

Friday, 27 June 2025



Mr Scott Young
Rio Tinto Copper Winu
Central Park, 152-158 St Georges Terrace,
Perth, WA, 6000, Australia
Via email to: Scott.Young@riotinto.com

Re: *Melaleuca* Vegetation Mapping for the Winu Project, May 2025. Ref WB1071

Dear Scott

Western Botanical is pleased to provide details of the assessment of *Melaleuca* vegetation/ Percival Palaeovalley.

1. Background

Rio Tinto Winu Pty Limited (Rio Tinto Winu) plan to develop a new copper-gold mine, referred to as the Winu Project. The Winu Project is located approximately 320 km east of Port Hedland and 300 km south of Broome within the northern Pilbara region of Western Australia, extending across both the Nyangumarta and Martu People's Native Title Determination Areas (Figure 1).

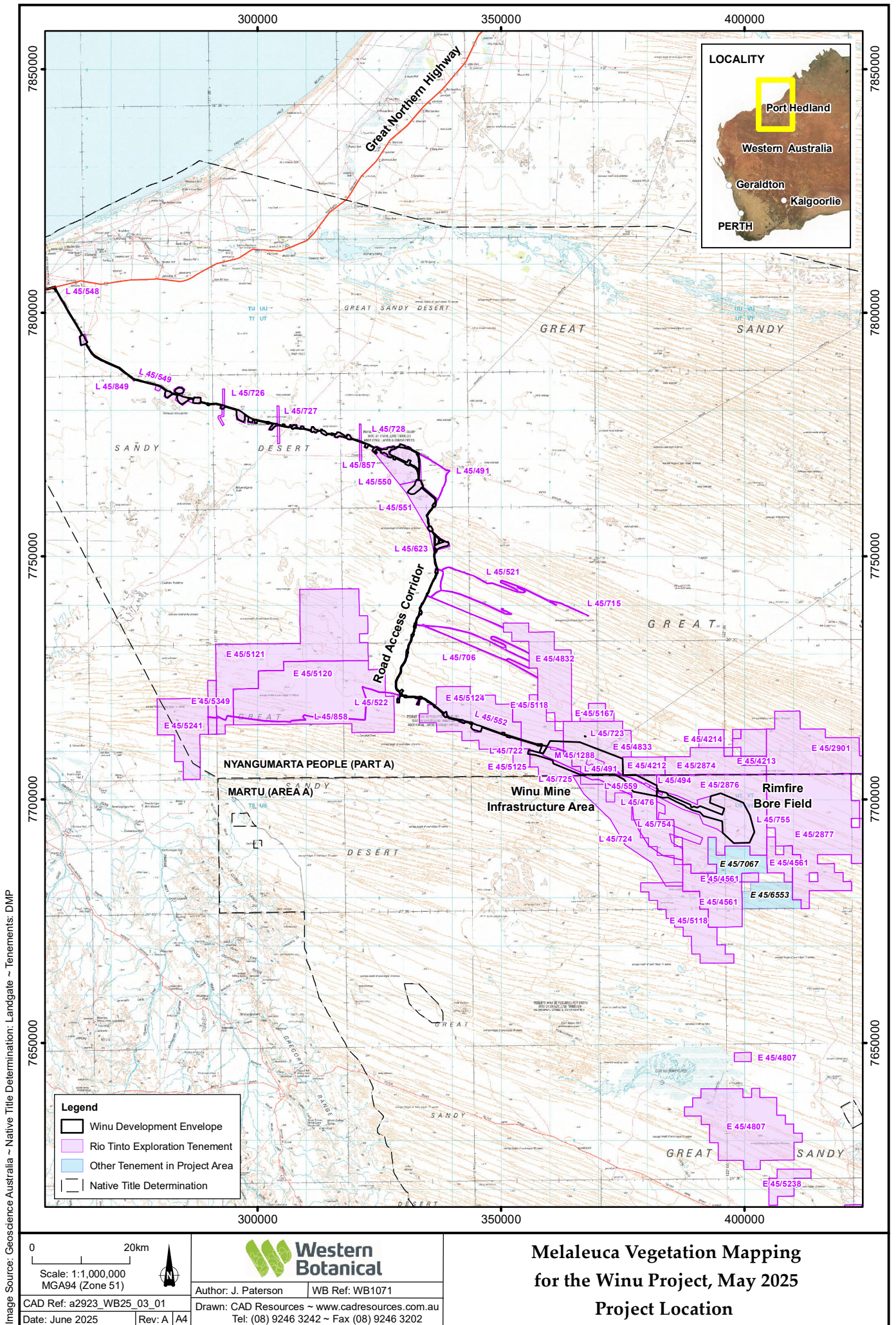
The Project's Development Envelope (DE) is 23,649.02 ha in size, consisting of three components:

- Mine Infrastructure Area (MIA): area containing the mineralised deposit and related infrastructure; includes monitoring bores north of mine area (10,181.48 ha);
- Road Access Corridor (RAC): existing access road linking Great Northern Highway to the Winu Project Area (6,647.25 ha);
- Rimfire Bore Field (Rimfire): regional bore field located 31 km east of the MIA. Includes a linkage corridor to the MIA (6,820.34 ha);

As part of a previous (2022-2024) works package, Western Botanical were commissioned by Rio Tinto Winu to conduct a number of Detailed Flora and Vegetation Assessments across the Winu Project, and further, to consolidate all previous botanical survey data, and address any gaps in existing survey work, with the objective of bringing all components of the Winu Project to 'Detailed' survey level (Western Botanical 2024, Ref WB1051).

Figure 1. Location of the Winu Project.





During this consolidated reporting, Western Botanical noted the correlation between *Melaleuca lasiandra*-dominated Vegetation Association, P19, and the Percival Paeleovalley, suggesting a potential Groundwater-Dependant Ecosystem (GDE); at least for areas further south of the Rimfire Bore Field which were observed to contain *Eucalyptus victrix*, a facultative phreatophyte (i.e., a plant that can utilize groundwater but is not entirely dependent on it for survival).

Limited drilling in the area provides some evidence of a perched aquifer system delineated by the Percival Aquifer (i.e., ~4 metres below ground level (mbgl) at AKD10), contrasting from the >17-20 mbgl found in other locations in Rimfire. Current drawdown models for the Rimfire Bore Field are limited by poor understanding of the connection between this shallow system and the deeper systems. As the Rimfire Borefield is critical component of the Winu Project for water supply, further work may be warranted to develop a better understanding of; i) the connection between the shallow and deeper systems, and b) to confirm if the vegetation is GDE or not.

RTW commissioned Western Botanical to map the *Melaleuca*-dominated vegetation, in order to understand its extent and floristic characteristics, and gather baseline information for potential future monitoring programmes.

