Reserve 15162 Tower Road Mount Barker

Flora and Vegetation Survey Report

Bio Diverse Solutions

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1. Introduction, scope and background information

Great Southern Centre for Outdoor Recreation Excellence (GSCORE, "the client") commissioned Bio Diverse Solutions as Environmental Consultants to undertake an out of season flora and vegetation assessment of Reserve 15162 Tower Road in Mount Barker. The scope of works included:

- Desktop assessment including all publicly available database searches and utilising advice from DBCA provided by GSCORE;
- Conduct a single phase (out of season) reconnaissance survey across the survey area through low intensity sampling in vegetation types present, and mapping the boundaries of vegetation types and vegetation condition mapping according to the Keighery condition rating scale (Keighery 1994);
- Identify and map any TEC or PECs present within the survey area; and
- Preparation of brief desktop assessment report detailing all findings, including likelihood of occurrence of conservation significant flora.

1.1. Site location and Development Proposal

The "survey area" is defined as the 58ha area within Reserve 15162 (excluding the tower area), Tower Road, Mount Barker. The survey area is located approximately 6.2km south west of the Mount Barker CBD, refer to Figure 1 below. The client is proposing to potential develop recreational trails within the Reserve.

Figure 1: Survey Area Locality

2. Desktop Assessment

2.1. Desktop Assessment Methodology

Desktop inventory of potential threatened flora species likely to occur within 10km of the survey area was undertaken using the following databases:

- Nature Map Database Search (combined data from DBCA, WA Museum and WA Herbarium);
- Protected matters search tool (DAWE 2020);
- WA Herbarium records accessed through Flora Base (Western Australian Herbarium, DBCA); and
- Advice provided by the client from the DBCA (10-0120FL) and South Coast Region Parks and Wildlife Flora Officer (S. Barrett).

The full species list compiled from all available data (Table 5) is based on observations from a broader area than the survey area and is likely to include species that would not occur in the actual survey area due to a lack of suitable habitat. The data also includes very old records and in some cases the species in question may have become locally or regionally extinct.

The conservation significance of flora species has been assessed using data from the following sources:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Administered by the Australian Government Department of the Environment and Energy (DAWE);
- *Biodiversity Conservation Act 2016* (BC Act). Administered by the Western Australian Department of Biodiversity Conservation and Attractions (DBCA); and
- DBCA Priority Flora list. A non-legislative list maintained by DBCA for management purposes.

2.2. Geology and soils

Database searches using the NRInfo Portal (Department of Primary Industries and Regional Development, 2020) shows the subject site lies within the Porongurup Range System (242Pr). The system is described as "*Granitic hills and fringing siltstone slopes, in the Albany Sandplain Zone. Sandy gravel, loamy gravel, loamy duplex and stony soil. Jarrah-marri-karri forest, jarrah woodland and shrublands.*" (DPIRD, 2020). The Albany Sandplain Zone is described as having "*Gently undulating plain dissected by a number of short rivers flowing south. Eocene marine sediments overlying Proterozoic granitic and metamorphic rocks. Soils are sandy duplex soils, often alkaline and sodic, with some sands and gravels."* (DPIRD, 2020).

2.3. Climate

The closest Bureau of Meteorology (BoM) site is Mount Barker (009581) The average annual temperature in Mount Barker ranges from 9.5 – 20.2°C. The average summer temperature ranges between 11.4-26.3°C, whilst average winter temperatures range between 6.1-15.3°C. The annual mean rainfall for Mount Barker is 726.9mm (BOM, 2020).

2.4. Existing Land use

The survey area consists of remnant native vegetation within Reserve 15162 and lies within a modified agricultural landscape.

2.5. Habitat Connectivity

The South Coast Macro Corridor Network is a bioregional and landscape-scale approach to habitat connectivity that acknowledges that remnant vegetation can play a very important role in developing corridors between protected areas to help achieve long-term biodiversity management outcomes (Wilkins *et al*. 2006; DBCA, 2017a). The survey area is classified as a "Strategic Zone A" area which "*Contains areas of woody vegetation where polygons greater than 30 ha in size are spaced no greater than 1km apart and potentially form the most strategic link between major protected areas"*. The area lies within one of the major vegetation corridors known as the "Porongurup Range Corridor" which connects remnant vegetation to existing "Protected Area" corridors (Mount Lindesay National Park, Lake Barnes Road Nature Reserve) to the south and Porongurup National Park to the east (WALGA, 2018a).

2.6. Water

The survey area does not lie within any Public Drinking Water Source areas (WALGA, 2018b). There is a minor creek line that exists the survey area in the south eastern corner that connects to a creek line that runs through private properties adjacent to the train line.

There are no significant wetlands within the survey area.

2.7. Environmentally Sensitive Areas

The survey area does not contain any Environmentally Sensitive Areas (ESA).

2.8. Remnant Vegetation

The survey area lies within the Southern Jarrah Forest JAF02 IBRA subregion. Hearn et al (2002) describes the IBRA region as "*Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Wandoo - Marri woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands.*"

The vegetation has been mapped on a broad scale by J.S. Beard (Shepherd *et al.* 2002) in the 1970's, where a system was devised for state-wide mapping and vegetation classification based on geographic, geological, soil, climate structure, life form and vegetation characteristics (Sandiford and Barrett, 2010). Vegetation units were regarded as associations and were grouped into Vegetation Systems representing a particular pattern of association distribution within a given area. A GIS search of J.S. Beards (Beard *et al.* 2013) vegetation classification places the survey area within one System and Vegetation Association (Source Pre-European dataset, DPIRD-006):

- **System Association Name**: Narrikup.
- **Vegetation Association Number:** 3.
- **Vegetation Description:** Forest. Mainly jarrah and marri *Eucalyptus marginata*, *Corymbia calophylla.*
- **Remnant Vegetation by Beard Association Rarity in LGA:** 30 - 40% remaining (WALGA, 2018c).
- **Remnant Vegetation by Beard Association Rarity in IBRA Region:** >40% remaining (WALGA, 2018d).

Mattiske and Havel (1998) as part of the biodiversity assessment for the comprehensive regional assessment for the south west forest region mapped the area as containing two vegetation complexes present:

- **Vegetation Complex:** Barrow (BAf).
- **Vegetation Description:** Open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* with *Eucalyptus cornuta* on slopes below granite hills in the sub humid zone.
- **Vegetation Complex:** Barrow (BAg).
- **Vegetation Description:** Mosaic of lithic complex, closed heath of Myrtaceae-Proteaceae spp. and low open woodland of *Corymbia calophylla* on hills dominated by granite outcrops in the sub humid zone.

2.9. Threatened Flora

As a result of the above-mentioned database searches 14 Threatened and 10 Priority species were identified as potentially being present within the survey area (10km buffer). Of the 24 species identified as potentially being present, database records indicate that two species are present within the reserve; *Verticordia endlicheriana var. angustifolia* (P3) and *Banksia verticillata* (T- CR).

