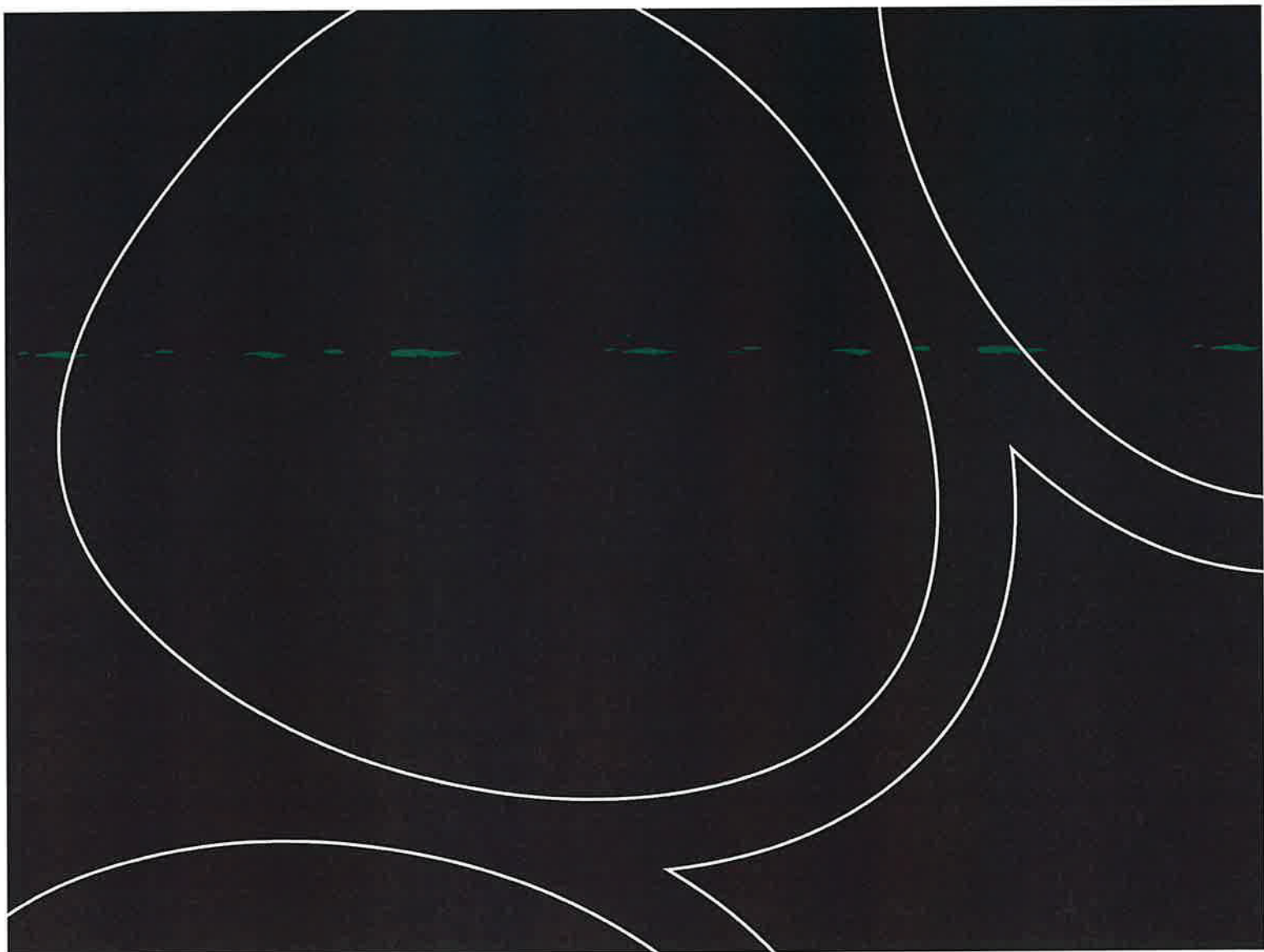


# Holtze Development Area 2025 Annual Compliance Report

Environmental Approval EP2022/022-001



<b>Document title</b>	Holtze Development Area 2025 Annual Compliance Report
<b>Approved by</b>	Nicole Conroy - Chief Environmental Scientist
<b>Date approved</b>	
<b>TRM number</b>	TRM: 20190010-19-016

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# Contents

<b>Introduction</b> .....	<b>6</b>
<b>Reporting period</b> .....	<b>6</b>
<b>Compliance with conditions</b> .....	<b>6</b>
Condition 1 – Limitations and extent of action.....	6
1.1 Compliance statement.....	6
1.2 Activities that support compliance statement.....	6
1.2.1.1 Land clearing.....	6
1.2.1.2 Typhonium Protection Area (TPA).....	6
1.2.1.3 Cycad Management Area.....	7
1.3 Non-compliance details.....	7
Condition 2 – Terrestrial ecosystems.....	8
2.1 Compliance statement.....	8
2.2 Activities that support compliance statement.....	8
2.2.1.1 Typhonium Management Plan.....	8
2.2.1.2 Cycad Management Plan.....	10
2.3 Non-compliance details.....	10
Condition 3 – Inland water environmental quality.....	10
3.1 Compliance statement.....	10
3.2 Activities that support compliance statement.....	10
3.3 Non-compliance details.....	11
Condition 4 – Community and economy.....	11
4.1 Compliance statement.....	11
4.2 Supporting evidence.....	11
4.2.1.1 Community Consultation and Complaints Handling.....	11
4.2.1.2 Noise.....	11
4.3 Non-compliance details.....	11
Condition 5 – Culture and heritage.....	11
5.1 Compliance statement.....	12
5.2 Supporting evidence.....	12
5.3 Non-compliance details.....	12
Conditions 6-10 – Administrative conditions.....	12
6.1 Compliance statement.....	12
6.2 Supporting evidence.....	14
6.3 Non-compliance details.....	14
<b>Appendix A</b>	
Typhonium Protection Area Baseline Survey Report	
<b>Appendix B</b>	
Signage for Typhonium Protected Area	

**Appendix C**

Cycad Management Plan

**Appendix D**

Holtze Headworks ESCP Site Inspection

# Endorsement

I Nicole Conway delegate of the Chief Executive Officer of the Northern Territory of Australia Department of Logistics and Infrastructure and Approval Holder of EP2022/022-001 endorse that this Compliance Report to the best of my knowledge is true and correct.

Signature: 

Date: 28.05.26

## Introduction

This Compliance Report has been prepared by the Department of Logistics and Infrastructure (DLI) in accordance with Condition 10 of Environmental Approval Number EP2022/022-001 issued pursuant to Section 69 of the *Environment Protection Act 2019* for the Holtze Development Area.

## Reporting period

This compliance report covers the period from 1 January 2025 to 31 December 2025.

## Compliance with conditions

### Condition 1 – Limitations and extent of action

#### 1.1 Compliance statement

Condition No.	Condition	Compliance statement
1	<b>Limitations and extent of action</b>	
1-1	<p>When implementing the action, the approval holder must ensure the action does not exceed the following extent:</p> <ol style="list-style-type: none"> <li>1. Land clearing – No more than 116 ha in total to be cleared within the <b>approved extent</b> shown in Figure 1. Avoid clearing <b>significant and sensitive vegetation</b> within the <b>approved extent</b>, to the maximum extent practicable.</li> <li>2. Direct disturbance of <i>Typhonium praetermissum</i> - All individual <i>Typhonium praetermissum</i> plants within the <b>Typhonium protection area</b> shown at Figure 2 must be retained and protected.</li> <li>3. Direct disturbance of <i>Cycas armstrongii</i> – No clearing of <b>very high density or high density</b> occurrences of <i>Cycas armstrongii</i> as shown at Figure 3.</li> </ol>	Compliant

#### 1.2 Activities that support compliance statement

##### 1.2.1.1 Land clearing

Approximately 12.75 ha of native vegetation was cleared in 2025, bringing the cumulative total area cleared to 17.25 ha.

##### 1.2.1.2 Typhonium Protection Area (TPA)

The TPA is a 15.8 ha fenced area, created to protect a population of the threatened plant *Typhonium praetermissum*. EcOz Environmental Consultants was engaged to conduct baseline surveys of *T. praetermissum* within the TPA. The main aim of the baseline surveys and reporting is to establish an accurate and up-to-date record of the number of plants within the TPA, to be used as a baseline to measure any future changes to the population. The baseline survey report is provided at Appendix A.

### 1.2.1.3 Cycad Management Area

In 2024, EcOz Environmental Consultants were engaged to undertake a cycad survey of the Holtze Development Area. As a result, one 'high density area' was defined (i.e. an area where cycad density is 400 to 700 stems per hectare). No 'very high density' areas were identified. The high-density area has been demarcated and referred to as the 'cycad management area'. The cycad management area has been protected from development activities by temporary fencing, installed in 2024. The management area is shown in Figure 1 below.



Figure 1 - Cycad Management Area

### 1.3 Non-compliance details

There were no non-compliances relevant to these approval conditions during the reporting period.

## Condition 2 – Terrestrial ecosystems

### 2.1 Compliance statement

Condition No.	Condition	Compliance statement
2	<b>Terrestrial ecosystems</b>	
2-1	The approval holder must implement the action to meet the following environmental objective: protect terrestrial habitats to maintain flora and fauna values including biodiversity, ecological integrity and ecological functioning.	Compliant
2-2	To support achievement of condition 2-1, the approval holder must implement the action in such a manner that: <ul style="list-style-type: none"> <li>(1) the condition of habitat within the <b>Typhonium protection area</b> for <i>Typhonium praetermissum</i> is maintained or improved;</li> <li>(2) the long-term security of <i>Typhonium praetermissum</i> plants within the <b>Typhonium protection area</b> is maintained, through implementing measures such as restrictions on land use and access;</li> <li>(3) habitat quality and condition within the <b>Typhonium protection area</b> is monitored and assessed periodically to measure the viability of the protection area and its capacity to support conservation of capacity to support conservation of <i>Typhonium praetermissum</i> and demonstrate that condition 2-2(1) is achieved;</li> <li>(4) is consistent with any <i>Typhonium praetermissum</i> regional conservation management strategy developed by the Northern Territory Government;</li> <li>(5) the long term security of retained occurrences of <b>high</b> and <b>very high density</b> <i>Cycas armstrongii</i> areas, is maintained through implementing measures such as restrictions on land use and access;</li> <li>(6) is consistent with any regional conservation strategy for woodland species developed by the Northern Territory Government; and</li> <li>(7) controls the introduction and spread of <b>declared weeds</b> and invasive exotic plants.</li> </ul>	Compliant

### 2.2 Activities that support compliance statement

#### 2.2.1.1 Typhonium Management Plan

The Typhonium Management Plan, developed in 2024, provides guidance on the long-term management of the TPA. Key tasks conducted throughout 2025, in accordance with the management plan include maintaining fencing, weed and fire control.

#### Fencing

DLI contract managers confirmed that no construction activities have encroached on the TPA since the fencing was installed. Appendix B shows signage that has been installed on fencing.

#### Weed Management

In April 2025, DLI supported the Department of Lands Planning and Environment (DLPE) Crown Lands Division to deliver a one-off weed control treatment targeting declared species selective spot spraying on the boundary of the Protection Area. Figure 1, below, shows the location of weed treatment.

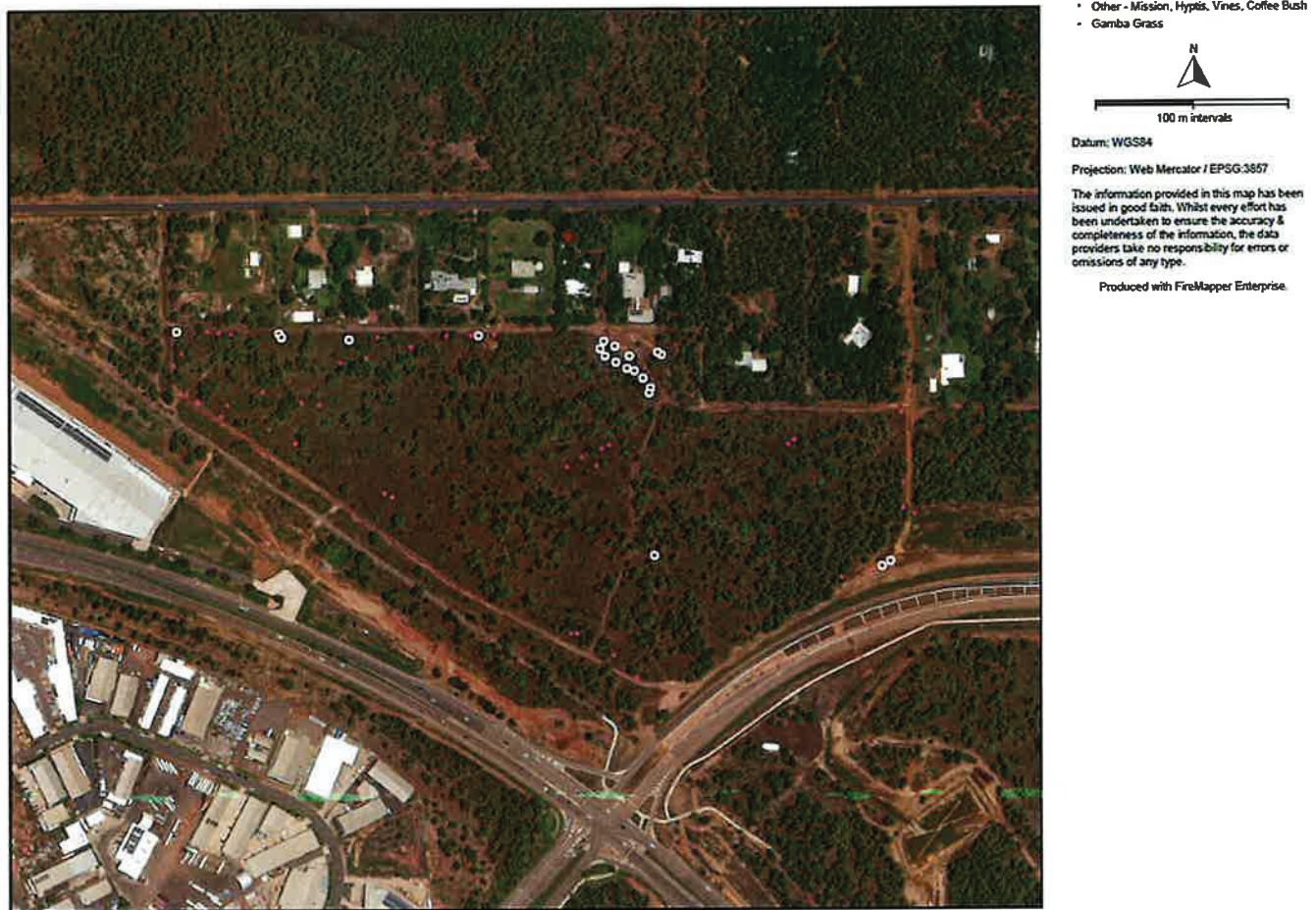


Figure 2 - Weed Treatment Sites

### Fire Management and Mitigation

During the site assessment, multiple fallen trees and overhanging vegetation from adjacent residential properties were observed to obstruct firebreaks along the northern boundary. These obstructions could significantly restrict both routine land management and emergency firefighting access. Crown Lands Management ensured ongoing maintenance of firebreaks to ensure compliance with legislative requirements prior to 1 June each year, including:

- Slashing to a minimum width of 8 metres; and
- Maintaining grass height below 50 mm.

The TPA has undergone late wet season (April) or early dry season (May) burns annually over the past 7 years under contractual arrangements. The recent Survey indicates that Typhonium populations persist and may be increasing under the existing burn regime, suggesting that current practices have not adversely impacted the species. However, extending the interval between burns may result in the accumulation of surface and near-surface fuel loads, increasing radiant heat intensity during fire events and potentially impacting underground corm structures.

