Orebody 31
Level 2 Flora and Vegetation Survey

Prepared for BHP Billiton Iron Ore Pty Ltd
February 2014

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EXECUTIVE SUMMARY

In June 2013 BHP Billiton Iron Ore Pty Ltd (BHP Billiton Iron Ore) commissioned Onshore Environmental Consultants Pty Ltd (Onshore Environmental) to undertake a second season Level 2 flora and vegetation survey of the Orebody (OB) 31 project area, herein referred to as the 'study area'. The study area is located approximately 6 km north of the Jimblebar / Wheelarra Hill mining operations in the eastern Ophthalmia Range, approximately 40 km east of Newman in the Eastern Pilbara region of Western Australia (Figure 1).

A first season flora and vegetation survey of the study area had previously been completed by Syrinx Environmental (2011) in late February / early March 2011. There were no significant flora or vegetation values identified during the first season survey.

The second season survey was completed by Onshore Environmental between the 1st and 14th October 2013. This report details results from the second season survey.

A total number of 273 plant taxa (including varieties and subspecies) from 34 families and 109 genera were recorded from the study area. Species representation was greatest among the Fabaceae, Poaceae, Malvaceae, Chenopodiaceae, Asteraceae, Amaranthaceae, Scrophulariaceae Myrtaceae and Goodeniaceae families, which is typical for the Pilbara Bioregion. The most speciose genus was *Acacia* (36 taxa), followed by *Senna* (11 taxa), *Sida* (11 taxa), *Eremophila* (10 taxa), *Ptilotus* (8 taxa), *Eragrostis* (8 taxa), *Maireana* (8 taxa), *Triodia* (7 taxa), *Hibiscus* (7 taxa), *Eriachne* (6 taxa), *Abutilon* (6 taxa), *Sclerolaena* (6 taxa), *Goodenia* (5 taxa) and *Aristida* (5 taxa).

There were no plant taxa gazetted as Threatened Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* (WC Act), or listed under the *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act) recorded from the study area. There was one Priority 3 flora species recorded from two point locations at the north-western fringe of the study area; *Rhagodia* sp. Hamersley (M. Trudgen 17794). Plants occurred as scattered tall shrubs on flood plains in association with *Acacia ancistrocarpa* and *Acacia aptaneura* High Shrubland over *Triodia basedowii* Hummock Grassland.

A second plant taxon was identified as a species of interest, *Acacia* sp. nov (reticulate/anastomosing). Expert *Acacia* taxonomist Mr Bruce Maslin was unable to match field samples from the study area with any collections housed at the Western Australia Herbarium (WAH), nor was there any match identified from the wattle key. It will be important to collect additional flowering and fruiting specimens over the coming season to assist with species identification confirmation or description of the new taxon. It was recorded as scattered mid shrubs from three points in the north-west corner of the study area, occurring on rocky low hill crests amongst low undulating hills that had been burnt within the past three years. Associated vegetation was described as Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835) with Open Shrubland of *Grevillea berryana* and *Acacia* sp. nov (reticulate/anastomosing) over Low Open Shrubland of *Senna stricta, Ptilotus rotundifolius* and *Ptilotus calostachyus.*

There were two introduced (weed) species recorded as scattered individuals from lower lying landforms in the study area, including footslopes, plains and drainage lines; **Cenchrus ciliaris* (Buffel Grass) and **Malvastrum americanum* (Spiked Malvastrum). Neither of these taxa is listed as a Declared Pest under the *Biosecurity and Agriculture Management Act (2007)* (BAM Act).

A total of 35 vegetation associations were described and mapped within the study area. Vegetation condition ranged from excellent to good, with the largest proportion of the study area rated as very good. The vegetation associations were classified into the following 15 Broad Floristic Formations on the basis of dominant vegetation stratum:

1) *Acacia* Low Open Forest
2) *Acacia* Low Woodland
3) *Acacia* Closed Scrub
4) *Acacia* Open Scrub
5) *Acacia* High Shrubland
6) *Acacia* High Open Shrubland
7) *Acacia* Shrubland
8) *Eremophila* Low Shrubland
9) *Sclerolaena* Low Shrubland
10) *Triodia* Hummock Grassland
11) *Triodia* Open Hummock Grassland
12) *Themeda* Closed Tussock Grassland
13) *Themeda* Tussock Grassland
14) *Eragrostis* Tussock Grassland
15) **Cenchrus* Tussock Grassland

None of the vegetation associations within the study area had any affiliation with Federal or State listed Threatened Ecological Communities (TECs), or State listed Priority Ecological Communities (PECs).

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1.0 INTRODUCTION

1.1 Preamble

Onshore Environmental was commissioned by BHP Billiton Iron Ore to undertake a second season Level 2 flora and vegetation survey of OB31 and surrounds, the study area. The results will be used to inform future environmental approvals completed as part of investigations into potential new sustaining mines to replace OB18 and OB25 before their predicted depletion at the end of the 2018.

The study area is situated on the eastern end of Ophthalmia Range in the Eastern Pilbara region of Western Australia, approximately 40 km east of Newman and 6 km north of the Jimblebar Iron Ore Mine (Figure 1). The study area occurs on the same lease as the Jimblebar mining operations (AML7000244) and covers approximately 33.35 km^2 (3,335.85 ha).

The second season survey completed by Onshore Environmental in October 2013 follows a first season survey of the same study area by Syrinx Environmental (2011) in late February / early March 2011.

1.2 Previous Surveys

There has been one single season flora and vegetation survey previously completed within the study area (Syrinx Environmental 2011), and at least 30 other surveys completed on BHP Billiton Iron Ore tenements within a 25 km radius of the study area. These additional surveys have been completed between 1993 and 2013 and are listed below and described in more detail in Section 3.1.1:

- OB 19 Level 2 Flora and Vegetation Survey (Onshore 2013);
- South West Jimblebar Flora and Vegetation Survey (Syrinx 2012);
- Wheelarra Hill North Flora and Vegetation Survey (Syrinx 2012);
- Eastern Mines Weed Survey (Astron 2012);
- Level 1 flora and fauna surveys along the Great Northern Highway for Jimblebar mine module transport (Eco Logical 2012);
- OB 31 Flora and Vegetation Assessment (Syrinx 2011);
- RPG6 Jimblebar Hub (Water Pipeline) Flora and Vegetation Assessment (ENV 2010);
- Jimblebar Wye Targeted Declared Rare Flora and Priority Listed Flora Assessment (ENV 2010);
- Jimblebar Ammonium Nitrate Storage Facility Flora and Vegetation Assessment (ENV 2009);
- Construction Water Supply Pipeline and Ammonium Nitrate Storage Facility Flora and Vegetation Assessment (ENV 2009);
- Jimblebar Hub Flora and Vegetation (Outback Ecology 2009);
- Eastern Pilbara Accommodation Camp Flora and Fauna Assessment (Outback Ecology 2009);
- Jimblebar Wheelarra Hill Flora and Fauna Assessment (Outback Ecology 2009);
- Wheelarra Hill Iron Ore Mine Modification Flora and Fauna Assessment (Outback Ecology 2009);
- Rapid Growth Project 5: Repeater 9 Access Road Flora and Vegetation Assessment (ENV 2008);

- Draft Report for Wheelarra Hill (Jimblebar Mine Site) Priority Species Verification – Goodenia hartiana Species Verification (GHD 2008);
- Jimblebar Access Road Flora and Vegetation Assessment (ENV 2008);
- Jimblebar Hashimoto Flora and Vegetation Survey (Ecologia 2007);
- Jimblebar RPG4 Rail Loop Flora and Vegetation Assessment 1 (ENV 2007);
- Jimblebar Stage 2, Levee Banks and Communications Tower Redevelopment Flora and Vegetation Assessments (ENV 2007);
- Jimblebar West Flora and Vegetation Assessment (ENV 2007);
- Jimblebar Marra Mamba Exploration Biological Survey (Ecologia 2006);
- Jimblebar East Exploration Project Biological Survey (Ecologia 2005);
- Jimblebar Wheelarra Hill 3 Flora and Fauna Assessment (Biota 2004);
- Jimblebar Wheelarra Hill Expansion Biological Survey (Ecologia 2004);
- Jimblebar Flora and Soil Survey (Ecologia 1999);
- Jimblebar Rail Spur Biological Assessment Survey (1996);
- OB18 Biological Assessment Survey (Ecologia 1995);
- Jimblebar Mine Site Biological Survey (BHP BIO 1994); and
- Ecological Observations Jimblebar Railway Line (Dames and Moore 1993).

180000 190000 200000 210000 220000 230000

7430000

7420000

7410000

KALGAN

KALGAN CREEK

MARBLE BAR ROAD

BHP OREBODY 23

JIMBLEBAR CREEK

BHP JIMBLEBAR

JIMBLEBAR

SHOVELANNA CREEK

CARAMULLA CREEK

LOCATION MAP

ONSHORE ENVIRONMENTAL

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Kilometers

1:150,000

Datum: GDA94

Projection: MGA Zone 51

BHPBIO

OB31
REGIONAL LOCATION

Legend

- Study Area
- Places
- Operating Mines
- Watercourses
- Roads
- Railways

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1.3 Climate

The Pilbara region has an arid to tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September. The majority of annual rainfall is received during the hot summer months. Summer and autumn rainfall is typically associated with cyclonic activity and thunderstorms, with falls being of higher intensity and shorter duration contributing to an erratic annual range (ANRA 2013).

Annual average rainfall for the Pilbara ranges from 180 mm to over 400 mm (Beard 1975) with the long-term average for nearby Newman Weather Station of 311.5 mm occurring over an annual average of 29.5 rain days. Most of the annual precipitation occurs between the four months from December to March. The average maximum summer temperatures typically range between 38 ºC and 40 ºC, while winter maximum temperatures range from 28 ºC to 30.5 ºC (BOM 2013).

The annual rainfall for Newman during 2012 was significantly higher than the long-term average despite no rain being recorded during the months of May, July and August. The January 2012 total of 238.4 mm was almost five fold higher than the long-term monthly average of 51.4 mm (Figure 2, BOM 2013).

Monthly rainfall totals at Newman for the seven months from January to July 2013 was 83.8 mm, 39.0 mm, 24.8 mm, 10.6 mm, 69.0 mm and 9.6 mm respectively. Falls for the months of January and June were above the long-term average, with the remaining months below the long-term average. There was negligible rainfall received during the three months prior to the October 2013 survey by Onshore Environmental (Figure 2, BOM 2013).

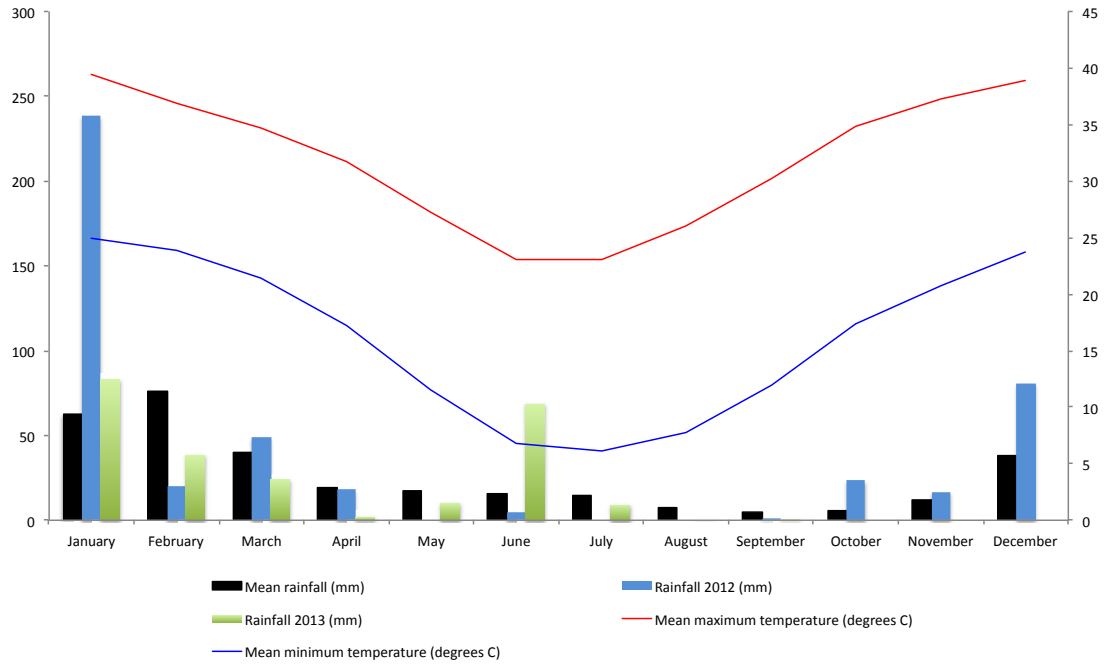


Figure 2 Rainfall and climatic data recorded at Newman Airport between January 2012 and October 2013 (Bureau of Meteorology 2013).

1.4 Biogeographic Regions

The latest version of the Interim Biogeographic Regionalisation for Australia (IBRA7) divides Australia into 89 bioregions based on climate, geology, landform, native vegetation and species information (Department of Sustainability, Environment, Water, Population and Communities DSEWPaC 2013) and includes 419 sub-regions. The bioregions and sub-regions are the reporting unit for assessing the status of native ecosystems and their level of protection in the National Reserve System.

The study area is located in the Pilbara bioregion. The Pilbara bioregion consists of four sub-regions: Chichester, Fortescue, Hamersley and Roebourne. The study area is located on the southern edge of the Fortescue sub-region (PIL2), adjacent to the boundary of the Hamersley sub-region (PIL3). Therefore the site is located in the transition zone between these two sub-regions in terms of vegetation assemblages and flora diversity.

The Fortescue sub-region is described as consisting of alluvial plains and river frontage with extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east (Kendrick 2001a). River gum woodlands fringe the drainage lines and it contains the northern limit of Mulga. It also contains a broad calcrete aquifer (originating within a paleo-drainage valley) that feeds many permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of River Gum *(Eucalyptus camaldulensis)* and Cadjeput *(Melaleuca argentea)* woodlands (Kendrick 2001a). The study area is located within the Fortescue River catchment area and is located adjacent to Jimblebar Creek and Caramulla Creek, and also includes two smaller major drainage lines and flood plains that are characteristic of the Fortescue sub-region.

The Hamersley sub-region is described as a mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges (basalt, shale and dolerite) (Kendrick 2001b). It contains Mulga low woodland over bunch grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils of the ranges. The study area encompasses mountainous and valley communities more in line with the Hamersley sub-region.

1.5 Existing Land Use

Land tenure in the Pilbara region consists of Aboriginal and leasehold reserves, national parks and reserves and Crown land which falls under a range of pastoral and mining leases. The dominant landuses in the Pilbara are mining, pastoralism in the form of cattle grazing, conservation, unallocated crown land, crown reserves and urban areas (Kendrick 2001a, 2001b).

1.6 Landforms

The study area is located on the eastern end of the Ophthalmia Range, which together with the Hamersley Range encompass the Hamersley Plateau. The Hamersley Plateau is characterised by long strike ridges rising 300 m or more above valley floors and flats. Other characteristic landforms of the general area include stony plains and some alluvial plains and sandplains (Tille 2007). The entire region contains mainly rounded ranges and hills in contrast to the characteristic ‘mesa

form' hills that are located further to the north-east. The study area contained these dissected rounded ranges through the middle of the area, draining out into sloping plains to the north and south. Two un-named major drainage channels occurred in the north-west and south-east corners of the study area.

1.7 Soils

The Australian Soil Resource Information System (CSIRO 2006) described two soil types as occurring within the study area:

- Fa13 – Ranges of banded jaspilite and chert along with shales, dolomites and irone ore formations; some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments. This unit is largely associated with the Hamersley and Ophthalmia Ranges. The soils are frequently stony and shallow and there are extensive areas without soil cover. The main soil types are shallow stony earthy loams; and
- Mz25 – Plains associated with the Fortescue Valley; there is a surface cover of stony gravels close to the ranges and hills; the main soil types are acid red earths with some neutral red earths; red-brown hardpan is absent. There are some associated areas of calcareous earths and loams on calcrete and some hard red soils around creek lines.

Tille (2007) classified the most recent and detailed mapping of Western Australia's Rangelands and Arid Interior into a hierarchy of soil-landscape mapping units. The study area is located near the boundary of the following two soil units:

- 285 – Hamersley Plateaux Zone, located in the Fortescue Province is described as having stony soils with red shallow loams and some red/brown non-cracking clays and red loamy earths; and
- 290 – Bulloo Plains and Hills Zone, located in the Ashburton Province is described as having red shallow loams (often with hardpans), red loamy earths, stony soils and red deep sands with some red shallow sands.

1.8 Geology

The geology of the wider Pilbara region is ancient and has been evolving over the past 3,500 million years (Trendall as cited in Johnson 2004). There are three main geological phases that comprise the development of the Pilbara region as it is today. These include the Precambrian basement rocks, the Phanerozoic sedimentary rocks and the Cainozoic deposits (Johnson 2004).

The Precambrian basement rocks were formed through sedimentation, intrusion and volcanism before being metamorphosed by movements in the Earths crust. These rocks cover most of the Pilbara but have been dissected by more recent intrusions. After a course of sea level changes, deposition of the large Phanerozoic sedimentary basins that cover the western and eastern areas of the Pilbara occurred. Following this, the erosion of the basement rocks and transportation of this sediment via drainages has lead to the deposition of Cainozoic superficial units that now cover most of the basement rocks and sedimentary basins (Johnson 2004).

The surface geology of the study area contains the geological formations outlined below (Williams and Tyler, 1991):

- Brockman Iron Formation (Hb), which consists of iron band formation, chert and shale deposits that forms prominent strike ridges and is mainly located in the southern portion of the site, which consists of a series of low hills;

- Weeli Wolli Formation (Hj), which is mainly present in the central part of the Study area conformably overlies the Brockman Iron Formation and is made up of inter-bedded banded ironstone formation (often jaspilitic), chert and shale;
- Boolgeeda Iron Formation (Ho) that occupies the northern extent of the Study area and is characterized by low hills consisting of fine grained, finely laminated dark grey brown to black flaggy iron formation, minor chert jaspilite shale, it is the uppermost unit of the Hamersley Group. Trendall and Blockley (1970) as cited in Williams and Tyler (1991) suggested that the unit could be divided into an upper and lower iron-formation with the layers separated by a poorly exposed shaly unit. This unit is approximately 200 m thick, but the top of the formation is not exposed;
- Woongarra Volcanic (Hw) is located adjacent to, and north of the Weeli Wolli Formation in the central part of the Study area. This 260 m thick formation typically consists of rhyolite and rhyodacite as sills or flows and is commonly porphyritic and contains phenocrysts of quartz, feldspar and minor tuff and jaspilitic iron formation;
- Alluvium (Qa) is located in the low-lying areas of the site, mainly in the northern and southern sections of the Study area. This formation is characterized by deposits of silt, sand and gravel which are typical of floodplains and drainage channels in the region; and
- Colluvium (CzC) is located in the small section to the northeast and southeast corner of the Study area in the low-lying scree slopes. This formation is typically characterized by partly consolidated and consolidated ferrugenised silt, sand and gravel; valley-fill deposits dissected by present drainage.

1.9 Hydrology

The study area is located within the Fortescue River Catchment and the hydrology of the area is dominated by ephemeral creeks and drainage lines that flow into major drainage lines to the north and east of the study area, namely Jimblebar Creek and Caramulla Creek. Both of these creeklines flow into the Fortescue River. All rivers in the Pilbara region are seasonal and require heavy rains to flow (Johnson 2004). Due to the hot dry climate and high evaporation rates groundwater is the most available source of water (Johnson 2004). The ground water table generally follows the surface topography, is recharged via infiltration from rainfall, and stored in large groundwater reserves in the valley fill alluvium of the Fortescue River and Hamersley Range (Johnson 2004).

The natural hydrology of the study area and surrounds is influenced by the location downstream of the artificial Ophthalmia Dam, located approximately 20 km to the south-west. Ng *et al.* (1991), as cited in Payne and Mitchell (1999), showed that the Ophthalmia Dam has an impact in terms of noticeably reducing flow volumes, peak flows, flooded width and frequency of flooding on the downstream floodplain.

1.10 Flora and Vegetation

The study area is located within the Fortescue Botanical District and close to the border of the Hamersley Botanical District (both within the Pilbara IBRA region) which is part of the Eremaean Province (Beard 1990). It is dominated by tree and shrub – steppe communities consisting mainly of *Eucalyptus* and *Acacia* species;

Triodia pungens and *Triodia wiseana* and some Mulga (*Acacia aneura*) occur within valley areas and short grass plains occur on alluvia.

The original vegetation mapping was undertaken by Beard (1975) and refined by Shepherd *et al.* (2002). There was two vegetation associations described from the study area (Figure 3). While the Pre-European extent for each vegetation association is 100 %, less than 10 % of each association occurs within formal or informal reserves (Table 1).

Table 1 Pre-European extent of vegetation associations occurring within the Study area (Shepherd *et al.* 2002).

Vegetation Sub-Association	Description	Pre-Euro. Extent Remaining	% remaining IUCN Class I-IV Reserves	% remaining Other Reserves	% remaining DPaW Managed PL
Fortescue - Vallley 82	Hummock grasslands, low tree steppe; Snappy gum over *Triodia wiseana*	2,290,910 ha (100 %)	8.9 ha	0.2 ha	1.0 ha
Fortescue - Valley 216	Low woodland; mulga (with spinifex) on rises	298,549 ha (100 %)	0.0 ha	0.0 ha	0.0 ha

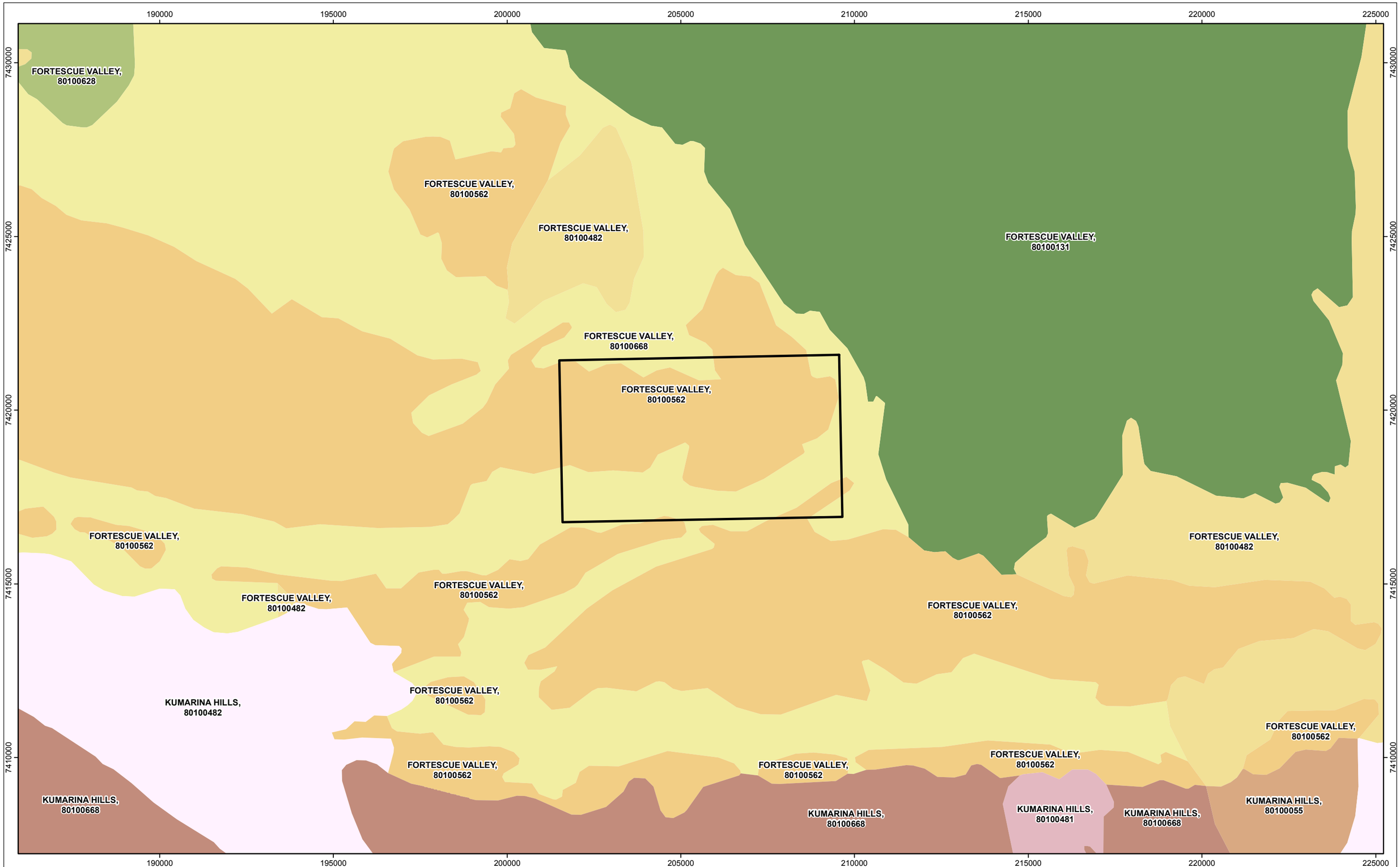
1.11 Land Systems

The Department of Agriculture (now the Department of Agriculture and Food) has conducted inventory and condition surveys of the Pilbara (van Vreesyk *et al.* 2004) using an integrated survey method involving the land system approach to rangeland description evaluation. The primary objective of the surveys was to provide comprehensive descriptions and mapping of the biophysical resources of the region, as well as an evaluation on the condition of soils and vegetation. The mapping is based on patterns in topography, soils and vegetation.

A total of 102 land systems were defined in the Pilbara at a scale of 1: 250,000 (van Vreesyk et al. 2004). There were three land systems represented within the study area; Boolgeeda, Newman and Washplain Land Systems (Table 2, Figure 4). The Boolgeeda Land System comprises low hills and rises in the northern and eastern sectors of the study area. The Newman Land System comprises the plateaux, ridges and hills that cover the major portions of the central and southern sectors of the study area. The Washplain Land System comprises the stony plains, alluvial hardpan plains and sandplains that cover only a small portion in the south-west of the study area.

Table 2 Land Systems occurring within the study area (descriptions from van Vreeswyk *et al.* 2004).

Land System	Land System	Representation in the Pilbara	Description
RGEBGD	Boolgeeda	7,748 km^2 or 4.3 %	Stony plains with hard Spinifex grasslands or Mulga shrublands. The geology is quaternary colluvium.
RGENEW	Newman	14,580 km^2 or 8.0 %	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.
RGEWSP	Washplain	917 km^2 or 0.5 %	Hardpan plains supporting groved mulga shrublands.



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Kilometers

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Datum: GDA94

Projection: MGA Zone 51

BHPBIO

OB 31

Pre-European Vegetation (Beard 1975) Mapping

Legend

Study Area

Pre-European Vegetation (Beard 1975)

SYSTEM, VEGETATION ASSOCIATION

- FORTESCUE VALLEY, 111
- FORTESCUE VALLEY, 157
- FORTESCUE VALLEY, 216
- FORTESCUE VALLEY, 29
- FORTESCUE VALLEY, 82
- KUMARINA HILLS, 18
- KUMARINA HILLS, 216
- KUMARINA HILLS, 28
- KUMARINA HILLS, 29

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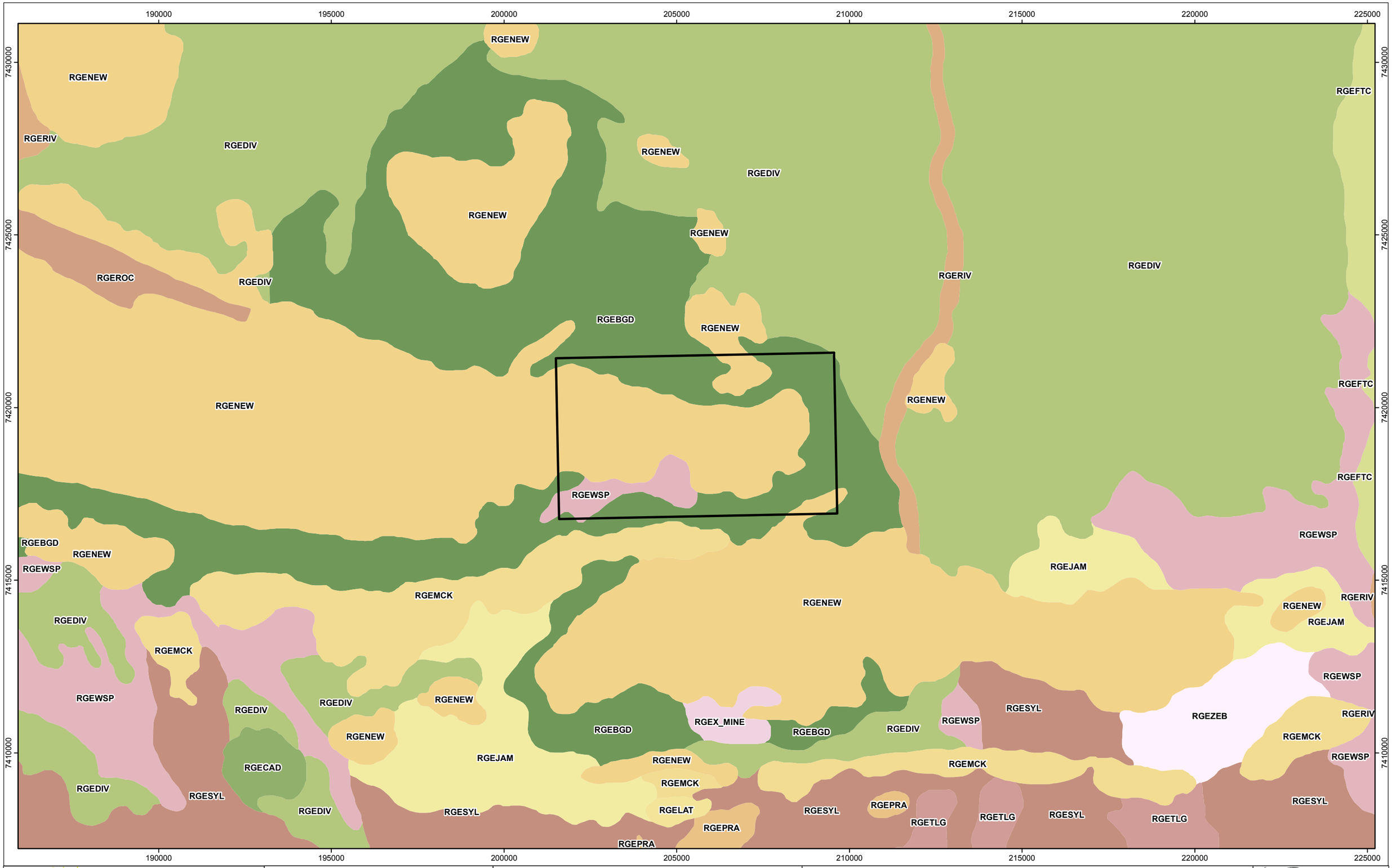

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Datum: GDA94
Projection: MGA Zone 51

BHPBIO

OB 31
Land Systems

Legend

Study Area

Land Systems

Mapping Unit, Land Systems

- RGEBGD, Boolgeeda Land System
- RGECAD, Cadgie Land System
- RGEDIV, Divide Land System
- RGEFTC, Fortescue Land System
- RGEJAM, Jamindie Land System
- RGELAT, Laterite Land System
- RGEMCK, McKay Land System
- RGENEW, Newman Land System
- RGEPRA, Prairie Land System
- RGERIV, River Land System
- RGEROC, Rocklea Land System
- RGESYL, Sylvania Land System
- RGETLG, Talga Land System
- RGEWSP, Washplain Land System
- RGEX_MINE, Mine
- RGEZEB, Zebra Land System

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2 METHODOLOGY

2.1 Legislation and Guidance Statement

The flora and vegetation survey was carried out in a manner that was compliant with Environmental Protection Authority (EPA) requirements for the environmental surveying and reporting of flora and vegetation in Western Australia:

- Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas. Position Statement No. 2 (EPA 2000);
- Terrestrial Biological Surveys as an Element of Environmental Protection. Position Statement No. 3 (EPA 2002); and
- EPA Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia No. 51 (EPA 2004).

The survey was also conducted in accordance with BHP Billiton Iron Ore's Guidance for Flora and Vegetation Surveys in the Pilbara (BHP Billiton Iron Ore 2010).

2.2 Desktop Searches

Desktop searches of three databases were completed for information relating to rare flora (DPaW 2013a), TECs and PECs (DPaW 2013b) previously collected or described within, or in close proximity to, the study area. For this report a database search covering the entire study area was completed. The search was extended beyond the immediate survey limits to place flora values into a local and regional context. The search co-ordinate used was a 50 km radius around the central point of the study area; 193000mE 7417000mN (Zone 51 GDA94). The State database search investigated three DPaW databases:

1. The DPaW Threatened Flora Database (DPaW 2013a);
2. The DPaW Threatened and Priority Flora List (DPaW 2013b); and
3. The Western Australian Herbarium Specimen Database for priority species opportunistically collected in the area of interest.

A search of the EPBC Act Protected Matters database was undertaken (DSEWPaC 2013), as well as a search of the International Union for Conservation of Nature (IUCN) database (IUCN 2013). A comprehensive literature review of surveys previously completed within or in close proximity to the study area was also undertaken.

2.3 Field Survey Methodology

2.3.1 Timing and Personnel

The second season Level 2 flora and vegetation survey was completed by Principal Botanist Dr Jerome Bull, Senior Botanist Ms Ellen Palmer, and Field Botanist Mr Daniel Roberts working over a 14 day pereiod between the 1st and 14th October 2013.

2.3.2 Sampling of Study Sites

The field survey involved systematic sampling using quadrats (referred to as study sites). Relevé vegetation descriptions were made to increase the accuracy of vegetation mapping and targeted searches were completed in areas supporting significant plant taxa, or within habitats where it was anticipated significant flora may occur.

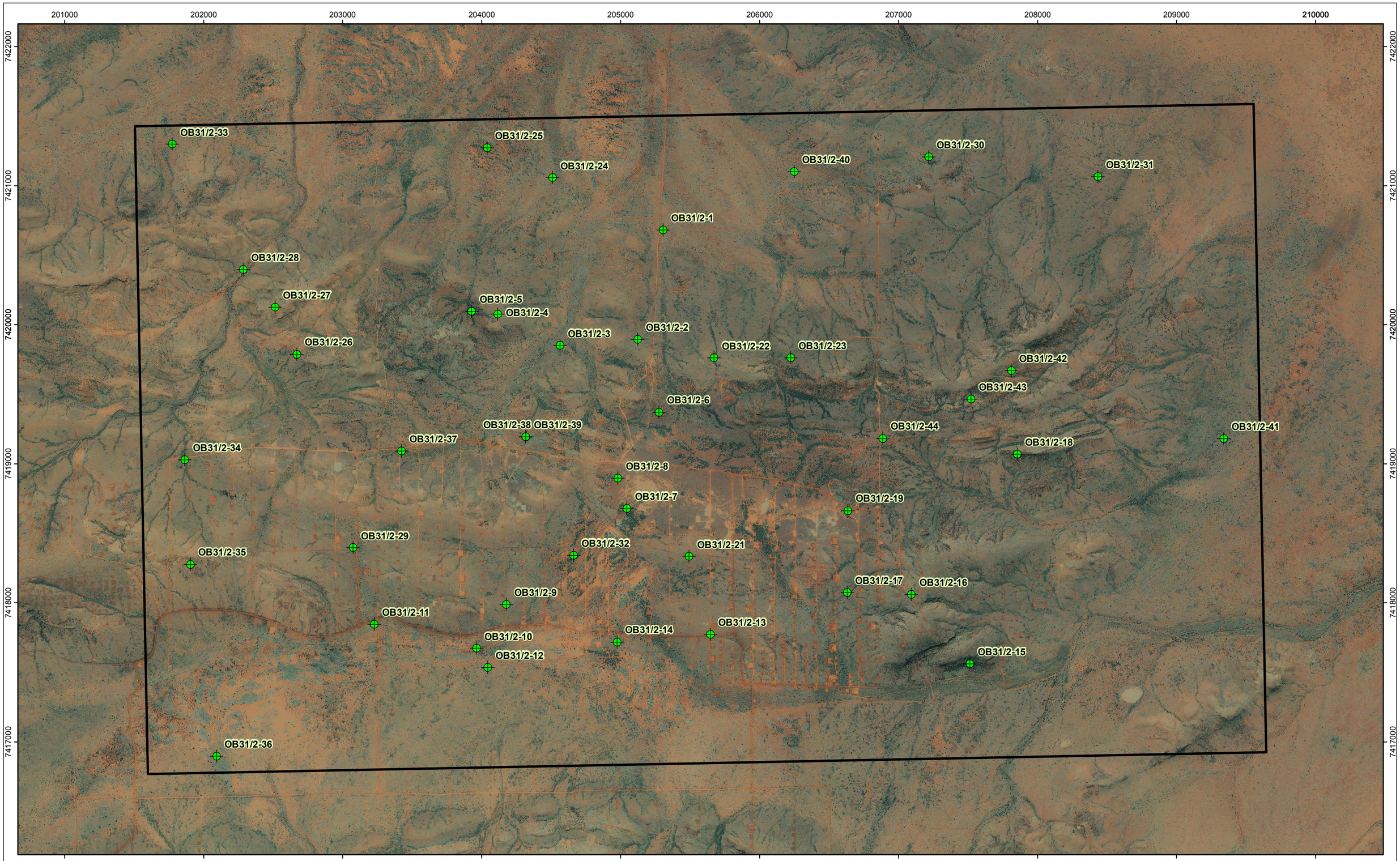
Quadrats were generally 50 m by 50 m. However along narrow associations such as minor drainage lines an equivalent area (2,500 m^2) was surveyed. The area sampled for each quadrat is standard for the Pilbara bioregion. The number of study sites sampled was determined by the size and heterogeneity of the study area, with a minimum density of one quadrat per square kilometre. For the study area a total of 45 quadrats were formally assessed, including re-survey of 27 study sites previously assessed by Syrinx Environmental in 2011. An additional 146 relevé sites were assessed. The locations of all quadrats sampled are provided in Figure 5.

