

## Appendix 7

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# FLORA MONITORING REPORT

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## **ROCGLLEN COAL MINE –**

**2010**

**Prepared for    Whitehaven Coal Mining Pty Ltd  
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# ROCGLEN COAL MINE, GUNNEDAH

## INITIAL MONITORING REPORT – APRIL, 2010

### 1 BACKGROUND

Whitehaven Coal Mining Pty Ltd [WCM] recognizes the need for ongoing monitoring of undisturbed vegetation communities as well as areas being rehabilitated at the Rocglen Coal Mine site..

As a consequence, WCM has adopted the following monitoring process for each of the control and rehabilitated site monitoring quadrats that will be established at Sunnyside.

- Monitoring will be undertaken by a qualified ecologist experienced in the flora of the Gunnedah area.
- The ecologist will establish a minimum of one permanent photopoint and an associated 100m x 100m quadrat in each vegetation community to be disturbed over the life of the mine.
- Photographs will be taken in set directions from one or more set corners of the permanent quadrat at the commencement of monitoring and thereafter at annual intervals for five years and then at two year intervals until the mine monitoring program ceases.
- Each permanent quadrat will be monitored at the commencement of the monitoring program and thereafter at annual intervals for the next five years and then every two years until the mine monitoring program ceases.
- Measurements to be undertaken include include:
  - foliage cover along two 100m step point transects;
  - an assessment of the species composition of the ground flora in the quadrat using the modified Braun-Blanquet scale;
  - tree and shrub counts in the quadrat to quantify deaths or regeneration..

WCM will consult with the monitoring ecologist within four weeks of each Monitoring programme to establish the need for, and any recommendations for replantings, further plantings, maintenance works etc. required to ensure the success of the native vegetation establishment program. The recommended works will be undertaken in the timeframe recommended by the ecologist

Nine separate vegetation communities have been identified within the wider Sunnyside Coal Mine Study Area [GCNRC, 2007].

## 2 EXTENT OF REQUIRED MONITORING

### 2.1 The Vegetation Communities Present at Rocglen

NOTE \* denotes an introduced species

The flora study for the proposed Rocglen [then known as Belmont] Coal Mine [GCNRC, 2007] identified six vegetation communities within the area associated with the mine site proper. Additional communities were identified along two possible haul road routes but these are not relevant to this Monitoring Report.

The relevant vegetation communities associated with the mine proper, **with the original community numbers as they appeared in the flora study**, are:

- **Community 1** - Narrow-leaf Ironbark - Pilliga Grey Box Community
- **Community 2** - Pilliga Grey Box - White Cypress Pine Community
- **Community 3** - Pilliga Grey Box - White Box - Yellow Box - White Cypress Pine Community
- **Community 6** - Brigalow Community
- **Community 7** - Regenerating White Cypress Pine
- **Community 8** - Cleared Lands - Used for Grazing and / or Cultivation

Descriptions of these communities are presented in the following sections.

#### 2.1.1 - Community 1 - Narrow-leaf Ironbark - Pilliga Grey Box Community

The main tree species within this community are *Eucalyptus crebra* [Narrow-leaf Ironbark] and *Eucalyptus pilligaensis* [Pilliga Grey Box] and *Callitris glaucophylla* [White Cypress Pine] spaced from 1 to 10 metres apart. Other tree species occurring in this community include *Alectryon oleifolius* [Rosewood], *Geijera parviflora* [Wilga], *Callitris endlicheri* [Black Cypress Pine] and *Pittosporum phillyraeoides* [Butterbush].

Parts of this area have been used as gravel pits and are regenerating.

Shrubs are spaced from <1 to 2 metres apart or may be scattered. Species include *Myoporum montanum* [Western Boobialla], *Acacia decora* [Western Golden Wattle], *Dodonaea viscosa* subsp. *spatulata* [Broad-leaf Hopbush], *Beyeria viscosa* [Sticky Wallaby-bush], *Pimelea microcephala* [Shrubby Riceflower], *Cassinia laevis* [Cough Bush] and *Acacia dealbata* [Silver Wattle].

