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Lots 2 and 10 Rowley Road, Mandogalup – Supplementary flora and vegetation assessment

1. Introduction

Questdale Holdings Pty Ltd (the proponent) (in association with Frankland Sand Supplies) are proposing to clear native vegetation to extend an existing sand quarry extraction operation located on Lots 2 and 10 Rowley Road, Mandogalup, Western Australia ('the Proposal Area'). The Environmental Protection Authority, in its initial assessment of the draft Environmental Review Document, requested further information relating to survey coverage and sampling density of the Flora and Vegetation studies undertaken within the Proposal Area.

In response to these comments, Strategen-JBS&G conducted a supplementary flora and vegetation survey in September 2020 to provide further coverage within the Proposal Area and further confirm the vegetation values present. This technical memorandum presents a summary of the results of this survey.

2. Methods

The survey area was accessed on 9 September 2020, with the assessment undertaken by Tristan Sleight (Strategen-JBS&G Lead Botanist). Two supplementary quadrats were scored, within vegetation type VT1 (Figure 1; Plate 1 and Plate 2). At each quadrat the following information was recorded:

- Name of recorder.
- Date.
- Quadrat dimensions.
- GPS co-ordinates (recorded in GDA94 UTM 50H).
- Photograph of the vegetation from north-west corner.
- Vegetation condition.
- Brief vegetation description.
- Vascular flora taxa present (with average height and total percentage foliage cover of each taxon).
- Topography.
- Soil type and colour.
- Geology (type, size and cover of any rocks, stones, gravel or outcropping).
- Average percentage cover of leaf litter and bare ground.

- Disturbance details including fire history (time since last fire), and physical disturbance including evidence of erosion, grazing and weed invasion.

All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

An analysis of similarity between the two quadrats scored in 2020 and the existing four quadrats surveyed in 2017 was undertaken. An association matrix was prepared using the Bray-Curtis coefficient, resulting in pairwise coefficients of similarities between quadrats). Agglomerative hierarchical clustering, using flexible UPGMA ($\beta=-0.1$) was used to generate a quadrat classification dendrogram.



Legend:

Survey Area

Vegetation type

VT1: Low woodland of *Banksia menziesii* and *B. attenuata* over open heath of *Xanthorrhoea preissii*, *Hibbertia hypericoides* and *Mesomelaena pseudostygia* with emergent *Eucalyptus marginata* (37.48 ha)

VT2: Closed scrub of *Acacia saligna* over mixed introduced species

VT3: Closed herbland of mixed introduced species with emergent *Eucalyptus maginata*, *Allocasuarina fraseriana* and *Acacia saligna*

Cleared

Scale 1:5,000 at A4

0 50 100
metres

Coord. Sys. GDA 1994 MGA Zone 50



Job No: 56799

Client: Qube

Version: A

Drawn By: cthatcher

Date: 02-Nov-2020

Checked By: TS

**Lot 2 and 10 Rowley Road
Mandogalup**

**PROPOSAL AREA AND
SURVEY COVERAGE**

FIGURE 1



3. Results

Within the two additional quadrats scored during the 2020 assessment, 48 native vascular plant taxa from 24 plant families were recorded (Attachment A). No Threatened flora listed under either the *Environment Protection and Biodiversity Conservation Act 1999* or the *Biodiversity Conservation Act 2016*, or Priority listed flora were recorded within the two quadrats.

An updated species-area curve (Figure 6), based on a species accumulation analysis was used to evaluate the adequacy of sampling (Colwell 2013). The asymptotic value was determined using Michaelis-Menten modelling. Using this analysis, the incidence based coverage estimator of species richness (ICE) was calculated to be 56 (Chao 2005). Based on this value, and the total of 73 native species recorded within quadrats during the survey, approximately 85% of the flora species potentially present within the Survey Area were recorded.

