LEVEL 2 FLORA AND VEGETATION SURVEY

OF

LAMB CREEK PROJECT AREA

FOR

PROCESS MINERALS INTERNATIONAL

JUNE 2012

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EXECUTIVE SUMMARY

Process Minerals International (PMI) proposes to develop a small iron ore mine with associated haul roads and infrastructure at Lamb Creek. The Lamb Creek project area is located approximately 130 kilometres (km) north-west of Newman in the East Pilbara Region of Western Australia, and is accessed via the Great Northern Highway.

A Level 2 flora and vegetation survey was completed in the approximately 20 km^2 survey area, comprising a desktop search and a single-phase comprehensive field survey from 27 March to 1 April 2012 by a team of three botanists. 46 survey quadrats were established.

A total of 230 species, from 110 genera and 42 families, were recorded during the survey of the Lamb Creek area, from 414 specimens collected. Of those, 209 were collected within survey quadrats; the rest were collected opportunistically.

No species of Threatened Flora (Declared Rare Flora) pursuant to the Western Australian *Wildlife Conservation Act* 1950, and no species listed as Threatened pursuant to the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* were recorded in the project area.

Three species of Priority Flora listed by DEC were recorded during the survey, comprising one Priority 1 species (*Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662)) and two Priority 2 species (*Aristida calycina* var. *calycina* and *Aristida lazaridis*). These taxa were found only in the far south-west of the survey area in the vicinity of the intersection of the proposed access/haul roads with the Great Northern Highway.

Five species of introduced flora were recorded in the survey area: *Bidens bipinnata* (Bipinnate Beggartick), *Cenchrus ciliaris* (Buffel Grass), *Chloris virgata* (Feathertop Rhodes Grass), *Malvastrum americanum* (Spiked Malvastrum), and *Portulaca oleracea* (Purslane).

None of these taxa were listed as Declared Plants by the WA Department of Agriculture and Food pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* (Western Australia). None of these taxa were listed as Weeds of National Significance by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC 2012).

Vegetation mapping was conducted by statistical analysis using the software PATN combined with field observations of vegetation boundaries and visual classification of aerial photography. The most widespread vegetation type was *Eucalyptus gamophylla* woodland over hummock grassland which was estimated to cover approximately 46% of the survey area.

Six main vegetation communities were recognised and mapped following field observations and statistical analysis of the field data.

No Threatened or Priority Ecological Communities listed by the DEC were recorded.

1. INTRODUCTION

1.1. PROJECT BACKGROUND

Process Minerals International (PMI) proposes to develop a small iron ore mine with associated haul roads and infrastructure at Lamb Creek. The Lamb Creek project area is located approximately 130 kilometres (km) north of Newman in the East Pilbara Region of Western Australia, and is accessed via the Great Northern Highway.

An overview of the tenements in which the project is located is presented in Table 1. The project is currently in the design phase; hence alternative locations for elements such as the accommodation facility appear in several tenements.

Table 1 Tenements in which the project area is located

Tenement	**Project Elements** (as per April 2012)	**Size**
M47/1468	Mining area	1201 ha
L47/635	Bore field, accommodation facility, pipeline, power line, taking water.	82 ha
L47/636	Bore field, accommodation facility, pipeline, power line, taking water.	64 ha
L47/637	Bore field, pipeline, power line, road, taking water.	149 ha
L47/638	Bore field, pipeline, power line, road, taking water.	30 ha
L47/639	Bore field, pipeline, power line, road, taking water.	276 ha
L47/640	Bore field, pipeline, power line, road, taking water.	156 ha
L47/641	Bore field, pipeline, power line, road, truck parking bay, taking water.	42 ha
E47/1238	Exploration licence including M47/1468	44 blocks
E47/1239	Pending: Currently held by Rio Tinto	64 blocks
Source: Tengraph and Mineral Titles Online (Department of Mines and Petroleum 2012)		

1.2. SCOPE AND OBJECTIVES OF THE SURVEY

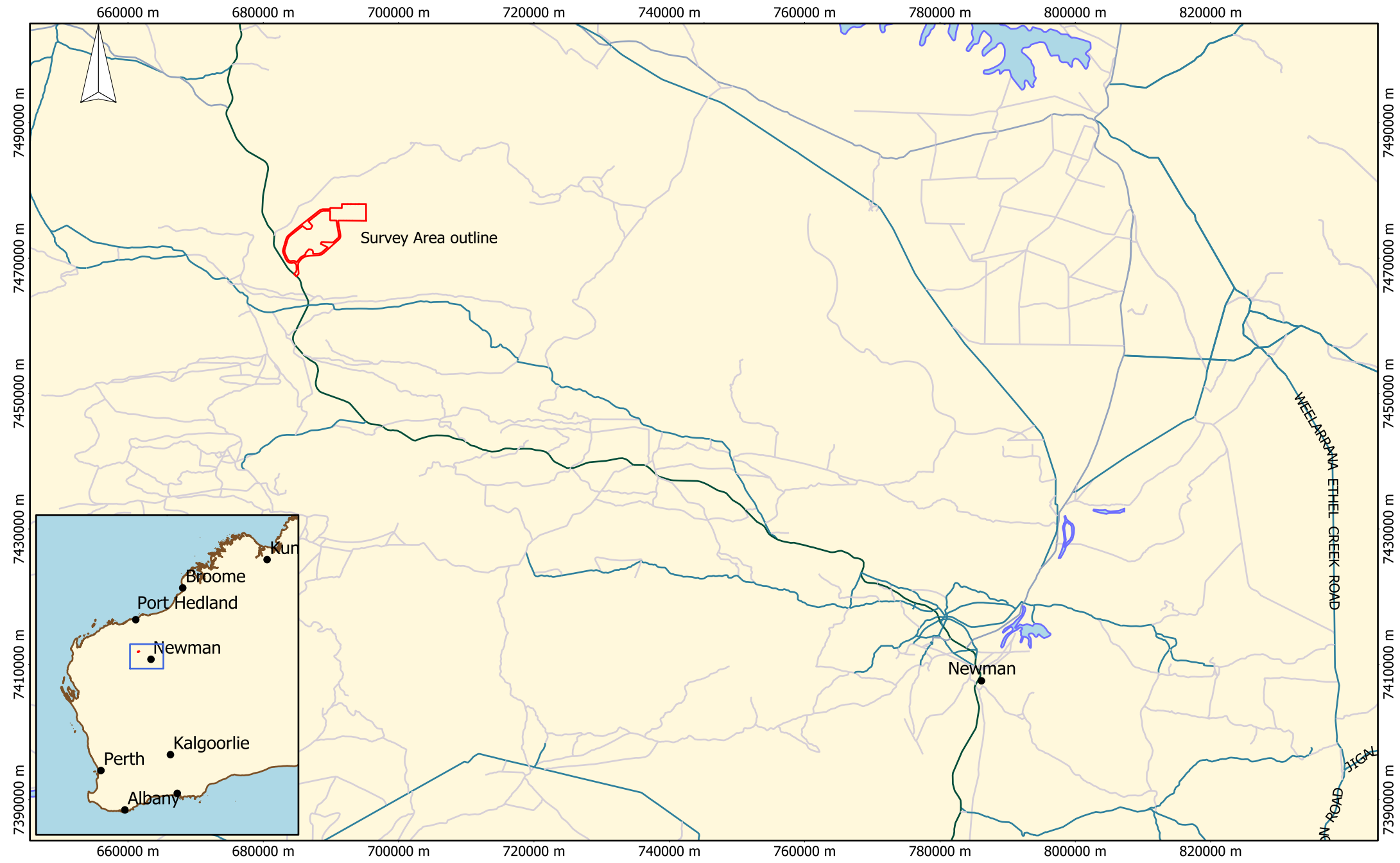
As part of the environmental approvals process, Rapallo conducted a single phase Level 2 flora and vegetation survey of the proposed Lamb Creek iron ore mine, two alternative haul road routes (120 metre buffer either side) and three alternative accommodation village sites. For the purpose of this report this area will hereafter be referred to as the "survey area" (Figure 1). The area surveyed comprised approximately 20 km^2, although the actual project footprint will be smaller.

The aims of the survey were to:

- characterise the flora and vegetation within the survey area;
- identify and map the vegetation communities;
- identify and map all Threatened and Priority Flora Species.

This information will be used to assist with environmental assessment of the project and, and to guide environmental management plans.

The flora and vegetation survey was designed according to Environmental Protection Authority (EPA) *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (2004). This guidance indicates that a project in the Pilbara region with an impact greater than 50 ha requires a Level 2 flora and vegetation survey.



Rapallo

Original Size: A4 Scale: 1:700,000
Datum: MGA94
0 30 km

Process Minerals International

Figure 1

Location of the Survey Area

1.3. LEGISLATION AND SURVEY GUIDANCE

1.3.1. COMMONWEALTH LEGISLATION AND CONSERVATION CATEGORIES

Native flora and ecological communities are protected at a federal level under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, defined as matters of national environmental significance. Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance need to be referred to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (SEWPaC) for assessment and approval.

The EPBC Act protects Australia's native species and ecological communities by providing for identification and listing of threatened species and ecological communities. The conservation status of native species and communities is assessed by the Commonwealth Threatened Species Scientific Committee criteria outlined in the *EPBC Act 1999* and the *Environment Protection and Biodiversity Conservation Regulations 2000*.

The following categories of threatened flora are recognised: Extinct (EX), Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

Ecological communities are unique and naturally occurring groups of plants and animals. Their presence can be determined by factors such as soil type, position in the landscape, climate and water availability. The following categories of Threatened Ecological Communities are recognised: Critically Endangered (CR), Endangered (EN), and Vulnerable (VU).

1.3.2. WESTERN AUSTRALIAN LEGISLATION AND CONSERVATION CATEGORIES

At a state level, native flora and vegetation communities are protected under the *Wildlife Conservation Act 1950*, the *Western Australian Environmental Protection Act 1986* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Threatened and Priority Flora

All native vegetation in Western Australia is protected under the *Environmental Protection Act 1986* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Under the Act and Regulations, clearing of native vegetation is prohibited unless a clearing permit is granted or the clearing is for a purpose defined under Regulation 5 as an exempt activity.

Flora that are threatened, rare or otherwise in need of protection, are protected under the *Wildlife Conservation Act 1950*. Threatened (Declared Rare) Flora species are listed under Schedule 1. Extinct flora are listed under Schedule 2. The species listed under Schedules 1 and 2 are published in the WA Government Gazette *Wildlife Conservation (Rare Flora) Notices*, the most recent dated 17 February 2012 (Western Australian Government 2012).

Threatened (Declared Rare) Flora listed on Schedule 1 are further ranked by the Department of Environment and Conservation (DEC) according to their level of threat using IUCN Red List criteria. The following categories of threatened flora are recognised: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

The DEC also recognises Priority Flora, comprising taxa that have not yet been adequately surveyed to be listed as Threatened, but for which the DEC believes there is cause for concern. Priority flora listings can be found on the FloraBase website (Western Australian Herbarium 2012). Priority flora species recognised as having conservation significance and are given consideration when developments are

proposed within their distributions and known habitats. There are 5 levels of Priority flora: Priorities 1, 2 or 3 (not yet adequately surveyed), Priority 4 (rare, near threatened or in need of monitoring), and Priority 5 (conservation dependent) (Appendix 1).

Environmentally Sensitive Areas

Environmentally sensitive areas (ESAs) are protected under the *Environmental Protection (Clearing of Native Vegetation) Regulation 2004* and are listed for their environmental values at state or national levels. ESAs in Western Australia are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*. (Western Australian Government 2005). These include:

- Declared World Heritage property sites
- Bush Forever sites
- Defined wetlands and riparian vegetation within 50 metres of the wetland
- Area of vegetation within 50 metres of Declared Rare Flora
- Areas covered by Threatened Ecological Communities

Exemptions offered for clearing under Regulation 5 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not apply within an ESA.

Threatened and Priority Ecological Communities

An Ecological Community is defined by the DEC as a naturally occurring biological assemblage that occurs in a particular type of habitat. In Western Australia there is currently no legislation covering the conservation of Threatened Ecological Communities (TEC). However, TEC are indirectly protected under the *Environmental Protection Act 1986* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* through protection of individual flora species. Under the Regulations TEC are defined as Environmentally Sensitive Areas, and therefore the exemptions from requiring a clearing permit do not apply in a TEC.

The DEC (2010) defines a Threatened Ecological Community as one that fits into one of the following categories: Presumed Totally Destroyed (PD), Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

Ecological communities that do not meet TEC criteria are listed on the Priority Ecological Community (PEC) list. Priorities 1, 2 and 3 are communities that are possibly threatened but not yet adequately surveyed. Priority 4 comprised communities that are in need of monitoring, and Priority 5 are communities that are conservation dependent (DEC 2010, 2012b).

1.3.3. National and Western Australian Weed Strategies

Invasive weeds are a serious threat to Australia's natural environment and can have major economic and social impacts, causing damage to natural landscapes, agricultural lands, waterways and coastal areas. A weed can either be an exotic (introduced) species, or a native species that colonises and ecosystem where it does not naturally occur (Commonwealth of Australia 2012a).

Federal Weeds of National Interest

The Federal government departments responsible for weed issues are SEWPaC and the Department of Agriculture, Fisheries and Forestry (DAFF). Weeds of national interest are published on one of several lists, with the nature of weeds and the national actions required determining on which list a species appears. The Federal lists are:

- Weeds of National Significance (WONS) – Published in the *Australian Weeds Strategy* (Commonwealth of Australia 2007) these 20 weeds are considered to be Australia's most significant environmental weeds;
- The National Environmental Alert List – 28 plant species in the early stages of establishment, which have the potential to become a significant threat to biodiversity if they are not managed;
- Sleeper weeds – Exotic plants that currently have established small populations but which have the potential to spread widely and affect agricultural or natural environments;
- Species targeted for national eradication under the Natural Resource Management Ministerial Council's National Cost-sharing Eradication Programme;
- Species targeted for biological control.

Western Australian Declared and Environmental Weeds

In addition to the weeds of national interest, state and territory governments have their own lists of noxious weeds. In Western Australia, the principal legislation pertaining to weeds is the *Agriculture and Related Resources Protection Act 1976* (ARRPA).

The Department of Agriculture and Food has published a list of *Declared Plants* under the ARRPA (DAFWA 2011). There are five categories of declared plants defined under the ARRPA with the following management actions and aims associated with them:

Priority 1 – Prohibiting movement of plants and/or their seeds through the prevention of trade, sale or movement of plants into the State or that area of the State;

Priority 2 – Eradication of plants from the State or that area of the State;

Priority 3 – Controlling infestations by reducing area and/or density of infestation from the State or that area of the State;

Priority 4 – Preventing infestations spreading beyond existing boundaries of infestation; and

Priority 5 – Infestations must be controlled on public land or land under the control of a local government.

The DEC (previously Department of Conservation and Land Management, CALM) has published the *Environmental Weed Strategy for Western* Australia (CALM 1999). The strategy itself is still considered relevant but the *List of Environmental Weed Species of Actual and Potential Significance in WA* (Appendix 3 to the Strategy) is now out-dated (DEC 2012a).

More recently the DEC published a series of lists of Environmental Weeds in each of the DEC regions, based on workshops held between 2008 and 2010. These lists do not assign a single "priority" classification to each weed, but instead outline the relative threat in each region based on a number of criteria including their distribution, ecological impact and rate of dispersal. The DEC points out that at present these lists should be used as a guide only (DEC 2012a).

At the time of writing, FloraBase (WA Herbarium 2012) lists 1,358 taxa that may be considered weed species of actual or potential significance in Western Australia, of which 107 in the Pilbara region. These figures are subject to change as a result of ongoing changes to taxon nomenclature.

1.3.4. ENVIRONMENTAL PROTECTION AUTHORITY GUIDANCE

The Western Australian Environment Protection Authority (EPA) has produced a series of position statements and guidance statements to aid in assessing the environmental impacts of developments in Western Australia.

The following statements outline the minimum expectations of the EPA in regards to consideration of terrestrial flora and vegetation communities in an environmental impact assessment.

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

Combined, these guidance and position statements provide general recommendations for consideration for planning environmental surveys, including the level of survey required, design and intensity factors, survey limitations and reporting criteria.

2. EXISTING ENVIRONMENT

2.1. BIOGEOGRAPHY

The survey area lies within the Hamersley (PIL3) subregion of the Pilbara Interim Biogeographic Regionalisation of Australia (IBRA) region (SEWPaC 2012a), covering the southern section of the Pilbara Craton (Kendrick 2002). The Hamersley subregion is a mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges of basalt, shale and dolerite (Kendrick 2002).

2.1.1. LAND SYSTEMS

The survey area traverses five different land systems within the Hamersley subregion, as described by Van Vreeswyk *et al*. (2004). These are:

- **Boolgeeda** – Stony lower slopes and stony plains and narrow drainage floors and channels, supporting hard and soft spinifex grasslands and mulga shrublands., level stony plains and narrow sub-parallel drainage floors, relief up to 20 m. Often occurs below hill systems such as Newman and Rocklea.
- **McKay** – Hills, ridges, plateaux remnants and minor breakaways of sedimentary and meta sedimentary rocks supporting hard spinifex grasslands; relief up to 100 m.
- **Newman** – Rugged high mountains, ridges and plateaux with near vertical escarpments of jaspilite, chert and shale, supporting hard spinifex grasslands; relief up to 400 m.
- **Platform** – Stony upper plains, dissected slopes and drainage floors, supporting hard spinifex grasslands. Erosional surfaces formed by partial dissection of the old tertiary surface. The gently inclined upper plains have extensive marginal dissection zones with gently inclined to steep slopes. Floors incised up to 30m with steep stable marginal slopes becoming wider downslope.
- **Wannamunna** – Hardpan plains and internal drainage tracts supporting mulga shrubland and woodlands, and occasionally eucalypt woodlands). Depositional surfaces, level hardpan wash plains subject to overland sheet flow. Broad internal drainage flats receiving run-on from adjacent hardpan surfaces; rare channelled tracts but moistly no organised through drainage; relief up to 5m.

The approximate area of each land system within the Pilbara region and within the survey area is presented in Table 2.

Table 2 Land systems of the survey area

Land System	Total area in Pilbara (km^2)	Area within survey area (km^2)	Percentage of total within survey area
Boolgeeda	7,748	11.58	0.15 %
McKay	4,202	0.44	0.01 %
Newman	14,580	2.77	0.02 %
Platform	1,570	1.98	0.12 %
Wannamunna	577	0.27	0.04 %

2.1.2. GEOLOGY

The survey area is located in the south-west corner of the Roy Hill 1:250,000 Geological Survey Sheet (SF50-12: Thorne & Tyler 1997). The geology of the survey area is generally defined by the assemblage of prehnite, pumpellyite, epidote, actinolite. Basement rocks comprise the early Proterozoic Brockman

Iron Formation and Weeli Wolli Formation. The Brockman Iron Formation consists of banded iron formation (BIF) and shale, while the Weeli Wolli formation consists of BIF separated by shale and siltstone bands, with younger dolerite sills that intersect the sedimentary sequence.

Regionally, the fresh basement rocks are typically overlain by weathered basement rocks which occur as lateritic and basal gravel and/or conglomerate deposits. These weathered deposits underlie early Tertiary Channel Iron Deposits (CID), which are the dominant economic-grade iron deposits in the region. The CID is typically overlain by younger alluvial and colluvial gravels and sediments (Thorne & Tyler 1997).

The survey geology comprises the following geological units (Thorne & Tyler 1997).

- **Brockman Iron Formation** (PLHB): banded iron-formation, chert, and pelite;
- **Quaternary Alluvium** (Qa): unconsolidated silt, sand, and gravel; in drainage channels and on adjacent floodplains;
- **Quaternary Alluvium and Colluvium** (Qw): red-brown sandy and clayey soil; on low slopes and sheetwash areas; and
- **Cainozoic Colluvium** (Czc): partly consolidated quartz and rock fragments in silt and sand matricx; old valley-fill deposits.

2.1.3. SOILS AND LANDFORMS

The survey area is located within the Fortescue botanical district of the Pilbara region (Beard 1990). This region is mountainous, with soils ranging from shallow, stony sandy loams along slopes, to cracking clays, stripped hardpans and calcareous loams along active waterways (Beard 1990).

The survey area is typical of the eastern Pilbara with rocky hills, small gorges, mostly seasonal watercourses and gravelly loam valleys. It is typified by hard red alkaline soils on plains, pediments and alluvial areas, while shallow, skeletal soils are common on ranges that rise to 1,250 m (Beard 1990). The southern part of eastern Pilbara region is characterised by earthy loams underlain by red-brown hardpan (Beard 1975; 1990).

The survey area has two distinct soil and landform assemblages. The majority of the potential haul road alignment and the edges of the mine tenement are characterised as landform unit Fa13. The central part of the mine tenement and small portion of the potential haul road alignment is characterised as landform unit Fb3. These are defined as follows (CSIRO Australia 2006–):

- **Fa13 –** Ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations with some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments. This unit is largely associated with the Hamersley and Ophthalmia Ranges. The soils are frequently stony and shallow and there are extensive areas without soil cover: chief soils are shallow stony earthy loams (Um5.51) along with some (Uc5.11) soils on the steeper slopes. Associated are (Dr2.33, Dr2.32) soils on the limited areas of dissected pediments, while (Um5.52) and (Uf6.71) soils occur on the valley plains; and
- **Fb3** – High-level valley plains set in extensive areas of unit Fa13. There are extensive areas of pisolitic limonite deposits: principal soils are deep earthy loams (Um5.52) along with small areas of (Gn2.12) soils.

2.1.4. HYDROLOGY

Regional stream flow in the Pilbara is ephemeral, related to intense rainfall from with cyclonic activity or localised thunderstorms. Stream flow decays rapidly once rainfall has ceased. The drainage system upstream of the Fortescue Marsh has negligible base flow with stream flow and water table recharge following rainfall events (Van Vreeswyk *et al*. 2004).

The proposed mining area (tenement M47/1468) contains four minor non-perennial (type 2) watercourses. The southern proposed haul route option (L47/638, L47/639, L47/641) and two prospective accommodation areas (L47/635, L47/636) are crossed by eight minor non-perennial watercourses. Seven non-perennial watercourses cross the northern proposed haul road option (L47/637, L47/640) and the northern prospective accommodation area (E47/1329). No major or perennial drainage lines occur within or directly adjacent to the survey area (Commonwealth of Australia 2012b).

2.2. REGIONAL VEGETATION

The survey area is located in the Fortescue botanical district of the Pilbara region (Beard 1990), which forms part of the Eremaean Province. The Pilbara region receives a slightly higher than average rainfall than most of the Eremaean Province, due to the prevalence of cyclones off the coast, but this is not enough to modify the essentially desert appearance of the plant cover (Beard 1990).

The Fortescue district consists predominantly of tree and shrub steppe communities with *Eucalyptus* trees, *Acacia* shrubs and spinifex grasses including *Triodia pungens* and *T. wiseana* (Beard 1975). Mulga (*Acacia aneura*) occurs in valleys and short-grass plains may be present on alluvial soils (Beard 1990).

Vegetation of the Hamersley (PIL3) IBRA subregion is generally low Mulga woodland over bunch grasses on fine textured soils in the valleys with snappy gums (*Eucalyptus leucophloia*) over *Triodia brizoides* on skeletal soils of the ranges (Kendrick 2002). The mountain tops and gorges of the Hamersley subregion provide refugia for humidophile and/or fire intolerant flora, and support a diversity of range-restricted species (Kendrick 2002).

Beard (1975) mapped the area of the flora survey as Hamersley 82: hummock-grass (*Triodia wiseana*) steppe with irregularly scattered *Eucalyptus brevifolia* trees; and Hamersley 18: Low woodland of *Acacia aneura*.

Table 3 Beard (1975) vegetation areas of the Lamb Creek survey area

Beard (1970) vegetation type	Total area in WA (km^2)*	Area within survey area (km^2)	Percentage of total within survey area*
Hamersley 82	246,591.1	8.67	0.0035 %
Hamersley 18	29,209.1	12.01	0.0411 %

*Note: areas of vegetation types are taken from Shepherd *et al.* (2001). This document is now over ten years old, and significant vegetation clearing has taken place in the Pilbara region in the time since its publication. Area values given should be considered optimistic estimates rather than actual areas.