2. Methods

2.1 Field assessment

The field assessment was conducted by Western Botanical botanists, Jason Paterson and Nicole Dakin, between 2nd-3rd, and on 7th May 2025. A series of foot/vehicle traverses and quadrat assessments were conducted to record and describe Vegetation Associations, coupled with broadscale aerial mapping to capture the extent of the *Melaleuca*-dominated Vegetation Associations in the area.

A series of 50 m x 50 m quadrats were established within each recognised Vegetation Association, using steel fence droppers and measuring tapes to demarcate corners and boundaries. Photographs were taken from the two permanent corners (north-west and south-east), while data pertaining to the following parameters was recorded into notebooks at each quadrat site.

General: vegetation association, date, persons recording, quadrat size;

Location: unique site number, project name, coordinates recorded on handheld GPS, datum GDA94 (accuracy +/- 5 m), digital photograph;

Vegetation: species present, height and projected foliar cover (PFC) for each species, species outside of the quadrat (but not noted within), structural description (Based on NVIS level 5 'Association' descriptions);

Disturbance: vegetation condition, fire age;

Physical Conditions: rock type, soil, landform description, runoff.

New or unknown taxa recorded during quadrat assessments were collected, and given unique collection numbers. The vegetation of the Study Area was mapped at NVIS level 5 'Association' level on high-resolution aerial imagery, uploaded to iPads with ESRI Field maps data collection software.

3. Results

3.1 *Melaleuca*–dominated Vegetation Association Mapping

Four *Melaleuca*-dominated Vegetation Associations were encountered within the Percival Paleochannel area, as well as one clay-pan and two previously described units. Vegetation mapping was of greater accuracy and intensity towards the northern areas of the *Melaleuca* habitat (i.e., closer to the Rimfire Borefield). Mapping within southern areas was largely conducted via helicopter survey, and lacks definition to the degree of subcategorization (i.e., either mapped as P23, or as *Melaleuca* habitat and not adequately assessed).

As suggested in Western Botanical 2024 (Ref WB1051), the vegetation occurring south of the previously assessed areas within the Rimfire Bore Field differ from the P19 – *Melaleuca lasiandra* Low Open Shrubland over *Triodia schinzii*; tending to *Melaleuca glomerata* and *Eucalyptus victrix* Open Shrubland over *Triodia basedowii* Hummock Grassland associations. The extent of the *Melaleuca*-dominated vegetation appears to correlate well with the Percival Paleovalley, with minor variations in floristics driven by proximity to underlying geomorphological and groundwater features (i.e., low lying clay-pans, calcrete rises etc).

A list of Vegetation Associations is presented in Table 1. Vegetation mapping of the *Melaleuca* habitat is presented in Figure 2 and a map of vegetation mapping confidence is presented in Figure 3.

Table 1. Vegetation Associations encountered across the Percival Paleochannel

Landform	Veg Code	Vegetation Association	Total Extent (ha)
Sand Dunes and Associated Swales	*D4	<i>Melaleuca lasiandra</i> Open Low Shrubland over <i>Triodia schinzii</i>	72.72
Interdunal Sand Plain	*P19	<i>Melaleuca lasiandra</i> Low Open Shrubland over <i>Triodia schinzii</i>	49.09
	P23	<i>Melaleuca</i> spp. (boundaries defined, excludes subcategorization)	7,082.05
	P23a	<i>Melaleuca lasiandra</i> , <i>Melaleuca glomerata</i> (<i>Eucalyptus victrix</i> , <i>Acacia colei</i> var. <i>colei</i>) Open Shrubland over <i>Triodia basedowii</i> (<i>Acacia stellaticeps</i>)	929.40
	P23b	<i>Melaleuca lasiandra</i> (<i>Hakea lorea</i> , <i>Melaleuca glomerata</i>) Open Shrubland over <i>Triodia epactia</i> (<i>Euploca glandulifera</i> , <i>Ptilotus axillaris</i>)	92.45
	P23c	Interzone - <i>Melaleuca lasiandra</i> , <i>Melaleuca glomerata</i> , <i>Acacia ancistrocarpa</i> (<i>Acacia drepanocarpa</i> , <i>Acacia monticola</i>) Open Shrubland over <i>Triodia schinzii</i>	565.52
	P23d	<i>Melaleuca glomerata</i> Scattered Low Shrubs over <i>Trianthema turgidifolium</i> (<i>Triodia basedowii</i>)	49.77
	Melaleuca habitat (approximate)	<i>Melaleuca</i> spp. (observed; not assessed; boundaries not defined)	N/A
Claypans and Low-Lying Clay Flats	C8	Clay-Pan (<i>Eragrostis cumingii</i>) with Scattered Herbs and Grasses	3.41
Mosaic units	C1+P23	Mosaic <i>Eucalyptus victrix</i> Open Woodland + <i>Melaleuca</i> spp. Open Shrubland.	21.07

P23a - *Melaleuca lasiandra*, *Melaleuca glomerata* (*Eucalyptus victrix*, *Acacia colei* var. *colei*) Open Shrubland over *Triodia basedowii* (*Acacia stellaticeps*)

The P23a Vegetation Association occurs in low flat drainage areas, associated with the Percival Paleovalley, on red to grey sandy-clay soils. The vegetation includes occasional *Eucalyptus victrix* 3-4m with *Melaleuca lasiandra* 2-3m PFC 1-3% over *Melaleuca glomerata* 1.5 (10- 15%) with occasional *Acacia colei* var. *colei* 2m over *Triodia basedowii* (5-15%), *Acacia stellaticeps* 0.4m *Fimbristylis* sp. 0.2m, *Euploca glandulifera* 0.4m, *Ptilotus exaltatus* 0.3m, *Ptilotus calostachyus* 0.4m, *Sida ?ammophila* 0.3m, *Aristida holathera* 0.4m, *Senna notabilis* 0.2m, *Arivela viscosa* 0.3m and *Eragrostis eriopoda* 0.4m (PFC 25%) (Plate 1).

The vegetation comprising the P23a Low Shrubland is considered Excellent condition.



Plate 1. P23a - *Melaleuca lasiandra*, *Melaleuca glomerata* (*Eucalyptus victrix*, *Acacia colei* var. *colei*) Open Shrubland over *Triodia basedowii* (*Acacia stellaticeps*)

P23b - *Melaleuca lasiandra* (*Hakea lorea*, *Melaleuca glomerata*) Open Shrubland over *Triodia epactia* (*Euploca glandulifera*, *Ptilotus axillaris*)

The P23b Vegetation Association occurs on low calcrete outcropping associated with the Percival Paleochannel. The soil is described as firm red sand with patches of clay. The Vegetation comprising this unit consists of *Hakea lorea* subsp. *lorea* 3m, *Grevillea wickhamii* subsp. *hispidula* 2.5m, *Eucalyptus victrix* 2.5m and *Melaleuca lasiandra* 2.5m with a PFC of 1-2% over a Hummock Grassland of *Triodia epactia* 0.4-1m (35%), with *Acacia stellaticeps* 0.6m, *Euploca glandulifera* 0.2m, *Ptilotus axillaris* 0.05m, *Eriachne mucronata* 0.4m, *Ptilotus astrolasius* 0.23m, PFC 40%.



