

# Appendix 3

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## FLORA ASSESSMENT

# **FLORA STUDY OF 'THE CANYON' AREA**

## **EXTENSION**

### **WHITEHAVEN COAL MINE via GUNNEDAH**

#### **NSW**

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## EXECUTIVE SUMMARY

The vegetation communities within the proposed Canyon Extension to the Whitehaven Coal Mine Study Area have been described following a field survey and review of past flora studies in the area.

Some of the Study Area has been cleared for farming and grazing. Some remnant communities remain but these are generally modified to some degree.

The Study revealed that the ground cover on many sections of the Study Area is invaded by introduced weed and pasture species.

No Threatened Flora species, Endangered Flora Populations or Critical Habitat have been recorded in the past or during the present study within the Study Area.

A remnant of one Endangered Ecological Community occurs within the Study Area. This is the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community. The community is located outside the Company's mining lease and thus the area of disturbance.

[Note that the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community [NSW Threatened Species Conservation Act, 1997 [TSC Act]] equates with the Grassy White Box Woodlands [Commonwealth Environment Protection and Biodiversity Conservation Act, 2000 [EPBC Act]].

The proposed development would not result in any clearing of the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community and so there will be no significant impact on this Endangered Ecological Community.

# FLORA STUDY OF 'THE CANYON' AREA EXTENSION, WHITEHAVEN COAL MINE via GUNNEDAH, NSW

## 1 INTRODUCTION

The study was carried out for Whitehaven Coal Mining Ltd. The Study Area is located immediately to the south of the existing Whitehaven Coal Mine. [Figure 1], The Study Area is larger than the area that would be disturbed by the proposed extension. The estimated area of disturbance is 46 hectares.

Field inspections of the Study Area were carried out on 25<sup>th</sup> September, 2003 and 18<sup>th</sup> April, 2004.

## 2 DESCRIPTION OF THE STUDY AREA

The Study Area comprises a mixture of cleared and relatively flat land and areas of remnant native vegetation. Part of the cleared land has been used for grain growing in the past and the remainder has been grazed until the commencement of mining at Whitehaven.

## 3 SURVEY METHODOLOGY

Prior to field survey the Study Area was viewed stereoscopically using 1: 50,000 scale colour airphotos. The photos used [Boggabri Run 4, Prints 160, 161] were flown in August, 1997 by the Surveyor-General's Department. While these airphotos are old they still provide an excellent overview of the locations of the various vegetation communities within the Study Area.

Stereoscopic interpretation of the photographs provided a good basis for identifying field sampling sites prior to the actual field visit.

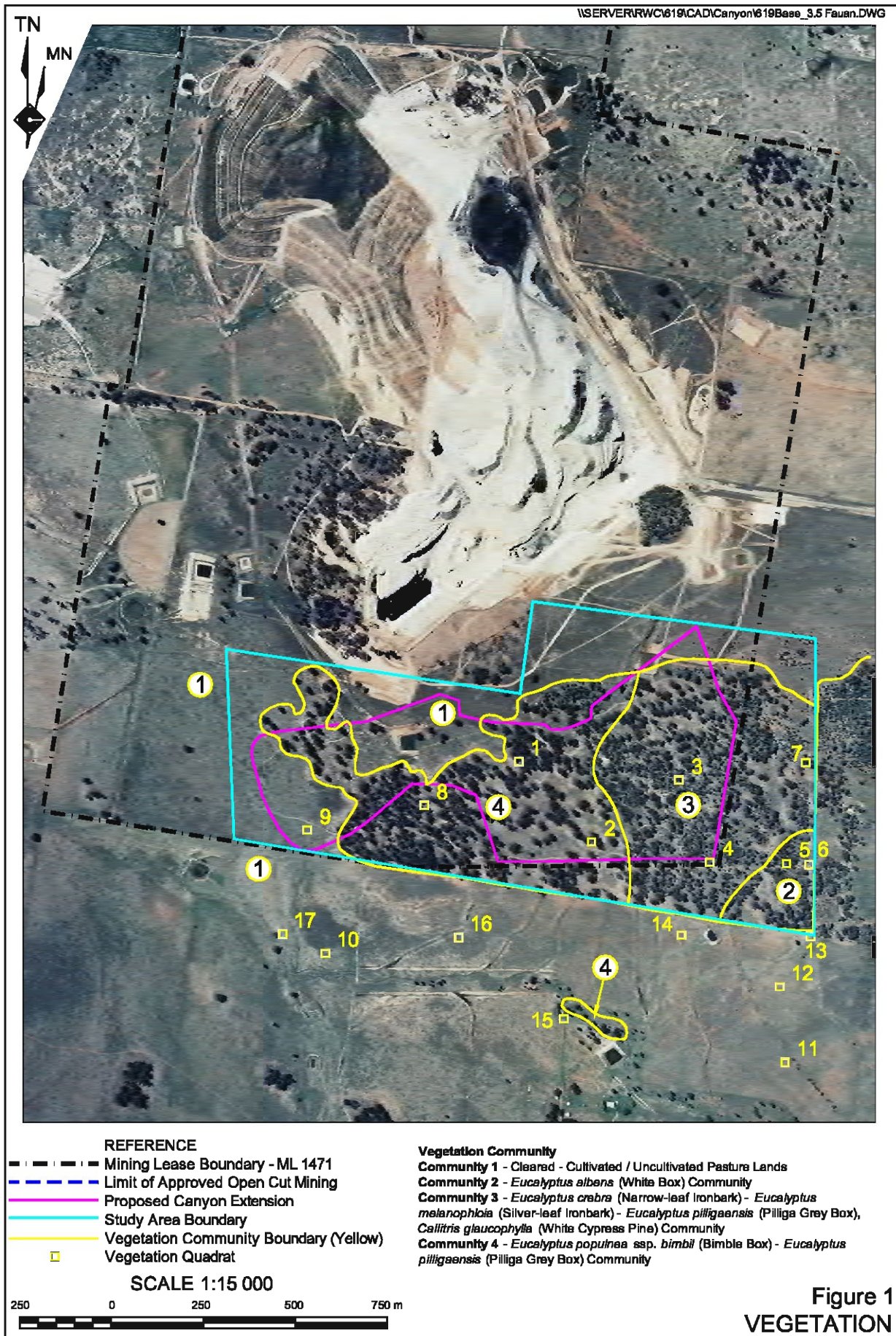
The vegetation within the Study Area was sampled at 18 sites. Quadrats 20m X 20m in area were sampled at each site. The quadrat locations are shown in Figure 1. The tree and shrub species recorded are listed in Table 1 while the ground layer species are shown in Tables 2.

## 4 PREVIOUS VEGETATION STUDIES OF THE REGION NEAR THE STUDY AREA

Note: \* denotes introduced species

### 4.1 Boggabri 1: 100 000 Scale Vegetation Map and Report

The Study Area lies within the area covered by the Boggabri 1; 100 000 scale vegetation map [Cannon et al, 2002].





The map indicates that five vegetation communities occur within the Study Area. These are:

- White Cypress and Ironbark Forests;
- Slopes Grassy Woodlands;
- Floodplain Woodlands;
- Black Earth Grasslands; and
- Non-native Vegetation

#### 4.1.1 White Cypress and Ironbark Forests

Cannon et al [2002] note that the main tree species within this community are *Callitris glaucophylla* [White Cypress Pine], *Eucalyptus crebra* [Narrow-leaf Ironbark], *Eucalyptus melanophloia* [Silver-leaf Ironbark] and localized occurrences of *Eucalyptus albens* [White Box].

Shrub species recorded include *Notelaea microcarpa* [Native Olive], *Beyeria viscosa* [Sticky Wallaby Bush] and *Olearia elliptica* [Sticky Daisy Bush] while the main ground covers are *Austrostipa scabra* [Rough Speargrass], *Desmodium brachypodum* [Large Tick-trefoil]. *Cymbopogon refractus* [Barbed-wire Grass] and *Aristida ramosa* [Purple Wiregrass].

#### 4.1.2 Slopes Grassy Woodlands

The main tree species within this community are *Eucalyptus albens* [White Box], *Callitris glaucophylla* [White Cypress Pine] and *Eucalyptus melanophloia* [Silver-leaf Ironbark]. Shrubs species include *Notelaea microcarpa* [Native Olive] and *Pimelea neo-anglica*.

Groundcover species include *Austrostipa scabra* [Rough Speargrass], *Desmodium brachypodum* [Large Tick-trefoil]. *Cymbopogon refractus* [Barbed-wire Grass] and *Aristida ramosa* [Purple Wiregrass], *Bothriochloa decipiens* [Pitted Bluegrass] and *Glycine tabacina* [Variable Glycine].

#### 4.1.3 Floodplain Woodlands

*Eucalyptus populnea* [Bimble Box], *Eucalyptus microcarpa* [Grey Box], *Eucalyptus melliodora* [Yellow Box], *Eucalyptus camaldulensis* [River Red Gum] and *Geijera parviflora* [Wilga] are the main tree species recorded within this community. *Sclerolaena muricata* [Black Roly-poly] is a common shrub species. Groundcover species include *Austrostipa verticillata* [Slender Bamboo Grass], *Paspalidium constrictum* [Box Grass], *Einadia nutans* [Climbing Saltbush], *Cynodon dactylon* [Couch Grass] and *Enteropogon acicularis* [Curly Windmill Grass].

#### 4.1.4 Black Earth Grasslands

Cannon et al [2002] note that this grassland community is dominated by *Dichanthium sericeum* [Queensland Bluegrass], *Austrostipa aristiglumis* [Plains Grass], *Aristida leptopoda* [White Wiregrass], *Cullen tenax* [Emufoot], *Oxalis perennans* [Wood Sorrel], *Chloris truncata* [Windmill Grass] and *Sclerolaena muricata* [Black Roly-poly].

#### 4.1.5 Non-native Community.

This community is not described by Cannon et al [2002].

## 4.2 Whitehaven Flora Study -2000 [GCNRC 2000]

The flora study carried out for the Environmental Impact Statement prepared for the existing Whitehaven Coal Mine identified nine different communities within the Study Area for that project.