The main ground cover species include *Aristida jerichoensis* var. *subspinulifera* [No. 9 Wiregrass], *Cymbopogon refractus* [Barbed-wire Grass], *Dichondra repens* [Kidney Weed], *Austrostipa scabra* [Rough Speargrass], *Digitaria brownii* [Cotton Panic], *Solanum ferocissimum* [Spiny Potato-bush], *Vitadina muelleri* [Fuzzweed] and *Opuntia* sp. [Prickly Pear].

### 2.1.2 – Community 2 - Pilliga Grey Box - White Cypress Pine Community

Trees are spaced from <2 to 15 metres apart. The main tree species are *Eucalyptus pilligaensis* [Pilliga Grey Box] and *Callitris glaucophylla* [White Cypress Pine]. Other tree species include *Eucalyptus crebra* [Narrow-leaf Ironbark], *Eucalyptus albens* [White Box], *Alectryon oleifolius* [Rosewood], *Geijera parviflora* [Wilga], *Capparis mitchellii* [Wild Orange], *Allocasuarina luehmannii* [Bull Oak] and occasional *Casuarina cristata* [Belah], *Eucalyptus populnea* subsp. *bimbil* [Bimble Box] [including seedlings] and *Eucalyptus melliodora* [Yellow Box].

Shrubs are spaced from <1 to 15 metres apart or may be widely scattered. The main species is *Maireana microphylla* [Eastern Cottonbush], *Parsonia eucalyptophylla* [Gargaloo], *Eremophila mitchellii* [Budda], *Acacia oswaldii* [Miljee], *Myoporum montanum* [Western Boobialla] and *Notelaea microcarpa* var. *microcarpa* [Native Olive].

Occasional dead plants of *Lycium ferocissimum*\* [African Boxthorn] were noted in roadside locations.

The main ground cover species are *Aristida ramosa* [Purple Wiregrass], *Aristida jerichoensis* var. *subspinulifera* [No. 9 Wiregrass], *Austrostipa verticillata* [Slender Bamboo Grass], *Einadia nutans* [Climbing Saltbush], *Enteropogon acicularis* [Curly Windmill Grass], *Sclerolaena birchii* [Galvanised Burr], *Sida rhombifolia*\* [Paddy's Lucerne] and *Austrostipa scabra* [Rough Speargrass]

### 2.1.3 – Community 3 - Pilliga Grey Box - White Box - Yellow Box - White Cypress Pine Community

This community is largely restricted to roadside remnants and occurrences along the main drainage line through the centre of the study area.

Trees are spaced from 2 to 30 metres apart. The main tree species are *Eucalyptus pilligaensis* [Pilliga Grey Box], *Eucalyptus albens* [White Box], *Callitris glaucophylla* [White Cypress Pine], *Eucalyptus melliodora* [Yellow Box] and *Allocasuarina luehmannii* [Bull Oak].

Other tree species include *Eucalyptus crebra* [Narrow-leaf Ironbark], *Geijera parviflora* [Wilga], *Alectryon oleifolius* [Rosewood], *Pittosporum angustifolium* [Butterbush] and *Eucalyptus melanophloia* [Silver-leaf Ironbark]. *Eucalyptus dealbata* [Tumbledown Gum] occurs within this community in some midslope areas.

Shrub cover varies from relatively dense [<1 to 10 metre spacings] to scattered. The main species is *Maireana microphylla* [Eastern Cottonbush] with some *Acacia oswaldii* [Miljee], *Acacia dealbata* [Silver Wattle] and *Dodonaea viscosa* subsp. *spatulata* [Broad-leaf Hopbush].

Ground cover species include *Aristida ramosa* [Purple Wiregrass], *Aristida jerichoensis* var. *subspinulifera* [No. 9 Wiregrass], *Austrostipa scabra* [Rough

Speargrass], *Austrostipa verticillata* [Slender Bamboo Grass], *Carthamus lanatus*\* [Saffron Thistle], *Chloris truncata* [Windmill Grass], *Digitaria brownii* [Cotton Panic], *Einadia nutans* [Climbing Saltbush], *Enteropogon acicularis* [Curly Windmill Grass], *Eragrostis molybdea* [Granite Lovegrass], *Sclerolaena birchii* [Galvanised Burr] and *Vittadinia* sp. [Fuzzweed].

