Memorandum

To:	Mammas Kokkinomagoulos (Mammas.Kokkinomagoulos@nt.gov.au);
From:	Glenn Low (glenn.low@ecoz.com.au)
Date:	18/01/2024
Project ref:	EZ23143 Wurrumiyanga Subdivision Referral
Subject:	T23-1459 Wurrumiyanga Subdivision Referral – *Cycas armstrongii* density survey

1 Purpose of this memo

Dear Primrose,

EcOz Environmental Consultants (EcOz) were engaged by the Department of Infrastructure, Planning and Logistics (DIPL) to undertake a flora density survey for the Darwin Cycad (*Cycas armstrongii*) along the western boundary of Wurrumiyanga. Meaning 'the place where the cycads grow' in Tiwi, Wurrumiyanga is located on the south-east corner of Bathurst Island, 80 km north-west of Darwin.

This memo presents the survey methodology and findings as part of the scope of works supporting the Northern Territory Environmental Protection Authority (NT EPA) Referral (DIPL contract T23-1459) for the proposed 70-lot residential subdivision works. There were no areas of high or very high density cycads observed.

In addition to the cycad density survey, this memo also presents data on weeds, feral animals, and a sensitive vegetation type (large hollow-bearing trees/old-growth forest) recorded in the proposed subdivision boundary. This supplementary data will assist the pre-referral screening report.

2 Darwin Cycad (*Cycas armstrongii*)

The Darwin Cycad (*Cycas armstrongii*) is listed as Vulnerable under the TPWC Act. With a slender trunk, it is one of the smallest Cycas species in the NT. The species occurs in open grassy woodlands where adequate draining appears to be a limiting factor. It also occurs on rocky outcrops, undulating hills and plains (Kerrigan et al. 2021; Liddle 2009). Prime cycad habitat contains deep loamy, well-drained soil and the species is frequently associated with Eucalyptus savanna woodland habitat (Liddle 2009). Darwin Cycads are endemic to the Top End and are abundant in some parts of the Tiwi Islands and greater Darwin region, often forming dense stands (Kerrigan et al. 2021). Nevertheless, their long-term conservation has to be considered because they are long-lived, have a slow reproductive rate, and restricted range with poor representation in NT conservation reserves (Liddle 2009). Land clearing poses a major threat to the species.

Areas with high-density stands of cycads are important for maintaining the species' diversity and function (Hill 2020; Stokeld et al. 2020). When within ideal habitat and under favourable conditions, the Darwin Cycad can occur at densities ranging from several to more than 1,000 individuals per hectare (Watkinson and Powell 1997; Liddle 2004). As defined by the Department of Environment, Parks and Water Security (DEPWS), cycad densities of more than 400 mature stems per hectare are deemed high density and more than 700 mature stems per hectare are considered very high density.

In May 2022, during the Wurrumiyanga Environmental Assessment (DIPL contract T21-2263), EcOz observed Darwin Cycad stands within the proposed subdivision boundary but did not identify any high density stands. The Tiwi Islands' population of the Darwin Cycad is particularly important to the conservation of the species because broadscale land clearing, as seen in the Darwin region, is not occurring on the Tiwi Islands. Notwithstanding the recent discovery of the species at Cobourg Peninsula, the Tiwi Islands is the only other location where the Darwin Cycad occurs.

2.1.1 Methods

For a recent development project in Holtze, EcOz devised a Darwin Cycad density survey methodology on the advice of the Flora and Fauna Branch of DEPWS. The survey methodology was a more detailed adaptation of that used by DEPWS in a survey of Middle Arm Peninsula. The density survey undertaken at Wurrumiyanga employed this same survey methodology in accordance with Section 6.2.2 of the *Guidelines for assessment of impacts on terrestrial biodiversity* (NT EPA 2013).

To contextualise the cycad density counts and assist the determination of the intensity and impacts of the proposed development, the survey area was extended beyond the proposed subdivision boundary (15.18 ha) to include the immediate surroundings. The subdivision footprint (60.26 ha) used for the original ecology surveys by EcOz in 2022, which encompasses the currently proposed subdivision boundary, was designated as the cycad survey area (Figure 1).

The survey area was divided into a 100 x 100 m grid. Inaccessible areas containing existing infrastructure were excluded. This resulted in 73 grid cells, of which 27 intersect with the proposed subdivision boundary. Within the centre of each of grid, Bitterlich point sampling was used to obtain stem counts of *Cycas armstrongii*. Remaining within the grid and where relevant, surveyors identified what looked to be the densest patch of cycads and in that location took an additional Bitterlich point sampling to obtain the highest densities of stem counts within each cell. This involves the surveyor undertaking a 360º 'sweep' using a forestry 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^2 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 31.5 to 55 counts per sweep. A count of more than 55 corresponds to a very high density.