The sampling sites were assessed to provide a list of the total flora occurring within the study area and a description of the vegetation structure. Data collected covered a range of environmental parameters including:

- Landform and habitat;
- Aspect;
- Soil colour and soil type;
- Rock type;
- Slope (angle);
- Percentage of bare ground, logs, twigs and leaves;
- Vegetation condition;
- Disturbance (caused by fire, clearing, grazing etc.);
- Age since fire;
- Broad floristic formation;
- Vegetation association description; and
- Height and percentage ground cover provided by individual plant taxa.

Other parameters recorded for each study site were:

- Study site number and date of assessment;
- Names of the botanists undertaking the assessment;
- Location description a waypoint – GPS coordinate (GDA94) using a handheld GPS; and
- Photograph number.



ONSHORE ENVIRONMENTAL

Figure:	5	Date:	17 Dec. 2013
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Datum: GDA94
Projection: MGA Zone 51

BHPBIO

OB31
SAMPLE LOCATION

FIGURE 5

Legend

- Study Area
- Sample Location

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2.3.3 Targeted Surveys for Conservation Significant Species

The entire study area was ground-truthed at 1 km intervals during field assessment and vegetation mapping. This ground coverage provided the opportunity to record opportunistic locations for Threatened and Priority listed flora, and also undertake closer examination of specific landforms where conservation significant flora may be expected to occur.

2.3.4 Weed Survey and Mapping

Introduced weed species were recorded from the 45 formal quadrats assessed within the study area. Opportunistic collections were also made while moving between study sites and targeted weed searches were completed in high moisture habitats, including drainage lines and flood plains.

2.3.5 Vegetation Association Mapping

The vegetation mapping utilised high-resolution aerial photography of the entire study area at a scale of 1:10,000, with definition of vegetation polygons based on contrasting shading patterns. Ground-truthing of the study area was completed during the survey with vegetation descriptions made within selected vegetation polygons to confirm dominant structural layers and associated plant taxa.

The location of 45 quadrats (50 m x 50 m or 2,500 m^2 in equivalent area) and 146 relevé plots was overlaid on the aerial photography, and associated flora and vegetation data was used to provide vegetation association descriptions for individual polygons defined.

Description of vegetation structure follows the height, life form and density classes of Specht (1970) as modified by Alpin (1979) and Trudgen (2009) (see Appendix 1). This is largely a structural classification suitable for broader scale mapping, but taking all ecologically significant strata into account. Vegetation condition for each of the sampling sites was determined using a recognised rating scale (based on Keighery 1994, see Appendix 2).

2.3.6 Vouchering

At least one voucher specimen was taken for each species collected to verify identification. Taxonomy was completed by Dr Jerome Bull and Dr Eleanor Bennett at the Western Australian Herbarium (WAH), with selected voucher specimens provided to the BHP Billiton Iron Ore sponsored botanist, Mr Steve Dillon. Use was made of the WAH for confirmation of species identification. Nomenclature follows Paczkowska and Chapman (2000) and the WAH.

2.3.7 Field Survey Constraints

The EPA Guidance Statement for Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004) list twelve potential constraints that field surveys may encounter. These constraints are addressed in Table 3.

Table 3 Relevance of constraints, as identified by EPA (2004), to the flora and vegetation survey.

Constraint	Relevance
Scope	The scope was established by BHP Billiton Iron Ore in compliance with relevant EPA Guidance Statements.
Proportion of flora collected and identified	It is likely that a large proportion of the flora occurring within the study area has been collected, given the intensity of the 2013 survey effort by Onshore Environmental.
Sources of information	The first season flora and vegetation survey was previously completed within the same study area during February / March 2011 by Syrinx Environmental. There has been additional high intensity sampling from at least 30 neighbouring BHP Billiton Iron Ore tenements (25 km radius around the study area), providing an extensive local database. This is confirmed by the intensity of records for the area on Florabase.
The proportion of the task achieved and further work which might be needed	All allocated tasks were achieved during the survey and no further work is required at this site.
Timing / weather / season / cycle	The second season survey was completed in October 2013 late in the season and under relatively dry seasonal conditions. However, the first season survey was undertaken under optimum seasonal conditions during February / March 2011. The timing and weather conditions across both surveys was optimal.
Disturbances, e.g. fire, flood	Disturbances within the study area include fire (mosaic of burn ages recorded), grazing of lowland vegetation associations by domestic stock (cattle), introduction of weed species (particularly in riparian habitats) and historical access tracks and exploration activities.
Intensity	A total of 45 quadrats were assessed within the study area by Onshore Environmental during 2013.
Completeness	Given that two seasons of Level 2 surveys have now been conducted within the study area (by two consultants), it is considered the area has been adequately surveyed.
Resources	Appropriate resources have been applied to surveying the study area.
Access problems	The entire study area could be accessed by vehicle and on foot, noting that vegetation mapping was facilitated by high-resolution aerial photography.
Availability of contextual information	More than 30 flora and vegetation surveys have been undertaken within a 25 km radius of the study area, providing an extensive local database.
Experience levels	The Principal Botanist working on the survey has over ten years Pilbara experience, and the accompanying Senior Botanist and Field Botanist each have in excess of three years Pilbara experience. Together the group has completed numerous surveys at, and in close proximity to the study area over recent years.

2.3.8 Assessment of Conservation Significance

The conservation significance of flora and ecological communities are classified on a Commonwealth, State and Local level on the basis of various Acts and Agreements (EPA Guidance Statement No. 51, EPA 2004), including:

Commonwealth Level:

- EPBC Act: The Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) lists Threatened Flora and Ecological Communities, which are determined by the Western Australian Threatened Species Scientific Committee according to criteria set out in the Act. The Act lists flora that are considered to be of conservation significance under one of six categories (Appendix 3).

State Level:

- WC Act: At a State level native flora species are protected under the WC Act – Wildlife Conservation (Rare Flora) Notice. A number of plant species are assigned an additional level of conservation significance based on a limited number of known populations and the perceived threats to these locations. Species of the highest conservation significance are gazetted Threatened Flora (T) under subsection 2 of section 23F of the Act. It is an offence to take or damage Threatened flora without Ministerial approval. Section 23F of the Act defines 'to take' as "to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means".
- DPaW Priority list: DPaW produces a list of Priority species and ecological communities (PECs) that have not been assigned statutory protection under the WC Act. Priority Flora are under consideration for declaration as 'Rare Flora', classified as in urgent need of further survey (Priority One to Three), require monitoring every 5-10 years (Priority Four) or require a specific conservation program to prevent the taxon becoming threatened within five years (Priority 5), see Appendix 4. The list of PECs identifies those that need further investigation before nomination for TEC status.

Local Level:

- Species may be considered of local conservation significance because of their patterns of distribution and abundance. Although not formally protected by legislation, such species are acknowledged to be in decline as a result of threatening processes, primarily habitat loss through land clearing.

3.0 RESULTS

3.1 Desktop Review

3.1.1 Previous Flora Surveys

The single season survey completed within the study area, along with 30 previous flora and vegetation surveys completed within a 25 km radius of the study area, were reviewed to determine existing values within the region. Table 4 summarises findings of the literature review, tabulating methodology, main findings including conservation significant flora, current status of significant flora (i.e. change of conservation ranking since survey).

Table 4 Summary of results from previous flora and vegetation surveys within, or in close proximity to, the study area.

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Onshore (2013) Orebody 17/18 Derived Vegetation Association Mapping Report	Small area of OB 17/18 located in the Eastern Pilbara, west of the Jimblebar Mine. It is located directly north-west of the study area.	Desktop survey	Five of the 27 vegetation associations described by ENV (2007)	N/A	No Threatened or Priority Flora
Syrinx (2012) South West Jimblebar Flora and Vegetation Survey	South West Jimblebar is located 40 km east of Newman, and is adjacent to the existing Jimblebar Mine. It is approximately 8 km south-west of the study area.	14-8 March 2011 19 quadrats and four relevés.	17 vegetation associations within ten broad floristic formations	202 plant taxa from 33 families and 93 genera. Most commonly recorded families were Poaceae (42 taxa), Fabaceae (38 taxa) and Malvaceae (14 taxa). The dominant genus was *Acacia* (23 taxa) followed by *Eremophila* (10 taxa) and *Ptilotus* (9 taxa). There were four introduced species recorded; **Bidens bipinnata, *Cenchrus ciliaris, *Cucumis melo, *Portulaca oleracea*	No Threatened Flora. Two Priority flora taxa; *Aristida ?jerichoensis* var subspinulifera (P1), *Goodenia ?nuda* (P4) Five range extensions: *Alloteropsis cimicina, Brachyscome ciliaris* var. *ciliaris, Evolvulus alsinoides* var. *decumbens, Tephrosia sphaerospora* and *Tribulopis angustifolia*

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Syrinx (2012) Wheelarra Hill North Level 2 Flora and Vegetation Assessment	Situated immediately south of the study area	Two season survey. First season from 17-29 May 2011 and second season from 4-12 October 2011 83 quadrats and 19 relevés	25 vegetation associations were recorded within nine broad floristic formations	411 taxa from 49 families and 145 genera. The most commonly recorded families were Fabaceae (78 taxa), Poaceae (58 taxa) and Malvaceae (47 taxa). The dominant genera were *Acacia* (40 taxa), *Ptilotus* (16 taxa) and *Senna* (15 taxa). Four introduced species; **Bidens bipinnata, *Cenchrus ciliaris, *Malvastrum americanum, *Portulaca oleracea*	No Threatened Flora. One Priority 1 flora *Aristida ?jerichoensis* var. *subspinulifera* Nine range extensions: *Sclerolaena minuta, Eragrostis olida, Oldenlandia galioides, Evolvulus alsinoides* var. *decumbens, Phyllanthus erwinii, Phyllanthus maderaspatensis, Santalum spicatum, Cyperus ixiocarpus, Abultilon cunninghamii,* and two possible range extensions; *Tephrosia* aff. *sphaerospora*, *Hibiscus* aff. *apodus*

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Astron (2012) Eastern Mines Weed Survey, Jimblebar	Situated immediately south of the study area	22-30 May 2012 25 project monitoring sites and 6 reference monitoring sites	N/A	13 weed spcies; **Acetosa vesicaria, *Aerva javanica, *Bidens bipinnata, *Cenchrus ciliaris, *Chloris barbata, *Chloris virgata, *Citrullus colocynthis, *Cynodon dactylon, *Malvastrum americanum, *Portulaca oleracea, *Solanum nigrum, *Sochus asper, *Vachellia farnesiana*	N/A
Eco Logical (2012) Level 1 flora and fauna surveys along the Great Northern Highway for Jimblebar mine module transport.	Boodarie Staging Yard in Port Hedland south to Jimblebar Mine along the Great Northern Highway near Newman. Site 1: Located 3.8 km south-east of Newman townsite Site 2: Located 9 km north-west of Newman Site 3: Located 98 km north-west of Newman At any point the Great Northern Highway is at least 15 km west or north-west of the study area	18-19 August 2011 three quadrats	seven vegetation associations	52 flora taxa comprising 14 families; the most commonly occurring families were: Poaceae, (12 taxa), Fabaceae (12 taxa), Amaranthaceae (8 taxa) and Myrtaceae (5 taxa). One introduced weed species, **Cenchrus ciliaris*	No Threatened or Priority flora

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Syrinx (2011) OB 31 Flora and Vegetation Assessment	The same location as the current study area	10-15 February and 9-13 March 2011 29 quadrats	21 vegetation associations classified into 12 broad floristic formations	206 plant taxa from 36 families and 93 genera, with dominant families being the Fabaceae (10 taxa), Malvaceae (20 taxa) and Chenopodiaceae (12 taxa). Four introduced weed species*; *Bidens bipinnata, *Cenchrus ciliaris, *Malvastrum americanum, *Portulaca oleracea*	No Threatened or Priority flora
ENV (2010) RGP6 Jimblebar Hub (Water Pipeline) Flora and Vegetation Assessment	Situated immediately south of the study area	November 2009 16 quadrats and seven relevés	14 vegetation associations	166 plant taxa comprising 33 families and 81 genera. The most common families were Poaceae (29 taxa), Mimosaceae (25 taxa) and Malvaceae (15 taxa). The common genera were *Acacia* (25 taxa), *Senna* (10 taxa) and *Ptilotus* (8 taxa). Two introduced flora species were recorded; **Cenchrus ciliaris, *Malvastrum americanum*	No Threatened or Priority flora

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
ENV (2010) Jimblebar Wye Targeted Declared Rare Flora and Priority Listed Flora Assessment	Situated approximately 20 km directly west of the study area.	3-5 March 2010 and 8-11 June 2010 Transects in habitats known to support targeted flora	N/A	N/A	No Threatened flora One Priority flora; *Gymnanthera cunninghamii* (P3)
ENV (2009) Ammonium Nitrate Storage Facility Flora and Vegetation Assessment	Situated approximately 15 km to the southeast of the study area	17 September 2009 seven quadrats and one relevé	Eight vegetation associations	123 taxa comprising 34 families and 70 genera. Common families were Poaceae (23 taxa), Mimosaceae (16 taxa), Malvaceae (10 taxa). The most common genera were *Acacia* (16 taxa), *Ptilotus* (7 taxa) and *Senna* (6 taxa). Two introduced flora species; **Cenchrus ciliaris, *Portulaca oleracea*	No Threatened or Priority flora

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
ENV (2009) Construction Water Supply Pipeline and Ammonium Nitrate Storage Facility Flora and Vegetation Assessment	Situated approximately 15 km south-east of the study area	17 September and 4-6 November 2009 23 quadrats and 8 relevés	19 vegetation associations	213 taxa comprising 38 families and 91 genera The most common families were Poaceae (38 taxa), Mimosaceae (32 taxa) and Malvaceae (20 taxa). The most common genera were *Acacia* (32 taxa), *Senna* (11 taxa) and *Ptilotus* (10 taxa). Three introduced flora species were recorded; **Cenchrus ciliaris, *Malvastrum americanum, *Portulaca oleracea*	No Threatened Flora One current Priority flora *Goodenia nuda* (P4)
Outback Ecology (2009) Eastern Pilbara Accommodation Camp Flora and Fauna Assessment	Situated approximately 15 km south-east of the study area.	30 October – 4 November 2008 15 quadrats	16 vegetation associations	115 taxa from 23 families and 44 genera; dominant families were: Mimosaceae (23 taxa), Poaceae (17 taxa), Caesalpinaceae (13 taxa), Myrtaceae (9 taxa), Papilionaceae (7 taxa), Myoporaceae (8 taxa) and Chenopodiaceae (7 taxa); dominant genera were *Acacia* (23 taxa), *Senna* (12 taxa) and *Eremophila* (8 taxa); no weed species	No Threatened or Priority flora

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Outback Ecology (2009) Wheelarra Hill Iron Ore Mine Modification Flora and Fauna Assessment	Situated approximately 8 km south-east of the study area.	This report documents the results of supplementary flora and vegetation surveys conducted in October and November 2008 and January 2009. 22 quadrats	Five broad vegetation associations	146 plant taxa from 29 families and 62 genera; one introduced weed, **Cenchrus ciliaris*	No Threatened Flora One current Priority 4 flora, *Goodenia nuda,* recorded from one location

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
ENV (2008) Rapid Growth Project 5: Repeater 9 Access Road Flora and Vegetation Assessment	Situated approximately 20 km directly west of the study area	12-13 June 2008 six quadrats and one relevé	Six broad vegetation communities were mapped	163 taxa comprising 95 genera; most common families were Poaceae (28 taxa), Mimosaceae (14 taxa), Amaranthaceae (11 taxa) and Malvaceae (11 taxa); the most common genera were *Acacia* (13 taxa), *Eremophila* (9 taxa) and *Senna* (7 taxa); 14 introduced species were recorded: **Acetosa vesicaria, *Aerva javanica, *Brassica tournefortii, *Cenchrus ciliaris, *Citrullus lanatus, *Cucumis melo* subsp. *agrestis, *Cynodon dactylon, *Datura leichhardtii, *Malvastrum americanum, *Portulaca oleracea, *Setaria verticillata, *Sonchus asper, *Sonchus oleraceus* and **Vachellia farnesiana*	No Threatened Flora recorded One current Priority flora species, *Rostellularia adscendens* var. *latifolia* (P3) A second Priority 1 flora recorded *Eremophila* sp. Ophthalmia Range (R. Brearley s.n. 20/3/2004) has since been renamed *Eremophila margarethae* (not Threatened)

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
GHD (2008) Draft Report for Wheelarra Hill (Jimblebar Mine Site) Priority Species Verification – Goodenia hartiana Species Verification	Situated immediately south of the study area	25-26 September 2007 12 quadrats	N/A	N/A	No Threatened or Priority flora
ENV (2008) Jimblebar Access Road Flora and Vegetation Assessment	Situated 15 km south-west of the study area	20-23 May 2007 22 quadrats	Ten distinct vegetation communities were described	112 taxa were recorded from 28 families; three introduced weed species were **Cenchrus ciliaris,* **Aerva javanica* and **Citrullus lanatus*	No Threatened or Priority flora
GHD (2008) Mesa Gap Biological Survey	Situated between OB 18 and Jimblebar Mines, directly south of the study area	October 2007 40 quadrats	Eight vegetation associations from 7 landforms	133 plant taxa from 32 families with dominant families being the Fabaceae (15 species), Poaceae (9 species) and Myrtaceae (6 species); there were no introduced weed species	No Threatened or Priority flora
Pilbara Flora (2008) OB17 Flora and Vegetation Survey	Situated approximately 5 km south-west of the study area	October 2008	Six vegetation associations from four landforms	61 plant taxa from 39 genera and 23 families, with dominant families being the Fabaceae (35 species), Poaceae (20 species) and Myrtaceae (8 species). There were no introduced weed species	No Threatened or Priority flora

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
ENV (2007) West Jimblebar Exploration Lease Flora and Vegetation Assessment – Management Recommendations	Situated approximately 15 km south-east of the study area	14-18 May 2007 29 quadrats	N/A	318 taxa were recorded from 113 genera and 44 families. Most frequently represented families were Poaceae, Mimosaceae and Malvaceae Three introduced weeds were recorded	No Threatened flora One current Priority flora species, *Goodenia nuda* (P4) One range extension was recorded, *Thyridolepis xerophila*
ENV (2007) OB 18 Flora and Vegetation Assessment Phase II	Situated directly south-east of the study area	July and August 2006 71 quadrats and relevés	A total of 27 vegetation associations classified into six broad landforms - Hill crests, Hill slopes, Gorges and Gullies, Drainage lines, Footslopes and Flood plains.	276 plant taxa including 46 families; dominant families were Poaceae (41 taxa), Mimosaceae (30 taxa), Amaranthaceae (19 taxa) and Malvaceae (18 taxa); two weed species were recorded, **Acetosa vesicaria* and **Cenchrus ciliaris*	No Threatened or Priority flora

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Ecologia (2007) Hashimoto Exploration Project Biological Survey: Flora and Vegetation	Situated directly south-east of the study area	August/September 2005 and February 2006 44 quadrats	Described as nine vegetation/landform associations: Range crest vegetation; Rocky range slope vegetation; Acacia aneura (mulga) woodland; Valley plain vegetation; Scattered Corymbia deserticola and Eucalyptus gamophylla and shrubs over Triodia basedowii; Range slope vegetation; Gorge and Gully vegetation; Minor drainage channel vegetation; and Minor creek line vegetation.	372 species, representing 42 families and 129 genera were recorded. Thirty eight (38) collections could not be identified beyond family level. The most commonly recorded genera were Acacia (26 species), Ptilotus (20 species), Eremophila (16 species), and Sida (15 species). Three introduced species were recorded: *Cenchrus ciliaris, *Bidens bipinnata and *Sonchus oleraceus.	No Threatened Flora One current Priority 4 flora, *Goodenia nuda.* A Priority 2 flora taxon *Goodenia hartiana* has since been split into a number of new entities including *Goodenia* sp. Sandy Creek (not Threatened).
ENV (2007) Jimblebar Stage 2, Levee Banks and Communications Tower Redevelopment Flora and Vegetation Assessments	Situated immediately south of the study area	April – June 2007 Four quadrats	Six vegetation associations	103 plant taxa from 24 families; most common families were Poaceae (30 taxa), Mimosaceae (17 taxa) and Papilionaceae (8 taxa)' five weed species were **Cenchrus ciliaris, *Cenchrus setiger, *Citrullus lanatus, *Bidens bipinnata* and **Cynodon dactylon*	No Threatened or Priority flora

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
ENV (2007) RGP4 Jimblebar Rail Loop Flora and Vegetation Assessment	Situated approximately 5 km south of the study area	27 November – 1 December 2006 Four quadrats	Four vegetation associations classified into three landform types; creekline, floodplain and plain.	65 plant taxa (44 genera) with most common families being Poaceae (14 taxa), Mimosaceae (11 taxa) and Malvaceae (5 taxa); two introduced weeds were **Bidens bipinnata* and **Cenchrus ciliaris*	No Threatened or Priority flora
Ecologia (2006) Jimblebar Marra Mamba Exploration Biological Survey	Situated approximately 5 km south of the study area	22-28 May 2006 105 quadrats	Four vegetation types	267 plant taxa with most common families being Poaceae (33 species) and Malvaceae (22 species); two introduced weeds were **Acetosa vesicaria* and **Cenchrus ciliaris*	No Threatened Flora recorded. One current Priority 4 flora *Goodenia nuda.* A second Priority 3 flora recorded, *Triumfetta leptacantha* is no longer Threatened

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Ecologia (2005) Jimblebar East Exploration Project Biological Survey	Situated approximately 15 km south-east of the study area	8-14 Feb 2005 26 sampling sites (50 m x 50 m in size)	Seven vegetation types were recorded relating to specific landforms: (i) undulating fine to coarse gravelly plains; (ii) flat to slightly undulating fine gravelly to sandy plains; (iii) fine gravelly to clayey sand undulating or flat plains; (iv) fine gravelly gentle lower slopes / low rises and undulating plains; (v) flat red clayey sandplains with areas of loose soil; (vi) flat clayey sandplains often with loose soil; (vii) flat red, sandy clay plains, with areas of soil surface crust and loose soil	155 plant taxa with most common families being Poaceae (27 taxa), Caesalpiniaceae (13 taxa) and Mimosaceae (12 taxa); one weed species was **Cenchrus ciliaris.*	No Threatened or Priority flora
Ecologia (2004) OB 18 Flora and Fauna Review	Situated directly south-west of the study area	Targeted searches in July 2004	As above	As above	No Threatened Flora One Priority 2 Flora *Rhodanthe frenchii* identified from one gorge site[1].

[1] It is noted that the original identification was not confirmed through the WAH and represents a 300 km range extension to the east. It has not been recorded locally during numerous surveys over a 17 year period since the original record.

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Ecologia (2004) Jimblebar-Wheelarra Hill Expansion Biological Study	Situated approximately 10 km directly south of the study area	9 Feb – 4 March 2004. A total of 44 quadrats were sampled, each measuring 100 x 100 m.	Nine vegetation associations were recorded.	181 plant species from 47 families and 80 genera; dominant genera were *Acacia* (30 species), *Senna* (10 species) and *Eremophila* (7 species); one weed species, **Cenchrus ciliaris.*	No Threatened or Priority flora *Goodenia hartiana* (P2) recorded but this taxon later split and now confirdetermined to be *Goodenia* sp. Sandy Creek (not Threatened).
Biota (2004) Jimblebar – Wheelarra Hill 3 Flora and Fauna Assessment	Situated approximately 10 km directly south of the study area	August 2003. The survey was conducted to review and update existing botanical information and recording supplementary floristic data.	Six vegetation types described were based on the Ecologia (1999) flora survey of the area. Vegetation was confined to the following landforms: Range Crests, Range Slopes, Rocky Range Slopes, Lower Footslopes, Gorges and Gullies and Numerous minor creek channels.	227 taxa from 42 families and 99 genera; dominant genera were *Acacia* (29 taxa), *Senna* (15 taxa) and *Ptilotus* (9 taxa); one weed species was **Acetosa vesicaria.*	No Threatened or Priority flora One Priority species, *Tephrosia* sp. Pilbara Ranges (P3). This species has been re-named *Tephrosia* sp. Cathedral Gorge (F.H. Molleman 2420) and is no longer Threratened

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Ecologia (1996) Jimblebar Rail Spur Biological Assessment Survey	Situated approximately 5 km directly south of the study area.	6-8 June 1995 Two detailed floristic survey sites were assessed (100 m x 100 m in size) with additional opportunistic vegetation sampling.	The survey area encompassed the breadth of a creekline, but did not extend to surrounding hills. Two vegetation types were recorded: (i) Vegetation type associated with the creek banks (ii) Vegetation type associated with the creek bed	106 taxa from 32 families and 71 genera; common families were Poaceae (13 taxa), Mimosaceae and Chenopdiaceae (9 taxa each) and Caesalpiniaceae and Malvaceae (7 taxa each); common genera were *Acacia* (9 taxa), *Senna* (6 taxa), *Eucalyptus* (5 taxa) and *Ptilotus* (4 taxa); four weed species were **Cenchrus ciliaris,* **Acetosa vesicaria,* **Malvastrum americanum* and **Sonchus oleraceaus.*	No Threatened or Priority flora
BHP IO (1994) Jimblebar Mine Site Biological Survey	Situated approximately 5 km directly south of the study area.	11-22 June 1994 22 plotless sampling areas (covering approx. 100m^2 each)	Five broad vegetation assemblages recognised including Tall Shrubland (Minor Drainage Lines), Sparse Tree Steppe, Shrub Steppe, Open Mixed Shrubland and Mixed Communities (Gorges)	132 species, representing 30 families; dominant families were Mimosaceae (19 taxa), Poaceae (10 taxa), Myrtaceae (9 taxa) and Caesalpiniaceae (8 taxa); dominant genera were *Triodia, Acacia, Senna* and *Eremophila*. One weed species, **Rumex vesicarius* (now **Acetosa vesicaria)*	No Threatened Flora One Priority 3 taxon, *Cryptandra* sp. Mt Meharry (S. van Leeuwen 682). This is now known as *Cryptandra monticola* and no longer considered to be Threatened.

Report	Proximity to Study Area	Survey Timing & Intensity	Vegetation Associations & Landform	Floristics	Significant Flora
Dames & Moore (1993) Ecological Observations Jimblebar Railway Line	Situated approximately 5 km directly south of the study area.	19 - 22 November 1992 39 borrow pits and 2 control areas	The report assessed disturbed borrow pit areas the vegetation data provided is not applicable.	NR	No Threatened or Priority Flora

3.1.2 Threatened Flora listed under the EPBC Act

A search of the EPBC Act Protected Matters database was undertaken (DSEWPaC 2013) within a 50 km buffer of the study area (EPBC Act 1999 Protected Matters Tool 2013). The database search listed two Threatened Flora or their habitat as likely to occur within the study area; *Lepidium catapycnon* (Hamersley Lepidium) and *Pityrodia augustensis* (Mt Augustus Foxglove). No Threatened Ecological Communities (TECs) were recorded in the search.

3.1.3 Threatened Flora listed under the IUCN Red List database

A search of the International Union for Conservation of Nature (IUCN) database was also conducted (IUCN 2013). No Threatened Flora was listed as likely to occur within the study area from this search.

3.1.4 Threatened Flora listed under the WA Wildlife Conservation (Rare Flora) Notice 2013

The DPaW search identified one Threatened Flora as occurring within a 50 km radius of the study area; *Lepidium catapycnon.*

3.1.5 Priority Flora recognised by the DPaW

The DPaW rare flora database search (DPaW 2013a) identified 88 Priority flora taxa as potentially occurring within a 50 km radius of the study area (Table 5).

Table 5 Significant flora previously recorded from a 50 km search radius of the study area (DPaW 2013).

SCC State Conservation Code (WC Act) and DPaW (2013)
FCC Federal Conservation Code (EPBC Act)

Species	SCC	FCC
Acacia bromilowiana	4	
Acacia daweana	3	
Acacia effusa	3	
Acacia subtiliformis	3	
Adiantum capillus-veneris	2	
Amaranthus centralis	3	
Aristida jerichoensis var. *subspinulifera*	1	
Astrebla lappacea	3	
Atriplex flabelliformis	3	
Atriplex lindleyi subsp. *conduplicata*	3	
Barbula ehrenbergii	1	
Bothriochloa decipiens var. *cloncurrensis*	1	
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	1	
Brunonia sp. long hairs (D.E. Symon 2440)	1	
Calotis latiuscula	3	
Calotis squamigera	1	
Cochlospermum macnamarae	1	
Crotalaria smithiana	3	
Dampiera anonyma	3	
Dampiera metallorum	3	
Dicladanthera glabra	2	

Species	SCC	FCC
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	1	
Eremophila appressa	1	
Eremophila forrestii subsp. *Pingandy* (M.E. Trudgen 2662)	2	
Eremophila magnifica subsp. *magnifica*	4	
Eremophila magnifica subsp. *velutina*	3	
Eremophila pilosa	1	
Eremophila rigida	3	
Eremophila sp. Hamersley Range (K. Walker KW 136) PN	1	
Eremophila sp. Rudall River (P.G. Wilson 10512) PN	2	
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	1	
Eremophila sp. West Angelas (S. van Leeuwen 4068)	1	
Eucalyptus lucens	1	
Eucalyptus rowleyi	3	
Euphorbia parvicaruncula	1	
Fimbristylis sieberiana	3	
Geijera salicifolia	3	
Genus sp. Hamersley Range hilltops (S. van Leeuwen 4345)	1	
Glycine falcata	3	
Goodenia hartiana	2	
Goodenia lyrata	3	
Goodenia nuda	4	
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	3	
Grevillea sp. Turee (J. Bull & G. Hopkinson ONS JJ 01.01) PN	1	
Gymnanthera cunninghamii	3	
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	2	
Hibiscus sp. Mt Brockman (E. Thoma ET 1354) PN	1	
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	3	
Indigofera sp. Gilesii (M.E. Trudgen 15869) PN	3	
Iotasperma sessilifolium	3	
Ipomoea racemigera	1	
Isotropis parviflora	2	
Lepidium catapycnon	T	V
Maireana prosthecochaeta	3	
Myriocephalus scalpellus	1	
Nicotiana heterantha	1	
Nicotiana umbratica	3	
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	
Olearia mucronata	3	
Oxalis sp. Pilbara (M.E. Trudgen 12725)	2	
Pentalepis trichodesmoides subsp. *hispida*	2	
Peplidium sp. fortescue marsh (S. van Leeuwen 4865)	1	
Pilbara trudgenii	2	
Polymeria distigma	3	
Ptilotus subspinescens	3	
Rhagodia sp. Hamersley (M. Trudgen 17794)	3	
Rhynchosia bungarensis	4	
Rostellularia adscendens var. *latifolia*	3	
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	2	

Species	SCC	FCC
Sida sp. Barlee Range (S. van Leeuwen 1642)	3	
Sida sp. Hamersley Range (K. Newbey 10692)	1	
Solanum albostellatum	3	
Solanum sp. Gurinbiddy Range (M.E. Trudgen & M. Trudgen MET 12775) PN	3	
Spartothamnella puberula	2	
Stemodia sp. Battle Hill (A.L. Payne 1006)	1	
Swainsona thompsoniana	3	
Tecticornia medusa	3	
Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	1	
Tetratheca fordiana	1	
Teucrium pilbaranum	1	
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	3	
Thryptomene wittweri	T	V
Triodia sp. Karijini (S. van Leeuwen 4111) PN	1	
Triodia sp. Mt Ella (M.E. Trudgen 12739)	3	
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	3	
Triodia triticoides	1	
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	1	
Whiteochloa capillipes	3	

3.1.6 TECs listed under State and Federal legislation

A search of the EPBC Act Protected Matters database (DSEWPaC 2013) confirmed there were no Federal listed TECs previously recorded within, or adjacent to, the study area. Similarly, a search of the State database by DPaW (2013b) confirmed there were no currently listed TEC records for the immediate study area.

3.1.7 PECs recognised by DPaW

A search of the State database (DPaW 2013) confirmed there were no PECs within a 50 km radius of the study area.

3.2 Flora Species

A total number of 274 plant taxa (including varieties and subspecies) from 34 families and 109 genera were recorded from the study area (Table 6, Appendices 5 and 6). Species representation was greatest among the Fabaceae, Poaceae, Malvaceae, Chenopodiaceae, Asteraceae, Amaranthaceae, Scrophulariaceae Myrtaceae and Goodeniaceae families, which is typical for the Pilbara Bioregion. The most speciose genus was *Acacia* (37 taxa), followed by *Senna* (11 taxa), *Sida* (11 taxa), *Eremophila* (10 taxa), *Ptilotus* (8 taxa), *Eragrostis* (8 taxa), *Maireana* (8 taxa), *Triodia* (7 taxa), *Hibiscus* (7 taxa), *Eriachne* (6 taxa), *Abutilon* (6 taxa), *Sclerolaena* (6 taxa), *Goodenia* (5 taxa) and *Aristida* (5 taxa).

Table 6 Statistics for total flora recorded from the study area.

Overview	No. Taxa
Families	34
Genera	109
Taxa (species, subspecies, varieties)	273
Native Taxa	271
Introduced Taxa	2
Threatened Flora	0
Priority Flora	1
Species of Interest	1
Range Extension	1
Speciose Families	**No. Taxa**
FABACEAE	62
POACEAE	50
MALVACEAE	35
CHENOPODIACEAE	24
ASTERACEAE	11
AMARANTHACEAE	11
SCROPHULARIACEAE	10
MYRTACEAE	9
GOODENIACEAE	8
Speciose Genera	**No. Taxa**
Acacia (Fabaceae)	36
Senna (Fabaceae)	11
Sida (Malvaceae)	11
Eremophila (Scrophulariaceae)	10
Ptilotus (Amaranthaceae)	8
Eragrostis (Poaceae)	8
Maireana (Chenopodiaceae)	8
Triodia (Poaceae)	7
Hibiscus (Malvaceae)	7
Eriachne (Poaceae)	6
Abutilon (Malvaceae)	6
Sclerolaena (Chenopodiaceae)	6

3.3 Conservation Significant Flora Species

3.3.1 Threatened Flora listed under the WC Act and EPBC Act

There was no plant taxon gazetted as Threatened Flora (T) pursuant to subsection (2) of Section 23F of the WC Act or listed under the EPBC Act recorded from the study area.

3.3.2 Significant Flora

There was one Priority 3 flora recorded from the study area, *Rhagodia* sp. Hamersley (M. Trudgen 17794), and a second taxon of interest, *Acacia* sp. nov (reticulate/anastomosing). The location for all records of the two significant flora identified within the study area are provided in Appendix 6.

Rhagodia sp. Hamersley (M. Trudgen 17794) is a perennial chenopod species growing to a height of 2 m in orange to red loam soils on flood plains (Plate 1). The current known distribution is restricted to the Pilbara IBRA region with

increasing numbers of populations recorded in recent years between Tom Price and Newman. *Rhagodia* sp. Hamersley (M. Trudgen 17794) has previously been recorded extensively over floodplains adjacent to BHP Billiton Iron Ore's Mining Area C operations, occurring adjacent to the Great Northern Highway and extending eastwards to the Packsaddle Village (Onshore Environmental 2011c), south into the South Flank exploration tenements (Onshore Environmental 2011a) and further east to the Jinidi tenements (Onshore Environmental 2011d). It was recently recorded during a review of vegetation mapping at BHP Billiton Iron Ore's Carramulla tenements, situated approximately 25 km east of the study area (Onshore Environmental 2014). This record is the most south-eastern extent of the known distribution.

Rhagodia sp. Hamersley (M. Trudgen 17794) was recorded from two point locations at the north-western fringe of the study area (Figure 6). Plants occurred as scattered tall shrubs on flood plains in association with *Acacia ancistrocarpa* and *Acacia aptaneura* High Shrubland over *Triodia basedowii* Hummock Grassland.

Plate 1 *Rhagodia* **sp. Hamersley (M. Trudgen 17794).**

A second plant taxon was identified as a species of interest, *Acacia* sp. nov (reticulate/anastomosing). This taxon is an interesting yellow - green leaved *Acacia* occurring to approximately 1.5 m to 2 m in height (Plate 2) and with distinct anastomosing veins in the leaves (Plate 3). *Acacia* specialist at the WAH Mr Bruce Maslin has been unable to identify the taxon on the basis of photographs, and has requested the field specimens for further analysis. The field collections have been submitted to BHP Billiton Iron Ore sponsored botanist Mr Steve Dillon. *Acacia* sp. nov (reticulate/anastomosing) was recorded as scattered mid shrubs from three points in the north-west corner of the study area, occurring on rocky low hill crests amongst low undulating hills that had been burnt within the past three years. Associated vegetation was described as Hummock Grassland of *Triodia* sp.

Shovelanna Hill (S. Van Leeuwen 3835) with Open Shrubland of *Grevillea berryana* and *Acacia* sp. nov (reticulate/anastomosing) over Low Open Shrubland of *Senna stricta, Ptilotus rotundifolius* and *Ptilotus calostachyus.*

Plate 2 Habit of *Acacia* sp. nov (reticulate/anastomosing).

Plate 3 Close-up view of the reticulate/anastomosing venation in the phyllode.

3.3.3 Range Extensions

One plant species recorded from the study area was identified as showing a large range extension, *Acacia clelandii*. *Acacia clelandii* is a spreading shrub reaching 5m in height and occurring in sandy soils on dunes or rocky hills (Plate 4). It has characteristic terete or subterete phyllodes, occasionally flat, straight or slightly curved. It is know from populations situated approximately 150 km east of Wiluna. The collections from OB 31 represent a 400 km range extension north of the known populations.

Acacia clelandii was recorded from two study sites situated in the central sector of the study area, occurring as scattered shrubs between 1.5 m and 3.5 m in height and providing less than one percent ground coverage. Plants occurred on highly weathered ironstone on stony undulating low hills. Vegetation was described as Hummock Grassland of *Triodia angusta* with Shrubland of *Acacia sibirica, Senna stricta* and *Acacia wanyu* over Open Shrubland of *Eremophila exilifolia, Senna stricta* and *Acacia sibirica* with Low Open Woodland of *Acacia aptaneura.*

Plate 4 Habit of *Acacia clelandii* within the study area.