These communities were:

### [a] Community 1 Level Plains Country - Treeless or with Scattered Trees – Cultivated

Trees are either absent or spaced 40 to >100 m apart with some small scattered patches of trees. Species recorded were *Alectryon oleifolius* [Rosewood], *Eucalyptus populnea* ssp. *bimbil* [Bimble Box], *Eucalyptus pilligaensis* [Pilliga Grey Box] and *Casuarina cristata* [Belah]

The main ground cover species present are *Carthamus lanatus* \* [Saffron Thistle], *Brassica napus*\* [Canola], volunteer cereals, *Chloris truncata* [Windmill Grass], *Cynodon dactylon* [Couch Grass], *Conyza* sp\* [Fleabane], *Medicago polymorpha*\* [Burr Medic], *Medicago truncatula*\* [Barrel Medic], *Sclerolaena birchii* [Galvanised Burr], *Sclerolaena muricata* [Black Roly-poly], *Solanum esuriale* [Quena], *Solanum nigrum*\* [Black-berry Nightshade], *Stipa aristiglumis / falcata* [Plains Grass], *Eleocharis pusilla*? [Spike Rush], *Cyperus* sp. [Swamp Grass], *Austrodanthonia* sp [Wallaby Grass], *Lolium rigidum*\* [Annual Ryegrass] and *Austrostipa* sp [Speargrass].

### [b] Community 2 - Level Plains Country - Treeless or with Scattered Trees – Uncultivated

Trees are either absent or spaced from 15 m [in scattered areas to >100m apart. Species recorded were mainly *Eucalyptus populnea* ssp. *bimbil* [Bimble Box] and *Alectryon oleifolius* [Rosewood] but occasional trees of *Eucalyptus melanophloia* [Silver-leaf Ironbark] and *Callitris glaucophylla* [White Cypress Pine] were noted closer to the undulating country. Scattered *Maireana microphylla* [Eastern Cottonbush] and *Lycium ferocissimum*\* [African Boxthorn] plants were also noted.

The main ground cover species present are *Carthamus lanatus*\* [Saffron Thistle], *Medicago polymorpha*\* [Burr Medic], *Enteropogon acicularis* [Curly Windmill Grass], *Hypochaeris glabra*\* [Flatweed], *Lolium rigidum*\* [Annual Ryegrass], *Sclerolaena muricata* [Black Roly-poly], and *Stipa aristiglumis / falcata* [Plains Grass].

### [c] Community 3 - Undulating Country - Treeless or with Scattered Trees – Cultivated

Tree cover is either absent or trees are present at spacings varying from 20 to >100m apart. Species noted included *Callitris glaucophylla* [White Cypress Pine], *Eucalyptus populnea* ssp. *bimbil* [Bimble Box], *Eucalyptus melanophloia* [Silver-leaf Ironbark] and *Eucalyptus pilligaensis* [Pilliga Grey Box]. Some *Schinus ariera*\* [Pepper Trees] occur near 'Whitehaven' homestead. Scattered shrubs of *Lycium ferocissimum*\* [African Boxthorn] and *Maireana microphylla* [Eastern cottonbush] also occur.

The main ground cover species present are volunteer cereals, *Chondrilla juncea*\* [Skeleton Weed], *Calotis lappulacea* [Yellow Daisy Burr], *Carthamus lanatus*\* [Saffron Thistle] and *Enteropogon acicularis* [Curly Windmill Grass] [on land not cultivated for some time].

#### [d] Community 4 - Undulating Country - Treeless or with Scattered Trees – Uncultivated

Trees are basically absent from this community although some scattered *Alectryon oleifolius* [Rosewood] and *Acacia homalophylla* [Yarran] trees were recorded at the community margins.

The main ground cover species present are *Aristida* sp [Wiregrass], *Bothriochloa macra* [Red Grass], *Enneapogon* sp., [Bottlewashers], *Hypochaeris glabra\** [Flatweed] and *Sclerolaena muricata* [Black Roly-poly]

#### [e] Community 5 - Main Creek Channel

The channel is generally treeless although scattered *Alectryon oleifolius* [Rosewood], *Eucalyptus populnea* ssp. *bimbil* [Bimble Box], *Eucalyptus pilligaensis* [Pilliga Grey Box] and *Casuarina cristata* [Belah] may occur in, or adjacent to, the some parts of the channel.

The main ground cover species present are *Chloris ventricosa* [Tall Chloris], *Lolium rigidum\** [Annual Ryegrass], *Eleocharis pusilla?* [Spike Rush] and *Stipa arisitglumis / falcata* [Plains Grass].

#### [f] Community 6 – Dense White Cypress Pine Regeneration

Tree cover is dominated by regenerating *Callitris glaucophylla* [White Cypress Pine] at spacings generally in the 1 – 2m range but up to 8m apart.

The main ground cover species present are *Aristida* sp [Wiregrass], *Calotis lappulacea* [Yellow Daisy Burr], *Hypochaeris glabra\** [Flatweed], *Austrostipa* sp. [Speargrass], *Carthamus lanatus\** [Saffron Thistle], *Dichanthium sericeum* [Queensland Bluegrass] and *Trifolium glomeratum\** [Cluster Clover].

#### [g] Community 7 – Level Country with Box [*Eucalyptus* spp.] Communities

Tree cover is spaced from <1 to 20 to 30m apart. Species recorded were mainly *Eucalyptus populnea* ssp. *bimbil* [Bimble Box] with some *Eucalyptus pilligaensis* [Pilliga Grey Box] and *Eucalyptus albens* [White Box]. Shrub spacing varies from <1 to 10m apart to just scattered occurrences. The main species is *Maireana microphylla* [Eastern Cottonbush] with some *Lycium ferocissimum\** [African Boxthorn].

The main ground cover species present are *Aristida* sp. [Wiregrass], *Atriplex* sp. [Saltbush], *Bothriochloa macra* [Redgrass], *Carthamus lanatus\** [Saffron Thistle], *Lactuca serriola\** [Prickly Lettuce], *Enteropogon acicularis* [Curly Windmill Grass], *Sclerolaena birchii* [Galvanised Burr], *Sclerolaena muricata* [Black Roly-poly], *Sida* sp.[Sida], *Austrostipa* sp. [Speargrass], *Austrostipa verticillata* [Slender Bamboo Grass] and Cyperaceae sp. [Swamp Grass].

#### [h] Community 8 – Undulating Country with Box or Box / Ironbark [*Eucalyptus* spp.] / White Cypress Pine Communities

Tree cover varies within this community in density and species composition. Tree spacings range from <1 to 20 – 30 metres. Generally, *Callitris glaucophylla* [White Cypress Pine], *Eucalyptus melanophloia* [Silver-leaf Ironbark] and *Eucalyptus albens* [White box] are the

dominants on the ridge crests with *Eucalyptus crebra* [Narrow-leaf Ironbark] also occurring. Further down the slopes, *Eucalyptus populnea* ssp. *bimil* [Bimble Box], White Box, *Eucalyptus melliodora* [Yellow Box], *Geijera parviflora* [Wilga] and *Eucalyptus pilligaensis* [Pilliga Grey Box] are more common. On some lower slopes *Allocasuarina luehmannii* [Bull Oak] is present.

Shrubs species include *Eremophila mitchellii* [Budda], *Maytenus cunninghamii* [Yellow Berry Bush], *Notelaea microcarpa* var. *microcarpa* [Native Olive], *Eremophila debile* [Amulla] *Maireana microphylla* [Eastern Cottonbush] and some *Lycium ferocissimum*\* [African Boxthorn].

The main ground cover species present are *Aristida* sp [Wiregrass], *Bracteantha bracteata* [Golden Everlastings], *Calotis lappulacea* [Yellow Daisy Burr], *Carthamus lanatus*\* [Saffron Thistle], *Centaurea* sp.\* [Thistle], *Centauryum* sp.\* [Centaury], *Enteropogon acicularis* [Curly Windmill Grass], *Lepidium africanum*\* [Peppergrass], *Sclerolaena birchii* [Galvanised Burr], *Austrostipa* sp. [Speargrass], *Austrostipa verticillata* [Slender Bamboo Grass] and *Sclerolaena muricata* [Black Roly-poly].

#### [i] Community 9 – Brigalow [*Acacia harpophylla*] Community

Tree cover is dominated by Brigalow with trees spaced from 1 to 5 metres apart. *Capparis mitchellii* [Wild Orange] was also noted. The community occurs in a single isolated clump in the north-west of the study area

The main ground cover species present are *Austrostipa verticillata* [Slender Bamboo Grass], *Enteropogon acicularis* [Curly Windmill Grass] and *Austrostipa aristiglumis* [Plains Grass].

### 4.3 The Present Study

#### 4.3.1 General

**Note:** \* denotes an introduced species

Some of the Study Area has been cleared and cultivated in the past but the majority retains a cover of remnant native vegetation. A small area that has been cleared on the northern section of the Study Area supports a good cover of native and naturalized grasses and herbs. It is unknown whether or not this area has ever been cultivated.

#### 4.3.2 Communities Within the Study Area

The field study identified four vegetation communities within the Study Area. These are:

- **Community 1** - Cleared - Cultivated / Uncultivated Pasture Lands
- **Community 2** - *Eucalyptus albens* [White Box] Community
- **Community 3** – *Eucalyptus crebra* [Narrow-leaf Ironbark] – *Eucalyptus melanophloia* [Silver-leaf Ironbark] – *Eucalyptus pilligaensis* [Pilliga Grey Box] - *Callitris glaucophylla* [White Cypress Pine] Community
- **Community 4** - *Eucalyptus populnea* ssp. *bimil* [Bimble Box] – *Eucalyptus pilligaensis* [Pilliga Grey Box] Community

Details of these communities are contained in the following sections. The ground cover species recorded within each quadrat [community] are listed in **Table 2[a-b]**.

#### 4.3.2.1 Community 1 - Cleared - Cultivated / Uncultivated Pasture Lands

[Quadrats 9, 10, 11, 12, 13a, 14, 16, 17]

This community comprises level to undulating cleared and cultivated / uncultivated land. The area is generally treeless but some areas support scattered regeneration of *Callitris glaucophylla* [White Cypress Pine]. Shrubs of *Maireana microphylla* [Eastern Cottonbush] are present in a scattering over much of the area occupied by this community.

The main groundcover species recorded are *Aristida ramosa*. [Purple Wiregrass], *Austrostipa scabra* [Rough Speargrass], *Bothriochloa macra* [Red Grass], *Bracteantha bracteata* [Golden Everlastings], *Carthamus lanatus*\* [Saffron Thistle], *Chloris ventricosa* [Tall Chloris], *Hypochaeris radicata*\* [Flatweed], *Sclerolaena birchii* [Galvanised Burr], *Sonchus oleraceus*\* [Sowthistle], *Trifolium arvense*\* [Haresfoot Clover] and *Trifolium campestre*\* [Hop Clover].

