

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: Significant Vegetation of the Winu Project, June 2025. Ref WB1069

Dear Scott

Western Botanical is pleased to provide details regarding Assessment of Significance of Vegetation Associations of the Winu Project.

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 (Figure 1), extending across both the Nyangumarta and Martu People's Native Title Determination Areas.

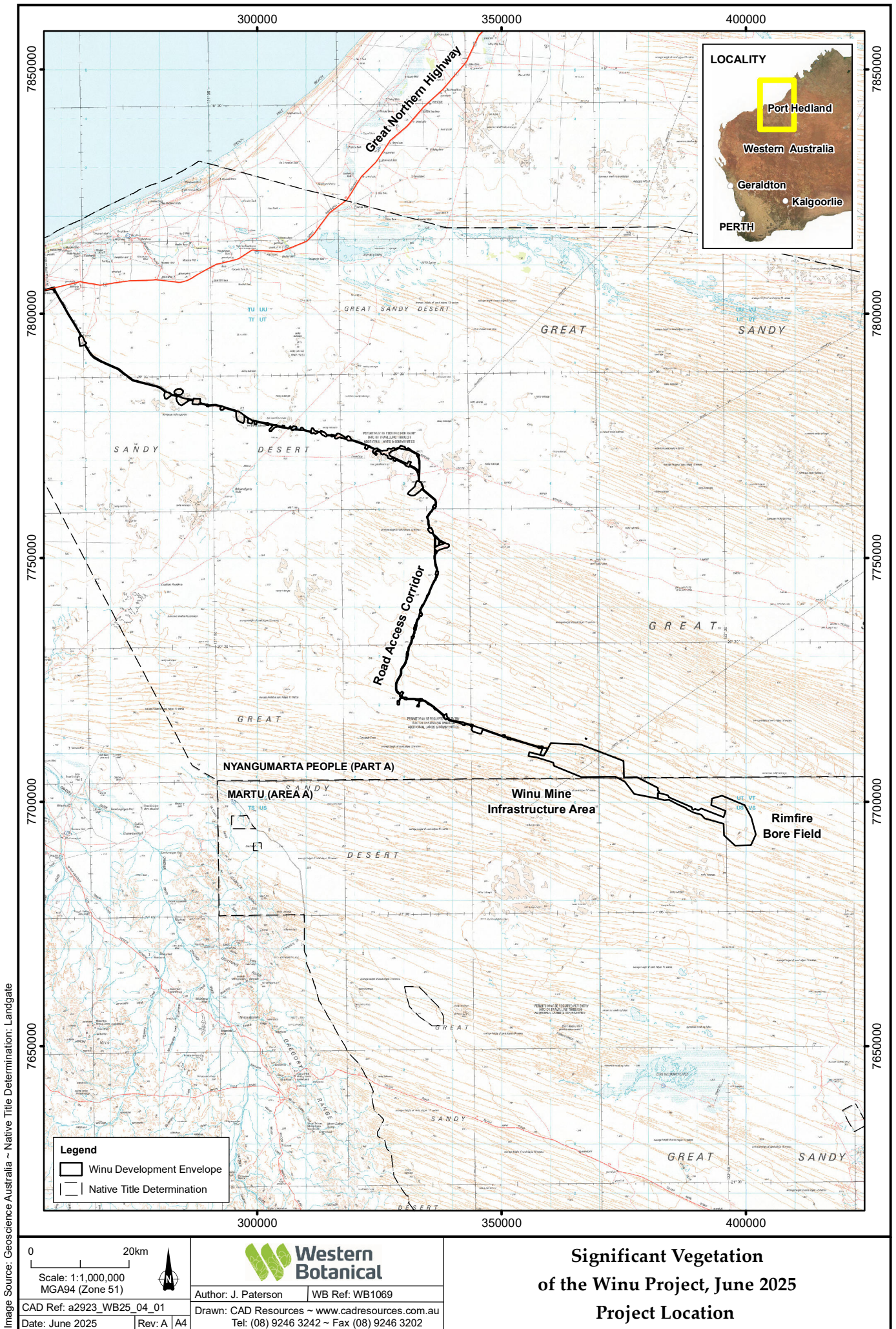
The Project's Development Envelope (DE) is 23,649.02 ha in size, consisting of three components:

- 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);

A number of botanical surveys have been conducted across the Winu Project in previous years, from 2017- present, including Detailed Flora and Vegetation Surveys within and outside the DE. Survey areas representing previous and future project option domains and terminology include; the Winu Project Area (WPA), Winu Re-injection Bore Field (WRIB), the Winu Road Access Corridor (WRAC), the Winu Project Area Extensions (WPAE), Texas Bore Field (Texas), Winu South (WS) and finally, the Rimfire Bore Field Pipeline Corridor (RBFPC).

