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**SINOSTEEL MIDWEST CORPORATION
BLUE HILLS IRON ORE PROJECT
FLORA AND VEGETATION ENDEMISM DESKTOP**

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ACRONYMS

DEC	Department of Environment and Conservation (now DPaW)
DEFL	The DEC's Threatened (Declared Rare) Flora Database
DER	Department of Environment Regulation (formerly DEC)
DMP	Department of Mines and Petroleum
DPaW	Department of Parks and Wildlife (formerly DEC)
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
P1	Priority 1
P2	Priority 2
P3	Priority 3
PEC	Priority Ecological Community
SMC	Sinosteel Midwest Corporation
T	Threatened
TEC	Threatened Ecological Community
WAHERB	Western Australian Herbarium
WC Act	<i>Wildlife Conservation Act 1950</i>

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EXECUTIVE SUMMARY

Sinosteel Midwest Corporation Limited (SMC) are planning to expand the footprint of the Blue Hills Iron Ore Project, located in the Midwest mining region of Western Australia. The Blue Hills Iron Ore Project is partially located within what is known as an environmentally sensitive area of the Midwest, on Mungada Ridge.

Several flora and vegetation surveys have been undertaken in the area, with results showing the presence of potentially endemic, Threatened and Priority flora species and significant vegetation communities. As a large volume of biological survey work has previously been carried out in the area, SMC saw the value in undertaking a comprehensive analysis of all available information and therefore commissioned a study to determine the likely endemism of significant flora populations and ecological communities known to occur on Mungada Ridge via a desktop assessment of all available previous flora and vegetation surveys in the area.

A total of 24 reports and the DPaW Threatened and Priority Flora database search, Threatened and Priority Ecological Community database search, WA Herbarium database search, Threatened and Priority Flora Species list were reviewed for the purpose of this assessment.

Based on the species list obtained from all reports and database searches reviewed, a total of 76 conservation significant taxa from 52 genera and 30 families were identified. Seven of these are listed as Threatened (formerly DRF), 23 as Priority 1, seven as Priority 2, 36 as Priority 3 and three as Priority 4.

Acacia woodmaniorum is the only species determined to endemic to the local region, although is not strictly considered endemic to Mungada Ridge, nor the Blue Hills tenements of the proposed impact area. *Acacia woodmaniorum* has 9,576 known localities and 30,195 individual plants in the local region, with 82% of the localities occurring on Mungada Ridge, 60% within the Blue Hills tenements and 33% within the impact area. This representation also equates to 90% of plants in the local context occurring on Mungada Ridge and 55% and 26% occurring within the tenements and the impact area, respectively.

One Priority 1 PEC, Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes (banded ironstone formation) occurs over Mungada Ridge, although is not endemic to the ridge, with representation extending up to 20 km to the north and south, 7 km to the east and 16 km to the west. Mungada Ridge occupies 1.2% of the DPaW database search area for the PEC. However, this area of occupation also includes buffers and the actual extent of the PEC area is likely to be less.

Two of the comprising FCTs; that contribute to the Blue Hills vegetation complexes PEC (Woodman FCT 1 and 4) are represented by a large proportion of their extent on Mungada Ridge. However, neither of these FCTs, nor any other FCTs represented on Mungada Ridge or in the Blue Hills tenements are endemic to the ridge or the tenements.

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1 INTRODUCTION

1.1 BACKGROUND

Sinosteel Midwest Corporation Limited (SMC) are planning to expand the footprint of the Blue Hills Iron Ore Project (herein referred to as the Blue Hills expansion), located in the Midwest mining region of Western Australia. The Blue Hills Iron Ore Project is partially located within what is known as an environmentally important area of the Midwest, on Mungada Ridge.

A number of flora and vegetation surveys have been undertaken in the area, including the 2005 assessment undertaken by the Department of Conservation and Land Management (CALM, now DPaW) which included a vegetation survey of the central Tallering Land System, specifically targeting hills and ridges of Banded Ironstone Formations (BIF) in an area predominantly covered by mining and exploration tenements including Blue Hills.

Subsequent studies in the region have identified that the Blue Hills is of significance, supporting values including Threatened (formerly Declared Rare Flora (DRF)) flora, Priority Flora, a Priority Ecological Community (PEC), conservation significant fauna and other flora and fauna of interest. The PEC, *Blue Hills vegetation complex*, is restricted to BIF in the region (Environmental Protection Authority, 2009b).

In order to progress the environmental approvals for the proposed Blue Hills expansion, SMC commenced discussion with the Office of the Environmental Protection Authority (OEPA) on 5 June 2013. During this meeting, it was recommended that SMC further consider the regional significance, the floral value and the level of endemism of flora and vegetation of Mungada Ridge, as well as the overall proposed impact on the PEC.

Endemism is defined as the ecological state of being unique to a defined geographic location, such as a specific area, a landform, a region, a nation or other defined zone, or unique to a habitat type (Wikipedia, 2013). Therefore, species or communities could be considered endemic to a certain country (e.g. Australia), a specific type of landform (e.g. BIF ranges) or a specific area (e.g. the BIF or Mungada Ridge). By definition, species or communities are not endemic to a certain location if they occur elsewhere, even if in limited abundance or extent. Endemics are vulnerable to extinction, as impacts to their restricted location could result in total loss of the species or community type.

Ongoing interest in mining developments in region has necessitated a large volume of biological survey work and SMC has access to a significant dataset. Therefore, in order to further consider matters raised by the OEPA, SMC saw the value in undertaking a comprehensive analysis of all available information, and therefore commissioned a study to determine the likely endemism of significant flora populations and ecological communities known to occur on Mungada Ridge via a desktop assessment of all known previous flora and vegetation surveys in the area.

1.2 SCOPE OF WORK

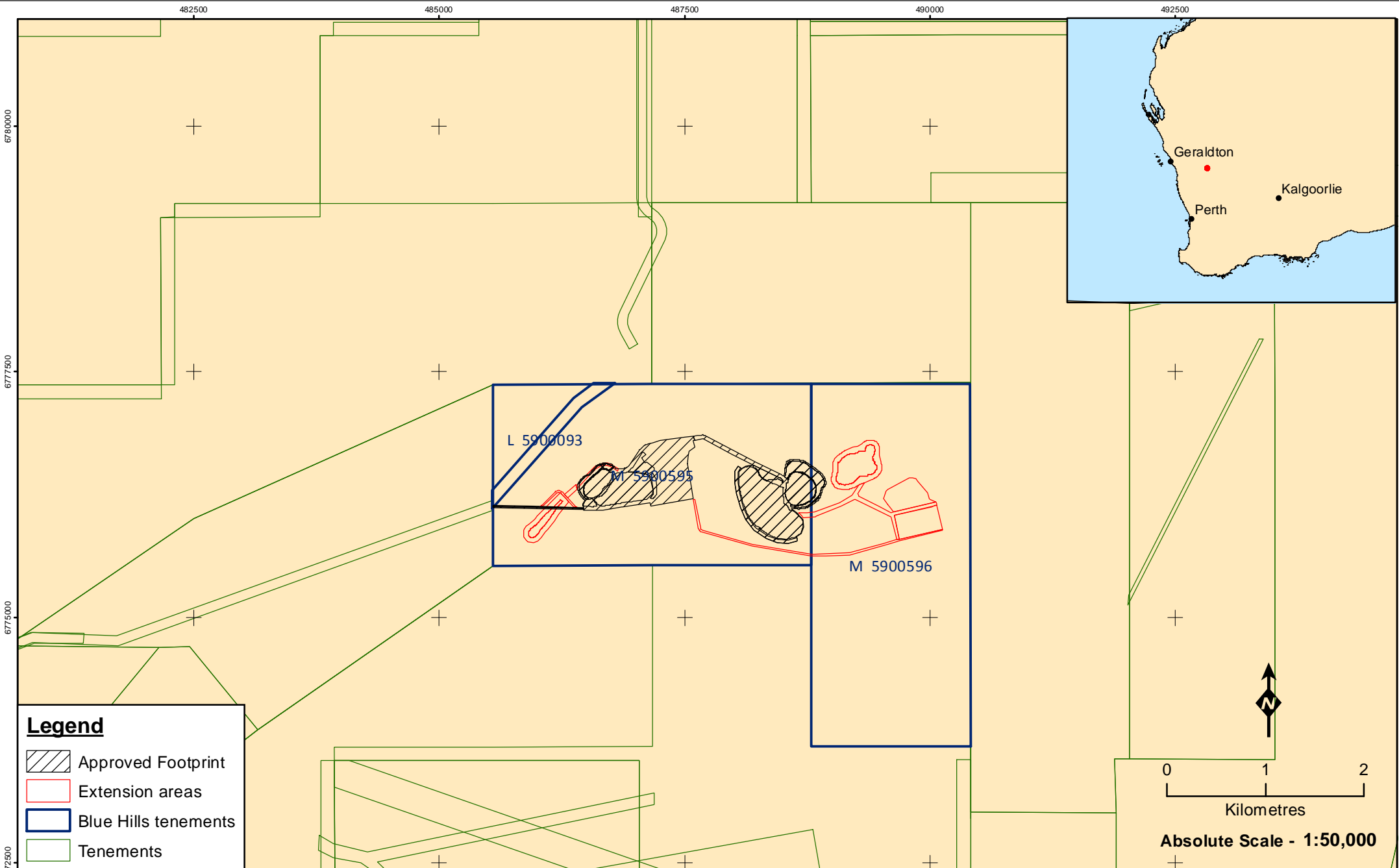
The approach undertaken for the desktop assessment was as follows:

- Undertake an updated Department of Parks and Wildlife (DPaW, formerly Department of Environment and Conservation (DEC)) database search for Priority Flora, Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs);
- Analyse and map all existing reports and data;
- Provide a summary of proportion of known individuals, populations and communities on Mungada Ridge in comparison to the surrounding region; and

- Provide recommendations regarding any further assessment that might be required to ascertain the actual extent of the significant species and communities in the region and conclude the level of endemism.

1.3 PROJECT LOCATION

The Blue Hills Project is located in the Southern Murchison region of Western Australia, within the Shire of Perenjori (Figure 1.1). The closest major towns are Geraldton and Morawa, which are approximately 225 km north west and 90 km west of the Project, respectively.



Legend

-  Approved Footprint
-  Extension areas
-  Blue Hills tenements
-  Tenements

<p>Figure: 1.1 Project ID: 1532</p>	<p>Drawn: BMJ Date: 30/07/2013</p>
<p><small>Coordinate System Name: GDA 1994 MGA Zone 50 Projection: Transverse Mercator Datum: GDA 1994</small></p>	<p><small>Unique Map ID: BMY001</small></p>



Location of Blue Hills study area

1.4 LEGISLATIVE FRAMEWORK

Legislation relevant to the protection of biodiversity in Western Australia includes, but is not limited to, the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999), the State *Wildlife Conservation Act 1950* (WC Act 1950) and *Environmental Protection Act 1986* (EP Act 1986).

The Commonwealth EPBC Act was developed to provide protection for matters of national environmental significance. It includes provisions to protect threatened species and communities and the conservation of migratory species.

The State WC Act was developed to provide for the protection of wildlife in Western Australia. Under section 14 of this act, all flora and fauna are protected in Western Australia. In addition, the Minister has published a list of species in need of special protection because they are considered rare, likely to become extinct, or are presumed extinct. The current listing was published in Western Australian Government Gazette on 8 December 2012.

The State EP Act was developed to ensure that impacts on native flora, vegetation, fauna and Environmentally Sensitive Areas (ESAs) are considered in the assessment of development proposals.

While the assessment of specific proposals is not within the scope of this report, the surveys undertaken conform to the requirements of the Environmental Protection Authority's (EPA's) *Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002) and *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004a).

Under the relevant legislation, certain species of fauna, flora, ecological communities and ESAs are awarded protection in the interest of their conservation.

1.4.1 Threatened and Priority Flora

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia)

At a Commonwealth level, Threatened flora are protected under the EPBC Act 1999, which lists species that are considered Critically Endangered, Endangered, Conservation Dependant, Extinct, or Extinct in the Wild (Appendix A).

Wildlife Conservation Act 1950 (Western Australia)

Threatened Flora

Taxa which have been adequately searched for and are deemed to either rare, in danger of extinction, or otherwise in need of special protection in the wild, are gazetted as Threatened Flora (Schedule 1, WC Act 1950). Threatened Flora (Schedule 1) taxa are further categorised 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; and,
- VU: Vulnerable – considered to be facing a high risk of extinction in the wild.

These taxa are legally protected and their removal or impact to their surroundings cannot be conducted without Ministerial approval, obtained specifically on each occasion for each population (refer to Appendix A for conservation category definitions).

Priority Flora

In April 2011, the DEC (now DPaW) revised the conservation codes for Western Australian flora. DPaW assigns conservation codes to endemic plant species that are geographically restricted to few known populations or threatened by local processes. Allocating conservation codes to plant species assists in protecting populations and conserving species from potential threats (Smith 2012).

DPaW maintains a list of Priority Flora taxa, which are considered poorly known, uncommon or under threat, but for which there is insufficient justification, based on known distribution and population sizes, for inclusion in Schedule 1 of the WC Act. A Priority taxon is assigned to one of five priority categories (Appendix A).

1.4.2 Threatened and Priority Ecological Communities

Ecological communities are naturally occurring biological assemblages located in a particular type of habitat. At a national level, TECs are protected under the EPBC Act. TECs are listed under this act as either 'Critically Endangered', 'Endangered' or 'Vulnerable'. A definition of these codes is provided in Appendix A.

DPaW also maintains a list of TECs endorsed by the Minister of Environment (Department of Environment and Conservation 2010) that are classified as being either 'Presumed Totally Destroyed', 'Critically Endangered', 'Endangered' or 'Vulnerable'. Definition of these codes is also provided in Appendix A.

TECs are also protected under the EP Act and *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

DPaW maintains an additional list of PECs for communities that could potentially be classified as TECs, but are not currently adequately defined or surveyed. Communities are placed in this category while consideration can be given to their declaration as a TEC. Five priority codes exist for PECs and these are defined in Appendix A.

1.4.3 Floristic Community Types

When the vegetation of an area is mapped, the vegetation is described as a series of Floristic Community Types (FCTs). FCTs are vegetation communities determined from field surveys using quadrats, followed by statistical analyses. From these analyses quadrats are grouped according to similarity, described and then mapped.

Some TECs or PECs include the phrase 'vegetation complexes', referring to a several vegetation groups. In these cases, FCTs can be used to investigate the regional distribution of individual components that make up a TEC or PEC.

1.4.4 ESAs

Section 51B of the EP Act allows the Minister to declare environmentally sensitive areas. Once declared, the exemptions listed in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* no longer apply in these areas and approval to clear must be sought through a native vegetation clearing permit (NVCP), if the proposed impact does not seek approval as part of a wider part IV approvals process.

Although often reported as being an environmentally sensitive area, the Blue Hills tenements and Mungada Ridge do not support any declared ESAs.

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2 EXISTING ENVIRONMENT

2.1 CLIMATE

Blue Hills and Mungada Ridge lie in the semi-desert Mediterranean bioclimatic region which experiences mild, wet winters and hot, dry summers. The nearest weather recording station is at Paynes Find, located approximately 140 km from Blue Hills. The mean annual rainfall at Paynes Find is 291 mm, and the average monthly rainfall ranges from 10 mm in October to 43 mm in June. The mean monthly maximum temperatures range from 18°C in winter to 37°C in summer, and the mean monthly minimum temperatures range from 5°C in winter to 21°C in summer (Figure 2.1) (BoM accessed online 16/07/2013).

