

## Addendum 3 – Flora and Fauna Survey – Proposed Open Pit Area – Borthwick Property

### SUMMARY

A flora and fauna survey was undertaken on the 17 September 2015 on the Borthwick property associated with the proposed Kookaburra Gully Graphite Project. The vegetation associations were mapped, condition ratings assigned and a thorough search was undertaken for nationally and State threatened flora species. Any threatened fauna species were also opportunistically recorded, if present.

The remnant vegetation on the Borthwick property, Mineral Claim (MC) 4372, comprises old growth *Eucalyptus cladocalyx* (Sugar Gum) woodland dominating a rocky crest and hill slopes with a moderate level of weed invasion occurring, mainly from species such as African Daisy. Five vegetation associations were mapped with the overall condition assigned according to factors such as levels of weed invasion, diversity of native species and other impacts such as grazing (Figure 1). The vegetation appeared to be in poorer condition than the woodland remnant on the Cullen property, MC 4373, with many open areas of denuded understorey vegetation brought about by grazing and mechanical clearance and possibly the 2005 Wangary fire. Two of these associations were found to be additional to the 23 associations mapped during the previous EBS Ecology surveys undertaken for the project (Table 1).

Neither of the two nationally threatened species which were identified on the neighbouring Cullen property; State and nationally vulnerable *Olearia pannosa* subsp. *pannosa* (Silver Daisy-bush) and the State rare and nationally endangered *Pultenaea trichophylla* (Tufted Bush-pea), were observed within the Borthwick property during the September 2015 survey. State rare species; *Daviesia pectinata* (Zig-zag Bitter Pea) and *Acacia imbricata* (Feathery Wattle) were both widespread throughout the property.

No nationally and State threatened fauna species were recorded.

### VEGETATION ASSOCIATIONS

Table 1. Overall summary of vegetation associations.

Vegetation assoc. #	Vegetation association	Condition
1	Exotic dominated	0:1
2	<i>Eucalyptus cladocalyx</i> Woodland	4:1 - 8:1
3	<i>Eucalyptus cladocalyx</i> +/- <i>Eucalyptus calycogona</i> ssp. <i>spaffordii</i> Woodland	5:1 – 6:1
4	<i>Eucalyptus cladocalyx</i> +/- <i>Eucalyptus calycogona</i> ssp. <i>spaffordii</i> +/- <i>Eucalyptus</i>	5:1

Vegetation assoc. #	Vegetation association	Condition
	<i>peninsularis</i> Woodland	
5	<i>Melaleuca uncinata</i> +/- <i>Allocasuarina verticillata</i> Shrubland	4:1 - 7:1
6	<i>Eucalyptus peninsularis</i> Low Woodland	5:1 - 6:1
7	<i>Xanthorrhoea semiplana</i> ssp. +/- <i>Allocasuarina verticillata</i> Grassland	4:1 - 6:1
8	<i>Allocasuarina verticillata</i> +/- emergent <i>Acacia pycnantha</i> Low Open Forest	4:1 - 7:1
9	<i>Eucalyptus</i> spp. Mixed Mallee	6:1
10	<i>Eucalyptus</i> spp. +/- <i>Callistemon rugulosa</i> Mallee	6:1
11	<i>Eucalyptus petiolaris</i> Woodlands +/- <i>Allocasuarina verticillata</i> +/- <i>Acacia pycnantha</i>	4:1 - 5:1
12	<i>Eucalyptus petiolaris</i> Woodland over <i>Acacia pycnantha</i> and <i>Acacia rupicola</i>	5:1
13	<i>Acacia pycnantha</i> / <i>Acacia imbricata</i> Shrubland	8:1
14	<i>Gahnia filum</i> Sedgeland	4:1
15	<i>Gahnia filum</i> / <i>Juncus kraussii</i> Sedgeland	6:1
16	<i>Juncus kraussii</i> Sedgeland	7:1
17	<i>Juncus kraussii</i> Sedgeland +/- scattered <i>Eucalyptus petiolaris</i>	4:1 - 5:1
18	<i>Juncus kraussii</i> Sedgeland +/- <i>Ficinia nodosa</i> +/- scattered <i>Melaleuca halmaturorum</i>	3:1
19	<i>Juncus kraussii</i> / <i>Ficinia nodosa</i> / <i>Juncus pallidus</i> Sedgeland +/- scattered <i>Acacia pycnantha</i>	4:1
20	<i>Cypress gymnocaulos</i> / <i>Juncus kraussii</i> Sedgeland	4:1
21	<i>Acacia imbricata</i> / <i>Lissanthe strigosa</i> / <i>Acacia rupicola</i> open shrubland +/- <i>Eucalyptus cladocalyx</i> +/- <i>Eucalyptus calycogona</i> ssp. <i>spaffordii</i>	8:1
22	<i>Acacia pycnantha</i> +/- <i>Allocasuarina verticillata</i> Low Open Forest	5:1
23	<i>Eucalyptus petiolaris</i> Woodland	8:1
24	<i>Eucalyptus calycogona</i> ssp. <i>calycogona</i> open mallee over <i>Melaleuca uncinata</i>	8:1
25	<i>Acacia imbricata</i> / <i>Lissanthe strigosa</i> / <i>Acacia rupicola</i> open shrubland	8:1