#### **2.1.4 – Community 6 - Brigalow Community**

The Brigalow community is represented by a single isolated remnant of about 55 stems of *Acacia harpophylla* [Brigalow]. Some trees may be multi-stemmed so the number of individual trees present is undoubtedly somewhat less

The remnant is located in the centre of a cultivation paddock that regularly produces crops.

*Maireana microphylla* [Eastern Cottonbush] shrubs are spaced from <1 to 3m apart and some *Lycium ferocissimum*\* [African Boxthorn] plants are present.

The community was heavily grazed and the only recognisable ground cover species was *Austrostipa verticillata* [Slender Bamboo Grass].

#### **2.1.5 – Community 7 - Regenerating White Cypress Pine Community**

Trees are spaced from <1 to 20 metres apart. *Callitris glaucophylla* [White Cypress Pine] is really the only tree species of note within these areas. The height of the saplings varies considerably from less than 1 metre to 7- 8 metres or so.

Few shrubs occur within this community. Those recorded were *Indigofera australis* [Hill Indigo], and *Pimelea microcephala* [Shrubby Riceflower].

The main ground cover species include *Aristida ramosa* [Purple Wiregrass], *Aristida jerichoensis* var. *subspinulifera* [No. 9 Wiregrass], *Austrostipa scabra* [Rough Speargrass], *Bothriochloa macra* [Red Grass], *Carthamus lanatus*\* [Saffron Thistle], *Chamaesyce drummondii* [Caustic Weed], *Cheilanthes sieberi* [Rock Fern], *Enneapogon gracilis* [Slender Bottlewashers], *Eragrostis* sp. [Lovegrass], *Glycine* sp. [Glycine], *Opuntia* sp. [Prickly Pear], *Petrorhagia nanteuillii*\* [Proliferous Pink], *Rostellularia adscendens* [Pink Tongues], *Sida corrugata* [Corrugated Sida], *Desmodium brachypodium* [Large Tick-trefoil], *Sida cunninghamii* [Ridge Sida], *Solanum esuriale* [Quena], *Sclerolaena birchii* [Galvanised Burr], *Vittadinia* sp. [Fuzzweed] and *Wahlenbergia* sp [Bluebell].

#### **2.1.6 – Community 8 - Cleared Lands - Used for Grazing and / or Cultivation**

This community is basically treeless although some shade trees remain in most paddocks.

Species present as scattered trees within the paddocks or around boundaries include *Eucalyptus pilligaensis* [Pilliga Grey Box], *Brachychiton populneus* [Kurrajong], *Geijera parviflora* [Wilga], *Callitris glaucophylla* [White Cypress Pine], *Allocasuarina luehmannii* [Bull Oak], *Eucalyptus melliodora* [Yellow Box],

*Alectryon oleifolius* [Rosewood] and occasional *Eucalyptus crebra* [Narrow-leaf Ironbark].

*Maireana microphylla* [Eastern Cottonbush] is basically the only shrub present and its spacing varies from 5 to 30 metre through a scattered distribution to complete absence on recently cultivated land.

The main ground cover species are *Aristida ramosa* [Purple Wiregrass] *Aristida jerichoensis* var. *subspinulifera* [No. 9 Wiregrass], *Austrostipa scabra* [Rough Speargrass], *Bothriochloa macra* [Red Grass], *Carthamus lanatus*\* [Saffron Thistle], *Sclerolaena birchii* [Galvanised Burr], *Austrostipa verticillata* [Slender Bamboo Grass], *Centaureum tenuiflorum*\* [Centaury], *Chloris truncata* [Windmill Grass] and *Chondrilla juncea*\* [Skeleton Weed].

A complete listing of the species recorded in this community is contained in **Table 2**.