2.3. CLIMATE

The Pilbara region of Western Australia experiences an arid tropical climate with most rain falling during the hot summers between January and March (Beard 1990). Rainfall occurs in sporadic heavy rainfall events that occur during or immediately following cyclones. Cyclones develop off the north-west coast and often cross the coastline between Karratha and Port Hedland and move inland over the Fortescue Valley system towards Newman.

The closest Bureau of Meteorology (BOM) weather station to the survey area is at Newman Airport (station number 007176), located 130 km south-east of the survey area. This weather station has been recording rainfall data since 1971 and temperature data since 1996.

Data recorded at Newman Airport (Figure 2) shows a mean annual rainfall of 313.2 millimetres (mm). Mean monthly rainfall is highest in February at 77.3 mm, and lowest in September at 4.5 mm. The hottest month is January with a mean maximum temperature of 39.2°C and a mean minimum temperature of 23.9°C. The annual wind records from 9am and 3pm show a dominant easterly throughout the day, with the strongest winds recorded in the morning of up to 30 km/hour (BOM 2012).

Evaporation rates are not recorded at the Newman Airport Weather Station. However, evaporation in the Central Pilbara Region is estimated to be between 2000 mm and 3500 mm per annum, which is approximately ten times greater than annual rainfall (Gardiner 2003). This disparity maintains a typically arid landscape, with the exception of areas located in proximity to river systems and shallow groundwater resources.

The flora and vegetation survey of the survey area took place from 27 March to 1 April 2012. Rainfall in the three months preceding the survey was higher than average for the region, with a total of 307.8 mm recorded for the months of January to March 2012 combined, of which 239.4 was recorded in January 2012. Temperatures during the survey were generally warm during the day, ranging from 33.8 °C to 36.8 °C during the day, and mild at night, ranging from 22.1 °C to 25.2 °C (BOM 2012).

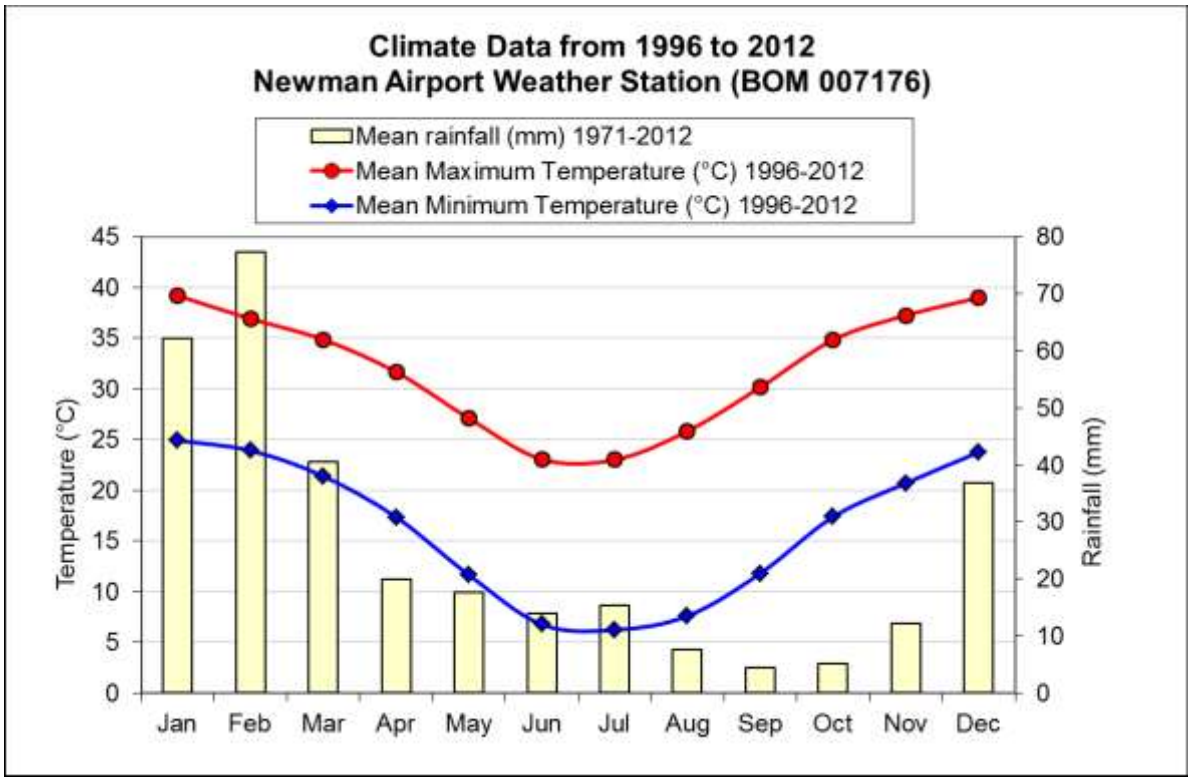


Figure 2 Newman Airport Weather Station – Average temperatures and rainfall

2.4. RESERVES AND ENVIRONMENTALLY SENSITIVE AREAS

Environmentally Sensitive Areas

The survey area is not situated within an ESA as defined under the Environmental Protection (Environmentally Sensitive Areas) Notice 2005 (Western Australian Government 2005).

There are no ESAs within 5 km of the survey area. The nearest Nationally Important Wetland is the Fortescue Marshes, located 52 km north of the survey area (SEWPaC 2012c).

Conservation Reserves

The survey area does not occur within a conservation reserve. The nearest nature reserves to the survey area (within a 100 km radius) are listed below (SEWPaC 2012c).

- Karijini National Park (DEC) – 26 km west of the survey area;
- Mungaroona Range National Park (DEC) – 52 km north of the survey area.

Threatened and Priority Ecological Communities

The project area is not located within a known TEC or PEC. The nearest known PEC is the Coolibah-Lignum Flats vegetation community, with the edge of the buffer zone located 6 km south of the survey area (DEC Threatened and Priority Communities database, search reference 35-0212EC).

The Coolibah-Lignum Flats vegetation complex is described as: Woodland or forest of *Eucalyptus victrix* (coolibah) over thicket of *Muehlenbeckia florulenta* (lignum) on red clays in run-on zones. Associated species include *Eriachne benthamii*, *Themeda triandra*, *Aristida latifolia*, *Eulalia aurea* and *Acacia aneura* (DEC 2012b). A series of sub-types have been identified:

- Coolibah and mulga (*Acacia aneura*) woodland over lignum and tussock grasses on clay plains (Coondewanna Flats and Wanna Munna Flats) – Priority 3
- Coolibah woodlands over lignum (*Muehlenbeckia florulenta*) over swamp wandiree; Lake Robinson is the only known occurrence – Priority 1
- Coolibah woodland over lignum and silky browntop (*Eulalia aurea*); two occurrences known on Mt Bruce Flats – Priority 3

3. METHODS

A Level 2 flora and vegetation survey was completed in the survey area, comprising a desktop search and a single-phase comprehensive field survey. Throughout this report taxonomy and taxonomic nomenclature follows the Western Australian Herbarium FloraBase website (Western Australian Herbarium 2012).

3.1. DESKTOP SEARCH

A desktop search was completed in preparation for the field survey, in order to provide a local context for the survey results, and to identify flora species and vegetation communities of conservation significance in the vicinity of the project area. The desktop search included a database search and a review of publically accessible literature and relevant survey reports within 100 km of the project area.

The database search included a combined search of the DEC Threatened (Declared Rare) and Priority Flora database, the WA Herbarium Specimen database, and the DEC Threatened and Priority Flora List (DEC reference number 38-0212FL); the NatureMap online search tool (DEC 2012); and the Protected Matters online search tool (SEWPaC 2012c) (Table 4).

Following completion of the field survey and taxonomic identifications, a follow-up database search was requested from the DEC (search reference number 04-0512FL) to obtain full details of all populations of the Priority species recorded during the survey in order to calculate the potential conservation impact of the project on these species (Table 4).

Table 4 Database Searches

Database Name	Latitude	Longitude	Search Area
DEC Threatened and Priority Flora database WA Herbarium database DEC Threatened and Priority Flora Species List	Search area based on shapefile of project area		40 km buffer around shapefile boundary
NatureMap	22°50’18” S	118°50’17” E	40 km buffer around coordinates
SEWPaC Protected Matters	22°53’28” S 22°50’28” S 22°47’44” S 22°50’20” S	118°48’09” E 118°47’16” E 118°58’05” E 118°51’54” E	10 km buffer around coordinates
DEC Species Specific search	Search carried out by species, not location		

Published literature and reports reviewed for the desktop search are listed in Table 5.

Table 5 Reports Reviewed for Desktop Study

Report Title	Distance from project area
Astron (2010a). *West Pilbara Iron Ore Project Reconciliation of Vegetation Descriptions and Associated Vegetation Mapping*. Unpublished report for API Management Pty Ltd.	25–30 km north-west
Astron (2010b). *Area C to Yandi flora and vegetation survey*. Unpublished report for BHP Billiton.	14 km north to 15 km east
Astron (2012) *Iron Valley Project Flora and Vegetation Survey*. Unpublished report for URS Australia Pty Ltd on behalf of Iron Ore Holdings Ltd.	48 km east north-east

Report Title	Distance from project area
Biota (2004). *Vegetation and flora survey of the proposed FMG stage A rail corridor*. Unpublished report for Fortescue Metals Group.	40 km east to 100 km north (only sites <100 km included in review)
Biota (2010). *Vegetation and flora surveys of the Oxbow and Junction South West deposits near Yandicoogina*. Unpublished report for Rio Tinto Pty Ltd.	35 km east
ENV (2008). *Rapid Growth Project 5: Jimblebar Junction to Yandi Junction Railway Reserve, Flora and Vegetation Assessment Report*. Unpublished report for BHP Billiton.	15 km north to 150 km south-east (only sites <100 km included)
Mattiske (2005). *Flora and vegetation on the Cloudbreak and White King leases*. Unpublished report prepared for Fortescue Metals Group Ltd.	85 km north-east
Mattiske (2008a). *Flora and Vegetation Survey of Exploration Tenement E47/1237 Phil's Creek Project area*. Unpublished report for URS Australia.	35 km east
Mattiske (2008b). *Flora and vegetation of the Hope Downs 4 mine infrastructure corridor*. Unpublished for Pilbara Iron.	30 km south-east
Rapallo (2012). *Level 2 flora and vegetation survey of Phil's Creek Haul Road*. Unpublished report for Process Minerals International.	30–45 km north-east

3.2. FIELD SURVEY

A single-phase Level 2 flora and vegetation survey was completed in the survey area from 27 March to 1 April 2012. The timing of the survey in autumn, following a period of significant rainfall or the region (section 2.3) is considered an appropriate time for conducting flora surveys in the Pilbara bioregion (EPA 2004). This is the time when the majority of plant species are flowering, fruiting and have foliage that allows identification, and provides the best opportunities for recording ephemeral or cryptic species.

The survey was completed by a team of three suitably qualified and experienced botanists. Geographic information system (GIS) data and aerial photography were used to demark the project area and to identify potential areas of interest. Survey areas were accessed by helicopter and were surveyed on foot.

The survey activities included:

- Flora quadrat surveys;
- Vegetation mapping;
- Opportunistic flora collections.

All specimens collected in the field were identified at the Western Australian Herbarium by Rapallo botanists, assisted by expert taxonomists where required (Table 7). Taxonomic identifications were completed using specialist texts, floral identification keys and comparisons with reference specimens held at the Western Australian Herbarium.

Specimens of conservation significant species, species found outside their normal range and other species of interest were lodged with the Western Australian Herbarium.

3.2.1. FLORA QUADRATS

Quadrat surveys involved a detailed and comprehensive search of a 50 by 50 m quadrat. Within each quadrat all flora taxa were recorded and specimens were collected of each species or subspecies when they were first encountered during the survey. Hence, specimens were collected for all taxa recorded in

the first quadrat, while specimen collection from subsequent quadrats only comprised taxa that had not been collected from previous quadrats unless considered possible to be different taxa. All species were thus collected at least once.

The following data were recorded for each quadrat:

- Location coordinates and elevation (on Garmin GPS units (MGA50, GDA94) and datasheet);
- Botanist name and Date – The name of the botanist involved in sampling the quadrat and the survey date;
- Species – all vascular plant species present, including introduced species were recorded;
- Percentage Foliar Cover – the percentage cover was estimated for each species within the quadrat;
- Height – the maximum height of each taxon was recorded;
- Soil and geology description including soil colour and type, and rock percentage cover, type, and size;
- Terrain and topography description;
- Vegetation condition - assessed in accordance to the Vegetation Condition Classification of Keighery 1994 – Appendix II);
- Vegetation Description - vegetation was described according to Aplin's (1979) modification of the vegetation classification system of Specht (1970) and the National Vegetation Invenotry System, Level 5 (Department of Environment and Heritage 2003 (Appendix V);
- Digital photographs of the quadrats were taken from different directions;

A total 46 of flora quadrats were established during the survey, with sites located in each of the five land systems within the project area. The number of sites (quadrats) per land system are listed in (Table 6) below and mapped in **Error! Reference source not found.**.

Table 6 Survey site established in each land system in the Lamb Creek survey area

Land system	Number of sites	Site names
Boolgeeda	14	LCF10, LCF11, LCF12, LCF14, LCF15, LCF21, LCF24, LCF26, LCF27, LCF35, LCF39, LCF40, LCF41, LCF42, LCF52
McKay	18	LCF05, LCF06, LCF16, LCF17, LCF18, LCF19, LCF20, LCF22, LCF23, LCF25, LCF28, LCF29, LCF30, LCF31, LCF32, LCF36, LCF37, LCF38
Newman	3	LCF01, LCF02, LCF43, LCF46
Platform	5	LCF03, LCF04, LCF07, LCF08, LCF09, LCF45
Wannamunna	2	LCF33, LCF34, LCF51

3.2.2. VEGETATION MAPPING

The boundaries of vegetation communities were established by ground-truthing the imagery of aerial photographs. Transition boundaries of vegetation communities were recorded manually on an aerial photograph of the project area, and waypointed with a GPS. Vegetation classification was carried out using the statistical analysis program PATN (Belbin 1989). Digital maps of vegetation communities were produced by Rapallo in a geographic information system (GIS) program using the results of the PATN analysis as a guide, with field-collected data serving to clarify and interpret the PATN results where required.

3.2.3. OPPORTUNISTIC FLORA COLLECTIONS

Opportunistic flora collections were made while traversing the project area between survey quadrats and during vegetation mapping. Opportunistic collections provide a valuable complement to the other collections and survey data, as they may be used to improve the botanical knowledge of the area.

Specimens were collected of all species that had not been recorded during the quadrat surveys. For each opportunistic collection, the following data were recorded: GPS location, density or numbers at location, growth form, and height of the plant. Digital photographs were taken where necessary for identification purposes and whenever a species was thought to be a conservation significant taxon.

3.3. STATISTICAL ANALYSIS

3.3.1. PATN ANALYSES

Survey sites were grouped into clusters of similar vegetation communities, based on the presence and density of the taxa recorded, by using the software program PATN v3.12 (Belbin 1989).

Analysis was done using Bray and Curtis association, a flexible UPGMA classification with a beta of -0.1, and seven final groups. Ordination was done using the default settings.

Kruskal-Wallis statistics were used to identify the taxa that were producing the most statistical noise; these taxa were then removed from the analysis. This process was repeated until the ordination stress values produced by the analysis were considered sufficiently low (ideally below 0.15). The Kruskal-Wallis values were then used to determine which species contributed most strongly to each vegetation group in order to describe the vegetation types.

3.3.2. ESTIMATES

The software program EstimateS (Windows Version 8.20) (Colwell 2006) was used to estimate survey completeness by generating species accumulation curves, and by calculating predicted total species richness. Analyses were conducted on presence-absence data from flora survey quadrats (46 quadrats, 214 taxa), using the default settings, with the following exceptions:

- Accumulations (runs) were randomised 10,000 times without replacement;
- Upper abundance limit for rare or infrequent species was set to 5;

The species accumulation curve was plotted as the number of species recorded (y-axis) against the number of flora quadrats surveyed (x-axis). Predicted species richness was calculated by taking the average of the estimators Jacknife 1, Jacknife 2 and Bootstrap.

Predicted species richness was compared with observed species richness, comprising all species recorded from quadrats (214 taxa), and with observed species richness comprising total number of species recorded during the survey, including opportunistic records (223 taxa).

3.4. SURVEY PERSONNEL AND LICENSING

The following people were involved with the survey and the preparation of this report:

Table 7 Personnel involved in the survey

Staff	Role	Flora License
Linda Dalgliesh	Botanist for Rapallo Environmental	SL009472
Joshua Gilovitz	Botanist for Rapallo Environmental	SL009605
Marieke Weerheim	Environmental Scientist for Rapallo Environmental	SL009964
Dr Eleanor Bennett	Taxonomist for Bennett Environmental Consulting	n/a
Sharnya Thompson	Consultant Taxonomist	n/a

Collection of specimens for the flora and vegetation survey was licensed under the Western Australian *Wildlife Conservation Act 1950* "Licence to take Flora for Scientific or Other Prescribed Purposes". As part of the license requirements, a copy of this report will be forwarded to the DEC.

3.5. SURVEY LIMITATIONS

The potential limitations of the survey, as outlined in EPA *Guidance Statement No. 51* (2004) are discussed in Table 8.

Table 8 Potential limitations and discussion of their relevance to the survey

Potential Limitation	Discussion
Sources of information and availability of contextual information (i.e. pre-existing background vs. new material)	Government database records were obtained for the area, although some of the species recorded in the field were not present in those data. Multiple similar flora surveys exist for surrounding areas, including one completed by Rapallo.
Scope (i.e. what life forms, etc., were sampled).	All vascular plant species were recorded when found in survey quadrats or encountered while traversing the area on foot.
Proportion of flora collected and identified (based on sampling, timing and intensity).	Statistical analysis shows that 86% of the predicted species richness was recorded during the survey, with a near-asymptotic species accumulation curve (Section 4.2.1). Specimen quality was high: of the 414 specimens collected, 96.4% could be identified to species or infraspecific level.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed).	The survey area is considered well sampled, with the exception of two areas within the main mining area that were poorly sampled. These areas are considered unlikely to contain different vegetation or species than those that were recorded throughout the rest of the survey area based on helicopter flyovers and satellite photographs.
Mapping reliability.	High quality satellite photographs of the area were available, and various other mapping resources (soils, geology, vegetation) were also available.
Timing, weather, season, cycle.	The survey was carried out in late March - early April, which is considered to be an appropriate time for the area. Rainfall was above average in the three months preceding the survey, and floristic diversity was high.

Potential Limitation	Discussion
Disturbances (fire, flood, accidental human intervention etc.).	The survey area occurs in an active pastoral lease, and some sites were noted as disturbed by cattle, as well as infrastructure associated with the pastoral lease and recent mineral exploration. Evidence of old (>5 years) fire was noted in some areas, however the majority of the survey area was relatively undisturbed and long unburnt.
Intensity (in retrospect, was the intensity adequate).	Statistical analysis demonstrates that survey intensity was adequate floristically; however more intensive sampling of some minor vegetation types may have resulted in more precise mapping.
Resources.	The field staff had adequate resources for the survey including reports of previous botanical surveys of the area, lists and information outlining all Declared Rare and Priority Flora, maps, GPS information supplied by the client, handheld GPS units, cameras, and the necessary equipment for botanical collection.
Experience levels (e.g. degree of expertise in plant identification to taxon level).	Herbarium identification was carried out by a combination of Rapallo staff and experienced external contractors (Eleanor Bennet and Sharnya Thomson). All specimen identifications were verified by a second botanist/taxonomist following initial identification.

4. RESULTS

4.1. DESKTOP SEARCH RESULTS

The combined review of databases, survey reports and published literature yielded a total of 68 taxa of conservation significant flora taxa previously recorded from within 100 km of the survey area. The majority of these (57 taxa) were recorded in the various databases, while an additional 11 taxa were recorded in previous surveys within 100 km of the survey area (Table 9).

Table 9 Number of conservation significant taxa recorded in databases and previous surveys

Conservation Status	Databases (within 40 km)	Survey reports (within 100 km)	Total taxa
Threatened (Declared Rare) Flora	2	1	2
Priority 1	11	2	11
Priority 2	14	3	15
Priority 3	26	12	34
Priority 4	4	5	6
Totals	**57**	**23**	**68**

Two species of Threatened (Declared Rare) flora were recorded within 40 km of the survey area. These were *Lepidium catapycnon* (Hamersley Lepidium) and *Thryptomene wittweri* (Mountain Thryptomene); both taxa are listed under the EPBC Act as Vulnerable, and listed under the Wildlife Conservation Act as Schedule 1 – rare or likely to become extinct.

In addition, 66 taxa listed by the DEC as Priority Flora were recorded in the desktop search; these comprised 11 Priority 1 species, 15 Priority 2 species, 34 Priority 3 species, and six Priority 4 species.

The complete list of conservation significant flora recorded in the desktop search is presented in Table 10. Please note that the DEC Threatened (Declared Rare) and Priority Flora database (TPFL) lists populations, and the WA Herbarium database (WAHerb) lists individual specimens. All other databases and reports listed in Table 10 represent presence or absence of a particular taxon within the search area.

Table 10 Desktop search results – Conservation significant flora taxa recorded within 100 km of the survey area

Taxon name and conservation status	Databases [1]					Survey reports [2]							
	TPFL	TPList	WAHerb	NatureMap	SEWPaC	A1	B1	B2	E	M1	M2	M3	R
Threatened (Declared Rare) Flora													
Lepidium catapycnon	17		1	1	1			1				1	
Thryptomene wittweri	2		4	1									
Priority 1													
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	1		2	1									
Brunonia sp. Long hairs (D.E. Symon 2440)			1	1									
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	1		1	1									
Eremophila sp. West Angelas (S. van Leeuwen 4068)			1	1									
Eremophila spongiocarpa	1	1	1	1			1			1			
Grevillea sp. Turee (J. Bull & G. Hopkinson ONS JJ 01.01)				1									
Josephina sp. Marandoo (M.E. Trudgen 1554)	2	1	1	1			1						
Rhodanthe ascendens	1	1	1										
Tetratheca fordiana	1	1	1										
Teucrium pilbaranum		1	1	1									
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)			6	1									
Priority 2													
Adiantum capillus-veneris		1											
Aristida calycina var. *calycina*		1											
Aristida lazaridis		1											
Cladium procerum		1											
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	1	1	3	1									
Euphorbia clementii	1			1									
Euphorbia sp. Mt Bruce flats (S. van Leeuwen 3861)		1											

Taxon name and conservation status	Databases [1]					Survey reports [2]							
	TPFL	TPList	WAHerb	NatureMap	SEWPaC	A1	B1	B2	E	M1	M2	M3	R
Indigofera ixocarpa		1											
Isotropis parviflora		1											
Oxalis sp. Pilbara (M.E. Trudgen 12725)		1	3	1									
Paspalidium retiglume							1						
Pilbara trudgenii	3		2	1									
Spartothamnella puberula	1	1	3	1									
Stylidium weeliwolli	1		4									1	
Vigna sp. Central (M.E. Trudgen 1626)		1				1							
Priority 3													
Abutilon trudgenii							1						
Acacia daweana	2	1	1										
Acacia effusa	4	1	2	1									
Acacia glaucocaesia						1							
Acacia subtiliformis	2	1	2	1									
Ampelopteris prolifera		1											
Atriplex flabelliformis		1											
Dampiera anonyma		1											
Dampiera metallorum	9	1	17	1									
Eremophila forrestii subsp. *viridis*												1	
Eremophila magnifica subsp. *velutina*	1		1										
Eriachne sp. Dampier Peninsula (K.F. Kenneally 5946)		1											
Euphorbia inappendiculata											1		
Euphorbia stevenii		1											
Fimbristylis sieberiana	1		1										
Glycine falcata	1	1	1	1									
Goodenia lyrata	3		2	1									

Taxon name and conservation status	Databases [1]					Survey reports [2]							
	TPFL	TPList	WAHerb	NatureMap	SEWPaC	A1	B1	B2	E	M1	M2	M3	R
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	4	1	3	1			1						
Indigofera gilesii subsp. *gilesii*	3	1	6	1									
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)						1							
Iotasperma sessilifolium		1	1	1									
Nicotiana umbratica		1											
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)			2	1									
Olearia mucronata	2	1	1	1									
Owenia acidula						1							
Phyllanthus aridus		1											
Rhagodia sp. Hamersley (M Trudgen 17794)	3		3	1								1	1
Rostellularia adscendens var. *latifolia*			3	1					1	1			
Sida sp. Barlee Range (S. van Leeuwen 1642)			3	1									
Tecticornia medusa			1	1									
Terminalia supranitifolia						1							
Themeda sp. Hamersley Station (M.E. Trudgen 11431)		1	4	1			1			1			
Triodia sp. Mt Ella (M.E. Trudgen 12739)			7	1									
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)						1							
Priority 4													
Acacia bromilowiana	4	1	10	1		1							
Bulbostylis burbidgeae							1		1				
Eremophila magnifica subsp. *magnifica*			4	1									
Eremophila youngii subsp. *lepidota*										1		1	
Goodenia nuda	3		3	1		1		1	1				
Rhynchosia bungarensis			2	1		1							

Footnotes with Table 9

1) Databases: TPFL = DEC Threatened (Declared Rare) and Priority Flora database
TPList = DEC Threatened and Priority Flora List
WAHerb = Western Australian Herbarium Database
NatureMap = DEC Naturemap online search tool (DEC 2007–)
SEWPaC = Protected Matters online search tool (SEWPaC 2012c)

2) Survey reports: A1 = Astron (2010a)
A2 = Astron (2010b)
B1 = Biota (2004)
B2 = Biota (2010)
E = ENV (2008)
M1 = Mattiske (2005)
M2 = Mattiske (2008a)
M3 = Mattiske (2008b)
R = Rapallo (2012)

4.2. FIELD SURVEY RESULTS

4.2.1. FLORA TAXA RECORDED IN THE SURVEY

Summary Statistics

A total of 414 specimens were collected during the survey. Following taxonomic identification, these were found to represent 230 species or infraspecies. Of all specimens collected, 15 could not be identified to species level due to absence of suitable fruiting or flowering material. Specimens that could not be positively identified to species or subspecies level were only counted in the final species list if they were thought likely to represent a taxon that was not otherwise recorded. The total species list is presented in Appendix III.