2.10. Threatened and Priority Ecological Communities

Database results also indicate that one ecological community "The Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia" may be present within the survey area. This ecological community is listed as a Priority Ecological Community (PEC) P3 within WA under the *Biodiversity Conservation Act 2016* (BC Act) and

as an Endangered Threatened Ecological Community (TEC) under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

The Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia is generally Kwongkan / kwongan shrubland, ranging from sparse to dense, thicket-forming, where Proteaceous species form a significant component. It is confined to the southeast botanical province of Western Australia (*sensu* Hopper and Gioia, 2004) and primarily occurs on sandplains and marine plains and lower to upper slopes and ridges, as well as uplands across this region (Department of the Environment and Energy, 2014). The shrubland consists of predominantly obligate seeding proteaceous shrubland and heath (kwongkan) and mallee heath on sandplain, duplex sand/clay and gravels overlying Eocene sediments, quartzite, schist, Yilgarn and Albany Fraser granite and greenstone ranges. Its flora is characterised by high species diversity and a high degree of endemism, particularly in the Stirling Range, Fitzgerald River National Park, Ravensthorpe Range and Russell Ranges. Due to the high levels of endemism, there are few species that exist across the entire range of the dense, obligate seeding Proteaceae dominated shrublands and kwongan of the Esperance Sandplains, however particular species have been identified as common dominant species in each of its ecodistricts (DBCA, 2017).

The approved conservation advice for the ecological community indicates that there is no relationship with the Beards vegetation type present within the survey area (as per Appendix C and Table C2 of the approved conservation advice).

3. Flora and Vegetation Field Survey Methodology

Bio Diverse Solutions undertook an out of season Reconnaissance level flora and vegetation survey on the 6th April 2020. The vast majority of the area has been recently burnt (within the last 6 months) and thus was largely uninterpretable. Granite outcrops within the burnt areas of vegetation were targeted as it was thought they may have provided areas of refuge and is likely to contain habitat for conservation significant species. The portion of unburnt (less recently >12months) was surveyed more intensely. The area was surveyed using transects and relevés and traversed on foot. The flora was systematically recorded and collections of plant specimens were made where further identification was required. For conservation significant species that were not flowering and where foliage or nuts/ fruit couldn't be used for identification, potential habitat was used as an indication of the likelihood of species occurrence.

3.1. Survey Limitations and constraints

Survey limitations were encountered during this survey (timing, disturbances and effort and extent), and are considered to be a significant limiting factor for this survey. See Table 1 below for details.

Table 1: Survey Limitations and constraints

Limitation	Comment
Experience of personnel	Dr Karlene Bain has over 20 years' experience within the industry from her time spent with the now Parks and Wildlife service and through operating her own consulting company. Bianca Theyer has 4.5 years' experience in flora and vegetation assessment since working with Bio Diverse Solutions.
Survey timing	The client requested an out of season survey (outside the spring flowering period). The majority of species were not flowering, creating difficulties in identification.
Access restrictions	Access by vehicle around the boundary and on foot. No access restrictions were encountered.
Availability of contextual information	Publicly available desktop and background information was readily available to give a broad contextual understanding of the site.
Survey effort and extent	92 species were identified. Due to the impacts to vegetation of the recent fires the large eastern end portion was less intensely surveyed. Instead survey focus was on the large areas of granite outcrop to ascertain suitable habitat for conservation significant species in these areas.
Disturbances that may affect results	A recent (within 6 months) fire has impacted the majority of the survey area. The vegetation is currently regenerating with seedlings beginning to emerge, causing the vegetation to be largely uninterpretable.
Identification issues	The out of season timing and fire disturbances resulted in issues with flora identification. Surveyors feel the area is likely to contain a higher species richness than what was captured during the survey due to the lack of diagnostic features available at the time of survey. Plants that did not have adequate diagnostic features were not recorded.

4. Flora and vegetation survey outcomes

During the survey 92 species, consisting of 30 families and 58 genera were found. The most commonly occurring family was Ericaceae, Fabaceae and Proteaceae. The list includes 88 native species (Refer to Appendix B) and five introduced / alien species. The vegetation complexes identified across the subject site are described in Section 4.1. Refer to Figure 6 in Appendix A for vegetation mapping, and Appendix B for full species list.

4.1. Vegetation Classification

Broadscale vegetation units have been classified within the survey area. Burnt areas have been classified as what they would historically be (pre fire) with a small area near the lookout badly burnt, and largely unidentifiable. Refer to the descriptions below.

Yate Woodland

This vegetation unit is located in the western third of the survey area directly adjacent to the radio tower area. The unit lies within a moderately sloped area with granite outcrops and dark brown sandy clay soils.

Dominated by *Eucalyptus cornuta* with a midstorey of *Taxandria parviceps, Taxandria marginata, Bossiaea ornata, Acacia pulchella, Acacia extensa, Hakea undulata,* and *Leucopogon verticillatus.* Understorey and ground covers consisted of *Patersonia occidentalis, Xanthosia rotundifolia, Acacia pulchella, Mesomelaena tetragona, Leucopogon propinquus, Leucopogon obovatus, Thomasia sp., Hibbertia racemosa, Conostylis aculeata, Desmocladus fasciculatus, Boronia spathulata, Lepidosperma squamatum, Anarthria prolifera, Opercularia hispidula, Synaphea sp.* and *Sphenotoma capitata.*

Figure 2: Yate Woodland over granite

Jarrah / Marri Woodland

This vegetation unit is most common across the survey area and has been impacted by the fire that went through the reserve approximately 6 months ago. There is a section in the western portion bound by Tower road to the north and a fire access track to the south that has not been impacted by the recent fire. There is evidence that fire has impacted this area approximately greater than 12 months ago. Soils within this vegetation unit differ slightly throughout the survey area. In the

western section there are areas of granite with light grey sand, as well as more lateritic soils with scatter quartzite. In the south eastern areas of the survey area soils were noted to be dark / white sands and light / yellow brown sandy clay. There are scattered areas of granite throughout this vegetation unit.