**Note:** In **Table 1**, data for field survey quadrats 31-38 [inclusive] have been omitted from the Table as they were located along an alternative transport route that is now not relevant to the proposal. The remaining quadrats retain their original numbers.

## **2.2 Vegetation Communities to be Monitored**

The Monitoring program outlined in **Section 1** requires permanent photopoints and quadrats to be established and other forms of regular monitoring to be undertaken within vegetation communities that will be affected by the mine.

Of the six communities described in the flora study that was prepared prior to the mine establishment [GCNRC, 2007] only two vegetation communities will be affected. These are Communities 2 and 8. The remaining communities will not be affected. Consequently, Community 2 is the only native vegetation community that requires permanent monitoring facilities to be established at this time.

In addition to the monitoring quadrat in Community 2, a single quadrat was established within Community 8 to monitor ground cover and other vegetation changes in this open cleared area. Additional quadrats will be established on the mined area once rehabilitation is complete.

## **3 OVERVIEW OF MONITORING**

### **3.1 Initial Monitoring Plots [2010]**

Monitoring at Rocglen Coal Mine commenced on 20<sup>th</sup> April, 2010

Details of these monitoring [permanent quadrat] sites are contained in **Table 1**.

**Table 1****Permanent Quadrat Locations**

<b>SITE NO.</b>	<b>POINT DESCRIPTION</b>	<b>EASTING</b>	<b>NORTHING</b>	<b>COMMUNITY / LAND DESCRIPTION</b>
I	north-west corner peg	238377E	6594961N	Community 2
2	north-west corner peg	238300E	6595324N	Community 8

**4 MONITORING OUTCOMES****4.1 PERMANENT QUADRATS****4.1.1 Tree and Shrub Counts**

Tree and shrub counts on each quadrat were carried out when the permanent quadrats were established on 18<sup>th</sup> April, 2010. The data are contained in **Tables 2 and 3** along with any relevant comments about tree and shrub health.

**Table 2****Tree and Shrub Count for Permanent Quadrat 1**

<b>SPECIES</b>	<b>MATURE TREES / SHRUBS</b>	<b>SAPLINGS</b>	<b>SEEDLINGS</b>	<b>TOTAL / COMMENT</b>
<i>Eremophila mitchellii</i> [Budda]	<b>100</b>	<b>0</b>	<b>7</b>	<b>107</b>
<i>Geijera parviflora</i> [Wilga]	<b>6</b>	<b>53</b>	<b>0</b>	<b>59</b>
<i>Hakea leucoptera</i> [Needlewood]	<b>1</b>	<b>0</b>	<b>21 [suckers]</b>	<b>22</b>
<i>Senna artemisioides</i> subsp. <i>filifolia</i> [Punty Bush]	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>
<i>Eucalyptus pilligaensis</i> [Pilliga Grey Box]	<b>3</b>	<b>0</b>	<b>7</b>	<b>10</b>
<i>Pittosporum angustifoliaum</i> [Butterbush]	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<i>Maireana microphylla</i> [Eastern Cottonbush]	<b>72</b>	<b>0</b>	<b>0</b>	<b>72</b>
<i>Acacia oswaldii</i> [Miljee]	<b>2</b>	<b>0</b>	<b>1</b>	<b>3</b>
<i>Casuarina luehmanniana</i> [Bull Oak]	<b>2</b>	<b>0</b>	<b>3</b>	<b>5</b>
<i>Alectryon oleifolius</i> [Rosewood]	<b>2</b>	<b>0</b>	<b>3</b>	<b>5</b>

**Table 2 [cont]**

**Tree and Shrub Count for Permanent Quadrat 1**

<b>SPECIES</b>	<b>MATURE TREES / SHRUBS</b>	<b>SAPLINGS</b>	<b>SEEDLINGS</b>	<b>TOTAL / COMMENT</b>
<i>Notelaea microcarpa</i> subsp. <i>microcarpa</i> [Native Olive]	<b>1</b>	<b>0</b>	<b>1</b>	<b>2</b>
<i>Capparis lasiantha</i> [Nepine]	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>
<i>Lycium ferocissimum</i> * [African Boxthorn]	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<i>Pimelea microcephala</i> [Shrubby Rice-flower]	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