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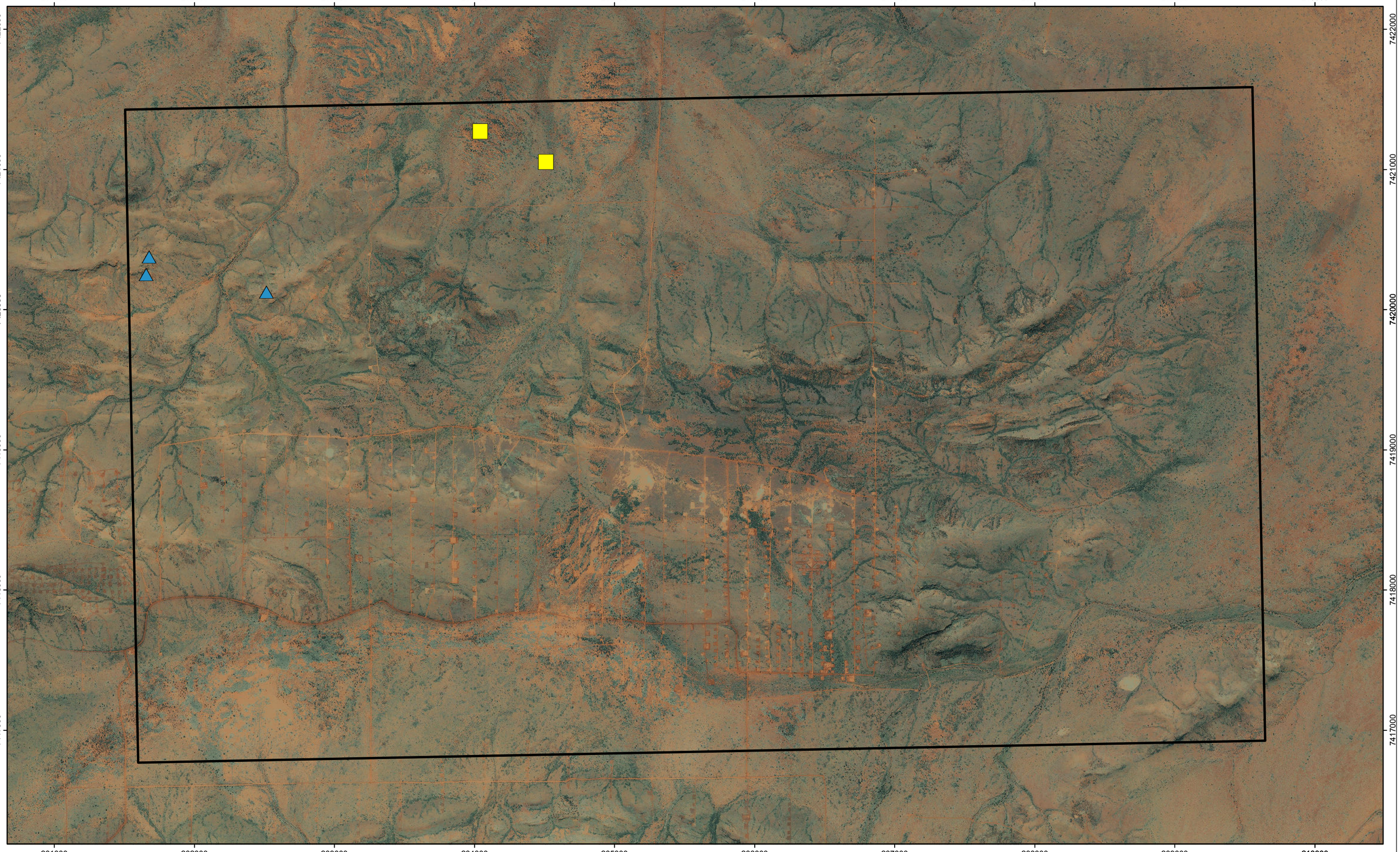
7422000 7421000 7420000 7419000 7418000 7417000



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ONSHORE ENVIRONMENTAL

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Projection: MGA Zone 51

BHPBIO

OB31
SIGNIFICANT FLORA

FIGURE

Legend

Study Area

Significant Species

Genus / Species

Acacia sp. nov (reticulate/anastoming)

Rhagodia sp. Hamersley (M.E. Trudgen 17794)

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3.4 Introduced Flora

There were two introduced (weed) species recorded as scattered individuals from lower lying landforms in the study area, including footslopes, plains and drainage lines; **Cenchrus ciliaris* (Buffel Grass) and **Malvastrum americanum* (Spiked Malvastrum) (Table 7, Figure 7, Appendix 7). Neither of these taxa is listed as a Declared Pest under the BAM Act.

Table 7 Introduced weed species recorded from the study area.

Taxon (Common Name)	Photograph	Description	Occurrence in study area
**Cenchrus ciliaris* (Buffel Grass)		Tufted perennial grass originating from the Middle East as a fodder species by pastoralists. It grows in dense tussocks up to 1 m tall and typically occurs in monospecific stands on loamy plains and creekline levee banks. It is an aggressive colonizing species that has become well established throughout the Pilbara, Gascoyne and Murchison regions of Western Australia, and is continuing to spread in the south west (Hussey *et al.* 1997).	Occurs as seven widely spread disjunct records across the majority of the study area Seven point locations Occurring as scattered plants at each location and providing ground cover of less than 2%
**Malvastrum americanum* (Spiked Malvastrum)		Erect perennial herb or shrub, ranging from 0.5 m to 1.3 m in height. It grows in a variety of soil types on stony ridges and hill sides, flood plains and along drainage lines.	Single record of scattered plants providing less than 2% ground cover in the central sector of the study area

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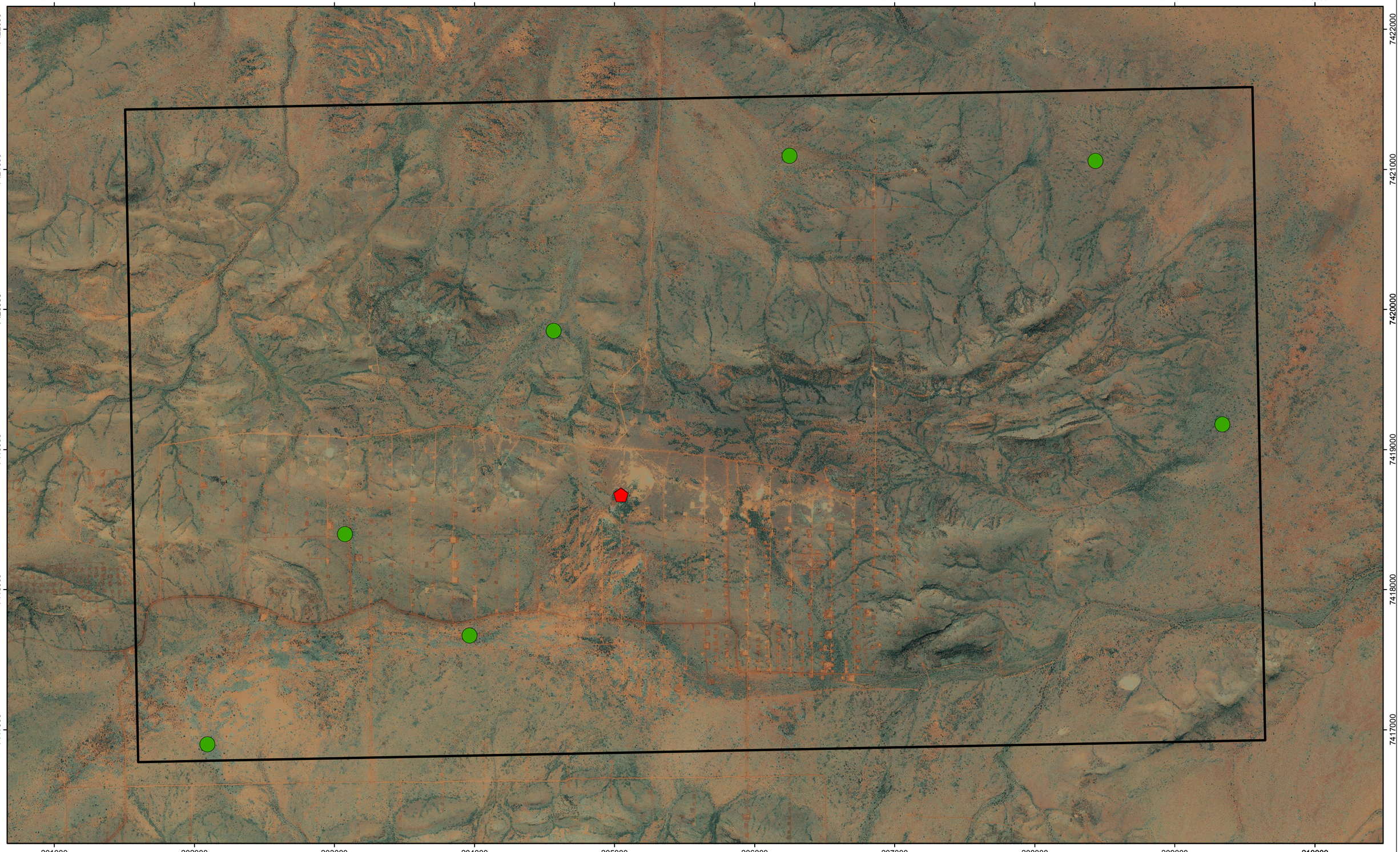
7422000 7421000 7420000 7419000 7418000 7417000



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0 100 200 400 600 800 1,000

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Projection: MGA Zone 51

BHPBIO

OB31
INTRODUCED FLORA

FIGURE

Legend

- Study Area

Introduced Flora

Genus / Species

- **Cenchrus ciliaris*
- **Malvastrum americanum*

Figure:	7	Date:	17 Dec. 2013
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3.5 Threatened Ecological Communities

No TECs occur within or adjacent to the study area. The nearest known TEC is the endangered Ethel Gorge aquifer stygobiont community located approximately 40km west of the study area.

3.6 Priority Ecological Communities

None of the vegetation associations described and mapped from the study area were found to have affiliations with any PECs documented within the Pilbara.

3.7 Vegetation

A total of 35 vegetation associations were described and mapped within the study area (Figure 8). The vegetation associations have been classified into 15 Broad Floristic Formations on the basis of the dominant vegetation stratum (Table 8). All site data collected is presented in Appendix 8.

Table 8 Vegetation descriptions for 35 vegetation associations mapped within the study area.

BFF		Vegetation Association Description	Characteristics	Condition
Acacia Low Open Forest	1a	Low Open Forest (to Low Woodland) of *Acacia aptaneura*, *Acacia paraneura* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Scrub (to High Shrubland) of *Acacia balsamea*, *Acacia wanyu* and *Acacia monticola* over Open Hummock Grassland of *Triodia pungens* forming mulga groves on floodplains and on minor drainage lines through undulating ironstone ridges, hills and valleys	*Acacia balsamea* and *Acacia wanyu* forming scrub along drainage lines	Very Good
Acacia Low Open Forest	1b	Low Open Forest of *Acacia aptaneura*, *Acacia paraneura* and *Eucalyptus leucophloia* subsp. l*eucophloia* over Open Scrub of *Acacia wanyu*, *Acacia tetragonophylla* and *Acacia bivenosa* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill on minor drainage lines through undulating ironstone ridges, hills and valleys	Chenopod species on bare stony plains, with occasional groves of Mulga. *Tecticornia* (samphire) and *Atriplex* (saltbush) species are sometimes present	Very Good
Acacia Low Woodland	2a	Low Woodland of *Acacia aptaneura*, *Acacia catenulata* subsp. *occidentalis* and *Acacia ayersiana* over High Shrubland of *Acacia subcontorta* over Open Hummock Grassland of *Triodia basedowii* on stony loam plains	*Acacia subcontorta* dominated shrublands	Excellent
Acacia Low Woodland	2b	Low Woodland of *Acacia citrinoviridis*, *Eucalyptus victrix* and *Acacia pruinocarpa* over High Shrubland of *Acacia monticola*, *Acacia pyrifolia* var. *pyrifolia* and *Petalostylis labicheoides* over Open Tussock Grassland of *Themeda triandra* and *Eriachne tenuiculmis* on medium drainage line	*Acacia citrinoviridis* Low Woodlands and Low Open Forest (when mature); also scattered *Eucalyptus victrix*	Very Good
Acacia Closed Scrub	3	Closed Scrub (to Closed Low Forest) *of Acacia pteraneura* and Corymbia aspera over Tussock Grassland of *Panicum effusum* and *Eragrostis flaccida* and Open Shrubland of *Eremophila fraseri* on gilgai drainage zones and flats	Dense Mulga over mixed tussock grasslands	Very Good
Acacia Open Scrub	4a	Open Scrub of *Acacia ancistrocarpa*, *Acacia bivenosa* and *Acacia tenuissima* over Hummock Grassland of *Triodia pungens* with Low Open Mallee of *Eucalyptus gamophylla* on drainage lines and drainage zones	*Acacia ancistrocarpa* forming scrub over *Triodia pungens*; few trees	Very Good

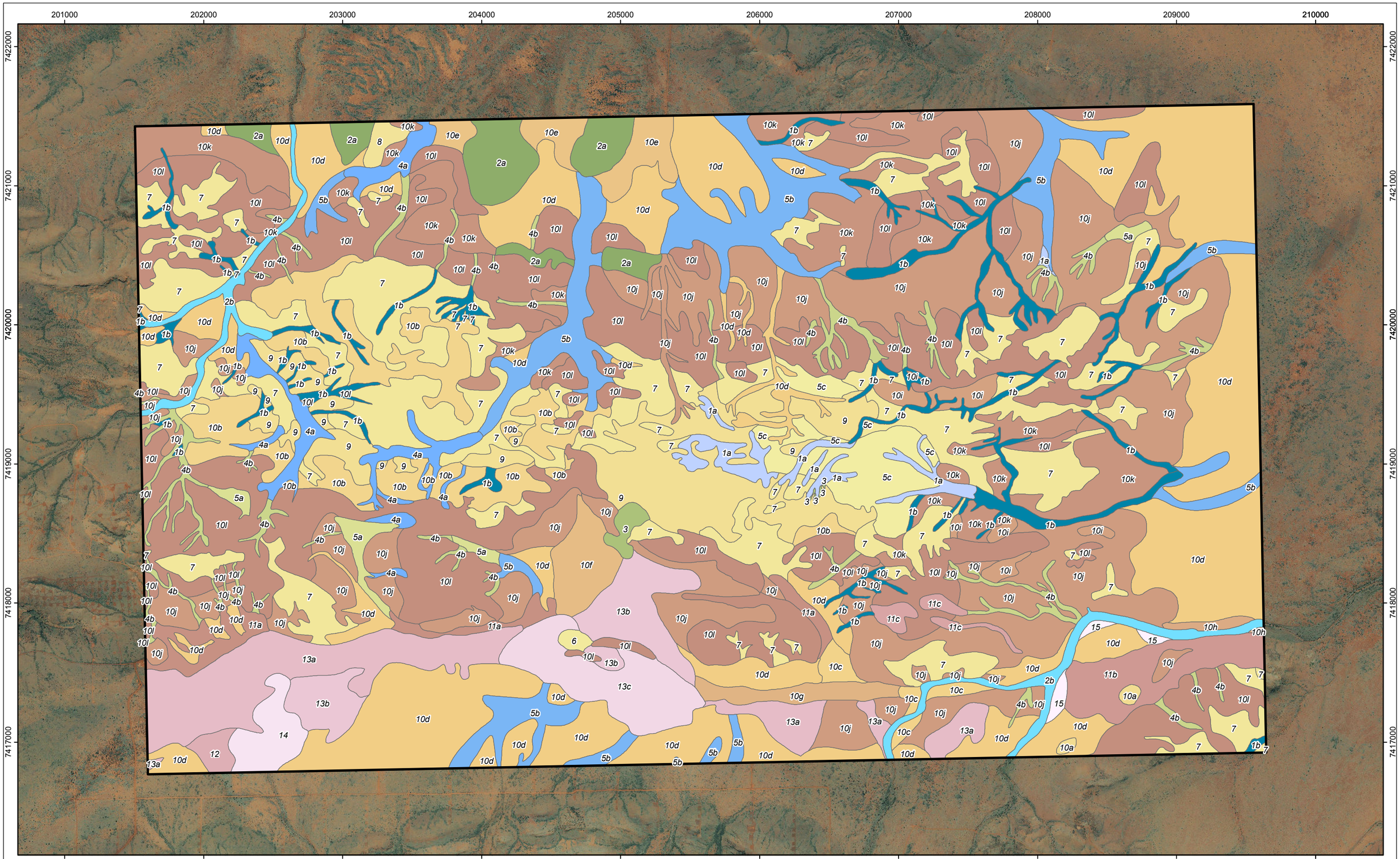
BFF		Vegetation Association Description	Characteristics	Condition
Acacia Open Scrub	4b	Open Scrub of *Acacia monticola* and *Grevillea wickhamii* subsp. *hispidula* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Scattered Low Trees of *Corymbia deserticola* subsp. *deserticola*, *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* on minor drainage line dissecting low hills and footslopes	*Acacia monticola* occurring as the dominant component along drainage lines of footslopes	Very Good
Acacia High Shrubland	5a	High Shrubland of *Acacia ancistrocarpa*, *Acacia adsurgens* and *Acacia elachantha* over Open Hummock Grassland of *Triodia schinzii* and Open Tussock Grassland of *Aristida inaequiglumis*, *Eulalia aurea* and *Digitaria brownii* on footslopes	*Triodia schinzii* in sandy drainage zones	Good
Acacia High Shrubland	5b	High Shrubland of *Acacia ancistrocarpa*, *Acacia adsurgens* and *Acacia elachantha* over Open Tussock Grassland of *Themeda triandra*, *Aristida holathera* var. *holathera* and *Paraneurachne muelleri* with Low Open Woodland of *Corymbia hamersleyana*, *Corymbia aspera* and *Hakea lorea* subsp. *lorea* on sandy drainage zones and floodplains	*Corymbia* species over mixed tussocks and hummocks with *Kennedia, Leptosema, Bonamia* and other low shrubs found on sandy drainage zones	Very Good
Acacia High Shrubland	5c	High Shrubland of *Acacia balsamea*, *Acacia wanyu* and *Acacia tetragonophylla* over Open Shrubland of *Senna glutinosa* subsp. x *luerssenii*, *Eremophila platycalyx* and *Senna stricta* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill on undulating plateaux and hill slopes	*Acacia balsamea* and *Acacia wanyu* as co-dominant shrubs, with *Eremophila platycalyx*	Very Good
Acacia High Open Shrubland	6	High Open Shrubland of *Acacia aptaneura* and *Acacia paraneura* over Scattered Tussock Grasses of *Aristida contorta* and *Aristida inaequiglumis* and Scattered Hummock Grasses of *Triodia basedowii* and *Triodia pungens* on clay loam flats and stony plains	Mulga shrublands on bare ground	Very Good
Acacia Shrubland	7	Shrubland of *Acacia wanyu*, *Acacia tetragonophylla* and *Senna glutinosa* subsp. x *luerssenii* over Low Shrubland of *Senna stricta*, *Eremophila cuneifolia* and *Scaevola spinescens* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill on undulating hills, ironstone ridges and valleys	*Acacia wanyu, Senna stricta* and *Eremophila cuneifolia* on undulating hill slopes. Mulga common at varying density. *Triodia angusta* sometimes co dominant	Very Good

BFF		Vegetation Association Description	Characteristics	Condition
Eremophila Low Shrubland	8	Low Shrubland of *Eremophila compacta*, *Eremophila cuneifolia* and *Lepidium platypetalum* with Low Open Woodland of *Acacia aptaneura* and *Acacia paraneura* and High Open Shrubland of *Acacia wanyu* and *Senna glutinosa* subsp. x *luerssenii* on low hill crests and slopes	*Eremophila compacta* in the understorey. Similar to Vegetation association 7	Very Good
Sclerolaena Low Shrubland	9	Low Shrubland of *Sclerolaena cuneata*, *Frankenia setosa* and *Eremophila cuneifolia* with Open Shrubland of *Acacia synchronicia* and Scattered Low Trees of *Acacia aptaneura* and *Acacia paraneura* on gently sloping plains	Chenopod species on bare stony plains, with occasional groves of Mulga. *Tecticornia* (samphire) and *Atriplex* (saltbush) species are sometimes present	Very Good
Triodia Hummock Grassland	10a	Hummock Grassland of *Triodia angusta* and *Triodia pungens* with Shrubland of *Acacia bivenosa* and Low Open Mallee of *Eucalyptus socialis* subsp. *eucentrica* and *Eucalyptus gamophylla* on low calcrete hills and rises	*Eucalyptus socialis* subsp. *eucentrica* mallee on calcrete	Very Good
Triodia Hummock Grassland	10b	Hummock Grassland of *Triodia angusta* with Open Shrubland of *Acacia synchronicia*, *Acacia tetragonophylla* and *Acacia wanyu* over Low Open Shrubland of *Eremophila cuneifolia*, *Lepidium platypetalum* and *Maireana pyramidata* on undulating hills, ironstone ridges and eroded slopes	*Triodia angusta* dominated slopes	Very Good
Triodia Hummock Grassland	10c	Hummock Grassland of *Triodia basedowii* and *Triodia pungens* with High Shrubland (to Open Scrub) of *Acacia ancistrocarpa*, *Acacia pyrifolia* var. *pyrifolia* and *Acacia bivenosa* and Low Open Woodland of *Corymbia hamersleyana* on sandy floodplains and levee banks	*Corymbia hamersleyana* as the dominant tree layer over a dense cover of mixed *Acacia* species	Very Good
Triodia Hummock Grassland	10d	Hummock Grassland of *Triodia basedowii* with Low Open Woodland of *Corymbia hamersleyana*, *Hakea lorea* subsp. *lorea* and High Open Shrubland of *Acacia ancistrocarpa*, *Acacia pachyacra* and *Acacia bivenosa* on stony sandplains	*Triodia basedowii* hummock grasslands, with variable suite of *Acacia* species; on sandplains	Very Good

BFF		Vegetation Association Description	Characteristics	Condition
Triodia Hummock Grassland	10e	Hummock Grassland of *Triodia basedowii* with Low Woodland of *Acacia pteraneura* over Open Shrubland of *Eremophila forrestii* subsp. *forrestii* and *Senna glutinosa* ssp. x *luerssenii* on sandy loam plains	Combination of Mulga and *Triodia basedowii*	Good
Triodia Hummock Grassland	10f	Hummock Grassland of *Triodia basedowii*, *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Low Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and *Acacia paraneura* over Shrubland of *Eremophila fraseri* and *Eremophila forrestii* subsp. *forrestii* on sandy drainage zones	*Eremophila fraseri* as an understorey component and hummock grassland dominant (rather than tussock grassland)	Good
Triodia Hummock Grassland	10g	Hummock Grassland of *Triodia pungens* with High Shrubland of *Acacia ancistrocarpa* and *Acacia tenuissima* with Low Open Woodland of *Eucalyptus xerothermica*, *Corymbia aspera* and *Corymbia hamersleyana* on clay loam drainage zones	Presence of *Eucalyptus xerothermica;* rarely found in the study area	Very Good
Triodia Hummock Grassland	10h	Hummock Grassland of *Triodia pungens* with Shrubland (to Open Scrub) of *Acacia pyrifolia* var. *pyrifolia*, *Gossypium robinsonii* and *Acacia maitlandii* with Low Open Woodland of *Corymbia hamersleyana* on sandy floodplain and levee banks	*Acacia pyrifolia* dominated scrub on floodplains	Very Good
Triodia Hummock Grassland	10i	Hummock Grassland of *Triodia* sp. Shovelanna Hill and *Triodia pungens* with High Shrubland of *Acacia rhodophloia* and Low Shrubland of *Eremophila exilifolia* on ironstone hill slopes	*Acacia rhodophloia* dominated shrublands, with an *Eremophila* understorey	Very Good
Triodia Hummock Grassland	10j	Hummock Grassland of *Triodia* sp. Shovelanna Hill with High Shrubland of *Acacia ancistrocarpa*, *Grevillea wickhamii* subsp. hispidula and *Acacia bivenosa* over Low Open Shrubland of *Acacia hilliana* on footslopes	*Acacia* shrublands providing 10-30% cover over *Triodia* sp. Shovelanna Hill	Very Good
Triodia Hummock Grassland	10k	Hummock Grassland of *Triodia* sp. Shovelanna Hill with High Shrubland of *Acacia wanyu*, *Acacia bivenosa* and *Grevillea wickhamii* subsp. *hispidula* over Open Shrubland of *Senna glutinosa* subsp. x *luerssenii* on footslopes and lower hill slopes	*Acacia wanyu* dominated footslopes with *Triodia* sp. Shovelanna Hill in the ground cover	Excellent

BFF		Vegetation Association Description	Characteristics	Condition
Triodia Hummock Grassland	10l	Hummock Grassland of *Triodia* sp. Shovelanna Hill with Low Shrubland of *Acacia hilliana*, *Acacia adoxa* var. *adoxa* and *Halgania solanacea* with High Open Shrubland of *Grevillea wickhamii* subsp. *hispidula*, *Acacia marramamba* and *Grevillea berryana* on hill crests and slopes	Scattered to high open shrublands of *Acacia* and *Grevillea* species over *Triodia* sp. Shovelanna Hill. *Acacia hilliana* often forms low open heath	Good
Triodia Open Hummock Grassland	11a	Open Hummock Grassland of *Triodia basedowii* and *Triodia pungens* over Open Tussock Grassland of *Aristida inaequiglumis*, *Themeda triandra* and *Digitaria brownii* with Low Open Woodland of *Corymbia hamersleyana* on loamy drainage zones adjacent to floodplains	*Corymbia hamersleyana* dominated floodplains; no Mulga; mixed *Acacia* shrublands with mixed tussock or hummock grasslands	Good
Triodia Open Hummock Grassland	11b	Open Hummock Grassland of *Triodia basedowii* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and *Corymbia hamersleyana* and High Open Shrubland of *Eremophila platycalyx*, *Acacia wanyu* and *Acacia synchronicia* on stony rises, plains and footslopes	Presence of *Eremophila platycalyx* and *Acacia synchronicia* as dominant shrubs with mixed *Triodia* and Mulga	Very Good
Triodia Open Hummock Grassland	11c	Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Corymbia ferriticola* and *Eucalyptus leucophloia* subsp. *leucophloia* and Open Shrubland of *Astrotricha hamptonii*, *Dodonaea pachyneura* and *Acacia maitlandii* on faces of large open ravines and occasionally cliffs	*Corymbia ferriticola* and other typical cliff dwelling species of the Pilbara e.g. *Astrotricha hamptonii, Ficus brachpoda*	Excellent
Themeda Closed Tussock Grassland	12	Closed Tussock Grassland of *Themeda triandra* and *Eulalia aurea* with Low Open Woodland of *Hakea lorea* subsp. *lorea*, *Acacia aptaneura* and *Corymbia aspera* and Open Shrubland of *Acacia pyrifolia* var. *pyrifolia* and *Acacia ancistrocarpa* on plains and drainage zones	Dense *Themeda* grasslands rather than mixed tussock species	Very Good
Themeda Tussock Grassland	13a	Tussock Grassland of *Themeda triandra*, *Digitaria brownii* and *Aristida inaequiglumis* with Low Woodland of *Acacia aptaneura* and *Corymbia hamersleyana* and Very Open Hummock Grassland of *Triodia basedowii* on clay drainage zones and floodplains	*Corymbia hamersleyana* and *Acacia aptaneura* forest over mixed tussock grasslands; sometimes has bare ground	Good

BFF		Vegetation Association Description	Characteristics	Condition
Themeda Tussock Grassland	13b	Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Digitaria brownii* with Low Open Woodland (to Low Woodland) of *Acacia aptaneura* and *Acacia paraneura* and Open Shrubland of *Eremophila fraseri* on floodplains	*Eremophila fraseri* as an understorey component under Mulga woodlands; tussock grasslands rather than hummock grasslands	Very Good
Themeda Tussock Grassland	13c	Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Digitaria brownii* with Low Woodland (to Low Open Woodland) of *Acacia aptaneura*, *Eucalyptus xerothermica* and *Corymbia hamersleyana* and Low Open Shrubland of *Isotropis forrestii* and *Ptilotus obovatus* on drainage zones and flats	Presence of *Eucalyptus xerothermica* forming woodland with Mulga. This species was rarely found in the study area. Vegetation is similar to Vegetation association 13a but with *Eucalyptus xerothermica*	Very Good
Eragrostis Tussock Grassland	14	Tussock Grassland of *Eragrostis eriopoda*, *Paraneurachne muelleri* and *Aristida contorta* with Low Open Woodland of *Corymbia hamersleyana*, *Hakea lorea* subsp. *lorea* and *Corymbia aspera* and Open Shrubland of *Acacia melleodora* and *Senna artemisioides* subsp. *oligophylla* on gently sloping sandy loam plains	Different suite of species forming the tussock grassland dominated by *Eragrostis eriopoda*	Very Good
**Cenchrus* Tussock Grassland	15	Tussock Grassland of **Cenchrus ciliaris* with Low Open Woodland of *Acacia citrinoviridis*, *Acacia aptaneura* and *Corymbia hamersleyana* and High Shrubland of *Gossypium robinsonii*, *Acacia pyrifolia* var. *pyrifolia* and *Petalostylis labicheoides* on sandy floodplain	**Cenchrus ciliaris* dominated floodplain with *Acacia citrinoviridis* as a characteristic tree species	Good



ONSHORE ENVIRONMENTAL

Figure:	8	Date:	17 Dec. 2013
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Projection: MGA Zone 51

BHPBIO

OB31
VEGETATION MAPPING

FIGURE

Legend

Study Area

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Legend

Study Area

Vegetation Mapping

Acacia Low Open Forest

1a Low Open Forest (to Low Woodland) of *Acacia aptaneura*, *Acacia paraneura* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Scrub (to High Shrubland) of *Acacia balsamea*, *Acacia wanyu* and *Acacia monticola* over Open Hummock Grassland of *Triodia pungens* forming mulga groves on floodplains and on on minor drainage lines through undulating ironstone ridges, hills and valleys

1b Low Open Forest of *Acacia aptaneura*, *Acacia paraneura* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Scrub of *Acacia wanyu*, *Acacia tetragonophylla* and *Acacia bivenosa* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. *Shovelanna Hill* on minor drainage lines through undulating ironstone ridges, hills and valleys

Acacia Low Woodland

2a Low Woodland of *Acacia aptaneura*, *Acacia catenulata* subsp. *occidentalis* and *Acacia ayersiana* over High Shrubland of *Acacia ?cuthbertsonii* over Open Hummock Grassland of *Triodia basedowii* on stony loam plains

2b Low Woodland of *Acacia citrinoviridis*, *Eucalyptus victrix* and *Acacia pruinocarpa* over High Shrubland of *Acacia monticola*, *Acacia pyrifolia* var. *pyrifolia* and *Petalostylis labicheoides* over Open Tussock Grassland of *Themeda triandra* and *Eriachne tenuiculmis* on medium drainage line

Acacia Closed Scrub

3 Closed Scrub (to Closed Low Forest) of *Acacia pteraneura* and *Corymbia aspera* over Tussock Grassland of *Panicum effusum* and *Eragrostis flaccida* and Open Shrubland of *Eremophila fraseri* on gilgai drainage zones and flats

Acacia Open Scrub

4a Open Scrub of *Acacia ancistrocarpa*, *Acacia bivenosa* and *Acacia tenuissima* over Hummock Grassland of *Triodia pungens* with Low Open Mallee of *Eucalyptus gamophylla* on drainage lines and drainage zones

4b Open Scrub of *Acacia monticola* and *Grevillea wickhamii* subsp. *hispidula* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Scattered Low Trees of *Corymbia deserticola* subsp. *deserticola*, *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* on minor drainage line dissecting low hills and footslopes

Acacia High Shrubland

5a High Shrubland of *Acacia ancistrocarpa*, *Acacia adsurgens* and *Acacia elachantha* over Open Hummock Grassland of *Triodia schinzii* and Open Tussock Grassland of *Aristida inaequiglumis*, *Eulalia aurea* and *Digitaria brownii* on footslopes

5b High Shrubland of *Acacia ancistrocarpa*, *Acacia adsurgens* and *Acacia elachantha* over Open Tussock Grassland of *Themeda triandra*, *Aristida holathera* var. *holathera* and *Paraneurachne muelleri* with Low Open Woodland of *Corymbia hamersleyana*, *Corymbia aspera* and *Hakea lorea* subsp. *lorea* on sandy drainage zones and floodplains

5c High Shrubland of *Acacia balsamea*, *Acacia wanyu* and *Acacia tetragonophylla* over Open Shrubland of *Senna glutinosa* subsp. x *luerssenii*, *Eremophila platycalyx* and *Senna stricta* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill on undulating plateaux and hill slopes

Acacia High Open Shrubland

6 High Open Shrubland of *Acacia aptaneura* and *Acacia paraneura* over Scattered Tussock Grasses of *Aristida contorta* and *Aristida inaequiglumis* and Scattered Hummock Grasses of *Triodia basedowii* and *Triodia pungens* on clay loam flats and stony plains

Acacia Shrubland

7 Shrubland of *Acacia wanyu*, *Acacia tetragonophylla* and *Senna glutinosa* subsp. x *luerssenii* over Low Shrubland of *Senna stricta* , *Eremophila cuneifolia* and *Scaevola spinescens* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill on undulating hills, ironstone ridges and valleys

Eremophila Low Shrubland

8 Low Shrubland of *Eremophila compacta*, *Eremophila cuneifolia* and *Lepidium platypetalum* with Low Open Woodland of *Acacia aptaneura* and *Acacia paraneura* and High Open Shrubland of *Acacia wanyu* and *Senna glutinosa* subsp. x *luerssenii* on low hill crests and slopes

Sclerolaena Low Shrubland

9 Low Shrubland of *Sclerolaena cuneata*, *Frankenia setosa* and *Eremophila cuneifolia* with Open Shrubland of *Acacia synchronicia* and Scattered Low Trees of *Acacia aptaneura* and *Acacia paraneura* on gently sloping plains

Triodia Hummock Grassland

10a Hummock Grassland of *Triodia angusta* and *Triodia pungens* with Shrubland of *Acacia bivenosa* and Low Open Mallee of *Eucalyptus socialis* subsp. *eucentrica* and *Eucalyptus gamophylla* on low calcrete hills and rises

10b Hummock Grassland of *Triodia angusta* with Open Shrubland of *Acacia synchronicia*, *Acacia tetragonophylla* and *Acacia wanyu* over Low Open Shrubland of *Eremophila cuneifolia*, *Lepidium platypetalum* and *Maireana pyramidalis* on undulating hills, ironstone ridges and eroded slopes

10c Hummock Grassland of *Triodia basedowii* and *Triodia pungens* with High Shrubland (to Open Scrub) of *Acacia ancistrocarpa*, *Acacia pyrifolia* var. *pyrifolia* and *Acacia bivenosa* and Low Open Woodland of *Corymbia hamersleyana* on sandy floodplains and levee banks

10d Hummock Grassland of *Triodia basedowii* with Low Open Woodland of *Corymbia hamersleyana*, *Hakea lorea* subsp. lorea and High Open Shrubland of *Acacia ancistrocarpa*, *Acacia pachyacra* and *Acacia bivenosa* on stony sandplains

10e Hummock Grassland of *Triodia basedowii* with Low Woodland of *Acacia pteraneura* over Open Shrubland of *Eremophila forrestii* subsp. *forrestii* and *Senna glutinosa* ssp. x *luerssenii* on sandy loam plains

10f Hummock Grassland of *Triodia basedowii*, *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Low Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and *Acacia paraneura* over Shrubland of *Eremophila fraseri* and *Eremophila forrestii* subsp. *forrestii* on sandy drainage zones

10g Hummock Grassland of *Triodia pungens* with High Shrubland of *Acacia ancistrocarpa* and *Acacia tenuissima* with Low Open Woodland of *Eucalyptus xerothermica*, *Corymbia aspera* and *Corymbia hamersleyana* on clay loam drainage zones

10h Hummock Grassland of *Triodia pungens* with Shrubland (to Open Scrub) of *Acacia pyrifolia* var. *pyrifolia*, *Gossypium robinsonii* and *Acacia maitlandii* with Low Open Woodland of *Corymbia hamersleyana* on sandy floodplain and levee banks

10i Hummock Grassland of *Triodia* sp. *Shovelanna Hill* and *Triodia pungens* with High Shrubland of *Acacia rhodophloia* and Low Shrubland of *Eremophila exilifolia* on ironstone hill slopes

10j Hummock Grassland of *Triodia* sp. Shovelanna Hill with High Shrubland of *Acacia ancistrocarpa*, *Grevillea wickhamii* subsp. *hispidula* and *Acacia bivenosa* over Low Open Shrubland of *Acacia hilliana* on footslopes

10k Hummock Grassland of *Triodia* sp. Shovelanna Hill with High Shrubland of *Acacia wanyu*, *Acacia bivenosa* and *Grevillea wickhamii* subsp. *hispidula* over Open Shrubland of *Senna glutinosa* subsp. x *luerssenii* on footslopes and lower hill slopes

10l Hummock Grassland of *Triodia* sp. Shovelanna Hill with Low Shrubland of *Acacia hilliana*, *Acacia adoxa* var. *adoxa* and *Halgania solanacea* with High Open Shrubland of *Grevillea wickhamii* subsp. *hispidula*, *Acacia marramamba* and *Grevillea berryana* on hill crests and slopes

Triodia Open Hummock Grassland

11a Open Hummock Grassland of *Triodia basedowii* and *Triodia pungens* over Open Tussock Grassland of *Aristida inaequiglumis*, *Themeda triandra*and *Digitaria brownii* with Low Open Woodland of *Corymbia hamersleyana* on loamy drainage zones adjacent to floodplains

11b Open Hummock Grassland of *Triodia basedowii* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and *Corymbia hamersleyana* and High Open Shrubland of *Eremophila platycalyx*, *Acacia wanyu* and *Acacia synchronicia* on stony rises, plains and footslopes

11c Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Corymbia ferriticola* and *Eucalyptus leucophloia* subsp. *leucophloia* and Open Shrubland of *Astrotricha hamptonii*, *Dodonaea pachyneura* and *Acacia maitlandii* on faces of large open ravines and occasionally cliffs

Themeda Closed Tussock Grassland

12 Closed Tussock Grassland of *Themeda triandra* and *Eulalia aurea* with Low Open Woodland of*Hakea lorea* subsp. *lorea*, *Acacia aptaneura* and *Corymbia aspera* and Open Shrubland of *Acacia pyrifolia* var. *pyrifolia* and *Acacia ancistrocarpa* on plains and drainage zones

Themeda Tussock Grassland

13a Tussock Grassland of *Themeda triandra*, *Digitaria brownii* and *Aristida inaequiglumis* with Low Woodland of *Acacia aptaneura* and *Corymbia hamersleyana* and Very Open Hummock Grassland of *Triodia basedowii* on clay drainage zones and floodplains

13b Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Digitaria brownii* with Low Open Woodland (to Low Woodland) of *Acacia aptaneura* and *Acacia paraneura* and Open Shrubland of *Eremophila fraseri* on floodplains

13c Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Digitaria brownii* with Low Woodland (to Low Open Woodland) of *Acacia aptaneura*, *Eucalyptus xerothermica* and *Corymbia hamersleyana* and Low Open Shrubland of *Isotropis forrestii* and *Ptilotus obovatus* on drainage zones and flats

Eragrostis Tussock Grassland

14 Tussock Grassland of *Eragrostis eriopoda*, *Paraneurachne muelleri* and *Aristida contorta* with Low Open Woodland of *Corymbia hamersleyana*, *Hakea lorea* subsp. *lorea* and *Corymbia aspera* and Open Shrubland of *Acacia melleodora* and *Senna artemisioides* subsp. *oligophylla* on gently sloping sandy loam plains

*Cenchrus Tussock Grassland

15 Tussock Grassland of **Cenchrus ciliaris* with Low Open Woodland of *Acacia citrinoviridis*, *Acacia aptaneura* and *Corymbia hamersleyana* and High Shrubland of *Gossypium robinsonii*, *Acacia pyrifolia* var. *pyrifolia* and *Petalostylis labicheoides* on sandy floodplain

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ONSHORE ENVIRONMENTAL

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OB31
VEGETATION MAPPING LEGEND

FIGURE

LEGEND

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Broad Floristic Formation	**1a *Acacia* Low Open Forest**
Vegetation Association	Low Open Forest (to Low Woodland) of *Acacia aptaneura*, *Acacia paraneura* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Scrub (to High Shrubland) of *Acacia balsamea*, *Acacia wanyu* and *Acacia monticola* over Open Hummock Grassland of *Triodia pungens* forming mulga groves on floodplains and on minor drainage lines through undulating ironstone ridges, hills and valleys
	
Area Mapped	29 ha
Quadrats Sampled	x54, x51, x186
Location	Located amongst the range in the centre and a small section in the north east of the study area
Leaf Litter Cover (%)	N/A
Bare Ground (%)	N/A
Soils and Geology	Ironstone
Land System	Newman
Land Form	Minor drainage lines and Mulga groves through undulating ironstone ridges, hills and valleys
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	N/A
Average Fire Age	N/A
Characteristics	Characterised by the presence of *Acacia balsamea* and *Acacia wanyu* in scrub along drainage lines.
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura, Eucalyptus leucophloia* subsp. *leucophloia*
Tall Shrubs >2m	*Acacia balsamea, Acacia wanyu, Acacia monticola*
Hummock Grasses	*Triodia pungens*

Broad Floristic Formation	**1b *Acacia* Low Open Forest**
Vegetation Association	Low Open Forest of *Acacia aptaneura*, *Acacia paraneura* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Scrub of *Acacia wanyu*, *Acacia tetragonophylla* and *Acacia bivenosa* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill in brown loam on minor drainage lines through undulating ironstone ridges, hills and valleys
	
Area Mapped	95 ha
Quadrats Sampled	5, 22
Location	Located in minor drainage lines dissecting the central western and eastern sections of the study area
Leaf Litter Cover (%)	2-10
Bare Ground (%)	20-25
Soils and Geology	Brown loam, Ironstone – Banded Iron Formation (BIF), pebbles, cobbles, outcrops
Land System	Newman, Boolgeeda
Land Form	Minor drainage line through undulating ironstone ridges, hills and valleys
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Mining exploration, current drilling activity, zoology survey, livestock
Average Fire Age	Old (6+ years)
Characteristics	Characterised by chenopod species on bare stony plains, with occasional groves of Mulga. *Tecticornia* and *Atriplex* species are sometimes present.

Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura, Eucalyptus leucophloia* subsp. *leucophloia*
Tall Shrubs >2m	*Acacia wanyu, Acacia tetragonophylla, Acacia bivenosa*
Shrubs 1-2m	*Dodonaea petiolaris, Eremophila latrobei* subsp. *latrobei, Senna stricta*
Hummock Grasses	*Triodia pungens*, *Triodia* sp. Shovelanna Hill

Broad Floristic Formation	**2a *Acacia* Low Woodland**
Vegetation Association	Low Woodland of *Acacia aptaneura*, *Acacia catenulata* subsp. *occidentalis* and *Acacia ayersiana* over High Shrubland of *Acacia subcontorta* over Open Hummock Grassland of *Triodia basedowii* in orange silty clay loam on stony loam plains

Area Mapped	62 ha
Quadrats Sampled	25, x65, x66
Location	Located on plains in the upper north eastern section of the study area
Leaf Litter Cover (%)	2-10
Bare Ground (%)	65
Soils and Geology	Orange silty clay loam, BIF pebbles and cobbles
Land System	Boolgeeda
Land Form	Stony loam plains
Priority Ecological Community	None
Rare Flora	*Rhagodia* sp. Hamersley (M. Trudgen 17794)
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	Cattle grazing, current drilling activity in area
Average Fire Age	Moderate (3-5 years)
Characteristics	Characterised by *Acacia subcontorta* dominated shrublands
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia catenulata* subsp. *occidentalis, Acacia ayersiana*
Tall Shrubs >2m	*Acacia subcontorta*
Shrubs 1-2m	*Eremophila forresttii* subsp. *forrestii, Sida ectogama, Dodonaea petiolaris*
Hummock Grasses	*Triodia basedowii*

Broad Floristic Formation	**2b *Acacia* Low Woodland**
Vegetation Association	Low Woodland of *Acacia citrinoviridis*, *Eucalyptus victrix* and *Acacia pruinocarpa* over High Shrubland of *Acacia monticola*, *Acacia pyrifolia* var. *pyrifolia* and *Petalostylis labicheoides* over Open Tussock Grassland of *Themeda triandra* and *Eriachne tenuiculmis* in sand on medium drainage lines
	
Area Mapped	40 ha
Quadrats Sampled	28, x77
Location	Located along two medium drainage lines one located in the north-western corner and the other located in the south-eastern corner of the study area. The first enters the study area from the north-east and flows out to the west and the second enters from the east and flows out to the south.
Leaf Litter Cover (%)	N/A
Bare Ground (%)	40
Soils and Geology	Sand, riverine gravels and mixed rock outcrops
Land System	Boolgeeda, Newman
Land Form	Medium drainage line
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Livestock, current drilling activity nearby
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Acacia citrinoviridis* Low Woodlands and Low Open Forest (when mature); also scattered *Eucalyptus victrix*

Vegetation Structure & Floristics	
Trees <10m	*Acacia citrinoviridis, Eucalyptus victrix, Acacia pruinocarpa*
Tall Shrubs >2m	*Acacia monticola, Acacia pyrifolia* var. *pyrifolia, Petalostylis labicheoides*
Low Shrubs <1m	*Tephrosia rosea* var. Fortescue Creeks
Hummock Grasses	*Triodia pungens*
Tussock Grasses	*Themeda triandra, Eriachne tenuiculmis*

Broad Floristic Formation	**3** ***Acacia*** **Closed Scrub**
Vegetation Association	Closed Scrub (to Closed Low Forest) of *Acacia pteraneura* and *Corymbia aspera* over Tussock Grassland of *Panicum effusum* and *Eragrostis flaccida* and Open Shrubland of *Eremophila fraseri* in orange clayey sand on gilgai drainage zones and flats
	
Area Mapped	7 ha
Quadrats Sampled	31, 7
Location	Located in small patches within the centre of the OB 31 Study area
Leaf Litter Cover (%)	<2-10
Bare Ground (%)	17
Soils and Geology	Orange clayey sand with Gilgai drainage lines and small sumps, Ironstone BIF cobbles, pebbles, gravels
Land System	Newman
Land Form	Gilgai Drainage Zone and Flats
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris, *Malvastrum americanum*
Vegetation Condition	Very Good
Disturbances	Frequent fire, feral and domestic animals, weeds, current drilling activity, tracks
Average Fire Age	Moderate (3-5 years)
Characteristics	Characterised by dense Mulga over Mixed Tussock Grasslands.
Vegetation Structure & Floristics	
Trees <10m	*Acacia pteraneura, Corymbia aspera*
Shrubs 1-2m	*Eremophila fraseri*
Tussock grasses	*Panicum effusum, Eragrostis flaccida*

Broad Floristic Formation	**4a *Acacia* Open Scrub**
Vegetation Association	Open Scrub of *Acacia ancistrocarpa*, *Acacia bivenosa* and *Acacia tenuissima* over Hummock Grassland of *Triodia pungens* with Low Open Mallee of *Eucalyptus gamophylla* in brown loamy sand on drainage lines and drainage zones

Area Mapped	44 ha
Quadrats Sampled	37
Location	Located along drainage lines and zones in the central western section of the OB 31 Study area
Leaf Litter Cover (%)	2-10
Bare Ground (%)	20
Soils and Geology	Brown loamy sand, BIF Ironstone pebbles
Land System	Newman, Boolgeeda
Land Form	Drainage zone/ drainage line
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Access track
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Acacia ancistrocarpa* scrub over *Triodia pungens*; few trees
Vegetation Structure & Floristics	
Mallee	*Eucalyptus gamophylla*
Tall Shrubs >2m	*Acacia ancistrocarpa, Acacia bivenosa, Acacia tenuissima*
Hummock Grasses	*Triodia pungens*

Broad Floristic Formation	**4b *Acacia* Open Scrub**
Vegetation Association	Open Scrub of *Acacia monticola* and *Grevillea wickhamii* subsp. *hispidula* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Scattered Low Trees of *Corymbia deserticola* subsp. *deserticola*, *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* in brown loamy sand to silty clay loam on minor drainage line dissecting low hills and footslopes

Area Mapped	68 ha
Quadrats Sampled	17, 34, x11, x46, x86
Location	Found along minor drainage lines dissecting footlsopes extending across the entire study area from east to west. They area concentrated in the north and south of the study area and are uncommon in the centre
Leaf Litter Cover (%)	2-10
Bare Ground (%)	15
Soils and Geology	Brown loamy sand to silty clay loam, BIF Ironstone outcropping (in drainage channel), cobbles, pebbles
Land System	Boolgeeda, Newman
Land Form	Minor drainage line through low hills and footslopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Current drilling activity (drill pads common), tracks
Average Fire Age	Old (6+ years)

Characteristics	Characterised by *Acacia monticola* as the dominant component along drainage lines of footslopes
Vegetation Structure & Floristics	
Trees <10m	*Corymbia deserticola* subsp. *deserticola, Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia*
Tall Shrubs >2m	*Acacia monticola, Grevillea wickhamii* subsp. *hispidula*
Shrubs 1-2m	*Acacia maitlandii, Acacia tenuissima, Santalum lanceolatum*
Hummock grasses	*Triodia pungens, Triodia* sp. Shovelanna Hill

Broad Floristic Formation	**5a *Acacia* High Shrubland**
Vegetation Association	High Shrubland of *Acacia ancistrocarpa*, *Acacia adsurgens* and *Acacia elachantha* over Open Hummock Grassland of *Triodia schinzii* and Open Tussock Grassland of *Aristida inaequiglumis*, *Eulalia aurea* and *Digitaria brownii* in brown clayey sand on footslopes

Area Mapped	17 ha
Quadrats Sampled	29, x37, x38
Location	Found in four small locations, three of which are located in the western section and one in the north-eastern section of the study area.
Leaf Litter Cover (%)	2-10
Bare Ground (%)	60
Soils and Geology	Brown clayey sand, Ironstone BIF minimal gravel
Land System	Newman
Land Form	Sandy drainage zone
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Good
Disturbances	Mining exploration (2 tracks and 1 drill pad within site)
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Triodia schinzii* in sandy drainage zones.
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana, Acacia aptaneura, Acacia ?pteraneura*
Tall Shrubs >2m	*Acacia ancistrocarpa, Acacia adsurgens, Acacia elachantha*
Shrubs 1-2m	*Isotropis atropurpurea, Isotropis forrestii*
Hummock Grasses	*Triodia schinzii*
Tussock Grasses	*Aristida inaequiglumis, Eulalia aurea, Digitaria brownii*

Broad Floristic Formation	**5b *Acacia* High Shrubland**
Vegetation Association	High Shrubland of *Acacia ancistrocarpa*, *Acacia adsurgens* and *Acacia elachantha* over Open Tussock Grassland of *Themeda triandra*, *Aristida holathera* var. *holathera* and *Paraneurachne muelleri* with Low Open Woodland of *Corymbia hamersleyana*, *Corymbia aspera* and *Hakea lorea* subsp. *lorea* in loamy sand on sandy drainage zones and floodplains
	
Area Mapped	170 ha
Quadrats Sampled	3, x68, x71, x72, x75
Location	Located in sandy drainage zones and floodplains found in the extreme north, extreme south and extreme east of the study area.
Leaf Litter Cover (%)	2-10
Bare Ground (%)	N/A
Soils and Geology	Loamy sand, minimal rocks
Land System	Boolgeeda, Newman
Land Form	Sandy drainage zone/ plains
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Feral animals, current drilling activity
Average Fire Age	Moderate (3-5 years)
Characteristics	Characterised by *Corymbia* species over mixed Tussocks and Hummocks with *Kennedia*, *Leptosema*, *Bonamia* and other sandy drainage zone species

Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana, Corymbia aspera, Hakea lorea* subsp*. lorea*
Tall Shrubs >2m	*Acacia ancistrocarpa, Acacia adsurgens, Acacia elachantha*
Low Shrubs <1m	*Kennedia prorepens, Leptosema chambersii, Isotropis atropurpurea*
Hummock Grasses	*Triodia basedowii*
Tussock Grasses	*Themeda triandra, Aristida holathera var. holathera, Paraneurachne muelleri*

Broad Floristic Formation	**5c *Acacia* High Shrubland**
Vegetation Association	High Shrubland of *Acacia balsamea*, *Acacia wanyu* and *Acacia tetragonophylla* over Open Shrubland of *Senna glutinosa* subsp. x *luerssenii*, *Eremophila platycalyx* and Senna stricta over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill in brown loam on undulating plateaux and hill slopes

Area Mapped	56 ha
Quadrats Sampled	20, 44, x15, x16, x44
Location	Located on relatively extensive plateaux and hill slopes found in the central east of the study area
Leaf Litter Cover (%)	<2
Bare Ground (%)	50
Soils and Geology	Brown loam, BIF Ironstone and weathered ?granite (crumbly pink rock) outcrops, cobbles, pebbles
Land System	Newman
Land Form	Undulating plateau and hill slopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Fire, access tracks, current drilling activity
Average Fire Age	Moderate (~ 5 years)
Characteristics	Characterised by *Acacia balsamea* and *A. wanyu* as co-dominant shrubs, with *Eremophila platycalyx*
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura*
Tall Shrubs >2m	*Acacia balsamea, Acacia wanyu, Acacia tetragonophylla*
Shrubs 1-2m	*Senna glutinosa* subsp. x *luerssenii, Eremophila platycalyx, Senna stricta*
Hummock Grasses	*Triodia pungens, Triodia* sp. Shovelanna Hill

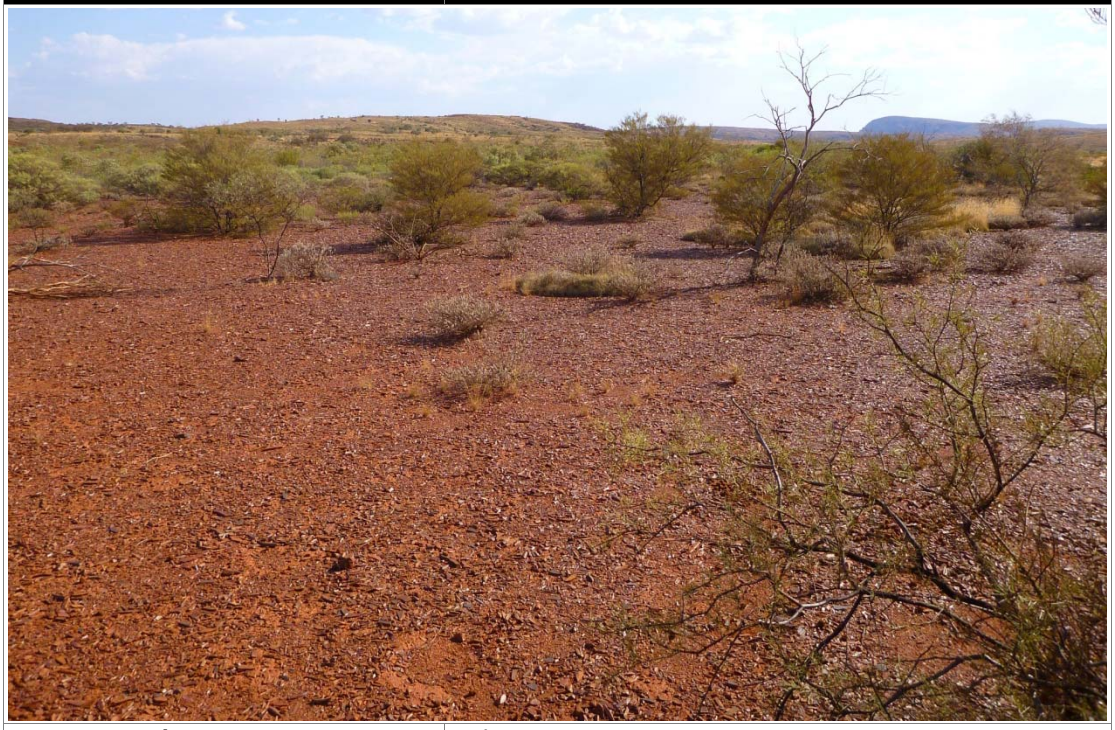
Broad Floristic Formation	**6 *Acacia* High Open Shrubland**
Vegetation Association	High Open Shrubland of *Acacia aptaneura* and *Acacia paraneura* over Scattered Tussock Grasses of *Aristida contorta* and *Aristida inaequiglumis* and Scattered Hummock Grasses of *Triodia basedowii* and *Triodia pungens* on clay loam flats and stony plains

Area Mapped	3 ha
Quadrats Sampled	x184
Location	Located in one small remote location in the central south of the study area.
Leaf Litter Cover (%)	<1
Bare Ground (%)	85
Soils and Geology	Red brown loam, ironstone scree
Land System	Washplain
Land Form	Clay loam flats, stony plain
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Grazing
Average Fire Age	Old
Characteristics	Characterised by Mulga shrublands over bare ground
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura*
Hummock Grasses	*Triodia basedowii, Triodia pungens*
Tussock Grasses	*Aristida contorta, Aristida inaequiglumis*

Broad Floristic Formation	**7 *Acacia* Shrubland**
Vegetation Association	Shrubland of *Acacia wanyu*, *Acacia tetragonophylla* and *Senna glutinosa* subsp. x *luerssenii* over Low Shrubland of *Senna stricta*, *Eremophila cuneifolia* and *Scaevola spinescens* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill in red brown sandy loam on undulating hills, ironstone ridges and valleys
	
Area Mapped	444 ha
Quadrats Sampled	6, 15, 18, 26, 35, 43
Location	Located extensively, on undulating hills, ridges and valleys concentrated in a broad area of the study area that runs centrally from north-west to south-east. There are also pockets found to the north-east
Leaf Litter Cover (%)	<2
Bare Ground (%)	50-60
Soils and Geology	Red brown sandy loam, Ironstone BIF, Chert, weathered ?granite (pink rock), eroded outcrops, cobbles, pebbles, gravels
Land System	Newman
Land Form	Undulating hills, ironstone ridges and valleys
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Mining exploration, current drilling activity, access tracks, historic tracks, livestock
Average Fire Age	Old (6+ years)

Characteristics	Characterised by *Acacia wanyu*, *Senna stricta* and *Eremophila cuneifolia* on undulating hill slopes. Mulga is common in varying densities. *Triodia angusta* is sometimes co dominant
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura*
Shrubs 1-2m	*Acacia wanyu, Acacia tetragonophylla, Senna glutinosa* subsp. x *luerssenii*
Low Shrubs <1m	*Senna stricta, Eremophila cuneifolia, Scaevola spinescens*
Hummock Grasses	*Triodia sp.* Shovelanna Hill

Broad Floristic Formation	**8 *Eremophila* Low Shrubland**
Vegetation Association	Low Shrubland of *Eremophila compacta*, *Eremophila cuneifolia* and *Lepidium platypetalum* with Low Open Woodland of *Acacia aptaneura* and *Acacia paraneura* and High Open Shrubland of *Acacia wanyu* and *Senna glutinosa* subsp. x *luerssenii* on low hill crests and slopes



Area Mapped	6 ha
Quadrats Sampled	x149, x152, x153, x158
Location	Located in one small isolated section in the north-western section of the OB 31 Study area
Leaf Litter Cover (%)	N/A
Bare Ground (%)	N/A
Soils and Geology	N/A
Land System	Boolgeeda
Land Form	Low hill crest and slope
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	N/A
Average Fire Age	N/A
Characteristics	Characterised by presence of *Eremophila compacta* in the understorey. Similar to Vegetation association 7
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura*
Tall Shrubs >2m	*Acacia wanyu, Senna glutinosa* subsp. x *luerssenii*
Low Shrubs <1m	*Eremophila compacta, Eremophila cuneifolia, Lepidium platypetalum*
Hummock Grasses	*Triodia* sp. Shovelanna Hill
Tussock Grasses	*Eragrostis eriopoda, Aristida contorta*

Broad Floristic Formation	**9 *Sclerolaena* Low Shrubland**
Vegetation Association	Low Shrubland of *Sclerolaena cuneata*, *Frankenia setosa* and *Eremophila cuneifolia* with Open Shrubland of *Acacia synchronicia* and Scattered Low Trees of *Acacia aptaneura* and *Acacia paraneura* in red brown silty clay loam on gently sloping plains

Area Mapped	144 ha
Quadrats Sampled	8, 19, x2, x4, x8
Location	Located on gently sloping plains found in the central west and continuing through to a few scattered locations in the central east of the study area
Leaf Litter Cover (%)	<2
Bare Ground (%)	65
Soils and Geology	Red brown silty clay loam, ironstone BIF, chert, cobbles, pebbles, gravel
Land System	Newman
Land Form	Sloping plains, gentle slopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Mining exploration, current drilling activity, tracks, livestock
Average Fire Age	Old (6+ years)
Characteristics	Characterised by chenopod species on bare stony plains, with occasional groves of Mulga. *Tecticornia* and *Atriplex* species are sometimes present
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura*
Shrubs 1-2m	*Acacia synchronicia*
Low Shrubs <1m	*Sclerolaena cuneata, Frankenia setosa, Eremophila cuneifolia*

Broad Floristic Formation	**10a *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia angusta* and *Triodia pungens* with Shrubland of *Acacia bivenosa* and Low Open Mallee of *Eucalyptus socialis* subsp. *eucentrica* and *Eucalyptus gamophylla* on low calcrete hills and rises
	
Area Mapped	3 ha
Quadrats Sampled	x191
Location	Located in two remote locations found in the south-east corner of the study area
Leaf Litter Cover (%)	<2
Bare Ground (%)	65
Soils and Geology	Calcrete
Land System	Newman
Land Form	Low calcrete hill/ rise
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	None
Average Fire Age	Moderate
Characteristics	Characterised by *Eucalyptus socialis* subsp. *eucentrica* mallee on calcrete
Vegetation Structure & Floristics	
Trees <10m	*Hakea lorea* subsp. *lorea*
Mallee	*Eucalyptus socialis* subsp. *eucentrica, Eucalyptus gamophylla*
Shrubs 1-2m	*Acacia bivenosa*
Low Shrubs <1m	*Scaevola ambylanthera, Ptilotus obovatus,* Senna sp. Meekatharra
Hummock Grasses	*Triodia angusta, Triodia pungens*

Broad Floristic Formation	**10b *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia angusta* with Open Shrubland of *Acacia synchronicia*, *Acacia tetragonophylla* and *Acacia wanyu* over Low Open Shrubland of *Eremophila cuneifolia*, *Lepidium platypetalum* and *Maireana pyramidata* on undulating hills, ironstone ridges and eroded slopes

Area Mapped	134 ha
Quadrats Sampled	38, x106
Location	Concentrated on extensively eroded slopes found in the central west and at a remote location found in the central eastern section of the study area
Leaf Litter Cover (%)	<2
Bare Ground (%)	30
Soils and Geology	Ironstone
Land System	Newman
Land Form	Undulating hills, ironstone ridges and eroded slopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Mining exploration, current drilling activity, tracks, feral animals (rabbits)
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Triodia angusta* dominated slopes
Vegetation Structure & Floristics	
Shrubs 1-2m	*Acacia synchronicia, Acacia tetragonophylla, Acacia wanyu*
Low Shrubs <1m	*Eremophila cuneifolia, Lepidium platypetalum, Maireana pyramidata*
Hummock Grasses	*Triodia angusta*

Broad Floristic Formation	**10c *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia basedowii* and *Triodia pungens* with High Shrubland (to Open Scrub) of *Acacia ancistrocarpa*, *Acacia pyrifolia* var. *pyrifolia* and *Acacia bivenosa* and Low Open Woodland of *Corymbia hamersleyana* on sandy floodplains and levee banks

Area Mapped	14 ha
Quadrats Sampled	45
Location	Located on floodplains and levee banks associated with the medium drainage line found the south-east corner of the study area
Leaf Litter Cover (%)	<2
Bare Ground (%)	55
Soils and Geology	Sand
Land System	Boolgeeda
Land Form	Sandy floodplain, levee banks
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Frequent fire, livestock
Average Fire Age	Moderate (3-5 years)
Characteristics	Characterised by *Corymbia hamersleyana* as a dominant tree layer over a dense cover of mixed *Acacia* species
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana*
Tall Shrubs >2m	*Acacia ancistrocarpa, Acacia pyrifolia* var. *pyrifolia, Acacia bivenosa*
Hummock Grasses	*Triodia basedowii, Triodia pungens*
Tussock Grasses	*Paraneurachne muelleri, Aristida holathera* var. *holathera, Eragrostis eriopoda*

Broad Floristic Formation	**10d *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia basedowii* with Low Open Woodland of *Corymbia hamersleyana*, *Hakea lorea* subsp. *lorea* and High Open Shrubland of *Acacia ancistrocarpa*, *Acacia pachyacra* and *Acacia bivenosa* in orange brown loamy sand on stony sandplains

Area Mapped	614 ha
Quadrats Sampled	1, 12, 24, 33, 39, 40, 41
Location	Common across the entire study area located on expansive sand plains located along the outer sections, the greatest expanses occur on the eastern then southern side of the study area
Leaf Litter Cover (%)	<2
Bare Ground (%)	50
Soils and Geology	Orange brown loamy sand, Ironstone BIF, Chert, cobbles, pebbles, gravel
Land System	Boolgeeda, Newman
Land Form	Stony sandplains
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Very Good
Disturbances	Livestock, weeds, current drilling activity, zoology survey, feral hoofed animals
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Triodia basedowii* grasslands, with variable *Acacia* species; on sandplains
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamerlseyana, Hakea lorea* subsp. *lorea*
Tall Shrubs >2m	*Acacia ancistrocarpa, Acacia pachyacra, Acacia bivenosa*
Low Shrubs <1m	*Bonamia erecta*
Hummock Grasses	*Triodia basedowii*
Tussock Grasses	*Paraneurachne muelleri, Aristida inaequiglumis*

Broad Floristic Formation	**10e *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia basedowii* with Low Woodland of *Acacia pteraneura* over Open Shrubland of *Eremophila forrestii* subsp. *forrestii* and *Senna glutinosa* ssp. x *luerssenii* on sandy loam plains
	
Area Mapped	33 ha
Quadrats Sampled	x62, x63, x64
Location	Found on plains that are only located in a small section of the northern central part of the study area
Leaf Litter Cover (%)	5
Bare Ground (%)	55
Soils and Geology	Sandy loam
Land System	Boolgeeda
Land Form	Sandy loam plains
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Good
Disturbances	fire, grazing
Average Fire Age	Moderate
Characteristics	Characterised by the combination of Mulga and *Triodia basedowii*
Vegetation Structure & Floristics	
Trees <10m	*Acacia pteraneura*
Shrubs 1-2m	*Eremophila forrestii* subsp. *forrestii, Senna glutinosa* subsp. x *luerssenii*
Hummock Grasses	*Triodia basedowii*

Broad Floristic Formation	**10f *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia basedowii*, *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Low Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and Acacia paraneura over Shrubland of *Eremophila fraseri* and *Eremophila forrestii* subsp. *forrestii* on sandy drainage zones

Area Mapped	26 ha
Quadrats Sampled	32, x33
Location	Located in a unique sandy drainage zone found in the central section of the study area
Leaf Litter Cover (%)	<2
Bare Ground (%)	50
Soils and Geology	Sand
Land System	Newman, Washplain
Land Form	Tiger mulga flats, gentle sloping plains
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Good
Disturbances	Mining exploration, current drilling activity, livestock, tracks
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Eremophila fraseri* in the understorey and hummock rather than tussock grasslands
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia pruinocarpa, Acacia paraneura*
Shrubs 1-2m	*Eremophila fraseri, Eremophila forrestii* subsp. *forrestii*
Low Shrubs <1m	*Ptilotus schwartzii*
Hummock Grasses	*Triodia basedowii, Triodia pungens, Triodia* sp. Shovelanna Hill

Broad Floristic Formation	**10g *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia pungens* with High Shrubland of *Acacia ancistrocarpa* and *Acacia tenuissima* with Low Open Woodland of *Eucalyptus xerothermica*, *Corymbia aspera* and *Corymbia hamersleyana* on clay loam drainage zones

Area Mapped	17 ha
Quadrats Sampled	x178
Location	Located in one area to the south of the study area as a drainage zone in association with the medium drainage line located in the south-eastern section of the study area
Leaf Litter Cover (%)	10
Bare Ground (%)	35
Soils and Geology	Clay loam
Land System	Boolgeeda
Land Form	Clay loam drainage zone
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	None
Average Fire Age	Old to Very Old
Characteristics	Characterised by the presence of *Eucalyptus xerothermica*; rarely found elsewhere in the study area
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus xerothermica, Corymbia aspera, Corymbia hamersleyana*
Tall Shrubs >2m	*Acacia ancistrocarpa, Acacia tenuissima*
Hummock Grasses	*Triodia pungens*
Tussock Grasses	*Themeda triandra, Aristida inaequglumis, Digitaria brownii*

Broad Floristic Formation	**10h *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia pungens* with Shrubland (to Open Scrub) of *Acacia pyrifolia* var. *pyrifolia*, *Gossypium robinsonii* and *Acacia maitlandii* with Low Open Woodland of *Corymbia hamersleyana* on sandy floodplain and levee banks

Area Mapped	4 ha
Quadrats Sampled	x188, x194
Location	Located as a sandy flood plain with levee banks in one isolated area north of the medium drainage line found in the south-eastern section of the study area
Leaf Litter Cover (%)	10
Bare Ground (%)	40
Soils and Geology	Red brown sand
Land System	Boolgeeda
Land Form	Sandy floodplain, levee banks
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Very Good
Disturbances	Grazing by cattle, weeds
Average Fire Age	Old
Characteristics	Characterised by *Acacia pyrifolia* dominated scrub on floodplains
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana*
Tall Shrubs >2m	*Acacia pyrifolia* var. *pyrifolia, Gossypium robinsonii, Acacia maitlandii*
Hummock Grasses	*Triodia pungens*
Tussock Grasses	**Cenchrus ciliaris*

Broad Floristic Formation	**10i *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia* sp. Shovelanna Hill and *Triodia pungens* with High Shrubland of *Acacia rhodophloia* and Low Shrubland of *Eremophila exilifolia* on ironstone hill slopes
	
Area Mapped	20 ha
Quadrats Sampled	x187
Location	Located on mid ironstone hill slopes found in the central east of the study area
Leaf Litter Cover (%)	<5
Bare Ground (%)	65
Soils and Geology	Ironstone
Land System	Newman
Land Form	Hill slopes, ironstone
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	None
Average Fire Age	Old
Characteristics	Characterised by *Acacia rhodophloia* dominated shrublands, with an *Eremophila* understorey
Vegetation Structure & Floristics	
Tall Shrubs >2m	*Acacia rhodophloia*
Low Shrubs <1m	*Eremophila exilifolia*
Hummock Grasses	*Triodia* sp. Shovelanna Hill

Broad Floristic Formation	**10j *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia* sp. Shovelanna Hill with High Shrubland of *Acacia ancistrocarpa*, *Grevillea wickhamii* subsp. *hispidula* and *Acacia bivenosa* over Low Open Shrubland of *Acacia hilliana* in red brown silty loam on footslopes

Area Mapped	510 ha
Quadrats Sampled	2, 9, x27, x30, x39, x49
Location	Common throughout the entire study area, concentrated in a band running from east to west in the northern and southern sections of the study area concentrated on footslopes of the main ranges
Leaf Litter Cover (%)	<2
Bare Ground (%)	40-45
Soils and Geology	Red brown silty loam, Ironstone BIF, Chert, outcrops, cobbles, pebbles
Land System	Boolgeeda, Newman
Land Form	Footslopes
Priority Ecological Community	None
Rare Flora	*Acacia* sp. nov (reticulate/anastoming)
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Mining exploration, current drilling activity, livestock
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Acacia* shrublands, 10-30% over *Triodia* sp. Shovelanna Hill
Vegetation Structure & Floristics	
Trees <10m	*Acacia pruinocarpa*
Mallee	*Eucalyptus gamophylla*
Tall Shrubs >2m	*Acacia ancistrocarpa, Grevillea wickhamii* subsp. *hispidula, Acacia bivenosa*
Shrubs 1-2m	*Acacia trudgeniana, Acacia tenuissima*
Low Shrubs <1m	*Acacia hilliana*
Hummock Grasses	*Triodia* sp. Shovelanna Hill

Broad Floristic Formation	**10k *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia* sp. Shovelanna Hill with High Shrubland of *Acacia wanyu*, *Acacia bivenosa* and *Grevillea wickhamii* subsp. *hispidula* over Open Shrubland of *Senna glutinosa* subsp. x *luerssenii* in brown silty loam on footslopes and lower hill slopes
	
Area Mapped	206 ha
Quadrats Sampled	30, x163
Location	Located on footslopes found in the northern and central eastern sections of the study area
Leaf Litter Cover (%)	5
Bare Ground (%)	45
Soils and Geology	Brown silty loam, Ironstone BIF, outcrops, cobbles, pebbles
Land System	Newman, Boolgeeda
Land Form	Footslopes, lower hill slopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	Mining exploration, current drilling activity
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Acacia wanyu* dominated footslopes on *Triodia* sp. Shovelanna Hill
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Eucalyptus leucophloia* subsp. *leucophloia*
Tall Shrubs >2m	*Acacia wanyu, Acacia bivenosa, Grevillea wickhamii* subsp. *hispidula*
Shrubs 1-2m	*Senna glutinosa* subsp. x *luerssenii*
Hummock Grasses	*Triodia* sp. Shovelanna Hill

Broad Floristic Formation	**10l *Triodia* Hummock Grassland**
Vegetation Association	Hummock Grassland of *Triodia* sp. Shovelanna Hill with Low Shrubland of *Acacia hilliana*, *Acacia adoxa* var. *adoxa* and *Halgania solanacea* with High Open Shrubland of *Grevillea wickhamii* subsp. *hispidula*, *Acacia marramamba* and *Grevillea berryana* in red brown silty loam on hill crests and slopes

Area Mapped	632 ha
Quadrats Sampled	4, 13, 14, 16, 21, 23, 27, 42
Location	Located on hillcrests and slopes of the main range found across the entire OB 31 Study area.
Leaf Litter Cover (%)	<2
Bare Ground (%)	50-55
Soils and Geology	Red brown silty loam, Ironstone BIF (some pisolitic), dolerite/granite outcrops, cobbles, pebbles
Land System	Newman, Boolgeeda, Washplain
Land Form	Hill crests and slopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Good
Disturbances	Mining exploration, current drilling activity, dust, frequent fire, access tracks, livestock
Average Fire Age	Moderate (3-5 years)
Characteristics	Characterised by Scattered to High Open Shrublands of *Acacia* and *Grevillea* species over *Triodia* sp. Shovelanna Hill. *Acacia hilliana* often occurs as groves of Low Open Heath
Vegetation Structure & Floristics	
Tall Shrubs >2m	*Grevillea wickhamii* subsp. *hispidula, Acacia marramamba, Grevillea berryana*
Low Shrubs <1m	*Acacia hilliana, Acacia adoxa* var. *adoxa, Halgania solanacea*
Hummock Grasses	*Triodia* sp. Shovelanna Hill

Broad Floristic Formation	**11a *Triodia* Open Hummock Grassland**
Vegetation Association	Open Hummock Grassland of *Triodia basedowii* and *Triodia pungens* over Open Tussock Grassland of *Aristida inaequiglumis, Themeda triandra* and *Digitaria brownii* with Low Open Woodland of *Corymbia hamersleyana* in brown clayey sand on loamy drainage zones adjacent to floodplains

Area Mapped	31 ha
Quadrats Sampled	11, x129
Location	Located on drainage zones adjacent to floodplains found in narrow sections found in the south of the OB 31 Study area.
Leaf Litter Cover (%)	2-10
Bare Ground (%)	35
Soils and Geology	Brown clayey sand, Ironstone BIF gravel
Land System	Boolgeeda
Land Form	Loamy drainage zones, adjacent to Mulga flats.
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Good
Disturbances	Mining exploration, current drilling activity
Average Fire Age	Old (6+ years)
Characteristics	Characterised by *Corymbia hamersleyana* dominated floodplains; no Mulga; Mixed *Acacia* shrublands with mixed Tussock/ Hummock grasslands
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana*
Tall Shrubs >2m	*Acacia ancistrocarpa, Acacia bivenosa, Acacia adsurgens*
Hummock Grasses	*Triodia basedowii, Triodia pungens*
Tussock Grasses	*Aristida inaequiglumis, Themeda triandra, Digitaria brownii*