Based on these considerations, the following management measures have been adopted by DLPE Crown Lands Division:

- A maximum burn interval of 1–2 years; or
- Late wet season (April)/ early dry season burns (May) continue as the preferred approach.

These actions align with fuel load management legislative obligations under the *Fire and Emergency Act 1996*.

### 2.2.1.2 Cycad Management Plan

In 2025, EcOz Environmental Consultants were engaged to prepare a cycad management plan for the cycad management area (presented in Appendix C).

## 2.3 Non-compliance details

There were no non-compliances relevant to these approval conditions during the reporting period.

## Condition 3 – Inland water environmental quality

### 3.1 Compliance statement

Condition No.	Condition	Compliance statement
3	<b>Inland water environmental quality</b>	
3-1	<p>The approval holder must prepare an Erosion and Sediment Control Plan (ESCP) prior to <b>substantial implementation</b> that:</p> <ul style="list-style-type: none"> <li>(1) has been developed by a Certified Professional in Erosion and Sediment Control (CPESC) in accordance with International Erosion Control Association (IECA) 2008 <i>Best Practice Erosion and Sediment Control</i> document; and</li> <li>(2) provides detail of the design, implementation, monitoring, maintenance and removal of erosion, sediment and drainage controls in all exposed soil areas during construction;</li> <li>(3) reviewed by a CPESC within 12 months of <b>substantial implementation</b>, or at any time if:                             <ul style="list-style-type: none"> <li>a. ongoing monitoring identifies a failure of the ESCP; or</li> <li>b. an accelerated or changed work program is required.</li> </ul> </li> </ul>	Compliant

### 3.2 Activities that support compliance statement

The 2024 compliance report confirmed that condition 3-1(1) and (2) have been satisfied. No further action is required.

On 21 January 2025, a CPESC reviewed the site ESCP and conducted a site inspection. The site inspection report is provided at Appendix D. As a result of the inspection the ESCP was updated as detailed in Holtze Headworks ESCP, drawing date 13/02/2025, CPESC number – 9681.

### 3.3 Non-compliance details

There were no non-compliances relevant to these approval conditions during the reporting period.

## Condition 4 – Community and economy

### 4.1 Compliance statement

Condition No.	Condition	Compliance statement
4	<b>Community and economy</b>	
4-1	<p>The approval holder must implement measures, to mitigate construction noise and vibration, that meet:</p> <ul style="list-style-type: none"> <li>(1) construction noise management levels established using the Northern Territory Noise Management Framework Guideline (NT EPA 2018);</li> <li>(2) vibration criteria established using the Assessing vibration: a technical guideline (NSW Department of Environment and Conservation 2006) (for human exposure);</li> <li>(3) BS 7385 Part 2-1993 “Evaluation and measurement for vibration in buildings Part 2” as applicable to Australian conditions; and</li> <li>(4) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage).</li> </ul>	Compliant
4-2	In addition to the performance outcomes, commitments and mitigation measures specified in the <b>referral</b> , all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the construction and operation of the action.	Compliant

### 4.2 Supporting evidence

#### 4.2.1.1 Community Consultation and Complaints Handling

The contractor’s construction and environmental management plan (CEMP) was provided with the 2024 annual compliance plan. The CEMP section 7 Community Consultation and Complaints Handling includes details on the recording and handling of complaints. This procedure relates to any complaints and is a tool for gauging compliance with condition 4-1 and 4-2.

#### 4.2.1.2 Noise

A noise complaint was recorded from a nearby resident during May 2025, attributed to a beeping noise from construction trucks. An investigation identified that the cause was a reversing alarm, which is an important requirement under Work Health and Safety Regulations. The noise complaint was resolved by ensuring that the contractor adhered to approved hours, in accordance with NT EPA guidelines.

### 4.3 Non-compliance details

There were no non-compliances relevant to these approval conditions during the reporting period.

## Condition 5 – Culture and heritage

## 5.1 Compliance statement

Condition No.	Condition	Compliance statement
5	<b>Cultural and heritage</b>	
5-1	<p>Prior to <b>substantial implementation</b>, the approval holder must:</p> <ul style="list-style-type: none"> <li>(1) undertake further archaeological investigation and review within the proposal area in proximity to Mitchell Creek (in the southern part of Section 4231); and</li> <li>(2) implement to the extent practicable, the outcomes of the archaeological investigation and review, including recommendations for measures to avoid or minimise disturbance to Aboriginal heritage places or objects where objects are found to be present.</li> </ul>	NA
5-2	<p>The scope of works for the further archaeological investigation and review required by condition 5-1(1), must:</p> <ul style="list-style-type: none"> <li>(1) include protocols for the survey, a review of mitigation measures and provisions to recommend new mitigation measures, if required; and</li> <li>(2) be developed in consultation with, and to the satisfaction of, the Heritage Branch of DTFHC.</li> </ul>	NA

## 5.2 Supporting evidence

Conditions 5-1 (1) and (2) and 5-2 (1) and (2) were addressed in the 2023 Compliance Report and are now closed out.

## 5.3 Non-compliance details

There were no non-compliances relevant to these approval conditions during the reporting period.

## Conditions 6-10 – Administrative conditions

### 6.1 Compliance statement

Condition No.	Condition	Compliance statement
6	<b>Commencement of action</b>	
6-1	This approval expires five (5) years after the date on which it is granted, unless <b>substantial implementation</b> has commenced on or before that date.	NA
6-2	Within 10 business days of <b>substantial implementation</b> of the action the approval holder must provide notification in writing to the <b>Minister</b> .	NA
7	<b>Completion of action</b>	
7-1	The approval holder must provide notification in writing to the <b>Minister</b> within 10 business days of <b>completion of the action</b> .	NA
8	<b>Change of contact details</b>	

8-1	The approval holder must provide notification in writing to the <b>Minister</b> of any change of its name, physical address or postal address for the serving of notices or other correspondence within 10 business days of such change.	NA
<b>9</b>	<b>Staging, combining and updating plans or programs</b>	
9-1	The approval holder may: <ul style="list-style-type: none"> <li>(1) prepare and submit any plan or program required by this approval on a staged basis (if a clear description is provided as to the specific stage and scope of the action to which the plan or program applies, the relationship of the stage to any future stages and the trigger for updating the plan or program);</li> <li>(2) combine any plan or program required by this approval (if a clear relationship is demonstrated between the plans or programs that are proposed to be combined); and</li> <li>(3) update any plan or program required by this approval (to ensure the plans and programs required under this approval are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the action)</li> </ul>	Compliant
9-2	Updated plans or programs supersede the previous versions of them and must be implemented in accordance with the conditions of this approval that require the plan or program.	Compliant
<b>10</b>	<b>Annual compliance reporting</b>	
10-1	The approval holder must provide an annual compliance report to the Minister for the purpose of determining whether the conditions of this environmental approval are being complied with.	Compliant
10-2	Unless a different date or frequency is approved by the Minister, the first annual compliance report must be submitted by 30 April addressing the period of the preceding calendar year from 1 January to 31 December, and subsequent reports must be submitted annually from that date.	Non-compliant
10-3	Each annual compliance report must be endorsed by the approval holder, or a person approved by approval holder to be delegated to sign on the approval holder's behalf.	Compliant
10-4	Each annual compliance report must: <ul style="list-style-type: none"> <li>(1) state whether each condition of this approval has been complied with, including: <ul style="list-style-type: none"> <li>a. exceedance of any limits and extents;</li> <li>b. achievement of environmental objectives;</li> <li>c. requirements to implement the action;</li> <li>d. monitoring requirements; and</li> <li>e. reporting requirements.</li> </ul> </li> <li>(2) include the results of monitoring (inclusive of any raw data) in order to demonstrate compliance with the each condition of this approval;</li> <li>(3) provide evidence to substantiate statements of compliance, or details of where there has been a non-compliance;</li> <li>(4) include the corrective, remedial and preventative actions taken in response to any potential non-compliance; and</li> <li>(5) be provided in a form suitable for publication online by the <b>DEPWS</b>.</li> </ul>	Compliant
<b>11</b>	<b>Provision of environmental data</b>	
11-1	All environmental monitoring data required to be collected or obtained under this environmental approval and the approval holder's commitments, standards and	Compliant

	management plans must be retained by the approval holder for a period of not less than 10 years commencing from the date that the data is collected or obtained.	
11-2	The approval holder must, as and when directed by the Minister, provide any environmental data (including sampling design, sampling methodologies, empirical data and derived information products such as maps) relevant to the assessment of the action and implementation of this environmental approval, to the Minister in the form and manner and at the intervals specified in the direction.	NA

## 6.2 Supporting evidence

Condition 6-1 and 6-2 – As compliance was reported in the 2024 compliance report, these conditions are no longer applicable.

Condition 9-1 (1), (2) and (3) have been addressed for Part A and Part B construction works.

DLI Land Servicing and Engineering as the agency delivering the Part A and B construction works will be responsible for record keeping and data collection. An NTG Content Manager folder has been set up for the collection of this data. TRM File – Part A: LPD10172 and Part B: LPD10242. Data will be held and be available on request which meets condition 11-1 and 11-2.

## 6.3 Non-compliance details

### *Non-compliance against Condition 10-2*

DLI did not submit the 2025 annual compliance report by 30 April 2026. This oversight is administrative in nature, and has not impacted the environmental outcomes relevant to this environmental approval.

## Appendix A

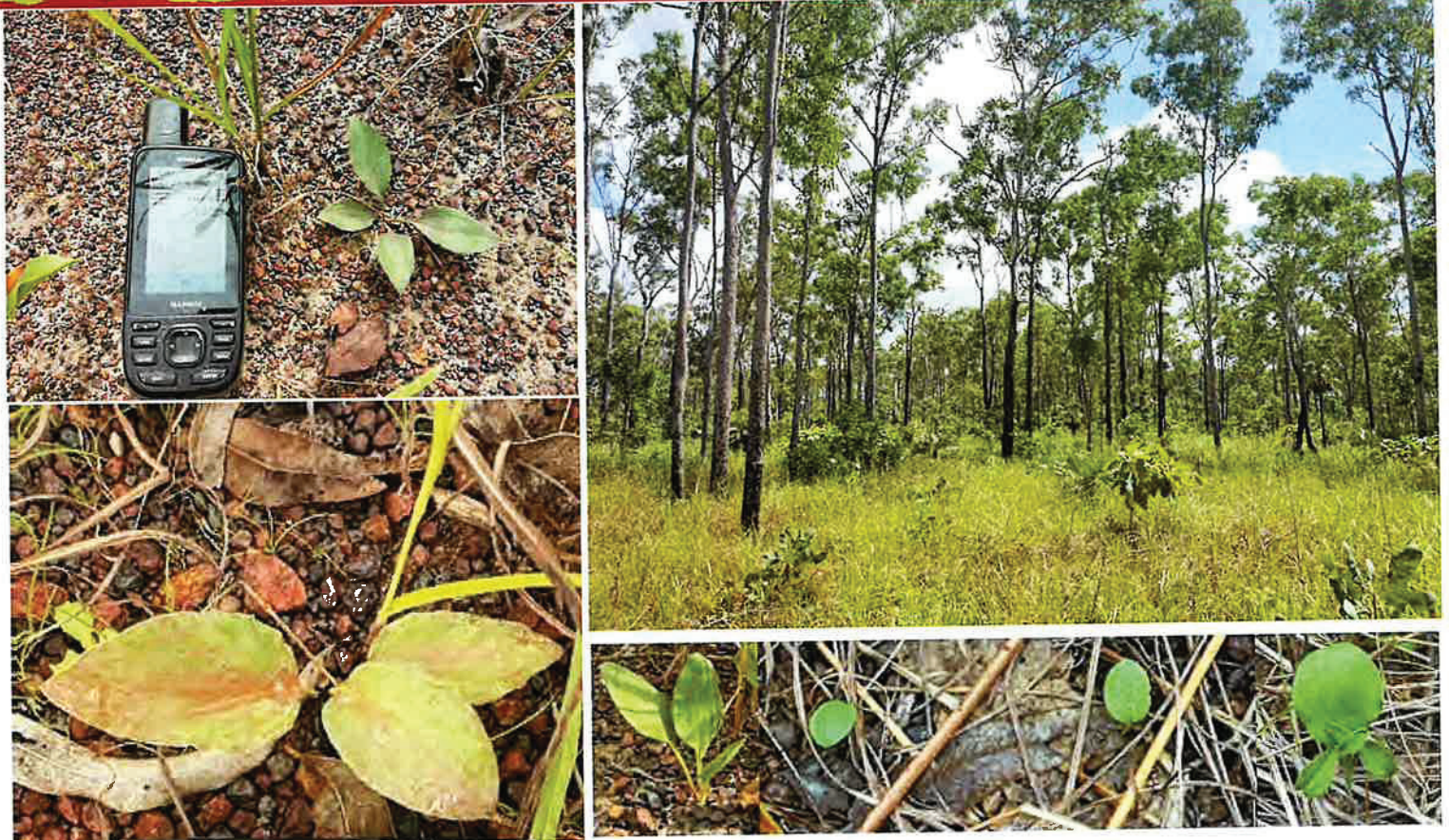
### Typhonium Protection Area Baseline Survey Report





# *Typhonium* Protection Area – Baseline Survey Report

DEPARTMENT OF LOGISTICS AND  
INFRASTRUCTURE



# DOCUMENT CONTROL RECORD

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# TABLE OF CONTENTS

1	INTRODUCTION .....	1
2	ECOLOGY.....	2
3	METHODS.....	5
3.1	Reference sites .....	6
3.2	Detection survey.....	7
3.3	Abundance survey.....	8
3.4	Survey effort (tracks).....	8
3.5	Genetic and morphology sampling.....	9
3.6	Site condition.....	9
4	RESULTS.....	9
4.1	Survey results.....	9
4.2	Site condition.....	14
4.3	Fire, weeds, feral animals and other anthropogenic disturbances .....	16
5	DISCUSSION .....	16
6	RECOMMENDATIONS .....	22
7	REFERENCES .....	23

## Tables

Table 3-1.	TPA survey summary for 2025 .....	8
Table 3-2.	Reference site survey summary for 2025.....	8
Table 3-3.	Survey effort in study sites .....	8
Table 4-1.	Total number of plant records (i.e. from abundance surveys).....	9
Table 4-2.	Detection and abundance data.....	10
Table 4-3.	Incidental weeds detected in survey sites .....	16
Table 5-1.	Table of previous survey results within TPA.....	18

## Figures

Figure 2-1.	Map of TPA and reference site locations .....	3
Figure 2-2.	Photograph of suitable habitat of <i>T. praetermissum</i> (Reference site 2).....	4
Figure 2-3.	Photograph of <i>T. praetermissum</i> observed in the TPA .....	4
Figure 2-4.	Photograph of <i>T. praetermissum</i> (2 plants) observed in Reference site 2 .....	4
Figure 3-1.	Graph of rainfall (Jan – Mar) and survey start dates .....	6
Figure 4-1.	Map of <i>T. praetermissum</i> abundance within TPA .....	11
Figure 4-2.	Map of <i>T. praetermissum</i> abundance within Reference site 1 .....	12
Figure 4-3.	Map of <i>T. praetermissum</i> abundance within Reference site 2 .....	13
Figure 4-4.	Photograph of TPA.....	14
Figure 4-5.	Photograph of RS1.....	15
Figure 4-6.	Photograph of RS2.....	15
Figure 4-7.	Photographs showing vegetation change over the survey period within TPA.....	16
Figure 5-1.	Graph of monthly total rainfall (mm) at Darwin Airport and number of plant records per month in the TPA.....	17

Figure 5-2. Average density of <i>T. praetermissum</i> plants within the TPA.....	20
Figure 5-3. Abundance variation during survey within the TPA.....	21

## Appendices

Appendix A	Site condition photographs
Appendix B	Plant morphology photographs
Appendix C	Soil surface photographs

## Acknowledgements

Nicholas Cuff, Chief Botanist, NT Herbarium, provided advice on the aims and methodology of the survey.