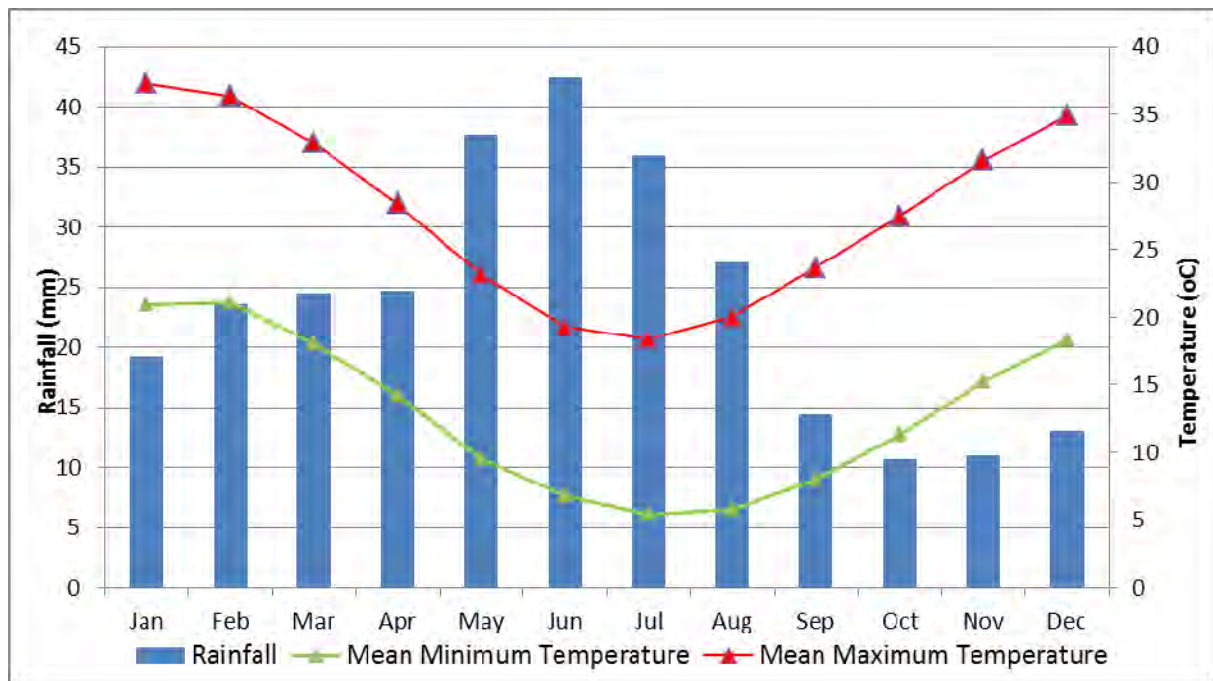


Figure 2.1 - Climate data for the Paynes Find weather station (BoM, 2013)

2.2 BIOGEOGRAPHY

The Interim Biogeographic Regionalisation for Australia (IBRA (Version 7) classifies the Australian continent into regions (bioregions) of similar geology, landform, vegetation, fauna and climate characteristics (Australian Government Department of Sustainability 2012). The project area is located within the Eremaean Botanical Province in the Yalgoo (YAL) bioregion. The Yalgoo bioregion is further divided into two subregions, Edel and Tallering. The Project area is located in the Tallering subregion (YAL2) (EPA 2006).

The vegetation of the Yalgoo bioregion is characterised by red sandy plains, supporting low to open woodlands of *Eucalyptus*, *Acacia* and *Callitris* species (Desmond and Chant 2001). The vegetation of the sandy-earth plains is *Acacia aneura*, *Callitris*, *Eucalyptus salubris*, *Acacia ramulosa* var. *ramulosa* and *Acacia ramulosa* var. *linophylla* open woodlands and scrubs. Ephemeral species are particularly abundant in this bioregion (Desmond and Chant 2001).

The Tallering subregion is dominated by red sandy plains and sandy earth plains of the western Yilgarn Craton. The predominant land use in the Tallering subregion is grazing on native pastures (approximately 77%) (Payne *et al.* 1998). The Yalgoo bioregion is an interzone between the southwestern and the Murchison bioregions (Desmond and Chant 2001). The Yalgoo bioregion represents the westernmost section of the pastoral land area.

2.3 LAND SYSTEMS

Land systems are described using the biophysical characteristics of geology, landforms, vegetation and soils (Curry *et al.* 1994; Payne *et al.* 1998). The Blue Hills Project area and Mungada Ridge lie within five land systems Cunyu, Pindar, Tallering, Yowie and Tealtoo (Figure 2.2).

The Cunyu land system is characterised by calcreted drainage zones on hardpan; alluvial plains with raised calcrete platforms supporting variable mostly non-halophytic shrublands and calcareous shrubby grasslands.

The Pindar land system is characterised by loamy plains surrounded by sandplain supporting York gum woodlands and *Acacia* shrublands. It has Quaternary sands and Cainozoic alluvial and colluvial deposits.

The Tallering land system is characterised by prominent ridges and hills of banded ironstone, dolerite and sedimentary rocks. The soils of the hillslopes and ridges are shallow red earths and stony red earths with smaller areas of red clayey sands with ferruginous gravel found on the stony and gravelly plains.

The Yowie land system is dominated by loamy plains and has soils of variable depth including red clayey sands, hardpan loams and red earths on hardpan. Smaller areas of variable depth exist, with red clayey sands and ferruginous gravel over hardpan. Deep red earths and juvenile alluvial deposits occur on the gravelly plains and narrow drainage tracts of the land system.

The Tealtoo land system consists of depositional surfaces of level to gently undulating loamy plains with fine ironstone lag gravel. The soils are deep red earths on ironstone gravel or hardpan, shallow hardpan loams and shallow red clayey sands with ferruginous gravel on hardpan or gravel.

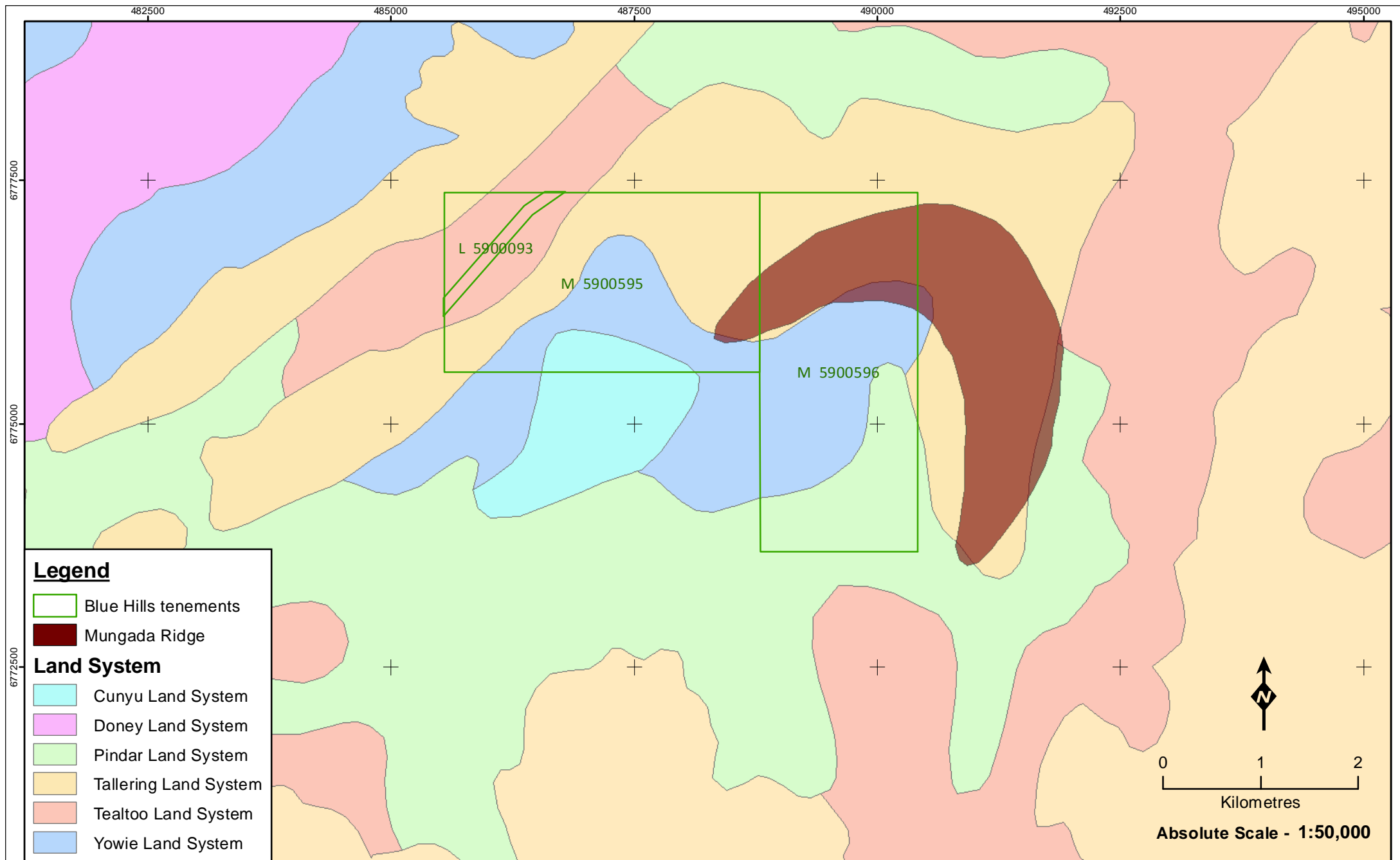
2.4 BEARD VEGETATION ASSOCIATIONS

The study area lies within Beard's (1975) Pilbara region of the Eremaean Botanical Province, part of a series of maps completed by Beard *et al.* from 1974 to 1981 throughout Western Australia. The vegetation mapping was subsequently reinterpreted to reflect the National Vegetation Information System (Department of Environment and Water Resources 2003) standards and revised taxonomy for some species and digitised (Shepherd *et al.* 2001).

The Blue Hills tenements (L59.93, M59/595 and M59/596) lie within four Beard vegetation units (Figure 2.3). The following three vegetation associations occur over Mungada Ridge:

- 355 - Shrublands; bowgada and jam scrub with scattered York gum and red mallee;
- 358 - Shrublands, bowgada and *Acacia quadrimarginea* on stony ridges; and
- 420 - Shrublands, bowgada and jam scrub.

Vegetation unit 363 - Shrublands, bowgada scrub with scattered cypress pine, occurs within the north-west of the Blue Hills tenements, but does not form part of the ridge.




Legend

- Blue Hills tenements
- Mungada Ridge

Land System

- Cunya Land System
- Doney Land System
- Pindar Land System
- Tallering Land System
- Tealtoo Land System
- Yowie Land System


 0 1 2
 Kilometres
Absolute Scale - 1:50,000



**Land Systems
of Blue Hills study area**

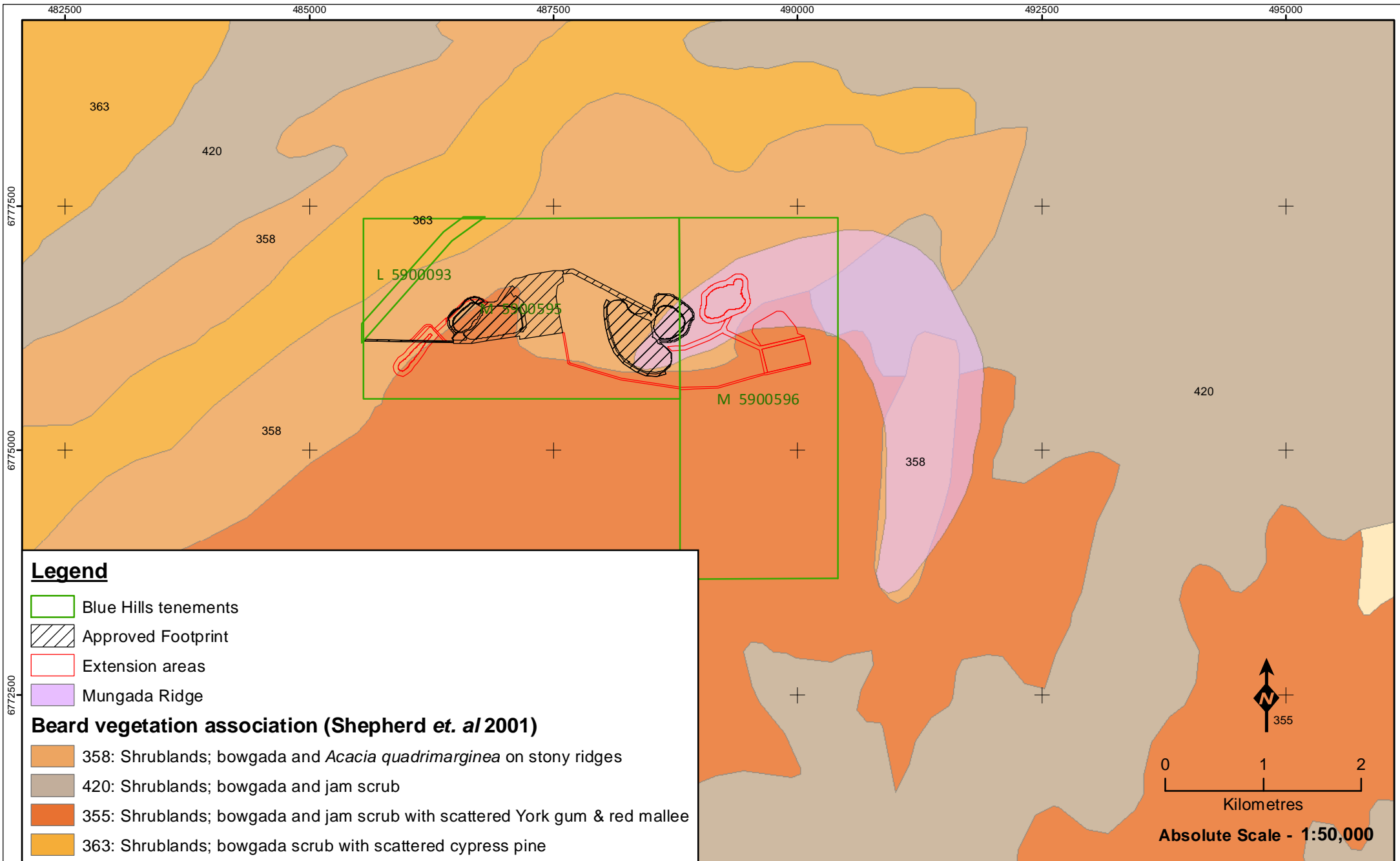
Figure: 2.2
Project ID: 1532

Coordinate System
 Name: GDA 1994 MGA Zone 50
 Projection: Transverse Mercator
 Datum: GDA 1994

Drawn: RY
Date: 08/07/2013

Unique Map ID: RY155

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3 METHODOLOGY

As part of the environmental approvals process for the Blue Hills Iron Ore Project, numerous baseline flora and vegetation surveys and targeted Priority flora surveys of the proposed mine site, infrastructure, associated access corridors have been required. These are additional to other significant work in the region by DEC and have allowed assessments of potential impacts to be made and appropriate management strategies identified.