Broad Floristic Formation	**11b *Triodia* Open Hummock Grassland**
Vegetation Association	Open Hummock Grassland of *Triodia basedowii* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and *Corymbia hamersleyana* and High Open Shrubland of *Eremophila platycalyx*, *Acacia wanyu* and *Acacia synchronicia* on stony rises, plains and footslopes

Area Mapped	43 ha
Quadrats Sampled	x192
Location	Located in one comparatively extensive area in the south-east corner of the study area
Leaf Litter Cover (%)	N/A
Bare Ground (%)	N/A
Soils and Geology	N/A
Land System	Boolgeeda
Land Form	Stony rises, plains, footslopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	N/A
Average Fire Age	N/A
Characteristics	Characterised by presence of *Eremophila platycalyx* and *Acacia synchronicia* as dominant shrubs with mixed *Triodia* and Mulga species
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia pruinocarpa, Corymbia hamersleyana*
Tall Shrubs >2m	*Eremophila platycalyx, Acacia wanyu, Acacia synchronicia*
Hummock Grasses	*Triodia basedowii, Triodia* sp. Shovelanna Hill
Bunch Grasses	*Aristida contorta*

Broad Floristic Formation	**11c *Triodia* Open Hummock Grassland**
Vegetation Association	Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Corymbia ferriticola* and *Eucalyptus leucophloia* subsp. *leucophloia* and Open Shrubland of *Astrotricha hamptonii*, *Dodonaea pachyneura* and *Acacia maitlandii* on faces of large open ravines and occasionally cliffs
	
Area Mapped	11 ha
Quadrats Sampled	x19
Location	Located in three distinct areas of ravines and cliffs in close proximity to each other restricted to a location in the central south east of the study area.
Leaf Litter Cover (%)	10
Bare Ground (%)	40
Soils and Geology	Ironstone BIF
Land System	Newman
Land Form	Large open ravines with occasional cliffs
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	None
Average Fire Age	Old
Characteristics	Characterised by *Corymbia ferriticola* as a tree component, and typical cliff dwelling species of the Pilbara (e.g. *Astrotricha hamptonii*, *Ficus brachpoda*)
Vegetation Structure & Floristics	
Trees <10m	*Corymbia ferriticola, Eucalyptus leucophloia* subsp. *leucophloia*
Shrubs 1-2m	*Astrotricha hamptonii, Dodonaea pachyneura, Acacia maitlandii*
Hummock Grasses	*Triodia pungens, Triodia* sp. Shovelanna Hill
Tussock Grasses	*Eriachne mucronata*

Broad Floristic Formation	**12 *Themeda* Closed Tussock Grassland**
Vegetation Association	Closed Tussock Grassland of *Themeda triandra* and *Eulalia aurea* with Low Open Woodland of *Hakea lorea* subsp. *lorea*, *Acacia aptaneura* and *Corymbia aspera* and Open Shrubland of *Acacia pyrifolia* var. *pyrifolia* and *Acacia ancistrocarpa* in orange clay loam, sandy on plains and drainage zones

Area Mapped	7 ha
Quadrats Sampled	36, x135
Location	Found in a single sandy drainage zone in the extreme south-west corner of the study area.
Leaf Litter Cover (%)	2-10
Bare Ground (%)	17
Soils and Geology	Orange clay loam, sandy
Land System	Washplain
Land Form	Plain, drainage zone
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Livestock
Average Fire Age	Moderate (3-5 years)
Characteristics	Characterised by dense *Themeda* grasslands rather than mixed Tussock species.
Vegetation Structure & Floristics	
Trees <10m	*Hakea lorea* subsp. *lorea, Acacia aptaneura, Corymbia aspera*
Shrubs 1-2m	*Acacia pyrifolia* var. *pyrifolia, Acacia ancistrocarpa*
Tussock grasses	*Themeda triandra, Eulalia aurea*

Broad Floristic Formation	**13a *Themeda* Tussock Grassland**
Vegetation Association	Tussock Grassland of *Themeda triandra*, *Digitaria brownii* and *Aristida inaequiglumis* with Low Woodland of *Acacia aptaneura* and *Corymbia hamersleyana* and Very Open Hummock Grassland of *Triodia basedowii* in orange light clay on clay drainage zones and floodplains

Area Mapped	122 ha
Quadrats Sampled	10, x34, x36, x40
Location	Located on extensive drainage zones and floodplains found in the south of the OB 31 Study area.
Leaf Litter Cover (%)	2-10
Bare Ground (%)	25
Soils and Geology	Orange light clay, Ironstone BIF, chert pebbles, gravel
Land System	Washplain, Boolgeeda
Land Form	Clay Drainage Zones/ Mulga flats
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Good
Disturbances	Livestock, drilling activity
Average Fire Age	Moderate (3-5 years)
Characteristics	Characterised by *Corymbia hamersleyana* and *Acacia aptaneura* forest over mixed tussock grasslands; sometimes has bare ground
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Corymbia hamersleyana*
Shrubs 1-2m	*Acacia ancistrocarpa, Eremophila forrestii subsp. forrestii*
Low Shrubs <1m	*Isotropis forrestii, Ptilotus obovatus, Sida platycalyx*
Hummock Grasses	*Triodia basedowii*
Tussock Grasses	*Themeda triandra, Digitaria brownii, Aristida inaequiglumis*

Broad Floristic Formation	**13b *Themeda* Tussock Grassland**
Vegetation Association	Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Digitaria brownii* with Low Open Woodland (to Low Woodland) of *Acacia aptaneura* and *Acacia paraneura* and Open Shrubland of *Eremophila fraseri* on floodplains

Area Mapped	60 ha
Quadrats Sampled	x33, x139, x140
Location	Located on broad, wide floodplains found in the south-western section of the study area
Leaf Litter Cover (%)	15
Bare Ground (%)	40
Soils and Geology	Red brown loam or sandy loam
Land System	Washplain
Land Form	Floodplains, Drainage Plains, Mulga Flats
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Grazing, fire
Average Fire Age	Moderate to Old
Characteristics	Characterised by *Eremophila fraseri* as an understorey component under Mulga Woodlands; tussock rather than hummock grasslands.
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Acacia paraneura*
Shrubs 1-2m	*Eremophila fraseri*
Low Shrubs <1m	*Senna artemisiodes* subsp. *helmsii, Isotropis forrestii*
Tussock Grasses	*Themeda triandra, Eulalia aurea, Digitaria brownii*

Broad Floristic Formation	**13c *Themeda* Tussock Grassland**
Vegetation Association	Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Digitaria brownii* with Low Woodland (to Low Open Woodland) of *Acacia aptaneura*, *Eucalyptus xerothermica* and *Corymbia hamersleyana* and Low Open Shrubland of *Isotropis forrestii* and *Ptilotus obovatus* on drainage zones and flats
	
Area Mapped	54 ha
Quadrats Sampled	x185
Location	Found in one location as a broad drainage zone and flats located in the central south of the study area
Leaf Litter Cover (%)	5
Bare Ground (%)	60
Soils and Geology	Red brown loam
Land System	Washplain
Land Form	Drainage zones/ flats
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Grazing
Average Fire Age	Moderate to Old
Characteristics	Characterised by the presence of *Eucalyptus xerothermica* in Mulga woodlands. This species was rarely found throughout the study area. This is similar to Vegetation Association 13a but with *Eucalyptus xerothermica*
Vegetation Structure & Floristics	
Trees <10m	*Acacia aptaneura, Eucalyptus xerothermica, Corymbia hamersleyana*
Low Shrubs <1m	*Isotropis forrestii, Ptilotus obovatus*
Hummock Grasses	*Triodia pungens*
Tussock Grasses	*Themeda triandra, Eulalia aurea, Digitiaria brownii*

Broad Floristic Formation	**14** ***Eragrostis*** **Tussock Grassland**
Vegetation Association	Tussock Grassland of *Eragrostis eriopoda*, *Paraneurachne muelleri* and *Aristida contorta* with Low Open Woodland of *Corymbia hamersleyana*, *Hakea lorea* subsp. *lorea* and *Corymbia aspera* and Open Shrubland of *Acacia melleodora* and *Senna artemisioides* subsp. *oligophylla* on gently sloping sandy loam plains

Area Mapped	23 ha
Quadrats Sampled	x137, x138
Location	Found as an isolated gently sloping plain located in the south-west corner of the study area
Leaf Litter Cover (%)	10
Bare Ground (%)	40
Soils and Geology	Orange sandy loam
Land System	Washplain
Land Form	Sandy loam plain, gently sloping
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Very Good
Disturbances	Grazing
Average Fire Age	Old
Characteristics	Characterised by different suite of Tussock grasslands dominated by *Eragrostis eriopoda*
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana, Hakea lorea* subsp. *lorea, Corymbia aspera*
Shrubs 1-2m	*Acacia melleodora, Senna artemisioides* subsp. *oligophylla*
Low Shrubs <1m	*Ptilotus obovatus*
Tussock Grasses	*Eragrostis eriopoda, Paraneurachne muelleri, Aristida contorta*

Broad Floristic Formation	**15 *_Cenchrus_ Tussock Grassland**
Vegetation Association	Tussock Grassland of **Cenchrus ciliaris* with Low Open Woodland of *Acacia citrinoviridis*, *Acacia aptaneura* and *Corymbia hamersleyana* and High Shrubland of *Gossypium robinsonii*, *Acacia pyrifolia* var. *pyrifolia* and *Petalostylis labicheoides* on sandy floodplain
	
Area Mapped	5 ha
Quadrats Sampled	x190
Location	Found as a southern sandy floodplain of the medium drainage line located in the south-eastern corner of the study area
Leaf Litter Cover (%)	5
Bare Ground (%)	60
Soils and Geology	Sand
Land System	Boolgeeda
Land Form	Sandy floodplain.
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Good
Disturbances	Grazing by cattle, weeds
Average Fire Age	Moderate to Old
Characteristics	Characterised by **Cenchrus ciliaris* dominated floodplain with *Acacia citrinoviridis* as a characteristic tree species
Vegetation Structure & Floristics	
Trees <10m	*Acacia citrinoviridis, Acacia aptaneura, Corymbia hamersleyana*
Tall Shrubs >2m	*Gossypium robinsonii, Acacia pyrifolia* var. *pyrifolia, Petalostylis labicheoides*
Hummock Grasses	*Triodia pungens*
Tussock Grasses	**Cenchrus ciliaris*

3.8 Vegetation Condition

Vegetation condition within the study area ranged from excellent to good, with the largest proportion (71%) of vegetation associations rated as very good (Figure 9). Three vegetation associations were rated in excellent condition (2a, 10k, 11c); these were associated with stony plains, footslopes and cliffs/ravines. Seven vegetation associations were rated in good condition (5a, 10e, 10f, 10l, 11a, 13a, 15); these were generally associated with lowland habitats such as floodplains, sandy loam plains and sandy drainage zones that were subject to higher levels of grazing by domestic stock, and associated issues such as surface erosion and introduction of weeds.

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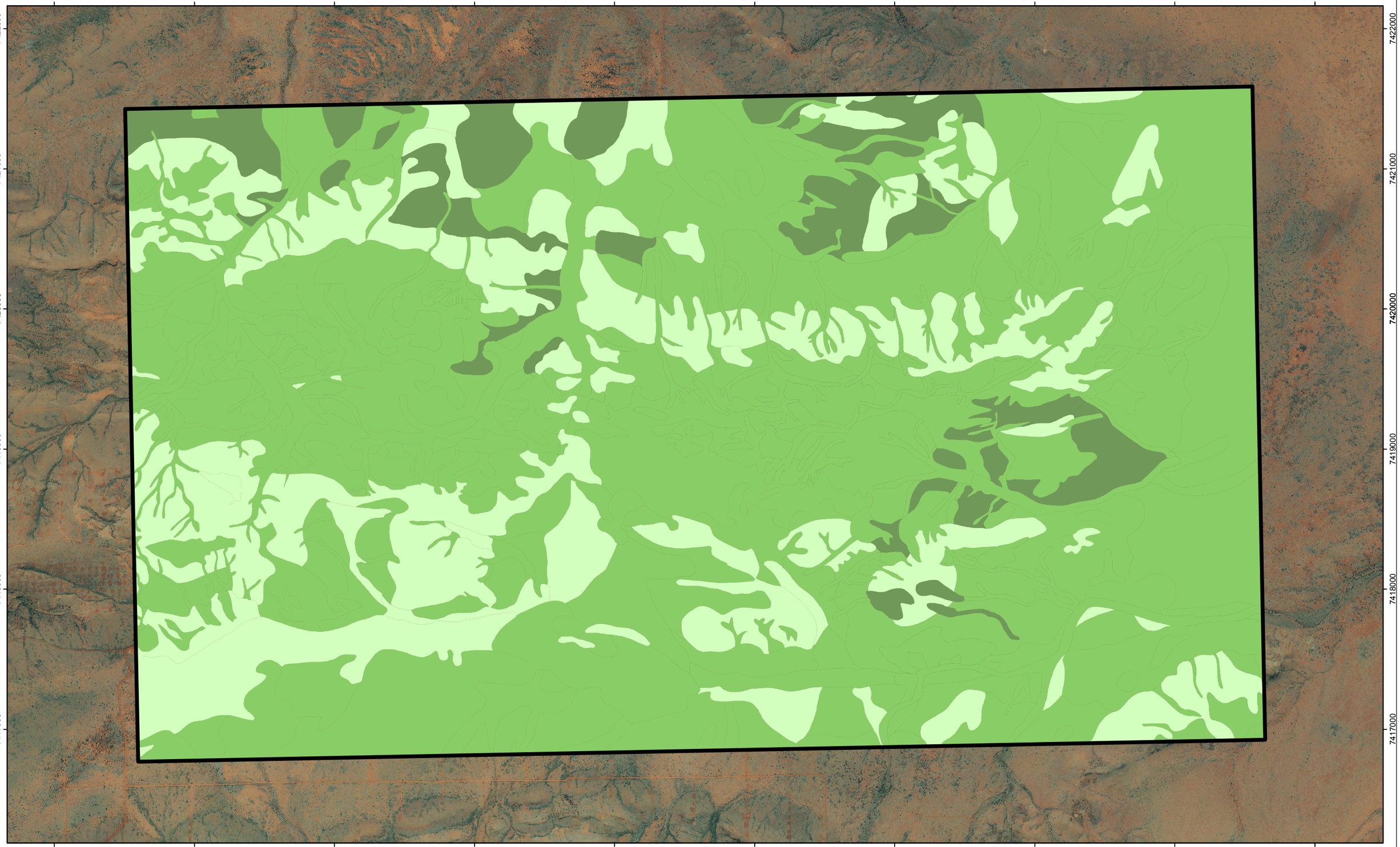

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ONSHORE ENVIRONMENTAL

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Projection: MGA Zone 51

BHPBIO

OB31
VEGETATION CONDITION

FIGURE

Legend

Study Area

Vegetation Condition

- Excellent
- Very Good
- Good

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4.0 SUMMARY

The second season survey of a 33.35 km^2 study area encompassing OB31 was completed by Onshore Environmental between the 1st and 14th October 2013. A total number of 273 plant taxa (including varieties and subspecies) from 34 families and 109 genera were recorded from the study area. Species representation was greatest among the Fabaceae, Poaceae, Malvaceae, Chenopodiaceae, Asteraceae, Amaranthaceae, Scrophulariaceae Myrtaceae and Goodeniaceae families, which is typical for the Pilbara Bioregion. The most speciose genus was *Acacia* (36 taxa), followed by *Senna* (11 taxa), *Sida* (11 taxa), *Eremophila* (10 taxa), *Ptilotus* (8 taxa), *Eragrostis* (8 taxa), *Maireana* (8 taxa), *Triodia* (7 taxa), *Hibiscus* (7 taxa), *Eriachne* (6 taxa), *Abutilon* (6 taxa), *Sclerolaena* (6 taxa), *Goodenia* (5 taxa) and *Aristida* (5 taxa).

There were no plant taxa gazetted as Threatened Flora pursuant to the WC Act, or listed under the EPBC Act. There was one Priority 3 flora species recorded from two point locations at the north-western fringe of the study area; *Rhagodia* sp. Hamersley (M. Trudgen 17794). Plants occurred as scattered tall shrubs on flood plains in association with *Acacia ancistrocarpa* and *Acacia aptaneura* High Shrubland over *Triodia basedowii* Hummock Grassland.

A second plant taxon was identified as a species of interest, *Acacia* sp. nov (reticulate/anastomosing). Expert *Acacia* taxonomist Mr Bruce Maslin was unable to match field samples from the study area with any collections housed at the Western Australia Herbarium (WAH), nor was there any match identified from the wattle key. It will be important to collect additional flowering and fruiting specimens over the coming season to assist with species identification confirmation or description of the new taxon. It was recorded as scattered mid shrubs from three points in the north-west corner of the study area, occurring on rocky low hill crests amongst low undulating hills that had been burnt within the past three years. Associated vegetation was described as Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835) with Open Shrubland of *Grevillea berryana* and *Acacia* sp. nov (reticulate/anastomosing) over Low Open Shrubland of *Senna stricta, Ptilotus rotundifolius* and *Ptilotus calostachyus.*

There were two introduced (weed) species recorded as scattered individuals from lower lying landforms in the study area, including footslopes, plains and drainage lines; **Cenchrus ciliaris* (Buffel Grass) and **Malvastrum americanum* (Spiked Malvastrum). Neither of these taxa is listed as a Declared Pest under the BAM Act.

A total of 35 vegetation associations were described and mapped within the study area. Vegetation condition ranged from excellent to good, with the largest proportion of the study area rated as very good. The vegetation associations were classified into the following 15 Broad Floristic Formations on the basis of dominant vegetation stratum. None of the vegetation associations had any affiliation with Federal or State listed TECs, or State listed PECs.

5.0 STUDY TEAM

The Level 2 flora and vegetation survey of the study area was planned, co-ordinated and executed by the following personnel:

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APPENDIX 1

Conservation Codes for Western Australian Flora.

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

1: Priority One - Poorly Known Taxa

Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

2: Priority Two - Poorly Known Taxa

Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.

3: Priority Three - Poorly Known Taxa

Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

4: Priority Four - Rare, Near Threatened and other taxa in need of monitoring

(a) **Rare.** Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
(b) **Near Threatened**. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
(c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5: Priority Five - Conservation Dependent taxa

Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

APPENDIX 2

Conservation categories for flora described under the EPBC Act.

CATEGORY	DESCRIPTION
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A species is categorised as extinct in the wild if it is only known to survive in cultivations, in captivity, or as a naturalised population well outside its past range; or if it has not been recorded in its known/expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	The species is facing an extremely high risk of extinction in the wild and in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival, or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Conservation Dependent	The species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

APPENDIX 3

Vegetation Classifications for the Pilbara based on Specht (1970), as modified by Aplin (1979) and Trudgen (2009).

Height Class	Canopy Cover				
	100 - 70%	70 - 30%	30 - 10%	10 - 2%	< 2%
Trees > 30 m	High Closed Forest	High Open Forest	High Woodland	High Open Woodland	Scattered Tall Trees
Trees 10-30 m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees < 10 m	Low Closed Woodland	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Mallee	Closed Mallee	Mallee	Open Mallee	Very Open Mallee	Scattered Mallees
Shrubs > 2 m	Closed Scrub	Open Scrub	High Shrubland	High Open Shrubland	Scattered Tall Shrubs
Shrubs 1-2 m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs < 1 m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Low Scattered Shrubs
Hummock Grass	Closed Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Very Open Hummock Grassland	Scattered Hummock Grass
Tussock Grass	Closed Tussock Grassland	Tussock Grassland	Open Tussock Grassland	Very Open Tussock Grassland	Scattered Tussock Grass
Bunch Grass	Closed Bunch Grassland	Bunch Grassland	Open Bunch Grassland	Very Open Bunch Grassland	Scattered Bunch Grass
Sedges	Closed Sedges	Sedges	Open Sedges	Very Open Sedges	Scattered Sedges
Herbs	Closed Herbs	Herbs	Open Herbs	Very Open Herbs	Scattered Herbs

Source: S. Van Leeuwen (DPaW)

APPENDIX 4

Vegetation condition scale
(as developed by Keighery 1994)

CONDITION	CODE	DESCRIPTION
Pristine	1	Pristine or nearly so, no obvious signs of disturbance.
Excellent	2	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	3	Vegetation structure altered; obvious signs of disturbance.
Good	4	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
Degraded	5	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching Very Good condition without intensive management.
Completely Degraded	6	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

APPENDIX 5

Total flora list from the Study area

FAMILY	GENUS	SPECIES	SUBSP./VAR.
AIZOACEAE	*Trianthema*	*glossostigma*	
AIZOACEAE	*Trianthema*	*triquetra*	
AMARANTHACEAE	*Altenanthera*	*nodiflora*	
AMARANTHACEAE	*Gomphrena*	*kanisii*	
AMARANTHACEAE	*Gomphrena*	sp. indet.	
AMARANTHACEAE	*Ptilotus*	*aervoides*	
AMARANTHACEAE	*Ptilotus*	*astrolasius*	
AMARANTHACEAE	*Ptilotus*	*calostachyus*	
AMARANTHACEAE	*Ptilotus*	*gomphrenoides*	
AMARANTHACEAE	*Ptilotus*	*nobilis*	
AMARANTHACEAE	*Ptilotus*	*obovatus*	
AMARANTHACEAE	*Ptilotus*	*rotundifolius*	
AMARANTHACEAE	*Ptilotus*	*schwartzii*	var. *schwartzii*
APOCYNACEAE	*Sarcostemma*	*viminale*	subsp. *australe*
ARALIACEAE	*Astrotricha*	*hamptonii*	
ARALIACEAE	*Trachymene*	*oleracea*	
ASTERACEAE	*Blumea*	*tenella*	
ASTERACEAE	*Calocephalus*	sp. indet.	
ASTERACEAE	*Chrysocephalum*	*pterochaetum*	
ASTERACEAE	*Pluchea*	*dentex*	
ASTERACEAE	*Pluchea*	*dunlopii*	
ASTERACEAE	*Pluchea*	*ferdinandi-muelleri*	
ASTERACEAE	*Pterocaulon*	*sphacelatum*	
ASTERACEAE	*Pterocaulon*	*sphacelatum*	
ASTERACEAE	*Rutidosis*	*helichrysoides*	
ASTERACEAE	*Streptoglossa*	*bubakii*	
ASTERACEAE	*Streptoglossa*	sp. indet.	
BORAGINACEAE	*Heliotropium*	*inexplicitum*	
BORAGINACEAE	*Trichodesma*	*zeylanicum*	subsp. *zeylanicum*
BRASSICACEAE	*Lepidium*	*platypetalum*	
BRASSICACEAE	*Lepidium*	*muelleri-ferdinandii*	
BRASSICACEAE	*Lepidium*	*pedicellosum*	
BRASSICACEAE	*Stenopetalum*	cf. *anfractum*	
CHENOPODIACEAE	*Atriplex*	*sp. indet*	
CHENOPODIACEAE	*Atriplex*	*codonocarpa*	
CHENOPODIACEAE	*Dysphania*	*glomulifera*	
CHENOPODIACEAE	*Dysphania*	*rhadinostachya*	
CHENOPODIACEAE	*Enchylaena*	*tomentosa*	
CHENOPODIACEAE	*Frankenia*	*setosa*	
CHENOPODIACEAE	*Maireana*	*carnosa*	
CHENOPODIACEAE	*Maireana*	*georgei*	
CHENOPODIACEAE	*Maireana*	*melanocoma*	
CHENOPODIACEAE	*Maireana*	*pyramidata*	
CHENOPODIACEAE	*Maireana*	*tomentosa*	
CHENOPODIACEAE	*Maireana*	*thesioides*	
CHENOPODIACEAE	*Maireana*	*triptera*	
CHENOPODIACEAE	*Maireana*	*villosa*	
CHENOPODIACEAE	*Rhagodia*	*eremaea*	
CHENOPODIACEAE	*Rhagodia*	sp. Hamersley (M.E. Trudgen 17794)	

FAMILY	GENUS	SPECIES	SUBSP./VAR.
CHENOPODIACEAE	*Salsola*	*australis*	
CHENOPODIACEAE	*Sclerolaena*	*burbidgeae*	
CHENOPODIACEAE	*Sclerolaena*	cf. *convexula*	
CHENOPODIACEAE	*Sclerolaena*	*cornishiana*	
CHENOPODIACEAE	*Sclerolaena*	*cuneata*	
CHENOPODIACEAE	*Sclerolaena*	*densiflora*	
CHENOPODIACEAE	*Sclerolaena*	*eriacantha*	
CHENOPODIACEAE	*Tecticornia*	*disarticulata*	
CLEOMACEAE	*Cleome*	*viscosa*	
CONVOLVULACEAE	*Bonamia*	*erecta*	
CONVOLVULACEAE	*Duperreya*	*commixta*	
CONVOLVULACEAE	*Evolvulus*	*alsinoides*	var. *decumbens*
CYPERACEAE	*Bulbostylis*	*barbata*	
CYPERACEAE	*Fimbristylis*	*dichotoma*	
CYPERACEAE	*Fimbristylis*	cf. *microcarya*	
CYPERACEAE	*Fimbrystylis*	sp. indet	
EUPHORBIACEAE	*Euphorbia*	*australis*	subsp. *hispidula*
EUPHORBIACEAE	*Euphorbia*	*boophthona*	
EUPHORBIACEAE	*Euphorbia*	cf. *trigonosperma*	
FABACEAE	*Acacia*	*adoxa*	var. *adoxa*
FABACEAE	*Acacia*	*adsurgens*	
FABACEAE	*Acacia*	*ancistrocarpa*	
FABACEAE	*Acacia*	*aneura*	
FABACEAE	*Acacia*	*aptaneura*	
FABACEAE	*Acacia*	*ayersiana*	
FABACEAE	*Acacia*	*balsamea*	
FABACEAE	*Acacia*	*bivenosa*	
FABACEAE	*Acacia*	*catenulata*	subsp. *occidentalis*
FABACEAE	*Acacia*	*citrinoviridis*	
FABACEAE	*Acacia*	*clelandii*	
FABACEAE	*Acacia*	*dictyophleba*	
FABACEAE	*Acacia*	*elachantha*	
FABACEAE	*Acacia*	*hilliana*	
FABACEAE	*Acacia*	*hilliana x monticola*	
FABACEAE	*Acacia*	*kempeana*	
FABACEAE	*Acacia*	*maitlandii*	
FABACEAE	*Acacia*	*marramamba*	
FABACEAE	*Acacia*	*melleodora*	
FABACEAE	*Acacia*	*monticola*	
FABACEAE	*Acacia*	*pachyacra*	
FABACEAE	*Acacia*	*paraneura*	
FABACEAE	*Acacia*	*pruinocarpa*	
FABACEAE	*Acacia*	*pteraneura*	
FABACEAE	*Acacia*	*pyrifolia*	var. *pyrifolia*
FABACEAE	*Acacia*	sp. nov (reticulate/anostoming)	
FABACEAE	*Acacia*	*rhodophloia*	
FABACEAE	*Acacia*	*sericophylla*	
FABACEAE	*Acacia*	*sibirica*	

FAMILY	GENUS	SPECIES	SUBSP./VAR.
FABACEAE	*Acacia*	sp. Jimblebar (S. van Leeuwen 1342)	
FABACEAE	*Acacia*	*subcontorta*	
FABACEAE	*Acacia*	*synchronicia*	
FABACEAE	*Acacia*	*tenuissima*	
FABACEAE	*Acacia*	*tetragonophylla*	
FABACEAE	*Acacia*	*trudgeniana*	
FABACEAE	*Acacia*	*wanyu*	
FABACEAE	*Aenictophyton*	*reconditum*	subsp. *macrophyllum*
FABACEAE	*Aeschynomene*	*indica*	
FABACEAE	*Crotalaria*	*medicaginea*	
FABACEAE	*Gompholobium*	*oreophilum*	
FABACEAE	*Indigofera*	*georgei*	
FABACEAE	*Indigofera*	*monophylla*	
FABACEAE	*Isotropis*	*atropurpurea*	
FABACEAE	*Isotropis*	*forrestii*	
FABACEAE	*Kennedia*	*prorepens*	
FABACEAE	*Leptosema*	*chambersii*	
FABACEAE	*Mirbelia*	*viminalis*	
FABACEAE	*Petalostylis*	*cassioides*	
FABACEAE	*Petalostylis*	*labicheoides*	
FABACEAE	*Senna*	*artemisioides*	subsp. *filiformis*
FABACEAE	*Senna*	*artemisioides*	subsp. *helmsii*
FABACEAE	*Senna*	*artemisioides*	subsp. *oligophylla*
FABACEAE	*Senna*	*artemisioides*	subsp. *oligophylla x helmsii*
FABACEAE	*Senna*	*glutinosa*	subsp. *glutinosa*
FABACEAE	*Senna*	*glutinosa*	subsp. x *luerssenii*
FABACEAE	*Senna*	*glutinosa*	subsp. *pruinosa*
FABACEAE	*Senna*	*notabilis*	
FABACEAE	*Senna*	*stricta*	
FABACEAE	*Senna*	*sericea*	
FABACEAE	*Senna*	sp. Meekatharra (E. Bailey 1-26)	
FABACEAE	*Tephrosia*	*rosea*	var. Fortescue creeks (M.I.H. Brooker 2186)
FRANKENIACEAE	*Frankenia*	*setosa*	
GOODENIACEAE	*Goodenia*	sp. indet	
GOODENIACEAE	*Goodenia*	sp. Sandy Creek (R.D. Royce 1653)	
GOODENIACEAE	*Goodenia*	*stobbsiana*	
GOODENIACEAE	*Goodenia*	*triodiophila*	
GOODENIACEAE	*Goodenia*	*vilmoriniae*	
GOODENIACEAE	*Scaevola*	*browniana*	
GOODENIACEAE	*Scaevola*	*parvifolia*	subsp. *pilbarae*
GOODENIACEAE	*Scaevola*	*spinescens*	
GYROSTEMONACEAE	*Codonocarpus*	*continifolius*	
LAMIACEAE	*Clerodendrum*	*floribundum*	subsp. *angustifolium*

FAMILY	GENUS	SPECIES	SUBSP./VAR.
LAMIACEAE	*Dicrastylis*	*cordifolia*	
LAMIACEAE	*Newcastelia*	*hexarrhena*	
LAURACEAE	*Cassytha*	*capillaris*	
LORANTHACEAE	*Amyema*	*hilliana*	
LORANTHACEAE	*Amyema*	sp. indet.	
MALVACEAE	*Abutilon*	*cryptopetalum*	
MALVACEAE	*Abutilon*	*cunninghamii*	
MALVACEAE	*Abutilon*	*lepidum*	
MALVACEAE	*Abutilon*	*macrum*	
MALVACEAE	*Abutilon*	*otocarpum*	
MALVACEAE	*Abutilon*	sp. indet.	
MALVACEAE	*Androcalva*	*luteiflora*	
MALVACEAE	*Corchorus*	sp. Hamersley Range hilltops (S. van Leeuwen 3826)	
MALVACEAE	*Corchorus*	*sidoides*	
MALVACEAE	*Gossypium*	*robinsonii*	
MALVACEAE	*Halgania*	*gustafsenii*	
MALVACEAE	*Halgania*	*solanacea*	var. Mt Doreen (G.M. Chippendale 4206)
MALVACEAE	*Hibiscus*	*brachychlaenus*	
MALVACEAE	*Hibiscus*	*burtonii*	
MALVACEAE	*Hibiscus*	*coatesii*	
MALVACEAE	*Hibiscus*	cf. *leptocladus*	
MALVACEAE	*Hibiscus*	*sturtii*	var. *platychlamys*
MALVACEAE	*Hibiscus*	*sturtii*	var. *truncata*
MALVACEAE	*Hibiscus*	*sturtii*	var. *campylochlamys*
MALVACEAE	*Keraudrenia*	*nephrosperma*	
MALVACEAE	*Keraudrenia*	*velutina*	subsp. *elliptica ms*
MALVACEAE	**Malvastrum*	*americanum*	
MALVACEAE	*Melhania*	*oblongifolia*	
MALVACEAE	*Sida*	*arenicola*	
MALVACEAE	*Sida*	*cardiophylla*	
MALVACEAE	*Sida*	*echinocarpa*	
MALVACEAE	*Sida*	*ectogama*	
MALVACEAE	*Sida*	*fibulifera*	
MALVACEAE	*Sida*	*platycalyx*	
MALVACEAE	*Sida*	sp. Pilbara (A.A. Mitchell PRP 1543)	
MALVACEAE	*Sida*	sp. indet.	
MALVACEAE	*Sida*	sp. Golden calyces glabrous (H.N. Foote 32)	
MALVACEAE	*Sida*	sp. spiciform panicles (E. Leyland s.n. 14/8/90)	
MALVACEAE	*Sida*	sp. verrucose glands (F.H. Mollemans 2423)	
MALVACEAE	*Triumfetta*	*chaetocarpa*	
MORACEAE	*Ficus*	*brachypoda*	
MYRTACEAE	*Calytrix*	*carinata*	

FAMILY	GENUS	SPECIES	SUBSP./VAR.
MYRTACEAE	*Corymbia*	*aspera*	
MYRTACEAE	*Corymbia*	*deserticola*	
MYRTACEAE	*Corymbia*	*ferriticola*	
MYRTACEAE	*Corymbia*	*hamersleyana*	
MYRTACEAE	*Eucalyptus*	*gamophylla*	
MYRTACEAE	*Eucalyptus*	*leucophloia*	subsp. *leucophloia*
MYRTACEAE	*Eucalyptus*	*trivalva*	
MYRTACEAE	*Eucalyptus*	*odontocarpa*	
MYRTACEAE	*Lamarchea*	*sulcata*	
OLEACEAE	*Jasminum*	*didymum*	subsp. *lineare*
PHYLLANTHACEAE	*Phyllanthus*	*erwinii*	
POACEAE	*Amphipogon*	*sericeus*	
POACEAE	*Aristida*	*contorta*	
POACEAE	*Aristida*	*holathera*	var. *holathera*
POACEAE	*Aristida*	*inaequiglumis*	
POACEAE	*Aristida*	*inaequiglumis*	
POACEAE	*Aristida*	sp. indet.	
POACEAE	*Brachyachne*	*prostrata*	
POACEAE	**Cenchrus*	*ciliaris*	
POACEAE	*Chloris*	*pectinata*	
POACEAE	*Chloris*	sp. indet.	
POACEAE	*Chrysopogon*	*fallax*	
POACEAE	*Cymbopogon*	*ambiguus*	
POACEAE	*Cymbopogon*	*obtectus*	
POACEAE	*Dactyloctenium*	*radulans*	
POACEAE	*Dichanthium*	*sericeum*	subsp. *humilis*
POACEAE	*Digitaria*	*ammophila*	
POACEAE	*Digitaria*	*brownii*	
POACEAE	*Enneapogon*	*lindleyanus*	
POACEAE	*Enneapogon*	*polyphyllus*	
POACEAE	*Enteropogon*	*ramosus*	
POACEAE	*Eragrostis*	*cumingii*	
POACEAE	*Eragrostis*	*eriopoda*	
POACEAE	*Eragrostis*	*leptocarpa*	
POACEAE	*Eragrostis*	*pergracilis*	
POACEAE	*Eragrostis*	sp. indet.	
POACEAE	*Eragrostis*	*tenellula*	
POACEAE	*Eragrostis*	*xerophila*	
POACEAE	*Eragrostis*	*dielsii*	
POACEAE	*Eriachne*	*flaccida*	
POACEAE	*Eriachne*	cf. *helmsii*	
POACEAE	*Eriachne*	*lanata*	
POACEAE	*Eriachne*	*mucronata*	
POACEAE	*Eriachne*	*pulchella*	subsp. *dominii*
POACEAE	*Eriachne*	sp. indet.	
POACEAE	*Eulalia*	*aurea*	
POACEAE	*Panicum*	*effusum*	
POACEAE	*Paraneurachne*	*muelleri*	
POACEAE	*Paspalidium*	*clementii*	

FAMILY	GENUS	SPECIES	SUBSP./VAR.
POACEAE	*Schizachyrium*	*fragile*	
POACEAE	*Sporobolus*	*australasicus*	
POACEAE	*Themeda*	*triandra*	
POACEAE	*Triodia*	*angusta*	
POACEAE	*Triodia*	*basedowii*	
POACEAE	*Triodia*	*brizoides*	
POACEAE	*Triodia*	*pungens*	
POACEAE	*Triodia*	*schinzii*	
POACEAE	*Triodia*	sp. Shovelanna Hill (S. van Leeuwen 3835)	
POACEAE	*Triodia*	*melvillei*	
POACEAE	*Triraphis*	*mollis*	
POACEAE	*Yakirra*	*australiensis*	
PROTEACEAE	*Grevillea*	*berryana*	
PROTEACEAE	*Grevillea*	*wickhamii*	subsp. *hispidula*
PROTEACEAE	*Hakea*	*chordophylla*	
PROTEACEAE	*Hakea*	*lorea*	subsp. *lorea*
PTERIDACEAE	*Cheilanthes*	*brownii*	
PTERIDACEAE	*Cheilanthes*	*seiberi*	
RUBIACEAE	*Psydrax*	*latifolia*	
RUBIACEAE	*Psydrax*	*suaveolens*	
RUBIACEAE	*Spermacoce*	*brachystema*	
RUBIACEAE	*Synaptantha*	*tillaeacea*	
SANTALACEAE	*Anthobolus*	*leptomerioides*	
SANTALACEAE	*Santalum*	*lanceolatum*	
SAPINDACEAE	*Dodonaea*	*coriacea*	
SAPINDACEAE	*Dodonaea*	*pachyneura*	
SAPINDACEAE	*Dodonaea*	*petiolaris*	
SCROPHULARIACEAE	*Eremophila*	*compacta*	subsp. *compacta*
SCROPHULARIACEAE	*Eremophila*	*cuneifolia*	
SCROPHULARIACEAE	*Eremophila*	*exilifolia*	
SCROPHULARIACEAE	*Eremophila*	*forrestii*	subsp. *forrestii*
SCROPHULARIACEAE	*Eremophila*	*fraseri*	
SCROPHULARIACEAE	*Eremophila*	*lanceolata*	
SCROPHULARIACEAE	*Eremophila*	*latrobei*	subsp. *filiformis*
SCROPHULARIACEAE	*Eremophila*	*latrobei*	subsp. *latrobei*
SCROPHULARIACEAE	*Eremophila*	*longifolia*	
SCROPHULARIACEAE	*Eremophila*	*platycalyx*	
SOLANACEAE	*Solanum*	*centrale*	
SOLANACEAE	*Solanum*	*horridum*	
SOLANACEAE	*Solanum*	*lasiophyllum*	
SOLANACEAE	*Solanum*	*sturtianum*	
SURIANACEAE	*Stylobasium*	*spathulatum*	
VIOLACEAE	*Hybanthus*	*aurantiacus*	
ZYGOPHYLLACEAE	*Tribulus*	sp. indet.	
ZYGOPHYLLACEAE	*Tribulus*	*suberosus*	