Plate 2. P23b - *Melaleuca lasiandra* (*Hakea lorea*, *Melaleuca glomerata*) Open Shrubland over *Triodia epactia* (*Euploca glandulifera*, *Ptilotus axillaris*)

P23c - Interzone - *Melaleuca lasiandra*, *Melaleuca glomerata*, *Acacia ancistrocarpa* (*Acacia drepanocarpa*, *Acacia monticola*) Open Shrubland over *Triodia schinzii*

The P23c Low Shrubland is an interzonal unit, recorded to capture the broad and mixed boundary between the *Melaleuca*-dominated P23 Vegetation of the Percival Paleovalley and *Acacia*-dominated Vegetation Associations occurring outside. The vegetation includes a mid-to-upper storey of *Melaleuca lasiandra* 4m with a PFC of 2% over *Acacia ancistrocarpa* 1.5m or *Acacia drepanocarpa* 2m, *Acacia monticola* 2m and *Melaleuca glomerata* 1.5m (2%) over a Hummock Grassland of *Triodia schinzii* 0.5-1.3m, *Triodia basedowii* 0.6m-1m and Low Shrubland of *Jacksonia aculeata* 1m, *Tephrosia arenicola* 0.4m, *Ptilotus calostachyus* 0.2m, *Sida arenicola* 0.5, *Dampiera candicans* 0.2m and *Eragrostis eriopoda* 0.2m with a PFC of 6%.

The Condition of the vegetation comprising the P23c association is considered Excellent.



Plate 3. P23c - Interzone - *Melaleuca lasiandra*, *Melaleuca glomerata*, *Acacia ancistrocarpa* (*Acacia drepanocarpa*, *Acacia monticola*) Open Shrubland over *Triodia schinzii*

P23d - *Melaleuca glomerata* Scattered Low Shrubs over *Trianthema turgidifolium* (*Triodia basedowii*)

The P23d Scattered Low Shrubs Vegetation Association occurs on claypan drainage areas associated with the Percival Paeleovalley. It occurs on red sand and hard grey clay, with some surface lag and crust. The vegetation consists of a mid-upper story of Scattered Low Shrubs of *Melaleuca glomerata* 1m with a PFC of 3% over *Trianthema turgidifolium* 0.4m, *Aristida holathera* var. *holathera* 0.5m and *Eragrostis cumingii* 0.3m, *Sporobolus actinocladus* 0.1m, *Aristida inaequiglumis* 0.5m, *Streptoglossa decurrens* 0.3m, *Bulbostylis barbata* 0.05m, *Pluchea ferdinandi-muelleri* 0.4m and *Pluchea tetranthera* 0.4m with a PFC of 30%.

The condition of the Vegetation comprising the association is considered Excellent.



Plate 4. P23d - *Melaleuca glomerata* Scattered Low Shrubs over *Trianthema turgidifolium* (*Triodia basedowii*)

C8 – Clay-Pan (*Eragrostis cumingii*) with Scattered Herbs and Grasses

The C8 Vegetation Association occurs on isolated claypans associated with the Percival Paeleovalley. This vegetation within this association consists of isolated *Melaleuca glomerata*, and *Trianthema turgidifolium* (from adjacent P23d Vegetation Association), over small annual herbs and grasses, including *Eragrostis cumingii* 0.3m, *Cyperus rigidellus* 0.1m, *Pluchea rubelliflora* 0.05m, *Calandrinia tepperiana* 0.01m and *Eragrostis lanicaulis* (P3) 0.2m with a PFC of 2-10%.

The Vegetation comprising this association is considered Excellent, and undergoes seasonal inundation as part of typical claypan ecology.



Plate 5. C8 – Clay-Pan (*Eragrostis cumingii*) with Scattered Herbs and Grasses

C1+P23 - Mosaic *Eucalyptus victrix* Open Woodland + *Melaleuca* spp. Open Shrubland.

The Mosaic *Eucalyptus victrix* Open Woodland + *Melaleuca* spp. Open Shrubland occurred within neighbouring tenement, E 45/7067, and remains unassessed. From aerial survey, it appeared to consist of an upper-stratum dominated by *Eucalyptus victrix* 8m with a PFC 5-15% over a mid-stratum Shrubland of *Melaleuca* sp? (*lasiandra* or *glomerata*) and *Senna* sp? with a PFC of 5-15% over a Tussock Grassland of species unknown. This vegetation possibly represents a new Association, however, without adequate assessment, this cannot be confirmed.

It is unknown whether the size of the dominant overstory species, *Eucalyptus victrix*, is indicative of a GDE or whether it is a soak.