In order to assess the endemism of flora and vegetation communities of Mungada Ridge, results from these flora and vegetation surveys were consolidated, analysed and reviewed along with additional regional relevant surveys and relevant database searches. Data was consolidated to produce an assessment of the population sizes, distributions and endemism of Threatened and Priority Flora, PECs and FCTs of Mungada Ridge.

Data was incorporated from the following sources:

- The DPaW Threatened (Declared Rare) and Priority Flora Database (TPFL) (spatial search) conducted in July 2013;
- Records from the Western Australian Herbarium Specimen Database (WAHERB) retrieved in July 2013;
- The DPaW Threatened and Priority Flora List (TP List) (searched using 'place names') conducted in July 2013;
- Records from the DPaW Threatened and Priority Ecological Communities database;
- All data and records from surveys previously conducted by *ecologia*; and
- All data and records able to be retrieved from surveys previously conducted by other consultants (listed in Section 4.1).

Data available in a spatial format was consolidated using GIS software, so that analysis of the size and the extent of populations across a range of geographic extents local to Mungada Ridge could be analysed.

Three levels of endemism were considered in the context of three geographic extents, for significant flora and vegetation present in the study area:

1. Endemism within the footprints (approved Blue Hills mining footprint and the proposed extension);
2. Endemism on Mungada Ridge (with the extent of Mungada Ridge estimated from aerial imagery and manually digitised in GIS); and
3. Endemism in the local region, encompassing a general area within a 10 km radius of the Blue Hills project area, plus some additional extent to the north, considered appropriate due to the existence of BIF ranges in this area.

3.1 ANALYSIS OF SIGNIFICANT VEGETATION (PEC) ENDEMISM

An updated search of the DPaW TEC and PEC database was carried out for this assessment. The resulting shapefile was layered in GIS with the extent of Mungada Ridge and the impact footprints for the SMC Blue Hills project. This enabled a visual and quantitative (area calculation) analysis of the extent of the relevant PEC; Blue Hills vegetation complexes, within the proposed impact area, on Mungada Ridge and in the region.

The FCTs that together characterise the Blue Hills vegetation complexes PEC, mapped by Woodman (2012) were then analysed in more detail, in order to determine the extent of each of these within

the footprints, on Mungada Ridge and in the region. This enabled an assessment on the level of endemism of the significant vegetation at all of these scales.

3.2 ANALYSIS OF SIGNIFICANT FLORA SPECIES ENDEMISM

Prior to spatial analysis, some “tidying” of the species data gathered for the assessment was carried out, in order to remove potential duplicates resulting from multiple studies conducting in overlapping geographical extents. A buffer of 50 cm was applied to each data point and where overlaps were identified within this buffer, the corresponding record from one dataset (the least recent and/or least comprehensive study) was removed.

All of the consolidated and “tidied” records for Threatened and Priority Flora that have been recorded within the Blue Hills tenements were spatially analysed to calculate the number of individuals and localities on Mungada Ridge and in the region. This determined which species appear to possibly be endemic to Mungada Ridge (based on available data) and prompted further analysis of the level of proposed impact from the approved and proposed extension of the Blue Hills project.

An impact assessment for species potentially endemic to Mungada Ridge, calculating the proportion of individual plants and localities within the approved and proposed extension footprint, in the context of all known individuals and localities in the region, was then carried out.

3.3 LIMITATIONS

Some of the data was only available in qualitative format, for example, records from the DPaW TP list, which only provides a list of species for which records for a certain named place occur. This information does not provide qualitative data indicative of abundance or population size, nor does it provide a geographic location. Such information is only useful as indicative occurrence of Threatened and Priority Flora species, although adds value in that it can sometimes highlight species that could require further investigation. There were no such instances of a highlighted need for further investigation for any one species during this analysis, as spatially robust data provided adequate information.

Another limitation of the data analysis was the potential for duplicate data records existing for the same species, as a result of layering the results of several field surveys over one another. Whilst an abundance of field data is positive for accurately defining the biological values of the area, potential duplicate records have the potential to produce misleading results.

Additionally, some available data has been collected as singular points that each represent multiple records (i.e. one GPS location was recorded for the occurrence of more than one plant). Such data presents limitations in the ability to remove duplicate records for the same plant, collected by multiple surveys.

A varying intensity of survey effort across the study area has the potential to skew results and also presents challenges in combining datasets. Some surveys in the area have focussed on vegetation mapping (e.g. Woodman 2012) and others have addressed an intensive and comprehensive targeted conservation significant flora survey (e.g. Maia 2011). A higher intensity of targeted surveys has been carried out within areas where impacts are proposed, or may be proposed in the future. For this reason, when calculating the proportion of significant species of plants that occur within the footprints in the context of the region, a higher percentage is likely to result.

The local region has been defined as a 10 km radius of the Blue Hills project area for flora populations, plus a greater extent to the west and particularly the north, for regional vegetation (FCTs), as this is considered appropriate given the detailed mapping available (Woodman, 2012) and the presence of BIF ranges in the area. Additionally, qualitative data and records from sources such as DPaW’s Florabase website were consulted in assessing the endemism of flora. These extents are

considered adequate for assessing the endemism of the significant flora and vegetation in the context of the three geographical extents used.

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4 RESULTS

4.1 PREVIOUS SURVEYS

Several vegetation and flora surveys have been undertaken in the Blue Hills, Koolanooka and surrounding areas. A full list of these is provided in Table 4.1.

Table 4.1 - List of all reports reviewed and DPaW searches

Consultant/Author	Report Title	Survey Area	Date
ATA Environmental	Midwest Corporation Limited Vegetation and Flora Assessment, Koolanooka	Koolanooka	2004
Bennett Environmental Consulting	Flora and Vegetation, Blue Hills	Blue Hills	2004
Markey and Dillon	Flora and Vegetation of the Banded Ironstone Formations of the Yilgarn Craton: the central Talling Land System	Mt Karara, Windaning Hill/Mungada Ridge, Jasper Hill	2006
<i>ecologia</i> Environment	Midwest Corporation Limited DSO Koolanooka/Blue Hills Project PER	Koolanooka/Blue Hills	2007
<i>ecologia</i> Environment	Tilley Siding East Vegetation and Flora Survey	Tilley Siding	2007
<i>ecologia</i> Environment	Tilley Siding Mining Proposal Rare and Priority Flora Survey	Tilley Siding	2007
<i>ecologia</i> Environment	Blue Hills Rare and Priority Flora Survey (Exploration drilling areas Blue Hills West, Blue Hills North, Mungada West, Mungada East and Forest Lookout)	Blue Hills	2007
<i>ecologia</i> Environment	Koolanooka/Blue Hills Flora and Vegetation Survey	Koolanooka/Blue Hills	2008
<i>ecologia</i> Environment	Koolanooka-Blue Hills DSO Mining Project Public Environmental Review EPA Assessment No. 1653	Koolanooka/Blue Hills	2008
<i>ecologia</i> Environment	Koolanooka Reconnaissance Areas M70/1013, M70/1012 and E70/2433 Declared Rare and Priority Flora Survey	Koolanooka	2008
<i>ecologia</i> Environment	Koolanooka-Blue Hills Direct Shipping Ore (DSO) Mining Project Significant Flora Management Plan	Koolanooka/Blue Hills	2008
<i>ecologia</i> Environment	Koolanooka Reconnaissance Areas M70/0112 and M70/1013 Declared Rare and Priority Flora Survey	Koolanooka	2008
Woodman Environmental Consulting	Flora and Vegetation Impact Assessment Proposed Karara Iron Ore Project	Karara	2008
Woodman Environmental Consulting	Mungada Project Survey Area Flora and Vegetation	Mungada	2008
<i>ecologia</i> Environment	Koolanooka M10/1012 and Blue Hills M59/596 Hydrological Drilling Programme Targeted Rare and Priority Flora Survey	Koolanooka/Blue Hills	2009
Woodman Environmental Consulting	Karara to Tilley Rail Corridor Flora and Vegetation Impact Assessment	Karara/Tilley Rail Corridor	2009
Environmental Protection Authority	Mungada Iron Ore Project – Karara Mining Limited Report and Recommendations of the	Mungada	2009

Consultant/Author	Report Title	Survey Area	Date
	EPA		
Environmental Protection Authority	Koolanooka/Blue Hills Direct Shippin Iron Ore Mining Project, Shires of Morawa and Perenjori report and recommendations of the EPA	Koolanooka.Blue Hills	2009
Maia	Blue Hills Mungada West and East Tenements 59/595 and M59/596 Infrastructure Areas, targeted flora surveys June, July and September 2011	Blue Hills Mungada West and East	2011
Maia	SMC Koolanooka Tenements M70/1012, M70/1013and E70/2433 Targeted Flora Survey	Koolanooka	2011
Maia	SMC Koolanooka Property Fence Replacement Targeted Flora Survey	Koolanooka	2011
<i>ecologia</i> Environment	Sinosteel Midwest Corporation Blue Hills DSO Mining Proposal Revised V2 – M59/595, M59/596 and L59/62	Blue Hills	2012
Maia	Blue Hills Mungada East and West Expansion Project Potential Impacts Study	Blue Hills	2012
Woodman Environmental Consulting	Regional flora and vegetation survey of the Karara to Minjar Block	Karara/Minjar	2012
DPaW	Threatened and Priority Flora Database Search	10 km boundary around SMCs Blue Hills tenements	2013
DPaW	WA Herbarium Database Search	10 km boundary around SMCs Blue Hills tenements	2013
DPaW	Threatened and Priority Flora Species List	10 km boundary around SMCs Blue Hills tenements	2013
DPaW	Threatened and Priority Ecological Communities Database	10 km boundary around SMCs Blue Hills tenements	2013

4.2 FLORA OF MUNGADA RIDGE

4.2.1 Conservation Significant Flora

The consolidated species list of Priority and Threatened flora obtained from all reports reviewed and DPaW database search results identified a total of 76 conservation significant taxa from 52 genera and 30 families. Seven of these species are listed as Threatened (DRF) under the Wildlife Conservation Act (1950), 23 as Priority 1, seven as Priority 2, 36 as Priority 3 and three as Priority 4. Myrtaceae is the most represented family with 10 genera and 17 taxa, followed by Fabaceae with four genera and 10 taxa, and Proteaceae with three genera and seven taxa. A full list of all conservation significant flora and their locations are included in Appendix B.

Threatened Flora

Five species within the vicinity of Mungada Ridge are currently listed as Threatened under the EPBC Act and the WC Act. These are:

- *Darwinia masonii* (Vulnerable);
- *Dasymalla axillaris* (Critically Endangered);
- *Eremophila rostrata* subsp. *trifida* (Critically Endangered);
- *Gyrostemon reticulatus* (Critically Endangered); and
- *Hybanthus cymulosus* (Critically Endangered).

A further two flora species are listed as Threatened under the WC Act, but not under the EPBC Act. These species are:

- *Acacia woodmaniorum* (Vulnerable); and
- *Stylidium scintillans* (Vulnerable).

The five species listed under both acts (*Darwinia masonii*, *Dasymalla axillaris*, *Eremophila rostrata* subsp. *trifida*, *Gyrostemon reticulatus* and *Hybanthus cymulosus*) were identified in the TP List search but were not present in the WAHERB or TPFL searches. The TP List search identifies Priority and Threatened species that share a nearest named place with the study area. The five species listed above have a 'nearest named place' in common with Mungada Ridge, but have not been recorded within the DPaW search area, i.e. within 10 km of the tenement boundaries. These species have been included in the species list in **Error! Reference source not found.**, however as localities are not provided, their locations could not be mapped and their abundance could not be included in calculations.

Priority Flora

In total, 69 Priority flora have been recorded to occur within the vicinity of the study area, including 23 Priority 1, seven Priority 2, 36 Priority 3 and three as Priority 4 species. These species are listed below in Table 4.2.

Table 4.2 - Threatened and Priority flora recorded within the vicinity of Mungada Ridge

Family	Species	Conservation Ranking			Source			
		EPBC	WC Act	DEC	TP List	TPFL	WA Herb	Previous surveys
Aizoaceae	<i>Gunniopsis divisa</i>			P1	X	X	X	
	<i>Gunniopsis rubra</i>			P3				X
Araliaceae	<i>Hydrocotyle</i> sp. Warriedar (P.G. Wilson 12267)			P1		X	X	
Asteraceae	<i>Calotis</i> sp. Perrinvale Station (R.J. Cranfield 7096)			P3			X	
	<i>Millotia dimorpha</i>			P1		X	X	
Asteraceae	<i>Rhodanthe collina</i>			P1		X	X	
Casuarinaceae	<i>Allocasuarina tessellata</i>			P1	X			
Celastraceae	<i>Psammomoya implexa</i>			P3	X		X	
Chenopodiaceae	<i>Tecticornia fimbriata</i>			P3	X			
Colchicaceae	<i>Wurmbea murchisoniana</i>			P4	X			
Cyperaceae	<i>Leptospermum exsertum</i>			P1	X			
	<i>Lepidosperma</i> sp. Blue Hills (A. Markey & S. Dillon 3468)			P1	X	X	X	X
	<i>Lepidosperma</i> sp. Koolanooka			P1	X			X
Ericaceae	<i>Melichrus</i> sp. Bungalbin Hill (F.H. & M.P. Mollemans 3069) PN			P3	X			
Fabaceae	<i>Acacia diallaga</i>			P2	X		X	
	<i>Acacia graciliformis</i>			P1				X
	<i>Acacia isoneura</i> subsp. <i>isoneura</i>			P3	X			
	<i>Acacia karina</i>			P2	X			
	<i>Acacia muriculata</i>			P1				X
	<i>Acacia sulcicaulis</i>			P1		X		
	<i>Acacia woodmaniorum</i>		T	T	X	X		X
	<i>Bossiaea</i> sp. Jackson Range (G. Cockerton & S. McNee LCS 13614)			P3		X	X	
	<i>Mirbelia ferricola</i>			P3	X			X
<i>Urodon capitatus</i>			P3	X				

Family	Species	Conservation Ranking			Source			
		EPBC	WC Act	DEC	TP List	TPFL	WA Herb	Previous surveys
Frankeniaceae	<i>Frankenia glomerata</i>			P3				
Goodeniaceae	<i>Lechenaultia galactites</i>			P3	X			
Gyrostemonaceae	<i>Gyrostemon reticulatus</i>	T	T	T	X			
Hemerocallidaceae	<i>Caesia</i> sp. Koolanooka Hills (R. Meissner & Y. Caruso 78)			P1	X			
Lamiaceae	<i>Dasymalla axillaris</i>	T	T	T	X			
	<i>Dicrastylis linearifolia</i>			P3				
	<i>Prostanthera</i> sp. Karara (D. Coultas & K. Greenacre Opp 8)			P1	X		X	
	<i>Spartothamnella</i> sp. Helena & Aurora Range (P.G. Armstrong 155-109)			P3	X	X	X	
Malvaceae	<i>Hibiscus</i> sp. Ninghan Station (A.A. Mitchell 1161) PN			P1	X			
Myrtaceae	<i>Baeckea</i> sp. Paynes Find (S. Patrick 1095)			P1	X			
	<i>Baeckea</i> sp. Perenjori (J.W. Green 1516)			P2	X			X
	<i>Baeckea</i> sp. Three Springs (M.E. Trudgen 5368)			P2				X
	<i>Calytrix uncinata</i>			P3				
	<i>Chamelaucium</i> sp. Warriedar (A.P. Brown & S. Patrick APB 1100)			P1	X	X	X	
	<i>Chamelaucium</i> sp. Yalgoo (Y. Chadwick 1816)			P1		X	X	
	<i>Darwinia masonii</i>	T	T	T	X			
	<i>Enekbatus longistylus</i>			P3	X			
	<i>Eucalyptus jutsonii</i> subsp. <i>Kobela</i>			P1	X			
	<i>Euryomyrtus recurva</i>			P3	X			
	<i>Melaleuca barlowii</i>			P3				X
	<i>Micromyrtus acuta</i>			P3	X	X	X	
	<i>Micromyrtus mucronulata</i>			P1	X			
	<i>Micromyrtus placoides</i>			P3	X			
<i>Micromyrtus trudgenii</i>			P3	X		X	X	
<i>Thryptomene</i> sp. Wandana (M.E. Trudgen MET 22016)			P3	X				