APPENDIX 6

Records of conservation significant flora from the study area

Quadrat or Releve No.	GCS GDA94 Latitude	GCS GDA94 Longitude	Genus	Species
25	204040	7421274	*Rhagodia*	sp. Hamersley (M.E. Trudgen 17794)
24	204510	7421057	*Rhagodia*	sp. Hamersley (M.E. Trudgen 17794)
27	202515	7420127	*Acacia*	sp. nov (reticulate/anastomosing)
x118	201656	7420251	*Acacia*	sp. nov (reticulate/anastomosing)
x120	201677	7420375	*Acacia*	sp. nov (reticulate/anastomosing)

APPENDIX 7

Records for introduced weed species recorded from the Study area

Quadrat	GCS GDA94 Latitude	GCS GDA94 Longitude	Genus	Species
10	203965	7417672	**Cenchrus*	*ciliaris*
29	203075	7418396	**Cenchrus*	*ciliaris*
3	204565	7419850	**Cenchrus*	*ciliaris*
31	208436	7421064	**Cenchrus*	*ciliaris*
36	202093	7416897	**Cenchrus*	*ciliaris*
40	206250	7421100	**Cenchrus*	*ciliaris*
41	209341	7419181	**Cenchrus*	*ciliaris*
7	205046	7418679	**Malvastrum*	*americanum*

APPENDIX 8

Site sheets summarising raw data for quadrats within the study area

Site	Orebody 31 - Site OB31/2-1
Date	11/10/13
Recorder	DR/EP
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	205307
Northing	7420681
Habitat	PLN
Aspect	
Slope	Low
Soil	Loamy Sand
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Open Hummock Grassland of Triodia basedowii with Low Open Woodland of Corymbia hamersleyana over Open Shrubland of Acacia melleodora, Acacia ancistrocarpa, Grevillea wickhamii over Very Open Tussock Grassland of Aristida holathera var. holathera, Paraneurachne muelleri, Themeda triandra

Species			% Cover	Height
Acacia	*adsurgens*		<2	0.60
Acacia	*ancistrocarpa*		2 – 10	1.70
Acacia	*melleodora*		<2	1.50
Acacia	*sericophylla*		<2	1.30
Acacia	*trudgeniana*		2 – 10	2.50
Acacia	*wanyu*		<2	1.20
Androclava	*luteiflora*		<2	2.00
Aristida	*holathera*	var. *holathera*	2 – 10	0.40
Aristida	*inaequiglumis*		<2	0.80
Bonamia	*erecta*		2 – 10	0.40
Cassytha	*capillaris*		<2	0.10
Corchorus	*sidoides*		<2	0.50
Corymbia	*hamersleyana*		<2	3.20
Cymbopogon	*obtectus*		<2	0.40
Digitaria	*brownii*		<2	0.30
Eragrostis	*eriopoda*		<2	0.40
Eulalia	*aurea*		<2	0.60
Grevillea	*wickhamii*		2 – 10	2.30
Hakea	*lorea*	subsp. *lorea*	<2	1.20
Hibiscus	*coatesii*		<2	0.30
Isotropis	*atropurpurea*		<2	1.00
Kennedia	*prorepens*		2 – 10	0.50
Paraneurachne	*muelleri*		2 – 10	0.40
Ptilotus	*astrolasius*		<2	0.40
Ptilotus	*calostachyus*		<2	0.50
Scaevola	*parvifolia*		<2	0.20

Species			% Cover	Height
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.80
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.20
Senna	*stricta*		<2	1.10
Sida	*fibulifera*		<2	0.20
Sida	sp. Pilbara		<2	0.70
Solanum	*centrale*		<2	0.30
Solanum	*lasiophyllum*		<2	0.40
Solanum	*sturtanium*		<2	1.00
Themeda	*triandra*		2 – 10	0.40
Triodia	*basedowii*		11 – 30	0.60
Triodia	*pungens*		<2	0.80

Site	Orebody 31 - Site OB31/2-2
Date	12/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	205124
Northing	7419894
Habitat	HCR
Aspect	
Slope	Low
Soil	Sandy Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Huumock Grassland of Triodia sp. Shovelanna Hill (S. Van leeuwen 3835) with Shrubland of Acacia tenuissima, Grevillea wickhamii, Acacia adsurgens with Highh Open Shrubland of Acacia bivenosa

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	<2	0.80
Acacia	*adsurgens*		2 – 10	1.50
Acacia	*ancistrocarpa*		<2	1.90
Acacia	*aptaneura*		<2	0.80
Acacia	*hilliana*		<2	0.40
Acacia	*marramamba*		2 – 10	2.00
Acacia	*melleodora*		<2	1.40
Acacia	*monticola*		<2	2.00
Acacia	*pruinocarpa*		<2	0.30
Acacia	*sibirica*		<2	1.30
Acacia	*tenuissima*		2 – 10	2.00
Acacia	*tetragonophylla*		<2	1.20
Acacia	*bivenosa*		2 – 10	2.50
Anthobolus	*leptomerioides*		<2	0.80
Aristida	*holathera*	var. *holathera*	<2	0.20
Calytrix	*carinata*		<2	1.50
Cymbopogon	*obtectus*		<2	0.50
Digitaria	*brownii*		<2	0.40
Dodonaea	*coriacea*		<2	0.80
Duperreya	*commixta*		<2	0.10
Eremophila	*forrestii*		<2	0.80
Eremophila	*fraseri*		<2	1.00
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.00
Eulalia	*aurea*		<2	0.50
Goodenia	sp. Sandy Creek		<2	0.40
Goodenia	*triodiophila*		<2	0.20
Grevillea	*berryana*		<2	1.40
Grevillea	*wickhamii*		2 – 10	2.00

Species			% Cover	Height
Hakea	*lorea*	subsp. *lorea*	<2	1.00
Halgania	*solanacea*	var. Mt Doreen	<2	0.40
Hibiscus	*sturtii*	var. *truncata*	<2	0.40
Hybanthus	*aurantiacus*		<2	0.50
Indigofera	*monophylla*		<2	0.40
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	0.40
Ptilotus	*calostachyus*		<2	0.50
Ptilotus	*rotundifolius*		<2	0.50
Senna	*artemisioides*	subsp. *helmsii*	<2	0.80
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.00
Senna	*glutinosa*	subsp. *pruinosa*	<2	1.30
Senna	*stricta*		<2	1.20
Sida	sp. Pilbara		<2	0.60
Tribulus	*suberosus*		<2	1.00
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		30 – 70	0.50

Site	Orebody 31 - Site OB31/2-3
Date	12/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204565
Northing	
Habitat	PLN
Aspect	
Slope	Flat
Soil	Loamy Sand
Rock Type	
% Leaves:Logs	2-10:2-10
Vegetation Condition	Very Good
Disturbance Type	Other
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia basedowii with Shrubland of Acacia melleodora, Acacia adsurgens, Acacia kempeana over Open Tussock Grassland of Paraneurachne muelleri, Aristida holathera var. holathera, Eulalia aurea with Low Open Woodland of Acacia sericophylla, Hakea chordophylla, Acacia aptaneura over High Open Shrubland of Acacia bivenosa, Grevillea wickhamii, Acacia kempeana over Low Open Shrubland of Kennedia prorepens

Species			% Cover	Height
**Cenchrus*	*ciliaris*		<2	0.50
Acacia	*adoxa*	*var. adoxa*	<2	0.50
Acacia	*adsurgens*		2 – 10	1.50
Acacia	*ancistrocarpa*		<2	1.50
Acacia	*aptaneura*		<2	2.50
Acacia	*bivenosa*		2 – 10	3.00
Acacia	*elachantha*		<2	2.50
Acacia	*hilliana*		<2	0.50
Acacia	*kempeana*		2 – 10	2.20
Acacia	*melleodora*		2 – 10	0.40
Acacia	*sericophylla*		<2	3.50
Acacia	*tenuissima*		<2	1.00
Acacia	*tetragonophylla*		<2	1.00
Acacia	*wanyu*		<2	2.00
Anthobolus	*leptomerioides*		<2	1.50
Aristida	*holathera*	*var. holathera*	2 – 10	0.50
Aristida	*inaequiglumis*		<2	1.00
Bonamia	*erecta*		<2	0.30
Cassytha	*capillaris*		<2	0.10
Chrysopogon	*fallax*		<2	0.50
Codonocarpus	*cotinifolius*		<2	2.00
Corymbia	*hamersleyana*		<2	1.20
Cymbopogon	*obtectus*		<2	0.40
Digitaria	*brownii*		<2	0.70
Dodonaea	*coriacea*		<2	0.30

Species			% Cover	Height
Eragrostis	*eriopoda*		<2	0.40
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.70
Eucalyptus	*gamophylla*		2 – 10	3.00
Eulalia	*aurea*		<2	0.60
Grevillea	*wickhamii*		2 – 10	2.50
Hakea	*chordophylla*		<2	6.00
Hakea	*lorea*	subsp. *lorea*	<2	3.50
Halgania	*solanacea*	var. Mt Doreen	<2	0.40
Hibiscus	*sturtii*	var. *platychlamys*	<2	0.40
Hibiscus	*sturtii*	var. *truncata*	<2	0.40
Hybanthus	*aurantiacus*		<2	0.50
Isotropis	*atropurpurea*		2 – 10	0.50
Kennedia	*prorepens*		2 – 10	0.60
Paraneurachne	*muelleri*		2 – 10	0.40
Ptilotus	*astrolasius*		<2	0.40
Rhagodia	*eremaea*		<2	1.50
Santalum	*lanceolatum*		<2	1.00
Scaevola	*parvifolia*	subsp. *pilbarae*	<2	0.30
Sclerolaena	*cornishiana*		<2	0.30
Senna	*artemisioides*	subsp. *helmsii*	<2	0.25
Senna	*glutinosa*	subsp. *glutinosa*	<2	1.50
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.20
Sida	sp. Pilbara		<2	0.80
Sida	sp. indet.		<2	0.40
Solanum	*lasiophyllum*		<2	0.30
Solanum	*sturtanium*		<2	0.80
Stylobasium	*spathulatum*		2 – 10	1.50
Themeda	*triandra*		<2	1.00
Triodia	*basedowii*		31 – 70	0.70
Triodia	*pungens*		<2	0.80
Triodia	*schinzii*		<2	1.00
Triodia	sp. *Shovelanna Hill* (S. Van Leeuwen 3835)		<2	0.50

Site	Orebody 31 - Site OB31/2-4
Date	8/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204117
Northing	7420076
Habitat	HCR
Aspect	
Slope	Low
Soil	Silty Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Mining Exploration
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Scattered Tall Shrubs of Grevillea wickhamii, Grevillea berryana, Acacia marramamba over Scattered Low Shrubs of Ptilotus rotundifolius

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	<2	0.40
Acacia	*ayersiana*		<2	1.50
Acacia	*bivenosa*		<2	1.50
Acacia	*hilliana*		<2	0.40
Acacia	*marramamba*		<2	1.50
Acacia	*paraneura*		<2	1.50
Acacia	*pruinocarpa*		<2	
Acacia	*tetragonophylla*		<2	1.00
Anthobolus	*leptomerioides*		<2	0.50
Calytrix	*carinata*		<2	0.50
Cymbopogon	*obtectus*		<2	0.60
Dodonaea	*coriacea*		<2	0.50
Duperreya	*commixta*		<2	0.10
Eremophila	*fraseri*		<2	
Eulalia	*aurea*		<2	0.80
Goodenia	sp. Sandy Creek		<2	0.60
Grevillea	*berryana*		<2	1.50
Grevillea	*wickhamii*		<2	2.50
Hakea	*chordophylla*		<2	2.00
Hakea	*lorea*	subsp. *lorea*	<2	2.00
Halgania	*solanacea*	var. Mt Doreen	<2	0.50
Hybanthus	*aurantiacus*		<2	0.70
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	0.50
Psydrax	*latifolia*		<2	1.00
Pterocaulon	*sphacelatum*		<2	0.50
Ptilotus	*calostachyus*		<2	0.40
Ptilotus	*rotundifolius*		<2	0.70

Species			% Cover	Height
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.60
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.30
Senna	*glutinosa*	subsp. *pruinosa*	<2	1.30
Senna	*stricta*		<2	0.50
Solanum	*lasiophyllum*		<2	0.60
Trianthema	*glossostigma*		<2	0.10
Triodia	*pungens*		<2	0.40
Triodia	sp. *Shovelanna Hill* (S. Van Leeuwen 3835)		31 – 70	0.50

Site	Orebody 31 - Site OB31/2-5
Date	11/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	203929
Northing	7420097
Habitat	DDE
Aspect	
Slope	Low
Soil	Silty Loam
Rock Type	Cobbles
% Leaves:Logs	2-10:2-10
Vegetation Condition	Excellent
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Low Open Forest of Acacia aptaneura, Acacia ayersiana over High Shrubland of Acacia wanyu over Open Hummock Grassland of Triodia pungens, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835)

Species			% Cover	Height
Abutilon	*lepidum*		<2	0.30
Acacia	*aptaneura*		11 – 30	4.50
Acacia	*ayersiana*		11 – 30	4.00
Acacia	*paraneura*		<2	4.50
Acacia	*pruinocarpa*		<2	3.00
Acacia	*tetragonophylla*		<2	2.30
Acacia	*wanyu*		11 – 30	1.70
Acacia	*bivenosa*		<2	2.50
Anthobolus	*leptomerioides*		<2	1.50
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	0.60
Brachyachne	*protrata*		<2	0.10
Cassytha	*capillaris*		<2	0.10
Codonocarpus	*cotinifolius*		<2	1.50
Corchorus	*sidoides*		2 – 10	0.40
Digitaria	*brownii*		<2	0.50
Dodonaea	*petiolaris*		2 – 10	1.50
Duperreya	*commixta*		<2	0.10
Enneapogon	*polyphyllus*		<2	0.30
Eragrostis	sp. indet		<2	0.30
Eremophila	*cuneifolia*		<2	1.30
Eremophila	*forrestii*		<2	1.00
Eremophila	*latrobei*	subsp. *latrobei*	2 – 10	1.50
Eucalyptus	*leucophloia*	subsp. *leucophloia*	<2	6.00
Eulalia	*aurea*		<2	1.00
Hibiscus	*burtonii*		<2	0.70
Hibiscus	*coatesii*		<2	0.50

Species			% Cover	Height
Indigofera	*georgei*		<2	
Lepidium	*platypetalum*		<2	0.50
Maireana	*georgei*		<2	0.40
Maireana	*melanocoma*		<2	0.30
Maireana	*thesioides*		<2	0.40
Paraneurachne	*muelleri*		<2	0.40
Psydrax	*latifolia*		<2	2.50
Ptilotus	*calostachyus*		<2	0.60
Ptilotus	*nobilis*		<2	0.60
Santalum	*lanceolatum*		<2	2.00
Scaevola	*spinescens*		2 – 10	0.80
Sclerolaena	*densiflora*		<2	0.30
Senna	cf. sp. Meekatharra		<2	0.40
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.00
Senna	*stricta*		2 – 10	1.50
Sida	*arenicola*		<2	0.60
Sida	*cardiophylla*		<2	0.60
Solanum	*horridum*		<2	
Solanum	*lasiophyllum*		<2	0.30
Trianthema	*glossostigma*		<2	0.10
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		<2	0.50
Triodia	*pungens*		11 – 30	1.10

Site	Orebody 31 - Site OB31/2-6
Date	11/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	205277
Northing	7419371
Habitat	HCR
Slope	Moderate
Soil	Sandy Loam
Rock Type	Boulders
% Leaves:Logs	2-10:<2
Vegetation Condition	Very Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	High Shrubland of Acacia wanyu, Acacia tetragonophylla, Senna stricta with Low Open Woodland of Acacia aptaneura over Low Open Shrubland of Senna stricta, Eremophila cuneifolia, Lepidium platypetalum over Very Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. van Leeuwen 3835), Triodia pungens

Species			% Cover	Height
Acacia	*aptaneura*		2 – 10	4.00
Acacia	*tetragonophylla*		<2	1.50
Acacia	*wanyu*		2 – 10	2.30
Anthobolus	*leptomerioides*		<2	1.00
Aristida	*contorta*		<2	0.20
Eragrostis	sp. indet		<2	0.30
Eremophila	*cuneifolia*		2 – 10	0.50
Eremophila	*latrobei*	subsp. *filiformis*	<2	1.50
Lepidium	*platypetalum*		<2	0.50
Maireana	*georgei*		<2	0.30
Maireana	*melanocoma*		<2	0.20
Maireana	*thesioides*		<2	0.30
Maireana	*triptera*		<2	0.40
Paraneurachne	*muelleri*		<2	0.50
Ptilotus	*nobilis*		<2	0.30
Ptilotus	*obovatus*		<2	0.70
Scaevola	*spinescens*		<2	1.30
Sclerolaena	*cuneata*		<2	0.20
Sclerolaena	*densiflora*		<2	0.20
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.50
Senna	sp. Meekatharra		<2	0.70
Senna	*stricta*		2 – 10	1.50
Tribulus	*suberosus*		<2	0.80
Triodia	*pungens*		2 – 10	0.80
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.50
Triodia	*basedowii*		<2	0.70

Site	Orebody 31 - Site OB31/2-7
Date	10/10/13
Recorder	JB/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	205046
Northing	7418679
Habitat	PLN
Aspect	
Slope	Flat
Soil	Light Clay
Rock Type	Gravel
% Leaves:Logs	2-10:2-10
Vegetation Condition	Good
Disturbance Type	Frequent Fire
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Closed Scrub of Acacia aptaneura, Corymbia aspera over Tussock Grassland of Panicum effusum, Eragrostis leptocarpa, Eriachne flaccida with Open Shrubland of Eremophila fraseri

Species			% Cover	Height
**Malvastrum*	*americanum*		<2	0.30
Abutilon	*cryptopetalum*		<2	0.80
Abutilon	*macrum*		<2	0.40
Abutilon	*otocarpum*		<2	0.40
Acacia	*ancistrocarpa*		<2	1.50
Acacia	*aptaneura*		71 – 100	3.00
Acacia	*aptaneura*		<2	2.50
Acacia	*bivenosa*		<2	2.00
Acacia	*synchronicia*		<2	1.00
Acacia	*tetragonophylla*		<2	1.50
Aeschynomene	*indica*		<2	0.80
Altenanthera	*nodifera*		<2	0.20
Aristida	*contorta*		2 – 10	0.30
Aristida	*inaequiglumis*		2 – 10	0.50
Blumea	*tenella*		<2	0.10
Bulbostylis	*barbata*		<2	0.10
Calocephalus	sp. indet.		<2	0.10
Cheilanthes	*sieberi*		<2	0.20
Chloris	sp. indet.		<2	0.30
Chrysopogon	*fallax*		2 – 10	0.80
Cleome	*viscosa*		<2	0.60
Corymbia	*aspera*		2 – 10	4.00
Crotalaria	*medicaginea*		<2	0.50
Cymbopogon	*obtectus*		<2	0.40
Dactyloctenium	*radulans*		<2	0.10
Dicanthium	*sericeum*	subsp. *humilis*	2 – 10	0.40
Digitaria	*ammophila*		<2	0.30
Digitaria	*brownii*		<2	0.50

Species			% Cover	Height
Dodonaea	*petiolaris*		<2	1.50
Duperreya	*commixta*		<2	0.10
Enneapogon	*polyphyllus*		<2	0.50
Enteropogon	*ramosus*		<2	0.40
Eragrostis	*cumingii*		2 – 10	0.20
Eragrostis	*eriopoda*		<2	0.40
Eragrostis	*leptocarpa*		2 – 10	0.30
Eragrostis	*pergracilis*		<2	0.20
Eragrostis	*tenellula*		<2	0.30
Eragrostis	*xerophila*		<2	0.30
Eremophila	*forrestii*		<2	1.50
Eremophila	*fraseri*		2 – 10	1.50
Eremophila	*lanceolata*		<2	0.40
Eriachne	*flaccida*		2 – 10	0.40
Eriachne	sp. indet.		2 – 10	0.20
Eulalia	*aurea*		<2	0.60
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.20
Fimbristylis	*dichomtoma*		<2	0.30
Isotropis	*forrestii*		2 – 10	0.80
Maireana	*tomentosa*		<2	0.40
Maireana	*triptera*		<2	0.40
Panicum	*effusum*		2 – 10	0.40
Psydrax	*latifolia*		<2	1.50
Pterocaulon	*sphacelatum*		<2	0.50
Ptilotus	cf. *gomphrenoides*		<2	0.10
Ptilotus	*gomphrenoides*		<2	0.20
Ptilotus	*nobilis*		<2	0.10
Ptilotus	*obovatus*		<2	0.40
Rhagodia	*eremaea*		<2	0.80
Rutidosis	*helichrysoides*		<2	0.50
Sclerolaena	*burbidgeae*		<2	0.10
Sclerolaena	*cornishiana*		<2	0.30
Sclerolaena	*cuneata*		<2	0.20
Sclerolaena	*densiflora*		<2	0.20
Senna	*artemisioides*	subsp. *helmsii*	<2	1.50
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.80
Senna	sp. Meekatharra		<2	0.50
Sida	cf. *fibulifera*		<2	0.20
Spermacoce	*brachystema*		<2	0.30
Sporobolus	*australasicus*		2 – 10	0.20
Themeda	*triandra*		2 – 10	0.60
Trianthema	*triquetra*		<2	0.10

Site	Orebody 31 - Site OB31/2-8
Date	10/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204980
Northing	7418896
Habitat	PLN
Slope	Flat
Soil	Silty Clay Loam
Rock Type	Gravel
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Low Shrubland of Eremophila cuneifolia, Sclerolaena cuneata, Maireana thesioides with Open Shrubland of Acacia synchronicia, Acacia paraneura, Sennna glutinosa subsp. luerssenii over Scattered Tussock Grass of Enteropogon ramosus, Eragrostis xerophila

Species			% Cover	Height
Acacia	*aptaneura*		<2	1.00
Acacia	*paraneura*		<2	4.00
Acacia	*synchronicia*		2 – 10	1.30
Acacia	*tetragonophylla*		<2	1.20
Anthobolus	*leptomerioides*		<2	0.40
Aristida	*contorta*		<2	0.20
Aristida	*inaequiglumis*		<2	0.60
Enneapogon	*polyphyllus*		<2	0.10
Enteropogon	*ramosus*		<2	0.80
Eragrostis	*xerophila*		<2	0.30
Eremophila	*cuneifolia*		2 – 10	1.00
Eremophila	*forrestii*		<2	0.80
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.40
Frankenia	*setosa*		<2	0.30
Lepidium	*platypetalum*		<2	0.20
Maireana	*carnosa*		<2	0.20
Maireana	*georgei*		<2	0.20
Maireana	*pyramidata*		<2	0.80
Maireana	*thesioides*		<2	0.40
Maireana	*tomentosa*		<2	0.20
Rhagodia	*eremaea*		<2	0.60
Sclerolaena	cf. *convexula*		2 – 10	0.20
Sclerolaena	*cuneata*		2 – 10	0.20
Sclerolaena	*densiflora*		<2	0.20
Senna	sp. Meekatharra		2 – 10	0.50
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.20
Senna	sp. *Meekatharra*		<2	1.00
Tecticornia	*disarticulata*		<2	0.40
Triodia	*pungens*		<2	0.50

Site	Orebody 31 - Site OB31/2-9
Date	11/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204178
Northing	7417988
Habitat	HCR
Aspect	
Slope	Low
Soil	Silty Loam
Rock Type	Boulders
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Shrubland of Acacia hilliana, Acacia adoxa var. adoxa, Keraudrenia velutina subsp. ellipticum with High Open Shrubland of Grevillea wickhamii

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	2 – 10	0.40
Acacia	*bivenosa*		<2	1.50
Acacia	*pruinocarpa*		<2	1.50
Acacia	*trudgeniana*		<2	1.00
Acacia	*hilliana*		2 – 10	0.40
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	1.00
Calytrix	*carinata*		<2	0.50
Corymbia	*hamersleyana*		<2	1.00
Cymbopogon	*obtectus*		<2	0.60
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.50
Eriachne	*mucronata*		<2	0.40
Eucalyptus	*gamophylla*		<2	2.00
Gompholobium	*oreophilum*		<2	0.50
Goodenia	sp. Sandy Creek		<2	0.40
Goodenia	*triodiophila*		<2	0.30
Grevillea	*wickhamii*		2 – 10	2.50
Hakea	*chordophylla*		<2	3.00
Hakea	*lorea*	subsp. *lorea*	<2	1.50
Halgania	*solanacea*	var. Mt Doreen	<2	0.50
Keraudrenia	*velutina*	subsp. *ellipticum*	2 – 10	0.60
Scaevola	*browniana*		<2	0.50
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.00
Senna	*glutinosa*	subsp. *pruinosa*	<2	1.50
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		31 – 70	0.40

Site	Orebody 31 - Site OB31/2-10
Date	11/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	203965
Northing	7417672
Habitat	DDE
Aspect	
Slope	Flat
Soil	Light Clay
Rock Type	Gravel
% Leaves:Logs	2-10:2-10
Vegetation Condition	Good
Disturbance Type	Cattle Grazing
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Low Open Forest of Acacia aptaneura, Corymbia hamersleyana over Tussock Grassland of Themeda triandra, Digitaria brownii, Aristida inaequiglumis with Open Shrubland of Eremophila forrestii, Acacia ancistrocarpa over Very Open Hummock Grassland of Triodia basedowii

Species			% Cover	Height
**Cenchrus*	*ciliaris*		<2	0.50
Acacia	*ancistrocarpa*		2 – 10	2.30
Acacia	*elachantha*		<2	2.50
Acacia	*pachyacra*		<2	2.00
Acacia	*pruinocarpa*		<2	1.50
Acacia	*tenuissima*		<2	1.00
Acacia	*tetragonophylla*		<2	2.00
Acacia	*aptaneura*		31 – 70	5.00
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	*var. holathera*	<2	0.40
Aristida	*inaequiglumis*		2 – 10	1.00
Bonamia	*erecta*		<2	0.20
Chloris	*sp. cf. pectinata*		<2	0.30
Chrysopogon	*fallax*		<2	1.20
Corchorus	*sidoides*		<2	0.40
Corymbia	*hamersleyana*		2 – 10	6.00
Digitaria	*ammophila*		<2	0.30
Digitaria	*brownii*		<2	0.80
Dodonaea	*coriacea*		<2	1.30
Eremophila	*forrestii*		2 – 10	0.50
Eremophila	*fraseri*		<2	1.20
Eulalia	*aurea*		<2	0.60
Evolvulus	*alsinoides*	*var. decumbens*	<2	0.20
Gomphrena	sp. indet		<2	0.30
Goodenia	sp. indet		<2	0.30
Gossypium	*robinsonii*		<2	3.00

Species			% Cover	Height
Grevillea	*wickhamii*		<2	2.00
Hakea	*lorea*	*subsp. lorea*	<2	1.00
Hibiscus	*burtonii*		<2	0.30
Hibiscus	*sturtii*	*var. platychlamys*	<2	0.30
Hybanthus	*aurantiacus*		<2	0.50
Indigofera	*georgei*		<2	0.70
Maireana	*villosa*		<2	0.40
Ostropis	*forrestii*		2 – 10	0.80
Paraneurachne	*muelleri*		<2	0.30
Psydrax	*suaveolens*		<2	1.50
Ptilotus	*nobilis*		<2	0.20
Ptilotus	*obovatus*		<2	0.50
Scaevola	*spinescens*		<2	0.40
Senna	cf. sp. Meekatharra		<2	1.00
Sida	*fibulifera*		<2	0.30
Solanum	*horridum*		<2	0.20
Solanum	*lasiophyllum*		<2	0.40
Solanum	*sturtianum*		<2	1.50
Themeda	*triandra*		11 – 30	0.40
Triodia	*basedowii*		2 – 10	0.40
Triodia	*pungens*		<2	0.60

Site	Orebody 31 - Site OB31/2-11
Date	10/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	203228
Northing	7417845
Habitat	PLN
Aspect	
Slope	Flat
Soil	Clayey Sand
Rock Type	Gravel
% Leaves:Logs	2-10:2-10
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Tussock Grassland of Aristida inaequiglumis, Themeda triandra, Digitaria brownii with Open Shrubland of Triodia basedowii, Acacia adsurgens over Very Open Hummock Grassland of Triodia basedowii with Scattered Low Trees of Corymbia hamersleyana

Species			% Cover	Height
Abutilon	*macrum*		<2	0.50
Abutilon	*otocarpum*		<2	0.30
Acacia	*adsurgens*		2 – 10	1.70
Acacia	*ancistrocarpa*		2 – 10	2.00
Acacia	*apchyacra*		<2	2.00
Acacia	*aptaneura*		<2	1.00
Acacia	*aptaneura*		<2	1.20
Acacia	*bivenosa*		<2	1.70
Acacia	*sibirica*		<2	0.80
Acacia	*wanyu*		<2	1.00
Aristida	*contorta*		<2	0.20
Aristida	*inaequiglumis*		31 – 70	1.20
Bonamia	*erecta*		<2	0.30
Corchorus	*sidoides*		<2	0.20
Corymbia	*hamersleyana*		<2	6.00
Cymbopogon	*obtectus*		<2	0.40
Digitaria	*brownii*		2 – 10	0.50
Duperreya	*commixta*		<2	0.10
Eragrostis	*eriopoda*	*proper*	<2	0.30
Eremophila	*lanceolata*		<2	0.30
Eremophila	*longifolia*		<2	0.20
Eucalyptus	*gamophylla*		2 – 10	2.70
Eulalia	*aurea*		<2	0.50
Euphorbia	*australis*	subsp. *hispidula*	<2	
Euphorbia	*boopthona*		<2	0.20
Euphorbia	*cf. trignosperma*		<2	0.10
Evolvulus	*alsinoides*	var. *indet*	<2	0.20

Species			% Cover	Height
Gossypium	*robinsonii*		<2	2.50
Hakea	*lorea*	subsp. *lorea*	<2	1.00
Heliotropium	*inexplicitum*		<2	0.10
Hibiscus	*sturtii*	var. *platychlamys*	<2	0.30
Indigofera	*georgei*		<2	1.00
Isotropis	*forrestii*		2 – 10	1.00
Maireana	*villosa*		<2	0.40
Paraneurachne	*muelleri*		<2	0.60
Phyllanthus	*erwinii*		<2	
Ptilotus	*calostachyus*		<2	0.50
Ptilotus	*nobilis*		<2	0.30
Ptilotus	*obovatus*		<2	0.50
Santalum	*lanceolatum*		<2	2.00
Senna	*artemisioides*	subsp. *helmsii*	<2	0.40
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.40
Senna	cf. sp. Meekatharra		<2	1.00
Sida	*fibulifera*		<2	0.20
Sida	*platycalyx*		<2	0.30
Sida	sp. Pilbara		<2	0.50
Solanum	*horridum*		<2	0.20
Solanum	*lasiophyllum*		<2	0.60
Solanum	*sturtanium*		<2	0.60
Streptoglossa	*bubakii*		<2	0.40
Themeda	*triandra*		2 – 10	0.60
Trichodesma	*zeylanicum*		<2	1.20
Triodia	*basedowii*		2 – 10	1.00
Triodia	*pungens*		<2	1.30

Site	Orebody 31 - Site OB31/2-12
Date	10/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204045
Northing	7417536
Habitat	PLN
Aspect	
Slope	Flat
Soil	Clayey Sand
Rock Type	Cobbles
% Leaves:Logs	<2:2-10
Vegetation Condition	Excellent
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia basedowii with High Open Shrubland of Acacia pachyacra, Acacia ancistrocarpa, Hakea lorea subsp. lorea over Open Shrubland of Eremophila forrestii, Acacia adsurgens, Acacia aptaneura

Species			% Cover	Height
Acacia	*adsurgens*		<2	1.70
Acacia	*ancistrocarpa*		2 – 10	2.30
Acacia	*aptaneura*		<2	1.50
Acacia	*bivenosa*		<2	0.50
Acacia	*melleodora*		<2	1.20
Acacia	*pachyacra*		2 – 10	1.50
Acacia	*pruinocarpa*		<2	1.70
Acacia	*rhodophloia*		<2	4.00
Acacia	*tetragonophylla*		<2	2.00
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.30
Aristida	*inaequiglumis*		31 – 70	1.00
Bonamia	*erecta*		<2	0.30
Corchorus	*sidoides*		<2	0.40
Corymbia	*hamersleyana*		<2	3.50
Cymbopogon	*obtectus*		<2	0.80
Dysphania	*glomerata*		<2	0.20
Eragrostis	*eriopoda*		<2	0.50
Eremophila	*forrestiii*		<2	1.00
Eulalia	*aurea*		<2	0.20
Hakea	*lorea*	subsp. *lorea*	<2	2.00
Paraneurachne	*muelleri*		<2	0.30
Pterocaulon	*sphacelatum*		<2	0.40
Ptilotus	*calostachyus*		<2	0.40
Ptilotus	*obovatus*		<2	1.00
Scaevola	*parvifolia*		<2	0.30
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.20

Species			% Cover	Height
Sida	sp. Pilbara		<2	0.30
Solanum	*sturtianum*		<2	0.70
Streptoglossa	*bubakii*		<2	0.20
Tribulus	*suberosus*		<2	0.70
Trichodesma	*zeylanicum*		<2	1.30
Triodia	*basedowii*		31 – 70	0.70

Site	Orebody 31 - Site OB31/2-13
Date	10/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	205647
Northing	7417773
Habitat	HCR
Aspect	
Slope	Low
Soil	Silty Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Degraded
Disturbance Type	Mining Exploration
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Open Shrubland of Acacia hilliana, Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206) , Acacia adoxa var. adoxa over Scattered Tussock Grass of Amphipogon sericeus, Eriachne lanata

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	<2	0.30
Acacia	*hilliam*		<2	0.30
Acacia	*marramamba*		<2	1.30
Acacia	*pruinocarpa*		<2	0.50
Acacia	*tenuissima*		<2	1.00
Amphipogon	*sericeus*		<2	0.30
Eriachne	*lanata*		<2	0.30
Gompholobium	*oreophilum*		<2	0.30
Goodenia	sp. Sandy Creek		<2	0.20
Grevillea	*wickhamii*		<2	0.20
Halgania	*solanacea*	var. Mt Doreen	2 – 10	0.30
Hybanthus	*aurantiacus*		<2	0.60
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	1.00
Ptilotus	*calostachyus*		<2	0.40
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		<2	0.30

Site	Orebody 31 - Site OB31/2-14
Date	10/10/13
Recorder	DR/EP
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204976
Northing	7417718
Habitat	HSL
Aspect	
Slope	Low
Soil	Sandy Loam
Rock Type	Gravel
% Leaves:Logs	<2:<2
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with High Open Shrubland of Eremophila forrestii, Eremophila fraseri, Acacia pruinocarpa over Shrubland of Acacia pruinocarpa, Acacia trudgeniana

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	<2	0.30
Acacia	*aptaneura*		<2	4.00
Acacia	*melleodora*		<2	1.00
Acacia	*pruinocarpa*		2 – 10	2.00
Acacia	*tetragonophylla*		<2	0.30
Acacia	*trudgeniana*		2 – 10	2.00
Acacia	*subcontorta*		<2	1.30
Amphipogon	*sericeus*		<2	0.30
Aristida	*holathera*	var. *holathera*	<2	0.20
Aristida	*inaequiglumis*		<2	0.80
Calytrix	*carinata*		<2	1.00
Cymbopogon	*obtectus*		<2	0.30
Duperreya	*commixta*		<2	0.10
Eragrostis	sp. indet		<2	0.50
Eremophila	*forrestii*		<2	1.00
Eremophila	*fraseri*		<2	1.00
Eulalia	*aurea*		<2	0.50
Goodenia	sp. Sandy Creek		<2	0.20
Hakea	*lorea*	subsp. *lorea*	<2	2.50
Halgania	*solanacea*	var. *Mt Doreen*	<2	0.40
Keraudrenia	*nephrosperma*			
Paraneurachne	*muelleri*		<2	0.30
Petalostylis	*cassioides*		<2	1.00
Ptilotus	*calostachyus*		<2	0.60
Ptilotus	*nobilis*		<2	0.40
Ptilotus	*obovatus*		<2	0.60
Senna	*artemisioides*	subsp. *oligophylla*	<2	

Species			% Cover	Height
Senna	cf. sp. Meekatharra		<2	2.00
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.30
Sida	*arenicola*		<2	0.20
Sida	*cardiophylla*		<2	0.30
Solanum	*lasiophyllum*		<2	0.40
Triodia	*basedowii*		<2	0.50
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		31 – 70	0.40

Site	Orebody 31 - Site OB31/2-15
Date	13/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	207514
Northing	7417562
Habitat	HSL
Aspect	
Slope	Moderate
Soil	Sandy Loam
Rock Type	Boulders
% Leaves:Logs	
Vegetation Condition	Excellent
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Low Woodland of Acacia subcontorta, Acacia synchronicia over Low Shrubland of Senna stricta, Eremophila cuneifolia, Scaevola spinescens over Open Hummock Grassland of Triodia pungens, Triodia sp. Shovelanna Hill (S. Van leeuwen 3835)

