

DECEMBER 2010



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**SINOSTEEL MIDWEST CORPORATION LTD.
FLORISTIC DATA ADDENDUM IN REPOSE TO DEC COMMENTS
WELD RANGE PER**

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**SINOSTEEL MIDWEST CORPORATION
WELD RANGE PER
RESPONSES TO COMMENTS BY DEC**

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ACRONYMS

List all acronyms used in the report here. Format alphabetically as follows:

DEC Department of Environment and Conservation

EPA Environmental Protection Authority

EPBC *Environment Protection and Biodiversity Conservation Act 1950*

BACKGROUND

The following addendum is in response to queries raised by the Department of Environment and Conservation (DEC) in response to the Weld Range PER, released for public comment on September 2010.

Queries and recommendations are indicated in [blue](#) at the commencement of each section.

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1 IMPACTS TO PRIORITY FLORA

Issue: The project will require the clearing of approximately 4,074 hectares of native vegetation, and will directly impact on 22 priority listed flora species including, five priority 1, 14 priority 3 and three priority 4 taxa.

Recommendation 1: That the proponent provides adequate information to enable DEC to make determinations on whether direct and indirect impacts from the proposal on conservation significant flora, could lead to changes in their threat status under World Conservation Union (IUCN) categories.

Recommendation 2: That following the provision of the information requested in Recommendation 1, DEC be given an opportunity to provide further advice on impacts on flora of conservation significance.

Discussion

Of the 27 priority listed flora species identified in the project 'Study Area', 22 will be directly impacted by the proposed development (i.e. Option 1). The effect of the mining proposal on the conservation status of these species has not been evaluated in the context of flora conservation principles, which are set out in the Strategic Review. Under Key Principle (i) it is suggested that no development activity should "...proceed in the Yilgarn Craton BIFs that would result in the IUCN Threat Category of any given plant or animal taxon increasing i.e. initially not being listed as threatened under any category being listed (the three IUCN categories for threatened species being Vulnerable, Endangered and Critically Endangered), or increasing from Vulnerable to Endangered, or from Endangered to Critically Endangered".

While the PER provides impact percentages (direct only) for the 22 priority listed species impacted by the proposal, these percentages are for the total known population, with local or project level impacts not provided. It is important that further details (including project level information) be provided to facilitate DEC's determination of possible threat status changes to these flora.

The PER does not properly present and discuss the potential impacts on priority listed flora within the Weld Range context. Given the large number of priority listed flora that occur within the project area (27) and the high predicted impacts on many of these species, offsets should be applied. Further detailed advice on this aspect can be provided on request.

1.1 CHANGE TO IUCN CATEGORISATION

According to the DEC's guidelines to the nomination of Western Australian floristic taxa, (DEC, 2010) classification under the IUCN categories is limited to those taxa scheduled as Declared Rare Flora (DRF) under the Western Australian *Wildlife Conservation Act 1950*. As there are no taxa currently listed as DRF recorded within the SMC Weld Range study area (Study Area), there are not taxa listed under IUCN categories at present and the proposal will not result in a change of IUCN status to any taxa unless the impact is sufficiently great that the DRF criteria becomes applicable.. DRF taxa are defined as "taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee."

On the basis of the information presented below, it is considered unlikely that any of the taxa recorded are likely to be elevated to DRF status due to reduced viability of the species as a result of the proposed impacts.

1.2 REGIONAL VIABILITY BASED ON REVISED IMPACT ESTIMATES

1.2.1 Estimation of plant numbers

The impact of the final impact footprint (termed “BFS Option 1 in the PER) to each taxon was calculated as a percentage of the total number of loci (defined as clusters of plants within 500 metre of each other) and the total number of plants. As previously noted in the PER, the proportion of plants impacted is approximate and likely to be an overestimate, as many records within the DEC database do not detail plant numbers. In some instances qualitative measures of abundance such as “frequent”, “uncommon” are included however in many instances there is no information regarding abundance. Table 1-1 details the assumptions of plant number made in instances where qualitative or no information was available. These assumptions, whilst necessary to achieve any quantification of impacts to plant numbers, result in an overestimation of impact, as the majority of records inside the Study Area have been accurately counted, whilst the majority of records outside have not, and in many instances have defaulted to an estimate of one plant/location.

Table 1-1 – Number of Plants Assumed for Records Where Only Descriptions or % Cover Available

Abundance Description or Percentage Cover	No. of Plants Assumed
no indication	1
very rare	1
several	3
infrequent, uncommon, scarce, one small group, a few scattered	5
occasional, moderately common, locally frequent, very localised	10
common here, locally common, locally frequent, locally abundant	20
frequent, common, plentiful, abundant, dominant	50
>2% cover	5
2-10% cover	10
10-30% cover	20

1.2.2 Revision to plant numbers for some taxa

Subsequent to publication of the Weld Range PER, further floristic surveys within the proposed Oakajee Port and Rail (OPR) corridor have resulted in additional records of some Priority Flora. As a result the percent impact to total plant numbers has been revised downwards, as detailed in Table 1.2.

1.2.3 Assessment of regional impact

The viability of each taxon has been assessed based on its regional distribution, representation in the conservation estate, and abundance at each location outside the area of impact. On this basis it was considered that the viability of three taxa:

- *Beyeria lapidicola* (P1);
- *Micromyrtus placoides* (P3); and
- *Tecticornia cymbiformis* (P3)

could potentially have reduced viability, although not sufficient to result in their extinction. It is considered unlikely that potential reduction would be sufficient to justify their inclusion of the list of scheduled (DRF) or IUCN listed taxa. Table 1.2 summarised the assessment for each taxon impacted. Figures 1.1 to 1.21 indicate the regional distribution of each taxon.

Table 1.2 – Assessment of Local impact to Priority Flora in the SMC Weld Range Study Area based on revised data

Taxon	Total No Locations separated by >500 m	Estimated Total No. Plants	Impact BFS Option 1 (PER)				*Revised impact BFS Option 1				Distribution and likely impact of proposed infrastructure on species viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	Total No Loci separated by >500 m	% Total	Est. Total No. Plants	% Total	
<i>Beyeria lapidicola</i> (P1)	12	80	5	41.7	19	23.8	Unchanged				Disjunct loci of occurrence at Weld Range, Wiluna West Range and Ida Valley (Figure 1.1). Several records are located within the Ida Valley, Mt Forrest Conservation Park. The majority of records have been recorded on BIF ranges, and it is likely to be regionally restricted to this habitat. The abundance of most records outside the Study Area is unknown or qualitative and hence impact to the total number of plants is likely to have been significantly overestimated. The proposal could lead to a contraction of the known range of this species if the population at Weld range became unviable.
<i>Eremophila rhegos</i> (P1)	3	58	1	33.3	3	5.2	0	0	0	0	The population recorded within the impact area in 1995 could not be relocated in 2010 despite extensive searching and the availability of accurate coordinates and location details for the original record. It is considered very unlikely to be still present within the area of impact.
<i>Euphorbia sarcostemmoides</i> (P1)	11	45	0	0	0	0	0	0.0	0	0.0	Not impacted

Taxon	Total No Locations separated by >500 m	Estimated Total No. Plants	Impact BFS Option 1 (PER)				*Revised impact BFS Option 1				Distribution and likely impact of proposed infrastructure on species viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	Total No Loci separated by >500 m	% Total	Est. Total No. Plants	% Total	
<i>Goodenia lyrata</i> (P1)	10	35	2	20	15	42.8	Unchanged				A very widely distributed species, recorded in the Pilbara, Murchison and Goldfields (Figure 1.2). One record within the Pilbara occurs in Karinjini National Park. Most records do not indicate abundance, hence the current estimate of impact to total plant numbers is likely to be a very significant overestimate. The broad distribution of this taxon means that its viability is unlikely to be threatened by the proposed infrastructure despite the apparently high level of impact. Note that the estimate of impact has been reduced from 71% (reported in PER) to 42% as a result of data correction (previous double-counting of one record which occurs in both the pit and haul road).
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94) (P1)	17	90	1	10	1	1.6	1	5.9	1	1.1	Recorded at multiple locations to the north of the Study Area within the Murchison bioregion, isolated records also present within Yalgoo bioregion. One record at the boundary of proposed conservation estate at Twin Peaks. Given the moderately broad distribution (Figure 1.3), the viability of the taxon is unlikely to be threatened by the minor impact of the proposed infrastructure.
<i>Stenanthemum patens</i> (P1)	8	186	1	12.5	20	10.8	Unchanged				Widespread but disjunct populations recorded within the Murchison in a range of habitats. Given the broad distribution (Figure 1.4) the viability of the taxon is unlikely to be threatened by the proposed infrastructure.
<i>Acacia burrowsiana</i> (P3)	14	4354	1	7.1	9	0.2	Unchanged				Widespread but disjunct populations recorded within the Murchison in a range of habitats including a large population within the Lorna Glen Conservation Park and a population within the proposed Lake Mason conservation estate. Given the broad distribution (Figure 1.5) and protected status of some plants the viability of the taxon is unlikely to be threatened by the proposed infrastructure.

