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Environmental Consultancy

SMC: BLUE HILLS (TENEMENTS M59/595 & M59/596)

Targeted Flora Survey, June 2014




This document describes the results of a targeted flora survey carried out in June 2014 by Maia Environmental Consultancy Pty Ltd (Maia) over sections of Sinosteel Midwest Corporation Limited's (SMC) Mungada West and Mungada East mining tenements (M59/595 and M59/596 respectively).

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Acronyms and Abbreviations

ATA	Alan Tingay and Associates
BAM Act	*Biosecurity and Agriculture Management Act 2007*
Bennett	Bennett Environmental Consulting
BIF	Banded ironstone formation
BoM	Bureau of Meteorology
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation
DoE	Department of the Environment
DPaW	Department of Parks and Wildlife
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally sensitive area
forma	Form
FCT	Floristic community types
GPS	Global Positioning System
ha	Hectare
km	Kilometres
m	Metres
mm	Millimetres
Maia	Maia Environmental Consultancy Pty Ltd
ms	Manuscript
NRS	National Reserve System
NVIS	National Vegetation Information System
P (1-5)	Priority 1 to Priority 5
PEC	Priority Ecological Community
SLIP	Shared Landform Information Platform
SMC	Sinosteel Midwest Corporation Limited
sp.	Species
subsp.	Subspecies
T	Threatened
TEC	Threatened Ecological Community
VA	Vegetation association
var.	Variety
WA	Western Australia
WAOL	Western Australian Organism List
WAH	Western Australian Herbarium
WEC	Woodman Environmental Consulting

WIND	DEC's Windarling Hill quadrats
WC Act	*Wildlife Conservation Act 1950*
WoNS	Weed of National Significance

Summary

Introduction

Sinosteel Midwest Corporation Limited (SMC) plans to carry out exploration activities on mining tenements M59/595 and M59/596 at Blue Hills.

Maia Environmental Consultancy Pty Ltd (Maia) was commissioned by SMC to carry out a targeted flora survey over areas in which the drilling program is proposed (the Survey Area).

Blue Hills is located approximately 60 km north-east of Perenjori in the Shire of Perenjori, Western Australia (WA). The Survey Area lies in the Tallering subregion of the Yalgoo bioregion.

The Survey Area comprises two areas at Mungada West (referred to as Mungada West 1 and Mungada West 2 in this report) and one at Mungada East. One polygon was surveyed at each area.

The Survey

The survey was conducted by four botanists between June 18 and 21, 2014. The botanists walked transects spaced at approximately 15 m apart across all three polygons and targeted conservation significant flora species, any apparently novel species and weeds.

When encountered, the locations of known and potential conservation significant flora and weed species were recorded on a GPS and their number counted.

The coordinates for each individual *Acacia woodmaniorum* located by the botanists were recorded on a GPS. However, in areas too dangerous for the botanists to access safely the number of *A. woodmaniorum* occurring in the area was counted from the safest closest point and the coordinates at that point recorded.

Notes were made on the vegetation and its condition within the Survey Area and photographs were taken.

Survey Results

Seventy taxa (88.57% perennial, 11.43% annual) were recorded from 52 genera and 33 families.

The most common families were Fabaceae (13), Myrtaceae (8), Poaceae and Proteaceae (4 each).

The most common genera were *Acacia* (9), *Melaleuca* and *Philotheca* (3).

No flora species protected by the EPBC Act were recorded in the Survey Area.

One species protected by the WC Act, *Acacia woodmaniorum*, was recorded in the Mungada East polygon and 4,043 *A. woodmaniorum* were recorded. *A. woodmaniorum* was not located in the Mungada West 1 or Mungada West 2 polygons.

Six Priority Flora species were located in the polygons surveyed: *Acacia karina*, *Lepidosperma* sp. Blue Hills (both Priority 1), *Drummondita fulva*, *Micromyrtus acuta*, *M. trudgenii* and *Persoonia pentasticha* (all Priority 3). All six species were located within the Mungada East polygon, three within the Mungada West 2 polygon (*D. fulva, M. acuta* and *M. trudgenii*) and one within the Mungada West 1 polygon (*D. fulva*).

No weed species listed on any of the national weed lists were recorded during the survey and no plant listed as a Declared Pest in WA. Two environmental weed species were located - *Mesembryanthemum nodiflorum* at Mungada West 2 and *Cuscuta epithymum* at Mungada East. *M. nodiflorum* is ranked as Low and *Cuscuta epithymum* is ranked as Negligible on the weed rankings summary spreadsheet for the Midwest DPaW Region.

All of the Mungada East polygon, most of the Mungada West 2 polygon and none of the Mungada West 1 polygon (nor the drill pads and tracks proposed around the Mungada West 1 polygon) fall within the boundaries of the Blue Hills (Mount Karara / Mungada Ridge / Blue Hills) vegetation complexes (banded ironstone formation) Priority 1 Priority Ecological Community (PEC).

Seven vegetation associations (VA) were noted in the Survey Area (VA1-7).

The floristic community types (FCTs) of the Survey Area and surrounds have been mapped by Woodman Environmental Consulting (WEC).

The vegetation in the Mungada West 1 polygon and associated proposed tracks and drill pads was mapped as mosaics of FCTs 4/17 and 1a/2 by WEC.

The Mungada West 2 polygon lies over an area mapped as two of WEC's FCTs – the mosaic of FCT4/17 and FCT12. However, the area mapped as the mosaic of FCT4/17 has been cleared as part SMC's approved mining activities. Maia noted three vegetation associations in this polygon - VA5, VA6 and VA7. VA5 is similar to a mixture of WEC's FCT8 and FCT11 and VA7 is similar to FCT4. None of the FCTs mapped by WEC within SMC's tenement boundaries match VA6, however, it is known that small patches of myrtaceous shrublands occur in the area.

The Mungada East polygon lies over an area mapped by WEC as FCT 12, 13 and 14. Maia noted VAs 1, 2, 3 and 4 in this polygon. VA1 has similar species to WEC's FCT13, VA2 is similar to FCT12, VA3 is a mixture of FCT14 and FCT8 and VA4 is similar to FCT4.

The vegetation of the Survey Area is considered to be in Excellent condition.

Three inactive Mallefowl mounds were located in the Mungada West 2 polygon.

Conclusions and Recommendations

The total number of *A. woodmaniorum* located within the Mungada East polygon is less than the total calculated from the combined results of earlier surveys carried out by WEC and Maia.

The total number of each of the six priority species located within the polygons has increased relative to data collated from previous surveys carried out within the polygons.

Acacia woodmaniorum is listed as a Threatened Flora species under the WC Act and consequently the 50 m of vegetation around each *A. woodmaniorum* is an environmentally sensitive area (ESA). In addition to this the Survey Area lies in a Schedule 1 area. Therefore, once SMC's proposed drill pads and tracks have been aligned to minimise impact to *A. woodmaniorum*, Native Vegetation Clearing Permit and Permit to Take applications will need to be submitted and approved before any vegetation and any *A. woodmaniorum* or any vegetation within 50 m of an *A. woodmaniorum* record can be cleared.

Impact to priority plants recorded in the Survey Area can be reduced by utilising priority plant locations recorded during the survey and aligning proposed tracks and drill pads to minimise impact to these flora species whenever practicable. Impact to the two Priority 1 species in particular should be avoided or minimised whenever possible.

Adequate weed hygiene practices should be employed during any approved exploration activities to prevent the spread of weeds into, within and from the Survey Area.

In addition to this all personnel working on the project should follow all relevant procedures detailed in SMC's Environmental Management Plan (EMP). The following procedures in particular:

- EMP-05 Fauna;
- EMP-06 Weed Management;
- EMP-07 Ground Disturbance Permit;
- EMP-08 Vegetation Clearance;
- EMP-09 Vegetation Clearing Demarcation Standards;
- EMP-10 Topsoil;
- EMP-11 Access Tracks and Drill Pads; and,
- EMP-14-Surface Water.

SMC: Blue Hills (Tenements M59/595 & M59/596)
Targeted Flora Survey, June 2014

1 Introduction

1.1 Project Scope of Work

Sinosteel Midwest Corporation Limited (SMC) plans to carry out exploration activities on mining tenements M59/595 and M59/596 at Blue Hills.

Maia Environmental Consultancy Pty Ltd (Maia) was commissioned by SMC to carry out a targeted flora survey over areas in which the drilling program is proposed (the Survey Area). Conservation significant flora species previously recorded, those thought possible to occur in the area, weeds and any other uncommon species were to be targeted by the botanists while carrying out the survey.

1.2 The Survey Area

Blue Hills is located approximately 60 km north-east of Perenjori in the Shire of Perenjori, Western Australia (WA) (Map 9.1, Section 9). The Survey Area lies in the Tallering subregion of the Yalgoo bioregion.

The Survey Area comprises two areas at Mungada West (referred to as Mungada West 1 and Mungada West 2 in this report) and one at Mungada East (Map 9.2, Section 9). Different survey methods were adopted at each area for the following reasons:

- Mungada West 1: This area lies outside the boundaries of the Blue Hills (Mount Karara / Mungada Ridge / Blue Hills) vegetation complexes (banded ironstone formation) Priority 1 Priority Ecological Community (PEC) that is mapped over some of SMC's Blue Hills mining tenements. However, old records for the Threatened Flora (T) species *Acacia woodmaniorum* occur in the vicinity of the drill pads and tracks proposed in this area. Because of this a polygon was placed around the old records and surrounding area and a targeted survey carried out within it. The proposed tracks and drill pads lie in an area that has been surveyed previously, no *A. wooodmaniorum* have been located in those areas and they were not resurveyed.

- Mungada West 2: This area lies inside the boundaries of the Blue Hills (Mount Karara / Mungada Ridge / Blue Hills) vegetation complexes (banded ironstone formation) Priority 1 PEC. Some but not all of the proposed drill pads and tracks lie in areas that have been surveyed previously. However, as a number of conservation significant species occur in the area, and sometimes in large numbers, a polygon was drawn around the proposed drill pads and tracks and the wider area was surveyed. Surveying a larger polygon would allow SMC to amend the alignment of proposed drill pads and tracks as much as possible to minimise impact to conservation significant species.

- Mungada East: *Acacia woodmaniorum* (T) occurs in high numbers in the area where drill pads and tracks are proposed at Mungada East. In addition to this a number of priority flora species have been recorded in the area previously. In order to define the current distribution and numbers of *A. woodmaniorum* in the proposed exploration area a larger polygon was drawn around the proposed drill pads and tracks so that a census survey could be carried out within the polygon. By surveying the wider area current numbers and locations of all of the *A. woodmaniorum* occurring in the polygon could be waypointed, which would allow SMC to place drill pads and tracks to minimise impact to *A. woodmaniorum* and any other conservation significant species located within the polygon. Additional information collected while carrying out the *A. woodmaniorum* census in this polygon (life stage, reproductive status and health of

the plants) would also be used for any Permit to Take application submitted for these proposed works. The plant census would also allow impacts to *A. woodmaniorum* to be more accurately calculated.

The total area to be surveyed was 29.88 ha and the area of each polygon is listed in Table 1.1.

Table 1.1: Survey area, tenement and cover (ha)

Survey Area	Tenement	Area (ha)
Mungada West 1	M59/595	0.92
Mungada West 2	M59/595	9.52
Mungada East	M59/596	19.44
	Total Area	29.88

2 METHODS AND BACKGROUND INFORMATION

2.1 INFORMATION SOURCES

To gather information on the flora species and ecological communities occurring in the Survey Area the sources listed in Table 2.1 were used.

Table 2.1: Databases used or searched

Database	Reference	Buffer (km)
EPBC Act Protected Matters Search Tool	DoE (2014a)	10
NatureMap	DEC (2007 -)	10
Co-ordinates used for EPBC Act Protected Matters Search Tool and NatureMap Search: 29^0 08' 29" S and 116^0 53' 5" E		

Relevant lists were searched to determine whether any weeds listed in the NatureMap and EPBC Act Protected Matters Search Tool search results were any of the following:

- Weeds of National Significance (Australian Government, 2013);
- National Environmental Alert List (Australian Government, 2013);
- Sleeper Weed List (Australian Government, 2013);
- Species Targeted for Eradication (Australian Government, 2013);
- Species Targeted for Biological Control (Australian Government, 2013); and
- Declared Pests (plants) of Western Australia (DAFWA, 2014a).

Information from the following sources was downloaded from Landgate's Shared Land Information Platform (SLIP Enabler) (Landgate, 2014) and mapped using ArcGIS:

- DEC Managed Lands and Waters (DEC, 2013a);
- Environmentally Sensitive Areas (ESA) (DEC, 2013b);
- Environmental Protection Authority (EPA) Redbook Areas (EPA, 2010);
- Schedule 1 Areas (DEC, 2012);

A number of targeted flora surveys have been carried out over the two mining tenements by Maia and others and information from these surveys was also sourced.

The results of these searches are discussed in Section 3 and the list of conservation significant flora species produced by the searches is included as Table A1.1 (Appendix 1).

SMC supplied Maia with the Blue Hills (P1) PEC boundary.

2.2 SURVEY METHODS

The three polygons to be surveyed were uploaded onto a Global Positioning System (GPS). Four botanists carried out the survey and they walked at a distance of approximately 15 m apart across each of the polygons.

When encountered, the locations of known and potential conservation significant flora and weed species were recorded on a GPS and their numbers counted.

Each individual *Acacia woodmaniorum* located by the botanists was waypointed. However, in areas too dangerous for the botanists to access safely the number of *A. woodmaniorum* occurring in the area was counted from the safest closest point and the coordinates at that point recorded.

Notes on the vegetation and the condition of the vegetation were also taken. Specimens of each conservation significant species encountered during the survey were collected for post-survey taxonomic verification.

2.3 Rainfall

Rains received at the Bureau of Meteorology's (BoM) Morawa Airport weather station in the months before the survey are listed in Table 2.2.

Table 2.2: Rainfall at Morawa Airport (BoM, 2014)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Morawa Airport, Station Number 8296, 1997-2014													
2014	7.4	3.0	3.6	69.4	36.8	20.0							
L-t mean	**22.4**	**19.1**	**14.8**	**16.2**	**40.2**	**38.8**	**44.3**	**32.4**	**24.2**	**9.2**	**9.3**	**15.4**	**286.8**

Note: L-t = long-term.

Total rainfall at Morawa Airport over the three months before the survey (March to May 2014) was higher than the long-term average rainfall for the same three months (109.8 mm compared with the long-term mean of 71.2 mm).

2.4 Previous Biological Surveys

Maia carried out four targeted flora surveys on SMC's Blue Hills mining tenements between June and September 2011 for both exploration activities and mining approvals purposes (Maia, 2011a, 2011b, 2012a). Large polygons have been surveyed across Mungada ridge and adjacent to the existing Mungada West and Mungada East pits. Maia also established vegetation monitoring sites at Blue Hills in 2012 and these were assessed in 2013 (Maia, 2012b, 2013). Areas previously surveyed by Maia are shown on Map 9.3 (Section 9).

Bennett Environmental Consulting (Bennett, 2004) carried out a flora and vegetation survey over SMC's Blue Hills miningtenements for Alan Tingay and Associates (ATA) in October 2003. Bennett assessed 29 quadrats and 13 relevés and mapped 15 vegetation associations over the two tenements.

Ecologia Environment carried out a targeted flora survey at proposed exploration areas at Blue Hills (Ecologia, 2007). A flora and vegetation survey was also carried out by Ecologia in July and September 2006, February, June and August 2007 and 42 quadrats were assessed on SMC's mining tenements (Ecologia, 2008a). A targeted flora survey was also carried out by Ecologia as part of a hydrological drilling programme (Ecologia, 2008b).

Markey & Dillon (2008) carried out a survey on the flora and vegetation of several ironstone ranges and outcrops on the central Tallering System. The survey was part of a series, undertaken by the former Department of Environment and Conservation (DEC – now Department of Parks and Wildlife (DPaW)), on the flora and vegetation of the banded iron formations (BIF) of the Yilgarn Craton. Twenty quadrats were assessed on Windaning Hill (WIND) and three of these were within SMC's tenements (WIND01, WIND02 and WIND20). Twenty-one quadrats were assessed on Karara Ridge to the west of SMC's mining tenements and 62 on other hills of the central Tallering System.

Woodman Environmental Consulting (WEC) mapped the vegetation at Mt Karara and Mungada Ridge at Blue Hills (WEC, 2008).

2.5 Vegetation Mapping

Fourteen floristic community types (FCTs) and three mosaics have been mapped within SMC's Blue Hills mining tenements – FCT1a, 1b, 2, 3, 7b, 7c, 8, 10a, 11, 12, 13, 14, 15 and 16 and – FCT1a/2, 4/17 and 11/9 (WEC, 2008). These FCTs are described in Table 2.3 and their distribution on SMC's tenements is shown on Map 9.7 (Section 9). WEC rated the following FCTs as having the highest conservation significance (i.e. rated 5 on a scale of 1 to 5): FCT8, 11, 12 and FCT13 and the mosaic of FCT11/9. FCT4, 9, 10a and FCT14 and the mosaic of FCT4/17 were rated as 4 by WEC. These high ratings were based on their restricted habitat and the higher number of priority species found within those FCTs (WEC, 2008).