#### 4.3.2.2 Community 2 - *Eucalyptus albens* [White Box] Community

[Quadrats 6, 13]

This community occurs over a limited area on an upper slope section of the Study Area adjacent to the former Vickery Mine site. The main tree species is *Eucalyptus albens* [White Box] although scattered *Eucalyptus populnea ssp. bimbil* [Bimble Box], *Eucalyptus crebra* [Narrow-leaf Ironbark], *Geijera parviflora* [Wilga] and *Callitris glaucophylla* [White Cypress Pine] [including regenerating seedlings / saplings] are present. Recorded shrubs include *Maireana microphylla* [Eastern Cottonbush] and *Eremophila debilis* [Amulla].

The main groundcover species recorded were *Anagallis arvensis*\* [Scarlet Pimpernell], *Aristida ramosa* [Purple Wiregrass], *Bothriochloa macra* [Red Grass], *Brunoniella australis* [Blue Trumpets], *Carthamus lanatus*\* [Saffron Thistle], *Chenopodium* sp. [Crumbweed], *Hedynois rhagadioloides ssp. cretica*\* [Cretan Weed], *Lepidium africanum*\* [Peppercrass], *Scutellaria humilis* [Dwarf Skullcap] and *Wahlenbergia communis* [Tufted Bluebell].

#### 4.3.2.3 Community 3 – *Eucalyptus crebra* [Narrow-leaf Ironbark] – *Eucalyptus melanophloia* [Silver-leaf Ironbark] – *Eucalyptus pilligaensis* [Pilliga Grey Box] - *Callitris glaucophylla* [White Cypress Pine] Community

[Quadrats 3, 4, 5, 7, 8]

This community The main tree species within this community are *Eucalyptus crebra* [Narrow-leaf Ironbark], *Eucalyptus melanophloia* [Silver-leaf Ironbark], *Eucalyptus pilligaensis* [Pilliga Grey Box] and *Callitris glaucophylla* [White Cypress Pine]. Other tree species include scattered *Allocasuarina luehmannii* [Bull Oak] and *Geijera parviflora* [Wilga]. Shrubs include *Acacia decora* [Western Golden Wattle], *Lycium ferocissimum*\* [African Boxthorn], *Eremophila debilis* [Amulla], *Maireana microphylla* [Eastern Cottonbush] and *Dodonea viscosa ssp. spatulata* [Broad-leaf Hopbush].

The main groundcover species include *Anagallis arvensis*\* [Scarlet Pimpernell], *Aristida ramosa* [Purple Wiregrass], *Austrostipa scabra* [Rough Speargrass], *Bothriochloa macra* [Red Grass], *Bracteantha bracteata* [Golden Everlastings], *Calotis lappulacea* [Yellow Burr-daisy], *Daucus glochidiatus* [Australian Carrot], *Digitaria brownii* [Cotton Panic], *Echium plantagineum*\* [Paterson's

Curse], *Eragrostis lacunaria* [Purple Lovegrass], *Hedypnois rhagadioloides* ssp. *cretica*\* [Cretan Weed], *Lepidium africanum*\* [Peppercress], *Medicago polymorpha*\* [Burr Medic], *Scutellaria humilis* [Dwarf Skullcap], *Sida corrugata* [Corrugated Sida], *Sida cunninghamii* [Hill Sida] and *Vittadinia* sp. [Fuzzweed].

**4.3.2.4 Community 4 - *Eucalyptus populnea* ssp. *bimbil* [Bimble Box] – *Eucalyptus pilligaensis* [Pilliga Grey Box] Community**

[Quadrats 1, 2, 15]

This community occurs on generally lower and more level sections of the Study Area. The main tree species are *Eucalyptus populnea* ssp. *bimbil* [Bimble Box] and *Eucalyptus pilligaensis* [Pilliga Grey Box]. Other tree species recorded include *Callitris glaucophylla* [White Cypress Pine], *Alectryon oleifolius* [Rosewood], *Geijera parviflora* [Wilga],

Shrubs recorded include include *Eremophila debilis* [Amulla], *Maireana microphylla* [Eastern Cottonbush], *Eremophila mitchellii* [Budda], *Acacia oswaldii* [Miljee], *Senna artemisioides* ssp. [Punty Bush], *Acacia homalophylla* [Yarran] and *Lycium ferocissimum*\* [African Boxthorn]. The vine, *Parsonsia eucalyptophylla* [Gargaloo], is also present.

The main groundcover species include *Aristida ramosa* [Purple Wiregrass], *Austrostipa scabra* [Rough Speargrass], *Bothriochloa macra* [Red Grass], *Bracteantha bracteata* [Golden Everlastings], *Calotis lappulacea* [Yellow Burr-daisy], *Enteropogon acicularis* [Curly Windmill Grass], *Eragrostis* sp. [Lovegrass], *Hedypnois rhagadioloides* ssp. *cretica*\* [Cretan Weed], *Medicago minima*\* [Small Woolly Burr Medic], *Medicago polymorpha*\* [Burr Medic], *Sclerolaena birchii* [Galvanised Burr], *Sporobolus caroli* [Fairy Grass] and *Vittadinia* sp. [Fuzzweed].

**Table 1  
Tree and Shrub Species Occurring at the Individual Quadrat Sites**

Note: 'T' followed by [a] number[s] denotes tree spacing in metres

Page 1 of 3

QUADRAT	GPS LOCATION [AMG]	COMMUNITY DESCRIPTION
1	229455 E / 6594962N	Trees clumped over 50% of area: T2-5; <i>Eucalyptus populnea</i> ssp. <i>bimbil</i> [Bimble Box], <i>Geijera parviflora</i> [Wilga]; Shrubs: <i>Lycium ferocissimum</i> * [African Boxthorn], <i>Maireana microphylla</i> [Eastern Cottonbush], <i>Eremophila debilis</i> [Amulla], <i>Eremophila mitchellii</i> [Budda]
2	229656E / 6594748N	Trees clumped over 50% of area: T<1-5; <i>Eucalyptus pilligaensis</i> [Pilliga Grey Box], <i>Alectryon oleifolius</i> [Rosewood], Shrubs: Eastern Cottonbush, African Boxthorn*, Amulla, <i>Parsonsia eucalyptophylla</i> [Gargaloo], <i>Acacia oswaldii</i> [Miljee], <i>Senna artemisioides</i> ssp. [Punty Bush], <i>Acacia homalophylla</i> [Yarran]

**Table 1 (Cont'd)**  
**Tree and Shrub Species Occurring at the Individual Quadrat Sites**

Note: 'T' followed by [a] number[s] denotes tree spacing in metres

Page 2 of 3

QUADRAT	GPS LOCATION [AMG]	COMMUNITY DESCRIPTION
3	229890E / 6594920N	Trees: T2-40 <i>Eucalyptus crebra</i> [Narrow-leaf Ironbark], Pilliga Grey Box, <i>Callitris glaucophylla</i> [White Cypress Pine] Shrubs: <i>Acacia decora</i> [Western Golden Wattle], African Boxthorn*
4	229978E / 6594698N	Trees: T 5-15 <i>Eucalyptus melanophloia</i> [Silver-leaf Ironbark], Narrow-leaf ironbark, Pilliga Grey Box, White Cypress Pine regeneration. Shrubs: Western Golden Wattle, Amulla, Eastern Cottonbush, <i>Jasminum lineare</i> [Native Jasmine]
5	230186E / 6594698N	Trees: Some Silver-leaf Ironbark, Bimble Box, White Cypress Pine regeneration Shrubs: Western Golden Wattle [scattered]
6	230249E / 6594697N	Fence corner: T2-20 <i>Eucalyptus albens</i> [White Box], patches of White Cypress Pine regeneration Shrubs: Amulla, Eastern Cottonbush
7	230234E / 6594973N	Level with north end of Vickery spoil dumps; Trees T<1-15 Bimble Box, Silver-leaf Ironbark, patches of White Cypress Pine regeneration Shrubs: Amulla, Eastern Cottonbush
8	229199E / 6594839N	Trees: T5-15 Pilliga grey Box, some Bimble Box, <i>Allocasuarina luehmannii</i> [Bull Oak], occasional Silver-leaf Ironbark Shrubs: African Boxthorn*
9	228883E / 6594766N	Treeless; Shrubs S2-10 Eastern Cottonbush
10	228938E / 6594432N	Treeless; Shrubs S1-30 Eastern Cottonbush
11	230193E / 6594158N	Treeless with scattered White Cypress Pine regeneration; some Eastern Cottonbush
12	230175E / 6594363N	Treeless; patches of Eastern Cottonbush

**Table 1 (Cont'd)**  
**Tree and Shrub Species Occurring at the Individual Quadrat Sites**

Note: 'T' followed by [a] number[s] denotes tree spacing in metres

Page 3 of 3

QUADRAT	GPS LOCATION [AMG]	COMMUNITY DESCRIPTION
13	230256E / 6594503N	Gate in old fence line ; Trees: T 2-15 White Box, Bimble Box, Narrow-leaf Ironbark, White Cypress Pine, Wilga Shrubs: Eastern Cottonbush, Amulla
14	229905E / 6594499N	Treeless: [White Box ends at dam and changes to Pilliga Grey Box and Bimble Box] Shrubs: Eastern Cottonbush
15	229589E / 6594264N	Small dam north of 'Wilga' house Trees: T5-20 along drainage line Bimble Box, White Cypress Pine Shrubs: Eastern Cottonbush, African Boxthorn*
16	229300E / 6594482N	Treeless: Shrubs: Eastern Cottonbush
17	228821E / 6594482N	Treeless: Shrubs: Eastern Cottonbush

**Table 2[a]**  
**Ground Cover Species Recorded In Quadrats [Q1 to Q9]**

'P' denotes presence in quadrat '-' denotes absence in quadrat

Page 1 of 4

SPECIES	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
<i>Alternanthera nodiflora</i> [Common Joyweed]	-	-	-	-	-	-	-	-	-
<i>Anagallis arvensis</i> *[Scarlet Pimpernell]	-	-	-	P	P	-	P	-	-
<i>Apium</i> sp.	-	-	-	-	-	-	P	-	-
<i>Arctotheca calendula</i> * [Capeweed]	-	-	-	-	-	-	-	-	-
<i>Aristida ramosa</i> [PurpleWiregrass]	P	P	-	-	-	P	P	P	-
<i>Asperula</i> sp. [Woodruff]	-	-	-	-	-	-	-	-	-
<i>Austroanthonia</i> sp. [Wallaby Grass]	-	P	-	-	-	-	P	-	-
<i>Austrostipa aristigulumis</i> [Plains Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa scabra</i> [Rough Speargrass]	P	P	-	P	P	P	P	P	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	P	-	-	-	-	-	-	P	-
<i>Bothriochloa macra</i> [Red Grass]	-	-	P	-	-	P	P	-	-



