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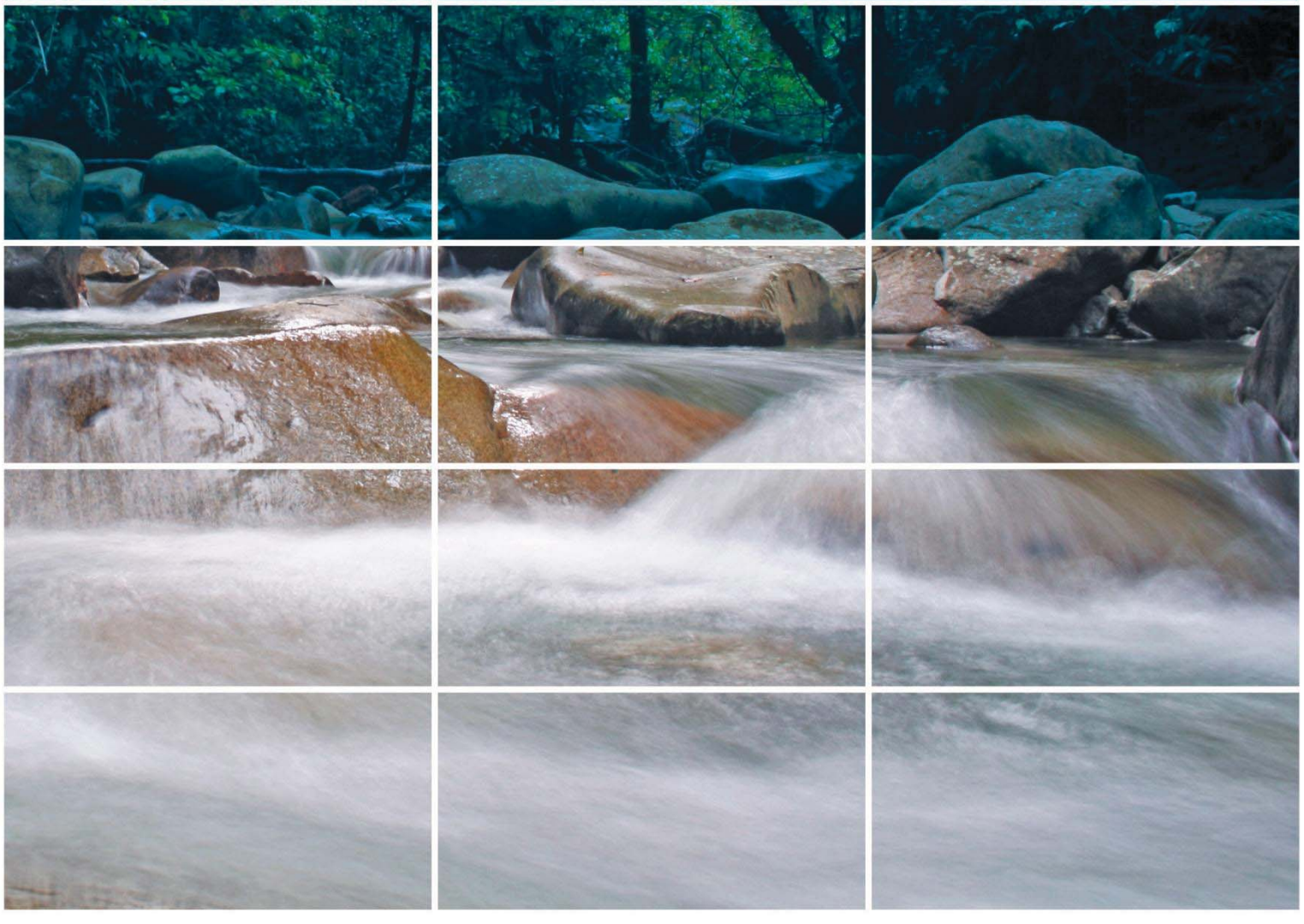
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

ROBE PISOLITE ASSESSMENT AND TARGETED GOMPHOLOBIUM KARIJINI (P2) SURVEY, SOLOMON MINE PROJECT

AUGUST 2011



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ROBE PISOLITE ASSESSMENT AND TARGETED GOMPHOLOBIUM KARIJINI (P2) SURVEY, SOLOMON MINE PROJECT

Prepared for:

Fortescue Metals Group Pty Ltd
Level 2, 87 Adelaide Terrace
PERTH WA 6000

Report Date: 15 August 2011
Project Ref: ENAUPERT02679AA
Report Ref: EP2011/064 V2

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SOCIAL AND SAFETY PERFORMANCE

15 August 2011

Fortescue Metals Group Pty Ltd
Level 2, 87 Adelaide Terrace
PERTH WA 6000

Attention: Alex Langley

Dear Alex

RE: Robe Pisolite Assessment and Targeted Gompholobium karijini (P2) Survey, Solomon Mine Project

Please find attached one (1) hardcopy of the Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey, Solomon Mine Project Report, Solomon Rail Project (with Appendices) and one digital copy (on CD).

Please do not hesitate to contact Graeme Finlayson or myself should you wish to discuss any aspect of the Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey Report.

For and on behalf of Coffey Environments Pty Ltd

Martine Scheltema
Principal Environmental Consultant

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1	ENAUPERT02679AA_Flora and Vegetation _001_clg_V1	Draft V1	1 July 2011	Fortescue Metals Group Pty Ltd	CLG
1	ENAUPERT02679AA_Flora and Vegetation _001_clg_V1	Draft V1	1 July 2011	Coffey Environments	CLG
1	ENAUPERT02679AA_Flora and Vegetation _Robe pisolite_001_clg_V2	V2	15 August 2011	Fortescue Metals Group Pty Ltd	GF
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ABBREVIATIONS

AHD	Australian Height Datum
AMG	Australian Map Grid
BID	Bedded Iron Deposit
BOM	Bureau of Meteorology
CALM	Department of Conservation and Land Management
CID	Channel Iron Deposit
DEC	Department of Environment and Conservation
DEWHA	The Department of the Environment, Water, Heritage and The Arts
DID	Detrital Iron Deposit
DRF	Declared Rare Flora
DSEWPaC	Departement of Sustainability, Environment, Water, Population and Communities
EPA	Environmental Protection Authority
EPBC	Environmental Protection and Biodiversity Conservation
GDA	Geocentric Datum of Australia
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
PEC	Priority Ecological Community
SLIP	Shared Land Information Platform
TEC	Threatened Ecological Community
WGS84	World Geodetic System 1984

EXECUTIVE SUMMARY

Project Background and Scope

Fortescue Metals Group Ltd (Fortescue) have been granted ministerial approval to develop an iron ore mine in the Pilbara within the Solomon Project. This is subject to Fortescue meeting approval conditions detailed in the Ministerial Statement.

A number of previous flora and vegetation assessments have been undertaken within the Solomon Project study area by various consultants. These assessments included numerical (PATN) analysis of the quadrat data collected during the flora and vegetation surveys. The results of the numerical (PATN) analysis identified the Robe Pisolite geological unit occurring within the Solomon Project as having vegetation with significant (and possibly high) conservation value.

The Ministerial Statement states:

Prior to ground disturbing activities, excluding establishment of access roads or any other preliminary works as approved by the Chief Executive Officer of the Office of the Environmental Protection Agency, and within 12 months of all other ground disturbing activities the proponent shall conduct and submit to the Chief Executive Officer of the Office of the Environmental Protection Agency a survey of the Robe Pisolite vegetation unit and the Priority species Gompholobium Karijini within the project area to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Agency on advice from the DEC.

As a result Fortescue commissioned Coffey Environments to undertake sampling of additional quadrats within the vicinity of Zion and to undertake a targeted search for *Gompholobium karijini* (P2) within the Solomon Project.

The scope of the flora and vegetation assessment was to undertake the following:

- Establishment and sampling of additional flora sampling quadrats (50m x 50m in dimension, or 2500m^2 in area) within the vicinity of Zion to assist with delineation of the Robe Pisolite boundary;
- Visual assessment of vegetation units and landform to assist with determination of boundary of extent of Robe Pisolite;
- Analysis of floristic data (PATN) collected during survey to determine the conservation significance of the vegetation, specifically whether it is considered to be part of the Robe Pisolite geological unit;
- A site visit to traverse the areas that *Gompholobium karijini* (P2) is likely to be located;
- Record locations of *Gompholobium karijini* (P2) using a Global Positioning System (GPS) and count numbers present; and
- Identify the broad vegetation communities associated with the locations of *Gompholobium karijini* (P2).

Methodology

The flora and vegetation assessment methodology complied with Coffey Environments interpretation of EPA's *Guidance for the Assessment of Environmental Factors No 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3* (EPA, 2002). Consideration was also given to the Department of Environment and Conservation's (DEC's) Draft Botanical Survey Guidelines for the Pilbara Region (CALM, 2003), the Working Draft Guidelines for Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (DEC, 2007), discussions during meetings between Coffey Environments, Fortescue and the DEC, and email correspondence.

A total of 19 flora quadrats surveyed within the vicinity of Zion by Coffey Environments in 2008 were determined as being part of the Robe Pisolite geological unit during the PATN analysis (E.A Griffin & Associates with M.E. Trudgen & Associates, 2010). The Robe Pisolite survey undertaken in May 2011 involved the establishment and sampling of 15 additional flora quadrats (50m x 50m in dimension, or 2500m2 in area) within the vicinity of the quadrats previously identified as being associated with Robe Pisolite unit. This was undertaken in order to assist with delineation of the extent of the Robe Pisolite unit. A visual assessment of vegetation units and landform was also undertaken to assist with determination of boundary of extent of Robe Pisolite.

Numerical (i.e. PATN) analysis of the floristic data collected during the 2011 survey was undertaken by E.A. Griffin and Associates and M.E Trudgen to determine the conservation significance of the vegetation, specifically whether it is considered to be part of the Robe Pisolite geological unit.

The targeted *Gompholobium karijini* (P2) survey focused on areas that *Gompholobium karijini* had previously been recorded, as well as habitat that the species is known to be found in association with. The locations of *Gompholobium karijini* (P2) were recorded using a Global Positioning System (GPS) and the approximate number of plants present was recorded.

Robe Pisolite

A total of five relatively distinct vegetation types were identified from the quadrats sampled during the April/May 2011 survey. These vegetation types comprised of:

- *Eucalyptus leucophloia* subsp. *leucophloia*, *Eucalyptus gamophylla* and *Corymbia hamersleyana* Low Open Woodland to 8m over *Grevillea wickhamii* subsp. *hispidula* and *Hakea lorea* subsp. *lorea* Tall Open Shrubland to 3.5m over *Acacia arida* Shrubland to Open Shrubland to 1.6m over *Triodia wiseana* Hummock Grassland to 0.8m on stony hilltops and slopes;
- *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* Low Open Woodland to 5m over *Acacia hilliana* and *Gompholobium karijini* Low Open Shrubland to 0.6m over *Triodia wiseana* Open Hummock Grassland to 0.5m on stony hilltops and slopes;
- *Corymbia hamersleyana* Low Open Woodland to 6m over *Acacia acradenia* Tall Open Shrubland to 2.5m over *Acacia arida* Low Open Shrubland to 1.4m over *Triodia wiseana* Hummock Grassland to 0.6m on stony hilltops and slopes;
- *Corymbia hamersleyana* Low Open Woodland to 6m over *Acacia pyrifolia*, *Grevillea wickhamii* subsp. *hispidula*, *Acacia bivenosa*, *Acacia citrinoviridis* and *Atalaya hemiglauca* Closed Tall Scrub to 4m over *Cymbopogon obtectus*, *Themeda triandra* and *Chrysopogon fallax* Open Tussock Grassland to 1m over *Triodia epactia* Very Open Hummock Grassland to 0.5m in gorge adjacent to major drainage line; and
- *Eucalyptus camaldulensis* var. *obtusa* and *Eucalyptus victrix* Tall Open Woodland to 25m over *Acacia citrinoviridis*, *Acacia pyrifolia* and *Grevillea wickhamii* subsp. *hispidula* to 4m over *Tephrosia rosea* var. *glabrior* and *Stemodia grossa* Low Open Shrubland to 0.6m over *Cymbopogon obtectus* and *Themeda triandra* Scattered Grasses to 0.8m in major drainage line.

The vegetation of the stony hill and slope habitats of the study area were generally in Very Good condition. These areas are not preferred grazing habitat for stock, and the stony, relatively dry substrates also tend to discourage germination and growth of weed species.

The vegetation of the major drainage line within the gorge was in Very Good condition due to seasonal waterflow discouraging the germination and growth of weed species. The vegetation located adjacent to the major drainage line within the gorge was in Good to Poor condition due to the presence of some aggressive weed species such as Beggar's Tick **Bidens bipinnata* and Buffel Grass **Cenchrus ciliaris.*

No Threatened Ecological Communities protected under the *Environment Protection and Biodiversity Conservation Act 1999* were identified from the DSEWPaC's database search as having the potential to occur within the study area. No TECs listed on DSEWPaC's database were identified during the flora and vegetation survey.

The Priority Ecological Community (PEC), *Five plant assemblages of the Wona Land System*, which was identified on the DEC Threatened and Priority Ecological Communities database as occurring within the vicinity of the study area, was not recorded during the 2011 flora and vegetation survey. No other PECs were recorded during the survey.

A total of 96 species of terrestrial vascular flora from 62 genera belonging to 30 families were recorded from the 15 quadrats sampled during the April/May 2011 flora survey. A total 3 of these species (approximately 3%) are introduced flora.

No Declared Rare Flora were identified from the study area, although two Priority flora species, *Gompholobium karijini* (Priority 2) and *Goodenia nuda* (Priority 4) were recorded within the study area.

While there is no statutory obligation for Fortescue to protect Priority listed flora, wherever possible Fortescue should endeavour to ensure impacts on these species are minimised or avoided, as they are considered by the DEC to be rare or threatened, however there is insufficient information to properly evaluate their conservation significance.

A total of three species of introduced flora have been recorded from the study area, none of which are listed as a Declared Plant under the *Agriculture and Related Resources Protection Act 1999* (Agwest, 2011). These included Beggar's ticks (*Bidens bipinnata)*, Buffel grass (*Cenchrus ciliaris*) and Native Cucumber (*Cucumis melo* subsp. *agrestis*). According to the Environmental Weed Strategy (CALM, 1999), *Cenchrus ciliaris* are classified as having a High rating due to their high impact on biodiversity. In addition, *Cenchrus ciliaris* is listed on DSEWPaC's on-line database as a species identified as posing a significant threat to biodiversity.

The floristic data collected during the 2011 flora survey was assigned to floristic units defined as a result of numerical (i.e. PATN) analysis of data collected within the Solomon Mine and Rail Projects in 2008 by Griffin E.A. & M.E. Trudgen (2009a and 2009b). The assignment of units was conducted by Griffin E.A. & M.E. Trudgen (2011) to investigate the conservation value of the vegetation, specifically whether the vegetation sampled within the study area is considered to be associated with Robe Pisolite.

The majority of quadrats sampled during the 2011 flora survey were considered to be uncommon and of restricted distribution within the Pilbara region.

Based on the numerical analysis and assignment of units (Griffin E.A. & M.E. Trudgen, 2009a, 2009b, and 2011) and geological mapping, it is considered that the majority of the vegetation within the study area is of significant conservation value.

Gomphologium karijini (P2)

The Priority 2 species *Gompholobium karijini* is a low shrub growing to approximately 1m in height. *Gompholobium karijini* prefers stony hill and slope habitats on red brown loamy gravel soils. Apart from the records made from the Solomon Rail Project Solomon Project, and Investigator, very few records of *Gompholobium karijini* are known. The sites within the Solomon Rail Project, Solomon Project and Investigator, include the only sites known to have this species contributing significantly to the vegetation composition.

In order to assist with determining the extent of *Gompholobium karijini* (P2) within the Solomon Mine Project, a targeted survey for *Gompholobium karijini* (P2) was undertaken in April/May 2011 by Coffey Environments. The targeted *Gompholobium karijini* (P2) survey focused on areas that *Gompholobium*

karijini had previously been recorded, as well as habitat that the species is known to be found in association with.

Gompholobium karijini (P2) was identified in association with three main vegetation types during the April/May 2011 targeted survey. These include:

- *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* Low Open Woodland to 5m over *Acacia hilliana* and *Gompholobium karijini* Low Open Shrubland to 0.6m over *Triodia wiseana* Open Hummock Grassland to 0.5m;
- *Corymbia hamersleyana, Eucalyptus gamophylla* and *Eucalyptus leucohploia* subsp. *leucophloia* Low Open Woodland to 5m over *Acacia hilliana* Low Open Shrubland to Scattered Shrubs to 0.6m over *Triodia wiseana* Hummock Grassland to 0.5m;
- *Eucalyptus leucophloia* subsp. *leucophloia*, *Eucalyptus gamophylla* and *Corymbia hamersleyana* Low Open Woodland to 8m over *Grevillea wickhamii* subsp. *hispidula* Tall Open Shrubland to 3m over *Acacia arida* Shrubland to Open Shrubland to 1.6m over *Triodia wiseana* Hummock Grassland to 0.8m; and

The above vegetation types were considered to be in Very Good condition due to absence of weeds and grazing. *Gompholobium karijini* (P2) was also recorded in association with cleared areas within drill pads and along exploration tracks. These areas were considered to be in Very Poor to Degraded condition.

A total of 2086 individuals of *Gompholobium karijini* (P2) were recorded at 140 locations within the Solomon Mine Project during the April/May 2011 survey. The majority of *Gompholobium karijini* (P2) locations were recorded within the vicinity of Zion.

Based on the results of the April/May 2011 targeted survey it is considered likely that there are significantly more locations and higher numbers of *Gompholobium karijini* (P2) present within and around the Solomon Mine Project than those recorded to date, particularly within the vicinity of Firetail and Zion

1 INTRODUCTION

1.1 Background

Fortescue Metals Group Ltd (Fortescue) have been granted Ministerial approval under the Environmental protection Act 1986 to develop an iron ore mine in the Pilbara within the Solomon Project (Figures 1 and 2). This is subject to Fortescue meeting approval conditions contained within the Ministerial Statement.

A number of previous flora and vegetation assessments have been undertaken within the Solomon Project study area by various consultants. These assessments included numerical (PATN) analysis of the quadrat data collected during the flora and vegetation surveys. The results of the numerical (PATN) analysis identified the Robe Pisolite geological unit occurring within the Solomon Project as having vegetation with significant (and possibly high) conservation value. In addition, there was significant overlap between the conservation value of the vegetation of the Robe Pisolite in the Solomon Project, and the conservation value of vegetation with significant cover of the Priority 2 flora species, *Gompholobium karijini.*

The Ministerial Statement States:

Prior to ground disturbing activities, excluding establishment of access roads or any other preliminary works as approved by the Chief Executive Officer of the Office of the Environmental Protection Agency, and within 12 months of all other ground disturbing activities the proponent shall conduct and submit to the Chief Executive Officer of the Office of the Environmental Protection Agency a survey of the Robe Pisolite vegetation unit and the Priority species Gompholobium Karijini within the project area to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Agency on advice from the DEC.

As a result Fortescue commissioned Coffey Environments to undertake sampling of additional quadrats within the vicinity of Zion and to undertake a targeted search for *Gompholobium karijini* (P2) within the Solomon Project.

1.2 Scope of Works

The scope of the flora and vegetation assessment was to undertake the following:

- Establishment and sampling of additional flora sampling quadrats (50m x 50m in dimension, or 2500m² in area) within the vicinity of Zion to assist with delineation of the Robe Pisolite boundary;
- Visual assessment of vegetation units and landform to assist with determination of boundary of extent of Robe Pisolite;
- Analysis of floristic data (PATN) collected during survey to determine the conservation significance of the vegetation, specifically whether it is considered to be part of the Robe Pisolite geological unit;
- A site visit to traverse the areas that *Gompholobium karijini* (P2) is likely to be located;
- Record locations of *Gompholobium karijini* (P2) using a Global Positioning System (GPS) and count numbers present; and
- Identify the broad vegetation communities associated with the locations of *Gompholobium karijini* (P2).

1.3 Previous Biological Surveys in the Region

The following botanical studies are relevant to the study area:

- Biota Environmental Sciences (2004a). *Vegetation and Flora Survey of the Proposed FMG Stage A Rail Corridor*. Unpublished report for FMG, August, 2004;
- Biota Environmental Sciences (2004b). *Fortescue Metals Group Stage B Rail Corridor, Christmas Creek, Mt Lewin, Mt Nicholas and Mindy Mindy Mine Areas Vegetation and Flora Survey.* Unpublished report for FMG, December 2004;
- Biota Environmental Sciences (2004c). *Hope Downs Additional Rail Corridor (Chichester Range) – Vegetation and Flora Survey.* Unpublished report for Hope Downs Management Services, January 2004;
- Biota Environmental Sciences (2004d). *Hope Downs Rail Corridor, Hamersley Range Extension – Vegetation and Flora Survey*. Unpublished report for Hope Downs Management Services, January 2004;
- Biota Environmental Sciences and Trudgen, M.E. (2002). *Hope Downs Rail Corridor, Port Hedland to Weeli Wolli Creek – Vegetation and Flora Survey.* Unpublished report prepared for Hope Downs Management Services, February 2002;
- Coffey Environments (2007). *Supplementary Vegetation and Flora Surveys of the Port Hedland to Cloudbreak Rail Corridor and Associated Borrow Pits and Infrastructure.* Report prepared for Fortescue Metals Group Limited;
- Coffey Environments (2010a). *Flora and Vegetation Assessment, Solomon Rail Project.* Report prepared for Fortescue Metals Group Limited;
- Coffey Environments (2010b). *Flora and Vegetation Assessment, Solomon Project and Investigator.* Report prepared for Fortescue Metals Group Limited;
- E.A Griffin & Associates with M.E. Trudgen & Associates (2010). *Numerical analysis of floristic data from the Fortescue Metals Group Solomon Rail Project Area with data from surrounding Pilbara Bioregion of Western Australia and supplementary sites.* Prepared for Coffey Environments.
- Ecoscape (2010a). *Level 2 Flora and Vegetation Assessment, Firetail Mining Area.* Report prepared for Fortescue Metals Group Limited;
- Ecoscape (2010b). *Solomon Project Rail Re-alignment, Flora and Vegetation Assessment.* Report prepared for Fortescue Metals Group Limited;
- Ecoscape (2010c). *Solomon Project Rail Camp 1G, Flora and Vegetation Assessment.* Report prepared for Fortescue Metals Group Limited;
- Ecoscape (2010d). *Solomon Project Airstrip, Flora and Vegetation Assessment.* Report prepared for Fortescue Metals Group Limited;
- ENV Australia Pty Ltd (2010). *Solomon Project: Kings.* Report prepared for Fortescue Metals Group Limited;
- Integrated Environmental Services (1978) *The Biological Environment of the West Angelas Area Western Australia.* Prepared for Cliffs International Inc;

- Mattiske, E M & Associates (1986*) Flora and Vegetation Survey of the Channar Mining Area and Surrounds, Hamersley Range, Western Australia*. Unpublished Report prepared for Hamersley Iron Pty Ltd;
- Mattiske, E M & Associates (1989) *Flora and Fauna Studies Brockman 2.* Unpublished Report prepared for Hamersley Iron Pty Ltd;
- Mattiske, E M & Associates (1991) *Flora and Vegetation Marandoo Lease and Proposed Transport Corridors.* Unpublished Report prepared for Hamersley Iron Pty Ltd;
- Mattiske Consulting Pty Ltd (2005) *Flora and vegetation on the Cloud Break and White Knight Leases.* Unpublished Report prepared for Fortescue Metals Group Limited;
- Texasgulf Australia (1979) *Marandoo Flora and Fauna*. Internal report for Texasgulf Australia Ltd, Perth;
- Trudgen, M E (1975) *Floristic Report on Marandoo Mining Site*;
- Trudgen, M (1995a) *A Flora Survey of Deposit 'A' near West Angela Hill, with Description of Vegetation of Flora Collecting Sites.* Unpublished Report Prepared for Robe River Iron Associates;
- Trudgen, M (1995b) *Preliminary Flora Survey of Deposit 'B' near West Angela Hill, with Description of Vegetation of Flora Collecting Sites.* Unpublished Report Prepared for Robe River Iron Associates; and
- Trudgen, M E & Casson, N (1998) *Flora and Vegetation Surveys of Orebody A and Orebody B in the West Angela Hill area, an area surrounding them, and of rail route options considered to link them to the existing Robe River Iron Associates rail line.* Unpublished Report prepared for Robe River Iron Associates.

2 EXISTING ENVIRONMENT

2.1 Location

The Solomon Project is located approximately 60km north of Tom Price in the Pilbara region of Western Australia (Figure 1). Access is via the public roads running north of Tom Price, and also from the Pilbara Iron rail access road, and then by a combination of station tracks and exploration access tracks.

The Solomon Project is approximately 20km west of the western boundary of Karijini National Park (Figure 2) in the Hamersley Ranges. Mining will be undertaken at numerous locations within the valleys in the Hamersley Ranges, specifically Valley of the Kings, Valley of the Queens, Trinity, Zion and Firetail (Figure 2). Ore will be transported by train on a to-be-constructed railway line to Port Hedland.

2.2 Land Use History

The southern portion of the Solomon Project area is largely situated on the Hamersley pastoral lease, while the northern portion has a small area within Zion located on Mt Florance pastoral lease. The pastoral areas have been lightly grazed for many years. The Solomon Project area has been subject to exploration activity prior to Fortescue acquiring the tenements.

2.3 Karijini National Park

Karijini National Park covers an area of 627,444ha in the Hamersley Ranges (CALM 1999). The Park extends from latitude 23°13'S to 22°13'S (approximately 110km) and longitude 117°53'E to 118°45'E (approximately 70km). An area was excised from the Park for the Marandoo iron ore mine and associated infrastructure. Karijini National Park remains in relatively undisturbed condition and has only been lightly grazed, although there is evidence of exploration and mining activity at a number of locations.

The primary feature of the National Park is the deep, steep-sided gorges that are the focus of the tourist activity during the cooler months of the year. The Park is managed by the DEC.

2.4 Climate

The study area is situated in the Pilbara region of Western Australia. The Pilbara bioregion experiences an arid-tropical climate with hot summers from October to April and mild winters from May to September (Gentilli, 1972). Rainfall in the Pilbara is highly unpredictable and recordings are highest at stations around the Hamersley Ranges, which lie at altitudes of up to 900mAHD (Beard, 1975). The Pilbara receives the majority of its annual rainfall between December to March. This rain is usually the result of moist tropical storms and cyclones originating in the north, producing sporadic and drenching thunderstorms. Winter rain is generated by extensive cold fronts moving east across the state, which occasionally reach the Pilbara, although these are less frequent further to the north. These fronts produce only light winter rains that are mostly ineffective for plant growth other than herbs and grasses. Larger perennial species require the intense and prolonged summer storms. Surface water can be found in some pools and springs in the Pilbara all year round, although most watercourses only flow briefly due to the short summer wet season. Annual evaporation exceeds rainfall by as much as 2,500mm per year.

The closest Bureau of Meteorology (BOM) weather stations to the study area that maintain long term datasets are located at Paraburdoo, Tom Price and Wittenoom. The Tom Price and Paraburdoo weather stations are located approximately 60km and 120km south of the Solomon Project, respectively. The Wittenoom weather station is located approximately 50km east of the Solomon Project.

According to the BOM (2011), average maximum daily temperatures from December 2010 to April 20 ranged between 33°C to 40°C for the Paraburdoo, Tom Price and Wittenoom weather stations. Minimum average temperatures were about 15°C lower than the maximum temperatures.

Charts 1, 2 and 3 below, show the monthly rainfall for the six months preceding the 2011 flora survey for the Paraburdoo, Tom Price and Wittenoom weather stations, respectively. Each chart also shows the mean rainfall for each of the month, which has been calculated based on the historical data available for each of the weather stations.

The data for Paraburdoo indicates that the rainfall in the month of January preceding the 2011 flora survey was over three times higher than the average rainfall. April rainfall was also above average, while February and March were below average (Chart 1). Tom Price experienced average or above average rainfall from November to February, followed by below average rainfall in March (Chart 2). Further to the east, Wittenoom experienced average or above rainfall in November, December, February and April, and below average rainfall in January and March (Chart 3).

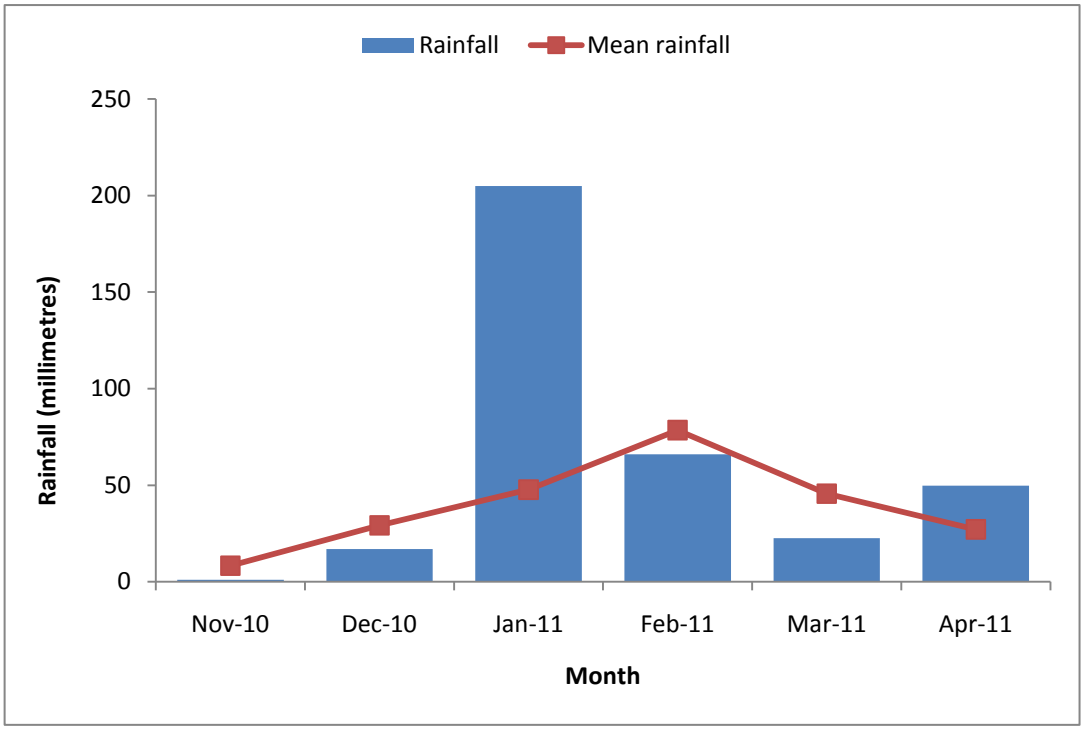

Chart 1:
Monthly rainfall for six months preceding flora survey and mean rainfall (1971-2010) for Paraburdoo (BOM,2011)

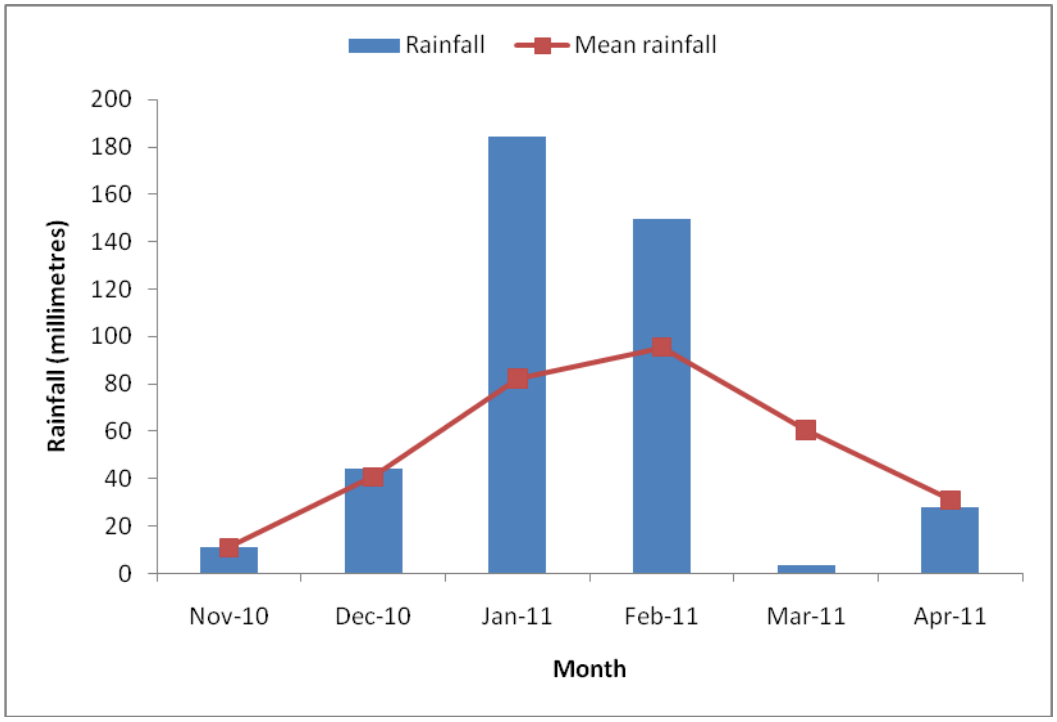

Chart 2:
Monthly rainfall for six months preceding flora survey and mean rainfall (1972-2010) for Tom Price (BOM,2011)

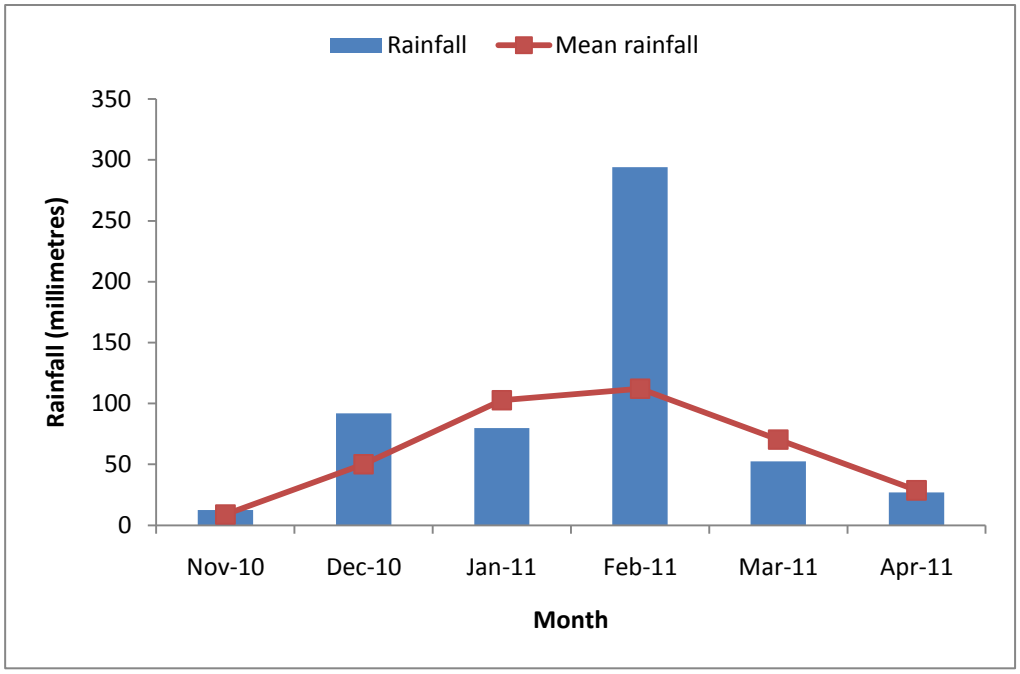

Chart 3:
Monthly rainfall for six months preceding flora survey and mean rainfall (1949-2010) for Wittenoom (BOM,2011)

2.5 Geology

The Fortescue province lies over the Pilbara craton. The Hamersley Range was formed on the late Archaean-Palaeoproterozoic metamorphosed banded iron formations, shales, dolerite, carbonate, chert and rhyolite of the south Pilbara sub-basin. These rocks belong to the Hamersley group and make up part of the Ophthalmia fold belt. Tille (2006) described the Hamersley plateaux as hills and dissected plateaux (with some stony plains and hardpan wash plains) on sedimentary and volcanic rocks of the Hamersley basin. Much of the area is covered with stony soils with shallow red loams and some red/brown non-cracking clays and red loamy earths.

Outcropping geology in the region is the Dales Gorge, Whaleback Shale and Joffre members of the Brockman Iron Formation which are known to host large iron ore deposits within other regions of the Hamersley Ranges (bedded iron deposits or BIDs).

Incised into this bedrock geology are large channel systems, predominantly one to two kilometres in width, and stretching for tens of kilometres. During the Tertiary period weathering and erosion of the generally iron rich surrounding bedded material deposited iron rich material into these channels, and this material has subsequently been buried and preserved.

The material overlying the channel iron deposit (CID) material is of younger age and has also been eroded from iron rich material. This clastic material is concentrated into horizons of elevated iron grade termed DIDs (detrital iron deposits), which forms part of the sequence of overlying later Tertiary aged alluvials.

Exploration operations by Fortescue within the Solomon Project area has focused on exploring these valley systems and has discovered large tonnages of all of these three classic Hamersley Province iron deposit types (DID, CID and BID). In certain areas, the DIDs will overlay a thick sequence of CID material which in turn may be underlain by BID material.

2.6 Topography and Landforms

Three major topographical units are associated with the study area:

- Chichester Plateau: a plateau of mainly basalts, including siltstone, mudstone, shale, dolomite and jaspilite; forming a watershed between numerous rivers flowing north through the Abydos Plain to the coast, and the Fortescue's drainage on the southern side;
- Fortescue Valley: occupying the lowland between the Chichester and Hamersley Plateaus; the eastern portion drains into the Fortescue Marsh; and
- Hamersley Plateau: rounded hills and ranges, mainly of jaspilite and dolomite with some shale, siltstone and volcanics.

The landform units typical of the Pilbara are (taken from Van Vreeswyk, 2004):

- Ridges and hills: ridges and hills rising above the surrounding plains. The surface is largely covered with skeletal soils, with areas of exposed rock. Vegetation is dominated by Eucalyptus kingsmillii mallees, E. leucophloia woodlands, Callitris columellaris low forest, Acacia scrubs and hummock grasses (Triodia spp.);
- Scree slopes: Gravelly gibber loams with pockets of skeletal neutral soil on undulating slopes. Vegetation is dominated by Acacia and Senna scrubs, Eucalyptus gamophylla mallees and hummock grasses (Triodia spp.);
- Valley floor: Neutral to slightly acidic loams or sandy loams on flat or low slope valley floors. Vegetation is dominated by mixed woodlands over mixed hummock grasses;

- Outwash plains: Neutral to slightly acidic deep loams or clayey loams on flat plains. Vegetation is dominated by mixed woodlands over mixed hummock and tussock grasses;
- Low hills of calcrete and dolomite outcrops: Shallow loams of clays over stony pavements and screes. Vegetation is dominated by Eucalyptus transcontinentalis and E. oleosa mallees, Acacia bivenosa and Cassia desolata scrub over Triodia hummock grasses;
- Minor drainage channels: Shallow sandy soils and sandy loams. Vegetation is dominated by fringing mixed eucalypt woodlands over mixed scrubs and hummock grasses;
- Major drainage channels: Heavy gravels with sandy levee banks and islands. Vegetation is dominated by fringing Eucalyptus camaldulensis var. obtusa woodlands over Acacia scrubs and Melaleuca glomerata thickets; and
- Gorges: Exposed rock, gravel and sand. Vegetation is dominated by fringing Melaleuca leucadendron forests.