**Table 2**

**Tree and Shrub Count for Permanent Quadrat 2**

<b>SPECIES</b>	<b>MATURE TREES / SHRUBS</b>	<b>SAPLINGS</b>	<b>SEEDLINGS</b>	<b>TOTAL / COMMENT</b>
<i>Eremophila mitchellii</i> [Budda]	<b>11</b>	<b>0</b>	<b>0</b>	<b>11</b>
<i>Eucalyptus pilligaensis</i> [Pilliga Grey Box]	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
<i>Lycium ferocissimum</i> * [African Boxthorn]	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<i>Maireana microphylla</i> [Eastern Cottonbush]	<b>7</b>	<b>0</b>	<b>0</b>	<b>7</b>

**4.1.2 Step-point Transect [Vegetative Cover] Data**

Two 100-point step-point transects were undertaken on each permanent Quadrat to obtain a measure of plant cover and the species composition of the ground cover. The observations recorded for each Quadrat are shown in **Tables 3 and 4**.

It should be noted that in these Tables the **perennial** component of the vegetation cover includes only definitely perennial species while the **annual** cover class includes both annual and biennial species.

4.1.2.1.      **Quadrat 1**

**Table 3**

**Step-point Data for the groundcover on Permanent Quadrat 1**

SPECIES	% COVER TRANSECT 1	% COVER TRANSECT 2	MEAN % COVER
<i>Aristida ramosa</i> [Purple Wiregrass]	2.0%	0%	1.0%
<i>Austrodanthonia</i> sp. [Wallaby Grass]	18.0%	3.0%	10.5%
<i>Austrostipa scabra</i> [Rough Speargrass]	4.0%	4.0%	4.0%
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	0%	1.0%	0.5%
<i>Bothriochloa macra</i> [Red Grass]	3.0%	1.0%	2.0%
<i>Chloris truncata</i> [Windmill Grass]	0%	1.0%	0.5%
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	51.0%	61.0%	56.0%
<i>Eragrostis alveiformis</i> [Granite Lovegrass]	2.0%	5.0%	3.5%
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	1.0%	1.0%	1.0%
<i>Paspalidium constrictum</i> [Box Grass]	2.0%	6.0%	4.0%
Perennial Grass	2.0%	1.0%	1.5%
<i>Portulaca oleracea</i> [Munyeroo]	0%	1.0%	0.5%
<i>Sclerolaena birchii</i> [Galvanised Burr]	2.0%	2.0%	2.0%
<i>Sclerolaena muricata</i> [Black Roly-poly]	1.0%	0%	0.5%
<i>Sporobolus caroli</i> [Fairy Grass]	4.0%	0%	2.0%
<i>Vittadinia</i> sp. [Fuzzweed]	1.0%	0%	0.5%
<i>Wahlenbergia communis</i> [Tufted Bluebell]	0%	1.0%	0.5%
<b>BARE</b>	<b>1.0%</b>	<b>8.0%</b>	<b>4.5%</b>
<b>LITTER</b>	<b>6.0%</b>	<b>4.0%</b>	<b>5.0%</b>
<b>TOTAL COVER</b>	<b>99.0%</b>	<b>92.0%</b>	<b>95.5%</b>
<b>TOTAL LIVING VEGETATION</b>	<b>93.0%</b>	<b>88.0%</b>	<b>90.5%</b>
<b>TOTAL ANNUAL COVER</b>	<b>0%</b>	<b>1.0%</b>	<b>0.5%</b>
<b>TOTAL PERENNIAL VEGETATION COVER</b>	<b>93.0%</b>	<b>87.0%</b>	<b>90.0%</b>

**Additional Species Observed Within the Quadrat but not Recorded in Step Points**

*Alternanthera pungens*\* [Khaki Weed]  
*Carthamus lanatus*\* [Saffron Thistle]  
*Chamaesyce drummondii* [Caustic Weed]  
*Convolvulus erubescens* [Australian Bindweed]  
*Dichanthium sericeum* [Queensland Bluegrass]  
*Evolvulus alsinoides* [Blue Bindweed]  
*Oxalis* sp.\* [Wood Sorrel]  
*Sida cunninghamii* [Hill Sida]