The cycad density survey was led by EcOz ecologist Glenn Low who has undertaken cycad surveys recently across Holtze. The other three surveyors – Simon Aylott (EcOz Senior Ecologist), Derek Puruntatameri and Lorenzo Kerinaiua (Tiwi Land and Sea Rangers) – are familiar with the species and Wurrumiyanga locality.

2.1.2 Results

The results of the survey are shown in Figure 1. Sparse *Cycas armstrongii* stands were observed; however, no grid cells – across either the proposed subdivision boundary or the wider cycad survey area – fell within the high or very high density category.

3 Significant vegetation

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

3.1.1 Old-growth forest

The size of a tree (height and diameter at breast height) is linked to its age and the potential for that tree to support hollows critical for numerous hollow-dependent fauna species. The definition of significant patches of large old hollow-bearing trees provided in the guidelines is restricted to stands of vegetation dominated by *Eucalyptus miniata* and *Eucalyptus tetrodonta* with a minimum of five or more stems greater than 50 cm diameter at breast height (DBH) per hectare and/or 30 or more stems greater than 40 cm DBH per hectare. The *Land Clearing Guidelines* acknowledge this narrow definition and suggests consultation with the Flora and Fauna team at DEPWS. It is EcOz's experience consulting with DEPWS across recent projects that no other DBH or stem density thresholds are available to define significant patches of vegetation dominated by other canopy species and, as such, the same thresholds apply across all canopy species. Consequently, areas with a minimum of five or more stems greater than 50 cm DBH per hectare and/or 30 or more stems greater than 40 cm DBH per hectare, irrespective of canopy species, were identified as significant.

A total of 106 old-growth trees were recorded in the survey area, comprising 67 stems between 40 – 50 cm DBH and 39 stems with DBH greater than 50 cm (Figure 2). Patches of old-growth trees are concentrated in the north-eastern corner and southern half of the survey area, of which the latter intersects with the proposed subdivision boundary. Old-growth canopy species include the Stringybark (*Eucalyptus tetrodonta*), Grey Box (*Eucalyptus tectifica*), Broad-leaved Box (*Eucalyptus oligantha*), Melville Island Bloodwood (*Corymbia nesophila*), Broad-leaved Bloodwood (*Corymbia foelscheana*), Cocky Apple (*Planchonia careya*) and African Mahogany (*Khaya senegalensis*). There is a continuous three-hectare area in the south-western corner of the proposed subdivision boundary that is significant because it contains five or more stems greater than 50 cm DBH per hectare (Figure 2). Due to time constraints, the south-eastern corner of the proposed subdivision was not comprehensively surveyed; satellite imagery suggests old-growth trees are likely to occur here. Old-growth trees were not observed in the north-western corner of the surveyed area. The 106 records of old-growth trees are also inclusive of hollow-bearing trees; however, data collection was not comprehensive due to time constraints.

3.2 Weeds and Feral Animals

Some species of introduced flora are declared to be weeds under the NT *Weeds Management Act* because of the environmental and/or economic harm they can cause. Class A weeds are to be eradicated by landowners and occupiers. Class B weeds must have their growth and spread controlled by landowners and occupiers. The remaining introduced flora species are referred to as *environmental weeds*. The Commonwealth Government has also categorised some species as Weeds of National Significance (WoNS).

Weed distribution is often related to environmental disturbances caused by the construction of roads and tracks and feral animals. Weeds are most prevalent within the Wurrumiyanga township including a detection of Gamba Grass in 2020, which was considered to have been eradicated on Bathurst and Melville Islands. One

Feral Pig (*Sus scrofa*) was observed uprooting the ground in the residential area (corner of Airport Rd and Timeapatua Circuit) adjacent to the proposed subdivision boundary.

The survey area is characterised as previously-disturbed vacant land and is located between the Wurrumiyanga aerodrome and existing residential lots; accordingly, weed species were observed within the survey area. As the cycad survey coincided with the late dry season prior to rainfall, several grassy weeds were dead and unable to be identified. This primarily pertains to suspected instances of Annual Mission Grass (*Cenchrus pedicellatus*). [1] A list of weeds identified in the survey area is provided in Table 1.

The project area lies within the *Darwin Regional Weed Strategy 2021-2026* (DRWS) (DEPWS 2021). This weed management plan focusses on weeds that are most important to the region, categorising them as either:

- Category 1 – Priority weeds for eradication.
- Category 2 – Priority weeds for strategic control (including eradication of outliers).
- Category 3 – Weeds of concern – prevent spread.
- Category 4 – Hygiene or biosecurity weeds – prevent spread.
- Category 5 – Alert weeds eradication on detection.

Table 1. Weed species recorded during cycad survey in November 2023

Common Name	Scientific Name	Status Class	WoNS	DRWS Category
Mission Grass (perennial)	*Cenchrus polystachios*	Class B	-	2
African Mahogany	*Khaya senegalensis*	Environmental Weed	-	3
Hyptis	*Mesosphaerum suaveolens*	Class B	-	4
Wild Passionflower	*Passiflora foetida*	Environmental Weed	-	-

The weed species identified are consistent with those recorded by EcOz within the cycad survey area in March 2022 and a recent site inspection of the Wurrumiyanga aerodrome by EcOz in early October 2023.