2.7 Physiogeographic Units of Study Area

Beard (1975) identified three major physiographic units within the section of the Fortescue District encompassing the study area:

1 Hamersley Plateau - a compact unit defined by the outcrop of Lower Proterozoic rocks, predominantly jaspilite and dolomite with some shale, siltstone and volcanics;

2 Chichester Plateau - a plateau of mainly basalts, with included siltstone, mudstone, shale, dolomite and jaspilite; forming a watershed between numerous rivers flowing north through the Abydos Plain to the coast, and the Fortescue drainage on the southern side of the range; and

3 Fortescue Valley - occupying a trough between the Chichester and Hamersley Plateau; the eastern portion drains into the Fortescue Marshes, while the western portion drains through a valley through the Chichester Plateau.

2.8 Soils

Based upon the Natural Resources Management, Shared Land Information Platform (SLIP) (Department of Agriculture, 2011) three main soil types have been identified as occurring within the study area:

- Soils with shallow watertable (drainage lines);
- Rocky or stony soils; and
- Loamy earth soils.

2.9 Drainage

Major drainage associated with the Solomon Project includes the Ashburton River to the south, the Fortescue River to the north and Robe River to the west. The Solomon Project area drains internally and north into the Fortescue River.

2.10 Biological Context of Study Area

2.10.1 Pilbara IBRA Bioregion

The project area lies in the Pilbara biogeographic region of the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell, 1995), revised by Environment Australia (2000). These

bioregions are defined on the basis of geology, landform, vegetation, fauna and climate. The Pilbara biogeographic region is similar to that commonly recognised as the Pilbara region. The eastern portion of the Pilbara region in particular is located in a transitional zone between the floras of the Eyrean (central desert) and southern Torresian (tropical) bioclimatic regions, and contains elements of both floras. In recognition of this high species diversity and the high levels of endemism in the region, the Hamersley/Pilbara region has been designated one of 15 national biodiversity "hotspots" by DSEWPaC.

With an area of 179,287km^2, the Pilbara bioregion includes four major subregions; Chichester, Fortescue Plains, Hamersley and Roebourne. The Solomon Project crosses three of these subregions, including Chichester, Fortescue Plains and Hamersley.

1. Chichester (PIL 1) subregion (Kendrick and McKenzie, 2001a):

Undulating archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The climate is semi-desert-tropical and receives 300mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule and Sherlock). Subregional area is 9,044,560ha.

2. Fortescue Plains subregion (PIL 2) (Kendrick, 2001b):

Alluvial plains and river frontage. Extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east. Deeply incised gorge systems in the western (lower) part of the drainage. River gum woodlands fringe the drainage lines. Northern limit of Mulga (*Acacia aneura*). An extensive calcrete aquifer (originating within a palaeo-drainage valley) feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of River Gum and Cadjeput *Melaleuca* woodlands. Climatic conditions are semi desert tropical, with average rainfall of 300mm, falling mainly in summer cyclonic events. Drainage occurs to the north-west. Subregional area is 2,041,914ha.

3. Hamersley (PIL3) subregion (Kendrick, 2001c):

Mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges (basalt, shale and dolerite). 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 climate is semi-desert tropical, average 300mm rainfall, usually in summer cyclonic or thunderstorm events. Winter rain is not uncommon. Drainage into either the Fortescue to the north, the Ashburton to the south, or the Robe to the west. Subregional area is 6,215,092ha.

2.10.2 Beard's Vegetation Mapping

The study area lies entirely within the Fortescue Botanical District of the Eremaean Botanical Province as defined by Beard (1975). The vegetation of this province is typically open, and frequently dominated by spinifex, wattles and occasional Eucalypts.

The Natural Resources Management, Shared Land Information Platform (SLIP) (Department of Agriculture, 2011) provides State-wide coverage of the Pre-European extent of vegetation within Western Australian at the scale of 1:250,000. This dataset is based on the work of J. S. Beard, supplemented where necessary to give a uniform standard of mapping detail.

According to the Department of Agriculture (2011) database, the Solomon Project includes portions of two of Beard's mapping units. These are described below:

- **565 *Eucalyptus* open woodland/*Triodia* open hummock grassland.** Hummock Grasslands, low tree steppe, bloodwood over soft Spinifex. This unit occurs within the western end of Valley of the Queens; and
- **82 *Eucalyptus* isolated trees/*Triodia* open hummock grassland.** Hummock Grasslands, low tree steppe, snappy gum over *Triodia wiseana*. This unit covers the majority of the study area.

2.10.3 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TECs) are recognised at the State and Commonwealth level.

In Western Australia, the DEC recognises four categories of TECs as classified by English and Blyth (1997). These are – *"Presumed Totally Destroyed", "Critically Endangered", "Endangered"* and *"Vulnerable"*. State level TECs are currently not afforded statutory protection under the *Environmental Protection Act 1986* or the *Wildlife Conservation Act 1950.*

Commonwealth legislation protects native vegetation communities classified as Threatened under Schedule 2 of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999.* There are three categories of TECs under the *EPBC Act 1999* – "*Critically Endangered", "Endangered"* and "*Vulnerable"*.

TECs that are listed under the State system are not necessarily listed under the EPBC Act.

Under the State system, possible TECs that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5. Priority Ecological Communities are currently are not afforded statutory protection under the *Environmental Protection Act 1986* or the *Wildlife Conservation Act 1950.*

2.10.4 Land Systems

In 2002 Payne *et al.* (2002) delineated the land system mapping for the Pilbara region into a system of mapping units. These land units occur in association with characteristic physiographic types. A total of 4 land system units are traversed by the Solomon Mine Project. These are mapped in Figure 3 and described below.

1. *Newman* Rugged jaspellite plateaux, ridges and mountains supporting hard spinifex grassland. Covers an area of approximately 1,458,000ha in the Pilbara region.
2. *Boolgeeda* Stony lower slopes and plains found below hill systems supporting hard and soft spinifex grasslands and mulga shrublands. Covers an area of approximately 774,800ha in the Pilbara region.
3. *Platform* Dissected slopes and raised plains supporting hard spinifex grasslands. Covers an area of approximately 157,000ha in the Pilbara.
4. *Robe* Low plateaux, mesas and buttles of limonites supporting soft spinifex (occasionally hard spinifex) grasslands. Covers an area of approximately 86,500ha in the Pilbara.

2.10.5 Other Botanical Studies

The Pilbara Region Biological Survey undertaken by the DEC commenced in 2002 and field work was completed in 2009. The collation and analysis of the information collected during the survey is still currently underway. The purpose of the Pilbara Region Biological Survey is to gain greater knowledge about the biodiversity of the Pilbara region in Western Australia. Over 70,000 plant voucher specimens were collected during survey representing about 1,100 species of which at least 10 are new to science and 30 new to the Pilbara (DEC, 2011a).

3 FLORA AND VEGETATION SURVEY METHODOLOGY

3.1 Survey Methodology

3.1.1 Vegetation Classification System

The standard for describing structural vegetation units throughout the Solomon Project is based on Muir (1977) and Aplin (1979), which is a modification of the vegetation classification system of Specht (1970). This classification is outlined in the table below (Table 1).

Table 1

Vegetation Structural Classes

(Based on Muir, 1977 and Aplin, 1979)

Stratum	Canopy Cover				
	70%-100%	**30%-70%**	**10%-30%**	**2%-10%**	**<2%**
Trees over 30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland	Scattered Tall Trees
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees under 10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Shrubs over 2m	Tall Closed Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland	Scattered Tall Shrubs
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs under 1m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Scattered Low Shrubs
Hummock Grasses	Closed Hummock Grassland	Mid-dense Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Scattered Hummock Grasses
Grasses, Sedges and Herbs	Closed Tussock Grassland/ Sedgeland/ Herbland	Tussock Grassland/ Sedgeland/ Herbland	Open Tussock Grassland/ Sedgeland/ Herbland	Very Open Tussock Grassland/ Sedgeland/ Herbland	Scattered Tussock Grasses/ Sedges/ Herbs

A vegetation condition rating scale that was developed based on a rating scale devised by M.E. Trudgen was suggested by DEC as the most appropriate for assessing vegetation condition in the Pilbara region. This rating scale is outlined in Table 2.

Table 2

Vegetation Condition Rating Scale

E=Excellent Pristine or nearly so; no obvious signs of damage caused by activities of European man.
VG= Very Good Some relatively slight signs of damage caused by activities of European man. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds.
G=Good More obvious signs of damage caused by activities of European man, including some obvious signs of impact on the vegetation structure such as that caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones.
P=Poor Still retains basic vegetation structure or ability to regenerate to it after very obvious activities of European man, such as grazing, partial clearing (chaining) or frequent fires. Weeds as above, probably plus some aggressive ones.
VP=Very Poor Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species including very aggressive species.
D=Degraded Areas that completely or almost completely without native species in the structure of their vegetation, i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

Dr Steven van Leeuwen (DEC) provided confirmation that the vegetation classification system and condition rating scales proposed for use in the Pilbara are acceptable and conform to DEC requirements.

3.1.2 Terrestrial Survey Methodology

The flora and vegetation assessment methodology complied with Coffey Environments interpretation of EPA's *Guidance for the Assessment of Environmental Factors No 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3* (EPA, 2002). Consideration was also given to the Department of Environment and Conservation's (DEC's) Draft Botanical Survey Guidelines for the Pilbara Region (CALM, 2003), the Working Draft Guidelines for Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (DEC, 2007), discussions during meetings between Coffey Environments, Fortescue and the DEC, and email correspondence.

A total of 19 flora quadrats surveyed within the vicinity of Zion by Coffey Environments in 2008 were determined as being part of the Robe Pisolite geological unit during the PATN analysis (E.A Griffin & Associates with M.E. Trudgen & Associates, 2010). The Robe Pisolite survey undertaken in April/May 2011 involved the establishment and sampling of 15 additional flora quadrats (50m x 50m in dimension, or 2500m2 in area) within the vicinity of the quadrats previously identified as being associated with Robe Pisolite unit. This was undertaken in order to assist with delineation of the extent of the Robe Pisolite unit. A visual assessment of vegetation units and landform was also undertaken to assist with determination of boundary of extent of Robe Pisolite.

Numerical (i.e. PATN) analysis of the floristic data collected during the 2011 survey was undertaken by E.A. Griffin and Associates and M.E Trudgen Analysis of floristic data (PATN) to determine the conservation significance of the vegetation, specifically whether it is considered to be part of the Robe Pisolite geological unit.

The targeted *Gompholobium karijini* (P2) survey focused on areas that *Gompholobium karijini* had previously been recorded, as well as habitat that the species is known to be found in association with. The locations of *Gompholobium karijini* (P2) were recorded using a Global Positioning System (GPS) and the approximate number of plants present was recorded. The broad vegetation communities associated with the locations of *Gompholobium karijini* (P2) were also recorded.

3.1.3 Survey Timing

The terrestrial field flora and vegetation surveys of the study area were conducted by two botanists over 4 days from 3rd May to 6th May 2011.

The botanical survey team comprised of:

- Ms Cassyanna Gray (Coffey Environments); and
- Mr Clinton Van Den Bergh (Coffey Environments).

The May 2011 survey was conducted following the main rainfall season for the Pilbara. The rainfall in the months preceding the survey was largely average to above average, therefore the conditions were considered to be adequate for the collection of ephemeral flora and flowering grasses.

3.1.4 Quadrat Methodology

The locations of the19 flora quadrats sampled in 2008 and the 15 flora quadrats sampled in 2011 are mapped in Figures 4.

Quadrats were typically 50m x 50m in dimension, in accordance with the DEC's Draft Botanical Survey Requirements for the Pilbara Region (CALM, 2003) and EPA Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*

(EPA, 2004). It also gives a good indication of the shrub and grass layer vegetation structure for most vegetation types in the Pilbara that occur in 'uniform' habitats (e.g. plains and hillslopes, where vegetation stands are typically greater than this quadrat size). Quadrat shape and/or size were adjusted as necessary to fit smaller or oddly shaped habitats (e.g. flowlines, rocky outcrops).

Each quadrat was permanently marked using wooden stakes at each corner of the quadrat. Quadrats were uniquely identified alpha numerically.

In addition to flora, the following parameters were recorded for each quadrat:

1. ***Location*** — AMG coordinates recorded in WGS84 datum (~equivalent to GDA94) using a hand-held Global Positioning System (GPS), to an accuracy usually within 5m; readings taken for all four corners of the quadrat, plus general description of the location in terms of exploration area;
2. ***Vegetation Description*** — Broad description based on the height and estimated cover of dominant species after Muir (1977), modified according to Aplin's (1979) modification of the vegetation classification system of Specht (1970) (see Table 2);
3. ***Habitat*** — Description of landform and habitat;
4. ***Soil*** — Broad description of soil type and stony surface mantle;
5. ***Disturbance Details*** — Evidence of grazing, mining exploration activities, weed invasion, frequent fires etc. Note that fire effects were only considered as a negative impact if they were caused by repeated burning (such as that done for pastoral purposes). Fire is a natural and frequent process in the Pilbara to which the vegetation has adapted, and to class areas as being in poor condition simply because they have been recently burnt is misleading; and
6. ***Percentage Foliar Cover*** — Cover was estimated visually for dominant species. Estimates were made to the nearest percent where possible, or a range (e.g. 5%-10%) was used. '<' was used where only occasional individuals were present, with a cover of less than 1%.

Colour photographs of the vegetation at each site were taken from the northwest corner of each quadrat using a digital camera (see Appendix A).

3.1.5 Flora Identification and Data Entry

Voucher specimens of species that were unknown to the botanists in the field were collected and assigned a unique number to facilitate tracking of data. All collected specimens were identified by Malcolm Trudgen, or under the guidance of Malcolm Trudgen. These specimens were identified by keying out, reference to appropriate publications, use of reference collections and comparison to the collections held at the Western Australian Herbarium and Malcolm Trudgen's own extensive collection. Specimens will be lodged with the Western Australian Herbarium for all taxa that they require and for which suitable material is available.

Nomenclature was checked against the current listing of scientific names recognised by the Western Australian Herbarium and updated as necessary.

All raw site data were entered into an Access database, with species names entered following formal identification of the collected specimens.

3.1.6 Declared Rare and Priority Flora Database Searches

A search of the DEC and the Western Australian Herbarium databases were undertaken for Declared Rare Flora (DRF) and Priority Flora recorded within the vicinity of the survey area. The search area was bounded by a search area 22°04'22"S, 117°47'07"E and 22°14'24"S, 117°59'15"E. One Declared Rare Flora (DRF) species (*Lepidium catapycnon*) and 58 Priority Listed flora were listed as potentially occurring within the study area (Table 3).

Table 3

DEC Listed Threatened and Priority Taxa Recorded from Vicinity of the Study Area (DEC database search, 2011)

Species	Conservation	Flowering Period
Acacia daweana	3	Jul-Sep
Acacia effusa	3	May-Aug
Adiantum capillus-veneris	2	-
Ampelopteris prolifera	2	-
Aristida calycina var. *calycina*	2	-
Aristida lazaridis	2	-
Astrebla lappacea	3	Jun-Jul
Barbula ehrenbergii	1	-
Brachyscome sp. Wanna Munna Flats	1	Jul, Sep
Calotis latiuscula	3	Jun-Oct
Calotis squamigera	1	Jul
Cladium procerum	2	Nov
Dampiera anonyma (ms)	3	Jun-Aug
Dampiera metallorum (ms)	3	Apr-Oct
Dicladanthera glabra	2	Apr/Aug-Oct
Eragrostis crateriformis	3	Jan-Jul
Eragrostis surreyana (ms)	3	May-Sep
Eremophila forrestii subsp. Pingandy (M.E Trudgen 2662)	2	May-Jul
Eremophila magnifica subsp. *magnifica*	4	Aug-Nov
Eremophila magnifica subsp. *velutina*	3	Aug-Sep
Eremophila spongiocarpa	1	May/Sep

Table 3

DEC Listed Threatened and Priority Taxa Recorded from Vicinity of the Study Area (cont'd)
(DEC database search, 2011)

Species	Conservation	Flowering Period
Eriachne sp. Dampier Peninsula (K.F Kenneally 5946)	3	Mar-Apr
Euphorbia sp. Mt Bruce Flats	2	-
Euphorbia stevenii	3	-
Fimbristylis sieberiana	3	May–Jun
Glycine falcata	3	May-Jul
Gompholobium karijini	2	Aug-Sep
Goodenia nuda	4	Apr-Aug
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	3	Aug
Grevillea baxteri	4	-
Helichrysum oligochaetum	1	Aug-Nov
Indigofera ixocarpa ms	2	May
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	3	-
Iotosperma sessilfolium	3	-
Isotropis parviflora	2	Feb-Mar, May
Josephinia sp Marandoo (ME Trudgen 1554)	1	Aug
Kunzea salina	2	Dec
Lepidium catapycnon	T	Sep
Melaleuca eximia	2	Aug
Nicotiana heterantha	1	Mar-Jun, Sep
Nicotian umbractica	3	Apr, Jun, Sep
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	Mar-May, Jul
Olearia mucronata	3	Aug-Jan
Oxalis sp. Pilbara (M.E. Trudgen 12725)	2	May
Paspalidium retiglume	2	Apr

Table 3

DEC Listed Threatened and Priority Taxa Recorded from Vicinity of the Study Area (cont'd)
(DEC database search, 2011)

Species	Conservation	Flowering Period
Phyllanthus aridus	3	May–Jun
Polymeria distigma	3	Apr-Jul
Rhodanthe ascendens	1	Aug
Rhynchosia bungarensis	4	May-Dec
Sida sp. Barlee Range (S. van Leeuwen 1642)	3	Aug
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	2	Jul-Aug
Sida sp. Hamersley Range (K Newbey 10692)	1	
Spartothamnella puberula	2	Sep-Nov
Swainsona sp. Hamersley Station (A.A. Mitchell 196)	3	Mar
Themeda sp. Hamersley Station (ME Trudgen 11431)	3	Aug
Vigna sp. Central (M.E. Trudgen 1626)		May-Jun, Oct
Whiteochloa capillipes	3	Feb-Jun
Xanthoparmelia nashii	3	-

A search of DSEWPaC's on-line database was undertaken to identify significant flora species of national environmental significance that are protected under the *Environment Protection and Biodiversity Conservation Act 1999* potentially occurring in the area. The search identified one flora species classified as Vulnerable, *Lepidium catapycnon* (DRF), as having the potential to occur within the study area.

3.1.7 Threatened and Priority Ecological Community Database Search

A search of the DEC Threatened and Priority Ecological Communities database was undertaken for the vicinity of the study area in April 2011. One TEC, *Themeda* grasslands on cracking clays (Hamersley Station, Pilbara), was identified as occurring within the vicinity of the study area. The TEC is described as grassland plains dominated by the perennial *Themeda* (Kangaroo grass) and many annual herbs and grasses. The TEC occurs south-east of the Serenity and Mt Sheila West exploration areas on Hamersley Station.

One 'Priority 3' PEC, Plant assemblages of the Wona Land System, was identified from the search of the DEC Threatened and Priority Ecological Communities database as occurring >20 kilometres from the study area. The PEC, Five plant assemblages of the Wona Land System, is described as a system

of basalt upland gilgai plains with tussock grasslands, in Chichester National Park and in pastoral leases.

A search of DSEWPaC's on-line database was undertaken in April 2011 to identify significant ecological communities of national environmental significance that are protected under the *Environment Protection and Biodiversity Conservation Act 1999* potentially occurring in the area. No Threatened Ecological Communities were identified from the database search as having the potential to occur within the study area.

3.2 Botanical Survey Limitations

The DEC's Draft Botanical Survey Guidelines (CALM, 2003) recommends that a minimum of two separate sampling sessions are required to comprehensively and adequately document the flora and vegetation of a project area. As many of the plants in the region exhibit an ephemeral or annual life history, the timing of sampling sessions will be dependent largely on rainfall. In general, an initial sampling should occur three to five weeks after significant rainfall and then be followed by a subsequent session towards the end of the season. Ideally sampling would occur in February/March/April with a follow up in July/August/September. The guidelines acknowledge that a single sampling session is often all that is possible given time constraints and weather conditions. Only a single sampling season was undertaken for the April/May 2011 flora survey.

The April/May 2011 survey was conducted following the main rainfall season for the Pilbara. BOM (2011) data for the weather stations located at Paraburdoo, Tom Price and Wittenoom, indicates that the study area generally received average to above average rainfall in the months preceding the survey, therefore the conditions were considered to be very good for the collection of ephemeral flora and flowering grasses.

A statement of botanical survey limitations is outlined in Table 4 below. Fungi and non-vascular flora (e.g. algae, mosses and liverworts) were not specifically sampled.

Table 4

Statement of Botanical Survey Limitations

Possible Limitations	Constraints (Yes/No); Significant, Moderate Or Negligible	Comment
Competitions/experience of the consultant conducting the survey	No constraints	Botanists with extensive survey experience. Unknown specimens were collected and these were identified by M.E. Trudgen (or under M.E. Trudgen's guidance), whose Pilbara Region taxonomic skills are highly regarded.
Proportion of the flora identified	No constraints	Adequate rainfall in months preceding April/May 2011 survey. See Section 2.4
Sources of information (historic/recent or new data)	No constraints	Well documented. See Section 2.10

Table 4

Statement of Botanical Survey Limitations (cont'd)

Possible Limitations	Constraints (Yes/No); Significant, Moderate Or Negligible	Comment
Proportion of the task achieved and further work that may need to be undertaken	Minor constraints	Single season sampling of quadrats undertaken in very good sampling season. Targeted survey was undertaken to determine general numbers of *Gompholobium karijini* (P2) but entire Solomon Project was not intensively grid searched, therefore more individuals are likely to be present.
Timing/weather/season/cycle	No constraint	Adequate rainfall in months preceding April/May 2011 survey.
Intensity of survey (e.g. In retrospect was the intensity adequate)	Minor constraints	20 quadrats were sampled in 2008 and 15 quadrats were sampled in 2011 within vicinity of Robe Pisolite Land System. Entire Solomon Project was not intensively grid searched to target *Gompholobium karijini* (P2).
Completeness (e.g. was relevant area fully surveyed)	Minor constraints	
Resources (e.g. degree of expertise available for plant identification)	No constraints	M.E. Trudgen consulted to identify specimens collected.
Remoteness and/or access problems	No constraints	Quadrats intensely traversed entirely on foot, 4WD vehicles and All Terrain Vehicles used to access sample sites.
Availability of contextual (e.g. bioregional) information for the survey area.	No constraints	See sections 1.3 and 2.10

4 RESULTS OF ROBE PISOLITE SURVEY

4.1 Vegetation Types

A total of five relatively distinct vegetation types were identified from the quadrats sampled during the April/May 2011 survey. These vegetation types comprised of:

- *Eucalyptus leucophloia* subsp. *leucophloia*, *Eucalyptus gamophylla* and *Corymbia hamersleyana* Low Open Woodland to 8m over *Grevillea wickhamii.* subsp. *hispidula* and *Hakea lorea* subsp. *lorea* Tall Open Shrubland to 3.5m over *Acacia arida* Shrubland to Open Shrubland to 1.6m over *Triodia wiseana* Hummock Grassland to 0.8m on stony hilltops and slopes;
- *Corymbia hamersleyana* and *Eucalyptus leucohploia* subsp. *leucophloia* Low Open Woodland to 5m over *Acacia hilliana* and *Gompholobium karijini* Low Open Shrubland to 0.6m over *Triodia wiseana* Open Hummock Grassland to 0.5m on stony hilltops and slopes;
- *Corymbia hamersleyana* Low Open Woodland to 6m over *Acacia acradrenia* Tall Open Shrubland to 2.5m over *Acacia arida* Low Open Shrubland to 1.4m over *Triodia wiseana* Hummock Grassland to 0.6m on stony hilltops and slopes;
- *Corymbia hamersleyana Low Open Woodland to 6m over Acacia pyrifolia, Grevillea wickhamii subsp. hispidula, Acacia bivenosa, Acacia citrinoviridis and Atalaya hemiglauca Closed Tall Scrub to 4m over Cymbopogon obtectus, Themeda triandra and Chrysopogon fallax Open Tussock Grassland to 1m over Triodia epactia Very Open Hummock Grassland to 0.5m in gorge adjacent to major drainage line; and*
- *Eucalyptus camaldulensis var. obtusa and Eucalyptus victrix Tall Open Woodland to 25m over Acacia citrinoviridis, Acacia pyrifolia and Grevillea wickhamii subsp. hispidula to 4m over Tephrosia rosea var. glabrior and Stemodia grossa Low Open Shrubland to 0.6m over Cymbopogon obtectus and Themeda triandra Scattered Grasses to 0.8m in major drainage line.*

4.2 Vegetation Condition

The vegetation of the stony hill and slope habitats of the study area were generally in Very Good condition. These areas are not preferred grazing habitat for stock, and the stony, relatively dry substrates also tend to discourage germination and growth of weed species.

The vegetation of the major drainage line within the gorge was in Very Good condition due to a low weed density and the presence of naturally occurring bare areas. The vegetation located adjacent to the major drainage line within the gorge was in Good to Poor condition due to the presence of some aggressive weed species such as Beggar's Tick **Bidens bipinnata* and Buffel Grass **Cenchrus ciliaris.*

4.3 Conservation Significance of Vegetation

4.3.1 Threatened Ecological Communities

The TEC, *Themeda* grasslands on cracking clays (Hamersley Station, Pilbara), which was identified on the DEC Threatened and Priority Ecological Communities database as occurring within the vicinity of the study area, was not recorded during the 2008 and 2011 flora and vegetation surveys. No other TECs were recorded during the survey.

No TECs protected under the *Environment Protection and Biodiversity Conservation Act 1999* were identified from the DSEWPaC's database search as having the potential to occur within the study area.

No TECs listed on DSEWPaC's database were identified during the 2008 and 2011 flora and vegetation survey.

4.3.2 Priority Ecological Communities

The PEC, *Five plant assemblages of the Wona Land System*, which was identified on the DEC Threatened and Priority Ecological Communities database as occurring within the vicinity of the study area, was not recorded during the 2008 and 2011 flora and vegetation surveys. No other PECs were recorded during the survey.

4.4 Terrestrial Flora

A total of 96 species of terrestrial vascular flora from 62 genera belonging to 30 families were recorded from the 15 quadrats sampled during the April/May 2011 flora survey (see Appendix B). A total 3 of these species (approximately 3%) are introduced flora (see Section 4.6).

The families with the highest representation of taxa were the Poaceae (Grass family; 17 taxa) and the Mimosaceae (Wattle family; 13 taxa). The most highly represented genera were *Acacia* (13 taxa) and *Senna* (5 taxa). These families and genera are those that are predominant in the vegetation of the eastern Pilbara, and that usually have most representatives on flora lists from this region, due to their prominence in the Eremaean flora.

4.5 Conservation Significant Flora

4.5.1 Declared Rare and Priority Flora

4.5.1.1 Levels of Conservation Significance

While all native flora are protected under the *Wildlife Conservation Act 1950-1979*, a number of plant species are assigned an additional level of conservation protection based on the limited number of known populations and the perceived threats to these populations (Table 5). Species of the highest conservation significance are designated Threatened (T), either extant or presumed extinct. Species that appear to be rare or threatened, but for which there is insufficient information to properly evaluate their conservation significance, are assigned to one of five Priority flora categories.

In addition, the presence of some flora species means that it may be necessary to refer proposals to the Federal Minister for the Environment under the *Environment Protection and Biodiversity Conservation* (EPBC) *Act 1999*. In the Pilbara, there are two Declared Rare Flora species (*Lepidium catapycnon* and *Thryptomene wittweri*) which are also protected under the *EPBC Act 1999*.

Table 5

Categories of Conservation Significance for Flora Species (DEC 2011b)

T: Threatened Flora (Declared Rare Flora - Extant Taxa). Taxa that 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 (Schedule 1 under the Wildlife Conservation Act 1950).

X: Presumed Extinct Flora (Declared Rare Flora – Extinct). Taxa that have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 1 under the Wildlife Conservation Act 1950).

1: Priority One: Poorly-known species. Taxa which are known from one or a few (generally <5) populations which are under threat.

2: Priority Two: Poorly-known species. Species 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

3: Priority Three: Poorly-known species. Species 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.

4: Priority Four: Rare, Near Threatened and other species in need of monitoring.

1. Rare. Species 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.
2. Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
3. Species 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 species. Species that are not threatened but are subject to specific conservation program, the cessation of which could result in the species becoming threatened within five years.

4.5.1.2 Threatened and Priority Flora from the Study Area

A search of DEC's Threatened (Declared Rare) and Priority Flora database and the Western Australian Herbarium Specimen database was conducted for the vicinity of the study area (see Table 3). The search listed one Declared Rare Flora (DRF) species (*Lepidium catapycnon*) and 58 Priority listed flora as potentially occurring within the vicinity of the study area.

Two Priority listed flora, *Gompholobium karijini* (P2) and *Goodenia nuda* (P4) was recorded during the April/May 2011 flora survey (Appendix E).

The attributes and distribution of *Gompholobium karijini* (P2) within the Solomon Mine Project is discussed in detail in Section 5 of this report.

Goodenia nuda (P4) is an erect to ascending herb growing to 0.5 m high, with yellow flowers between April and August. *Goodenia nuda* prefers drainage lines and low lying areas. According to Naturemap (DEC, 2007-) a total of 42 locations have previously been recorded within Western Australia, 40 of which occur within the Pilbara bioregion. Specimens lodged previously with the WA Herbarium are

from localities including Weeli Wolli Creek, Roy Hill Station, Mulga Downs Homestead and near Tom Price.

A total of approximately 5 *Goodenia nuda* (P4) plants were recorded on top of a low rise within Quadrat RB013 (Figure 4).

Reference: Photography by K.C Richardson. Image used with the permission of the Western Australian Herbarium, Department of Environment and Conservation http://florabase.dec.wa.gov.au/help/copyright accessed on Wednesday, 15 June 2011.

4.5.1.3 Apparently Undescribed Taxa

- ***Senna* spp.**

Hybrids and hybrid backcrosses of *Senna* species are frequently encountered during Pilbara surveys. All of the *Senna* taxa identified within the study area have been recorded previously on other surveys within the Pilbara, and none are considered to be uncommon (pers.comm. Malcolm Trudgen).

4.6 Introduced Flora

A total of 3 species of introduced flora were recorded from the study area during the April/May 2011 flora survey, none of which are listed as a Declared Plant under the *Agriculture and Related Resources Protection Act 1999* (Agwest, 2011). Weed species recorded from the study area are mostly common and generally relatively widespread species in the Pilbara region:

- Beggar's ticks (**Bidens bipinnata)* was recorded from one location (Quadrat RB014) during the April/May 2011 flora survey. This annual daisy is found mainly in creeklines and in Mulga vegetation. It can be very dense after good rains, especially in shaded areas, and can crowd out native flora species.

- Buffel grass (**Cenchrus ciliaris*) (High rating) was introduced as fodder species by pastoralists. It is a tufted or sometimes stoloniferous perennial, grass-like or herb in habit, between 0.2–1.5 m in height. It has purple flowers between February and October, and prefers white, red or brown sand, stony red loam and black cracking clay. While this highly invasive perennial species have demonstrated allelopathic capacities (whereby they release chemicals which inhibit growth of other species), they are not listed as Declared Weeds due to their importance to the pastoral industry. **Cenchrus ciliaris* was recorded from one location (Quadrat RB014) within the study area; and

- Native Cucumber (**Cucumis melo* subsp. *agrestis*) is prostrate annual vine with yellow flowers and edible fruit and is associated with low-lying areas or drainage lines. **Cucumis melo* subsp. *agrestis* was recorded from one site (Quadrat RB014) within the study area.

The Environmental Weeds Strategy for Western Australia (CALM, 1999), developed criteria for the assessment and rating of introduced flora species in terms of their environmental impact on biodiversity. The criteria included:

- **Invasiveness –** ability to invade bushland in good to excellent condition or ability to invade waterways (score of yes or no);
- **Distribution –** wide current or potential distribution including consideration of known history of widespread distribution elsewhere in the world (scored as yes or no); and
- **Environmental Impacts** – ability to change the structure, composition and function of ecosystems, in particular an ability to form a monoculture in a vegetation community (scored as a yes or no).

The rating of each introduced flora species was determined by using the following scoring system:

High - an introduced flora species that scores yes to all three criteria. An introduced flora species with a rating of High would indicate prioritising this weed for control and/or research.

Moderate - An introduced flora species that scores yes to two of the criteria. Rating an introduced flora species as Moderate would indicate that control or research effort should be directed if funds are available, however it should be monitored.

Mild – An introduced flora species that scores yes to one of the criteria. A Mild rating would indicate that monitoring and control of the introduced flora species is necessary where appropriate.

Low – an introduced flora species that score no to all of the criteria. A Low rating would mean that this species would require a low level of monitoring.

According to the Environmental Weed Strategy (CALM, 1999), **Cenchrus ciliaris* is classified as having a High rating due to its high impact on biodiversity. In addition, **Cenchrus ciliaris* is listed on DSEWPaC's on-line database as a species identified as posing a significant threat to biodiversity.

Neither of the remaining introduced flora species recorded from the study area were listed in the Environmental Weed Strategy or on DSEWPaC's on-line database (DSEWPaC, 2011).

4.7 Floristic analysis results

4.7.1 Purpose

The floristic data collected during the 2011 flora survey was assigned to floristic units defined as a result of numerical (i.e. PATN) analysis of data collected within the Solomon Mine and Rail Projects in 2008 by Griffin E.A. & M.E. Trudgen (2009a and 2009b). The classification (grouping of sites using PATN analysis) from Griffin E.A. & M.E. Trudgen (2009a and b) was used as a reference classification for the 2011 flora data as it was the most appropriate. It included the earlier data collected within the Solomon Mine and Rail Projects by Coffey Environments (giving a local basis for comparison) and other data from across the Pilbara Bioregion. The other data used for the classification provided a sufficient basis for regional comparison of the Coffey Environments data.

The assignment of units was conducted by Griffin E.A. & M.E. Trudgen to investigate the conservation value of the vegetation, specifically whether the vegetation sampled within the study area is considered to be associated with Robe Pisolite (Griffin E.A. & M.E. Trudgen, 2011).

The results of the numerical analysis are provided in Appendix D and summarised below.

4.7.2 Conservation Assessment Framework

Two types of analyses were used to assign the 2011 floristic data to the 2009 classification. Firstly, PATN analysis was used to carry out pattern analyses of the combined data set created by adding the new data collected by Coffey Environments to the regional dataset used in Griffin & Trudgen (2009a & 2009b). This regional data set has 2,883 sites, including data previously recorded within the Solomon Mine and Rail Projects by Coffey Environments. Secondly, the analysis was used to identify the sites in the earlier dataset most similar (Nearest Neighbour) to each of the new sites.

The results of the two methods were then used to investigate the best assignment for the new sites. It was found that while some of the new sites were readily placed by these two methodologies, others were better placed by comparing the vegetation descriptions, habitats and flora lists of the of the new sites concerned to those of sites in the reference data set.

4.7.3 Limitations

All exercises such as those carried out for the floristic analysis have potential limitations, including the following:

- Deficiencies in quadrat selection;
- Inadequate number of quadrats or poor sampling strategy;
- Inadequate searching of quadrats;
- Inaccurate identification of specimens/over reliance on field identification of specimens; and
- Variations in seasonal conditions and recent fire.

Therefore, the major sources of difference in data quality between the projects in the dataset are the differences in experience of those undertaking the primary observations, and variation in seasonal conditions.

4.7.4 Conservation Value of Vegetation

The assignment of flora sites sampled in 2011 to units identified from the previous PATN analysis for the Solomon Mine and Rail Projects (Griffin E.A. & M.E. Trudgen, 2009a and 2009b) is presented in Table 6 below. The potential significance according of each of the units according to Griffin E.A. & M.E. Trudgen, 2009a, 2009b and 2011) is also shown.

Table 6

Summary of Floristic Units Identified as Occurring Within the Study Area

Unit	Quadrats Associated	Significance according Griffin E.A. & M.E. Trudgen, 2009a, 2009b and 2011)
157	RB15	Uncommon. Restricted distribution.
174	RB14	Not uncommon. Restricted to central part of northern side of Hamersley Range.
279	RB05, RB06, RB08, RB09, RB12, RB13	Uncommon. Restricted distribution.

Table 6

Summary of Floristic Units Identified as Occurring Within the Study Area (cont'd)

Unit	Quadrats Associated	Significance according Griffin E.A. & M.E. Trudgen, 2009a, 2009b and 2011)
280	RB03, RB04	Uncommon. Restricted distribution.
282	RB01, RB02, RB07, RB10, RB011	Uncommon. Not of restricted distribution

The majority of quadrats sampled during the 2011 flora survey were considered to be uncommon and of restricted distribution within the Pilbara region.

One quadrat (RB15) was assigned to Unit 157, which is considered to be uncommon and of restricted distribution. Seven quadrats associated with this unit were previously recorded from the vicinity of Serenity, Valley of the Kings, Zion and Trinity.

One quadrat (RB14) was assigned to Unit 174, which is not considered to be uncommon but is considered to be restricted to the central portion of the northern side of Hamersley Range. A total of 20 quadrats associated with this unit were previously recorded from the vicinity of Zion and Trinity.

Six quadrats (RB05, RB06, RB08, RB09, RB12, RB13) were assigned to Unit 279, which is considered to be uncommon and of restricted distribution. Nine quadrats associated with this unit were previously recorded from Valley of the Queens, Valley of the Kings and Zion.

Two quadrats (RB03 and RB04) were assigned to Unit 280, which is considered to be uncommon and of restricted distribution. A total of 14 quadrats associated with this unit were previously recorded from Zion and Firetail.

Quadrats RB01, RB02, RB07, RB10, RB11 were assigned to Unit 282, which is considered to be uncommon but not of restricted distribution. Five quadrats associated with this unit have previously been recorded, including one from Firetail, one from the West Angelas Project Four Corners Bore Route and three from Fortescue's Cloudbreak to Port Hedland Rail Route.

Table 7 below shows the quadrats occurring within the Robe Pisolite study area that occur on Robe Pisolite and their associated habitat. This is based on a combination of Robe Pisolite geological information provided by Griffin & Trudgen (2009a & 2009b) and Fortescue Metals Group in July 2011.

Table 7

Sampling Sites Occurring on Robe Pisolite

Quadrat	Habitat
RB01	Hill top
RB02	Hill top
RB03	Red brown, loamy gravel, gravel surface
RB04	Low rise
RB05	Hill top

Table 7

Sampling Sites Occurring on Robe Pisolite (cont'd)

Quadrat	Habitat
RB06	Upper slope, gentle
RB07	Hill top
RB08	Hill top to lower slope, adjacent to gully
RB09	Brown red loamy clayey gravel, rock surface
RB010	Hilltop
RB11	Hill top
RB13	Top of low rise
RB14	Gorge adjacent to major drainage line
RB15	Major drainage
ZION008	Gully, running north-south
ZION009	Gently slope north
ZION010	Hilltop
ZION011	Gentle slope north
ZION012	Gentle slope
ZION013	Minor hill, sloping to west
ZION014	Flat hilltop
ZION015	Gully, running east-west
ZION017	Minor gully
ZION018	Gully, running east-west
ZION019	Hill slope, facing east
ZION020	Gently sloping hillsides, sloping up to the east
ZION021	Undulating low hills
ZION022	Wide gully, running north-south
ZION023	Mesa top, sloping east
ZION025	Gully, running north-south
ZION050	Major drainage line, flowing north-south

Two quadrats (RB12 and ZION007) sampled within the vicinity of the Robe Pisolite study area do not occur on Robe Pisolite based on available geological information. ZION007 is assigned to Unit 300 which is uncommon and restricted in a wider sense but not locally uncommon.