DRAFT

# 1 INTRODUCTION

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The Typhonium Protection Area (TPA) is a 15.8 ha fenced area, approximately 1 km north-west of Palmerston Regional Hospital, created to protect a population of the threatened plant *Typhonium praetermissum*. The TPA lies within the Holtze Development Area, a 202 ha urban development proposed by the Northern Territory Government. The Environmental Approval for this development (EP2022/022 – 001) requires the long-term protection of the species through the creation and maintenance of the TPA. The Typhonium Management Plan (TMP), developed in 2024, provides guidance on the long-term management of the TPA.

The NT Department of Infrastructure, Planning and Logistics engaged EcOz Environmental Consultants to conduct baseline surveys of *Typhonium praetermissum* within the TPA. The main aim of the baseline surveys and reporting is to establish an accurate and up-to-date record of the number of plants within the TPA, to be used as a baseline to measure any future changes to the population. Because the pattern of annual emergence for this species is not fully understood, it was important to measure the variability in abundance of the species over a single wet season (intra-seasonal variability), with future surveys recommended to measure the abundance over successive years (inter-seasonal variation). Another aim was to analyse the relationship between detection and abundance surveys – the two primary survey methods for *Typhonium praetermissum* – to determine whether a detection survey alone can be used to estimate abundance. A final aim was to evaluate the suitability of two reference sites for *Typhonium praetermissum*, to be used to contextualise future survey results within the TPA.

In summary, this report presents:

- Results of 2025 baseline surveys of the TPA and two reference sites for *Typhonium praetermissum*.
- The intra-seasonal variability of *Typhonium praetermissum* within the TPA and two reference sites.
- Analyses of the data from detection and abundance surveys to better understand how the relationship between these two survey techniques may be used to improve efficiency in surveying for this species in the TPA.
- An evaluation of the suitability of two reference sites for on-going monitoring of the TPA.
- Recommendations of methods for future surveys, including suggestions for measuring inter-seasonal variability.

The long-term nature of the TPA and its monitoring requirements present an opportunity to better understand this cryptic species. Lessons learnt will not only improve monitoring within the TPA, but also survey methods and conservation strategies for *Typhonium praetermissum* more generally.

## 2 ECOLOGY

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*Typhonium praetermissum* is a small, geophytic perennial herb that is endemic to the Greater Darwin region. The species is listed as Vulnerable under the *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act). It is not listed currently under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) but has been nominated for listing as Endangered. The outcome of this nomination is expected in late November 2025.

*Typhonium* species are seasonally dormant during dry conditions, emerging from underground corms after onset of sufficient rain during the wet season. For *T. praetermissum*, this is generally between November and April with the emergence of blue-green, slightly leathery leaves and a solitary inflorescence that may appear with, or before the leaves emerge (Bickerton et al. 2020; Holmes et al. 2005) – see Figure 2-3 and Figure 2-4. The inflorescence is a dark purple-black spathe with prominent constriction, with a maroon-black appendix and club-shaped neuter organs situated immediately above the pistils (DEPWS 2024). Flowering events occur for a short period in November – December, whereas fruiting occurs January to February (NTH 2013).

*Typhonium praetermissum* occurs in relatively open (unshaded) *Eucalyptus miniata* and *E. tetradonta* woodland with characteristic red-brown clay or gravelly lateritic soils supporting less than 20% vegetation cover (DENR 2012, NTH 2013) – see Figure 2-2. The distribution of this species extends from Gunn Point, south to Lake Bennett and west to the Cox Peninsula. Within this distribution, sub-populations of the species have been identified based on their isolation from one another due to physical barriers, such as distance and intervening land characteristics (Cuff & Green 2019). Furthermore, sub-populations have become disconnected due to urbanisation and industry.

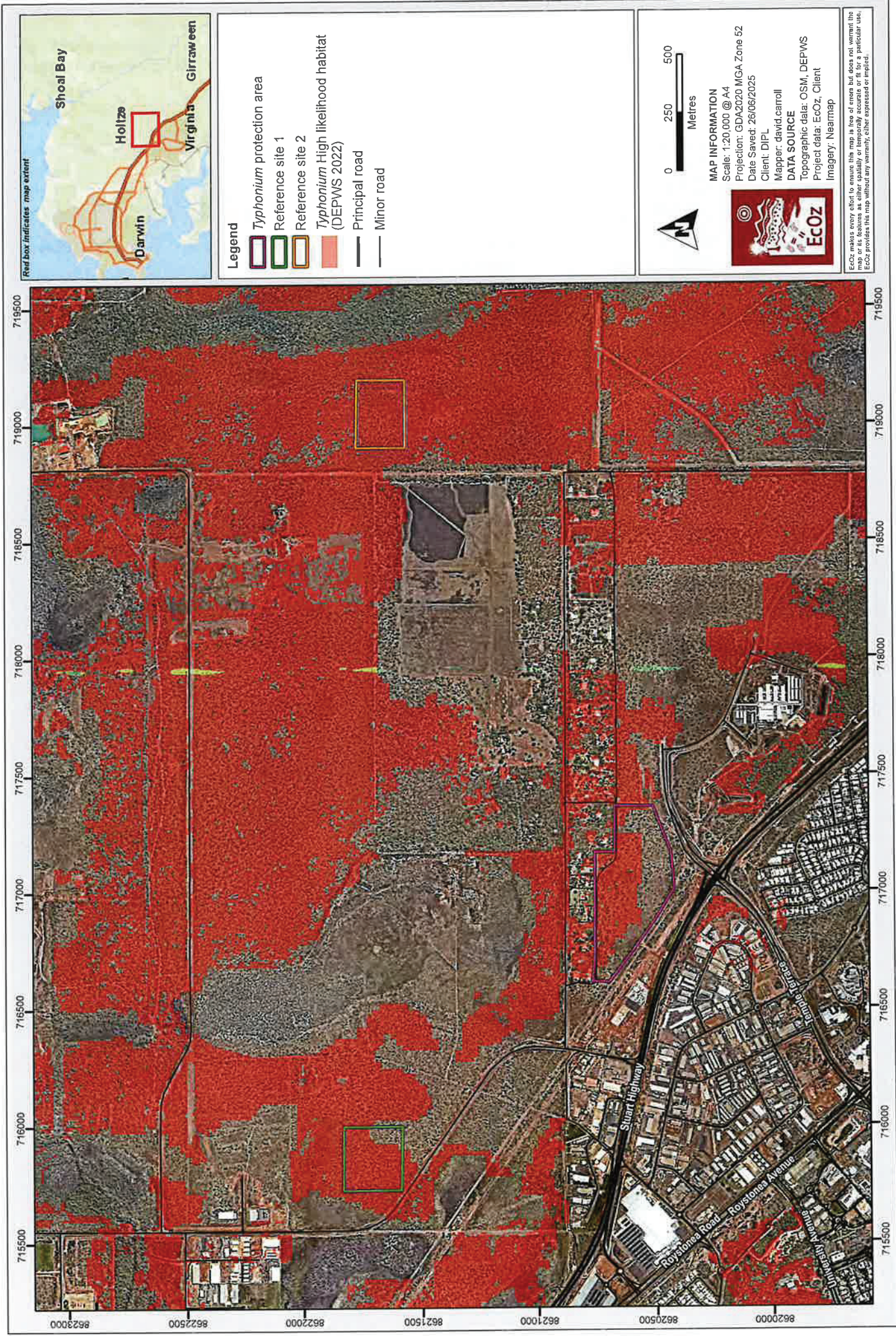
The *Typhonium praetermissum* plants within the TPA are part of the Holtze sub-population. Prior to the 2025 surveys, there were 673 known records of *Typhonium praetermissum* within the Greater Holtze area, a 3,269 ha area stretching from near Pinelands in the west, to Howard Springs Nature Park in the east, and including the suburbs of Holtze and Kowandi. Within the TPA – also prior to the 2025 surveys – there are 163 records of this species (Flora Atlas 2025), detected between 2015 and 2021. All these records are the result of multiple surveys in different locations over many years and do not represent a comprehensive study of *Typhonium* within the Greater Holtze area.

Several threatening processes impact this species including:

- Habitat loss, fragmentation and direct mortality due to land clearing.
- The spread of introduced grass species such as Gamba Grass (*Andropogon gayanus*) and Mission Grasses (*Cenchrus polystachios* and *Cenchrus pedicellatus*). These high biomass grasses are known to hinder recruitment of native herbaceous flora as well as increase fuel loads and fire intensities, potentially reducing *T. praetermissum* habitat quality (DENR 2012).
- Digging / foraging by feral animals such as Feral Pigs (*Sus scrofa*) (DENR 2012).

The Department of Environment, Parks and Water Security (DEPWS) developed a habitat model for *Typhonium praetermissum* for the Greater Darwin region (Cuff & Green 2019, updated in 2022). High likelihood modelled habitat is included in Figure 2-1.

Climatic conditions (such as rainfall) influence the occurrence and phenology of *Typhonium* plants. As *Typhonium praetermissum* only emerges during the wet season, rainfall (water availability) is a vital environmental factor that may determine the emergence of the species.



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 Layout: Figure 2-1 - Map of TPA and Reference site locations

Figure 2-1. Map of TPA and Reference site locations



Figure 2-2. Photograph of suitable habitat of *T. praetermissum* (Reference site 2)



Figure 2-3. Photograph of *T. praetermissum* observed in the TPA

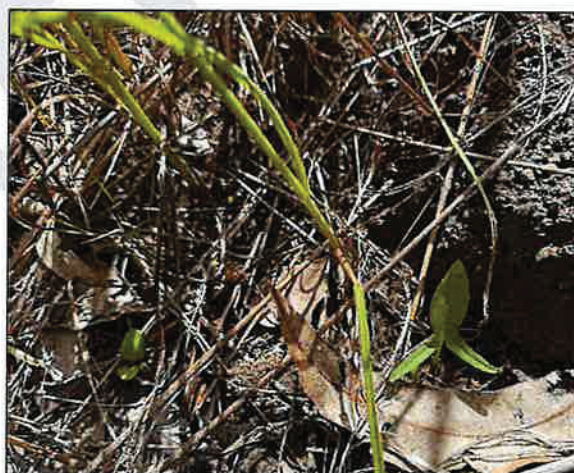


Figure 2-4. Photograph of *T. praetermissum* (2 plants) observed in Reference site 2

### 3 METHODS

---

Survey methodology followed the protocols outlined within the DEPWS *Typhonium* Survey Guidelines (Bickerton et al. 2020). Adaptations were made, in consultation with the NT Herbarium, to meet additional requirements of the survey; namely, to measure intra-seasonal variability, and to compare the accuracy of detection versus abundance surveys in measuring population sizes (Nicholas Cuff, Chief Botanist, pers. coms 19 December 2024).

Further changes to the methodology were made due to logistical constraints arising during field work. Delays in approval of the reference site locations meant that the first round of reference site surveys (detection and abundance) was not undertaken. In addition, only abundance surveys were undertaken in the second and third survey rounds (February and March) for all sites, to reduce survey time. More detail about these changes is provided below and discussed later in the report. Survey effort is described in Table 3-3.

The DEPWS *Typhonium* Survey Guidelines (Bickerton et al. 2020) state:

- *Timing of surveys are to ensure maximum detectability (i.e. after favourable rainfall, when flowering and/or adequate leaf tissue is available).*

The baseline surveys took place in three rounds – starting 20 January, 17 February and 17 March, respectively. The two reference sites were surveyed in the February and March rounds only. Surveys generally occurred after rainfall (see Figure 3-1); however, the need to undertake three rounds of surveys during one season limited flexibility of timing.

- *Undertaking the surveys within areas identified as having a high likelihood of occurrence based on the habitat models.*

Detection surveys were conducted within the entire area of the TPA and both reference sites and were not restricted to high likelihood modelled habitat within the project area.

- *Splitting the surveys into three stages.*
  - *A reconnaissance survey to inform the detection survey area.*
  - *A detection survey for determining presence/absence and distribution across the site.*
  - *An abundance survey to count plants to estimate local population size*
- *Spacing survey transects according to stage and detection probability in different vegetation communities:*
  - *Detection surveys used transects spaced 17 m apart (utilises a wider transverse width than abundance surveys, allowing for reduced survey intensity).*
  - *Abundance surveys used transects spaced 5 m apart (utilises a narrower transverse width than detection surveys, allowing for greater detection of individual plants).*

For the January detection survey in the TPA, transects were spaced 17 m apart across the whole area, followed by an abundance survey spaced 5 m apart within a 50 m buffer area around any plant records.

For the February and March surveys in the TPA, RS1 and RS2, abundance surveys using 5 m transects were conducted in the 50 m buffered area and 15 m transects were walked in the remainder of the area. This method reduced the detection survey transects from 17 m to 15 m, which allowed detection survey results from within the abundance survey area to be calculated retrospectively from the abundance survey results. More detail on method is provided in Sections 3.2 and 3.3.

- Undertaking the surveys on clear days when wind or rain do not affect visibility.

Where possible, days of forecast high rainfall or wind were avoided. During January, *Heteropogon triticeus* (Giant Speargrass) was still relatively sparse and short, improving the detectability of *Typhonium praetermissum* plants. However, as *Heteropogon triticeus* grew taller and denser throughout the wet season (photographs of growth progress shown in Appendix A), *Typhonium praetermissum* detectability may have been affected.

- Undertaking reconnaissance surveys at appropriate reference sites (one or more) where existing populations are known to occur, prior to conducting intended surveys. This allows surveyors to determine detectability at proposed survey time.

Reconnaissance surveys were conducted at the TPA, RS1 and RS2 prior to surveys, as well as a third potential reference site (RS3). The reconnaissance survey was used to determine whether plants were present and detectable (i.e. emergent) at each site and were also an opportunity to evaluate the quality of habitat and to ground-truth reference site boundaries. As a result, one potential reference site (RS3) was excluded from further study in favour of RS1 and RS2, and the boundaries of RS1 were moved to include a greater area of suitable habitat.

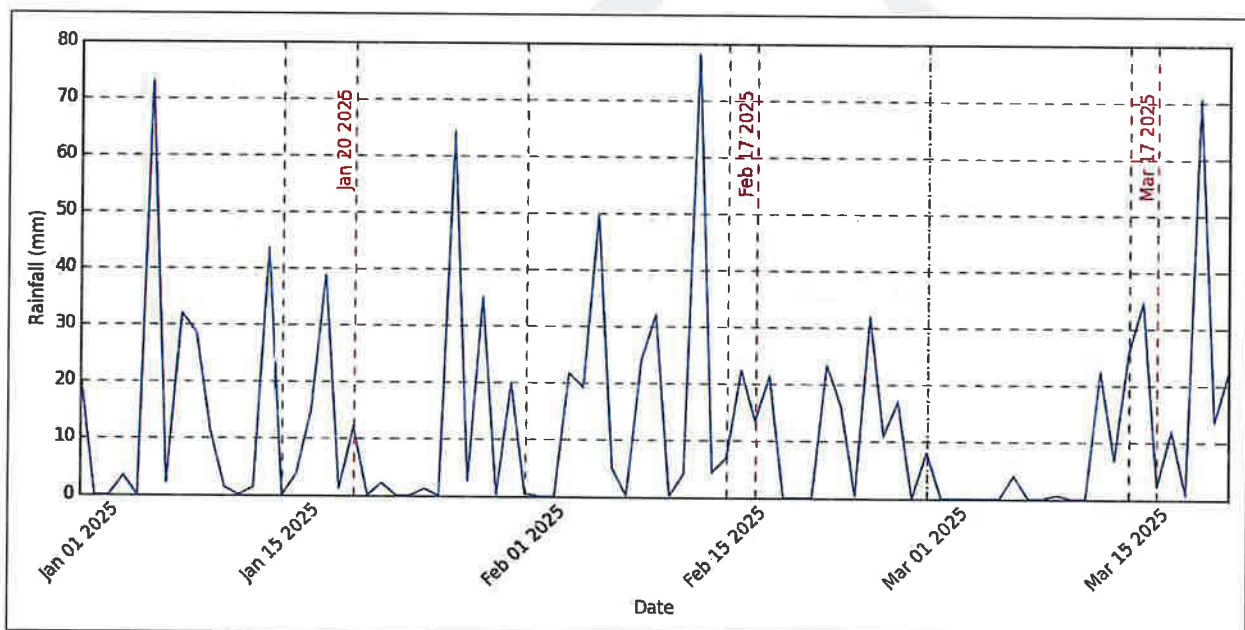


Figure 3-1. Graph of rainfall (Jan – Mar) and survey start dates

### 3.1 Reference sites

Two reference sites were included in the baseline surveys to determine if temporal trends in abundance within the TPA are reflected in surrounding populations (Figure 2-1). The reference sites were chosen based on several factors, including similar environmental values, known records of *Typhonium praetermissum* plants in moderate to high densities, and distance from the TPA. The sites were initially chosen through desktop research, and the results were approved by Nicholas Cuff (Chief Botanist, NT Herbarium) and Dr. Caroline Chong (Threatened Species Scientist, Flora and Fauna Division) (pers. comm. 23 January 2025). The sites were based upon the following:

- Same land unit as the TPA – both sites are within the 3c land unit (flat to gently undulating upland surface; gradient 0 to 2%; deep red massive earths, minor yellow massive earths: Eucalypt open forest) (NTG 2015).
- Similar land use history and condition (for more detail, refer to Section 3.6).
- Location – within a 2 km radius of the TPA, to ensure the plants surveyed in the reference sites are of the same sub-population and subject to similar localised weather conditions.
- Potential for long-term access and secure from future development.
- Existence of recent records.