Figure 1. Location of the Winu Project, Western Australia.





As part of the Detailed assessment component, as many as 49 Vegetation Associations have been encountered, mapped and described across 64398.95 ha of the Winu Project (Figure 2). These include four associations occurring on Sand dunes and associated swales (D1-4); 30 occurring on Interdunal sand plains (P1-23 – including multiple subgroups for P10, P15 and P23); seven occurring on Stony rises and gentle outcroppings (R1-7); and finally, eight occurring on Claypans and low-lying clay flats (C1-8). Vegetation Associations were also observed to form mosaics in which a single vegetation association could not be distinguished (n=25).

While previous flora reports (Biota 2021), have identified vegetation types of local significance, “as they supported large populations of Priority flora: vegetation units D1 and D2 of sand dunes, and P1 of the sand plains”, this has not been addressed in Western Botanical (2024; Ref WB1051). Rio Tinto Winu commissioned Western Botanical to assess Vegetation Associations and rank their significance across the Winu Project, utilizing the most up-to-date flora (Appendix 1) and vegetation data.

2. Methods

2.1. Defining Vegetation Significance.

Vegetation significance ranking has previously been implemented as part of environmental impact assessment of Rio Tinto’s West Angels Project. Criteria for ranking Vegetation significance may incorporate the following factors:

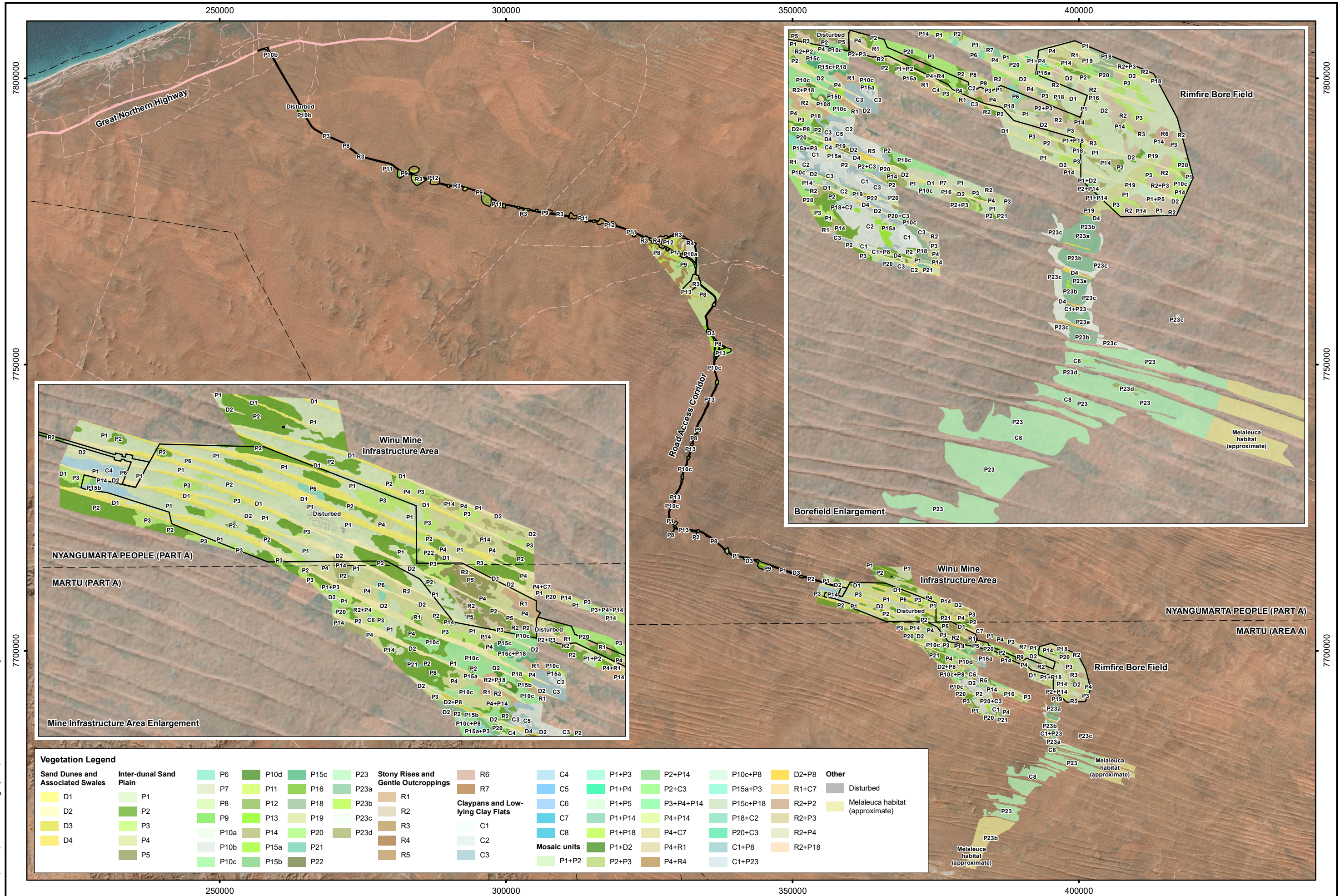
- Threatened and Priority Ecological Communities (TECs and PECs);
- Threatened and Priority listed flora;
- Aquatic and terrestrial Groundwater Dependent Ecosystems (GDEs);
- Formal conservation estate;
- Groundwater Dependent Vegetation;
- Major drainage features; and,
- Ecosystems at Risk.