The average number of flora taxa per survey quadrat was 25.83. This number is relatively high for surveys in the Pilbara area and was influenced by the presence of many annual / ephemeral species in at the sites, due to the survey being completed within three months following significant rainfall events, and also due to the presence of some extremely species-rich sites that increased the overall average.

Table 11 Summary statistics of taxa recorded in the survey area

Taxonomic level	Number of taxa	Most common taxa (number of species)
Family	42	Poaceae (41), Fabaceae (41), Malvaceae (26)
Genus	110	Acacia (23), Ptilotus (11), Senna (9)
Species	230	-

The average Keighery (1994) vegetation condition was 2.51 (excellent - very good). The most common disturbances observed were grazing by cattle, vehicle tracks and mineral exploration impact, and weeds.

Survey Completeness

The species richness estimators calculated with EstimateS indicate that 81% of the predicted number of flora taxa were recorded during the survey at Lamb Creek. This is reflected in the species accumulation curve, which approached an asymptote as the number of sites increased (Figure 3).

The predicted species richness was 264.9 based on the average of the estimators Jacknife 1, Jacknife 2 and Bootstrap, with observed species richness of 214 representing the number of species recorded from flora quadrats. Opportunistic flora collections made while walking between sites included another 16 species that had not been recorded in the quadrats. Hence, the total number of 230 flora species represents 86.8% of predicted species richness.

These figures suggest that increased survey effort, i.e. more flora quadrats, and/or more transects, may have produced a higher number of species recorded from the survey area. However, the fact that the accumulation curve reached a near-asymptote indicates that a large increase in the number of survey quadrats would have been required to reach a figure about 90% survey completeness. Furthermore, the fact that 93% of all taxa recorded during the survey were collected from the quadrat sites indicates that the sites were well placed within the survey area to sample all available vegetation types.

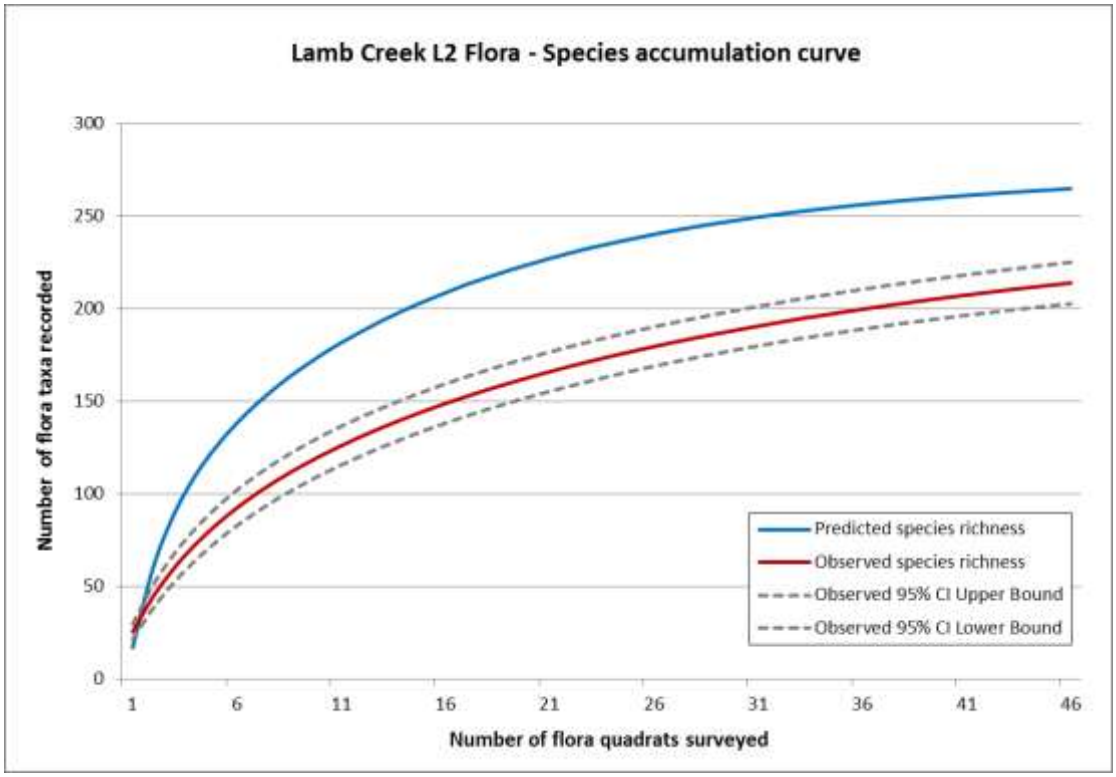


Figure 3 Species accumulation curve for the Lamb Creek L2 flora survey

4.2.2. CONSERVATION SIGNIFICANT TAXA

No species of Threatened Flora (Declared Rare Flora) pursuant to the Western Australian *Wildlife Conservation Act* 1950, and no species listed as Threatened pursuant to the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* were recorded in the survey area.

Three species of Priority Flora listed by DEC were recorded during the survey, comprising one Priority 1 species (*Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662)) and two Priority 2 species (*Aristida calycina* var. *calycina* and *Aristida lazaridis*). The locations of conservation significant flora taxa recorded in the survey area are presented in Figure 4; the coordinates of all these records are listed in Appendix IV.

Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662) - Priority 1

This species is a small herb in the Asteraceae (daisy) family, with pink flowers and sharply divided leaves.

Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662) was collected at LCF33, LCF51, and LCF34. Single plants or small numbers present at all sites. This species was recorded as occurring in small but consistent numbers throughout the area between these sites, at the far-western extent of the proposed haul road.

The species is known from ten collections in the WA Herbarium from an approximately 330 km wide south east - north west band, with the current survey area situated roughly in the centre. The nearest record is from 2006 and was 20km to the west of the collection made within the survey area. *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) is represented by two records in the TPFL database, which are both probably derived from WAHERB specimen records as they share dates and coordinates with WAHERB records.

A specimen of this species will be submitted to the WA Herbarium collection.

Aristida calycina var. *calycina* - Priority 2

Aristida calycina var. *calycina* is described as a loosely tufted perennial grass, 0.3-1.3 m high, with smooth lemma groove. It occurs on red earths, sands, and alluvial soils (Western Australian Herbarium 2012). Widespread throughout NSW and is present in several other Australian states (The Royal Botanic Gardens and Domain Trust 2012).

This species was collected at site LCF31, where only a single plant was recorded. The specimen did not match the description of the species exactly, however was very close to collection S. van Leeuwen PBS0466, and will be assumed to be *A. calycina* var. *calycina* for the purposes of this report.

This taxon is known in Western Australia from a single specimen at the Western Australian Herbarium (Sheet 04867599), and is not recorded in DEC's TPFL database. The existing WA Herbarium record was collected in 1996 and has coordinates placing it approximately 65 km away from our collection.

The specimen collected will be submitted to the Western Australian Herbarium collection.

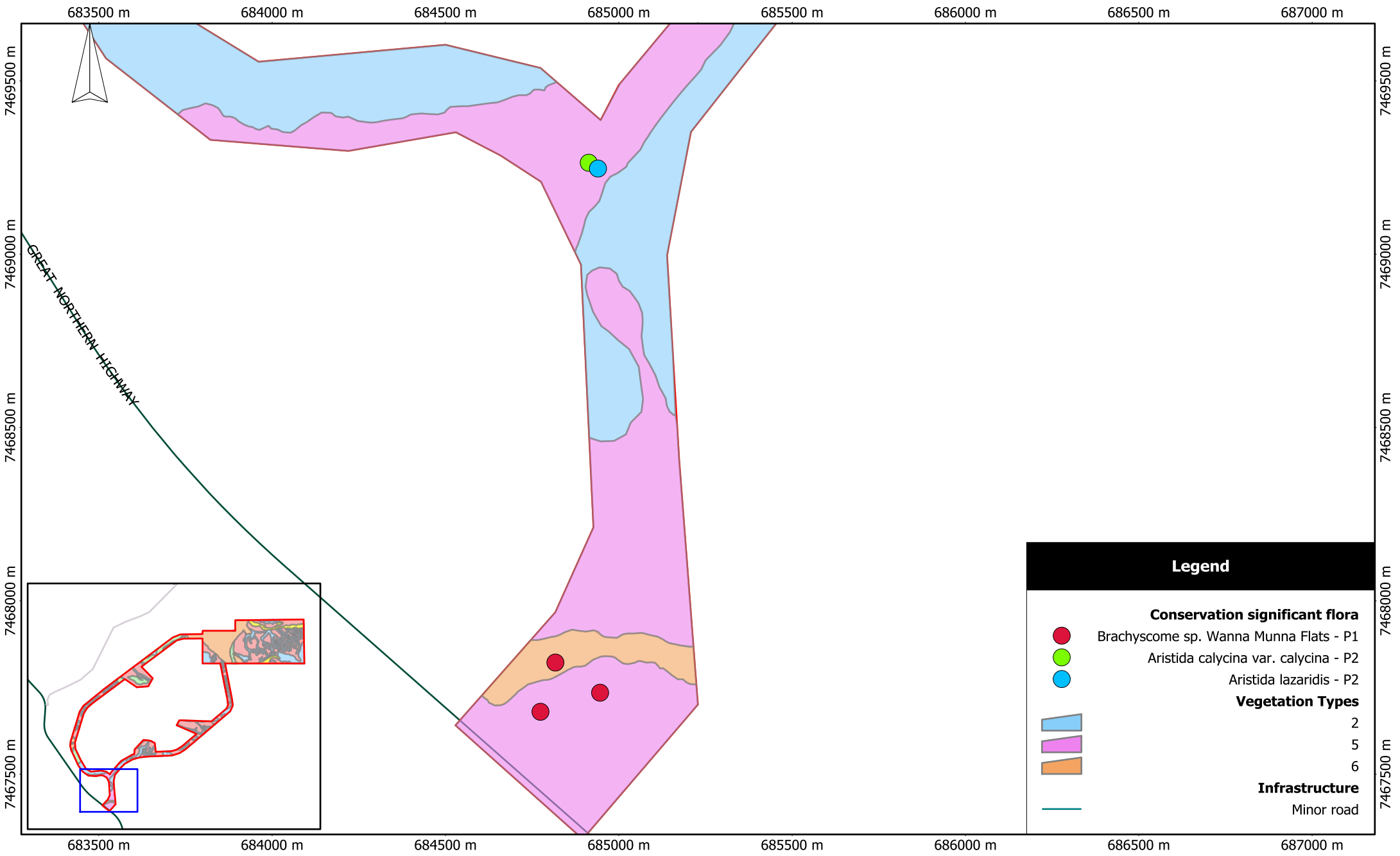
Aristida lazaridis - Priority 2

Aristida lazaridis is a tufted perennial grass, 0.4-1.5 m high, with green and purple flowers in April, occurring on sand or loam (Western Australian Herbarium 2012).

This species was record at site LCF31, where it was relatively abundant, with a density rated at 5-25%.

Aristida lazaridis is known from only two specimens at the WA Herbarium. One was collected in 2008, approximately 55 km to the east south east of our record, and the second was collected the same distance to the north west in 1996. The species is not recorded in DEC's TPFL database.

A specimen of *Aristida lazaridis* will be submitted to the WA Herbarium collection.



Rapallo

Original Size: A4 Scale: 1:14,000
Datum: MGA94
0 500 m

Process Minerals International

Figure 4

Conservation significant flora recorded in the survey area

4.2.3. WEEDS

Five species of introduced flora (weeds) were recorded in the survey area: *Bidens bipinnata* (Bipinnate Beggartick), *Cenchrus ciliaris* (Buffel Grass), *Chloris virgata* (Feathertop Rhodes Grass), *Malvastrum americanum* (Spiked Malvastrum), and *Portulaca oleracea* (Purslane).

None of these taxa were listed as Declared Plants by the WA Department of Agriculture and Food pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* (Western Australia). None of these taxa were listed as Weeds of National Significance by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC 2012).

Five weed species were recorded at nine locations in the Lamb Creek survey area (Figure 5, Figure 6). Weed species were more abundant at locations where evidence of cattle was noted. The site that contained the most weed species was LCF31, where four weed species were found.

Bidens bipinnata (Bipinnate Beggartick)

Bidens bipinnata is an erect annual herb, from 0.1-0.9 m high, with yellow flowers from March to September. It occurs on alluvium, clay, loam over sandstone, and limestone, along rivers and creeks, in coastal areas, and on rocky hillsides. It is widespread throughout the Pilbara and also occurs in other north-western WA regions (Western Australian Herbarium 2012).

Bidens bipinnata was the most commonly recorded weed species, found at nine sites in the survey area: LCF12, LCF15, LCF18, LCF20, LCF23, LCF31, LCF34, LCF37, LCF46.

Cenchrus ciliaris (Buffel Grass)

Cenchrus ciliaris is a tufted perennial grass to 1.5m in height, with purple seed-heads from February to October (Western Australian Herbarium 2012). The seeds of this weed are spread by wind, water, stock and machinery (Thorp and Wilson 1998-2012). Buffel Grass has become a major environmental weed of northern Australia, displacing native species, and carrying fire into areas where fire was not normally part of the ecosystem (Thorp and Wilson 1998-2012, Hussey *et al* 2007).

This species was observed at a single site, LCF23, in the current project.

Chloris virgata (Feathertop Rhodes Grass)

Chloris virgata is an annua grass, usually from 0.23-0.45 m high, with green-purple flowers from April to May or in September. It usually occurs on sand dunes. It occurs in many areas of WA and is common in the Pilbara region (Western Australian Herbarium 2012).

Chloris virgata was observed at a single site, LCF31, in the current project.

Malvastrum americanum (Spiked Malvastrum)

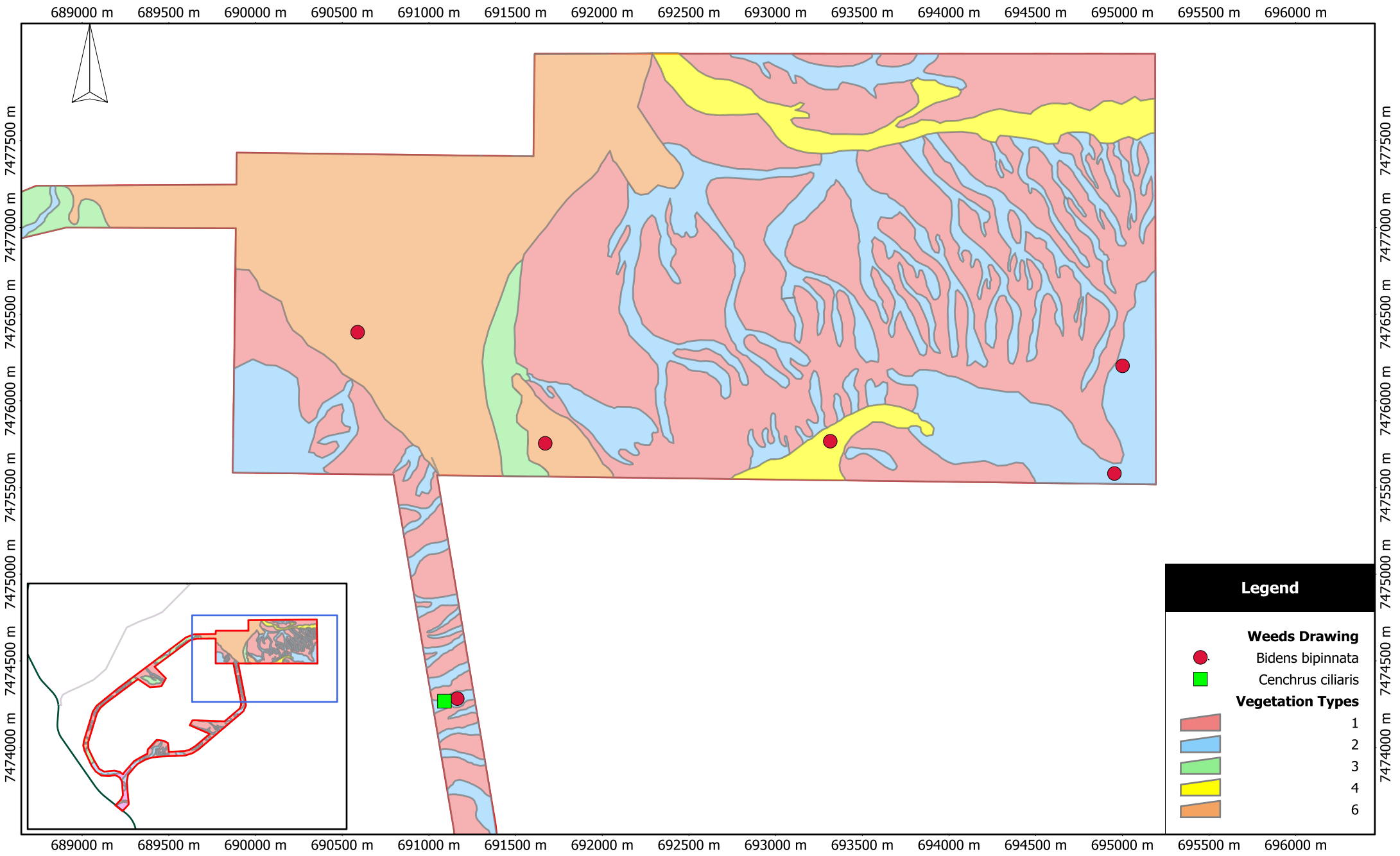
Malvastrum americanum is an erect perennial herb or shrub, from 0.5-1.3 m high. It has yellow-orange flowers in April to July. It occurs on orange, red, or yellow sands, gritty alluvial sand, black or brown clay, alluvial cracking clays, limestone, and calcrete, on stony ridges and hillsides, floodplains, and along drainage lines. It is widespread and common within the Pilbara and other north-western regions of WA (Western Australian Herbarium 2012).

Malvastrum americanum was recorded at site LCF31 in the survey area.

Portulaca oleracea (Purslane)

Portulaca oleracea is a succulent, prostrate to decumbent annual herb to 0.2 m high. It has yellow flowers from April to May, and occurs on clay loam and sand, often in disturbed sites. It has been recorded extensively in the Pilbara, and also occurs in many other regions of WA (WA Herbarium 2012).

In the survey area, *Portulaca oleracea* was recorded at sites LCF31 and LCF34.



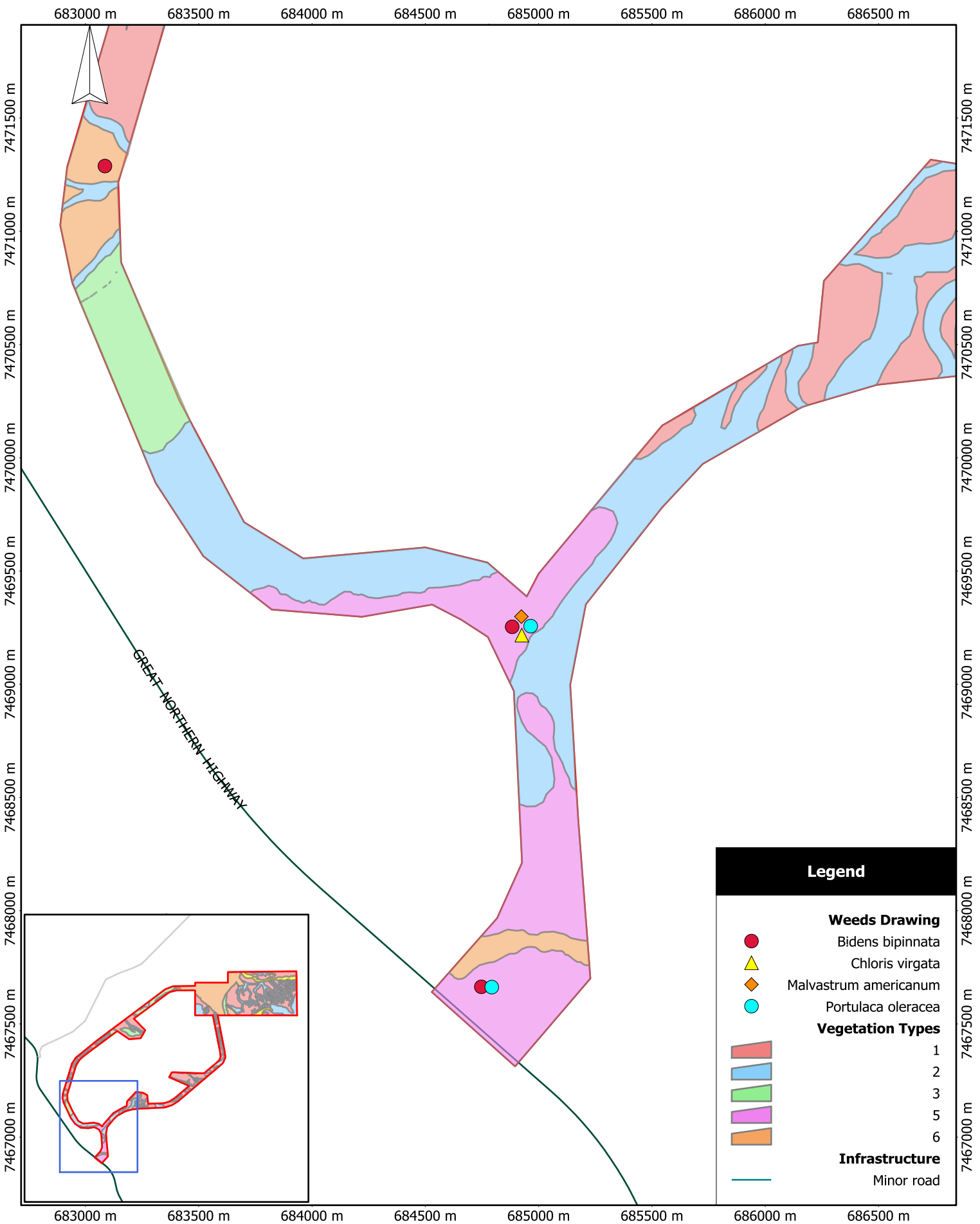
Rapallo

Original Size: A4 Scale: 1:28,000
Datum: MGA94
0 1000 m

Process Minerals International

Figure 5

Introduced flora species recorded in the survey area (1 of 2)



Rapallo

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Scale: 1:21,000
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Process Minerals International

Figure 6

Introduced flora species recorded in the survey area (2 of 2)

4.2.4. VEGETATION COMMUNITIES IN THE SURVEY AREA

Six vegetation communities were identified in the survey area. PATN analysis results were largely consistent with field mapping of vegetation communities, although they were partially manually adjusted to produce the final integrated results.