Based on the floristic analysis results and geological mapping, it is considered that the majority of the vegetation within the study area is of significant conservation value. Figure 4 shows the indicative area within the immediate vicinity of the study area that is considered to contain vegetation of significant conservation value in association with Robe Pisolite.

Five quadrats RB03, ZION008, ZION019, ZION020, ZION021 located slightly outside of the study area are considered to contain vegetation of significant conservation value in association within Robe Pisolite. As a result the conservation significance boundary has been extended outside of the study area to include the vegetation occurring in association with these quadrats.

4.7.4.1 *Gompholobium karijini*

According to Griffin E.A. & M.E. Trudgen (2009a and 2009b) Robe Pisolite was the dominant geological unit from which the Priority Two species, *Gompholobium karijini* was recorded from within the Solomon Mine Project area, so there is significant overlap in the conservation value of the vegetation of the Robe Pisolite and the vegetation with *Gompholobium karijini* (P2) contributing significantly to the shrub layer.

The sites within the Solomon Rail Project, Solomon Project and Investigator, include the only sites known that have this species contributing significantly to the vegetation. One quadrat (RB13) surveyed during the 2011 flora survey had a significant cover (i.e 2% or greater) of *Gompholobium karijini* (P2).

5 RESULTS OF *GOMPHOLOBIUM KARIJINI* (P2) SURVEY

5.1 Background and Description

The Priority 2 species *Gompholobium karijini* is a low shrub growing to approximately 1m in height. *Gompholobium karijini* prefers stony hill and slope habitats on red brown loamy gravel soils. Like many species from the Pea (Papilionaceae) family, it is also a disturbance opportunist, establishing in disturbed areas such as on drill pads and along exploration tracks.

Apart from the records made from the Solomon Rail Project, Solomon Project, and Investigator, very few records of *Gompholobium karijini* are known. It had been named based on the geographic area from which it was collected near, Hamersley Gorge located within Karijini National Park, however the species is uncommon there. The sites within the Solomon Rail Project, Solomon Project and Investigator, include the only sites known to have this species contributing significantly to the vegetation composition.

In order to assist with determining the extent of *Gompholobium karijini* (P2) within the Solomon Mine Project, a targeted survey for *Gompholobium karijini* (P2) was undertaken in April/May 2011 by Coffey Environments. The targeted *Gompholobium karijini* (P2) survey focused on areas that *Gompholobium karijini* had previously been recorded, as well as habitat that the species is known to be found.

Gompholobium karijini (P2) can be readily distinguished in the field from the similar and more common *Gompholobium* sp. Pilbara due to its more or less glabrous stems and leaves.

Reference: Photography by C. Gray (Coffey Environments)

5.2 Vegetation Types and Condition

Gompholobium karijini (P2) was identified in association with three main vegetation types during the April/May 2011 targeted survey. These include:

- *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* Low Open Woodland to 5m over *Acacia hilliana* and *Gompholobium karijini* Low Open Shrubland to 0.6m over *Triodia wiseana* Open Hummock Grassland to 0.5m;

- *Corymbia hamersleyana, Eucalyptus gamophylla* and *Eucalyptus leucophloia* subsp. *leucophloia* Low Open Woodland to 5m over *Acacia hilliana* Low Open Shrubland to Scattered Shrubs to 0.6m over *Triodia wiseana* Hummock Grassland to 0.5m;
- *Eucalyptus leucophloia* subsp. *leucophloia*, *Eucalyptus gamophylla* and *Corymbia hamersleyana* Low Open Woodland to 8m over *Grevillea wickhamii* subsp. *hispidula* Tall Open Shrubland to 3m over *Acacia arida* Shrubland to Open Shrubland to 1.6m over *Triodia wiseana* Hummock Grassland to 0.8m; and

The above vegetation types were considered to be in Very Good condition due to absence of weeds and grazing.

Being a disturbance opportunist, *Gompholobium karijini* (P2) was also recorded in association with cleared areas within drill pads and along exploration tracks. These areas were considered to be in Very Poor to Degraded condition.

5.3 Locations and Numbers of *Gompholobium karijini* (P2)

A summary of the distribution of *Gompholobium karijini* (P2) recorded during the April/May 2011 survey is provided in Appendix D. The locations and numbers of these are shown on Figure 5.

A total of 2086 individuals of *Gompholobium karijini* (P2) were recorded at 140 locations within the Solomon Mine Project during the April/May 2011 survey. The majority of *Gompholobium karijini* (P2) (1285 individuals) locations were recorded within the vicinity of Zion.

According to DEC records, three locations of *Gompholobium karijini* (P2) have previously been recorded within the vicinity of the Solomon Project. The locations of these are shown on Figure 6.

Based on the results of the April/May 2011 targeted survey it is considered likely that there are significantly more locations and higher numbers of *Gompholobium karijini* (P2) present within and around the Solomon Mine Project than those recorded to date, particularly within the vicinity of Firetail and Zion.

6 DISCUSSION AND CONCLUSIONS

Robe Pisolite

A total of five relatively distinct vegetation types were identified from the 15 quadrats sampled during the April/May 2011 survey.

The majority of the vegetation sampled was in Very Good condition due to absence of weeds and grazing. A portion of vegetation located within a gorge adjacent to a major drainage line was in Good to Poor condition due to the presence of some aggressive weed species such as Beggar's Tick **Bidens bipinnata* and Buffel Grass **Cenchrus ciliaris.*

A total of 96 species of terrestrial vascular flora from 62 genera belonging to 30 families were recorded from the 15 quadrats sampled during the April/May 2011 flora survey. A total 3 of these species (approximately 3%) are introduced flora.

The floristic data collected during the 2011 flora survey was assigned to floristic units defined as a result of numerical (i.e. PATN) analysis of data collected within the Solomon Mine and Rail Projects in 2008 by Griffin E.A. & M.E. Trudgen (2009a and 2009b). The assignment of units was conducted by Griffin E.A. & M.E. Trudgen (2011) to investigate the conservation value of the vegetation, specifically whether the vegetation sampled within the study area is considered to be associated with Robe Pisolite.

The majority of quadrats sampled during the 2011 flora survey were considered to be uncommon and of restricted distribution within the Pilbara region.

Based on the numerical analysis and assignment of units (Griffin E.A. & M.E. Trudgen, 2009a, 2009b, and 2011) and geological mapping, it is considered that the majority of the vegetation within the study area is of significant conservation value.

Gompholobium karijini (P2)

Gompholobium karijini (P2) was identified in association with three main vegetation types during the April/May 2011 targeted survey. The vegetation types were considered to be in Very Good condition due to absence of weeds and grazing. *Gompholobium karijini* (P2) was also recorded in association with cleared areas within drill pads and along exploration tracks. These areas were considered to be in Very Poor to Degraded condition.

A total of 2086 individuals of *Gompholobium karijini* (P2) were recorded at 140 locations within the Solomon Mine Project during the April/May 2011 survey. The majority of *Gompholobium karijini* (P2) (1285 individuals) locations were recorded within the vicinity of Zion.

Based on the results of the April/May 2011 targeted survey it is considered likely that there are significantly more locations and higher numbers of *Gompholobium karijini* (P2) present within and around the Solomon Mine Project than those recorded to date, particularly within the vicinity of Firetail and Zion.

7 REFERENCES

Agwest (2011). Declared Plants List – Update January 2011. Department of Agriculture, Perth.

Aplin T.E.H. (1979). The Flora. Chapter 3 *In* O'Brien, B.J. (ed.) (1979). Environment and Science. University of Western Australia Press.

Beard J.S. (1975). *Vegetation Survey of Western Australia*. 1:100,000 Vegetation Series Mapsheet 5 - Pilbara.

Biota Environmental Sciences (2004a). *Vegetation and Flora Survey of the Proposed FMG Stage A Rail Corridor.* Unpublished report for FMG, August, 2004.

Biota Environmental Sciences (2004b). *Fortescue Metals Group Stage B Rail Corridor, Christmas Creek, Mt Lewin, Mt Nicholas and Mindy Mindy Mine Areas Vegetation and Flora Survey.* Unpublished report for FMG, December 2004.

Biota Environmental Sciences (2004c). *Hope Downs Additional Rail Corridor (Chichester Range) – Vegetation and Flora Survey.* Unpublished report for Hope Downs Management Services, January 2004.

Biota Environmental Sciences (2004d). *Hope Downs Rail Corridor, Hamersley Range Extension – Vegetation and Flora Survey.* Unpublished report for Hope Downs Management Services, January 2004.

Biota Environmental Sciences and Trudgen, M.E. (2002). *Hope Downs Rail Corridor, Port Hedland to Weeli Wolli Creek – Vegetation and Flora Survey.* Unpublished report prepared for Hope Downs Management Services, February 2002.

Brian J O'Brien & Associates Pty Ltd (1992). *Marandoo Iron Ore Mine and Central Pilbara Railway. Environmental Review and Management Programme.* Report prepared for Hamersley Iron Pty. Limited.

Bureau of Meteorology (2011). http://www.bom.gov.au/climate/averages/

Coffey Environments (2007). *Supplementary Flora and Vegetation Surveys, Port Hedland to Cloudbreak Rail, Borrow Pits and Associated Infrastructure.* Report prepared for Fortescue Metals Group Pty Ltd.

Coffey Environments (2010a). *Flora and Vegetation Assessment, Solomon Rail Project.* Report prepared for Fortescue Metals Group Limited;

Coffey Environments (2010b). *Flora and Vegetation Assessment, Solomon Project and Investigator.* Report prepared for Fortescue Metals Group Limited;

Department of Agriculture (2011). *Natural Resource Management Shared Land Information* http://spatial.agric.wa.gov.au/slip/.

(CALM) Department of Conservation and Land Management (1999). *Environmental weed strategy for Western Australia including Weedbase [a database of environmental weeds of Western Australia*.

(CALM) Department of Conservation and Land Management (2003). *Draft Botanical Survey Guidelines Pilbara Region*. April 2003.

(DEC) Department of Environment and Conservation (2007). *Working Draft Guidelines for Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment*. Prepared for DEC by Ecologia.

(DEC) Department of Environment and Conservation (2011a). *Pilbara Regional Biological Survey, 2002-2009.* http://www.dec.wa.gov.au/science-and-research/biological-surveys/pilbara-region-biological-survey-2002-2009.html

(DEC) Department of Environment and Conservation (2011b). *Florabase, Conservation Codes for Western Australia.* Available at: http://florabase.calm.wa.gov.au/conservationtaxa

(DEC) Department of Environment and Conservation (2007-). *NatureMap: Mapping Western Australia's Biodiversity*. Department of Environment and Conservation. Available at: http://naturemap.dec.wa.gov.au/

Department of Sustainability, Environment, Water, Populations and Communities (DWEWPaC) (2011). *EPBC ACT, Protected Matters Search Tool.* Available at: http://www.environment.gov.au/epbc/pmst/index.html

Griffin E.A. & M.E. Trudgen (2009a). *Numerical analysis of floristic data from the Fortescue Metals Group Solomon Project and Investigator Mine Project Area with data from the surrounding Pilbara Bioregion of Western Australia***.** Unpublished report prepared for Coffey Environments.

Griffin E.A. & M.E. Trudgen (2009b*). Numerical analysis of floristic data from the Fortescue Metals Group Solomon Rail Project Area with data from the surrounding Pilbara Bioregion of Western Australia .* Unpublished report prepared for Coffey Environments.

E.A Griffin & Associates with M.E. Trudgen & Associates (2011). *Assignment of additional vegetation quadrats (Robe Pisolite Survey) recorded by Coffey Environments from the Fortescue Metals Solomon Project Area to the 2009 floristic classification including the area.* Prepared for Coffey Environments.

Ecoscape (2010a). *Level 2 Flora and Vegetation Assessment, Firetail Mining Area.* Report prepared for Fortescue Metals Group Limited;

Ecoscape (2010b). *Solomon Project Rail Re-alignment, Flora and Vegetation Assessment.* Report prepared for Fortescue Metals Group Limited;

Ecoscape (2010c). *Solomon Project Rail Camp 1G, Flora and Vegetation Assessment.* Report prepared for Fortescue Metals Group Limited;

Ecoscape (2010d). *Solomon Project Airstrip, Flora and Vegetation Assessment.* Report prepared for Fortescue Metals Group Limited;

English, V. and J. Blyth (1997). *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province.* ANCA National Reserves System Cooperative Programme: Project Number N702. Final report, May 1997.

ENV Australia Pty Ltd (2010). *Solomon Project: Kings.* Report prepared for Fortescue Metals Group Limited;

Environment Australia (2000). *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1, Summary Report*. Environment Australia, November 2000.

(EPA) Environmental Protection Authority (2002). Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection*.

(EPA) Environmental Protection Authority (2004). Guidance Statement No. 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*.

Gentilli, J. (1972). Australian Climate Patterns. Nelson, Melbourne.

Integrated Environmental Services (1978). *The Biological Environment of the West Angelas Area Western Australia.* Prepared for Cliffs International Inc.

Kendrick, P. and McKenzie, N. (2001a). Pilbara 1 (PIL1 – Chichester subregion). In: *The Biodiversity Audit of Western Australia.* Department of Conservation and Land Management, Perth. Available at: http://www.naturebase.net/science/bio_audit/index.html.

Kendrick, P. (2001b). Pilbara 2 (PIL2 – Fortescue Plains subregion). In: *The Biodiversity Audit of Western Australia.* Department of Conservation and Land Management, Perth. Available at: http://www.naturebase.net/science/bio_audit/index.html.

Kendrick, P. (2001c). Pilbara 3 (PIL3 – Hamersley subregion). In: *The Biodiversity Audit of Western Australia.* Department of Conservation and Land Management, Perth. Available at: http://www.naturebase.net/science/bio_audit/index.html.

**Mattiske, E M & Associates (1986*). Flora and Vegetation Survey of the Channar Mining Area and Surrounds, Hamersley Range, Western Australia*. Unpublished Report prepared for Hamersley Iron Pty Ltd.

Mattiske, E M & Associates (1989). *Flora and Fauna Studies Brockman 2.* Unpublished Report prepared for Hamersley Iron Pty Ltd.

Mattiske, E M & Associates (1991). *Flora and Vegetation Marandoo Lease and Proposed Transport Corridors.* Unpublished Report prepared for Hamersley Iron Pty Ltd.

Mattiske Consulting (2005). Flora and Vegetation on the Cloud Break and White Knight Leases. Unpublished report prepared for FMG, June 2005.

Muir B.G. (1977). *Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve*. Records of the Western Australian Museum, Supplement No. 3.

Payne, A.L., van Vreeswyk, A.M.E., Hennig, P., and Leighton, K.A. P. Hennig (2002). Pilbara Ranges Project Rangeland Survey Agriculture WA. (issued November 2004).

Specht, R.L. (1970). *Vegetation in the Australian Environment*. GW Leeper Ed. Fourth edition. CSIRO, Melbourne.

Texasgulf Australia (1979). *Marandoo flora and fauna*. Internal report for Texasgulf Australia Ltd, Perth.

Thackway, R. and I.D. Cresswell (1995). *An interim biogeographic regionalisation for Australia: A framework setting priorities in the national reserves system cooperative program*. Australian Nature Conservation Agency.

Tille, P. (2006). *Resource management technical report 313: Soil-landscape of Western Australia's rangelands and arid interior*. A report prepared for the Western Australian Department of Agriculture and Food, Perth, Western Australia.

Trudgen, M E (1975). *Floristic Report on Marandoo Mining Site*.

Trudgen, M (1995a). *A Flora Survey of Deposit 'A' near West Angela Hill, with Description of Vegetation of Flora Collecting Sites.* Unpublished Report Prepared for Robe River Iron Associates.

Trudgen, M (1995b). *Preliminary Flora Survey of Deposit 'B' near West Angela Hill, with Description of Vegetation of Flora Collecting Sites.* Unpublished Report Prepared for Robe River Iron Associates.

Trudgen, M E & Casson, N (1998). *Flora and Vegetation Surveys of Orebody A and Orebody B in the West Angela Hill area, an area surrounding them, and of rail route options considered to link them to*

the existing Robe River Iron Associates rail line. Unpublished Report prepared for Robe River Iron Associates.

Van Vreeswyk, A.M.E., Payne, A.L., Leighton, K.A. & Hennig, P. (2004). *An inventory and condition survey of the Pilbara region, Western Australia*. Department of Agriculture Technical Bulletin No 92, December 2004.

Western Australian Herbarium (1998–). FloraBase — The Western Australian Flora. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/ .

8 DISCLAIMER

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Figures

Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey, Solomon Mine Project

Drawn:	C. Reeves
Checked:	C. Gray
Date:	8 Jun 2011
Projection:	MGA zn50
Scale:	1 : 10 000 000 at A4

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

Fortescue Metals Group
ROBE PISOLITE ASSESSMENT AND TARGETED *GOMPHOLOBIUM KARIJINI* (P2) SURVEY WITHIN SOLOMON PROJECT

REGIONAL LOCATION

Figure 1

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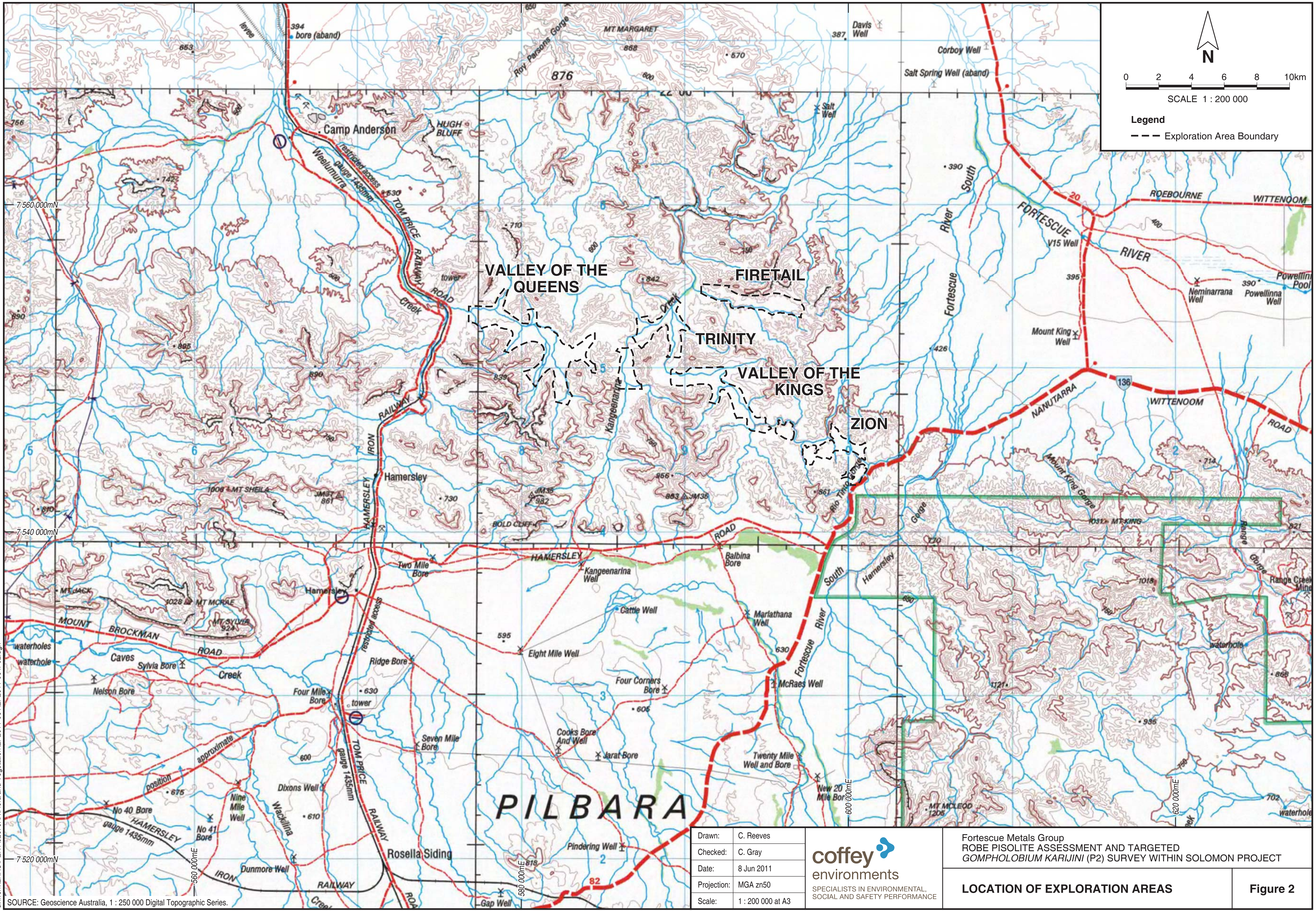
N
0 2 4 6 8 10km
SCALE 1 : 200 000
Legend
Exploration Area Boundary
VALLEY OF THE QUEENS
FIRETAIL
TRINITY
VALLEY OF THE KINGS
ZION
Camp Anderson
HUGH BLUFF
TOM PRICE RAILWAY
Hamersley
MT SHEILA
BOLD CLIFF
MT MARGARET
Roy Parsons Gorge
FORTESCUE RIVER
ROEBOURNE WITTENOOM
NANUTARRA WITTENOOM ROAD
Mount King Well
Neminarrana Well
Powellinna Well
V15 Well
Salt Spring Well (aband)
Corboy Well
Davis Well
MT KING
Mount King Gorge
HAMERSLEY ROAD
Kangeenarina Well
Balbina Bore
Cattle Well
Marlathana Well
Eight Mile Well
Four Corners Bore
McRaes Well
Cooks Bore And Well
Jarat Bore
Twenty Mile Well and Bore
New 20 Mile Bore
Seven Mile Bore
Ridge Bore
Four Mile Bore
MOUNT BROCKMAN ROAD
MT JACK
MT MCRAE
MT SYLVIA
Caves
Sylvia Bore
Nelson Bore
No 40 Bore
No 41 Bore
Nine Mile Well
Dixons Well
Dunmore Well
Rosella Siding
Pindering Well
Gap Well
MT MCLEOD
PILBARA
7 560 000mN
7 540 000mN
7 520 000mN
560 000mE
580 000mE
600 000mE
620 000mE
SOURCE: Geoscience Australia, 1 : 250 000 Digital Topographic Series.
G:\work\ENAU\PERT\02679AA\Flora and Vegetation\EP2011-064\EP2011-064F02.dgn

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Checked:	C. Gray
Date:	8 Jun 2011
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Scale:	1 : 200 000 at A3

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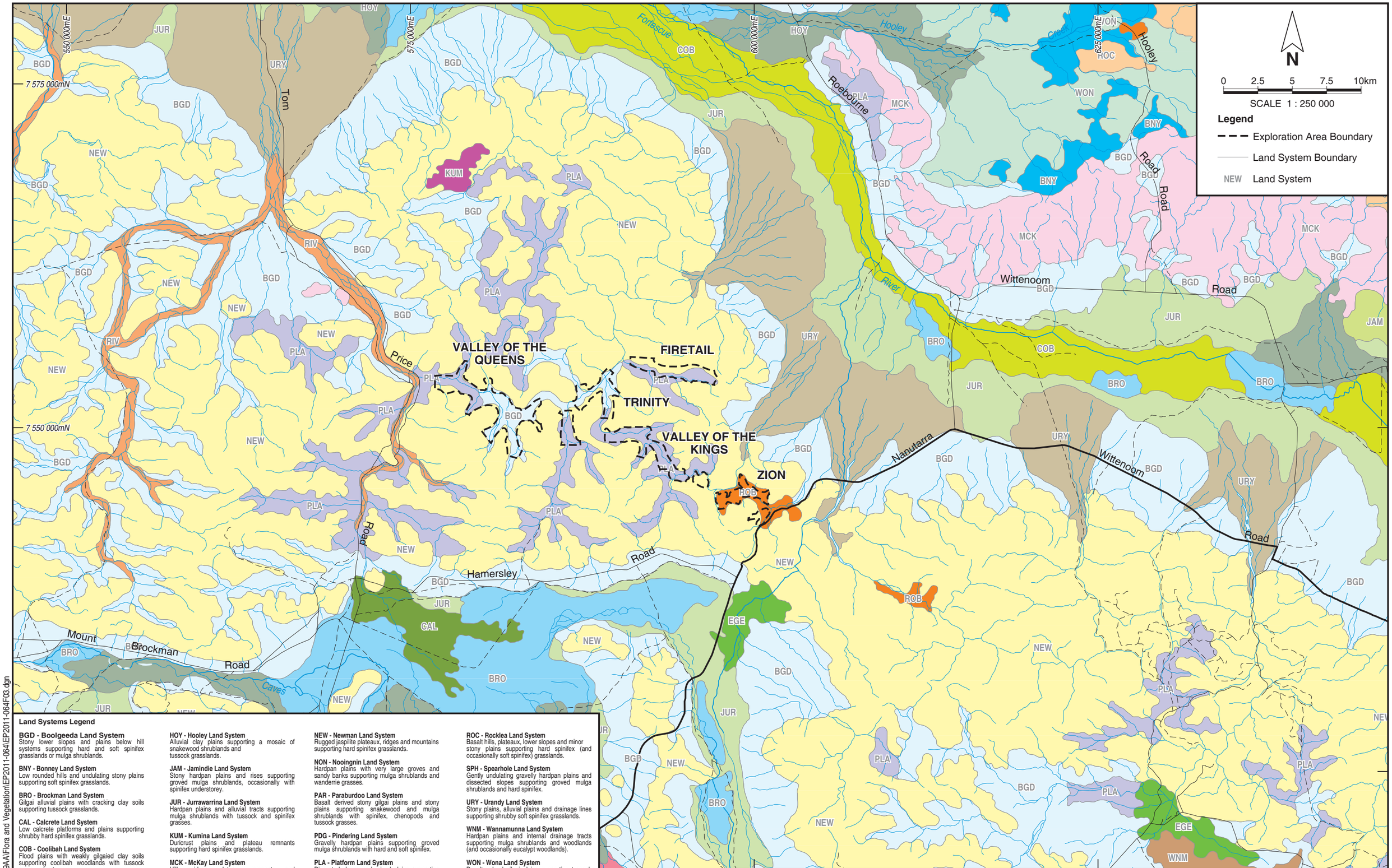
ROBE PISOLITE ASSESSMENT AND TARGETED *GOMPHOLOBIUM KARIJINI* (P2) SURVEY WITHIN SOLOMON PROJECT

LOCATION OF EXPLORATION AREAS

Figure 2



Land Systems Legend

BGD - Boolgeeda Land System
Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.

BNY - Bonney Land System
Low rounded hills and undulating stony plains supporting soft spinifex grasslands.

BRO - Brockman Land System
Gilgai alluvial plains with cracking clay soils supporting tussock grasslands.

CAL - Calcrete Land System
Low calcrete platforms and plains supporting shrubby hard spinifex grasslands.

COB - Coolibah Land System
Flood plains with weakly gilgaied clay soils supporting coolibah woodlands with tussock grass understorey.

EGE - Egerton Land System
Highly dissected hardpan plains supporting mulga shrublands and hard spinifex hummock grasslands.

FAN - Fan Land System
Washplains and gilgai plains supporting groved mulga shrublands and minor tussock grasslands.

SOURCE:

HOY - Hooley Land System
Alluvial clay plains supporting a mosaic of snakewood shrublands and tussock grasslands.

JAM - Jamindie Land System
Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey.

JUR - Jurrawarrina Land System
Hardpan plains and alluvial tracts supporting mulga shrublands with tussock and spinifex grasses.

KUM - Kumina Land System
Duricrust plains and plateau remnants supporting hard spinifex grasslands.

MCK - McKay Land System
Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands.

MDO - Marandoo Land System
Basalt hills and restricted stony plains supporting grassy mulga shrublands.

NEW - Newman Land System
Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.

NON - Nooingnin Land System
Hardpan plains with very large groves and sandy banks supporting mulga shrublands and wanderrie grasses.

PAR - Paraburdoo Land System
Basalt derived stony gilgai plains and stony plains supporting snakewood and mulga shrublands with spinifex, chenopods and tussock grasses.

PDG - Pindering Land System
Gravelly hardpan plains supporting groved mulga shrublands with hard and soft spinifex.

PLA - Platform Land System
Dissected slopes and raised plains supporting hard spinifex grasslands.

RIV - River Land System
Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.

ROB - Robe Land System
Low plateaux, mesas and buttes of limonites supporting soft spinifex (and occasionally hard spinifex) grasslands.

ROC - Rocklea Land System
Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands.

SPH - Spearhole Land System
Gently undulating gravelly hardpan plains and dissected slopes supporting groved mulga shrublands and hard spinifex.

URY - Urandy Land System
Stony plains, alluvial plains and drainage lines supporting shrubby soft spinifex grasslands.

WNM - Wannamunna Land System
Hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands (and occasionally eucalypt woodlands).

WON - Wona Land System
Basalt upland gilgai plains supporting tussock grasslands and minor hard spinifex grasslands.

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Fortescue Metals Group
ROBE PISOLITE ASSESSMENT AND TARGETED
GOMPHOLOBIUM KARIJINI (P2) SURVEY WITHIN SOLOMON PROJECT

LAND SYSTEMS

Figure 3

G:\work\ENAU\PERT\02679AA\Flora and Vegetation\EP2011-064\EP2011-064F03.dgn

596 000mE

598 000mE

7 546 000mN

7 544 000mN

N

0 200 400 600 800 1000m

SCALE 1 : 15 000

Legend

- Study Area Boundary
- Conservation Significant Vegetation Associated with Robe Pisolite
- 2008 Quadrat Location
- 2011 Quadrat Location

ZION010
ZION050
ZION008
ZION009
ZION011
RB12
ZION013
ZION012
RB13
RB15
RB14
RB11
ZION018
ZION014
ZION015
ZION017
ZION020
ZION019
ZION022
ZION021
RB10
RB03
RB05
ZION023
RB01
RB04
RB08
RB02
ZION028
ZION026
ZION025
RB09
RB07
RB06

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Checked:	C. Gray
Date:	31 Jul 2011
Projection:	MGA zn50
Scale:	1 : 15 000 at A3

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Fortescue Metals Group
ROBE PISOLITE ASSESSMENT AND TARGETED
GOMPHOLOBIUM KARIJINI (P2) SURVEY WITHIN SOLOMON PROJECT

ROBE PISOLITE STUDY AREA AND QUADRAT LOCATIONS

Figure 4

595 000mE
590 000mE
595 000mE
600 000mE
7 550 000mN
7 545 000mN

FIRETAIL
VALLEY OF THE QUEENS
TRINITY
VALLEY OF THE KINGS
ZION

25
154
152
12
1
2
130
31
55
12
221
13
97
40
25
298
20
1
32
34
16
8
12
1
111
10
75
5
2
10
22
133
1
318
1
1
12

N

0 500 1000 1500 2000m

SCALE 1 : 50 000

Legend

- Study Area Boundary
- Exploration Area Boundary
- *Gompholobium karijini* (P2) Locations - Recorded in 2008
- *Gompholobium karijini* (P2) Locations - Recorded in 2011
- 8 Number of Plants

G:\work\ENAU\PERT\02679AA\Flora and Vegetation\EP2011-064\EP2011-064F05.dgn

Drawn:	C. Reeves
Checked:	C. Gray
Date:	31 Jul 2011
Projection:	MGA zn50
Scale:	1 : 50 000 at A3

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Fortescue Metals Group
ROBE PISOLITE ASSESSMENT AND TARGETED
GOMPHOLOBIUM KARIJINI (P2) SURVEY WITHIN SOLOMON PROJECT

Gompholobium karijini (P2) LOCATIONS RECORDED FROM THE STUDY AREA DURING 2011

Figure 5

N

0 2 4 6 8 10km

SCALE 1 : 200 000

Legend

- Site Boundary
- Exploration Area Boundary
- WA Herbarium Flora Location

FIRETAIL

TRINITY

VALLEY OF THE QUEENS

VALLEY OF THE KINGS

ZION

WITTENOOM AND SURROUNDING AREAS ARE CONTAMINATED BY ASBESTOS

Gompholobium karijini (P2)

Gompholobium karijini (P2)

Gompholobium karijini (P2)

PILBARA

FLORA LOCATIONS SOURCE: DEC, May 2011.

Drawn:	C. Reeves
Checked:	C. Gray
Date:	21 Jul 2011
Projection:	MGA zn50
Scale:	1 : 200 000 at A3

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Fortescue Metals Group
FLORA, VEGETATION AND FAUNA ASSESSMENTS
SOLOMON MINE PROJECT

Gompholobium karijini
(PRIORITY 2) LOCATIONS - DEC DATABASE

Figure 6

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Appendix A
Quadrat Data

Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey, Solomon Mine Project

Appendix A
ENAUPERT02679AA
Robe pisolite
Quadrat 1

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 598531**mE;** 7545389**mN**
Habitat: Hilltop
Soil: Red brown loamy gravel, pebble/rock surface
Vegetation: *Eucalyptus leucophloia* subsp. *leucophloia*, *Eucalyptus gamophylla* and *Corymbia hamersleyana* Low Open Woodland to 8m over *Grevillea wickhamii* subsp. *hispidula* Tall Open Shrubland to 3..5m over Shrubland of *Acacia arida* to 1.6m over Hummock Grassland of *Triodia wiseana* to 0.6m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia arida	25	1.6
Corymbia hamersleyana		3
Eriachne ciliata		0.1
Eucalyptus gamophylla	3	6
Eucalyptus leucophloia subsp. *leucophloia*	3	8
Gompholobium karijini		0.8
Grevillea wickhamii subsp. *hispidula*	2	3.5
Petalostylis labicheoides		1.5
Polycarpaea holtzei		0.1
Triodia wiseana	30	0.6

ENAUPERT02679AA
Robe pisolite
Quadrat 2

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 598426**mE;** 7545242**mN**
Habitat: Hilltop
Soil: Red brown loamy gravel, rock/gravel surface
Vegetation: *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp*. leucophloia* Low Open Woodland to 4m over *Acacia arida* Shrubland to 1.6m over *Triodia wiseana* Hummock Grassland to 0.6m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia arida	25	1.6
Clerodendrum floribundum var. *angustifolium*		1
Corymbia hamersleyana	3	4
Eucalyptus leucophloia subsp. *leucophloia*	1	5
Jasminum didymum subsp. *lineare*		creeper
Petalostylis labicheoides		1.2
Triodia wiseana	25	0.6

ENAUPERT02679AA
Robe pisolite
Quadrat 3

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 599246**mE;** 7545712**mN**
Soil: Red brown loamy gravel, gravel surface
Vegetation: *Corymbia hamersleyana* and *Eucalyptus gamophylla* Low Open Woodland to 6m over Shrubland of *Acacia arida* to 1.8m over Hummock Grassland of *Triodia wiseana* to 0.8m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia adoxa var. *adoxa*		0.3
Acacia arida	20	1.8
Acacia pruinocarpa		1.3
Clerodendrum floribundum var. *angustifolium*		1.4
Corymbia hamersleyana	3	6
Eucalyptus gamophylla		2.5
Hakea lorea subsp. *lorea*		2
Jasminum didymum subsp. *lineare*		creeper
Senna artemisioides subsp. *oligophylla*		0.6
Senna glutinosa subsp. *glutinosa*		0.6
Senna glutinosa subsp. *pruinosa*		0.6
Triodia wiseana	25	0.8

ENAUPERT02679AA
Robe pisolite
Quadrat 4

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 599240**mE;** 7545390**mN**
Habitat: Low rise
Soil: Red brown loamy gravel, gravel/rock surface
Vegetation: *Corymbia hamersleyana* and *Eucalyptus gamophylla* Low Open Woodland to 4m over *Acacia arida* Shrubland to 0.8m over *Triodia wiseana* Hummock Grassland to 0.8m
Veg Condition: Very Good
Fire Age: > 5 years

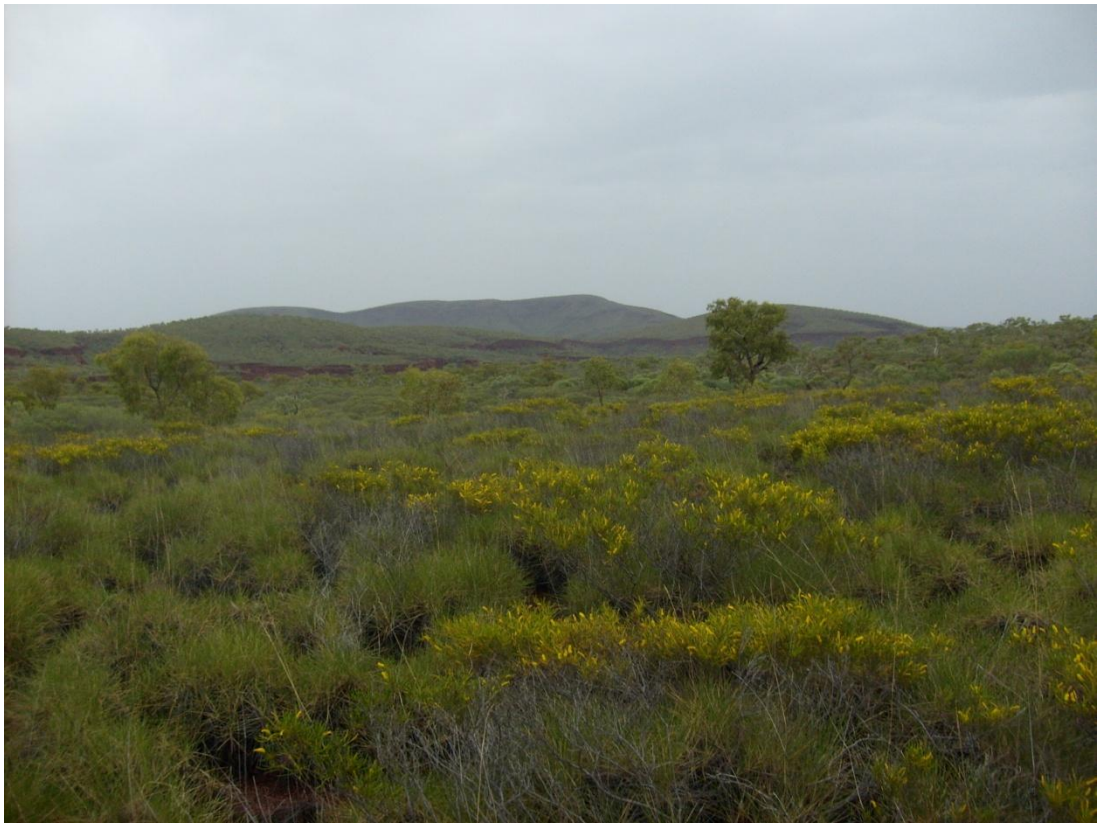
Species List:

Name	Cover (%)	Height (m)
Acacia acradenia		0.5
Acacia arida	15	1.8
Corchorus lasiocarpus subsp. *parvus*		0.2
Corymbia hamersleyana	3	4
Eucalyptus gamophylla	2	2.5
Gompholobium karijini		0.2
Jasminum didymum subsp. *lineare*		creeper
Petalostylis labicheoides		1.5
Rhyncharrhena linearis		creeper
Santalum lanceolatum		1
Senna notabilis		0.2
Solanum horridum		0.1
Trachymene oleracea		0.2
Triodia wiseana	30	0.8

ENAUPERT02679AA
Robe pisolite
Quadrat 5

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 599579**mE;** 7545608**mN**
Habitat: Hilltop
Soil: Red brown loamy gravel, gravel/pebble surface
Vegetation: *Corymbia hamersleyana* Low Open Woodland to 5m over *Acacia arida* Open Shrubland to 1.4m over *Acacia hilliana* Low Shrubland to 0.8m over *Triodia wiseana* Hummock Grassland to 0.6m
Veg Condition: Very Good
Fire Age: > 5 years



Species List:

Name	Cover (%)	Height (m)
Acacia acradenia		1
Acacia arida	3	1.4
Acacia hilliana	25	0.8
Bulbostylis barbata		0.1
Corymbia hamersleyana	3	5
Eriachne ciliata		0.1
Grevillea wickhamii subsp. *hispidula*		1
Hakea lorea subsp. *lorea*		2.5
Jasminum didymum subsp. *lineare*		creeper
Polycarpaea holtzei		0.1
Ptilotus exaltatus var. *exaltatus*		0.05
Santalum lanceolatum		1.5
Triodia wiseana	30	0.6

ENAUPERT02679AA
Robe pisolite
Quadrat 6

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 600044**mE**; 7544704**mN**
Habitat: Upper slope, gentle
Soil: Red brown loamy clay, rock/gravel surface
Vegetation: *Eucalyptus leucophloia* subsp. *leucophloia* Low Open Woodland to 6m over Grevillea wickhamii Tall Open Shrubland to 2.5m over *Acacia arida* Shrubland to 1.5m over *Triodia wiseana* Hummock Grassland to 0.4m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia adoxa var. *adoxa*		0.3
Acacia arida	20	1.5
Acacia hilliana	3	0.5
Bulbostylis barbata		0.1
Eriachne ciliata		0.1
Eucalyptus leucophloia subsp. *leucophloia*	5	6
Grevillea wickhamii subsp. *hispidula*	5	2.5
Keraudrenia velutina subsp. *elliptica*		0.3
Polycarpaea holtzei		0.1
Ptilotus exaltatus var. *exaltatus*		0.05
Senna glutinosa subsp. *glutinosa*		0.4
Senna notabilis		0.05
Triodia wiseana	20	0.4

ENAUPERT02679AA
Robe pisolite
Quadrat 7

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 600137**mE;** 7545033**mN**
Habitat: Hilltop
Soil: Red brown loamy clay, gravel/rock surface
Vegetation: *Corymbia hamersleyana* Low Open Woodland to 6m over *Acacia acradrenia* Tall Open Shrublland to 2.5m over *Acacia arida* Low Open Shrubland to 1.4m over *Triodia wiseana* Hummock Grassland to 0.6m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia acradenia	5	2.5
Acacia arida	3	1.4
Clerodendrum floribundum var. *angustifolium*		0.2
Corymbia hamersleyana	3	6
Eriachne mucronata (typical form)		0.3
Grevillea wickhamii subsp. *hispidula*		3.5
Jasminum didymum subsp. *lineare*		creeper
Petalostylis labicheoides		1.2
Polymeria aff. *ambigua* (CGC-25)		prostrate
Rhyncharrhena linearis		creeper
Trichodesma zeylanicum var. *zeylanicum*		0.3
Triodia wiseana	15	0.6

ENAUPERT02679AA
Robe pisolite
Quadrat 8

Described by: CLG **Date**: 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 600023**mE;** 7545403**mN**
Habitat: Hilltop to lower slope, adjacent to gully
Soil: Brown red loamy clayey gravel, gravel/rock surface
Vegetation: *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* Low Open Shrubland to 4m over *Hakea lorea* subsp. *lorea* Tall Open Shrubland to 3m over *Acacia hilliana* Low Shrubland to 0.6m

Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia adoxa var. *adoxa*		0.6
Acacia arida		1
Acacia bivenosa		1
Acacia hilliana	20	0.6
Acacia monticola		1
Corchorus lasiocarpus subsp. *parvus*		0.2
Corymbia hamersleyana	2	4
Eucalyptus leucophloia subsp. *leucophloia*	3	4
Gompholobium karijini		0.5
Goodenia cusackiana		0.2
Goodenia stobbsiana		0.05
Grevillea wickhamii subsp. *hispidula*		3
Hakea lorea subsp. *lorea*	2	3
Indigofera monophylla (forma)		0.3
Keraudrenia velutina subsp. *elliptica*		0.3
Petalostylis labicheoides		1.2
Polycarpaea holtzei		0.1

Ptilotus exaltatus var. *exaltatus*		0.05
Senna glutinosa subsp. *glutinosa*		1
Stackhousia viminea		0.2
Triodia wiseana	40	0.4

ENAUPERT02679AA
Robe pisolite
Quadrat 9

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 599260**mE;** 7545011**mN**
Soil: Brown red loamy gravel, gravel/rock surface
Vegetation: *Eucalyptus leucophloia* subsp. l*eucophloia* Low Open Woodland to 6m over *Acacia hilliana* Open Shrubland to 0.8m over *Triodia wiseana* Hummock Grassland to 0.6m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia hilliana	5	0.8
Acacia maitlandii		1.5
Acacia monticola		2.5
Acacia retivenea subsp. *clandestina*		1.5
Corchorus lasiocarpus subsp. *parvus*		0.05
Eriachne ciliata		0.1
Eucalyptus leucophloia subsp. *leucophloia*	3	6
Gompholobium karijini		0.6
Goodenia stobbsiana		0.05
Hakea lorea subsp. *lorea*		2
Keraudrenia velutina subsp. *elliptica*		0.3
Polycarpaea holtzei		0.05
Ptilotus exaltatus var. *exaltatus*		0.05
Stackhousia viminea		0.2
Trachymene oleracea		0.1
Triodia wiseana	12	0.6

ENAUPERT02679AA
Robe pisolite
Quadrat 10

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 598828**mE;** 7544661**mN**
Soil: Brown red loamy clayey gravel, rock/gravel surface
Vegetation: *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* Low Open Woodland to 5m over *Acacia arida* Shrubland to 1.5m over *Triodia wiseana* Hummock Grassland to 0.6m
Veg Condition: Very Good
Fire Age: > 3 years

Species List:

Name	Cover (%)	Height (m)
Acacia acradenia		2
Acacia arida	20	1.5
Acacia bivenosa		1
Acacia retivenea subsp. *clandestina*		5
Clerodendrum floribundum var. *angustifolium*		2.5
Corymbia hamersleyana	2	4
Eriachne mucronata (typical form)		0.2
Eucalyptus leucophloia subsp. *leucophloia*		0.05
Hakea lorea subsp. *lorea*		1
Jasminum didymum subsp. *lineare*		creeper
Petalostylis labicheoides		1.5
Ptilotus exaltatus var. *exaltatus*		0.5
Santalum lanceolatum		1
Senna notabilis		0.2
Triodia wiseana	15	0.6

ENAUPERT02679AA
Robe pisolite
Quadrat 11

Described by: CLG **Date:** 4/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 597335**mE;** 7545178**mN**
Habitat: Hilltop
Soil: Brown red loamy clayey gravel, gravel/rock surface
Vegetation: *Eucalyptus leucophloia* subsp. *leucophloia, Eucalyptus gamophylla* and *Corymbia hamersleyana* Low Open Woodland to 6m over *Acacia arida* Open Shrubland to 1.5m over *Triodia wiseana* Hummock Grassland to 0.8m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia arida	5	1.5
Acacia bivenosa		1.5
Acacia pruinocarpa		1.5
Acacia retivenea subsp. *clandestina*		2.2
Corymbia hamersleyana	2	6
Eucalyptus gamophylla	2	3.5
Eucalyptus leucophloia subsp. *leucophloia*	3	5
Petalostylis labicheoides		0.4
Triodia wiseana	20	0.8

ENAUPERT02679AA
Robe pisolite
Quadrat 12

Described by: CLG **Date:** 5/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 596089**mE;** 7546066**mN**
Habitat: Upper slope to top of rise, undulating low hills
Soil: Red brown loamy clay, rock/gravel surface
Vegetation: *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* Low Open Woodland to 8m over *Acacia hilliana* Open Shrubland to 0.6m over *Triodia wiseana* Hummock Grassland to 0.5m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia adoxa var. *adoxa*		0.3
Acacia hilliana	12	0.6
Acacia retivenea subsp. *clandestina*		1.3
Aristida holathera var. *latifolia*		0.2
Bulbostylis barbata		0.05
Corymbia hamersleyana	2	6
Eriachne ciliata		0.1
Eucalyptus leucophloia subsp. *leucophloia*	3	8
Gompholobium karijini		0.5
Grevillea wickhamii subsp. *hispidula*		1.6
Keraudrenia velutina subsp. *elliptica*		0.3
Polycarpaea holtzei		0.05
Sporobolus virginicus		0.1
Triodia wiseana	15	0.5

ENAUPERT02679AA
Robe pisolite
Quadrat 13

Described by: CLG **Date:** 5/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone:50 596350**mE;** 7545633**mN**

Habitat: Top of low rise

Soil: Red brown loamy gravel, rock/gravel surface

Vegetation: *Corymbia hamersleyana* and *Eucalyptus leucohploia* subsp*. leucophloia* Low Open Woodland to 5m over *Acacia hilliana* and *Gompholobium karijini* Low Open Shrubland to 0.6m over *Triodia wiseana* Open Hummock Grassland to 0.5m

Veg Condition: Very Good

Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia adoxa var. *adoxa*		0.3
Acacia arida		1
Acacia hilliana	4	0.5
Acacia retivenea subsp*. clandestina*		1.5
Bulbostylis barbata		0.1
Corymbia hamersleyana	2	5
Eriachne ciliata		0.2
Eucalyptus leucophloia subsp. *leucophloia*	2	5
Gompholobium karijini	2	0.6
Goodenia nuda		0.3
Goodenia stobbsiana		0.1
Grevillea wickhamii subsp. *hispidula*		2
Hakea lorea subsp*. lorea*		2.5
Mirbelia viminalis		0.6
Petalostylis labicheoides		0.8
Polycarpaea holtzei		0.1
Ptilotus exaltatus var. *exaltatus*		0.05
Stackhousia viminea		0.2

Triodia wiseana	8	0.4

ENAUPERT02679AA
Robe pisolite
Quadrat 14

Described by: CLG **Date:** 6/05/2011 **Type:** Quadrat (50m x 50m)

MGA Zone: 50 597118**mE;** 7545406**mN**
Habitat: Gorge adjacent to major drainage line
Soil: Brown red loamy clay, gravel surface
Vegetation: *Corymbia hamersleyana* Low Open Woodland to 6m over *Acacia pyrifolia* var. *pyrifolia*, *Grevillea wickhamii* subsp. *hispidula*, *Acacia bivenosa*, *Acacia citrinoviridis* and *Atalaya hemiglauca* Closed Tall Scrub to 4m over *Cymbopogon obtectus*, *Themeda triandra* and *Chrysopogon fallax* Open Tussock Grassland to 1m over *Triodia epactia* Very Open Hummock Grassland to 0.5m
Veg Condition: Good to Poor
Fire Age: >5 years

Species List:

Name	Cover (%)	Height (m)
Abutilon dioicum		0.4
Abutilon otocarpum		0.3
Acacia bivenosa	25	2.5
Acacia citrinoviridis	4	4
Acacia dictyophleba		2
Acacia pruinocarpa		2
Acacia pyrifolia var. *pyrifolia*	40	2.5
Alternanthera nana		0.1
Amaranthus undulatus		0.1
Aristida inaequiglumis		0.3
Atalaya hemiglauca		3
Bidens bipinnata		0.3
Boerhavia coccinea		creeper
Bulbostylis barbata		0.1
Cenchrus ciliaris		0.4
Chrysopogon fallax	2	1

Cleome viscosa		0.3
Corchorus tridens		prostrate
Corymbia hamersleyana	3	6
Cucumis maderaspatanus		creeper
Cucumis melo subsp. *agrestis*		creeper
Cymbopogon obtectus	2	0.6
Enneapogon lindleyanus		0.3
Enneapogon polyphyllus		0.3
Eragrostis cumingii		0.2
Eriachne mucronata (typical form)		0.2
Euphorbia biconvexa		0.1
Euphorbia tannensis subsp. *eremophila* (Hamersley form)		0.3
Flueggea virosa subsp*. melanthesoides*		2.2
Gossypium robinsonii		1.5
Grevillea pyramidalis subsp*. leucadendron*		3
Grevillea wickhamii subsp. *hispidula*		6
Hakea lorea subsp*. lorea*		1.2
Hibiscus sturtii var. *campylochlamys*		0.4
Hybanthus aurantiacus		0.2
Indigofera monophylla (forma)		0.3
Ipomoea polymorpha		prostrate
Leptopus decaisnei var. *orbicularis*		0.3
Perotis rara		0.1
Polymeria aff. *ambigua* (PAN 26B-20)		creeper
Pterocaulon sphaeranthoides		0.05
Ptilotus fusiformis var. *fusiformis*		0.3
Ptilotus obovatus var*. obovatus*		0.3
Rhynchosia minima		creeper
Santalum lanceolatum		1.2
Senna artemisioides subsp. *oligophylla*		1.5
Senna artemisioides subsp. *oligophylla* x *helmsii*		1.5
Senna glutinosa subsp. *glutinosa*		1
Setaria surgens		0.2
Sida sp. *verrucose glands* (F.H. Mollemans 2423)		0.3
Stemodia grossa		0.1
Tephrosia rosea var. *glabrior*		0.1
Themeda triandra	8	0.4
Trachymene oleracea		0.1
Trichodesma zeylanicum var. *zeylanicum*		0.6
Triodia epactia	7	0.5

ENAUPERT02679AA
Robe pisolite
Quadrat 15

Described by: CLG **Date:** 6/05/2011 **Type:** Quadrat (100m x 25m)

MGA Zone: 50 596633**mE;** 7545481**mN**
Habitat: Major drainage
Soil: Brown red sandy pebbly gravel, rock/gravel surface
Vegetation: *Eucalyptus camaldulensis* var. *obtusa* and *Eucalyptus victrix* Tall Open Woodland to 25m over *Acacia citrinoviridis*, *Acacia pyrifolia* var. *pyrifolia* and *Grevillea wickhamii* subsp. *hispidula* to 4m over *Tephrosia rosea* var. *glabrioir* and *Stemodia grossa* Low Open Shrubland to 0.6m over *Cymbopogon obtectus* and *Themeda triandra* Scattered Grasses to 0.8m
Veg Condition: Very Good
Fire Age: > 5 years

Species List:

Name	Cover (%)	Height (m)
Acacia arida		1.3
Acacia citrinoviridis		4
Acacia pruinocarpa		1
Acacia pyrifolia var. *pyrifolia*	2	2
Acacia tumida		2
Alternanthera nana		0.1
Atalaya hemiglauca		3
Capparis spinosa var. *nummularia*		1.2
Cleome viscosa		0.3
Clerodendrum floribundum var. *angustifolium*		0.4
Corchorus incanus subsp. *lithophilus*		0.3
Crotalaria medicaginea		0.1
Cucumis maderaspatanus		creeper
Cymbopogon obtectus		0.8
Eucalyptus camaldulensis var. *obtusa*		20
Eucalyptus victrix		25

Eulalia aurea		0.1
Gomphrena cunninghamii		0.1
Grevillea wickhamii subsp. *hispidula*		3
Hybanthus aurantiacus		0.1
Indigofera monophylla (forma)		0.4
Petalostylis labicheoides		2
*Phyllanthus mader*aspatensis		0.2
Ptilotus exaltatus var. *exaltatus*		0.2
Rhynchosia minima		creeper
Santalum lanceolatum		1
Stemodia grossa	2	0.3
Stemodia kingii		0.6
Tephrosia rosea var. *glabrior*	3	0.6
Themeda triandra		0.4

Appendix B
Flora Species List

Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey, Solomon Mine Project

Appendix B
ENAUPERT02679AA
Robe Pisolite Assessment
FLORA SPECIES LIST

-		# Sites
031	**POACEAE**	
	Aristida holathera var. *latifolia*	1
	Aristida inaequiglumis	1
*	*Cenchrus ciliaris*	1
	Chrysopogon fallax	1
	Cymbopogon obtectus	2
	Enneapogon lindleyanus	1
	Enneapogon polyphyllus	1
	Eragrostis cumingii	1
	Eriachne ciliata	6
	Eriachne mucronata (typical form)	3
	Eulalia aurea	1
	Perotis rara	1
	Setaria surgens	1
	Sporobolus virginicus	1
	Themeda triandra	2
	Triodia epactia	1
	Triodia wiseana	13
032	**CYPERACEAE**	
	Bulbostylis barbata	5
090	**PROTEACEAE**	
	Grevillea pyramidalis subsp. *leucadendron*	1
	Grevillea wickhamii subsp. *hispidula*	9
	Hakea lorea subsp. *lorea*	7
092	**SANTALACEAE**	
	Santalum lanceolatum	5
106	**AMARANTHACEAE**	
	Alternanthera nana	2
	Amaranthus undulatus	1
	Gomphrena cunninghamii	1
	Ptilotus exaltatus var. *exaltatus*	7
	Ptilotus fusiformis var. *fusiformis*	1
	Ptilotus obovatus var. *obovatus*	1
107	**NYCTAGINACEAE**	
	Boerhavia coccinea	1
113	**CARYOPHYLLACEAE**	
	Polycarpaea holtzei	7
137A	**CAPPARACEAE**	
	Capparis spinosa var. *nummularia*	1
	Cleome viscosa	2

163	**MIMOSACEAE**	
	Acacia acradenia	4
	Acacia adoxa var. *adoxa*	5
	Acacia arida	12
	Acacia bivenosa	4
	Acacia citrinoviridis	2
	Acacia dictyophleba	1
	Acacia hilliana	6
	Acacia maitlandii	1
	Acacia monticola	2
	Acacia pruinocarpa	4
	Acacia pyrifolia var. *pyrifolia*	2
	Acacia retivenea subsp. *clandestina*	5
	Acacia tumida var. *pilbarensis*	1
164	**CAESALPINIACEAE**	
	Petalostylis labicheoides	9
	Senna artemisioides subsp. *oligophylla*	2
	Senna artemisioides subsp. *oligophylla* x *helmsii*	1
	Senna glutinosa subsp. *glutinosa*	4
	Senna glutinosa subsp. *pruinosa*	1
	Senna notabilis	3
165	**PAPILIONACEAE**	
	Crotalaria medicaginea	1
	Gompholobium karijini	6
	Indigofera monophylla (forma)	3
	Mirbelia viminalis	1
	Rhynchosia minima	2
	Tephrosia rosea var. *glabrior*	2
185	**EUPHORBIACEAE**	
	Euphorbia biconvexa	1
	Euphorbia tannensis subsp. *eremophila* (Hamersley form)	1
	Flueggea virosa subsp. *melanthesoides*	1
	Leptopus decaisnei var. *orbicularis*	1
	Phyllanthus maderaspatensis	1
202	**STACKHOUSIACEAE**	
	Stackhousia viminea	3
207	**SAPINDACEAE**	
	Atalaya hemiglauca	2
220	**TILIACEAE**	
	Corchorus incanus subsp. *lithophilus*	1
	Corchorus lasiocarpus subsp. *parvus*	3
	Corchorus tridens	1

221	**MALVACEAE**	
	Abutilon dioicum	1
	Abutilon otocarpum	1
	Gossypium robinsonii	1
	Hibiscus sturtii var. *campylochlamys*	1
	Sida sp. verrucose glands (F.H. Mollemans 2423)	1
223	**STERCULIACEAE**	
	Keraudrenia velutina subsp. *elliptica*	4
243	**VIOLACEAE**	
	Hybanthus aurantiacus	2
273	**MYRTACEAE**	
	Corymbia hamersleyana	12
	Eucalyptus camaldulensis var. *obtusa*	1
	Eucalyptus gamophylla	4
	Eucalyptus leucophloia subsp. *leucophloia*	9
	Eucalyptus victrix	1
281	**APIACEAE**	
	Trachymene oleracea	3
301	**OLEACEAE**	
	Jasminum didymum subsp. *lineare*	6
305	**ASCLEPIADACEAE**	
	Rhyncharrhena linearis	2
307	**CONVOLVULACEAE**	
	Ipomoea polymorpha	1
	Polymeria aff. *ambigua* (CGC-25)	1
	Polymeria aff. *ambigua* (PAN 26B-20)	1
310	**BORAGINACEAE**	
	Trichodesma zeylanicum var. *zeylanicum*	2
311	**VERBENACEAE**	
	Clerodendrum floribundum var. *angustifolium*	5
315	**SOLANACEAE**	
	Solanum horridum	1
316	**SCROPHULARIACEAE**	
	Stemodia grossa	2
	Stemodia kingii	1

337	**CUCURBITACEAE**	
	Cucumis maderaspatanus	2
*	*Cucumis melo* subsp. *agrestis*	1
341	**GOODENIACEAE**	
	Goodenia cusackiana	1
	Goodenia nuda (P4)	1
	Goodenia stobbsiana	3
345	**ASTERACEAE**	
*	*Bidens bipinnata*	1
	Pterocaulon sphaeranthoides	1

Appendix C
Numerical Analysis Report

Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey, Solomon Mine Project

Assignment of additional vegetation quadrats (Robe Pisolite survey) recorded by Coffey Environments from the Fortescue Metals Group Solomon Project Area to the 2009 floristic classification including the area

Prepared for

Coffey Environments

by

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Final, July 2011

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1.0 INTRODUCTION

1.1 Purpose of this report

The purpose of this report is to assign additional vegetation recording sites (quadrats) from the Fortescue Metals Group Solomon Project Area to the units defined in the floristic classification presented in Griffin and Trudgen (2009a and b), or if appropriate to assign some of the sites to new units. The new data was from a survey focussed on sites on the Robe Pisolite, a geological type.

The classification (grouping of sites using pattern analysis and shown in a dendrogram or tree like diagram) from Griffin and Trudgen (2009a and b) is used as a reference classification for the new data as it is the most appropriate one available. It includes the earlier data from the Fortescue Metals Group Solomon Project Area collected by Coffey Environments (giving a local basis for comparison) and other data from across the Pilbara Bioregion (as defined by Thackway and Cresswell, eds 1995). The other data used for the classification provides a sufficient basis for regional comparison of the Coffey Environments data.

Referring the new sites from the "Robe Pisolite" survey to the floristic classification presented in Griffin And Trudgen (2009a and b) classification has the advantage that all the sites from the Solomon Project Area (the earlier sites and the two new data sets) have been placed in one classification. This significantly simplifies the use of the sites to assess conservation value of the vegetation of the Solomon Project Area compared to having several overlapping classifications.

1.2 Location of the Fortescue Metals Group Solomon Project Area

The Fortescue Metals Group Solomon Project Area is located in the Hamersley Ranges in the northwest of Western Australia. It lies a short distance to the west of Karijini National Park and about 175 kilometres southeast of the coastal town of Karratha.

1.3 The new sites

The Coffey Environments consulting group recorded fifteen (15) new sites for their "Robe Pisolite" survey. These sites have the prefix RB in front of the quadrat number (e.g. RB15).

1.4 Environmental features of the project area

The landscape, geology and other features of the Solomon Project Area are briefly described in Griffin and Trudgen (2009a and b).

1.5 Limitation of the scope of this report

This report does not provide a conservation assessment of the vegetation recording sites considered in it. It is limited to assigning the new sites considered to the classification presented in Griffin and Trudgen (2009a and b). The intention is that this report provides the assignment of the sites to the classification, while the classification provides a framework for assessment of the conservation value of the vegetation sampled. Therefore, this report makes the assignment of sites to the classification available, so that the Coffey Environments consulting group can provide the appropriate conservation assessment.

2.0 METHODS

2.1 Data preparation

The new data and the data from the earlier analysis (Griffin & Trudgen 2009a, b) incorporating sites from the Solomon Project Area was all imported into a Microsoft Access database. The "queries" (short programs written using Microsoft Access) used to carry out the analyses were also incorporated into this database.

To make the data set as compatible as possible across the various projects used, a process of reconciliation of flora species names used in the different projects was undertaken. This was necessary because of the potential for project specific variations in the application of names. Appendix 1 (see below) gives the reconciliation for the data sets. To further reduce this problem one of us (M.E. Trudgen, who has determined many of the specimens collected for the regional data set the new sites are compared to, including the specimens for the earlier Coffey Environments surveys in the Solomon Project Area) checked the identifications of the voucher specimens collected by Coffey Environments for the new quadrats.

After a first pattern analysis was carried out, it was considered necessary to further review the data, as the new sites tended to group together and away from the earlier sites recorded in the Solomon Project Area. This further investigation of the data was done by comparing the relative frequency of the occurrence of species in different surveys carried out in the Solomon Project Area. Appendix 2 gives this comparison. As a result of this comparison, corrections were made to the data where it was likely that species had been mis-identified in the field or mis-corrections had been made based on the few voucher specimens collected.

2.2 Analyses carried out

Two types of analyses were used to attempt to assign the new sites to the 2009 classification. Firstly, after the data reconciliations noted above, the PATN pattern analysis package (Belbin 1987 and later dates) was used to carry out pattern analyses of a combined data set created by adding the new data collected by Coffey Environments to the regional dataset used in Griffin & Trudgen (2009a & 2009b). This regional data set has 2,883 sites a part of which is quadrats recorded by Coffey Environments from the Fortescue Metals Solomon Project Areas for earlier surveys.

Using the same steps outlined in Griffin & Trudgen (2009a & 2009b), the PATN package was used assign the sites in the combined data set to groups based on the similarities in the flora recorded for them and then to generate a dendrogram that represents the relationships of these groups and the sites to each other within them. The 2,883 sites from the earlier classification (the reference data set) were annotated on this dendrogram with their unit or group numbers from the earlier classification. The placement of the new sites in the dendrogram was then used to infer which unit for them from the earlier classification they could each be most reasonably assigned to using this methodology. Appendix 3 (see below) gives extracts from the dendrogram that show how the new sites are grouped with the reference sites and smaller extracts are given in Table 1 where each site is discussed.

The second analysis used was to identify the sites in the earlier dataset most similar to (the Nearest Neighbour of) each of the new sites. This analysis uses another part of the PATN package). The results of the two methods were then used to investigate the best assignment for the new sites. It should be noted that the site from the reference data set that is most similar in its overall list to a new site might not necessarily belong to the group the new site should be referred to. This may either be caused by poor data (a poorly recorded site may have a list that has mis-identifications or omissions), or by some species having impact on the formation of groups because they are more erratic in their distribution than others.

It was found that while some of the new sites were readily placed by these two methodologies that others were (at least apparently) better placed by comparing the vegetation descriptions, habitats and flora lists of the new sites concerned (placing emphasis on species that are more habitat restricted) to those of sites in the reference data set in units identified using the Nearest Neighbours methodology and classification, but which were not the closest site identified using these techniques. This is quite time consuming.

The need to carry out this intuitive interpretation of the best placement of sites was needed, as it was apparent that some sites were just not well placed using the analytical techniques used (they differed too much in vegetation description and habitat). It is considered that this was due to differences in the data quality of the new sites compared to the earlier Coffey Environments sites, which were recorded with every species collected at each site, a time consuming but high quality recording methodology (it involved collecting over 9,600 specimens). In some instances it appeared that low species numbers and possible mis-

identifications were the cause of sites being poorly placed. However, for some groups the reference data set has few sites from the Solomon Project Area and this also meant that sites could not be easily placed.

Collecting less requires less time, but inevitably introduces error as it means relying on memory to identify species in the field. The need to assigns sites by comparison to a range of similar units may have also been party due to the quality of the recording of other sites in the regional dataset (see limitation section below), but this is considered likely to be a minor problem due to the strong regionalisation in the floristic composition of the vegetation in the Pilbara Bioregion. Without the classification and nearest neighbours to act as a filtering process, assignment (based on vegetation descriptions, habitat and flora lists) by comparison to units would have been extremely difficult.

3.0 LIMITATIONS

Any pattern analysis, such as those carried out using the PATN package (Belbin 1987 and later dates), is limited in its accuracy by the quality of the data used and by the adequacy of the sample for answering the questions asked. These data limitations can include:

- Deficiencies in site (quadrat) selection - poor site selection can mean that the data recorded does not represent one vegetation type, but is mixed, muddying the classification produced;

- Inadequate numbers of sites or poor sampling strategy, leading to not all types being sampled, or some types appearing less common than they really are, or more common than they really are;

- Inadequate searching of quadrats, leading to only part of the flora present being recorded and poor definition of the groups defined, or poor assignment of sites;

- Inaccurate identification of specimens, leading to poor definition of the groups defined, or poor assignment of sites;

- Over reliance on field identification of species (lower than ideal collecting of specimens), leading to errors in the species recorded for quadrats and consequent poor definition of the groups defined, or poor assignment of sites;

- Seasonal conditions such as drought can significantly affect the flora that can be recorded and recent fire can also significantly affect the flora that can be recorded. Somewhat perversely, sites that are long unburnt can have the smaller species that occur there suppressed by heavy growth of *Triodia* (they would come up after fire or in small numbers after heavy rain), leading to low numbers of species being recorded.

Over a number of years, the senior authors of this report have come to the conclusion that there is a widespread lack of recognition of the level of skill needed to reduce such errors to the point where they do not have an undue effect on the data provided to them to process for

reports such as the current report. A number of these issues are undoubtedly related to inadequate time being allowed for survey work.

The analyses carried out here therefore have limitations related to the different data sets used in those analyses. Experience with the data used in Griffin & Trudgen (2009a & 2009b) from earlier surveys to place the Solomon Project Area data in a regional context has suggested that it is robust enough for that purpose. The Solomon Project Area data used in Griffin & Trudgen (2009a & 2009b) was based on collection of all species at all sites and the specimens were identified by one of us (M.E. Trudgen) ensuring a good level of consistency of identification with the regional data used.

Specific limitations in the data supplied by Coffey Environments for this report have been caused by over-reliance on field identifications, resulting in some records having to be excluded from the analysis. For exampled, a number of records were identified in the field as "*Indigofera monophylla*", it is well known that this name has been applied to a cluster of at least eight species in the Pilbara Bioregion. As form names are used for this cluster of species in the analyses carried out, these occurrences had to be excluded. It also appears from the data supplied that more quadrats were recorded per day than can usually be properly searched (especially as the data supplied indicates there was only one person recording the quadrats) in one day.

Experience (Griffin and Trudgen 2010) with a data with similar limitations has indicated that under these circumstances that the analyses carried out would give answers that were frequently near (or include) the correct unit to assign a new site to, but that it would be necessary to compare the vegetation descriptions and flora lists for the new sites to a number of the units in the classification to make decision as to which to finally assign each site to(see methodology section above).

These limitations in the data mean that the assignment of sites to the previous classification will have a level of error, it is not possible to define this as a proportion of the sites; however it is not thought to be very high.

4.0 RESULTS

4.1 Assignment of New sites to 2009 classification

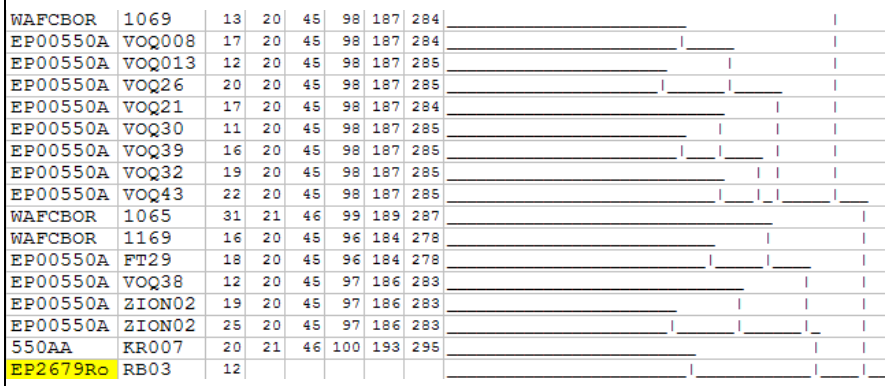
Each of the new sites recorded by Coffey Environments is placed in a unit from the reference classification (Griffin & Trudgen 2009a & b) in Table 1, or given some assignment such as possibly new, or cannot be placed, if assignment to the reference classification was not possible.

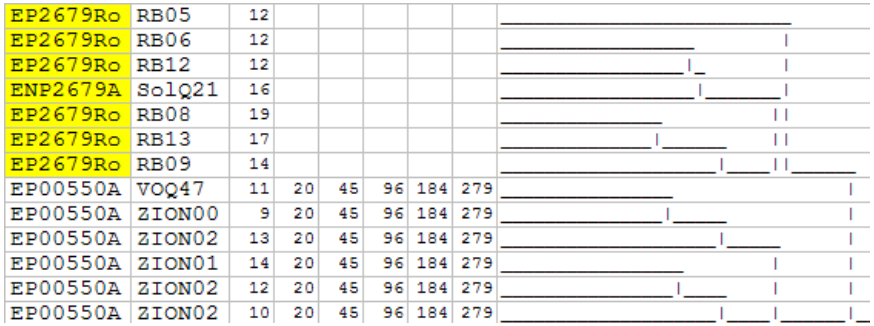
The unit (or possible units) implied by the placement of the new sites in the dendrogram that displays the new classification and the results from the Nearest Neighbours analysis are also given. To assist in interpreting these possible assignments, other data (a small dendrogram extract, vegetation and habitat descriptions) is also given.

It can be seen from the second column of Table 1 that most of the new quadrats were assigned to a unit from the 2009 classification with reasonable confidence. However, some of the new quadrats are assigned provisionally (indicated by a question mark) and a few probably represent units not sampled by the 2009 classification.

Table 1. Assignment of the new quadrats recorded by Coffey Environments to the units defined in the 2009 reference classification.

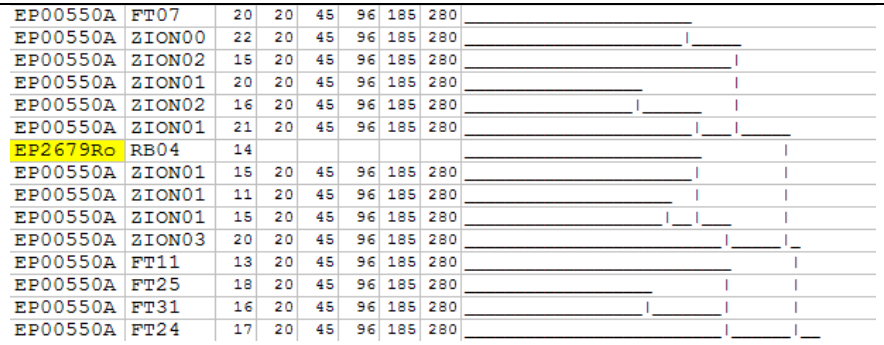
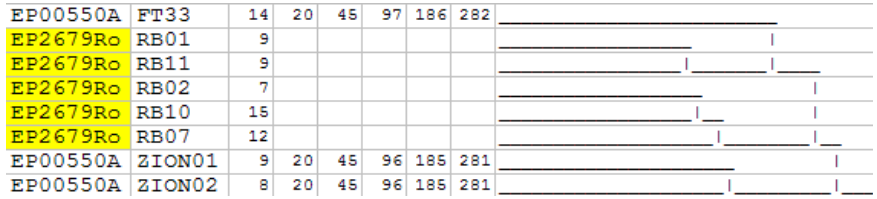
Notes. The second column contains the final assignment to a unit, the third the inferred unit from the dendrogram, the fourth the results from the nearest neighbours analysis (in descending similarity when more than one).

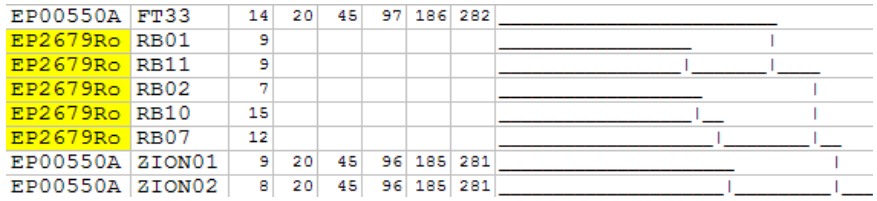
Quadrat codes	Final assignment to 2009 classification	Unit # From Dendro-gram (second run)	Unit #s from Nearest Neighbours Second run	Vegetation description, dendrogram extract (and part of discussion when longer)	Habitat comparison	Discussion
RB03	280? New ?	295	295	RB03: Corymbia hamersleyana and Eucalyptus gamophylla Low Open Woodland to 6m over Shrubland of Acacia arida to 1.8m over Hummock Grassland of Triodia wiseana to 0.8m KR007: Scattered Low Trees of Eucalyptus leucophloia subsp. Leucophloia to 7m over Mid-dense Hummock Grassland of Triodia wiseana to 1m 	No habitat description provided	Only 12 species were recorded at the site. In the new dendrogram, RB03 only associates with one of the five sites in Unit 295 in the reference classification. None of these sites have Eucalyptus gamophylla or Acacia arida in the vegetation description but all have Eucalyptus leucophloia as the dominant tree. Comparison of the list of species for site RB03 to the list for KR007 suggests that these sites are not really very close. There is a large difference in the number of species recorded and the dominant species. However, they have two species in common (a Jasminum and a Clerodendrum)

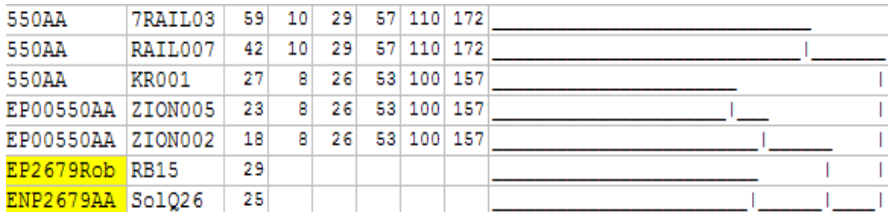
				Acacia arida and Eucalyptus gamophylla are a fairly uncommon combination, and given the data (common species, erratic species, possible poor searching) this combination is probably as good a guide as there is for allocating site RB03. Both of these species occur frequently in the vegetation descriptions of Unit 280 as well as in some other Units in the 280's. It seems likely then that 280? is as good an allocation as can be given, with the possibility that the site represents a species poor unit not represented in the reference data set (so 280?, new?).		that are semi-random in distribution and also two common Senna species and a common Hakea species. It is concluded form this that the site is either quite different to any in the data set or the data for it is poor. (See to left.)
RB05	279	279	279	Corymbia hamersleyana Low Open Woodland to 5m over Acacia arida Open Shrubland to 1.4m over Acacia hilliana Low Shrubland to 0.8m over Triodia wiseana Hummock Grassland to 0.6m.  The fact that the old and new sites have not mixed in the dendrogram is probably because of differences in data quality. Habitat supports the grouping. Acacia hilliana as a key species and to a secondary degree Acacia arida. There may be two subgroups based on the presence and absence of the latter Acacia species. Better data may enable	RB05 is located on a hilltop. The sites in the reference data set that are included in Unit 279 were also from hillslopes.	Site RB05 occurs in a cluster with six other new sites the new dendrogram (RB06, RE12, RE08, RE13, RE09 AND SolQ21). RB05 fits with fairly well in Unit 279 of the reference classification. As well as being placed there by the new classification (where it groups with six other new sites) and the "Nearest Neighbours" analysis. The vegetation descriptions of all the sites (new and old) and the species lists indicate that this is a group of sites with Acacia hilliana as a key species and to a secondary degree Acacia arida. There may be two subgroups based on these two Acacia

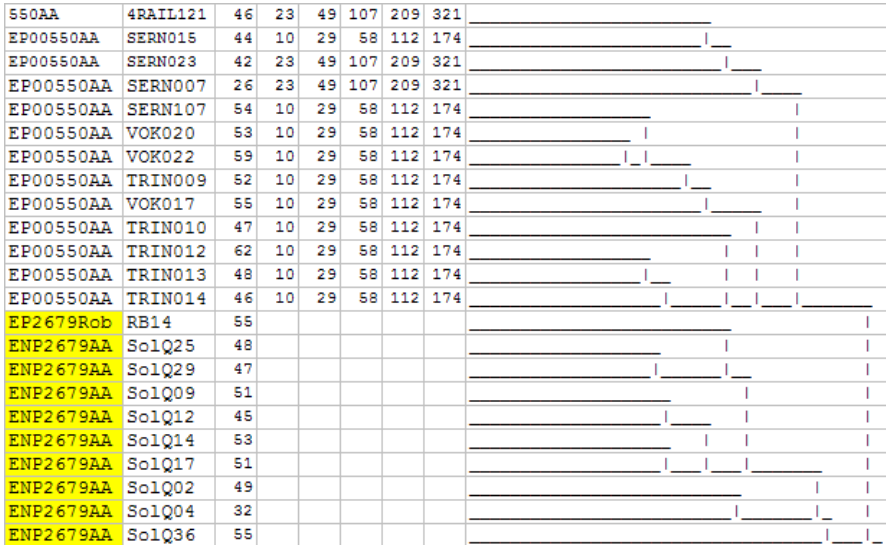
				recognition of subgroups, as there is clustering within the old data as well as the new data. Gompholobium karajini is a consistent species for this unit.		species. Habitat supports the grouping. A table in Appendix 4 compares the species lists for the old and new sites in Unit 279.
RB06	279	279	279	Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to 6m over Grevillea wickhamii Tall Open Shrubland to 2.5m over Acacia arida Shrubland to 1.5m over Triodia wiseana Hummock Grassland to 0.4m Site RB06 is most similar to (new) sites RB12 and SolQ21.	RB06 is located on a gentle upper slope. Sites from Unit 279 are also located on hillslopes.	See discussion under RB05 above. Site RB06 occurs in a cluster with six other new sites the new dendrogram (RB05, RE12, RE08, RE13, RE09 AND SolQ21).
RB12	279	279	279	Eucalyptus leucophloia subsp. leucophloia and Corymbia hamersleyana Low Open Woodland to 8m over Acacia hilliana Open Shrubland to 0.6m over Triodia wiseana Hummock Grassland to 0.5m Site RB12 is most similar to (new) sites RB06 and SolQ21. The vegetation description of this site is also very similar to site VOQ47 that is assigned to Unit 279.	RB12 is located on the upper slope to top of rise, undulating low hills Sites from Unit 279 are also located on hillslopes.	See discussion under RB05 above. Site RB12is placed with a series of six other new sites (RB06, RB05, RE08, RE13, RE09 and SolQ21). Site RB12 appears to fit into Unit 279 with similar vegetation structure and species list (see Appendix 4) to other sites from this unit (specifically VOQ47). Fire age is >5 years.
RB08	279	279	279	Eucalyptus leucophloia subsp. leucophloia and Corymbia hamersleyana Low Open Shrubland to 4m over Hakea lorea subsp. lorea Tall Open Shrubland to 3m over Acacia hilliana Low	RB08 is located on a Hilltop to lower slope,	See discussion under RB05 above.

