may be used by this species for nesting and shelter covers 2 ha of the proposed development area.

**Table 5-7. Significant impact assessment for the Brush-tailed Rabbit-rat**

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in the size of an important population** | Mortality of Brush-tailed Rabbit-rats within the proposed development area could only occur as a direct impact from vegetation clearing, should the species be inhabiting trees or hollow logs. The proponent will mitigate the impact of proposal activities on this species through a pre-clearance survey of suitable habitat. Other ways that could lead to a long-term decline in the population are described below. | No |
| **Reduce the area of occupancy of an important population** | The AOO for Brush-tailed Rabbit-rats is estimated to be 400 $km^2$ (Woinarski et al., 2014). It was calculated using a 2 x 2 km grid cell method, based on the IUCN *Guidelines for Using the IUCN Red List Categories and Criteria* (2019).<br>Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the proposed development area. In other words, if the nesting/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because the Brush-tailed Rabbit-rat's general habitat requirements are available within the wider area, it is highly unlikely the loss of habitat within such a small area would result in a reduced AOO. | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Fragment an existing important population into two or more populations** | The home range of the Brush-tailed Rabbit-rat is small – Firth et al. (2006a) estimated it to be 0.79 ha – making them more susceptible to fragmentation than more mobile species. However, there is suitable habitat in the areas adjacent to the north, west and south edges of the proposed development area. Therefore, the proposal is unlikely to fragment the population into two or more populations, and unlikely result in a significant impact on the species. | No |
| **Disrupt the breeding cycle of an important population** | The Brush-tailed Rabbit-rats have a long breeding season from March to October. Females give birth to at least two sets of young (Taylor & Horner 1971; Firth 2007; Kemper & Firth 2008). Disturbance of such a small proportion of potential breeding habitat will not have a population-side impact. Any disruption to the breeding cycle of the species can be mitigated by engaging a suitably experienced fauna spotter-catcher, to relocate nesting individuals to a suitable area, allowing the mammals to re-establish a nest within the same breeding cycle. | No |
| **Adversely affect habitat critical to the survival of the species** | Critical habitat for the Brush-tailed Rabbit-rat is not clearly defined because it occurs extensively across a wide-ranging habitat of tropical Eucalypt open forests. It has been suggested by Woinarski et al. (2017) that relatively long-unburnt forest (with patchy, cool and infrequent fires) provides habitat critical to the survival of this species, and that these areas can change as fire regimes change over time.<br>Fire scar data surrounding the proposed development area shows the habitat there has been burned in 4-5 of the past 10 years (2012-2022) which is likely to have reduced the habitat quality (for instance, loss of hollow logs for breeding and shift in species composition). As such, the proposed development area cannot be defined as critical habitat for this species. | No |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | The area of available habitat on Bathurst Island is 128,317 ha (DEPWS 2000). Clearing of 15.25 ha – including the 2 ha of large, hollow-bearing trees represents a very small portion – 0.01% – of the potential habitat available to the Brush-tailed Rabbit-rat on Bathurst Island and is therefore not expected to be a significant impact to the species. | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** | Weeds such as Mission Grass (which is known to occur in parts of the proposed development area) are a known threat to the Brush-tailed Rabbit-rat because they alter the fire regime, leading to more intense fires that can destroy important habitat such as hollow logs for breeding. Feral Cats and Black Rats are also species that are listed as threats to Brush-tailed Rabbit-rats, through predation and competition, respectively.<br>In the case of invasive weeds,<br>A Weed Management Plan will be developed as part of the CEMP to minimise the introduction and spread of invasive weeds during all phases of the proposal. The CEMP will be developed under the DIPL *standard specification for environmental management 2.0* (available here) prior to commencement of works.<br>Ongoing control of weeds will prevent the spread of weeds into the wider area and the proposed public open space areas will be managed by the TIRC. With these immediate and on-going controls, the impact of weeds can be avoided.<br>Feral Cats will be present in the wider area, although research (Davies et al. 2021) has shown that the density of Feral Cats on Bathurst Island is lower than on Melville Island, reducing the risk to the species from predation. Black Rats are likely to be present due to the close proximity to existing housing.<br>While Feral Cats and Black Rats are threats to the Brush-tailed Rabbit-rat, vegetation clearing and then construction of housing adjacent to the township is unlikely to result in a significant increase in either pest species, and therefore the threat to the Brush-tailed Rabbit-rat is not significant. | No |
| **Introduce disease that may cause the species to decline** | EcOz ecologists are not aware of any diseases that could be introduced that would impact the Brush-tailed Rabbit-rat. Woinarski et al. (2017) suggest that Black Rats may introduce novel diseases to the Brush-tailed Rabbit-rat but to date there is no evidence of them doing so which then led to a decline in the species. In any case, the Black Rat is already established on the Island and the proposal is unlikely to significantly increase the numbers of Black Rats to the extent that a decline in the species would occur. | No |
| **Interfere with the recovery of the species** | The *National Recovery Plan for Brush-tailed Rabbit-rat* (Woinarski et al. 2017) contains a large number of conservation and management actions, none of which will be interfered with by development of the proposal. | No |