None of the vegetation communities in the survey area represented a TEC or PEC. The Coolibah-Lignum Flats vegetation complex PEC includes some species recorded in the survey, including 'mulga' (*Acacia aptaneura*, previously considered part of the *A. aneura* complex), however mulga was not found in association with *Eucalyptus victrix*, or with the species assemblage described in the PEC. *Eucalyptus victrix* was thought to be recorded at a single site, however due to lack of fruit was not able to be identified positively, and at that site it was not associated with any of the other species described in the Coolibah-Lignum Flats vegetation complex PEC.

PATN Dendrogram

Following analysis and evaluation, 110 species were selected for inclusion in the PATN analysis. This produced a dendrogram of seven vegetation types, with a stress value of 0.1686 (Figure 7). The quadrats assigned to one group, which consisted of two sites (LF12 and LCF32), were manually reassigned to other groups based on field observations, to produce six final groups.

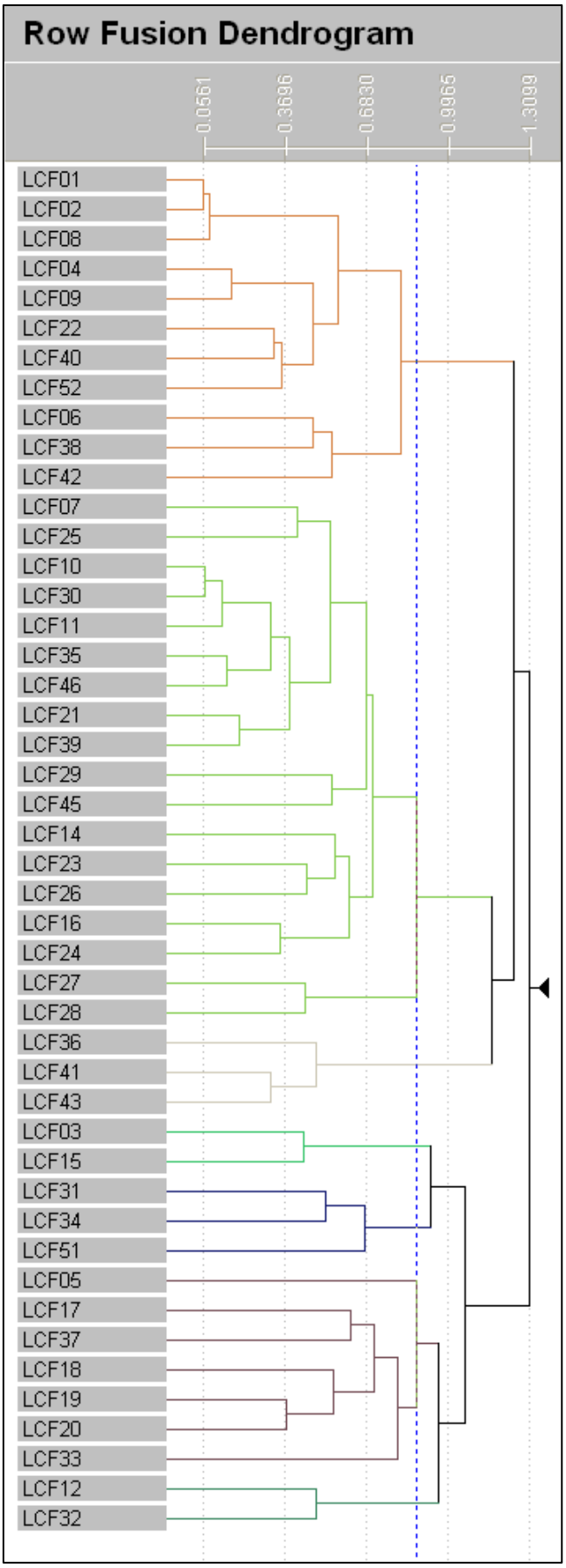

Figure 7 PATN dendrogram of analysis of survey quadrats

Vegetation Mapping

Based on field observations and PATN analysis, six main vegetation communities were recorded. The vegetation type occurring most widely across the survey area was *Eucalyptus gamophylla* woodland over hummock grassland (Table 1).

Table 1 Total and percentage area of each vegetation type recorded in the Lamb Creek survey area

Vegetation community	Total area (km^2) within survey area	Percentage of survey area
1. *Eucalyptus gamophylla* woodland over hummock grassland	9.57	46 %
2. *Eucalyptus leucophloia* subsp. *leucophloia* woodland over mixed shrubs over *Triodia wiseana* grassland	5.25	25 %
3. *Acacia* shrubland over hummock grassland	1.30	6 %
4. *Acacia tumida* var. *pilbarensis* scrub in creeklines	0.64	3 %
5. Wannamunna Mulga grove	0.66	3 %
6. *Acacia aptaneura* over hummock grassland	3.26	16 %
Totals	20.68	**100** %

The vegetation communities of the survey area are mapped in Figures 8, 9, 10, 11, 12 and 13 and described in detail in Table 13 below.

Table 13 Description of vegetation communities

Vegetation Community	Plate	Land System	Substrate	Description	Quadrats
1. *Eucalyptus gamophylla* woodland over hummock grassland	1	Boolgeeda, McKay, Newman, Platform	Clay loams with BIF and ironstone pebbles and gravel on open plains and gentle rises	*Eucalyptus gamophylla* low open woodland over *Acacia elachantha* or *Acacia hilliana*, *Senna glutinosa* subsp. *pruinosa* open shrubland over *Triodia brizoides*, *Triodia wiseana* hummock grassland.	LCF01, LCF02, LCF04, LCF06, LCF08, LCF09, LCF22, LCF38, LCF40, LCF42, LCF52
2. *Eucalyptus leucophloia* subsp. *leucophloia* woodland over mixed shrubs over *Triodia wiseana* grassland	2	Boolgeeda, Platform	Clays and clay loams with BIF and ironstone pebbles, cobbles, and sheetrock in gorges and rocky creeklines and on hillsides and breakaways	*Eucalyptus leucophloia* subsp. *leucophloia*, *Eucalyptus gamophylla* low open woodland over mixed species (typically *Gossypium robinsonii*, *Acacia hilliana*, *Grevillea wickhamii*, *Keraudrenia nephrosperma*) scattered shrubs over *Triodia wiseana* hummock grassland.	LCF07, LCF10, LCF11, LCF12, LCF14, LCF16, LCF21, LCF23, LCF24, LCF25, LCF26, LCF27, LCF28, LCF29, LCF30, LCF35, LCF39, LCF45

Vegetation Community	Plate	Land System	Substrate	Description	Quadrats
3. *Acacia* shrubland over hummock grassland	3	Boolgeeda, Newman	Sandy clay with ironstone gravel and pebbles on gentle slopes at bases of hills	*Acacia bivenosa* or *Acacia adsurgens* open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) , *Triodia wiseana* hummock grassland.	LCF36, LCF41, LCF43
4. *Acacia tumida* var. *pilbarensis* scrub in creeklines	4	Boolgeeda, Platform	Clay loam and sandy clay with laterite pebbles in drainage lines	*Acacia tumida* var. *pilbarensis* tall open scrub over *Themeda triandra* tussock grassland and *Triodia wiseana* open hummock grassland.	LCF03, LCF15
5. Wannamunna Mulga grove	5	Boolgeeda, Wannamunna	Sandy clay and clay on flat plains	*Acacia aptaneura* low woodland over *Themeda triandra*, *Cymbopogon ambiguus*, *Chrysopogon fallax* open tussock grassland.	LCF31, LCF32, LCF34, LCF51
6. *Acacia aptaneura* over hummock grassland	6	Boolgeeda, Wannamunna	Broad open drainage system through stony plains with clay soils	*Acacia aptaneura* and/or *Corymbia deserticola* low woodland over *Acacia elechantha* and mixed *Eremophila* species over *Triodia wiseana* very open hummock grassland	LCF17, LCF18, LCF19, LCF20, LCF33, LCF37

Type 1: *Eucalyptus gamophylla* woodland over hummock grassland

A widespread vegetation type within the survey area, and especially within the main mining tenement and western haul road areas of the project, occurring on open plains and gentle rises.

This vegetation type had a mean Keighery health rating of 2.667 (excellent-very good) with the main disturbance causes being grazing (cattle), vehicle tracks, and erosion.

No weed species or Priority flora species were observed in this vegetation type.

Plate 1 ***Eucalyptus gamophylla*** **woodland over hummock grassland vegetation type (site LCF09)**

Type 2: *Eucalyptus leucophloia* subsp. *leucophloia* woodland over *Triodia wiseana* hummock grassland

The most widespread vegetation type within the survey area occurring on rocky ridges, hillsides, rocky minor drainage lines, and gorges.

This vegetation type had a mean Keighery health rating of 2 (excellent) with the main disturbance causes being grazing (cattle) and weeds.

The weed species *Bidens bipinnata* and *Cenchrus ciliaris* were observed at three sites in this vegetation type. No Priority flora species were observed in this vegetation type.

Plate 2 ***Eucalyptus leucophloia* subsp. *leucophloia* woodland vegetation type (site LCF24)**

Type 3: *Acacia* shrubland over hummock grassland

This is a minor vegetation type within the survey area. It occurs at three sites along the western haul road section of the survey area and on rocky gentle slopes at the base of hills.

This vegetation type had a mean Keighery health rating of 1.667 (pristine - excellent) with the main disturbance causes being grazing (cattle) and vehicle tracks.

No weed species or priority flora species were observed in this vegetation type.

Plate 3 ***Acacia*** **shrubland over hummock grassland vegetation type (site LCF36)**

Type 4: *Acacia* shrubland over hummock grassland

A minor vegetation type within the survey area, occurring at only two sites in medium-sized creek lines.

This vegetation type had a mean Keighery health rating of 3 (very good) with the main disturbance causes being grazing (cattle) and weeds.

The weed species *Bidens bipinnata* was found at one site in this vegetation type. No Priority flora species were observed in this vegetation type.

Plate 4 ***Acacia tumida* var. *pilbarensis* scrub in creeklines vegetation type (site LCF03)**

Type 5: Wannamunna Mulga grove vegetation

This vegetation type occurred primarily in the Wannamunna land system and was recorded at four sites.

This vegetation type had a mean Keighery health rating of 3 (very good) with the main disturbance causes being weeds and grazing (cattle).

The weed species *Bidens bipinnata*, *Chloris virgata*, *Malvastrum americanum*, and *Portulaca oleracea* were found in this vegetation type. Priority flora species including *Aristida calycina* var. *calycina* (Priority 2), *Aristida lazaridis* (Priority 2), and *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) (Priority 1) were observed in three sites of this vegetation type.

Plate 5 Wannamunna mulga grove vegetation type (site LCF31)

Type 6: *Acacia aptaneura* over hummock grassland

This vegetation type was recorded at seven sites, throughout the extent of the survey area but particularly in the open plains at the western end of the main mining tenement area.

This vegetation type was the most highly disturbed of all types in the current survey, and had a mean Keighery health rating of 3.57 (very good-good) with the main disturbance causes being grazing (cattle), active mining exploration, and vehicle tracks.

The weed species *Bidens bipinnata* was found at three sites in this vegetation type. The Priority flora species *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) (Priority 1) was observed at one site in this vegetation type (LCF33).

Plate 6 ***Acacia aptaneura*** **over hummock grassland (site LCF18)**

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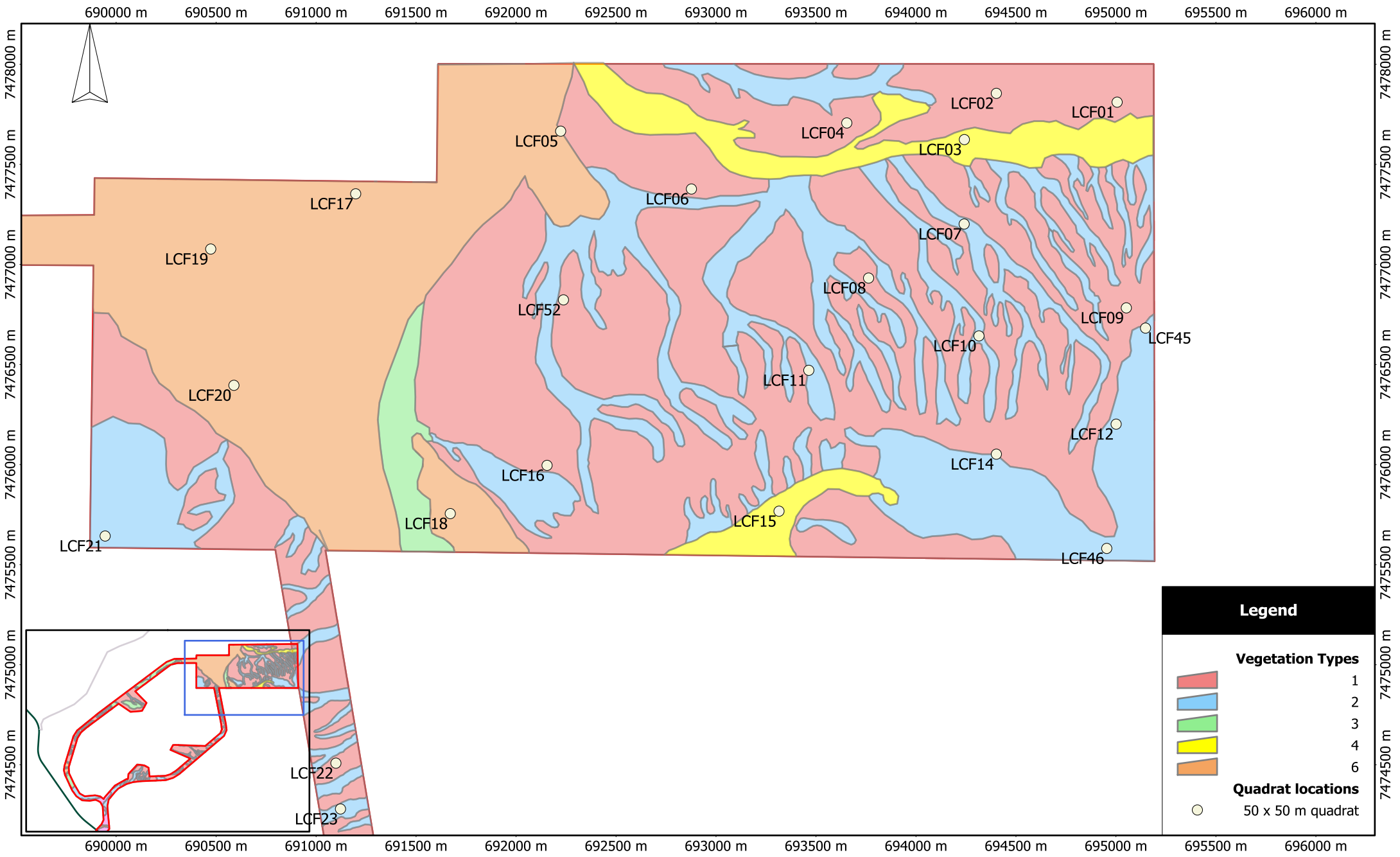

Rapallo

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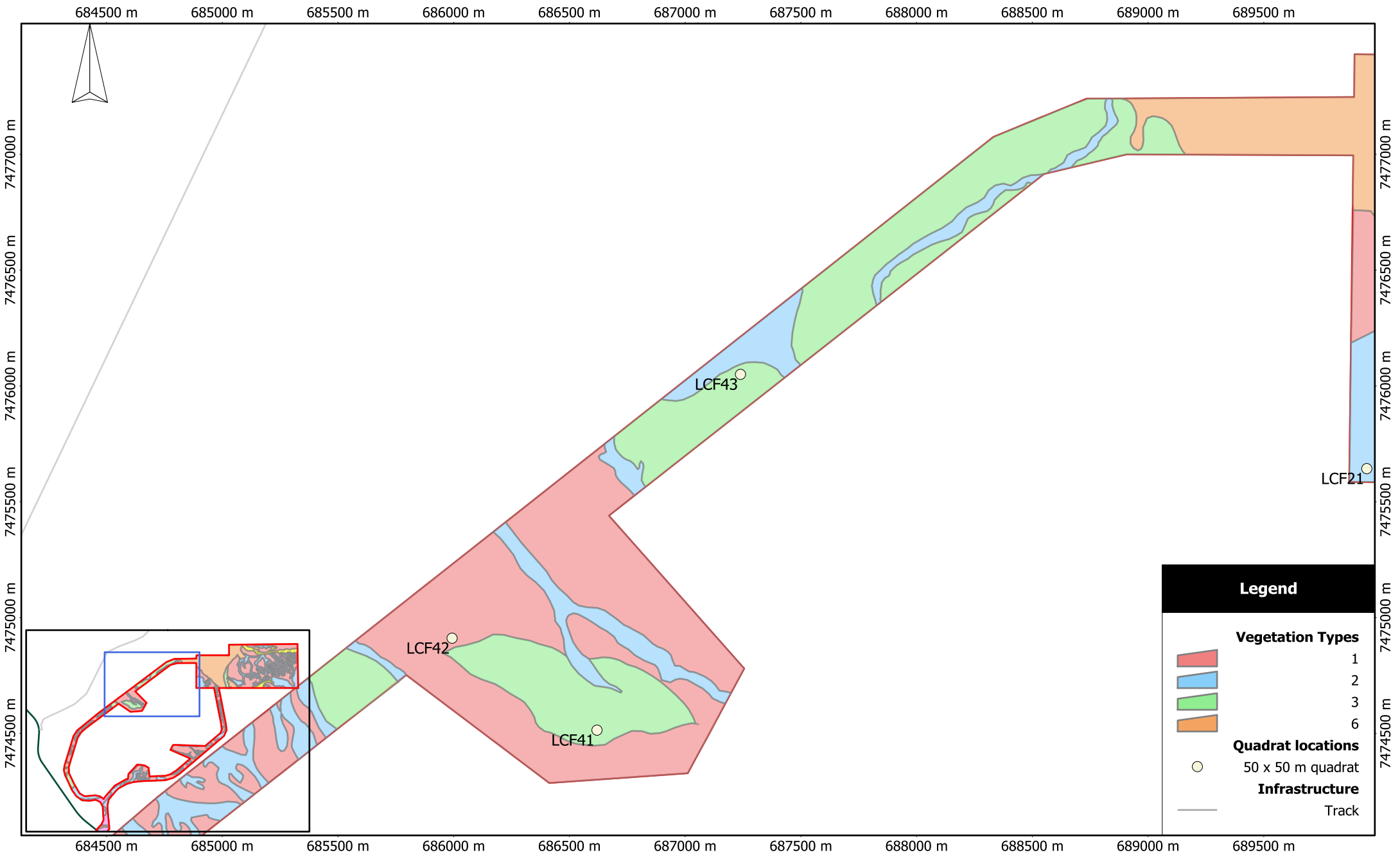
Process Minerals International

Figure 8

Vegetation communities mapped in the survey area: Proposed mining area (1 of 6)



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Original Size: A4 Scale: 1:20,000
Datum: MGA94

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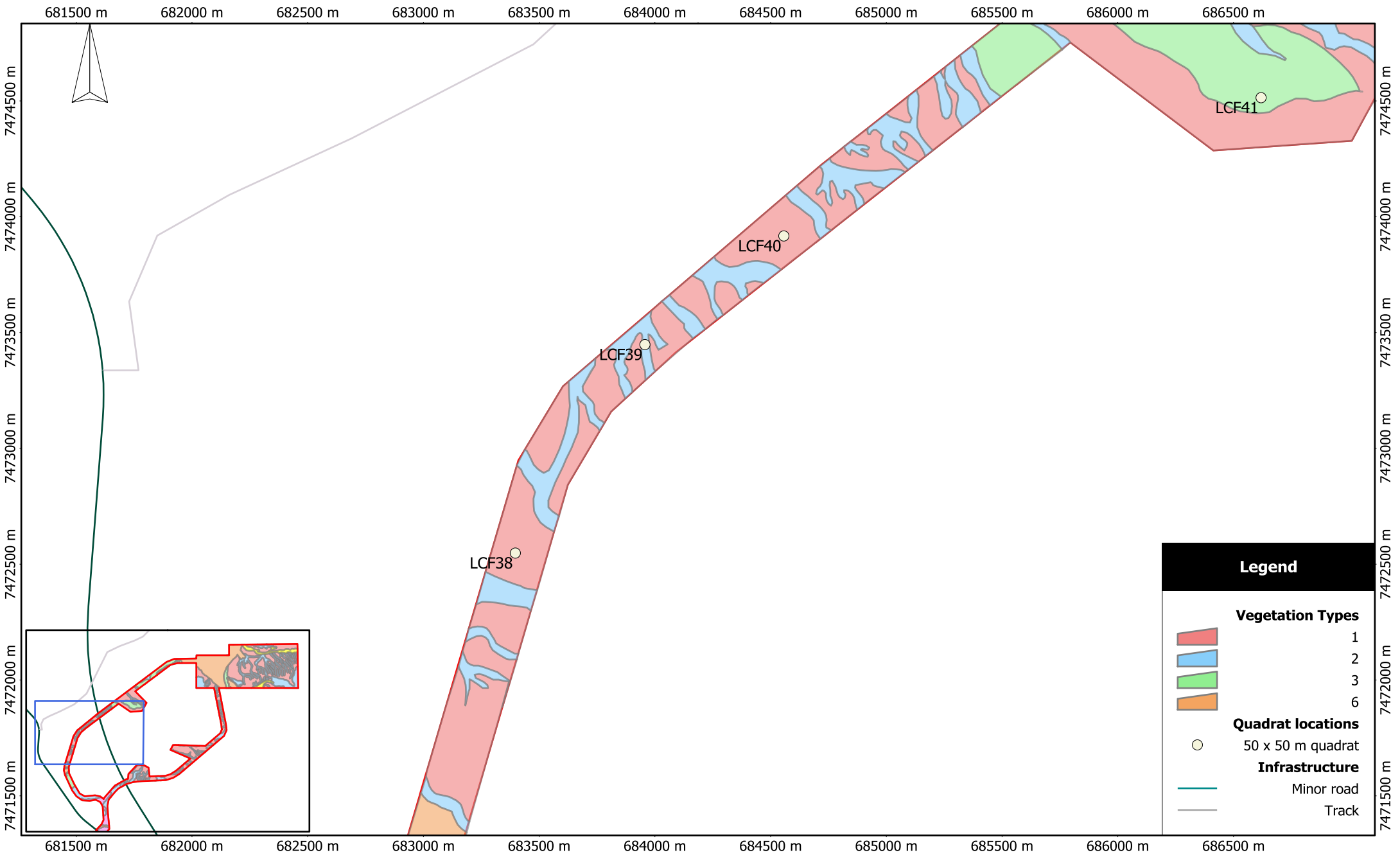
Process Minerals International

Figure 9

Vegetation communities mapped in the survey area: Northern haul road (2 of 6)