The vegetation communities previously mapped and recorded by L. Bebbington (2015) were checked during the survey. Some of these were found to no longer exist due to clearance within cultivated areas. Other areas within the remnant were described and mapped at a very fine scale depending on the understorey composition, however the overstorey was found to be old growth *Eucalyptus cladocalyx* Woodland with varying understorey composition, structure and condition. One of the mallee / Broombush associations was not found in the location of where it had been mapped by Bebbington (2015). The association descriptions are provided below.

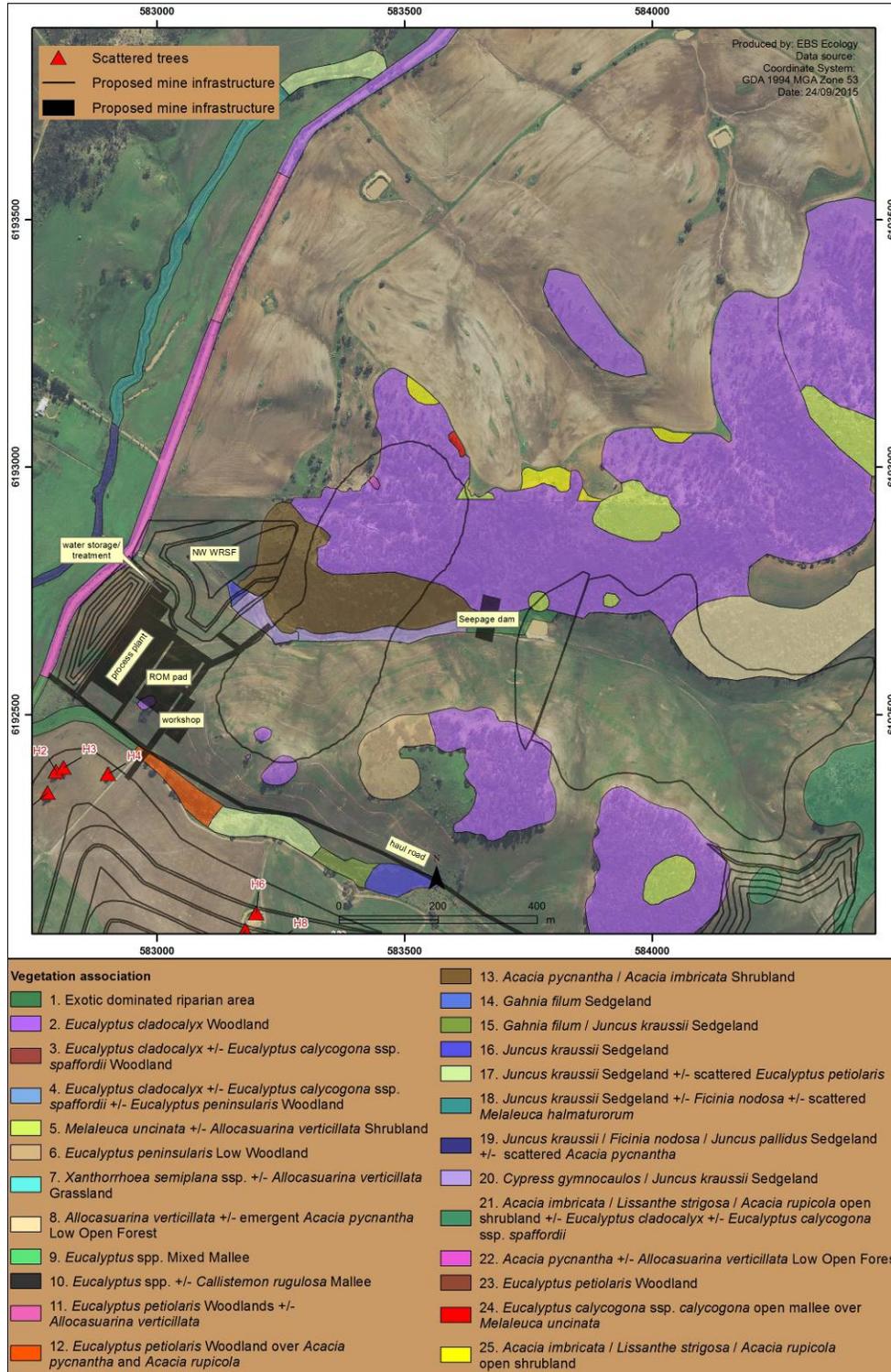


Figure 1. Vegetation Association and threatened species Map

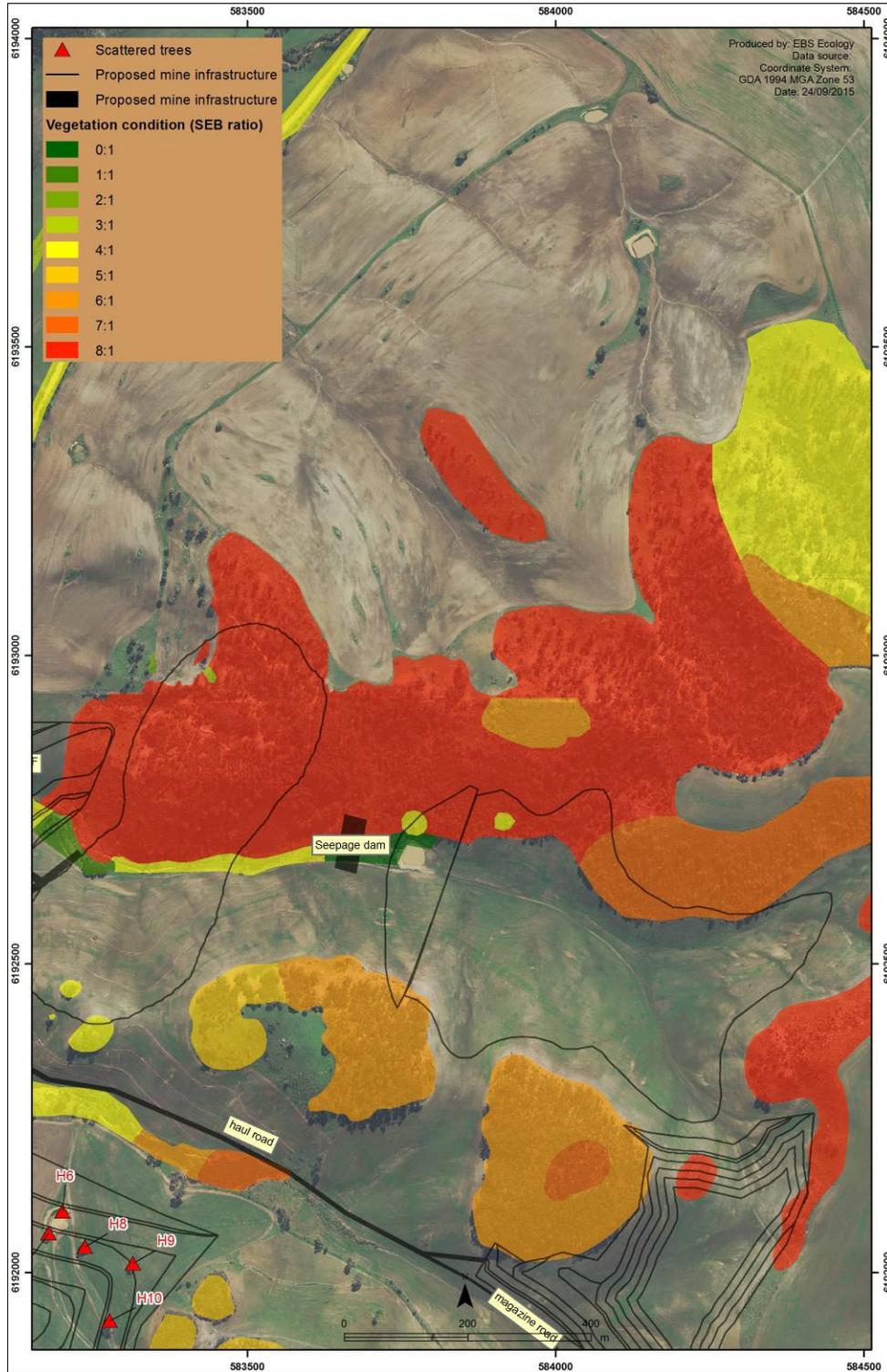


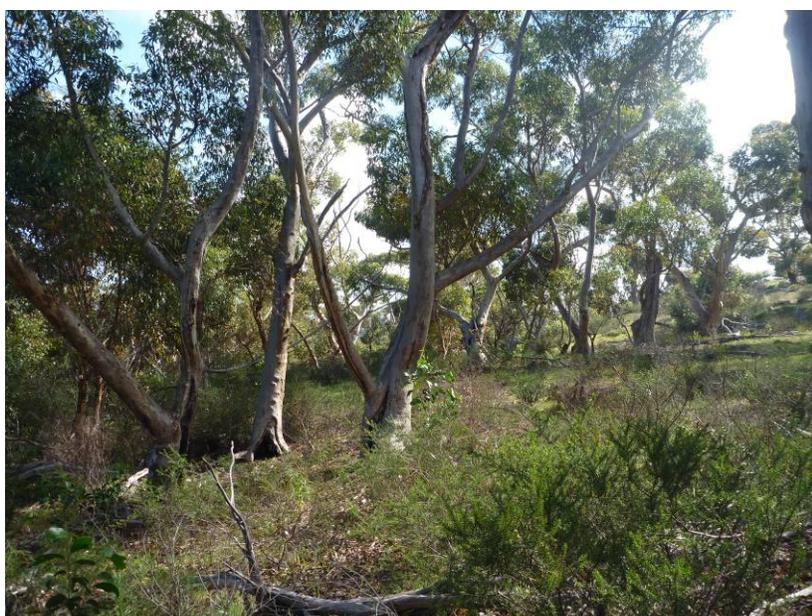
Figure 2. Vegetation condition map

**Association 2 - *Eucalyptus cladocalyx* (Sugar Gum) Woodland**

This vegetation association dominated the Borthwick property. The structure of the community varied depending on its fire history and grazing levels. The overstorey stratum is considered to be ‘old growth’ with many of the mature individuals of advanced age. Understorey diversity was moderate to low with sheep grazing removing palatable shrubs and ground layer herbaceous species. Condition was therefore variable, with some areas supporting mixed native grass patches, and other shrubby strata including *Acacia imbricata* (Feathery Wattle), *Acacia rupicola* (Rock Wattle) and *Daviesia pectinata* (Zig-zag Bitter Pea). Density of understorey varied considerably with some areas extremely dense whilst others were very open and almost denuded.