The polygons to be surveyed by Maia and the tracks and drill pads proposed around the Mungada West 1 polygon lie over three of these FCTs and two of the mosaics (FCT12, 13, 14 and mosaics 1a/2 and 4/17 - highlighted green in Table 2.3) as well as land mapped as degraded (Map 9.7, Section 9). Three of these FCTs were rated as having high conservation significance by WEC – FCT12, 13 and 14 - and also the mosaic of 4/17 (WEC, 2008).

Table 2.3: FCTs on SMC's Blue Hills mining tenements (WEC, 2008)

Code	Floristic Community Types
1a	Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with Open Shrubland dominated by *Acacia tetragonophylla* and *A. obtecta* over chenopod species including *Sclerolaena fusiformis*, *Sclerolaena diacantha* and *Rhagodia drummondii* on flats and drainage depressions.
1b	Shrubland dominated by *Acacia* species including *Acacia burkittii*, *A. tetragonophylla* and *A. inceana* subsp. *conformis* over mixed species including *Eremophila pantonii*, *Solanum nummularium* and *Rhagodia drummondii* on flats with occasional ironstone/granite gravels.
2 (mapped as 1a/2 mosaic)	Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* and/*or E. striaticalyx* subsp. *striaticalyx* over Shrubland of mixed species including *Acacia erinacea*, *Eremophila pantonii* and *Senna stowardii* over mixed species including *Sclerolaena fusiformis* and *Scaevola spinescens* on flats and rocky lower slopes with ironstone gravels.
3	Open Woodland of *Eucalyptus kochii* subsp. ?*plenissima* or Shrubland of *Acacia tetragonophylla*, *A. burkittii* and *A. assimilis* subsp. *assimilis* over mixed species including *Rhagodia drummondii*, *Scaevola spinescens*, *Philotheca brucei* subsp. *brucei* and *Eremophila clarkei* on flats to mid slopes with ironstone gravels and rarely banded ironstone formations (BIF).
4 (mapped as 4/7 mosaic)	Shrubland dominated by *Acacia ramulosa* subsp. *ramulosa* over sparse mixed species on flats and slopes.
7b	Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* over *Muehlenbeckia florulenta*, *Teucrium racemosum* and *Sclerolaena fusiformis* on open drainage depression.
7c	Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* or *Eucalyptus striaticalyx* subsp. *striaticalyx* or Shrubland of *Melaleuca lateriflora* over chenopod species including *Sclerolaena diacantha*, *Maireana carnosa* and *M. thesioides* on drainage depressions and lower slopes.
8	Shrubland of mixed *Acacia* species, including *A. assimilis* subsp. *assimilis*, *A. ramulosa* subsp. *ramulosa* and *A. burkittii*, and *Melaleuca nematophylla* and *Calycopeplus paucifolius* with occasional *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Callitris columellaris*, over mixed species including *Eremophila latrobei* subsp. *latrobei*, *E. clarkei*, *Philotheca sericea*, *Prostanthera magnifica* and *Aluta aspera* subsp. *hesperia* on upper slopes and crests with BIF outcropping.
9 (mapped as 11/9 mosaic)	Shrubland of mixed *Acacia* species, including *Acacia umbraculiformis* ms, *A. tetragonophylla* and *A. assimilis* subsp. *assimilis*, and occasional *Allocasuarina acutivalvis* subsp. *prinsepiana* over mixed species including *Eremophila clarkei*, *E. latrobei* subsp. *latrobei*, *Philotheca brucei* subsp. *brucei*, *P. sericea*, *Xanthosia bungei* and *Mirbelia bursarioides* ms on midslopes to crests with BIF or cherty soils.

Code	Floristic Community Types
10a	Dense Shrubland of mixed *Acacia* species including *A. tetragonophylla* and *A. exocarpoides*, and *Allocasuarina acutivalvis* subsp. *prinsepiana* with occasional *Eucalyptus petraea* over mixed species including *Calycopeplus paucifolius*, *Dodonaea inaequifolia*, *Philotheca sericea* and occasional *Acacia woodmaniorum* (Threatened) on upper slopes to crests on BIF.
11	Shrubland of *Acacia* species dominated by *A. umbraculiformis* ms over mixed species including *Aluta aspera* subsp. *hesperia*, *Mirbelia bursarioides* ms, *Philotheca sericea*, *Micromyrtus trudgenii* (Priority 3) on lower slopes to upper slopes with ironstone gravels and occasional BIF.
12	Shrubland of *Acacia* species including *A. assimilis* subsp. *assimilis*, *Acacia ramulosa* subsp. *ramulosa*, *Acacia exocarpoides* and *Acacia sibina* over mixed species including *Hibbertia arcuata*, *Calycopeplus paucifolius* and *Grevillea obliquistigma* subsp. *obliquistigma* on flats to mid-upperslopes with ironstone gravels.
13	Dense Shrubland of *Allocasuarina acutivalvis* subsp. *prinsepiana* with *Melaleuca nematophylla* over *Grevillea paradoxa*, *Xanthosia bungei* and *Lepidosperma* sp. Blue Hills (A. Markey & S. Dillon 3468) (Priority 1) on mid-upper slopes on BIF.
14	Shrubland of *Acacia* species including *A. assimilis* subsp. *assimilis* and *Acacia ramulosa* subsp. *ramulosa* and *Allocasuarina acutivalvis* subsp. *prinsepiana* with emergent *Eucalyptus leptopoda* subsp. *elevata* over mixed species including *Aluta aspera* subsp. *hesperia*, *Prostanthera magnifica* and *Grevillea obliquistigma* subsp. *obliquistigma* on slopes and ridges.
15	Shrubland of mixed *Acacia species* including *A. burkittii*, *A. assimilis* subsp. *assimilis*, *A. latior* ms and *A. sibina* with *Melaleuca hamata* over *Eremophila* spp., *Malleostemon tuberculatus* and *Philotheca deserti* subsp. *deserti* on flats and lower slopes.
16	Shrubland of *Acacia* species dominated by *A. latior* ms and *Melaleuca leiocarpa* with emergent *Eucalyptus leptopoda* var. *arctata* over mixed species including *Wrixonia prostantheroides*, *Enekbatus stowardii* ms, *Aluta aspera* subsp. *hesperia* and ***Hibbertia stenophylla*** on flats to mid slopes.
17 (mapped as 4/17 mosaic)	Shrubland of *Acacia* species dominated by *A. sibina* and *A. latior* ms with *Melaleuca hamata* and / or *Melaleuca leiocarpa* with emergent *Eucalyptus ewartiana* on flats.

Note: cells coloured green were rated as highly conservation significant by WEC (2008).

Five of the floristic communities described by the results of the former DEC's survey over the central Tallering System occur in the Mungada area (Communities 1b, 2, 3, 4a, 5b) (Markey & Dillon, 2008) (Table 2.4).

Table 2.4: FCTs described By Markey and Dillon (2008)

Code	Floristic Community Type
1b	Speciose shrublands on the shallow, loamy soils of hillslopes and isolated ridges of the survey area. *Acacia* (*A. sibina*, *A. ramulosa* var. *ramulosa*) and *Allocasuarina* dominated shrublands and thickets over a rich shrub understorey, and often with emergent trees of *Eucalyptus* and *Melaleuca leiocarpa*.
2	Tall shrublands of *Allocasuarina acutivalvis*, *Melaleuca nematophylla, Grevillea paradoxa and Gastrolobium laytonii* and the low shrubs *Aluta aspera* subsp. *hesperia* and *Xanthosia bungei.*
3	Sparse shrublands on the crests and moderately steep slopes of low escarpments, ridges and outcrops of BIF. Characteristic species include *Stylidium longibracteatum*, *Micromyrtus trudgenii* (Priority 3) and *Calytrix uncinata* (Priority 3). *Acacia aulacophylla*, *Eremophila glutinosa*, *Melaleuca hamata* (rarely encountered, with both occurrences in this community type), *Austrodanthonia caespitosa*, *Mirbelia bursarioides*, *Cheiranthera filifolia* var. *simplicifolia*, *Drummondita fulva* (Priority 3), *Prostanthera patens* and *Thryptomene costata* are significant indicator species.

Code	Floristic Community Type
4a	Open stands of *Callitris columellaris* and sparse shrublands on steep, rocky or boulder-strewn ridges, cliffs and tors with shallow loamy soils. Notable and significant indicator species include the shrubs *Calycopeplus pauciflorus*, *Dodonaea petiolaris* and *Dodonaea viscosa*, the rockferns, *Cheilanthes sieberi* subsp. *sieberi*, *Cheilanthes lasiophyllum* and *Pleurosorus rutifolius* and the herbaceous *Isotoma petraea*.
5b	Lowland open *Eucalyptus* woodlands and *Acacia ramulosa* var. *ramulosa* shrublands over sparse shrubs of *Senna*, *Ptilotus obovatus* var. *obovatus*, *Scaevola spinescens* and chenopods. Located on gently sloping – flat lower slopes and outwash plains, on deeper red earths. Significant indicator species include *Eucalyptus kochii* subsp. *amaryssia*, *Maireana planifolia* x *villosa*, *Olearia humilis* and the two characteristic species of *Senna*, *S. charlesiana* and *S. artemisioides* subsp. *filifolia.*

3 Database and Literature Search Results

3.1 Conservation Significant Flora

The significant flora species results from the database (and additional literature) searches are listed in Table A1.1 (Appendix 1). A comment on the possibility of each species listed occurring in the Survey Area is also included in Table A1.1. The locations of conservation significant flora species previously located in the Survey Area and surrounds are shown on Maps 9.4 to 9.6 (Section 9).

3.1.1 Threatened Flora

3.1.1.1 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Some flora species are protected by Australian Government legislation based on the perceived levels of threat to the species population at a national level. These species are placed within one of six conservation categories (Table A2.1, Appendix 2) and four of these categories are specially protected under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) (DoE, 2014b).

- Eleven species protected by the EPBC Act occur in the Yalgoo bioregion (WAH, 1998-): *Acacia unguicula*, *Dasymalla axillaris*, *Hybanthus cymulosus* (all Critically Endangered), *Acacia imitans*, *Eucalyptus crucis* subsp. *praecipua*, *Eremophila nivea*, *Eremophila viscida*, *Cyphanthera odgersii* subsp. *occidentalis* (all Endangered), *Darwinia masonii*, *Eucalyptus beardiana* and *Eucalyptus synandra* (all Vulnerable).

- The Survey Area was buffered by 10 km for the EPBC Act Protected Matters Search Tool search. The results included three of the 11 species listed above (or species habitats) as likely to occur in the area searched (DoE, 2014a) – *Hybanthus cymulosus*, *Dasymalla axillaris* (both Critically Endangered) and *Eremophila viscida* (Endangered).

- The Survey Area was buffered by 10 km for the NatureMap search and no species protected by the EPBC Act were listed in the results (DEC, 2007 -).

3.1.1.2 WESTERN AUSTRALIAN WILDLIFE CONSERVATION ACT 1950

All flora species native to WA are protected under the State's *Wildlife Conservation Act* (WC Act). Under this act, 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 species that are threatened or presumed extinct respectively (DPaW, 2014a).

In WA the term Threatened Flora is applied to extant declared rare flora (DRF) and Presumed Extinct Flora to extinct DRF (DPaW, 2014a and defined in Table A2.2, Appendix 2). The most recent DRF list was published on September 17, 2013 (Government of Western Australia, 2013). Currently, 14 Threatened Flora species occur in the Yalgoo bioregion. Two of these 14 species are known to occur within or in the vicinity of SMC's Blue Hills mining tenements - *Acacia woodmaniorum* and *Stylidium scintillans* (both Vulnerable).

- The results of the search carried out using the EPBC Act Protected Matters Search Tool included three species (or species habitat) listed under the WC Act as being likely to occur within the 10 km buffer around the Survey Area (DoE, 2014a) – *Hybanthus cymulosus*, *Dasymalla axillaris* (both Critically Endangered) and *Eremophila viscida* (Endangered).

- Two species listed under the WC Act were listed in the NatureMap results and occur within the 10 km buffer around the Survey Area – *Acacia woodmaniorum* and *Stylidium scintillans* (both Vulnerable) (DEC, 2007 -).

- *Acacia Woodmaniorum* has been recorded in high numbers on sections of Mungada Ridge around the existing Mungada East pit and in lower numbers in previously disturbed areas around the existing Mungada West pit (Ecologia, 2007, 2008a; Maia, 2011a, 2012a, 2012b, 2013; Markey & Dillon, 2008; WEC, 2008).

- *Stylidium scintillans* occurs just north of SMC's northern tenement boundary and a survey targeting prospective *S. scintillans* habitat in areas around the pits at Mungada was carried out by Maia in September 2011. No *S. scintillans* was located in the areas surveyed (Maia, 2012a).

- *Eucalyptus synandra* (Vulnerable) has been recorded along the Emu Proof Fence on Karara Station (Ecologia, 2008a); however, *E. synandra* was not listed in the NatureMap search results (DEC, 2007 -) and no records are known within 10 km of the Survey Area.

3.1.2 Priority Flora

Because of the large Western Australian flora, many species are known from only a few collections, or a few sites, and have not been adequately surveyed. 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 (P) 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 P4; these species require regular monitoring. Conservation Dependent species are placed in P5 (DPaW, 2014a).

Definitions for each of the categories discussed above are included in Table A2.3 (Appendix 2). The most recent Priority Flora List was published on October 18, 2013 (Smith, 2013).

Currently, 172 Priority Flora species are listed as occurring in the Yalgoo bioregion (WAH, 1998-). The NatureMap search results indicated that 25 priority species have been recorded within or in the vicinity of the Survey Area.

- These 25 records comprise 11 P1 species, two P2 species and 13 P3 species (Table A1.1, Appendix 1).

3.1.3 Conservation Significant Flora Previously Recorded in and in the Vicinity of the Survey Area

Acacia woodmaniorum (T) occurs on and in the vicinity of SMC tenements M59/595 and M59/596 (Ecologia, 2007, 2008a; Maia, 2011a, 2012a, 2012b, 2013; Markey & Dillon, 2008; WEC, 2008).

One additional Priority Flora species not listed in the NatureMap search results has been recorded during surveys carried out on and in the vicinity of SMC's Blue Hills mining tenements - *Lepidosperma* sp. Blue Hills (P1) (Ecologia, 2008a; Maia 2011a, 2012a, 2012b, 2013; WEC, 2008).

Bennett recorded two priority species during its survey of the area (Bennett, 2004) (Table A1.1, Appendix 1).

The former DEC (now DPaW) recorded 12 currently listed Priority Flora species during its survey of the central extent of the Tallering System (Markey & Dillon, 2008) (Table A1.1, Appendix 1).

Eighteen currently listed Priority Flora species were recorded by WEC (2008) during surveys of a number of tenements at Blue Hills (Table A1.1, Appendix 1).

Ecologia recorded seven priority species during surveys carried out on SMC's Blue Hills mining tenements (Ecologia, 2007, 2008a and 2008b) (Table A1.1, Appendix 1).

Five Priority Flora species have been recorded by Maia during surveys on M59/595 and M59/596 (Maia 2011a, 2011b, 2012a, 2012b, 2013).

In all, 27 Priority Flora species have been located previously within or in the vicinity of the Survey Area (Table A1.1, Appendix 1).

3.2 Introduced Flora

A weed is defined in the Australian Weeds Strategy (DEWR, 2007) as 'a plant which has, or has the potential to have, a detrimental effect on economic, social or conservation values'. Weeds can include species that have proliferated in bushland without direct human intervention or assistance (referred to as naturalised alien species).

3.2.1 Weeds of National Significance

A number of lists of weeds of national interest are currently recognised (e.g. weeds of national significance, WoNS). The nature of the weeds and the resulting actions required for their control determine on which list a weed species may appear. Some weeds are of particular concern and, as a result, have been listed for priority management or in legislation. The weed lists are available on the Australian Government's website (Australian Government, 2013). These lists are: WoNS, National Environmental Alert, Sleeper Weeds; Six Species Targeted for National Eradication; and, Species Targeted for Biological Control.

- No species listed on any of the national weed lists were produced in the results of the EPBC Act Protected Matters Search Tool search (DoE, 2014a).
- No species included on any of the national weed lists was listed in the results of the NatureMap search (DEC, 2007 -).
- No species listed on any of the national weed lists have been recorded in surveys previous conducted by Maia at Blue Hills (Maia, 2011a, 2011b, 2012a, 2012b, 2013).

3.2.2 Plant Pests Declared in Western Australia

To protect WA agriculture the Department of Agriculture and Food, WA (DAFWA) regulates harmful plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). Plants that are prevented entry into WA or have control or keeping requirements within WA are known as declared pests (DAFWA, 2014b).

The Western Australian Organism List (WAOL) has been created to easily find out the declared status of organisms that have been classified as part of the enactment of the BAM Act (DAFWA, 2014a).

Organisms are grouped into four main classifications: Declared pests; Permitted; Prohibited; and Permitted requiring a permit (DAFWA, 2014a).

Under the BAM Act, all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management) (DAFWA, 2014a). These categories are explained in Table A3.1, Appendix 3.