Subsequently, the degree of each of these characteristics can be used to quantify the scale of significance, such as:

- Regional;
- High local;
- Moderate local;
- Low local;
- Low to negligible; and,
- Negligible.

Figure 2. Vegetation mapping across the Winu Project.





Ecologia (2013) describe local significance, as vegetation that is locally uncommon, or that provides habitats of local significance. Vegetation of local significance is not legislatively protected but is of conservation value if areas are restricted and have not been identified to occur outside the Study Area, and such Conservation significance is typically a consideration for Environmental Impact Assessments (EIA).

2.2 Ranking Vegetation Significance

Using the criteria above, the Vegetation Associations described across the Winu Project were placed in a simplified comparison matrix to rank their Significance. The following significance factors were not applicable to Vegetation Associations across the Winu Project:

- Threatened and Priority Ecological Communities (TEC/ PEC);
- Formal Conservation Estate;
- Groundwater Dependent Vegetation (currently not supported across the Winu Project);
- Major drainage features; and,
- Ecosystems at risk

Factors used to rank vegetation Significance across the Winu Project include the following:

- Priority flora species present i.e., the number (diversity) of different Priority species occurring within a given Vegetation Association;
- Total Priority flora abundance; i.e., the sum of all Priority flora records occurring within a given Vegetation Association (Appendix 1); and
- Terrestrial Groundwater Dependent Ecosystems (GDEs) (sourced from GDA Atlas (Bureau of Meteorology, BOM 2025)) (Appendix 2);

Additional factors used to provide further scaling and accuracy across the results included:

- Total extent of a given Vegetation Association across the Winu Project; and,
- Total area surveyed within a given Vegetation Association.

These helped account for differences in total Priority flora abundances as a result of varying survey efforts. Rank score cut-off ranges were applied to the various factors in order to quantify a collective score across all factors. Associated cut-off values and rationale for usage is presented in Table 1.

Table 1. Rank score cut-off ranges for vegetation Significance factors.