Family	Species	Conservation Ranking			Source			
		EPBC	WC Act	DEC	TP List	TPFL	WA Herb	Previous surveys
	<i>Verticordia venusta</i>			P3	X			
Orchidaceae	<i>Cyanicula fragrans</i>			P3			X	
Parmeliaceae	<i>Parmeliopsis macrospora</i>			P3	X			
	<i>Xanthoparmelia dayiana</i>			P3	X		X	
Poaceae	<i>Austrostipa blackii</i>			P3		X		
Portulacaceae	<i>Calandrinia kalanniensis</i>			P2	X	X		
	<i>Calandrinia</i> sp. Warriedar (F. Obbens 04/09)			P2	X		X	
Proteaceae	<i>Grevillea asparagoides</i>			P3	X			
	<i>Grevillea globosa</i>			P3	X			X
	<i>Grevillea scabrida</i>			P3		X	X	X
	<i>Grevillea subtiliflora</i>			P3		X	X	
	<i>Persoonia kararae</i>			P2	X			
	<i>Persoonia pentasticha</i>			P3	X		X	X
Rhamnaceae	<i>Petrophile pauciflora</i>			P3	X	X	X	
	<i>Polianthion collinum</i>			P3			X	
Rutaceae	<i>Stenanthemum poecilum</i>			P3		X	X	X
	<i>Drummondita fulva</i>			P3	X		X	X
	<i>Drummondita rubroviridis</i>			P1				X
	<i>Philothea nutans</i>			P1	X			
Santalaceae	<i>Korthalsella leucothrix</i>			P3	X			
Sapindaceae	<i>Dodonaea amplisemina</i>			P4	X			
	<i>Dodonaea scurra</i>			P1				X
Scrophulariaceae	<i>Eremophila rostrata</i> subsp. <i>trifida</i>	T	T	T	X			
	<i>Eremophila</i> sp. Rothsay (D. Coultas & J. Kelt s.n. PERTH 08200440)			P1	X		X	
	<i>Eremophila youngii</i> subsp. <i>lepidota</i>			P4	X			

Family	Species	Conservation Ranking			Source			
		EPBC	WC Act	DEC	TP List	TPFL	WA Herb	Previous surveys
Stylidiaceae	<i>Stylidium scintillans</i>		T	T	X	X	X	
Violaceae	<i>Hybanthus cymulosus</i>	T	T	T	X			

4.2.2 Analysis of Proportion of Threatened and Priority Flora recorded on Mungada Ridge and within Footprints

For the purpose of this study, three analyses were carried out, to analyse the proportion of significant flora on Mungada Ridge, within the SMC tenements and within the footprints (existing approved footprint and the new extension areas) of the Blue Hills project.

In total, 76 Threatened and Priority species were identified from the database searches with 44 of these known to occur within 10 km of the tenement boundaries (the local region). The proportion of these species recorded on Mungada Ridge, within the tenements and within the footprints was calculated with the results summarised in Table 4.3.

Thirty-two taxa have no records within either the Blue Hills tenements or on Mungada Ridge. These species were identified from the TP List and share a nearest named place with Mungada Ridge, but there are no known records within 10 km. Only six taxa have records within the footprint/impact area.

Population locations for Threatened and Priority species at the Blue Hills and Koolanooka areas are mapped and included in Appendix B and C.

Three key species were identified from the analysis that have a significant proportion of known individuals on Mungada Ridge (*Polianthion collinum*, *Lepidosperma* sp. Blue Hills and *Acacia woodmaniorum*).

Polianthion collinum has only nine recorded localities, and 59% of those were located within the tenements and Mungada Ridge. There are no records of *Polianthion collinum* within the proposed footprints/impact areas, and therefore, impacts to this species and its endemism are not considered further in this report.

Lepidosperma sp. Blue Hills (A. Markey & S. Dillon 3,468) has 4,978 known plants recorded in the region, 98% of which occur on Mungada Ridge, 36% within the tenements and 11% occur within the impact area. There are additional locations for this species at Mt Singleton and Charles Darwin Reserve (FloraBase, 2013) although this data was not included in the analysis.

Acacia woodmaniorum has 9,576 known localities and 30,195 individual plants in the local region. Of these, 90% of the individuals and 82% of localities occur on Mungada Ridge, with 55% of individuals and 60% of localities within the tenements and 22% of individuals and 33% of localities within the proposed impact areas.

In addition to *Lepidosperma* sp. Blue Hills and *Acacia woodmaniorum*, four other taxa have records in the impact area. *Drummondita fulva*, *Micromyrtus placoids*, *M. trudgenii* and *Persoonia pentasticha* have with 6%, 42%, 25% and 17% of the recorded individuals and 12%, 25%, 30% and 8% of the localities occurring within the proposed impact area, respectively.

The "tidied" data that has attempted to remove duplicate records of the same plants, resulting from multiple surveys over the same study areas has been used to analyse the estimated impact on *Lepidosperma* sp. Blue Hills and *Acacia woodmaniorum* (Table 4.4). Results of this analysis shows that 11.19% and 26.23% of individuals and 11.80% and 32.77% of localities occur within the proposed impact area.

Although in the context of this analysis, *Lepidosperma* sp. Blue Hills appears to be endemic to Mungada Ridge, and represented by a large proportion of its extent near Blue Hills within the proposed impact area, this species has populations that occur outside the local area analysed, and therefore is not endemic to Mungada Ridge.

Table 4.3 Proportion of all known individuals to occur on Mungada Ridge and within the impact area based on all previous survey data

Taxon	Plants							Localities						
	Total number of plants known in local region	Individuals on Mungada Ridge		Individuals within tenements		Individuals in Approved Footprint and Extension Area		Total number of known localities in local region	Localities on Mungada Ridge		Localities within tenements		Localities in Approved Footprint and Extension Area	
		Number	%	Number	%	Number	%		Number	%	Number	%	Number	%
<i>Acacia diallaga</i>	8							8						
<i>Acacia graciliformis</i>	588							77						
<i>Acacia karina</i>	25	2	8	1	4			25	2	8	1			
<i>Acacia muriculata</i>	119							47						
<i>Acacia sulcaticaulis</i>	13							13						
<i>Acacia woodmaniorum</i>	30,195	27,198	90	16,633	55	7,986	26	9,576	7,817	82	5,732	60	3,142	33
<i>Austrostipa blackii</i>	8	2	25					8	2	25				
<i>Baeckea</i> sp. Perenjori	2,372							191						
<i>Baeckea</i> sp. Three Springs	1							1						
<i>Bossiaea</i> sp. Jackson Range (G. Cockerton & S. McNee LCS 13614)	2							2						
<i>Calandrinia kalanniensis</i>	2							2						
<i>Calandrinia</i> sp. Warriedar (F. Obbens 04/09)	1							1						
<i>Calotis</i> sp. Perrinvale Station (R.J. Cranfield 7096)	9	2	22	1	11	1	11	9	2	22	1	11	1	11
<i>Chamelaucium</i> sp. Warriedar (A.P. Brown & S. Patrick APB 1100)	17							17						
<i>Chamelaucium</i> sp. Yalgoo (Y. Chadwick 1816)	5							5						
<i>Cyanicula fragrans</i>	1							1						
<i>Dodonaea scurra</i>	313							118						
<i>Drummondita fulva</i>	4,173	2,032	49	1,938	46	263	6	722	110	15	630	87	89	12
<i>Drummondita rubroviridis</i>	46							25						
<i>Eremophila</i> sp. Rothsay (D. Coultas & J. Kelt s.n. PERTH 08200440)	2							2						
<i>Frankenia glomerata</i>	7							1						
<i>Grevillea globosa</i>	4							4						
<i>Grevillea scabrida</i>	19							15						
<i>Grevillea subtiliflora</i>	17							17						
<i>Gunniopsis divisa</i>	4			2	50			4			2	50		
<i>Hydrocotyle</i> sp. Warriedar (P.G. Wilson 12267)	9							9						

Taxon	Plants							Localities						
	Total number of plants known in local region	Individuals on Mungada Ridge		Individuals within tenements		Individuals in Approved Footprint and Extension Area		Total number of known localities in local region	Localities on Mungada Ridge		Localities within tenements		Localities in Approved Footprint and Extension Area	
		Number	%	Number	%	Number	%		Number	%	Number	%	Number	%
<i>Lepidosperma</i> sp. Blue Hills (A. Markey & S. Dillon 3468)	4,978	4,943	99	1797	36	553	11	761	749	98	258	34	91	12
<i>Lepidosperma</i> sp. Koolanooka	2,621							348						
<i>Melaleuca barlowii</i>	2							1						
<i>Micromyrtus acuta</i>	10							10						
<i>Micromyrtus placoides</i>	12	5	42	5	42	5	42	4	1	25	1	25	1	25
<i>Micromyrtus trudgenii</i>	13,137	5,952	45	8,361	64	3,239	25	1,867	546	29	1661	89	564	30
<i>Millotia dimorpha</i>	9							9						
<i>Mirbelia ferricola</i>	60							27						
<i>Persoonia pentasticha</i>	358	66	18	196	55	60	17	153	22	14	39	25	13	8
<i>Petrophile pauciflora</i>	2							2						
<i>Polianthion collinum</i>	9	5	56	1	11			9	5	56	1	11		
<i>Prostanthera</i> sp. Karara (D. Coultas & K. Greenacre Opp 8)	6							6						
<i>Psammomoya implexa</i>	2							2						
<i>Rhodanthe collina</i>	29			3	10	3	10	29			3	10	2	7
<i>Spartothamnella</i> sp. Helena & Aurora Range (P.G. Armstrong 155-109)	2			2	100			2			2	100		
<i>Stenanthemum poecilum</i>	669	1	1	1	1			132	1	1	1	1		
<i>Stylidium scintillans</i>	24							24						
<i>Xanthoparmelia dayiana</i>	1							1						
TOTAL	59,891	40,208		28,941		12,110		14,287	9,257		8,332		3,903	
KEY														
Proportion within specified area (<24%)														
Proportion within specified area (25-59%)														
Proportion within specified area (>60%)														

Table 4.4 – Proportion of all known individuals to occur on Mungada Ridge, within the tenements and within the impact area (based on revised/”tidied” data)

Taxon	Plants							Localities						
	Total number of individuals known in local region	Individuals within approved area		Individuals within extension area		Individuals within total impact area		Total number of known localities in local region	Localities within approved footprint		Localities within extension areas		Localities within total impact area	
		Number	%	Number	%	Number	%		Number	%	Number	%	Number	%
<i>Acacia woodmaniorum</i>	30,108	4,219	14.01	3,680	12.22	7,899	26.23	9,544	2,140	22.42	988	10.35	3,128	32.77
<i>Lepidosperma</i> sp. Blue Hills (A. Markey & S. Dillon 3468)	4,975	14	0.28	534	10.91	548	11.19	754	5	0.66	84	11.14	89	11.80

The distribution of each Threatened or Priority flora species was reviewed in relation to analysed data, as well as records on FloraBase, then mapped in relation to Mungada Ridge and the regional surrounds (Appendix C). From this, it was determined whether or not the species is endemic to the ridge. Species identified as potentially endemic to the ridge included those that have the majority of all known individuals occurring on the ridge, with only a few nearby locations, or if there is uncertainty regarding some of the regional locations (in accordance with the precautionary principle).

Based on data reviewed from the previous surveys and locations from the DPaW Threatened and Rare Flora database search, one species *A. woodmaniorum* has been highlighted as of high local significance to Mungada Ridge (Table 4.5) and as endemic to the local region analysed in this study. This species is not considered to be strictly endemic to Mungadae Ridge however, as localities have been recorded outside the extent of the ridge. *Acacia woodmaniorum* is discussed in further detail below.

Table 4.5 - Assessment of endemism to Mungada Ridge of recorded flora of conservation significance

Taxon	Endemic to Mungada Ridge or Local Region?		
	Yes	Potential	No
<i>Acacia diallaga</i>			●
<i>Acacia graciliformis</i>			●
<i>Acacia karina</i>			●
<i>Acacia muriculata</i>			●
<i>Acacia sulcaticaulis</i>			●
<i>Acacia woodmaniorum</i>		●	
<i>Austrostipa blackii</i>			●
<i>Baeckea</i> sp. Perenjori			●
<i>Baeckea</i> sp. Three Springs			●
<i>Bossiaea</i> sp. Jackson Range (G. Cockerton & S. McNee LCS 13614)			●
<i>Calandrinia kalanniensis</i>			●
<i>Calandrinia</i> sp. Warriedar (F. Obbens 04/09)			●
<i>Calotis</i> sp. Perrinvale Station (R.J. Cranfield 7096)			●
<i>Chamelaucium</i> sp. Warriedar (A.P. Brown & S. Patrick APB 1100)			●
<i>Chamelaucium</i> sp. Yalgoo (Y. Chadwick 1816)			●
<i>Cyanicula fragrans</i>			●
<i>Dodonaea scurra</i>			●
<i>Drummondita fulva</i>			●
<i>Drummondita rubroviridis</i>			●
<i>Eremophila</i> sp. Rothsay (D. Coultas & J. Kelt s.n. PERTH 08200440)			●
<i>Frankenia glomerata</i>			●
<i>Grevillea globosa</i>			●
<i>Grevillea scabrida</i>			●
<i>Grevillea subtiliflora</i>			●
<i>Gunniopsis divisa</i>			●
<i>Hydrocotyle</i> sp. Warriedar (P.G. Wilson 12267)			●
<i>Lepidosperma</i> sp. Blue Hills (A. Markey & S. Dillon 3468)			●

Taxon	Endemic to Mungada Ridge or Local Region?		
	Yes	Potential	No
<i>Lepidosperma</i> sp. Koolanooka			●
<i>Melaleuca barlowii</i>			●
<i>Micromyrtus acuta</i>			●
<i>Micromyrtus placoides</i>			●
<i>Micromyrtus trudgenii</i>			●
<i>Millotia dimorpha</i>			●
<i>Mirbelia ferricola</i>			●
<i>Persoonia pentasticha</i>			●
<i>Petrophile pauciflora</i>			●
<i>Polianthion collinum</i>			●
<i>Prostanthera</i> sp. Karara (D. Coultas & K. Greenacre Opp 8)			●
<i>Psammomoya implexa</i>			●
<i>Rhodanthe collina</i>			●
<i>Spartothamnella</i> sp. Helena & Aurora Range (P.G. Armstrong 155-109)			●
<i>Stenanthemum poecilum</i>			●
<i>Stylidium scintillans</i>			●
<i>Xanthoparmelia dayiana</i>			●

4.2.3 *Acacia woodmaniorum*

Acacia woodmaniorum (Threatened) is a prickly, hard shrub growing up to 2 m high (Plate 4.1 and Plate 4.2). The branches are intricate and the marginal nerve is red in younger leaves but ages to yellow on older leaves. The bark is grey and rough. *A. woodmaniorum* produces yellow flowers during July and the pods produced after flowering are narrowly oblong and flat but slightly rounded over the seeds (Maslin and Buscumb, 2007). As a Threatened (Vulnerable) species, *A. woodmaniorum* is considered to be facing a high risk of extinction in the wild.