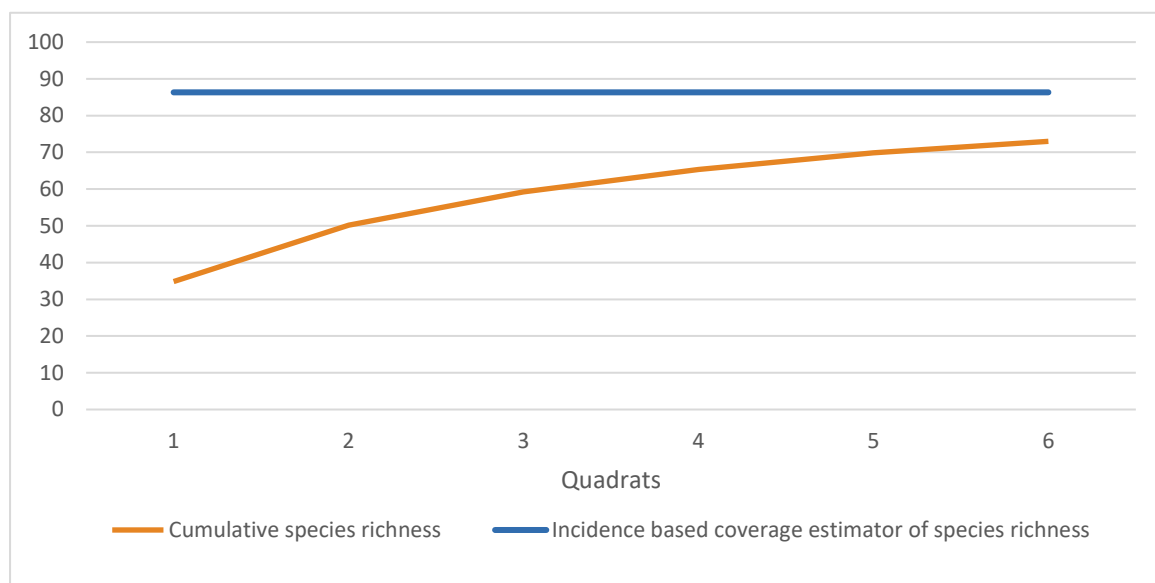


Figure 2: Averaged randomised Species Accumulation Curve

The dendrogram for the presence-absence analysis is shown Figure 3. Quadrats RR01 and Q05 are somewhat isolated from the remaining four quadrats, which grouped together. This is due to the following floristic differences:

- Presence of *Eucalyptus marginata*, *Lomandra preissii*, *Stylidium repens* and *Xanthosia huegelii* within quadrats RR01 and Q05
- absence of *Petrophile linearis* in quadrats RR01 and Q05.

It is noted that *Eucalyptus marginata* was scattered throughout in the vegetation within VT1 and that *Stylidium repens* and *Xanthosia huegelii* were noted within areas of VT1 opportunistically. The vegetation structure within both quadrats was also comparable to the vegetation across VT1. Based on these factors, quadrats RR01 and Q05 are not considered distinct from the remaining four quadrats and are representative of the vegetation described as VT1.

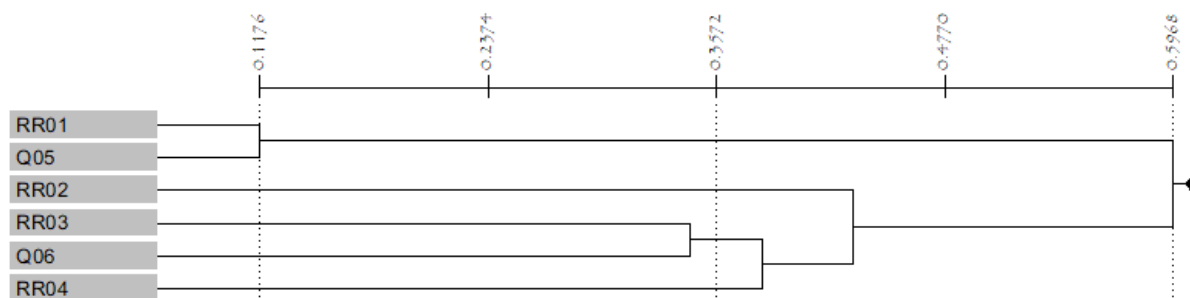


Figure 3: Row fusion dendrogram

4. Discussion and conclusion

The scoring of two additional quadrats within VT1 increase the rate of coverage to one quadrat per 5.6 ha. Based on the results of the randomised Species Accumulation Curve, adequate coverage of the vegetation within the Proposal area has been achieved. The structure of vegetation within VT1 is consistent throughout, with scattered *Eucalyptus marginata* throughout. While differences in floristic composition between two quadrats (RR01 and Q05) were recorded, as shown in Figure 3, the structure and dominant taxa are consistent throughout. Given this, all six quadrats scored are considered to be representative of VT1.