Ranking criteria	Rank						Rationale
	0	1	2	3	4	5	
Priority Flora Species	0	1 to 3	4 to 6	7 to 9	10 to 12		Based on 12 Priority flora species in total.
Priority Flora Abundance	0	1 to 99	100 to 999	1,000 to 9,999	10,000 to 99,999	100,000 to 999,999	Based on upper limit of ~30,000 within one Vegetation Association.
Terrestrial GDE	0	1					Yes/No Vegetation Associated with mapped Terrestrial GDE
Ranking criteria	Rank						Rationale
		0.5	1	1.5	2	2.5	
Vegetation Extent (ha)		10,000 to 99,999	1,000 to 9,999	100 to 999	10 to 99	1 to 9	Inverse relationship applied to highlight increased significance of infrequent Vegetation associations (i.e., those with limited extent)

2.3 Groundwater Dependent Ecosystems (GDEs)

A Groundwater Dependent Ecosystem (GDE) is defined as an ecosystem that relies on groundwater for some or all its water requirements. The GDE Atlas is a national dataset of Australian GDEs to inform groundwater planning and management. The Atlas contains information about three types of ecosystems (aquatic, terrestrial and subterranean). Terrestrial GDEs refer to ecosystems that rely on the subsurface presence of groundwater, this includes all vegetation ecosystems (BoM, 2024b). Several sections within the DE, restricted to the RAC, are classified as having low to moderate potential to support a terrestrial GDE.

Aquatic GDEs are ecosystems that rely on the surface expression of groundwater—this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs. Subterranean GDEs refer to subterranean ecosystems, including cave and aquifer ecosystems. (BoM, 2024b). There are no known Aquatic GDEs across the Winu Project.

Terrestrial GDE data from GDE Atlas has been incorporated into the assessment.

2.4 Priority Flora Abundances Adjustments

Priority flora abundances within each Vegetation Association were upscaled to correspond with the proportion of ‘Area Surveyed’ against ‘Total Area Mapped’. Total area surveyed was calculated by applying a 25m buffer around all tracklogs.

3. Results

Two assessments were conducted; the initial incorporating raw Priority flora abundance in conjunction with GDE presence and Priority flora diversity; and the second employing adjusted Priority flora abundance, based on proportional values of ‘Area Surveyed’ against ‘Total Area Mapped’. Using the methodology described above, Vegetation Associations were quantitatively ranked and assigned a qualitative Significance level. Vegetation Association Significance across the Winu Project ranged from being of ‘Moderate Local Significance’ to ‘Negligible Significance’.

Priority species diversity was greatest in the D1, D2, D3, P1, P2, P3, P4 and C4 Vegetation Associations, typically ranging from four to seven different Priority flora species in each. These results support field observations, with sand dune vegetation typically supporting a greater diversity of Priority flora species, followed by the broader sandplain units. These were typically assigned with ‘Moderate Local Significance’. Of these, the P1 association was found to support the greatest number of Priority flora species (n=7), including *Goodenia hartiana* (P2), *Comesperma sabulosum* (P3), *Corynotheca asperata* (P3), *Dasymalla chorisepala* (P3), *Indigofera ammobia* (P3), *Synostemon arenosus* (P3), *Tribulopsis marliesiae* (P3).

Vegetation Associations that were found to intersect areas with low potential to support a Terrestrial GDE include, P8, P9, P11, P12 and R3. Considering the lower ranking score applied to this criterion (i.e., 0-1), presence of Terrestrial GDE typically had a lower influence on the overall significance ranking, ranging from ‘Low to Negligible Significance’ to ‘Moderate Significance’.

The principal driver of Significance across the Vegetation Associations was Priority flora abundance. Output from the raw Priority flora abundance data were similar to Priority species diversity, with the D1, P1, P2, P3, P4, as well as P8, C2, R1 and R2 containing the greatest Priority flora abundances. Considering the additional effort undertaken in the P8, R1, R2 and C2 vegetation, in conducting targeted *Goodenia hartiana* (P2) and *Cynodon anisocarpus* (P1) searches, these results are as expected.

Results of the initial Vegetation Significant ranking are presented in Table 2.

Table 2. Assessment 1 Vegetation Significance Ranking Results.