Plate 4.1 - *Acacia woodmaniorum* leaves and pods (ecologia, 2008e)



Plate 4.2 - *Acacia woodmaniorum* close up of leaf (ecologia, 2008e)

Acacia woodmaniorum is common and widespread on Mungada Ridge and beyond this there are additional known populations up to 5 km to the north and 2 km to the east. It is largely restricted to the Blue Hills area (ecologia, 2008a).

Fifteen records of *A. woodmaniorum* are listed on FloraBase, with its distribution restricted to the Blue Hills area within the Yalgoo Bioregion (Figure 4.1) (FloraBase, July 2013). This species is found in large numbers primarily on the rocky crests and southern slopes of the Blue Hills Range of banded ironstone and laterite. However, it has also been found in disturbed areas inside and adjacent to the existing Mungada West and East pits. Its preferred habitat appears to be Mungada Ridge (Maia, 2011a). A total of 9,576 recorded locations from the surveys were obtained, 82% of which are in association with Mungada Ridge, and 90% (27,198) of the total known number of individual plants.

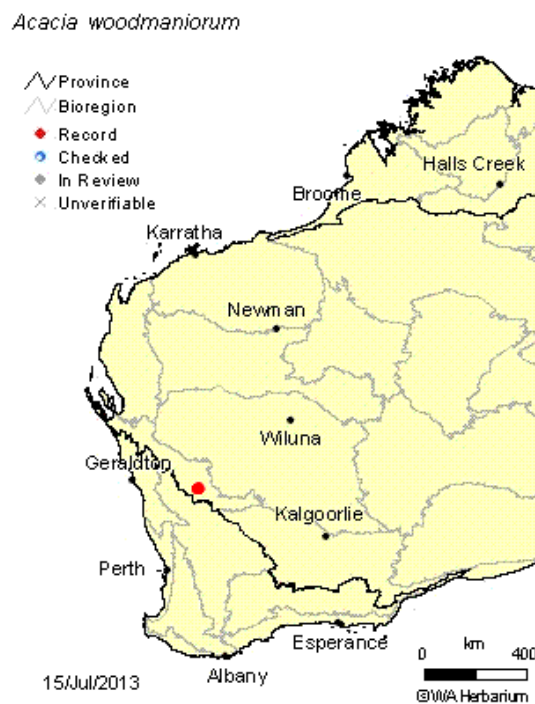


Figure 4.1 - Distribution map for *Acacia woodmaniorum* (FloraBase, 2013)

4.3 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

A search buffer of 50 km was requested from DPaW surrounding the Blue Hills project area for the TEC and PEC search. The following seven PECs and one TEC were identified to occur regionally (Figure 4.2):

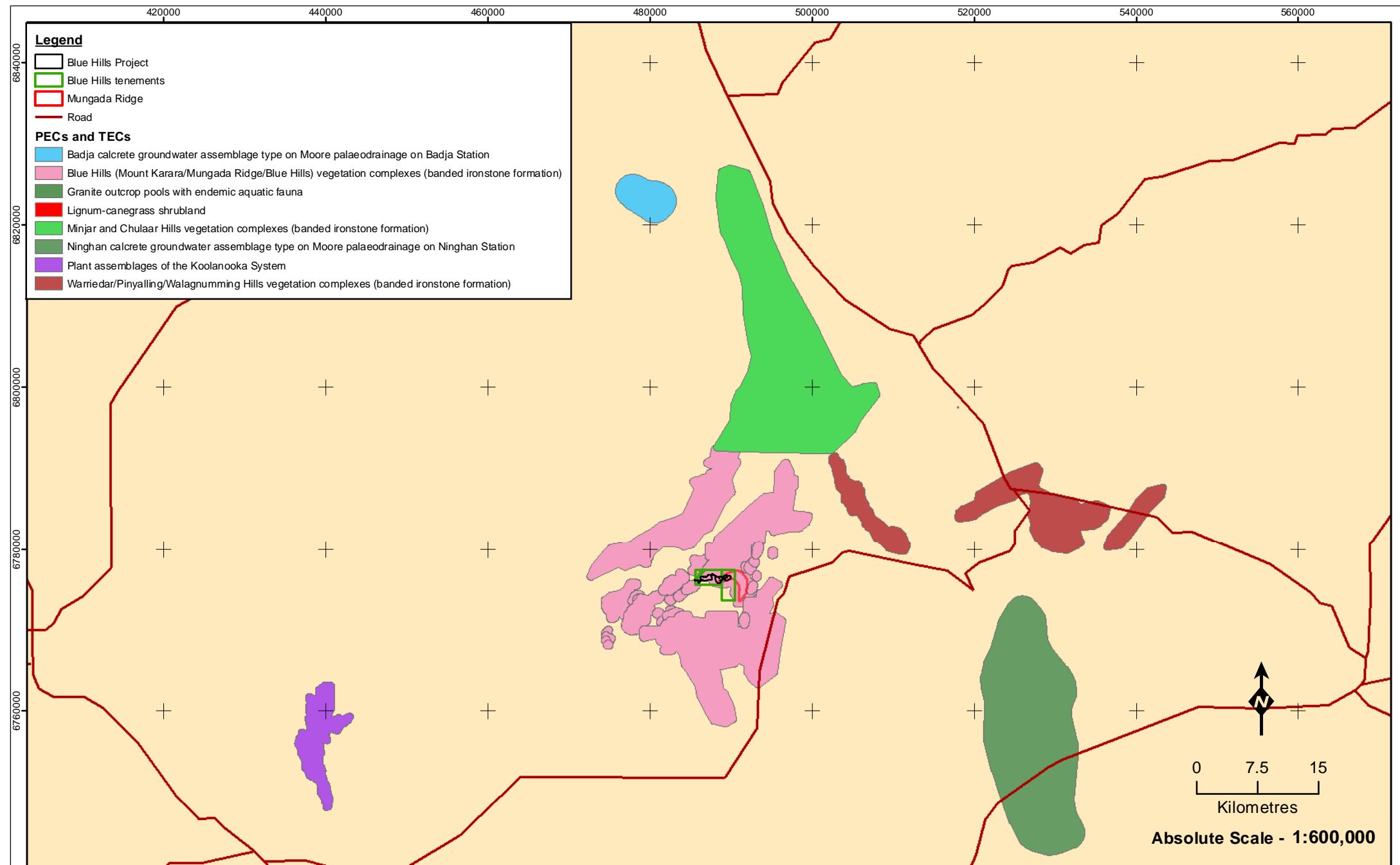
- Plant Assemblages of the Koolanooka System (TEC, VU A,B);
- Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes (banded ironstone formation) (PEC, Priority 1);
- Badja calcrete groundwater assemblage type on Moore paleodrainage on Badja Station (PEC, Priority 1);
- Ninghan calcrete groundwater assemblage type on Moore palaeodrainage on Ninghan Station (PEC, Priority 1);
- Granite outcrop pools with endemic aquatic fauna (PEC, Priority 3(i));
- Minjar and Chulaar Hills vegetation complex (banded ironstone formation) (PEC, Priority 1);
- Warriedar/Pinyalling/Walagnummin Hills vegetation complexes (banded ironstone formation) (PEC, Priority 1); and
- Lignum-canegrass shrubland (PEC, Priority 3).

One Priority 1 PEC occurs within the Mungada Ridge study area: Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes of banded ironstone formation. Priority 1 PEC's are "those with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. 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" (DEC 2007).

Mungada Ridge is located entirely within the known extent of the Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes of banded ironstone formation PEC. However, the PEC is not endemic to the ridge (Table 4.6, Figure 4.2) with the buffers of the PEC extending up 20 km to the north and the south of Mungada ridge, 7 km to the east and 16 km to the west. Mungada Ridge occupies 1.2% of the area of the Blue Hills vegetation complexes PEC resulting from the DPaW search, and less than 1% of the PEC is within the impact area. However, this area also includes buffers and the actual area of the extent of the PEC area is likely to be less. Accurate mapping of the PEC in the region would be required to assess the actual percentage of the PEC that Mungada Ridge occupies. However, the extent of this PEC is based on regional FCT mapping (Woodman 2008, 2012) and is considered to be sufficiently accurate at that scale.

Table 4.6 - Regional assessment of Priority Ecological Communities

PEC	Area of PEC regionally (inc. buffers) (ha)	Mungada Ridge (ha)	Area of PEC within Mungada Ridge (ha)	% of PEC within Mungada Ridge	Area of PEC within impact area (ha)	% of PEC within impact area
Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes (banded ironstone formation)	41,838	491	491	1.2%	26	<1%



**Threatened and Priority
 Ecological Communities of
 Blue Hills and Koolanooka**

**Figure: 4.2
 Project ID: 1532**

**Drawn: BMJ
 Date: 17/07/2013**

Coordinate System
 Name: GDA 1994 MGA Zone 50
 Projection: Transverse Mercator
 Datum: GDA 1994

Unique Map ID: BMY012

4.3.1.1 Vegetation units of the Blue Hills Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes

Woodman (2008 and subsequently 2012) mapped the regional FCTs for Karara Mining and identified thirty-two vegetation units. Of these, seven occur on Mungada Ridge (Figure 4.3). The areas that these units occupy on Mungada Ridge, and more broadly in the region itself were calculated and data is presented in Table 4.7. Two FCTs were found to have greater than 15% of their known distribution on Mungada Ridge. Due to their restricted regional distribution, and being representative of a PEC, these FCTs are of higher conservation significance. The two FCTs identified to be represented by a larger proportion of their known extent on Mungada Ridge are:

- Woodman FCT 1 Tall shrubland to tall open shrubland of mixed *Acacia* species, including *Acacia aneura*, *A. assimilis* subsp. *assimilis*, *A. ramulosa* var. *ramulosa* and occasional *Allocasuarina acutivalvis* subsp. *prinsepiana* over mid sparse shrubland of mixed species including *Eremophila clarkei*, *E. latrobei* subsp. *latrobei*, *Mirbelia bursarioides* ms, *Philotheca brucei* subsp. *brucei* and *Philotheca sericea* over low isolated clumps of shrubs of *Xanthosia bungei* on red-brown silty clay loams on lowerslopes to crests with one (BIF) or granite outcropping.
- Woodman FCT 4 Tall shrubland of mixed species including *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Acacia assimilis* subsp. *assimilis* with low isolated clumps of trees of *Eucalyptus petraea* over mid sparse shrubland of mixed species including *Calycopeplus paucifolius* over low isolated clumps of heath shrubs of *Xanthosia bungei* on red-brown clay loam on flats to breakaways.

Although these FCTs are represented by a relatively large proportion of their extent on Mungada Ridge, they are not endemic to the ridge, nor the local region (within 10-20 km). It follows that none of the FCTs supported by Mungada Ridge are endemic to this location.

Table 4.7 Regional assessment of vegetation units found on Mungada Ridge

Woodman (2009) FCT	Regional Floristic community description	Area on Mungada Ridge (ha)	Area regionally (ha)	% found on Mungada Ridge
1	Tall shrubland to tall open shrubland of mixed <i>Acacia</i> species, including <i>Acacia aneura</i> , <i>A. assimilis</i> subsp. <i>assimilis</i> , <i>A. ramulosa</i> var. <i>ramulosa</i> and occasional <i>Allocasuarina acutivalvis</i> subsp. <i>prinsepiana</i> over mid sparse shrubland of mixed species including <i>Eremophila clarkei</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>Mirbelia</i> sp. <i>bursarioides</i> , <i>Philotheca brucei</i> subsp. <i>brucei</i> and <i>Philotheca sericea</i> over low isolated clumps of shrubs of <i>Xanthosia bungei</i> on red-brown silty clay loams on lowerslopes to crests with one (BIF) or granite outcropping.	215.22	1035.50	20.78
2	Tall shrubland to tall open shrubland of mixed <i>Acacia</i> species, including <i>Acacia ramulosa</i> var. <i>ramulosa</i> , <i>A. exocarpoides</i> , <i>A. aneura</i> and <i>A. tetragonophylla</i> over mid open shrubland to mid sparse shrubland of mixed species including <i>Eremophila clarkei</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>Hibbertia arcuata</i> , <i>Philotheca brucei</i> subsp. <i>brucei</i> and <i>Philotheca sericea</i> on red-brown silty loams or clay loams on flats to upperslopes with ironstone (BIF) or granite outcropping.	44.43	3671.31	1.21
3	Tall shrubland to tall open shrubland of mixed <i>Acacia</i> species, including <i>Acacia ramulosa</i> var. <i>ramulosa</i> , <i>A. aulacophylla</i> , and <i>A. aneura</i> over mid open shrubland to mid sparse shrubland of mixed species including <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>E. glutinosa</i> , <i>Micromyrtus trudgenii</i> , <i>Mirbelia</i> sp. <i>bursarioides</i> , <i>Philotheca brucei</i> subsp. <i>brucei</i> , <i>Philotheca sericea</i> and <i>Prostanthera patens</i> over low isolated clumps of forbs of <i>Stylidium longibracteatum</i> on red-brown or light brown clay loams or silty clay on flats to crests with ironstone (BIF) or granite outcropping.	0.37	813.50	0.05
4	Tall shrubland of mixed species including <i>Allocasuarina acutivalvis</i> subsp. <i>prinsepiana</i> , <i>Acacia assimilis</i> subsp. <i>assimilis</i> with low isolated clumps of trees of <i>Eucalyptus petraea</i> over mid sparse shrubland of mixed species including <i>Calycopeplus paucifolius</i> over low isolated clumps of heath shrubs of <i>Xanthosia bungei</i> on red-brown clay loam on flats to breakaways	30.73	190.27	16.15
7	Tall closed shrubland to tall open shrubland of mixed <i>Acacia</i> species including <i>Acacia latior</i> and <i>A. sibina</i> with low isolated clumps of trees of mixed <i>Eucalyptus</i> spp. over low sparse	9.28	9458.85	0.10