Taxon	Total No Locations separated by >500 m	Estimated Total No. Plants	Impact BFS Option 1 (PER)				*Revised impact BFS Option 1				Distribution and likely impact of proposed infrastructure on species viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	Total No Loci separated by >500 m	% Total	Est. Total No. Plants	% Total	
<i>Acacia speckii</i> (P3)	107	1146	18	18.6	200	18.2	18	16.8	200	17.5	Widespread and abundant at many locations in the Murchison, and Yalgoo bioregions (Figure 1.6), with one location within the Gascoyne. Several records within proposed Barnong Conservation Estate. Recent surveys in the OPR rail corridor suggest that this species is widespread and abundant at some locations. The viability of the taxon is unlikely to be threatened by the proposed infrastructure.
<i>Calytrix erosipetala</i> (P3)	36	2058	1	2.9	20	1	Unchanged				Very widespread in the Murchison (Figure 1.7) including one record in the proposed Black Range conservation estate. The impact to this species is very minor and unlikely to threaten its viability.
<i>Dodonaea amplisemina</i>	69	853	12	17.9	183	23.2	12	17.4	183	21.5	Widespread in the Murchison and Yalgoo bioregions with one population in the Gascoyne (Figure 1.8). The abundance of plants at many populations outside the Study Area is unknown and the % impact to total plants is likely to be significantly overestimated. Records within proposed conservation estates at Doolgunna and Barnong. The viability of the taxon is unlikely to be threatened by the proposed infrastructure.
<i>Eremophila arachnoides</i> <i>Chinnock subsp.</i> <i>Arachnoids</i> (P3)	12	225	1	9.1	20	9.8	1	8.3	20	8.9	Moderately widespread in the Murchison, with disjunct populations also recorded in the Little Sandy Desert and Geraldton Sandplains bioregions (Figure 1.9). "Common" at many locations regionally but not counted, so the % plants impacted may be significantly overestimated. The viability of the taxon is unlikely to be threatened by the proposed infrastructure.

Taxon	Total No Locations separated by >500 m	Estimated Total No. Plants	Impact BFS Option 1 (PER)				*Revised impact BFS Option 1				Distribution and likely impact of proposed infrastructure on species viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	Total No Loci separated by >500 m	% Total	Est. Total No. Plants	% Total	
<i>Grevillea stenostachya</i> (P3)	105	1038	6	6.6	205	21.1	6	5.7	205	19.7	Populations in the western Murchison, northern Yalgoo, northern Geraldton Sandplains and Southern Carnarvon bioregions in a range of habitats (Figure 1.10). Several records within Toolonga Nature Reserve and one within proposed estate at Woolgorong. As the majority of DEC records to not contain abundance data, the % of total plants impacted is likely to be significantly overestimated. The viability of the taxon is unlikely to be threatened by the proposed infrastructure.
<i>Hemigenia tysonii</i> (P3)	112	13448	9	11.3	410	6.2	9	8.0	410	3.0	Widespread populations in the western Murchison, also in the south of the Carnarvon bioregion (Figure 1.11). Recent surveys in the OPR rail corridor have significantly expanded the number of plants to the south west of the Study Area. The viability of the taxon is unlikely to be threatened by the proposed infrastructure.
<i>Homalocalyx echinulatus</i> (P3)	30	1050	6	20	438	41.7	Unchanged				Scattered records in the Murchison and southern Gascoyne bioregions. One record in proposed conservation estate at Doolgunna. As the majority of DEC records to not contain abundance data, the % of total plants impacted is likely to be significantly overestimated. Recent surveys in the OPR rail corridor have expanded the range to the southwest (Figure 1.12). The viability of the taxon is unlikely to be threatened by the proposed infrastructure.
<i>Micromyrtus placoides</i> (P3)	47	2222	20	42.5	532	24.6	20	43.5	532	23.9	Scattered records in the western Murchison and Yalgoo bioregions (Figure 1.13), with habitat specificity for BIF or granite outcropping or slopes. Weld Range records represent the north eastern boundary of known distribution. Abundance appears to be low (although not quantified) at most DEC listed locations other than Weld Range. The viability of this taxon may be impacted to a minor degree by the proposed infrastructure based on data to date.

Taxon	Total No Locations separated by >500 m	Estimated Total No. Plants	Impact BFS Option 1 (PER)				*Revised impact BFS Option 1				Distribution and likely impact of proposed infrastructure on species viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	Total No Loci separated by >500 m	% Total	Est. Total No. Plants	% Total	
<i>Mirbelia stipitata</i> (P3)	6	9	0	0	0	0	Unchanged				Not impacted
<i>Phyllanthus baeckeoides</i> (P3)	15	1309	0	0	0	0	Unchanged				Not impacted
<i>Prostanthera ferricola</i> (P3)	14	672	1	7.1	14	2.1	Unchanged				Scattered records in the Murchison and Gascoyne bioregions and one record in the southern Geraldton Sandplains (Figure 1.14). Several records within the proposed Doolgunna conservation estate. As the majority of DEC records do not contain abundance data, the % of total plants impacted is likely to be overestimated. The viability of the taxon is unlikely to be threatened by the minor impact of the proposed infrastructure.
<i>Prostanthera petrophila</i> (P3)	97	2148	25	26.3	435	20.3	Unchanged				Scattered records in the western Murchison and Yalgoo bioregions (Figure 1.15). Two records within proposed Woolgorong conservation estate. The abundance of collections elsewhere is largely unknown or qualitative and therefore the impact to the total number of plants is likely to be significantly overestimated. The impact to populations at Weld range is not considered to pose a threat to the viability of the species.
<i>Ptilotus beardii</i> (P3)	55	14709	3	7.9	836	29.8	3	5.5	836	5.7	Widespread in the western Murchison and scattered in the northern Yalgoo bioregions (Figure 1.16). Several records in proposed Muggon conservation estate. Recent surveys in the OPR rail corridor have significantly expanded the total number of plants recorded and thus the % impacts to this species have been reduced. The viability of the taxon is unlikely to be threatened by the minor impact of the proposed infrastructure.
<i>Ptilotus luteolus</i> (P3)	15	533	0	0	0	0	0	0.0	0	0.0	No impact.