**Table 2. Summary of vegetation association 2. *Eucalyptus cladocalyx* Woodland.**

Representation	Dominant community in proposed pit area
Conservation value	Very High
Vegetation condition	Poor to moderate, dependent on grazing pressure and mechanical clearance of understorey.
Overstorey species	<i>Eucalyptus cladocalyx</i> (Sugar Gum)
Midstorey species	<i>Acacia pycnantha</i> (Golden Wattle), <i>Acacia imbricata</i> (Feathery Wattle), <i>Acacia rupicola</i> (Rock Wattle), <i>Daviesia pectinata</i> (Zig-zag Bitter pea), <i>Lissanthe strigosa</i> (Peach Heath)
Understorey species	<i>Rytidosperma</i> spp. (Wallaby Grass), <i>Austrostipa</i> sp. (Spear Grass), <i>Gonocarpus mezeianus</i> (Broad-leaf Raspwort).
Threatened species	<i>Acacia imbricata</i> (Feathery Wattle), <i>Daviesia pectinata</i> (Zig-zag Bitter pea)
Declared weeds	<i>Senecio pterophorus</i> (African Daisy)



**Figure 3. *Eucalyptus cladocalyx* (Sugar Gum) Woodland**

### Association 5 - *Melaleuca uncinata* shrubland

This community was mapped on the far eastern edge of the proposed pit and continued along the fenceline, consistent with the Cullen property. The abundance of *Melaleuca uncinata* varied from dense to sparse and displayed a reasonably high diversity of perennial herbaceous species, grasses and sedges. Understorey species were mainly dominated by *Lissanthe strigosa* (Peach Heath), *Acacia imbricata* (Feathery Wattle) and *Lepidosperma viscidum* (Sticky Sword-sedge), with grasses and herbs including *Austrostipa* sp. (Spear Grass), *Gonocarpus mezianus* (Broad-leaf Raspwort) and *Lagenophora huegelii* (Bottle Daisy). The two nationally threatened plant species which were recorded within this association on the Cullen property were not detected.

**Table 3. Summary of vegetation association 5. *Melaleuca uncinata* +/- *Allocasuarina verticillata* Shrubland**

Representation	Widespread within the wider region, locally not dominant.
Conservation value	Moderate
Vegetation condition	Moderate
Overstorey species	<i>Melaleuca uncinata</i> (Broombush)
Midstorey species	<i>Acacia imbricata</i> (Feathery Wattle), <i>Lepidosperma viscidum</i> (Sticky Sword-sedge), <i>Eutaxia microphylla</i> (Common Eutaxia), <i>Astroloma conostephioides</i> (Flame Heath)
Understorey species	<i>Austrostipa</i> sp. (Spear Grass), <i>Gonocarpus mezianus</i> (Broad-leaf Raspwort) and <i>Lagenophora huegelii</i> (Bottle Daisy)
Threatened species	<i>Acacia imbricata</i> (Feathery Wattle)
Declared weeds	<i>Senecio pterophorus</i> (African Daisy)



**Figure 4. *Melaleuca uncinata* shrubland with diverse understorey**

## Association 22 - *Acacia pycnantha* +/- *Allocasuarina verticillata*

### Low Woodland

A very small patch of this association was mapped on the western edge of the remnant within the proposed pit area. It was found to be in very poor condition with low diversity and low cover of native species. Many of the *Acacia pycnantha* individuals were dead. This species of Acacia is fairly short lived (10-15 years), however there did not appear to be a mixed aged spread within the population or obvious recruitment occurring. This association was evident along the road reserves of Pillaworta Road. The understorey contained sparse natives and exotics including *Rytidosperma* sp. (Wallaby Grass), *Acacia imbricata* (Feathery Wattle), *Arctotheca calendula* (Cape Weed) and *Senecio pterophorus* (African Daisy).