Woodman (2009) FCT	Regional Floristic community description	Area on Mungada Ridge (ha)	Area regionally (ha)	% found on Mungada Ridge
	shrubland of mixed species including <i>Dianella revoluta</i> over low isolated clumps of grasses of <i>Monachather paradoxus</i> and <i>Amphipogon caricinus</i> subsp. <i>caricinus</i> on red-brown silty clay loam with ironstone gravel on flats to lowerslopes			
10	Tall closed shrubland to tall open shrubland of mixed <i>Acacia</i> species dominated by <i>Acacia assimilis</i> subsp. <i>assimilis</i> over mid open shrubland to mid sparse shrubland of mixed species including <i>Aluta aspera</i> subsp. <i>hesperia</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> and <i>Philotheca sericea</i> on red or red-brown silty clay loam or clay loam with ironstone gravel on flats to crests (primarily midslopes)	124.42	3033.97	4.10
14	Tall shrubland of mixed <i>Acacia</i> species dominated by <i>Acacia effusifolia</i> over low isolated clumps of grasses of <i>Thyridolepis multiculms</i> and <i>Monachather paradoxus</i> on red or red-brown silty loam with ironstone gravel on flats to upperslopes	2.84	230.59	1.23
26	Tall shrubland to tall open shrubland of mixed species including <i>Acacia ramulosa</i> var. <i>ramulosa</i> , <i>A. tetragonophylla</i> , <i>A. assimilis</i> subsp. <i>assimilis</i> and <i>Hakea recurva</i> subsp. <i>recurva</i> with low isolated clumps of trees of <i>Eucalyptus</i> spp. over low sparse shrubland of <i>Senna artemisioides</i> subsp. <i>filifolia</i> and <i>Rhagodia drummondii</i> over low isolated clumps of grasses of <i>Austrostipa elegantissima</i> on red or red-brown clay loam or sandy clay loam on flats to midslopes	42.18	5283.26	0.80
28	Tall shrubland to tall open shrubland of <i>Acacia</i> species including <i>Acacia ramulosa</i> var. <i>ramulosa</i> , <i>A. tetragonophylla</i> and <i>A. burkittii</i> over mid sparse shrubland of species including <i>Eremophila clarkei</i> , <i>E. oldfieldii</i> , <i>Solanum lasiophyllum</i> , <i>Scaevola spinescens</i> and <i>Dodonaea inaequifolia</i> on red or red-brown clay loam or silty clay loam with ironstone gravel on flats to midslopes of low hills	18.83	1492.60	1.26
32	Tall shrubland to tall open shrubland of <i>Acacia</i> species including <i>Acacia umbraculiformis</i> , <i>A. tetragonophylla</i> , <i>A. ramulosa</i> var. <i>ramulosa</i> and <i>A. kochii</i> over mid sparse shrubland of species including <i>Solanum lasiophyllum</i> , <i>Dodonaea inaequifolia</i> and <i>Thryptomene costata</i> over low isolated clumps of ferns of <i>Cheilanthes seiberi</i> over low sparse forbland of <i>Borya sphaerocephala</i> on red-brown clay loam on slopes with granite or ironstone outcropping	2.52	4216.12	0.06

460000

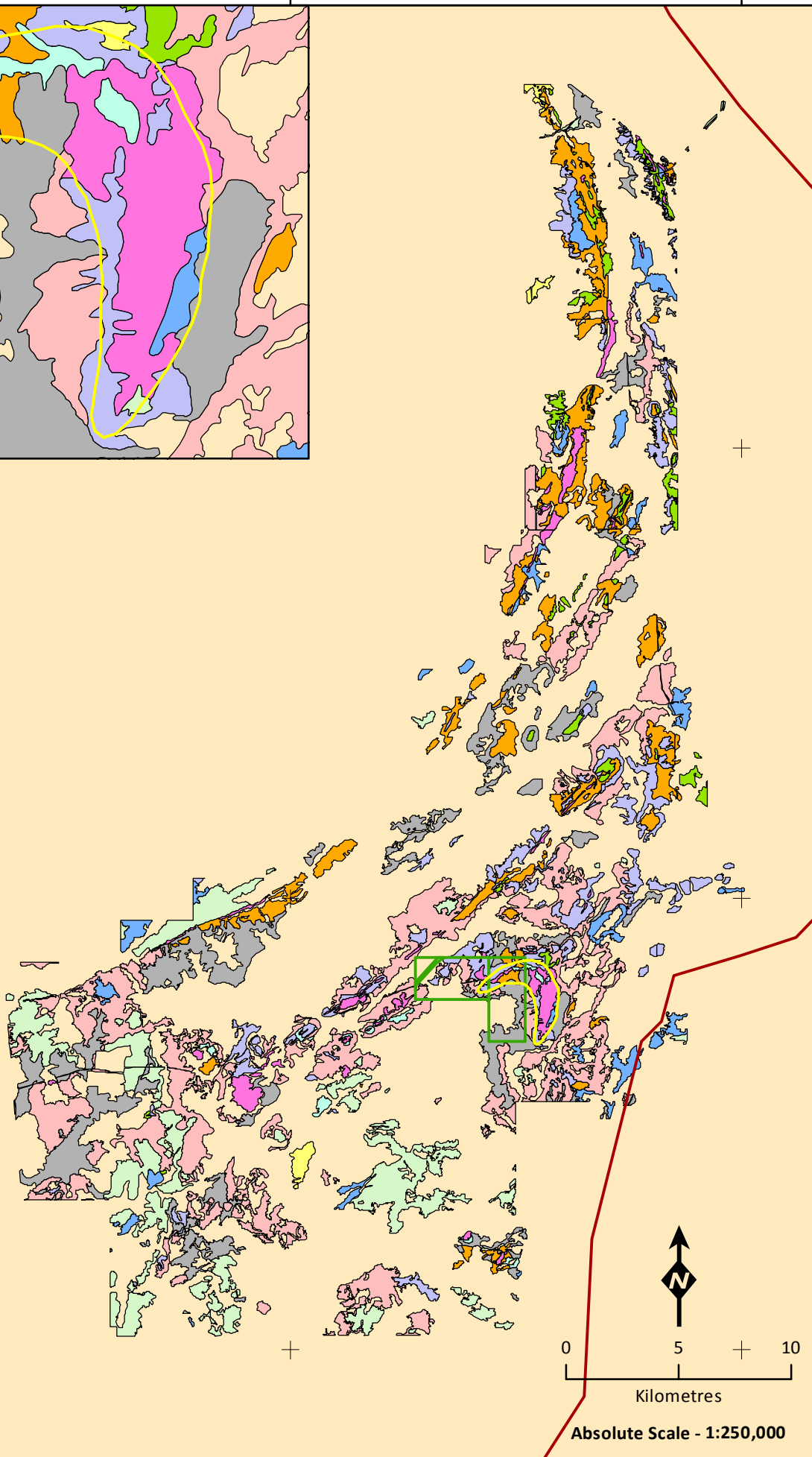
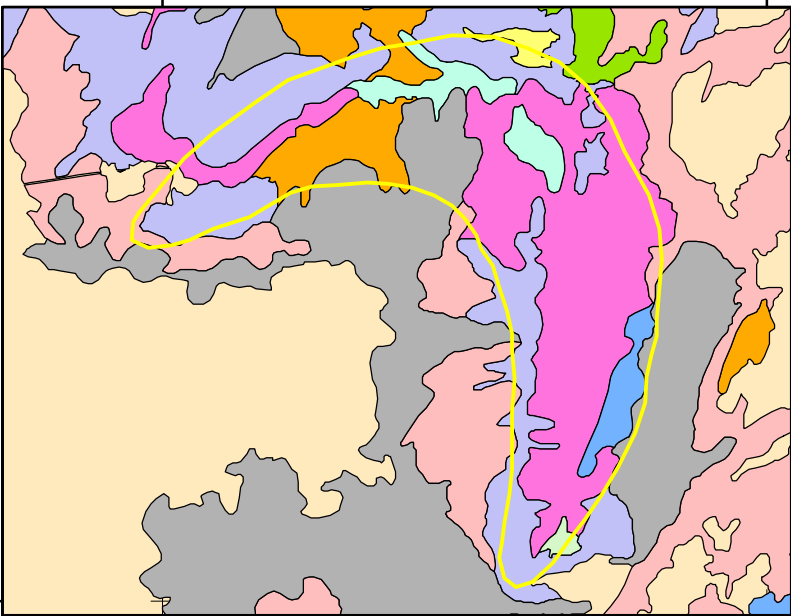
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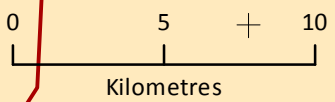
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Legend

- Mungada Ridge
- Blue Hills tenements
- Road
- FCT 1
- FCT 2
- FCT 3
- FCT 4
- FCT 7
- FCT 10
- FCT 14
- FCT 26
- FCT 28
- FCT 32



Absolute Scale - 1:250,000



**FCTs of Mungada
Ridge and their regional
distribution
(Woodman 2012)**

**Figure: 4.3
Project ID: 1532**

**Drawn: RY
Date: 19/07/2013**

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: RY116

A4

5 CONCLUSION AND RECOMMENDATIONS

Seventy-six Threatened or Priority flora were identified from the database searches to be relevant to the area, of which 44 occur within 10 km of the tenement boundaries. One species, *Acacia woodmaniorum* (T) is potentially endemic to the local region, although is not strictly endemic to Mungada Ridge.

Seven PECs and TECs are known to occur within the vicinity of Mungada Ridge. One Priority 1 PEC, Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes (banded ironstone formation) occurs over Mungada Ridge, although it is not endemic to the ridge and extends 20 km to the north and south, 7 km to the east and 16 km to the west. Mungada Ridge occupies 1.2% of area provided for the Blue Hills vegetation complexes PEC from the DPaW search. However, this area also includes buffers and the actual PEC area is likely to be less.

Regional vegetation mapping (Woodman 2008, 2012) identified that two FCTs within the PEC have more than 15% of their extent on Mungada Ridge. Within the PEC on Mungada Ridge these two units are of higher conservation value. However, they are not restricted, nor endemic to the ridge, nor are any of the other FCTs supported by the ridge.

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APPENDIX A CONSERVATION CATEGORIES

Table A.1 – Definition of codes for Threatened Ecological Communities

Code	Definition
PD: Presumed Totally Destroyed	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. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant
CR: Critically Endangered	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. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
EN: Endangered	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. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future.
VU: Vulnerable	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. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

Table A.2 – Definition of codes for Priority Ecological Communities (DPaw)

Code	Definition
P1: Priority One	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or Pastoral lands, urban areas, active mineral leases) and for which current threats exist. 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.
P2: Priority Two	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent 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.

Code	Definition
P3: Priority Three	<p>(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:</p> <p>(ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;</p> <p>(iii) Communities made up of large, and/or widespread occurrences that may or 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.</p> <p>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.</p>
P4: Priority Four	<p>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.</p> <p>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.</p> <p>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.</p> <p>Ecological communities that have been removed from the list of threatened communities during the past five years.</p>
P5: Priority Five	<p>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.</p>

Table A.3 – Definition of Threatened Flora Species Categories under the EPBC Act

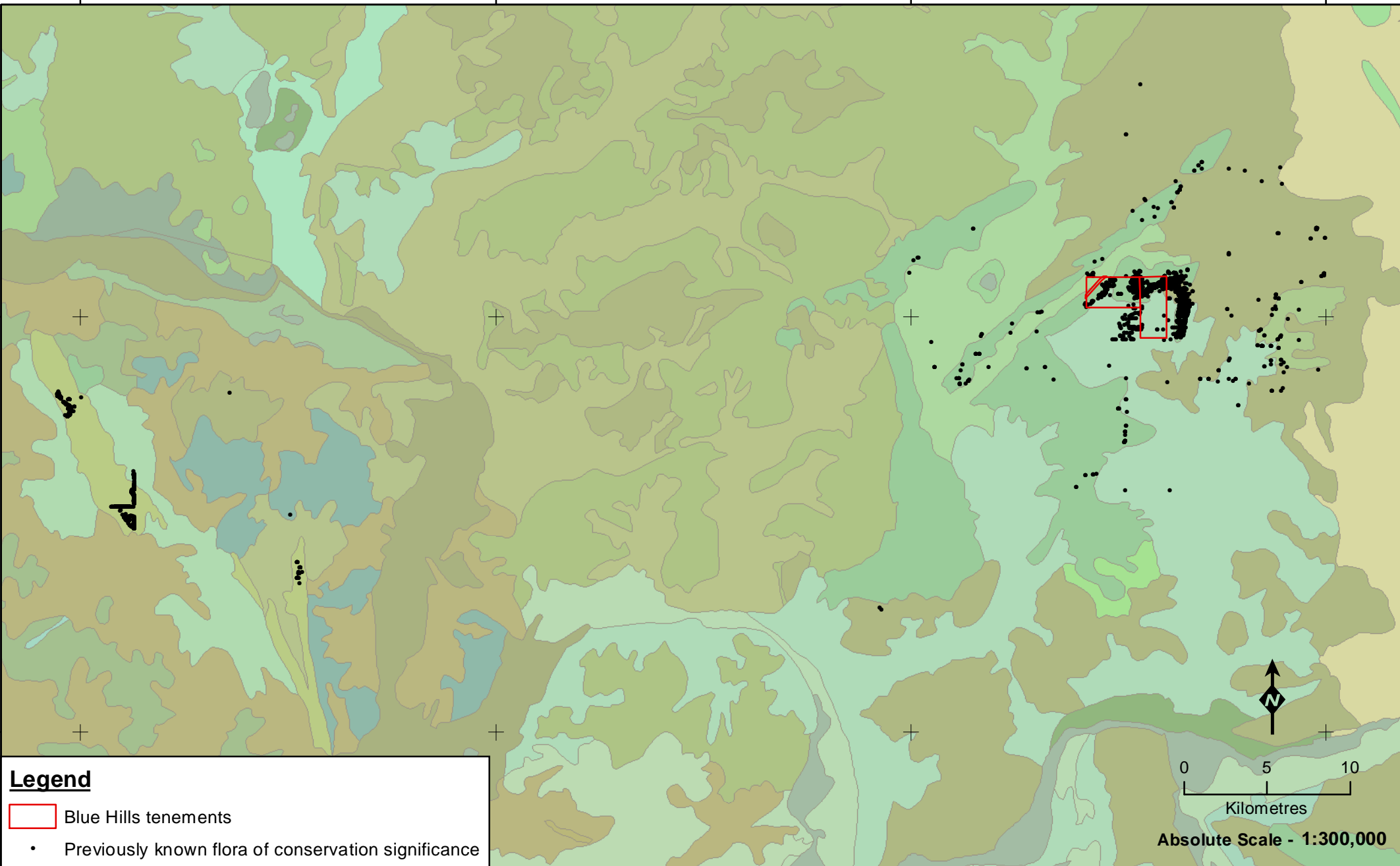
Conservation Code	Definition
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A species is categorised as extinct in the wild if it is only known to survive in cultivation, in captivity or as a naturalised population well outside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

Table A.4 – Definition of Declared Rare and Priority Flora Categories under the WC Act

Conservation Code	Definition
DRF	Declared Rare Flora-Extant Taxa. Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
P1: Priority One	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2: Priority Two	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3: Priority Three	Poorly Known Taxa. Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.
P4: Priority Four	Rare Taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