- No declared pest plant species was listed in the results of the EPBC Act Protected Matters Search Tool search (DoE, 2014a).
- One Declared Pest Plant was listed in the NatureMap search – *Galium aparine,* which is prohibited for the entire of WA and has a C1 Exclusion listing (DEC, 2007 - ; DAFWA, 2014a).
- *Echium plantagineum* has been recorded on SMC's Blue Hills mining tenements (Maia, 2011a, 2011b, 2012a, 2012b, 2013). This species is listed as a Declared Plant Pest and has a C3 Management listing for several shires and cities of WA but not in the Shires of Perenjori and Yalgoo (DAFWA, 2014a).

3.2.3 Environmental Weeds

Environmental weeds are introduced plants that establish themselves in natural ecosystems and adversely modify natural processes resulting in the decline of the communities they invade (DPaW, 2014b).

- The EPBC Act Protected Matters Search Tool listed one invasive / weed species (or its habitat) which could occur in the area: *Cenchrus ciliaris* (Buffel Grass) (DoE, 2014a).
- The NatureMap search listed 18 weed species which have been recorded in the area previously: *Arctotheca calendula*, *Brassica tournefortii*, *Cleretum papulosum* subsp. *papulosum*, *Cuscuta epithymum*, *Cuscuta planifolia*, *Ehrharta longifolia*, *Hedypnois rhagadioloides* subsp. *cretica*, *Hypochaeris glabra*, *Lamarckia aurea*, *Mesembryanthemum nodiflorum*, *Pentameris airoides*, *Rostraria pumila*, *Silene nocturna*, *Sonchus oleraceus*, *Urospermum picroides*, *Ursinia anthemoides*, *Vulpia muralis, Vulpia myuros* forma *myuros* (DEC, 2007 -).
- Maia has recorded the following weed species on SMC's Blue Hills tenements: *Arctotheca calendula*, *Brassica tournefortii*, *Bromus diandrus*, *Cleretum papulosum* subsp. *papulosum*, *Cuscuta epithymum*, *Cuscuta planiflora*, *Erodium cicutarium*, *Lamarckia aurea* and *Pentameris airoides* subsp. *airoides* (Maia, 2011a, 2011b, 2012a, 2012b, 2013).

DPaW has developed a weed prioritisation process for weeds occurring in different WA bioregions. Weed species have been rated by assessing their potential distribution and impact (i.e. weed consequence), consequence and invasiveness (i.e. weed risk) and current distribution and control feasibility (i.e. weed management ability). Once these matrices have been assessed a final weed species ranking is developed, which is the product of a weed's risk rating and management ability rating.

Using this process some weed species achieve a very high (VH) ranking and DPaW's objective for those species is eradication. The objective for lower rankings (high (H), medium (M) and low (L)) can be eradication, control or containment, while the lowest ranking (negligible (N)) requires no action to be taken but their status to be monitored. Other species have been listed as requiring further assessment before they can be ranked (DPaW, 2013a).

The Midwest rankings summary spreadsheet lists 396 weed species that have been ranked for the Midwest DPaW Region (DPaW, 2013b); nine of the 396 have been given a VH rank and eight an H rank. No VH or H ranked species have been located previously in the Survey Area.

Seventeen of the 21 environmental weed species produced by the searches above are listed as having Low priority and four are listed as negligible.

3.3 Threatened and Priority Ecological Communities

Ecological communities can be protected by the EPBC Act and are listed as Threatened Ecological Communities (TECs).

There is currently no legislation covering the conservation of TECs in WA. However, an informal, non-statutory process is in place (DPaW, 2014c). The Minister for Environment may list an ecological community as being threatened if the community is presumed to be totally destroyed or to be at risk of becoming totally destroyed (DPaW, 2014d). DPaW has been identifying and informally listing TECs since 1994. As of May 2014, 376 ecological communities had been entered into the TEC database and the WA Minister for Environment has endorsed 69 of these.

The remaining 307 communities are allocated to one of five priority categories. These communities (with insufficient information available to be considered a TEC, or which are rare but not currently threatened), are

placed on the Priority List and referred to as Priority Ecological Communities (PECs). The categories for TECs and PECs are detailed in Table A2.4 and A2.5 in Appendix 2 (DEC, 2010).

The most recent TEC list is correct to 19 May 2014 and no TECs occur in the Yalgoo bioregion / Midwest DPaW Region (DPaW, 2014e).

The most recent PEC list was released on 4 May 2014 (DPaW, 2014f) and includes 78 PECs in the Midwest DPaW region and one of these occurs at Blue Hills - the Blue Hills (Mount Karara / Mungada Ridge / Blue Hills) vegetation complexes (banded ironstone formation) P1 PEC.

All of the Mungada East polygon, most of the Mungada West 2 polygon and none of the Mungada West 1 polygon lies within the boundary of the PEC (Map 9.7, Section 9).

3.4 Environmentally Sensitive Areas, DPaW Managed Lands and Schedule 1 Areas

Some areas in WA are listed as environmentally sensitive areas (ESAs); these are areas requiring special protection of rare or threatened flora, sites that have high conservation, scientific or aesthetic values and/or Aboriginal or European cultural sites.

- The Survey Area does not lie within a designated ESA and no ESA is shown as occurring within or in the vicinity of the Survey Area (Map 9.8, Section 9). However, the vegetation within 50 m of any *Acacia woodmaniorum* record is an ESA and *A. woodmaniorum* grows across Mungada Ridge.

The National Reserve System (NRS) is a network of protected areas managed for conservation and restoration of the natural environment, the protection, care and study of indigenous flora and fauna, and the preservation of any feature of archaeological, historic or scientific interest. Conservation parks have regional or local significance and are set aside to conserve wildlife and the landscape for scientific study and to preserve features of archaeological, historical or scientific interest. Only low impact recreation may be permitted in these areas, and this only providing it does not adversely affect ecosystems (DEC, 2013c).

- The Survey Area does not lie within or close to a conservation estate (Map 9.8, Section 9).

A Schedule 1 area requires a permit for vegetation clearing resulting from low impact mineral or petroleum activities.

- The Survey Area lies within a Schedule 1 area – the Yalgoo bioregion (Map 9.8, Section 9).

Former leasehold areas were previously pastoral leases or parts of pastoral leases that have been acquired for conservation and are managed under interim arrangements prior to their reservation as conservation reserves (DEC, 2008).

- The Survey Area lies on Karara Station, which was previously a pastoral lease (Map 9.8, Section 9).

An EPA Red Book area is an area recommended by the EPA for conservation (EPA, 2010).

- The Survey Area does not lie within or close to an EPA Red Book area (Map 9.8, Section 9).

4 Survey Results

4.1 Survey Timing and Coverage Achieved

The survey was conducted by four botanists between June 18 and 21, 2014. The transects walked in each polygon are shown on Map 9.9 (section 9).

A section of the south-eastern portion of Mungada West 2 polygon was not surveyed as this area had already been cleared (under existing project approvals).

4.2 Flora Species Recorded

The following information was collected on the general flora of the Survey Area:

- Seventy taxa (88.57% perennial, 11.43% annual) were recorded from 52 genera and 33 families.
- The most common families were Fabaceae (13), Myrtaceae (8), Poaceae and Proteaceae (4 each).
- The most common genera were *Acacia* (9), *Melaleuca* and *Philotheca* (3).

A list of the flora taxa recorded at Mungada West 2 and Mungada East is included as Table A4.1, Appendix 4.

4.3 Conservation Significant Flora

4.3.1 Threatened Flora

4.3.1.1 EPBC Act 1950

No flora species protected by the EPBC Act were recorded in the Survey Area.

4.3.1.2 WC Act 1950

One species protected by the WC Act was recorded in the Survey Area – *Acacia woodmaniorum*. A description for and photographs of *A. woodmaniorum* follow and its locations are shown on Map 9.10 (Section 9). The coordinates for these locations have been provided in shapefile format to SMC. SMC has also been provided with the 50 m buffers around each *A. woodmaniorum* location. *A. woodmaniorum* was recorded in the Mungada East polygon but not in the Mungada West 1 and Mungada West 2 polygons.

***Acacia woodmaniorum* (Threatened – WC Act Vulnerable)**

A. woodmaniorum is a prickly, hard shrub that grows to 2 m. It is found on the southern faces of hill slopes and crests of banded ironstone and laterite (Plate 4.1). The bark is grey and slightly rough and its branches are intricate. The marginal nerve of the phyllodes (leaf-like structures) is red in younger leaves and ages to yellow (Plate 4.2). *A. woodmaniorum* produces yellow flowers during July (Plate 4.2) (WAH, 1998-).

Plate 4.1: Growth habit

Plate 4.2: Close-up of phyllodes and flowers

4.3.2 Priority Flora

Six Priority Flora species were recorded in the Survey Area.

- *Acacia karina*, *Lepidosperma* sp. Blue Hills (both P1), *Drummondita fulva*, *Micromyrtus acuta*, *M. trudgenii* and *Persoonia pentasticha* (all P3).
- The six species were located within the Mungada East polygon.
- Three of the species were recorded within the Mungada West 2 polygon – *D. fulva*, *M. acuta*, and *M. trudgenii* (all P3).
- One of the species – *D. fulva* – was recorded within the Mungada West 1 polygon.

Each of these species has been recorded previously on SMC's Blue Hills tenements.

Descriptions for and photographs of the six priority species follow and their locations are shown on Maps 9.11 and 9.12 (Section 9). The coordinates for the priority flora locations have been provided in shapefile format to SMC.

***Acacia karina* (Priority 1)**

A. karina is a straggly, woody shrub growing to 1.5 m high on slopes of shalestone, ironstone pebbles and banded ironstone (Plate 4.3). The leaves are round in cross section and appressed (flattened) hairs occur between the nerves (Maslin & Buscumb, 2007). *A. karina* produces yellow flowers in July (Plate 4.4) (WAH, 1998-).

Plate 4.3: Growth habit

Plate 4.4: Close-up of leaves and flowers

***Lepidosperma* sp. Blue Hills (Priority 1)**

L. sp. Blue Hills is a sedge that grows to 0.5 m high and is found on hill slopes, breakaways and rocky outcrops of laterite, granite, banded ironstone and sandstone rock (Plate 4.5). *L*. sp. Blue Hills produces brown flowers during September (Plate 4.6) (WAH, 1998-).

Plate 4.5: Growth habit

Plate 4.6: Close-up of culms and flowers

***Drummondita fulva* (Priority 3)**

D. fulva is an erect, branching shrub which grows to 1.5 m tall and is found on lower hillslopes and hill crests of banded ironstone and associated meta-sedimentary rock (Plate 4.7). The branchlets are smooth and have glandular ridges. The fleshy leaves are club-shaped and green and have a reddish-brown tip (Plate 4.8). *D. fulva* produces red flowers from September to October (Plate 4.8) (WAH, 1998-).

Plate 4.7: Growth habit

Plate 4.8: Close-up of leaves and flowers

***Micromyrtus acuta* (Priority 3)**

M. acuta is an erect shrub that grows to 2 m high and grows on rocky outcrops of grey to light brown silty fine to coarse sand over laterite and granite (Plate 4.9). The leaves are 1.5-1.8 mm long and oblong in shape (Plate 4.10) (Rye, 2006). *M. acuta* produces white flowers from July to October (Plate 4.10) (WAH, 1998 -).

Plate 4.9: Growth habit

Plate 4.10: Close-up of leaves and flowers

***Micromyrtus trudgenii* (P3)**

M. trudgenii is an erect, open, straggly weeping shrub growing to 2 m in height. It is found on hillslopes and ridges of quartz, basalt, dolerite and banded ironstone (Plate 4.11). The leaves are 4-9 mm long and are densely arranged on the smaller branchlets (Plate 4.12) (Rye, 2007). *M. trudgenii* produces yellow flowers from June to October (Plate 4.12) (WAH, 1998 -).

Plate 4.11: Growth habit

Plate 4.12: Close-up of leaves and flowers

***Persoonia pentasticha* (P3)**

P. pentasticha is an erect, spreading shrub that grows to 1.8 m in height. It is found on lower hillslopes and outcrops of granite, haematite or banded ironstone (Plate 4.13). The terete leaves are simple, folded and are covered with short simple curled hairs. *P. pentasticha* produces yellow flowers (Plate 4.14) from August to November (WAH, 1998 -).

Plate 4.13: Growth habit

Plate 4.14: Close-up of leaves and flowers

4.3.3 Conservation Significant Flora Numbers

Table 4.1 presents information on the reproductive status and number of each conservation significant species located during the survey carried out in June 2014. It also includes the number of plants previously known to occur in the polygons surveyed. To calculate previous plant numbers existing records for each of the species were intersected with the polygon boundaries and the number of plants falling within them totalled (for each polygon and species).

Table 4.1: Conservation significant flora recorded in the Survey Area

Taxon	Rank	Reproductive Material Present on Plants in June 2014	Polygon	Previous Surveys Count	Current Survey Count	Change	Map Number (Section 9)
Acacia woodmaniorum	T	Flowers and old fruit	Mungada East	4,733	4,043	-690	9.10
			Mungada West 1	12	0	-12	9.12
Acacia karina	P1	Flowers	Mungada East	0	2	+2	9.11
Lepidosperma sp. Blue Hills	P1	Flowers	Mungada East	571	627	+56	9.11
Drummondita fulva	P3	Flowers	Mungada East	104	1,422	+1,318	9.11
			Mungada West 1	0	5	+5	9.12
			Mungada West 2	122	128	+6	9.12

Taxon	Rank	Reproductive Material Present on Plants in June 2014	Polygon	Previous Surveys Count	Current Survey Count	Change	Map Number (Section 9)
Micromyrtus acuta	P3	Flowers	Mungada East	0	58	+58	9.11
			Mungada West 2	0	774	+774	9.12
Micromyrtus trudgenii	P3	Flowers	Mungada East	541	4,182	+3,641	9.11
			Mungada West 2	320	1,066	+746	9.12
Persoonia pentasticha	P3	No	Mungada East	10	54	+44	9.11

Note: T = Threatened, P1 and P3 = Priority 1 and Priority 3.

No *Acacia woodmaniorum* were located in the Mungada West 1 polygon.

Fewer *A. woodmaniorum* were located within the Mungada East polygon than totalled from earlier records.

The numbers of all six priority species within the three polygons have increased compared with the earlier data.

4.4 Introduced Species

4.4.1 National Weeds Lists

No weeds on any of the national weed lists were located in the Survey Area.

4.4.2 Pest Plants Declared in Western Australia

No Declared Plant Pests were located in the Survey Area.

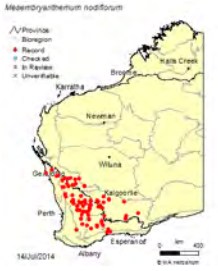
4.4.3 Environmental Weeds

Two environmental weed species were located in the Survey Area - *Mesembryanthemum nodiflorum* was located at Mungada West 2 and *Cuscuta epithymum* at Mungada East. Their locations have been provided in shapefile format to SMC.

Mesembryanthemum nodiflorum is ranked as Low and *Cuscuta epithymum* is ranked as Negligible on the weed rankings summary spreadsheet for the Midwest DPaW Region (DEC, 2013b).

Descriptions and photographs for these two species are provided in Table 4.2. Both of these species have records within the Yalgoo Bioregion (Table 4.2).

Table 4.2: Weed species recorded in the Survey Area

Weed	Description	Habitat	Known Distribution in WA	Distribution in the Survey Areas	Photograph
Cuscuta epithymum	A parasitic, twining leafless annual herb or climber. The white flowers are produced at the nodes along the stems from August to October. The fruit are white to cream and nodular.	Often sandy soils over limestone and granite.		This species was recorded at one location within the Mungada East Survey Area.	
Mesembryanthemum nodiflorum	A prostrate or erect annual herb growing to 0.2 m high. The leaves are narrow and fleshy. The flowers are white and are produced from September to November.	Sandy clay, loam, clay loam. Claypans, saline areas.		This species was recorded at one location within the Mungada West 2 Survey Area.	

Descriptions and habitats from WAH (1998-) and Hussey *et al*. (2007). Map showing known WA Distributions from WAH (1998-). Mapping by Paul Gioia. Image used with the permission of the Western Australian Herbarium, Department of Parks and Wildlife (http://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Tuesday, 15 July 2014. Descriptions by the Western Australian Herbarium, Department of Parks and Wildlife. Text used with permission (http://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Tuesday, 15 July 2014. Unless otherwise indicated photographs are by Maia. Image for *Cuscuta epithymum* - Photography by K.C. Richardson. Image used with the permission of the Western Australian Herbarium, Department of Parks and Wildlife (http://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Tuesday, 15 July 2014.

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4.5 VEGETATION

Vegetation associations (VA) within the Mungada East (VA1 to 4) and Mungada West 2 (VA5 to 7) polygons were noted by the botanists while carrying out the survey and they are described and shown in Table 4.3. The vegetation association occurring in and around the Mungada West 1 polygon, which lies outside the boundaries of the PEC and where a targeted survey for *Acacia woodmaniorum* was carried out, was not noted; however, this area has been mapped as mosaics of FCTs 4/17 and 1a/2 (Table 2.1, Section 2; WEC, 2008).