**Table 2[a] (Cont'd)**  
**Ground Cover Species Recorded In Quadrats [Q1 to Q9]**

'P' denotes presence in quadrat '-' denotes absence in quadrat

Page 2 of 4

SPECIES	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
<i>Brachyscome</i> sp. [Daisy]	-	-	-	-	-	-	-	-	-
<i>Bracteantha bracteata</i> [Golden Everlastings]	P	P	P	P	P	-	P	P	P
<i>Brassica rapa</i> [Canola]	-	-	-	-	-	-	-	-	P
<i>Brunoniella australis</i> [Blue Trumpets]	-	-	-	-	-	P	-	P	-
<i>Bulbine bulbosa</i> [Native Leek]	-	-	-	-	-	-	P	-	P
<i>Bulbine semibarbata / alata</i> [Leek Lily]	-	-	-	-	-	-	-	-	-
<i>Calotis hispidula</i> [Bogan Flea]	P	-	-	-	-	-	-	-	P
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	-	P	P	P	P	-	-	-	P
<i>Capsella bursa-pastoris</i> * [Shepherd's Purse]	P	-	-	-	-	-	-	-	-
<i>Carthamus lanatus</i> * [Saffron Thistle]	-	-	-	-	-	P	-	P	-
<i>Centaurea solstitialis</i> * [St. Barnaby's Thistle]	-	P	-	P	P	-	P	-	-
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	-	-	-	-	-	-	-	-
<i>Chenopodium</i> sp. [Goosefoot]	P	-	-	-	-	-	-	P	-
<i>Chenopodium</i> sp. [Crumbweed]	-	-	-	-	-	P	-	-	-
<i>Chloris truncata</i> [Windmill Grass]	-	-	-	-	-	-	-	-	-
<i>Choris ventricosa</i> [Tall Chloris]	-	-	-	-	-	-	-	-	P
<i>Chrysocephalum apiculatum</i> [Yellow Buttons]	-	-	P	-	-	-	P	-	-
<i>Convolvulus erubescens</i> [Australian Bindweed]	-	-	-	-	-	-	-	-	-
<i>Crassula</i> sp. [Stonecrop]	-	-	P	-	-	-	-	-	-
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	-	-	P	-	-	-	-	-	-
<i>Cynoglossum</i> sp. [Nounds-tongue]	-	-	-	P	P	-	-	-	-
Cyperaceae [unidentifiable [Sedge]	P	-	-	-	-	-	-	-	-
<i>Cyperus "eragrostis"</i> [Sedge]	-	-	-	-	-	-	-	-	-
<i>Daucus glochidiatus</i> [Australian Carrot]	-	-	-	P	P	-	P	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	-	-	-	-	-	-	-
<i>Dichondra repens</i> [Kidney Weed]	-	-	-	-	-	-	-	-	-
<i>Dichopogon</i> sp. [Chocolate Lily]	-	-	P	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	P	P	P	P	-	-
<i>Digitaria divaricatissima</i> [Umbrella Grass]	-	-	-	-	-	-	-	P	-
<i>Echium plantagineum</i> * [Paterson's Curse]	-	-	P	P	P	-	-	-	P
<i>Einadia nutans</i> [Climbing Saltbush]	P	-	P	-	-	-	-	P	-
<i>Enneapogon nigricans</i> [Niggerheads]	-	-	P	-	-	-	-	P	-
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	P	P	P	-	-	-	-	P	P
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	P	-	P	P	P	-	-	P	-
<i>Eragrostis microcarpa</i> [Dainty Lovegrass]	-	-	-	-	-	-	-	-	P
<i>Eragrostis</i> sp. [Lovegrass]	P	P	-	P	P	-	-	P	-
<i>Eriochloa</i> sp [Early Spring Grass]	-	-	-	-	-	-	-	-	-

**Table 2[a] (Cont'd)**  
**Ground Cover Species Recorded In Quadrats [Q1 to Q9]**

'P' denotes presence in quadrat ' - ' denotes absence in quadrat

Page 3 of 4

SPECIES	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
<i>Erodium crinitum</i> [Blue Crowfoot]	-	P	P	-	-	-	P	P	-
<i>Eulalia aurea</i> [Silky Browntop]	-	-	-	-	-	-	-	-	-
<i>Geranium</i> sp.	-	-	-	-	-	-	-	-	-
<i>Glycine</i> sp. [Glycine]	-	-	P	-	-	-	-	-	-
<i>Goodenia glauca</i> [Pale Goodenia]	-	-	-	-	-	-	-	-	-
<i>Goodenia hederacea</i> [Forest Goodenia]	-	-	-	-	-	-	-	P	-
<i>Hedypnois rhagadioloides</i> ssp. <i>cretica</i> * [Cretan Weed]	-	P	P	-	-	P	P	P	P
<i>Helipterum</i> sp.	-	-	-	-	-	-	-	-	-
<i>Hypochaeris glabra</i> * [Smooth Catsear]	-	-	-	P	P	-	-	-	-
<i>Hypochaeris radicata</i> * [Flatweed]	-	-	-	-	-	-	P	-	-
<i>Ixiolaena</i> sp. [Plover Daisy]	-	-	-	-	-	-	-	-	P
<i>Lepidium africanum</i> * [Peppergrass]	-	-	-	P	P	P	P	-	-
<i>Leptochloa digitata</i> [Umbrella Canegrass]	-	-	-	-	-	-	-	-	-
Liliaceae [unidentifiable]	-	-	-	P	P	-	P	P	-
<i>Lolium rigidum</i> * [Annual Ryegrass]	-	-	-	-	-	-	-	-	P
<i>Lomandra</i> sp. [Matrush]	-	-	-	-	P	P	-	-	P
<i>Maireana enchylaenoides</i> [Wingless Fissure-weed]	-	P	-	-	-	-	-	-	-
Malvaceae [unidentifiable]	-	-	-	-	-	-	-	-	-
<i>Medicago minima</i> * [Small Woolly Burr Medic]	-	P	-	P	P	-	P	P	P
<i>Medicago polymorpha</i> * [Burr Medic]	P	P	P	P	P	P	P	P	P
<i>Medicago sativa</i> * [Lucerne]	-	-	-	-	-	-	-	-	P
<i>Nicotiana</i> sp. [Native Tobacco]	P	-	-	-	-	-	-	-	-
<i>Opuntia stricta</i> * [Prickly Pear]	-	-	-	P	P	-	-	-	-
<i>Oxalis</i> sp. [Wood Sorrel]	-	-	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	-	-	-	-	-	-	-	-	-
<i>Petrorhagia</i> sp.* [Pink]	-	-	-	-	-	-	-	-	-
<i>Plantago</i> sp. [Sago Weed]	-	P	-	P	P	-	-	-	-
<i>Polycarpon tetraphyllum</i> * [Four-leaf Allseed]	-	-	-	-	-	-	-	-	-
<i>Rostellularia adscendens</i> [Pink Tongues]	-	-	-	-	P	P	-	-	-
<i>Rumex brownii</i> [Slender Dock]	-	-	-	-	-	-	-	-	-
<i>Sclerolaena birchii</i> [Galvanised Burr]	P	-	-	-	-	P	-	P	-
<i>Sclerolaena muricata</i> [Black Roly-poly]	P	-	-	-	-	-	-	-	-
<i>Scutellaria humilis</i> [Dwarf Skullcap]	-	-	P	P	P	P	P	-	-
<i>Sida corrugata</i> [Corrugated Sida]	-	P	-	P	P	-	-	P	-
<i>Sida cunninghamii</i> [Hill Sida]	-	-	-	P	P	P	-	P	-
<i>Silybum marianum</i> * [Variegated Thistle]	-	-	-	-	-	-	-	-	-
<i>Sisymbrium</i> sp.* [Mustard Weed]	P	P	-	-	-	-	-	P	-
<i>Solanum esuriale</i> [Quena]	-	-	-	-	-	-	-	-	-
<i>Solanum ferocissimum</i> [Spiny Potato-bush]	P	-	-	-	-	-	-	-	-
<i>Sonchus oleraceus</i> * [Sowthistle]	-	-	-	-	-	-	P	P	-
<i>Sporobolus caroli</i> [Fairy Grass]	P	P	-	-	-	-	-	-	-
<i>Stackhousia viminea</i> [Slender Stackhousia]	-	-	-	-	-	-	-	P	-

**Table 2[a] (Cont'd)**  
**Ground Cover Species Recorded In Quadrats [Q1 to Q9]**

'P' denotes presence in quadrat '-' denotes absence in quadrat

Page 4 of 4

SPECIES	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
<i>Themeda avenacea</i> [Tall Oat Grass]	-	-	-	-	-	-	-	-	P
<i>Trifolium arvense</i> * [Haresfoot Clover]	-	-	-	P	-	-	-	-	-
<i>Trifolium campestre</i> * [Hop Clover]	-	-	-	-	-	-	-	-	-
<i>Trifolium glomeratum</i> * [Cluster Clover]	-	-	P	-	-	-	P	-	P
<i>Vittadinia</i> sp. [Fuzzweed]	P	P	-	P	P	-	P	P	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	-	-	-	-	-	-	-	-
<i>Xanthium spinosum</i> * [Bathurst Burr]	-	-	-	-	-	-	-	-	-