The vegetation unit is dominated by *Corymbia calophylla* with *Eucalyptus marginata* occasionally dominant / co-dominant. Midstorey species consist of *Corymbia calophylla* (juvenile), *Taxandria parviceps, Acacia myrtifolia, Taxandria marginata, Acacia pulchella, Acacia extensa*, *Hakea amplexicaulis, Hakea varia, Banksia grandis, Bossiaea eriocarpa, Calothamnus sp.,* Pultenaea reticulatum. Understorey and groundcover species consist of *Leucopogon australis, Leucopogon verticillata, Anarthria prolifera, Desmocladus fasciculatus, Leucopogon reflexus, Gompholobium capitatum, Boronia sp., Chorizema spathulatum, Hovea chorizemifolia, Kennedia prostrata., Dasypogon bromeliifolius, Banksia porrecta, Banksia nivea, Banksia armata, Xanthorrhoea preissii, Xanthorrhoea preissii , Pimelea sp., Ricinocarpos glaucus, Boronia spathulata, Banksia arctotidis, Dasypogon bromeliifolius, Opercularia hispidula, Hardenbergia comptoniana, Tetrarrhena laevis* and *Leptomeria squarrulosa.*

Figure 3: Jarrah / Marri Woodland

Open Granite Outcrops

This vegetation unit is defined as the areas of sheet granite within the survey area. This vegetation type has also been impacted by the recent fire within the eastern portion of the survey area. The western portion (adjacent to Tower Road) has been similarly impact by a fire greater than 12 months ago. No overstorey is present within this vegetation unit. Midstorey species consists of *Taxandria parviceps, Calothamnus sp., Acacia pulchella* and *Acacia scirpifolia.* Understorey and groundcovers consist of *Rhodanthe citrina, Verticordia sp. (endlicheriana var. angustifolia?), Borya sp., Laxmannia sp., Disa bracteata, Thomasia sp., Kennedia prostrata, Dasypogon bromeliifolius, Leucopogon sp., Mesomelaena tetragona, Desmocladus fasciculatus, Lepidosperma squamatum, Synaphea sp., Xanthorrhoea preissii, Hibbertia furfuracea.* Most occurrences of this vegetation type contain mixed seedlings that are regenerating from the recent fire, many of which are currently unidentifiable to species level.

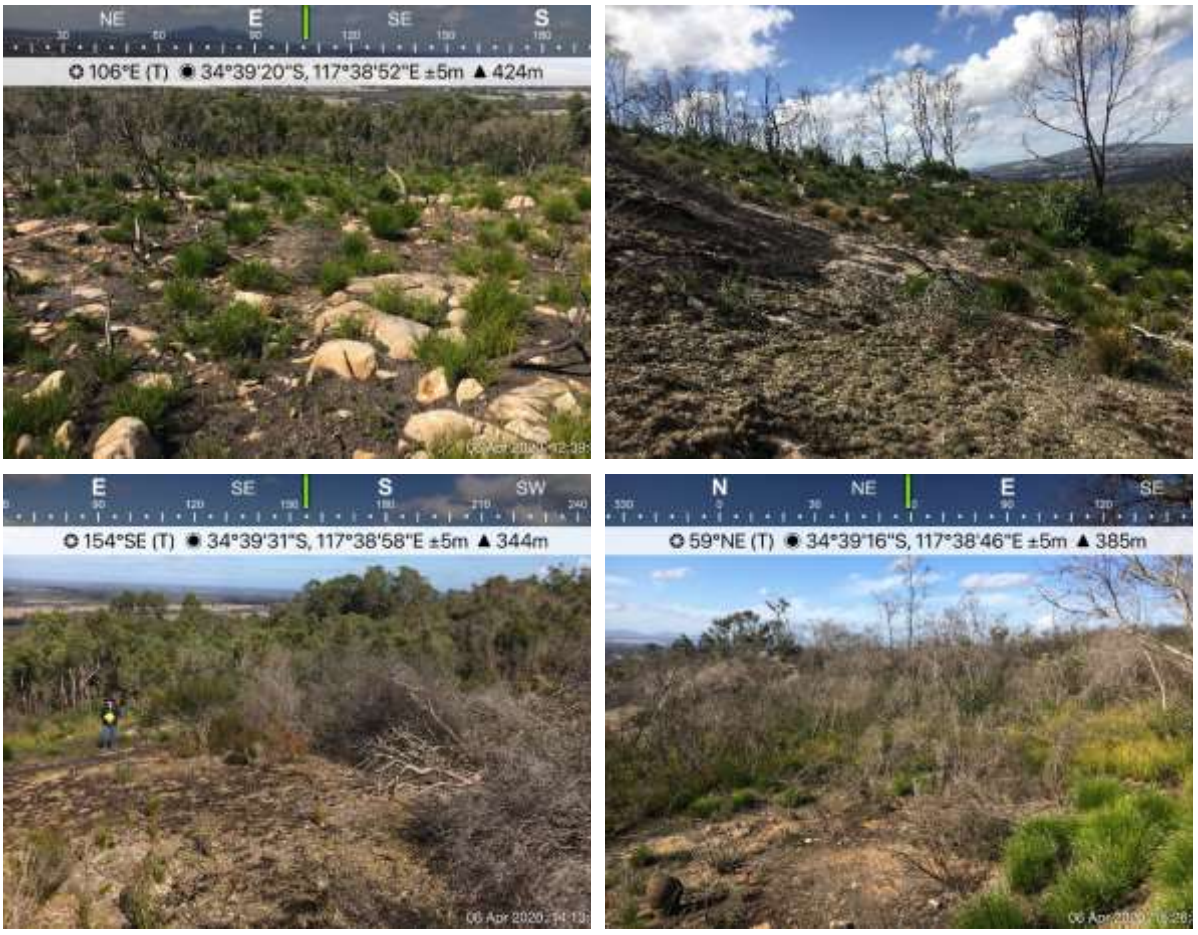


Figure 4: Granite Outcrops

4.2. Vegetation Condition

The subject site is approximately 58ha of native vegetation that has been recently burnt. Approximately 7.3ha within the western portion of the site appears to have been burnt over 12 months ago. The remaining approximately 50ha has been burnt more recently (approximately 6 months ago). The vegetation within the western portion of the site has been classified as "Excellent" with few disturbances present in the area. The remaining areas of vegetation have been classified as "Excellent / Very Good". There are areas of vegetation that are in excellent condition, with other smaller patches throughout that are in very good condition due to the lack of vegetative structure (due to the fire) and through plant deaths. There is some evidence of drought and feral animal (rabbit) disturbance to the moss and some seedlings on the granite outcrops. Refer to Table 2 for condition rating descriptions and Figure 7 in Appendix A for condition mapping.

Table 2: Condition Rating Scale (Keighery 1994)

Vegetation Condition Rating	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires; the presence of some more aggressive weeds; dieback; logging; & grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate to it. For example, disturbance to vegetation structure caused by very frequent fires; the presence of some very aggressive weeds at high density; partial clearing; dieback; & grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires; the presence of very aggressive weeds; partial clearing; dieback; & grazing.
Completely Degraded	Vegetation structure not intact; the area completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

4.3. Weeds and disturbance

Of the 92 species recorded within the subject site, five species are introduced; *Disa bracteata, Dittrichia viscosa, Hypochaeris sp., Phytolacca octandra* and *Briza maxima.* All species are declared as "Permitted – s11" under the *Biosecurity and Agriculture Management Act 2007.* Under the Environmental Weeds Strategy for Western Australia (*CALM 1999*) the species *Hypochaeris sp.,* and *Briza maxima* are rated as "Moderate". *Phytolacca octandra* is rated as "Mild", *Dittrichia viscosa* is rated as "Low" and *Disa bracteata* is not listed. The strategy classifies weeds according to their relative level of threat to conservation (high medium or low) and this rating is based on their distribution, relative level of invasiveness and environmental impact. Refer to Table 3 below.