**APPENDIX B PREVIOUSLY RECORDED CONSERVATION
SIGNIFICANT FLORA**

See digital data attached



Legend

- Blue Hills tenements
- Previously known flora of conservation significance

0 5 10
Kilometres
Absolute Scale - 1:300,000



**Previously known
Priority and Threatened Flora
of greater Blue Hills and Koolanooka**

Figure: C.1
Project ID: 1532

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: BMY
Date: 30/07/2013

Unique Map ID: BMY003

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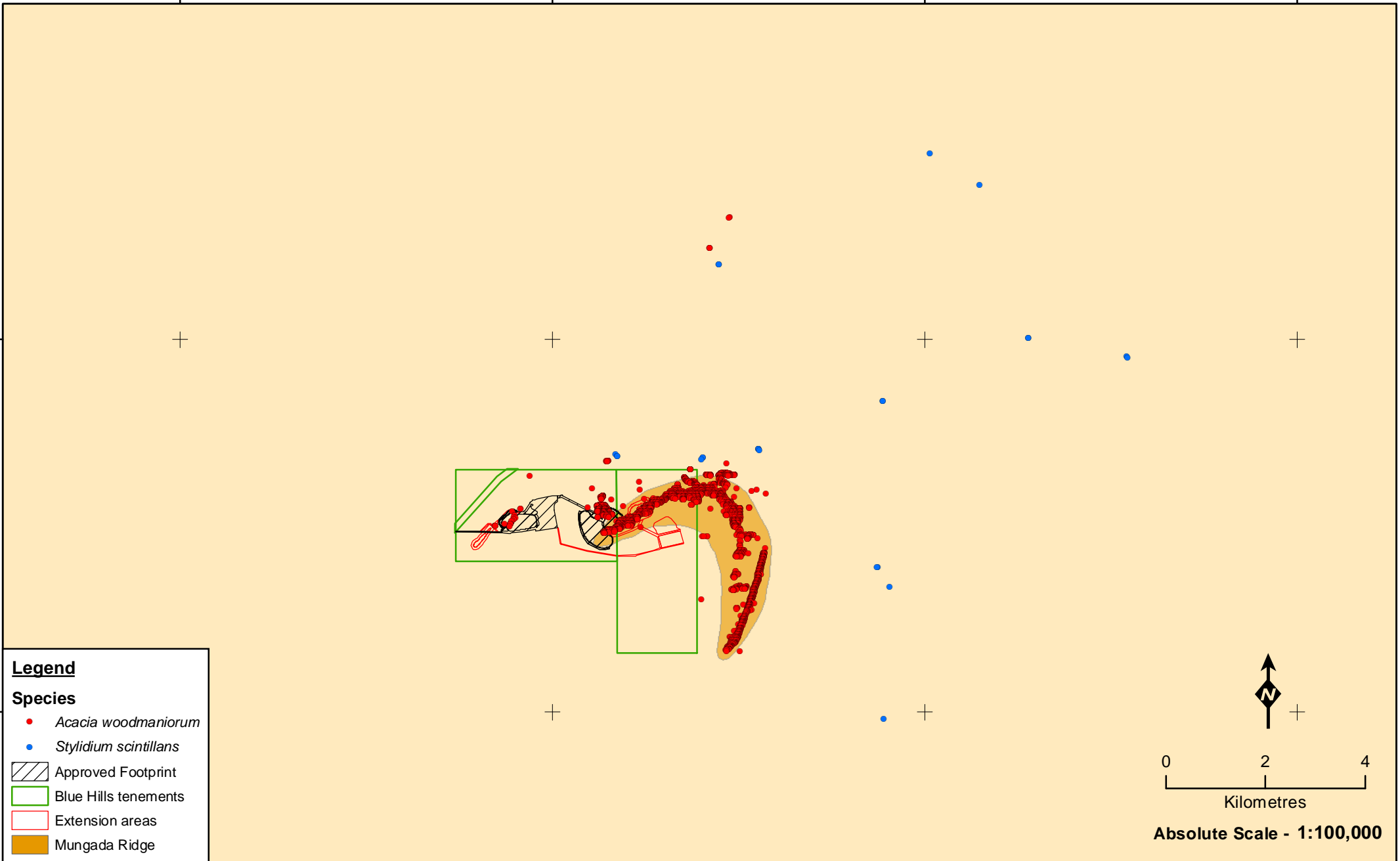
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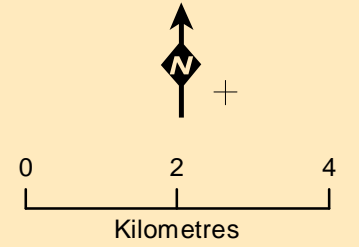
6772500



Legend

Species

- *Acacia woodmaniorum*
- *Stylidium scintillans*
- Approved Footprint
- Blue Hills tenements
- Extension areas
- Mungada Ridge



Absolute Scale - 1:100,000



**Previously known
Threatened Flora
of greater Blue Hills**

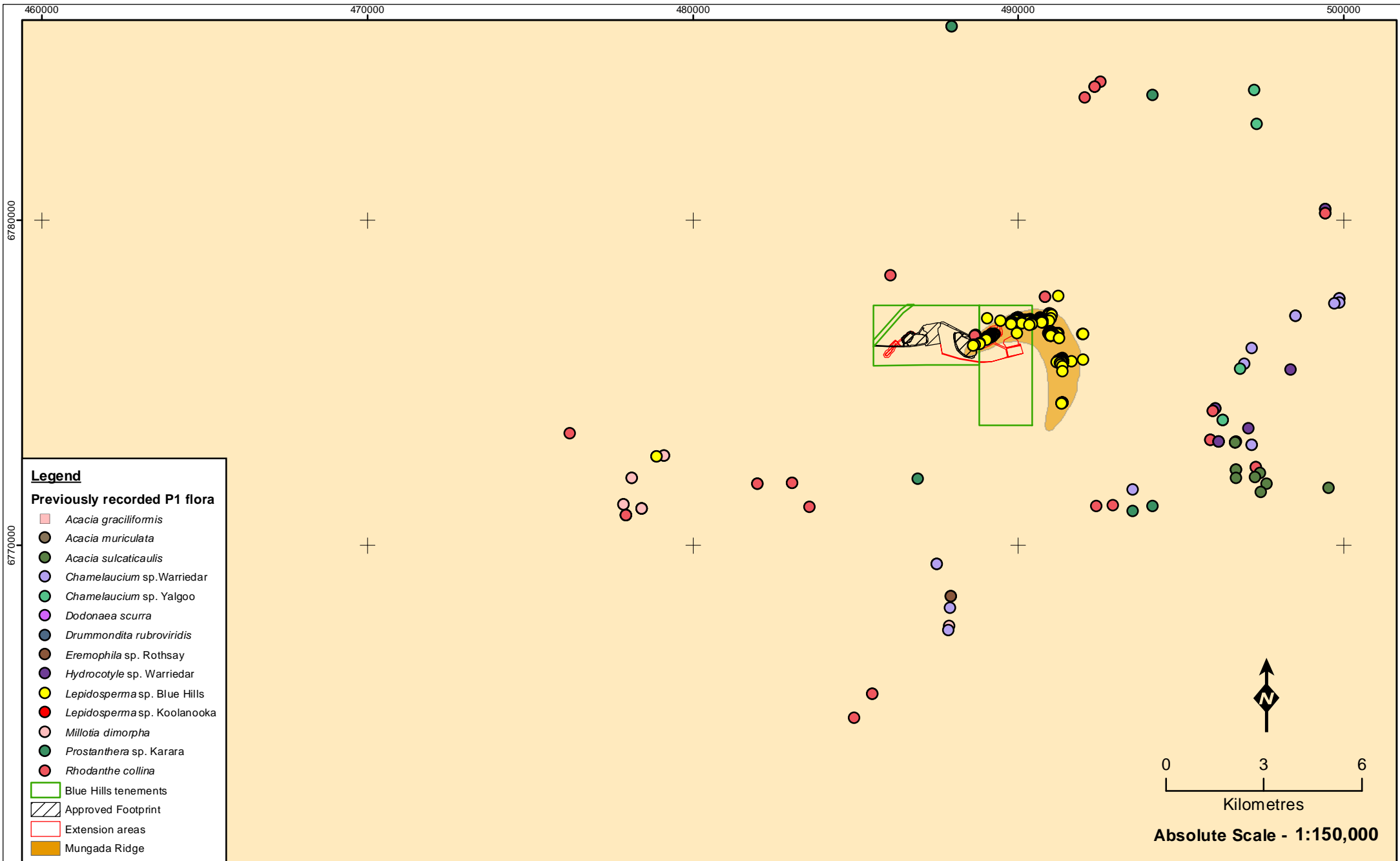
Figure: C.2
Project ID: 1532

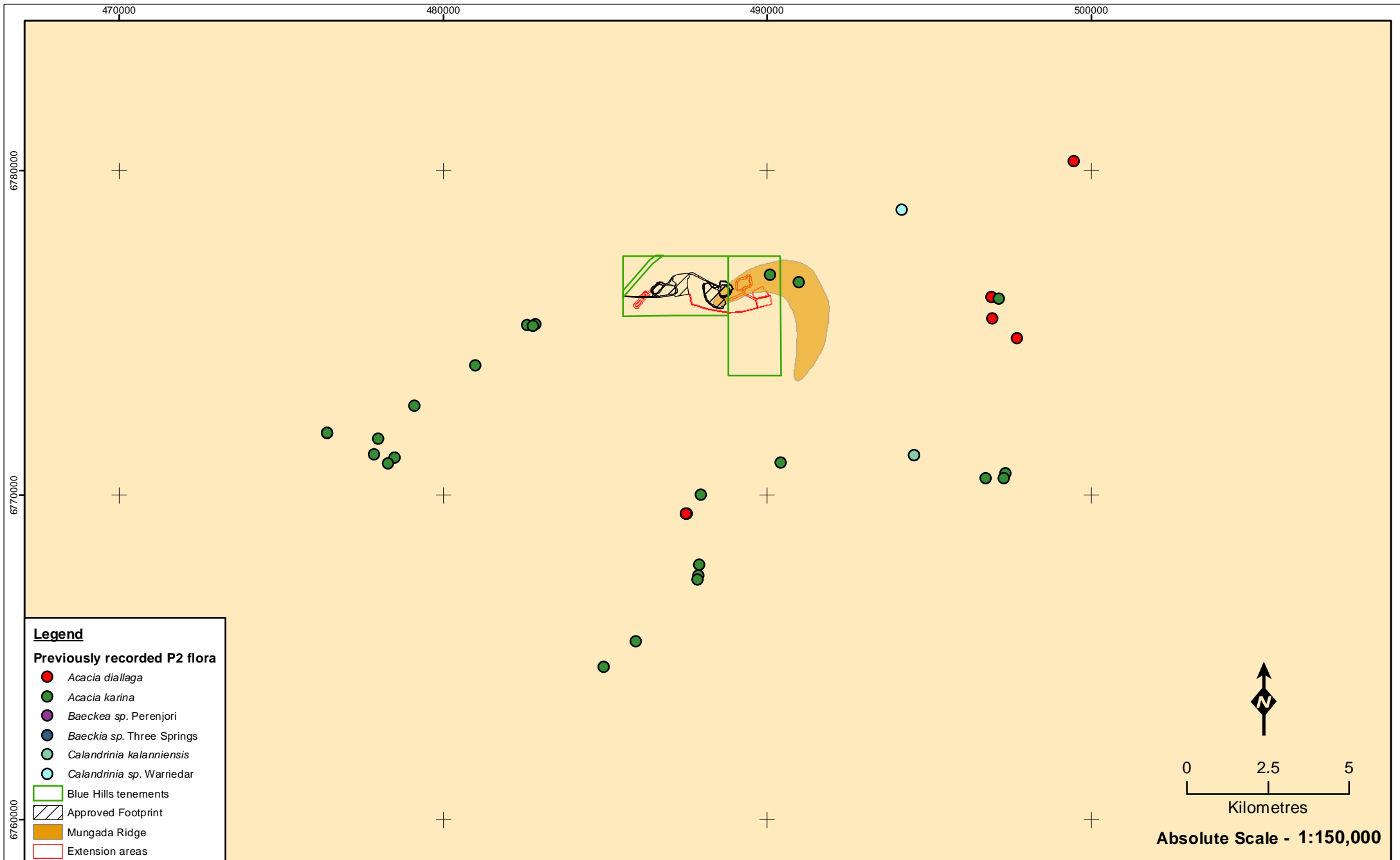
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: BMY
Date: 28/08/2013

Unique Map ID: BMY004

A4





Legend

Previously recorded P2 flora

- *Acacia diallaga*
- *Acacia karina*
- *Baeckea sp. Perenjori*
- *Baeckia sp. Three Springs*
- *Calandrinia kalanniensis*
- *Calandrinia sp. Warriedar*