5. References

- Chao A 2005, 'Species richness estimation', in *Encyclopaedia of Statistical Sciences*, eds N Balakrishnan, CB Read & B Vidakovic, Wiley, New York, pp. 7909-7916.
- Colwell RK 2013, *Estimates: Statistical estimation of species richness and shared species from samples. Version 9*, [Online], Available from: <http://viceroy.colorado.edu/estimates/> [14 February 2017].
- Western Australian Herbarium 1998-, FloraBase – the Western Australian Flora, [Online], Government of Western Australia, Available from: <http://florabase.dpaw.wa.gov.au/> [1 February 2017].

Attachment A – Representative Photographs



Plate 1: Site Q05



Plate 2: Site Q06

Attachment B – Taxa recorded

Family	Species	% Cover	
		Q05	Q06
Aizoaceae	* <i>Carpobrotus edulis</i>	+	+
Anarthriaceae	<i>Lyginia barbata</i>	1	+
Apiaceae	<i>Trachymene pilosa</i>	+	+
	<i>Xanthosia huegelii</i>	+	+
Asparagaceae	<i>Lomandra preissii</i>	+	+
	<i>Sowerbaea laxiflora</i>	+	+
Asteraceae	* <i>Hypochaeris glabra</i>	+	+
	<i>Ursinia anthemoides</i>	+	+
	<i>Lagenophora huegelii</i>	+	+
	<i>Siloxerus humifusus</i>	+	+
Colchicaceae	<i>Burchardia congesta</i>	+	+
Cyperaceae	<i>Lepidosperma</i> sp.	+	+
	<i>Mesomelaena pseudostygia</i>	5	5
	<i>Tetraria octandra</i>	+	+
Dasypogonaceae	<i>Dasypogon bromeliifolius</i>	+	3
Dilleniaceae	<i>Hibbertia hypericoides</i>	5	5
	<i>Hibbertia racemosa</i>	+	+
Droseraceae	<i>Drosera ?menziesii</i>	+	+
Ericaceae	<i>Conostephium pendulum</i>	1	+
	<i>Leucopogon conostephioides</i>	+	+
Fabaceae	<i>Acacia pulchella</i>	1	+
	<i>Acacia stenoptera</i>	+	+
	<i>Daviesia nudiflora</i>	+	1
	<i>Gompholobium tomentosum</i>	1	+
	<i>Hardenbergia comptoniana</i>	1	+
Goodeniaceae	<i>Dampiera linearis</i>	+	+
	<i>Scaevola canescens</i>	+	+
Haemodoraceae	<i>Anigozanthos manglesii</i>	+	+
	<i>Conostylis aculeata</i>	+	+
	<i>Phlebocarya ciliata</i>	+	+
Hemerocallidaceae	<i>Tricoryne</i> sp.	+	+
Iridaceae	* <i>Gladiolus caryophyllaceus</i>	+	+
	<i>Patersonia occidentalis</i>	3	2
Myrtaceae	<i>Calytrix fraseri</i>	+	+
	<i>Eremaea pauciflora</i>	+	1
	<i>Eucalyptus marginata</i>	5	+
	<i>Myrtaceae</i> sp.	+	+
Orchidaceae	<i>Leporella fimbriata</i>	+	+
Poaceae	* <i>Aira caryophyllea</i>	+	+
	<i>Hovea trisperma</i>	+	+
	<i>Neurachne alopecuroidea</i>	+	+
Primulaceae	* <i>Lysimachia arvensis</i>	+	+
Proteaceae	<i>Banksia attenuata</i>	15	20
	<i>Banksia menziesii</i>	+	15
	<i>Hakea lissocarpa</i>	+	1
	<i>Petrophile linearis</i>	+	+
	<i>Stirlingia latifolia</i>	5	1
Restionaceae	<i>Desmocladius flexuosus</i>	2	2
Stylidiaceae	<i>Stylidium brunonianum</i>	+	+
	<i>Stylidium repens</i>	+	+
Violaceae	<i>Hybanthus calycinus</i>	+	+
Xanthorrhoeaceae	<i>Chamaescilla corymbosa</i>	+	+
	<i>Xanthorrhoea preissii</i>	10	8
Zamiaceae	<i>Macrozamia riedlei</i>	3	+