During the reconnaissance for these two sites, the boundaries of one site was changed slightly to include apparent habitat with more previous records. The final sites chosen for surveys were:

- Reference site 1 (RS1) – a 6.6 ha area, 1.5 km north-west of the TPA, within the southern end of Sections 7864 and 4228, and accessed via Thorngate Road.
- Reference site 2 (RS2) – a 5.9 ha area, 2 km north-east of the TPA, within Section 4225, and accessed via Taylor Road.

The International Union for the Conservation of Nature (IUCN) defines sub-populations of threatened species as 'geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange' (IUCN 2012). The primary pollination vector for many *Typhonium* species in the Greater Darwin region is thought to be Rove beetles from the Family Staphylinidae. The mobility of these insects is not documented; however, it is not likely that the insects would travel more than two kilometres (Cuff & Green 2019). Therefore, genetic exchange between *Typhonium* populations separated by 2 km or separated by physical barriers that would impede these pollinators is likely to be restricted. Dispersal of *Typhonium praetermissum* may be limited given the clustered occurrence of plants observed in the field, the lack of evidence of long-distance dispersal by animal vectors, and fruit/seed distribution indicating that gravity and water movement are the primary dispersal mechanisms (Cuff and Green 2019).

*Typhonium praetermissum* records are assumed to belong to the same sub-population if they occur within continuous and intact suitable habitat with a maximum separation distance of 2.5 km (Cuff & Green 2019). Sub-population extents are increasingly refined as survey effort and genetic analysis data of the genus becomes available.

The *Typhonium praetermissum* records previously recorded in the study area are part of the Palmerston and Holtze sub-population. Because of the proximity between records, it is likely that all *Typhonium praetermissum* plants detected as part of the 2024 survey are also part of this sub-population.

## 3.2 Detection survey

Ecologists Nerida Liddle and Liezl Brand conducted a detection survey on 20 and 21 January 2025 across the entire TPA. The survey used transect lines spaced 17 m apart with surveyors using a handheld GPS to navigate along each transect and recording a GPS waypoint where *Typhonium praetermissum* plants were detected. Each surveyor effectively covered a 2 m width on either side of each transect line (4 m wide transect). This transect width is based on the average distance that can be reliably observed, considering vegetation cover.

Detection surveys were conducted during January throughout the entire TPA. To increase efficiency for future detection surveys, a 50 m buffer was created around plants detected during the January TPA survey to delineate the most appropriate areas to survey for abundance (the abundance study area). For each subsequent detection survey, transects were spaced 15 m apart. This spacing aligned with the 5 m abundance transects and meant that detection survey data inside the abundance study area could be calculated from abundance survey data and detection survey transects were only conducted outside of the abundance survey area.

Detection and abundance surveys were not conducted in the two reference sites during January. However, reconnaissance surveys were conducted in these sites at this time to determine the habitat quality and *Typhonium praetermissum* presence.

### 3.3 Abundance survey

A 50 m buffer was applied around each previous *Typhonium* record collected during the reconnaissance and detection survey. These buffers were amalgamated, thus defining the area for the abundance survey. Transect lines at 5 m spacing were overlaid onto the abundance survey area and uploaded to a handheld GPS for field reference. Transect lines were then navigated in the field, with surveyors walking adjacent transects at a similar pace to each other. Due to the closer transect placement, approximately 80% coverage of the survey area was achieved. A GPS waypoint was recorded for each plant observed (where multiple plants occurred in one location, a single GPS waypoint was recorded with a note of the number of plants encountered).

Only abundance surveys were conducted in the reference sites (starting from February). Table 3-1 and Table 3-2 present the survey method summary conducted for Year 1 for the TPA and reference sites.

**Table 3-1. TPA survey summary for 2025**

TPA		
Survey month	Survey conducted	Area in site
January	Detection (17m)	Whole site
	Abundance (5m)	Whole site
February	Detection (15m)	In gaps (where no previous plant detections)
	Abundance (5m)	Areas where plants detected in January surveys
March	Detection (15m)	In gaps (where no previous plant detections)
	Abundance (5m)	Areas where plants detected in previous surveys

**Table 3-2. Reference site survey summary for 2025**

Survey month	Survey conducted	Area in site
January	No surveys	-
February	Abundance (5m)	Whole site
March	Abundance (5m)	Whole site

### 3.4 Survey effort (tracks)

Each of the three survey sites was surveyed in its entirety during each survey. The total survey effort for each of the surveys is shown in Table 3-3. Due to the change in survey methodology starting in February, total kilometres for detection surveys conducted in the TPA February and March are less than January (see Section 3.2).

**Table 3-3. Survey effort in study sites**

Site	Survey effort (total km walked)					
	January		February		March	
	Detection survey	Abundance survey	Detection survey	Abundance survey	Detection survey	Abundance survey
TPA	11.77	27.02	4.26	29.43	4.14	30.77
RS1	n/a	n/a	n/a	15.80	n/a	15.30

RS2	n/a	n/a	n/a	15.47	n/a	14.34
-----	-----	-----	-----	-------	-----	-------

### 3.5 Genetic and morphology sampling

No genetic samples were collected during the 2025 surveys, because surveys were conducted in areas where the species has previously been detected and confirmed to be *Typhonium praetermissum*. Consultation with the NT Herbarium confirmed that, based on prior genetic testing, the individuals in both reference sites were the same sub-species as those within the TPA (pers. comm. Nicholas Cuff 23 January 2025).

### 3.6 Site condition

The site condition of each survey site, including rubbish, evidence of fire, pests and other disturbances, was recorded during surveys of the TPA and reference sites, to support long-term monitoring of changes in habitat condition at the site. Photographs of the site condition and soil surface were taken from the same locations within the TPA and reference sites during each monthly survey to record the change in vegetation over time.

Incidental weeds were recorded during the surveys using the WeedMate 2.0 application, which is affiliated with Weed Management Branch of the Northern Territory Government and aligned with the NT Weed Management Handbook (WMB 2021).

## 4 RESULTS

Seven separate surveys were undertaken during the survey period – three within the TPA and two in RS1 and in RS2, respectively. *Typhonium praetermissum* plants were recorded in all surveys.

### 4.1 Survey results

Table 4-1 presents the number of plants recorded during each survey. In the TPA, the total number of plants (i.e. from abundance survey results, because no plants were found outside of this area) declined each month over the survey period, from 478 (January), to 388 (February), to 187 (March). In RS1, the number of plants also declined, from 197 (February) to 155 (March). In RS2, the number of plants stayed the same at 281 for both February and March. No evidence of fruiting or flowering was observed during surveys at any of the study sites.

Most of the records in the TPA occurred in the southern and eastern half of the area, with one small patch in the north-west (Figure 4-1). In RS1, the records of *Typhonium praetermissum* were spread evenly across most of the central and western area, with fewer records in the eastern side (Figure 4-2). In RS2, plants were recorded everywhere but were most abundant in the central area (Figure 4-3).

**Table 4-1. Total number of plant records (i.e. from abundance surveys)**

Sites	January	February	March
TPA (15.8 ha)	478	388	187
RS1 (6.6 ha)	-	197	155
RS2 (5.9 ha)	-	281	281

The results of the detection surveys and abundance surveys are recorded in Table 4-2. The ratio of detection to abundance survey data was calculated by dividing the abundance (A) results by detection (D) results for

each month, to determine the detection-to-abundance ratio (D:A), or 'multiplier', for each site. This will be discussed further in the next section.

**Table 4-2. Detection and abundance data**

Site	No. of <i>Typhonium praetermissum</i> records detected									Average multiplier (A/D*)
	January			February			March			
	D survey	A survey	Multiplier (A/D*)	D survey	A survey	Multiplier (A/D*)	D survey	A survey	Multiplier (A/D*)	
<b>TPA</b>	123	478	3.89	93	388	4.17	36	187	5.19	<b>4.36</b>
<b>RS1</b>	N/A	N/A	N/A	62	197	3.18	50	155	3.10	<b>3.14</b>
<b>RS2</b>	N/A	N/A	N/A	78	281	3.60	64	281	4.39	<b>4.00</b>

*\*Multiplier: Calculating detection records estimations based on number of abundance records to obtain an A:D ratio*

All three sites contain large areas of high likelihood modelled habitat (NTG 2022). In the TPA surveys, approximately 74% of plants were recorded outside of high likelihood modelled habitat. These plants were mostly recorded in the south of the TPA. The remaining 26% of plants fell within the high-likelihood habitat. Within RS1, an average of 13% of records were outside the modelled habitat, while RS2 – which is composed almost entirely of high-likelihood modelled habitat – had no records outside of this habitat.



**Legend**

- Typhonium protection area
- Typhonium High likelihood habitat (DEPWS 2022)
- Principal road
- Minor road

**Typhonium praetermissum plants recorded**

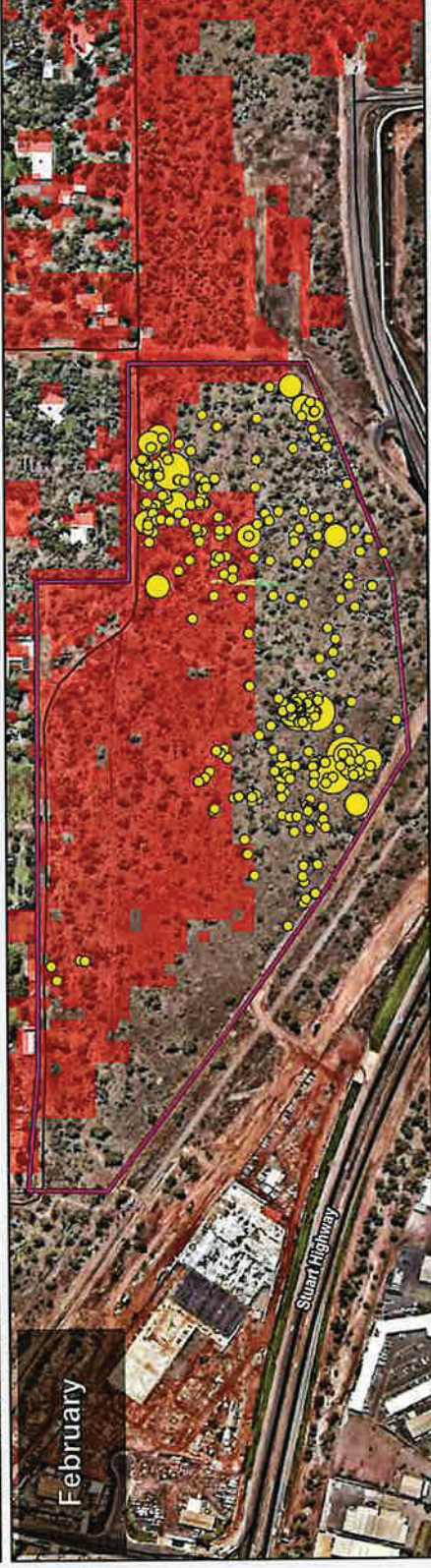
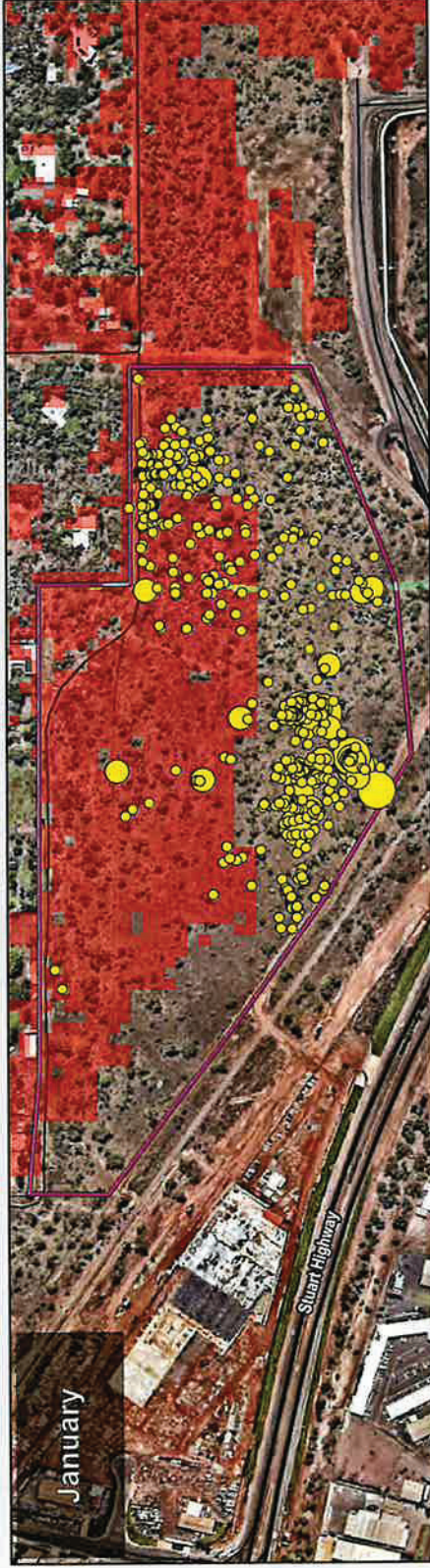
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Mapper: david carroll