Table 3: Weed species recorded from the subject site

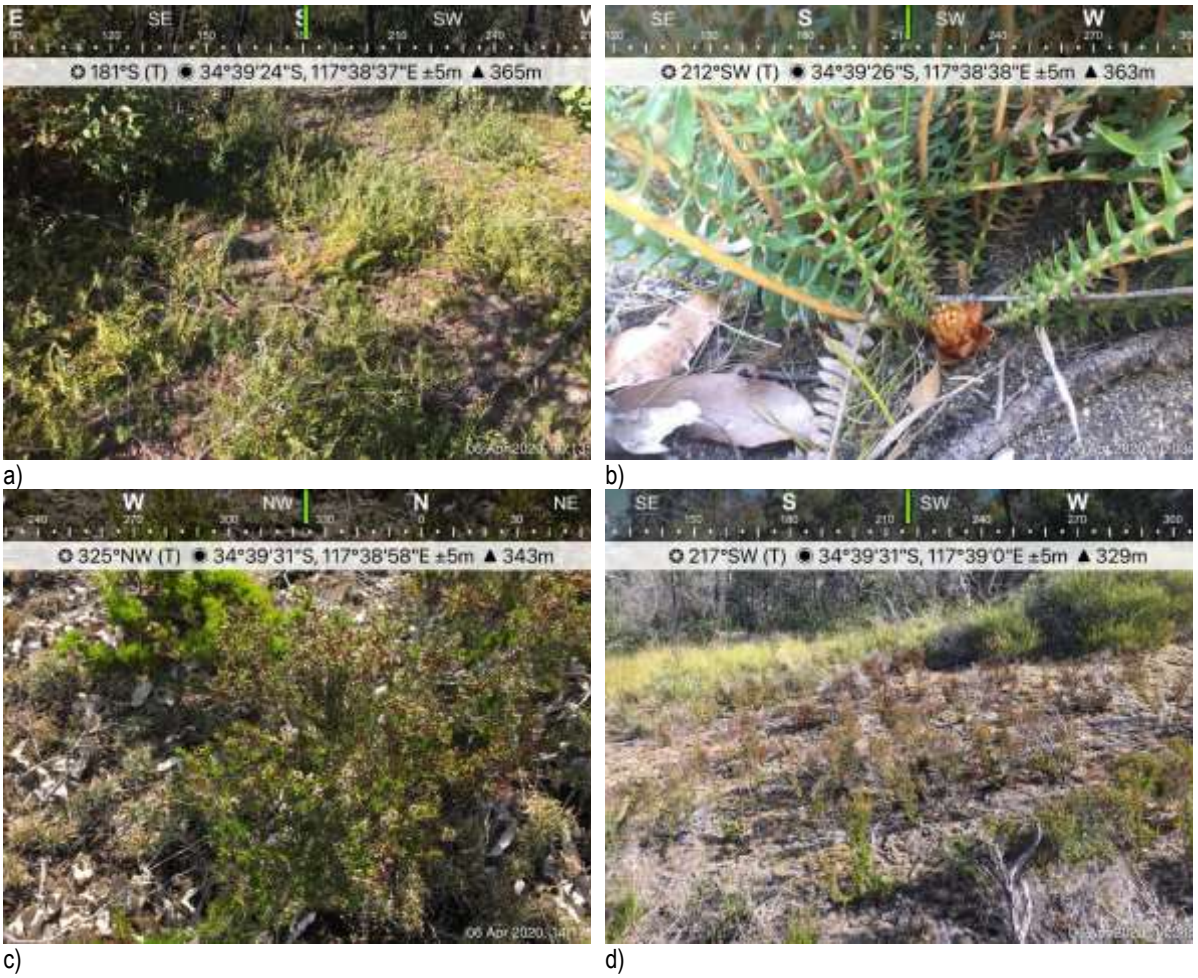
Family	Species	WA Weed Strategy rating (CALM 1999) / BAM Act
Asteraceae	*Hypochaeris sp.*	Moderate / Permitted - s11
Orchidaceae	*Disa bracteata*	- / Permitted - s11
Asteraceae	*Dittrichia viscosa*	Low / Permitted - s11
Phytolaccaceae	*Phytolacca octandra*	Mild / Permitted - s11
Poaceae	*Briza maxima*	Moderate / Permitted - s11

4.4. Threatened Flora

The scope for this survey was to provide the client with information on any conservation significant species that are potentially present within the survey area, as well as an indication of the vegetation composition for the reserve. The survey effort found *Banksia porrecta* (P4) to be present at the site. A verticordia species was identified within the site on two of the granite outcrops which is potentially *Verticordia endlicheriana var. angustifolia* (P3). This species has previously been identified within the site; a spring survey will confirm if the plants identified in this survey are the priority species. A spring survey is required to confirm the presence and distribution of these two species within the survey area. Although database records show that *Banksia*

verticillata (T – CR) is present the species was not detected during this survey. No other conservation significant species were identified during the survey, however there were individuals of Borya, Laxmannia, Synaphea and Pimelea that were unable to be identified to species level due to lack of flowering material. Each of these genera have species that are conservation significant that could occur in this area and within the mapped vegetation types. There is suitable habitat to support 18 of the 24 species identified during the desktop assessment. The majority of these species were outside their flowering period during this survey, a spring survey is required to accurately ascertain their presence / absence from the site. Refer to Table 4 and Table 5 for likelihood of presence criteria and likelihood of presence analysis post survey. Locations of conservation significant flora are presented in Appendix A – Figure 8.

The species composition of the site is not consistent with the Threatened/Priority Ecological Community "The Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia".



a) b)

c) d)

Figure 5: Conservation significant flora within the site.

a) and b) Banksia porrecta (P4); c) and d) Potential *Verticordia endlicheriana var. angustifolia* (P3)

Table 4: Criteria for assessing the likelihood of occurrence of conservation significant flora

Likelihood	Criteria
Present	Species is recorded within the survey area.
Likely	Species has been previously recorded in close proximity and suitable habitat occurs within the survey area.
Possible	Species previously recorded within 10 km and suitable habitat occurs in the survey area.
Unlikely	Suitable habitat for the species does not occur at the survey area OR Suitable habitat may occur but the species has a highly restricted distribution, is very rare and only known from a limited number of populations.
Highly Unlikely	The survey area is outside the species' natural distribution.