**Table 2[b]**  
**Ground Cover Species Recorded In Quadrats [Q10 to Q17]**

'P' denotes presence in quadrat '-' denotes absence in quadrat

Page 1 of 3

SPECIES	Q10	Q11	Q12	Q13	Q13a	Q14	Q15	Q16	Q17
<i>Alternanthera nodiflora</i> [Common Joyweed]	-	-	-	-	-	-	-	-	P
<i>Anagallis arvensis</i> * [Scarlet Pimpernell]	P	-	P	P	-	-	P	-	-
<i>Apium</i> sp.	-	-	-	-	-	-	-	-	-
<i>Arctotheca calendula</i> * [Capeweed]	-	P	-	-	-	-	P	-	-
<i>Aristida ramosa</i> [Purple Wiregrass]	-	P	-	-	P	P	-	-	-
<i>Asperula</i> sp. [Woodruff]	-	-	-	-	P	-	-	-	-
<i>Austrodanthonia</i> sp. [Wallaby Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa aristiglumis</i> [Plains Grass]	P	-	-	-	-	-	-	-	P
<i>Austrostipa scabra</i> [Rough Speargrass]	-	-	P	P	-	P	-	P	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	-	-	-	-	-	-	-	-	-
<i>Bothriochloa macra</i> [Red Grass]	P	P	P	P	-	-	-	P	-
<i>Brachyscome</i> sp. [Daisy]	-	-	-	-	-	-	-	P	-
<i>Bracteantha bracteata</i> [Golden Everlastings]	-	-	P	P	P	-	-	P	-
<i>Brassica rapa</i> [Canola]	-	-	-	-	P	-	P	-	-
<i>Brunoniella australis</i> [Blue Trumpets]	-	-	-	-	P	-	-	-	-
<i>Bulbine bulbosa</i> [Native Leek]	-	-	-	-	-	-	-	-	-
<i>Bulbine semibarbata</i> / <i>alata</i> [Leek Lily]	-	-	-	-	P	-	-	-	-
<i>Calotis hispidula</i> [Bogan Flea]	-	-	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	-	-	-	-	-	-	-	-	-
<i>Capsella bursa-pastoris</i> * [Shepherd's Purse]	-	-	-	-	-	-	-	-	-
<i>Carthamus lanatus</i> * [Saffron Thistle]	P	P	P	P	-	P	P	P	P
<i>Centaurea solstitialis</i> * [St. Barnaby's Thistle]	-	-	-	-	-	-	-	-	-
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	P	-	-	-	-	-	-	-
<i>Chenopodium</i> sp. [Goosefoot]	-	-	-	-	-	-	-	-	-

**Table 2[b] (Cont'd)**  
**Ground Cover Species Recorded In Quadrats [Q10 to Q17]**

'P' denotes presence in quadrat '-' denotes absence in quadrat

Page 2 of 3

SPECIES	Q10	Q11	Q12	Q13	Q13a	Q14	Q15	Q16	Q17
<i>Chenopodium</i> sp. [Crumbweed]									
<i>Chloris truncate</i> [Windmill Grass]	-	-	-	-	-	-	-	-	P
<i>Choris ventricosa</i> [Tall Chloris]	-	-	-	-	P	-	-	-	P
<i>Chrysocephalum apiculatum</i> [Yellow Buttons]	-	-	-	-	-	-	-	-	-
<i>Convolvulus erubescens</i> [Australian Bindweed]	-	P	P	P	-	P	-	P	-
<i>Crassula</i> sp. [Stonecrop]	-	-	-	-	-	-	-	P	-
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	-	-	-	-	-	-	-	-	-
<i>Cynoglossum</i> sp.	-	-	-	-	-	-	-	-	-
Cyperaceae [unidentifiable]	-	-	-	-	-	-	-	-	-
<i>Cyperus "eragrostis"</i> [Sedge]	-	-	-	-	-	-	-	-	P
<i>Daucus glochidiatus</i> [Australian Carrot]	-	-	-	-	-	-	-	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	-	-	-	P	-	-	-
<i>Dichondra repens</i> [Kidney Weed]	-	P	P	-	-	-	-	-	-
<i>Dichopogon</i> sp. [Chocolate Lily]	-	-	-	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	-	-	-	-	-	-
<i>Digitaria divaricatissima</i> [Umbrella Grass]	-	-	-	-	-	-	-	-	-
<i>Echium plantagineum</i> * [Paterson's Curse]	-	-	-	-	-	-	P	-	-
<i>Einadia nutans</i> [Climbing Saltbush]	-	-	-	-	-	-	-	-	-
<i>Enneapogon nigricans</i> [Niggerheads]	-	-	P	P	-	-	-	-	-
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	-	-	-	-	P	-	-	-	P
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Eragrostis microcarpa</i> [Dainty Lovegrass]	P	-	-	-	-	-	-	-	P
<i>Eragrostis</i> sp. [Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Eriochloa</i> sp [Early Spring Grass]	-	-	-	-	-	-	-	-	P
<i>Erodium crinitum</i> [Blue Crowfoot]	-	-	-	-	-	P	-	-	-
<i>Eulalia aurea</i> [Silky Browntop]	-	-	-	-	-	-	-	-	P
<i>Geranium</i> sp.	-	-	-	-	-	-	P	-	-
<i>Glycine</i> sp. [Glycine]	-	-	-	-	-	-	-	-	-
<i>Goodenia glauca</i> [Pale Goodenia]	-	-	-	-	P	-	-	-	-
<i>Goodenia hederacea</i> [Forest Godenia]	-	-	-	P	P	-	-	-	-
<i>Hedypnois rhagadioloides</i> ssp. <i>cretica</i> * [Cretan Weed]	P	-	-	-	-	P	P	-	-
<i>Helipterum</i> sp.	-	-	-	-	-	-	-	P	-
<i>Hypochoeris glabra</i> * [Smooth Catsear]	-	-	-	-	-	-	-	-	-
<i>Hypochoeris radicata</i> * [Flatweed]	P	P	-	P	-	-	-	P	-
<i>Ixiolaena</i> sp. [Plover Daisy]	-	-	-	-	-	-	-	-	-
<i>Lepidium africanum</i> * [Peppercress]	-	-	-	P	-	-	P	-	-
<i>Leptochloa digitata</i> [Umbrella Canegrass]	-	-	-	-	-	-	-	-	P
Liliaceae [unidentifiable]	-	-	-	-	P	-	-	-	-
<i>Lolium rigidum</i> * [Annual Ryegrass]	P	-	-	-	P	-	P	-	-
<i>Lomandra</i> sp. [Matrush]	-	-	-	-	-	-	-	-	-
<i>Maireana enchylaenoides</i> [Wingless Fissure-weed]	-	-	-	-	-	-	-	-	-

**Table 2[b] (Cont'd)**  
**Ground Cover Species Recorded In Quadrats [Q10 to Q17]**

'P' denotes presence in quadrat '-' denotes absence in quadrat

Page 3 of 3

SPECIES	Q10	Q11	Q12	Q13	Q13a	Q14	Q15	Q16	Q17
Malvaceae [unidentifiable]	-	-	-	-	-	-	-	-	P
<i>Medicago minima</i> * [Small Woolly Burr Medic]	-	-	-	P	-	P	P	P	-
<i>Medicago polymorpha</i> * [Burr Medic]	-	-	-	-	-	-	P	-	-
<i>Medicago sativa</i> * [Lucerne]	-	-	-	-	-	-	-	-	-
<i>Nicotiana</i> sp. [Native Tobacco]	-	-	-	-	-	-	-	-	-
<i>Opuntia stricta</i> * [Prickly Pear]	-	-	P	P	-	-	-	-	-
<i>Oxalis</i> sp. [Wood Sorrel]	-	P	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	-	-	-	-	P	-	-	-	-
<i>Petrorhagia</i> sp.* [Pink]	-	P	P	P	-	-	-	-	-
<i>Plantago</i> sp. [Sago Weed]	-	-	-	-	-	-	-	-	-
<i>Polycarpon tetraphyllum</i> * [Four-leaf Allseed]	-	-	-	-	-	-	-	P	-
<i>Portulaca oleracea</i> [Munyeroo]	-	-	-	-	-	-	-	-	-
<i>Rostellularia adscendens</i> [Pink Tongues]	-	-	-	-	-	-	-	-	-
<i>Rumex brownii</i> [Slender Dock]	-	-	-	-	-	-	P	-	-
<i>Sclerolaena birchii</i> [Galvanised Burr]	-	P	P	P	-	P	-P	P	P
<i>Sclerolaena muricata</i> [Black Roly-poly]	-	-	-	-	-	-	-	-	P
<i>Scutellaria humilis</i> [Dwarf Skullcap]	-	-	P	P	-	-	-	-	-
<i>Sida corrugata</i> [Corrugated Sida]	-	-	-	-	-	-	-	-	-
<i>Sida cunninghamii</i> [Hill Sida]	-	-	-	-	-	-	-	-	-
<i>Silybum marianum</i> * [Variegated Thistle]	-	-	P	P	-	-	-	-	-
<i>Sisymbrium</i> sp.* [Mustard Weed]	-	-	-	-	P	-	-	-	-
<i>Solanum esuriale</i> [Quena]	-	-	-	-	-	-	-	-	P
<i>Solanum ferocissimum</i> [Spiny Potato-bush]	-	-	-	-	-	-	-	-	-
<i>Sonchus oleraceus</i> * [Sowthistle]	P	-	-	-	P	-	P	P	-
<i>Sporobolus caroli</i> [Fairy Grass]	-	-	-	-	-	-	-	-	-
<i>Stackhousia viminea</i> [Slender Stackhousia]	-	-	-	-	-	-	-	-	-
<i>Themeda avenacea</i> [Tall Oat Grass]	-	-	-	-	-	-	-	-	P
<i>Trifolium arvense</i> * [Haresfoot Clover]	P	P	P	P	-	P	-	-	-
<i>Trifolium campestre</i> * [Hop Clover]	P	P	P	P	-	-	-	P	-
<i>Trifolium glomeratum</i> * [Cluster Clover]	P	P	-	-	-	-	P	-	-
<i>Vitadina</i> sp. [Fuzzweed]	-	-	-	-	-	P	-	-	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	-	P	P	-	-	-	P	-
<i>Xanthium spinosum</i> * [Bathurst Burr]	-	-	-	-	-	-	P	-	-

#### 4.4 Noxious Weed Considerations

Ground cover within some of the the Study Area is invaded by introduced weed and pasture species, both in cropped areas and areas of remnant native vegetation. Of these, African Boxthorn [*Lycium ferocissimum*]\* [W3], Galvanised Burr [*Sclerolaena birchii*] [W2], Bathurst Burr [*Xanthium spinosum*]\* [W3], Paterson's Curse [*Echium plantagineum*]\* [W3] and Prickly Pear [*Opuntia stricta*]\* [W4f] were present at some sites.

All of these species are listed as being noxious for Gunnedah Shire on the NSW Department of Primary Industries [Agriculture] Website. [search date 15<sup>th</sup> September, 2004]. These species will need to be controlled.

**Note:** The noxious weed codes relevant to the species occurring within the Study Area are as follows:

**W2** The weed must be fully and continuously suppressed and destroyed.

**W3** The weed must be prevented from spreading and its numbers and distribution reduced.

**W4f** The weed must not be sold, propagated or knowingly distributed. Any biological control or other control program directed by the local control authority must be implemented.

## 5 KOALA HABITAT CONSIDERATIONS

Circular B35 issued to Councils by the Department of Urban Affairs and Planning provides information on State Environmental Planning Policy No 44 - Koala Habitat Protection (SEPP 44).

The Study Area is situated within Gunnedah Shire. Schedule 1 of the Policy lists the Gunnedah Shire as a local government area to which the Policy applies.