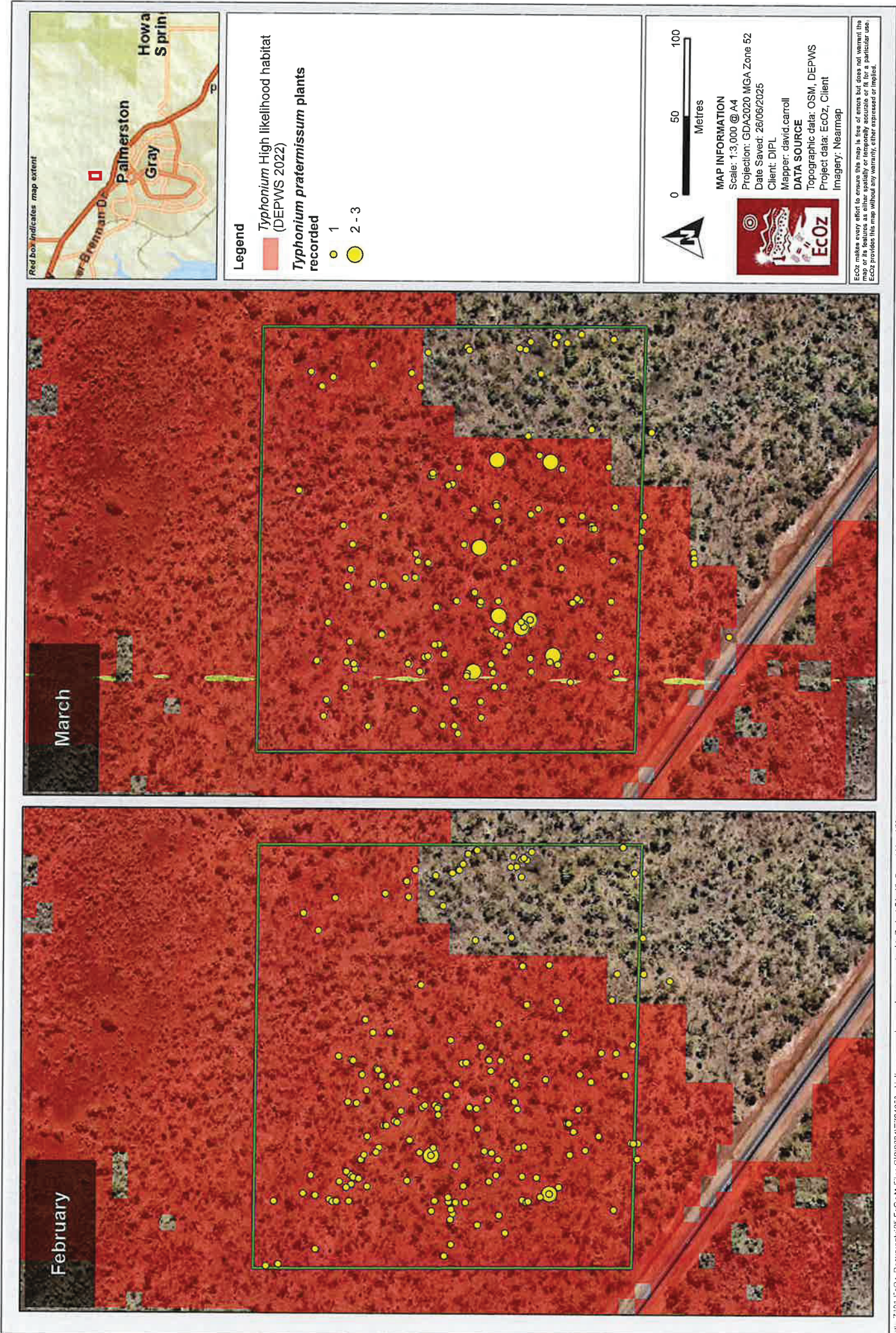
**DATA SOURCE**  
Topographic data: OSM, DEPWS  
Project data: EcOz, Client  
Imagery: Nearmap

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Layout: Figure 4-1. Map of T. praetermissum abundance within TPA

**Figure 4-1. Map of T. praetermissum abundance within TPA**



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 Layout: Figure 4-2. Map of T. praetermissum abundance within Reference site 1

**Figure 4-2. Map of T. praetermissum abundance within Reference site 1**

## Appendix B

### Signage for Typhonium Protected Area

 Removing threatened flora without a permit is an offence under the Northern Territory Parks and Wildlife Conservation Act 1976.

# TYPHONIUM PROTECTION AREA

This area supports an important population of the threatened flora species, *Typhonium praetermissum*.



Fencing has been erected to reduce the impact to this species by human traffic, pests and the spread of weeds. The area is managed by the Department of Lands, Planning and Environment. More information about *Typhonium praetermissum* can be found by contacting 8924 4218 or at: [eflora.nt.gov.au](http://eflora.nt.gov.au) For questions concerning management, please contact Crown Land Estate: 8999 6886

## Appendix C

### Cycad Management Plan



# Cycad Management Plan Holtze Development Area

DEPARTMENT OF LOGISTICS AND  
INFRASTRUCTURE (DLI)



# DOCUMENT CONTROL RECORD

<b>Job</b>	EZ24068
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<b>Author(s)</b>	Simon Aylott

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# TABLE OF CONTENTS

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<b>1</b>	<b>INTRODUCTION</b> .....	<b>1</b>
<b>2</b>	<b>CYCAS ARMSTRONGII</b> .....	<b>3</b>
<b>3</b>	<b>THREATS</b> .....	<b>4</b>
<b>4</b>	<b>MANAGEMENT ACTIONS</b> .....	<b>6</b>
4.1	Fencing.....	6
4.2	Weeds .....	6
4.3	Fire .....	7
4.4	Signage .....	7
<b>5</b>	<b>POPULATION MONITORING</b> .....	<b>10</b>
<b>6</b>	<b>ADAPTIVE MANAGEMENT</b> .....	<b>10</b>
<b>7</b>	<b>REFERENCES</b> .....	<b>11</b>
<b>APPENDIX A</b>	<b>MEMORANDUM – HOLTZE CYCAD MAPPING</b> .....	<b>12</b>
<b>APPENDIX B</b>	<b>SIGN TEXT</b> .....	<b>13</b>
<b>APPENDIX C</b>	<b>FENCE DESIGN</b> .....	<b>14</b>

## Tables

Table 1.	Weed records within 1 km of the management area .....	4
Table 2.	Summary of management actions for the management area.....	9

## Figures

Figure 1.	Map showing the location of the management area.....	2
Figure 2.	Map of weed records within 1 km of the management area.....	5
Figure 3.	Map showing temporary fencing of the management area .....	8

# 1 INTRODUCTION

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The Department of Logistics and Infrastructure (DLI) – previously the Department of Infrastructure Planning and Logistics) – has been granted environmental approval for the Holtze Development Area under Section 69 of the NT *Environment Protection Act 2019* (EP Act). The environmental approval conditions (EP2022/022 – 001) stipulated that ‘the long term security of retained occurrences of **high** and **very high density** *Cycas armstrongii* areas is maintained through implementing measures such as restrictions on land use and access.’

A 2024 survey by EcOz Environmental Consultants (EcOz) found one high density area within the Development Area (‘high density’ is defined in the approval as 400 to 700 stems per hectare), but no very high-density areas. The high-density area has been demarcated and is herein referred to as the ‘management area’ – see Figure 1. There have been three cycad surveys within the Development Area since 2014. All three surveys have measured the density of *Cycas armstrongii*; however, survey methods and density categories have changed over time. In all surveys, the methodology was developed in consultation with the Flora and Fauna Division of the Department of Lands, Planning and the Environment (DLPE). For more information about survey methodology as well as a brief history of the cycad surveys in the Holtze Development Area – see Appendix A.

EcOz was engaged by DLI to develop a Cycad Management Plan (CMP) to meet the requirements of the abovementioned approval conditions. The aim of the CMP is to provide sufficient guidance to ensure the ongoing health and security of the high-density *Cycas armstrongii* population within the management area. Successful implementation of this plan will be used to demonstrate compliance with the environmental approval conditions.

The management area is within Parcel 4231, Hundred of Bagot, Holtze. It is a small area of just over 0.3 ha located 700 m south-east of the Palmerston Regional Hospital, in the suburb of Holtze. It lies on a ridge, with a steep downward slope into a drainage depression to the west, and gentle upward slope to the east. Two residential lots exist approximately 70 m to the south-east. The vegetation of the CMA is characterised as a *Eucalypt miniata* – *Eucalypt tetradonta* low open woodland on brown kandosols. The surrounding vegetation is dominated by woodlands of *E. miniata* and *E. tetradonta*.

The management actions presented in this management plan have been developed against ‘SMART’ criteria, which assess whether each action is:

- **Specific** – targets a particular threat or management goal
- **Measurable** – can be quantified or progress can be measured through monitoring
- **Achievable** – is realistic based available resources and knowledge
- **Relevant** – is related to the objectives of the CMP
- **Timely** – is time-bound.

This report sets out the objectives, process and plan for effective management of the management area. It does not specify the roles and responsibilities for implementing this plan, nor does it aim to function as a training tool for relevant staff engaged in practical management of the site. The plan has been developed using an adaptive management approach, which aims to use improve management processes based on feedback over time, or ‘learning by doing’ (DEH 2024). While this report provides guidance for effective management of the management area, a critical extra step is to analyse and evaluate monitoring data as it is collected and use the conclusions to update the management plan.

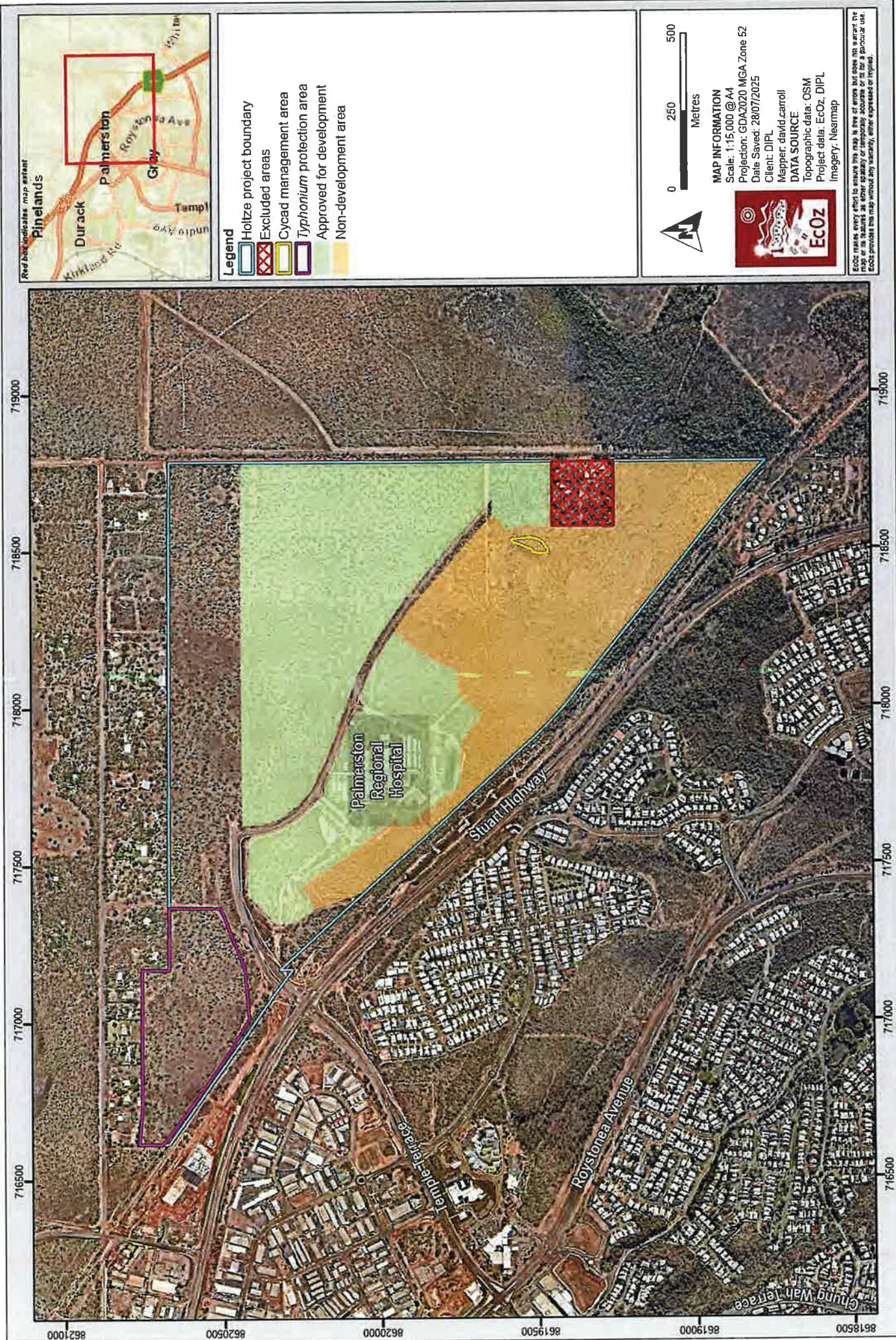


Figure 1. Map showing location of the cycad management area (zoomed to Holtze)

## 2 CYCAS ARMSTRONGII

---

### *Ecology*

The Darwin Cycad (*Cycas armstrongii*) is medium-sized cycad up to 6 m tall with a slender trunk 6 to 12 m in diameter. It is listed as Vulnerable under the *Territory Parks and Wildlife Conservation Act 1976 (TPWC Act)* but is not listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The Darwin Cycad occurs in open grassy woodlands where adequate drainage appears to be a limiting factor (Liddle 2009). It also occurs on rocky outcrops, undulating hills, and plains (Kerrigan et al. 2012). Prime cycad habitat has deep loamy, well-drained soil and the species is frequently associated with *Eucalyptus miniata* and *Eucalyptus tetradonta* (Liddle 2009).

Darwin Cycads are endemic to the Top End, with abundant populations occurring throughout the greater Darwin region, the Tiwi Islands and Cobourg Peninsula. When habitat conditions are favourable, the Darwin Cycad can occur at densities ranging from several individuals to more than 1,000 individuals per hectare (Watkinson and Powell 1997; Liddle 2004). Despite the apparent abundance of the species, their long-term conservation should be considered because they are long-lived, have a slow reproductive rate and, while locally abundant, less than 1% of the species is represented in conservation reserves (Liddle 2009). Therefore, the areas of high-density stands of cycads are important for maintaining the species' genetic diversity and function (Hill 2020).

The definition of 'high' and 'very high' density stands within the Holtze Development was defined in the draft approval conditions as being:

- High density: 400 to 700 stems per hectare
- Very high density: greater than 700 stems per hectare.

### *Distribution*

Darwin Cycads are found throughout the Holtze Development Area in varying densities. Approximately half of the area is sparsely populated, with 0 to 20 plants per hectare. Much of the remaining area – particularly in the east (where the management area is located) – has low<sup>1</sup> (21 to 50 per ha) to medium-low (51 to 200 per ha) densities of Cycads. Several areas of medium-high densities (201 to 400 per ha) occur in the south and east, with only one high density (401 – 700 per ha) stand.

Bitterlich sweep surveys<sup>2</sup> show that the management area is the only place within the Holtze Development Area where a high density of cycads occurs. An individual count of *Cycas armstrongii* has not been undertaken within the management area.

---

<sup>1</sup> The densities 'low' and 'medium-low' and 'medium-high' are not formally defined in the draft approval conditions. They are adapted here using the results of cycad survey report (EcOz 2023).

<sup>2</sup> See Appendix A for an explanation of the methodology of these surveys and for information regarding the evolution of cycad surveys in the Holtze Development Area 2014 – 2024.

## 3 THREATS

The reservation of high-quality habitat, control of exotic grasses and fire management are priority management requirements for the conservation of the Darwin Cycad (DEPWS 2021). This section explains why managing the threats of fire, weeds and habitat is important for the long-term security of the management area.

### *Fire*

The Darwin Cycad is known to be resilient to frequent, low-intensity fires, but not to high-intensity fires. The viability of seeds (which begin developing from October) declines following scorching from fire, and stem mortality increases with intense fire events, such as late season fires. Mortality of more than 50% of adult stems per fire event has been recorded when subject to fuel loads of 20 tonnes per hectare (Liddle 2004). An intense fire event that occurs more frequently than 1 in 10 years is damaging to populations of the species (Liddle 2004; 2009). NAFI fire data from the years 2015 to 2024 show that the area has been burned five times and has not been subject to any late season fires during the same period.

### *Weeds*

There are no weed records within the management area. Records of weeds within a 1 km radius of the management area which were recorded between 2010 and 2024 were accessed through NR Maps (see Table 1 and Figure 2).