Species			% Cover	Height
Acacia	*bivenosa*		<2	2.00
Acacia	*marramamba*		<2	1.00
Acacia	*subcontorta*		11 – 30	4.00
Acacia	*synchronicia*		2 – 10	2.00
Acacia	*tetragonophylla*		<2	0.20
Aristida	*contorta*		<2	0.20
Duperreya	*commixta*		<2	0.10
Eragrostis	*sp. indet*		<2	0.30
Eremophila	*cuneifolia*		2 – 10	0.90
Eremophila	*exilifolia*		<2	1.20
Eremophila	*latrobei*	subsp. *latrobei*	<2	2.00
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.10
Keraudrenia	*velutina*	subsp. *ellipticum*		
Maireana	*georgei*		<2	0.40
Maireana	*melanocoma*		<2	0.40
Ptilotus	*obovatus*		2 – 10	0.80
Rhagodia	*eremaea*		<2	0.60
Scaevola	*spinescens*		2 – 10	1.30
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.70
Senna	*stricta*		11 – 30	1.00
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.30
Triodia	*pungens*		2 – 10	0.40

Site	Orebody 31 - Site OB31/2-16
Date	9/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	207094
Northing	7418060
Habitat	HCR
Aspect	Moderate
Soil	Loamy Sand
Rock Type	Gravel
% Leaves:Logs	<2:<2
Vegetation Condition	Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Low Open Heath of Acacia hilliana, Acacia adoxa var. adoxa, Keraudrenia velutina subsp. ellipticum over Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van leeuwen 3835) with Open Shrubland of Grevillea wickhamii, Acacia rhodophloia

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	2 – 10	0.40
Acacia	*hilliana*		11 – 30	0.40
Acacia	*marramamba*		<2	0.80
Acacia	*rhodophloia*		<2	1.20
Acacia	*sibirica*		<2	0.50
Acacia	*tetragonophylla*		<2	1.50
Acacia	*ancistrocarpa*		<2	1.50
Anthobolus	*leptomerioides*		<2	0.50
Calytrix	*carinata*		<2	0.30
Corymbia	*hamersleyana*		<2	1.50
Cymbopogon	*obtectus*		<2	0.30
Duperreya	*commixta*		<2	0.10
Enchylaena	*tomentosa*		<2	0.20
Eragrostis	sp. indet		<2	0.10
Eremophila	*exilifolia*		<2	0.80
Eriachne	*lanata*		<2	0.20
Eucalyptus	*leucophloia*	subsp. *leucophloia*	<2	5.00
Grevillea	*berryana*		<2	1.50
Grevillea	*wickhamii*		<2	1.50
Hakea	*chordophylla*		<2	2.00
Halgania	*solanacea*	var. Mt Doreen	<2	0.50
Keraudrenia	*velutina*	subsp. *ellipticum*	2 – 10	0.40
Newcastelia	*hexarrhena*		<2	0.40
Ptilotus	*calostachyus*		<2	0.40
Senna	*stricta*		<2	0.50
Sida	sp. Golden calyces		<2	0.30
Trianthema	*glossostigma*		<2	0.10
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		31 – 70	0.50

Site	Orebody 31 - Site OB31/2-17
Date	9/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	206632
Northing	7418074
Habitat	DDE
Aspect	
Slope	Low
Soil	Silty Clay Loam
Rock Type	Cobbles
% Leaves:Logs	
Vegetation Condition	Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Open Scrub of Acacia monticola, Acacia maitlandii over Open hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with Low Open Shrubland of Acacia adoxa var. adoxa, Acacia hilliana, Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	2 – 10	0.50
Acacia	*adsurgens*		<2	1.00
Acacia	aff. *citrinoviridis*		<2	1.00
Acacia	*ancistrocarpa*		<2	1.50
Acacia	*hilliana*		<2	0.30
Acacia	*maitlandii*		2 – 10	1.30
Acacia	*marramamba*		<2	1.30
Acacia	*monticola*		31 – 70	2.50
Acacia	*sp. Jimblebar?*		<2	1.30
Acacia	*tenuissima*		<2	1.50
Andorcalva	*luteiflora*		<2	1.50
Cassytha	*capillaris*		<2	0.10
Clerodendrum	*floribundum*	subsp. *angustifolium*	<2	0.50
Corchorus	*sidoides*		<2	0.20
Corymbia	*deserticola*		<2	5.00
Dodonaea	*coriacea*		<2	0.40
Dodonaea	*petiolaris*		<2	0.80
Duperreya	*commixta*		<2	0.20
Enneapogon	*polyphyllus*		<2	0.40
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.50
Gompholobium	*oreophilum*		<2	0.20
Gossypium	*robinsonii*		<2	0.10
Grevillea	*wickhamii*		<2	1.80
Halgania	*solanacea*	var. Mt Doreen	<2	0.30
Hybanthus	*aurantiacus*		<2	0.20

Species			% Cover	Height
Petalostylis	*cassioides*		<2	1.00
Santalum	*lanceolatum*		<2	1.20
Senna	*artemisioides*	subsp. *helmsii*	<2	0.40
Senna	*glutinosa*	subsp. *glutinosa*	<2	1.20
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.00
Senna	*glutinosa*	subsp. *pruinosa*	<2	1.50
Sida	sp. indet.		<2	0.40
Trachymene	*oleracea*		<2	1.00
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		11 – 30	0.50
Triodia	*pungens*		2 – 10	0.60

Site	Orebody 31 - Site OB31/2-18
Date	11/10/13
Recorder	JB/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	207855
Northing	7419069
Habitat	SCA
Aspect	
Slope	Low
Soil	Loamy Sand
Rock Type	Boulders
% Leaves:Logs	<2:<2
Vegetation Condition	Excellent
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Low Woodland of Acacia aptaneura over Shrubland of Acacia tetragonophylla, Senna stricta, Acacia wanyu over Low Shrubland of Eremophila cuneifolia, Scaevola spinescens over Open Hummock Grassland of Triodia pungens, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835)

Species			% Cover	Height
Acacia	*ancistrocarpa*		<2	0.80
Acacia	*aptaneura*		11 – 30	2.50
Acacia	*bivenosa*		<2	2.00
Acacia	*paraneura*		<2	5.00
Acacia	*wanyu*		2 – 10	1.50
Acacia	*tetragonophylla*		11 – 30	1.30
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.40
Eremophila	*cuneifolia*		2 – 10	0.80
Eremophila	*latrobei*	subsp. *filiformis*	<2	1.50
Eriachne	*pulchella*	subsp. *dominii*	<2	0.20
Lepidium	*platypetalum*		<2	0.40
Maireana	*georgei*		<2	0.20
Maireana	*melanocoma*		<2	0.40
Maireana	*thesioides*		<2	0.60
Psydrax	*flav*		<2	0.50
Ptilotus	*obovatus*		<2	0.60
Scaevola	*spinescens*		2 – 10	0.90
Sclerolaena	cf. *convexula*		<2	0.30
Senna	cf. sp. Meekatharra		<2	1.50
Senna	*glutinosa*	subsp. *luerssenii*	<2	0.20
Senna	*sticta*		2 – 10	1.20
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.40
Triodia	*pungens*		31 – 70	0.40

Site	Orebody 31 - Site OB31/2-19
Date	9/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	206635
Northing	7418664
Habitat	PLN
Aspect	Low
Slope	Silty Clay Loam
Soil	
Rock Type	Cobbles
% Leaves:Logs	<2:2-10
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Low Shrubland of Frankenia setosa with High Open Shrubland of Acacia aptaneura, Acacia synchronicia, Eremophila platycalyx over Open Shrubland of Eeremophila cuneifolia

Species			% Cover	Height
Abutilon	cf. *macrum*		<2	0.50
Acacia	*aptaneura*		2 – 10	4.00
Acacia	*synchronicia*		2 – 10	1.70
Acacia	*tetragonophylla*		<2	1.00
Anthobolus	*leptomerioides*		<2	0.50
Aristida	*contorta*		<2	0.10
Brachyachne	*prostrata*		<2	
Dactylon	*radulans*		<2	0.10
Digitaria	*brownii*		<2	0.20
Enneapogon	*polyphyllus*		<2	0.20
Eragrostis	sp. indet.		<2	0.30
Eragrostis	*xerophila*		<2	0.30
Eragrostis	sp. indet.		<2	0.10
Eremophila	*cuneifolia*		2 – 10	0.80
Eremophila	*forrestii*		<2	1.00
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.00
Eremophila	*platycalyx*		2 – 10	1.20
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.20
Frankenia	*cetosa*		2 – 10	0.30
Lepidium	*platypetalum*		<2	0.10
Maireana	*georgei*		<2	0.10
Maireana	*melanocoma*		<2	0.20
Maireana	*pyramidata*		<2	0.70
Maireana	*tomentosa*		<2	0.20
Psydrax	*latifolia*		<2	1.00
Psydrax	*suaveolens*		<2	1.50
Ptilotus	*obovatus*		<2	0.50
Sclerolaena	cf. *convexula*		<2	0.30

Species			% Cover	Height
Sclerolaena	*cuneata*		2 – 10	0.20
Sclerolaena	*densiflora*		<2	0.20
Sclerolaena	sp. indet.		2 – 10	0.20
Senna	*artemisioides*	subsp. *helmsii*	<2	0.50
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.50
Senna	sp. Meekatharra		<2	0.80
Sida	sp. indet.		<2	0.10
Solanum	*lasiophyllum*		<2	0.30
Sporobolus	*australasicus*		<2	0.20
Stretoglossa	*bubakii*		<2	0.20
Tecticornia	*disarticulata*		2 – 10	0.30
Triraphis	*mollis*		<2	0.10

Site	Orebody 31 - Site OB31/2-20
Date	9/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	206414
Northing	7481932
Habitat	RES
Aspect	
Slope	Low
Soil	Silty Clay Loam
Rock Type	Cobbles
% Leaves:Logs	<2:2-10
Vegetation Condition	Very Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia pungens with Low Woodland of Acacia paraneura, Acacia aptaneura, Acacia ayersiana over High Shrubland of Acacia wanyu, Acacia balsamea, Acacia tetragonophylla

Species			% Cover	Height
Abutilon	*otocarpum*		<2	0.10
Acacia	*aptaneura*		2 – 10	6.00
Acacia	*ayersiana*		2 – 10	1.40
Acacia	*balsamea*		2 – 10	3.50
Acacia	*paraneura*		2 – 10	5.50
Acacia	*tetragonophylla*		2 – 10	1.70
Acacia	*wanyu*		11 – 30	1.70
Amphipogon	*sericeus*		<2	0.30
Anthobolus	*leptomerioides*		<2	0.80
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	0.30
Cassytha	*capillaris*		<2	0.10
Cheilanthes	*sieberi*		<2	0.20
Cymbopogon	*obtectus*		<2	0.40
Digitaria	*brownii*		<2	0.40
Duperreya	*commixta*		<2	0.10
Eragrostis	sp. indet.		<2	0.40
Eremophila	*cuneifolia*		2 – 10	1.30
Eremophila	*forrestii*		<2	1.30
Eremophila	*fraseri*		<2	1.50
Eremophila	*latrobei*	subsp. *filiformis*	<2	1.50
Eriachne	*mucronata*		<2	0.50
Eriachne	*pulchella*	subsp. *dominii*	<2	0.10
Eucalyptus	*leucophloia*	subsp. *leucophloia*	<2	6.00
Eulalia	*aurea*		<2	0.50
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.20

Species			% Cover	Height
Indigofera	*monophylla*		<2	0.30
Lepidum	*platypetalum*		<2	0.30
Maireana	*georgei*		<2	0.40
Maireana	*melanocoma*		<2	0.30
Paraneurachne	*muelleri*		<2	0.40
Psydrax	*latifolia*		<2	1.50
Ptilotus	*calostachyus*		<2	0.20
Ptilotus	*nobilis*		<2	0.30
Ptilotus	*obovatus*		<2	0.40
Santalum	*lanceolatum*		<2	0.50
Sarcostemma	*viminale*	subsp. *australe*	<2	1.50
Sclerolaena	cf. *convexula*		<2	0.20
Senna	*artemisioides*	subsp. *helmsii*	<2	1.50
Senna	cf. sp. Meekatharra		<2	2.50
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.70
Senna	sp. Meekatharra		<2	0.20
senna	*stricta*		<2	1.00
Solanum	*horridum*		<2	0.20
Solanum	*lasiophyllum*		<2	0.50
Tribulus	*suberosus*		<2	0.50
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.50
Triodia	*pungens*		31 – 70	0.70

Site	Orebody 31 - Site OB31/2-21
Date	10/10/13
Recorder	JB/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	205494
Northing	7418333
Habitat	HSL
Aspect	
Slope	Low
Soil	Loamy Sand
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van leeuwen 3835) with High Open Shrubland of Acacia trudgeniana, Hakea lorea subsp. lorea, hakea chordophylla over Low Open Shrubland of Acacia hilliana, Acacia adoxa var. adoxa, Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	2 – 10	0.30
Acacia	*ancistrocarpa*		<2	1.20
Acacia	*hilliana*		2 – 10	0.30
Acacia	*monticola*		<2	1.50
Acacia	*pruinocarpa*		<2	2.00
Acacia	*tenuissima*		<2	0.50
Acaia	*trudgeniana*		<2	2.00
Amphipogon	*sericeus*		<2	1.30
Calytrix	*carinata*		<2	0.30
Cymbopogon	*obtectus*		<2	0.80
Dodonaea	*coriacea*		<2	0.50
Goodenia	sp. Sandy Creek		<2	0.30
Grevillea	*wickhamii*		<2	1.00
Hakea	*chordophylla*		<2	2.70
Hakea	*lorea*	subsp. *lorea*	2 – 10	1.50
Halgania	*solanacea*	var. Mt Doreen	<2	0.30
Hibiscus	*sturtii*	var. *truncata*	<2	0.30
Hybanthus	*aurantiacus*		<2	0.20
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	0.40
Scaevola	*parvifolia*		<2	0.20
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.80
Solanum	*lasiophyllum*		<2	0.50
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		11 – 30	0.30

Site	Orebody 31 - Site OB31/2-22
Date	12/10/13
Recorder	JB/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	205673
Northing	7419761
Habitat	DDE
Aspect	10
Slope	Low
Soil	Loamy Sand
Rock Type	Cobbles
% Leaves:Logs	2 – 10:<2
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	High Shrubland of Grevillea wickhamii, Acacia sibirica, over Shrubland of Acacia wanyu, EX04.01 over Open Hummock Grassland of Triodia sp. Shovelanna Hilll (S. Van leeuwen 3835), Triodia pungens with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia, Acacia pruinocarpa

Species			% Cover	Height
Acacia	*adoxa*	var. *adoxa*	<2	0.70
Acacia	*aptaneura*		<2	1.30
Acacia	*maitlandii*		<2	1.70
Acacia	*marramamba*		2 – 10	1.10
Acacia	*pruinocarpa*		2 – 10	3.00
Acacia	*sibirica*		2 – 10	2.00
Acacia	*sibirica*		2 – 10	2.00
Acacia	*tetragonophylla*		<2	1.00
Acacia	*wanyu*		11 – 30	1.50
Anthobolus	*leptomerioides*		<2	1.20
Aristida	*holathera*	var. *holathera*	<2	0.30
Aristida	*inaequiglumis*		<2	1.00
Cassytha	*capillaris*		<2	0.10
Corchorus	*sidoides*		<2	0.60
Cymbopogon	*obtectus*		<2	0.30
Dodonaea	*coriacea*		<2	0.50
Eragrostis	*eriopoda*		<2	0.30
Eremophila	*cuneifolia*		<2	0.30
Eremophila	*latrobei*	subsp. *latrobei*	<2	2.00
Eriachne	*mucronata*		2 – 10	0.30
Eucalyptus	*leucophloia*	subsp. *leucophloia*	2 – 10	3.50
Gompholobium	*oreophilum*		2 – 10	0.60
Grevillea	*wickhamii*		2 – 10	2.00
Hibiscus	*coatesii*		<2	0.30
Hybanthus	*aurantiacus*		<2	0.20
Indigofera	*monophylla*		<2	0.20

Species			% Cover	Height
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	1.00
Lamarchea	*sulcata*		<2	1.20
Ptilotus	*calostachyus*		<2	0.40
Ptilotus	*rotundifolius*		<2	1.00
Santalum	*lanceolatum*		<2	2.00
Sclerolaena	cf. *convexula*		<2	0.30
Senna	*artemisioides*	subsp. *helmsii*	<2	0.80
Senna	*glutinosa*	subsp. *luerssenii*	<2	0.40
Senna	*stricta*		2 – 10	1.00
Sida	*arenicola*		<2	0.20
Sida	sp. Golden calyces		<2	0.30
Solanum	*horridum*		<2	0.20
Solanum	*lasiophyllum*		<2	0.30
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		11 – 30	0.40
Triodia	*pungens*		11 – 30	0.50

Site	Orebody 31 - Site OB31/2-23
Date	9/10/13
Recorder	HCR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	206225
Northing	7419763
Habitat	HCR
Aspect	
Slope	Low
Soil	Silty Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Excellent
Disturbance Type	Mining Exploration
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Open Shrubland of Acacia balsamea, Acacia marramamba over Low Open Shrubland of Acacia hilliana, Ptilotus rotundifolius

Species			% Cover	Height
Acacia	*adsurgens*		<2	2.50
Acacia	*balsamea*		<2	1.30
Acacia	*bivenosa*		<2	2.70
Acacia	*hilliana*		2 – 10	0.40
Acacia	*marramamba*		2 – 10	1.50
Acacia	*sibirica*		<2	1.20
Amphipogon	*sericeus*		<2	0.50
Calytrix	*carinata*		<2	0.40
Cymbopogon	*obtectus*		<2	0.30
Duperreya	*commixta*		<2	0.10
Eremophila	*exilifolia*		<2	0.70
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.50
Fimbristylis	*dichotoma*		<2	0.20
Goodenia	*triodiophila*		<2	0.30
Grevillea	*berryana*		2 – 10	3.20
Grevillea	*wickhamii*		<2	1.70
Hakea	*lorea*	subsp. *lorea*	<2	0.50
Halgania	*solanacea*	var. Mt Doreen	<2	0.20
Hybanthus	*aurantiacus*		<2	0.20
Paraneurachne	*muelleri*		<2	0.50
Psydrax	*suaveolens*		<2	0.80
Pterocaulon	*sphacelatum*		<2	0.50
Ptilotus	*calostachyus*		<2	0.60
Ptilotus	*rotundifolius*		<2	0.90
Senna	cf. sp. Meekatharra		<2	1.20
Senna	*glutinosa*	subsp. *luerssenii*	<2	2.00
Senna	*stricta*		<2	1.00

Species			% Cover	Height
Sida	*echinocarpa*		<2	0.30
Sida	sp. Golden calyces		<2	0.40
Solanum	*horridum*		<2	0.20
Solanum	*lasiophyllum*		<2	0.80
Tribulus	*suberosus*		<2	1.00
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		31 – 70	0.50

Site	Orebody 31 - Site OB31/2-24
Date	12/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204510
Northing	7421057
Habitat	PLN
Aspect	
Slope	Flat
Soil	Loamy Sand
Rock Type	Gravel
% Leaves:Logs	2 – 10:<2
Vegetation Condition	Excellent
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia basedowii with High Shrubland of Acacia ancistrocarpa, Acacia aptaneura, Acacia adsurgens over Low Open Shrubland of Bonamia erecta, Isotropis atropurpurea, Solanum sturtianum over Very Open Tussock Grassland of Aristida inaequiglumis, Paraneurachne muelleri, Eragrostis eriopoda with Scattered Low Trees of Corymbia hamersleyana

Species			% Cover	Height
Abutilon	*cunninghamii*		<2	0.90
Acacia	*adsurgens*		<2	2.00
Acacia	*ancistrocarpa*		11 – 30	2.00
Acacia	*aptaneura*		<2	1.50
Acacia	*bivenosa*		<2	2.50
Acacia	*elachantha*		<2	2.00
Acacia	*kempeana*		<2	2.50
Acacia	*pachyacra*		<2	1.70
Acacia	*tetragonophylla*		<2	1.50
Aristida	*contorta*		<2	0.30
Aristida	*holathera*	var. *holathera*	<2	0.30
Aristida	*inaequiglumis*		2 – 10	0.80
Bonamia	*erecta*		2 – 10	0.50
Chrysopogon	*fallax*		<2	0.70
Corchorus	*hamersleyana*		2 – 10	4.50
Corchorus	*sidoides*		<2	0.40
Cymbopogon	*obtectus*		2 – 10	0.70
Dicrastylis	*cordifolia*		<2	0.50
Digitaria	*brownii*		<2	0.60
Dodonaea	*coriacea*		<2	0.70
Enneapogon	*polyphyllus*		<2	0.40
Eragrostis	*eriopoda*		<2	0.40
Eulalia	*aurea*		<2	0.50
Euphorbia	*australis*	subsp. *hispidula*	<2	0.20
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.10

Species			% Cover	Height
Goodenia	*vilmorinae*		<2	0.40
Goodenia	sp. indet		<2	0.40
Gossypium	*robinsonii*		<2	2.50
Grevillea	*wickhamii*		<2	1.00
Hakea	*lorea*	subsp. *lorea*	<2	2.50
Hibiscus	*sturtii*	var. *platychlamys*	<2	0.30
Hybanthus	*aurantiacus*		<2	0.60
Indigofera	*georgei*		<2	0.50
Isotropis	*atropurpurea*		2 – 10	0.80
Isotropis	*forrestii*		<2	0.50
Paraneurachne	*muelleri*		2 – 10	0.30
Ptilotus	*astrolasius*		<2	0.40
Ptilotus	*obovatus*		<2	0.50
Rhagodia	sp. Hamersley (M.E. Trudgen 17794)		<2	1.50
Rulingia	*luteiflora*		<2	1.50
Santalum	*lanceolatum*		<2	1.50
Scaevola	*parvifolia*	subsp. *pilbarae*	<2	0.30
Senna	*artemisioides*	subsp. *helmsii*	<2	0.70
Senna	cf. sp. Meekatharra		<2	1.30
Sida	*arenicola*		<2	1.00
Sida	*echinocarpa*		<2	0.30
Sida	sp. Pilbara		<2	0.50
Solanum	*lasiophyllum*		<2	0.50
Solanum	*sturtanium*		<2	0.80
Themeda	*triandra*		<2	0.80
Tribulus	sp. indet.		<2	0.20
Trichodesma	*zeylanicum*		<2	1.00
Triodia	*basedowii*		31 – 70	0.70

Site	Orebody 31 - Site OB31/2-25
Date	12/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204040
Northing	7421274
Habitat	PLN
Aspect	
Slope	Flat
Soil	Silty Clay Loam
Rock Type	Cobbles
% Leaves:Logs	2 – 10:2 – 10
Vegetation Condition	Excellent
Disturbance Type	Cattle Grazing
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Low Woodland of Acacia aptaneura, Acacia catenulata subsp. occidentalis, Acacia paraneura over High Shrubland of Acacia ayersiana, Acacia aptaneura over Open Hummock Grassland of Triodia basedowii with Low Open Shrubland of Eremophila forrestii, Sida ectogama, Dodonaea petiolaris

Species			% Cover	Height
^*Rhagodia*	sp. Hamersley (M.E. Trudgen 17794)		<2	1.50
Acacia	*aptaneura*		2 – 10	6.50
Acacia	*bivenosa*		<2	3.00
Acacia	*catenulata*	subsp. *occidentalis*	2 – 10	4.00
Acacia	*paraneura*		2 – 10	4.00
Acacia	*pruinocarpa*		<2	5.00
Acacia	*tetragonophylla*		<2	3.00
Acacia	*ayersiana*		2 – 10	2.20
Acacia	cf. *cuthbertsonii*		2 – 10	2.50
Acacua	*pteraneura*		2 – 10	2.50
Anthobolus	*leptomerioides*		<2	2.00
Aristida	*contorta*		<2	0.20
Aristida	*inaequiglumis*		<2	0.50
Corchorus	*sidoides*		<2	0.40
Corymbia	*hamersleyana*		<2	2.00
Cymbopogon	*obtectus*		<2	1.00
Digitaria	*brownii*		<2	0.50
Dodonaea	*petiolaris*		2 – 10	1.50
Enneapogon	*polyphyllus*		<2	0.30
Eragrostis	*eriopoda*		<2	0.40
Eremophila	*forrestii*		2 – 10	1.30
Eremophila	*fraseri*		<2	1.00
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.70
Eriachne	*pulchella*	subsp. *dominii*	<2	0.10
Eulalia	*aurea*		<2	0.50

Species			% Cover	Height
Gomphrena	*kanisii*		<2	0.20
Gossypium	*robinsonii*		<2	2.50
Hibiscus	*burtonii*		<2	0.50
Hibiscus	*coatesii*		<2	0.30
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	0.50
Maireana	*villosa*		<2	0.40
Paraneurachne	*muelleri*		<2	0.40
Psydrax	*suaveolens*		<2	1.30
Psydrax	*latifolia*		<2	2.20
Ptilotus	*nobilis*		<2	0.40
Ptilotus	*obovatus*		<2	1.00
Ptilotus	*schwartzii*		<2	0.30
Senna	*artemisioides*	subsp. *helmsii*	<2	1.40
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.00
Senna	sp. Meekatharra		<2	1.20
Sida	*cardiophylla*		<2	0.60
Sida	sp. indet.		<2	0.30
Sida	*ectogama*		2 – 10	1.30
Solanum	*lasiophyllum*		<2	0.40
Triaphis	*mollis*		<2	0.10
Triodia	*basedowii*		11 – 30	0.40
Triodia	*pungens*		<2	0.60

Site	Orebody 31 - Site OB31/2-26
Date	8/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	202671
Northing	7419788
Habitat	HSL
Aspect	
Slope	Low
Soil	Silty Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Road/ Access Track
Fire Age	Moderate (3 – 5 yrs)
Vegetation	High Shrubland of Acacia wanyu, Senna glutinosa subsp. luerssenii over Low Shrubland of Eremophila cuneifolia over Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens

Species			% Cover	Height
Acacia	*aptaneura*		<2	3.50
Acacia	*bivenosa*		<2	2.50
Acacia	*paraneura*		<2	3.00
Acacia	*sibirica*		<2	0.60
Acacia	*tetragonophylla*		<2	1.50
Acacia	*wanyu*		2 – 10	2.00
Amphipogon	*sericeus*		<2	0.30
Anthobolus	*leptomerioides*		<2	0.40
Aristida	*contorta*		<2	0.10
Brachyachne	*prostrata*		<2	0.10
Cassytha	*capillaris*		<2	0.10
Cymbopogon	*obtectus*		<2	0.20
Dodonaea	*coriacea*		<2	0.30
Duperreya	*commixta*		<2	0.20
Enneapogon	*polyphyllus*		<2	0.30
Eragrostis	sp. indet.		<2	0.10
Eremophila	*cuneifolia*		11 – 30	1.00
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.20
Eriachne	*pulchella*	subsp. *dominii*	<2	0.20
Frankenia	*setosa*		<2	0.30
Gomphrena	*kanisii*		<2	0.20
Hibiscus	*coatesii*		<2	0.20
Lepidium	*platypetalum*		<2	0.50
Maireana	*carnosa*		<2	0.20
Maireana	*georgei*		<2	0.30
Maireana	*melanocoma*		<2	0.30
Maireana	*tomentosa*		<2	0.20

Species			% Cover	Height
Maireana	*triptera*		<2	0.20
Paraneurachne	*muelleri*		<2	0.40
Ptilotus	*calostachyus*		<2	0.30
Ptilotus	*nobilis*		<2	0.30
Ptilotus	*obovatus*		<2	0.40
Sclerolaena	cf. *convexula*		<2	0.20
Sclerolaena	*cuneata*		<2	0.20
Sclerolaena	*densiflora*		<2	0.20
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.50
Senna	*artemisioides*	subsp. *helmsii*	<2	0.50
Senna	*glutinosa*	subsp. *luerssenii*	2 – 10	1.70
Senna	*glutinosa*	subsp. *pruinosa*	<2	0.20
Senna	sp. Meekatharra		<2	0.40
Senna	*stricta*		<2	0.30
Solanum	*lasiophyllum*		<2	0.30
Tribulus	*suberosus*		<2	1.00
Triodia	*pungens*		2 – 10	1.00
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		<2	0.60

Site	Orebody 31 - Site OB31/2-27
Date	8/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	202515
Northing	7420127
Habitat	HCR
Aspect	45
Slope	Low
Soil	Silty Loam
Rock Type	Boulders
% Leaves:Logs	<2:<2
Vegetation Condition	Excellent
Disturbance Type	Mining Exploration
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Open Shrubland of Grevillea berryana over Low Open Shrubland of Senna stricta, Ptilotus rotundifolius, Ptilotus calostachyus

Species			% Cover	Height
Acacia	*adsurgens*		<2	2.00
Acacia	*aptaneura*		<2	2.00
Acacia	*bivenosa*		<2	1.00
Acacia	*melleodora*		<2	1.00
Acacia	sp. nov (reticulate /anastomosing)		<2	1.50
Acacia	*tetragonophylla*		<2	1.00
Amphipogon	*sericeus*		<2	0.30
Anthobolus	*leptomerioides*		<2	1.00
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.30
Aristida	*inaequiglumis*		<2	0.50
Chrysopogon	*pterochaetum*		<2	0.30
Codonocarpus	*continifolius*		<2	0.50
Cymbopogon	*ambiguus*		<2	1.00
Cymbopogon	*obtectus*		<2	0.50
Digitaria	*brownii*		<2	0.40
Eragrostis	sp. indet.		<2	0.20
Eremophila	*cuneifolia*		<2	0.40
Eremophila	*fraseri*		<2	0.50
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.50
Eriachne	*mucronata*		<2	0.40
Goodenia	sp. indet.		<2	
Goodenia	*stobbsiana*		<2	0.30
Goodenia	*triodiophila*		<2	0.20
Grevillea	*berryana*		<2	2.00
Grevillea	*wickhamii*		<2	0.40

Species			% Cover	Height
Halgania	*gustafsenii*		<2	0.30
Hibiscus	*burtonii*		<2	0.30
Hybanthus	*aurantiacus*		<2	0.30
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	0.40
Maireana	*georgei*		<2	0.30
Maireana	*melanocoma*		<2	0.20
Maireana	*triptera*		<2	0.20
Paraneurachne	*muelleri*		<2	0.40
Paspalidium	*clementii*		<2	0.20
Psydrax	*latifolia*		<2	0.50
Psydrax	*suaveolens*		<2	0.50
Ptilotus	*calostachyus*		<2	0.50
Ptilotus	*nobilis*		<2	0.30
Ptilotus	*obovatus*		<2	0.50
Ptilotus	*rotundifolius*		<2	0.80
Sclerolaena	cf. *convexula*		<2	0.30
Senna	*glutinosa*	subsp. *luerssenii*	<2	0.50
Senna	sp. Meekatharra		<2	0.40
Senna	*stricta*		2 – 10	0.80
Sida	sp. Golden calyces		<2	0.20
Solanum	*horridum*		<2	0.10
Solanum	*lasiophyllum*		<2	0.40
Stenopetalum	cf. *anfractum*		<2	0.40
Trianthema	*glossostigma*		<2	0.10
Tribulus	*suberosus*		<2	1.00
Triodia	*pungens*		<2	0.80
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		31 – 70	0.80

Site	Orebody 31 - Site OB31/2-28
Date	13/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	202287
Northing	7420396
Habitat	DDE
Aspect	
Slope	Low
Soil	Sand
Rock Type	Gravel
% Leaves:Logs	
Vegetation Condition	Very Good
Disturbance Type	Cattle Grazing
Fire Age	Old (6+ yrs)
Vegetation	Low Woodland of Acacia citrinoviridis, Acacia pruinocarpa, Acacia aptaneura over Open Hummock Grassland of Triodia pungens, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with High Open Shrubland of Acacia citrinoviridis, Acacia monticola, Petalostylis labicheoides

Species			% Cover	Height
Acacia	*ancistrocarpa*		<2	2.00
Acacia	*aptaneura*		2 – 10	4.00
Acacia	*citrinoviridis*		11 – 30	4.50
Acacia	*monticola*		<2	2.70
Acacia	*pruinocarpa*		2 – 10	3.50
Acacia	*sibirica*		<2	2.00
Acacia	*subcontorta*		<2	2.50
Acacia	*wanyu*		2 – 10	1.20
Acacia	*bivenosa*		<2	2.00
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	0.80
Bonamia	*erecta*		<2	0.30
Cassytha	*capillaris*		<2	0.10
Corchorus	*sidoides*		<2	0.40
Corymbia	*aspera*		<2	5.00
Cymbopogon	*obtectus*		<2	0.50
Dicrastylis	*cordifolia*		<2	0.50
Digitaria	*brownii*		<2	0.50
Dodonaea	*coriacea*		<2	0.50
Dodonaea	*pachyneura*		<2	1.50
Duperreya	*commixta*		<2	0.10
Eragrostis	sp. indet.		<2	0.30
Eremophila	*forrestii*		<2	1.00
Eremophila	*latrobei*	var. *latrob*	<2	1.50
Eriachne	*lanata*		<2	0.40
Eriachne	*mucronata*		<2	0.30

Species			% Cover	Height
Eriachne	*pulchella*	subsp. *dominii*	<2	0.20
Eucalyptus	*leucophloia*	subsp. *leucophloia*	<2	4.00
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.10
Gompholobium	*oreophilum*		<2	0.50
Goodenia	*vilmorinae*		<2	0.20
Gossypium	*robinsonii*		<2	1.50
Grevillea	*wickhamii*		<2	1.50
Hibiscus	*burtonii*		<2	0.50
Hybanthus	*aurantiacus*		<2	0.50
Isotropis	*atropurpurea*		<2	0.50
Maireana	*georgei*		<2	0.20
Petalostylis	*labicheoides*		<2	1.50
Ptilotus	*calostachyus*		<2	0.50
Ptilotus	*obovatus*		<2	0.80
Rulingia	*luteiflora*		<2	1.00
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.80
Senna	*glutinosa*	subsp. *luerssenii*	<2	0.80
Sida	sp. Pilbara		<2	0.50
Sida	sp. indet.		<2	0.30
Sida	sp. Spiciform panicles		<2	1.20
Solanum	*lasiophyllum*		<2	0.50
Solanum	*sturtanium*		<2	1.00
Synaptantha	*tillaeacea*		<2	0.10
Tephrosia	*rosea*	var. Fortescue creeks	<2	0.50
Themeda	*triandra*		2 – 10	0.80
Triodia	*pungens*		11 – 30	0.80
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.50

Site	Orebody 31 - Site OB31/2-29
Date	11/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	203075
Northing	7418396
Habitat	DDE
Aspect	90
Slope	Low
Soil	Clayey Sand
Rock Type	Gravel
% Leaves:Logs	2 – 10:<2
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	High Shrubland of Acacia adsurgens, Acacia ancistrocarpa over Open Tussock Grassland of Aristida inaequiglumis, Digitaria brownii, Eulalia aurea over Open Hummock Grassland of Triodia schinzii over Low Open Woodland of Corymbia hamersleyana, Acacia aptaneura, Acacia pteraneura over Open Shrubland of Isotropis atropurpurae, Isotropis forrestii

Species			% Cover	Height
**Cenchrus*	*ciliaris*		<2	0.50
Abutilon	*cryptopetalum*		<2	1.50
Acacia	*adsurgens*		2 – 10	1.80
Acacia	*ancistrocarpa*		2 – 10	1.70
Acacia	*aptaneura*		2 – 10	4.00
Acacia	*bivenosa*		<2	2.50
Acacia	*elachantha*		2 – 10	2.50
Acacia	*melleodora*		<2	0.50
Acacia	*monticola*		<2	1.80
Acacia	*pteraneura*		<2	0.80
Acacia	*sericophylla*		<2	3.50
Acacia	*tenuissima*		<2	1.50
Acacia	*tetragonophylla*		<2	1.20
Acacia	*pteraneura*		<2	2.50
Androclava	*luteiflora*		<2	1.80
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		11 – 30	1.00
Chrysopogon	*fallax*		<2	0.50
Corchorus	*sidoides*		<2	0.30
Corymbia	*hamersleyana*		2 – 10	6.00
Cymbopogon	*obtectus*		<2	0.50
Dicrastylis	*cordifolia*		<2	0.80
Digitaria	*brownii*		2 – 10	0.80
Dodonaea	*coriacea*		<2	0.50
Dodonaea	*petiolaris*		<2	1.00

Species			% Cover	Height
Duperreya	*commixta*		2 – 10	0.10
Enneapogon	*polyphyllus*		<2	0.20
Eragrostis	*eriopoda*		<2	0.40
Eremophila	*exilifolia*		<2	0.80
Eremophila	*forrestii*		<2	0.50
Eremophila	*longifolia*		2 – 10	2.30
Eucalyptus	*gamophylla*		2 – 10	3.00
Eulalia	*aurea*		2 – 10	0.80
Grevillea	*wickhamii*		<2	1.30
Hibiscus	cf. *leptocladus*		<2	0.50
Hibiscus	*sturtii*	var. *platychlamys*	<2	0.40
Hibiscus	*sturtii*	var. *truncata*	<2	0.30
Hybanthus	*aurantiacus*		<2	0.60
Indigofera	*monophylla*		<2	0.30
Isotropis	*atropurpurea*		2 – 10	0.80
Isotropis	*forrestii*		2 – 10	1.00
Keraudrenia	*velutina*	subsp. *ellipticum*	2 – 10	0.60
Panicum	*effusum*		<2	0.40
Paraneurachne	*muelleri*		<2	0.40
Scaevola	*parvifolia*		<2	0.20
Senna	*artemisioides*	subsp. *helmsii*	<2	0.30
Senna	*notabilis*		<2	0.30
Sida	*arenicola*		<2	1.50
Sida	sp. indet.		<2	0.50
Sida	sp. Pilbara		<2	1.00
Solanum	*horridum*		<2	0.20
Solanum	*lasiophyllum*		<2	0.30
Themeda	*triandra*		2 – 10	0.40
Trichodesma	*zeylanicum*		<2	1.00
Triodia	*schinzii*		11 – 30	1.00
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		<2	0.60
Triodia	*pungens*		<2	0.80

Site	Orebody 31 - Site OB31/2-30
Date	9/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	207217
Northing	7421208
Habitat	HSL
Aspect	45
Slope	Low
Soil	Silty Loam
Rock Type	Boulders
% Leaves:Logs	
Vegetation Condition	Excellent
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with High Shrubland of Acacia wanyu, Acacia tetragonophylla with Low Open Woodland of Acacia aptaneura, Eucalyptus leucophloia subsp. leucophloia over Open Shrubland of Senna stricta, Acacia wanyu, Scaevola spinescens