Vegetation associations are described using the current NVIS methodology at the association level (ESCAVI, 2003).

Table 4.3: Vegetation associations recorded in the Survey Area

Description	Associated Species	Photograph
Mungada East		
VA1: Low Woodland of *Allocasuarina acutivalvis* subsp. *prinsepiana* with a Sparse Low Shrubland of *Xanthosia kochii*, and Sparse to Open Tall Shrubland of *Calycopeplus paucifolius and Melaleuca nematophylla*.	*Eremophila clarkei*, *Gastrolobium laytonii*, *Acacia assimilis* subsp. *assimilis*.	
VA2: Open Tall Shrubland of Mixed *Acacia* species (*Acacia assimilis* subsp. *assimilis*, *Acacia effusifolia* and *Acacia sibina*) with Isolated Mid Shrubs of *Eremophila latrobei* subsp. *latrobei, Philotheca sericea* and *Eremophila clarkei* and Isolated Low Shrubs of *Hibbertia arcuata*.	*Philotheca brucei* subsp. *brucei*, *Acacia aneura*, *Mirbelia bursarioides*, *Acacia exocarpoides*, *Calycopeplus paucifolius*.	
VA3: Open Tall Shrubland / Isolated Tall Shrubs of *Acacia assimilis* subsp. *assimilis* and *Acacia sibina*, *Acacia effusifolia* with a Mid to Low Open Shrubland of *Aluta aspera* subsp. *hesperia* and *Philotheca sericea*.	*Eremophila clarkei*, *Hemigenia botryphylla*, *Hibbertia arcuata*, *Micromyrtus trudgenii* (P3), *Eremophila latrobei* subsp. *latrobei*, *Grevillea obliquistigma* subsp. *obliquistigma*.	

Description	Associated Species	Photograph
Mungada East		
VA4: Open Tall Shrubland of *Acacia effusifolia* and *Acacia sibina* with Isolated Mid Shrubs of *Philotheca brucei* subsp. *brucei*.	*Dianella revoluta* var. *divaricata*.	
Mungada West 2		
VA5: Sparse Tall Shrubland of *Acacia ramulosa* subsp. *ramulosa* with an Open Mid to Low Shrubland of *Aluta aspera* subsp. *hesperia*, *Eremophila latrobei* subsp. *latrobei* and *Eremophila clarkei*.	*Micromyrtus trudgenii* (P3), *Drummondita fulva* (P3), *Philotheca sericea, Acacia assimilis* subsp. *assimilis, Hibbertia arcuata.*	
VA6: Open Mid to Low Shrubland of *Micromyrtus acuta* (P3) and *Aluta aspera* subsp. *hesperia* with a Sparse Tall Shrubland of *Acacia assimilis* subsp. *assimilis* and *Acacia effusifolia*.	*Thryptomene costata, Melaleuca nematophylla, Eremophila latrobei* subsp. *latrobei.*	
VA7: Open Tall Shrubland of *Acacia ramulosa* subsp. *ramulosa* with an Open Low Shrubland of *Eremophila latrobei* subsp. *latrobei*.	*Acacia assimilis* subsp. *assimilis, Acacia exocarpoides, Eremophila clarkei, Drummondita fulva* (P3), *Hakea recurva* subsp. *recurva*, *Mirbelia bursarioides, Philotheca desert* subsp. *deserti.*	

4.6 Floristic Community Types

The vegetation in the Mungada West 1 polygon and associated proposed tracks and drill pads were mapped as mosaics of FCTs 4/17 and 1a/2 by WEC (WEC, 2008).

The Mungada West 2 polygon lies over an area mapped as two of WEC's FCTs – the mosaic of FCT4/17 and FCT12 (WEC, 2008). However, the area mapped as the mosaic of FCT4/17 has been cleared as part SMC's approved mining activities. WEC rated FCT12 as one of the four FCTs (excluding mosaics) rated as having the highest conservation significance based on the number of priority species found in them (WEC, 2008). Maia noted three vegetation associations in this polygon - VA5, VA6 and VA7 (Table 4.3, Section 4). VA5 is similar to a mixture of WEC's FCT8 and FCT11 and VA7 is similar to FCT4. None of the FCTs mapped by WEC within SMC's tenement boundaries match VA6, however, it is known from Markey & Dillon (2008) and Maia (2012b) that small patches of myrtaceous shrublands occur in the area.

The Mungada East polygon lies over an area mapped by WEC as FCT 12, 13 and 14 (WEC, 2008). WEC ranked FCTs 11, 12 and 13 as having the highest conservation significance and FCT14 as one of those having the next highest conservation significance. Maia described the vegetation of this polygon as VAs 1, 2, 3 and 4. VA1 has similar species to WEC's FCT13, VA2 is similar to FCT12, VA3 is a mixture of FCT14 and FCT8 and VA4 is similar to FCT4.

4.7 Ecological Communities

All of the Mungada East polygon, most of the Mungada West 2 polygon and none of the Mungada West 1 polygon (nor the drill pads and tracks proposed around the Mungada West 1 polygon) fall within the boundaries of the Blue Hills (Mount Karara / Mungada Ridge / Blue Hills) vegetation complexes (banded ironstone formation) P1 PEC (Map 9.7, Section 9).

4.8 Vegetation Condition

Vegetation condition was assessed using the scale developed by Trudgen (1988) and subsequently modified and adapted by Keighery (1994).

The vegetation of the Mungada East and Mungada West polygons is considered to be in Excellent condition. Weed cover is minimal in the Survey Area and there appears to be very little grazing by goats. Old drill pads and tracks occur in the Survey Area; however vegetation cleared is minimal and most areas have been ripped and rehabilitated. No recent fire scars were evident and it appears that no fires have occurred in the Survey Area for more than 10 years.

4.9 Malleefowl (*Leipoa ocellata*) Nest Mounds

Malleefowl (*Leipoa ocellata*) is a fauna species protected by the EPBC Act and WC Act.

Three inactive Malleefowl (*Leipoa ocellata*) nest mounds were recorded in the Mungada West 2 polygon and their locations are shown on Map 9.13 (Section 9).

No nest mounds were recorded in the Mungada West 1 or Mungada East polygons.

Malleefowl mound locations have been supplied to SMC in shapefile format.

5 IMPACTS

Impacts to conservation significant flora species and FCTs have not been calculated by Maia, as the final alignment of tracks and drill pads will be determined based on the results of this survey.

Polygons were surveyed around the exploration areas of interest that occur within the boundaries of the PEC in order to provide SMC with a degree of flexibility in the placement of tracks and drill pads.

SMC intends to adjust the final alignment of tracks and drill pads to minimise impact to conservation significant species generally and to the Threatened Flora species *Acacia woodmaniorum* in particular.

6 CONCLUSIONS, DISCUSSION AND RECOMMENDATIONS

Maia provides the following conclusions based on the results of this survey:

- No Threatened Flora species protected by the EPBC Act were located in the Survey Area.
- One Threatened Flora species protected by the WC Act was located in the Survey Area – *Acacia woodmaniorum*.
- No *A. woodmaniorum* were located in the two Mungada West polygons. The plants that had been recorded previously in the Mungada West 1 polygon were not located.
- The total number of *A. woodmaniorum* located within the Mungada East polygon is less than that calculated from earlier survey records combined from WEC and Maia data. This could be due to a number of reasons: the time since the last detailed surveys recording plant numbers were carried out; the relatively short life span of *A. woodmaniorum* and general population dynamics over time; the method used to collect the *A. woodmaniorum* census data in June 2014 (i.e. a waypoint for every single plant that could be located in 2014 rather than one way point being recorded per group of plants and the number of plants in the group estimated); and, some areas where plant numbers could have been estimated rather than counted could have been accessed in June 2014 and more accurate numbers recorded.
- Six Priority Flora species were located in the Survey Area: *Acacia karina*, *Lepidosperma* sp. Blue Hills (both P1), *Drummondita fulva*, *Micromyrtus acuta*, *M. trudgenii* and *Persoonia pentasticha* (all P3).
- The total number of each of the six priority species located within the polygons has increased relative to data collated from previous surveys carried out within the polygons. This is not unexpected because all of the polygons were surveyed in June 2014 (apart from already cleared areas), rather than the sub-samples of the polygons that had been surveyed for potential track and drill pad alignments during earlier targeted surveys.
- Two environmental weed species were located in the Survey Area: *Mesembryanthemum nodiflorum* at Mungada West 2 and *Cuscuta epithymum* at Mungada East. *Mesembryanthemum nodiflorum* is ranked as Low and *Cuscuta epithymum* is ranked as Negligible on DPaW's Midwest Region weed rankings summary spreadsheet.
- All of the Mungada East polygon, most of the Mungada West 2 polygon and none of the Mungada East 1 polygon lies within the boundaries of the Priority 1 Blue Hills (Mount Karara / Mungada Ridge / Blue Hills) vegetation complexes (banded ironstone formation) PEC.
- The vegetation on SMC's Blue Hills tenements was mapped as part of another project being carried out on neighbouring tenements. Fourteen of the 17 FCTs that were mapped overall occur in SMC's Blue Hills tenements. The polygons surveyed lie over three of the FCTs previously mapped (FCT12, 13 and 14) and two of the mosaics (4/17 and 1a/2). FCTs 12, 13 and 14 are mapped in the Mungada East polygon, FCT12 and the mosaic of FCT 4/17 within the Mungada West 2 polygon (however the area mapped as FCT4/17 has been cleared under SMC's existing mining project approvals) and the mosaics of FCTs 4/17 and 1a/2 where the drill pads and tracks are proposed to the south-east of the Mungada West 1 polygon. Three of these FCTs were rated as having high conservation significance – FCT12, 13 and 14 - and also the mosaic of 4/17.
- Three inactive Malleefowl (*Leipoa ocellata*) nest mounds were recorded in the Mungada West 2 polygon. The Malleefowl is a fauna species protected by the EPBC Act and WC Act.

- No nest mounds were recorded in the Mungada West 1 and Mungada East polygons.

Maia provides the following recommendations regarding the Survey Area and its vegetation, flora and fauna.

- The Survey Area lies in a Schedule 1 area and as such is a non-permitted area with respect to low impact mineral and petroleum activities.
- *Acacia woodmaniorum* is listed under the WC Act and consequently the 50 m of vegetation around each *A. woodmaniorum* is an ESA. Therefore, once SMC's proposed drill pads and tracks have been aligned to minimise impact to *A. woodmaniorum*, Native Vegetation Clearing Permit and Permit to Take applications will need to be submitted and approved before any *A. woodmaniorum* or any vegetation within 50 m of an *A. woodmaniorum* record can be cleared.
- Impact to priority plants recorded in the Survey Area can be reduced by utilising priority flora locations recorded during the survey and aligning proposed tracks and drill pads to minimise impact to these flora species whenever practicable. Impact to the two P1 species in particular should be avoided whenever possible.
- Adequate weed hygiene practices should be employed during any approved exploration activities to prevent the spread of weeds into, within and from the Survey Area.
- While Maia botanists record the locations of any Malleefowl mounds encountered in a survey area they cannot be certain whether they are active or not. Therefore mounds should be either avoided or checked by a vertebrate fauna specialist for recent activity.

In addition to this all personnel working on the project should follow all relevant procedures detailed in SMC's Environmental Management Plan (EMP) (SMC, 2010). The following procedures in particular:

- EMP-05 Fauna;
- EMP-06 Weed Management;
- EMP-07 Ground Disturbance Permit;
- EMP-08 Vegetation Clearance;
- EMP-09 Vegetation Clearing Demarcation Standards;
- EMP-10 Topsoil;
- EMP-11 Access Tracks and Drill Pads; and,
- EMP-14-Surface Water.

7 PROJECT TEAM

The survey and reporting tasks carried out for this project were undertaken by the botanists listed in Table 7.1.

Table 7.1: Project Team

Project Team					
Name	**Qualification**	**Experience**	**Project Role**	**DPaW Flora License Number (Expiry)**	**Threatened Flora Collecting Permit Number (Expiry)**
Christina Cox	PhD	14 + years	Botanist–report	Not applicable	
Scott Hitchcock	BSc	8 + years	Botanist–survey	SL010983 (April 2015)	39-1314 (September 2014)
Rochelle Haycock	BSc	6 + years	Botanist–survey and report	SL010985 (April 2015)	99-1314 (March 2015)
Stuart Yandle	BSc	10 + years	Botanist–survey	SL010986 (April 2015)	-
Stephan Mitchell	BSc	1 year	Botanist–survey	-	-

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9 MAPS

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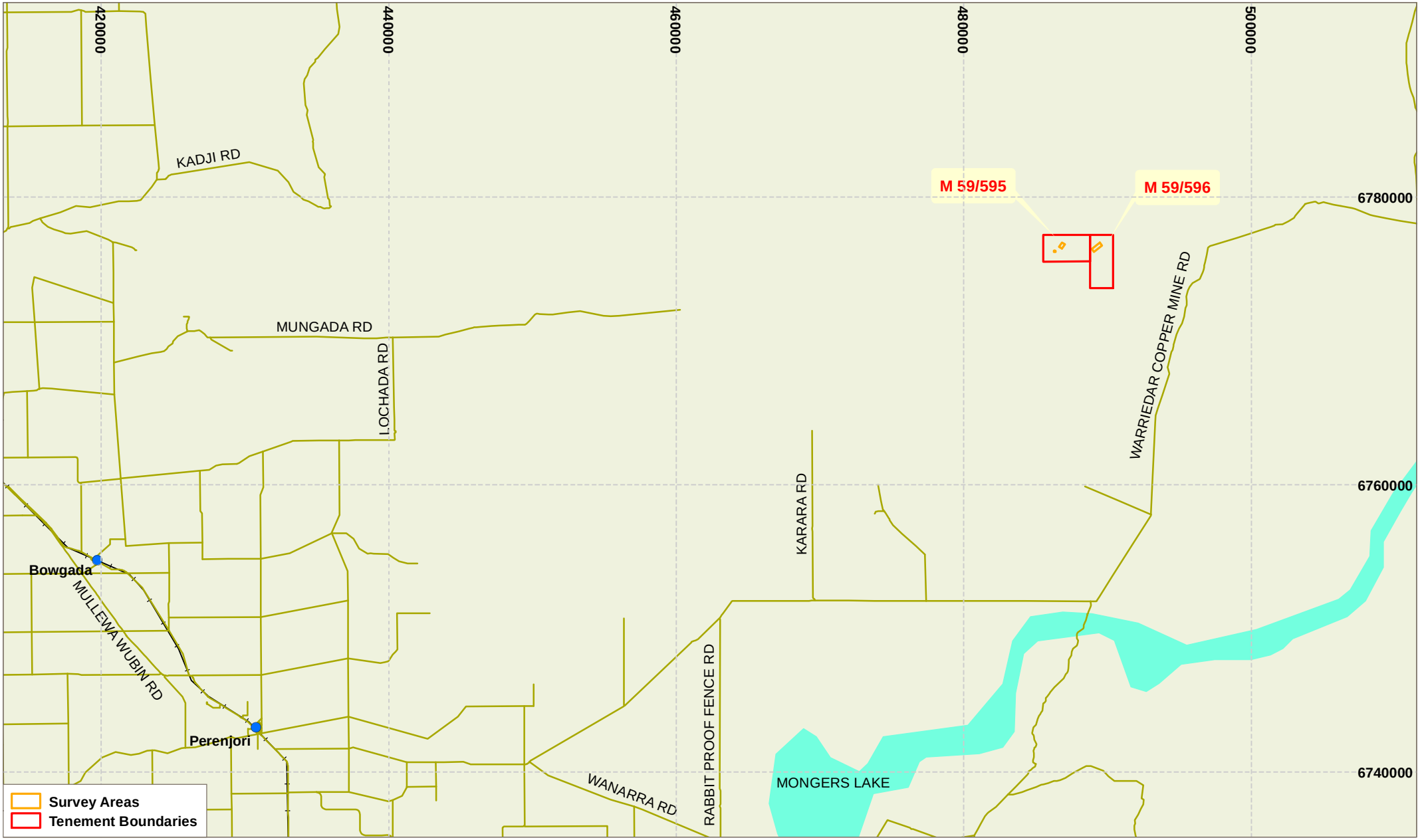