Rapallo

Original Size: A4 Scale: 1:20,000
Datum: MGA94

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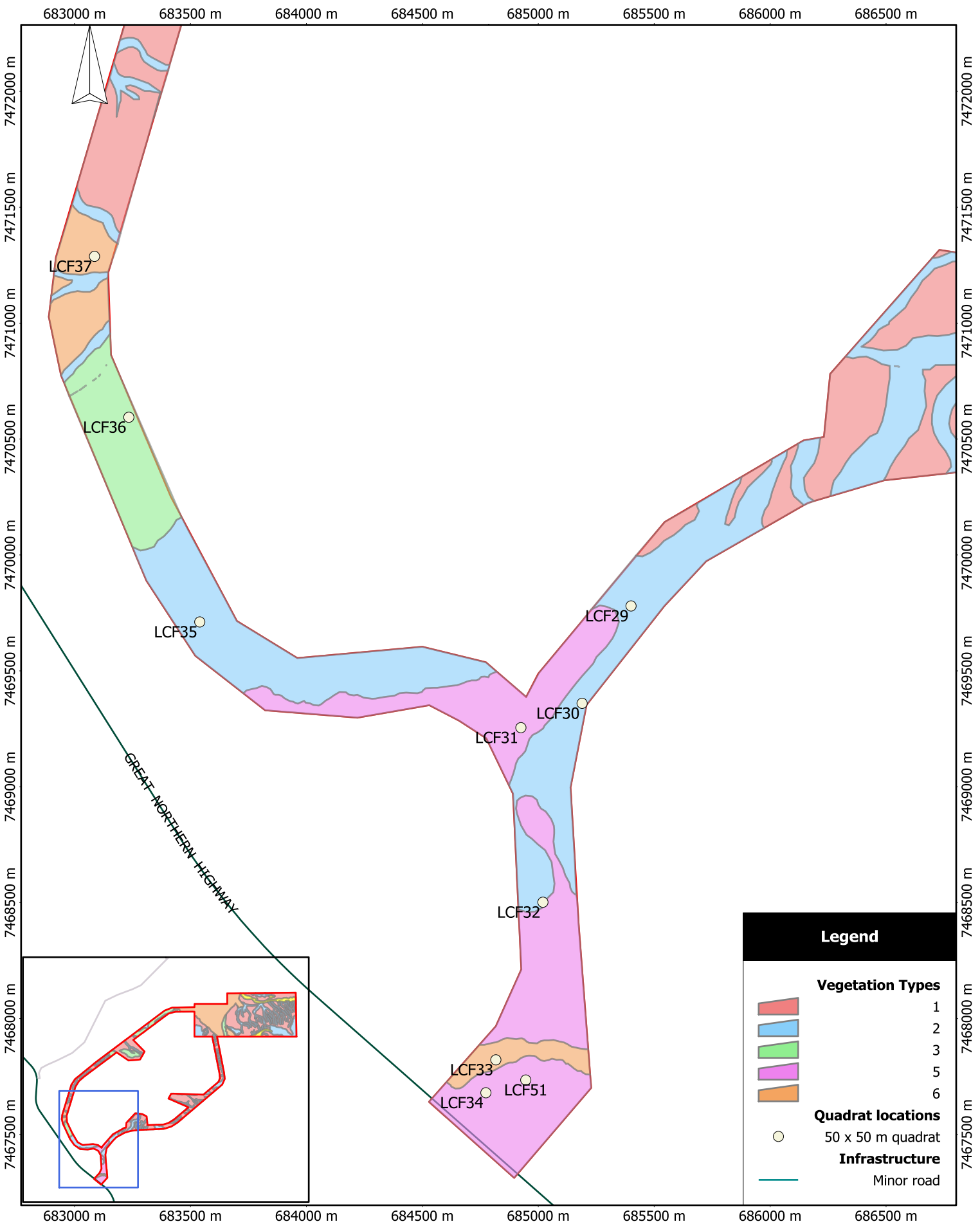
Process Minerals International

Figure 10

Vegetation communities mapped in the survey area: Northern haul road (3 of 6)



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Scale: 1:20,000
Datum: MGA94

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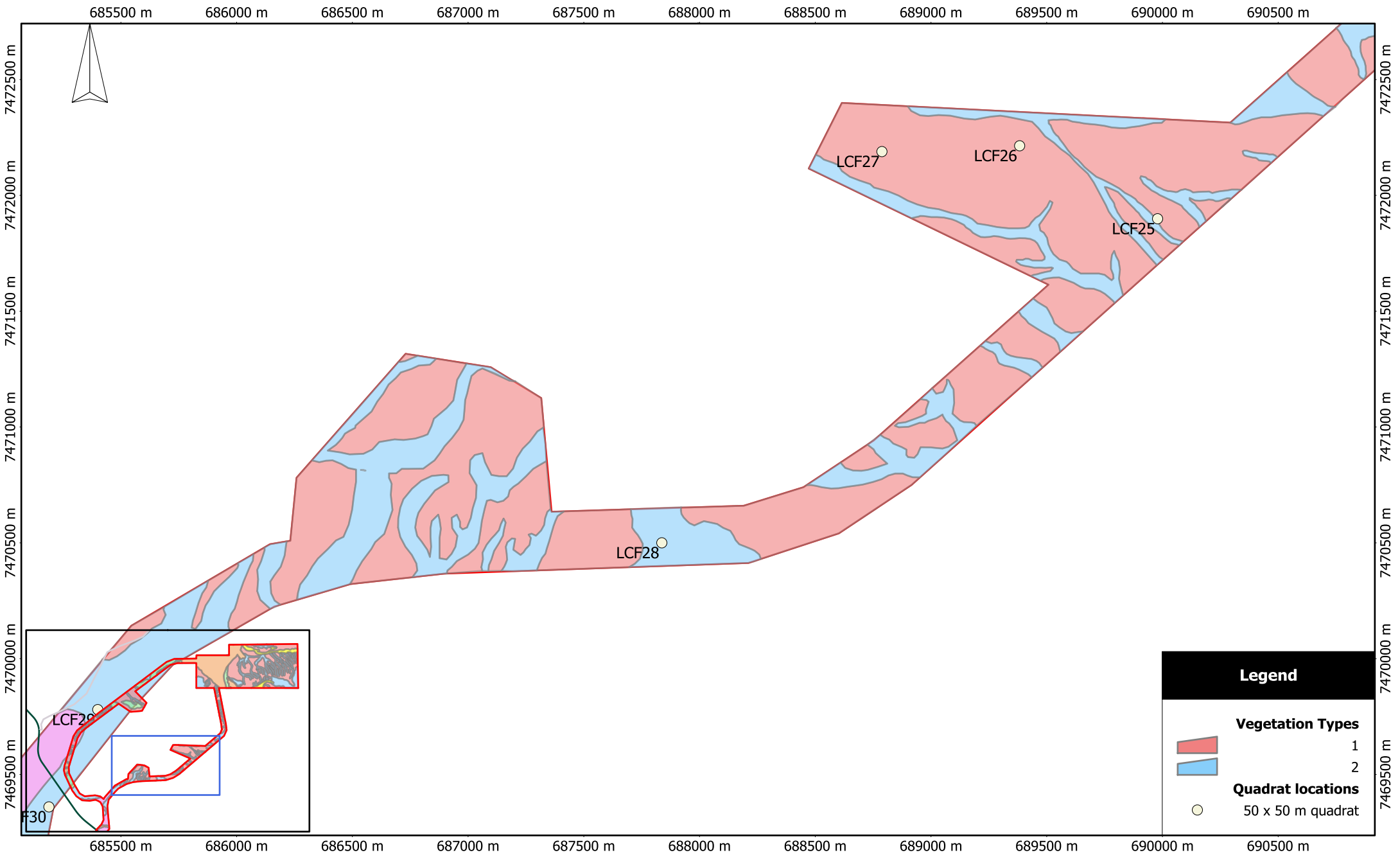
Process Minerals International

Figure 11

Vegetation communities mapped in the survey area: Intersection (4 of 6)



Rapallo

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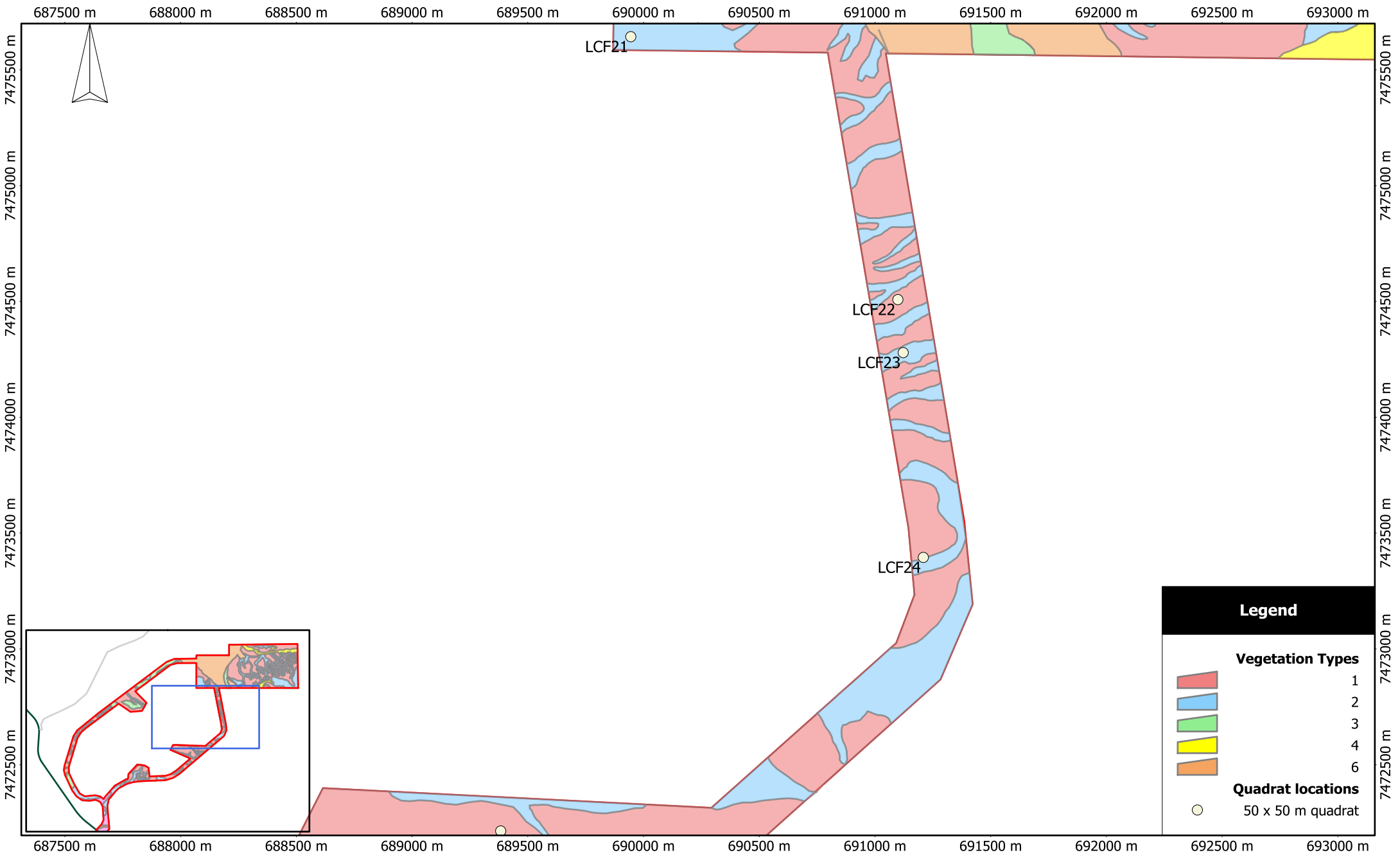
Process Minerals International

Figure 12

Vegetation communities mapped in the survey area: Southern haul road (5 of 6)



Rapallo

Original Size: A4 Scale: 1:20,000
Datum: MGA94

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Process Minerals International

Figure 13

Vegetation communities mapped in the survey area: Southern haul road (6 of 6)

5. DISCUSSION AND RECOMMENDATIONS

5.1. SUMMARY OF RESULTS

A total of 230 species, from 110 genera and 42 families, were recorded during the survey of the Lamb Creek area, from 414 specimens collected. Of those, 209 were collected within survey quadrats; the rest were collected opportunistically.

Six main vegetation communities were recognised and mapped following field observations and statistical analysis of the field data.

5.1.1. CONSERVATION SIGNIFICANT SPECIES AND COMMUNITIES

No species of Threatened Flora (Declared Rare Flora) pursuant to the Western Australian *Wildlife Conservation Act* 1950, and no species listed as Threatened pursuant to the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* were recorded in the project area.

Three species of Priority Flora listed by DEC were recorded during the survey, comprising one Priority 1 species (*Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662)) and two Priority 2 species (*Aristida calycina* var. *calycina* and *Aristida lazaridis*).

Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662), although listed as a Priority 1 taxon, is actually the most well-known of the three Priority flora species that were recorded in the Lamb Creek survey, having ten collections in the WA Herbarium, spanning across a relatively wide area. The population recorded in the Lamb Creek project appears to be a previously unknown one, as there are no corresponding records in any of the DEC flora databases. Conservation impact on this species of the proposed Lamb Creek project should be able to be minimised by relocation of the proposed access road to intersect with the Great Northern Highway at a more northern location, however further survey should be conducted to determine the extent of this population before any disturbance is undertaken as the occurrence of the species may not be exactly defined by the extent of the land system. Because *B.* sp. Wanna Munna Flats (S. van Leeuwen 4662) was observed to occur in small numbers, evenly spread across a wide area, and due to its ephemeral life cycle, it may be difficult to avoid disturbing the species if the proposed infrastructure cannot be relocated to outside of its known habitat.

Although ranked as lower Priority than *B.* sp. Wanna Munna Flats (S. van Leeuwen 4662), *Aristida calycina* var. *calycina* and *A. lazaridis* (both Priority 2 species) are less well-known in Western Australia. *Aristida calycina* var. *calycina* is only known from a single location in WA, approximately 65 km away from our record, and *A. lazaridis* is only known from two locations. As both of these species were found at the same single site only at Lamb Creek, avoiding conservation impacts entirely should be quite possible if proposed infrastructure is planned appropriately. Further survey should be conducted in the area to determine the full extent of these populations, particularly for *A. lazaridis*, which formed a dominant species in its stratum where it was recorded, and was probably widespread and common throughout the area of similar vegetation surrounding.

No Threatened or Priority Ecological Communities listed by the DEC were recorded.

Kendrick (2002) lists a number of 'ecosystems at risk' in the Hamersley IBRA subregion including some that have brief descriptions similar to vegetation types found in the survey area (for example 'Grove/inter-grove mulga, eastern Hamersley Range' and 'Valley floor Mulga'); however given the sparseness of these descriptions it is not possible to determine if the vegetation complexes recorded in fact match the ones described by Kendrick. These vegetation complexes are not formally listed as TECs or PECs and there is little further information available about them (Jill Pryde, pers. comm.). However, in the time elapsed since publication of the Biodiversity Audit of Western Australia's 53 biogeographical subregions, significant environmental change driven primarily by mining development has occurred in

the Pilbara, and Kendrick's (2002) estimations may now be poor indications of current conservation status. For this reason significant impact on these vegetation types (particularly the *Acacia aptaneura* complexes: vegetation types 5 and 6 in this document) should be avoided where possible.

5.1.2. WEEDS

Five species of introduced flora were recorded in the project area: *Bidens bipinnata* (Bipinnate Beggartick), *Cenchrus ciliaris* (Buffel Grass), *Chloris virgata* (Feathertop Rhodes Grass), *Malvastrum americanum* (Spiked Malvastrum), and *Portulaca oleracea* (Purslane). These species were located in a total of nine sites.

None of these taxa were listed as Declared Plants by the WA Department of Agriculture and Food pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* (Western Australia), or as Weeds of National Significance by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC 2012).

5.2. POTENTIAL PROJECT IMPACTS

As currently proposed, the project could impact on known habitat of the three Priority flora species observed in the Lamb Creek flora survey. The project also has the potential to impact on the 'at risk' ecological communities 'Grove/inter-grove mulga, eastern Hamersley Range' and 'Valley floor mulga' mentioned in Kendrick (2002). The project would also impact on the Wannamunna land system, a relatively uncommon land system with high conservation and pastoral value.

There is some risk of weed dispersal, particularly from the relatively weed-species rich south-west of the survey area to the relatively undisturbed main mining area.

5.3. RECOMMENDATIONS

1. Further targeted priority flora survey for *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662), *Aristida calycina* var. *calycina*, and *Aristida lazaridis* should be conducted prior to disturbance to areas of the Wannamunna land system, and the associated nearby *Acacia aptaneura* groves where these taxa where recorded in the current survey.

2. Rapallo recommends avoiding impact on the Wannamunna land system vegetation where most of the Priority species where encountered.

3. If it remains necessary to impact the Wannamunna land system vegetation, consultation with the DEC is recommended before any works are undertaken.

4. A weed management program should be developed to reduce the spread of invasive plants before any further disturbance and/or clearing takes place. This should include washing down any vehicles travelling from weed-infested areas into non-infested areas.

5. Consultation with the DEC is recommended before any disturbance occurs in creek lines near watercourses in the areas of the proposed access roads in order to determine whether these areas are to be considered as wetland vegetation as specified under the *Environmental Protection Act 1986* (Section 51-O).

6. Access roads and other infrastructure should be planned to avoid disturbance to locations recorded to contain Priority Flora species including a minimum 50 m buffer around those locations is recommended. If disturbance cannot be avoided, consultation with the DEC is recommended before any clearing is undertaken

7. During project clearing, topsoil, branches and other vegetation debris should be stockpiled and returned directly to the disturbed areas for rehabilitation operations.

8. Windrows of topsoil, log debris and leaf litter formed during clearing should be retained.

9. Where possible ensure no ground engagements (the grader held blade up) when clearing or re-clearing the existing access tracks.

10. Ensure rapid rehabilitation of cleared areas such as laydown sites, access tracks and grid lines when they are no longer required.

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Appendices

Appendix I: State and Federal Conservation Codes

Conservation Listings under the Environment Protection and Conservation Act 1999 (EPBC Act)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Section 179 Categories of threatened species

Extinct

(1) A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.

Extinct in the Wild

(2) A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time:

(a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or

(b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

Critically Endangered

(3) A native species is eligible to be included in the critically endangeredcategory at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.

Endangered

(4) A native species is eligible to be included in the endangered category at a particular time if, at that time:

(a) it is not critically endangered; and

(b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

Vulnerable

(5) A native species is eligible to be included in the vulnerable category at a particular time if, at that time:

(a) it is not critically endangered or endangered; and

(b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.

Conservation Dependent

(6) A native species is eligible to be included in the conservation dependent category at a particular time if, at that time:

(a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or

(b) the following subparagraphs are satisfied:

(i) the species is a species of fish;

(ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;

(iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory;

(iv) cessation of the plan of management would adversely affect the conservation status of the species.

(7) In subsection (6): fish includes all species of bony fish, sharks, rays, crustaceans, molluscs and other marine organisms, but does not include marine mammals or marine reptiles.

Species listed as 'conservation dependent' and 'extinct' are not matters of national environmental significance and therefore do not trigger the EPBC Act.

Categories and definitions of Threatened Flora species under the *Wildlife Conservation Act (1950)* of Western Australia, taken directly from the DEC WA Herbarium website.

Under the *Wildlife Conservation Act(1950)* the Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection. Schedules 1 and 2 deal with those that are threatened and those that are presumed extinct, respectively.

T:Threatened Flora (Declared Rare Flora - Extant)

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*).

Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria:

- CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
- EN: Endangered – considered to be facing a very high risk of extinction in the wild
- VU: Vulnerable – considered to be facing a high risk of extinction in the wild.

X:Presumed Extinct Flora (Declared Rare Flora - Extinct)

Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the *Wildlife Conservation Act 1950*).

Species that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora List under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

Priority One - Poorly Known Taxa

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

Priority Two - Poorly Known Taxa

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, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.

Priority Three - Poorly Known Taxa

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. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

Priority Four – Rare, Near Threatened and other species in need of monitoring

- 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. These species are usually represented on conservation lands.
- 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.
- Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Priority Five – Conservation Dependent species

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

Definitions and criteria for presumed totally destroyed, critically endangered, endangered and vulnerable ecological communities, taken from DEC (2010).

THREATENED ECOLOGICAL COMMUNITIES

A **threatened ecological community** (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

PRIORITY ECOLOGICAL COMMUNITIES

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the **Priority Ecological Community** List 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 One: Poorly-known ecological communities

Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;

(iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

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

Appendix II: Vegetation condition scale (Keighery 1994)

Vegetation condition scale (Keighery, 1994)

Vegetation Condition	Definition
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix III: List of Flora Species Recorded during the Survey

Family	LSS	Taxonomic Name
Lauraceae	80	*Cassytha capillaris*
Cyperaceae	156	*Bulbostylis barbata*
		Cyperus cunninghamii subsp. *cunninghamii*
		Eragrostis cumingii
		Eragrostis eriopoda
		Eragrostis pergracilis
		Eragrostis tenellula
		Fimbristylis dichotoma
		Fimbristylis simulans
Poaceae	163	*Amphipogon caricinus* subsp. *caricinus*
		Amphipogon sericeus
		Aristida calycina var. *calycina* **(P2)**
		Aristida contorta
		Aristida holathera
		Aristida inaequiglumis
		Aristida lazaridis **(P2)**
		**Cenchrus ciliaris*
		Chloris pectinata
		**Chloris virgata*
		Chrysopogon fallax
		Cymbopogon ambiguus
		Cymbopogon obtectus
		Dactyloctenium radulans
		Digitaria ctenantha
		Enneapogon caerulescens
		Enneapogon polyphyllus
		Enteropogon ramosus
		Eriachne aristidea
		Eriachne helmsii
		Eriachne obtusa
		Eriachne pulchella subsp. *pulchella*

Family	LSS	Taxonomic Name
		Eulalia aurea
		Iseilema membranaceum
		Paraneurachne muelleri
		Paspalidium basicladum
		Paspalidium rarum
		Paspalidium tabulatum
		Perotis rara
		Schizachyrium fragile
		Sporobolus australasicus
		Themeda triandra
		Tragus australianus
		Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)
		Triodia brizoides
		Triodia wiseana
		Triraphis mollis
		Urochloa holosericea subsp. *velutina*
		Urochloa piligera
Menispermaceae	169	*Tinospora smilacina*
Proteaceae	175	*Grevillea stenobotrya*
		Grevillea wickhamii
		Grevillea wickhamii subsp. *hispidula*
		Hakea lorea
Zygophyllaceae	199	*Tribulopis angustifolia*
		Tribulus astrocarpus
		Tribulus hirsutus
		Tribulus platypterus
Fabaceae	201	*Acacia adoxa* var. *adoxa*
		Acacia adsurgens
		Acacia ancistrocarpa
		Acacia aptaneura
		Acacia arida

Family	LSS	Taxonomic Name
		Acacia bivenosa
		Acacia dictyophleba
		Acacia elachantha
		Acacia hilliana
		Acacia inaequilatera
		Acacia maitlandii
		Acacia marramamba
		Acacia minyura
		Acacia monticola
		Acacia pachyacra
		Acacia pruinocarpa
		Acacia pyrifolia var. *morrisonii*
		Acacia steedmanii subsp. *borealis*
		Acacia synchronicia
		Acacia tenuissima
		Acacia tumida var. *pilbarensis*
		Acacia xiphophylla
		Crotalaria medicaginea
		Gompholobium sp. Pilbara (NF Norris 908)
		Indigofera georgei
		Indigofera monophylla
		Rhynchosia minima
		Senna artemisioides subsp. *filifolia*
		Senna artemisioides subsp. *helmsii*
		Senna artemisioides subsp. *oligophylla*
		Senna artemisioides subsp. *sturtii*
		Senna ferraria
		Senna glutinosa subsp. *glutinosa*
		Senna glutinosa subsp. *pruinosa*
		Senna notabilis
		Senna venusta

Family	LSS	Taxonomic Name
		Tephrosia densa
		Tephrosia supina
Surianaceae	202	*Stylobasium spathulatum*
Polygalaceae	203	*Polygala isingii*
Moraceae	211	*Ficus brachypoda*
Cucurbitaceae	224	*Cucumis maderaspatanus*
Celastraceae	229	*Stackhousia intermedia*
Euphorbiaceae	242	*Euphorbia australis*
		Euphorbia biconvexa
		Euphorbia boophthona
		Euphorbia latrobei subsp. *filiformis*
		Euphorbia tannensis subsp. *eremophila*
Phyllanthaceae	247	*Phyllanthus maderaspatensis*
Violaceae	261	*Hybanthus aurantiacus*
Myrtaceae	281	*Corymbia ?opaca*
		Corymbia deserticola
		Corymbia hamersleyana
		Eucalyptus ?victrix
		Eucalyptus ?xerothermica
		Eucalyptus gamophylla
		Eucalyptus kingsmillii subsp. *kingsmillii*
		Eucalyptus leucophloia subsp. *leucophloia*
Sapindaceae	299	*Dodonaea coriacea*
		Dodonaea viscosa subsp. *mucronata*
Malvaceae	309	*Abutilon dioicum*
		Abutilon indicum
		Abutilon otocarpum
		Corchorus incanus subsp. *lithophilus*
		Corchorus lasiocarpus subsp. *lasiocarpus*
		Gossypium australe
		Gossypium robinsonii