#### 4.1.2.2 Quadrat 2

**Table 4**

Step-point Data for the groundcover on **Permanent Quadrat 2**

SPECIES	% COVER TRANSECT 1	% COVER TRANSECT 2	MEAN % COVER
<i>Alternanthera</i> sp. [Joyweed]	0%	4.0%	2.0%
<i>Aristida ramosa</i> [Purple Wiregrass]	1.0%	1.0%	1.0%
<i>Austrodanthonia</i> sp. [Wallaby Grass]	0%	1.0%	0.5%
<i>Austrostipa scabra</i> . [Speargrass]	0%	6.0%	3.0%
<i>Bothriochloa macra</i> [Red Grass]	19.0%	3.0%	11.0%
<i>Chloris truncata</i> [Windmill Grass]	7.0%	8.0%	7.5%
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	4.0%	0%	2.0%
<i>Cynodon dactylon</i> * [Couch Grass]	1.0%	8.0%	4.5%
<i>Dactyloctenium radulans</i> [Button Grass]	3.0%	4.0%	3.5%
<i>Dichanthium sericium</i> [Queensland Bluegrass]	1.0%	0%	0.5%
<i>Dichondra repens</i> [Kidney Weed]	1.0%	0%	0.5%
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	1.0%	17.0%	9.0%
<i>Eragrostis alveiformis</i> [Granite Lovegrass]	13.0%	6.0%	9.5%
<i>Eragrostis cilianensis</i> * [Stinking Lovegrass]	5.0%	0%	2.5%
<i>Eragrostis microcarpa</i> [Dainty Lovegrass]	14.0%	13.0%	13.5%
<i>Eriochloa pseudoacrotricha</i> [Cupgrass]	12.0%	2.0%	7.0%
<i>Oxalis</i> sp. [Wood Sorrel]	1.0%	0%	0.5%
<i>Paspalidium constrictum</i> . [Box Grass]	4.0%	1.0%	2.5%
<i>Sclerolaena birchii</i> [Galvanised Burr]	3.0%	7.0%	5.0%
<i>Sida</i> sp. [Sida]	1.0%	0%	0.5%
<i>Sida rhombifolia</i> * [Paddy's Lucerne]	5.0%	7.0%	6.0%
<i>Sporobolus caroli</i> [Fairy Grass]	1.0%	4.0%	2.5%
<i>Sporobolus elongatus</i> [Western Rat'stail Grass]	0%	1.0%	0.5%
<i>Tragus australianus</i> [Small-burr Grass]	1.0%	0%	0.5%
<i>Urochloa</i> sp.	1.0%	1.0%	1.0%
<b>LITTER</b>	<b>1.0%</b>	<b>4.0%</b>	<b>2.5%</b>
<b>BARE</b>	<b>0%</b>	<b>2.0%</b>	<b>1.0%</b>
<b>TOTAL COVER</b>	<b>100.0%</b>	<b>98.0%</b>	<b>99.0%</b>
<b>TOTAL LIVING COVER</b>	<b>99.0%</b>	<b>94.0%</b>	<b>96.5%</b>
<b>PERENNIAL LIVING COVER</b>	<b>89.0.0%</b>	<b>89.0%</b>	<b>89.0%</b>
<b>ANNUAL LIVING COVER</b>	<b>10.0%</b>	<b>5.0%</b>	<b>7.5%</b>

#### **Additional Species Observed Within the Quadrat but not Recorded in Step Points**

*Austrostipa verticillata* [Slender Bamboo Grass]

*Chloris ventricosa* [Tall Chloris]

*Portulaca oleracea* [Munyeroo]

*Sclerolaena muricata* [Black Roly-poly]

*Sida sp.*

### 4.1.3 Species Abundance Data

The Rocglen Monitoring procedure adopted by WCM requires that the species recorded on each of the permanent quadrats will be given a modified Braun-Blanquet [Poore, 1995] cover abundance scale rating at each monitoring event. This scale is summarised in **Table 5**.