[1] Annual Mission Grass (DRWS Category 3) is listed on Figure 2 as '*Unknown weed*' and '*Mission Grass* (*unknown*)'. Annual Mission Grass was recorded by EcOz within the survey area in March 2022.

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4 Summary

No high or very-high density patches of *Cycas armstrongii* were recorded in the proposed subdivision boundary or wider survey area. Incidental weed data is consistent with recent surveys undertaken by EcOz in the Wurrumiyanga area. One significant vegetation type (large hollow-bearing trees/old-growth forest) occurs within the proposed subdivision boundary.

Any queries relating to the survey methodology or results can be directed to the report author.

Yours sincerely,

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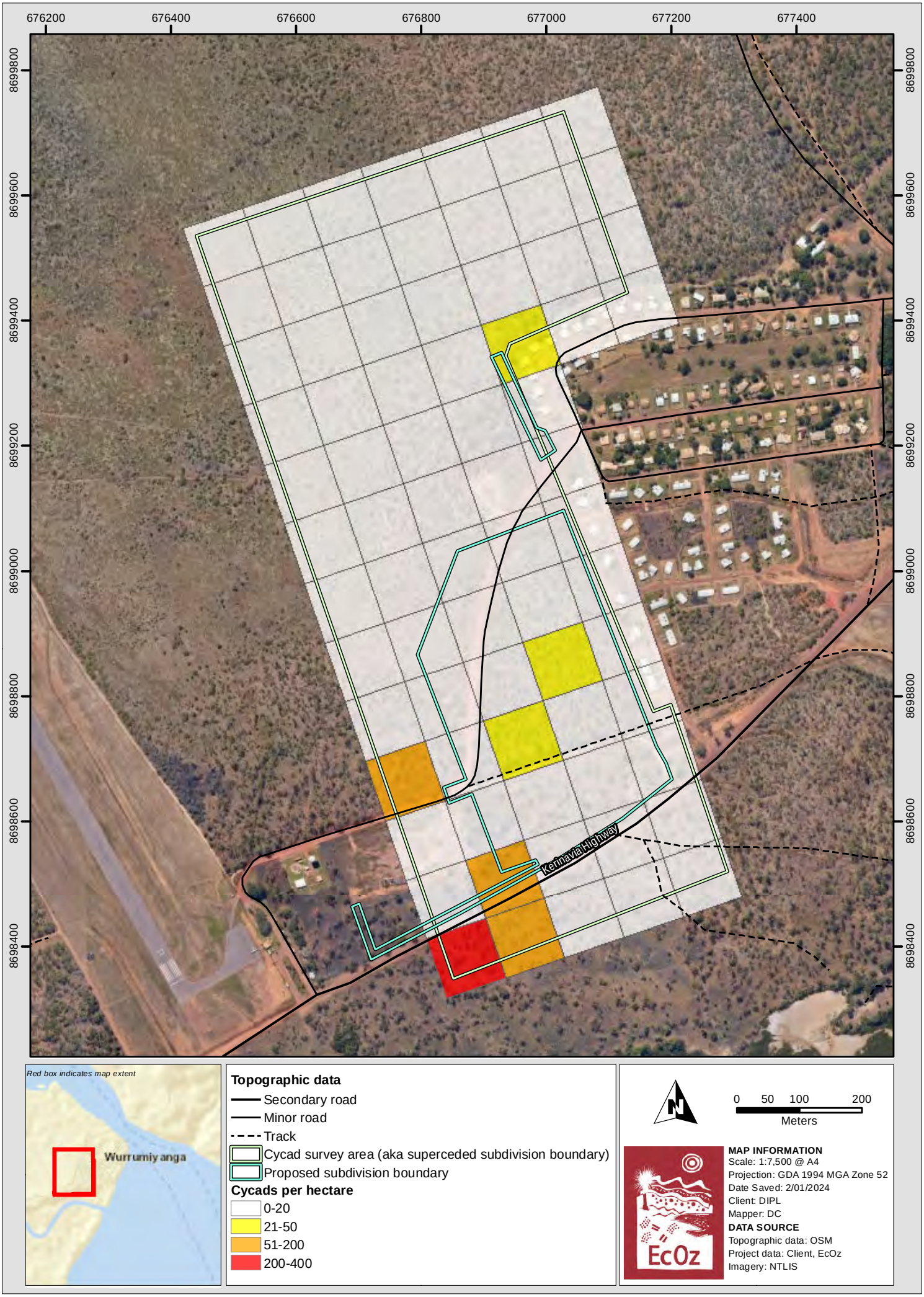

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Figure 1 - Cycad density

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Figure 2. Large old-growth trees and weed observations

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