Family	LSS	Taxonomic Name
		Hibiscus burtonii
		Hibiscus coatesii
		Hibiscus sturtii var. *campylochlamys*
		Hibiscus sturtii var. *platychlamys*
		Keraudrenia nephrosperma
		**Malvastrum americanum*
		Rulingia luteiflora
		Sida ?echinocarpa
		Sida ?sp. Spiciform panicles (E. Leyland s.n. 14/8/90)
		Sida ?sp. Supplejack Station (T.S. Henshall 2345)
		Sida arenicola
		Sida fibulifera
		Sida platycalyx
		Sida sp. Golden calyces glabrous (H.N. Foote 32)
		Sida sp. Pilbara (A.A. Mitchell PRP 1543)
		Sida sp. Tiny fruits (AA Mitchell PRP1152)
		Triumfetta maconochieana
Gyrostemonaceae	328	*Codonocarpus cotinifolius*
Capparaceae	330	*Capparis lasiantha*
		Capparis spinosa var. *nummularia*
Brassicaceae	332	*Cleome oxalidea*
		Cleome viscosa
		Lepidium echinatum
		Stenopetalum anfractum
		Stenopetalum pedicellare
Santalaceae	338	*Santalum lanceolatum*
Loranthaceae	339	*Amyema sanguinea* var. *sanguinea*
		Lysiana murrayi
Caryophyllaceae	355	*Polycarpaea corymbosa* var. *corymbosa*
		Polycarpaea holtzei
		Polycarpaea longiflora

Family	LSS	Taxonomic Name
Amaranthaceae	357	*Alternanthera nana*
		Gomphrena canescens subsp. *canescens*
		Gomphrena cunninghamii
		Ptilotus astrolasius
		Ptilotus calostachyus
		Ptilotus clementii
		Ptilotus exaltatus var. *exaltatus*
		Ptilotus fusiformis
		Ptilotus gaudichaudii var. *gaudichaudii*
		Ptilotus helipteroides
		Ptilotus macrocephalus
		Ptilotus obovatus subsp. *obovatus*
		Ptilotus polystachyus
		Ptilotus rotundifolius
Chenopodiaceae	358	*Dysphania glomulifera* subsp. *eremaea*
		Dysphania kalpari
		Dysphania rhadinostachya
		Enchylaena tomentosa
		Maireana villosa
		Rhagodia eremaea
		Salsola australis
		Sclerolaena cornishiana
Aizoaceae	364	*Trianthema glossostigma*
Nyctaginaceae	367	*Boerhavia gardneri*
Portulacaceae	374	*Calandrinia ptychosperma*
		**Portulaca oleracea*
Rubiaceae	409	*Oldenlandia crouchiana*
		Psydrax latifolia
Rubiaceae	409	*Psydrax rigidula*
Apocynaceae	413	*Cynanchum floribundum*
		Rhyncharrhena linearis

Family	LSS	Taxonomic Name
Boraginaceae	415	*Heliotropium tenuifolium*
		Trichodesma zeylanicum var. *zeylanicum*
Convolvulaceae	416	*Bonamia rosea*
		Convolvulus angustissimus subsp. *angustissimus*
		Duperreya commixta
		Evolvulus alsinoides var. *villosicalyx*
		Ipomoea polymorpha
Solanaceae	417	*Nicotiana occidentalis* subsp. *obliqua*
		Solanum ferocissimum
		Solanum lasiophyllum
		Solanum phlomoides
Oleaceae	423	*Jasminum didymum* subsp. *lineare*
Plantaginaceae	427	*Stemodia grossa*
		Stemodia viscosa
Scrophulariaceae	428	*Eremophila forrestii* subsp. *forrestii*
		Eremophila fraseri subsp. *fraseri*
		Eremophila lachnocalyx
		Eremophila longifolia
Lamiaceae	432	*Clerodendrum ?tomentosum*
		Clerodendrum floribundum var. *angustifolium*
		Newcastelia sp. Hamersley Range (S. van Leeuwen 4264)
		Spartothamnella teucriiflora
Goodeniaceae	458	*Dampiera candicans*
		Goodenia forrestii
		Goodenia microptera
		Goodenia muelleriana
		Goodenia prostrata
		Goodenia stobbsiana
		Scaevola browniana subsp. *browniana*
		Scaevola parvifolia subsp. *pilbarae*
Asteraceae	460	**Bidens bipinnata*

Family	LSS	Taxonomic Name
		Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662) **(P1)**
		Pterocaulon serrulatum
		Rhodanthe floribunda
Araliaceae	472	*Trachymene oleracea*

Appendix IV: Coordinates of Conservation Significant Taxa recorded in the Project Area

Taxon name	Conservation status	Quadrat	Latitude	Longitude
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	P1	LCF33	-22.878188	118.801596
		LCF34	-22.879474	118.801194
		LCF51	-22.878959	118.802863
Aristida calycina var. *calycina*	P2	LCF31	-22.865242	118.802478
Aristida lazaridis	P2			

Appendix V: Vegetation Structural Classes

Vegetation Structural Classes – Specht (1970) as modified by Aplin (1979)

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees >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 <10m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs >2m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs <1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses
Grasses Sedges, Herbs	Closed tussock grassland/bunch grassland /sedgeland /herbland	Tussock grassland/ bunch grassland/ sedgeland/ herbland	Open tussock grassland / bunch grassland/ sedgeland / herbland	Very open tussock grassland / bunch grassland / sedgeland / herbland	Scattered tussock grasses / bunch grasses / sedges / herbs

Appendix VI: Flora Quadrat Survey Site Descriptions

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF01							
Botanist	Chid	**Date**	3/27/2012	**Site area**	Quadrat 50 x 50 m		
Location	50K		695006 **mE**	7477811 **mN**	**Elevation** 733 m		
Topography and Geology	Landform: Low plateau / flat hilltop Soil: red brown clay loam. Geology: 95% cover of laterite, ironstone gravel, pebbles.						
Veg Condition	2	**Disturbances**	catte	**Land System**	Newman		
Site Photo							
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia hilliana* scattered low shrubs over *Triodia wiseana, Triodia brizoides* hummock grassland.						
Species	*Acacia adoxa* var. *adoxa* *Acacia ancistrocarpa* *Acacia hilliana* *Bulbostylis barbata* *Cassytha capillaris* *Dysphania rhadinostachya* *Eriachne obtusa* *Eucalyptus leucophloia* subsp. *leucophloia* *Goodenia microptera* *Goodenia stobbsiana* *Hakea lorea*			*Keraudrenia nephrosperma* *Polycarpaea holtzei* *Ptilotus calostachyus* *Ptilotus rotundifolius* *Santalum lanceolatum* *Senna glutinosa* subsp. *glutinosa* *Senna glutinosa* subsp. *pruinosa* *Solanum lasiophyllum* *Triodia brizoides* *Triodia wiseana*			

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF02					
Botanist	Linda	**Date**	3/27/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		694402 **mE**	7477855 **mN**	**Elevation** 731 m
Topography and Geology	Landform: Rolling hills Aspect and Slope: variable. Soil: orange brown clay. Geology: 100% cover of BIF, laterite pebbles.				
Veg Condition	2	**Disturbances**	none	**Land System**	Newman
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia, Corymbia* deserticola scattered low trees over *Triodia wiseana, Triodia brizoides* hummock grassland.				
Species	*Acacia adoxa* var. *adoxa* *Bulbostylis barbata* *Capparis lasiantha* *Cassytha capillaris* *Corymbia deserticola* *Dysphania rhadinostachya* *Eriachne helmsii* *Eucalyptus leucophloia* subsp. *leucophloia* *Euphorbia australis* *Goodenia microptera* *Goodenia stobbsiana*			*Hakea lorea* *Keraudrenia nephrosperma* *Polycarpaea holtzei* *Ptilotus calostachyus* *Ptilotus rotundifolius* *Senna glutinosa* subsp. *glutinosa* *Senna glutinosa* subsp. *pruinosa* *Solanum lasiophyllum* *Triodia brizoides* *Triodia wiseana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF03							
Botanist	Chid	**Date**	3/27/2012	**Site area**	Quadrat 50 x 50 m		
Location	50K		694242 **mE**	7477624 **mN**	**Elevation** 726 m		
Topography and Geology	Landform: Creekline Soil: orange clay loam. Geology: 5% cover of laterite pebbles.						
Veg Condition	3	**Disturbances**	cattle, weeds	**Land System**	Platform		
Site Photo							
Vegetation	*Acacia tumida* var. *pilbarensis* tall closed scrub with *Duperreya commixta* creepers over *Themeda triandra* tussock grassland and *Triodia wiseana* open hummock grassland.						
Species	*Acacia tumida* var. *pilbarensis* *Clerodendrum floribundum* var. *angustifolium* *Corymbia hamersleyana* *Dodonaea viscosa* subsp. *mucronata* *Duperreya commixta* *Eriachne helmsii*			*Eucalyptus leucophloia* subsp. *leucophloia* *Keraudrenia nephrosperma* *Rulingia luteiflora* *Senna glutinosa* subsp. *pruinosa* *Themeda triandra* *Triodia wiseana*			

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF04							
Botanist	Chid	**Date**	3/27/2012	**Site area**	Quadrat 50 x 50 m		
Location	50K		693654 **mE**	7477707 **mN**	**Elevation** 719 m		
Topography and Geology	Landform: Flat low plateau / plain Soil: red brown clay loam. Geology: 95% cover of laterite, ironstone gravel, pebbles.						
Veg Condition	3	**Disturbances**	cattle, tracks nearby, weeds	**Land System**	Platform		
Site Photo							
Vegetation	*Eucalyptus gamophylla* scattered low trees over *Triodia brizoides, Triodia wiseana* hummock grassland.						
Species	*Acacia ancistrocarpa* *Acacia hilliana* *Acacia pruinocarpa* *Acacia tenuissima* *Amphipogon caricinus* subsp. *caricinus* *Aristida contorta* *Aristida holathera* *Bulbostylis barbata* *Dysphania rhadinostachya* *Enneapogon polyphyllus* *Eriachne helmsii* *Eucalyptus gamophylla* *Goodenia microptera*				*Goodenia stobbsiana* *Hakea lorea* *Indigofera monophylla* *Jasminum didymum* subsp. *lineare* *Keraudrenia nephrosperma* *Polycarpaea holtzei* *Ptilotus calostachyus* *Ptilotus obovatus* var. *obovatus* *Schizachyrium fragile* *Senna artemisioides* subsp. *oligophylla* *Solanum lasiophyllum* *Triodia brizoides* *Triodia wiseana*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF05					
Botanist	Linda	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		692223 **mE**	7477666 **mN**	**Elevation** 699 m
Topography and Geology	Landform: Flat low plateau / plain Aspect and Slope: flat Soil: red clay. Geology: 90% cover of laterite (colluvial) gravels.				
Veg Condition	3	**Disturbances**	grazing, weeds, signs of old fires	**Land System**	McKay
Site Photo					
Vegetation	*Corymbia deserticola* scattered low trees over *Acacia elachantha* tall open shrubland over *Acacia hilliana, Acacia minyura, Senna artemisioides* subsp. *helmsii* low shrubland over *Eulalia aurea, Cymbopogon ambiguous* open tussock grassland and mixed scattered herbs.				

Species	
Abutilon otocarpum	*Euphorbia biconvexa*
Acacia aptaneura	*Evolvulus alsinoides* var. *villosicalyx*
Acacia elachantha	*Gomphrena canescens* subsp. *canescens*
Acacia elachantha	*Paspalidium rarum*
Acacia minyura	*Perotis rara*
Cassytha capillaris	*Ptilotus obovatus* subsp. *obovatus*
Corymbia deserticola	*Rhynchosia minima*
Cymbopogon ambiguus	*Senna artemisioides* subsp. *helmsii*
Dysphania rhadinostachya	*Senna notabilis*
Eremophila longifolia	*Sporobolus australasicus*
Eulalia aurea	*Triodia wiseana*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF06					
Botanist	Linda	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		692877 **mE**	7477377 **mN**	**Elevation** 722 m
Topography and Geology	Landform: Flat plain Soil: red clay. Geology: 90% cover of BIF colluvial fragments mostly <1cm, some 2-5%.				
Veg Condition	4	**Disturbances**	fire 1-2 years previous, old clearing, scrap piles, tracks (>3 years ago).	**Land System**	McKay
Site Photo					
Vegetation	*Corymbia deserticola* scattered low trees over *Acacia elachantha* shrubland over *Keraudrenia nephrosperma, Bonamia rosea, Senna artemisioides* subsp. *oligophylla* low open shrubland over *Triodia brizoides* very open hummock grassland.				
Species	*Abutilon dioicum* *Acacia ancistrocarpa* *Acacia elachantha* *Aristida contorta* *Bonamia rosea* *Corymbia deserticola* *Cymbopogon ambiguus* *Eucalyptus leucophloia* subsp. *leucophloia* *Evolvulus alsinoides* var. *villosicalyx* *Goodenia microptera* *Goodenia stobbsiana*		*Indigofera monophylla* *Keraudrenia nephrosperma* *Ptilotus calostachyus* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *glutinosa* *Senna notabilis* *Sida arenicola* *Sida sp. Pilbara (A.A. Mitchell PRP 1543)* *Trianthema glossostigma* *Triodia brizoides*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF07					
Botanist	Linda	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		694241 **mE**	7477202 **mN**	**Elevation** 710 m
Topography and Geology	Landform: Small dissected creekline through gently undulating country Soil: red clay. Geology: 100% cover of BIF cobbles.				
Veg Condition	2	**Disturbances**	none	**Land System**	Platform
Site Photo					
Vegetation	*Eucalyptus gamophylla* low woodland over *Acacia elachantha* tall shrubland over *Triodia wiseana* hummock grassland and *Hybanthus aurantiacus, Crotalaria medicaginea* scattered herbs.				

Species	
Acacia adoxa var. *adoxa*	*Gossypium australe*
Acacia bivenosa	*Hakea lorea*
Acacia elachantha	*Hybanthus aurantiacus*
Bulbostylis barbata	*Indigofera monophylla*
Cassytha capillaris	*Paspalidium basicladum*
Corchorus lasiocarpus subsp. *lasiocarpus*	*Perotis rara*
Crotalaria medicaginea	*Rhynchosia minima*
Cymbopogon ambiguus	*Senna artemisioides* subsp. *oligophylla*
Enneapogon caerulescens	*Tephrosia densa*
Eucalyptus gamophylla	*Triodia wiseana*
Evolvulus alsinoides var. *villosicalyx*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF08						
Botanist	Linda	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m	
Location	50K		693763 **mE**	7476932 **mN**	**Elevation** 730 m	
Topography and Geology	Landform: Gently undulating plains with dissected minor drainage lines Aspect and Slope: W (270°) gentle <5%. Soil: red clay. Geology:90% cover of BIF 2-10 cm.					
Veg Condition	3	**Disturbances**	old tracks, clearing	**Land System**	Platform	
Site Photo						
Vegetation	*Corymbia deserticola* scattered low trees over *Triodia wiseana, Triodia brizoides* hummock grassland.					
Species	*Acacia adoxa* var. *adoxa* *Acacia hilliana* *Acacia elachantha* *Bulbostylis barbata* *Corymbia deserticola* *Dysphania rhadinostachya* *Eremophila longifolia* *Fimbristylis dichotoma* *Fimbristylis simulans* *Goodenia microptera*			*Goodenia stobbsiana* *Hakea lorea* *Ptilotus calostachyus* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *glutinosa* *Senna glutinosa* subsp. *pruinosa* *Solanum lasiophyllum* *Triodia brizoides* *Triodia wiseana*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF09					
Botanist	Chid	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		695052 **mE**	7476783 **mN**	**Elevation** 742 m
Topography and Geology	Landform: Gently sloping plain at foto of ridge. Dissected by deep gorges. Slope: very gentle. Soil: brown clay loam. Geology: 95% cover of ironstone (some BIF), granite pebbles, cobbles.				
Veg Condition	2	**Disturbances**	cattle, fire (old)	**Land System**	Platform
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia hilliana* low open shrubland over *Triodia brizoides, Triodia wiseana* hummock grassland.				
Species	*Acacia hilliana* *Acacia pruinocarpa* *Aristida holathera* *Aristida inaequiglumis* *Bulbostylis barbata* *Eremophila lachnocalyx* *Eucalyptus ?xerothermica* *Eucalyptus gamophylla* *Eucalyptus leucophloia* subsp. *leucophloia* *Fimbristylis dichotoma* *Goodenia microptera*			*Goodenia stobbsiana* *Grevillea wickhamii* *Hakea lorea* *Hibiscus sturtii* var. *campylochlamys* *Polycarpaea holtzei* *Schizachyrium fragile* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *glutinosa* *Triodia brizoides* *Triodia wiseana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF10					
Botanist	Chid	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		694315 **mE**	7476643 **mN**	**Elevation** 733 m
Topography and Geology	Landform: Minor creekline in shallow valley bottom Slope: very gentle. Soil: brown sandy clay. Geology: 95% cover of granite, ironstone from pebbles to boulders.				
Veg Condition	2	**Disturbances**	tracks and drill pads nearby	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* scattered low trees over *Gossypium robinsonii* scattered shrubs over *Triodia wiseana* closed hummock grassland.				
Species	*Acacia adsurgens* *Acacia ancistrocarpa* *Acacia inaequilatera* *Corchorus lasiocarpus* subsp. *lasiocarpus* *Corymbia hamersleyana* *Cymbopogon ambiguus* *Enneapogon polyphyllus* *Eriachne helmsii* *Eucalyptus leucophloia* subsp.		*Leucophloia* *Fimbristylis dichotoma* *Gossypium robinsonii* *Hakea lorea* *Polycarpaea holtzei* *Rhynchosia minima* *Senna glutinosa* subsp. *glutinosa* *Senna glutinosa* subsp. *glutinosa* *Triodia wiseana*		

<table>
<tr><th colspan="7">Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF11</th></tr>
<tr><td>Botanist</td><td>Chid</td><td>Date</td><td>3/29/2012</td><td>Site area</td><td colspan="2">Quadrat 50 x 50 m</td></tr>
<tr><td>Location</td><td colspan="2">50K</td><td>693464 mE</td><td>7476471 mN</td><td colspan="2">Elevation 745 m</td></tr>
<tr><td>Topography and Geology</td><td colspan="6">Landform: Sloping valley side leading down to creekline
Aspect and Slope: East moderately inclined to steep.
Soil: red brown clay loam.
Geology: 95% cover of granite, ironstone pebbles, cobbles and boulders.</td></tr>
<tr><td>Veg Condition</td><td>1</td><td colspan="2">Disturbances</td><td>relatively recent fire.</td><td>Land System</td><td>Boolgeeda</td></tr>
<tr><td>Site Photo</td><td colspan="6">  </td></tr>
<tr><td>Vegetation</td><td colspan="6">Eucalyptus leucophloia subsp. leucophloia scattered low trees over Grevillea wickhamii open shrubland over Triodia wiseana hummock grassland.</td></tr>
<tr><td>Species</td><td colspan="3">Corymbia deserticola
Eucalyptus leucophloia subsp. leucophloia
Euphorbia biconvexa
Goodenia stobbsiana
Grevillea wickhamii</td><td colspan="3">Polygala isingii
Ptilotus calostachyus
Schizachyrium fragile
Senna glutinosa subsp. glutinosa
Triodia wiseana</td></tr>
</table>

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF12					
Botanist	Chid	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		695001 **mE**	7476202 **mN**	**Elevation** 789 m
Topography and Geology	Landform: Deep gorge valley bottom Aspect and Slope: North gently inclined. Soil: red brown sandy clay. Geology: 95% cover of granite, BIF pebbles, stones, boulders, sheet.				
Veg Condition	2	**Disturbances**	cattle, weeds	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Stylobasium spathulatum, Gossypium robinsonii* tall open shrubland over *Triodia wiseana* hummock grassland.				

Species	
Abutilon dioicum	*Gomphrena cunninghamii*
Abutilon indicum	*Gossypium robinsonii*
Acacia bivenosa	*Grevillea wickhamii*
Acacia inaequilatera	*Hakea lorea*
Acacia maitlandii	*Hibiscus coatesii*
Acacia synchronicia	*Paspalidium tabulatum*
**Bidens bipinnata*	*Pterocaulon serrulatum*
Capparis spinosa var. *nummularia*	*Salsola australis*
Corchorus lasiocarpus subsp. *lasiocarpus*	*Senna venusta*
Cymbopogon ambiguus	*Solanum phlomoides*
Dodonaea viscosa subsp. *mucronata*	*Stylobasium spathulatum*
Duperreya commixta	*Tinospora smilacina*
Eucalyptus leucophloia subsp. *leucophloia*	*Triodia wiseana*
Euphorbia biconvexa	

<table>
<tr><th colspan="6">Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF14</th></tr>
<tr><td>Botanist</td><td>Linda</td><td>Date</td><td>3/28/2012</td><td>Site area</td><td>Quadrat 50 x 50 m</td></tr>
<tr><td>Location</td><td colspan="2">50K</td><td>694402 mE</td><td>7476052 mN</td><td>Elevation 925 m</td></tr>
<tr><td>Topography and Geology</td><td colspan="5">Landform: Ridge top
Aspect and Slope: WSE (240°) gentle on ridge top <8%.
Soil: red clay.
Geology: 95% cover of BIF 5-10 cm.</td></tr>
<tr><td>Veg Condition</td><td>1</td><td>Disturbances</td><td>old fire (>5 years previous)</td><td>Land System</td><td>Boolgeeda</td></tr>
<tr><td>Site Photo</td><td colspan="5">  </td></tr>
<tr><td>Vegetation</td><td colspan="5">Eucalyptus leucophloia subsp. leucophloia, Eucalyptus gamophylla low open woodland over Triodia wiseana hummock grassland.</td></tr>
<tr><td>Species</td><td colspan="2">Eucalyptus gamophylla
Eucalyptus leucophloia subsp. leucophloia
Fimbristylis dichotoma
Goodenia microptera</td><td colspan="3">Goodenia stobbsiana
Senna glutinosa subsp. glutinosa
Solanum lasiophyllum
Triodia wiseana</td></tr>
</table>

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF15						
Botanist	Chid	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m	
Location	50K		693315 **mE**	7475767 **mN**	**Elevation** 753 m	
Topography and Geology	Landform: Creekline within broad open drainage system surrounded by hills. Soil: brown sandy clay. Geology: 90% cover of ironstone pebbles, gravel, rocks.					
Veg Condition	3	**Disturbances**	cattle, weeds, clearing nearby (tracks and drill pads)	**Land System**	Boolgeeda	
Site Photo						
Vegetation	*Hakea lorea* scattered low trees over *Acacia tumida* var. *pilbarensis*, *Grevillea wickhamii, Acacia monticola* tall open scrub over *Gossypium robinsonii* and mixed species low open shrubland over *Themeda triandra, Eriachne helmsii* tussock grassland and *Triodia wiseana* open hummock grassland.					
Species	*Abutilon indicum* *Acacia inaequilatera* *Acacia monticola* *Acacia tumida* var. *pilbarensis* **Bidens bipinnata* *Boerhavia gardneri* *Bulbostylis barbata* *Cleome viscosa* *Corchorus incanus* subsp. *lithophilus* *Crotalaria medicaginea* *Cucumis maderaspatanus* *Dodonaea viscosa* subsp. *mucronata* *Dysphania rhadinostachya* *Eriachne helmsii* *Evolvulus alsinoides* var. *villosicalyx* *Gomphrena cunninghamii* *Gossypium robinsonii* *Grevillea wickhamii*			*Hakea lorea* *Hybanthus aurantiacus* *Indigofera monophylla* *Jasminum didymum* subsp. *lineare* *Paspalidium tabulatum* *Phyllanthus maderaspatensis* *Polycarpaea longiflora* *Pterocaulon serrulatum* *Ptilotus obovatus* subsp. *obovatus* *Rhagodia eremaea* *Rhynchosia minima* *Santalum lanceolatum* *Senna venusta* *Stylobasium spathulatum* *Tephrosia densa* *Themeda triandra* *Trichodesma zeylanicum* var. *zeylanicum* *Triodia wiseana*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF16					
Botanist	Linda	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		692155 **mE**	7475996 **mN**	**Elevation** 728 m
Topography and Geology	Landform: Gentle undulating country between breakaways Aspect and Slope: 210° gentle (5%). Soil: red clay. Geology:95% cover of BIF 5-30 cm.				
Veg Condition	2	**Disturbances**	none	**Land System**	McKay
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* scattered low trees over *Acacia inaequilatera* scattered tall shrubs over *Triodia wiseana, Triodia brizoides* hummock grassland.				
Species	*Acacia adoxa* var. *adoxa* *Acacia hilliana* *Acacia elachantha* *Acacia inaequilatera* *Bulbostylis barbata* *Corymbia hamersleyana* *Dysphania rhadinostachya* *Eucalyptus leucophloia* subsp. *leucophloia* *Fimbristylis dichotoma* *Goodenia microptera*			*Goodenia stobbsiana* *Hakea lorea* *Jasminum didymum* subsp. *lineare* *Polycarpaea corymbosa* var. *corymbosa* *Polycarpaea holtzei* *Ptilotus calostachyus* *Senna artemisioides* subsp. *helmsii* *Senna glutinosa* subsp. *glutinosa* *Solanum lasiophyllum* *Triodia brizoides* *Triodia wiseana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF17							
Botanist	Linda	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m		
Location	50K		691198 **mE**	7477353 **mN**	**Elevation** 695 m		
Topography and Geology	Landform: Flat plain Soil: red clay. Geology:70% cover of BIF 2-10 cm.						
Veg Condition	3	**Disturbances**	cattle grazing, trampling of vegetation, weeds, nutrification (dung)	**Land System**	McKay		
Site Photo							
Vegetation	*Corymbia ?opaca, Eucalyptus ?xerothermica, Corymbia ?hamersleyana* scattered low trees over *Eremophila longifolia, Eremophila fraseri* subsp. *fraseri* open shrubland over *Acacia hilliana, Senna* spp., *Indigofera monophylla* low open shrubland over *Triodia wiseana* very open hummock grassland						
Species	*Abutilon otocarpum* *Acacia aptaneura* *Acacia inaequilatera* *Acacia pruinocarpa* *Aristida contorta* *Aristida contorta* *Boerhavia gardneri* *Capparis lasiantha* *Cleome viscosa* *Cymbopogon ambiguus* *Dysphania rhadinostachya* *Enneapogon caerulescens* *Eremophila fraseri* subsp. *fraseri* *Eremophila longifolia* *Eucalyptus ?xerothermica* *Euphorbia latrobei* subsp. *filiformis* *Evolvulus alsinoides* var. *villosicalyx*			*Gomphrena canescens* subsp. *canescens* *Hibiscus burtonii* *Indigofera monophylla* *Jasminum didymum* subsp. *lineare* *Perotis rara* **Portulaca oleracea* *Ptilotus obovatus* subsp. *obovatus* *Salsola australis* *Senna artemisioides* subsp. *helmsii* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *glutinosa* *Senna notabilis* *Sida arenicola* *Solanum lasiophyllum* *Sporobolus australasicus* *Triodia wiseana*			

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF18					
Botanist	Linda	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		691671 **mE**	7475755 **mN**	**Elevation** 721 m
Topography and Geology	Landform: Flat plain Soil: red clay. Geology: 50% cover of BIF 0.5-5 cm.				
Veg Condition	4	**Disturbances**	exploration diggings, grazing, tracks	**Land System**	McKay
Site Photo					
Vegetation	*Acacia aptaneura, Grevillea stenobotrya* low open woodland *Senna artemisioides* subsp. *helmsii, Eremophila fraseri* subsp. *fraseri* open shrubland over mixed species scattered herbs and tussock grasses.				