SEPP 44 requires the identification of any "potential koala habitat" within the study area.

However in section 1.5 of the 'Explanation of the Policy' it is noted that ... "In relation to affected DAs it is the intention of the policy that investigations for 'potential' and 'core' koala habitats be limited to those areas in which it is proposed to disturb habitat.

Potential koala habitat is an area "...of native vegetation where trees of the types listed in Schedule 2 [of SEPP 44] constitute at least 15% of the total number of trees in the upper and lower components of the tree component."

Two of the species listed in Schedule 2 of SEPP 44 are found within the Study Area. These are *Eucalyptus albens* [White Box] and *Eucalyptus populnea* ssp. *bimbil* [Bimble Box].

The exact proportion of these species within the overall Study Area remnants is unknown but the combined number of trees of these two species probably equates to about 15% of the total number of trees present in the remnant native vegetation areas within the Study Area and so these areas can be regarded as "potential koala habitat".

A fauna survey of the Study Area will indicate whether there are any indications of Koalas being present.

## 6 THREATENED SPECIES ISSUES

### 6.1 NSW Threatened Species Conservation Act [TSC Act]

A listing of Vulnerable and Endangered flora species, Endangered Ecological Communities, Endangered Populations and Critical Habitat obtained from the Department of Environment and Conservation [National Parks and Wildlife Service] 'Atlas of NSW Wildlife' indicates that the following threatened species and communities have been recorded, or are predicted to occur, within the Boggabri 1:100 000 scale map sheet area. [date of report 15<sup>th</sup> September, 2004]

The predicted occurrences are those obtained using the BIOCLIM computer model.

Geoff Cunningham Natural Resource Consultants

### 6.1.1 Threatened Species

There are four records of Threatened flora species contained in the 'Atlas of NSW Wildlife' for the search area. These all relate to *Hakea pulvinifera*, a species that is found only near Keepit Dam.

The likelihood of occurrence of this species within the Study Area is discussed in **Table 3**.

### 6.1.2 BIOCLIM Model Predictions [for the Boggabri [8936] 1: 100 000 Scale Map Sheet Area]

*Bothriochloa biloba* [no longer listed]  
*Cadellia pentastylis*  
*Calotis glandulosa*  
*Dichanthium setosum*  
*Goodenia macbarronii*  
*Hakea pulvinifera*  
*Philothea ericifolia*  
*Swainsona murrayana*  
*Thesium australe*

The likelihood of occurrence of these species within the Study Area is discussed in **Table 3**.

### 6.1.3 Endangered Ecological Communities

The Endangered Ecological Communities recorded or predicted to occur within the Boggabri [8936] 1: 100 000 scale map sheet area are:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- Coolibah and Black Box Woodland of the northern riverine plains in the Darling Riverine Plains and Brigalow Belt South Bioregions
- Howell Shrublands in the Northern Tablelands and Nandewar Bioregions
- McKies Stringybark / Blackbutt Open Forest in the Nandewar and New England Tableland Bioregions
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains
- Semi-evergreen Vine Ticket in the Brigalow Belt South and Nandewar Bioregions
- White Box Yellow Box Blakely's Red Gum Woodland.

### 6.1.4 Endangered Flora Populations

There are no Endangered Flora Populations recorded or predicted to occur within the Boggabri [8936] 1: 100 000 scale map sheet area.

### 6.1.5 Critical Habitat

There is no Critical Habitat recorded from the Study Area or within the Boggabri 1: 100 000 scale map sheet area.

## **6.2 Commonwealth Environment Protection and Biodiversity Conservation Act [EPBC Act]**

A listing of Threatened flora species and Threatened Ecological Communities likely to occur within a 30km radius of the centre of the Study Area was obtained from the Environment Australia Database in an EPBC Act Protected Matters Report date 15<sup>th</sup> September, 2004].

In addition, details of any World Heritage Properties or Wetlands of International Significance with the vicinity were obtained. The Protected Matters Report indicates that the following Threatened Species and Ecological Communities have been recorded in the region around the Study Area or are predicted to occur there.

### **6.2.1 Threatened Flora Species**

*Cadellia pentastylis*  
*Digitaria porrecta*  
*Diuris sheaffiana*  
*Goodenia macbarronii*  
*Homopholis belsonii*  
*Philotheca ericifolia*  
*Pterostylis cobarensis*  
*Thesium australe*  
*Tylophora linearis*

The likelihood of occurrence of these species within the Study Area is discussed in **Table 3**.

### **6.2.2 Threatened Ecological Communities**

Only one Threatened Ecological Community - Grassy White Box Woodlands - is recorded or predicted to occur within the area surrounding the Study Area.

### **6.2.3 Nearby World Heritage Properties**

None are present within the search area.

### **6.2.4 Associated Wetlands of International Significance**

None are present within the search area.



**Table 3**  
**Assessment of the Likelihood of Occurrence of Threatened Flora Species**

Page 1 of 2

SPECIES	ASSESSMENT
<i>Bothriochloa biloba</i>	This species has been recorded from a site 9km N of Gunnedah. It grows in woodlands on poorer soils, generally in the Northern Tablelands, North-west Slopes and Plains Botanical Subdivisions [Vickery, 1961; Harden, 1993]. <b>A POSSIBLE OCCURRENCE</b> as suitable habitat is present. The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA. [NOTE: this species has now been deleted from the Schedules of the TSC Act]</b>
<i>Cadellia pentastylis</i>	A small tree to 10m high that grows in thickets, west from Tenterfield and north from Terry Hie Hie [Harden, 1991]. Forms closed or open canopied communities in which it may dominate or mix with <i>Eucalyptus albens</i> , <i>Eucalyptus chloroclada</i> , <i>Eucalyptus pilligaensis</i> and <i>Callitris glaucophylla</i> . Recorded from Turkey Ridge, Deriah State Forest and Eulah Creek east of Narrabri, Terry Hie Hie, Gravesend: 'Tara', Warialda: 'Taronga', Mole River: Tenterfield Creek. [Benson, 1993]. Conserved in Gamilaraay Nature Reserve near Terry Hie Hie and Scrub Myrtle Flora Reserve in Deriah State Forest. <b>The species is distinctive in appearance and was not recorded during field inspection</b> even though suitable habitat may occur at the Study Area. There are no records of its presence at the site in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Calotis glandulosa</i>	This species is an erect or ascending branched herb to 35cm high, +/- woody at the base. Harden [1992] notes that it grows in grasslands and sclerophyll forest from Eden to the Dubbo area. <b>A POSSIBLE OCCURRENCE</b> as suitable general habitat is present. The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Dichanthium setosum</i>	Occurs chiefly in woodlands and grasslands on the Northern Tablelands and more rarely on the North-western Slopes and Plains and Central Western Slopes [Vickery, 1981; Harden, 1993]. Suitable habitat occurs at the site. <b>A POSSIBLE OCCURRENCE</b> but was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Digitaria porrecta</i>	A possible occurrence in the region. A loosely caespitose, erect or geniculate-ascending greyish pubescent perennial grass that grows in grassland on better soils [Harden, 1993]. Suitable habitat occurs at the site. <b>A POSSIBLE OCCURRENCE</b> but was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Diuris tricolor</i> <i>[sheaffiana]</i>	This species was listed on the Schedules of the Threatened Species Conservation Act as <i>Diuris sheaffiana</i> but further taxonomic research indicates that the original species is really <i>Diuris tricolor</i> – a widespread orchid that occurs throughout the western slopes from Narrandera north. Its preferred habitat is sandy soils in Callitris communities. [Bishop, 1996]. <b>SUITABLE HABITAT IS NOT PRESENT AT THE SITE.</b> The species was not recorded during field inspection and there are no records of its presence at the site in the past. Suitable habitat does not occur at the site. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE SITE.</b>
<i>Goodenia macbarronii</i>	Harden [1992] notes that this species is recorded from the Central Western Slopes Botanical Subdivision. It grows in damp sandy soils south from the Guyra and Inverell districts. <b>SUITABLE HABITAT IS NOT PRESENT.</b> The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>

**Table 3 (Cont'd)**  
**Assessment of the Likelihood of Occurrence of Threatened Flora Species**

Page 2 of 2

SPECIES	ASSESSMENT
<i>Hakea pulvinifera</i>	A root suckering shrub to about 4 m high with thick tessellated bark and hairy young branches; flowers in spring; confined to a single population on a hard rocky hillside below Keepit Dam near Gunnedah; apparently reproduces only by root suckers [Harden 2002]. <b>SUITABLE HABITAT IS NOT PRESENT.</b> The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Homopholis belsonii</i>	A rhizomatous and / or stoloniferous perennial grass; grows on poor soils in dry woodland north from the Narrabri district; flowers summer [Harden, 2002]. . Suitable habitat possibly occurs at the site. <b>A POSSIBLE OCCURRENCE.</b> The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Philotheca ericifolia</i>	Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies, in the upper Hunter Valley and Pilliga to Peak Hill district [Harden, 1991]. <b>SUITABLE HABITAT IS NOT PRESENT AT THE SITE.</b> The species was not recorded during field inspection and there are no records of its presence at the site in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE SITE.</b>
<i>Pterostylis cobarensis</i>	Harden [1993] notes that this species grows among rocks on low hills and on slopes above streams, chiefly from Nyngan to Bourke district. Bishop [1996] notes that this species occurs mainly in the Nyngan - Cobar - Bourke region and favours stony ridges, often growing under grey mallee [ <i>Eucalyptus morrisii</i> ]. <b>SUITABLE HABITAT IS NOT PRESENT.</b> The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Swainsona murrayana</i>	Harden[1991] notes that this species often grows with <i>Maireana</i> species on heavy soil, especially in depressions. Thompson [1993] records that it occurs on the western slopes and plains of NSW and in equivalent areas of northern and western Victoria and southern Queensland, with an outlying population in SA west of Broken Hill and that it occurs on heavy soils, often in depressions, frequently associated with <i>Maireana</i> spp. Suitable habitat possibly occurs on lower lying areas at the site. <b>A POSSIBLE OCCURRENCE.</b> The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Thesium australe</i>	Recorded from the North West Slopes Botanical Subdivision [Harden, 1992]. It flowers spring - summer and grows in grassland or woodland, often in damp sites. . <b>A POSSIBLE OCCURRENCE.</b> The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>
<i>Tylophora linearis</i>	Grows in dry scrub in the Barraba, Mendooran, Temora and West Wyalong districts [Harden, 1991]. Also recorded in the vicinity of the Hervey Range, some 9 - 10km east of Peak Hill. <b>A POSSIBLE OCCURRENCE.</b> The species was not recorded during field inspection and there are no records of its presence at the Study Area in the past. <b>IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE STUDY AREA.</b>

### 6.3 Rare or Threatened Australian Plants [ROTAP species]

There is no specific listing of ROTAP species for the area surrounding the Study Area. However, by checking with the listing for the Northwestern Slopes Botanical Subdivision in Briggs and Leigh [1995] it has been possible to compile a list of ROTAP species that have been recorded from this region.