				Shrubland to 0.6m RB08 is very similar to site RB13 (and less similar to site RB09). Site RB08 and RB13 have similar vegetation descriptions to that of site VOQ47, placed within Unit 279 in the reference classification.	adjacent to a gully. Sites from Unit 279 are also located on hillslopes.	
RB13	279	279	279	Corymbia hamersleyana and Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to 5m over Acacia hilliana and Gompholobium karijini Low Open Shrubland to 0.6m over Triodia wiseana Open Hummock Grassland to 0.5m See above for Site RB08	RB13 is located on top of low rise. Sites from Unit 279 are also located on hillslopes.	See discussion under RB05 above.
RB09	279	279	279	Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to 6m over Acacia hilliana Open Shrubland to 0.8m over Triodia wiseana Hummock Grassland to 0.6m RB09 is moderately similar to RB08 and RB13. However, unlike sites RB08 and RB13 this site does not have Corymbia hamersleyana in the vegetation description and is missing Acacia arida and A. adoxa from the species list.	No habitat was given for this site.	See discussion under RB05 above. Is similar to RB08 and RB13 but doesn't fit as well. Bad data?
RB04	280	280	280	The dendrogram places Site RB04 with Unit 280. Many of the vegetation descriptions include Petalostylis labicheoides and Santalum lanceolatum, which are both present in the species list for this site (see Appendix 4). However, Acacia tumida var. pilbarensis is notably missing from site RB04 in both the vegetation description and the species.	RB04 is located on a low rise. Sites from Unit 280 are from a range of hill/slope habitats.	The dendrogram (it falls in the centre of the group of sits for this unit in the new dendrogram) and the "Nearest Neighbours" analysis places Site RB04 with Unit 280 and it appears to fit well in this unit, especially with site ZION012.

						
RB01	282a A new sub-group	282 or 281? Or new?	281 or 282?	Eucalyptus leucophloia subsp. leucophloia, Eucalyptus gamophylla and Corymbia hamersleyana Low Open Woodland to 8m over Grevillea wickhamii subsp. hispidula Tall Open Shrubland to 3.5m over Shrubland of Acacia arida to 1.6m over Hummock Grassland of Triodia wiseana to 0.6m This site is most similar to site RB11.  Extract of new dendrogram, showing split between 282a and 281. RB01 has three tree species Eucalyptus leucophloia subsp. leucophloia, Eucalyptus gamophylla and Corymbia hamersleyana while geographically distant sites form sites from Unit 282 only include Eucalyptus leucophloia subsp. leucophloia or Corymbia hamersleyana with only site FT33 from Unit 282 including both Eucalyptus leucophloia subsp. leucophloia and Corymbia	Hilltop Unit 282 sites: Steep north facing slope of the hill. Below low cliff/ breakaway, Southerly facing lower slopes of a low hill in foothills of ranges, Lower to mid slopes (above h). Moderate slope, upper-midslope next to major gully/drop off Unit sites 281: sloping to west	In the new dendrogram some new sites and some earlier Solomon area sites group together, but maintain a split between Unit 282 and Unit 281 while segregating from geographically removed sites placed in Unit 282 in the reference classification. From the comparison of species in sites & groups in Appendix 4, this reflects real differences in species occurrences. The change is an outcome of the size of the data sets (more sites from the Solomon area are providing evidence for more localised groups) and the number of groups defined from the reference data set (the number of groups in the reference classification was set at 600 to reduce the number of groups with only one site in them).

				hamersleyana in the species list (see Appendix 4). Site RB01 has more species in common with unit 282 than unit 281 (see Appendix 4).	minor hill, outcropping ironstone, Mesa top sloping east	Placed in 282a (A Solomon subgroup not recognised as distinct before. Consists of RB01, RB11 & FT33.)
RB11	282a A new sub-group	282, 281	281	Eucalyptus leucophloia subsp. leucophloia, Eucalyptus gamophylla and Corymbia hamersleyana Low Open Woodland to 6m over Acacia arida Open Shrubland to 1.5m over Triodia wiseana Hummock Grassland to 0.8m	Hilltop	See discussion under RB01 above. Placed in 282a (A Solomon subgroup not recognised as distinct before. Consists of RB01, RB11 & FT33.)
RB02	282	282, 281	281	Corymbia hamersleyana and Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to 4m over Acacia arida Shrubland to 1.6m over Triodia wiseana Hummock Grassland to 0.6m  Extract of new dendrogram, showing split between 282a and 281. Site RB02 has been placed with two other new sites (RB10 and RBX07) in the dendrogram, these join with the two reference sites that formed Unit 281. An apparent difference between the old and new sites may be due to data quality differences (better data would be needed to confirm this).	Hilltop Sites from Unit 282: Steep north facing slope of the hill. Below low cliff/ breakaway, Southerly facing lower slopes of a low hill in foothills of ranges, Lower to mid slopes (above h). Moderate slope, upper-midslope next to major gully/drop off	In the new dendrogram some new sites and some earlier Solomon area sites group together, but maintain a split between Unit 282 and Unit 281 while segregating from geographically removed sites placed in Unit 282 in the reference classification. From the comparison of species in sites & groups in Appendix 4, this reflects real differences in species occurrences. The change is an outcome of the size of the data sets (more sites from the Solomon area are providing evidence for more localised groups) and the number of groups defined from the reference data set (the number of groups in the reference classification was set at

					Sites from Unit 281: sloping to west minor hill, outcropping ironstone, Mesa top sloping east	600 to reduce the number of groups with only one site in them).
RB10	282	282, 281	281	Corymbia hamersleyana and Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to 5m over Acacia arida Shrubland to 1.5m over Triodia wiseana Hummock Grassland to 0.6m	Habitat not available.	See discussion under site RB02 above.
RB07	282, new or poor data	282 or 281	281	Corymbia hamersleyana Low Open Woodland to 6m over Acacia acradenia Tall Open Shrubland to 2.5m over Acacia arida Low Open Shrubland to 1.4m over Triodia wiseana Hummock Grassland to 0.6m	Site RB07 is located on a hilltop.	See discussion under site RB02 above.
RB15	157	157	157	Eucalyptus camaldulensis var. obtusa and Eucalyptus victrix Tall Open Woodland to 25m over Acacia citrinoviridis, Acacia pyrifolia var. pyrifolia and Grevillea wickhamii subsp. hispidula to 4m over Tephrosia rosea var. glabrior and Stemodia grossa Low Op  RB015 has eight species in common with ZION002 and eleven species in common with ZION005..	Site RB15 is located within a major drainage line. Other sites from within Unit 157 are also located within major drainage lines.	Site RB015 seems to fit fairly well in Unit 157. Site RB015 is similar to (new) site SolQ26 and these two sites are (less) similar to sites ZION005 and ZION002 from Unit 157. The structure of the vegetation descriptions differs between the sites but the species composition is similar. Site ZION005 also contains Eucalyptus victrix in the species list. However neither site ZION005 or ZION002 contain

						Eucalyptus camaldulensis var. obtusa. However, site KR001 has this species.
RB14	174	174, 171	174	Corymbia hamersleyana Low Open Woodland to 6m over Acacia pyrifolia var. pyrifolia, Grevillea wickhamii subsp. hispidula, Acacia bivenosa, Acacia citrinoviridis and Atalaya hemiglauca Closed Tall Scrub to 4m over Cymbopogon obtectus, Themeda triandra and  Given that the dendrograms have significant subgroups in unit 171 and 174 at the 600-group level, it is likely that better data would give a somewhat different resolution of these parts of the dendrogram. More definitely recognising several distinct groups.	RB14 is located in a gorge adjacent to a major drainage line.	Site RB14 grouped with sites SOLQ25-36 from another new data set in the new dendrogram. They then join to ten sites from Unit 174 and three sites from Unit 321, which are partly mixed with the Unit 174 sites. It is notable that four of the new sites have Eucalyptus xerothermica (SolQ17, 02, 04, 36) and that one of the Unit 174 references sites (SERN015) and one of the Unit 321 reference sites (SERN023) have this species, which is not present in any of the Unit 171 reference sites. Thus, while unit 171 is the second closest in the new dendrogram and the second Nearest Neighbour, after Unit 174 in each case, Unit 174 is preferred. However, it is possible that some of the sites should go to Unit 171 (which is more common in the original data), but that survey specific difference in the data are affecting the dendrogram (this is a significant possibility). Also see note to the left.

						Placed in Unit 174, but the presence of *Acacia tumida* is unusual for this unit (and also for Unit 171), but there is one occurrence. As noted above, better data is likely to give a somewhat different resolution to the new sites forming this section of the data.

5. REFERENCES

Belbin, L. (1987). PATN Reference Manual (313p), Users Guide (79p), Command Manual (47p), and Example Manual (108p). CSIRO Division of Wildlife and Ecology, Lynham, ACT.

Griffin E.A. (Ted) & M.E. Trudgen (2009a). Numerical analysis of floristic data from the Fortescue Metals Group Solomon Project and Investigator Mine Project Area with data from the surrounding Pilbara Bioregion of Western Australia. Unpublished report prepared for Coffey Environments.

Griffin E.A. (Ted) & M.E. Trudgen (2009b). Numerical analysis of floristic data from the Fortescue Metals Group Solomon Rail Project Area with data from the surrounding Pilbara Bioregion of Western Australia . Unpublished report prepared for Coffey Environments.

Thackway, R., and Cresswell, D. (eds) (1995) *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0*. Australian Nature Conservation Agency, Canberra.

6.0 APPENDICES

Appendix 1. Reconciliation of Species in Regional Analysis

This appendix shows the reconciliation of names in the data sets used. Some records are omitted from the classification (for example where the specimen has not been named to species). Others are joined with another taxon either if they are the same (e.g. an old and new name) or if there is reason to believe that there has been confusion in the naming of specimens.

FCODE	NAME	lookup
	-99999	omitted
	Chara sp.	omitted
	Genus sp.	omitted
	Unknown	omitted
	Unknown sp. (inadequate material)	omitted
007	Cheilanthes sp.	omitted
007	Cheilanthes sp. (inadequate material)	omitted
031	? Bothriochloa	omitted
031	Amphipogon sericeus	Amphipogon sericeus (Hammersley form; MET 15,335)
031	Amphipogon sericeus (Hamersley form)	Amphipogon sericeus (Hammersley form; MET 15,335)
031	Amphipogon sericeus (Newman form BR2-21)	Amphipogon sericeus (Newman form; BR2-21)
031	Amphipogon sericeus (Newman form)	Amphipogon sericeus (Newman form; BR2-21)
031	Aristida holathera	Aristida holathera var. holathera
031	Aristida sp.	omitted
031	Aristida sp. (inadequate material)	omitted
031	Cenchrus setigerus	Cenchrus setiger
031	Cymbopogon ? ambiguus	Cymbopogon ambiguus
031	Cymbopogon ? bombycinus	Cymbopogon bombycinus
031	Cymbopogon ?obtectus	Cymbopogon obtectus
031	Cymbopogon sp.	omitted
031	Cymbopogon sp. (inadequate material)	omitted
031	Cyperochloa hirsuta	omitted
031	Digitaria sp.	omitted
031	Diplachne fusca (Entry error)	Leptochloa fusca subsp. fusca
031	Enneapogon caerulescens var. caerulescens	Enneapogon caerulescens
031	Enneapogon caerulescens var. occidentalis	Enneapogon caerulescens
031	Enneapogon sp.	omitted
031	Enneapogon sp. (inadequate material)	omitted
031	Eragrostis ? elongata	Eragrostis elongata
031	Eragrostis aff. eriopoda	Eragrostis aff. eriopoda (WAS site 963)
031	Eragrostis aff. xerophila	Eragrostis xerophila
031	Eragrostis sp.	omitted
031	Eragrostis sp. (inadequate material)	omitted
031	Eriachne aff. benthamii	Eriachne benthamii
031	Eriachne mucronata	Eriachne mucronata (typical form)
031	Eriachne mucronata (Arid Form)	Eriachne mucronata (arid form) (MET 12 736)
031	Eriachne mucronata (Typical Form)	Eriachne mucronata (typical form)
031	Eriachne pulchella subsp. dominii	Eriachne pulchella
031	Eriachne pulchella subsp. pulchella	Eriachne pulchella
031	Eriachne sp.	omitted
031	Eriachne sp. (inadequate material)	omitted
031	Iseilema sp.	omitted
031	Panicum effusum	Panicum effusum var. effusum
031	Panicum sp.	omitted
031	Paractaenum refractum	Urochloa piligera
031	Paspalidium sp.	omitted
031	Paspalidium tabulatum	Paspalidium tabulatum (Whim Creek form)
031	Poaceae sp.	omitted
031	Poaceae sp. (CP19-3, WPI)	omitted
031	Poaceae sp. (inadequate material)	omitted
031	Setaria sp.	Setaria dielsii
031	Themeda aff. triandra (MET 16 046)	Themeda aff. triandra (MET 16,046)
031	Triodia ? pungens	Triodia epactia
031	Triodia aff. epactia coffey sterile	Triodia epactia
031	Triodia aff. lanigera (dwarf habit)	omitted
031	Triodia aff. longiceps	Triodia longiceps
031	Triodia aff. pungens	Triodia pungens
031	Triodia basedowii?	Triodia basedowii
031	Triodia epactia (Form 1)	Triodia epactia
031	Triodia epactia (Form 2)	Triodia epactia

FCODE	NAME	lookup
031	Triodia epactia (Form 3)	Triodia epactia
031	Triodia epactia (Form 4)	Triodia epactia
031	Triodia epactia (Form 5)	Triodia epactia
031	Triodia sp.	omitted
031	Triodia sp. nov.	Triodia sp. Robe River
031	Urochloa gilesii subsp. gilesii (glabrous florets)	omitted
031	Urochloa gilesii subsp. occidentalis	Urochloa occidentalis var. occidentalis
031	Urochloa sp.	omitted
031	Urochloa sp. "glabrous apices"	omitted
031	Whiteochloa aff. airoides	Whiteochloa airoides
031	Whiteochloa cymbiformis	Whiteochloa airoides
031	Xerochloa imberbis	Xerochloa barbata
031	Xerochloa laniflora	Xerochloa barbata
032	Bulbostylis turbinata (form B; M1-16)	Bulbostylis turbinata
032	Cyperaceae sp.	omitted
032	Cyperus sp.	omitted
032	Fimbristylis ? depauperata	Fimbristylis depauperata
032	Fimbristylis sp.	omitted
087	Ficus aculeata var. indecora	Ficus opposita
087	Ficus opposita var. aculeata	Ficus opposita
087	Ficus opposita var. indecora	Ficus opposita
087	Ficus platypoda var. A	Ficus brachypoda
087	Ficus platypoda var. B	Ficus brachypoda
087	Ficus platypoda var. D	Ficus brachypoda
087	Ficus platypoda var. E	Ficus brachypoda
087	Ficus platypoda var. F	Ficus brachypoda
087	Ficus platypoda var. G	Ficus brachypoda
090	Grevillea sp.	omitted
090	Grevillea wickhamii subsp. ?	Grevillea wickhamii
090	Grevillea wickhamii subsp. aprica	Grevillea wickhamii
090	Grevillea wickhamii subsp. hispidula	Grevillea wickhamii
090	Grevillea wickhamii subsp. macrodonta	Grevillea wickhamii
090	Hakea lorea ssp. lorea	Hakea lorea subsp. lorea
092	?Santalum sp.	Santalum lanceolatum
092	Santalum sp.	Santalum lanceolatum
097	Amyema sp.	omitted
105	?Chenopodium gaudichaudianum	omitted
105	Chenopodium melanocarpum forma melanocarpum	Dysphania melanocarpa forma melanocarpa
105	Dysphania melanocarpa forma leucocarpa	Dysphania melanocarpa forma melanocarpa
105	Dysphania sp.	omitted
105	Enchylaena tomentosa x	omitted
105	Enchylaena tomentosa x Maireana georgei	omitted
105	Halosarcia ? halocnemoides subsp. tenuis	Halosarcia halocnemoides
105	Halosarcia ? pergranulata	Halosarcia pergranulata
105	Halosarcia ? pterigosperma	Halosarcia pterygosperma subsp. denticulata
105	Halosarcia halocnemoides subsp. catenulata	Halosarcia halocnemoides
105	Halosarcia halocnemoides subsp. tenuis	Halosarcia halocnemoides
105	Halosarcia pergranulata subsp. elongata	Halosarcia pergranulata
105	Halosarcia sp.	omitted
105	Maireana aff. georgei	Maireana georgei
105	Maireana planifolia x	Maireana planifolia x villosa
105	Maireana sp.	omitted
105	Maireana tomentosa	Maireana tomentosa subsp. tomentosa
105	Salsola kali	Salsola tragus
105	Salsola tragus subsp. grandiflora	Salsola tragus
105	Salsola tragus subsp. tragus	Salsola tragus
105	Sclerolaena bicornis	Sclerolaena bicornis var. bicornis
105	Sclerolaena sp.	omitted
105	Sclerolaena sp. (inadequate material)	omitted
105	Sclerolaena sp. nov. aff densiflora	Sclerolaena densiflora
106	? Gomphrena sp.	omitted
106	Alternanthera sp. (inadequate material)	omitted
106	Amaranthus ? interruptus	Amaranthus interruptus
106	Amaranthus sp.	omitted
106	Gomphrena canescens	Gomphrena canescens subsp. canescens
106	Gomphrena sp.	omitted
106	Gomphrena sp. (inadequate material)	omitted
106	Ptilotus aff. obovatus	Ptilotus obovatus
106	Ptilotus astrolasius	Ptilotus astrolasius var. astrolasius
106	Ptilotus calostachyus	Ptilotus calostachyus var. calostachyus
106	Ptilotus exaltatus	Ptilotus exaltatus var. exaltatus
106	Ptilotus fusiformis	Ptilotus fusiformis var. fusiformis
106	Ptilotus incanus var. elongatus	Ptilotus incanus

FCODE	NAME	lookup
106	Ptilotus incanus var. incanus	Ptilotus incanus
106	Ptilotus murrayi	Ptilotus murrayi var. murrayi
106	Ptilotus obovatus var. obovatus	Ptilotus obovatus
106	Ptilotus polystachyus	Ptilotus polystachyus var. polystachyus
106	Ptilotus schwartzii	Ptilotus schwartzii var. schwartzii
106	Ptilotus sp.	omitted
106	Ptilotus sp. (inadequate material)	omitted
106	Ptilotus sp. (WPI, CP50-23)	omitted
107	Boerhavia aff. coccinea	Boerhavia coccinea
107	Boerhavia coccinea (form B)	Boerhavia coccinea
107	Boerhavia sp.	Boerhavia coccinea
107	Boerhavia sp. (B82-6)	Boerhavia coccinea
107	Boerhavia type 1	Boerhavia coccinea
107	Boerhavia type 2	Boerhavia coccinea
110	Trianthema sp.	omitted
110	Trianthema triquetra	Trianthema triquetra var. triquetra
110A	Mollugo molluginea	Mollugo molluginea
110A	Mollugo molluginis	Mollugo molluginea
111	Calandrinia ?quadrivalvis	Calandrinia quadrivalvis
111	Calandrinia ?stagnensis	Calandrinia stagnensis
111	Calandrinia sp.	omitted
111	Portulaca sp.	omitted
111	Portulaca sp. (inadequate material)	omitted
113	Polycarpaea longiflora (pale form)	Polycarpaea longiflora
113	Polycarpaea longiflora (red form)	Polycarpaea longiflora
113	Polycarpaea longiflora (White form, M13-7)	Polycarpaea longiflora
113	Polycarpaea sp.	omitted
131	Cassytha sp.	omitted
137A	Cadaba capparoides	omitted
137A	Cleome uncifera	Cleome uncifera subsp. uncifera
138	Lepidium sp.	omitted
138	Stenopetalum sp.	omitted
152	Pittosporum phylliraeoides var. microcarpa	Pittosporum angustifolium
163	Acacia ? hilliana x stellaticeps (GLD(NIM)23.28)	omitted
163	Acacia ? lysiphloia x monticola (B.R. Maslin 2671)	omitted
163	Acacia aff. aneura (scythe-shaped; MET 15,743)	Acacia aneura var. intermedia
163	Acacia aff. inaequilatera (MET 15,011)	Acacia trudgeniana
163	Acacia anceps	Acacia ancistrocarpa
163	Acacia ancistrocarpa x stellaticeps	omitted
163	Acacia ancistrocarpa x stellaticeps	omitted
163	Acacia ancistrocarpa x trachycarpa	omitted
163	Acacia aneura var. ?	omitted
163	Acacia atkinsiana X tenuissima	omitted
163	Acacia bivenosa x sclerosperma	omitted
163	Acacia colei x elachantha	omitted
163	Acacia coriacea	Acacia coriacea subsp. coriacea
163	Acacia elacantha (golden hairy variant)	Acacia elachantha
163	Acacia elachantha (golden hairy variant)	Acacia elachantha
163	Acacia elachantha (golden hairy variant)	Acacia elachantha
163	Acacia elachantha (silvery hairy variant)	Acacia elachantha
163	Acacia eriopoda x monticola (B.R. Maslin 7322)	omitted
163	Acacia hamersleyensis	Acacia hamersleyensis (bushy form)
163	Acacia holosericea	omitted
163	Acacia monticola x tumida var. pilbarensis	omitted
163	Acacia morrisonii	Acacia pyrifolia var. morrisonii
163	Acacia pyrifolia	Acacia pyrifolia var. pyrifolia
163	Acacia pyrifolia var. morrisonii	Acacia pyrifolia var. morrisonii
163	Acacia pyrifolia var. pyrifolia	Acacia pyrifolia var. pyrifolia
163	Acacia pyrifolia var. pyrifolia	Acacia pyrifolia var. pyrifolia
163	Acacia pyrifolia var. pyrifolia	Acacia pyrifolia var. pyrifolia
163	Acacia retivenea	Acacia retivenea subsp. clandestina
163	Acacia sericocarpa	Acacia sericophylla
163	Acacia sericophylla	Acacia sericophylla
163	Acacia sp.	omitted
163	Acacia sp. (inadequate material)	omitted
163	Acacia stellaticeps	Acacia stellaticeps
163	Acacia stenophylla entry error ??	Acacia stellaticeps
163	Acacia trachycarpa x tumida	omitted
163	Acacia trachycarpa x tumida var. pilbarensis	omitted
163	Acacia trudgeniana	Acacia trudgeniana
163	Acacia trudgeniana	Acacia trudgeniana
163	Acacia tumida	Acacia tumida var. pilbarensis
163	Acacia tumida subsp. ? pilbarensis x ?	omitted

FCODE	NAME	lookup
163	Acacia tumida var. pilbarensis	Acacia tumida var. pilbarensis
163	Neptunia aff. dimorphantha (M27)	Neptunia dimorphantha
163	Vachellia farnesiana	Vachellia farnesiana
163	Vachellia farnesiana	Vachellia farnesiana
164	Cassia ? oligophylla x	omitted
164	Cassia ? oligophylla x glaucifolia	omitted
164	Cassia ?glaucifolia x aff. oligophylla (thinly sericeous)(FMR29-11)	omitted
164	Cassia aff. oligophylla (thinly sericeous) x helmsii	omitted
164	Cassia glaucifolia x ? (site 626)	omitted
164	Cassia glaucifolia x glutinosa	omitted
164	Cassia glutinosa x luerssenii	omitted
164	Cassia glutinosa x 'stricta'	omitted
164	Cassia hamersleyensis	Senna hamersleyensis
164	Cassia hamersleyensis x sp. Karajini (MET 10 392)	Senna hamersleyensis X sp. Karijini(M.E. Trudgen 10392) .
164	Cassia helmsii x	omitted
164	Cassia helmsii x 'stricta'	omitted
164	Cassia luerssenii x 'stricta'	omitted
164	Cassia oligophylla x	omitted
164	Cassia oligophylla x glutinosa (FMG116-02)	omitted
164	Cassia oligophylla x helmsii (FMR75-01)	omitted
164	Cassia pruinosa x ?glutinosa	omitted
164	Cassia pruinosa x luerssenii	omitted
164	Cassia sp. Karajini (MET 10,392)	Senna sp. Karijini (M.E. Trudgen 10392)
164	Cassia sp. West Angelas (MET 16,115)	Senna sp. West Angeles (M.E.Trudgen 16,115)
164	Senna ?glutinosa	Senna glutinosa subsp. glutinosa
164	Senna artemisioides	omitted
164	Senna artemisioides aff. subsp. oligophylla x helmsii	Senna artemisioides subsp. oligophylla x helmsii
164	Senna artemisioides subsp. ? oligophylla x	omitted
164	Senna artemisioides subsp. aff. oligophylla (thinly sericeous)	Senna artemisioides aff subsp oligophylla (thinly sericeous)
164	Senna artemisioides subsp. oligophylla x glutinosa	omitted
164	Senna artemisioides subsp. oligophylla x glutinosa	omitted
164	Senna glaucifolia x	omitted
164	Senna glutinosa	Senna glutinosa subsp. glutinosa
164	Senna glutinosa subsp. glutinosa x luerssenii	omitted
164	Senna glutinosa subsp. glutinosa x stricta	omitted
164	Senna glutinosa subsp. luersenii x pruinosa	omitted
164	Senna glutinosa subsp. luersenii x stricta	omitted
164	Senna glutinosa subsp. x luerssenii	Senna glutinosa subsp. luerssenii
164	Senna sp.	omitted
164	Senna sp. (inadequate material)	omitted
165	? Glycine sp.	omitted
165	Crotalaria medicaginea (Burrup form; B65-11)	Crotalaria medicaginea
165	Crotalaria medicaginea (Cape Preston form; M63-12)	Crotalaria medicaginea
165	Crotalaria medicaginea var. neglecta	Crotalaria medicaginea
165	Crotalaria sp.	omitted
165	Crotalaria trifoliastrum	Crotalaria medicaginea
165	Cullen sp.	omitted
165	Desmodium sp.	omitted
165	Indigastrum parviflorum (Cape Preston form; M23-12)	Indigastrum parviflorum
165	Indigofera monophylla (forma)	omitted
165	Indigofera sp.	omitted
165	Indigofera sp. (HD19)	omitted
165	Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	Indigofera monophylla (BRO 46-12)
165	Kennedia cf. prorepens (HD284-7)	Kennedia prorepens
165	Papillionaceae sp.	omitted
165	Rhynchosia bungarensis	Rhynchosia bungarensis
165	Rhynchosia minima	Rhynchosia minima var. australis
165	Rhynchosia minima var. aff. australis	Rhynchosia minima var. australis
165	Swainsona sp.	omitted
165	Tephrosia aff. densa	omitted
165	Tephrosia aff. supina	omitted
165	Tephrosia rosea	omitted
165	Tephrosia sp.	omitted
165	Tephrosia sp. (HD133)	omitted
165	Tephrosia sp. (inadequate material)	omitted
165	Tephrosia supina (06BP45-006)	omitted
165	Vigna sp.	omitted
165	Vigna sp. central (M.E. Trudgen 1626)	Vigna lanceolata var. latifolia
165	Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)	Vigna lanceolata var. latifolia
165	Zornia sp.	omitted
167	Erodium cygnorum	Erodium cygnorum subsp. cygnorum
173	Tribulus sp.	omitted

FCODE	NAME	lookup
173	Tribulus sp. (inadequate material)	omitted
173	Zygophyllum retivalve	Zygophyllum iodocarpum
173	Zygophyllum sp.	Zygophyllum iodocarpum
183	Polygala sp.	omitted
185	Adriana tomentosa	Adriana urticoides var. urticoides
185	Adriana tomentosa var. tomentosa	Adriana urticoides var. urticoides
185	Adriana urticoides var. hookeri	Adriana urticoides var. urticoides
185	Euphorbia aff. australis	omitted
185	Euphorbia aff. boophthona (large seed form)	Euphorbia boophthona (Large seed form)
185	Euphorbia aff. myrtoides	omitted
185	Euphorbia australis (mid-green form)	Euphorbia australis (mid-green form)
185	Euphorbia australis subsp. glaucescens (MS?)	omitted
185	Euphorbia biconvexa	Euphorbia coghlanii
185	Euphorbia sp.	omitted
185	Euphorbia sp. (inadequate material)	omitted
185	Euphorbia sp. (site 1089)	Euphorbia sp. (site 1089)
185	Euphorbia sp. (Site 1089)	Euphorbia sp. (site 1089)
185	Euphorbia tannensis	omitted
185	Euphorbia tannensis subsp. eremophila	Euphorbia tannensis subsp. eremophila (Hamersley form)
185	Phyllanthus reticulatus var. glaber	Phyllanthus ciccoides
185	Sauropus sp.	omitted
207	Alectryon oleifolius	Alectryon oleifolius subsp. oleifolius
207	Dodonaea lanceolata	Dodonaea lanceolata var. lanceolata
220	Corchorus aff. lasiocarpus subsp. parvus	Corchorus lasiocarpus subsp. parvus
220	Corchorus aff. parviflorus	Corchorus aff. parviflorus
220	Corchorus aff. parviflorus (JW011-11)	Corchorus aff. parviflorus
220	Corchorus aff. parviflorus (JW11-11)	Corchorus aff. parviflorus
220	Corchorus aff. walcottii Michi	omitted
220	Corchorus incanus	Corchorus incanus subsp. incanus
220	Corchorus incanus subsp. incanus	Corchorus incanus subsp. incanus
220	Corchorus incanus subsp. incanus	Corchorus incanus subsp. incanus
220	Corchorus lasiocarpus	omitted
220	Corchorus lasiocarpus var. lasiocarpus	Corchorus lasiocarpus subsp. lasiocarpus
220	Corchorus sidoides	omitted
220	Corchorus sp.	omitted
220	Corchorus sp. (inadequate material)	omitted
220	Triumfetta ? centralis	omitted
220	Triumfetta appendiculata (Burrup Form)	Triumfetta appendiculata
220	Triumfetta appendiculata (Mardie form)	Triumfetta appendiculata
220	Triumfetta appendiculata (Red Hill form)	Triumfetta appendiculata
220	Triumfetta cf. propinqua (B13-13)	omitted
220	Triumfetta sp.	omitted
220	Triumfetta sp. (inadequate material)	omitted
221	Abutilon aff. dioicum	Abutilon dioicum
221	Abutilon aff. fraseri (1)	Abutilon fraseri
221	Abutilon aff. fraseri (site 1212)	Abutilon fraseri
221	Abutilon aff. lepidium	omitted
221	Abutilon aff. lepidum (1)	Abutilon aff. lepidum (1) (MET 15 352)
221	Abutilon aff. lepidum (4)	Abutilon macrum
221	Abutilon otocarpum	Abutilon otocarpum (acute leaf form)
221	Abutilon oxycarpum	Abutilon oxycarpum subsp. prostratum
221	Abutilon sp.	omitted
221	Abutilon sp. (inadequate material)	omitted
221	Gossypium australe	Gossypium australe (Burrup Peninsula form)
221	Hibiscus aff. sturtii	omitted
221	Hibiscus austrinus var. austrinus	Hibiscus austrinus var. austrinus
221	Hibiscus austrinus var. austrinus	Hibiscus austrinus var. austrinus
221	Hibiscus sp.	omitted
221	Hibiscus sp. (inadequate material)	omitted
221	Hibiscus sturtii	Hibiscus sturtii var. campylochlamys
221	Hibiscus sturtii var. aff. grandiflorus	Hibiscus sturtii var. grandiflorus
221	Hibiscus sturtii var. aff. Platychlamys	omitted
221	Hibiscus sturtii var. platychlamys (MET 15067)	omitted
221	Melhania sp. Burrup wrong family #	Melhania sp. (Burrup)
221	Sida ? cardiophylla (juvenile)	omitted
221	Sida ? echinocarpa	omitted
221	Sida ? rohlenae	omitted
221	Sida aff. cardiophylla	omitted
221	Sida aff. clementii	omitted
221	Sida aff. excedentifolia (FML58-14A)	Sida excedentifolia
221	Sida aff. fibulifera	omitted
221	Sida aff. fibulifera	omitted
221	Sida aff. pilbarensis (EOB46-01B)	Sida aff. pilbarensis (EOB46-01B)

FCODE	NAME	lookup
221	Sida aff. pilbarensis (EOB46-01B)	Sida aff. pilbarensis (EOB46-01B)
221	Sida aff. spiciforme panicles (FML46-13)	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/1990 PN
221	Sida atrovirens	Sida sp. dark green fruit (S. van Leeuwen 2260)
221	Sida pilbarensis	Sida pilbarensis (ferruginous form)
221	Sida pilbarensis (ferruginous form)	Sida pilbarensis (ferruginous form)
221	Sida pilbarensis (ferruginous form)	Sida pilbarensis (ferruginous form)
221	Sida sp.	omitted
221	Sida sp. (CW21-3, WPI)	omitted
221	Sida sp. (CW28-12, WPI)	omitted
221	Sida sp. (inadequate material)	omitted
221	Sida sp. (WPI, CR16-27)	omitted
221	Sida sp. Articulation below (A.A. Mitchell PRP 1605)	Sida sp. Articulation below (A.A. Mitchell PRP 1605)
221	Sida sp. Excedentifolia (J.L. Egan 1925)	Sida excedentifolia
221	Sida sp. pilbara	Sida pilbarensis (ferruginous form)
221	Sida sp. Pilbara (A.A. Mitchell PRP 1543)	Sida pilbarensis (ferruginous form)
221	Sida sp. 'rugose'	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/1990 PN
221	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90) PN	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/1990 PN
221	Sida sp. spiciform panicles (E. Leyland sn 14/8/90)	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/1990 PN
221	Sida sp. Supplejack Station	Sida rhytidocarpa
221	Sida sp. Wittenoom (W.R. Barker 1962)	Sida arsiniata
221	Sida subarticulata	Sida sp. Articulation below (A.A. Mitchell PRP 1605)
223	Brachychiton sp.	Brachychiton acuminatus
223	Keraudrenia ?nephrosperma	Keraudrenia nephrosperma
223	Keraudrenia sp.	Keraudrenia velutina subsp. elliptica
223	Melhania sp.	omitted
273	Corymbia candida subsp. candida	Corymbia candida
273	Corymbia candida subsp. dipsodes	Corymbia candida
273	Corymbia ferriticola	Corymbia ferriticola subsp. ferriticola
273	Corymbia opaca	Corymbia hamersleyana
273	Corymbia sp.	omitted
273	Eucalyptus sp.	omitted
273	Eucalyptus sp. (WPI, UCW1-30)	omitted
273	Malleostemon hursthousei entry error	omitted
273	Melaleuca sp.	omitted
276	Haloragis gossei var. gossei	Haloragis gossei var. gossei
281	Trachymene aff. oleracea (B61)	Trachymene oleracea subsp. oleracea
281	Trachymene oleracea	Trachymene oleracea subsp. oleracea
303	Centaurium spicatum	Centaurium clementii
305	Tylophora flexuosa	Cynanchum sp. Hamersley (M. Trudgen 2302)
307	Bonamia media var. villosa	Bonamia sp. Dampier (A.A. Mitchell PRP 217)
307	Bonamia sp.	omitted
307	Bonamia sp. (inadequate material)	omitted
307	Bonamia sp. Dampier (A.A. Mitchell PRP 217)	Bonamia sp. Dampier (A.A. Mitchell PRP 217)
307	Convolvulus ? clementii	Convolvulus angustissimus subsp. angustissimus
307	Convolvulus ? remotus	Convolvulus angustissimus subsp. angustissimus
307	Duperreya commixta	Duperreya commixta
307	Duperreya commixta	Duperreya commixta
307	Duppereya commixta	Duperreya commixta
307	Ipomoea sp.	omitted
307	Polymeria ? lanata	Polymeria lanata
307	Polymeria aff. ambigua	omitted
307	Polymeria aff. ambigua (MET 12302)	Polymeria aff. ambigua (MET 12, 302)
307	Polymeria ambigua/calycina	Polymeria aff. ambigua (PAN 26B-20)
307	Polymeria longifolia	omitted
307	Polymeria sp.	omitted
307	Porana commixta	Duperreya commixta
310	Ehretia ? (B23-22)	Ehretia saligna var. saligna
310	Heliotropium ? conocarpum	Heliotropium conocarpum
310	Heliotropium ? cunninghamii	Heliotropium cunninghamii
310	Heliotropium ? foliatum	Heliotropium pachyphyllum
310	Heliotropium sp.	omitted
310	Heliotropium sp. (inadequate material)	omitted
311	Clerodendrum sp.	Clerodendrum floribundum var. angustifolium
311	Clerodendrum tomentosum	Clerodendrum tomentosum var. lanceolatum
311A	Dicrastylis georgei	Dicrastylis cordifolia
313	?Clerodendrum	omitted
313	Prostanthera campbellii	Prostanthera striatiflora
315	Nicotiana sp.	omitted
315	Nicotiana sp. (inadequate material)	omitted
315	Solanum ?lasiophyllum	omitted
315	Solanum sp.	omitted
315	Solanum sp. (inadequate material)	omitted
315	Solanum sturtianum	Solanum sturtianum

FCODE	NAME	lookup
316	Peplidium sp.	Peplidium sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768)
316	Stemodia sp.	Stemodia grossa
316	Stemodia sp. (inadequate material)	Stemodia grossa
318	Josephinia sp.	Josephinia sp. Marandoo (M.E. Trudgen 1554)
325	Rostellularia adscendens var. latifolia	Rostellularia adscendens var. clementii
326	Eremophila forrestii x latrobei	omitted
326	Eremophila fraseri subsp. parva	Eremophila fraseri subsp. fraseri
326	Eremophila latrobei	omitted
326	Eremophila sp.	omitted
326	Eremophila sp. 1 (poor specimen)	omitted
326	Eremophila sp. 2 (sterile)	omitted
326	Eremophila youngii x latrobei	omitted
337	Cucumis maderaspatanus	Cucumis maderaspatanus
337	Cucumis maderaspatanus	Cucumis maderaspatanus
337	Cucumis maderaspatanus	Cucumis maderaspatanus
337	Mukia aff. maderaspatana (1) (grey scabrid rounded)	Cucumis maderaspatanus
337	Mukia aff. maderaspatana (2) (grey scabrid serrate)	Cucumis maderaspatanus
337	Mukia aff. maderaspatana (3) (green scabrid rounded)	Cucumis maderaspatanus
337	Mukia aff. maderaspatana (4) (green not scabrid)	Cucumis maderaspatanus
337	Mukia aff. maderaspatana sp. A	Cucumis maderaspatanus
337	Mukia aff. maderaspatana sp. B	Cucumis maderaspatanus
337	Mukia aff. maderaspatana sp. C	Cucumis maderaspatanus
337	Mukia aff. maderaspatana sp. D	Cucumis maderaspatanus
337	Mukia aff. maderaspatana sp. E	Cucumis maderaspatanus
337	Mukia aff. maderaspatana sp. F	Cucumis maderaspatanus
337	Mukia maderaspatana	Cucumis maderaspatanus
337	Trichosanthes cucumerina	Trichosanthes cucumerina var. cucumerina
339	Wahlenbergia queenslandica	Wahlenbergia tumidifructa
339	Wahlenbergia sp.	Wahlenbergia tumidifructa
341	Goodenia aff. cusackiana	Goodenia cusackiana
341	Goodenia aff. microptera	Goodenia microptera
341	Goodenia aff. muelleriana	Goodenia muelleriana
341	Goodenia sp.	omitted
341	Goodenia sp. (inadequate material)	omitted
341	Goodenia sp. (site 1205)	omitted
341	Goodenia sp. (site 92)	omitted
341	Goodeniaceae sp.	omitted
341	Scaevola sp.	omitted
341	Scaevola spicigera	Scaevola spinescens (broad form)
341	Scaevola spinescens	Scaevola spinescens (broad form)
345	? Ixiolaena sp.	omitted
345	Asteraceae sp. (inadequate material)	omitted
345	Chrysocephalum apiculatum	Chrysocephalum aff. apiculatum
345	Chrysocephalum sp.	omitted
345	Flaveria australasica	Flaveria australasica subsp. australasica
345	Flaveria australasica subsp. australasica	Flaveria australasica subsp. australasica
345	Flaveria sp. Tom Price (M.E. Trudgen 11246)	Flaveria australasica subsp. gilgai
345	Lactuca saligna	Lactuca serriola
345	Pentalepis aff. trichodesmoides (M.E.Trudgen 15,170)	Pentalepis trichodesmoides
345	Pluchea sp.	omitted
345	Pseudognaphalium luteoalbum	Helichrysum luteoalbum
345	Pterocaulon ? sphaeranthoides x sphacelatum	Pterocaulon sphaeranthoides
345	Pterocaulon ?serrulatum	omitted
345	Pterocaulon sp.	omitted
345	Pterocaulon sp. (inadequate material)	omitted
345	Pterocaulon sphaeranthoides x sphacelatum	Pterocaulon sphaeranthoides
345	Rutidosis helichrysoides	Rutidosis helichrysoides subsp. helichrysoides
345	Streptoglossa sp.	omitted
345	Streptoglossa sp. (inadequate material)	omitted
345	Vittadinia sp.	omitted
F	Podaxis pistillaris	omitted

New Data only:

FCODE	NAME	lookup
007	Cheilanthes austrotenuifolia	Cheilanthes sieberi subsp. sieberi
031	Cymbopogon obtectus	some to Cymbopogon obtectus some to Cymbopogon ambiguus
031	Eriachne ciliata	omitted
031	Sporobolus virginicus	omitted
165	Tephrosia sp. Cathedral Gorge (F.H. Mollemans 2420)	omitted
202	Stackhousia viminea	omitted
307	Polymeria aff. ambigua (PAN 26B-20)	Polymeria aff. ambigua (MET 12, 302)

Appendix 2. Comparison of relative occurrence of species in different Solomon Project Area surveys

This appendix shows the relative frequency of species in different surveys carried out in the Fortescue Metals Group Project Area. This comparison was used to identify records in the new data that were likely to be errors. The greens are indicating higher frequency amongst the new sites and the reds indicating lower amongst the new sites. Such differences could be due to chance, or to sampling error such as field mis-identification. A number of changes were made to the data using this appendix as a guide prior to the second classification.