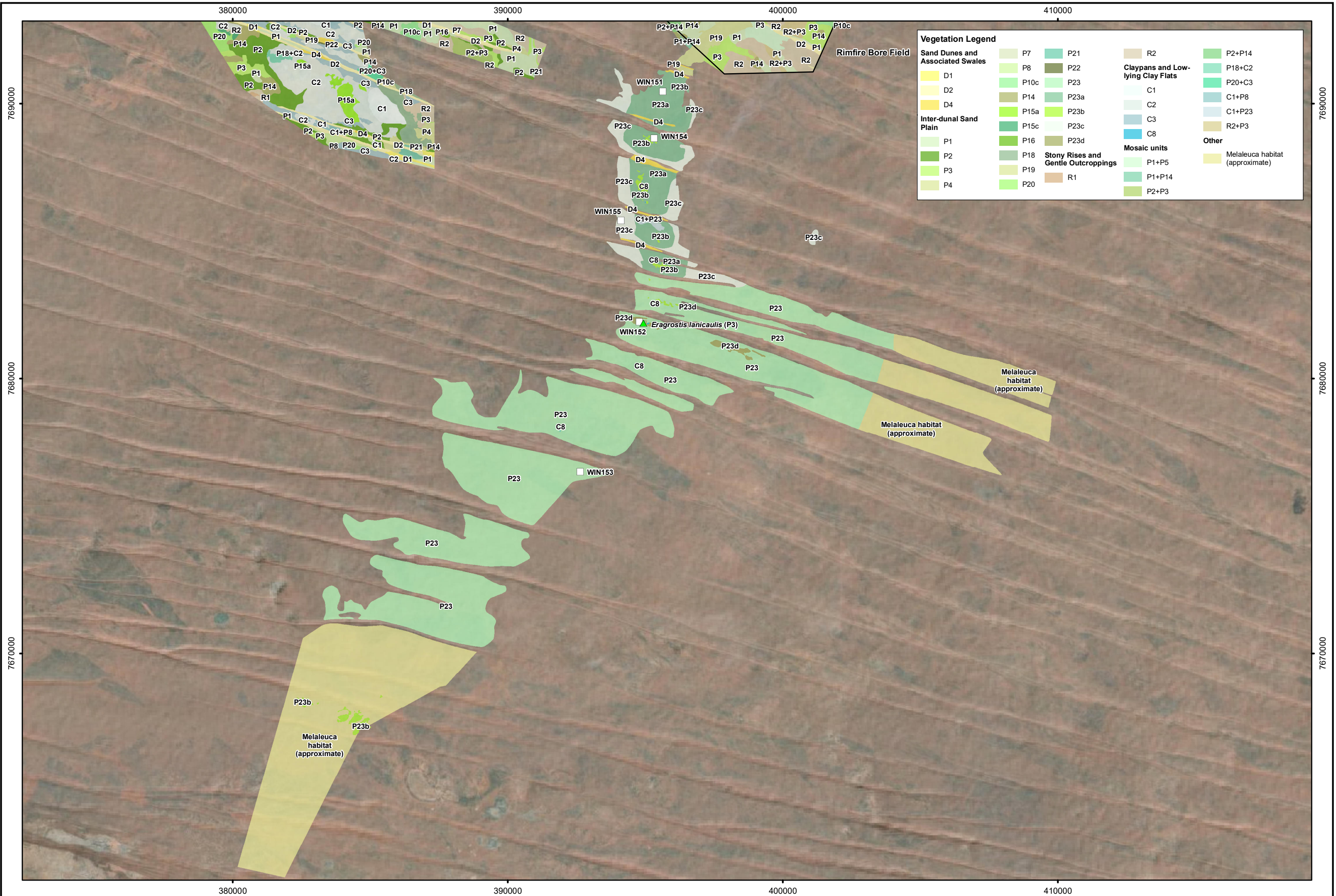


Plate 6. C1+P23 - Mosaic *Eucalyptus victrix* Open Woodland + *Melaleuca* spp. Open Shrubland.

Figure 2. *Melaleuca*- dominated Vegetation Association Mapping (Overview)



Image Source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community ~ Paleovalley: Geoscience Australia



Legend

- Winu Development Envelope
- Quadrat
- Eragrostis lanicaulis* (P3)



0 1 2km
Scale: 1:125,000
MGA94 (Zone 51)
Ref: a2923_WB25_03_04
Date: Jun 2025 | Rev: A | A3



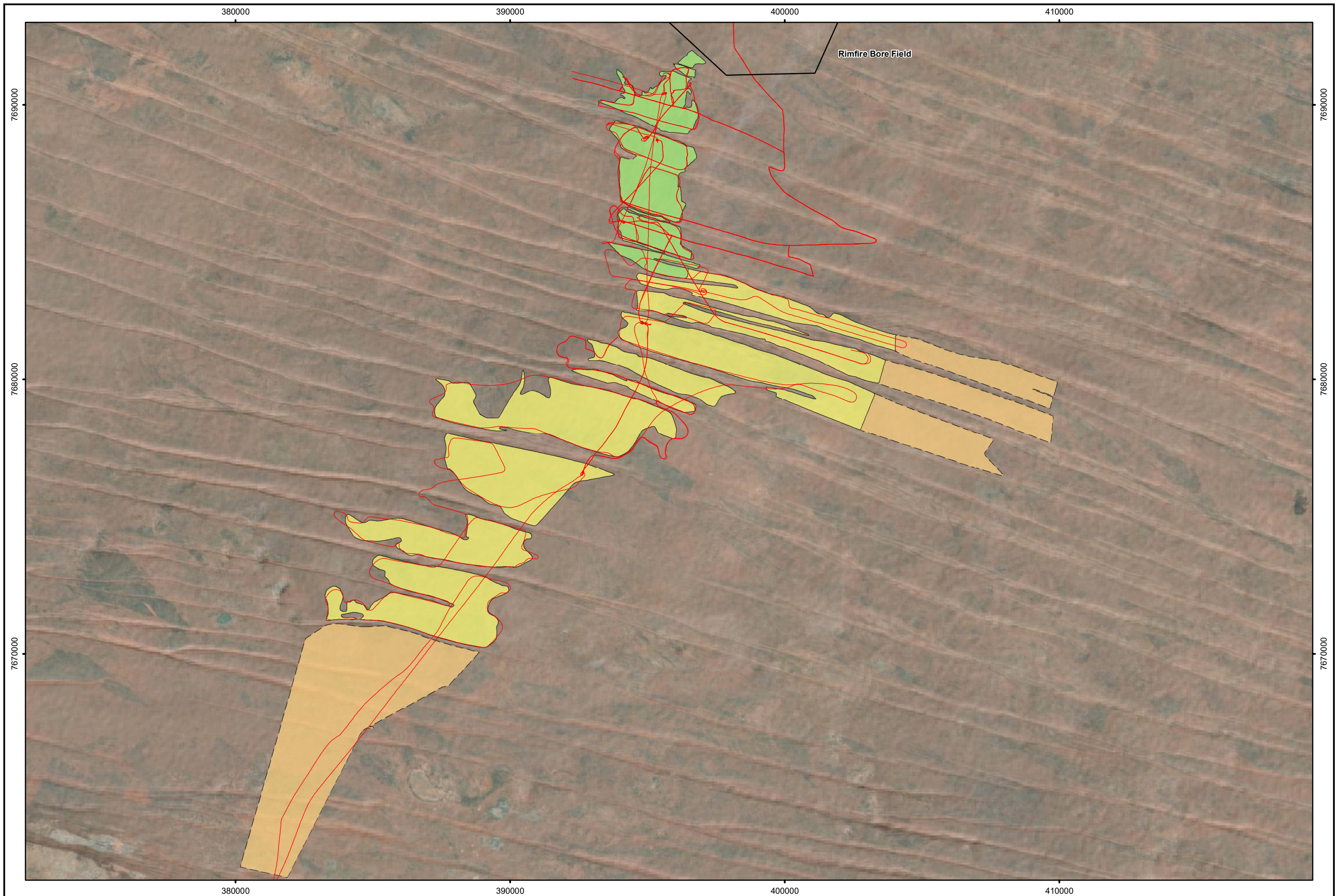
Author: J. Paterson | WB Ref: WB1071
Drawn: CAD Resources ~ www.cadresources.com.au
Tel: (08) 9246 3242 ~ Fax (08) 9246 3202

**Melaleuca Vegetation Mapping
for the Winu Project, May 2025**
Vegetation

Figure 3. *Melaleuca*- dominated Vegetation Mapping Confidence



Image Source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community ~ Paleo valley: Geoscience Australia



Legend Winu Development Envelope Survey Tracklog Vegetation Confidence High confidence Moderate confidence Low confidence		0 1 2km Scale: 1:125,000 MGA94 (Zone 51)		Melaleuca Vegetation Mapping for the Winu Project, May 2025 Vegetation Confidence	
		Ref: a2923_WB25_03_05 Date: Jun 2025	Author: J. Paterson WB Ref: WB1071		

3.2 Flora

A total of 65 flora species from 40 genera and 20 families were recorded across the Percival Paleovalley Study Area, nine of which were new to the Winu Project.