The species recorded on the different quadrats in the step-pointing transects are not the only species present. There are other species that were present in low numbers [i.e. < 0.5% cover] that were recorded as being present on the different quadrats.

These species were recorded during the step-point transects as plants not actually 'hit' but nevertheless present.

**Tables 6** and **7** provide this data based on the Step-point transects and these additional observations on each of the Permanent Quadrats.

**Table 5**

Modified Braun-Blanquet Cover Abundance Scale [Poore, 1955]

<b>Aerial Vegetative Cover</b>	<b>Cover Class</b>
95 -100°/a	6
75 - 95°/a	5
50 - 75%	4
25 - 50%	3
5 - 25%	2
1-5%	1
< 1%	+
Rare	r

**Table 6**Species Lists and modified Braun-Blanquet Scores for **Permanent Quadrat 1**

<b>SPECIES</b>	<b>modified BRAUN-BLANQUET SCORE</b>
<i>Alternanthera pungens</i> * [Khaki Weed]	r
<i>Aristida ramosa</i> [Purple Wiregrass]	1
<i>Austrodanthonia</i> sp. [Wallaby Grass]	2
<i>Austrostipa scabra</i> [Rough Speargrass]	1
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	+
<i>Bothriochloa macra</i> [Red Grass]	1
<i>Carthamus lanatus</i> * [Saffron Thistle]	r
<i>Chamaesyce drummondii</i> [Caustic Weed]	r
<i>Chloris truncata</i> [Windmill Grass]	+
<i>Convolvulus erubescens</i> [Australian Bindweed]	r
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	r
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	4
<i>Eragrostis alveiformis</i> [Granite Lovegrass]	1
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	1
<i>Evolvulus alsinoides</i> [Blue Bindweed]	r
<i>Oxalis</i> sp.* [Wood Sorrel]	r
<i>Paspalidium constrictum</i> [Box Grass]	1
Perennial Grass	1
<i>Portulaca oleracea</i> [Munyeroo]	+
<i>Sclerolaena birchii</i> [Galvanised Burr]	1
<i>Sclerolaena muricata</i> [Black Roly-poly]	+
<i>Sida cunninghamii</i> [Hill Sida]	r
<i>Sporobolus caroli</i> [Fairy Grass]	1
<i>Vittadinia</i> sp. [Fuzzweed]	+
<i>Wahlenbergia communis</i> [Tufted Bluebell]	+

**Table 7**Species Lists and modified Braun-Blanquet Scores for **Permanent Quadrat 2**

<b>SPECIES</b>	<b>modified BRAUN-BLANQUET SCORE</b>
<i>Alternanthera</i> sp. [Joyweed]	1
<i>Aristida ramosa</i> [Purple Wiregrass]	1
<i>Austrodanthonia</i> sp. [Wallaby Grass]	+
<i>Austrostipa scabra</i> . [Speargrass]	1
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	r
<i>Bothriochloa macra</i> [Red Grass]	2
<i>Chloris truncata</i> [Windmill Grass]	2
<i>Chloris ventricosa</i> [Tall Chloris]	r
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	1
<i>Cynodon dactylon</i> * [Couch Grass]	1
<i>Dactyloctenium radulans</i> [Button Grass]	1
<i>Dichanthium sericium</i> [Queensland Bluegrass]	+
<i>Dichondra repens</i> [Kidney Weed]	+
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	2
<i>Eragrostis alveiformis</i> [Granite Lovegrass]	2
<i>Eragrostis cilianensis</i> * [Stinking Lovegrass]	1
<i>Eragrostis microcarpa</i> [Dainty Lovegrass]	2
<i>Eriochloa pseudoacrotricha</i> [Cupgrass]	2
<i>Oxalis</i> sp. [Wood Sorrel]	+
<i>Paspalidium constrictum</i> . [Box Grass]	1
<i>Portulaca oleracea</i> [Munyeroo]	r
<i>Sclerolaena birchii</i> [Galvanised Burr]	2
<i>Sclerolaena muricata</i> [Black Roly-poly]	r
<i>Sida rhombifolia</i> * [Paddy's Lucerne]	2
<i>Sida</i> sp.	r
<i>Sida</i> sp. [Sida]	+
<i>Sporobolus caroli</i> [Fairy Grass]	1
<i>Sporobolus elongatus</i> [Western Rat'stail Grass]	+
<i>Tragus australianus</i> [Small-burr Grass]	+
<i>Urochloa</i> sp.	1