This is contained in **Table 4** along with details of the presence / absence at the Study Area.

**Table 4**  
**ROTAP Species Recorded from the Northwestern Slopes Botanical Subdivision**

Page 1 of 2

SPECIES	DETAILS OF OCCURRENCE
<i>Acacia acrionastes</i>	Rare in NSW, recorded from Pindari Dam; grows in dry sclerophyll forest on loamy clay soils on volcanic substrate [Harden, 2002]; not recorded from Study Area
<i>Acacia forsythia</i>	Rare; grows in dry sclerophyll forest; confined to sheltered sites chiefly at high altitudes in the Warrumbungle Mountains [Harden, 2002]; not recorded from Study Area
<i>Asperula charophyton</i>	Rare; grows in sclerophyll forest often near creeks; recorded from the Warrumbungle Mountains to east of Nundle [Harden, 2002]; not recorded from Study Area
<i>Asterolasia hexapetala</i>	Grows along rocky watercourses and lower slopes in sclerophyll forest and woodland; at lower altitudes in Warrumbungle National Park [Harden, 2002]; not recorded from Study Area
<i>Astrotricha roddii</i>	Rare; grows in low dry sclerophyll woodland on granite and porphyry outcrops in the Ashford area [Harden, 2002]; not recorded from Study Area
<i>Boronia granitica</i>	Rare; grows in sclerophyll forest and woodland and heath amongst granite outcrops; often in rock crevices; north from Parlour Mount [northwest of Armidale] and west to the Inverell district [Harden, 2002]; not recorded from Study Area
<i>Bothriochla biloba</i>	Grows in woodland on poorer soils [Harden, 2003]; recent collecting has shown this species to be more prevalent than was previously thought; not recorded from Study Area
<i>Cadellia pentastylis</i>	Grows in thickets, west from near Tenterfield and north from Maules Creek [40km southeast of Narrabri]; not recorded from Study Area
<i>Derwentia arenaria</i>	Grows on rocky slopes and river flats in sandy soils, often in eucalypt woodland; recorded from the western edge of the Tablelands and Slopes north from Mendooran [Harden, 2002]; not recorded from Study Area
<i>Discaria pubescens</i>	Grows in woodland and forest, often in rocky situations; widespread but considered endangered [Harden, 2000]; not recorded from Study Area
<i>Dodonaea rhombifolia</i>	Often grows in shrubland or woodland on rocky granitic or basalt soils; recorded from the coastal ranges south of Moruya, from Guy Fawkes River National Park to Oxley Wild Rivers National Park and in the Warrumbungle National Park; not recorded from Study Area
<i>Eucalyptus malacoxylon</i>	Locally frequent but restricted in its distribution; occurs in grassy or sclerophyll woodlands on sloping sandy soils; recorded from south of Inverell to Niangala [Harden, 2002]; not recorded from Study Area
<i>Eucalyptus mckieana</i>	Locally abundant in dry sclerophyll forest or woodland on poor sandy loam on acid granite rocks; recorded from the area between Bendemeer and Tingha and in the Torrington district [Harden, 2002]; not recorded from Study Area
<i>Goodenia macbarronii</i>	Grows in damp sandy soils south from the Guyra and Inverell districts [Harden, 2002]; not recorded from Study Area
<i>Grevillea beadleana</i>	Found on granite scarps and exposures, confined to the catchments of the Mole River and Guy Fawkes River, southwest of Grafton and near Enmore [southeast of Armidale] [Harden, 2002]; not recorded from Study Area
<i>Hakea pulvinifera</i>	Rare; confined to a single population on a hard rocky hillside below Keepit Dam near Gunnedah, apparently only reproduces by root suckers [Harden, 2002]; not recorded from Study Area
<i>Homopholis belsonii</i>	Grows in dry woodland on poor soils; north from the Narrabri district [Harden, 2003]; not recorded from Study Area
<i>Homoranthus prolixus</i>	Rare; grows in heath in skeletal soil in crevices in granite outcrops; recorded from the Howell area near Inverell and at Bendemeer. [Harden, 2002]; not recorded from Study Area

**Table 4 (Cont'd)**  
**ROTAP Species Recorded from the Northwestern Slopes Botanical Subdivision**

Page 2 of 2

SPECIES	DETAILS OF OCCURRENCE
<i>Isotropis foliosa</i>	Not common; often grows in sclerophyll forest on skeletal sites, chiefly on the Slopes, north from Denman [Harden, 2002]; not recorded from Study Area
<i>Lepidium aschersonii</i>	Not widespread [Harden, 2000]; not recorded from Study Area
<i>Lepidium peregrinum</i>	Rare; possibly extinct; recorded from the Blue Mountains and near the Queensland border [Harden, 2000]; not recorded from Study Area
<i>Olearia gravis</i>	Grows in dry sclerophyll forest in mountainous regions; north from Torrington [Harden, 1992]; not recorded from Study Area
<i>Persoonia cuspidifera</i>	Grows in dry sclerophyll forest or woodland on sandstone; chiefly in the southern Pilliga Scrub and Warrumbungle Range foothills [Harden, 2002]; not recorded from Study Area
<i>Persoonia terminalis</i> ssp. <i>terminalis</i>	Grows in dry sclerophyll forest on granite; restricted to the Torrington – Emmaville area [Harden, 2002]; not recorded from Study Area
<i>Philotheca ericifolia</i>	Grows chiefly in dry sclerophyll forest and heath; in the upper Hunter Valley and northern Pilliga Scrub to Peak Hill district; [Harden, 2002]; not recorded from Study Area
<i>Pterostylis woollsii</i>	Grows in scattered occurrences through the Tablelands and western Slopes; favours granite slopes supporting mixed Callitris – eucalypt woodland [Bishop, 1996]; not recorded from Study Area
<i>Senecio macranthus</i>	Grows in moist gullies in sclerophyll forest; mainly in the ranges from Wollombi Falls south to Tallong and inland to the Warrumbungle Mountains [Harden 1992]; not recorded from Study Area
<i>Swainsona murrayana</i>	Often grows with Maireana species on heavy soils, especially in depressions; west from Warialda district [Harden, 2002]; not recorded from Study Area
<i>Zieria odorifera</i>	Grows in tall heath, on rocky ridges in shallow sandy soils amongst rock outcrops recorded from Warrumbungle and Nandewar Ranges, at Howell, at the Basin Nature Reserve and The Pinnacle [west of Armidale [Harden, 2002]; not recorded from Study Area

## 7 RESULTS OF THE PRESENT SURVEY

### 7.1 Threatened Flora Species

None of the species listed under the TSC Act, or the EPBC Act, as being recorded from the region surrounding the Study Area [or predicted to occur there] was recorded during the survey.

### 7.2 Endangered / Threatened Ecological Communities

A remnant of one Endangered Ecological Community is present within the study area but is located outside the Company's mining lease and the area of disturbance. This is:

- White Box Yellow Box Blakely's Red Gum Woodland

[Note that the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community [TSC Act] equates with the Grassy White Box Woodlands [EPBC Act].]

### 7.3 Nearby World Heritage Properties

None are present within the search area

### 7.4 Associated Wetlands of International Significance

None are present within the search area

### 7.5 Critical Habitat

There is no Critical Habitat present within the Study Area.

### 7.6 ROTAP Species Occurrence

There are no occurrences of ROTAP Species at the Study Area.

## 8 EIGHT PART TEST

The likelihood of the occurrence of Threatened flora species within the Study Area has been assessed in **Table 3** above.

These assessments have been supplemented with field observations.

Much of the Study Area has been highly modified from its original condition and habitat values as a consequence of previous clearing of tree and shrub cover, by invasion by introduced weed species and by past agricultural land use.

Field observations recorded no Threatened flora species and there are no past records of any Threatened flora species at the site.

There is a remnant of one Endangered Ecological Community [TSC Act] present within the Study Area. It is located outside the Company's mining lease and the area of disturbance.

This community is the White Box Yellow Box Blakely's Red Gum Woodland that equates with the Grassy White Box Woodlands [EPBC Act].]

**The outcome of the assessments and field survey observations has been the conclusion that none of the Threatened flora species recorded or predicted to occur in the wider region around the Study Area occurs at the site.**

For the purposes of the Environmental Planning and Assessment Act the following factors must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

***[a] in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable population of the species is likely to be placed at risk of extinction,***

No occurrences of Threatened flora species were recorded during the field survey and there are no records of such species occurring at the Study Area in the past. Consequently there would be no disruption that will place a viable population of a Threatened flora species at risk of extinction.

***[b] in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,***

No threatened plant populations have been listed in the Schedules of the NSW Threatened Species Conservation Act or under the Commonwealth Environment Protection and Biodiversity Conservation Act occur within the Study Area. As a consequence, the proposed development would not disrupt / compromise the life cycle of any local Endangered Flora Populations.

***[c] in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,***

No Threatened flora species or Endangered Flora Populations occur within the Study Area. Consequently there would not be a significant area of habitat for such species or populations modified as a result of the proposed development.

One Endangered Ecological Community occurs within the Study Area. This is the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / Grassy White Box Woodlands [EPBC Act].

The White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / Grassy White Box Woodlands [EPBC Act] Endangered Ecological Community would not be affected by the proposed development. It is located outside the Company's mining lease and the area of disturbance. As a consequence, there will not be a significant area of known habitat affected by the proposed development.

Accordingly, on a local regional, State and national level, there would not be any significant impact of the proposed development.

***[d] whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,***

No Threatened flora species or Endangered Flora Populations occur within the Study Area. Consequently there will not be any isolation of habitat for such species or populations from currently interconnecting or proximate areas as a result of the proposed development.

The White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / Grassy White Box Woodlands [EPBC Act] Endangered Ecological Community remnant that occurs within the Study area will not be impacted by the proposed development. As a consequence, the proposed development would not cause any additional isolation of habitat.

***[e] whether critical habitat will be affected,***

No critical habitat exists within the Study Area. Therefore the proposed development will not affect critical habitat.

***[f] whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves [ or similar protected areas] in the regional environment of the species, population or community,***

No Threatened flora species or Endangered Flora Populations occur within the Study Area. Consequently there is no further consideration required for this part in relation to these species or Populations.