Veg Code:	Raw data			Ranking				Significance Level
	Priority Flora Species	Total Priority Flora Abundance	Terrestrial GDE (ha)	Rank Priority Flora Species	Rank Priority Flora Abundance	Rank Terrestrial GDE	Rank Average	
D1	6	20506	0	2	4	0	2.00	Moderate local
D2	6	5845	0	2	3	0	1.67	Low local
D3	4	1195	0	2	3	0	1.67	Low local
D4	3	114	0	1	2	0	1.00	Low to negligible
P1	7	101675	0	3	5	0	2.67	Moderate local
P2	6	99570	0	2	4	0	2.00	Moderate local

Veg Code:	Raw data			Ranking				Significance Level
	Priority Flora Species	Total Priority Flora Abundance	Terrestrial GDE (ha)	Rank Priority Flora Species	Rank Priority Flora Abundance	Rank Terrestrial GDE	Rank Average	
P3	6	86103	0	2	4	0	2.00	Moderate local
P4	5	20888	0	2	4	0	2.00	Moderate local
P5	2	6275	0	1	3	0	1.33	Low local
P6	3	2439	0	1	3	0	1.33	Low local
P7	0	0	0	0	0	0	0.00	Negligible
P8	2	115181	166.2	1	5	1	2.33	Moderate local
P9	2	1392	160.7	1	3	1	1.67	Low local
P10a	2	1678	0	1	3	0	1.33	Low local
P10b	3	1199	0	1	3	0	1.33	Low local
P10c	3	1320	0	1	3	0	1.33	Low local
P10d	1	32	0	1	1	0	0.67	Low to negligible
P11	2	384	251.5	1	2	1	1.33	Low local
P12	1	1	74.5	1	1	1	1.00	Low to negligible
P13	1	1496	0	1	3	0	1.33	Low local
P14	2	3372	0	1	3	0	1.33	Low local
P15a	2	785	0	1	2	0	1.00	Low to negligible
P15b	0	0	0	0	0	0	0.00	Negligible
P15c	2	3554	0	1	3	0	1.33	Low local
P16	1	110	0	1	2	0	1.00	Low to negligible
P18	3	950	0	1	2	0	1.00	Low to negligible
P19	1	4	0	1	1	0	0.67	Low to negligible
P20	3	5659	0	1	3	0	1.33	Low local
P21	1	3	0	1	1	0	0.67	Low to negligible
P22	1	161	0	1	2	0	1.00	Low to negligible
P23	0	0	0	0	0	0	0.00	Negligible
P23a	0	0	0	0	0	0	0.00	Negligible
P23b	0	0	0	0	0	0	0.00	Negligible
P23c	0	0	0	0	0	0	0.00	Negligible
P23d	0	0	0	0	0	0	0.00	Negligible
C1	1	280	0	1	2	0	1.00	Low to negligible
C2	2	285942	0	1	5	0	2.00	Moderate local
C3	3	6765	0	1	3	0	1.33	Low local
C4	4	4958	0	2	3	0	1.67	Low local
C5	1	5	0	1	1	0	0.67	Low to negligible
C6	0	0	0	0	0	0	0.00	Negligible
C7	1	301	0	1	2	0	1.00	Low to negligible
C8	1	1	0	1	1	0	0.67	Low to negligible
R1	2	76047	0	1	4	0	1.67	Low local
R2	2	32381	0	1	4	0	1.67	Low local
R3	3	84	1,411.6	1	1	1	1.00	Low to negligible
R4	0	0	0	0	0	0	0.00	Negligible
R5	0	0	0	0	0	0	0.00	Negligible
R6	0	0	0	0	0	0	0.00	Negligible
R7	0	0	0	0	0	0	0.00	Negligible
D2+P8	1	0	0	1	0	0	0.33	Low to negligible
P1+D2	1	85	0	1	1	0	0.67	Low to negligible
P1+P2	0	0	0	0	0	0	0.00	Negligible
P1+P3	0	0	0	0	0	0	0.00	Negligible
P1+P4	0	0	0	0	0	0	0.00	Negligible
P1+P5	1	150	0	1	2	0	1.00	Low to negligible
P1+P14	0	0	0	0	0	0	0.00	Negligible
P1+P18	1	105	0	1	2	0	1.00	Low to negligible
P2+P3	1	220	0	1	2	0	1.00	Low to negligible
P2+P14	0	0	0	0	0	0	0.00	Negligible
P2+C3	0	0	0	0	0	0	0.00	Negligible
P4+C7	1	30	0	1	1	0	0.67	Low to negligible