**Table 1. Weed records within 1 km of the management area**

Weed name	Declaration status	Weed of National Significance?	Records within 1km
Gamba Grass ( <i>Andropogon gayanus</i> )	B	Yes	32
Mission Grass – perennial ( <i>Cenchrus polystachios</i> )*	B	-	13
Hyptis ( <i>Hyptis suaveolens</i> )	B	-	5
Mission Grass – annual ( <i>Cenchrus pedicellatus</i> )	-	-	4
Grader Grass ( <i>Themeda quadrivalvis</i> )	B	-	3
Mimosa ( <i>Mimosa pigra</i> )	A	Yes	2
Senna – Sicklepod ( <i>Senna obtusifolia</i> )	B	-	2
Sida – Spinyhead ( <i>Sida acuta</i> )	B	-	2
Snakeweed ( <i>Stachytarpheta</i> sp.)	B	-	1

\* Six records of the *Cenchrus* genus are unclassified to species level and are not included.

The most relevant weeds for management are Gamba Grass and both Mission Grasses. These weeds are already common in the area and pose a risk of high intensity fires because of their large biomass. Gamba Grass supports fuel loads up to > 20 tonnes per hectare compared to native species (less than 6 tonnes per hectare); it also cures later in the dry season, significantly increasing fuel load for fires. Perennial and Annual Mission Grasses can support fuel loads up to 27 tonnes per hectare.

### *Habitat destruction*

Land clearing within the greater Darwin region due to rural residential living, horticulture, agriculture and forestry are major threats. The deep loamy soils that the species prefers are favoured soils for agricultural and horticultural developments. Similarly, large areas of suitable habitat have been cleared on the Tiwi Islands for forestry plantations.



Figure 2. Map of weeds within 1 km of the management area

## 4 MANAGEMENT ACTIONS

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The risk of harm to the Darwin Cycad is considered high during the construction phase of the development (due to the proximity of the high-density patch to proposed works), and moderate/low thereafter (due to the resilience of the species in areas where weeds are managed).

Management actions should be reviewed at the conclusion of the construction phase and could be subsumed within the general management of surrounding native vegetation, as long as management addresses the threats to Darwin Cycads outlined in Section 3. The CMA will not be delineated in the long-term except through signage. Management of the area will use geo-referenced maps when working there.

The following section details the specific management actions of this plan. A summary of each action is provided in Table 2, along with timing and recommended performance indicators. The overarching objective of all actions is to ensure the long-term security of the Darwin Cycad within the management area.

The risk of harm to the Darwin Cycad is considered high during the construction phase of the development (due to the proximity of the high-density patch to proposed works), and moderate/low thereafter (due to the resilience of the species in areas where weeds are managed).

Management actions should be reviewed at the conclusion of the construction phase and could be subsumed within the general management of surrounding native vegetation, as long as management addresses the threats to Darwin Cycads outlined in Section 3. The CMA will not be delineated in the long-term except through signage. Management of the area will use geo-referenced maps when working there.

### 4.1 Fencing

#### *Objectives*

To ensure the security of *Cycas armstrongii* plants within the management area during land clearing and construction phases of the development.

#### *Measures*

A temporary fence will be installed prior to clearing and construction to prevent accidental damage to cycads. Fence design is included in Appendix C. The fence will be located at the eastern edge of the CMA, where risk of damage is highest – see Figure 3. During construction of the Holtze development, the fence will be inspected once per week to ensure its integrity is maintained. Once the construction phase is complete, fencing will be removed and a sign (described in Section 4.4) will be erected to delineate the area and to inform the public about management.

### 4.2 Weeds

#### *Objective*

To control the introduction and spread of invasive weeds in the management area.

#### *Priorities*

Gamba Grass and both Mission Grasses are the priority for control, because of the high fuel loads of these species, leading to increased risk of intense fires.

All other Class B declared weed species must have their growth and spread prevented under Section 9 of the NT *Weeds Management Act 2001 (WMA)*.

### ***Methods for weed control***

Weeds will be chemically treated annually according to the methods prescribed in the NT *Weed Management Handbook* (WMB 2021). The treatment should occur in March to April when weeds are still growing, and should be targeted to avoid harm to non-weed species. Chemical treatment is not effective on drying plants, therefore manual weed control – such as hand-pulling of weeds – is required at the start of the dry season in late April/May. Hand-pulling and bagging of weeds is also necessary if plants have seeded.

To increase effectiveness, infestations of weeds within 50 m should be included in weed control because these dense patches of weeds can be source populations for future spread.

Annual weed surveys should be undertaken on foot by suitably-qualified persons in the early dry season (March/April) when the weeds are still growing and are easier to identify. All weed data-points are to be recorded using the NT WeedMate Application. The attributes stored within the application align with the NT Weed Data Collection Manual (Weed Management Branch 2015).

## **4.3 Fire**

### ***Objectives***

To avoid late and intense fires within the management area.

### ***Measures***

Crown Lands undertake annual controlled burns in the early dry season for this area. Given the species' tolerance to fire, this would be acceptable for the CMA. Keeping weeds out of the management area and installing signs are considered sufficient to minimise the risk of intense fires. The use of prescribed burns in the management area is to be assessed at the first review of the Cycad Management Plan for the area.

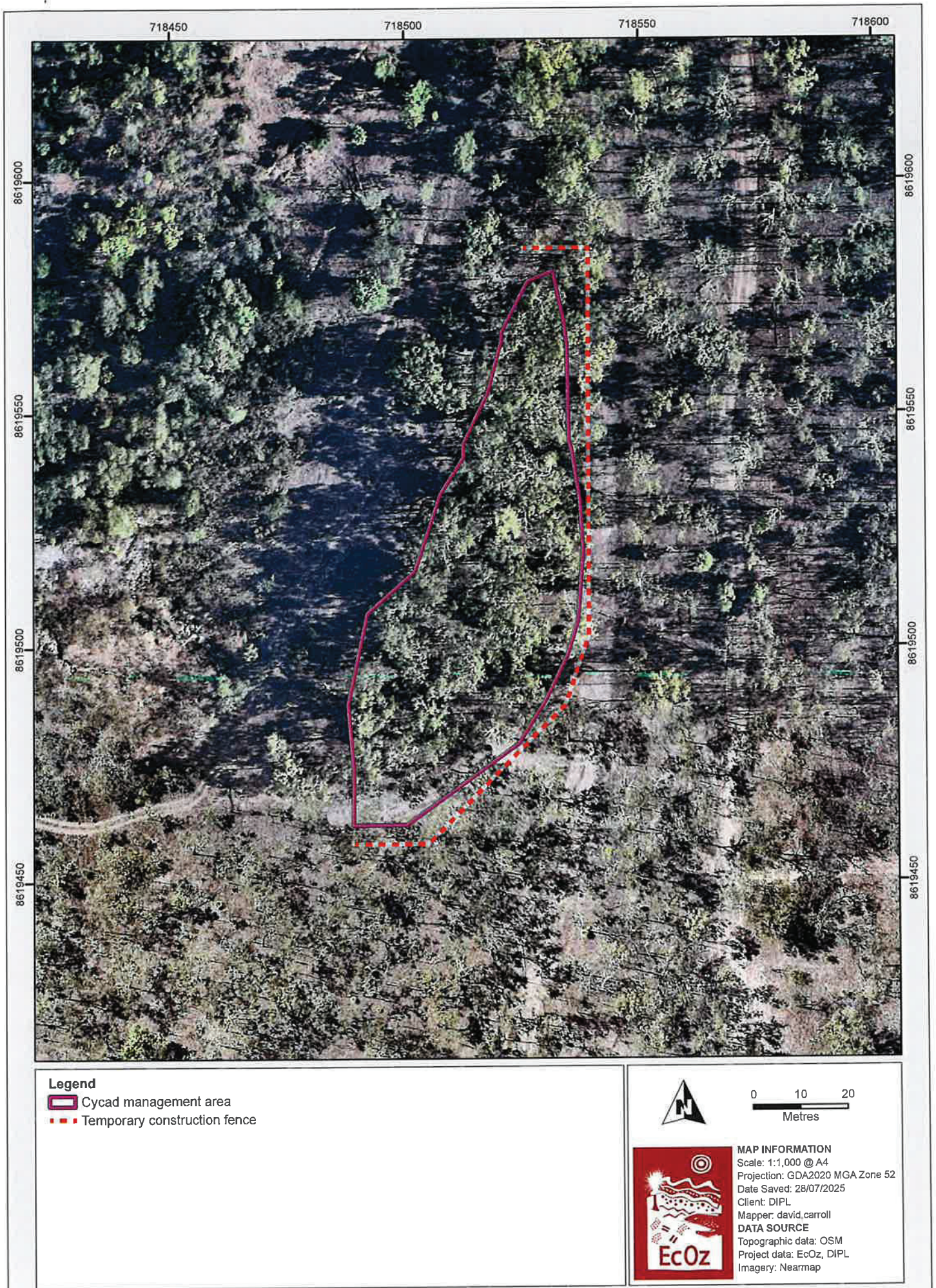
## **4.4 Signage**

### ***Objectives***

To delineate the CMA, to educate people about its purpose, and to encourage appropriate use of the area.

### ***Measures***

A small sign explaining the presence and purpose of the management area – as well as appropriate use – is to be posted where it will be most visible to the public. An example of the text that might be included on this sign is provided in Appendix B. The sign should explain the purpose of the management area, state appropriate use, and provide a contact number to report damage or request more information. The condition of the sign should be checked at the same time as weed and rubbish surveys.



Path: Z:\01 EcOz\_Documents\05 EcOz M-Files GIS\2024\EZ24068 - Holze approval - compliance reporting\1. Project Files\2. Report Maps\EZ24068 - WGH - Holze Approval - compliance reporting\EZ24068 - WGH - Holze Approval - compliance reporting.aprx  
 Layout: Figure 2. Map showing proposed temporary fencing of management area

**Figure 3. Map showing proposed temporary fencing of management area**

**Table 2. Summary of management actions for the management area**

Management actions	Timing	Performance indicators
Temporary construction fence	Prior to commencement of clearing and construction	Fence is installed as per Appendix C and Figure 3. The fence will be inspected weekly during clearing and construction to ensure its integrity. It will be removed post-construction.
Baseline weed survey	April / May 2026	Weed survey completed according to Weed Management Branch (WMB) methodology; results and recommendations for control submitted to DLL.
Annual weed survey	April / May 2027, then annual	Weed survey completed according to WMB methodology; results and recommendations for control submitted to DLL.
Weed control	March / April 2026, then annual	Chemical weed control completed according to NT Weed Management Handbook; records submitted to DLL.
Follow-up manual weed control (if required)	April / May 2026, then annual	Manual weed control completed (if required) according to NT Weed Management Handbook; records submitted to DLL.
Rubbish monitoring & removal	Same time as annual weed surveys	Rubbish survey complete. Status of rubbish recorded in weed report with coordinates. Larger or contaminated rubbish to be reported for collection.
Continue the current regime of controlled burning (assumed to be annual early dry season burning) within Holtze*	Late April or May, every 3-5 years	Absence of monsoon forest species.
Design and install one sign to inform public of the aims of the management area	Dry season 2025	One sign is installed. Sign condition to be checked during annual weed survey.

\* In consultation with BushfiresNT

## 5 POPULATION MONITORING

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### *Objective*

To count the number of individual Darwin Cycad plants within the management area to assess the effectiveness of the management plan.

### *Method*

Each mature (> 50 cm tall) Darwin Cycad plant within the management area will be counted. The method is flexible but must demonstrate how double-counting of plants was avoided. A suggested method is to walk transects at 5 m intervals and recording all Darwin Cycad plants within 2.5 m of the transect line using a hand-held GPS device. Marking each Darwin Cycad could be explored as another way to avoid double-counting. The timing of surveys is not critical, but is ideally undertaken in the dry season, when grass growth slows, and visibility of the understorey improves. Post-survey, a brief report describing the method, results and discussion will be submitted to DLI, along with spatial data, and retained for future reference. The discussion should include a comparison of data with previous years.

### *Census*

In 2025, a baseline survey will serve as the reference point for any future changes in the population of the area. Cycads are a slow-growing, long-lived and fire-tolerant species. Their biology suggests that change to the population will be slow, unless a large stochastic event occurs – such a cyclone. Monitoring of the population must balance the slow-changing nature of the species with the need to intervene promptly if a damaging event occurs. This plan therefore recommends abundance surveys be conducted every three years to monitor population levels. Should the number of individual cycad plants decrease by more than 5% in the first three surveys (i.e. from 2025 to 2031), then a review of the management plan will be triggered until the cause of the change is identified and addressed. After this time, statistical tests such as linear regression analysis might be used to determine if the change in population is statistically significant or not.

## 6 ADAPTIVE MANAGEMENT

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To assess the success of management actions within the management area – and whether adaptive management responses are required – monitoring must be undertaken and the data evaluated. Because the highest risk to the area is during construction, it is important to review this plan post-construction. Management actions may be reduced or subsumed within management of the surrounding area. Where relevant, monitoring is recorded next to management action in Table 2. The following additional generic recommendations are made regarding monitoring, evaluation and review of management action and plan success:

- Collect data systematically and document them appropriately. Initial baseline surveys should be recorded using the ArcGIS Field Maps program. Once set up, this program can be used for all subsequent surveys to record and share data. The WeedMate app (developed by the NT Weeds Management Branch) should be used for all weed surveys and will capture all required attributes for these surveys.
- Take into account recent research and recent NT Government advice regarding conservation of *Cycas armstrongii* when reviewing the CMP.
- Assign staff to report annually on the progress of the plan implementation.
- Review the CMP after construction of Holtze development concludes, or within 3 years of the baseline survey (whichever comes first).

## 7 REFERENCES

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- Department of Environment, Parks and Water Security (DEPWS) (2021). Threatened species of the Northern Territory: *Cycas armstrongii*. Northern Territory Government, Darwin. Available at: [https://nt.gov.au/data/assets/pdf\\_file/0017/208430/cycas-armstrongii.pdf](https://nt.gov.au/data/assets/pdf_file/0017/208430/cycas-armstrongii.pdf)
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- Weed Management Branch (WMB) (2021) Northern Weed Management Handbook. Published by the Department of Environment, Parks and Water Security. Available at: [https://nt.gov.au/data/assets/pdf\\_file/0004/233833/nt-weed-management-handbook.pdf](https://nt.gov.au/data/assets/pdf_file/0004/233833/nt-weed-management-handbook.pdf)

## **APPENDIX A MEMORANDUM – HOLTZE CYCAD MAPPING**

# Memorandum



To:	Nikki Conroy ( <a href="mailto:nicole.conroy@nt.gov.au">nicole.conroy@nt.gov.au</a> )
From:	Simon Aylott ( <a href="mailto:simon.aylott@ecoz.com.au">simon.aylott@ecoz.com.au</a> )
Date:	12/5/2025
Project ref:	EZ24068 – Holtze Development Area
Subject:	Cycad survey history in Holtze Development Area

## 1 Purpose of this memo

To provide background context for the different surveys for the threatened plant Darwin Cycad (*Cycas armstrongii*) within the Holtze Development Area. This memo has been written to supplement the Cycad Management Plan. It explains how the data that informed the plan were derived.

## 2 Surveys

Since 2014, there have been three cycad surveys conducted within the Holtze Development Area. All three surveys have all focused on measuring the density of *Cycas armstrongii*; however, survey methods and definitions for categorising density for the species have changed over time. This memo describes past survey methodologies to give a better understanding of current results.

### 2.1 November 2014

The first survey of cycads in the Holtze Development Area by EcOz Environmental Consultants (EcOz) occurred in 2014 as part of a flora and fauna assessment for the then Department of Lands, Planning and the Environment (DLPE), as part of preliminary investigations to develop land around the Palmerston Hospital. At that time, there were no survey guidelines for this species and so a bespoke survey method involving counting all cycads within 25 m wide transects was implemented across 55 sites. Large portions of the development area were not surveyed. The results were then extrapolated within coarsely-delineated areas of 'similar' habitat to produce a cycad density map. That map indicated that the south-west edge of the development area supported very high (700+) densities of *Cycas armstrongii*. The centre and east of the development area were designated as supporting a high density of *Cycas armstrongii* – noting that 'high' was defined as 200 to 700 cycads per ha, instead of the DEPWS definition of 400 to 700 per ha.