***Butler's Dunnart (Sminthopsis butleri)***

It is unlikely that the impact to the Butler's Dunnart from the clearing and construction will be significant, because the species occurs at low densities across the Tiwi Islands, and the proportion of Butler's Dunnart habitat within the proposed development area is very small – combined with mitigation (implementation of Vegetation Clearing Plan, pre-clearance surveys and suitably experienced use of a fauna spotter catcher) measures. Table 5-8 provides the assessment as defined in *EPBC Significant Impact Guidelines 1*.

The Butler's Dunnart is listed as Vulnerable both federally and, in the NT., The species has not been recorded within the proposed development area. However, there are relatively recent nearby records, and the proposed development area contains suitable habitat for this species.

**Table 5-8. Significant impact assessment for the Butler's Dunnart**

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in the size of an important population** | The occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. There is no evidence that Butler's Dunnarts in the region constitute a key source population, or one that is necessary for maintaining genetic diversity. Moreover, the proposed development area is located within the known distribution of this species, not at its limits. For these reasons, the occurrence of this species within the proposed development area is not considered an 'important' population, and these criteria do not apply.<br>Moreover, mortality of Butler's Dunnarts within the proposed development area could only occur as a direct impact from clearing, should the mammal be sheltering under rocks or hollow logs. The proponent will mitigate the impact of proposal activities on this species through a pre-clearance survey of suitable habitat. Other ways that could lead to a long-term decline in the population are described below. | No |
| **Reduce the area of occupancy of an important population** | The area of occupancy (AOO) for Butler's Dunnarts is unknown but thought to be declining (Woinarski et al., 2014). The records of the species on the Tiwi Islands are widespread. The Islands have a total area of 7,400 $km^2$ and suitable habitat for Butler's Dunnart exists over 6,500 $km^2$.<br>Under the 2 x 2 km grid cell method (which is based on the IUCN Guidelines for Using the IUCN Red List Categories and Criteria (2019)), the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the proposed development area. In other words, if the nesting/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because the Butler's Dunnart's habitat requirements are broad and are available within the wider area, it is highly unlikely the loss of habitat within such a small area would result in a reduced AOO. | No |
| **Fragment an existing important population into two or more populations** | There are no records of the Butler's Dunnart within the proposed development area. Nevertheless, there is suitable habitat in the areas adjacent to the north, west and south edges of the proposed development area. Therefore, the Project is unlikely to fragment the population into two or more populations. | No |
| **Disrupt the breeding cycle of an important population** | Butler's Dunnarts are thought to have a seasonal breeding season between August and December. Disturbance of such a small proportion of potential breeding habitat will not have a population-side impact. Any disruption to the breeding cycle of the Butler's Dunnarts can be mitigated by engaging a suitably experienced fauna spotter catcher to conduct a pre-clearance survey, to identify likely habitat and to relocate nesting individuals to a suitable area, allowing the mammals to re-establish a nest within the same breeding cycle. | No |
| **Adversely affect habitat critical to the survival of the species** | Critical habitat for the Butler's Dunnart is not clearly defined because the species occurs extensively across a wide-ranging habitat of tall Eucalypt open forests and also woodlands (where the species is known to occur in lower | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| | abundance (Ward 2009)) that exist over 6,500 km$^2$ of the Tiwi Islands.<br>On Bathurst Island, there is potentially 128,317 ha of available habitat for Butler's Dunnarts (DEPWS 2000). The 15.25 ha to be cleared represents 0.01% of the potential habitat available.<br>The loss of such a small proportion of this habitat cannot be considered likely to have an adverse effect on the survival of the species. | |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | Given the large area of breeding and foraging habitat in the region, the clearing of such a small proportion of it for the proposal is unlikely to result in a loss, or decrease in quality, of habitat to the extent that it will cause a decline in the species. | No |
| **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** | There is no direct evidence of impact from exotic grass species; however, there is potential for indirect impacts from changing fire regimes associated with exotic grasses (DCCEEW 2015c). Two such species, Mission Grass (annual and perennial) are known to occur in parts of the proposed development area.<br>Predation by Feral Cats has not been demonstrated to threaten the Butler's Dunnart, although plausible (Woinarski et al. 2014). Research by Davies et al. (2021) has found that Feral Cat densities are lower on Bathurst Island than Melville Island, reducing the risk to the species from predation.<br>While Feral Cats are a potential threat to the species, the Project is unlikely to result in a significant increase in Feral Cats in the region.<br>Preventing the introduction and spread of invasive weeds will be managed by a Weed Management Plan. A Plan will be developed as part of the CEMP to minimise the introduction and spread of invasive weeds during all phases of the proposal. The CEMP will be developed under the DIPL *standard specification for environmental management 2.0* (available here) prior to commencement of works.<br>Ongoing control of weeds will prevent the spread of weeds that are currently present into the broader area and will be managed by the TIRC.<br>Given the implantation of the a Weed Management Plan, the commitment to ongoing control of weeds in the area and the unlikely increase in Feral Cat activity as a result of the proposal, there is a low risk that a harmful invasive species will become established in the Butler's Dunnart habitat. | No |
| **Introduce disease that may cause the species to decline** | Disease is not listed as a threatening process for Butler's Dunnart. EcOz ecologists are not aware of any literature on diseases that could be introduced by the proposal and that would detrimentally affect this species. | No |
| **Interfere with the recovery of the species** | There is no Recovery Plan for this species. In the Conservation Advice (DCCEEW 2015), the main identified threats are altered fire regimes, introduced herbivores and predation by Feral Cats. The proposal will not substantially change any of these threats such that they interfere with the recovery of the species. | No |