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Kalgoorlie
Perth

Towns
Major Roads
Rail
Waterbodies

General Location

N

0 7.5
Kilometres

Datum: GDA 1994, MGA 50

Map: 9.1
Prepared for: SMC
Drawn by: RH
Date: 30/06/2014
Version: 1

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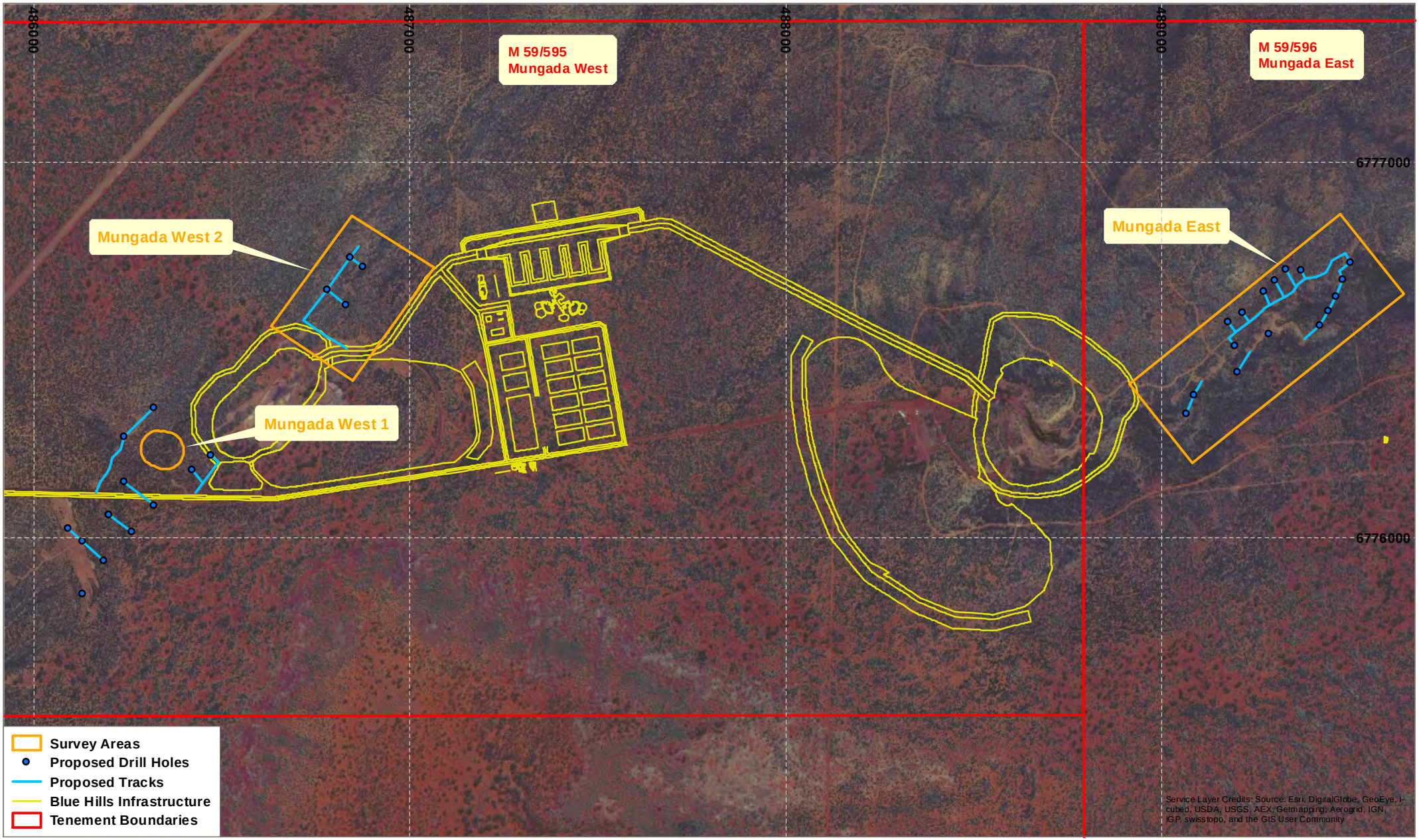

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

Survey Areas and Proposed Drill Holes and Tracks

maia

N

0 0.25

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.2
Prepared for: SMC
Drawn by: RH
Date: 30/06/2014
Version: 1

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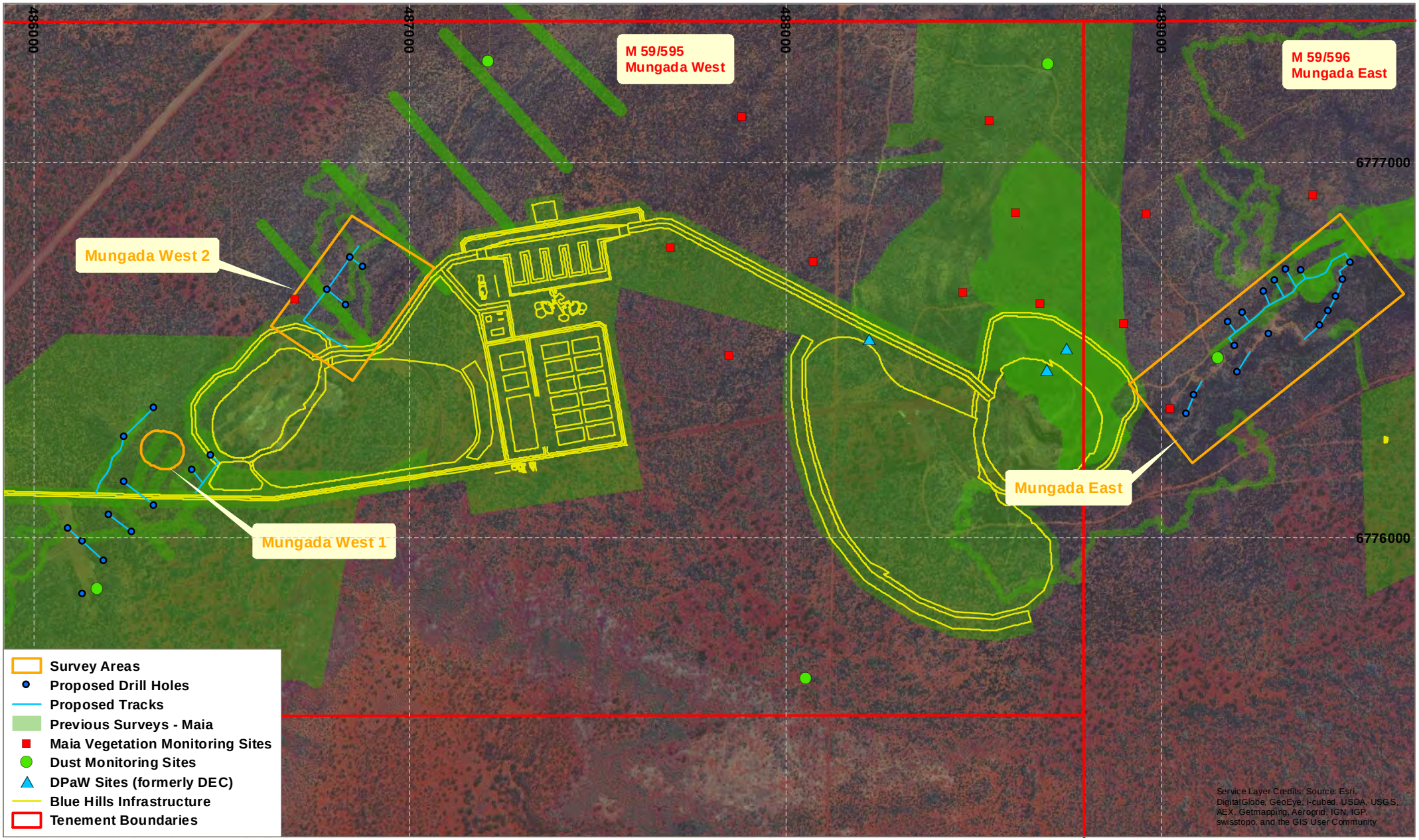

Location Map

Previous Surveys - Maia

N

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Kilometres

Datum: GDA 1994, MGA 50

Map: 9.3
Prepared for: SMC
Drawn by: RH
Date: 30/06/2014
Version: 1

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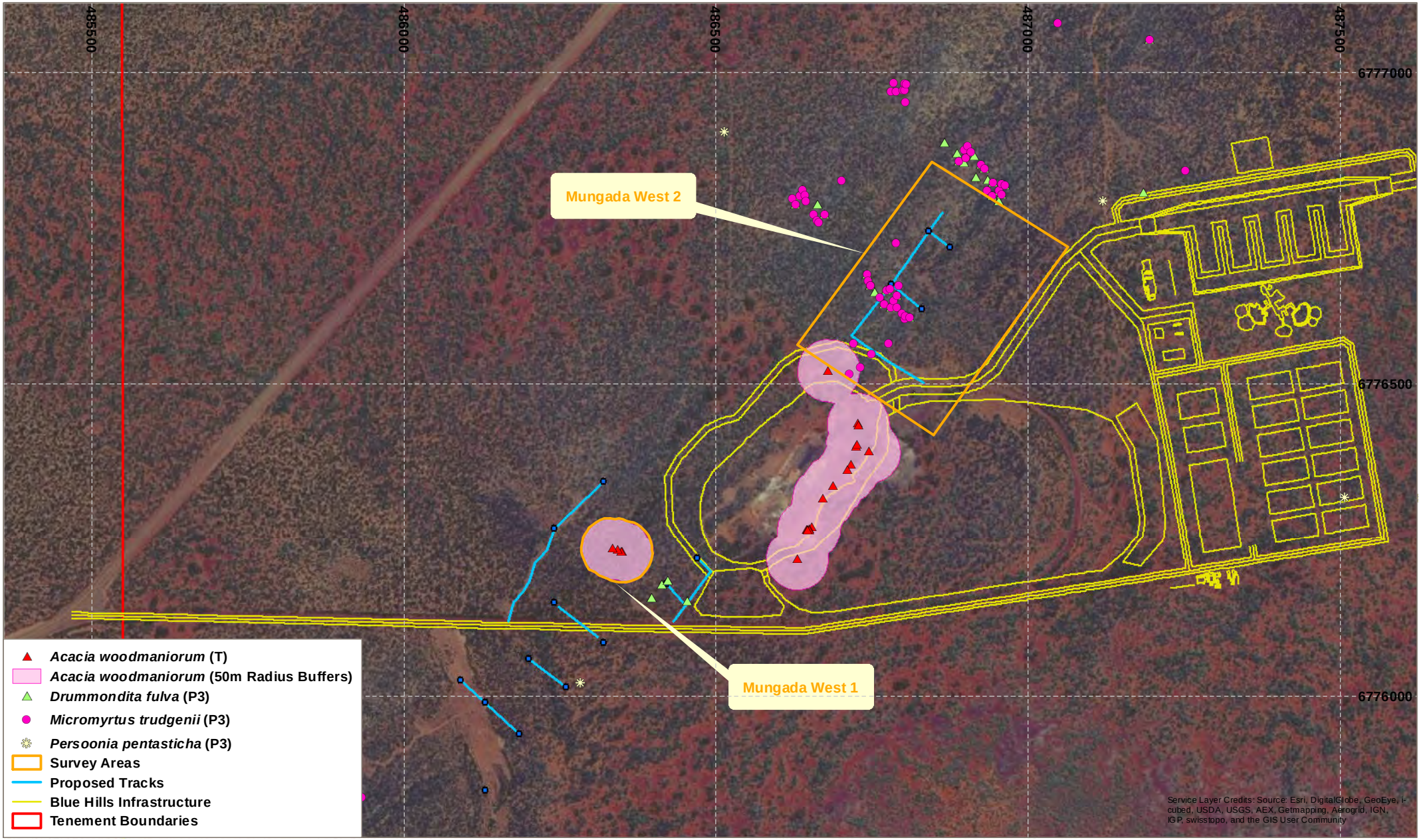

Location Map

Previous Locations of Conservation Significant Flora - Mungada West

maia

N

0 0.15

Kilometres

Datum: GDA 1994, MGA 50

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Prepared for: SMC
Drawn by: RH
Date: 2/07/2014
Version: 1

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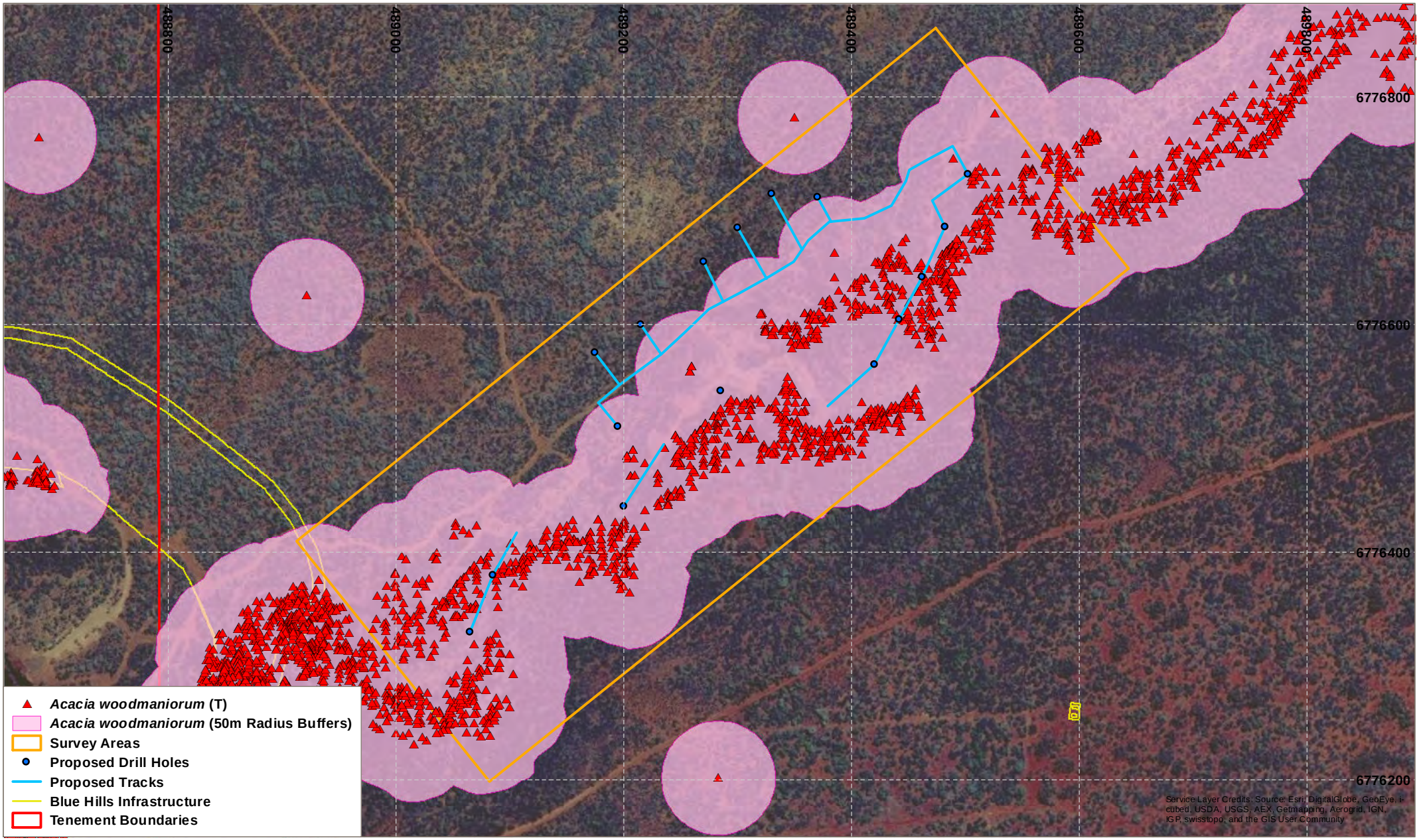

Location Map

Previous Locations of *Acacia woodmaniorum* (T) - Mungada East

maia

N

0 0.075

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.5

Prepared for: SMC

Drawn by: RH

Date: 2/07/2014

Version: 1

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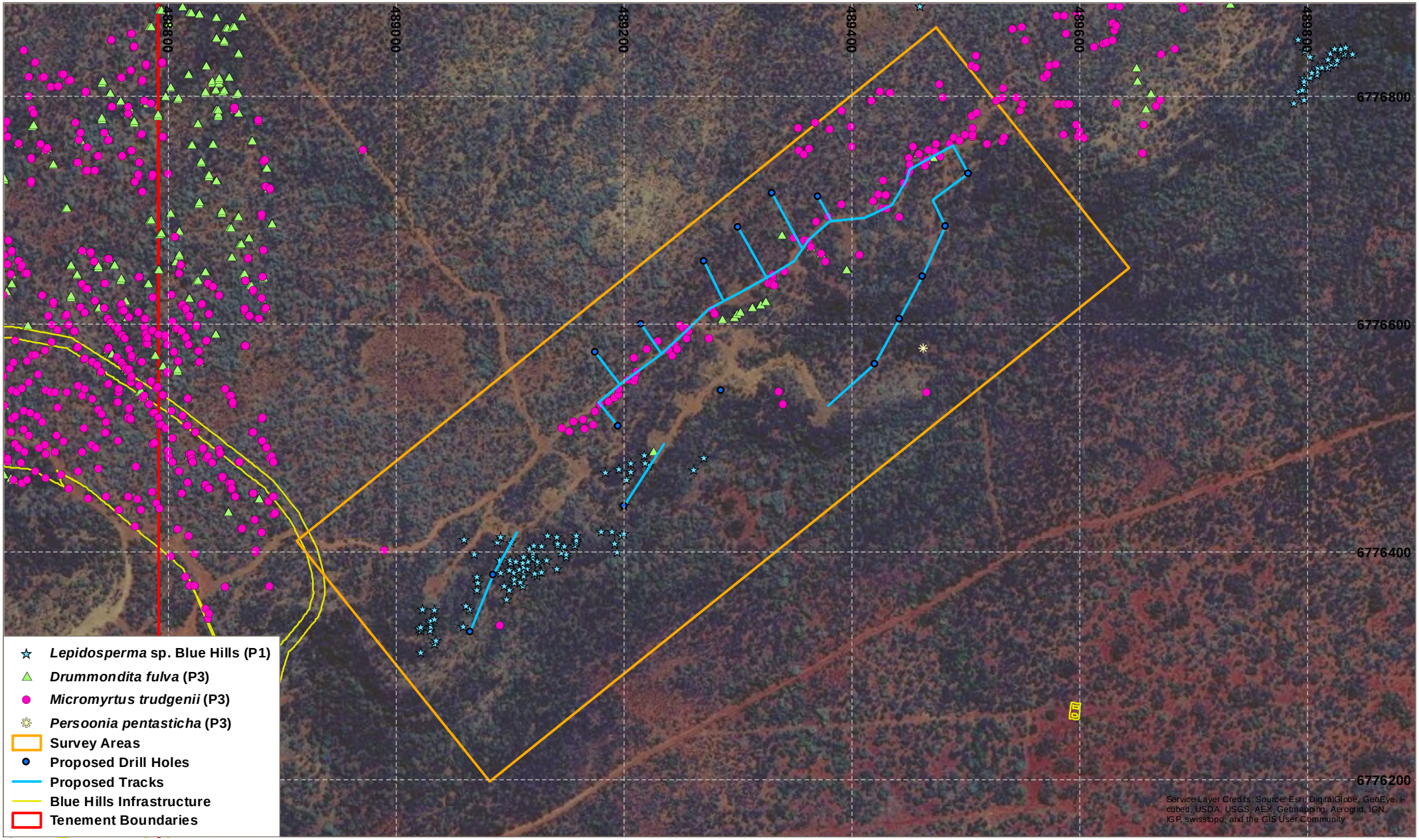