- Blue Hills tenements
- Approved Footprint
- Mungada Ridge
- Extension areas

Kilometres

Absolute Scale - 1:150,000



**Previously known
Priority 2 Flora
of greater Blue Hills**

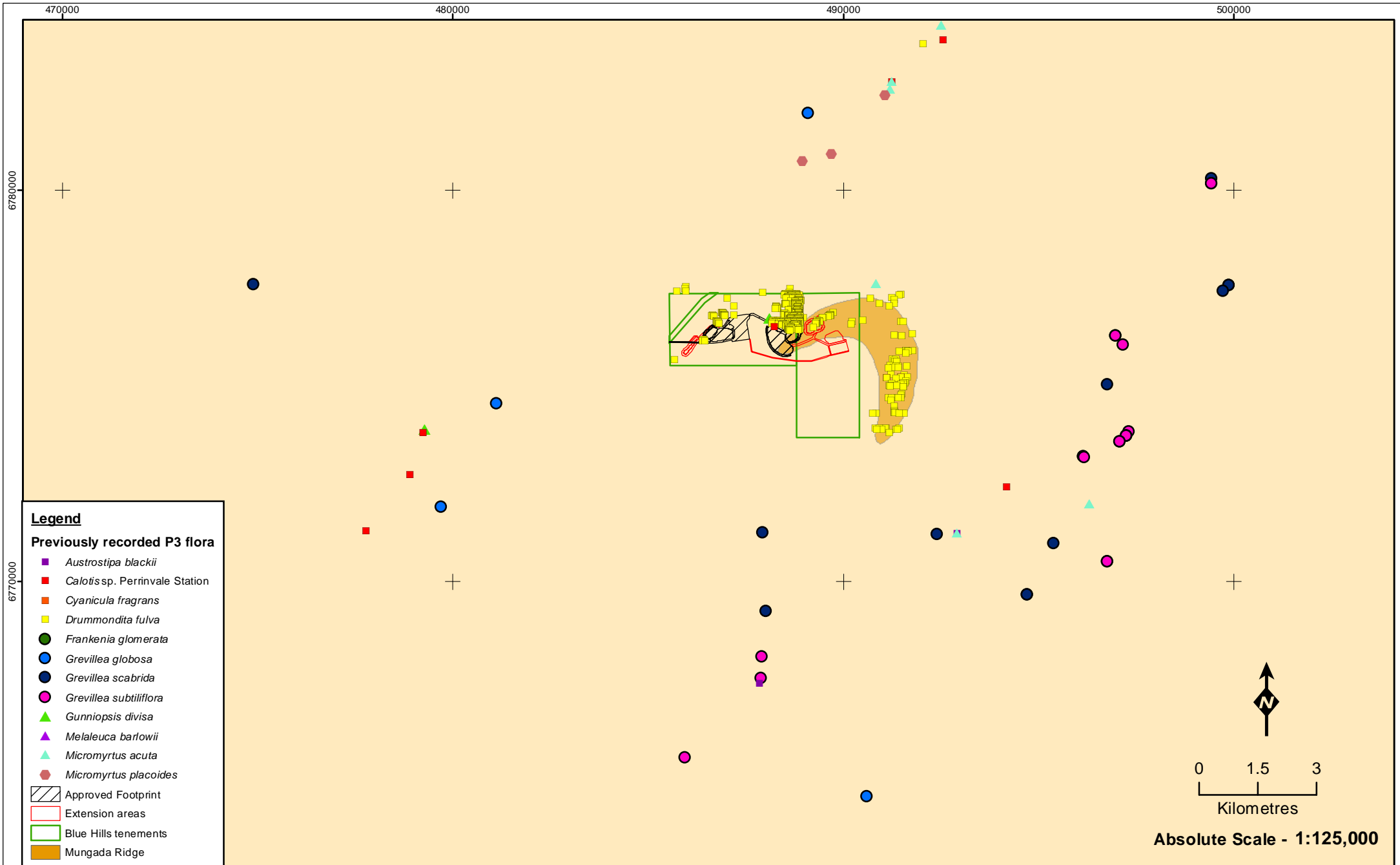
Figure: C.4
Project ID: 1532

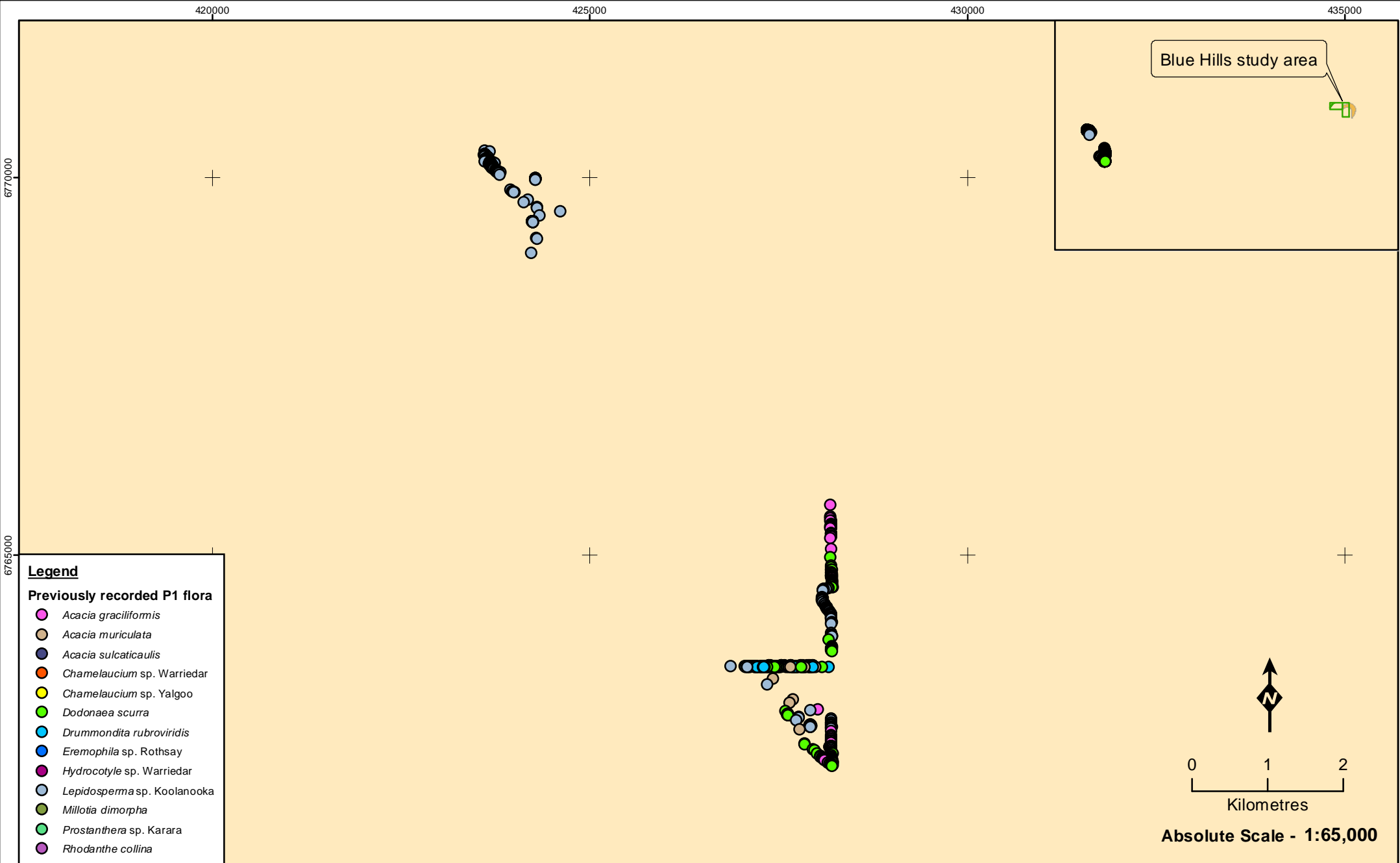
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: BMY & AH
Date: 28/08/2013

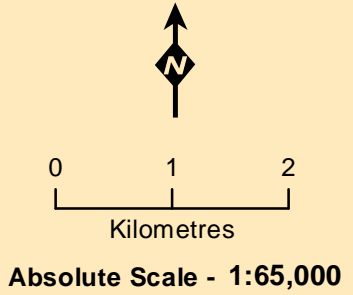
Unique Map ID: BMY006

A4





- Legend**
- Previously recorded P1 flora**
- *Acacia graciliformis*
 - *Acacia muriculata*
 - *Acacia sulcaticaulis*
 - *Chamelaucium* sp. Warriedar
 - *Chamelaucium* sp. Yalgoo
 - *Dodonaea scurra*
 - *Drummondita rubroviridis*
 - *Eremophila* sp. Rothsay
 - *Hydrocotyle* sp. Warriedar
 - *Lepidosperma* sp. Koolanooka
 - *Millotia dimorpha*
 - *Prostanthera* sp. Karara
 - *Rhodanthe collina*



**Previously known
Priority 1 Flora
of Koolanooka**

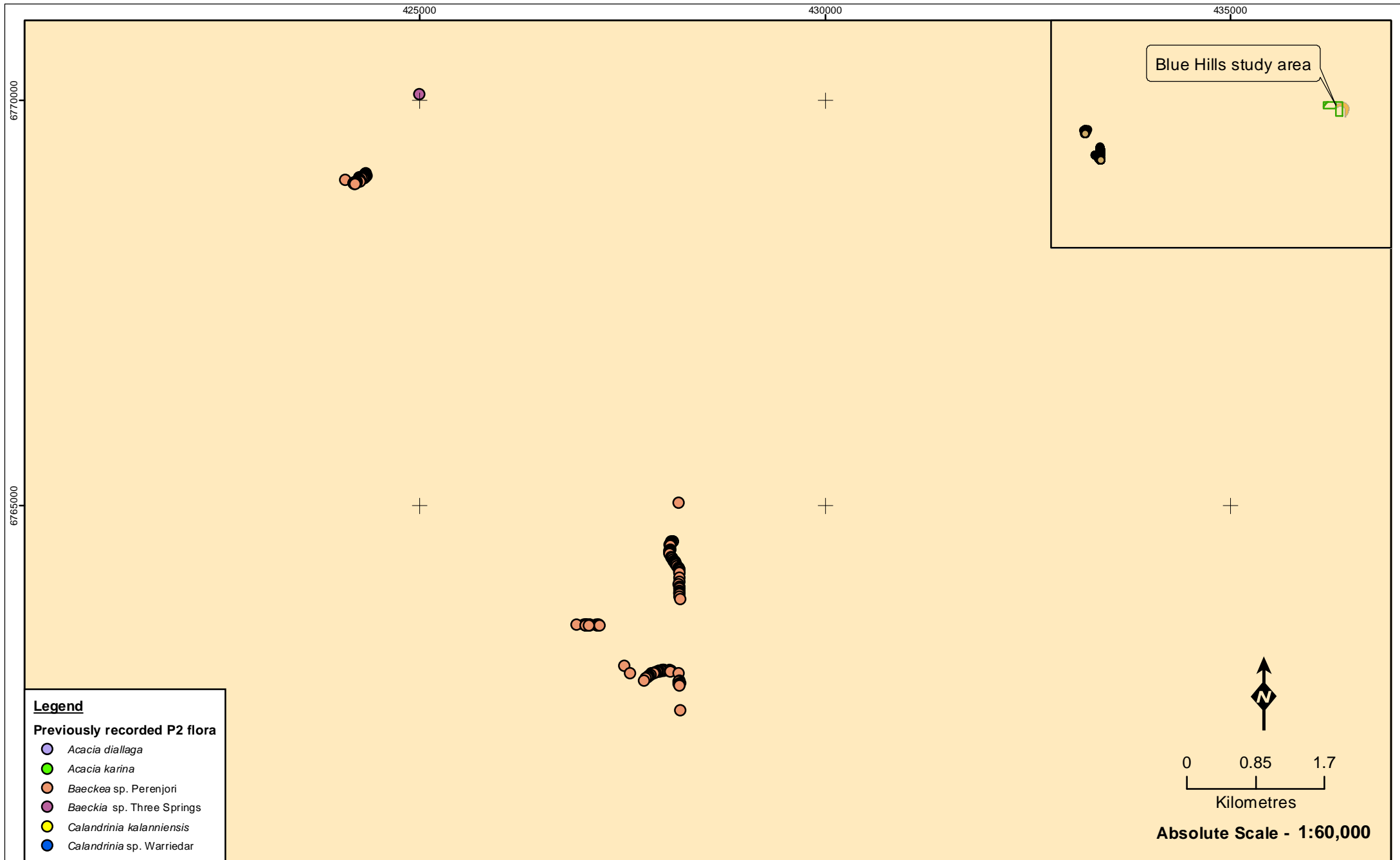
Figure: C.7
Project ID: 1532

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: BMY & AH
Date: 28/08/2013

Unique Map ID: BMY009

A4



Legend

Previously recorded P2 flora

- *Acacia diallaga*
- *Acacia karina*
- *Baeckea* sp. Perenjori
- *Baeckia* sp. Three Springs
- *Calandrinia kalanniensis*
- *Calandrinia* sp. Warriedar

0 0.85 1.7

Kilometres

Absolute Scale - 1:60,000



**Previously known
Priority 2 Flora
of Koolanooka**

Figure: C.8
Project ID: 1532

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: BMY & AH
Date: 28/08/2013

Unique Map ID: BMY010

A4

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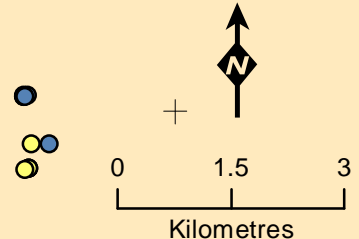
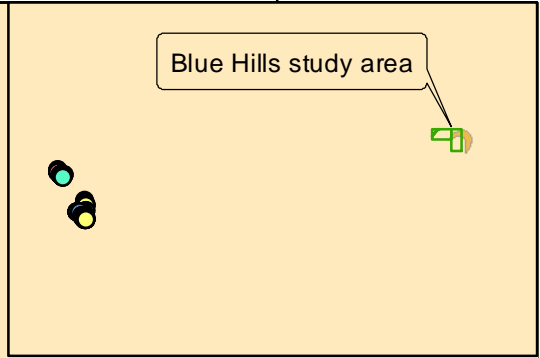
+

Blue Hills study area

Legend

Previously recorded P3 flora

- *Frankenia glomerata*
- *Mirbelia ferricola*
- *Persoonia pentasticha*
- *Stenanthemum poecilum*



Absolute Scale - 1:100,000



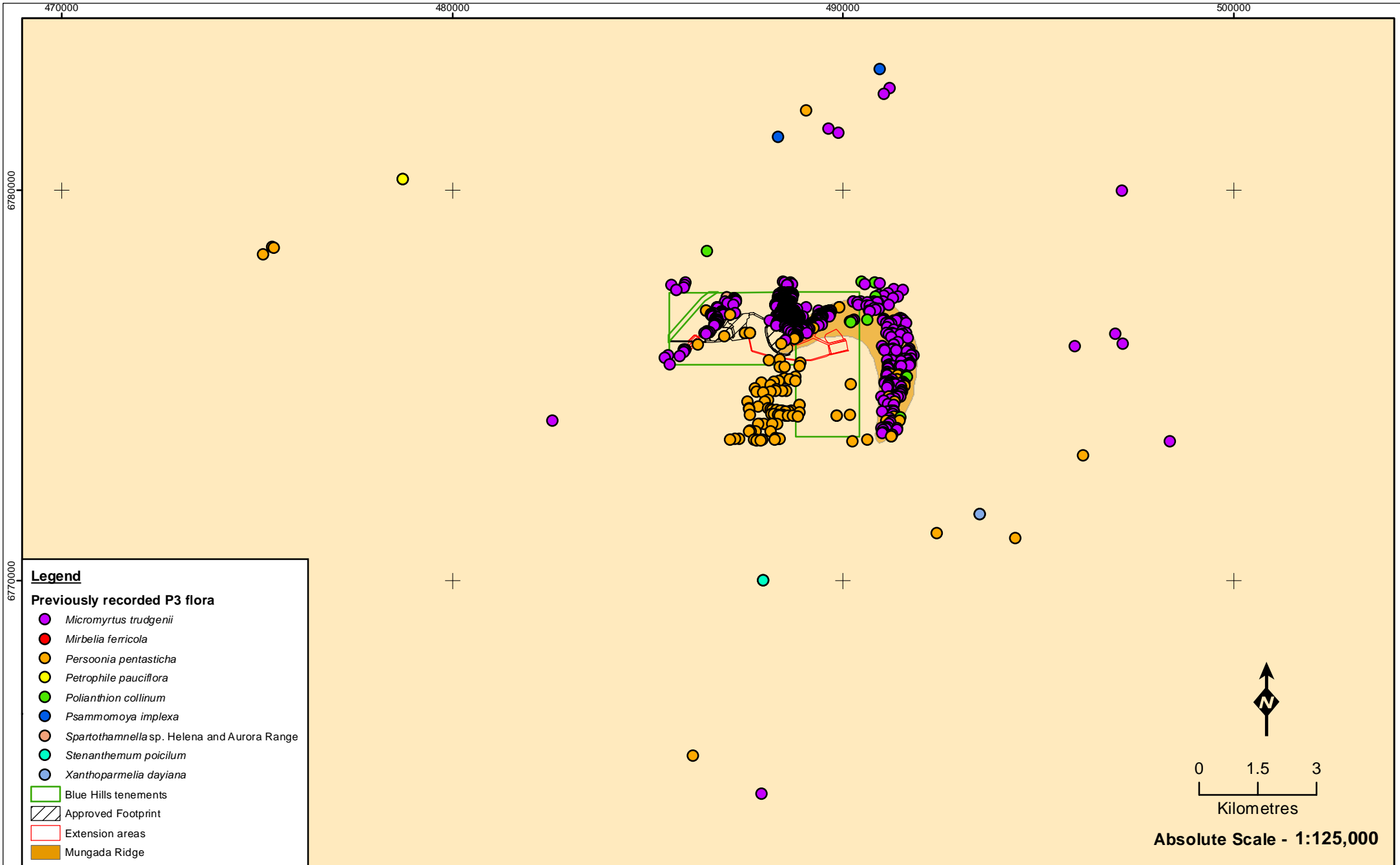
**Previously known
Priority 3 Flora
of Koolanooka**

**Figure: C.9
Project ID: 1532**

**Drawn: BMY & AH
Date: 28/08/2013**

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: BMY011

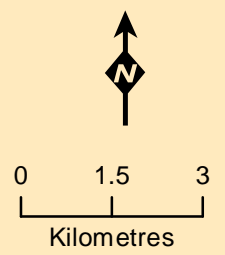


Legend

Previously recorded P3 flora

- *Micromyrtus trudgenii*
- *Mirbelia ferricola*
- *Persoonia pentasticha*
- *Petrophile pauciflora*
- *Polianthion collinum*
- *Psammomya implexa*
- *Spartoathamella* sp. Helena and Aurora Range
- *Stenanthemum poecilum*
- *Xanthoparmelia dayiana*

- Blue Hills tenements
- Approved Footprint
- Extension areas
- Mungada Ridge



Absolute Scale - 1:125,000



**Previously known
Priority 3 Flora
of greater Blue Hills**

Figure: C.6
Project ID: 1532

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: BMY & AH
Date: 28/08/2013

Unique Map ID: BMY007

A4