### 2.2 June 2023

The survey undertaken in May 2023 (reported on in June) employed a very different – and far more thorough – method. On the advice of Brydie Hill from the Flora and Fauna Branch of DEPWS, the method employed was a more detailed adaptation of that used by DEPWS in a survey of Middle Arm Peninsula. The development site was divided into a 100 x 100 m grid across all possible cycad

# Memorandum



habitat. Areas containing existing infrastructure were excluded, as was the drainage area associated with the headwaters of Mitchell Creek which is not suitable habitat for the Darwin Cycad. This resulted in 174 grids.

Within the centre of each of grid, Bitterlich point sampling was used to obtain stem counts of *Cycas armstrongii*. This involves the surveyor undertaking a 360° 'sweep' using a tool known as a Bitterlich wedge (with a basal area factor of 0.1) held ~50 cm from the observer's eye. This tool ensures that only cycads greater than 50 cm tall (i.e. adult plants) are counted, which is in accordance with the method used by DEPWS at Middle Arm, and with how populations of threatened species are determined by the NT and Commonwealth governments.

The use of the Bitterlich wedge results in an effective search radius of 15.8 m, and therefore a survey area of 785.4 m<sup>2</sup> per grid. The results of each sweep were then scaled up to give a density per hectare, such that a high density of *Cycas armstrongii* would be within the range of 31 to 55 counts per sweep. A count of more than 55 would correspond to a very high density (i.e. >700 individuals per ha).

The results were significantly different to those from the 2014 survey, with fewer high and no very high density areas recorded (see Figure 1). This was likely because in the June 2023 survey, only mature (>50 cm) individuals were counted rather than all cycads. The area surveyed was also larger, resulting in less extrapolation. Also, the term 'high density' was changed from 200 stems per ha in the 2014 survey to 400 stems per ha (in line with draft environmental approval conditions).



# Memorandum



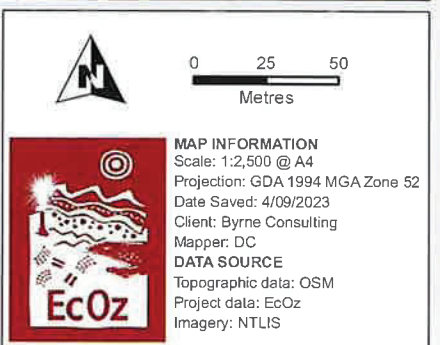
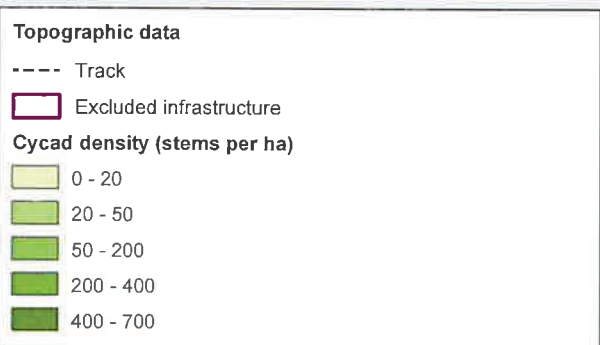
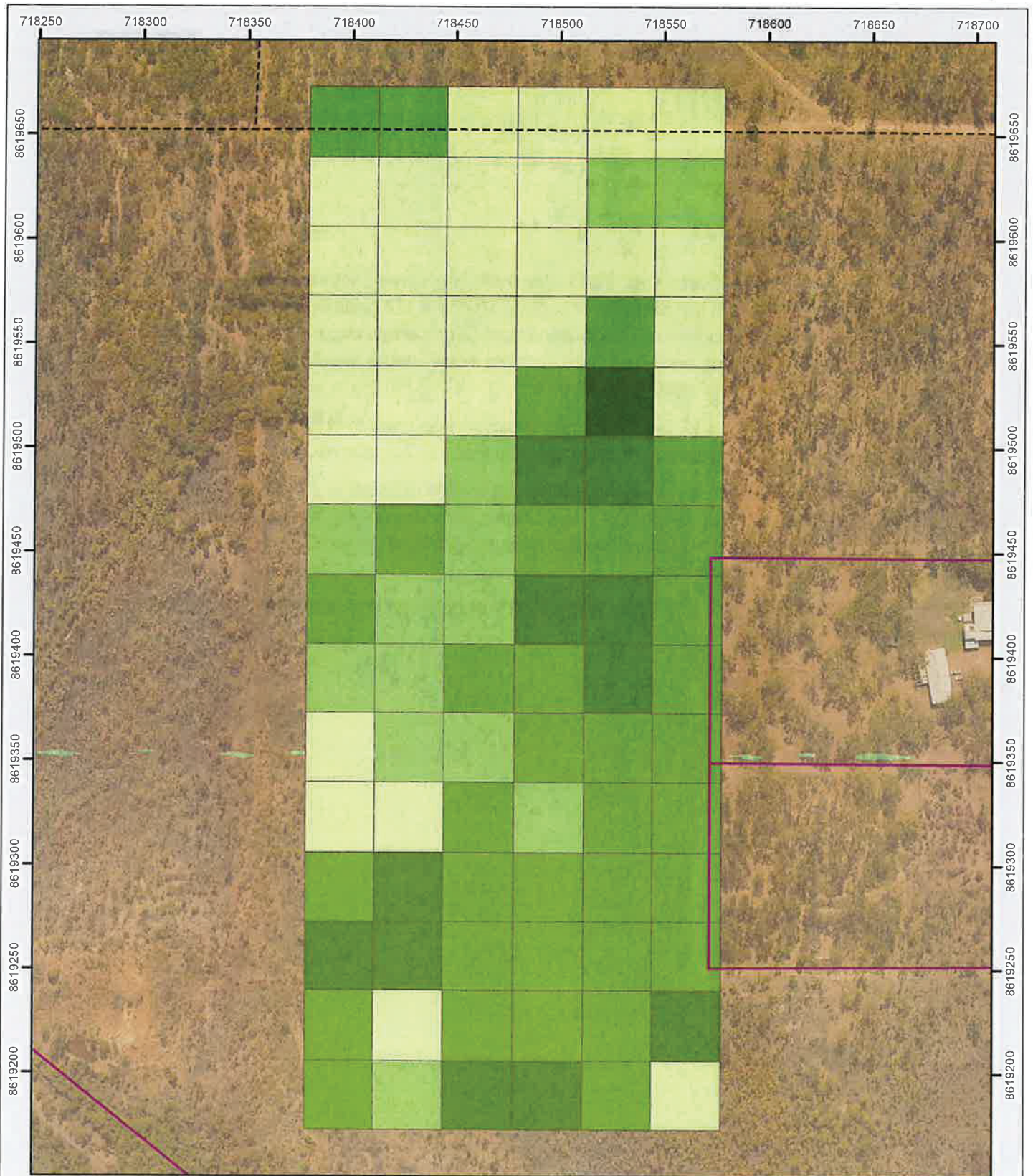
## 2.3 September 2023

The survey undertaken in September 2023 employed the same methodology as the May 2023 survey, but at a finer scale. In the September survey, 10 of the 174 grids in the south-eastern section – namely the sole grid cell containing a high-density of *Cycas armstrongii*, a line of grids intersected by a proposed utilities corridor, and all grids adjacent to those – were re-surveyed at a finer resolution of 33.33 x 33.33 m grids. This resulted in 90 grids.

Within the centre of each of grid, Bitterlich point sampling was used to obtain stem counts of Darwin Cycad, following the same procedure as described in Section 2.2, above.

As with the May 2023 survey, the use of the Bitterlich wedge resulted in an effective search radius of 15.8 m, and therefore a survey area of 785.4 m<sup>2</sup> per grid. The results of each sweep were then scaled up to give a density per hectare, such that high density of Darwin Cycad would be within the range of 31 to 55 counts per sweep.

The results of the September 2023 survey showed that only one grid was a high density area (see Figure 2).



**Figure 2. Map of Darwin Cycad density in the utilities corridor (Holtze Development Area) - September 2023**

# Memorandum



## 3 SUMMARY

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Three surveys for the threatened species *Cycas armstrongii* have been undertaken by EcOz in the Holtze Development Area between 2014 and 2023. The methodology of the surveys has changed as survey guidelines and project needs have evolved over time. The results of the most recent of these surveys (September 2023) represents a refinement of the previous two surveys and presents the most accurate map of Darwin Cycad density in that area.

## APPENDIX B SIGN TEXT

This area contains a high-density patch of Darwin Cycads (*Cycas armstrongii*), a threatened species in the NT. It is currently being managed by the Northern Territory Government.

Enjoy walking in this area and viewing these iconic Darwin plants. Please leave it as you found it.

NO DOGS, NO BICYCLES, NO MOTORCYCLES, NO FIREWORKS permitted.

Report any incidents of rubbish or damage: XXXX XXX XXX (*phone number*)

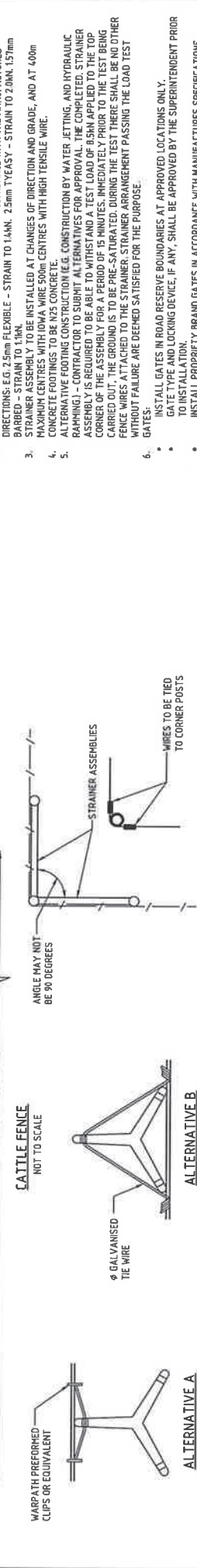
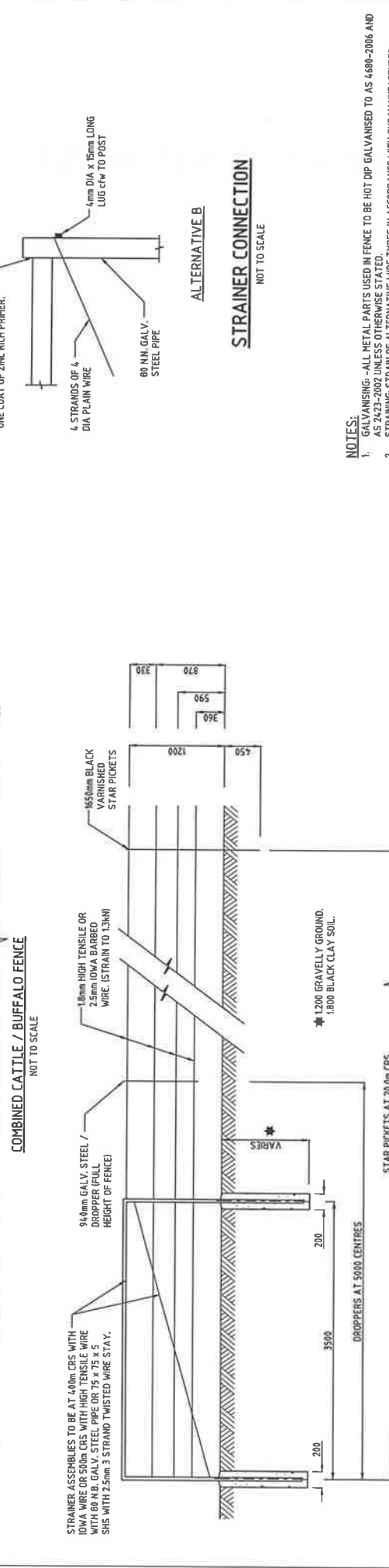
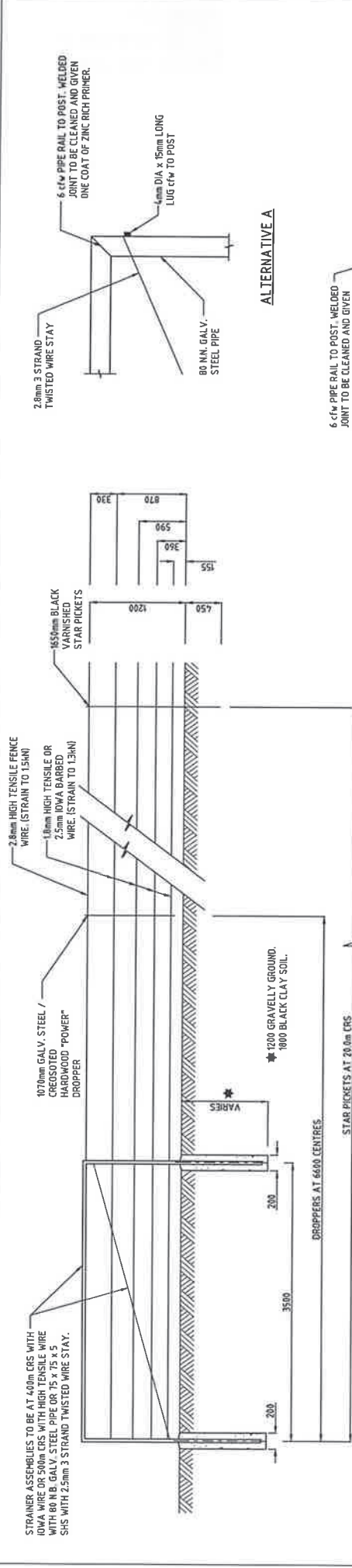
The following text is optional. It could also be included in the form of a link on the sign to more information:

The Darwin Cycad (*Cycas armstrongii*) is a threatened species that occurs throughout Greater Darwin, Tiwi Islands and the Coburg Peninsula – but nowhere else in the world. While they are a common sight around town, they are under threat from weeds, intense fires and habitat destruction. With only 1% of these plants protected within parks or reserves, it is important to protect dense patches like this one. Dense patches are rare and help maintain the species' genetic diversity and function.