Notes: In the headings to the columns: FCODE = Family code. All = total number of occurrences. Columns "I" are indices of relative frequency based on # in All and # in project. Green above expected, red below expected.

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
007	Cheilanthes austrotenuifolia	3					3	12.30			8.75
007	Cheilanthes lasiophylla	1			1	1.69					
007	Cheilanthes sieberi subsp. sieberi	8	3	1.26	3	0.63	2	3.07			2.19
020	Typha domingensis	3	2	2.25	1	0.56					
031	Acrachne racemosa	4	1	0.84	3	1.27					
031	Amphipogon sericeus (Hammersley form; MET 15,335)	26	4	0.52	22	1.43					
031	Aristida contorta	56	26	1.56	29	0.88	1	0.22			0.16
031	Aristida holathera var. holathera	45	14	1.05	31	1.17					
031	Aristida holathera var. latifolia	93	9	0.33	62	1.13	21	2.78	1	0.33	2.07
031	Aristida inaequiglumis	11	7	2.14	3	0.46			1	2.76	0.80
031	Aristida ingrata	23	5	0.73	18	1.32					
031	Aristida jerichoensis var. subspinulifera	1	1	3.37							
031	Aristida latifolia	32	18	1.90	12	0.63	2	0.77			0.55
031	Aristida obscura	4	1	0.84			3	9.22			6.56
031	Astrebla pectinata	3	3	3.37							
031	Bothriochloa bladhii subsp. bladhii	3	2	2.25	1	0.56					
031	Bothriochloa ewartiana	3	1	1.12	2	1.13					
031	Brachyachne convergens	8	6	2.53	2	0.42					
031	Cenchrus ciliaris	86	27	1.06	50	0.98	8	1.14	1	0.35	0.92
031	Cenchrus setiger	3	1	1.12	2	1.13					
031	Chloris pectinata	9	4	1.50	5	0.94					
031	Chloris pumilio	4	1	0.84	3	1.27					
031	Chrysopogon fallax	80	22	0.93	49	1.04	8	1.23	1	0.38	0.98
031	Cymbopogon ambiguus	86	33	1.29	50	0.98	3	0.43			0.31
031	Cymbopogon obtectus	51	9	0.59	29	0.96	11	2.65	2	1.19	2.23
031	Cymbopogon procerus	29	2	0.23	27	1.57					
031	Dactyloctenium radulans	18	9	1.69	9	0.85					
031	Dichanthium fecundum	1			1	1.69					
031	Dichanthium sericeum subsp. humilius	9	7	2.62	2	0.38					
031	Dichanthium sericeum subsp. sericeum	3	2	2.25	1	0.56					
031	Digitaria brownii	61	15	0.83	45	1.25	1	0.20			0.14
031	Digitaria ctenantha	28	7	0.84	21	1.27					
031	Echinochloa colona	2			2	1.69					
031	Enneapogon caerulescens	22	13	1.99	9	0.69					
031	Enneapogon intermedius	7	2	0.96	5	1.21					
031	Enneapogon lindleyanus	34	13	1.29	13	0.65	7	2.53	1	0.89	2.06
031	Enneapogon polyphyllus	78	34	1.47	32	0.69	11	1.73	1	0.39	1.35
031	Enteropogon ramosus	3	3	3.37							
031	Eragrostis aff. eriopoda (WAS site 963)	22	2	0.31	19	1.46	1	0.56			0.40
031	Eragrostis cumingii	61	7	0.39	42	1.16	11	2.22	1	0.50	1.72
031	Eragrostis exigua	1			1	1.69					
031	Eragrostis falcata	2	2	3.37							

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
031	Eragrostis leptocarpa	1	1	3.37							
031	Eragrostis minor	2	2	3.37							
031	Eragrostis pergracilis	1	1	3.37							
031	Eragrostis setifolia	9	5	1.87	4	0.75					
031	Eragrostis sp. Mt Montagu (MET 15,246)	1	1	3.37							
031	Eragrostis tenellula	6	3	1.69	3	0.85					
031	Eragrostis xerophila	16	7	1.47	9	0.95					
031	Eriachne aristidea	25	7	0.94	15	1.01	3	1.48			1.05
031	Eriachne benthamii	6	1	0.56	5	1.41					
031	Eriachne ciliata	54	2	0.12	24	0.75	22	5.01	6	3.37	4.54
031	Eriachne flaccida	1	1	3.37							
031	Eriachne lanata	3			3	1.69					
031	Eriachne mucronata (arid form) (MET 12 736)	2			2	1.69					
031	Eriachne mucronata (typical form)	136	27	0.67	91	1.13	15	1.36	3	0.67	1.16
031	Eriachne obtusa	7	7	3.37							
031	Eriachne pulchella	71	13	0.62	56	1.33	2	0.35			0.25
031	Eriachne tenuiculmis	35	4	0.39	29	1.40	2	0.70			0.50
031	Eulalia aurea	92	26	0.95	61	1.12	4	0.53	1	0.33	0.48
031	Iseilema dolichotrichum	3	3	3.37							
031	Iseilema eremaeum	8	1	0.42	2	0.42	5	7.69			5.47
031	Iseilema macratherum	5	5	3.37							
031	Iseilema membranaceum	15	7	1.57	8	0.90					
031	Leptochloa fusca subsp. fusca	1	1	3.37							
031	Mnesithea formosa	8			7	1.48	1	1.54			1.09
031	Panicum effusum var. effusum	1	1	3.37							
031	Panicum laevinode	5	5	3.37							
031	Paraneurachne muelleri	103	23	0.75	71	1.17	9	1.07			0.76
031	Paspalidium clementii	50	7	0.47	34	1.15	9	2.21			1.58
031	Paspalidium rarum	21	5	0.80	16	1.29					
031	Paspalidium retiglume	3	3	3.37							
031	Paspalidium tabulatum (Whim Creek form)	2			2	1.69					
031	Perotis rara	69	6	0.29	52	1.27	10	1.78	1	0.44	1.39
031	Schizachyrium fragile	43	6	0.47	28	1.10	9	2.57			1.83
031	Setaria dielsii	11	5	1.53	6	0.92					
031	Setaria surgens	37	2	0.18	31	1.42	3	1.00	1	0.82	0.95
031	Setaria verticillata	7	2	0.96	5	1.21					
031	Sorghum timorense	4	2	1.69	2	0.85					
031	Sporobolus actinocladus	3	3	3.37							
031	Sporobolus australasicus	40	19	1.60	15	0.63	6	1.84			1.31
031	Sporobolus virginicus	8					7	10.76	1	3.79	8.75
031	Themeda aff. triandra (MET 16,046)	2	2	3.37							
031	Themeda sp. Burrup (B84)	2					2	12.30			8.75
031	Themeda sp. Hamersley Station (M.E. Trudgen 11431)	1	1	3.37							
031	Themeda sp. Mt Barricade (M.E. Trudgen 2471)	4	2	1.69	1	0.42	1	3.07			2.19
031	Themeda triandra	146	32	0.74	100	1.16	12	1.01	2	0.42	0.84
031	Tragus australianus	2	1	1.69	1	0.85					
031	Triodia aff. basedowii	6	2	1.12	4	1.13					
031	Triodia aff. melvillei (MET 10, 114)	11			10	1.54	1	1.12			0.80
031	Triodia aff. shovelanna hill	3	1	1.12	2	1.13					
031	Triodia angusta	1			1	1.69					
031	Triodia brizoides	7	3	1.44	4	0.97					
031	Triodia epactia	191	67	1.18	117	1.04	6	0.39	1	0.16	0.32
031	Triodia longiceps	20	14	2.36	6	0.51					
031	Triodia secunda	1	1	3.37							
031	Triodia wiseana	271	63	0.78	165	1.03	30	1.36	13	1.46	1.39
031	Triraphis mollis	1			1	1.69					

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
031	Urochloa occidentalis var. ciliata	8	5	2.11	3	0.63					
031	Urochloa occidentalis var. occidentalis	6	5	2.81	1	0.28					
031	Urochloa piligera	3	1	1.12	2	1.13					
031	Urochloa subquadripara	3			3	1.69					
031	Yakirra australiensis var. australiensis	7			7	1.69					
032	Bulbostylis barbata	65	4	0.21	38	0.99	18	3.41	5	2.33	3.10
032	Cyperus blakeanus	1	1	3.37							
032	Cyperus hesperius	5	1	0.67	3	1.01	1	2.46			1.75
032	Cyperus iria	2			1	0.85	1	6.15			4.38
032	Cyperus vaginatus	15	12	2.70	1	0.11	2	1.64			1.17
032	Fimbristylis dichotoma	14	3	0.72	11	1.33					
032	Fimbristylis simulans	35	5	0.48	19	0.92	11	3.86			2.75
032	Schoenus falcatus	1	1	3.37							
047	Commelina ensifolia	5	4	2.70			1	2.46			1.75
054F	Tricoryne trudgeniana	1			1	1.69					
087	Ficus brachypoda	2			2	1.69					
087	Ficus virens var. sublanceolata	1	1	3.37							
090	Grevillea berryana	6			6	1.69					
090	Grevillea pyramidalis subsp. leucadendron	39	7	0.60	25	1.08	6	1.89	1	0.78	1.57
090	Grevillea wickhamii	140	22	0.53	93	1.12	16	1.41	9	1.95	1.56
090	Hakea chordophylla	50	11	0.74	38	1.29	1	0.25			0.18
090	Hakea lorea subsp. lorea	134	44	1.11	71	0.90	12	1.10	7	1.58	1.24
092	Anthobolus leptomerioides	6	3	1.69	3	0.85					
092	Santalum lanceolatum	87	17	0.66	56	1.09	9	1.27	5	1.74	1.41
097	Amyema bifurcata	1			1	1.69					
097	Amyema fitzgeraldii	1			1	1.69					
097	Amyema sanguinea var. pulcher	4			3	1.27	1	3.07			2.19
097	Amyema sanguinea var. sanguinea	1	1	3.37							
097	Lysiana casuarinae	1			1	1.69					
105	Dysphania kalpari	4			3	1.27	1	3.07			2.19
105	Dysphania melanocarpa forma melanocarpa	2	1	1.69			1	6.15			4.38
105	Dysphania rhadinostachya subsp. rhadinostachya	13			1	0.13	12	11.35			8.08
105	Enchylaena tomentosa var. tomentosa	3	2	2.25	1	0.56					
105	Maireana georgei	2			2	1.69					
105	Maireana melanocoma	2	1	1.69	1	0.85					
105	Maireana planifolia	3	2	2.25	1	0.56					
105	Maireana triptera	1			1	1.69					
105	Maireana villosa	12	4	1.12	7	0.99	1	1.02			0.73
105	Rhagodia eremaea	21	9	1.44	8	0.64	4	2.34			1.67
105	Salsola tragus	15	5	1.12	10	1.13					
105	Sclerolaena bicornis var. bicornis	1			1	1.69					
105	Sclerolaena cornishiana	18	7	1.31	11	1.03					
105	Sclerolaena costata	4	1	0.84	3	1.27					
105	Sclerolaena diacantha	1			1	1.69					
105	Sclerolaena lanicuspis	2	1	1.69	1	0.85					
106	Achyranthes aspera	2			2	1.69					
106	Aerva javanica	6	4	2.25	1	0.28	1	2.05			1.46
106	Alternanthera angustifolia	1			1	1.69					
106	Alternanthera nana	115	23	0.67	79	1.16	11	1.18	2	0.53	0.99
106	Amaranthus cuspidifolius	10	2	0.67	8	1.35					
106	Amaranthus induratus	1			1	1.69					
106	Amaranthus interruptus	3					3	12.30			8.75
106	Amaranthus undulatus	28	2	0.24	20	1.21	5	2.20	1	1.08	1.88
106	Gomphrena affinis subsp. pilbarensis	25	5	0.67	19	1.29	1	0.49			0.35
106	Gomphrena cunninghamii	64	8	0.42	44	1.16	11	2.11	1	0.47	1.64
106	Gomphrena kanisii	2	2	3.37							
106	Gomphrena leptoclada subsp. leptoclada	1	1	3.37							

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
106	Ptilotus aervoides	1			1	1.69					
106	Ptilotus astrolasius var. astrolasius	113	21	0.63	89	1.33	3	0.33			0.23
106	Ptilotus auriculifolius	7			4	0.97	3	5.27			3.75
106	Ptilotus axillaris	1					1	12.30			8.75
106	Ptilotus calostachyus var. calostachyus	83	18	0.73	57	1.16	8	1.19			0.84
106	Ptilotus carinatus	1	1	3.37							
106	Ptilotus clementii	4	2	1.69	1	0.42	1	3.07			2.19
106	Ptilotus exaltatus var. exaltatus	75	18	0.81	26	0.59	24	3.94	7	2.83	3.62
106	Ptilotus fusiformis var. fusiformis	41	3	0.25	25	1.03	12	3.60	1	0.74	2.77
106	Ptilotus gaudichaudii var. gaudichaudii	2	1	1.69	1	0.85					
106	Ptilotus gomphrenoides var. gomphrenoides	5	5	3.37							
106	Ptilotus helipteroides var. helipteroides	5	5	3.37							
106	Ptilotus incanus	1			1	1.69					
106	Ptilotus mollis	1					1	12.30			8.75
106	Ptilotus obovatus	72	19	0.89	38	0.89	14	2.39	1	0.42	1.82
106	Ptilotus polystachyus var. arthrotrichus	2	2	3.37							
106	Ptilotus polystachyus var. polystachyus	1	1	3.37							
106	Ptilotus rotundifolius	51	15	0.99	32	1.06	4	0.96			0.69
107	Boerhavia coccinea	76	10	0.44	52	1.16	13	2.10	1	0.40	1.61
107	Boerhavia gardneri	2	2	3.37							
107	Boerhavia repleta	1	1	3.37							
108	Codonocarpus cotinifolius	34	16	1.59	17	0.85	1	0.36			0.26
110	Trianthema glossostigma	5	3	2.02	2	0.68					
110	Trianthema pilosa	15			14	1.58	1	0.82			0.58
110	Trianthema triquetra var. triquetra	1			1	1.69					
110A	Glinus lotoides	1			1	1.69					
110A	Mollugo molluginea	87	7	0.27	69	1.34	11	1.55			1.11
111	Portulaca oleracea	21	3	0.48	13	1.05	5	2.93			2.08
113	Polycarpaea corymbosa var. corymbosa	10	1	0.34	4	0.68	5	6.15			4.38
113	Polycarpaea holtzei	70	3	0.14	37	0.89	23	4.04	7	3.03	3.75
113	Polycarpaea longiflora	81	15	0.62	48	1.00	18	2.73			1.94
122	Tinospora smilacina	8	3	1.26	4	0.85	1	1.54			1.09
131	Cassytha capillaris	18	8	1.50	9	0.85	1	0.68			0.49
131	Cassytha filiformis	1	1	3.37							
137A	Capparis lasiantha	13	12	3.11	1	0.13					
137A	Capparis spinosa var. nummularia	7	3	1.44	1	0.24	2	3.51	1	4.33	3.75
137A	Capparis umbonata	24	7	0.98	11	0.78	6	3.07			2.19
137A	Cleome viscosa	150	33	0.74	96	1.08	19	1.56	2	0.40	1.23
160	Stylobasium spathulatum	2	2	3.37							
163	Acacia acradenia	17	8	1.59	5	0.50			4	7.14	2.06
163	Acacia adoxa var. adoxa	129	19	0.50	93	1.22	12	1.14	5	1.18	1.15
163	Acacia adsurgens	1			1	1.69					
163	Acacia aff. aneura (narrow fine veined; site 1259)	34	15	1.49	15	0.75	4	1.45			1.03
163	Acacia aff. aneura (subterete long; site 1245)	2	1	1.69	1	0.85					
163	Acacia aff. stowardii (linear form)	1	1	3.37							
163	Acacia ampliceps	4	4	3.37							
163	Acacia ancistrocarpa	99	44	1.50	53	0.91	2	0.25			0.18
163	Acacia aneura (flat curved; MET 15 548)	1			1	1.69					
163	Acacia aneura (grey bushy form; MET 15 732)	3	1	1.12	2	1.13					
163	Acacia aneura var. ? aneura	7	4	1.93	3	0.72					
163	Acacia aneura var. conifera	15	7	1.57	8	0.90					
163	Acacia aneura var. intermedia	5			5	1.69					
163	Acacia aneura var. pilbarana	11	5	1.53	6	0.92					
163	Acacia arida	70	6	0.29	46	1.11	6	1.05	12	5.20	2.25
163	Acacia arrecta	2			2	1.69					
163	Acacia atkinsiana	67	25	1.26	39	0.98	3	0.55			0.39

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
163	Acacia bivenosa	113	67	2.00	31	0.46	11	1.20	4	1.07	1.16
163	Acacia citrinoviridis	15	8	1.80	3	0.34	2	1.64	2	4.04	2.33
163	Acacia colei var. colei	1	1	3.37							
163	Acacia coriacea subsp. pendens	12	11	3.09	1	0.14					
163	Acacia cowleana	25	13	1.75	12	0.81					
163	Acacia dictyophleba	135	30	0.75	99	1.24	5	0.46	1	0.22	0.39
163	Acacia elachantha	72	14	0.66	56	1.32	2	0.34			0.24
163	Acacia eriopoda	2	1	1.69	1	0.85					
163	Acacia exilis	1	1	3.37							
163	Acacia hamersleyensis (spindly form)	4	2	1.69	2	0.85					
163	Acacia hilliana	50	4	0.27	37	1.25	3	0.74	6	3.64	1.58
163	Acacia inaequilatera	112	39	1.17	63	0.95	10	1.10			0.78
163	Acacia kempeana	1	1	3.37							
163	Acacia maitlandii	54	12	0.75	41	1.28			1	0.56	0.16
163	Acacia marramamba	1			1	1.69					
163	Acacia monticola	85	20	0.79	60	1.19	3	0.43	2	0.71	0.51
163	Acacia orthocarpa	5	4	2.70	1	0.34					
163	Acacia pruinocarpa	93	32	1.16	47	0.85	10	1.32	4	1.30	1.32
163	Acacia pyrifolia var. pyrifolia	160	39	0.82	104	1.10	15	1.15	2	0.38	0.93
163	Acacia retivenea subsp. clandestina	10			5	0.85			5	15.17	4.38
163	Acacia sclerosperma subsp. sclerosperma	2	2	3.37							
163	Acacia spondylophylla	11			11	1.69					
163	Acacia stellaticeps	6	6	3.37							
163	Acacia stowardii (crowded smaller phyllodes)	1			1	1.69					
163	Acacia synchronicia	18	11	2.06	7	0.66					
163	Acacia tenuissima	108	36	1.12	69	1.08	3	0.34			0.24
163	Acacia tetragonophylla	12	4	1.12	8	1.13					
163	Acacia trachycarpa	14	12	2.89	2	0.24					
163	Acacia trudgeniana	8	2	0.84	6	1.27					
163	Acacia tumida var. pilbarensis	143	23	0.54	109	1.29	10	0.86	1	0.21	0.67
163	Acacia victoriae	7	4	1.93	3	0.72					
163	Acacia xiphophylla	12	5	1.40	7	0.99					
163	Neptunia dimorphantha	4	3	2.53	1	0.42					
163	Vachellia farnesiana	19	13	2.31	6	0.53					
164	Petalostylis labicheoides	53	9	0.57	31	0.99	4	0.93	9	5.15	2.15
164	Senna artemisioides aff subsp oligophylla (thinly sericeous)	6	3	1.69	3	0.85					
164	Senna artemisioides subsp. ? oligophylla x glaucifolia (HD 13-14)	5					5	12.30			8.75
164	Senna artemisioides subsp. helmsii	23	9	1.32	11	0.81	3	1.60			1.14
164	Senna artemisioides subsp. oligophylla	74	22	1.00	43	0.98	7	1.16	2	0.82	1.06
164	Senna artemisioides subsp. oligophylla x helmsii	122	41	1.13	79	1.10	1	0.10	1	0.25	0.14
164	Senna ferraria	1	1	3.37							
164	Senna glutinosa subsp. glutinosa	188	55	0.99	107	0.96	22	1.44	4	0.65	1.21
164	Senna glutinosa subsp. luerssenii	27	15	1.87	11	0.69	1	0.46			0.32
164	Senna glutinosa subsp. pruinosa	48	21	1.47	22	0.78	4	1.02	1	0.63	0.91
164	Senna hamersleyensis	2	1	1.69	1	0.85					
164	Senna hamersleyensis X sp. Karijini(M.E. Trudgen 10392) .	1	1	3.37							
164	Senna notabilis	67	12	0.60	36	0.91	16	2.94	3	1.36	2.48
164	Senna sp. Karijini (M.E. Trudgen 10392)	2	2	3.37							
164	Senna sp. West Angeles (M.E.Trudgen 16,115)	1	1	3.37							
164	Senna symonii	14	4	0.96	9	1.09	1	0.88			0.63
164	Senna venusta	1	1	3.37							
165	Aeschynomene indica	1			1	1.69					
165	Alysicarpus muelleri	6	4	2.25	2	0.56					
165	Cajanus cinereus	3			3	1.69					
165	Crotalaria cunninghamii	4	4	3.37							

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
165	Crotalaria dissitiflora subsp. benthamiana	7	6	2.89	1	0.24					
165	Crotalaria juncea	2	2	3.37							
165	Crotalaria medicaginea	79	6	0.26	66	1.41	6	0.93	1	0.38	0.78
165	Crotalaria novae-hollandiae subsp. novae-hollandiae	5			5	1.69					
165	Cullen cinereum	1	1	3.37							
165	Cullen graveolens	1	1	3.37							
165	Cullen leucanthum	1	1	3.37							
165	Cullen leucochaites	8	2	0.84	6	1.27					
165	Cullen pogonocarpum	1			1	1.69					
165	Desmodium campylocaulon	1	1	3.37							
165	Desmodium muelleri	1	1	3.37							
165	Gastrolobium grandiflorum	8	3	1.26	5	1.06					
165	Glycine canescens	3	1	1.12	2	1.13					
165	Gompholobium karijini	57	3	0.18	46	1.37	2	0.43	6	3.19	1.23
165	Gompholobium sp. Pilbara (N.F Norris 908)	42	16	1.28	22	0.89	4	1.17			0.83
165	Indigofera aff. monophylla (HD195-15)	169	48	0.96	121	1.21					
165	Indigofera colutea	19	2	0.35	16	1.42	1	0.65			0.46
165	Indigofera fractiflexa	7	1	0.48	6	1.45					
165	Indigofera linifolia	6	5	2.81	1	0.28					
165	Indigofera linnaei	11	1	0.31	10	1.54					
165	Indigofera monophylla (BRO 46-12)	1			1	1.69					
165	Indigofera monophylla (brown calyx form)	5	4	2.70	1	0.34					
165	Indigofera monophylla (grey/green leaflet form)	8	8	3.37							
165	Indigofera rugosa	5	5	3.37							
165	Indigofera trita	2	2	3.37							
165	Isotropis atropurpurea	30	11	1.24	18	1.01	1	0.41			0.29
165	Isotropis forrestii	1	1	3.37							
165	Leptosema chambersii	1			1	1.69					
165	Lotus cruentus	1	1	3.37							
165	Mirbelia viminalis	25	2	0.27	19	1.29	3	1.48	1	1.21	1.40
165	Rhynchosia bungarensis	1	1	3.37							
165	Rhynchosia minima var. australis	116	34	0.99	76	1.11	4	0.42	2	0.52	0.45
165	Sesbania cannabina	3	3	3.37							
165	Swainsona formosa	6			6	1.69					
165	Tephrosia aff. clementii (MET 15,528)	1	1	3.37							
165	Tephrosia aff. densa (HD31-4)	3			3	1.69					
165	Tephrosia aff. densa (WW22-16)	2			2	1.69					
165	Tephrosia aff. supina (HD133-20)	1			1	1.69					
165	Tephrosia aff. supina (WW23-22)	2	2	3.37							
165	Tephrosia densa	6			6	1.69					
165	Tephrosia rosea var. clementii	4	3	2.53	1	0.42					
165	Tephrosia rosea var. glabrior	77	14	0.61	53	1.16	8	1.28	2	0.79	1.14
165	Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	1	1	3.37							
165	Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	18	4	0.75	14	1.32					
165	Tephrosia sp. Cathedral Gorge (F.H. Mollemans 2420)	2					2	12.30			8.75
165	Tephrosia sp. Pilbara Ranges (S. van Leeuwen 4246)	9			9	1.69					
165	Tephrosia spechtii	28	2	0.24	20	1.21	6	2.64			1.88
165	Vigna lanceolata var. lanceolata	1	1	3.37							
165	Vigna lanceolata var. latifolia	1			1	1.69					
173	Tribulopis angustifolia	1			1	1.69					
173	Tribulus cistoides	1			1	1.69					
173	Tribulus hirsutus	7	1	0.48	2	0.48	4	7.03			5.00
173	Tribulus macrocarpus	13	1	0.26	10	1.30	2	1.89			1.35
173	Tribulus occidentalis	2	1	1.69	1	0.85					

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
173	Tribulus platypterus	3			2	1.13	1	4.10			2.92
173	Tribulus suberosus	4	2	1.69	1	0.42	1	3.07			2.19
183	Polygala aff. isingii	4			4	1.69					
185	Adriana urticoides var. urticoides	1	1	3.37							
185	Euphorbia aff. drummondii (M87)	3	1	1.12	2	1.13					
185	Euphorbia australis	1	1	3.37							
185	Euphorbia australis (mid-green form)	3	1	1.12	2	1.13					
185	Euphorbia boophthona	10	3	1.01	4	0.68	3	3.69			2.63
185	Euphorbia coghlanii	96	18	0.63	70	1.23	7	0.90	1	0.32	0.73
185	Euphorbia sp. (PAN1-14B)	4			4	1.69					
185	Euphorbia sp. (PAN5-15)	10	1	0.34	9	1.52					
185	Euphorbia sp. (site 1089)	36	10	0.94	18	0.85	8	2.73			1.94
185	Euphorbia sp. (site 1163)	5					5	12.30			8.75
185	Euphorbia tannensis subsp. eremophila (Hamersley form)	22	2	0.31	13	1.00	6	3.35	1	1.38	2.78
185	Euphorbia wheeleri	1	1	3.37							
185	Flueggea virosa subsp. melanthesoides	12	6	1.69	2	0.28	3	3.07	1	2.53	2.92
185	Leptopus decaisnei var. orbicularis	31	5	0.54	13	0.71	12	4.76	1	0.98	3.67
185	Phyllanthus erwinii	15			13	1.47	2	1.64			1.17
185	Phyllanthus maderaspatensis	75	25	1.12	44	0.99	5	0.82	1	0.40	0.70
202	Stackhousia intermedia	2	2	3.37							
202	Stackhousia viminea	5					2	4.92	3	18.20	8.75
207	Atalaya hemiglauca	31	16	1.74	10	0.55	3	1.19	2	1.96	1.41
207	Dodonaea coriacea	27	7	0.87	18	1.13	2	0.91			0.65
207	Dodonaea lanceolata var. lanceolata	20	3	0.51	13	1.10	4	2.46			1.75
207	Dodonaea pachyneura	1					1	12.30			8.75
207	Dodonaea petiolaris	18	4	0.75	12	1.13	2	1.37			0.97
215	Ventilago viminalis	1	1	3.37							
220	Corchorus aff. parviflorus	27	1	0.12	26	1.63					
220	Corchorus aff. parviflorus (JW011-11)	3					3	12.30			8.75
220	Corchorus crozophorifolius	17	2	0.40	14	1.39	1	0.72			0.51
220	Corchorus incanus subsp. incanus	5			5	1.69					
220	Corchorus incanus subsp. lithophilus	3					2	8.20	1	10.11	8.75
220	Corchorus lasiocarpus subsp. lasiocarpus	27	12	1.50	15	0.94					
220	Corchorus lasiocarpus subsp. parvus	101	18	0.60	73	1.22	7	0.85	3	0.90	0.87
220	Corchorus parviflorus	6	2	1.12	4	1.13					
220	Corchorus sidoides subsp. sidoides	7	5	2.41	2	0.48					
220	Corchorus sp. (HD260)	8	2	0.84	6	1.27					
220	Corchorus tridens	11			2	0.31	8	8.94	1	2.76	7.16
220	Triumfetta appendiculata	5	3	2.02	2	0.68					
220	Triumfetta chaetocarpa	1	1	3.37							
220	Triumfetta clementii	2	2	3.37							
220	Triumfetta johnstonii	4			4	1.69					
220	Triumfetta leptacantha	2			2	1.69					
220	Triumfetta maconochieana	27	1	0.12	22	1.38	4	1.82			1.30
221	Abutilon aff. lepidum (1) (MET 15 352)	10	3	1.01	7	1.18					
221	Abutilon amplum	1	1	3.37							
221	Abutilon cryptopetalum	1	1	3.37							
221	Abutilon cunninghamii	12	5	1.40	7	0.99					
221	Abutilon dioicum	26	5	0.65	19	1.24	1	0.47	1	1.17	0.67
221	Abutilon fraseri	24	12	1.69	9	0.63	3	1.54			1.09
221	Abutilon macrum	5	1	0.67	4	1.35					
221	Abutilon otocarpum (acute leaf form)	31	9	0.98	20	1.09	1	0.40	1	0.98	0.56
221	Abutilon trudgenii	6	1	0.56	4	1.13	1	2.05			1.46
221	Gossypium australe (Burrup Peninsula form)	117	36	1.04	81	1.17					
221	Gossypium australe (Whim Creek form)	43	8	0.63	23	0.90	12	3.43			2.44
221	Gossypium robinsonii	77	20	0.88	45	0.99	11	1.76	1	0.39	1.36
221	Hibiscus aff. coatesii (MET 15 305)	1			1	1.69					

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
221	Hibiscus aff. coatesii (MET 16,542)	7	1	0.48	6	1.45					
221	Hibiscus aff. coatesii (site 664)	21	5	0.80	16	1.29					
221	Hibiscus aff. coatesii (site 693)	7					7	12.30			8.75
221	Hibiscus aff. coatesii (site 733)	1	1	3.37							
221	Hibiscus aff. sturtii (site 1209)	3			3	1.69					
221	Hibiscus austrinus var. austrinus	1	1	3.37							
221	Hibiscus brachysiphonius	4	4	3.37							
221	Hibiscus burtonii	18	9	1.69	8	0.75	1	0.68			0.49
221	Hibiscus leptocladus	11			11	1.69					
221	Hibiscus sp. (site 316)	1			1	1.69					
221	Hibiscus sturtii var. campylochlamys	44	5	0.38	36	1.38	2	0.56	1	0.69	0.60
221	Hibiscus sturtii var. grandiflorus	18	9	1.69	9	0.85					
221	Hibiscus sturtii var. platychlamys	40	14	1.18	26	1.10					
221	Lawrencia densiflora	1	1	3.37							
221	Malvastrum americanum	48	16	1.12	29	1.02	3	0.77			0.55
221	Sida aff. echinocarpa (MET 15,350)	26	9	1.17	16	1.04	1	0.47			0.34
221	Sida aff. fibulifera (HD200-6)	9	4	1.50	5	0.94					
221	Sida aff. fibulifera (oblong; MET 15 220)	11	4	1.23	7	1.08					
221	Sida aff. fibulifera 'var. L'	7	7	3.37							
221	Sida arenicola	18	3	0.56	15	1.41					
221	Sida arsiniata	14	2	0.48	11	1.33	1	0.88			0.63
221	Sida cardiophylla	12	3	0.84	9	1.27					
221	Sida excedentifolia	1			1	1.69					
221	Sida pilbarensis (ferruginous form)	36	6	0.56	28	1.32	2	0.68			0.49
221	Sida rhytidocarpa	2			2	1.69					
221	Sida rohlenae subsp. rohlenae	7			6	1.45	1	1.76			1.25
221	Sida sp. Articulation below (A.A. Mitchell PRP 1605)	35	1	0.10	25	1.21	9	3.16			2.25
221	Sida sp. Barlee Range (S. van Leeuwen 1642)	1			1	1.69					
221	Sida sp. dark green fruit (S. van Leeuwen 2260)	2			2	1.69					
221	Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	6			6	1.69					
221	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/1990 PN	89	17	0.64	70	1.33	2	0.28			0.20
221	Sida sp. verrucose glands (F.H. Mollemans 2423)	73	21	0.97	46	1.07	5	0.84	1	0.42	0.72
221	Sida spinosa	2	2	3.37							
223	Brachychiton acuminatus	1	1	3.37							
223	Keraudrenia nephrosperma	39	9	0.78	30	1.30					
223	Keraudrenia velutina subsp. elliptica	32	8	0.84	18	0.95	2	0.77	4	3.79	1.64
223	Melhania oblongifolia	1			1	1.69					
223	Melhania sp. (CH15-39)	8	3	1.26	3	0.63	2	3.07			2.19
223	Rulingia luteiflora	7	1	0.48	6	1.45					
223	Waltheria indica	26	4	0.52	20	1.30	2	0.95			0.67
223	Waltheria virgata	20	2	0.34	15	1.27	3	1.84			1.31
235	Bergia perennis subsp. obtusifolia	2	1	1.69	1	0.85					
243	Hybanthus aurantiacus	93	14	0.51	63	1.15	14	1.85	2	0.65	1.51
263	Pimelea ammocharis	8	2	0.84	6	1.27					
265	Ammannia auriculata	2					2	12.30			8.75
265	Ammannia baccifera	1					1	12.30			8.75
273	Calytrix carinata	5			5	1.69					
273	Corymbia candida	2			2	1.69					
273	Corymbia deserticola subsp. deserticola	66	15	0.77	45	1.15	6	1.12			0.80
273	Corymbia ferriticola subsp. ferriticola	2			2	1.69					
273	Corymbia hamersleyana	242	46	0.64	165	1.15	19	0.97	12	1.50	1.12
273	Eucalyptus camaldulensis var. obtusa	14	8	1.93	3	0.36	2	1.76	1	2.17	1.88
273	Eucalyptus gamophylla	100	27	0.91	64	1.08	5	0.61	4	1.21	0.79
273	Eucalyptus leucophloia subsp. leucophloia	198	43	0.73	126	1.08	20	1.24	9	1.38	1.28