Previous Locations of All Other Conservation Significant Flora - Mungada East

N

0 0.075

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.6
Prepared for: SMC
Drawn by: RH
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Version: 1

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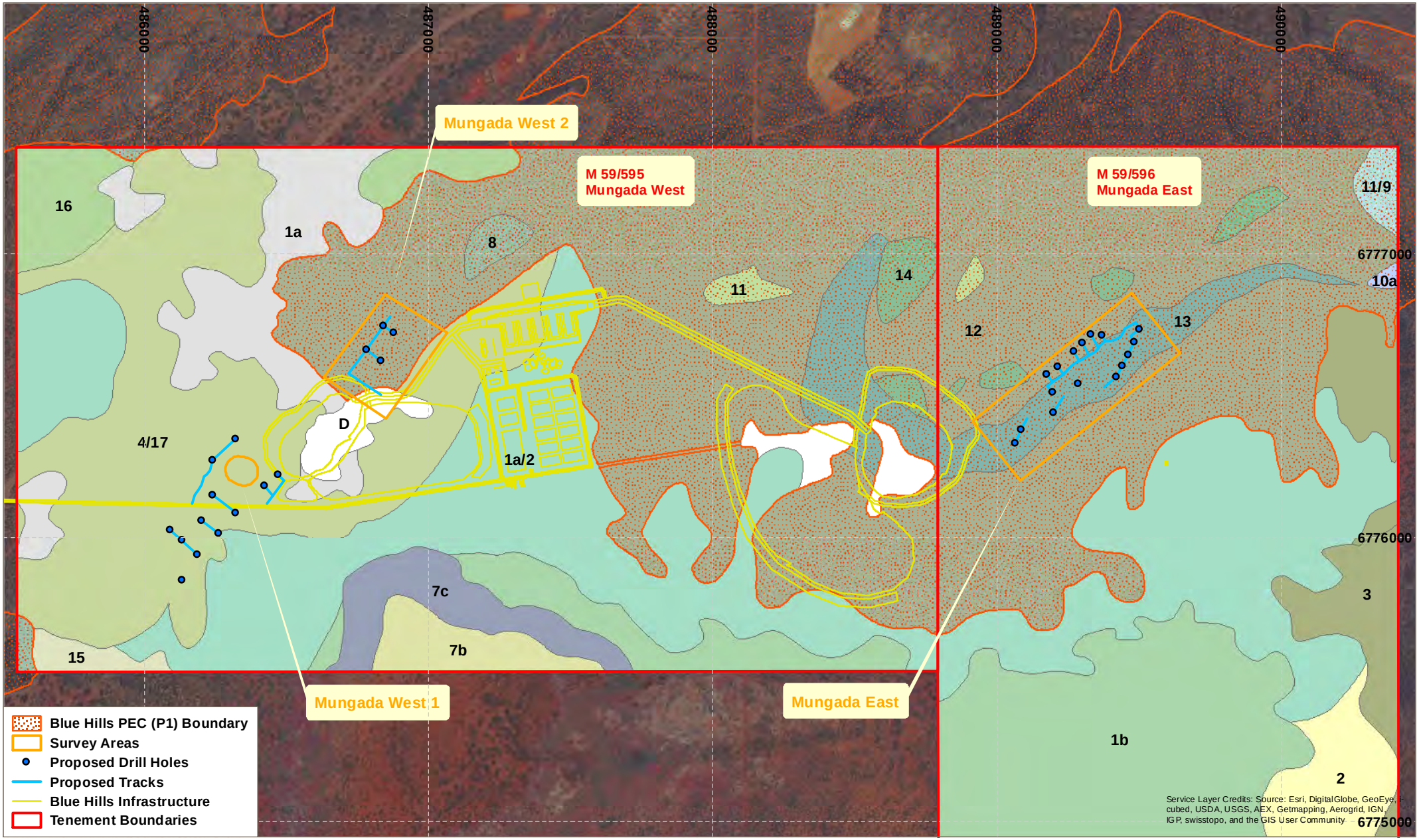

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

Blue Hills (P1)
Priority Ecological Community and Floristic Community Types (WEC, 2008)

maia

N

0 0.35
Kilometres

Datum: GDA 1994, MGA 50

Map: 9.7
Prepared for: SMC
Drawn by: RH
Date: 22/07/2014
Version: 1

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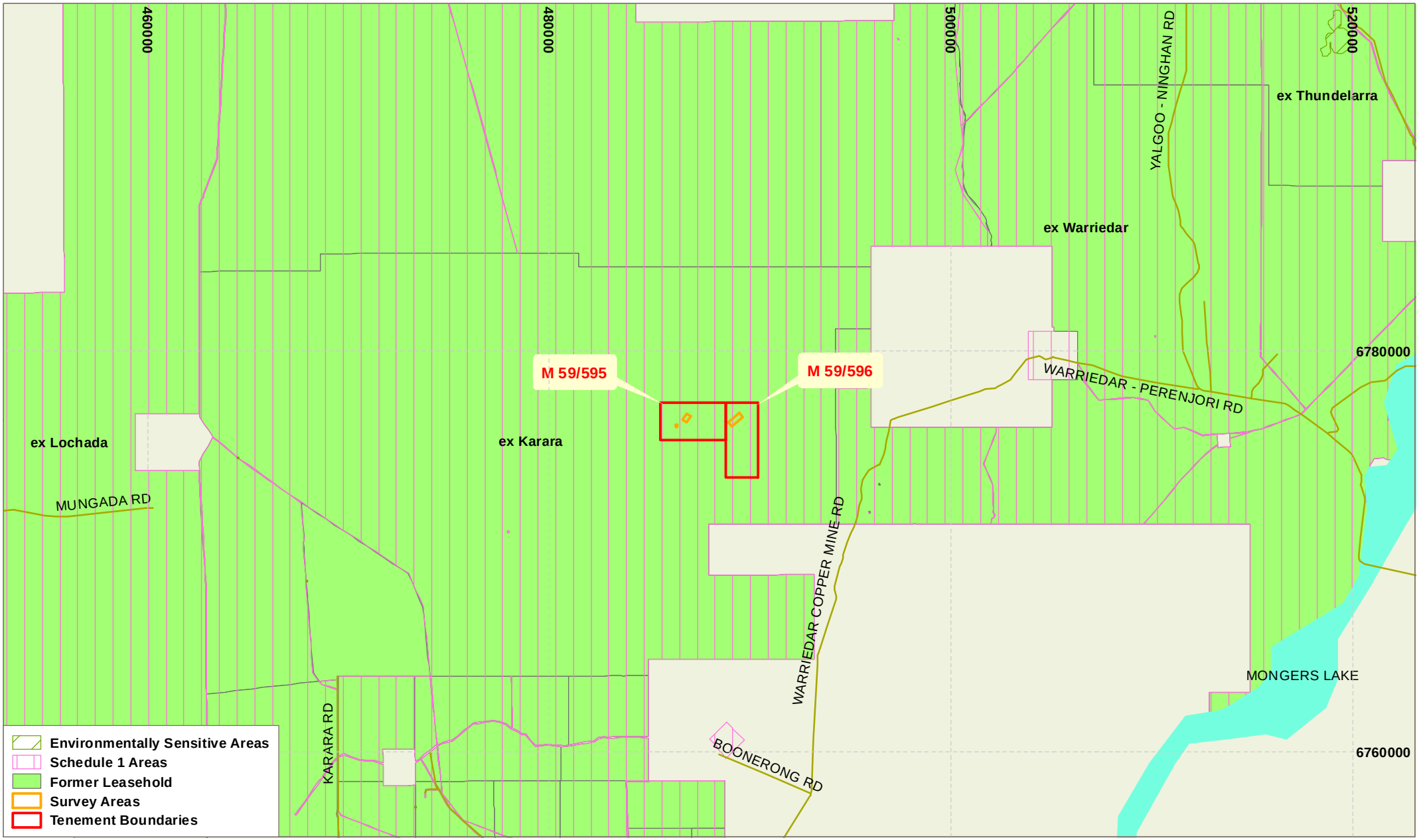

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Kalgoorlie
Perth

Major Roads
Waterbodies

Environmentally Sensitive Areas, DPaW Managed Lands and Schedule 1 Areas

maia

N

0 5
Kilometres

Datum: GDA 1994, MGA 50

Map: 9.8
Prepared for: SMC
Drawn by: RH
Date: 30/06/2014
Version: 1

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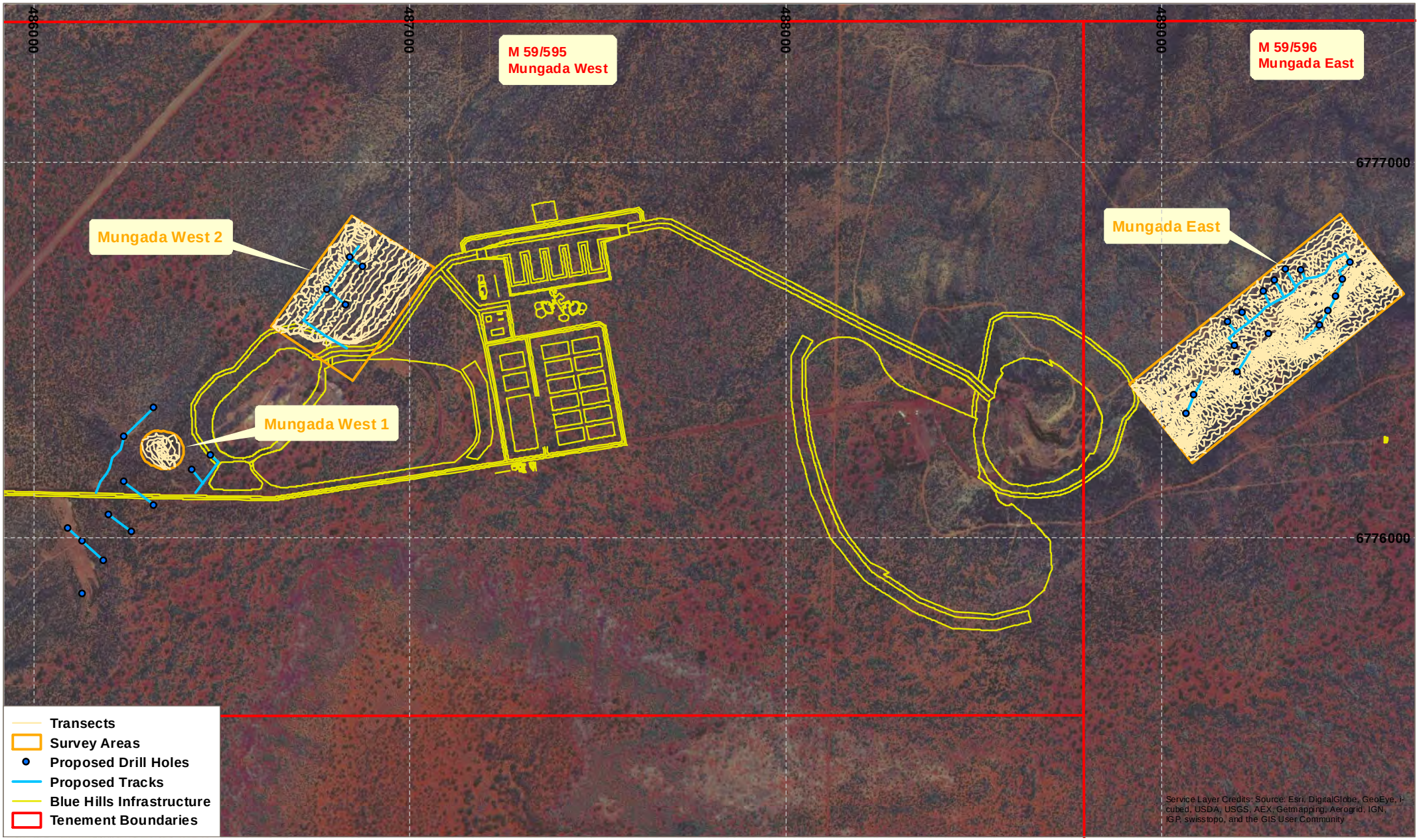

Location Map

Transects

maia

N

0 0.25

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.9
Prepared for: SMC
Drawn by: RH
Date: 2/07/2014
Version: 1

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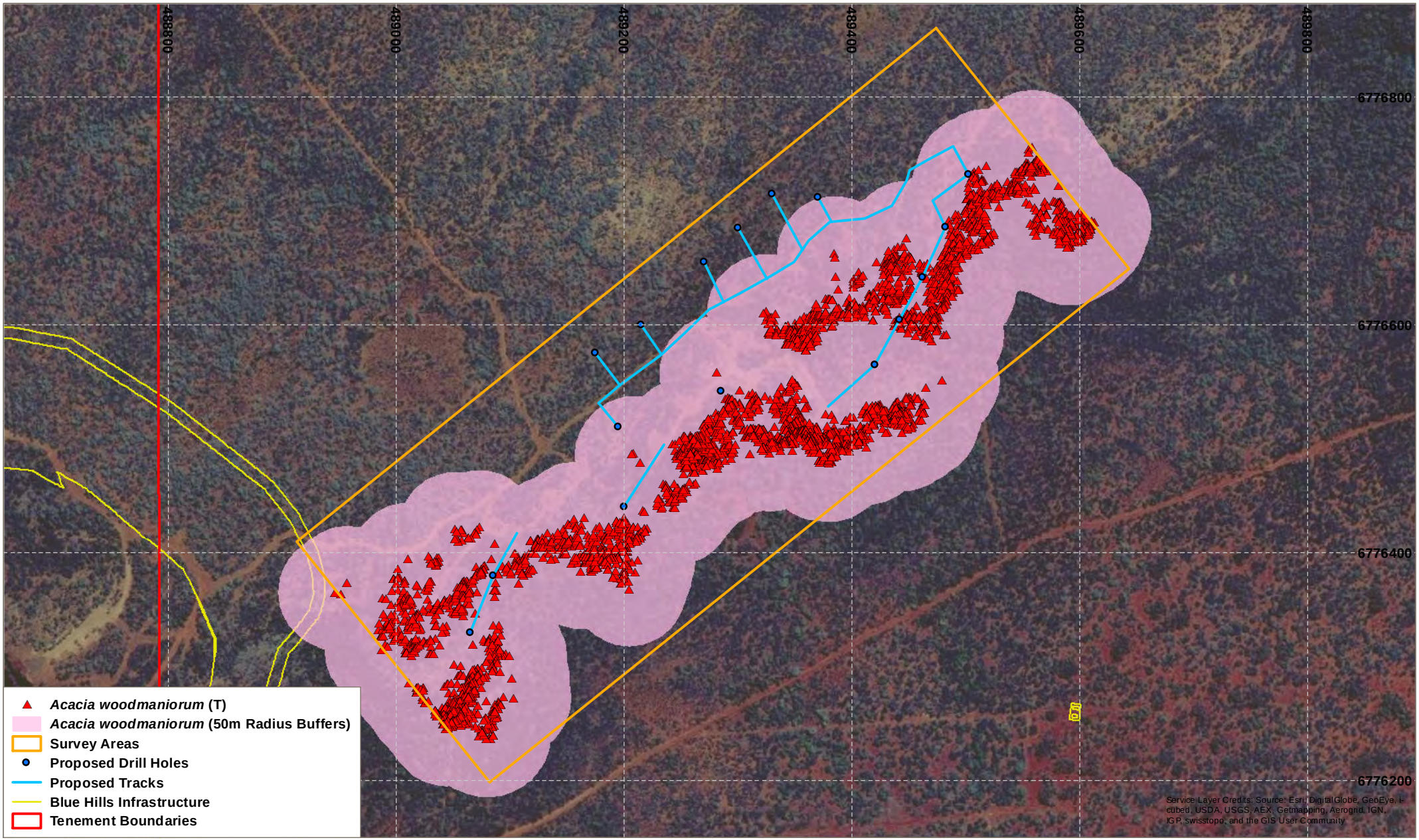