***Northern Brushtail Possum (Trichosurus vulpecula arnhemensis)***

It is unlikely that the impact to the Northern Brushtail Possum from the proposal activities will be significant, because the proportion of Northern Brushtail Possum habitat within the proposed development area is very small – combined with mitigation strategies (implementation of Vegetation Clearing Plan, pre-clearance surveys and use of a fauna spotter-catcher). Table 5-9 provides the assessment as defined in *EPBC Significant Impact Guidelines*.

The north-western sub-species of the Brushtail Possum is listed as Vulnerable in the EPBC Act and Near Threatened under the *TPWC Act*. There are nearby records and suitable habitat within the proposed development area.

**Table 5-9. Significant impact assessment for the Northern Brushtail Possum**

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in the size of an important population** | General occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. The Northern Brushtail Possum is considered to be one population: with a possible sub-population on the Tiwi Islands (DCCEEW 2021). While species' density on the Tiwi Islands is higher than on the mainland, their extent of occurrence (EOO) on Tiwi Islands is only 1.5 % of the total EOO (DCCEEW 2021). Therefore, all the NT occurrences are considered an important population for the species' long-term survival and recovery.<br>The Northern Brushtail Possum is mobile, which lowers the likelihood of direct mortality during vegetation clearing activities for the proposal. Furthermore, the proponent will mitigate the impact of construction on this species through avoidance of clearing trees suitable for shelter (if possible) as per a Vegetation Clearing Plan and a pre-clearance surveying of large trees with hollows to remove individuals prior to clearance of the trees. | No |
| **Reduce the area of occupancy of an important population** | The AOO for the Northern Brushtail Possums is estimated to be 1,392 $km^2$ (DCCEEW 2021), calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Categories and Criteria (2019). Given the large EOO of this species – estimated at over 570,000 $km^2$ – the AOO is likely larger given the low survey effort relative to the EOO.<br>Northern Brushtail Possum habitat is present within the proposed development area. The loss of some of that habitat (including large trees with potential hollows) cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the proposed development area. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Northern Brushtail Possum habitat requirements are quite broad within its distribution, habitat is not restricted to the proposed development area. Therefore, its loss will not result in a reduced AOO. | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Fragment an existing important population into two or more populations** | There are no records of the Northern Brushtail Possum within the proposed development area. Nevertheless, there is suitable habitat in the areas adjacent to the north, west and south edges of the proposed development area. Therefore, the proposal is unlikely to fragment the population into two or more populations. | No |
| **Disrupt the breeding cycle of an important population** | Direct mortality and displacement of individual Northern Brushtail Possums may cause a localised disruption to breeding cycles, due to their territorial nature and lack of a defined breeding season. Disturbance of such a small proportion of potential breeding habitat will not have a population-side impact. Nevertheless, engagement of a suitably experienced fauna spotter-catcher during vegetation clearing will further reduce the likelihood of direct mortality and a disruption to the breeding cycle. | No |
| **Adversely affect habitat critical to the survival of the species** | Critical habitat for the Northern Brushtail Possum has not been formally defined. In lieu of such, the most limiting of the species habitat requirements could be considered 'critical'. For the Northern Brushtail Possum, this is day-time shelter – large hollow-bearing trees with a food source (fleshy fruiting) midstory.<br>Such habitat occurs within 2 ha of the proposed development area, but far more broadly in the savanna woodland that dominates the region. The habitat to be removed represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species. | No |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | As discussed above, the habitat requirements for the Northern Brushtail Possum are broad – Eucalypt woodlands and forests, rainforest, riparian areas, and semi-urban environments in the Top End. Such habitat occurs within the proposed development area. However, it is also the dominant vegetation type across the population's entire range.<br>The proportion of Northern Brushtail Possum habitat present within the proposed development area compared within Bathurst Island is 0.01%. The loss of such a small area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline. | No |
| **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** | Feral Cats (as predators) and invasive grasses such as Mission Grass (with large biomasses that increase fire intensity and modify habitat) are considered current threats to Northern Brushtail Possum in the Conservation Advice (DCCEEW 2021).<br>Feral Cats are already common in the region, although densities are lower on Bathurst Island than Melville Island (Davies 2022) and development of the Project is unlikely to lead to any substantial change in their occurrence.<br>A Weed Management Plan will be developed as part of the CEMP to minimise the introduction and spread of invasive weeds during all phases of the proposal. The CEMP will be developed under the DIPL standard specification for | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| | environmental management 2.0 (available here) prior to commencement of works. | |