Veg Code:	Raw data			Ranking				Significance Level
	Priority Flora Species	Total Priority Flora Abundance	Terrestrial GDE (ha)	Rank Priority Flora Species	Rank Priority Flora Abundance	Rank Terrestrial GDE	Rank Average	
P4+P14	0	0	0	0	0	0	0.00	Negligible
P4+R1	0	0	0	0	0	0	0.00	Negligible
P4+R4	0	0	0	0	0	0	0.00	Negligible
P10c+P8	0	0	0	0	0	0	0.00	Negligible
P15a+P3	0	0	0	0	0	0	0.00	Negligible
P15c+P18	1	10	0	1	1	0	0.67	Low to negligible
P18+C2	0	0	0	0	0	0	0.00	Negligible
P20+C3	0	0	0	0	0	0	0.00	Negligible
R1+C7	1	1	0	1	1	0	0.67	Low to negligible
R2+P2	1	210	0	1	2	0	1.00	Low to negligible
R2+P3	1	70	0	1	1	0	0.67	Low to negligible
R2+P4	0	0	0	0	0	0	0.00	Negligible
R2+P18	1	57	0	1	1	0	0.67	Low to negligible
C1+P8	0		0	0	0	0	0.00	Negligible
C1+P23	0	0	0	0	0	0	0.00	Negligible
P3+P4+P14	0	0	0	0	0	0	0.00	Negligible

In order to account for differences in total Priority flora abundances as a result of varying survey extents across the different Vegetation Associations, the proportion of ‘Area Surveyed’ against ‘Total Area Mapped’ was used to scale the Priority flora abundance data.

Results of the secondary assessment are Presented in Table 3.

Table 3. Assessment 2 Vegetation Significance Ranking Results, ordered by Significance Level

Veg Code:	Raw data			Ranking				Significance Level
	Priority Flora Species	Total Adjusted Priority Flora Abundance	Terrestrial GDE (ha)	Rank Priority Flora Species	Rank Adjusted Priority Flora Abundance	Rank Terrestrial GDE	Rank Average	
P8	2	1077991	166.2	1	6	1	2.67	Moderate local
P1	7	497988	0	3	5	0	2.67	Moderate local
C2	2	1186979	0	1	6	0	2.33	Moderate local
P2	6	538417	0	2	5	0	2.33	Moderate local
P3	6	400577	0	2	5	0	2.33	Moderate local
R1	2	221177	0	1	5	0	2.00	Moderate local
R2	2	175307	0	1	5	0	2.00	Moderate local
P4	5	96389	0	2	4	0	2.00	Moderate local
D1	6	64137	0	2	4	0	2.00	Moderate local
C4	4	22769	0	2	4	0	2.00	Moderate local
D2	6	22079	0	2	4	0	2.00	Moderate local
D3	4	11441	0	2	4	0	2.00	Moderate local
P5	2	34862	0	1	4	0	1.67	Low local
C3	3	32737	0	1	4	0	1.67	Low local
P20	3	27435	0	1	4	0	1.67	Low local
P14	2	13845	0	1	4	0	1.67	Low local
P10a	2	12190	0	1	4	0	1.67	Low local
P15c	2	10997	0	1	4	0	1.67	Low local
P9	2	7704	160.7	1	3	1	1.67	Low local
P11	2	2906	251.5	1	3	1	1.67	Low local
R3	3	774	1,411.6	1	3	1	1.67	Low local
P13	1	8609	0	1	A	0	0.50	Low to negligible
P6	3	7453	0	1	3	0	1.33	Low to negligible

[illegible]

Incorporating adjusted Priority flora abundances across Vegetation Associations yielded similar results to the initial assessment using raw abundance data. Vegetation with the highest significance rankings included Sand Dune associations, D1, D2, and D3; Sand Plain associations, P1, P2, P3, P4 and P8; Claypan associations, C2 and C4; as well as Stony Rises and Gentle Outcroppings associations, R1 and R2.

4. Discussion

The results appear to support those documented in Biota (2021), with the addition of five Vegetation Associations as a result of increased Priority flora abundances within these associations as part of subsequent targeted survey work. At present, based on survey tracklogs, approximately 25% of the total mapped areas has been traversed and surveyed for Priority flora.

While this report attempts to quantify Vegetation significance amongst associations of the Winu Project, the methodology is not without some level of subjectivity. The thresholds to link the quantitative significance ranking with the qualitative significance levels is not supported by any literature. Rank score cut-off ranges for vegetation Significance factors were also applied without consulting the literature. This could be considered a limitation.