One Priority flora species, *Eragrostis lanicaulis* (P3), was recorded within the C8 - Clay-Pan (*Eragrostis cumingii*) with Scattered Herbs and Grasses Vegetation Association.

Of the recorded taxa, a total of 16 represent extensions to previously known ranges of over 80km. As the Great Sandy Desert bioregion has seldom undergone previous botanical assessment, these results are as expected.

A systematic list of flora taxa including Conservation Status and Range Extension details is presented in Table

Table 2. Systematic Species list of Flora recorded within the Percival Paleovalley Study Area.

Family	Taxon	Cons. Status ²
Aizoaceae	<i>Trianthema turgidifolium</i> ¹	RI 120km N
Amaranthaceae	<i>Ptilotus astrolasius</i>	
Amaranthaceae	<i>Ptilotus axillaris</i> ¹	RI 80km N
Amaranthaceae	<i>Ptilotus calostachyus</i>	
Amaranthaceae	<i>Ptilotus exaltatus</i>	RI 100km E
Asteraceae	<i>Pluchea ferdinandi-muelleri</i>	
Asteraceae	<i>Pluchea rubelliflora</i> ¹	RI 80km NE
Asteraceae	<i>Pluchea tetranthera</i>	RI 140km NE
Asteraceae	<i>Streptoglossa decurrens</i>	RI 100km E
Asteraceae	<i>Streptoglossa macrocephala</i>	RI 90km N
Boraginaceae	<i>Euploca glandulifera</i> ¹	RI 80km NE
Cleomaceae	<i>Arivela microphylla</i>	RE 200km W
Cleomaceae	<i>Arivela viscosa</i>	
Convolvulaceae	<i>Evolvulus alsinoides</i> var. <i>villosicalyx</i>	
Cyperaceae	<i>Bulbostylis barbata</i>	
Cyperaceae	<i>Cyperus rigidellus</i> ¹	RE 250km NE
Cyperaceae	<i>Fimbristylis ?dichotoma</i>	
Cyperaceae	<i>Fimbristylis</i> sp. Indet.	
Fabaceae	<i>Acacia ancistrocarpa</i>	
Fabaceae	<i>Acacia stellaticeps</i>	
Fabaceae	<i>Indigofera boviparda</i> subsp. <i>eremaea</i>	
Fabaceae	<i>Indigofera monophylla</i>	
Fabaceae	<i>Jacksonia aculeata</i>	
Fabaceae	<i>Senna notabilis</i>	
Fabaceae	<i>Tephrosia arenicola</i>	
Goodeniaceae	<i>Dampiera candicans</i>	

Family	Taxon	Cons. Status ²
Goodeniaceae	<i>Goodenia armitiana</i>	
Goodeniaceae	<i>Goodenia lamprosperma</i>	
Goodeniaceae	<i>Scaevola parvifolia</i> subsp. <i>parvifolia</i>	
Haloragaceae	? <i>Haloragis</i> sp. Indet.	
Lamiaceae	<i>Dicrastylis cordifolia</i>	
Lauraceae	<i>Cassytha capillaris</i>	
Malvaceae	<i>Corchorus sidoides</i> subsp. <i>sidoides</i>	
Malvaceae	<i>Hibiscus leptocladus</i>	RI 80km N
Malvaceae	<i>Sida</i> ? <i>ammophila</i> ¹	
Malvaceae	<i>Sida arenicola</i>	
Malvaceae	<i>Sida</i> sp. Pilbara (A.A. Mitchell PRP 1543)	RE 100km E
Molluginaceae	<i>Trigastrotheca molluginea</i>	
Montiaceae	<i>Calandrinia tepperiana</i>	
Myrtaceae	<i>Calytrix carinata</i>	
Myrtaceae	<i>Eucalyptus victrix</i>	
Myrtaceae	<i>Melaleuca glomerata</i>	RI 80km N
Myrtaceae	<i>Melaleuca lasiandra</i> ¹	
Nyctaginaceae	<i>Boerhavia</i> ? <i>gardneri</i>	
Poaceae	<i>Aristida contorta</i>	
Poaceae	<i>Aristida holathera</i> var. <i>holathera</i>	
Poaceae	<i>Aristida inaequiglumis</i>	RI 140km E
Poaceae	<i>Eragrostis cumingii</i>	
Poaceae	<i>Eragrostis eriopoda</i>	
Poaceae	<i>Eragrostis lanicaulis</i> ¹	Priority 3
Poaceae	<i>Eragrostis cumingii</i>	
Poaceae	<i>Eriachne aristidea</i>	
Poaceae	<i>Eriachne lanata</i>	
Poaceae	<i>Eriachne mucronata</i>	
Poaceae	<i>Eriachne obtusa</i>	
Poaceae	<i>Eulalia aurea</i>	
Poaceae	<i>Sporobolus actinocladus</i>	RI 150km N
Poaceae	<i>Triodia basedowii</i> ¹	
Poaceae	<i>Triodia epactia</i>	
Poaceae	<i>Triodia schinzii</i>	
Poaceae	Unknown sp. Indet. (Poaceae)	
Proteaceae	<i>Grevillea wickhamii</i> subsp. <i>hispidula</i>	
Proteaceae	<i>Hakea lorea</i> subsp. <i>lorea</i>	
Rubiaceae	<i>Synaptantha tillaeacea</i> var. <i>tillaeacea</i>	
Zygophyllaceae	<i>Tribulus hirsutus</i>	RI 90km NE

¹ Denotes flora taxa new to the Winu Project.

² RE denotes Range Extension, RI denotes Range Infill.

3.3 Assessment Against GDE Criteria

The mapped *Melaleuca*-dominated vegetation units appear to correlate with the boundaries of the Percival Paleovalley (Figure 4). The strong correlation of the vegetation with the perched aquifer suggests that the vegetation may be utilising the groundwater source.