| **Introduce disease that may cause the species to decline** | The Conservation Advice considers disease carried by Black Rats as a potential threat to the Northern Brushtail Possum due to documented population decline from epizootic disease (DCCEEW 2021). Black Rats are existing invasive species within the possum's range, and the proposal activities are unlikely to lead to any substantial change in their occurrence. | No |
| **Interfere with the recovery of the species** | There is no Recovery Plan for the Northern Brushtail Possum. Instead, the Conservation Advice for the species is considered to provide sufficient direction to implement priority actions, mitigate against key threats and enable recovery of the species (DCCEEW 2021).<br>The Conservation Advice (DCCEEW 2021) lists four primary conservation actions:<br>• Identify and protect important habitat for the Northern Brushtail Possum from habitat loss, degradation, and fragmentation.<br>• Minimise levels of feral cat predation by managing habitat to reduce cat impacts.<br>• Manage fire to promote resources important to the species, as well as reduce risk from predation.<br>• Undertake long-term monitoring to assess changes in population status, evaluate the success of management actions, and inform adaptive management.<br>The habitat loss associated with the proposal is minimal and not within areas identified as important habitat. The small areas cleared are unlikely to interfere with the recovery of the species. | No |

***Darwin Cycad (Cycas armstrongii)***

It is unlikely that the impact to the Darwin Cycad from the proposal activities will be significant, because the species does not occur in high densities within the proposed development area, does not contain habitat critical to the survival of the species. Table 5-10 provides the assessment as defined in *EPBC Significant Impact Guidelines*.

The Darwin Cycad is listed as Vulnerable in the NT and not listed federally. The species is known to occur within the proposed development area based on a targeted survey for the species (Ecoz 2024a). However, the survey did not find any dense or high-density stands.

**Table 5-10. Significant impact assessment for the Darwin Cycad**

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in the size of an important population** | The occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. There is no evidence that the Darwin Cycads in the region constitute a key source population, or one that is necessary for maintaining genetic diversity. Moreover, the proposed development area is located within the known | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Fragment an existing important population into two or more populations** | distribution of this species, not at its limits. For these reasons, the occurrence of this species within the proposed development area is not considered an 'important' population, and these criteria do not apply.<br>Furthermore, the proposal will not result in the loss of any high-density stands of the species. | No |
| **Disrupt the breeding cycle of an important population** | | No |
| **Reduce the area of occupancy of an important population** | | No |
| **Adversely affect habitat critical to the survival of the species** | Critical habitat has not been defined for the Darwin Cycad. The species is locally abundant in suitable habitat across its distribution. The loss of such a small proportion of this habitat cannot be considered likely to have an adverse effect on the survival of the species. | No |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | Although development of the proposal will involve clearing Darwin Cycad habitat and the loss of individual plants (if not translocated), substantial areas of suitable habitat and numerous plants will still be present elsewhere on Bathurst Island. The 15.25 ha that will be cleared represents a small portion – 0.013% – of the potential 109,532 ha (DEPWS 2000) of suitable habitat for this species on Bathurst Island | No |
| **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** | The *Management Plan for Cycads of the NT* (Liddle 2009) identifies invasive grasses such as perennial Mission Grass (with large biomasses that increase fire intensity and outcompete native plants) are harmful to the Darwin Cycad. This weed has been recorded within the parts of the proposed development area.<br>A Weed Management Plan will be developed as part of the CEMP to minimise the introduction and spread of invasive weeds during all phases of the proposal. The CEMP will be developed under the DIPL *standard specification for environmental management 2.0* (available here) prior to commencement of works.<br>Ongoing control of weeds will prevent the spread of weeds that are currently present into the broader area and will be managed by the TIRC. | No |
| **Introduce disease that may cause the species to decline** | Disease is not listed as a threatening process for Darwin Cycad. EcOz ecologists are not aware of any literature on diseases that could be introduced by the proposal and that would detrimentally affect this species. | No |
| **Interfere with the recovery of the species** | There is no recovery plan or actions for this species. The *Management Plan for Cycads of the NT* (Liddle, 2009) focusses on research and wild harvesting of cycads and does not contain any recovery actions that are relevant to this development. The habitat loss associated with the proposed development area is minimal and not within areas identified as important habitat. The small areas cleared are unlikely to interfere with the recovery of the species. | |