**Table 4. Summary of vegetation association *Acacia pycnantha* +/- *Allocasuarina verticillata* Low Woodland**

<b>Representation</b>	Patch along western edge of the remnant
<b>Conservation value</b>	Moderate
<b>Vegetation condition</b>	Very poor
<b>Overstorey species</b>	<i>Acacia pycnantha</i> (Golden Wattle)
<b>Midstorey species</b>	<i>Acacia imbricata</i> (Feathery Wattle)
<b>Understorey species</b>	<i>Rytidosperma</i> sp. (Wallaby Grass), <i>Austrostipa</i> sp. (Spear Grass)
<b>Threatened species</b>	<i>Acacia imbricata</i> (Feathery Wattle)
<b>Declared weeds</b>	<i>Senecio pterophorus</i> (African Daisy)



**Figure 5. View of degraded *Acacia pycnantha* low woodland patch**

**Association 24 - *Eucalyptus calycogona* ssp. *calycogona* open mallee over *Melaleuca uncinata***

A small patch was mapped along the eastern edge of the Sugar Gum Woodland close to the edge of the proposed pit and adjacent the cultivated land. It was found to be in moderate condition with a scattering of *Eucalyptus calycogona* ssp. *calycogona* and *Acacia pycnantha* (Golden Wattle) overstorey and a reasonable diversity of native understorey species. These included *Melaleuca uncinata* (Broombush), *Acacia imbricata* (Feathery Wattle), *Lomandra effusa* (Scented Matt-rush) and *Lissanthe strigosa* (Peach Heath). This area was mapped by L. Bebbington (2015) as *Melaleuca uncinata* Shrubland +/- *E. odorata* Open Mallee over Tussock Grassland, however during the latest survey of the site, no *E. odorata* individuals were detected.

**Table 5. Summary of vegetation association *Eucalyptus calycogona* ssp. *calycogona* open mallee over *Melaleuca uncinata* patch**

<b>Representation</b>	Patch along western edge of the remnant
<b>Conservation value</b>	Moderate
<b>Vegetation condition</b>	Moderate
<b>Overstorey species</b>	<i>Eucalyptus calycogona</i> ssp. <i>calycogona</i> (Square-fruited Mallee), <i>Acacia pycnantha</i> (Golden Wattle)
<b>Midstorey species</b>	<i>Acacia imbricata</i> (Feathery Wattle)
<b>Understorey species</b>	<i>Rytidosperma</i> sp. (Wallaby Grass), <i>Austrostipa</i> sp. (Spear Grass)
<b>Threatened species</b>	<i>Acacia imbricata</i> (Feathery Wattle)
<b>Declared weeds</b>	<i>Senecio pterophorus</i> (African Daisy)



**Figure 6. View of *Eucalyptus calycogona* ssp. *calycogona* open mallee over *Melaleuca uncinata* patch**

**Association 25 - *Acacia imbricata* / *Lissanthe strigosa* / *Acacia***

***rupicola* open shrubland**

A small degraded shrubland defined by this association was mapped at the north-eastern extreme of the vegetation, bordering the cultivated land, but outside of the pit. This association was typical on the hill crests and associated upper slopes in the eastern extent of the project area, similar to Association 21, however this patch lacked the emergent overstorey species *Eucalyptus cladocalyx* and *Eucalyptus calycogona ssp. spaffordii*. The community possibly had a greater cover of eucalypts in previous years and has been reduced to a shrubland. The overall species richness and cover density of natives was still considered to be moderately good.