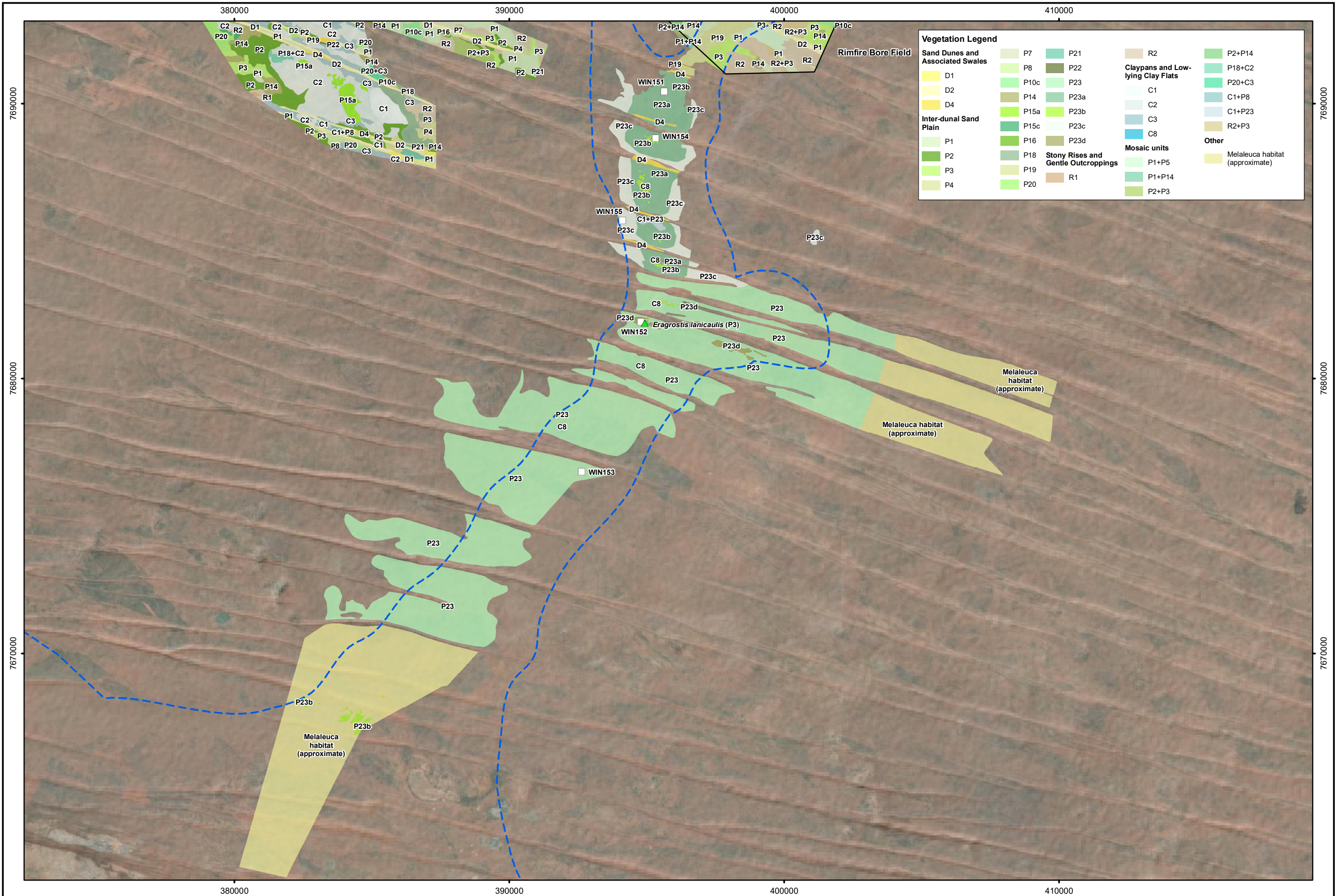
Potential GDEs were previously surveyed in the nearby Woodie Woodie Mine project area, located approximately 100 km south west from the Winu project area (Mattiske, 2019). The study noted several plant species associated with potential GDEs, including trees such as *Eucalyptus victrix*, *Eucalyptus camaldulensis* and *Melaleuca argentea*, and smaller plants including *Ammannia multiflora*, *Cyperus vaginatus*, *Eleocharis geniculata*, *Lobelia arnhemiaca*, *Potamogeton tricarinatus*, *Stemodia grossa* and *Typha domingensis*. While *Eucalytus victrix* was observed to be present in the *Melaleuca*-dominated vegetation units, none of the smaller water-dependent species were recorded. However, it is possible that different species would fulfil these ecological roles in the areas around Winu, so the exact species lists cannot be compared to identify a GDE. Data from surveys in the Great Sandy Desert are limited, it is unknown which species are associated with GDEs.



Figure 4. *Melaleuca*- dominated Vegetation Mapping against Percival Paleovalley



Image Source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community ~ Paleovalley: Geoscience Australia



Winu Development Envelope

Percival Paleovalley

Quadrat

Eragrostis lanicaulis (P3)

0

1

2km

Scale: 1:125,000

MGA94 (Zone 51)

Ref: a2923_WB25_03_06

Date: Jun 2025

Author: J. Paterson

WB Ref: WB1071

Drawn: CAD Resources ~ www.cadresources.com.au

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Western Botanical

Melaleuca Vegetation Mapping

for the Winu Project, May 2025

Vegetation and Percival Paleovalley

3.4 Conservation Significant Flora

Eragrostis lanicaulis (Priority 3)

Eragrostis lanicaulis (P3) is a member of the Poaceae family. It is described as a knotty or bulbous rhizomatous perennial grass that grows to 0.5m (Figure 4) (WA Herbarium 1998-2025). It is associated with red sandy clay flats, predominately occurring around the southern boundary of the Great Sandy Desert bioregion, with other occurrences in the Pilbara, Kimberley and Northern Territory (Figure 5).

One *Eragrostis lanicaulis* (P3) was recorded during the field survey, occurring within the C8 - Clay-Pan (*Eragrostis cumingii*) with Scattered Herbs and Grasses Vegetation Association. The Conservation significance of this taxon was unknown to Western Botanical at the time of the survey; therefore, it was not assessed. Field observations suggest it may occur in a number of the claypan areas.



Figure 5. *Eragrostis lanicaulis* (P3), displaying characteristic hairy internodes.

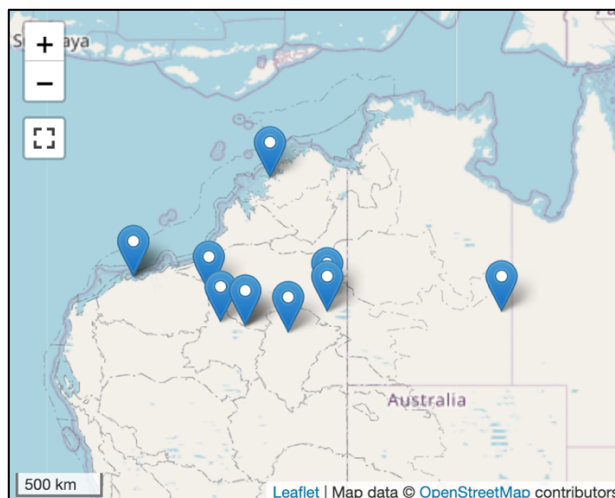


Figure 6. Distribution of *Eragrostis lanicaulis* (P3) across Western Australia (WA Herbarium).