## 4.2 PHOTOPOINTS

Photopoints were established at each of the two permanent monitoring plots in April, 2010. The aim is to visually record changes in the overall ground cover and numbers of trees and shrubs during the life of the monitoring program.

Views from the two photopoints are contained in **Appendix 1**.

## 5 COMMENTS ON MONITORING

### 5.1 Rainfall Since January 2009

**Table 8** shows the rainfall records for Whitehaven since April, 2009 [monitoring commenced April, 2010]

**Table 8 – Rocglen Rainfall**

MONTH	2009	2010
January	*	53.4mm
February	*	51.4mm
March	*	15.6mm
April	29.6mm	23.6mm
May	23.8mm	*
June	30.2mm	*
July	0.2mm	*
August	1.6mm	*
September	36.8mm	*
October	2.4mm	*
November	17.8mm	*
December	107.6mm	*

### 5.2 Development of Vegetation Cover

#### 5.2.1 Changes on Monitoring Quadrat 1

**Table 9** shows the initial levels of vegetation cover within Quadrat 1 at the time of establishment in April 2010.

Any changes in vegetative cover that occur within the quadrat in the coming year will be reported in the 2011 Monitoring Report.

**Table 9**

Note – ND indicates no data

Cover Classification	Percentage Cover at Observation		Change [in absolute terms]
	April, 2010		
Total Living Vegetation Cover	90.5%	ND	ND
Total Annual Cover	0.5%	ND	ND
Total Perennial Cover	90.0%	ND	ND
Litter Cover	5.0%	ND	ND
Bare Surface	4.5%	ND	ND

#### 5.2.2 Changes on Monitoring Quadrat 2

**Table 10** shows the initial levels of vegetation cover within Quadrat 2 at the time of establishment in April 2010.

Any changes in vegetative cover that occur within the quadrat in the coming year will be reported in the 2011 Monitoring Report.

**Table 10**

Cover Classification	Percentage Cover at Observation		Change [in absolute terms]
	April, 2010		
Total Living Vegetation Cover	96.5%	ND	ND
Total Annual Cover	7.5%	ND	ND
Total Perennial Cover	89.0%	ND	ND
Litter Cover	2.5%	ND	ND
Bare Surface	1.0%	ND	ND

### 5.3 Noxious Weed Control

Two noxious weeds were recorded during the monitoring. These are *Lycium ferocissimum*\* [African Boxthorn] and *Scleolaena birchii* [Galvanised Burr].

These weeds require control and regular monitoring to ensure that they are eradicated from the monitoring quadrats.

## 6 ACTIONS REQUIRED

The monitoring quadrats should both be fenced to exclude grazing domestic livestock so that adequate monitoring records can be obtained.

Signs should be erected on both quadrats indicating that they are 'NO GO' zones and all mine employees and contractors should be made aware of the presence and purpose of the quadrats.

Control of noxious weeds, and other weed species that may appear, should be undertaken.

## 7 REFERENCES

GCNRC [2007] – Flora Assessment. Belmont Coal Project near 'Belmont' Property via Gunnedah.. Specialist Consultant Studies Compendium. Part.2. In Environmental Assessment prepared by RW Corkery and Co Pty Limited, Orange for Whitehaven Coal Mining Pty Ltd, Gunnedah

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## APPENDIX 1 –Photographs from Photopoints



**Roclen Monitoring Quadrat 1** – April 2010 – Photo from southeast corner looking southwest



**Sunnyside Monitoring Quadrat 2** – April 2010 – Photo from southeast corner looking northwest