**Table 6. Summary of vegetation association *Acacia imbricata* / *Lissanthe strigosa* / *Acacia rupicola* open shrubland**

Representation	North-eastern extreme of the vegetation on Borthwick property, bordering the cultivated land.
Conservation value	Moderate
Vegetation condition	Moderate- Poor
Overstorey species	<i>Acacia imbricata</i> (Feathery Wattle) / <i>Lissanthe strigosa</i> (Peach Heath)/ <i>Acacia rupicola</i> (Rock Wattle).
Midstorey species	<i>Lomandra effusa</i> (Scented Matt-rush), <i>Pimelea sp.</i> (Rice Flower), <i>Lepidosperma viscidum</i> (Sticky Sword-sedge)
Understorey species	<i>Austrostipa sp.</i> (Spear Grass), <i>Rytidosperma</i> (Wallaby Grass), <i>Neurachne alopecuroidea</i> (Foxtail Mulga Grass)
Threatened species	<i>Acacia imbricata</i> (Feathery Wattle)
Declared weeds	<i>Senecio pterophorus</i> (African Daisy)



**Figure 7. Typical view of Association 25 on Borthwick property.**

## DISCUSSION AND THREATENED SPECIES

The Protected Matters Search identified 16 nationally threatened flora and fauna species and nine migratory species under the EPBC Act that may be relevant to the project area (Attachment 1) (DSEWPaC 2015). Two nationally Threatened Ecological Communities (TEC's) were highlighted as potentially occurring in the area. Nine migratory and eleven marine species were highlighted in the report. Fifty-four state rated flora and fauna species have the potential to occur within the project area according to the BDBSA search (November 2013).

No Threatened Ecological Communities were detected within the Borthwick property. The two nationally listed flora species, nationally vulnerable *Olearia pannosa* subsp. *pannosa* (Silver Daisy-bush) and the nationally endangered *Pultenaea trichophylla* (Tufted Bush-pea), recorded from the remnant vegetation on the Cullen property were targeted during the survey as well as numerous other national and state listed species which were identified by the EPBC Protected Matters Search and the BDBSA search.

Much of the vegetation shows symptoms of being heavily grazed in the past and possible impacts from the 2005 Wangary bushfire. It is likely that the combined total grazing pressure from sheep, rabbits and kangaroos has impacted upon recruitment and severely reduced overall native cover and richness in certain areas. Those small patches which are difficult for grazing animals to access have remained in a better condition than the more open areas. Native grasses appear to have been grazed down in recent times as well as recruiting *Acacia pycnantha* (Golden Wattle) and *Allocasuarina verticillata* (Drooping Sheoak) juveniles. Plant species richness and cover densities of understorey strata were found to vary considerably from the similar vegetation associations mapped on the Cullen property.

The survey was undertaken in the spring (late September) to attempt to capture the average flowering time for most of the annual species highlighted in the database searches. No threatened orchid species were detected during the survey despite a number of common orchids being present. The only threatened flora species detected on site was the State rare *Daviesia pectinata* (Zig-zag Bitter Pea), *Acacia imbricata* (Feathery Wattle) and *Eremophila gibbifolia* (Coccid Emubush). *Acacia imbricata* (Feathery Wattle) was widespread throughout the property in every association except Association 21 (*Acacia pycnantha* +/- *Allocasuarina verticillata* Low Woodland), whereas *Daviesia pectinata* (Zig-zag Bitter Pea) was detected in patches in the understorey associated with Association 2 (*Eucalyptus cladocalyx* (Sugar Gum) Woodland). *Eremophila gibbifolia* (Coccid Emubush) was located outside the proposed pit area to the east, within the Sugar Gum Woodland community. See Figure 8.



The vegetation associations within the proposed pit area on the Borthwick property are moderately-well represented outside of the proposed impacted project area, with the Sugar Gum Woodlands extending further east and the other small example of *Melaleuca uncinata* shrubland mapped within the Cullen property outside the pit area. *Acacia pycnantha* is also well represented within close proximity.

No nationally and State threatened fauna species were recorded.