### *Typhonium mirabile*

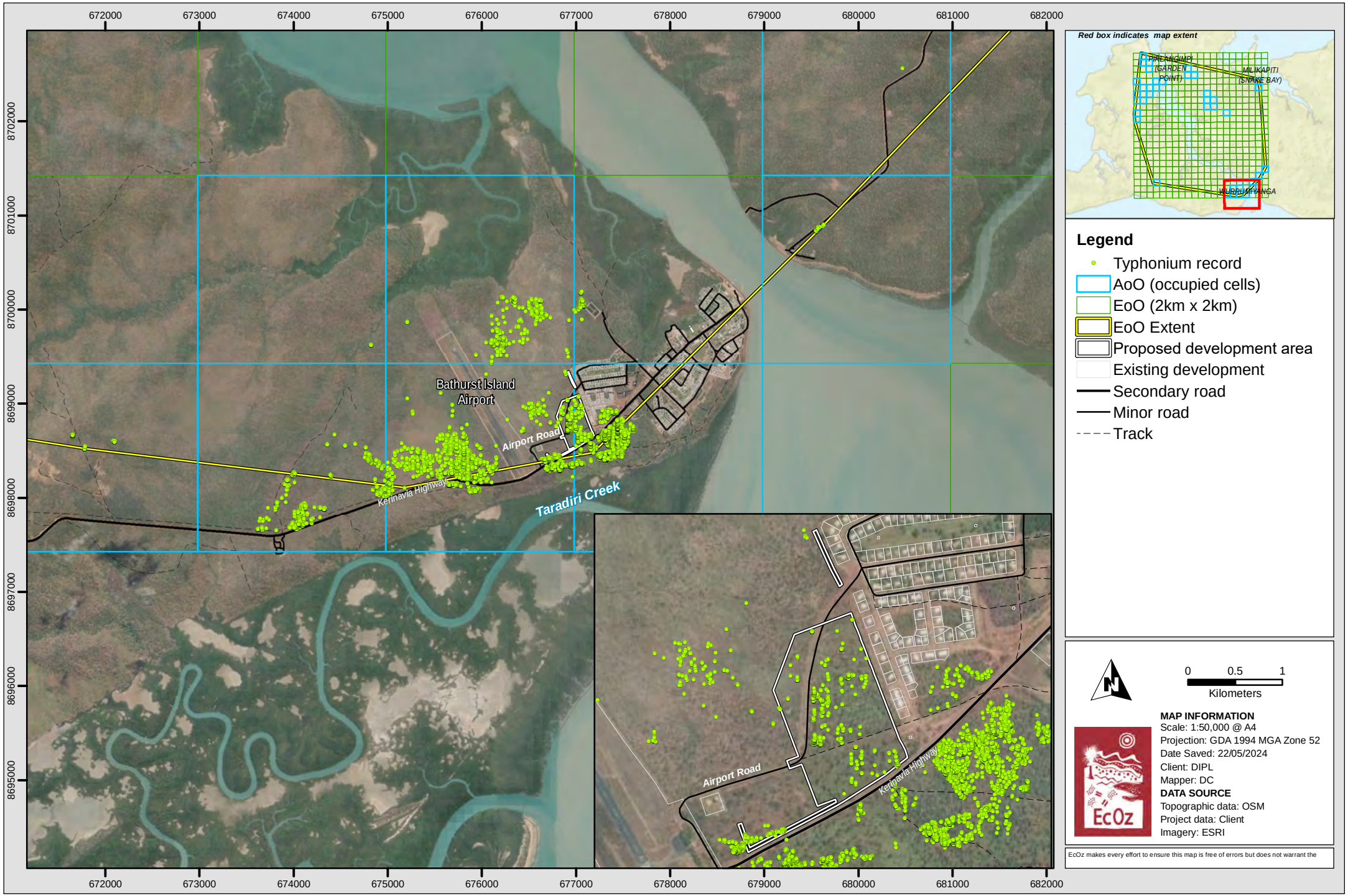
It is unlikely that the impact to the *Typhonium mirabile* from the clearing and construction will be significant to the species, because 5.25%, of at least 9,180 known records of the species in the sub-population will be impacted by the proposal, this impact would not reduce the AOO or EOO. Table 5-11 provides the assessment as defined in *EPBC Significant Impact Guidelines*.