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
273	Eucalyptus victrix	20	12	2.02	6	0.51	1	0.61	1	1.52	0.88
273	Eucalyptus xerothermica	40	16	1.35	18	0.76	6	1.84			1.31
273	Melaleuca argentea	5	2	1.35	1	0.34	2	4.92			3.50
273	Melaleuca bracteata	2	2	3.37							
273	Melaleuca eleuterostachya	1	1	3.37							
273	Melaleuca glomerata	10	10	3.37							
273	Melaleuca linophylla	3	2	2.25	1	0.56					
276	Haloragis gossei var. gossei	3	2	2.25	1	0.56					
280	Astrotricha hamptonii	1			1	1.69					
281	Trachymene oleracea subsp. oleracea	48	6	0.42	20	0.70	19	4.87	3	1.90	4.01
293	Samolus sp. Millstream (M.I.H. Brooker 2076)	1	1	3.37							
294	Plumbago zeylanica	1	1	3.37							
301	Jasminum didymum subsp. lineare	162	32	0.67	107	1.12	17	1.29	6	1.12	1.24
302	Mitrasacme connata	1			1	1.69					
305	Cynanchum floribundum	7	2	0.96	5	1.21					
305	Cynanchum sp. (MET 15,151)	1	1	3.37							
305	Cynanchum sp. Hamersley (M. Trudgen 2302)	1					1	12.30			8.75
305	Rhyncharrhena linearis	22	10	1.53	8	0.62	2	1.12	2	2.76	1.59
307	Bonamia rosea	90	26	0.97	58	1.09	6	0.82			0.58
307	Bonamia sp. (HD94-6)	1	1	3.37							
307	Bonamia sp. Dampier (A.A. Mitchell PRP 217)	35	5	0.48	29	1.40	1	0.35			0.25
307	Convolvulus angustissimus subsp. angustissimus	4	1	0.84	3	1.27					
307	Duperreya commixta	61	23	1.27	33	0.92	5	1.01			0.72
307	Evolvulus alsinoides var. alsinoides	1			1	1.69					
307	Evolvulus alsinoides var. decumbens	9			9	1.69					
307	Evolvulus alsinoides var. villosicalyx	146	33	0.76	103	1.19	10	0.84			0.60
307	Ipomoea muelleri	12	1	0.28	9	1.27	2	2.05			1.46
307	Ipomoea polymorpha	7			1	0.24	5	8.78	1	4.33	7.50
307	Operculina aequisepala	3	2	2.25			1	4.10			2.92
307	Polymeria aff. ambigua (CGC-25)	1							1	30.33	8.75
307	Polymeria aff. ambigua (MET 12, 302)	63	7	0.37	56	1.50					
307	Polymeria aff. ambigua (PAN 26B-20)	9					8	10.93	1	3.37	8.75
307	Polymeria calycina	4	2	1.69	2	0.85					
310	Ehretia saligna var. saligna	11	3	0.92	8	1.23					
310	Heliotropium chrysocarpum	4	4	3.37							
310	Heliotropium conocarpum	4	4	3.37							
310	Heliotropium crispatum	3	3	3.37							
310	Heliotropium cunninghamii	22	1	0.15	16	1.23	5	2.79			1.99
310	Heliotropium inexplicitum	1	1	3.37							
310	Heliotropium ovalifolium	3	2	2.25	1	0.56					
310	Heliotropium tanythrix	4	2	1.69	2	0.85					
310	Trichodesma zeylanicum var. zeylanicum	103	13	0.43	70	1.15	18	2.15	2	0.59	1.70
311	Clerodendrum floribundum var. angustifolium	48	6	0.42	31	1.09	6	1.54	5	3.16	2.01
315	Solanum diversiflorum	47	7	0.50	32	1.15	8	2.09			1.49
315	Solanum ellipticum	8	2	0.84	6	1.27					
315	Solanum ferocissimum	4	3	2.53			1	3.07			2.19
315	Solanum gabrielae	1			1	1.69					
315	Solanum horridum	12	2	0.56	7	0.99	2	2.05	1	2.53	2.19
315	Solanum lasiophyllum	47	17	1.22	26	0.94	4	1.05			0.74
315	Solanum phlomoides	9	8	3.00	1	0.19					
315	Solanum sturtianum	4	4	3.37							
316	Mimulus gracilis	1					1	12.30			8.75
316	Stemodia grossa	24	15	2.11	5	0.35	2	1.02	2	2.53	1.46
316	Stemodia kingii	5	3	2.02	1	0.34			1	6.07	1.75
316	Stemodia viscosa	2	1	1.69	1	0.85					

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
316	Striga curviflora	2			2	1.69					
318	Josephinia sp. Marandoo (M.E. Trudgen 1554)	1	1	3.37							
325	Dipteracanthus australasicus subsp. australasicus	8	2	0.84	5	1.06	1	1.54			1.09
325	Rostellularia adscendens var. clementii	9	5	1.87	4	0.75					
326	Eremophila cuneata	1			1	1.69					
326	Eremophila forrestii subsp. forrestii	16	6	1.26	9	0.95	1	0.77			0.55
326	Eremophila lanceolata	7	4	1.93	3	0.72					
326	Eremophila latrobei subsp. aff. filiformis	6	1	0.56	4	1.13	1	2.05			1.46
326	Eremophila latrobei subsp. filiformis	7	4	1.93	3	0.72					
326	Eremophila latrobei subsp. latrobei	1			1	1.69					
326	Eremophila longifolia	72	27	1.26	38	0.89	7	1.20			0.85
326	Eremophila macmillaniana	1			1	1.69					
326	Eremophila maculata subsp. brevifolia	1			1	1.69					
331	Oldenlandia crouchiana	21			9	0.72	12	7.03			5.00
331	Oldenlandia galioides	1					1	12.30			8.75
331	Psydrax latifolia	16	7	1.47	8	0.85	1	0.77			0.55
331	Psydrax rigidula	1	1	3.37							
331	Psydrax suaveolens	4			4	1.69					
331	Spermacoce brachystema	2					2	12.30			8.75
331	Synaptantha tillaeacea var. tillaeacea	1	1	3.37							
337	Cucumis maderaspatanus	108	21	0.66	67	1.05	18	2.05	2	0.56	1.62
337	Cucumis melo subsp. agrestis	9	2	0.75	6	1.13			1	3.37	0.97
339	Wahlenbergia tumidifructa	3	2	2.25	1	0.56					
340	Lobelia quadrangularis	1	1	3.37							
341	Dampiera candicans	63	8	0.43	50	1.34	5	0.98			0.69
341	Goodenia cusackiana	6	2	1.12	3	0.85			1	5.06	1.46
341	Goodenia forrestii	13	1	0.26	9	1.17	3	2.84			2.02
341	Goodenia heterochila	2					2	12.30			8.75
341	Goodenia lamprosperma	5	3	2.02	2	0.68					
341	Goodenia microptera	55	12	0.74	35	1.08	8	1.79			1.27
341	Goodenia muelleriana	6	5	2.81	1	0.28					
341	Goodenia nuda	38	4	0.35	21	0.93	12	3.88	1	0.80	2.99
341	Goodenia pascua	4	3	2.53	1	0.42					
341	Goodenia stellata	10	2	0.67	7	1.18	1	1.23			0.88
341	Goodenia stobbsiana	101	27	0.90	63	1.06	8	0.97	3	0.90	0.95
341	Goodenia triodiophila	24	2	0.28	22	1.55					
341	Scaevola acacioides	6	3	1.69	3	0.85					
341	Scaevola aff. browniana	10	2	0.67	7	1.18	1	1.23			0.88
341	Scaevola amblyanthera var. centralis	2	1	1.69	1	0.85					
341	Scaevola parvifolia subsp. pilbarae	11	5	1.53	6	0.92					
341	Scaevola spinescens (broad form)	4	1	0.84	1	0.42	2	6.15			4.38
341	Velleia connata	6	3	1.69	2	0.56	1	2.05			1.46
345	Bidens bipinnata	79	20	0.85	47	1.01	11	1.71	1	0.38	1.33
345	Centipeda minima subsp. macrocephala	1					1	12.30			8.75
345	Conyza bonariensis	2	1	1.69	1	0.85					
345	Flaveria australasica subsp. australasica	2	2	3.37							
345	Flaveria australasica subsp. gilgai	1	1	3.37							
345	Lactuca serriola	1	1	3.37							
345	Pentalepis trichodesmoides	2			2	1.69					
345	Pluchea dentex	9	5	1.87	3	0.56	1	1.37			0.97
345	Pluchea dunlopii	1	1	3.37							
345	Pluchea ferdinandi-muelleri	6	6	3.37							
345	Pluchea rubelliflora	4	2	1.69			2	6.15			4.38
345	Pluchea squarrosa	7	3	1.44	4	0.97					
345	Pluchea tetranthera	2	2	3.37							
345	Pterocaulon serrulatum	4	1	0.84	3	1.27					

			550AA		EP005 50AA		ENP2679AA		EP2679Robe		NEW
FCODE	SPECIES NAME	all	#	I	#	I	#	I	#	I	I
	Sites->		135		268		37		15		
345	Pterocaulon sphacelatum	2	2	3.37							
345	Pterocaulon sphaeranthoides	72	17	0.80	39	0.92	15	2.56	1	0.42	1.94
345	Rutidosis helichrysoides subsp. helichrysoides	5	2	1.35	3	1.01					
345	Sigesbeckia orientalis	5	2	1.35	3	1.01					
345	Sonchus hydrophilus	1	1	3.37							
345	Streptoglossa decurrens	2	2	3.37							
345	Vittadinia arida	2	2	3.37							
345	Vittadinia virgata	6	1	0.56	1	0.28	4	8.20			5.83

Appendix 3. Extracts from the new dendrogram (classification) illustrating the fusion of the new sites to the reference sites

Notes: As the whole dendrogram is very large, segments have been selected that show the positions of the new sites. The new sites from the "Robe Pisolite" survey are highlighted in blue. The new sites from another new data set (the "Solomon Supplementary" survey) are highlighted in yellow. The whole dendrogram is available on request.

PROJ	site	#	50	100	200	400	600	data	geo	VEGETATION	HABITAT
								06/07/11 21:25:04.24 dend Coffey Solomon Robe with Pilbara June 2011 rerun			
								0.0000 0.2389 0.4778 0.7167 0.9556 1.1944 1.4333			
								| | | | | | |			
WAMTHER	0341	18	1	5	14	30	49		d	Eucalyptus leucophloia, Corymbia hamersleyana low open woodland	Gently sloping small creek in
WAFCBOR	1171	14	1	5	14	30	49		d	Corymbia hamersleyana scattered low trees over Acacia	Large flowline between two
EP00550AA	VOK019	18	20	45	96	184	279		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia,	Small gully/flowline off the
EP00550AA	VOQ017	23	20	45	96	184	279		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia,	Gully, moderately sloping south
EP00550AA	VOQ018	20	20	45	96	184	279		Qa	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Hillside, steep upper slope with
WAFCBOR	1069	13	20	45	98	187	284		PLHb	Eucalyptus leucophloia low open woodland over Acacia pruinocarpa	Rounded upper slopes of large
EP00550AA	VOQ008	17	20	45	98	187	284		Czc	Open Woodland of Corymbia deserticola subsp. deserticola,	Valley floor, gently sloping east
EP00550AA	VOQ013	12	20	45	98	187	285		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 5m	Valley floor, very gently sloping
EP00550AA	VOQ26	20	20	45	98	187	285		PLHb	Open Woodland of Corymbia hamersleyana and Eucalyptus	Steep lower hillside
EP00550AA	VOQ21	17	20	45	98	187	284		Czc	Scattered Low Trees of Corymbia deserticola subsp. deserticola	Valley floor, upper lying, gently
EP00550AA	VOQ30	11	20	45	98	187	285		Czc	Tall Open Shrubland of Hakea chordophylla, Acacia inaequilatera	Valley floor, gently sloping North
EP00550AA	VOQ39	16	20	45	98	187	285		Qa	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 6m	Valley floor, very gently sloping
EP00550AA	VOQ32	19	20	45	98	187	285		Czc	Low Open Woodland of Corymbia hamersleyana and Corymbia	Low rise, hill top and upper slope
EP00550AA	VOQ43	22	20	45	98	187	285		Qa	Open Woodland of Corymbia hamersleyana to 5m over Tall Open	Valley floor, gently sloping
WAFCBOR	1065	31	21	46	99	189	287		Qa	Eucalyptus leucophloia. Corymbia hamersleyana, Corymbia	Long low ridge/spur of cemented
WAFCBOR	1169	16	20	45	96	184	278		Czc	Corymbia deserticola, Corymbia hamersleyana low woodland over	Long south-west trending colluvial
EP00550AA	FT29	18	20	45	96	184	278		Czc	Scattered Low Trees of Corymbia hamersleyana, Eucalyptus	Slight hill midslope - bottom of
EP00550AA	VOQ38	12	20	45	97	186	283		Czc	Scattered Low Trees of Corymbia deserticola subsp. deserticola	Valley floor, very gently sloping
EP00550AA	ZION026	19	20	45	97	186	283		Tp	Tall Shrubland of Grevillea wickhamii subsp. hispidula to 3.5m	flat area/plain on summit/hill
EP00550AA	ZION028	25	20	45	97	186	283		Tp	Low Open Woodland of Corymbia hamersleyana and Eucalyptus	Gently sloping south/relatively
550AA	KR007	20	21	46	100	193	295		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. Leucophloia	Midslope-sloping e-w
EP2679Robe	RB03	12								Corymbia hamersleyana and Eucalyptus gamophylla Low Open	
WAFCBOR	1068	20	20	45	97	186	282		PLHb	Eucalyptus leucophloia low open woodland over Triodia wiseana hummock grassland.	Steep north facing slope of the hill. Below low cliff/breakaway.
550AA	KR004	22	20	45	98	187	284		Qa	Low Open Woodland of Corymbia hamersleyana to 6m over Scattered	
EP00550AA	SERN 101	29	21	46	100	192	293		Czc	Low Open Woodland of Eucalyptus deserticola subsp. deserticola to	Lower slope valley floor near site
EP00550AA	SERN044	30	21	46	100	193	295		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Valley floor, very gently
EP00550AA	VOK015	30	21	46	100	193	295		PLHb	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Moderate to steep rocky hillside
EP00550AA	VOK025	25	20	45	96	184	278		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia,	Gully/flowline within a small
EP00550AA	VOK028	23	20	45	96	184	278		Czc	Scattered Low Trees of Corymbia deserticola subsp. deserticola	Ridge top running east-west
EP00550AA	SERN076	29	21	46	99	189	288		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Valley floor, low rise very gently
EP00550AA	SERN100	29	21	46	99	189	288		Czc	Scatttered Tall Shrubs of Acacia dictyophleba and Acacia	lower slope near base of hill
EP00550AA	SERN102	43	21	46	99	189	288		PLHb	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	low to mid slope at base of hill
550AA	5RAIL032	10	20	45	98	187	284		Czc	Scattered Low Trees of Corymbia deserticola subsp. deserticola	small hillside sloping west
550AA	5RAIL033	14	20	45	98	187	284		Czc	Open Woodlands of "Eucalyptus leucophloia subsp. leucophloia"	small hill top
ENP2679AA	SolQ22	24								Eucalyptus leucophloia subsp. leucophloia and Corymbia	Top of low rise
EP00550AA	VOK018	15	20	45	98	187	284		PLHb	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Hilltop with gentle slopes to the
EP00550AA	VOK027	26	21	46	100	193	296		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia,	Ridge top
550AA	5RAIL034	24	21	46	100	190	289		Czc	Low Woodland of Eucalyptus gamophylla, Corymbia deserticola	
EP00550AA	VOQ29	15	21	46	100	190	289		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Valley floor, very gently sloping
ENP2679AA	SolQ08	20								Corymbia hamersleyana, Corymbia deserticola subsp. deserticola,	Very low rise in valley
ENP2679AA	SolQ10	18								Eucalyptus leucophloia subsp. leucophloia, Corymbia hamersleyana	Low rocky rise
ENP2679AA	SolQ33	11								Eucalyptus leucophloia subsp, leucophloia and Corymbia	Upper slope 9northern side) to top
EP00550AA	CG005	18	21	46	100	192	293		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Valley floor, near base of hills,
EP00550AA	SERN046	18	21	46	100	192	293		Czc	Low Open Woodland of Eucalyptus gamophylla and Eucalyptus	flat plain on valley
550AA	RAIL008b	24	21	46	100	192	293		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 7m	Lower slope of hillside with
EP00550AA	SERN063	22	21	46	100	192	293		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to	Valley slope, sloping up to the
EP00550AA	SERN028	36	21	46	100	192	293		PLHb	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	flat plain side valley gently
EP00550AA	SERN043	31	21	46	100	192	293		Czc	Scattered Low Trees of Eucalyptus gamophylla to 2.2m over Tall	Lower slope with series of small
EP00550AA	SERN031	40	21	46	100	192	293		Czc	Low Open Woodland of Eucalyptus gamophylla and Corymbia	Flat low hill sloping down to the
EP00550AA	SERN042	20	21	46	100	192	293		Czc	Low Open Woodland of Eucalyptus hamersleyana to 5m over Shrubland	flat in valley
EP00550AA	SERN112	37	21	46	100	192	293		Czc	Scattered Low Trees of Corymbia deserticola subsp. deserticola	flat low lying plain in valley
EP00550AA	SERN019	21	21	46	100	193	296		Qa	Tall Open Shrubland of Acacia tumida var. pilbarensis to 2.2m	small rise in valley, relatively
EP00550AA	SERN106	17	21	46	100	193	296		Czc	Scattered Low Trees of Corymbia hamersleyana to 4m over	Flat, valley floor but not damp
EP00550AA	SERN-CV1	17	21	46	100	193	296		PLHb	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to	Moderately sloping hillslope,
EP00550AA	TRIN015	29	21	46	100	193	296		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Rocky hillside facing/sloping
550AA	7RAIL035	21	21	46	100	191	291		AHd	Low Open Woodland to Scattered Low Trees of Eucalyptus	Ridge running south up to the
EP00550AA	CG001	8	21	46	100	191	291		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Low rise, hill top
EP00550AA	CG004	20	21	46	100	191	291		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Valley floor, very gently sloping

PROJ	site	#	50	100	200	400	600	data	geo	VEGETATION	HABITAT
								06/07/11 21:25:04.24 dend Coffey Solomon Robe with Pilbara June 2011 rerun			
								0.0000 0.2389 0.4778 0.7167 0.9556 1.1944 1.4333			
EP00550AA	VOQ31	13	21	46	100	191	291		PLHb	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Steep hillside with very minor
550AA	BD001	15	21	46	100	191	292		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 8m	Sloping NE, on side hill into
550AA	RAIL001	12	21	46	100	191	292		PLHb	Tall Shrubland of Acacia monticola and Hakea chordophylla to 3m	Side hill sloping east
550AA	RAIL003	17	21	46	100	191	292		Czc	Low Woodland of Eucalyptus leucophloia subsp. leucophloia and	Hill top
550AA	KR006	15	21	46	100	191	292		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Lower slope to valley floor,
550AA	RAIL006	14	21	46	100	191	292		Czc	Tall Open Scrub of Acacia dictyophleba and Grevillea wickhamii	Side hill sloping west
EP00550AA	SERN068	17	21	46	100	191	292		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Valley floor
EP00550AA	SERN108	26	21	46	100	191	292		PLHb	Low Woodland of Corymbia hamersleyana and Eucalyptus leucophloia	minor drainage line E-W running
EP00550AA	VOQ36	24	21	46	100	191	292		PLHb	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Very steep hillside slope facing
EP00550AA	ZION006	24	21	46	100	191	292		Tp	Low Woodland of Eucalyptus gamophylla and Corymbia hamersleyana	undulating sloping NE minor
550AA	1RAIL106	10	15	40	82	153	234		Agm	Low Woodland of Corymbia hamersleyana to 6m over Scattered Tall	hilly sloping east
HDRAIL	H236	13	15	40	82	153	234		Agm	Acacia inaequilatera scattered tall shrubs over Triodia wiseana	Upper slope & crest of low gently
550AA	KR120	6	15	40	82	153	234		Agm	Tall Open Shrubland of Acacia orthocarpa and Acacia	
550AA	KR121	10	15	40	82	153	234		Agm	Tall Open Shrubland of Acacia inaequilatera and Acacia	Mid slope, sloping west towards
FMG-2006	P8K	9	15	40	82	153	234		AgSm	Acacia bivenosa, Senna glutinosa subsp. glutinosa and Acacia	Gently sloping, facing south
550AA	6RAIL009	22	22	48	106	207	318		Qa	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia,	Gentle slope north up the range to
EP00550AA	ZION039	18	22	48	106	207	318		Qa	Low Woodland of Eucalyptus leucophloia subsp. leucophloia to 5m	on side hill sloping North towards
EP00550AA	ZION010	23	22	48	106	207	318		Tp	Low Woodland of Corymbia hamersleyana to 3m over Tall Open	hill top sloping
550AA	7RAIL037	18	22	48	106	207	319		Czc	Low Open Woodland to Scattered Low Trees of Eucalyptus	Flat valley floor, with a minor
550AA	7RAILCV1	23	22	48	106	207	319		Czc	Low Open Woodland to Scattered Low Trees of Eucalyptus	Very gently sloping north
EP00550AA	ZION011	12	22	48	106	207	319		Tp	Low Woodland of Eucalyptus gamophylla, Eucalyptus leucophloia	Gently sloping North mid height
BC	BCQ25	20	22	48	106	207	318		Qa	Acacia inaequilatera scattered tall shrubs over Senna glutinosa	Moderate to steep, north facing
ENP2679AA	SolQ28	24								Eucalyptus gamophylla Low Woodland to 0.8m over Grevillea	Valley floor
EP00550AA	TRIN004	24	10	29	58	112	175		Qc	Scattered Low Trees of Corymbia hamersleyana to 8m over Tall	Slope below hill 100m east and
EP00550AA	TRIN011	13	21	46	100	190	290			Scattered Low Trees of Corymbia hamersleyana to 3m over Tall	sloping east below outcrop/hill
EP00550AA	VOK009	23	21	46	100	190	289		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Hilltop and slopes. Sloping up to
WASA	0689	33	42	83	167	330	497		Czc	Eucalyptus leucophloia low open woodland over Triodia wiseana	Rocky, very steep spurs with much
EP00550AA	FT14	27	21	46	100	193	295		PLHb	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Midslope
WAFCBOR	1179	26	42	83	167	330	497		PLHb	Corymbia ferriticola ssp. ferriticola, Eucalyptus leucophloia,	Moderately sloping upper spur.
WPI	BOR266	11	21	47	103	200	305		Wm	API-7511 Ficus ?brachypoda scattered low trees over Cymbopogon	
WPI	BOR271	15	21	47	103	200	305		Wm	Acacia pruinocarpa over API-7524 Eremophila long sticky XXXX	
EP00550AA	SERN078	16	21	47	103	200	306		PLHb	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Very steep hillside facing south
WPI	TR042	16	21	47	103	200	306		PLWb	Terminalia canescens low open woodland over Stylobasium	
550AA	6RAIL008	22	21	47	102	196	301		AHs	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Hilltop sloping down on all sides,
550AA	6RAIL07a	42	21	47	102	196	301		AHs	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Gully/gorge feeding into Rio
550AA	7RAIL038	22	21	47	102	196	301		Czc	Tall Shrubland to Tall Open Shrubland of Acacia bivenosa, Acacia	Minor gully/drainage line/flow
550AA	6RAIL010	44	21	47	102	196	301		Qa	Low Open Woodland of Eucalyptus xerothermica to 8m over Tall	Minor creek and flood plain
550AA	6RAIL011	56	21	47	102	196	301		AHs	Open Woodland of Eucalyptus xerothermica to 15m over Low	Gorge/gully approximately 12m high
WPI	CW018	28	21	47	102	196	301		Tp	Eucalyptus leucophloia ssp. leucophloia low woodland over Acacia	Gully (dissected drainage) running
WPI	TR024	46	21	47	102	196	301		Tp	Drainage line; Corymbia hamersleyana low open woodland over	Minor drainage line on upper slope
WPI	TR021	51	21	47	102	196	301		Wm	Acacia citrinoviridis low open forest over Indigofera	Rocky gully
WPI	CWW062	18	21	47	103	200	307		Wm	Acacia aneura (narrow, fine veined, site 1259) low woodland over	
ENP2679AA	SolQ18	28								Eucalyptus leucophloia subsp. leucophloia Low Woodland to 5m	Very steep rocky scree slope
ENP2679AA	SolQ30	31								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	Drainage
ENP2679AA	SolQ24	30								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	Top of ridge, very steep
ENP2679AA	SolQ27	39								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	Steep hillslope facing North
308	MAT05	21	21	47	102	197	302		PLHb	Eucalyptus leucophloia subsp. leucophloia scattered trees over	Steep rocky breakaway and
232a	MESG27	27	21	47	102	197	302		Pho	Eucalyptus leucophloia scattered low trees over Acacia acradenia	Steep upper slope of gully
WPI	TR006	22	21	47	102	198	303		Tp	Eucalyptus leucophloia ssp. leucophloia low open woodland over	Gully of mesa
WPI	TR011	28	21	47	102	198	303		Tp	Eucalyptus leucophloia ssp. leucophloia low open woodland over	Minor drainage line on mesa crest
WPI	UC002	30	21	47	102	199	304		Tp	Corymbia ferriticola low open woodland over Acacia	Creek line
WPI	UC006	39	21	47	102	199	304		Tp	Acacia citrinoviridis and Stylobasium spathulatum high shrubland	Valley floor
WPI	UC004	17	21	47	102	199	304		Tp	Eucalyptus leucophloia ssp. leucophloia low open woodland over	Upper slope of mesa
WPI	UC005	25	21	47	102	199	304		Tp	Eucalyptus leucophloia ssp. leucophloia and Corymbia ferriticola	Rocky mid slope on mesa
EP00550AA	FT03	30	21	46	101	194	297		Czc	Tall Open Shrubland of Petalostylis labicheoides to 3.3m over	lower to mid slope gully
EP00550AA	ZION008	35	21	46	101	194	297		Tp	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	running north the slopes E-W-S
EP00550AA	FT15	36	21	46	101	194	297		Czc	Tall Open Shrubland of Petalostylis labicheoides and Acacia	lower slope gully
EP00550AA	FT22	32	21	46	101	194	297		PLHb	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	midslope gully
EP00550AA	VOQ005	28	21	46	101	194	297		Czc	Open Woodland of Eucalyptus victrix and Corymbia deserticola	Creekline, valley floor to lower
EP00550AA	FT28	25	21	46	101	194	297			Scattered Low Trees of Corymbia hamersleyana to 5m over Tall	creekline + 1-2m of upland bank
EP00550AA	FT21	26	21	46	101	194	297		Tp	Scattered Low Trees of Corymbia hamersleyana to 4m over Tall	STEEP GULLY WITH FLOW LINE
EP00550AA	ZION034	24	21	46	101	194	297		AHs	Open Woodland of Corymbia hamersleyana & Eucalyptus leucophloia	Drainage line/gully
EP00550AA	ZION037	29	21	46	101	194	297		AHs	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 4m	Gully between two hills, sloping
550AA	KR005	39	23	49	107	209	323		PLHb	Scattered Low Trees Of Corymbia hamersleyana to 4.5m over	Low/Small, wide gully/ drainage
EP00550AA	ZION003	42	23	49	107	209	323		Tp	Low Woodland of Corymbia hamersleyana and Eucalyptus leucophloia	undulating levee vegetation south
EP00550AA	ZION041	48	23	49	107	209	323		Qa	Low Open Forest of Eucalyptus gamophylla, Eucalyptus leucophloia	two minor drainage lines running

PROJ	site	#	50	100	200	400	600	data	geo	VEGETATION	HABITAT
								06/07/11 21:25:04.24 dend Coffey Solomon Robe with Pilbara June 2011 rerun			
								0.0000 0.2389 0.4778 0.7167 0.9556 1.1944 1.4333			
								| | | | | | |			
EP00550AA	TRIN011A	24	21	46	100	190	290		Qc	Low Woodland of Eucalyptus leucophloia subsp. leucophloia and	drainage line 15m wide E-W
EP00550AA	SERN029	41	21	46	101	194	298		Czc	Low Woodland of Eucalyptus leucophloia subsp. leucophloia,	Valley floor, very gently sloping
EP00550AA	VOK012	50	21	46	101	194	298		Czc	Low Open Woodland to Scattered Low Trees of Eucalyptus	Flowline/gully between two small
EP00550AA	SERN109	47	21	46	101	194	298		Czc	Low Woodland of Corymbia hamersleyana to 6m over Tall Shrubland	minor drainage line running E-W
EP00550AA	VOK021	45	21	46	101	194	298		Qc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia,	Minor drainage line running east-
EP00550AA	VOK002	29	21	46	101	194	298		Czc	Scattered Low Trees of Corymbia hamersleyana to 5m over Tall	Gully/drainage line off the
EP00550AA	VOK007	36	21	46	101	194	298		Czc	Woodland of Eucalyptus leucophloia subsp. leucophloia and	Small drainage line/gully,
EP00550AA	VOK011	42	21	46	101	194	298		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Small gully off the ranges
EP00550AA	VOK005	43	10	29	58	112	174		Qa	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to	Gently sloping up to the west to
EP00550AA	ZION033	44	10	29	58	112	174		Qa	Low Open Woodland of Corymbia hamersleyana and Eucalyptus	Valley floor, very gently sloping
EP00550AA	FT32	12	21	46	101	195	300		Czc	Scattered Low Trees of Corymbia hamersleyana to 5m over Mid	hill top flat
EP00550AA	VOQ40	18	21	46	101	195	300		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Steep hill side, lower part of
EP00550AA	TRIN002	22	21	46	101	195	300		PLHb	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Mid-top of ridge-sloping greatly
EP00550AA	VOK008	24	21	46	101	195	300		Czc	Scattered Low Trees of Corymbia hamersleyana and Eucalyptus	Hilltop and slopes, with a
EP00550AA	ZION007	28	21	46	101	195	300		PLHb	Low Woodland of Corymbia hamersleyana and Eucalyptus leucophloia	sloping north on side hill, gently
EP00550AA	TRIN007	38	21	46	101	195	300		PLHb	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	hill side slope facing north
ENP2679AA	SolQ01	51								Corymbia hamersleyana Low Woodland to 6m over Acacia	Hill slope, moderately steep,
ENP2679AA	SolQ15	32								Corymbia hamersleyana and Eucalyptus leucophloia subsp.	Rocky steep scree slope facing
ENP2679AA	SolQ03	24								Corymbia deserticola subsp. deserticola, Corymbia hamersleyana	Low rocky rise, east of valley
ENP2679AA	SolQ05	26								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	Upper hillslope, moderately steep
ENP2679AA	SolQ06	39								Corymbia hamersleyana and Corymbia deserticola subsp.	Low rocky rise, east side of range
ENP2679AA	SolQ13	18								Eucalyptus leucophloia subsp. leucophloia and Corymbia	Rocky hilltop
ENP2679AA	SolQ32	14								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	Hilltop and slopes of low rise
ENP2679AA	SolQ35	26								Eucalyptus leucophloia subsp. leucophloia and Corymbia	Hilltop near breakaway
ENP2679AA	SolQ37	28								Corymbia hamersleyana and Eucalyptus leucophloia subsp.	Upper slope to top of low hill
550AA	RAIL008a	32	21	46	101	194	299		Czc	Low Open Woodland of Corymbia hamersleyana and Eucalyptus	Hill slope, moderately sloping
EP00550AA	SERN025	45	21	46	101	194	299		Czc	Low Open Woodland of Corymbia hamersleyana and Eucalyptus	Moderately sloping hillside,
EP00550AA	SERN082	34	21	46	101	194	299		PLHb	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Steep rocky hillside facing north-
EP00550AA	SERN012	23	21	46	101	194	299		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Hillside, moderately sloping,
EP00550AA	SERN024	31	21	46	101	194	299		PLHb	Low Woodland of Eucalyptus leucophloia subsp. leucophloia and	Hill top
EP00550AA	SERN022	37	21	46	101	194	299		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Sloping SW on side/bottom hill
EP00550AA	SERN081	52	21	46	101	194	299		PLHb	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Hillside sloping moderately down
EP00550AA	SERN105	30	21	46	101	194	299		PLHb	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	RIDGE TO MID SLOPE BENEATH HILL
550AA	4RAIL017	43	22	48	104	201	308		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Gently sloping north to the
550AA	RAIL020	28	22	48	104	201	308		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Valley floor, near base of hill,
550AA	6RAIL005	18	22	48	104	201	308		Czc	Low Woodland of Eucalyptus gamophylla, Eucalyptus leucophloia	Valley floor, gently sloping
550AA	6RAIL014	25	22	48	104	201	308		AHs	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Base of hillside, below breakaway,
550AA	RAIL019	37	22	48	104	201	308		Czc	Open Woodland of Eucalyptus gamophylla and Corymbia deserticola	Valley floor, near hill base,
EP00550AA	VOK024	31	22	48	104	201	308		Qc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Low gently hill slope, very gently
EP00550AA	SERN079	41	23	49	107	209	322		Qa	Open Low Woodland of Corymbia deserticola subsp. deserticola and	Valley floor
550AA	6RAIL001	39	22	48	104	203	310		Qs	Low Woodland of Eucalyptus gamophylla and Eucalyptus leucophloia	Gently sloping south/plain
550AA	6RAIL012	35	22	48	104	203	310		Qs	Low Open Woodland of Eucalyptus gamophylla and Eucalyptus	Very gently sloping downwards to
550AA	6RAIL017	27	22	48	104	203	310		Qa	Low Woodland of Corymbia hamersleyana and Eucalyptus leucophloia	Low lying drainage E-W
EP00550AA	VOQ009	42	22	48	104	203	310		Qa	Open Woodland of Eucalyptus xerothermica, Eucalyptus gamophylla	Valley floor, relatively flat
550AA	6RAIL015	29	23	49	107	209	323		Qs	Low Woodland of Eucalyptus leucophloia subsp. leucophloia and	Minor drainage line N-S
550AA	RAIL014	42	23	49	107	209	323		Czc	Low Open Woodland of Eucalyptus gamophylla and Eucalyptus	Relatively flat south of range
550AA	RAIL016	36	22	48	104	202	309		Qs	Low Woodland of Eucalyptus gamophylla and Corymbia deserticola	Gently sloping south - in plain
550AA	RAIL017	22	22	48	104	202	309			Scattered Low Trees of Eucalyptus gamophylla and Corymbia	Relatively flat plain
550AA	6RAIL002	39	10	29	58	111	173		Qs	Scattered Low Trees of Corymbia hamersleyana to 4m over	Gently sloping south/plain
EP00550AA	VOQ101	38	10	29	58	111	173		Qa	Tall Open Scrub of Acacia aneura var. ?, Acacia pruinocarpa,	Valley floor, floodplain
EP00550AA	VOQ016	25	10	29	58	111	173		Czc	Open Woodland of Eucalyptus gamophylla and Corymbia hamersleyana	Valley floor, moderately lying,
EP00550AA	VOQ014	31	10	29	58	111	173		Qa	Open Woodland of Corymbia deserticola subsp. deserticola to 4m	Valley Floor, moderately lying,
EP00550AA	VOQ20	31	10	29	58	111	173		Qa	Open Woodland of Corymbia deserticola subsp. deserticola and	Floodplain, very gently sloping
550AA	6RAIL018	34	22	48	104	203	311		Qa	Low Woodland of Eucalyptus leucophloia subsp. leucophloia and	Slightly undulating in valley
EP00550AA	VOQ019	23	22	48	104	203	311		Qa	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 7m	Valley floor, gently sloping south
EP00550AA	VOQ015	21	22	48	104	203	311		Qa	Open Woodland of Eucalyptus gamophylla to 5m over Tall Open	Valley floor, moderately lying,
EP00550AA	ZION045	24	23	49	107	209	323		Qa	Woodland of Eucalyptus gamophylla and Eucalyptus leucophloia	Valley floor, gently sloping east
550AA	6RAIL016	29	22	48	104	203	311		Czc	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Undulating in valley
ENP2679AA	SolQ23	32								Eucalyptus leucophloia subsp. leucophloia and Eucalyptus	Valley floor, very gently sloping
EP00550AA	VOQ42	31	22	48	104	203	311		Czc	Open Woodland of Eucalyptus leucophloia subsp. leucophloia and	Valley floor, moderately lying,
EP00550AA	VOQ012	30	22	48	104	203	312		Qa	Open Woodland of Eucalyptus gamophylla and Corymbia deserticola	Valley floor
EP00550AA	VOQ25	30	22	48	104	203	312		Qa	Scattered Low Trees of Corymbia hamersleyana to 5m over Tall	Valley floor, gently undulating
WAMTLEA	0489	8	20	45	96	183	277		AFm	Acacia hilliana low open shrubland over Plectrachne sp. (MET	Flat topped hill.
550AA	KR002	10	20	45	96	183	277		PLHb	Scattered Low Trees of Corymbia hamersleyana to 2.5m over Low	Hillslope, gently sloping eastward
EP00550AA	FT05	12	20	45	96	183	277		Czc	Scattered Low Trees of Corymbia hamersleyana to 3.4m over Mid	Hilltop and midslope