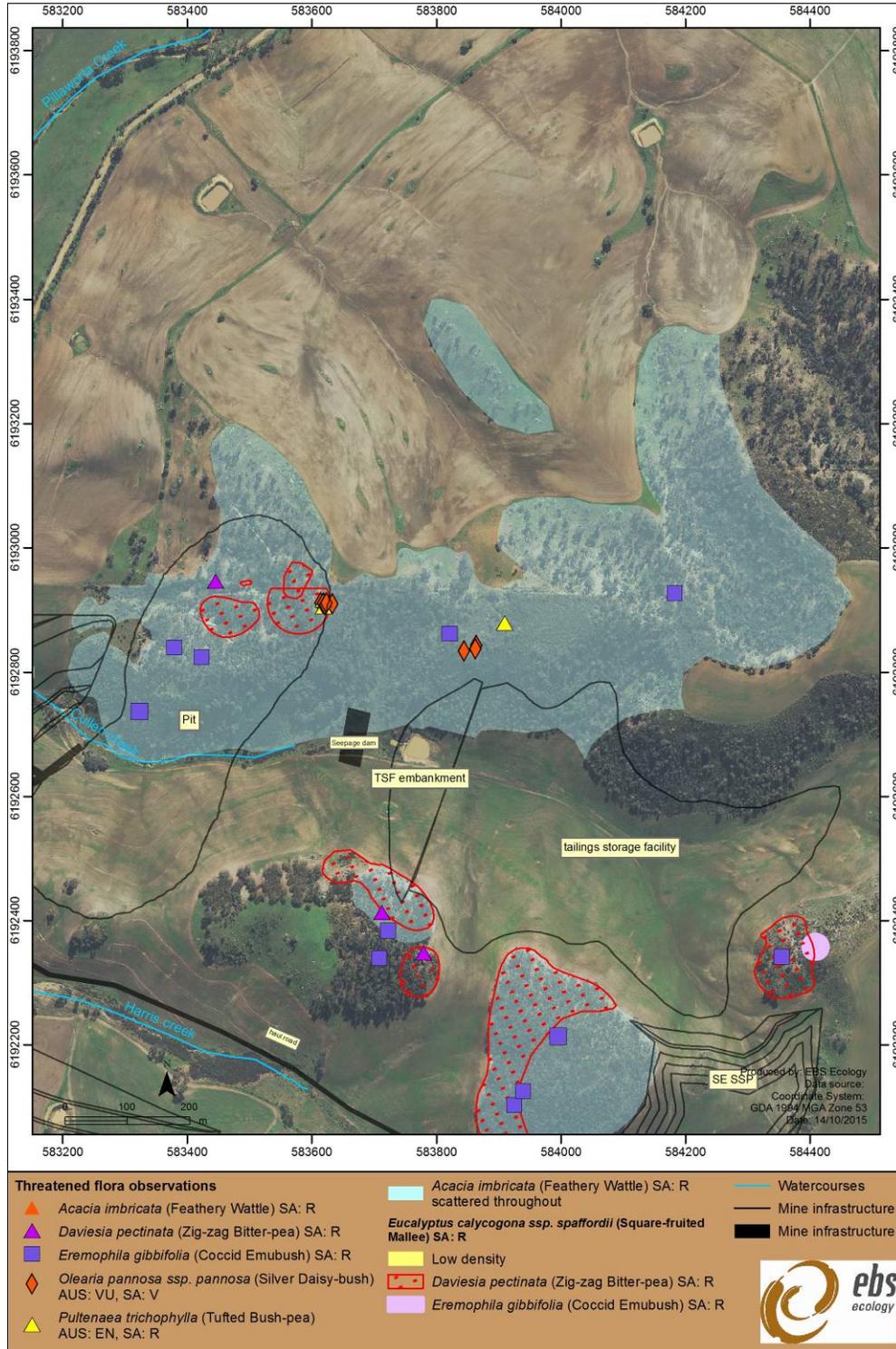


Figure 8. Threatened flora map