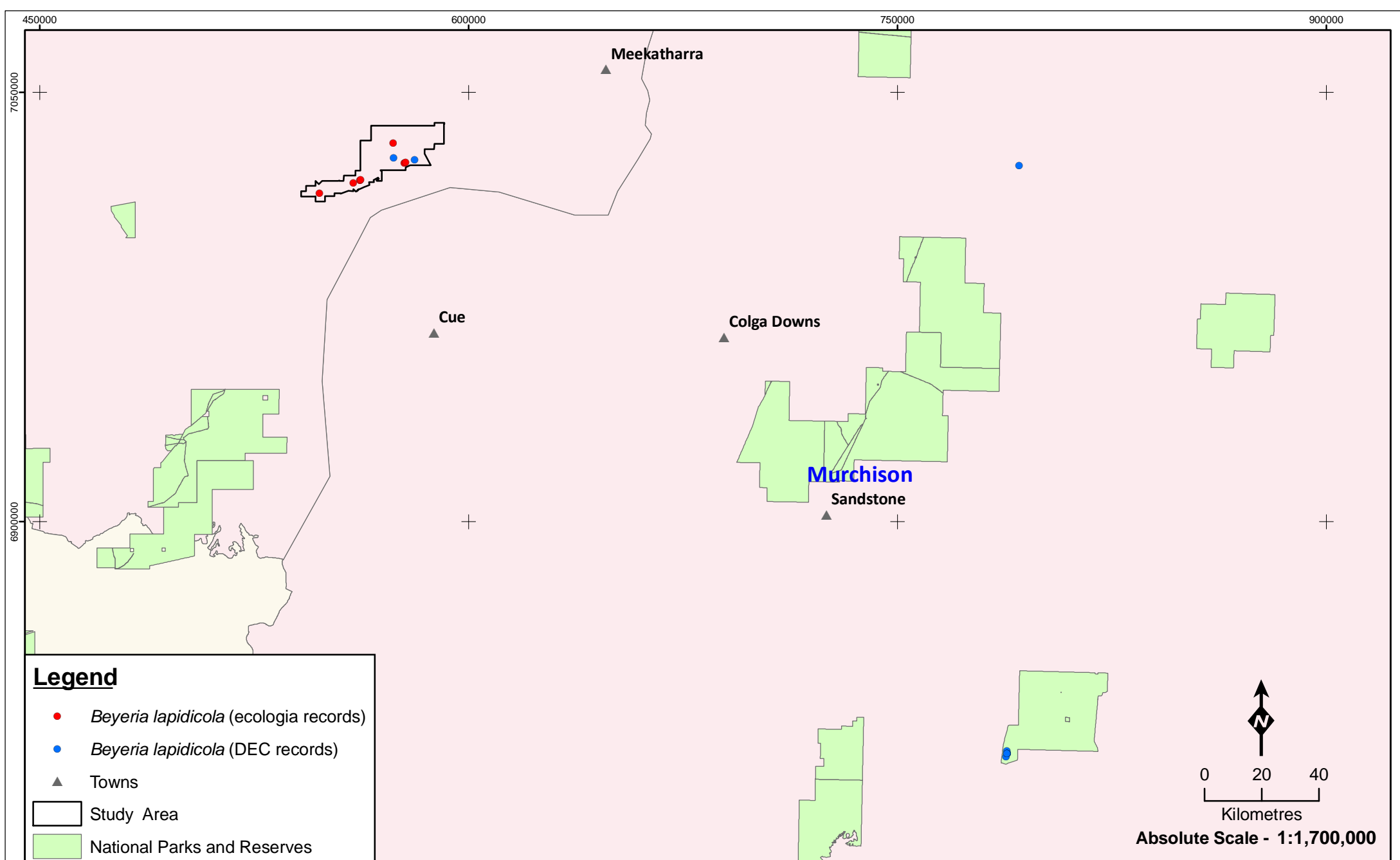
Taxon	Total No Locations separated by >500 m	Estimated Total No. Plants	Impact BFS Option 1 (PER)				*Revised impact BFS Option 1				Distribution and likely impact of proposed infrastructure on species viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	Total No Loci separated by >500 m	% Total	Est. Total No. Plants	% Total	
<i>Tecticornia cymbiformis</i> (P3)	7	69	1	14.3	14	20.3	Unchanged.				Small number of widespread, disjunct populations in the Murchison and Yalgoo bioregions (Figure 1.17). Given the specificity for saline riparian habitats this species is unlikely to be significantly more common. Due to the disjunct pattern of occurrence and moderately high impact the viability of this taxon may be impacted to a minor degree by the proposed infrastructure, based on data to date.
<i>Verticordia jamiesonii</i> (P3)	23	494	1	4.5	1	0.2	Unchanged.				Widely distributed in the Murchison, with a small number of records also from Yalgoo and the Gibson Desert bioregions (Figure 1.18). Records within Wanjarri Nature Reserve and proposed conservation estate at Twin Peaks and Woolgorong. The viability of the taxon is unlikely to be threatened by the very minor impact of the proposed infrastructure.
<i>Baেকেa sp. Melita Station</i> (P4)	60	2762	4	7	100	3.8	4	6.7	100	3.6	Widespread in the Murchison with one record in the Gascoyne bioregion (Figure 1.19). Recorded in proposed Bulga Downs and Ida Valley Conservation Parks. The viability of the taxon is unlikely to be threatened by the very minor impact of the proposed infrastructure.
<i>Goodenia berringbinensis</i> (P4)	18	33546	1	5.5	30	0.09	Unchanged.				Scattered distribution in the Murchison, Gascoyne and Yalgoo bioregions (Figure 1.20). Two records in proposed conservation estate at Dalgety Downs. Habitat specificity for moist environments such as bores, creek lines and edges of lakes. The viability of the taxon is unlikely to be threatened by the very minor impact of the proposed infrastructure.
<i>Grevillea inconspicua</i> (P4)	63	2328	6	9.7	82	3.5	Unchanged.				Widespread distribution in the Murchison bioregion including within the proposed Lake Mason conservation estate (Figure 1.21). The viability of the taxon is unlikely to be threatened by the minor impact of the proposed infrastructure.

Taxa for which > 50% total no of loci or plants are impacted

Taxa for which > 30% total number of loci or plants are impacted

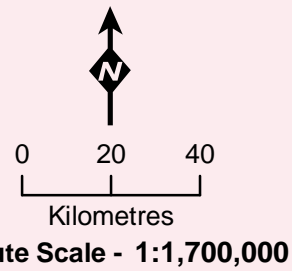
Taxa for which > 15% total number of loci or plants are impacted

Taxa with potential for reduced regional viability.



Legend

- *Beyeria lapidicola* (ecologia records)
- *Beyeria lapidicola* (DEC records)
- ▲ Towns
- Study Area
- National Parks and Reserves



Regional distribution of *Beyeria lapidicola*

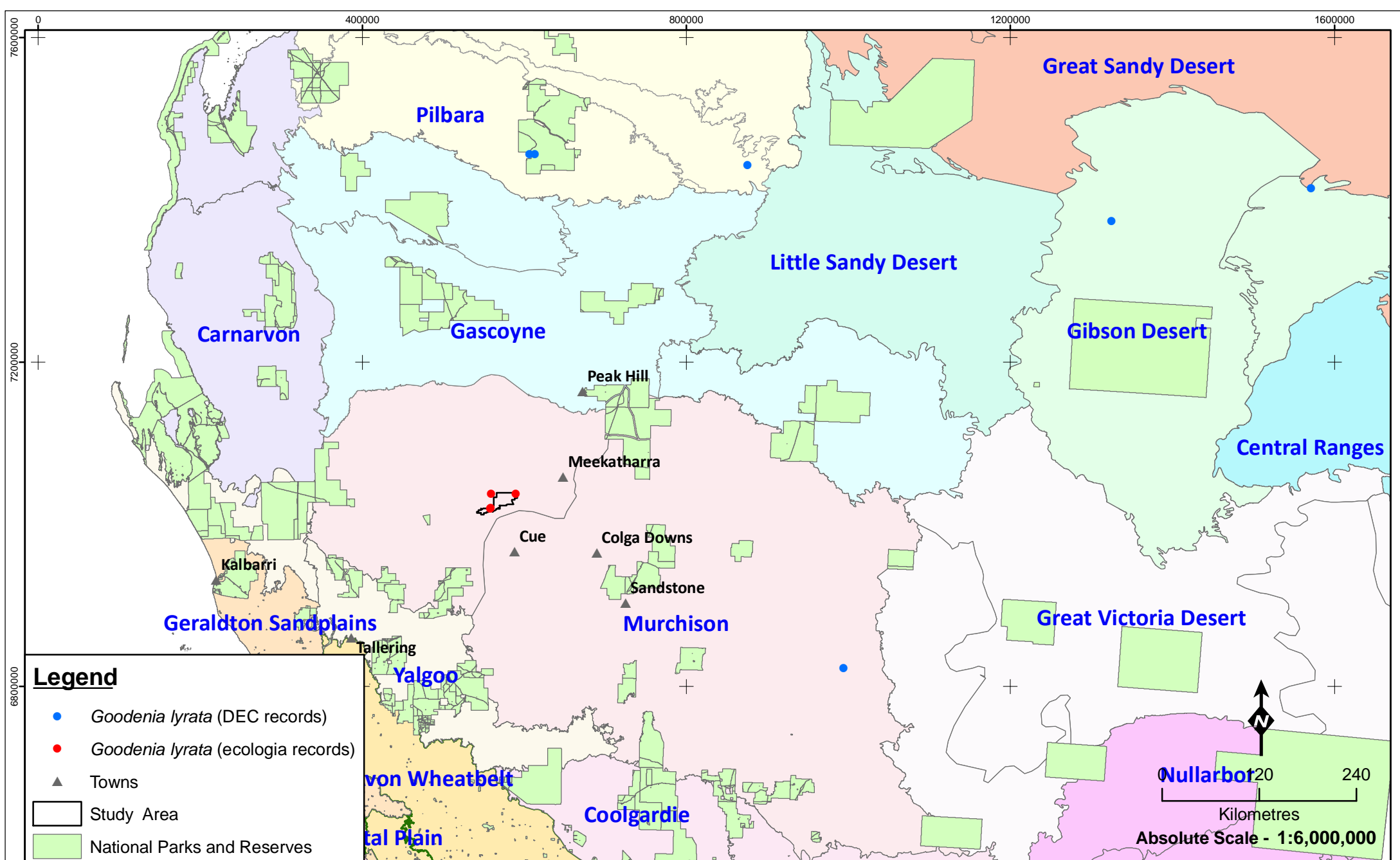
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 Projection: Transverse Mercator
 Datum: GDA 1994