*Typhonium mirabile* is listed as Endangered federally and in the NT. There are an estimated 15-30 sub-populations on the Tiwi Islands (DENR 2018). A subpopulation is defined as "geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange" (IUCN 2012). Sub-populations are important for conservation because genetic differences can develop between them, providing a richer gene pool for the species, therefore making the species more resilient to threats such as disease and climate change. Because sub-population are geographically distinct, they are considered 'important populations' in the *Significant Impact Guidelines 1.1* (DEWHA 2013).

**Table 5-11. Significant impact assessment table for *Typhonium mirabile***

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Lead to a long-term decrease in population size** | The number of individual *T. mirabile* estimated to be impacted by this development is 482 of a sub-population of 9,180 individuals (combination of all surveys conducted to date), or 5.25%. The loss of these individuals will result in a 5.13% decrease in the total known population of *T. mirabile* on Bathurst Island. | No |
| **Reduce in the area of occupancy of the species** | The AOO of *T. mirabile* is 148 $km^2$ (37 cells). Removal of all the known plants within the proposed development area will not reduce the AOO for this species because more records have been found outside of the footprint and within the AOO (see Figure 5-3). | No |
| **Fragment an existing population into two or more populations** | The proposal will impact 5.25% of one of the 15 to 30 known *T. mirabile* sub-populations on the Tiwi Islands. The proposed development area will not split the sub-population into two or disrupt the breeding cycle because the remaining 95% of known individuals will not be impacted and will retain connectivity within the sub-population. | No |
| **Adversely affect habitat critical to the survival of the species** | There is no specific subset of habitat that is critical to the life cycle of *T. mirabile*. Removal of <15.25 ha of high likelihood habitat within the two AOO cells that the proposed development area occupies (M_390 and M_413), compared to 76.4 ha of high likelihood habitat available within these two cells is not expected to adversely affect the species. | No |
| **Disrupt the breeding cycle of a population** | Clearing is expected to affect recruitment inside the proposed development area, but not to such an extent as to impact the sub-population. Moreover, *Typhonium* species have been recorded on historically-disturbed sites, suggesting it may be more resilient to disturbance than other threatened species. | No |
| **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** | The clearing of 15.25 ha of habitat represents approximately 20% of the available high likelihood habitat within the two cells that the proposed development area intersects. The discovery of more than 8,400 plants in the wider area of the proposed development area demonstrates that there is available habitat for this species surrounding the development area. | No |

| Criterion | Impact assessment | Significant impact identified (Yes/No) |
|---|---|---|
| **Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat** | The introduction of non-native grasses, particularly Mission and Gamba Grasses or the promotion of the native Sorghum species through changes in fire regimes may deleteriously impact *T. mirabile* (Kerrigan and Cowie 2006). Exotic grasses are already present within and adjacent to the proposed development area in large stands. | No |
| **Introduce disease that may cause the species to decline** | There are no diseases known to affect *T. mirabile*. | No |
| **Interfere with the recovery of the species** | There is no recovery plan for *T. mirabile*. | No |




Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ23143 - Wurrumiyanga Subdivision Referral\1. Project Files\2. Report Maps\Map of the updated EoO and AoO for T. mirabile - inset.mxd

**Figure 5-3. Map showing Typhonium records within and surrounding the proposed development area**

## 5.5 Conclusion

The proposal is likely to have a low residual impact to terrestrial ecosystems. The assessment found that the risk of significant impacts to all eight threatened species was low. The risk of impact from the loss of significant vegetation within the proposed development area from vegetation clearing was also assessed as low, based on its value as habitat relative to higher quality habitat in the wider area. Assuming effective implementation of the mitigation measures outlined above, the proposal is unlikely to result in material significant impacts to terrestrial ecosystems and will meet the NT EPA's objective.