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								06/07/11 21:25:04.24 dend Coffey Solomon Robe with Pilbara June 2011 rerun			
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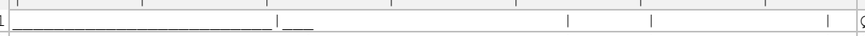
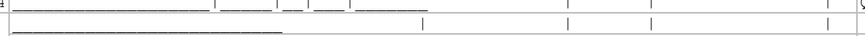
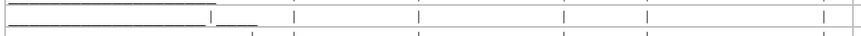
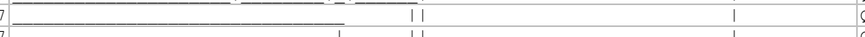
								| | | | | | |			
EP00550AA	FT12	12	20	45	96	183	277		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Midslope hill
EP00550AA	FT19	17	20	45	96	183	277		Tp	Low Open Woodland of Corymbia hamersleyana to 5m over Scattered	Lower slope next to major gully
EP00550AA	FT20	19	20	45	96	183	277		Tp	Scattered Tall Shrubs of Hakea chordophylla to 4m over Low Open	Mid slope next ot gully
EP00550AA	FT13	23	20	45	96	183	277		Czc	Scattered Low Trees of Corymbia hamersleyana to 5m over Mid	Minor creek line/ slight gully
EP00550AA	FT17	15	20	45	96	183	277		Czc	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Hilltop to upper slope
EP00550AA	FT18	9	20	45	96	183	277		Tp	Scattered Hummock Grasses of Triodia aff. melvillei (10, 114) to	Side of hill next to gully/ravine
EP00550AA	FT27	27	20	45	96	184	278		Czc	Low Open Woodland of Corymbia hamersleyana and Eucalyptus	Lower slope gully with flowline
EP00550AA	FT36	22	20	45	96	184	278		Czc	Low Woodland of Eucalyptus gamophylla to 3.4m over Mid Dense	FLAT DAMP AREA
550AA	6RAIL007	24	21	46	100	193	294		AHs	Low Open Woodland of Eucalyptus leucophloia to 5m over Scattered	Hilltop and slopes, facing the
ENP2679AA	SolQ19	15								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	Low rocky rise
EP00550AA	ZION021	14	21	46	100	193	294		Tp	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Undulating small hills - Sloping
EP2679Robe	RB05	12								Corymbia hamersleyana Low Open Woodland to 5m over Acacia arida	Hilltop
EP2679Robe	RB06	12								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	Upper slope, gentle
EP2679Robe	RB12	12								Eucalyptus leucophloia subsp. leucophloia and Corymbia	Upper slope to top of rise,
ENP2679AA	SolQ21	16								Corymbia hamersleyana and Eucalyptus leucophloia subsp.	Upper hillslope to hilltop,
EP2679Robe	RB08	19								Eucalyptus leucophloia subsp. leucophloia and Corymbia	Hilltop to lower slope, adjacent
EP2679Robe	RB13	17								Corymbia hamersleyana and Eucalyptus leucophloia subsp.	Top of low rise
EP2679Robe	RB09	14								Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to	
EP00550AA	VOQ47	11	20	45	96	184	279		Czc	Open Woodland of Corymbia hamersleyana and Eucalyptus	Mid to upper slope of low rise in
EP00550AA	ZION009	9	20	45	96	184	279		Tp	Low Open Forest of Eucalyptus gamophylla and Corymbia	Gently sloping north
EP00550AA	ZION027	13	20	45	96	184	279		Tp	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Steep Slope sloping South
EP00550AA	ZION019	14	20	45	96	184	279		Tp	Low Open Woodland to Scattered Low Trees of Eucalyptus	Hill slope, sloping to the east
EP00550AA	ZION020	12	20	45	96	184	279		Tp	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Gently sloping hillsides, sloping
EP00550AA	ZION024	10	20	45	96	184	279		AHs	Low Woodland of Eucalyptus leucophloia subsp. leucophloia to 4m	Mid summit, top of hill sloping
EP00550AA	FT07	20	20	45	96	185	280		Czc	Scattered Tall Shrubs of Petalostylis labicheoides to 3.2m over	Upslope from gully running N-S
EP00550AA	ZION004	22	20	45	96	185	280		Czc	Low Open Forest of Eucalyptus leucophloia subsp. leucophloia and	Small hill/outcropping ironstone
EP00550AA	ZION022	15	20	45	96	185	280		Tp	Scattered Low Trees of Corymbia ferriticola subsp. ferriticola	Wide gully/drainage line running
EP00550AA	ZION015	20	20	45	96	185	280		Tp	Scattered Trees of Eucalyptus leucophloia subsp. leucophloia to	Gully/flowline running east-west
EP00550AA	ZION025	16	20	45	96	185	280		Tp	Low Open Woodland of Corymbia hamersleyana to 6m over Tall Open	Gully running north-south
EP00550AA	ZION018	21	20	45	96	185	280		Tp	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Gully running east-west
EP2679Robe	RB04	14								Corymbia hamersleyana and Eucalyptus gamophylla Low Open	Low rise
EP00550AA	ZION012	15	20	45	96	185	280		Tp	Low Woodland of Eucalyptus leucophloia subsp. leucophloia and	Same as previous
EP00550AA	ZION014	11	20	45	96	185	280		Tp	Scattered Low Trees Corymbia hamersleyana and Eucalyptus	Flat hilltop with a very gently
EP00550AA	ZION017	15	20	45	96	185	280		Tp	Scattered Trees of Corymbia hamersleyana to 10m over Tall	Small gully/flowline
EP00550AA	ZION030	20	20	45	96	185	280		Tp	Low Open Woodland of Corymbia hamersleyana to 4m over Tall Open	Flat on small rise above valley
EP00550AA	FT11	13	20	45	96	185	280		Tp	Scattered Corymbia hamersleyana to 6m over Open Heath of Acacia	Ridge next to breakaway
EP00550AA	FT25	18	20	45	96	185	280		Tp	Low Open Woodland of Corymbia hamersleyana to 4m over Shrubland	Upper slope of hill
EP00550AA	FT31	16	20	45	96	185	280		Tp	Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia	Upper slope in-between ridge and
EP00550AA	FT24	17	20	45	96	185	280		PLHb	Low Open Woodland of Corymbia hamersleyana to 4.5m over Tall	Upper slope/sloping west and south
EP00550AA	FT33	14	20	45	97	186	282		PLHb	Low Open Woodland of Corymbia hamersleyana to 3.5m over	Upper- midslope next to major
EP2679Robe	RB01	9								Eucalyptus leucophloia subsp. leucophloia, Eucalyptus gamophylla	Hilltop
EP2679Robe	RB11	9								Eucalyptus leucophloia subsp. leucophloia, Eucalyptus gamophylla	Hilltop
EP2679Robe	RB02	7								Corymbia hamersleyana and Eucalyptus leucophloia subsp.	Hilltop
EP2679Robe	RB10	15								Corymbia hamersleyana and Eucalyptus leucophloia subsp.	
EP2679Robe	RB07	12								Corymbia hamersleyana Low Open Woodland to 6m over Acacia	Hilltop
EP00550AA	ZION013	9	20	45	96	185	281		Tp	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia	Sloping to west minor hill,
EP00550AA	ZION023	8	20	45	96	185	281		Tp	Scattered Low Trees of Corymbia hamersleyana to 7m (outside	Mesa top sloping east
WPI	AD002	11	17	42	90	168	253		Wm	Eucalyptus leucophloia ssp. leucophloia low open woodland over	Low hill side
WPI	KB004	13	17	42	90	168	253		Tp	Eucalyptus leucophloia ssp. leucophloia low woodland over	Midslope
WPI	TsRR021	16	17	42	90	168	253		Qc	Acacia inaequilatera high open shrubland over Triodia sp. Robe	Slope of a low hill
WPI	CN005	11	13	34	68	127	195		Tp	Triodia sp. Robe River and Triodia wiseana hummock grassland	Mesa crest
232a	MESG11	17	13	34	68	127	195		Tp	Eucalyptus leucophloia scattered low trees over Acacia	Low ridge on edge of mesa
WPI	HAM001	17	21	46	100	193	295		PLHb	Acacia inaequilatera open shrubland over Triodia wiseana hummock	Plateau
WPI	ASA005	15	17	42	90	169	254		Tp	Acacia atkinsiana and Acacia bivenosa high shrubland over	
WPI	TR031	16	17	42	90	169	254		PLWb	Eucalyptus leucophloia ssp. leucophloia scattered low trees over	Mesa top
WPI	TR014	9	17	42	90	169	254		Tp	Acacia pruinocarpa high shrubland over Triodia wiseana open	Mesa crest
WPI	TR070	12	17	42	90	169	254		Tp	Acacia inaequilatera over A. bivenosa over Triodia wiseana	Mesa top
WPI	TR026	10	17	42	90	169	254		Tp	Grevillea wickhamii ssp. hispidula high open shrubland over	Mesa crest
WPI	CNW001	8	17	42	90	169	254		Qc	Triodia wiseana hummock grassland	On the lower slope of medium sized
WPI	CNW006	9	17	42	90	169	254		Qc	Triodia wiseana hummock grassland	Debris slope
EP00550AA	ZION042	7	17	42	90	169	254		Qa	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 6m	Steep hillside slope facing North
ENP2679AA	SolQ31	14								Eucalyptus leucophloia subsp. leucophloia Open Woodland to 4m	Valley floor in between low
WPI	TRW001	19	13	35	71	134	205		Wm	Eucalyptus leucophloia ssp. leucophloia scattered low trees over	Low rolling hill
WPI	CN001	10	17	42	90	169	256		Tp	Triodia sp. Robe River open hummock grassland	Flat mesa top
WPI	UCW005	10	17	42	90	169	256		Tp	Eucalyptus leucophloia ssp. leucophloia scattered low trees over	Hill crest

PROJ	site	#	50	100	200	400	600	data	geo	VEGETATION	HABITAT
								06/07/11 21:25:04.24 dend Coffey Solomon Robe with Pilbara June 2011 rerun			
								0.0000 0.2389 0.4778 0.7167 0.9556 1.1944 1.4333			
								| | | | | | |			
WPI	CP600	11	17	42	90	169	256		Qac	Eucalyptus leucophloia subsp. leucophloia scattered low trees	Mesa free face
WPI	TR086	14	17	42	90	169	256		Tp	Triodia sp. Robe River and Triodia wiseana open hummock	Mesa top
WPI	JW009	15	17	42	90	169	256		Tp	Eucalyptus leucophloia ssp. leucophloia low woodland over Acacia	Mid to lower mesa debris slope
WPI	TR003	17	17	42	90	169	256		Tp	Eucalyptus leucophloia ssp. leucophloia scattered low trees over	Mesa top/edge
WPI	TR004r	28	17	42	90	169	256		Tp	Eucalyptus leucophloia ssp. leucophloia low open woodland over	Rock face community on upper
WAMTROB	0951	17	10	29	57	109	169		Czc	Corymbia hamersleyana low open woodland over Tephrosia rosea	Bed of a moderate sized creek.
FMG-2006	9GtoP9Fj	25	10	29	57	109	169		Czr	Corymbia ?hamersleyana scattered Low trees over Grevillea	Small to moderate creek between
550AA	KR008	21	10	29	57	109	169		Czc	Low Open Woodland of Corymbia hamersleyana to 5m over Open	Minor to major creek line running
550AA	RAIL004	31	10	29	57	109	169		Czc	Low Open Forest of Corymbia hamersleyana to 10m over Tall Open	Minor creek line
2491	FMC13	53	47	97	194	382	572		AHm	Eucalyptus leucophloia, Corymbia hamersleyana low open woodland	Flowline through low stony hills
2490	FMG72	51	47	97	194	382	572		AHm	Corymbia hamersleyana scattered low trees over Acacia tumida,	Broad creek bed and immediate bank
2491	FMR70	32	47	97	194	382	572		Qc	Corymbia spp. scattered low trees over Acacia tumida var.	Bed of medium sized creek with
HDRAIL	H261	39	47	97	194	382	572		Qa	Corymbia candida scattered trees over C. hamersleyana scattered	Wide raised flood flats between
ENP2679AA	SolQ34	38								Eucalyptus xerothermica Scattered Low Trees to 4m over Acacia	Moderate drainage line
271	BRO06	49	47	97	194	382	572		Czc	Petalostylis labicheoides, Grevillea wickhamii subsp. hispidula	Minor drainage line
271	BRO38	105	47	97	194	382	572		Qa	Corymbia hamersleyana low open woodland over Acacia bivenosa,	Broad creek line
271	BRO40	85	47	97	194	382	572		Qs	Corymbia hamersleyana low woodland over Grevillea wickhamii	Drainage line
271	BRO46	76	47	97	194	382	572		Qa	Petalostylis labicheoides and Acacia pyrifolia shrubland over	Floodplain of broad cobbly
HDRAIL	H285	42	7	22	43	82	126		Czc	Acacia aneura, A. coriacea scattered tall shrubs over Acacia	Creek line.
FMG-2006	P9C	36	47	97	194	383	574		Qa	Eucalyptus victrix and Corymbia sp 40 Low Open Woodland over	Floodplain dissected by minor
FMG-2006	P9C-2	45	47	97	194	383	574		Qc	Eucalyptus victrix Low Woodland over Acacia tumida var.	Creek banks - riparian vegetation
FMG-2006	P9U	52	47	97	194	383	574		Czr	Eucalyptus leucophloia subsp. leucophloia Scattered low trees	Drainage line at foot of gently
271	BRO09	64	7	23	45	87	133		Qa	Eucalyptus victrix scattered low trees over Pluchea dentex,	Broad cobbly bed of major creek
271	BRO49	58	7	23	45	87	133		Qa	Eucalyptus victrix open woodland over Goodenia lamprosperma very	Cobbly bed of broad major
FMG-2006	P9track3	37	7	23	45	87	134				
2491	FMC11	52	47	97	194	384	575		Qa	Eucalyptus victrix low open woodland over Acacia coriacea subsp.	Floodplain adjacent to moderate
2491	FMR60	52	47	97	194	384	575		Qa	Eucalyptus victrix scattered low trees over Acacia trachycarpa,	Bed of a medium sized creek
HDRAIL	H050	45	47	97	194	384	575		Qa	Eucalyptus victrix woodland over Acacia citrinoviridis open	Bank of Weeli Wolli Creek.
HDRAIL	H051	51	47	97	194	384	575		Qa	Eucalyptus victrix scattered low trees over Acacia	Floodplain.
2491	FML35	72	47	97	194	384	575		Td	Acacia aneura low woodland to low open forest over Acacia	Creek flood banks dissected by
2491	FMR58	61	47	97	194	384	575		Qs	Acacia aneura (A. pruinocarpa) low woodland to low open forest	Gentle southerly-facing slope
2491	FMR62	60	47	97	194	384	575		Qa	Acacia aneura low forest over Psydrax latifolia tall open	Broad flow line on very gentle S-
2491	FMR77	73	47	97	194	384	575		Qa	Corymbia hamersleyana scattered low mallees over Grevillea	Flood plain (narrow) at edge of a
2491	FMR57	81	47	97	194	384	575		Qa	Eucalyptus victrix low open woodland over Grevillea wickhamii,	Creek line (Goman Creek)
2491	FMR-MN	64	47	97	194	384	575		Qa	Eucalyptus victrix low open woodland over Grevillea wickhamii,	Creek line
HDRAIL	H257	68	47	97	194	384	575		Qa	Eucalyptus victrix scattered low trees over Acacia trachycarpa	Flood plain adjacent to creek.
550AA	1RAIL104	26	7	22	43	82	127		AFtc	Low Woodland of Eucalyptus camaldulensis var. obtusa to 6m over	minor drainage N-S
ENP2679AA	SolQ16	31								Eucalyptus camaldulensis var. obtusa Woodland to 20m over	Major drainage line running N/S,
ENP2679AA	SolQ20	42								Eucalyptus camaldulensis var. obtusa Tall Woodland to 20m over	Major drainage line
EP00550AA	TRIN008	28	8	26	53	100	157		Qa	Closed Forest of Eucalyptus camaldulensis var. obtusa to 28m	major drainage line E-W
EP00550AA	ZION050	16	8	26	53	100	157		Tp	Tall Open Forest of Eucalyptus camaldulensis var. obtusa over	Major Drainage line, Creek with
550AA	5RAIL031	18	8	26	53	99	154		Qa	Tall Open Shrubland of Acacia tumida to 3m over Open Tussock	Major drainage line N-S
550AA	8RAIL092	40	8	26	53	99	155		Qa	Low Open Woodland of Acacia aff. aneura (narrow, fine veined:	Flat mulga plain with a minor
HDRAIL	H045	25	8	26	53	99	155		Qa	Eucalyptus victrix scattered trees to open woodland over Acacia	Floodplain/flats of creek channels
WPI	BOR152	30	8	26	53	99	155		Qc	Acacia citrinoviridus and Acacia pyrifolia high shrubland over	Creek line
WPI	BOR247	29	8	26	53	99	155		Qc	Grevillea wickhamii and Acacia tumida open scrub over Triodia	Drainage line
550AA	7RAIL039	59	10	29	57	110	172		Qa	Scattered Trees of Eucalyptus victrix to 15m over Tall Shrubland	Tributary flowline from a major
550AA	RAIL007	42	10	29	57	110	172		PLHb	Open Forest of Eucalyptus victrix and Eucalyptus xerothermica to	Drainage at base of breakaway
550AA	KR001	27	8	26	53	100	157		PLHb	Woodland to Open Woodland of Eucalyptus camaldulensis var.	Major drainage
EP00550AA	ZION005	23	8	26	53	100	157		Tp	Shrubland of Tephrosia rosea var. glabrior to 1.2m over Low Open	Major drainage line runnning E-W
EP00550AA	ZION002	18	8	26	53	100	157		Tp	Open Forest of Eucalyptus victrix to 20m over Low Shrubland of	Major drainage line, creek bed
EP2679Robe	RB15	29								Eucalyptus camaldulensis var. obtusa and Eucalyptus victrix Tall	Major drainage
ENP2679AA	SolQ26	25								Eucalyptus victrix Low Open Woodland to 5m over Tephrosia rosea	Major drainage
550AA	8RAIL096	34	8	26	53	101	158		Qa	Open Woodland of Eucalyptus leucophloia subsp. leucophloia to 7m	Major drainage line running north-
WPI	CP031	30	8	26	53	101	159		Qa	Eucalyptus victrix woodland over mixed very open herbland	Creek/drainage line
WPI	KB021	55	8	26	53	101	159		Qa	Eucalyptus camaldulensis var. obtusa and E. victrix open forest	Large river bed and banks
WPI	TC008	29	8	26	53	101	159		Qc	Eucalyptus victrix woodland over Melaleuca linophylla and M.	River bed
WPI	HR044	35	8	26	53	101	159		Qc	Eucalyptus victrix woodland over Melaleuca linophylla high	River
301A	BUN05	31	8	26	53	101	159		Qac	Eucalyptus victrix open woodland over Acacia trachycarpa,	Wide creek line - seasonal water
308	MATH14	42	7	22	43	83	129		Qr	Eucalyptus camaldulensis low open woodland over Petalostylis	Broad river bed
378	BUN60	20	8	26	53	100	156		Q1	Eucalyptus victrix scattered trees over Tephrosia rosea var.	Pebbly, cobbly scoured river bed.
WPI	CP508	33	7	22	43	83	129		Qr	Eucalyptus camaldulensis var. obtusa open forest over Melaleuca	Robe river bed
308	MEAS08	59	7	22	43	83	129		Qac	Eucalyptus camaldulensis low open forest over Melaleuca	River channel, banks of one
550AA	4RAIL121	46	23	49	107	209	321		Qa	Low Open Woodland of Corymbia hamersleyana to 9m over Tall Open	Valley floor
EP00550AA	SERN015	44	10	29	58	112	174		Qa	Woodland of Eucalyptus xerothermica and Corymbia hamerlseyana to	low lying flat in valley

PROJ	site	#	50	100	200	400	600	data	geo	VEGETATION	HABITAT
								06/07/11 21:25:04.24 dend Coffey Solomon Robe with Pilbara June 2011 rerun			
								0.0000 0.2389 0.4778 0.7167 0.9556 1.1944 1.4333			
EP00550AA	SERN023	42	23	49	107	209	321		Qa	Low Open Woodland of Corymbia hamersleyana and Eucalyptus	Valley floor, very gently sloping
EP00550AA	SERN007	26	23	49	107	209	321		Qa	Open Woodland of Corymia hamersleyana to 7m over Tall Open	Valley floor, low lying, very
EP00550AA	SERN107	54	10	29	58	112	174		Qa	Low Open Forest of Woodland of Corymbia hamersleyana and	flat low lying in valley
EP00550AA	VOK020	53	10	29	58	112	174		Qa	Woodland to Open Woodland of Corymbia hamersleyana to 11m over	Valley floor, very gently sloping
EP00550AA	VOK022	59	10	29	58	112	174		Qa	Open Woodland of Corymbia hamersleyana and Eucalyptus gamophylla	Valley floor with small flowline
EP00550AA	TRIN009	52	10	29	58	112	174		Qa	OW of Corymbia hamersleyana to 11m over Tall Closed Scrub of	low lying in valley, flat
EP00550AA	VOK017	55	10	29	58	112	174		Qc	Woodland to Open Woodland of Corymbia hamersleyana to 10m Tall	Major drainage line, runs east
EP00550AA	TRIN010	47	10	29	58	112	174		Qa	Tall Open Scrub of Acacia pruinocarpa to 3m, Hakea lorea subsp.	low lying flat in valley
EP00550AA	TRIN012	62	10	29	58	112	174		Qa	Scattered Low Trees of Corymbia hamersleyana to 6m over Tall	low lying flat in valley
EP00550AA	TRIN013	48	10	29	58	112	174		Czc	Low Open Woodland of Corymbia to 8m over Tall Open Scrub of	Low lying in Valley flat
EP00550AA	TRIN014	46	10	29	58	112	174		Qa	Scattered Low Trees of Corymbia hamersleyana to 5m over Tall	Flat low lying in valley same as
EP2679Robe	RB14	55								Corymbia hamersleyana Low Open Woodland to 6m over Acacia	Gorge adjacent to major drainage
ENP2679AA	SolQ25	48								Corymbia hamersleyana Low Woodland to 5m over Hakea lorea subsp.	Valley floor adjacent to drainage,
ENP2679AA	SolQ29	47								Scattered Corymbia hamersleyana to 8m over Grevillea wickhamii	Valley floor east of ranges
ENP2679AA	SolQ09	51								Corymbia hamersleyana Low Open Woodland to 10m over Acacia	Drainage line
ENP2679AA	SolQ12	45								Corymbia hamersleyana Low Open Woodland to 8m over Acacia	Drainage
ENP2679AA	SolQ14	53								Corymbia hamersleyana Low Open Woodland to 6m over Acacia	Valley floor
ENP2679AA	SolQ17	51								Corymbia hamersleyana and Eucalyptus xerothermica Low Open	Valley floor very gently
ENP2679AA	SolQ02	49								Eucalyptus xerothermica Low Woodland to 8m over Grevillea	Valley floor, west of drainage
ENP2679AA	SolQ04	32								Eucalyptus xerothermica and Eucalyptus gamophylla Low Open	Floodplain
ENP2679AA	SolQ36	55								Corymbia hamersleyana, Eucalyptus xerothermica and Eucalyptus	Flowline
WAHAMSTN	0217	81	46	95	187	370	551		Qs	Acacia aneura var. ?aneura/intermedia, Acacia pruinocarpa high	Colluvial fan. Gentle slope to
WAHAMSTN	0218	55	46	95	187	370	551		Qs	Acacia aneura var. ?aneura/intermedia, Acacia pruinocarpa,	Poorly defined flow line on
550AA	4RAIL025	50	34	67	142	281	427		Qs	Tall Open Scrub of Acacia aneura var. ? aneura and Acacia	Flat plain
2490	FMG42	45	34	67	142	281	427		Qs	Acacia aneura, A. pruinocarpa tall open shrubland over Dodonaea	Clayey plain
EP00550AA	INV008	60	34	67	142	281	427		Qa	Scattered Trees of Corymbia candida to 12m over Low Open Trees	Flat mulga plain with a minor
EP00550AA	INV010	46	34	67	142	281	427		Qa	Low Open Woodland of Corymbia candida to 6m over Tall Shrubland	flat
EP00550AA	INV009	37	34	67	142	281	427		Qa	Tall Open Scrub of Acacia aneura var. conifera to 7m over	flat
550AA	8RAIL099	27	34	67	142	281	427		Qa	Tall Open Scrub of Acacia aff. aneura (narrow, fine veined;	Flats
EP00550AA	VOQ35	38	34	67	142	281	427		AFk	Tall Open Scrub of Acacia aneura var. pilbarana and Acacia	Valley floor, relatively flat
550AA	5RAIL035	48	34	67	142	281	427		Qa	Tall Open Scrub of Acacia aneura var. conifera, Acacia	Flat in valley
ENP2679AA	SolQ11	45								Acacia aff. aneura (narrow fine veined; site 1259) Open Forest	Valley floor flats
ENP2679AA	SolQ07	47								Acacia aff. aneura (narrow fine veined; site1259) Tall Open	Wide flowline
232a	MEA04	48	47	97	194	383	573		Qc	Eucalyptus leucophloia low woodland over Acacia pruinocarpa tall	Steep S-facing rocky gully slope
FMG-2006	P9G(2)	41	47	97	194	383	573		Qc	Corymbia aspera Low Open Woodland over Acacia aneura var.	Low lying in depression, very
550AA	7RAIL046	34	34	67	142	281	428		Qa	Tall Open Shrubland of Acacia aff. aneura (narrow, fine veined;	Flats, gently sloping south
550AA	8RAIL089	37	34	67	142	281	428		Qa	Tall Open Shrubland of Acacia synchronicia, Acacia sclerosperma	Very gently sloping south
550AA	8RAIL100	42	34	67	142	281	428		Qa	Tall Open Shrubland of Acacia pruinocarpa and Acacia aff. aneura	Very gently sloping south east
550AA	8RAIL090	35	34	67	142	281	428		Qa	Low Open Woodland of Eucalyptus xerothermica, "Corymbia	Very gently sloping down to the
550AA	8RAIL098	51	34	67	142	281	428		Qa	Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia,	Very gently sloping to the north-
EP00550AA	INV011	43	34	67	142	281	427		Qa	Woodland of Acacia aneura var. pilbarana to 11m over Tall Open	Flat mulga plain with slight
EP00550AA	INV029	23	34	67	142	281	427		Qa	Tall Open Scrub of Acacia aneura var. conifera to 7m over	flat plain
EP00550AA	INV063	28	34	67	142	281	427		Qa	Low Open Forest of Corymbia hamersleyana, Acacia aff. aneura	Low lying, relatively flat
EP00550AA	INV015	45	22	48	105	206	317		Qa	Tall Open Shrubland of Acacia ancistrocarpa, Acacia aff. aneura	Flat Mulga Plain
EP00550AA	INV061	23	22	48	105	206	317		Qc	Tall Open Shrubland of Acacia xiphophylla to 4m over Scattered	flat plain
								0.0000 0.2389 0.4778 0.7167 0.9556 1.1944 1.4333			

<u>Appendix 4</u>. Tables used to place sites in the reference classification by comparison of vegetation types and species composition

Species list for comparison of sites SolQ21, RB08, RB09 and RB13 with sites from Unit 279.

	Sites from Unit 279									New Sites							
Species	**VOK019**	**VOQ017**	**VOQ018**	**VOQ47**	**ZION009**	**ZION019**	**ZION020**	**ZION024**	**ZION027**	**SolQ21**	**RB013**	**RB05**	**RB06**	**RB08**	**RB09**	**RB12**	**Occur -rence for each species**
Acacia hilliana				1	1	1	1	1	1	1	1	1	1	1	1	1	**13**
Triodia wiseana	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**16**
Gompholobium karijini	1	1	1	1	1	1	1	1	1		1			1	1	1	**13**
Acacia adoxa var. adoxa	1	1	1	1	1	1	1	1	1	1	1		1	1		1	**14**
Hakea lorea subsp. lorea	1	1		1	1						1	1		1	1		**8**
Grevillea wickhamii subsp. hispidula	1	1	1	1	1		1			1	1	1	1	1		1	**12**
Corymbia hamersleyana	1	1	1	1	1	1			1	1	1	1		1		1	**12**
Eucalyptus leucophloia subsp. leucophloia	1	1	1	1		1	1	1	1	1	1		1	1	1	1	**14**
Polycarpaea holtzei										1	1	1	1	1	1	1	**7**
Acacia arida						1		1	1	1	1	1	1	1			**8**
Ptilotus exaltatus var. exaltatus											1	1	1	1	1		**5**
Goodenia stobbsiana											1			1	1		**3**
Stackhousia viminea											1			1	1		**3**
Petalostylis labicheoides						1			1		1			1			**4**
Acacia bivenosa					1	1								1			**3**
Acacia monticola	1	1	1				1	1						1	1		**7**
Eriachne ciliata										1	1	1	1		1	1	**6**
Keraudrenia velutina subsp. elliptica													1	1	1	1	**4**
Acacia retivenea subsp. clandestina											1				1	1	**3**
Corchorus lasiocarpus subsp. parvus	1								1					1	1		**4**
Mirbelia viminalis						1	1	1		1	1						**5**
Eriachne mucronata (Typical Form)			1	1				1									**3**
Bulbostylis barbata										1	1	1	1			1	**5**
Senna glutinosa subsp. glutinosa										1			1	1			**3**
Goodenia cusackiana														1			**1**
Goodenia nuda											1						**1**
Indigofera monophylla (forma)														1			**1**
Eucalyptus gamophylla	1	1			1	1	1										**5**
Corchorus aff. lasiocarpus subsp. parvus				1													**1**
Cymbopogon ambiguus				1													**1**
Acacia maitlandii								1							1		**2**
Trachymene oleracea															1		**1**
Aristida holathera var. latifolia	1	1								1						1	**4**

Acacia acradenia												1					**1**
Grevillea pyramidalis subsp. leucadendron										1							**1**
Jasminum didymum subsp. lineare		1										1					**2**
Santalum lanceolatum												1					**1**
Senna glutinosa subsp. pruinosa										1							**1**
Senna notabilis													1				**1**
Sporobolus virginicus																1	**1**
Tephrosia spechtii										1							**1**
Waltheria virgata										1							**1**
Acacia atkinsiana									1								**1**
Acacia pyrifolia var. pyrifolia	1		1														**2**
Acacia tenuissima		1															**1**
Acacia tumida var. pilbarensis		1	1														**2**
Calytrix carinata						1	1										**2**
Cassytha capillaris							1										**1**
Codonocarpus cotinifolius						1	1										**2**
Corchorus aff. parviflorus			1														**1**
Corymbia deserticola subsp. deserticola		1															**1**
Cucumis melo subsp. agrestis		1															**1**
Dampiera candicans	1		1														**2**
Dodonaea coriacea			1														**1**
Eulalia aurea	1																**1**
Euphorbia coghlanii	1	1	1														**3**
Evolvulus alsinoides var. villosicalyx		1															**1**
Fimbristylis simulans	1																**1**
Gossypium australe (Burrup Pen insula form)			1														**1**
Gossypium robinsonii			1														**1**
Grevillea wickhamii subsp. macrodonta									1								**1**
Hibiscus sturtii var. platychlamys		1															**1**
Keraudrenia nephrosperma		1															**1**
Paraneurachne muelleri	1																**1**
Phyllanthus erwinii		1															**1**
Ptilotus astrolasius var. astrolasius		1															**1**
Ptilotus calostachyus var. calostachyus						1			1								**2**
Scaevola aff. browniana									1								**1**
Senna artemisioides subsp. oligophylla			1														**1**
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)			1														**1**
Sida sp. verrucose glands (F.H. Mollemans 2423)		1															**1**
Solanum diversiflorum		1	1														**2**
Themeda triandra			1														**1**
Yakirra australiensis var. australiensis	1																**1**
Species count for site	**18**	**24**	**20**	**11**	**9**	**14**	**12**	**10**	**14**	**17**	**19**	**13**	**13**	**21**	**16**	**14**	

Species for comparison of sites ZION012, ZION017 and RB4 for unit placement of site RB04

	Old site		New site
Species	**ZION012**	**ZION017**	**RB04**
Acacia acradenia		1	1
Acacia adoxa var. adoxa	1	1	
Acacia arida	1	1	1
Acacia atkinsiana	1		
Acacia monticola		1	
Acacia tumida var. pilbarensis	1	1	
Cassytha capillaris		1	
Corchorus lasiocarpus subsp. parvus	1		1
Corymbia hamersleyana	1	1	1
Cymbopogon sp.		1	
Dampiera candicans	1		
Eucalyptus gamophylla	1	1	1
Gompholobium karijini	1	1	1
Gossypium robinsonii	1		
Grevillea wickhamii subsp. hispidula		1	
Jasminum didymum subsp. lineare	1		1
Petalostylis labicheoides	1	1	1
Rhyncharrhena linearis			1
Santalum lanceolatum		1	1
Scaevola aff. browniana		1	
Senna notabilis			1
Sida pilbarensis (ferruginous form)	1		
Solanum horridum			1
Trachymene oleracea			1
Triodia wiseana	1	1	1
Waltheria virgata		1	
Total number of species	**12**	**16**	**14**

Species list for comparison of sites RB01, RB02, RB07, RB10 and RB11 with sites from Unit 281 and Unit 282.

	Unit 281		New	New	New	New	Unit 282					
Species	ZION13	ZION23	RB10	RB07	RB11	RB01	FT33	P9GtoP9Fc	P9GtoP9Fh	P9GtoP9Fi	WAFCBOR_1068	Total number of species occurrence
Acacia acradenia		1	1	1								3
Acacia adoxa var. adoxa											1	1
Acacia arida	1	1	1	1	1	1	1	1	1	1		10
Acacia atkinsiana										1		1
Acacia bivenosa			1		1							2
Acacia coriacea subsp. pendens											1	1
Acacia inaequilatera								1				1
Acacia pruinocarpa		1						1			1	3
Acacia pyrifolia var. pyrifolia	1	1										2
Acacia retivenea subsp. clandestina			1		1							2
Acacia tumida var. pilbarensis											1	1
Clerodendrum floribundum var. angustifolium			1	1								2
Corchorus lasiocarpus subsp. parvus	1											1
Corchorus sp.								1	1		1	3
Corymbia hamersleyana			1	1	1	1	1		1			6
Cullen leucochaites											1	1
Cymbopogon ambiguus											1	1
Dampiera candicans	1											1
Dodonaea coriacea							1					1
Eriachne ciliata						1						1
Eriachne mucronata (Typical Form)	1	1	1	1								4
Eriachne pulchella subsp. dominii								1	1	1	1	4
Eriachne pulchella subsp. pulchella							1					1
Eucalyptus gamophylla					1	1						2
Eucalyptus leucophloia subsp. leucophloia	1		1		1	1	1				1	6
Fimbristylis simulans										1	1	2
Gompholobium karijini						1	1					2

Gompholobium sp. Pilbara (N.F. Norris 908)									1			1
Goodenia stobbsiana							1		1	1	1	4
Grevillea wickhamii								1	1	1		3
Grevillea wickhamii subsp. aprica											1	1
Grevillea wickhamii subsp. hispidula		1		1		1						3
Hakea chordophylla								1	1		1	3
Hakea lorea subsp. lorea			1									1
Indigofera fractiflexa							1					1
Jasminum didymum subsp. lineare			1	1								3
Keraudrenia nephrosperma							1	1	1			3
Mollugo molluginis								1			1	2
Petalostylis labicheoides	1	1	1	1	1	1	1					7
Polycarpaea holtzei						1	1	1		1	1	5
Polycarpaea longiflora											1	1
Polymeria aff. ambigua (CGC-25)				1								1
Ptilotus calostachyus var. calostachyus								1		1	1	3
Ptilotus exaltatus var. exaltatus			1									1
Ptilotus obovatus var. obovatus								1				1
Rhyncharrhena linearis				1								1
Santalum lanceolatum			1									1
Senna glutinosa subsp. glutinosa	1							1			1	2
Senna glutinosa subsp. pruinosa											1	1
Senna notabilis			1									1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)							1					1
Solanum phlomoides									1			1
Themeda triandra											1	1
Trianthema glossostigma									1			1
Trichodesma zeylanicum var. zeylanicum				1								1
Triodia epactia									1			1
Triodia sp.								1				1
Triodia wiseana	1	1	1	1		1	1				1	7
Triumfetta maconochieana							1					1

Appendix D
Summary of Distribution of *Gompholobium karijini* (P2) within the Study Area

Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey, Solomon Mine Project

APPENDIX D:

Summary of Distribution of *Gompholobium karijini* (P2) within the Study Area

Easting	Northing	No. of plants
585751	7555727	20
590974	7549907	130
590997	7549787	31
591199	7549284	55
591446	7549258	12
591628	7554564	25
592576	7548560	18
592608	7548659	22
592628	7548379	7
592629	7548691	9
592638	7548587	15
592642	7548423	7
592647	7548349	15
592666	7548371	7
592673	7548423	60
592694	7548668	12
592702	7548380	11
592723	7548478	2
592730	7548393	21
592770	7548276	4
592842	7548252	6
592892	7548558	4
592899	7554125	6
592909	7547569	13
592982	7554177	32
593010	7554157	33
593034	7548308	1
593034	7554216	8
593054	7554068	75
593710	7553911	31
593828	7553907	6
593885	7553888	67
593983	7553911	17
594040	7553924	14
594107	7553960	17
595228	7553994	2
595318	7546143	2
595347	7546130	7
595370	7545999	4
595373	7545921	2
595383	7545886	8

Easting	Northing	No. of plants
595389	7545989	2
595400	7554207	12
595822	7554158	1
595838	7545804	3
595859	7545837	2
595860	7545749	4
595888	7545793	3
595928	7545798	5
595938	7545761	1
595960	7545800	2
596089	7546066	5
596147	7546049	5
596173	7546051	11
596193	7546199	3
596231	7546200	5
596286	7546211	6
596363	7545705	31
596374	7547188	97
596375	7545618	35
596379	7546221	5
596379	7545683	17
596389	7545659	27
596394	7545706	13
596397	7545919	12
596400	7545821	6
596401	7545618	22
596415	7545745	7
596422	7545651	14
596444	7545671	10
596445	7545610	29
596447	7545592	33
596448	7545708	1
596470	7545689	32
596473	7545704	9
597317	7544588	6
597327	7544535	1
597342	7544485	1
597356	7544509	2
597600	7545099	51
597604	7544898	20
597605	7544992	7

APPENDIX D:

Summary of Distribution of *Gompholobium karijini* (P2) within the Study Area (cont'd)

Easting	Northing	No. of plants
597607	7544811	5
597611	7545160	3
597621	7545120	25
597628	7544503	4
597636	7544562	15
597655	7544568	10
597658	7544468	16
597661	7544608	6
597663	7544431	12
597667	7544564	12
597676	7544507	2
597678	7544540	54
597690	7544582	17
597694	7544447	6
597694	7544423	76
597703	7544556	31
597718	7544462	8
597719	7544580	20
597745	7544600	28
597763	7544510	1
597891	7544860	10
597999	7544593	22
598294	7544451	26
598296	7544484	23
598297	7544464	55
598308	7544510	25
598437	7544598	4
598531	7545387	1
598790	7545276	11
598800	7545204	1
598839	7544878	11
598850	7544929	1
598872	7544866	3
598938	7544919	15
599082	7544955	4
599137	7544937	1
599193	7545021	24
599197	7545390	3
599200	7545698	8
599205	7545595	24
599206	7544991	1

Easting	Northing	No. of plants
599208	7545032	11
599208	7545307	3
599236	7545021	2
599240	7545390	1
599260	7545011	2
599478	7543390	12
599603	7545280	15
599607	7545400	1
599851	7544836	5
599964	7544730	2
599997	7545324	2
600001	7545310	3
600023	7545403	3
600099	7544429	1
600161	7545053	1
600556	7544053	1
600642	7544034	1

Appendix E
Voucher Specimens

Robe Pisolite Assessment and Targeted *Gompholobium karijini* (P2) Survey, Solomon Mine Project

Determined Name: Gompholobium karijini

Field Name: Gompho karijini

Plant Description

Habit & Life-form: Shrub

Height: 0.5m **Width:** 0.5m

Other notes (flower colour etc):

Site Description

Landform: Low rise

Soil surface: Red brown loamy clay, rock/gravel surface

Soil Colour:

Soil Type:

Underlying Geology: Robe Pisolite **Fire history:** > 5years

Vegetation: Corymbia hamersleyana & Eucalyptus leucophloia subsp. leucophloia Low Open Woodland to 5m over Acacia hilliana Low Open Shrubland to 0.6m over Triodia wiseana Open Hummock Grassland to 0.5m.

Associated species: Acacia hilliana, Corymbia hamersleyana, Triodia wiseana

Frequency: ~500 plants with 1km radium

Other Notes: Another 1000 plants located to the west within 3km distance

Location

Locality: West of Hamersley Gorge

Nearest Named Place: Hamersley Gorge, Tom Price

GPS? (Y) | N **Datum:** GDA 94 | AGD 84 | (WGS 84) | AGD 66

Latitude: S **Longitude:** E **Altitude:** m

Zone: 50 **Easting:** 599236 **Northing:** 7545021

Collector(s): Clinton Van Den Bergh, Cassyanna Gray **No:** GK10 **Date:** 4/5/11

Record Basis: (Specimen) | Fruit | Wood | Seed | Spirit

Voucher for: Photo | Other: Priority 2

Phenology: (Sterile) | Fertile | Bud | Flowering | Fruiting

Determined Name: Gompholobium karijini.

Field Name: Gompho karijini

Plant Description

Habit & Life-form: Shrub

Height: 0.4m **Width:** 0.5m

Other notes (flower colour etc):

Site Description

Landform: Upper hillslope, moderately steep facing West

Soil surface: Red brown clayey loam, gravel / rock surface

Soil Colour:

Soil Type:

Underlying Geology: **Fire history:** <5years

Vegetation: Eucalyptus leucophloia subsp leucophloia Low Open Woodland to 5m over Hakea chordophylla Grevillea wickhamii to 2.5m over Triodia wiseana Very Open Hummock Grassland to 0.2m

Associated Species:
Eucalyptus leucophloia subsp. leucophloia, Triodia wiseana, Grevillea wickhamii

Frequency: ~20 plants

Other Notes:

Location

Locality: West of Hamersley Gorge

Nearest Named Place: Tom Price

GPS?: (Y) | N **Datum:** GDA 94 | AGD 84 | (WGS 84) | AGD 66

Latitude: S **Longitude:** E **Altitude:** m

Zone: 50 **Easting:** 585751 **Northing:** 7555727

Collector(s): Clinton Van Den Bergh, Cassyanna Gray **No:** 06-05 **Date:** 20/4/11

Record Basis: (Specimen) | Fruit | Wood | Seed | Spirit

Voucher for: Photo | Other: Priority 2

Phenology: (Sterile) | Fertile | Bud | Flowering | Fruiting