The White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / Grassy White Box Woodlands [EPBC Act] Endangered Ecological Community is stated by the Scientific Committee [2002] to be poorly represented in reserves but that it occurs in Border Ranges National Park, Goobang National Park, Goulburn River National Park, Manoblai nature reserve, Mount Kaputar National Park, Oxley Wild Rivers National Park, Queanbeyan Nature Reserve, Towari National Park, Warrumbungle National Park, Wingen Maid Nature Reserve, Wolemi National Park, Copeton State Conservation Area, Lake Glenbawn State Conservation Area and Lake Keepit State Conservation Area

***[g] whether the development or activity is of a class of development or activity that is recognised as a threatening process,***

'Clearing of Native Vegetation' has been listed as a Key Threatening Process on Schedule 3 to the Threatened Species Conservation Act.

'Land Clearance' is also listed as a Key Threatening Process under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999.

A small area [in a local and regional sense] of three native vegetation communities would be cleared under this development proposal but no clearing of areas supporting individual Threatened flora species or Endangered Flora Populations or Endangered Ecological Communities is proposed.

***[h] whether any threatened species, population or ecological community is at the limit of its known distribution,***

No Threatened flora species or Endangered Flora Populations occur within the Study Area. Consequently no such species or populations or communities are at the limit of their known distribution.

The White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / Grassy White Box Woodlands [EPBC Act] Endangered Ecological Community remnant is not near its limits of distribution.

The remnant of this community within the study area is located outside the Company's mining lease and the area of disturbance. As a consequence, there will not be a significant area of known habitat affected by the proposed development.

## **9 THREATENED SPECIES OVERVIEW**

[i] There are no records of threatened plant species contained in the 'Atlas of NSW Wildlife' database for study area.

[ii] No Threatened [TSC Act] plant species have been previously recorded from the study area and none were recorded during the field survey

[iii] No Threatened [EPBC Act] plant species have been previously recorded from the study area and none were recorded during the field survey

[iv] Despite predictions and records that indicated that a number of Threatened flora species might be likely to occur at the site, none of these was recorded. The likelihood of occurrence of these species has been assessed in **Table 3**.

[iv] Some of the study area has been cleared for cultivation while the remainder has been grazed in the past.

[v] There are no occurrences within the study area of any of the Endangered Plant Populations listed in the Schedules of the TSC Act or under the EPBC Act.

[vi] One Endangered Ecological Community occurs within the Study Area. This is the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / Grassy White Box Woodlands [EPBC Act] Endangered Ecological Community. This community remnant is located outside the Company's mining lease and the area of disturbance. As a consequence, there will not be a significant area of known habitat affected by the proposed development.

[vii] There is no critical habitat listed for the study area or its environs.

[viii] It is concluded that there will be no significant impact on Threatened flora species, Endangered Ecological Communities, Endangered Flora Populations or Critical Habitat as a consequence of the proposed development.

[ix] There are no ROTAP species recorded for the study area.

[x] In view of the lack of any significant impact on Threatened flora species, Endangered Ecological Communities, Endangered Flora Populations. A Species Impact Statement [TSC Act] or Referral [EBBC Act] will not be required.

## 10 PROPOSED MITIGATION / REHABILITATION MEASURES

The proponent has developed a program for rehabilitating the existing Whitehaven Coal Mine site after reshaping and top-soiling. This program has commenced and will be continued within The Canyon Extension to the existing mine.

Topsoil containing seeds of local native species is being used on the rehabilitated lands. This is shifted direct from stripped areas to rehabilitation sites wherever possible to avoid any impacts of storage.

The tree and shrub species being planted are representative of those that have been cleared to facilitate mining. The seed for the replanted seedlings has been collected on site.

These plantings would be protected from grazing by domestic stock and would be provided with plastic tree guards at planting to minimise impact from grazing by rabbits and hares.



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15<sup>th</sup> September, 2004

# **APPENDIX 1**

## **Plant Species Recorded within the Study Area**

## APPENDIX 1

### Plant Species Recorded within the Study Area

*Acacia decora* [Western Golden Wattle]  
*Acacia homalophylla* [Yarran]  
*Acacia oswaldii* [Miljee]  
*Alectryon oleifolius* [Rosewood]  
*Allocasuarina luehmannii* [Bull Oak]  
*Alternanthera nodiflora* [Common Joyweed]  
*Anagallis arvensis*\* [Scarlet Pimpernell]  
*Apium* sp.  
*Arctotheca calendula*\* [Capeweed]  
*Aristida ramosa* [Purple Wiregrass]  
*Asperula* sp. [Woodruff]  
*Austrodanthonia* sp. [Wallaby Grass]  
*Austrostipa aristiglumis* [Plains Grass]  
*Austrostipa scabra* [Rough Speargrass]  
*Austrostipa verticillata* [Slender Bamboo Grass]  
*Bothriochloa macra* [Red Grass]  
*Brachyscome* sp. [Daisy]  
*Bracteantha bracteata* [Golden Everlastings]  
*Brassica rapa* [Canola]  
*Brunoniella australis* [Blue Trumpets]  
*Bulbine bulbosa* [Native Leek]  
*Bulbine semibarbata / alata* [Leek Lily]  
*Callitris glaucophylla* [White Cypress Pine]  
*Calotis hispidula* [Bogan Flea]  
*Calotis lappulacea* [Yellow Burr-daisy]  
*Capsella bursa-pastoris*\* [Shepherd's Purse]  
*Carthamus lanatus*\* [Saffron Thistle]  
*Centaurea solstitialis*\* [St. Barnaby's Thistle]  
*Chamaesyce drummondii* [Caustic Weed]  
*Chenopodium* sp. [Crumbweed]  
*Chenopodium* sp. [Goosefoot]  
*Chloris truncata* [Windmill Grass]  
*Choris ventricosa* [Tall Chloris]  
*Chrysocephalum apiculatum* [Yellow Buttons]  
*Convolvulus erubescens* [Australian Bindweed]  
*Crassula* sp. [Stonecrop]  
*Cymbopogon refractus* [Barbed-wire Grass]  
*Cynoglossum* sp.  
Cyperaceae [unidentifiable]  
*Cyperus "eragrostis"* [Sedge]  
*Daucus glochidiatus* [Australian Carrot]  
*Dichanthium sericeum* [Queensland Bluegrass]  
*Dichondra repens* [Kidney Weed]  
*Dichopogon* sp. [Chocolate Lily]  
*Digitaria brownii* [Cotton Panic]  
*Digitaria divaricatissima* [Umbrella Grass]

*Echium plantagineum*\* [Paterson's Curse]  
*Einadia nutans* [Climbing Saltbush]  
*Enneapogon nigricans* [Niggerheads]  
*Enteropogon acicularis* [Curly Windmill Grass]  
*Eragrostis lacunaria* [Purple Lovegrass]  
*Eragrostis microcarpa* [Dainty Lovegrass]  
*Eragrostis* sp. [Lovegrass]  
*Eremophila debilis* [Amulla]  
*Eremophila mitchellii* [Budda]  
*Eriochloa* sp [Early Spring Grass]  
*Erodium crinitum* [Blue Crowfoot]  
*Eucalyptus crebra* [Narrow-leaf Ironbark]  
*Eucalyptus melanophloia* [Silver-leaf Ironbark]  
*Eucalyptus pilligaensis* [Pilliga Grey Box]  
*Eucalyptus populnea* ssp. *bimbil* [Bimble Box]  
*Eulalia aurea* [Silky Browntop]  
*Geijera parviflora* [Wilga]  
*Geranium* sp.  
*Glycine* sp. [Glycine]  
*Goodenia glauca* [Pale Goodenia]  
*Goodenia hederacea* [Forest Godenia]  
*Hedynois rhagadioloides* ssp. *cretica*\* [Cretan Weed]  
*Helipterum* sp. [Paper Daisy]  
*Hypochaeris glabra*\* [Smooth Catsear]  
*Hypochaeris radicata*\* [Flatweed]  
*Ixiolaena* sp. [Plover Daisy]  
*Jasminum lineare* [Native Jasmine]  
*Lepidium africanum*\* [Peppercress]  
*Leptochloa digitata* [Umbrella Canegrass]  
Liliaceae [unidentifiable]  
*Lolium rigidum*\* [Annual Ryegrass]  
*Lomandra* sp. [Matrush]  
*Lycium ferocissimum*\* [African Boxthorn]  
*Maireana enchylaenoides* [Wingless Fissure-weed]  
*Maireana microphylla* [Eastern Cottonbush]  
Malvaceae [unidentifiable]  
*Medicago minima*\* [Small Woolly Burr Medic]  
*Medicago polymorpha*\* [Burr Medic]  
*Medicago sativa*\* [Lucerne]  
*Nicotiana* sp. [Native Tobacco]  
*Opuntia stricta*\* [Prickly Pear]  
*Oxalis* sp. [Wood Sorrel]  
*Parsonsia eucalyptophylla* [Gargaloo]  
*Paspalidium constrictum* [Box Grass]  
*Petrorhagia* sp.\* [Pink]  
*Plantago* sp. [Sago Weed]  
*Polycarpon tetraphyllum*\* [Four-leaf Allseed]  
*Portulaca oleracea* [Munyeroo]  
*Rostellularia adscendens* [Pink Tongues]  
*Rumex brownii* [Slender Dock]  
*Sclerolaena birchii* [Galvanised Burr]  
*Sclerolaena muricata* [Black Roly-poly]  
*Scutellaria humilis* [Dwarf Skullcap]

*Senna artemisioides* ssp. [Punty Bush]  
*Sida corrugata* [Corrugated Sida]  
*Sida cunninghamii* [Hill Sida]  
*Silybum marianum*\* [Variegated Thistle]  
*Sisymbrium* sp.\* [Mustard Weed]  
*Solanum esuriale* [Quena]  
*Solanum ferocissimum* [Spiny Potato-bush]  
*Sonchus oleraceus*\* [Sowthistle]  
*Sporobolus caroli* [Fairy Grass]  
*Stackhousia viminea* [Slender Stackhousia]  
*Themeda avenacea* [Tall Oat Grass]  
*Trifolium arvense*\* [Hare'sfoot Clover]  
*Trifolium campestre*\* [Hop Clover]  
*Trifolium glomeratum*\* [Cluster Clover]  
*Vittadinia* sp. [Fuzzweed]  
*Wahlenbergia communis* [Tufted Bluebell]  
*Xanthium spinosum*\* [Bathurst Burr]