Species	
Abutilon otocarpum *Acacia aptaneura* *Acacia aptaneura* *Acacia minyura* *Acacia pruinocarpa* *Aristida contorta* **Bidens bipinnata* *Boerhavia gardneri* *Cleome viscosa* *Cucumis maderaspatanus* *Dysphania rhadinostachya* *Eremophila fraseri* subsp. *fraseri* *Euphorbia latrobei* subsp. *filiformis* *Gomphrena canescens* subsp. *canescens* *Goodenia stobbsiana*	*Grevillea stenobotrya* *Hakea lorea* *Jasminum didymum* subsp. *lineare* *Perotis rara* **Portulaca oleracea* *Pterocaulon serrulatum* *Sclerolaena cornishiana* *Senna artemisioides* subsp. *helmsii* *Senna notabilis* *Sida* ?sp. Supplejack Station (T.S. Henshall 2345) *Sida arenicola* *Solanum lasiophyllum* *Tribulus astrocarpus*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF19					
Botanist	Linda	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		690473 **mE**	7477077 **mN**	**Elevation** 704 m
Topography and Geology	Landform: Flat plain Soil: red clay. Geology: 90% cover of BIF 2-5 cm.				
Veg Condition	3	**Disturbances**	cattle grazing, old tracks, nutrification	**Land System**	McKay
Site Photo					
Vegetation	*Corymbia deserticola* scattered low trees over *Acacia pruinocarpa* scattered tall shrubs over mixed species low scattered shrubs over *Triodia wiseana* very open hummock grassland and mixed species very open herbland.				

Species	
Abutilon otocarpum	*Gomphrena cunninghamii*
Acacia ancistrocarpa	*Goodenia microptera*
Acacia aptaneura	*Jasminum didymum* subsp. *lineare*
Acacia pruinocarpa	*Perotis rara*
Aristida contorta	*Psydrax rigidula*
Boerhavia gardneri	*Pterocaulon serrulatum*
Cleome viscosa	*Ptilotus helipteroides*
Corymbia deserticola	*Ptilotus obovatus* subsp. *obovatus*
Cymbopogon obtectus	*Senna artemisioides* subsp. *helmsii*
Dodonaea viscosa subsp. *mucronata*	*Senna glutinosa* subsp. *glutinosa*
Dysphania rhadinostachya	*Senna notabilis*
Enneapogon caerulescens	*Solanum lasiophyllum*
Eremophila fraseri subsp. *fraseri*	*Sporobolus australasicus*
Euphorbia latrobei subsp. *filiformis*	*Tribulus hirsutus*
Evolvulus alsinoides var. *villosicalyx*	*Triodia wiseana*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF20					
Botanist	Linda	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		690589 **mE**	7476396 **mN**	**Elevation** 707 m
Topography and Geology	Landform: Flat plain. Soil: red clay. Geology: 10% cover of BIF pebbles and cobbles.				
Veg Condition	4	**Disturbances**	cattle and macropods grazing, tracks, trampled vegetation, nutrification (dung), weeds.	**Land System**	McKay
Site Photo					
Vegetation	*Corymbia deserticola, Acacia aptaneura* scattered low trees over *Dodonaea viscosa* subsp. *mucronata, Senna artemisioides* subsp. *helmsii, Sida* sp. Supplejack Station (T.S. Henshall 2345) open shrubland over *Triodia wiseana* scattered hummock grasses and mixed species very open herbland.				
Species	*Abutilon otocarpum* *Acacia aptaneura* *Acacia synchronicia* *Aristida contorta* **Bidens bipinnata* *Boerhavia gardneri* *Cleome viscosa* *Cleome viscosa* *Corymbia deserticola* *Cucumis maderaspatanus* *Cymbopogon ambiguus* *Dodonaea viscosa* subsp. *mucronata* *Dysphania rhadinostachya* *Eremophila fraseri* subsp. *fraseri*			*Gomphrena cunninghamii* *Jasminum didymum* subsp. *lineare* *Perotis rara* **Portulaca oleracea* *Pterocaulon serrulatum* *Ptilotus helipteroides* *Ptilotus obovatus* subsp. *obovatus* *Senna artemisioides* subsp. *helmsii* *Senna glutinosa* subsp. *glutinosa* *Senna notabilis* *Sida* ?sp. Supplejack Station (T.S. Henshall 2345) *Solanum lasiophyllum* *Stemodia viscosa*	

	Eremophila longifolia *Euphorbia latrobei* subsp. *filiformis* *Evolvulus alsinoides* var. *villosicalyx*	*Tribulus hirsutus* *Triodia wiseana*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF21					
Botanist	Chid	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		689945 **mE**	7475643 **mN**	**Elevation** 838 m
Topography and Geology	Landform: Slope on side of large hill Aspect and Slope: NNW moderately inclined. Soil: light brown sandy clay. Geology: 95% cover of ironstone pebbles and cobbles, some sheet rock.				
Veg Condition	1	**Disturbances**	none	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Grevillea wickhamii* tall open shrubland over *Triodia wiseana* open hummock grassland.				
Species	*Acacia inaequilatera* *Corchorus incanus* subsp. *lithophilus* *Corymbia hamersleyana* *Cymbopogon ambiguus* *Dampiera candicans* *Eriachne helmsii* *Eucalyptus leucophloia* subsp. *leucophloia* *Gossypium robinsonii* *Grevillea wickhamii*		*Hakea lorea* *Indigofera monophylla* *Ptilotus calostachyus* *Scaevola browniana* subsp. *browniana* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *glutinosa* *Solanum phlomoides* *Triodia wiseana*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF22					
Botanist	Chid	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		691099 **mE**	7474508 **mN**	**Elevation** 725 m
Topography and Geology	Landform: Flat plain Soil: orange brown sandy clay. Geology: 90% cover of ironstone pebbles.				
Veg Condition	2	**Disturbances**	cattle, vehicle tracks nearby	**Land System**	McKay
Site Photo					
Vegetation	*Eucalyptus gamophylla* low open woodland over *Acacia elachantha, A. synchronicia, A. xiphophylla* tall scattered shrubs over *Triodia brizoides, Triodia wiseana* open hummock grassland.				

Species	
Acacia adoxa var. *adoxa*	*Indigofera monophylla*
Acacia elachantha	*Ptilotus calostachyus*
Acacia synchronicia	*Ptilotus obovatus* subsp. *obovatus*
Acacia tenuissima	*Ptilotus rotundifolius*
Acacia xiphophylla	*Rhyncharrhena linearis*
Bulbostylis barbata	*Senna artemisioides* subsp. *oligophylla*
Capparis lasiantha	*Senna artemisioides* subsp. *sturtii*
Eucalyptus gamophylla	*Senna glutinosa* subsp. *glutinosa*
Gompholobium sp. Pilbara (NF Norris 908)	*Sida* sp. Pilbara (A.A. Mitchell PRP 1543)
Goodenia microptera	*Triodia brizoides*
Goodenia stobbsiana	*Triodia wiseana*
Grevillea wickhamii	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF23						
Botanist	Chid	**Date**	3/29/2012	**Site area**	Quadrat 50 x 50 m	
Location	50K		691122 **mE**	7474279 **mN**	**Elevation** 728 m	
Topography and Geology	Landform: Broad creekline Slope: flat. Soil: orange brown fine sandy clay. Geology: 30% cover of ironstone pebbles, cobbles.					
Veg Condition	2	**Disturbances**	weeds, cattle	**Land System**	McKay	
Site Photo						
Vegetation	*Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia monticola, Acacia pyrifolia* var. *morrisonii, Rulingia luteiflora* tall open scrub over *Triodia wiseana* very open hummock grassland.					
Species	*Acacia elachantha* *Acacia monticola* *Acacia pyrifolia* var. *morrisonii* *Acacia synchronicia* *Alternanthera nana* **Bidens bipinnata* *Boerhavia gardneri* **Cenchrus ciliaris* *Cleome viscosa* *Clerodendrum ?tomentosum* *Corymbia hamersleyana* *Cymbopogon ambiguus* *Digitaria ctenantha* *Dysphania rhadinostachya* *Enneapogon polyphyllus* *Eragrostis cumingii* *Eragrostis eriopoda* *Eucalyptus gamophylla* *Eucalyptus leucophloia* subsp. *leucophloia*				*Euphorbia tannensis* subsp. *eremophila* *Evolvulus alsinoides* var. *villosicalyx* *Gomphrena cunninghamii* *Gossypium robinsonii* *Grevillea wickhamii* subsp. *hispidula* *Hibiscus burtonii* *Hybanthus aurantiacus* *Indigofera monophylla* *Jasminum didymum* subsp. *lineare* *Paraneurachne muelleri* *Polycarpaea longiflora* *Rhyncharrhena linearis* *Rhynchosia minima* *Rulingia luteiflora* *Senna artemisioides* subsp. *oligophylla* *Tephrosia densa* *Themeda triandra* *Trachymene ?oleracea* *Triodia wiseana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF24					
Botanist	Linda	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		691209 **mE**	7473395 **mN**	**Elevation** 733 m
Topography and Geology	Landform: Foothills of breakaway / ridge Aspect and Slope: East 105° moderately inclined. Soil: red clay. Geology: 95% cover of BIF gravels and pebbles.				
Veg Condition	2	**Disturbances**	grazing (cattle)	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Acacia hilliana, Senna artemisioides* subsp. *oligophylla , Senna glutinosa* subsp. *glutinosa* open shrubland *over Triodia wiseana, Triodia brizoides* hummock grassland.				
Species	*Acacia adoxa* var. *adoxa* *Acacia hilliana* *Acacia monticola* *Bulbostylis barbata* *Corchorus lasiocarpus* subsp. *lasiocarpus* *Eucalyptus leucophloia* subsp. *leucophloia* *Fimbristylis dichotoma* *Fimbristylis simulans* *Goodenia microptera* *Hakea lorea* *Polycarpaea holtzei*			*Ptilotus calostachyus* *Ptilotus rotundifolius* *Schizachyrium fragile* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *pruinosa* *Solanum lasiophyllum* *Trachymene oleracea* *Triodia brizoides* *Triodia wiseana* *Triumfetta maconochieana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF25					
Botanist	Linda	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		689979 **mE**	7471899 **mN**	**Elevation** 757 m
Topography and Geology	Landform: Plain Soil: red clay. Geology: 80% cover of BIF gravels and pebbles.				
Veg Condition	3	**Disturbances**	grazing, fire approximately 3 years previously	**Land System**	McKay
Site Photo					
Vegetation	*Eucalyptus gamophylla* low woodland over *Keraudrenia nephrosperma* and mixed species low open shrubland over *Triodia wiseana, Triodia brizoides* hummock grassland.				
Species	*Acacia bivenosa* *Acacia elachantha* *Acacia inaequilatera* *Acacia tenuissima* *Aristida contorta* *Cymbopogon ambiguus* *Eucalyptus gamophylla* *Eucalyptus leucophloia* subsp. *leucophloia* *Goodenia stobbsiana* *Hakea lorea* *Indigofera monophylla* *Jasminum didymum* subsp. *lineare*			*Keraudrenia nephrosperma* *Ptilotus calostachyus* *Ptilotus rotundifolius* *Santalum lanceolatum* *Scaevola parvifolia* subsp. *pilbarae* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *glutinosa* *Senna glutinosa* subsp. *pruinosa* *Sida arenicola* *Solanum lasiophyllum* *Triodia brizoides* *Triodia wiseana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF26					
Botanist	Chid	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		689383 **mE**	7472214 **mN**	**Elevation** 785 m
Topography and Geology	Landform: Stony hillside Aspect and Slope: ENE moderately inclined. Soil: orange brown clay loam. Geology: 90% cover of ironstone pebbles, cobbles, sheets.				
Veg Condition	2	**Disturbances**	none	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* scattered low trees over *Acacia hilliana* scattered low shrubs over *Triodia wiseana* open hummock grassland.				

Species	
Acacia adoxa var. *adoxa*	*Hakea lorea*
Acacia hilliana	*Hibiscus sturtii* var. *campylochlamys*
Acacia monticola	*Polycarpaea holtzei*
Acacia tenuissima	*Polycarpaea longiflora*
Aristida holathera	*Ptilotus astrolasius*
Bulbostylis barbata	*Ptilotus calostachyus*
Corchorus incanus subsp. *lithophilus*	*Ptilotus clementii*
Corymbia hamersleyana	*Ptilotus rotundifolius*
Dodonaea coriacea	*Scaevola browniana* subsp. *browniana*
Enneapogon polyphyllus	*Schizachyrium fragile*
Eremophila forrestii subsp. *forrestii*	*Senna artemisioides* subsp. *oligophylla*
Eriachne helmsii	*Senna glutinosa* subsp. *glutinosa*
Eriachne pulchella subsp. *pulchella*	*Sida ?echinocarpa*
Eucalyptus leucophloia subsp. *leucophloia*	*Sida* sp. Golden calyces glabrous (H.N. Foote 32)
Fimbristylis dichotoma	*Solanum lasiophyllum*
Gomphrena cunninghamii	*Triodia wiseana*
Goodenia microptera	*Urochloa holosericea* subsp. *velutina*
Goodenia stobbsiana	
Grevillea wickhamii	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF27					
Botanist	Chid	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		688788 **mE**	7472189 **mN**	**Elevation** 828 m
Topography and Geology	Landform: Stony hillside Aspect: NE. Soil: pale brown fine clay. Geology: 95% cover of ironstone pebbles, cobbles.				
Veg Condition	1	**Disturbances**	none	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* scattered low trees over *Keraudrenia nephrosperma, Acacia hilliana* low shrubland over *Triodia wiseana* open hummock grassland and *Schizachyrium fragile* very open tussock grassland.				
Species	*Acacia adoxa* var. *adoxa* *Acacia hilliana* *Acacia tenuissima* *Amphipogon sericeus* *Aristida holathera* *Corchorus incanus* subsp. *lithophilus* *Corymbia hamersleyana* *Cymbopogon ambiguus* *Dampiera candicans* *Dodonaea coriacea* *Eriachne helmsii* *Eucalyptus leucophloia* subsp. *leucophloia*		*Goodenia microptera* *Hakea lorea* *Hibiscus sturtii* var. *campylochlamys* *Keraudrenia nephrosperma* *Ptilotus calostachyus* *Schizachyrium fragile* *Senna ferraria* *Sida* sp. Golden calyces glabrous (H.N. Foote 32) *Solanum lasiophyllum* *Triodia wiseana*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF28					
Botanist	Linda	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		687837 **mE**	7470500 **mN**	**Elevation** 777 m
Topography and Geology	Landform: Shallow wide drainage line on plain Aspect and Slope: S 200° gently inclined. Soil: red clay. Geology: 30% cover of BIF pebbles.				
Veg Condition	3	**Disturbances**	cattle grazing, erorion	**Land System**	McKay
Site Photo					
Vegetation	*Eucalyptus gamophylla, Corymbia hamersleyana* low woodland over *Acacia tenuissima, Acacia elachantha, Gossypium robinsonii* tall open shrubland over *Keraudrenia nephrosperma, Senna glutinosa* subsp. *pruinosa, Indigofera monophylla* low shrubland over *Triodia wiseana* open hummock grassland.				

Species		
	Acacia adoxa var. *adoxa*	*Gossypium robinsonii*
	Acacia aptaneura	*Hakea lorea*
	Acacia bivenosa	*Indigofera monophylla*
	Acacia elachantha	*Jasminum didymum* subsp. *lineare*
	Acacia elachantha	*Keraudrenia nephrosperma*
	Acacia steedmanii subsp. *borealis*	*Psydrax rigidula*
	Acacia tenuissima	*Ptilotus calostachyus*
	Aristida contorta	*Santalum lanceolatum*
	Corymbia deserticola	*Scaevola parvifolia* subsp. *pilbarae*
	Corymbia ?hamersleyana	*Senna artemisioides* subsp. *oligophylla*
	Cymbopogon obtectus	*Senna glutinosa* subsp. *pruinosa*
	Dodonaea viscosa subsp. *mucronata*	*Solanum lasiophyllum*
	Eucalyptus gamophylla	*Trachymene oleracea*
	Evolvulus alsinoides var. *villosicalyx*	*Triodia wiseana*
	Goodenia stobbsiana	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF29					
Botanist	Linda	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		685400 **mE**	7469780 **mN**	**Elevation** 754 m
Topography and Geology	Landform: Flat plain with large dissected drainage line in valley between two breakaways Soil: red clay. Geology: 30% cover of BIF gravels, pebbles and cobbles.				
Veg Condition	3	**Disturbances**	grazing, erosion, weeds	**Land System**	McKay
Site Photo					
Vegetation	*Corymbia hamersleyana* scattered low trees over *Gossypium robinsonii, Acacia elachantha* tall open shrubland over *Triodia wiseana* hummock grassland and *Eulalia aurea, Eragrostis eriopoda* very open tussock grassland.				
Species	*Acacia elachantha* *Acacia maitlandii* *Alternanthera nana* *Aristida contorta* *Boerhavia gardneri* *Cleome viscosa* *Corymbia ?hamersleyana* *Cymbopogon ambiguus* *Dysphania rhadinostachya* *Eragrostis eriopoda* *Eucalyptus gamophylla* *Eulalia aurea* *Euphorbia biconvexa* *Evolvulus alsinoides* var. *villosicalyx* *Gomphrena canescens* subsp. *canescens* *Gomphrena cunninghamii* *Goodenia forrestii*			*Gossypium robinsonii* *Hybanthus aurantiacus* *Jasminum didymum* subsp. *lineare* *Keraudrenia nephrosperma* *Perotis rara* *Pterocaulon serrulatum* *Rhynchosia minima* *Rulingia luteiflora* *Rulingia luteiflora* *Santalum lanceolatum* *Scaevola parvifolia* subsp. *pilbarae* *Senna artemisioides* subsp. *oligophylla* *Tephrosia densa* *Tribulus hirsutus* *Triodia wiseana* *Triumfetta ?maconochieana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF30					
Botanist	Chid	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		685189 **mE**	7469360 **mN**	**Elevation** 761 m
Topography and Geology	Landform: Stony hillside with rocky ledges and breakaways Aspect and Slope: NW moderately inclined. Soil: red brown sandy clay. Geology: 90% cover of pebbles, sheets, ledges.				
Veg Condition	0	**Disturbances**	?	**Land System**	McKay
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Gossypium robinsonii* scattered shrubs over *Triodia wiseana* hummock grassland and *Cymbopogon ambiguus* scattered tussock grasses.				

Species	
Acacia dictyophleba	*Goodenia muelleriana*
Acacia inaequilatera	*Goodenia stobbsiana*
Aristida holathera	*Gossypium robinsonii*
Boerhavia gardneri	*Hakea lorea*
Bulbostylis barbata	*Paraneurachne muelleri*
Corchorus incanus subsp. *lithophilus*	*Polycarpaea holtzei*
Corymbia deserticola	*Ptilotus obovatus* subsp. *obovatus*
Corymbia hamersleyana	*Ptilotus rotundifolius*
Cucumis maderaspatanus	*Rhyncharrhena linearis*
Cymbopogon ambiguus	*Rhynchosia minima*
Eremophila forrestii subsp. *forrestii*	*Schizachyrium fragile*
Eriachne helmsii	*Senna glutinosa* subsp. *glutinosa*
Eriachne pulchella subsp. *pulchella*	*Sida ?echinocarpa*
Eucalyptus leucophloia subsp. *leucophloia*	*Themeda triandra*
Euphorbia biconvexa	*Triodia wiseana*
	Triumfetta maconochieana

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF31							
Botanist	Chid	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m		
Location	50K		684925 **mE**	7469255 **mN**	**Elevation** 746 m		
Topography and Geology	Landform: Flat plain, open drainage area Soil: red sandy clay. Geology: 30% cover of ironstone gravel, pebbles.						
Veg Condition	3	**Disturbances**	weeds, cattle	**Land System**	McKay		
Site Photo							
Vegetation	*Acacia aptaneura* low open woodland over *Themeda triandra, Aristida lazaridis, Dactyloctenium radulans* open tussock grassland with *Nicotiana occidentalis* subsp. *obliqua, Salsola australis* open herbland.						
Species	*Bidens bipinnata* *Chloris virgata* **Malvastrum americanum* **Portulaca oleracea* *Abutilon otocarpum* *Acacia aptaneura* *Acacia pruinocarpa* *Aristida calycina* var. *calycina* *Aristida holathera* *Aristida lazaridis* *Boerhavia gardneri* *Capparis lasiantha* *Chrysopogon fallax* *Cleome viscosa* *Convolvulus angustissimus* subsp. *angustissimus* *Cucumis maderaspatanus* *Dactyloctenium radulans* *Dysphania rhadinostachya* *Enchylaena tomentosa* *Enneapogon polyphyllus* *Eremophila longifolia* *Euphorbia biconvexa*				*Evolvulus alsinoides* var. *villosicalyx* *Goodenia forrestii* *Hakea lorea* *Ipomoea polymorpha* *Iseilema membranaceum* *Nicotiana occidentalis* subsp. *obliqua* *Paspalidium rarum* *Pterocaulon serrulatum* *Ptilotus helipteroides* *Ptilotus macrocephalus* *Ptilotus obovatus* subsp. *obovatus* *Rhagodia eremaea* *Salsola australis* *Senna glutinosa* subsp. *pruinosa* *Sida* ?sp. Spiciform panicles (E. Leyland s.n. 14/8/90) *Sida fibulifera* *Tephrosia supina* *Themeda triandra* *Tragus australianus* *Triraphis mollis* *Urochloa piligera*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF32					
Botanist	Linda	**Date**	3/30/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		685020 **mE**	7468502 **mN**	**Elevation** 737 m
Topography and Geology	Landform: Open flat plain Soil: red clay. Geology: 50% cover of BIF gravels and pebbles.				
Veg Condition	4	**Disturbances**	weeds, grazing, tracks	**Land System**	McKay
Site Photo					
Vegetation	*Acacia aptaneura* scattered low trees over *Cymbopogon ambiguus, Aristida contorta* closed tussock grassland and mixed species very open herbland.				