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

***Acacia woodmaniorum* (T)**
- Mungada East June 2014

maia

N

0 0.075
Kilometres

Datum: GDA 1994, MGA 50

Map: 9.10
Prepared for: SMC
Drawn by: RH
Date: 22/07/2014
Version: 1

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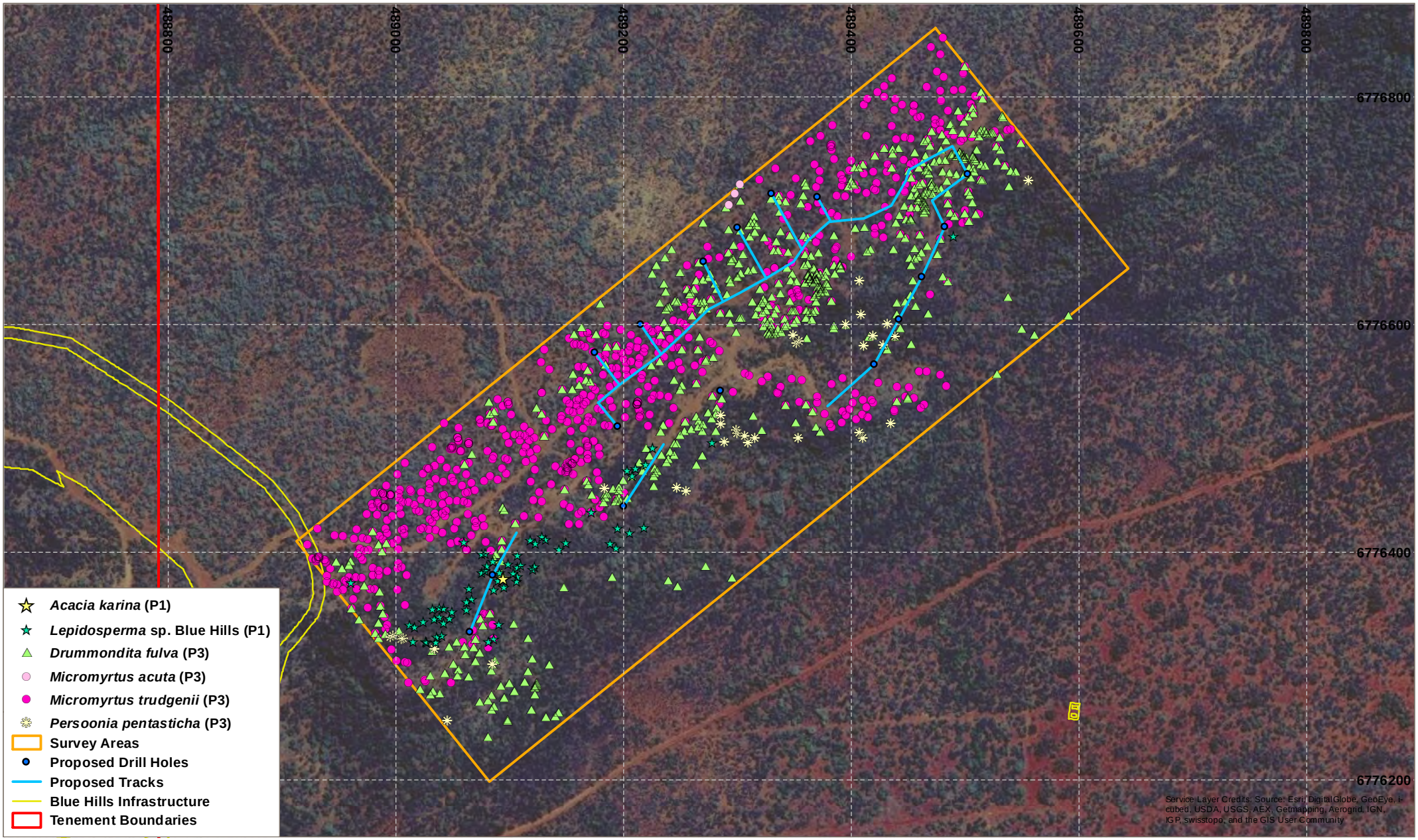

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

All Other Locations of Conservation Significant Flora - Mungada East June 2014

maia

N

0 0.075

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.11
Prepared for: SMC
Drawn by: RH
Date: 22/07/2014
Version: 1

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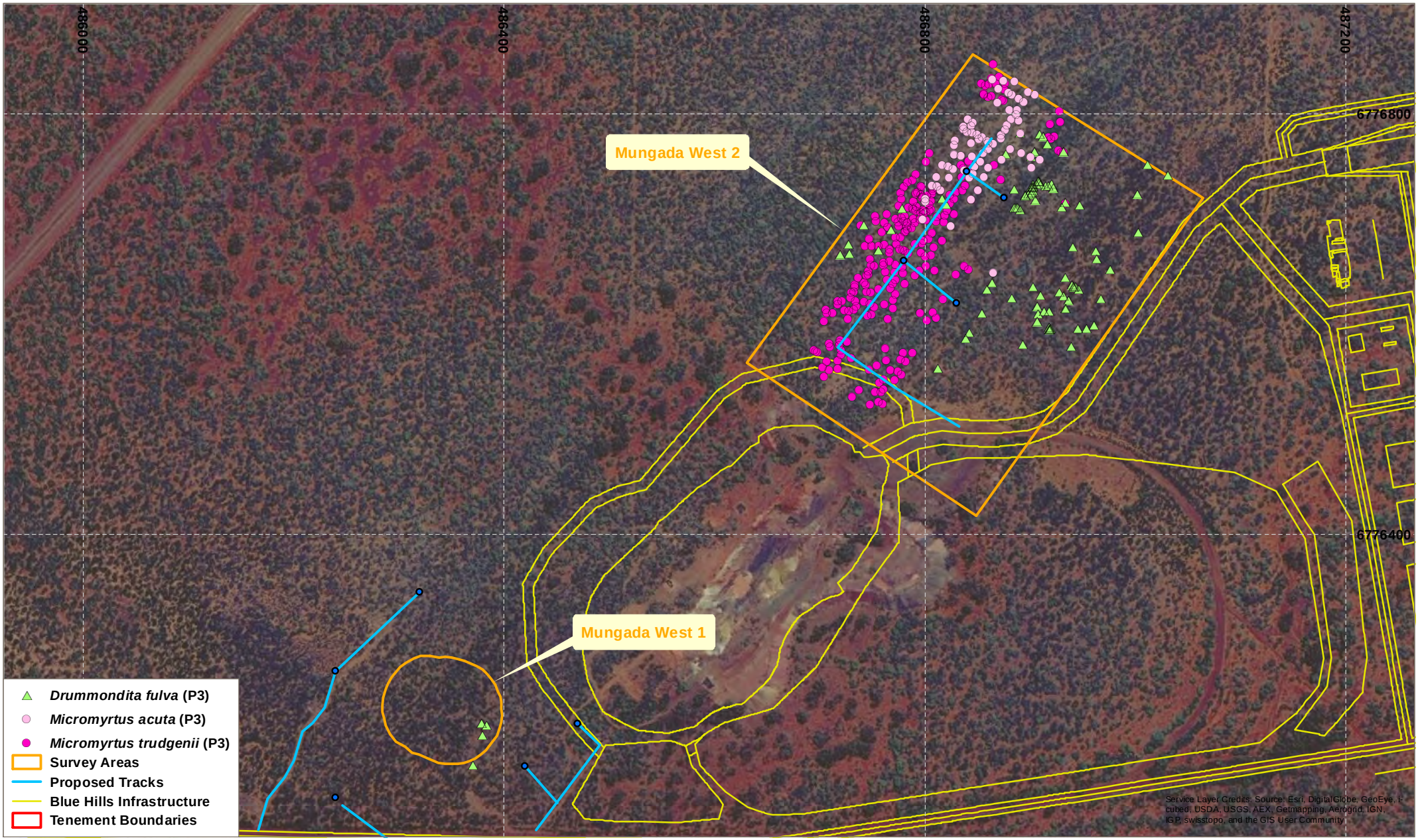

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

Conservation Significant Flora - Mungada West June 2014

maia

N

0 0.075

Kilometres

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Drawn by: RH
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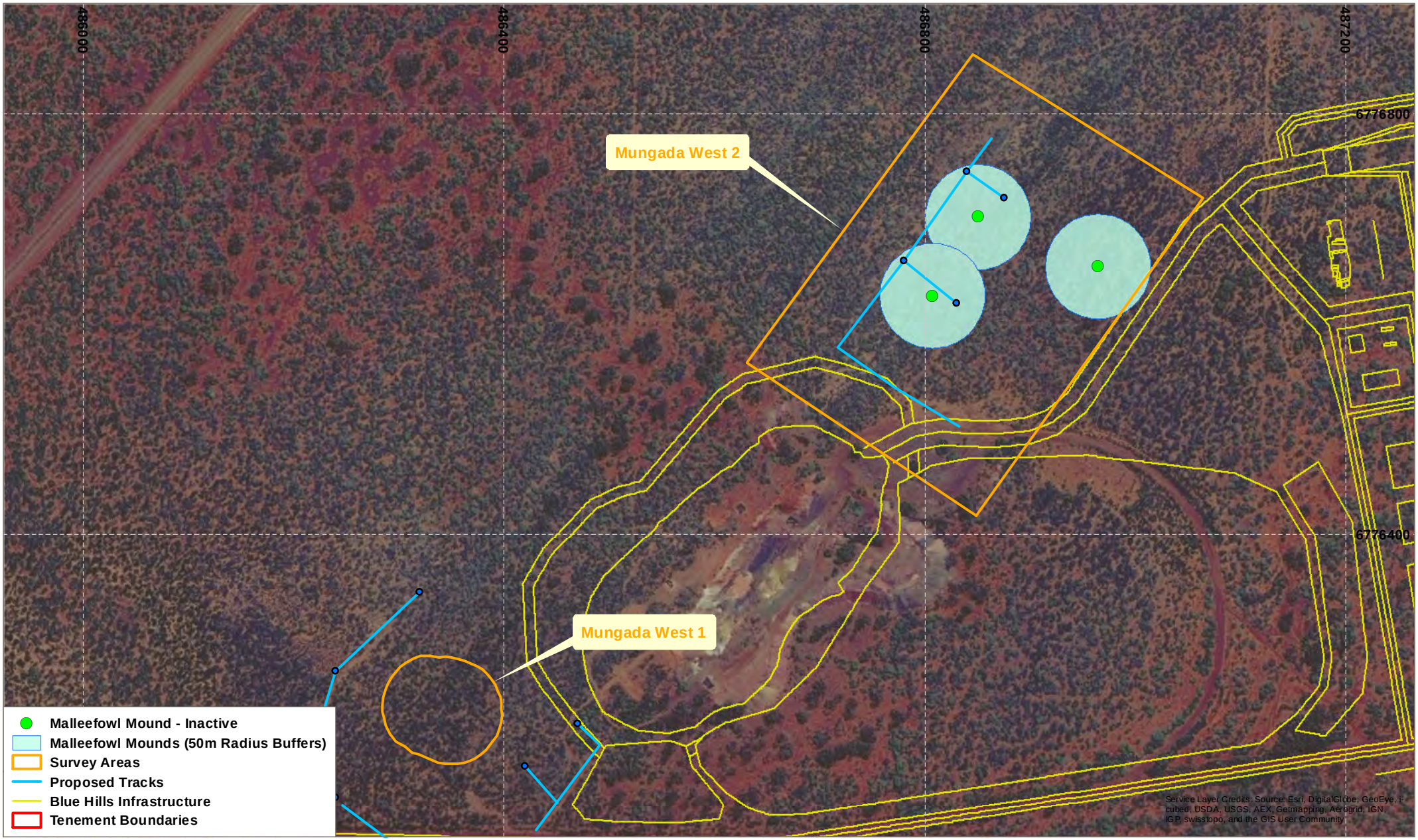

Location Map

***Leipoa ocellata* (Malleefowl -T)**
Nest Mounds - Mungada West

maia

N

0 0.075
Kilometres

Datum: GDA 1994, MGA 50

Map: 9.13
Prepared for: SMC
Drawn by: RH
Date: 2/07/2014
Version: 1

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APPENDIX 1: SEARCH RESULTS

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Table A1.1: Conservation significant flora species previously located in or in the vicinity of the Survey Area

Species	Rank	Flowering	Habitat	Recorded Locations (WAH, 1998-)	Possibility of Occurrence	Data Source
Hybanthus cymulosus	**T - EPBC Act Critically Endangered and WC Act Critically Endangered**	May to July	Clay, rocky loam clay. Small dry creekline with rocky red/brown loam over greenstone. Drainage line on slope to rocky hills, dolerite, banded ironstone. Loamy soil on plain.	Mount Gibson, Mount Singleton, Ninghan, Wubin.	Unlikely	EPBC Act
Dasymalla axillaris	**T - EPBC Act Critically Endangered and WC Act Critically Endangered**	July to December	Sandy soils. Plains.	North of Wubin, West of Bunjil, West of Mullewa-Wubin Road, Maya, Buntine, Caron Nature Reserve, South-South-East of Perenjori, Latham, Lake Moore, Pithara, Gnangara.	Unlikely	EPBC Act
Eremophila viscida	**T - EPBC Act Endangered and WC Act Endangered**	September to November	Granitic soils, sandy loam. Stony gullies, sandplains.	Trayning, North of Wongan Hills, Chiddarcooping Nature Reserve, Barnong Conservation Park, West of Mullewa – Wubin Road, Pindar, South-East of Pithara, Geelakin Rock, South of and Mukinbudin, West-North-West Bullfinch, North of and Westonia, West of Merredin, North-North-West of Latham, North-East of Carnamah, between Tardun and Wilroy, Baandee, Koorda, Kondut, Nungarin, Ballidu, Boodarockin, Kununoppin	Unlikely	EPBC Act
Acacia woodmaniorum	**T - WC Act Vulnerable**	July	Skeletal red silt, red-brown soil, banded ironstone, laterite. Slopes, sides of hills, crests of ridges, ranges, disturbed overburden of mine sites.	Mungada Ridge (Karara Station, Lochada Station), Jasper Hill, Windaning Hill (Blue Hills Range).	Possible (recorded during the current survey)	Ecologia (2007, 2008a), Maia (2011a, 2012a, 2012b, 2013), Markey & Dillon (2008), NM, WEC (2008)
Stylidium scintillans	**T - WC Act Vulnerable**	September to October	Granite outcrop, possibly on shalestone/ironstone outcrops.	Karara Station, Warriedar Station, Badja Station, Mungada Ridge, Golden Grove.	Possible	NM, WEC (2008)
Acacia diallaga	**P1**	September	Hillslopes, basalt outcropping.	Minjar Gold Mine, Mount Mulgine, Warriedar Station, Karara Station.	Unlikely	NM

Species	Rank	Flowering	Habitat	Recorded Locations (WAH, 1998-)	Possibility of Occurrence	Data Source
Acacia karina	**P1**	April, June	Red-brown silty clay loam with ironstone pebbles, banded ironstone, shalestone. Rocky slopes.	Mount Gibson, Karara Ridge, Mount Mulgine, Karara Station, Damperwah Hills, John Forrest Lookout, Warriedar Station, Mungada Ridge, Windaning Hill, Wylacoppin Hill, Mount Singleton.	Possible (recorded during the current survey)	Markey & Dillon (2008), NM, WEC (2008)
Acacia sulcaticaulis	**P1**	July, September	Slopes of brown clay loam over granite and quartz, greenstone. Rocky creekline.	Mount Mulgine, Warriedar Station.	Unlikely	NM
Allocasuarina tessellata	**P1**	April, August	Loam, sand. Greenstone & dolerite boulders.	Mt Gibson Station, Karara Station, Rothsay, Warriedar Station, Bundybunna Farm, Die Hardy Range, Ninghan Station, Mount Singleton.	Unlikely	NM
***Chamelaucium* sp. Warriedar (A.P. Brown & S. Patrick APB 1100)**	**P1**	July, September	Plain – red clay, slopes of brown clay loam over basalt, rocky hill with skeletal silty clay loam over granite/greenstone, dolerite hill slope.	Mount Mulgine, Warriedar Station, Karara Station, North-West of Paynes Find, North-East of Perenjori.	Unlikely	NM
***Chamelaucium* sp. Yalgoo (Y. Chadwick 1816)**	**P1**	August, September	Granite outcrops.	Yalgoo, South of Yalgoo, Wurarga.	Unlikely	NM, WEC (2008)
***Eremophila* sp. Rothsay (D. Coultas & J. Kelt s.n. PERTH 08200440)**	**P1**	October, November	Dolerite and basalt rises.	Karara Station	Unlikely	NM
Grevillea scabrida	**P1**	July	In gravelly soil, or loam, or clay; occupying ironstone gravelly plain, winter-wet areas.	Bullajungadeah Hills, Mt Gibson, Mungada, Minjar, Ninghan Station, Mount Singleton, Fields Find, Karara Station, Mount Mulgine, North of Wubin,	Possible	Ecologia (2007), NM, WEC (2008)
***Hydrocotyle* sp. Warriedar (P.G. Wilson 12267)**	**P1**	September	Red loam. Along creek embankment, rocky valley floor.	Warriedar-Coppermine Road, Yalgoo, Blue Hills, Mount Gibson Sanctuary, Warriedar Station.	Unlikely	NM
***Lepidosperma* sp. Blue Hills (A. Markey & S. Dillon 3468)**	**P1**	September	Breakaway, laterite and sandstone. Creek bank. Granite outcrop. Slope of laterised haematite and banded ironstone.	North Wanarra East Road, Perenjori, Warriedar Station, Charles Darwin Reserve, Mount Karara.	Possible (recorded during the current survey)	Ecologia (2008a), Maia (2011a, 2012a, 2012b, 2013), WEC (2008)
Millotia dimorpha	**P1**	September	Red loamy soils. Dolerite, haematite and banded ironstone slope.	Koolanooka Hills, Perenjori Hills, Karara Station, Mount Karara, Kadji Kadji,	Possible	Markey & Dillon (2008), NM, WEC (2008)
***Prostanthera* sp. Karara (D. Coultas & K. Greenacre Opp 8)**	**P1**	September	Low rise, red silty loam soils.	Karara Station	Unlikely	NM