Species			% Cover	Height
Acacia	*aptaneura*		2 – 10	3.00
Acacia	*bivenosa*		<2	2.00
Acacia	*tetragonophylla*		<2	1.50
Acacia	*wanyu*		11 – 30	2.00
Acacia	*pruinocarpa*		<2	3.00
Androclava	*luteiflora*		<2	1.50
Anthobolus	*leptomerioides*		<2	1.20
Aristida	*contorta*		<2	0.30
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	0.80
Duperreya	*commixta*		<2	0.10
Enneapogon	*lindleyanus*		<2	0.30
Eragrostis	sp. indet.		<2	0.20
Eremophila	*cuneifolia*		<2	0.80
Eremophila	*latrobei*	subsp. *filiformis*	<2	1.10
Eremophila	*latrobei*	subsp. *latrobei*	<2	2.50
Eucalyptus	*leucophloia*	subsp. *leucophloia*	<2	5.00
Eulalia	*aurea*		<2	0.20
Goodenia	sp. Sandy Creek		<2	0.40
Grevillea	*berryana*		<2	2.20
Grevillea	*wickhamii*		<2	2.00
Halgania	*solanacea*	var. Mt Doreen	<2	0.50
Maireana	*georgei*		<2	0.40
Maireana	*thesioides*		<2	0.80
Pterocaulon	*sphacelatum*		<2	0.20
Ptilotus	*calostachyus*		<2	0.20

Species			% Cover	Height
Ptilotus	*nobilis*		<2	0.50
Ptilotus	*obovatus*		<2	1.00
Ptilotus	*rotundifolius*		<2	0.20
Scaevola	*spinescens*		2 – 10	1.00
Sclerolaena	cf. *convexula*		<2	0.20
Senna	*glutinosa*	subsp. *luerssenii*	<2	2.50
Senna	sp. Meekatharra		<2	0.20
Senna	*stricta*		2 – 10	1.30
Sida	*arenicola*		<2	0.50
Sida	*echinocarpa*		<2	0.30
Sida	sp. Golden calyces		<2	0.30
Sida	sp. Pilbara		<2	0.50
Solanum	*horridum*		<2	0.30
Solanum	*lasiophyllum*		<2	0.60
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		31 – 70	0.50
Triodia	*pungens*		2 – 10	0.50

Site	Orebody 31 - Site OB31/2-31
Date	13/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	208436
Northing	7421064
Habitat	FOO
Aspect	
Slope	Low
Soil	Clayey Sand
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Other
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia basedowii with Shrubland of Grevillea wickhamii, Acacia adsurgens, Acacia tenuissima with High Open Shrubland of Grevillea wickhami, Acacia adsurgens, Acacia trudgeniana

Species			% Cover	Height
**Cenchrus*	*ciliaris*		<2	0.40
Acacia	*adoxa*	var. *adoxa*	<2	0.40
Acacia	*adsurgens*		2 – 10	1.70
Acacia	*ancistrocarpa*		<2	1.50
Acacia	*bivenosa*		<2	2.00
Acacia	*sibirica*		<2	0.40
Acacia	*tenuissima*		2 – 10	1.20
Acacia	*trudgeniana*		<2	2.00
Amphipogon	*sericeus*		<2	0.20
Anthobolus	*leptomerioides*		<2	1.10
Aristida	*holathera*	var. *holathera*	<2	0.30
Bonamia	*erecta*		<2	0.50
Cassytha	*capillaris*		<2	0.10
Cymbopogon	*obtectus*		<2	0.80
Dicrastylis	*cordifolia*		<2	0.30
Dodonaea	*coriacea*		<2	1.00
Eragrostis	*eriopoda*		<2	0.20
Eremophila	*latrobei*	subsp. *latrobei*	<2	1.00
Goodenia	*triodiophila*		<2	0.40
Grevillea	*wickhamii*		2 – 10	2.00
Hakea	*lorea*	subsp. *lorea*	<2	1.80
Halgania	*solanacea*	var. Mt Doreen	2 – 10	0.60
Hibiscus	*sturtii*	var. *truncata*	<2	0.40
Hybanthus	*aurantiacus*		<2	0.60
Ptilotus	*calostachyus*		<2	0.50
Ptilotus	*rotundifolius*		<2	0.80
Scaevola	*parvifolia*		<2	0.30

Species			% Cover	Height
Senna	*artemisioides*	subsp. *filiformis*	<2	1.20
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.50
Sida	*arenicola*		<2	0.20
Sida	*cardiophylla*		<2	0.20
Solanum	*centrale*		<2	0.30
Triodia	*basedowii*		2 – 10	0.60
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		11 – 30	0.50
Yakirra	*australiensis*		<2	0.10

Site	Orebody 31 - Site OB31/2-32
Date	10/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204663
Northing	7418342
Habitat	PLN
Aspect	
Slope	Flat
Soil	Sand
Rock Type	Gravel
% Leaves:Logs	<2:2 – 10
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia basedowii, Triodia pungens, Triodia sp. Shovelanna Hill (S. Van leeuwen 3835) with Low Woodland of Acacia paraneura, Acacia pruinocarpa, Acacia aptaneura over Shrubland of Eremophila forrestii, Eremophila fraseri

Species			% Cover	Height
Acacia	*aptaneura*		2 – 10	4.50
Acacia	*paraneura*		2 – 10	5.50
Acacia	*pruinocarpa*		2 – 10	5.50
Acacia	*tetragonophylla*		<2	2.00
Anthobolus	*leptomerioides*		<2	1.30
Aristida	*contro*		<2	0.20
Aristida	*inaequiglumis*		<2	0.40
Dodonaea	*petiolaris*		<2	1.20
Duperreya	*commixta*		<2	0.10
Enchylaena	*tomentosa*		<2	0.30
Eragrostis	*eriopoda*		<2	0.40
Eragrostis	*pergracilis*		<2	0.10
Eremophila	*forrestii*		11 – 30	1.50
Eremophila	*fraseri*		11 – 30	1.70
Eulalia	*aurea*		<2	0.60
ptilotus	*obovatus*		<2	0.60
Ptilotus	*schwartzii*		<2	0.30
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.20
Senna	cf. sp. Meekatharra		<2	2.00
Sida	*cardiophylla*		<2	0.20
Solanum	*lasiophyllum*		<2	0.40
Triodia	*basedowii*		11 – 30	0.50
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		<2	0.20
Triodia	*pungens*		11 – 30	0.50
Triraphis	*mollis*		<2	0.10

Site	Orebody 31 - Site OB31/2-33
Date	14/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	201775
Northing	7421298
Habitat	PLN
Aspect	
Slope	Low
Soil	Loamy Sand
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Cattle Grazing
Fire Age	Old (6+ yrs)
Vegetation	Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. van leeuwen 3835) with High Open Shrubland of Acacia bivenosa over Open Shrubland of Acacia wanyu, Acacia bivenosa, Acacia tenuissima

Species			% Cover	Height
Acacia	*adsurgens*		<2	1.50
Acacia	*aptaneura*		<2	0.20
Acacia	*bivenosa*		11 – 30	2.70
Acacia	*hilliana*		<2	0.30
Acacia	*sibirica*		<2	1.50
Acacia	*tenuissima*		<2	0.80
Acacia	*tetragonophylla*		<2	1.30
Acacia	*wanyu*		2 – 10	1.70
Amphipogon	*sericeus*		<2	0.30
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	0.50
Corchorus	*sidoides*		<2	0.30
Cymbopogon	*obtectus*		<2	0.40
Dodonaea	*coriacea*		<2	0.80
Duperreya	*commixta*		<2	0.10
Enneapogon	*polyphyllus*		<2	0.20
Eragrostis	*eriopoda*		<2	0.30
Eremophila	*forrestii*		<2	0.40
Eremophila	*fraseri*		<2	0.80
Eremophila	*latrobei*	subsp. *latrobei*	<2	0.80
Eriachne	*mucronata*		<2	0.70
Eucalyptus	*gamophylla*		<2	1.50
Eulalia	*aurea*		<2	0.80
Gomphrena	*kanisii*		<2	0.20
Goodenia	sp. Sandy Creek		<2	0.30

Species			% Cover	Height
Goodenia	*vilmoranae*		<2	0.20
Goodenia	*triodiophila*		<2	0.40
Hakea	*lorea*	subsp. *lorea*	<2	0.60
Halgania	*solanacea*	var. Mt Doreen	2 – 10	0.40
Hibiscus	*sturtii*	var. *truncata*	<2	0.20
Hybanthus	*aurantiacus*		<2	0.20
Indigofera	*monophylla*		<2	0.30
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	0.40
Paraneurachne	*muelleri*		<2	0.40
Ptilotus	*astrolasius*		<2	0.30
Ptilotus	*calostachyus*		<2	0.50
Ptilotus	*nobilis*		<2	0.50
Ptilotus	*obovatus*		<2	0.30
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.10
Senna	*artemisioides*	subsp. *helmsii*	<2	0.30
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.60
Senna	*glutinosa*	subsp. *luerssenii*	<2	0.50
Senna	*glutinosa*	subsp. *glutinosa*	<2	1.50
Senna	*stricta*		<2	0.80
Sida	sp. indet.		<2	0.30
Solanum	*lasiophyllum*		<2	0.40
Trianthema	*glossostigma*		<2	0.80
Tribulus	*suberosus*		<2	0.70
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		11 – 30	0.30
Triodia	*pungens*		<2	0.80

Site	Orebody 31 - Site OB31/2-34
Date	14/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	201866
Northing	7419028
Habitat	DDE
Aspect	20
Slope	Low
Soil	Loamy Sand
Rock Type	Cobbles
% Leaves:Logs	2 – 10:2 – 10
Vegetation Condition	Very Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Open Scrub of Acacia monticola, Grevillea wickhamii over Shrubland of Santalum lanceolatum, Acacia monticola over Open Hummock Grassland of Triodia pungens, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835)

Species			% Cover	Height
Acacia	*bivenosa*		<2	1.50
Acacia	*hilliana*		<2	0.40
Acacia	*monticola*		31 – 70	2.00
Acacia	*monticola*		<2	1.50
Acacia	*pruinocarpa*		<2	1.00
Acacia	*pteraneura*		<2	1.50
Acacia	*pteraneura*		<2	0.70
Androclava	*luteiflora*		<2	1.50
Aristida	*holathera*	var. *holathera*	<2	0.60
Aristida	*inaequiglumis*		<2	1.20
Bonamia	*erecta*		<2	0.40
Cassytha	*capillaris*		<2	0.10
Corchorus	*sidoides*		<2	0.70
Corymbia	*hamersleyana*		<2	3.50
Cymbopogon	*obtectus*		<2	0.80
Digitaria	*brownii*		<2	0.60
Duperreya	*commixta*		<2	0.10
Eragrostis	*eriopoda*		<2	0.50
Eriachne	*lanata*		<2	0.60
Eriachne	*mucronata*		<2	0.50
Eulalia	*aurea*		2 – 10	0.80
Gompholobium	*oreophilum*		<2	0.80
Grevillea	*wickhamii*		<2	2.20
Halgania	*solanacea*	var. Mt Doreen	<2	0.30
Hybanthus	*aurantiacus*		<2	0.60
Mirbelia	*viminalis*		<2	1.00
Paraneurachne	*muelleri*		2 – 10	0.50

Species			% Cover	Height
Petalostylis	*labicheoides*		2 – 10	1.50
Santalum	*lanceolatum*		2 – 10	1.70
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.30
Sida	*arenicola*		<2	1.30
Themeda	*triandra*		2 – 10	0.80
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		11 – 30	0.50
Triodia	*pungens*		11 – 30	0.80

Site	Orebody 31 - Site OB31/2-35
Date	14/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	201905
Northing	7418277
Habitat	HCR
Aspect	
Slope	Low
Soil	Loamy Sand
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Shrubland of Acacia wanyu, Acacia tetragonophylla over Low Shrubland of Senna stricta, Eremophila cuneifolia, Acacia wanyu over Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia brizoides, Triodia pungens

Species			% Cover	Height
Acacia	*aptaneura*		<2	3.00
Acacia	*paraneura*		2 – 10	3.00
Acacia	*tenuissima*		<2	1.00
Acacia	*tetragonophylla*		2 – 10	1.30
Acacia	*wanyu*		11 – 30	1.70
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.20
Aristida	*inaequiglumis*		<2	1.20
Corchorus	*sidoides*		<2	0.30
Duperreya	*commixta*		<2	0.10
Eragrostis	sp. indet.		<2	0.30
Eremophila	*cuneifolia*		2 – 10	0.70
Eulalia	*aurea*		<2	0.30
Fimbrystylis	sp. indet.		<2	0.20
Gomphrena	*kanisii*		<2	0.20
Goodenia	sp. Sandy Creek		<2	0.30
Grevillea	*wickhamii*		<2	1.50
Maireana	*georgei*		2 – 10	0.20
Maireana	*melanocoma*		<2	0.20
Pterocaulon	*sphacelatum*		<2	0.80
Ptilotus	*calostachyus*		<2	0.30
ptilotus	*nobilis*		<2	0.30
Ptilotus	*obovatus*		<2	0.20
Scaevola	*spinescens*		2 – 10	0.80
Sclerolaena	cf. *convexula*		<2	0.10
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.50
Senna	sp. Meekatharra		<2	0.60

Species			% Cover	Height
Senna	*stricta*		11 – 30	1.20
Solanum	*horridum*		<2	0.10
Solanum	*lasiophyllum*		<2	0.50
Tribulus	*suberosus*		<2	0.70
Triodia	*brizoides*		2 – 10	0.80
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.80
Triodia	*pungens*		<2	0.80

Site	Orebody 31 - Site OB31/2-36
Date	15/10/13
Recorder	JB/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	202093
Northing	7416897
Habitat	DDE
Aspect	
Slope	Flat
Soil	Clay Loam, Sandy
Rock Type	
% Leaves:Logs	2 – 10:2 – 10
Vegetation Condition	Very Good
Disturbance Type	Cattle Grazing
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Closed Tussock Grassland of Themeda triandra, Eulalia aurea, Digitari brownii with Open Shrubland of Acacia pyrifolia, Acacia ancistrocarpa, Acacia aptaneura with Scattered Low Trees of Hakea lorea subsp. lorea, Acacia aptaneura, Corymbia aspera

Species			% Cover	Height
**Cenchrus*	*ciliaris*		<2	0.40
Abutilon	*otocarpum*		<2	0.20
Acacia	*ancistrocarpa*		2 – 10	1.50
Acacia	*aptaneura*		<2	3.50
Acacia	*citrinoviridis*		<2	2.00
Acacia	*pachyneura*		<2	2.00
Acacia	*pyrifolia*		2 – 10	1.70
Aristida	*inaequiglumis*		2 – 10	1.00
Bonamia	*erecta*		<2	0.30
Chrysopogon	*fallax*		<2	1.20
Corchorus	*sidoides*		<2	0.40
Corymbia	*aspera*		<2	4.00
Corymbia	*hamersleyana*		<2	2.00
Digitaria	*brownii*		2 – 10	0.60
Duperreya	*commixta*		<2	0.10
Dysphania	*rhadinostachya*		<2	0.20
Enneapogon	*polyphyllus*		<2	0.30
Eragrostis	*eriopoda*		<2	0.40
Eremophila	*forrestii*		<2	1.00
Eulalia	*aurea*		2 – 10	0.60
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.10
Hakea	*lorea*	subsp. *lorea*	2 – 10	3.50
Indigofera	*georgei*		<2	0.40
Isotropis	*forrestii*		<2	0.80
Lepidium	*muelleri-fernandii*		<2	0.10
Paraneurachne	*muelleri*		<2	0.40
Pluchea	*dentex*		<2	0.60

Species			% Cover	Height
Pluchea	*dunlopii*		<2	0.50
Pterocaulon	*sphacelatum*		<2	0.50
Senna	*artemisioides*	subsp. *helmsii*	<2	0.50
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.20
Sida	cf. *fibulifera*		<2	0.30
Sida	*platycalyx*		<2	0.20
Solanum	*sturtanium*		<2	0.50
Themeda	*triandra*		71 – 100	0.90
Trichodesma	*zeylanicum*		<2	1.00

Site	Orebody 31 - Site OB31/2-37
Date	15/10/13
Recorder	JB/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	203425
Northing	7419092
Habitat	DDE
Slope	Low
Soil	Loamy Sand
Rock Type	Gravel
% Leaves:Logs	2 – 10:2 – 10
Vegetation Condition	Very Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Open Scrub of Acacia ancistrocarpa, Acacia bivenosa, Acacia tenuissima over Open Hummock Grassland of Triodia pungens with Very Open Mallee of Eucalyptus gamophylla

Species			% Cover	Height
Abutilon	*otocarpum*		<2	0.30
Acacia	*adsurgens*		<2	0.50
Acacia	*ancistrocarpa*		31 – 70	2.20
Acacia	*bivenosa*		11 – 30	3.00
Acacia	*pachyacra*		<2	0.90
Acacia	*synchronicia*		<2	1.50
Acacia	*tenuissima*		<2	0.90
Acacia	*tetragonophylla*		<2	0.70
Acacia	*trudgeniana*		<2	0.80
Androclava	*luteiflora*		<2	0.40
Aristida	*inaequiglumis*		<2	0.40
Bonamia	*erecta*		2 – 10	0.40
Corchorus	*sidoides*		<2	0.20
Cymbopogon	*obtectus*		<2	0.60
Dodonaea	*coriacea*		<2	0.30
Duperreya	*commixta*		<2	0.10
Eragrostis	*eriopoda*		<2	0.20
Eremophila	*cuneifolia*		<2	0.60
Eucalyptus	*gamophylla*		2 – 10	2.70
Eulalia	*aurea*		2 – 10	0.50
Evolvulus	*alsinoides*	var. *decumbens*	<2	0.20
Grevillea	*wickhamii*		<2	0.30
Hibiscus	*sturtii*	var. *platychlamys*	<2	0.20
Indigofera	*monophylla*		<2	0.40
Paraneurachne	*muelleri*		2 – 10	0.50
Ptilotus	*obovatus*		<2	0.60
Senna	*artemisioides*	subsp. *oligophylla*	<2	2.00
Senna	*artemisioides*	subsp. *helmsii*	<2	0.60
Senna	*glutinosa*	subsp. *luerssenii*	<2	0.70
Triodia	*pungens*		11 – 30	1.00

Site	Orebody 31 - Site OB31/2-38
Date	15/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204319
Northing	7419194
Habitat	FOO
Slope	Low
Soil	Clay Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Closed Hummock Grassland of Triodia angusta with Low Shrubland of Eremophila cuneifolia, Lepidium platypetalum, Acacia synchronicia with Open Shrubland of Acacia synchronicia, Acacia tetragonophylla, Senna gltuinosa subsp. luerssenii

Species			% Cover	Height
Acacia	*aptaneura*		<2	1.80
Acacia	*paraneura*		<2	1.10
Acacia	*synchronicia*		2 – 10	1.20
Acacia	*tetragonophylla*		<2	1.30
Atriplex	sp. indet.		<2	0.30
Cassytha	*capillaris*		<2	0.10
Duperreya	*commixta*		<2	0.10
Enteropogon	*rasmosus*		<2	0.60
Eragrostis	*eriopoda*		<2	0.20
Eremophila	*cuneifolia*		2 – 10	0.60
Eremophila	*forrestii*		<2	1.20
Lepidium	*platypetalum*		2 – 10	0.50
Maireana	*carnosa*		<2	0.20
Maireana	*melanocoma*		<2	0.20
Maireana	*pyramidata*		<2	0.80
Maireana	*thesioides*		<2	0.40
Maireana	*tomentosa*		<2	0.20
Pterocaulon	*sphacelatum*		<2	0.80
Scaevola	*spinescens*		<2	1.20
Sclerolaena	cf. *convexula*		<2	0.20
Sclerolaena	*cuneata*		<2	0.20
Sclerolaena	*densiflora*		<2	0.20
Senna	*artemisioides*	subsp. *luerssenii*	<2	1.30
Senna	*artemisioides*	subsp. *helmsii*	<2	0.80
Senna	*artemisioides*	subsp. *oligophylla*	<2	0.80
Senna	sp. Meekatharra		<2	1.20
Senna	*stricta*		<2	0.30
Solanum	*lasiophyllum*		<2	0.80
Triodia	*angusta*		31 – 70	1.00

Site	Orebody 31 - Site OB31/2-39
Date	16/10/13
Recorder	JB/EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	204319
Northing	7419194
Habitat	PLN
Aspect	
Slope	Low
Soil	Light Medium Clay
Rock Type	Gravel
% Leaves:Logs	<2:<2
Vegetation Condition	Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia basedowii with Shrubland of Acacia bivenosa, Acacia ancistrocarpa, Acacia pachyacra with Very Open Mallee of Eucalyptus gamophylla

Species			% Cover	Height
Acacia	*adsurgens*		<2	1.50
Acacia	*ancistrocarpa*		2 – 10	1.70
Acacia	*aptaneura*		2 – 10	1.50
Acacia	*aptaneura*		<2	2.50
Acacia	*hilliana*		<2	0.40
Acacia	*pachyacra*		2 – 10	1.40
Acacia	*pruinocarpa*		<2	4.00
Acacia	*tenuissima*		<2	1.30
Acacia	*wanyu*		<2	1.00
Acacia	*bivenosa*		2 – 10	3.00
Aristida	*holathera*	var. *holathera*	<2	0.40
Bonamia	*erecta*		<2	0.40
Cassytha	*capillaris*		<2	0.10
Cymbopogon	*obtectus*		<2	0.80
Digitaria	*brownii*		<2	0.60
Dodonaea	*coriacea*		<2	0.50
Duperreya	*commixta*		<2	0.10
Eragrostis	*eriopoda*		<2	0.30
Eremophila	*forrestii*		<2	1.00
Eremophila	*latrobei*	subsp. *filiformis*	<2	0.80
Eucalyptus	*gamophylla*		2 – 10	2.70
Eulalia	*aurea*		<2	0.50
Halgania	*solanacea*	var. Mt Doreen	<2	0.20
Hybanthus	*aurantiacus*		<2	0.50
Isotropis	*atropurpurea*		<2	0.30
Paraneurachne	*muelleri*		<2	0.40
Ptilotus	*obovatus*		<2	0.40
enna	*artemisioides*	subsp. *helmsii*	<2	0.80

Species			% Cover	Height
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.30
Senna	cf. sp. Meekatharra		<2	0.90
Senna	*stricta*		<2	1.20
Sida	sp. Pilbara		<2	0.30
Solanum	*centrale*		<2	0.20
Solanum	*lasiophyllum*		<2	0.80
Solanum	*sturtanium*		<2	1.20
Tribulus	*suberosus*		<2	1.20
Triodia	*basedowii*		31 – 70	0.80

Site	Orebody 31 - Site OB31/2-40
Date	16/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	206250
Northing	7421100
Habitat	PLN
Aspect	
Slope	Low
Soil	Sandy Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Road/ Access Track
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia basedowii, Triodia sp. Shovelanna Hill (S. Van leeuwen 3835) with Low Open Woodland of Corymbia hamersleyana over Open Shrubland of Acacia ancistrocarpa, Acacia bivenosa, Hakea lora subsp. lorea

Species			% Cover	Height
**Cenchrus*	*ciliaris*		<2	0.90
Abutilon	sp. indet.		<2	0.30
Acacia	*adoxa*		<2	0.60
Acacia	*adsurgens*		<2	0.60
Acacia	*ancistrocarpa*		2 – 10	1.70
Acacia	*bivenosa*		<2	1.70
Acacia	*elachantha*		<2	1.30
Acacia	*melleodora*		<2	1.30
Acacia	*tetragonophylla*		<2	1.10
Acacia	*trudgeniana*		<2	1.00
Amphipogon	*sericeus*		<2	0.40
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	0.80
Bonamia	*erecta*		2 – 10	0.40
Corymbia	*hamersleyana*		2 – 10	5.00
Cymbopogon	*obtectus*		<2	0.40
Dicrastylis	*cordifolia*		<2	0.20
Eragrostis	*eriopoda*		<2	0.40
Eucalyptus	*gamophylla*		<2	3.50
Eulalia	*aurea*		<2	0.70
Grevillea	*wickhamii*		<2	0.60
Hakea	*lorea*	subsp. *lorea*	<2	1.10
Hibiscus	*sturtii*	var. *platychlamys*	<2	0.30
Hybanthus	*aurantiacus*		<2	0.30
Isotropis	*atropurpurea*		<2	0.40
Kennedia	*prorepens*		2 – 10	0.50
Paraneurachne	*muelleri*		2 – 10	0.50

Species			% Cover	Height
Ptilotus	*astrolasius*		<2	0.50
Ptilotus	*calostachyus*		<2	0.60
Santalum	*lanceolatum*		<2	1.10
Senna	cf. sp. Meekatharra			
Sida	*arenicola*		<2	0.20
Solanum	*sturtianum*		<2	0.60
Triodia	*basedowii*		31 – 70	0.80
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.80

Site	Orebody 31 - Site OB31/2-41
Date	17/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	209341
Northing	7419181
Habitat	PLN
Aspect	
Slope	Flat
Soil	Sandy Loam
Rock Type	
% Leaves:Logs	2 – 10:2 – 10
Vegetation Condition	Very Good
Disturbance Type	Cattle Grazing
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia basedowii with High Shrubland of Acacia ancistrocarpa, with Low Open Woddland of Corymbia hamersleyana, Hakea lorea subsp. lorea

Species			% Cover	Height
**Cenchrus*	*ciliaris*		<2	0.30
Acacia	*adsurgens*		<2	3.00
Acacia	*ancistrocarpa*		11 – 30	3.00
Acacia	*citrinoviridis*		<2	0.50
Acacia	*melleodora*		<2	0.80
Acacia	*sericophylla*		<2	1.20
Anthobolus	*leptomerioides*		<2	0.50
Aristida	*holathera*	var. *holathera*	<2	0.30
Aristida	*inaequiglumis*		<2	1.00
Bonamia	*erecta*		<2	0.60
Cassytha	*capillaris*		<2	0.10
Corymbia	*hamersleyana*		2 – 10	
Cymbopogon	*obtectus*		<2	7.00
Gossypium	*robinsonii*		<2	3.00
Hakea	*lorea*	subsp. *lorea*	<2	1.70
Halgania	*solanacea*	var. Mt Doreen	<2	0.30
Hibiscus	*sturtii*	var. *platychlamys*	<2	0.50
Hybanthus	*aurantiacus*		<2	0.60
Isotropis	*atropurpurea*		<2	0.80
Jasminum	*didymum*	subsp. *lineare*	<2	1.50
Melhania	*oblongifolia*		<2	0.40
Paraneurachne	*muelleri*		<2	0.30
Psydrax	*latifolia*		<2	2.20
Pterocaulon	*sphacelatum*		<2	0.20
Ptilotus	*obovatus*		<2	0.60
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.20
Sida	*cardiophylla*		<2	0.80
Sida	*fibulifera*		<2	0.30

Species			% Cover	Height
Solanum	*horridum*		<2	0.30
Solanum	*lasiophyllum*		<2	0.70
Trichodesma	*zeylanicum*		<2	0.60
Triodia	*basedowii*		31 – 70	0.80
Triodia	*pungens*		<2	1.20

Site	Orebody 31 - Site OB31/2-42
Date	17/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	207813
Northing	7419670
Habitat	HCR
Aspect	
Slope	Low
Soil	Silty Loam
Rock Type	Boulders
% Leaves:Logs	<2:2 – 10
Vegetation Condition	Excellent
Disturbance Type	Frequent Fire
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia over Open Shrubland of Acacia maitlandii over Low Open Shrubland of Acacia maitlandii, Eremophila exilifolia, Acacia wanyu

Species			% Cover	Height
Acacia	*aptaneura*		<2	1.20
Acacia	*aptaneura*		<2	0.80
Acacia	*ayersiana*		<2	1.90
Acacia	*maitlandii*		2 – 10	1.50
Acacia	*marramamba*		2 – 10	1.50
Acacia	*pruinocarpa*		<2	0.80
Acacia	*tetragonophylla*		<2	0.80
Acacia	*wanyu*		2 – 10	1.00
Androclava	*luteiflora*		<2	2.00
Cymbopogon	*obtectus*		<2	0.40
Dodonaea	*pachyneura*		<2	1.50
Eragrostis	sp. indet.		<2	0.50
Eremophila	*exilifolia*		2 – 10	0.60
Eremophila	*latrobei*	subsp. *latrobei*	<2	0.40
Eriachne	*mucronata*		<2	0.30
Eriachne	*pulchella*	subsp. *dominii*	<2	0.20
Eucalyptus	*leucophloia*	subsp. *leucophloia*	2 – 10	
Gomphrena	*kanisii*		<2	0.20
Grevillea	*wickhamii*		<2	3.00
Hibiscus	*burtonii*		<2	0.20
Ptilotus	*obovatus*		<2	0.30
Senna	*glutinosa*	subsp. *glutinosa*	<2	0.80
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.40
Senna	*glutinosa*	subsp. *pruinosa*	<2	0.50
Senna	*stricta*		<2	1.00
Sida	sp. Golden calyces		<2	0.30

Species			% Cover	Height
Solanum	*lasiophyllum*		<2	0.30
Tribulus	*suberosus*		<2	0.60
Triodia	*pungens*		2 – 10	0.70
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		31 – 70	0.70

Site	Orebody 31 - Site OB31/2-43
Date	17/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	207522
Northing	7419465
Habitat	VLF
Aspect	
Slope	Low
Soil	Sandy Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Very Good
Disturbance Type	Mining Exploration
Fire Age	Old (6+ yrs)
Vegetation	Hummock Grassland of Triodia angusta with Shrubland of Acacia sibirica, Senna stricta, Acacia wanyu over Open Shrubland of Eremophila exilifolia, Senna stricta, Acacia sibirica with Low Open Woodland of Acacia aptaneura

Species			% Cover	Height
Acacia	*aptaneura*		2 – 10	4.00
Acacia	*dictyophleba*		<2	2.00
Acacia	*pruinocarpa*		<2	3.00
Acacia	*rhodophloia*		<2	1.50
Acacia	*sibirica*		2 – 10	1.90
Acacia	*subcontorta*		<2	3.50
Acacia	*tetragonophylla*		<2	1.70
Acacia	*wanyu*		2 – 10	2.30
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.30
Cassytha	*capillaris*		<2	0.10
Cheilanthes	*brownii*		<2	0.10
Dodonaea	*pachyneura*		<2	0.80
Eremophila	*cuneifolia*		<2	1.00
Eremophila	*exilifolia*		<2	0.70
Eremophila	*latrobei*	subsp. *latrobei*	<2	2.00
Eriachne	*pulchella*	subsp. *dominii*	<2	0.20
Eucalyptus	*leucophloia*	subsp. *leucophloia*	<2	4.00
Fimbrystylis	sp. indet.		<2	0.10
Maireana	*melanocoma*		<2	0.30
Amyema	sp. indet.		<2	
Ptilotus	*obovatus*		<2	0.40
Scaevola	*spinescens*		<2	1.50
Schizachyrium	*fragile*		<2	0.10
Sclerolaena	*cf. burbidgeae*		<2	0.20
Sclerolaena	*cf. convexula*		<2	0.20
Sclerolaena	*densiflora*		<2	0.20

Species			% Cover	Height
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.10
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.20
Senna	*glutinosa*	subsp. *pruinosa*	<2	1.30
Senna	*stricta*		2 – 10	1.30
Sida	sp. Golden calyces		<2	0.20
Triodia	*angusta*		11 – 30	1.20
Triodia	*pungens*		<2	0.60

Site	Orebody 31 - Site OB31/2-44
Date	18/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	206888
Northing	7419182
Habitat	HCR
Aspect	
Slope	Low
Soil	Sandy Loam
Rock Type	Cobbles
% Leaves:Logs	<2:<2
Vegetation Condition	Good
Disturbance Type	Road/ Access Track
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Shrubland of Acacia balsamea, Acacia marramamba, Acacia tetragonophylla over Open Hummock Grassland of Triodia pungens, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Open Shrubland of Acacia balsamea, Eremophila platycalyx, Senna stricta

Species			% Cover	Height
Acacia	*aptaneura*		<2	1.10
Acacia	*balsamea*		11 – 30	1.20
Acacia	*bivenosa*		<2	1.50
Acacia	*marramamba*		2 – 10	0.90
Acacia	*melleodora*		<2	1.80
Acacia	*pachyacra*		<2	2.00
Acacia	*paraneura*		<2	1.70
Acacia	*tetragonophylla*		2 – 10	1.30
Amphipogon	*sericeus*		<2	0.30
Androclava	*luteiflora*		<2	2.50
Anthobolus	*leptomerioides*		<2	0.60
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.40
Aristida	*inaequiglumis*		<2	0.60
Corchorus	*sidoides*		<2	0.40
Cymbopogon	*obtectus*		<2	0.60
Digitaria	*brownii*		<2	0.40
Dodonaea	*coriacea*		<2	0.30
Eragrostis	sp. indet.		<2	0.50
Eremophila	*cuneifolia*		<2	0.30
Eremophila	*exilifolia*		<2	0.80
Eremophila	*forrestii*		<2	0.90
Eremophila	*fraseri*		<2	0.10
Eremophila	*latrobei*	subsp. *filiformis*	<2	1.40
Eremophila	*platycalyx*		2 – 10	1.50
Eriachne	*mucronata*		<2	0.50
Eulalia	*aurea*		<2	

Species			% Cover	Height
Grevillea	*berryana*		<2	1.50
Grevillea	*wickhamii*		<2	2.00
Hibiscus	*sturtii*	var. *truncata*	<2	0.30
Keraudrenia	*velutina*	subsp. *ellipticum*	<2	1.20
Maireana	*georgei*		<2	0.30
Maireana	*villosa*		<2	0.20
Petalostylis	*cassioides*		<2	0.70
Psydrax	*suaveolens*		<2	1.80
Ptilotus	*aervoides*		<2	0.10
Ptilotus	*nobilis*		<2	0.30
Ptilotus	*obovatus*		<2	1.00
Scaevola	*spinescens*		<2	1.60
Sclerolaena	*cf. convexula*		<2	0.20
Senna	*artemisioides*	subsp. *helmsii*	<2	1.30
Senna	*glutinosa*	subsp. *luerssenii*	2 – 10	1.40
Senna	*stricta*		<2	0.30
Sida	sp. Golden calyces		<2	0.30
Solanum	*horridum*		<2	0.30
Solanum	*lasiophyllum*		<2	0.80
Tribulus	*suberosus*		<2	0.80
Triodia	*pungens*		11 – 30	
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.50

Site	Orebody 31 - Site OB31/2-45
Date	18/10/13
Recorder	EP/DR
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	108518
Northing	7417739
Habitat	PLN
Aspect	
Slope	Flat
Soil	Sandy Loam
Rock Type	Cobbles
% Leaves:Logs	<2:2 – 10
Vegetation Condition	Very Good
Disturbance Type	Frequent Fire
Fire Age	Moderate (3 – 5 yrs)
Vegetation	Hummock Grassland of Triodia basedowii, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with Shrubland of Acacia ancistrocarpa, Acacia wanyu with Low Open Woodland of Corymbia hamersleyana over Very Open Tussock Grassland of Paraneurachne muelleri, Eragrostis eriopoda, Aristida contorta

Species			% Cover	Height
Acacia	*ancistrocarpa*		2 – 10	1.00
Acacia	*aptaneura*		<2	
Acacia	*bivenosa*		<2	1.50
Acacia	*dictyophleba*		<2	0.50
Acacia	*melleodora*		<2	1.30
Acacia	*pruinocarpa*		<2	2.00
Acacia	*pyrifolia*		2 – 10	1.50
Acacia	sp. indet.		<2	1.50
Acacia	*wanyu*		2 – 10	1.20
Acacia	*adsurgens*		<2	0.80
Amphipogon	*sericeus*		<2	0.40
Anthobolus	*leptomerioides*		<2	0.60
Aristida	*contorta*		<2	0.20
Aristida	*holathera*	var. *holathera*	<2	0.60
Aristida	*inaequiglumis*		<2	1.00
Bonamia	*erecta*		<2	0.50
Corchorus	*sidoides*		<2	0.50
Corymbia	*hamersleyana*		2 – 10	4.50
Cymbopogon	*obtectus*		<2	0.80
Dodonaea	*coriacea*		<2	0.60
Duperreya	*commixta*		<2	0.10
Dysphania	*rhadinostachya*		<2	0.20
Eragrostis	*eriopoda*		<2	0.70
Eremophila	*cuneifolia*		<2	0.40
Eremophila	*platycalyx*		<2	1.30
Eucalyptus	*gamophylla*		2 – 10	2.50

Species			% Cover	Height
Gossypium	*robinsonii*		2 – 10	2.20
Hakea	*lorea*	subsp. *lorea*	<2	1.00
Hibiscus	*coatesii*		<2	0.20
Hybanthus	*aurantiacus*		<2	0.60
Indigofera	*monophylla*		<2	0.30
Keraudrenia	*velutina*	subsp. *ellipticum*		
Paraneurachne	*muelleri*		<2	0.50
Ptilotus	*astrolasius*		<2	0.30
Ptilotus	*calostachyus*		<2	0.60
Ptilotus	*nobilis*		<2	0.40
Ptilotus	*obovatus*		<2	0.80
Rhagodia	*eremaea*		<2	1.00
Salsola	*australis*		<2	0.20
Santalum	*lanceolatum*		<2	1.50
Santalum	*lanceolatum*		<2	1.20
Scaevola	*spinescens*		<2	1.00
Sclerolaena	sp. indet.		<2	0.30
Sclerolaena	sp. indet.		<2	0.30
Senna	*artemisioides*	subsp. *oligophylla*	<2	1.00
Senna	*artemisioides*	subsp. *helmsii*	<2	0.30
Senna	*glutinosa*	subsp. *luerssenii*	<2	1.50
Senna	sp. Meekatharra		<2	0.30
Sida	*cardiophylla*		<2	0.10
Sida	*echinocarpa*		<2	0.80
Solanum	*horridum*		<2	0.30
Solanum	*lasiophyllum*		<2	0.80
Solanum	*sturtanium*		<2	0.60
Stylobasium	*spathulatum*		<2	1.40
Tribulus	*suberosus*		<2	0.40
Triodia	*basedowii*		31 – 70	0.50
Triodia	*pungens*		<2	0.70
Triodia	sp. Shovelanna Hill (S. Van Leeuwen 3835)		2 – 10	0.40