4. Discussion

Overall, the *Melaleuca*-dominated vegetation associations south of the Rimfire Borefield appear to correlate with the Percival Paleochannel. The vegetation units included *Eucalyptus victrix*, a potential indicator of GDEs. However, this species is a facultative phreatophyte, and understory indicator species from previous surveys in nearby areas were not observed. While there is no clear evidence of the vegetation units being GDEs, these areas should still be considered as possible GDEs. It should be noted that there is a lack of contextual data in the Great Sandy Desert area, and the exact indicator species that would be present in the Winu area are not known.

Further studies of groundwater connectivity and water relations in plants would be required to prove that the mapped area is a GDE. It may be suggested that a monitoring program is established to detect any changes in vegetation health and recruitment due to indirect impacts from mining activities.

5. Limitations

While a detailed approach was incorporated for the mapping of the *Melaleuca* vegetation, it is constrained by overall survey effort. The vegetation mapping in general was broadscale, more focused on covering its extent via aerial assessment. While some quadrats were established, the number only equates to the total number of Vegetation Associations, and does not have the replication necessary to utilise in statistical analysis. Generally speaking, the further the distance from Rimfire, the lower the confidence in mapping.

Further to this, access in several areas was limited due to alternative tenure. The C1+P23 Association appeared to be the most representative of a GDE all of the areas surveyed, however, the understory could not be catalogued.

Finally, the current reporting effort lacks the context of geology, soils and land-system image, typically provided in a Detailed report.

Yours sincerely,

Jason Paterson
Project Manager, Botanist
Western Botanical



Appendix 1: Raw Quadrat Data

Rio Tinto Winu - Winu Project

Described by ND JP

Site WIN0151

Date

3/5/2025 Type Q

50x50

Season E

Uniformity Excellent

Location Melaleuca habitat

MGA Zone 51K 395641 mE 7690437 mN 121.99667680 E
20.88334568 S

Habitat P23a - Drainage flat in Paleochannel

Soil Mosaic of red sand and hard grey clay, firm, with some surface lag.

Rock Type Calcrete sub cropping.

Vegetation Eucalyptus victrix to 6m PFC 1% over Melaleuca lasiandra 3m Melaleuca glomerata 1.7m PFC 20% over Acacia stellaticeps 0.5m Aristida holathera var. holathera 0.4m Fimbristylis sp. 0.3m and Triodia basedowii 1m PFC 30%.

Veg Condition Excellent

Fire Age Long unburnt

Notes No effective disturbance. 85% bare ground cover, 1% cryptogam cover, 2% leaf litter cover, 40% all

Species	Phase 1			Phase 2			Comments
	Cover (%)	Height (cm)	Specimen	Cover (%)	Height (cm)	Specimen	
Eucalyptus victrix	3	600					
Melaleuca lasiandra	4	300					
Melaleuca glomerata	4	170					
Acacia stellaticeps	2	50					
Fimbristylis sp. Indet	1	30	Q151-02				
Triodia basedowii	2	50-100	Q151-01				
Streptoglossa macrocephala	0.1	30	Q151-03				
Aristida holathera var. holathera	3	40					
Eulalia aurea	0.1	40					
Pluchea tetranthera	0.1	50	Q151-04				
Eriachne aristidea	0.1	50					
Euploca glandulifera	0.1	20					Prev collected
Senna notabilis	0.1	40					
Indigofera monophylla	0.1	140					
Goodenia lamprosperma	0.1	20					
Sida ?ammophila	0.1	30					Prev collected
Pluchea ferdinandi-muelleri	0.1	40					
Corchorus sidoides subsp. sidoides	0.1	30					
Sida arenicola	0.1	100					
Ptilotus exaltatus	0.1	40					
Ptilotus calostachyus	0.1	40					
Triodia schinzii	0.1	40-150					
Eragrostis eriopoda	0.1	40					
Hibiscus leptocladus	0.1	30	Q151-05				
Arivela viscosa	0.1	50					
Trigastrotheca molluginea	0.1	20					
Goodenia armitiana	0.1	30					
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	20	Q151-06				
Acacia ancistrocarpa	0.1	30					
Synaptantha tillaeacea var. tillaeacea	0.1	5	Q151-07				



Rio Tinto Winu - Winu Project**Site** WIN0152**Described by** ND JP**Date**3/5/2025 **Type** Q

50x50

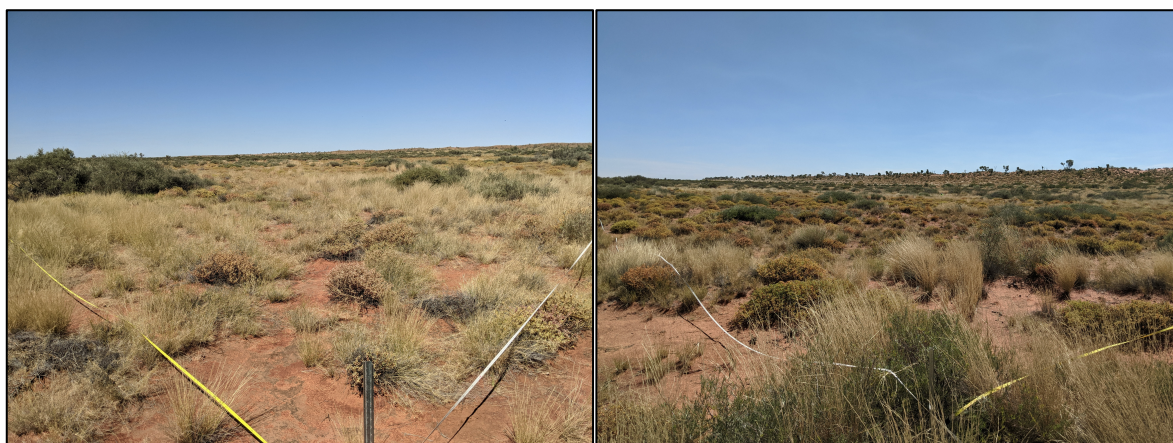
Season E**Uniformity** Excellent**Location** Melaleuca habitat**MGA Zone** 51K 394788 mE 7682059 mN 121.98796886 E