Drawn: SV
Date: 22/11/10

Unique Map ID: SV014

A4



Regional distribution of *Goodenia lyrata*

Figure:1.2
 Project ID: 722

Drawn: SV
 Date: 22/11/10
 Unique Map ID: SV006

Coordinate System
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 Projection: Transverse Mercator
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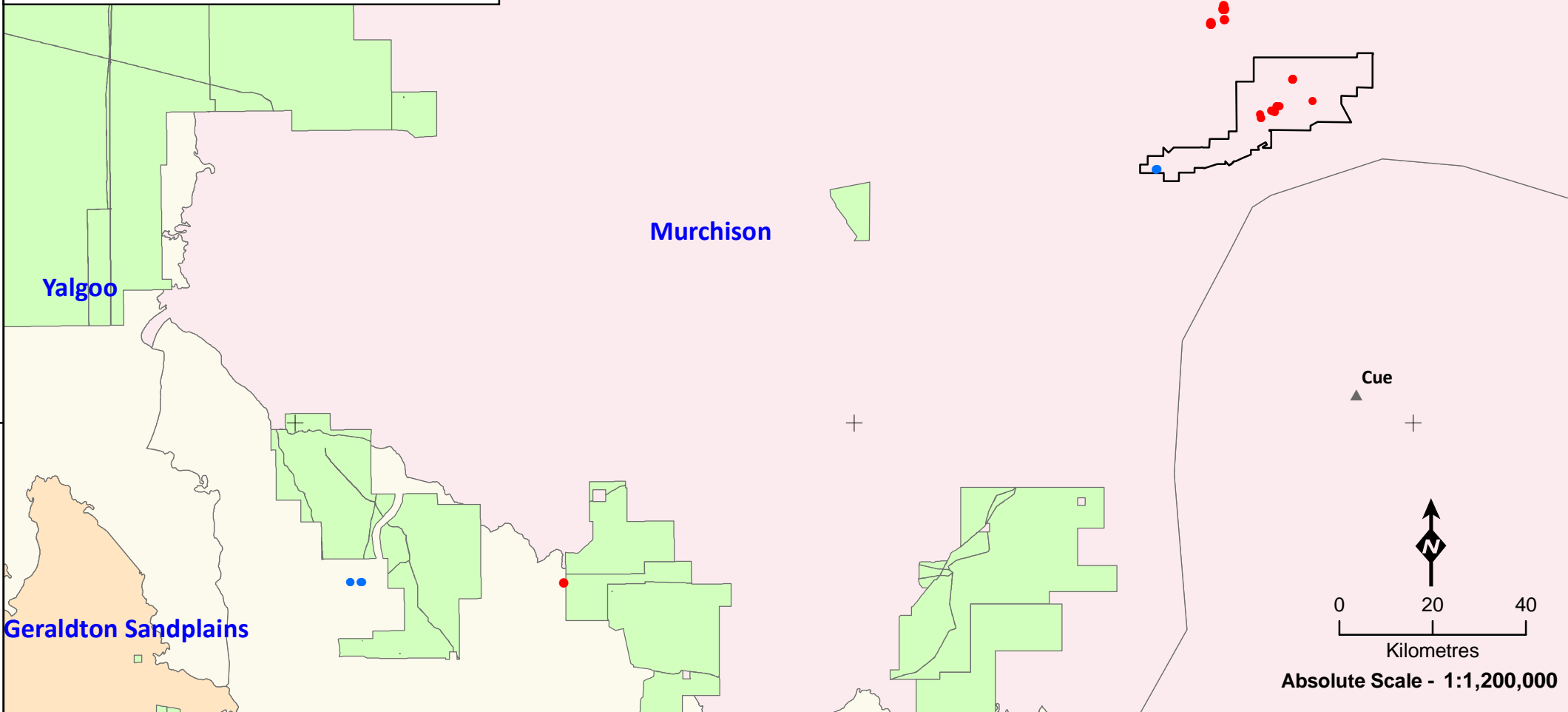
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Legend

- *Sauropus* sp. Woolgorong (DEC records)
- *Sauropus* sp. Woolgorong (ecologia records)
- ▲ Towns
- Study Area
- National Parks and Reserves



Regional distribution of *Sauropus* sp. Woolgorong

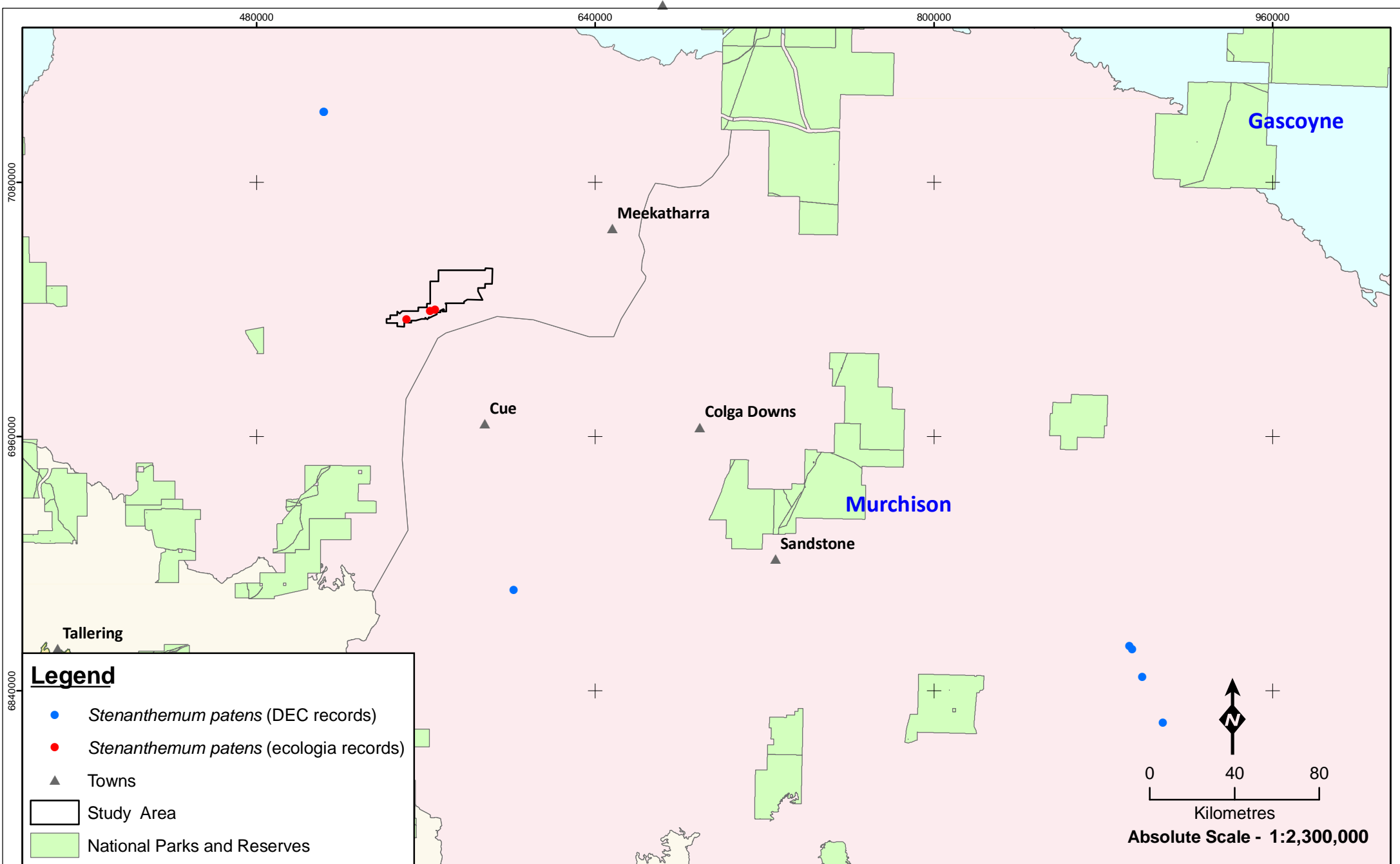
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Coordinate System
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Projection: Transverse Mercator
Datum: GDA 1994