Table 5: Potential threatened flora located within 10km of the survey area and post survey likelihood of presence analysis

Family	Species	Cons Code	Description and Habitat	Flowering period	Likelihood of occurrence	Potentially Suitable Habitat	Within Flowering Period or Identifiable Without Flower	Survey Outcome
Cyperaceae	*Schoenus sp. Mt Barker (G.J. Keighery 9679)*	P1	Mat forming perennial, grass-like or herb (sedge), clumps to 30 cm diameter. Sandy clay, loam.		Likely	Y	N	No species of Schoenus found during the survey
Ericaceae	*Sphenotoma drummondii*	T (EN)	Tufted shrub, 0.15-0.5 m high. Fl. White. Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks	Sep to Dec	Possible	Y	Y	Suitable habitat on site. Two other species of Sphenotoma were identified on site.
Fabaceae	*Bossiaea lalagoides*	P3	Erect, shrub, spindly shrub (broom-like). Gravelly clay, laterite and sandy loam in Eucalyptus marginata-Corymbia calophylla forest, E. diversicolor forest, E. marginata/wandoo woodland, and on sandy soil in Eucalyptus/Banksia woodland, heathland and Hakea/Daviesia scrub.	Sept to Nov	Possible	Y	N	Suitable habitat on site - spring survey required
Fabaceae	*Gastrolobium ferrugineum*	P2	Small tree, to 3 m high. Fl. yellow-red. Sand, brown-red sandy gravel, laterite. Plains.	Aug to Sept	Likely	Y	N	Suitable habitat on site - spring survey required
Haemodoraceae	*Conostylis misera*	T (EN)	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Fl. Yellow. White or grey sand, sandy loam. Winter-wet flats.	Oct to Nov	Likely	Y	N	Suitable habitat on site - spring survey required
Menyanthaceae	*Ornduffia marchantii*	P4	Seasonally wet loams on mid-slopes		Possible	N	N	Not identified, no suitable habitat on site
Myrtaceae	*Darwinia leiostyla*	P4	Erect shrub, 0.3-1.5 m high. Fl. red & pink & white. Sandy clay, black peaty sand, yellow sand, quartzite, sandstone. Rocky sites, streamlines, slopes of gullies and ranges.	Jan or May or Jul or Sep to Oct or Dec	Possible	N	N	Not identified, no suitable habitat on site
Myrtaceae	*Darwinia oxylepis*	T (EN)	Upright, dense shrub, 0.6-1.5 m high. Fl. Red. Stony, peaty sand. Rocky gullies	Aug to Nov	Unlikely	N	N	Not identified, no suitable habitat on site
Myrtaceae	*Darwinia wittwerorum*	T (EN)	Erect, single-stemmed shrub, 0.3-1 m high. Fl. green/white & pink. Clay loam, sandy clay. Roadsides, slopes	Sept to Dec	Highly Unlikely	N	N	Not identified, no suitable habitat on site
Myrtaceae	*Verticordia apecta*	T (CR)	Slender, erect shrub, 0.2-0.45 m high. Fl. white-pink. Sandy clay with loam & broken granite. Slopes	Nov	Unlikely	Y	N	Habitat present. Spring survey required
Myrtaceae	*Verticordia endlicheriana var. angustifolia*	P3	Erect shrub, 0.3-0.5 m high. Fl. Yellow. Sandy clay. Granite outcrops.	Oct to Nov	Present - Records indicate this species has been identified within the survey area	Y	N	Possibly identified on site (no diagnostic features). Habitat present. Spring survey required to confirm population distribution.
Orchidaceae	*Caladenia christineae*	T (EN)	Tuberous, perennial, herb, 0.25-0.4 m high. Fl. white-cream-yellow. Sand, clayey loam, laterite. Margins of winter-wet flats, swamps, & freshwater lakes.	Sept to Nov	Possible	N	N	No suitable habitat on site
Orchidaceae	*Caladenia harringtoniae*	T (VU)	Tuberous, perennial, herb, 0.2-0.4 m high. Fl. Pink. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops	Oct to Nov	Unlikely	Y	N	Suitable habitat on site - spring survey required
Orchidaceae	*Diuris micrantha*	T (VU)	Tuberous, perennial, herb, 0.3-0.6 m high. Fl. yellow & brown. Brown loamy clay. Winter-wet swamps, in shallow water	Sep to Oct	Highly Unlikely	N	N	Not identified, no suitable habitat on site
Orchidaceae	*Drakaea micrantha*	T (EN)	Sep to Oct. White-grey sand	Sep to Oct	Unlikely	Y	N	Suitable habitat on site - spring survey required
Proteaceae	*Adenanthos pungens subsp. pungens*	T (EN)	Erect shrub, 0.5-3 m high. Fl. pink/red. White/grey or pink sand, rocky soils, gypsum. Sand dunes, hillsides	Aug to Nov	Unlikely	Y	N	Not identified, no suitable habitat on site
Proteaceae	*Banksia brownii*	T (EN)	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Fl. cream & brown/orange-red. Sand over laterite, gravel, loam over granite. In gullies	Mar-Jul	Likely	Y	Y	Not identified, suitable habitat present
Proteaceae	*Banksia goodii*	T (VU)	Lignotuberous, prostrate shrub, ca 0.2 m high. Fl. orange-brown-red. White or grey sand over laterite	May or Nov	Unlikely	Y	N	Not identified, suitable habitat present

Table 5 continued.

Family	Species	Cons Code	Description and Habitat	Flowering period	Likelihood of occurrence	Potentially Suitable Habitat	Within Flowering Period or Identifiable Without Flower	Survey Outcome
Proteaceae	*Banksia porrecta*	P4	White/grey sand, sandy loam.	Jul to Aug	Present	Y	N	Identified on site. Follow up spring survey to confirm population distribution.
Proteaceae	*Banksia sphaerocarpa var. latifolia*	P2	Small rounded shrub to 50 cm in height. In granitic clay-loam in low, open forest of *Eucalyptus marginata* and *E. calophylla*, usually on mid to upper slopes in landscape	Mar to Jul	Likely	Y	Y	Not identified on site
Proteaceae	*Banksia verticillata*	T (CR)	Non-lignotuberous shrub or tree (rarely), 1.3-6 m high. Fl. yellow-orange. Sandy loam. On or beside granite outcrops.	Jan to Apr	Present - Records indicate this species has been identified within the survey area	Y	Y	NatureMap records indicate this species is present. However, it is readily identifiable without flowers and was not found within the parameters of this search. It is possible that there are seedlings within the burnt areas, but no dead adult plants were found. Follow up spring survey required to ascertain presence.
Proteaceae	*Isopogon uncinatus*	T (CR)	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Fl. yellow/cream. Loam or sand on granite, peaty sand. Swampy depressions, hillslopes	Oct to Nov	Unlikely	Y	N	Habitat present. Spring survey required
Proteaceae	*Synaphea preissii*	P3	Erect, low shrub, 0.15-0.4 m high. Fl. Yellow. Sand, gravelly loam.	Jul to Nov	Possible	Y	N	Suitable habitat on site - spring survey required
Thymelaeaceae	*Pimelea rosea subsp. annelsii*	P3	Shrub, 0.3-0.8 m high. Fl. Pink. Sandy soils with gravel, laterite. Upper slopes.	Sept to Nov	Likely	Y	N	Suitable habitat on site - spring survey required