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20.95898687 S

Habitat P23d - Claypan/ drainage area – Trianthema turgidifolium dwarf Shrubland.**Soil** Mosaic of red sand and hard grey clay, firm, with some surface lag and crust**Rock Type** Assumed calcrete sub cropping.**Vegetation** Melaleuca glomerata 1m PFC 3% over Trianthema turgidifolium 0.4m Aristida holathera var. holathera 0.5m Eragrostis cumingii 0.3m PFC 30%**Veg Condition** Excellent**Fire Age** Long unburnt**Notes** No effective disturbance except for grazing animals (camel). 65% bare ground cover, 5% cryptogam cover, 35% PFC all strata

Species	Phase 1			Phase 2			Comments
	Cover (%)	Height (cm)	Specimen	Cover (%)	Height (cm)	Specimen	
Melaleuca glomerata	3	100					
Trianthema turgidifolium	10	50					
Eragrostis cumingii	3	30					
Sporobolus actinocladius	0.1	40	Q152-01				
Aristida holathera var. holathera	0.1	50					
Aristida inaequiglumis	0.1	90	Q152-02				
Streptoglossa decurrens	0.1	25	Q152-03				
Bulbostylis barbata	0.1	5					
Unknown sp. Indet. (Poaceae)	0.1	20	Q152-05				
Fimbristylis ?dichotoma	0.1	20					Prev collected
Aristida inaequiglumis	0.1	100					Prev collected
Pluchea ferdinandi-muelleri	0.1	80					
Pluchea tetranthera	0.1	40					
Eriachne obtusa	0.1	30	Q152-04				
Eucalyptus victrix	0	200					



Rio Tinto Winu - Winu Project**Site** WIN0153**Described by** ND JP**Date**

3/5/2025

Type Q

50x50

Season E**Uniformity** Excellent**Location** Melaleuca habitat -**MGA Zone** 51K 392639 mE 7676604 mN 121.96696143 E

-

21.00814445 S

Habitat P23 - Interdunal swale.**Soil** Firm red sand, clayey underneath.**Rock Type** Unknown subcropping**Vegetation** Melaleuca lasiandra 4m PFC 2% over Acacia ancistrocarpa 1.5m Melaleuca glomerata 1.5m (2%) over Triodia basedowii 0.6m-1m and Jacksonia aculeata 1m PFC 6%.**Veg Condition** Excellent**Fire Age** 5-10 years – scorch marks on old Melaleucas**Notes** No effective disturbance. 75% bare ground cover, 15% total PFC all strata. Budgie roosting area.

Species	Phase 1			Phase 2			Comments
	Cover (%)	Height (cm)	Specimen	Cover (%)	Height (cm)	Specimen	
Melaleuca lasiandra	2	300					
Acacia ancistrocarpa	1	150					
Melaleuca glomerata	2	150					
Calytrix carinata	0.1	100					
Jacksonia aculeata	1	100					
Triodia basedowii	5	60-100					
Dampiera candidans	0.1	50					
Sida arenicola	0.1	140					
Scaevola parvifolia subsp. parvifolia	0.1	10					



Rio Tinto Winu - Winu Project

Described by ND JP

Site WIN0154

Date

7/5/2025

Type Q

50x50

Season E

Uniformity Excellent

Location Melaleuca habitat -

MGA Zone 51K 395327 mE 7688740 mN 121.99355611 E -
20.89865925 S

Habitat P23b - Calcrete outcropping, slight rise.

Soil Firm red sand with patches of clay.

Rock Type calcrete

Vegetation Hakea lorea subsp. lorea 3m Grevillea wickhamii subsp. hispidula 2.5m Eucalyptus victrix 2.5m
Melaleuca lasiandra 2.5m PFC 1% over Triodia epactia 0.4-1m, Acacia stellaticeps 0.6m Euploca
glandulifera 0.2m PFC 40%>

Veg Condition Excellent

Fire Age 5-10 years – scorch marks on old grevilleas

Notes No effective disturbance. 60 % bare ground cover, 2% Cryptogam cover, 45% total PFC all strata.

Species	Phase 1			Phase 2			Comments
	Cover (%)	Height (cm)	Specimen	Cover (%)	Height (cm)	Specimen	
Hakea lorea subsp. lorea	0.5	300					
Grevillea wickhamii subsp. hispidula	1	250					
Melaleuca lasiandra	0.1	250					
Eucalyptus victrix	0.1	300					
Melaleuca glomerata	1	150					
Euploca glandulifera	1	40	Q154-01				
Boerhavia ?gardneri	0.1	40	Q154-02				
Acacia stellaticeps	0.5	50					
Triodia epactia	30	50-120					
Eriachne mucronata	0.1	30					
Arivela microphylla	0.1	20	Q145-04				
Ptilotus axillaris	0.1	5	Q154-03				
Eragrostis eriopoda	0.1	30					
Cassytha capillaris	0.1	20					
Triodia basedowii	0.1	40-100					
Aristida contorta	0.1	20					
Ptilotus astrolasius	0.1	40					
Tribulus hirsutus	0.1	10	Q154-05				
Eriachne aristidea	0.1	30					
Sida ?ammophila	0.1	10					
Aristida holathera var. holathera	0.1	30					



Rio Tinto Winu - Winu Project

Described by ND JP

Site WIN0155

Date

7/5/2025

Type Q

50x50

Season E

Uniformity Excellent

Location Melaleuca habitat -

MGA Zone 51K 394113 mE 7685740 mN 121.98170175 E

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20.92569305 S

Habitat P23c - Adjacent drainage

Soil Firm red sand with clay.

Rock Type Unknown, sub cropping

Vegetation Melaleuca lasiandra 2.5m Acacia ancistrocarpa 2m PFC 25% over Triodia basedowii 0.5m-1m
Triodia epactia 0.5m-1m PFC 35%

Veg Condition Excellent

Fire Age 5-10 years – scorch marks on old grevilleas

Notes No effective disturbance. 65 % bare ground cover, 7% leaf litter cover, 70% total PFC all strata.

Species	Phase 1			Phase 2			Comments
	Cover (%)	Height (cm)	Specimen	Cover (%)	Height (cm)	Specimen	
Melaleuca lasiandra	10	250					
Acacia ancistrocarpa	12	200					
Eucalyptus victrix	0.1	150					
Triodia basedowii	35	50-100					
Triodia epactia	1.5	50-140					
Ptilotus astrolasius	0.1	50					
Tephrosia arenicola	0.1	80					
Jacksonia aculeata	0.1	50					
Ptilotus calostachyus	0.1	40					
Aristida holathera var. holathera	0.1	80					
Sida arenicola	0.1	160					
Acacia stellaticeps	0.1	40					
Dampiera candidans	0.1	60					
Eragrostis eriopoda	0.1	40					
Dicrastylis cordifolia	0.1	30					
Eriachne lanata	0.1	70					
Evolvulus alsinoides var. villosicalyx	0.1	30					