Drawn: SV
Date: 22/11/10

Unique Map ID: SV020

A4



Legend

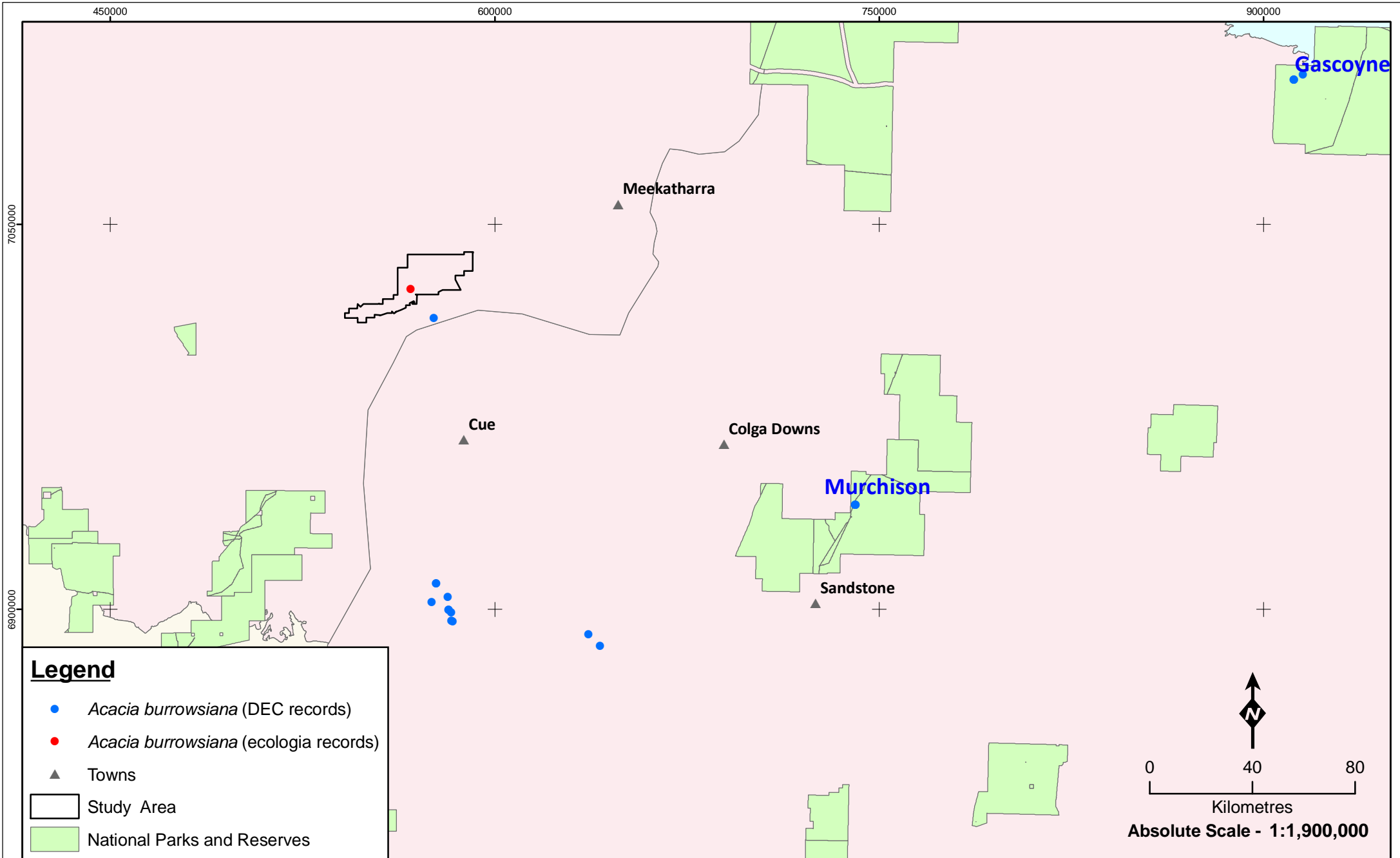
- *Stenanthemum patens* (DEC records)
- *Stenanthemum patens* (ecologia records)
- ▲ Towns
- Study Area
- National Parks and Reserves

Figure:1.4
Project ID: 722
 Coordinate System
 Name: GDA 1994 MGA Zone 50
 Projection: Transverse Mercator
 Datum: GDA 1994

Drawn: SV
Date:01/12/10
 Unique Map ID: SV039
A4

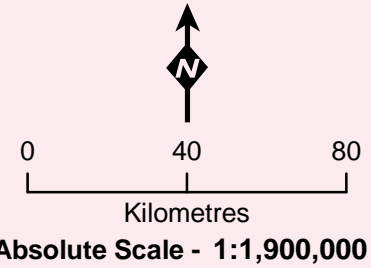


Regional distribution of *Stenanthemum patens*



Legend

- *Acacia burrowsiana* (DEC records)
- *Acacia burrowsiana* (ecologia records)
- ▲ Towns
- Study Area
- National Parks and Reserves



Regional distribution of *Acacia burrowsiana*

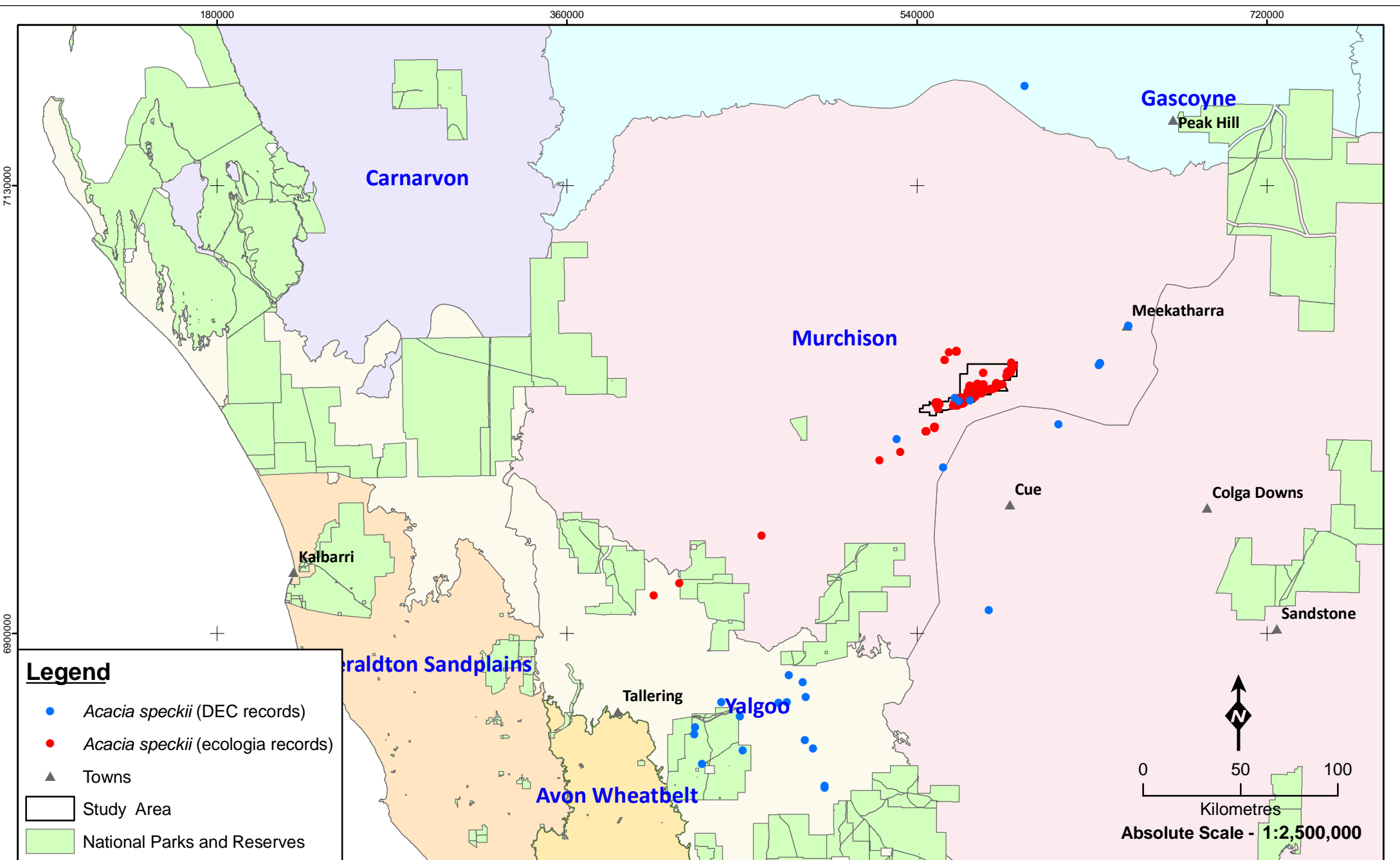
Figure:1.5
Project ID: 722

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

Drawn: SV
Date:02/12/10

Unique Map ID: SV041

A4



Legend

- *Acacia speckii* (DEC records)
- *Acacia speckii* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves

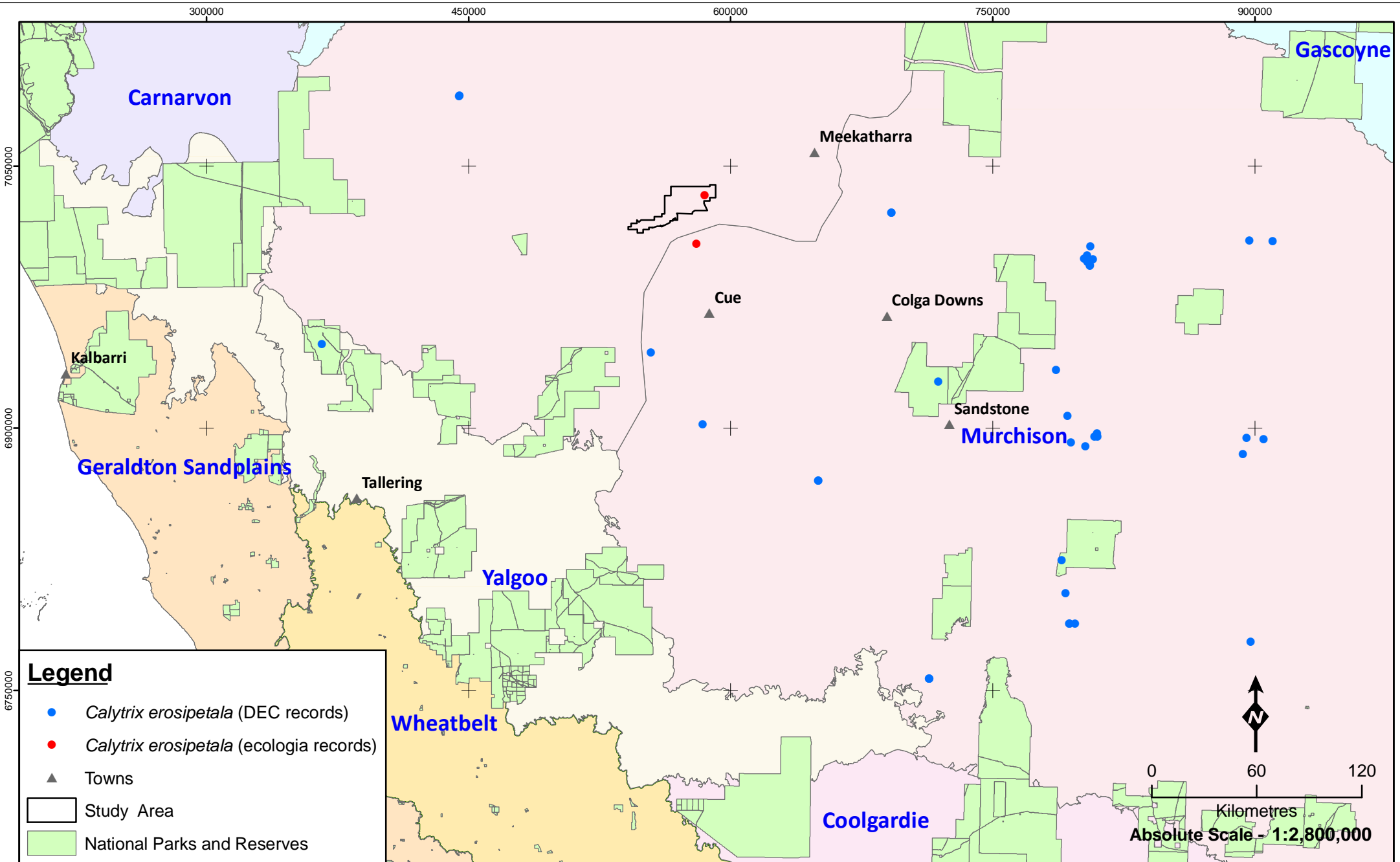


Regional distribution of *Acacia speckii*

Figure:1.6
Project ID: 722

Drawn: SV
Date:01/12/10
Unique Map ID: SV043

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



Legend

- *Calytrix erosipetala* (DEC records)
- *Calytrix erosipetala* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves

Figure:1.7
Project ID: 722

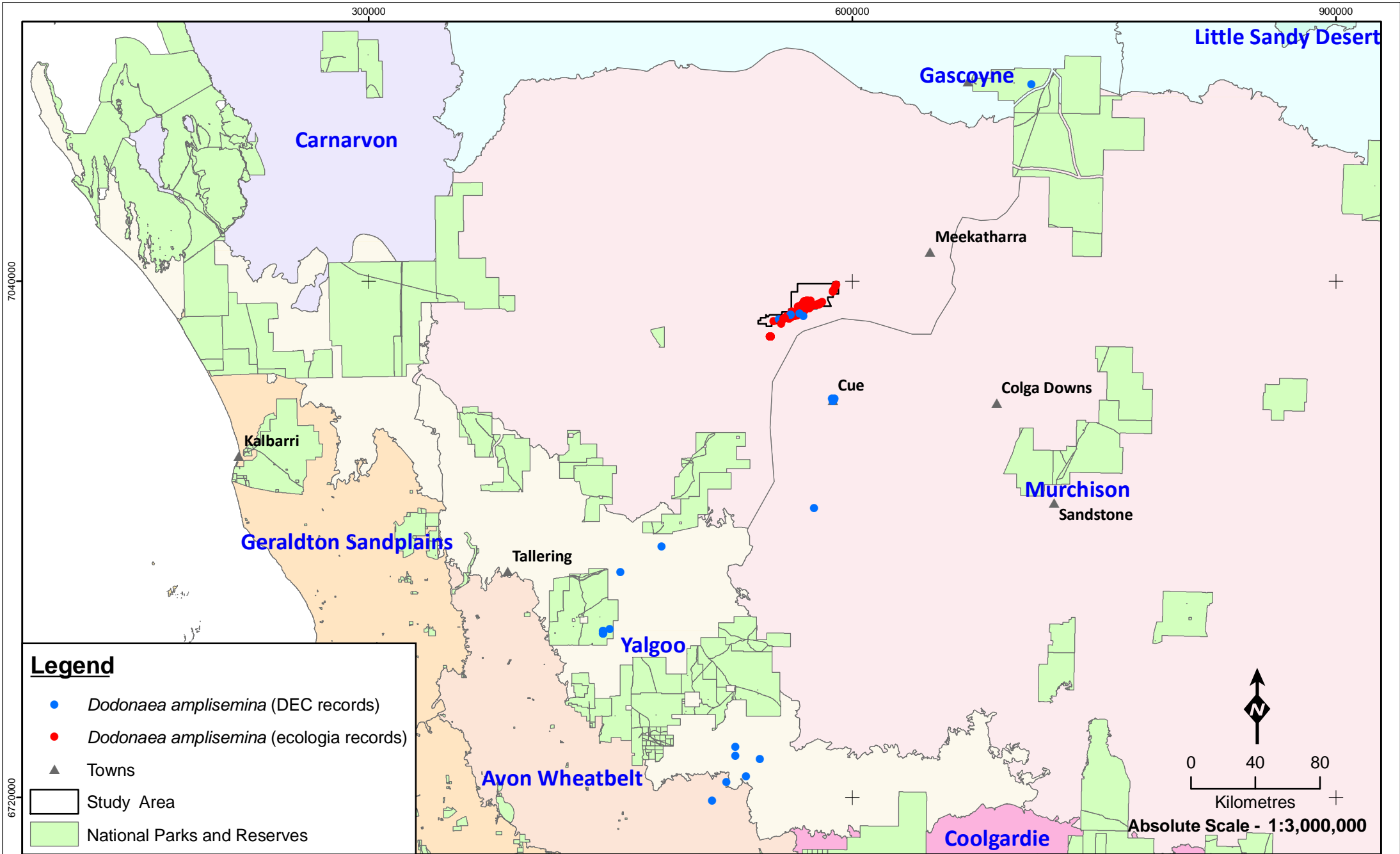
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Date:02/12/10

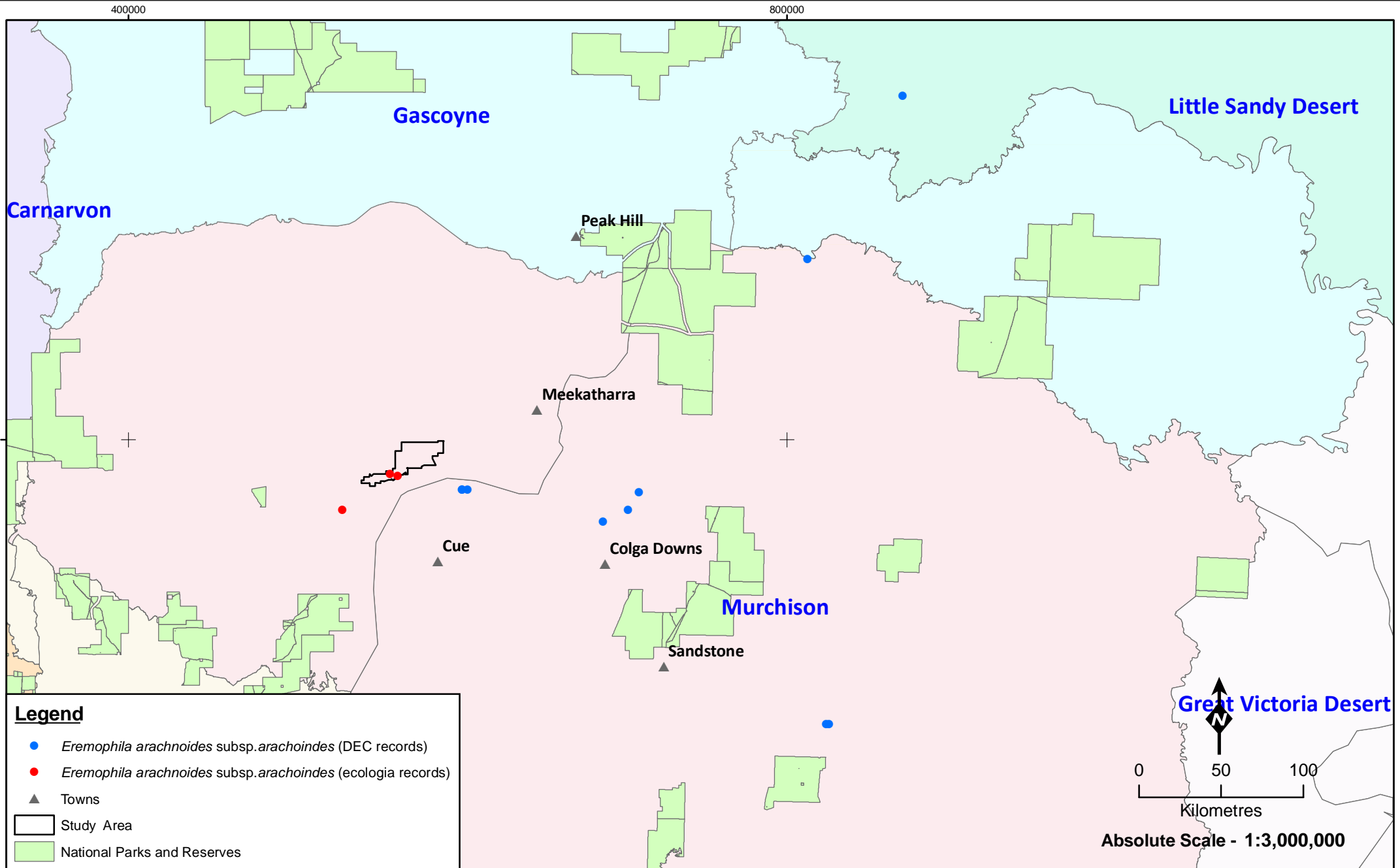
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: SV045