5. Summary

The scope for this out of season survey was to provide the client with further details on the vegetation composition present at the site and to identify areas of suitable habitat for conservation significant species. A total of 92 flora species were identified throughout the subject site, of these five are introduced. Three vegetation complexes were identified within the area; Yate Woodland, Jarrah / Marri Woodland and Granite Outcrops. Vegetation structure in the western portion consisted of a tree layer containing eucalypts of various ages including mature, young and saplings, with a sparse yet relatively diverse mid and understorey. There are areas that are obviously regenerating from fire (>12 months) with marri coppicing and seedlings and juvenile shrubs and scrubs appearing. Vegetation in the remaining areas of the survey area have been impacted by fire in the last 6 months. There are areas that have been more severely burnt which is evident through the lack of mid / overstorey species and a large proportion of seedlings appearing. Overall, the vegetation ranges from Excellent to Very Good throughout the survey area, with the main disturbance being the recent fire.

The survey effort found one conservation significant species *Banksia porrecta* (P4) within the site as well as a verticordia species which is potentially *Verticordia endlicheriana var. angustifolia* (P3). These were found in high numbers and a spring survey will help to further ascertain their presence throughout the survey area. Furthermore, there is suitable habitat for 18 of the potential conservation significant species, again, a spring survey is required to ascertain their presence in the survey area.

Given the majority of the area has been recently burnt, it is likely to be more beneficial to postpone any spring survey for 2021 to allow the vegetation to adequately recover.

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7. Appendices

Appendix A – Vegetation Mapping

Appendix B – Species List

Appendix A

Vegetation Mapping

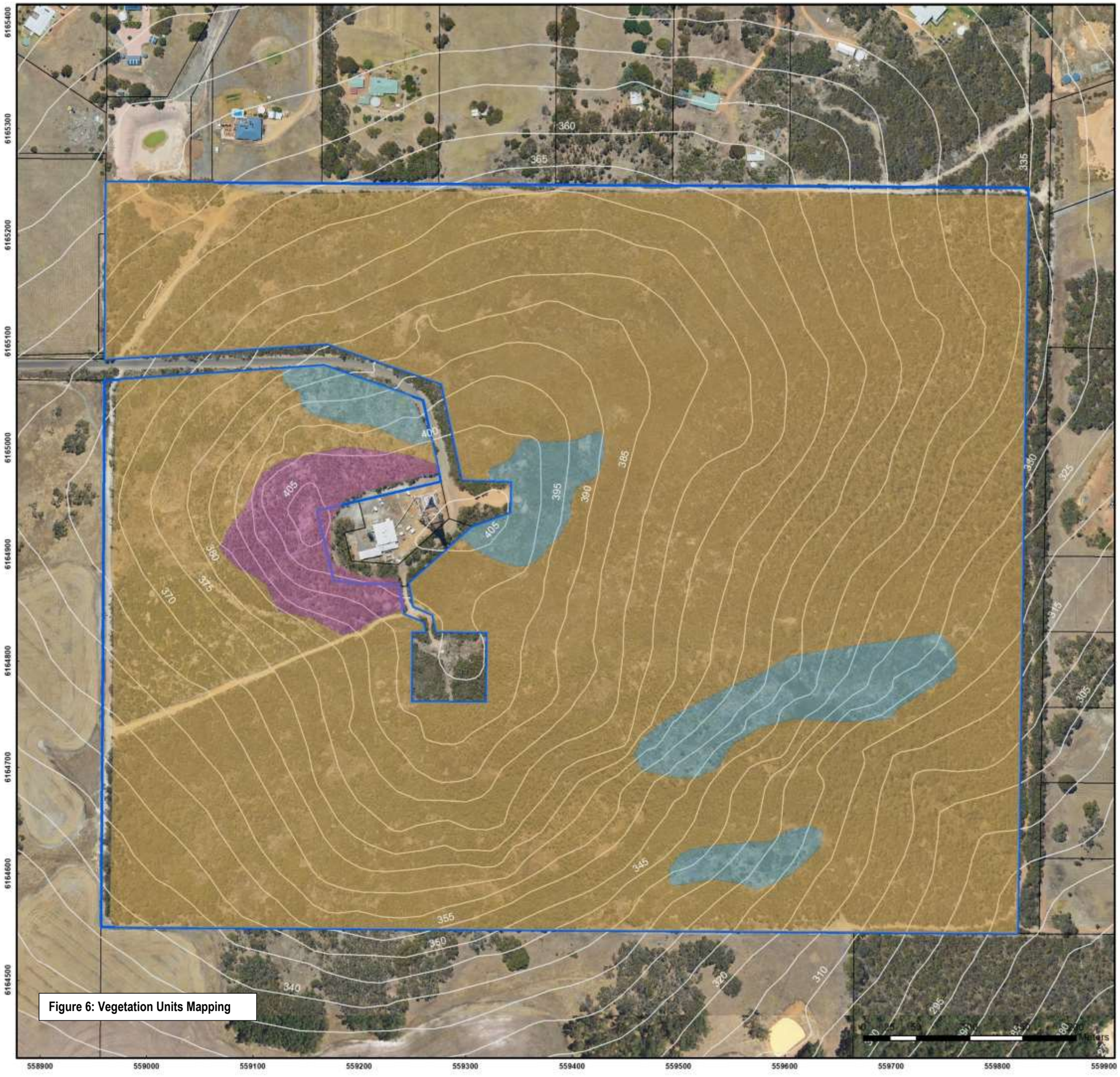

Figure 6: Vegetation Units Mapping

BIO DIVERSE SOLUTIONS
29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575

Overview Map Scale 1:100,000

Legend

- Subject Site
- Cadastre
- 5m Contours

Vegetation Units

- Granite Outcrop
- Jarrah / Marri Woodland
- Yate Woodland

Scale
1:3,500 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
GSCORE
Reserve 15162 Survey Tower Road
Mount Barker, WA 6324