**Table 5-12. Summary of terrestrial ecosystem significant impact assessment**

| Environmental value | Potential impacts and benefits | Avoidance and mitigation | Residual impact |
|---|---|---|---|
| • Vegetation and habitats<br>• Threatened flora<br>• Threatened fauna | • Direct mortality of fauna species<br>• Direct loss of threatened flora<br>• Direct loss of threatened fauna<br>• Loss of threatened species habitat<br>• Direct loss and degradation of vegetation and habitat<br>• Habitat and vegetation degradation from spread of weeds and/or imported pests | • Development and implementation of a CEMP in accordance with DIPL *standard specification for environmental management 2.0*.<br>• Conduct pre-clearance survey by suitably experienced person<br>• Engage fauna spotter catcher during clearing by suitably experienced person<br>• Erosion and Sediment Control Plan (ESCP)<br>• Weed management plan for construction and public open spaces and management of the subdivision. | **Low residual impact**<br><br>Assuming effective implementation of the mitigation measures outlined in Section 5.3, the proposal is unlikely to result in material significant impacts to terrestrial ecosystems and will meet the NT EPA's objective. |

# 6 CUMULATIVE IMPACTS

Cumulative impacts are impacts that can accumulate as a result of additive or interactive processes and actions, interactions among multiple management measures (past, present and future), a combination of multiple minor impacts over time, and activities conducted over a wider area than the proposed action, such as the activities of multiple proposals operating in a region.

The purpose of considering cumulative impacts is to determine whether environmental values could be at risk from impacts from multiple past, present, and future projects/activities, that are not apparent when the impact of the proposal is considered in isolation.

The impact assessment of terrestrial ecosystems concluded that the proposal has the potential to result in a low residual impact and therefore unlikely to result in a cumulative impact.

## 6.1 Cumulative impact focus

For assessment purposes, existing and planned projects on Bathurst Islands have been considered to provide an indication of the potential cumulative impact of land clearing across the Island because the Island is considered a SOCS. Previous assessments across the Tiwi Islands have identified the activities associated with land clearing as being a threatening process to the NT EPA objective for terrestrial ecosystems.

## 6.2 Relevant proposals

Existing or planned projects on the Tiwi Islands that the proponent is aware of, and that include land clearing activities and could contribute to cumulative impacts to terrestrial ecosystems, are discussed below.

### 6.2.1 Wurrumiyanga Solar Infill and Energy Storage Pilot Project

As previously mentioned in Section 2.5.1, the Wurrumiyanga Solar Infill and Energy Storage Pilot Project has commenced with proposed completion in April 2024. The project involves the design and construction of solar panel infrastructure (innovative 5B Maverick design) and associated battery energy storage system to provide additional source of solar energy to power the township of Wurrumiyanga. The project is being developed in the existing and previously cleared 3.6 ha Wurrumiyanga Solar Facility, which was cleared and completed in Q3 2017. No additional clearing was required for the set-up of the Wurrumiyanga Solar Infill and Energy Storage Pilot Project.

### 6.2.2 Prawn Farming Pilot Project

CSIRO and Tiwi Resources have been working together to identify a suitable location for a new prawn farm pilot site, at Wurankuwu on Bathurst Island (CSIRO 2023). Wurankuwu is located approximately 60km northwest inland from Wurrumiyanga (outside the scope of Figure 1-1). The proposed plan is to develop the pilot site over five-years, with the initial goal to build six one-hectare ponds and associated aquaculture infrastructure, with the potential to expand the project if the pilot project is deemed successful.

No referral submission or formal environmental assessment process has commenced under the *EP Act*, therefore the size of land required to be cleared for development of the project is uncertain. This project is in very early development stages.

## 6.3 Cumulative impact

***Biodiversity, ecological integrity and functioning***

The activity of land clearing is unlikely to result in cumulative impact across Bathurst Island on terrestrial ecosystem values. To date approximately <1% of Bathurst Island has been cleared for development, these

are focused in the Wurrumiyanga Township and Warankuwu Community areas. The proposed development area will result in a loss of a very small portion of intact Eucalypt woodland vegetation, this vegetation type is widespread across the island. Contextually, the proposed development area is approximately 0.005% of the overall Bathurst Island surface area. It is expected that the Prawn Farming Pilot Project and any other future proposals would require a level of environmental assessment or development approval prior to commencement of works and the cumulative impact of land clearing will be considered. However, the assumed scale of development is not expected to be significant and therefore would not result in a significant increase in land clearing across the Island, however it is uncertain with the limited information available.