**Regional distribution of
*Calytrix erosipetala***





Legend

- *Eremophila arachnoides* subsp. *arachnoides* (DEC records)
- *Eremophila arachnoides* subsp. *arachnoides* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves

Figure:1.9
Project ID: 722

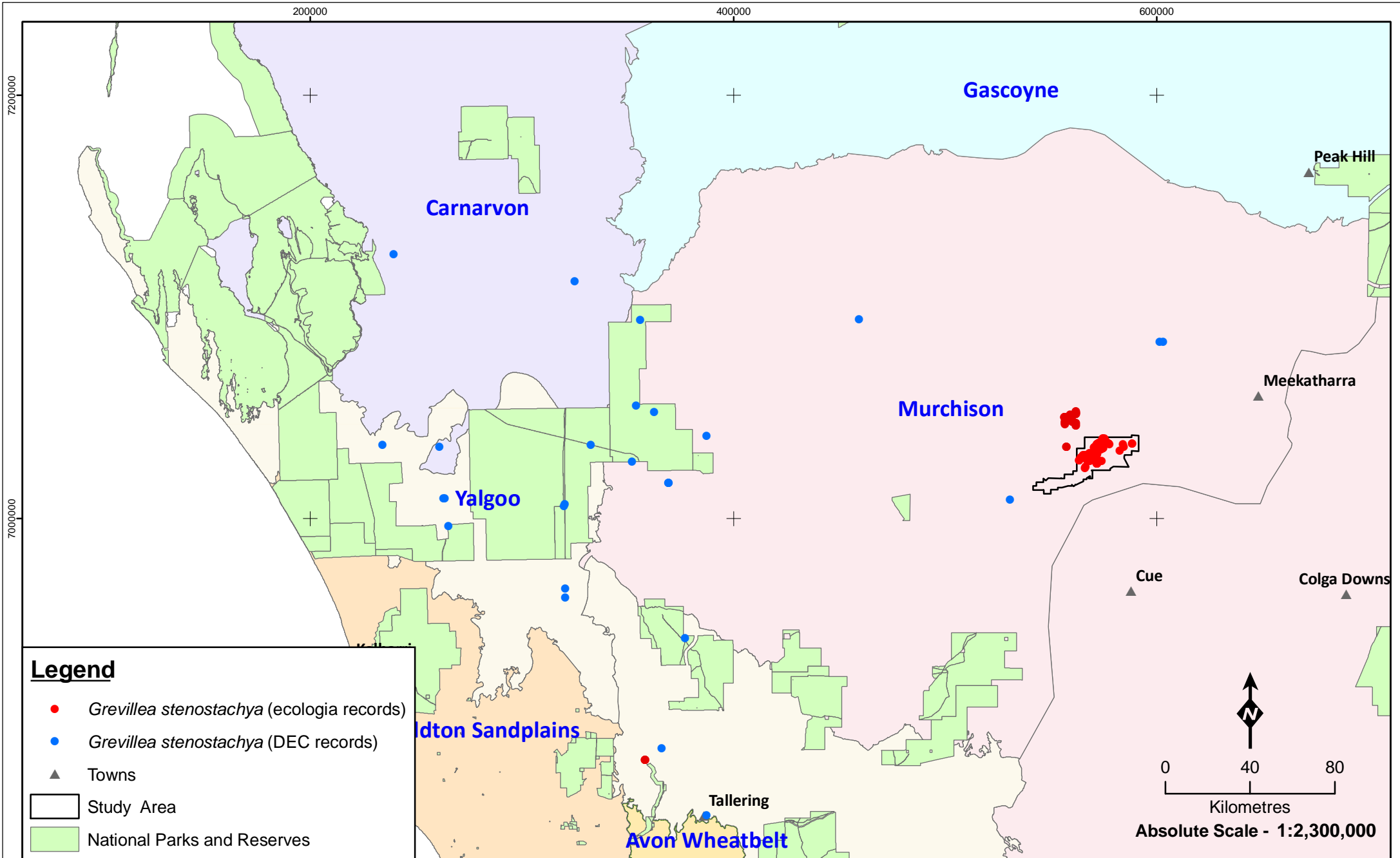
Drawn: SV
Date: 02/12/10

Regional distribution of
Eremophila arachnoides subsp. *arachnoides*

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

Unique Map ID: SV047





Legend

- *Grevillea stenostachya* (ecologia records)
- *Grevillea stenostachya* (DEC records)
- ▲ Towns
- Study Area
- National Parks and Reserves

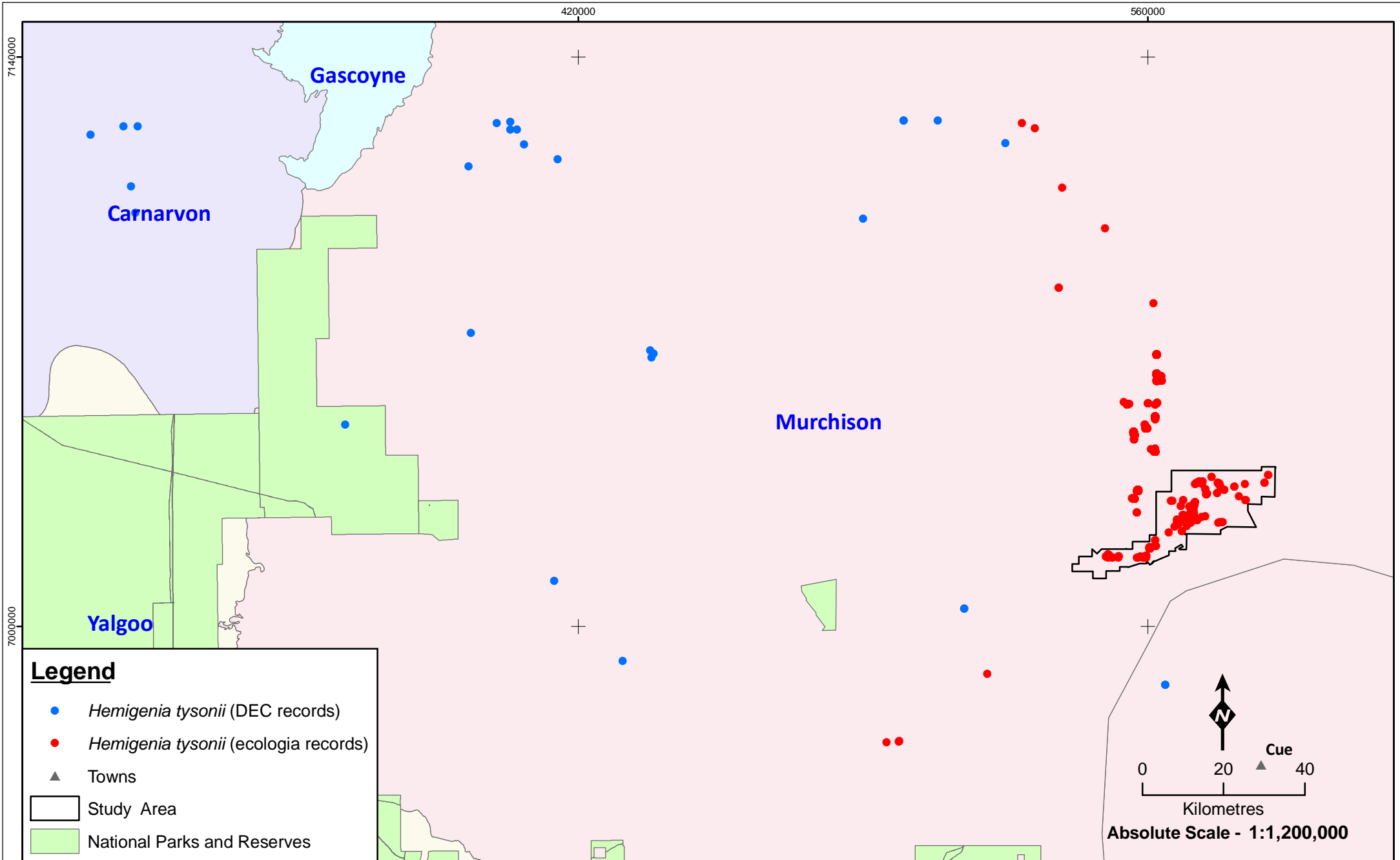


Regional distribution of *Grevillea stenostachya*

Figure:1.10
Project ID: 722

Drawn: SV
Date: 22/11/10
Unique Map ID: SV008

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



Legend

- *Hemigenia tysonii* (DEC records)
- *Hemigenia tysonii* (ecologia records)
- ▲ Towns
- Study Area
- National Parks and Reserves