Vegetation Units Mapping

STATUS	FILE	DATE
FINAL	MSC0275	7/04/2020

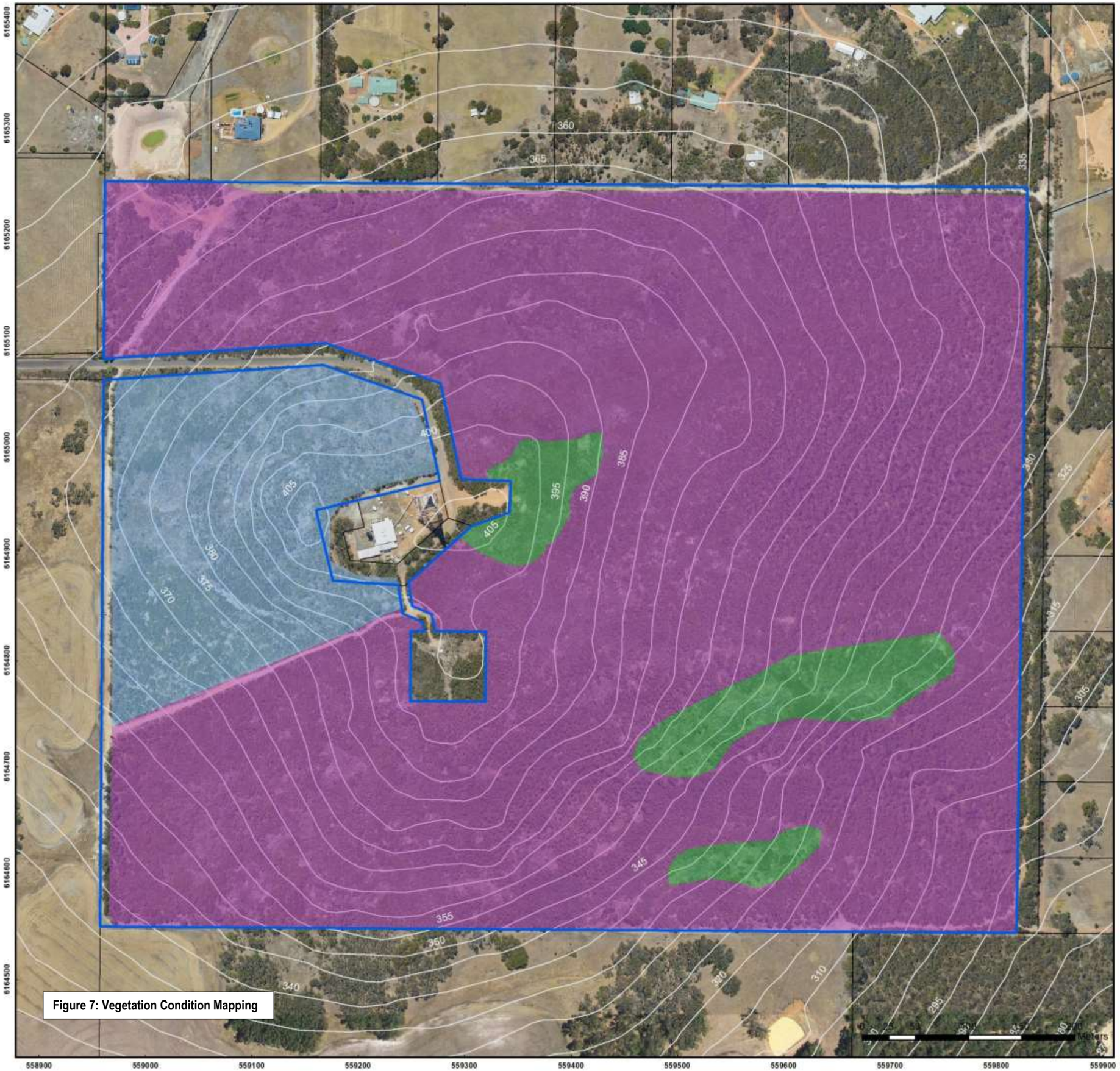

Figure 7: Vegetation Condition Mapping

BIO DIVERSE SOLUTIONS

29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575

Overview Map Scale 1:100,000

Legend

- Subject Site
- Cadastre
- 5m Contours

Vegetation Condition

- Excellent
- Very good
- Very good/Excellent

Scale
1:3,500 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2018
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
GSCORE
Reserve 15162 Survey Tower Road
Mount Barker, WA 6324