Species	
Abutilon otocarpum	*Evolvulus alsinoides* var. *villosicalyx*
Acacia aptaneura	*Gomphrena cunninghamii*
Acacia pruinocarpa	*Ipomoea polymorpha*
Aristida contorta	*Jasminum didymum* subsp. *lineare*
Aristida contorta	*Maireana villosa*
Boerhavia gardneri	*Perotis rara*
Cleome oxalidea	**Portulaca oleracea*
Cleome viscosa	*Pterocaulon serrulatum*
Cymbopogon ambiguus	*Ptilotus exaltatus* var. *exaltatus*
Cymbopogon obtectus	*Ptilotus helipteroides*
Dactyloctenium radulans	*Senna glutinosa* subsp. *glutinosa*
Dactyloctenium radulans	*Senna glutinosa* subsp. *pruinosa*
Dysphania rhadinostachya	*Senna notabilis*
Enneapogon caerulescens	*Sida arenicola*
Eremophila longifolia	*Solanum lasiophyllum*
Eulalia aurea	*Tephrosia supina*
Euphorbia biconvexa	*Triodia wiseana*
Euphorbia latrobei subsp. *filiformis*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF33					
Botanist	Linda	**Date**	3/31/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		684817 **mE**	7467822 **mN**	**Elevation** 725 m
Topography and Geology	Landform: Flat open plain Soil: red clay. Geology: 20% cover of BIF gravels and pebbles.				
Veg Condition	5	**Disturbances**	weeds, grazing, erosion, trampling of vegetation	**Land System**	Wannamunna
Site Photo					
Vegetation	*Acacia dictyophleba, Acacia pachyacra* scattered shrubs over *Dysphania kalpari, Goodenia prostrata, Boerhavia gardneri* herbland with *Aristida contorta, Perotis rara* very open tussock grassland.				

Species	
Abutilon otocarpum *Acacia aptaneura* *Acacia dictyophleba* *Acacia pachyacra* *Aristida contorta* *Boerhavia gardneri* *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) *Cleome oxalidea* *Cleome viscosa* *Codonocarpus cotinifolius* *Dysphania kalpari* *Euphorbia biconvexa* *Evolvulus alsinoides* var. *villosicalyx* *Goodenia prostrata*	*Lepidium echinatum* *Paspalidium rarum* *Perotis rara* *Polycarpaea corymbosa* var. *corymbosa* **Portulaca oleracea* *Pterocaulon serrulatum* *Ptilotus exaltatus* var. *exaltatus* *Ptilotus helipteroides* *Ptilotus polystachyus* *Sclerolaena cornishiana* *Sida platycalyx* *Solanum lasiophyllum* *Tribulus hirsutus* *Triodia ?brizoides* *Triodia wiseana*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF34					
Botanist	Chid	**Date**	3/31/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		684774 **mE**	7467680 **mN**	**Elevation** 725 m
Topography and Geology	Landform: Floodplain Slope: level. Soil: orange brown clay. Geology: no rock outcrop or coarse fragments.				
Veg Condition	2	**Disturbances**	weeds, cattle, roads nearby	**Land System**	Wannamunna
Site Photo					
Vegetation	*Acacia aptaneura* low open forest over *Eremophila longifolia* scattered shrubs over *Themeda triandra, Perotis rara* tussock grassland and mixed species very open herbland.				

Species	
Acacia aptaneura	*Evolvulus alsinoides* var. *villosicalyx*
Alternanthera nana	*Fimbristylis dichotoma*
Aristida contorta	*Goodenia prostrata*
Bidens bipinnata	*Indigofera georgei*
Boerhavia gardneri	*Lepidium echinatum*
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	*Lysiana murrayi*
	Nicotiana occidentalis subsp. *obliqua*
Calandrinia ptychosperma	*Perotis rara*
Chrysopogon fallax	**Portulaca oleracea*
Cleome viscosa	*Pterocaulon serrulatum*
Cucumis maderaspatanus	*Ptilotus clementii*
Dactyloctenium radulans	*Ptilotus gaudichaudii* var. *gaudichaudii*
Dysphania glomulifera subsp. *eremaea*	*Ptilotus obovatus* subsp. *obovatus*
Dysphania rhadinostachya	*Rhyncharrhena linearis*
Enchylaena tomentosa	*Sida* sp. Tiny fruits (AA Mitchell PRP1152)
Enteropogon ramosus	*Solanum ferocissimum*
Eragrostis cumingii	*Spartothamnella teucriiflora*
Eragrostis pergracilis	*Stenopetalum anfractum*
Eragrostis tenellula	*Stenopetalum pedicellare*
Eremophila longifolia	*Themeda triandra*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF35					
Botanist	Linda	**Date**	3/31/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		683540 **mE**	7469711 **mN**	**Elevation** 738 m
Topography and Geology	Landform: Undulating plain around base of breakaway Aspect and Slope: 235° gently inclined. Soil: red clay. Geology: 80% cover of BIF pebbles and cobbles.				
Veg Condition	3	**Disturbances**	grazing	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia, Eucalyptus gamophylla* scattered low trees over *Acacia bivenosa, Acacia elachantha* open shrubland over *Triodia wiseana* open hummock grassland.				

Species	
Acacia bivenosa	*Indigofera monophylla*
Acacia elachantha	*Jasminum didymum* subsp. *lineare*
Acacia pruinocarpa	*Perotis rara*
Aristida contorta	*Ptilotus calostachyus*
Cleome viscosa	*Ptilotus exaltatus* var. *exaltatus*
Cucumis maderaspatanus	*Ptilotus polystachyus*
Cymbopogon ambiguus	*Ptilotus rotundifolius*
Cymbopogon obtectus	*Schizachyrium fragile*
Eucalyptus gamophylla	*Senna artemisioides* subsp. *oligophylla*
Eucalyptus leucophloia subsp. *leucophloia*	*Senna glutinosa* subsp. *pruinosa*
Goodenia stobbsiana	*Solanum lasiophyllum*
Hakea lorea	*Triodia wiseana*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF36						
Botanist	Chid	**Date**	3/31/2012	**Site area**	Quadrat 50 x 50 m	
Location	50K		683234 **mE**	7470594 **mN**	**Elevation** 749 m	
Topography and Geology	Landform: Gentle slope at base of hill Aspect and Slope: WSW gently inclined. Soil: orange fine sandy clay. Geology: 95% cover of ironstone pebbles and cobbles.					
Veg Condition	2	**Disturbances**	cattle, tracks nearby	**Land System**	McKay	
Site Photo						
Vegetation	*Keraudrenia nephrosperma, Acacia adsurgens, Acacia bivenosa* open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* hummock grassland.					
Species	*Acacia adoxa* var. *adoxa* *Acacia adsurgens* *Acacia bivenosa* *Acacia dictyophleba* *Acacia maitlandii* *Bulbostylis barbata* *Cymbopogon ambiguus* *Eucalyptus leucophloia* subsp. *leucophloia*			*Hakea lorea* *Keraudrenia nephrosperma* *Ptilotus rotundifolius* *Schizachyrium fragile* *Senna artemisioides* subsp. *oligophylla* *Senna glutinosa* subsp. *glutinosa* *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) *Triodia wiseana*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF37					
Botanist	Chid	**Date**	3/31/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		683086 **mE**	7471288 **mN**	**Elevation** 747 m
Topography and Geology	Landform: Flat plain Slope: very gently linclined. Soil: red fine sandy clay. Geology: ironstone pebbles and cobbles.				
Veg Condition	3	**Disturbances**	weeds, cattle	**Land System**	McKay
Site Photo					
Vegetation	*Acacia aptaneura, Acacia inaequilatera* scattered low trees over *Eremophila longifolia*, *Senna artemisioides* subsp. *oligophylla* open shrubland over *Triodia wiseana* scattered hummock grasses and *Aristida inaequiglumis, Perotis rara* scattered tussock grasses.				
Species	*Abutilon otocarpum* *Acacia aptaneura* *Acacia inaequilatera* *Acacia marramamba* *Aristida contorta* *Aristida inaequiglumis* *Bidens bipinnata* *Cleome viscosa* *Corymbia deserticola* *Dysphania rhadinostachya* *Enneapogon polyphyllus* *Eragrostis cumingii* *Eremophila forrestii* subsp. *forrestii* *Eremophila longifolia* *Eriachne helmsii* *Evolvulus alsinoides* var. *villosicalyx* *Gomphrena canescens* subsp. *canescens* *Goodenia microptera*			*Gossypium australe* *Heliotropium tenuifolium* *Hibiscus sturtii* var. *platychlamys* *Perotis rara* *Psydrax latifolia* *Pterocaulon serrulatum* *Ptilotus helipteroides* *Ptilotus obovatus* subsp. *obovatus* *Rhyncharrhena linearis* *Senna artemisioides* subsp. *helmsii* *Senna artemisioides* subsp. *oligophylla* *Sida* ?sp. Spiciform panicles (E. Leyland s.n. 14/8/90) *Solanum phlomoides* *Sporobolus australasicus* *Tribulopis angustifolia* *Triodia wiseana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF38						
Botanist	Linda	**Date**	3/31/2012	**Site area**	Quadrat 50 x 50 m	
Location	50K		683397 **mE**	7472548 **mN**	**Elevation** 741 m	
Topography and Geology	Landform: Flat open plain in-between rollin hills Soil: dark red clay. Geology: 40% cover of BIF, pisolite gravels up to 2 cm.					
Veg Condition	3	**Disturbances**	grazing, erosion	**Land System**	McKay	
Site Photo						
Vegetation	*Eucalyptus gamophylla* low open woodland over *Acacia ancistrocarpa, Acacia elachantha* tall open shrubland over mixed species open tussock grassland and *Triodia brizoides* very open hummock grassland.					

Species	
Acacia ancistrocarpa	*Keraudrenia nephrosperma*
Acacia elachantha	*Paraneurachne muelleri*
Aristida contorta	*Polycarpaea holtzei*
Cymbopogon obtectus	*Ptilotus calostachyus*
Dysphania rhadinostachya	*Ptilotus rotundifolius*
Eragrostis pergracilis	*Scaevola parvifolia* subsp. *pilbarae*
Eucalyptus gamophylla	*Schizachyrium fragile*
Eulalia aurea	*Senna artemisioides* subsp. *oligophylla*
Euphorbia biconvexa	*Senna glutinosa* subsp. *pruinosa*
Evolvulus alsinoides var. *villosicalyx*	*Senna notabilis*
Goodenia microptera	*Sida* sp. Pilbara (A.A. Mitchell PRP 1543)
Goodenia stobbsiana	*Solanum lasiophyllum*
Hibiscus coatesii	*Triodia ?brizoides*
Jasminum didymum subsp. *lineare*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF39					
Botanist	Chid	**Date**	4/1/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		683957 **mE**	7473448 **mN**	**Elevation** 732 m
Topography and Geology	Landform: Narrow creekline on gentle slope at base of hill Aspect and Slope: NW gently inclined. Soil: red brown clay. Geology: 95% cover of ironstone, laterite gravel, pebbles, cobbles.				
Veg Condition	2	**Disturbances**	weeds, cattle	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Corymbia hamersleyana* scattered low trees over *Grevillea wickhamii, Acacia inaequilatera* tall open shrubland over *Triodia wiseana, Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland.				
Species	*Acacia inaequilatera* *Acacia monticola* *Aristida holathera* *Clerodendrum ?tomentosum* *Corymbia hamersleyana* *Cymbopogon ambiguus* *Enneapogon polyphyllus* *Eragrostis eriopoda* *Eriachne helmsii* *Fimbristylis simulans* *Gompholobium sp. Pilbara (NF Norris 908)* *Gossypium robinsonii*			*Grevillea wickhamii* *Hybanthus aurantiacus* *Jasminum didymum* subsp. *lineare* *Keraudrenia nephrosperma* *Senna glutinosa* subsp. *glutinosa* *Senna venusta* *Solanum lasiophyllum* *Themeda triandra* *Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)* *Triodia wiseana* *Urochloa piligera*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF40					
Botanist	Chid	**Date**	4/1/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		684557 **mE**	7473917 **mN**	**Elevation** 728 m
Topography and Geology	Landform: Gently undulating plain at foot of breakaway, some small flat drainage lines Aspect and Slope: 280° gently inclined Soil: red clay. Geology:95% cover of BIF, chert, quartz pebbles and cobbles.				
Veg Condition	0	**Disturbances**	grazing, erosion, weeds	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia, Eucalyptus gamophylla* scattered low trees over *Acacia elachantha, Acacia inaequilatera, Santalum lanceolatum* tall open shrubland over *Triodia brizoides, Triodia wiseana* hummock grassland.				

Species	
Acacia elachantha	*Polycarpaea holtzei*
Acacia inaequilatera	*Ptilotus calostachyus*
Aristida contorta	*Ptilotus obovatus* subsp. *obovatus*
Cleome viscosa	*Ptilotus rotundifolius*
Corymbia deserticola	*Santalum lanceolatum*
Eucalyptus gamophylla	*Schizachyrium fragile*
Eucalyptus leucophloia subsp. *leucophloia*	*Senna artemisioides* subsp. *oligophylla*
Fimbristylis simulans	*Senna glutinosa* subsp. *pruinosa*
Goodenia microptera	*Solanum lasiophyllum*
Lepidium echinatum	*Triodia ?brizoides*
Polycarpaea corymbosa var. *corymbosa*	*Triodia wiseana*

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF41					
Botanist	Chid	**Date**	4/1/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		686619 **mE**	7474514 **mN**	**Elevation** 745 m
Topography and Geology	Landform: Gentle slope at foot of hill, minor drainage lines dissecting. Aspect and Slope: N gently to moderately inclined. Soil: red orange sandy clay. Geology: 95% cover of ironstone gravel, pebbles.				
Veg Condition	2	**Disturbances**	weeds	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Acacia inaequilatera, Grevillea wickhamii* tall open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* hummock grassland.				
Species	*Acacia adoxa* var. *adoxa* *Acacia adsurgens* *Acacia bivenosa* *Acacia dictyophleba* *Acacia elachantha* *Acacia inaequilatera* *Acacia tenuissima* *Acacia xiphophylla* *Aristida holathera* *Aristida inaequiglumis* *Bulbostylis barbata* *Corchorus incanus* subsp. *lithophilus* *Dampiera candicans* *Eriachne aristidea* *Eucalyptus leucophloia* subsp. *leucophloia*			*Gossypium robinsonii* *Grevillea wickhamii* *Hakea lorea* *Hibiscus sturtii* var. *campylochlamys* *Indigofera monophylla* *Paraneurachne muelleri* *Polycarpaea longiflora* *Ptilotus astrolasius* *Ptilotus calostachyus* *Scaevola parvifolia* subsp. *pilbarae* *Schizachyrium fragile* *Senna glutinosa* subsp. *glutinosa* *Senna glutinosa* subsp. *pruinosa* *Sida ?echinocarpa* *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) *Triodia wiseana*	
Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF42					

Botanist	Linda	**Date**	4/1/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		685993 **mE**	7474911 **mN**	**Elevation** 712 m
Topography and Geology	Landform: Very gently undulating plain with dissected drainage lines and sheet flow. Aspect and Slope: 265° (W) gently inclined. Soil: red clay. Geology: 95% cover of BIF, chert, quartz gravels, pebbles and cobbles.				
Veg Condition	3	**Disturbances**	grazing, erosion	**Land System**	Boolgeeda
Site Photo					
Vegetation	*Corymbia ?hamersleyana, Eucalyptus gamophylla* scattered low trees over *Acacia elachantha, Grevillea wickhamii, Gossypium robinsonii* tall open shrubland over *Triodia brizoides, Triodia wiseana* open hummock grassland.				

Species	
Acacia aptaneura	*Keraudrenia nephrosperma*
Acacia elachantha	*Paraneurachne muelleri*
Acacia tenuissima	*Polycarpaea holtzei*
Aristida contorta	*Ptilotus astrolasius*
Corymbia ?hamersleyana	*Ptilotus calostachyus*
Cymbopogon ambiguus	*Ptilotus exaltatus* var. *exaltatus*
Cymbopogon obtectus	*Ptilotus rotundifolius*
Dodonaea viscosa subsp. *mucronata*	*Rhynchosia minima*
Eucalyptus gamophylla	*Scaevola parvifolia* subsp. *pilbarae*
Fimbristylis simulans	*Schizachyrium fragile*
Gossypium robinsonii	*Senna artemisioides* subsp. *oligophylla*
Grevillea wickhamii	*Senna glutinosa* subsp. *pruinosa*
Hibiscus sturtii var. *campylochlamys*	*Sida arenicola*
Hybanthus aurantiacus	*Solanum lasiophyllum*
Indigofera monophylla	*Tephrosia densa*
Jasminum didymum subsp. *lineare*	*Triodia ?brizoides*
	Triodia wiseana

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF43					
Botanist	Chid	**Date**	4/1/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		687239 **mE**	7476050 **mN**	**Elevation** 724 m
Topography and Geology	Landform: Gentle slope at base of hill Aspect and Slope: NW gently inclined. Soil: red sandy clay. Geology: 95% cover of ironstone gravel, pebbles.				
Veg Condition	1	**Disturbances**	none	**Land System**	Newman
Site Photo					
Vegetation	*Corymbia deserticola* scattered low trees over *Acacia elachantha, Keraudrenia nephrosperma* low open shrubland over *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) open hummock grassland.				

Species	
Acacia adsurgens *Acacia ancistrocarpa* *Acacia elachantha* *Acacia hilliana* *Amphipogon caricinus* subsp. *caricinus* *Aristida holathera* *Bulbostylis barbata* *Corymbia deserticola* *Cymbopogon ambiguus* *Eriachne helmsii* *Goodenia microptera* *Goodenia stobbsiana* *Heliotropium tenuifolium* *Hibiscus sturtii* var. *campylochlamys*	*Hybanthus aurantiacus* *Indigofera monophylla* *Keraudrenia nephrosperma* *Oldenlandia crouchiana* *Polycarpaea holtzei* *Ptilotus astrolasius* *Ptilotus calostachyus* *Ptilotus rotundifolius* *Schizachyrium fragile* *Senna artemisioides* subsp. *oligophylla* *Solanum lasiophyllum* *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835)

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF45					
Botanist	Chid	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		695148 **mE**	7476682 **mN**	**Elevation** 745 m
Topography and Geology	Landform: Creekline in gorge Aspect and Slope: N-S gully very gently inclined. Soil: dark orange-brown sandy clay. Geology: 95% cover of granite, BIF pebbles, stones, outcrops.				
Veg Condition	2	**Disturbances**	cattle	**Land System**	tba
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Gossypium robinsonii, Acacia tumida* var. *pilbarensis* tall open shrubland over *Triodia wiseana* hummock grassland and *Cymbopogon ambiguus, Eriachne helmsii, Themeda triandra* very open tussock grassland.				

Species	
Abutilon indicum	*Paspalidium tabulatum*
Acacia bivenosa	*Phyllanthus maderaspatensis*
Acacia monticola	*Pterocaulon serrulatum*
Acacia tumida var. *pilbarensis*	*Ptilotus obovatus* subsp. *obovatus*
Clerodendrum ?tomentosum	*Rhynchosia minima*
Corchorus lasiocarpus subsp. *lasiocarpus*	*Senna glutinosa* subsp. *glutinosa*
Cucumis maderaspatanus	*Stemodia grossa*
Cymbopogon ambiguus	*Stemodia viscosa*
Eremophila lachnocalyx	*Stylobasium spathulatum*
Eriachne helmsii	*Themeda triandra*
Eucalyptus leucophloia subsp. *leucophloia*	*Trichodesma zeylanicum* var. *zeylanicum*
Euphorbia biconvexa	*Triodia wiseana*
Gossypium robinsonii	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF46					
Botanist	Chid	**Date**	3/28/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		694954 **mE**	7475581 **mN**	**Elevation** 1009 m
Topography and Geology	Landform: slope near top of very large ridge Aspect and Slope: North facing, gently to moderately inclined. Soil: brown clay. Geology: 95% cover of BIF, ironstone pebbles, cobbles, sheets.				
Veg Condition	2	**Disturbances**	weeds	**Land System**	tba
Site Photo					
Vegetation	*Eucalyptus leucophloia* subsp. *leucophloia, Eucalyptus* gamophylla low open woodland over *Triodia wiseana* hummock grassland.				
Species	*Acacia pruinocarpa* *Acacia tenuissima* *Bidens bipinnata* *Capparis spinosa* var. *nummularia* *Codonocarpus cotinifolius* *Corchorus lasiocarpus* subsp. *lasiocarpus* *Cymbopogon ambiguus* *Cynanchum floribundum* *Dodonaea viscosa* subsp. *mucronata* *Eriachne helmsii*			*Eucalyptus gamophylla* *Eucalyptus leucophloia* subsp. *leucophloia* *Newcastelia* sp. Hamersley Range (S. van Leeuwen 4264) *Polycarpaea holtzei* *Ptilotus obovatus* subsp. *obovatus* *Scaevola browniana* subsp. *browniana* *Solanum phlomoides* *Triodia wiseana*	

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF51					
Botanist	Linda	**Date**	3/31/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		684946 **mE**	7467735 **mN**	**Elevation** 726 m
Topography and Geology	Landform: Flat plain Soil: red clay. Geology: no rock outcrop or coarse fragments				
Veg Condition	3	**Disturbances**	weeds, grazing	**Land System**	tba
Site Photo					
Vegetation	*Acacia aptaneura, Hakea lorea* low open woodland over *Goodenia prostrata, Dysphania kalpari, Sclerolaena cornishiana* very open herbland and *Cymbopogon ambiguus, Aristida contorta, Perotis rara* tussock grassland.				
Species	*Acacia aptaneura* *Acacia dictyophleba* *Alternanthera nana* *Aristida contorta* *Boerhavia gardneri* *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) *Bulbostylis barbata* *Cleome viscosa* *Cymbopogon ambiguus* *Dactyloctenium radulans* *Dysphania kalpari* *Eragrostis pergracilis* *Euphorbia biconvexa* *Evolvulus alsinoides* var. *villosicalyx* *Goodenia prostrata*			*Hakea lorea* *Paspalidium rarum* *Perotis rara* **Portulaca oleracea* *Pterocaulon serrulatum* *Ptilotus gaudichaudii* var. *gaudichaudii* *Ptilotus helipteroides* *Ptilotus obovatus* subsp. *obovatus* *Ptilotus polystachyus* *Ptilotus polystachyus* *Rhodanthe floribunda* *Sclerolaena cornishiana* *Solanum lasiophyllum* *Tribulus hirsutus*		

Lamb Creek Level 2 Flora and Vegetation Survey - Site LCF52					
Botanist	Linda	**Date**	4/1/2012	**Site area**	Quadrat 50 x 50 m
Location	50K		692237 **mE**	7476823 **mN**	**Elevation** 699 m
Topography and Geology	Landform: Flat plain Soil: red clay. Geology: 30% cover of BIF gravels, pebbles and cobbles.				
Veg Condition		**Disturbances**		**Land System**	tba
Site Photo					
Vegetation	*Acacia elachantha, Acacia inaequilatera, Grevillea wickhamii* scattered shrubs over *Triodia brizoides* open hummock grassland.				

Species

Abutilon dioicum
Abutilon otocarpum
Acacia ancistrocarpa
Acacia aptaneura
Acacia elachantha
Acacia inaequilatera
Alternanthera nana
Aristida contorta
Boerhavia gardneri
Dysphania rhadinostachya
Eremophila longifolia
Evolvulus alsinoides var. *villosicalyx*
Goodenia stobbsiana
Grevillea wickhamii
Hakea lorea
Hybanthus aurantiacus
Indigofera monophylla
Oldenlandia crouchiana
Paraneurachne muelleri
**Portulaca oleracea*
Ptilotus calostachyus
Ptilotus helipteroides
Ptilotus obovatus subsp. *obovatus*
Schizachyrium fragile
Senna artemisioides subsp. *oligophylla*
Senna glutinosa subsp. *glutinosa*
Senna notabilis
Sida ?sp. Supplejack Station (T.S. Henshall 2345)
Sida arenicola
Tragus australianus
Trianthema glossostigma
Triodia ?brizoides
Triodia wiseana

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