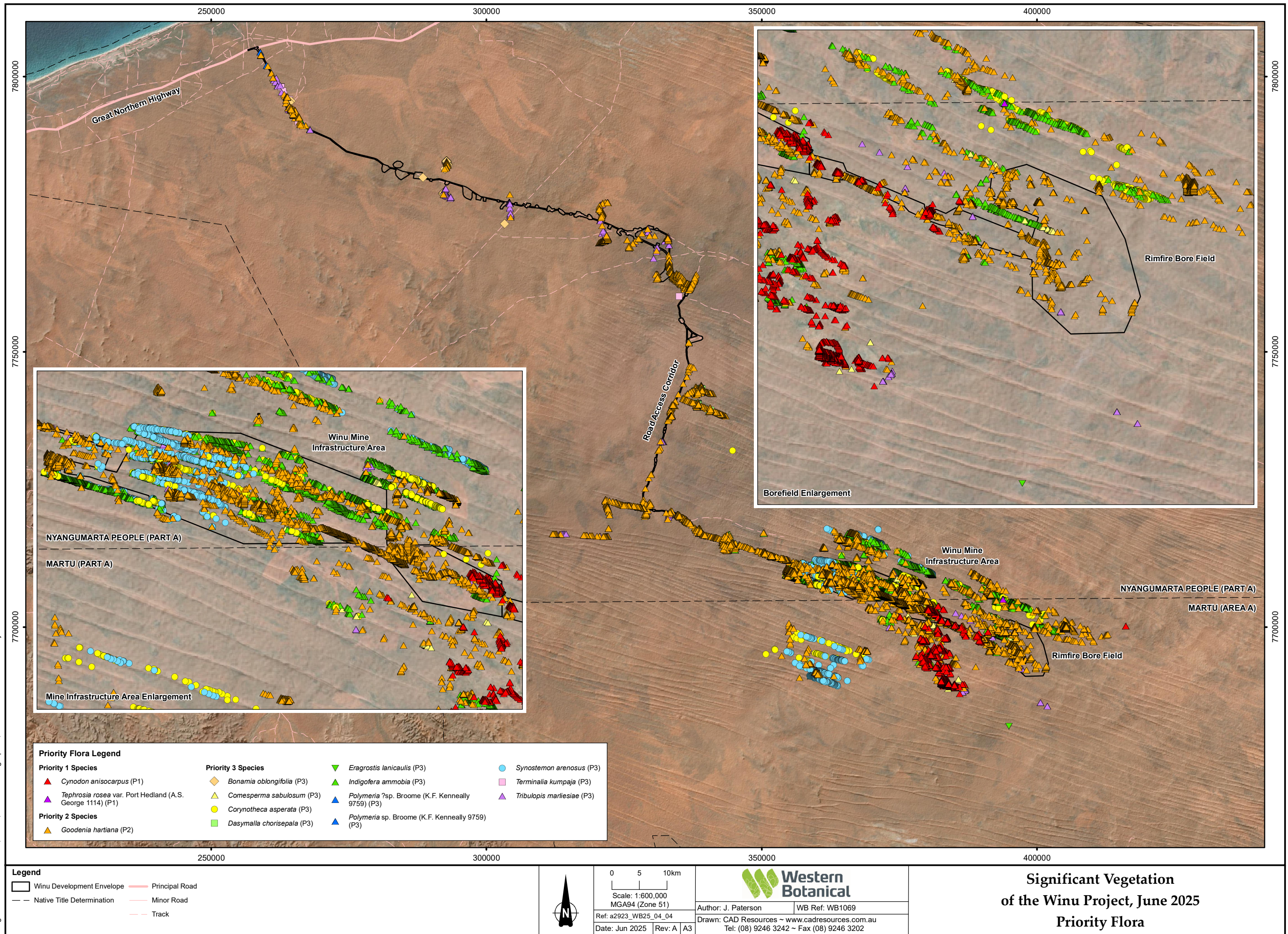
Yours sincerely,



Jason Paterson
Project Manager, Senior Botanist
Western Botanical

Appendix 1. Priority flora locations across the Winu Project.





Appendix 2. Terrestrial GDEs across the Winu Project.