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## APPENDIX C FENCE DESIGN





**NOTES:**

1. GALVANISING - ALL METAL PARTS USED IN FENCE TO BE HOT DIP GALVANISED TO AS 4880-2006 AND AS 2423-2002 UNLESS OTHERWISE STATED.
2. STRAINING STRAIN OR ALTERNATIVE WIRE TYPES IN ACCORDANCE WITH THE MANUFACTURES DIRECTIONS. STRAIN TO BE APPLICABLE - STRAIN TO 1.6KN, 2.5mm TIEASY - STRAIN TO 2.0KN, 1.57mm BARBED - STRAIN TO 1.4KN.
3. STRAINER ASSEMBLY TO BE INSTALLED AT CHANGES OF DIRECTION AND GRADE, AND AT 400m MAXIMUM CENTRES WITH IOWA WIRE 500m CENTRES WITH HIGH TENSILE WIRE.
4. CONCRETE FOOTINGS TO BE NZS CONCRETE.
5. ALTERNATIVE FOOTING CONSTRUCTION (E.G. CONSTRUCTION BY WATER, JETTING, AND HYDRAULIC RAMMING) - CONTRACTOR TO SUBMIT ALTERNATIVES FOR APPROVAL. THE COMPLETED STRAINER ASSEMBLY IS REQUIRED TO BE ABLE TO WITHSTAND A TEST LOAD OF 0.5KN APPLIED TO THE TOP CORNER OF THE ASSEMBLY FOR A PERIOD OF 15 MINUTES. IMMEDIATELY PRIOR TO THE TEST BEING CARRIED OUT, THE GROUND IS TO BE PRE-SATURATED. DURING THE TEST THERE SHALL BE NO OTHER FENCE WIRES ATTACHED TO THE STRAINER. STRAINER ARRANGEMENT PASSING THE LOAD TEST WITHOUT FAILURE ARE DEEMED SATISFIED FOR THE PURPOSE.
6. GATES:
  - INSTALL GATES IN ROAD RESERVE BOUNDARIES AT APPROVED LOCATIONS ONLY.
  - GATE TYPE AND LOCKING DEVICE, IF ANY, SHALL BE APPROVED BY THE SUPERINTENDENT PRIOR TO INSTALLATION.
  - INSTALL PROPERTY BRAND GATES IN ACCORDANCE WITH MANUFACTURES SPECIFICATIONS.
  - INSTALL STRAINER ASSEMBLY EACH SIDE OF GATE OPENING IN ACCORDANCE WITH APPROVED ACCESS WIDTH. IF TEMPORARY, GATES SHALL BE REMOVED AND FENCE REINSTALLED BETWEEN STRAINER ASSEMBLIES.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

**Northern Territory Government**

STANDARD DRAWINGS  
KERBING, FENCING & LANDSCAPING

**STOCK FENCE DESIGN AND DETAILS**

FILE No. ASSET No. SHEET No. 1 OF 1 DRAWING No. CS3310 0 AT

NO.	ISSUED AS A STANDARD DRAWING	DESCRIPTION	DATE	NAME	EMP/DEPART	DATE	NAME	DATE
0			SEPT 2014	J LILESON	EES/DIPL			

AWER/DP/K/ITS

DESIGNER: J LILESON DATE: MAY 2017  
CHECKED: S HATZI DATE: MAY 2017

DESIGNED: W H A M DATE: AUG 2004  
REVISION: S HATZI DATE: 10/20/07

WARNING  
BEWARE OF UNDERGROUND SERVICES.  
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

STAR PICKET FIXING  
NOT TO SCALE

CHANGE OF DIRECTION DETAILS  
NOT TO SCALE



## EcOz Environmental Consultants

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## Appendix D

### Holtze Headworks ESCP Site Inspection

## **HOLTZE PART A HEADWORKS EROSION AND SEDIMENT CONTROL SITE INSPECTION**

**Prepared By:** Paul Brandis (CPESC No. 9681)

**Date of Site Visit:** Tuesday 21<sup>st</sup> January 2025

**Time of Site Visit:** 2:30pm to 4:00pm

**Weather Conditions:** Fair

### **Attendance:**

- Byrne Consultants - Paul Brandis, Patrick Chin
- AKJ Services – Clint Dagger, Gail Caddy

### **Entry/Exit Controls**

- No entry/exit controls installed.
- Rumble grid observed on site, but not in use.
- Temp Facilities Area and current site entry/exit is covered in FCR, with no evidence of sediment being trafficked onto Glyde Point Road.
- Contractor advised new entry/exit is being constructed, and shaker grid will be installed.
  - **Action 1** – Complete construction of new entry/exit and install shaker grid as per IECA standards.



*Existing Site Entry/ Exit*



*Location of new Entry/Exit to be constructed*



*Shaker Grid Not in Use*

## Temporary Facilities / Compound

- Compound is surfaced with Fine Crushed Rock.
- Significant stockpiles of mulch, fill and FCR material in site compound with no sediment controls in place. General fill stockpile considered high risk due to material type and batter slopes.
  - **Action 2** – Install sediment fence/ mulch berm around fill stockpile, if practicable, to keep sediment as close to source as possible. If stockpile is not actively being used, consider erosion controls (e.g. cover with geotextile, or apply polymer).
- No perimeter controls installed (e.g. sediment fence, mulch berms etc). However, due to depth of topsoil strip, FSL is boxed in below the adjoining natural areas and flows are concentrating to the Western edge of the compound where they have been relieved with a number of outlet drains. These outlets have no sediment controls.
  - **Action 3** – Install 500mm high mulch filter berms around Eastern perimeter of compound, extents as required to achieve necessary flow containment. Provide Rock Filter Dams (RFDs) at relief points where outlet drains are located, as per detail in Attachment A. Set spillway 300mm high, with minimum spillway base width of 4m. Ensure RFDs are tied in with adjoining mulch berms to prevent bypass flow.



*Compound with FCR Pavement. General Fill Stockpile without Sediment Controls.*



*Typical Drainage Outlets on Western Perimeter of Compound Area.*

## Glyde Point Road Duplication

- Mulch Berms installed along perimeter from approx. CH 200 to CH 550. Works have not started yet before CH 200. Mulch berm does not extend past CH 550 to the contractors compound. Note quality of berm is variable, in terms of height and thickness.
  - **Action 4** – Install mulch berm along full perimeter of Glyde Point Road works. Ensure minimum 500mm height with consistent cross-section as per IECA Standards. Monitor erosion along toe of mulch berm. Add returns as required to control erosion.
- A gap has been left in the mulch berm for an existing service corridor/ access track.
  - **Action 5** – Provide trafficable bund across service track, to provide flow containment for Glyde Point Road catchment.
- Mulch Berm capacity has been exceeded in 3 No. locations with breaches forming in the berm. This has resulted in sediment laden water leaving site and sediment deposition approximately 10-15m past the berm. The breaches have been reinstated with dump rock.
  - **Action 6** – Replace dump rock with Rock Filter Dams (RFD) in each breach location along Glyde Point Road, as per detail in Attachment A. Set spillway 300mm high, with minimum spillway base width of 6m. Ensure RFD is tied in with adjoining mulch berms to prevent bypass flow. Clean up sediment deposition off-site, so far as reasonably practicable.
- 2x PVC pipe culverts were installed to maintain access over 2 low points. Both pipe outlets were discharging uncontrolled dirty water off site.
  - **Action 7** – Remove PVC pipes allowing uncontrolled discharge from Glyde Point Road catchment.



*End of Mulch Berm approx. CH 550. Mulch Berm needs to be extended for full extent of works.*



*Gap in Mulch Berm for access track. To be closed off with a trafficable berm.*



*Start of Mulch Berm approx. CH 200. Flows are concentrating and dump rock has been installed where previous breach has occurred. Install Rock Filter Dam.*



***Dump Rock at Previous Breach in Mulch Berm. To be replaced with RFD.***



***Dump Rock at Previous Breach in Mulch Berm. To be replaced with RFD.***



***Evidence of Sediment Deposition past breached sections of mulch berm. Sediment to be cleaned up so far as reasonably practicable.***



*Uncontrolled PVC pipe outlet – 2 No. to be removed.*

## Linco Road Duplication

- Pits being formed and cast in situ due to delays in pre-cast pits. No entry controls in place.
- Windrows formed along edges of trench to minimise entry of dirty water into trench.
- Dirty water catchment draining from high point in Linco Road to Glyde Point Road. It's not clear if this is entering Stormwater Pit 3/5 (as per the ultimate design), or putting extra pressure on the Glyde Point Road system.
  - **Action 8** – Install 500mm high trafficable earth diversion bank to direct stormwater into Stormwater Pit 3/5 via a Rock Filter Dam (RFD). Construct RFD as per detail in Attachment A; set spillway 300mm high; with minimum spillway base width of 4m. Ensure RFD is tied in with adjoining berms to prevent bypass flow.
  - **Note** – Additional Diversion Banks may be required progressively along this catchment to slow flows down, if erosion is observed over bare earth areas.
- Stormwater outlets provided to existing SEPs via trench leading to filter aggregate around a slotted PVC riser. This is insufficient to comply with IECA Best Practice Guidelines.
  - **Action 9** – Install 500mm high rock filter dam, as per detail in Attachment A, across width of entry trench at each discharge point into existing SEPs.
- Dewatering hoses observed connected to slotted PVC riser without any additional filtration measures. Contractor was notified of requirement to ensure any water discharge from site meets nominated water quality objective (pH 6.5 to 8.0, Max 75 NTUs).
  - **Note** – Ensure all water discharged from site is treated to meet water quality objectives prior to release.
- No works currently along PRH Access Roads. Some sediment wash off observed onto PRH Access Road 2 from existing power track, which appears historical.
- No perimeter controls at Linco Road eastern Limit of Works (cleared area for roundabout).
  - **Action 10** - Install perimeter controls to eastern limit of works, anywhere that sediment laden water can leave site.



*Pits being formed and cast in situ. No entry controls*



*Windrows formed along trench to prevent dirty water ingress*



***Dirty Water Catchment flows to Stormwater Pit DS3/5 or adds to Glyde Point catchment. Need to install diversion bank to convey water into Pit DS3/5 via Rock Filter Dam.***



***Filter rock and PVC riser to discharge stormwater into existing SEPs. Recommend addition of 500mm high RFD at start of trench (Typical).***



*Dewatering Hose Connected to PVC riser without filtration measures.*



*Sediment wash off onto PRH Access Road 2 from existing power track (appears historical)*



***No perimeter controls on eastern limits of works. Install sediment fence of mulch filter berms to all areas where stormwater may leave site.***

## Erosion Risk Assessment and Ground Cover Requirements

The ESCP currently in use is a 'Dry Season' plan. We are now in the wet season which is considered 'very high' risk for rainfall related erosion.

Erosion Risk Assessments completed in accordance with IECA Best Practice Erosion and Sediment Control (BPESC) Guidelines trigger the need for Type 1 sediment controls (e.g. sediment basins) for any bare earth catchments exceeding 2,500m<sup>2</sup>, unless effective ground cover can be provided.

**Action 11** - To avoid the need for sediment basins, the Contractor must be proactive in providing as much ground cover as practicable. This should be prioritised in areas not actively being worked for more than 5 days during wet season months. Options to achieve ground cover may include the application of a polymer (e.g. Vital Bon-matt Stonewall, or similar), light mulching or gravel.

### NEXT STEPS

It's recommended that the Contractor implement these Corrective Actions as soon as possible. Following this, an audit inspection should be undertaken by a Certified Professional in Erosion and Sediment Control (CPESC) to certify the controls implemented onsite comply with IECA BPESC Guidelines.

## SUMMARY OF CORRECTIVE ACTIONS

### *Entry/Exit Controls*

- **Action 1** – Complete construction of new entry/exit and install shaker grid as per IECA standards.

### *Temporary Facilities / Compound*

- **Action 2** – Install sediment fence/ mulch berm around fill stockpile, if practicable, to keep sediment as close to source as possible. If stockpile is not actively being used, consider erosion controls (e.g. cover with geotextile, or apply polymer).
- **Action 3** – Install 500mm high mulch filter berms around Eastern perimeter of compound, extents as required to achieve necessary flow containment. Provide Rock Filter Dams (RFDs) at relief points where existing outlet drains are located, as per detail in Attachment A. Set spillway 300mm high, with minimum combined spillway base width of 10m. Ensure RFDs are tied in with adjoining mulch berms to prevent bypass flow.

### *Glyde Point Road Duplication*

- **Action 4** – Install mulch berm along full perimeter of Glyde Point Road works. Ensure minimum 500mm height with consistent cross-section as per IECA Standards. Monitor erosion along toe of mulch berm. Add returns as required to control erosion.
- **Action 5** – Provide trafficable bund across service track, to provide flow containment for Glyde Point Road catchment.
- **Action 6** – Replace dump rock with Rock Filter Dams (RFD) in each breach location along Glyde Point Road, as per detail in Attachment A. Set spillway 300mm high, with minimum spillway base width of 6m. Ensure RFD is tied in with adjoining mulch berms to prevent bypass flow. Clean up sediment deposition off-site, so far as reasonably practicable.
- **Action 7** – Remove PVC pipes allowing uncontrolled discharge from Glyde Point Road catchment.

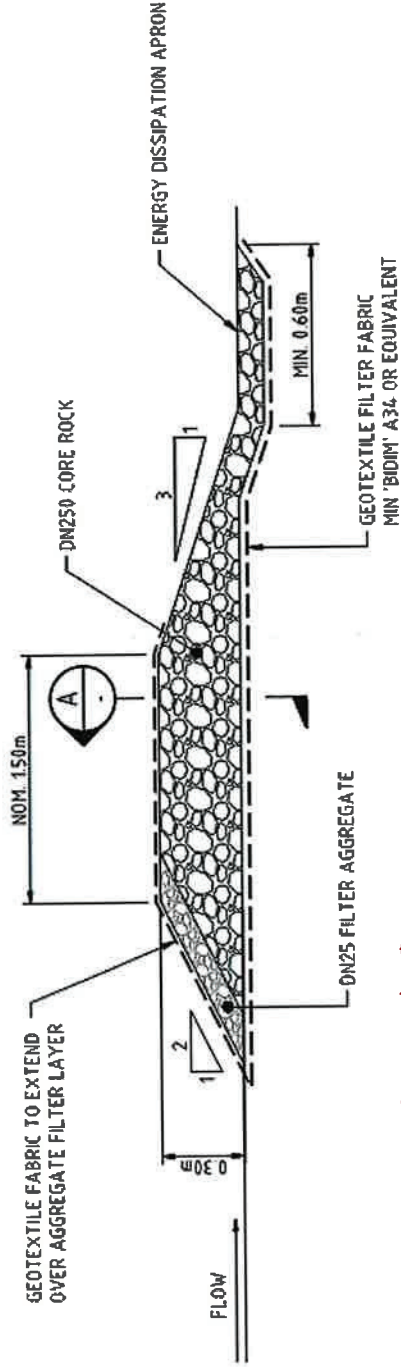
### *Linco Road Duplication*

- **Action 8** – Install 500mm high trafficable earth diversion bank to direct stormwater into Stormwater Pit 3/5 via a Rock Filter Dam (RFD). Construct RFD as per detail in Attachment A; set spillway 300mm high; with minimum spillway base width of 4m. Ensure RFD is tied in with adjoining berms to prevent bypass flow.
- **Action 9** – Install 500mm high rock filter dam, as per detail in Attachment A, across width of entry trench at each discharge point into existing SEPs.
- **Action 10** - Install perimeter controls to eastern limit of works, anywhere that sediment laden water can leave site.

### *General Requirements*

- **Action 11** - To avoid the need for sediment basins, the Contractor must be proactive in providing as much ground cover as practicable. This should be prioritised in areas not actively being worked for more than 5 days during wet season months. Options to achieve ground cover may include the application of a polymer (e.g. Vital Bon-matt Stonewall, or similar), light mulching or gravel.

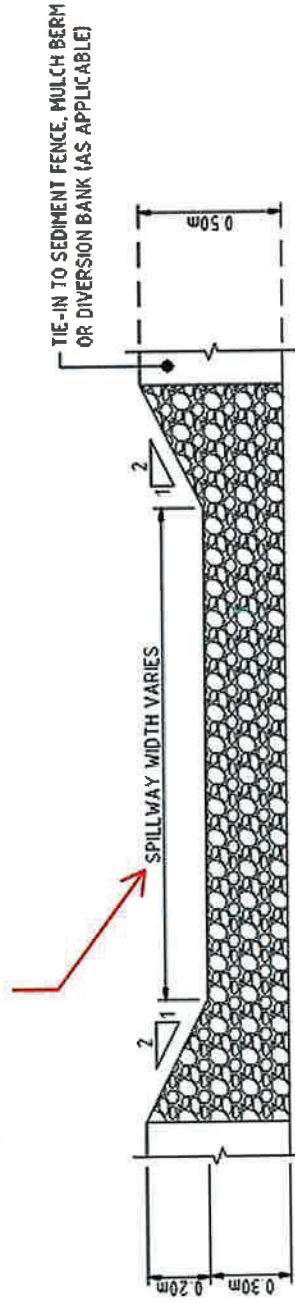
**ATTACHMENT A – TYPICAL ROCK FILTER DAM DETAILS**



**Glyde point road - 6m**

**Pit 3/5 - 4m**

**SEP trench - trench width**



SECTION  
NTS

**TYPICAL ROCK FILTER DAM SPILLWAY**