Species	Rank	Flowering	Habitat	Recorded Locations (WAH, 1998-)	Possibility of Occurrence	Data Source
Calandrinia kalanniensis	**P2**	November to January	Shallow brown clay, often gritty, derived from eroded granite. Rocky outcrops, herb fields.	Hospital Rocks, Mungada, North-East of Mukinbudin, Yanneymooning Nature Reserve, Petrudor Rocks, Hughden Rock, Xantippe Rock.	Unlikely	NM, WEC (2008)
***Calandrinia* sp. Warriedar (F. Obbens 04/09)**	**P2**	September	Gentle slope. Red brown clay loam (shallow gritty with some lateritic stones). Granite basement rock.	South of Mt Warriedar, Warriedar Station, Karara Station.	Possible	NM
Austrostipa blackii	**P3**	September to November	Granite breakaway. Hillcrest of banded ironstone, haematite and sedimentary rocks. Seasonal creekline. Plain with brown loam. Basalt Hill.	Warriedar Hill, Kambalda Nature Reserve, Charles Darwin Reserve, Yandanoo Hills, Windaning Hill, Koolanooka Hills, Beverley Airfiels Reserve, Dalwallinu Town Reserve, Tutanning Nature Reserve, Widgiemooltha, Ennuin Station, Hunt Range, Jaurdi Station.	Possible	Markey & Dillon (2008), NM, WEC (2008)
***Calotis* sp. Perrinvale Station (R.J. Cranfield 7096)**	**P3**	August, September	Banded ironstone outcrop, slope and hillcrest. Granite slope.	Mount Richardson, Karara Station, Charles Darwin Reserve, Golden Grove, Gnows Nest Range, Badja Station (Blue Hills Range), Minjar Hill, Mount Karara, Jasper Hill, Windaning Hill, Perrinvale Station, Cue.	Possible	NM, Markey & Dillon (2008), WEC (2008)
Drummondita fulva	**P3**	September to October	Skeletal, shallow, acidic soils of orange-red or red-brown sandy loams and clayey silts. Footslopes, lower to upper slopes and hillcrests.	Windaning Hill, Oxiana Golden Grove, Badja Station, Minjar Hill, Warriedar Station, Jasper Hill, Lochada Station.	Possible (recorded during the current survey)	Maia (2011a, 2011b, 2012a, 2012b, 2013), Markey & Dillon (2008), NM, WEC (2008)
Grevillea globosa	**P3**	January, June and November	Red loam, yellow sand.	Badja Station, Damperwah Hills, Fields Find, Mungada, Mt Karara, Golden Grove, Gossan Hill, Wuraga Road, Yuin, South-West of Paynes Find, Pindar, South-West of Yalgoo.	Unlikely	Ecologia (2007), NM, WEC (2008)
Grevillea subtiliflora	**P3**	April and July to September	Red-brown loam. Bouldery slope. Valley floor. Brown loam over dolerite slope. Undulating plain with red clay loam.	Warriedar Station, Minjar, Mount Singleton, Mount Gibson Station, South-West of Paynes Find, North of Wubin, Paynes Find.	Unlikely	NM, WEC (2008)

Species	Rank	Flowering	Habitat	Recorded Locations (WAH, 1998-)	Possibility of Occurrence	Data Source
Gunniopsis divisa	**P3**	August	Banded ironstone slopes, laterite, loam, quartz. Roadsides.	Mount Barloweerie, Wooleen Station, South of Murchsison River (Mullewa-Murchison Settlement Road), Mungada, Jack Hills, Mount Karara, Woolgorong Station, Murgoo Station, Meeberrie.	Possible	Markey & Dillon (2008), NM, WEC (2008)
Micromyrtus acuta	**P3**	July to October	Grey-tan silty fine to coarse sand, laterite, granite. Rock outcrops. Ironstone and banded ironstone hillslopes.	Mount Mulgine, Pinyalling Hill, Damperwah Hills, Warriedar Station, Jasper Hill, Windaning Hill, Lake Monger Lookout, White Wells Station, South-West of Paynes Find.	Possible (recorded during the current survey)	Ecologia (2007, 2008a), Maia (2011a, 2012b, 2013), Markey & Dillon (2008), NM, WEC (2008)
Micromyrtus trudgenii	**P3**	June to October	Red-brown loamy clay, yellow-brown soils, gravel, siltstone, quartz, basalt, banded ironstone, dolerite. Tops and slopes of hills and ridges.	Karara Station, Mt Mulgine, St Patricks, Arsenic Hill, Mungada, Badja Station, Minjar Hill, Warreidar Station, Jasper Hill, Golden Grove, Gossan Hill, West of Paynes Find.	Possible (recorded during the current survey)	Ecologia (2007, 2008a, 2008b), Maia (2011a, 2011b, 2012a, 2012b, 2013), Markey & Dillon (2008), NM, WEC (2008)
Persoonia pentasticha	**P3**	August to November	Sand, loam. Base of granite outcrops. Rocky slopes of haematite and laterite. Drainage line. Hillslope of banded ironstone and laterite.	Morawa, Charles Darwin Reserve, Barrabarra Nature Reserve, Mt Gibson, Damperwah Hills, Mugga Mugga Hill, Mungada, Badja Station, Koolanooka Hills, Extension Hill, Warriedar Station, Minjar, East Yuna Reserve, West Perenjori Nature Reserve, Pindar, Morawa, North of Wubin.	Possible (recorded during the current survey)	Bennett (2004), Ecologia (2007, 2008a), Maia (2011a, 2011b, 2012a), Markey & Dillon (2008), NM, WEC (2008)
Polianthion collinum	**P3**	May to July	Red clay loam between blocks of banded ironstone. Low hills and slopes.	Warriedar Station, Arsenic Hill, Mungada, Windaning Hill, Karara Station, Gossan Hill.	Possible	Markey & Dillon (2008), NM, WEC (2008)
Psammomoya implexa	**P3**	August to October	Stony rises. Banded ironstone and laterite slope.	Charles Darwin Reserve, Karara Station, Jasper Hill, Mullewa, Pintharuka, Lake Mollerin Nature Reserve, Gabyon Station, Ninghan, Wilroy.	Possible	Ecologia (2007), Markey & Dillon (2008), NM
Rhodanthe collina	**P3**	August to October	Loam. Rocky hills. Banded ironstone slopes, haematite, quartz, laterite.	Mungada, Koolanooka Hills, Blue Hills Range, Yandanoo Hills, Jasper Hill, Windaning Hill, Warriedar Station, Mongers Lake, Mount Gibson, Mingenew Hill.	Possible	Markey & Dillon (2008), NM, WEC (2008)

Species	Rank	Flowering	Habitat	Recorded Locations (WAH, 1998-)	Possibility of Occurrence	Data Source
Stenanthemum poicilum	**P3**	May to June and September to November	Red clay or sandy clay, loam. Yellow sandy loam flat. Creekline. Slope of basalt. Banded ironstone and chert outcrop. Haematite.	Rothsay, Charles Darwin Reserve, Mount Mulgine, Canna Reserve, Warriedar Station, Perenjori Hills, Koolanooka Hills, White Wells Station. Jasper Hill. Wilroy Reserve.	Possible	Bennett (2004), NM, WEC (2008)

Note: EPBC Act = EPBC Act Protected Matters Search Tool (DoE, 2014a), NM = NatureMap search (DEC, 2007 -); T = Threatened Flora species, P1-P3 = Priority 1 to Priority 3 species.

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APPENDIX 2: CONSERVATION SIGNIFICANCE – FLORA AND ECOLOGICAL COMMUNITIES

Commonwealth *Environment Protection and Biodiversity Act* 1999

Table A2.1: Categories and definitions for Rare Flora

Category	Definition
Extinct*	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	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 only known to survive in cultivation, in captivity or as a naturalized 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	A native species is eligible to be included in the critically endangered category 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	A native species is eligible to be included in the endangered category 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	A native species is eligible to be included in the vulnerable category 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*	A native species is eligible to be included in the conservation dependent category 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.
*Note: Species listed as 'conservation dependent' and 'extinct' are not matters of national environmental significance and therefore do not trigger the EPBC Act.	

Source: DoE (2014b).

Western Australian *Wildlife Conservation Act* 1950

Table A2.2: Conservation codes for Western Australian flora and fauna

Department of Parks and Wildlife

CONSERVATION CODES

for Western Australian Flora and Fauna

T: **Threatened species** - Specially protected under the *Wildlife Conservation Act 1950,* listed under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Species* 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.

X: **Presumed extinct species** - Specially protected under the *Wildlife Conservation Act 1950,* listed under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora).

Species* which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.

IA: **Migratory birds protected under an international agreement** - Specially protected under the *Wildlife Conservation Act 1950,* listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Birds that are subject to an agreement between governments of Australia and Japan, China and The Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.

S: **Other specially protected fauna** - Specially protected under the *Wildlife Conservation Act 1950,* listed under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Threatened Fauna and Flora are further recognised by the Department according to their level of threat using IUCN Red List criteria. For example Carnaby's Cockatoo *Calyptorynchus latirostris* is specially protected under the *Wildlife Conservation Act 1950* as a threatened species with a ranking of endangered.

Ranking:

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.

A list of the current rankings can be downloaded from the Listing of species and ecological communities webpage http://dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/84-listing-of-species-and-ecological-communities .

Source: DPaW (2014a).

Table A2.3: Categories and definitions for Priority Flora

Species that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna Lists 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.

1: Priority One: Poorly-known species

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, rail reserves 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.

2: Priority Two: Poorly-known species

Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, unallocated 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.

3: Priority Three: Poorly-known species

Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. 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.

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

(a) 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.
(b) 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.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5: Priority Five: Conservation Dependent species

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

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies, variety or forma).

Source: DPaW (2014a).

Table A2.4: Categories, definitions and criteria for Threatened Ecological Communities (TECs)

Category	Definition and Criteria
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. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats; or B) All occurrences recorded within the last 50 years have since been destroyed.
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. 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. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C): A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii): • (i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); • (ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): • (i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); • (ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; • (iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Category	Definition and Criteria
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. 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. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B, or C): A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): • (i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); • (ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): • (i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); • (ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; • (iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
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. 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. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B or C): A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

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

Table A2.5: Categories, definitions and criteria for Priority Ecological Communities (PECs)

Category	Definition and Criteria
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
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 within 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 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.

Category	Definition and Criteria
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.	(a) 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. (b) 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. (c) 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.

Source for Table A2.4 and Table A2.5: DEC (2010).

APPENDIX 3: DECLARED PLANT PEST CATEGORIES AND CONTROLS

Table A3.1: Categories and controls for Declared Pests

Category	Controls
C1 Category (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 Category (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 Category (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Source: DAFWA (2014a).

APPENDIX 4: FLORA TAXA RECORDED

Table A4.1: Vascular flora list

Family	Taxa	ME	MW2
Aizoaceae	***Mesembryanthemum nodiflorum***		•
Amaranthaceae	*Ptilotus obovatus* var. *obovatus*	•	•
Apiaceae	*Xanthosia kochii*	•	
Apocynaceae	*Alyxia buxifolia*	•	
Apocynaceae	*Rhyncharrhena linearis*	•	
Araliaceae	*Trachymene ornata*	•	•
Asparagaceae	*Arthropodium dyeri*	•	•
Asparagaceae	*Thysanotus manglesianus*	•	•
Asteraceae	*Lemooria burkittii*	•	
Boryaceae	*Borya sphaerocephala*		•
Casuarinaceae	*Allocasuarina acutivalvis* subsp. *prinsepiana*	•	
Chenopodiaceae	*Enchylaena tomentosa*		•
Colchicaceae	*Wurmbea densiflora*		•
Convolvulaceae	***Cuscuta epithymum***	•	
Cyperaceae	***Lepidosperma* sp. Blue Hills (A. Markey & S. Dillon 3468) (P1)**	•	
Dilleniaceae	*Hibbertia arcuata*	•	•
Dioscoreaceae	*Dioscorea hastifolia*	•	
Droseraceae	*Drosera macrantha*	•	•
Ericaceae	*Astroloma serratifolium*	•	•
Ericaceae	*Leucopogon* sp. Clyde Hill (M.A. Burgman 1207)	•	•
Euphorbiaceae	*Calycopeplus paucifolius*	•	•
Fabaceae	*Acacia aneura*	•	
Fabaceae	*Acacia assimilis subsp. assimilis*	•	•
Fabaceae	*Acacia effusifolia*	•	•
Fabaceae	*Acacia exocarpoides*	•	•
Fabaceae	***Acacia karina* (P1)**	•	
Fabaceae	*Acacia ramulosa* var. *ramulosa*	•	•
Fabaceae	*Acacia sibina*	•	•
Fabaceae	*Acacia tetragonophylla*	•	•
Fabaceae	***Acacia woodmaniorum* (T)**	•	
Fabaceae	*Daviesia hakeoides* subsp. *hakeoides*	•	
Fabaceae	*Gastrolobium laytonii*	•	
Fabaceae	*Mirbelia bursarioides*	•	•
Fabaceae	*Senna artemisioides* subsp. *petiolaris*	•	
Geraniaceae	*Erodium cygnorum*	•	•
Goodeniaceae	*Scaevola spinescens*	•	•
Hemerocallidaceae	*Dianella revoluta* var. *divaricata*	•	•
Lamiaceae	*Hemigenia botryphylla*	•	
Lamiaceae	*Prostanthera patens*	•	
Loranthaceae	*Amyema preissii*	•	
Malvaceae	*Brachychiton gregorii*		•
Malvaceae	*Keraudrenia velutina* subsp. *velutina*		•

Family	Taxa	ME	MW2
Myrtaceae	*Aluta aspera* subsp. *hesperia*	•	•
Myrtaceae	*Eucalyptus leptopoda* subsp. *arctata*	•	
Myrtaceae	*Melaleuca leiocarpa*		•
Myrtaceae	*Melaleuca nematophylla*	•	•
Myrtaceae	*Melaleuca radula*		•
Myrtaceae	***Micromyrtus acuta* (P3)**	•	•
Myrtaceae	***Micromyrtus trudgenii* (P3)**	•	•
Myrtaceae	*Thryptomene costata*	•	•
Poaceae	*Enneapogon caerulescens*	•	•
Poaceae	*Eriachne pulchella* subsp. *dominii*	•	
Poaceae	*Monachather paradoxus*	•	•
Poaceae	*Rytidosperma acerosum*	•	
Proteaceae	*Grevillea berryana*	•	
Proteaceae	*Grevillea obliquistigma* subsp. *obliquistigma*	•	
Proteaceae	*Hakea recurva* subsp. *recurva*	•	•
Proteaceae	***Persoonia pentasticha* (P3)**		•
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*	•	•
Rutaceae	***Drummondita fulva* (P3)**	•	•
Rutaceae	*Philotheca brucei* subsp. *brucei*	•	•
Rutaceae	*Philotheca deserti* subsp. *deserti*		•
Rutaceae	*Philotheca sericea*	•	•
Sapindaceae	*Dodonaea inaequifolia*	•	
Sapindaceae	*Dodonaea viscosa* subsp. *spatulata*	•	
Scrophulariaceae	*Eremophila clarkei*	•	•
Scrophulariaceae	*Eremophila latrobei* subsp. *latrobei*	•	•
Solanaceae	*Solanum cleistogamum*	•	•
Solanaceae	*Solanum lasiophyllum*	•	•
Solanaceae	*Solanum nummularium*	•	

Note: ME = Mungada East Survey Area, MW2 = Mungada West 2 Survey Area. T = Threatened Flora, P1-P3 = Priority 1 to Priority 3, * = environmental weed. Nomenclature based on current WA Herbarium terminology and confirmed on FloraBase (WAH, 1998 -).