Vegetation Condition Mapping

STATUS	FILE	DATE
FINAL	MSC0275	7/04/2020

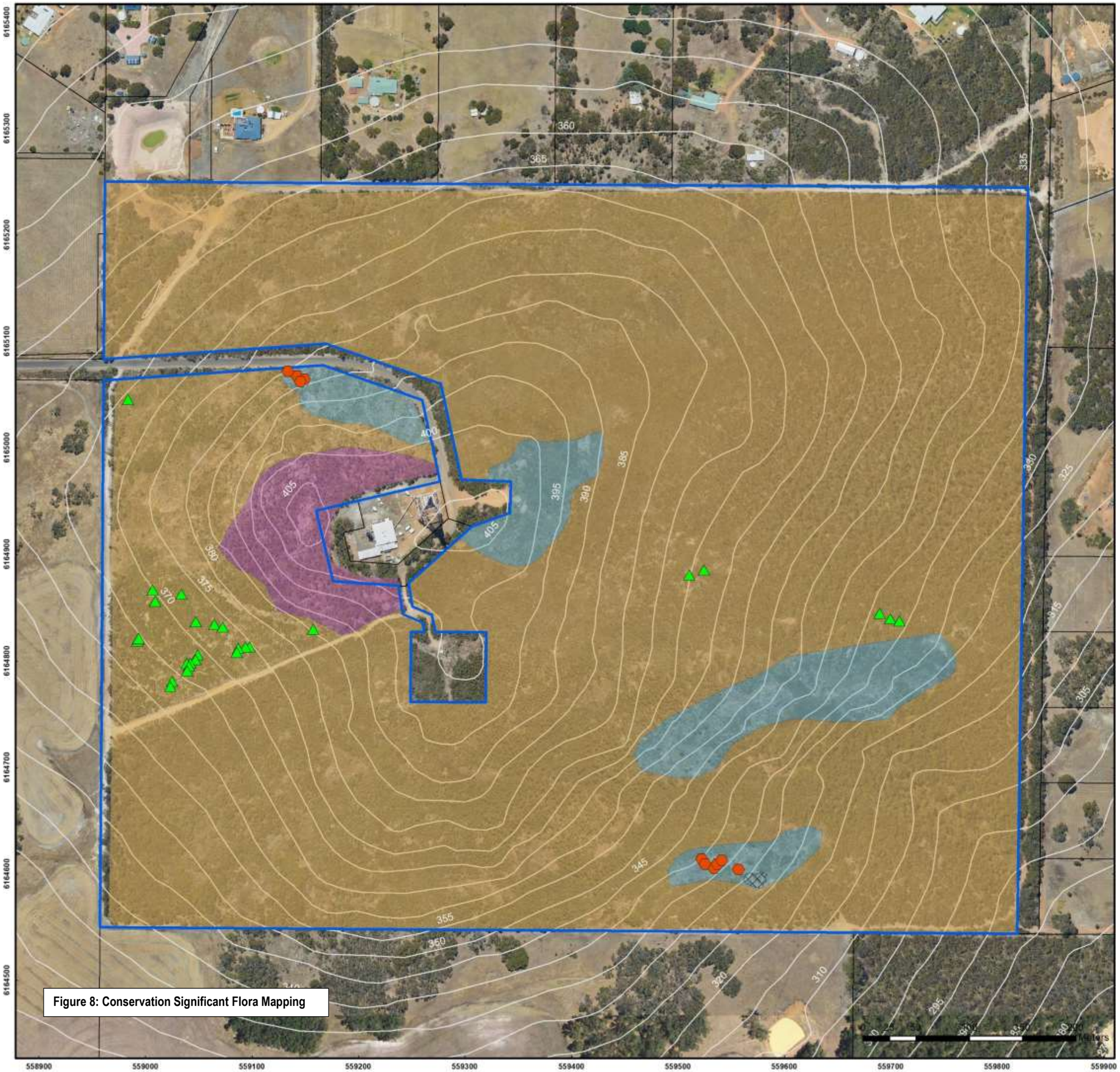

Figure 8: Conservation Significant Flora Mapping

BIO DIVERSE SOLUTIONS

29 Hercules Crescent
Albany, WA 6330
Australia

Tel: 08 9842 1575
Fax: 08 9842 1575

Overview Map Scale 1:100,000

Legend

- Subject Site
- Cadastre
- 5m Contours

Conservation Significant Flora

- Banksia porrecta (P4)
- Verticordia endlicheriana var. angustifolia (P3)
- Verticordia endlicheriana var. angustifolia (P3)

Vegetation Units

- Granite Outcrop
- Jarrah / Marri Woodland
- Yate Woodland

Scale
1:3,500 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
GSCORE
Reserve 15162 Survey Tower Road
Mount Barker, WA 6324

Conservation Significant Flora

STATUS	FILE	DATE
FINAL	MSC0275	7/04/2020

Appendix B

Species List

Family	*Scientific Name*	Cons Status
Anarthriaceae	*Anarthria prolifera*	
Anarthriaceae	*Lyginia sp.*	
Apiaceae	*Platysace sp.*	
Apiaceae	*Xanthosia rotundifolia*	
Araliaceae	*Trachymene pilosa*	
Asparagaceae	*Laxmannia sp.*	
Asparagaceae	*Thysanotus sp.*	
Asteraceae	*Dittrichia viscosa*	*
Asteraceae	*Hypochaeris sp.*	*
Asteraceae	*Pimelea sp.*	
Asteraceae	*Rhodanthe citrina*	
Boryaceae	*Borya sp.*	
Cyperaceae	*Evandra aristata*	
Cyperaceae	*Lepidosperma gracile*	
Cyperaceae	*Lepidosperma longitudinale*	
Cyperaceae	*Lepidosperma squamatum*	
Cyperaceae	*Mesomelaena tetragona*	
Dasypogonaceae	*Dasypogon bromeliifolius*	
Dilleniaceae	*Hibbertia amplexicaulis*	
Dilleniaceae	*Hibbertia furfuracea*	
Dilleniaceae	*Hibbertia racemosa*	
Dilleniaceae	*Hibbertia sp.*	
Droseraceae	*Drosera sp.*	
Ericaceae	*Astroloma sp.*	
Ericaceae	*Leucopogon australis*	
Ericaceae	*Leucopogon obovatus*	
Ericaceae	*Leucopogon propinquus*	
Ericaceae	*Leucopogon reflexus*	
Ericaceae	*Leucopogon sp.*	
Ericaceae	*Leucopogon verticillatus*	
Ericaceae	*Sphenotoma capitata*	
Ericaceae	*Sphenotoma gracilis*	
Ericaceae	*Sphenotoma sp.*	
Euphorbiaceae	*Ricinocarpos glaucus*	
Fabaceae	*Acacia extensa*	
Fabaceae	*Acacia myrtifolia*	
Fabaceae	*Acacia pulchella*	
Fabaceae	*Acacia scirpifolia*	
Fabaceae	*Bossiaea eriocarpa*	
Fabaceae	*Bossiaea linophylla*	
Fabaceae	*Bossiaea ornata*	
Fabaceae	*Chorizema reticulatum*	

Family	*Scientific Name*	Cons Status
Fabaceae	*Chorizema spathulatum*	
Fabaceae	*Gompholobium capitatum*	
Fabaceae	*Gompholobium sp.*	
Fabaceae	*Hardenbergia comptoniana*	
Fabaceae	*Hovea chorizemifolia*	
Fabaceae	*Kennedia prostrata*	
Fabaceae	*Kennedia sp.*	
Fabaceae	*Pultenaea reticulatum*	
Haemodoraceae	*Conostylis aculeata*	
Haemodoraceae	*Haemodorum sp.*	
Iridaceae	*Patersonia occidentalis*	
Iridaceae	*Patersonia sp.*	
Lauraceae	*Cassytha sp.*	
Lindsaeaceae	*Lindsaea linearis*	
Malvaceae	*Thomasia sp.*	
Myrtaceae	*Agonis theiformis*	
Myrtaceae	*Calothamnus sp. (possibly quadrifidus)*	
Myrtaceae	*Corymbia calophylla*	
Myrtaceae	*Eucalyptus cornuta*	
Myrtaceae	*Taxandria marginata*	
Myrtaceae	*Taxandria parviceps*	
Myrtaceae	*Verticordia sp. (possibly endlicheriana var. angustifolia)*	P3
Olacaceae	*Olax phyllanthi*	
Orchidaceae	*Disa bracteata*	*
Orchidaceae	*Eriochilus dilatatus*	
Orchidaceae	*Praecoxanthus aphyllus*	
Phyllanthaceae	*Phyllanthus calycinus*	
Phytolaccaceae	*Phytolacca octandra*	*
Poaceae	*Briza maxima*	*
Poaceae	*Tetrarrhena laevis*	
Proteaceae	*Banksia arctotidis*	
Proteaceae	*Banksia armata*	
Proteaceae	*Banksia grandis*	
Proteaceae	*Banksia nivea*	
Proteaceae	*Banksia porrecta*	P4
Proteaceae	*Banksia serra*	
Proteaceae	*Hakea amplexicaulis*	
Proteaceae	*Hakea trifurcata*	
Proteaceae	*Hakea undulata*	
Proteaceae	*Hakea varia*	
Proteaceae	*Synaphea sp.*	
Restionaceae	*Desmocladus fasciculatus*	

Family	Scientific Name	Cons Status
Restionaceae	*Desmocladus flexuosus*	
Rubiaceae	*Opercularia hispidula*	
Rubiaceae	*Opercularia vaginata*	
Rutaceae	*Boronia sp.*	
Rutaceae	*Boronia spathulata*	
Santalaceae	*Leptomeria squarrulosa*	
Xanthorrhoeaceae	*Xanthorrhoea gracilis*	
Xanthorrhoeaceae	*Xanthorrhoea preissii*	