### *Significant vegetation*

The proposal will result in a loss of a small area of old-growth vegetation that is likely to be used by threatened species, the presence of old-growth is widespread across the Island due to the limited development and land clearing undertaken to date. Whilst this localised loss is considered unlikely to have a significant impact on any species, it is uncertain whether the Prawn Farming Pilot Project will further contribute to loss and fragmentation of these habitat types. However, as mentioned above it is expected the project will require a level of environmental assessment or development approval prior to commencement of works. The cumulative impact associated with the existing cleared Wurrumiyanga Solar Facility is considered negligible due to the very small area cleared (<3.6ha).

### *Threatened species*

The proposal will result in a loss the plants of the threatened plant species *T. mirabile* and Darwin Cycad. Cumulative impacts to the species are unlikely to be significant as the plants are scattered, no high-density patches were recorded, and the species are known to occur widely across the Island. Surveys undertaken in the wider surrounding environment identified large, identified *T. mirabile* is widespread and common in the northern Bathurst Island area (DENR 2018), and approximately 109,532 ha (DEPWS 2000) of suitable habitat for the Darwin Cycad across the island.

Through removal of vegetation, the proposal will result in a local impact to threatened species that have the potential of utilising the area. Similarly to the threatened plant species the cumulative impacts to the species is unlikely to be significant as suitable habitat is known to occur across the Island, and secluded from existing townships and the Airport.

# 7 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

There are nine Matters of National Environmental Significance protected under the *EPBC Act* as listed in Table 7-1. An EPBC PMST search was undertaken within a 20 km buffer of the proposed development area and clipped to Bathurst Island on 20 November 2023 – see summary in Table 7-1. The PMST report is provided in at Appendix C of the terrestrial environmental report (Appendix B).

**Table 7-1. Summary of PMST results**

| Controlling provision | Quantity |
|---|---|
| World Heritage | None |
| National Heritage | None |
| Ramsar Wetland | None |
| **Threatened Species and Ecological Communities** | **50** |
| **Migratory Species** | **49** |
| Nuclear | None |
| Commonwealth Marine Area | None |
| Great Barrier Reef | None |
| Water resource in relation to large coal mining development or coal seam gas | None |

As discussed in Section 5.1.3, a likelihood of occurrence assessment (LOA) determined that three species listed as Endangered and four species listed as Vulnerable under the *EPBC Act* are either known, or highly likely, to occur within the proposed development area. Of these species, *Typhonium mirabile* is the only *EPBC Act* listed threatened species known to occur within the area. The potential for impacts to these threatened species has been considered and assessed in Section 5.4.3 of this referral report, using the criteria contained within the *EPBC Significant Impact Guidelines 1.1* (DEWHA, 2013). Assuming effective implementation of the mitigation measures outlined in Section 5.3, the assessment concludes that the proposal will not have a significant impact upon threatened species.

The EPBC PMST report identified the possibility of migratory species protected under international agreements occurring within the region. However, all of these migratory species are either not likely or have a low likelihood of occurring within the proposed development area. Many of the birds listed within the report are wetland species and/or occur almost exclusively in coastal and estuarine environments. For these species, and marine species, this proposed development area does not contain suitable habitat.

The remaining migratory species could occur within the terrestrial ecosystems within the proposed development area. However, even if individual members of some migratory species were to seasonally utilise habitat within the proposed development area, this occurrence is expected to be for a short period and in low abundances. Additionally, any migratory species utilising habitat within the proposed development area could reasonably be expected to utilise the areas of similar habitat in the region. As such, the habitat within the proposed development area is not considered to be important habitat for any migratory species.

Based on the significant impact assessment provided in Section 5.4.3, a referral under the *EPBC Act* will not be submitted to the Commonwealth DCCEEW for this proposal.

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# APPENDIX A PRE-REFERRAL SCREENING TOOL

# APPENDIX B WURRIMIYANGA SUBDIVISION ENVRIONMENTAL ASSESSMENT (ECOZ 2022)

# APPENDIX C *TYPHONIUM* SURVEY REPORT (CONNECT ENVIRONMENT 2023)

# APPENDIX D GEOTECHNICAL INVESTIGATION (DOUGLAS PARTNERS 2023A)

# APPENDIX E CONTAMINATION ASSESSMENT (DOUGLAS PARTNERS 2023B)

# APPENDIX F DARWIN CYCAD SURVEY MEMO (ECOZ 2024A)

# APPENDIX G INDICATIVE COORDINATED OF THE PROPOSED DEVELOPMENT AREA

# APPENDIX H COMMUNITY ENGAGEMENT MEMO (ECOZ 2024B)

# APPENDIX I CULTURAL VALUES AND AAPA DOCUMENTATION

(redacted for public exhibition purposes)

# APPENDIX J IMPACT ASSESSMENT REGISTER