Figure:1.11
Project ID: 722

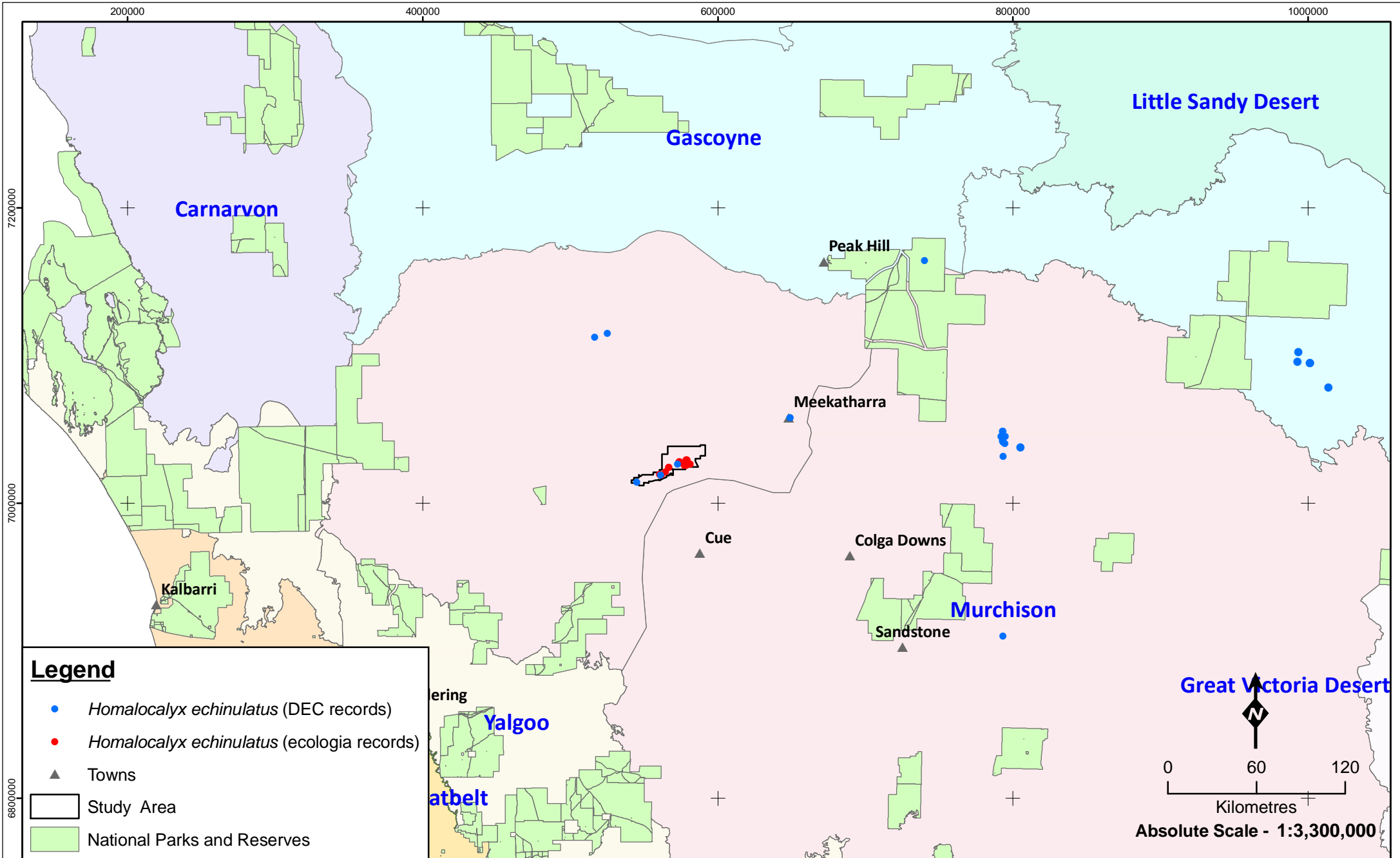
Drawn: SV
Date: 02/12/10

**Regional distribution of
*Hemigenia tysonii***

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

Unique Map ID: SV022





Legend

- *Homalocalyx echinulatus* (DEC records)
- *Homalocalyx echinulatus* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves



0 60 120
 Kilometres
Absolute Scale - 1:3,300,000



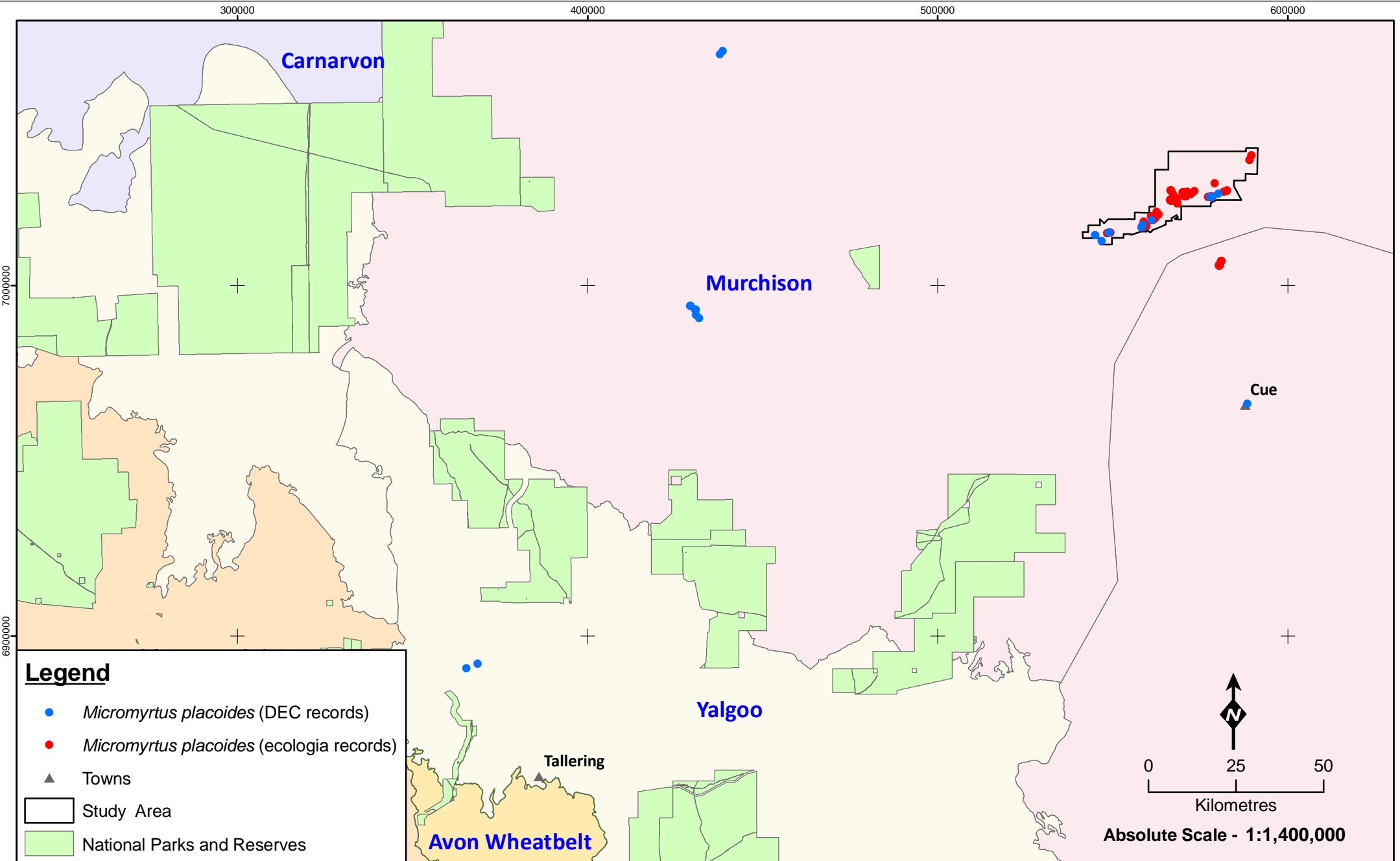
**Regional distribution of
*Homalocalyx echinulatus***

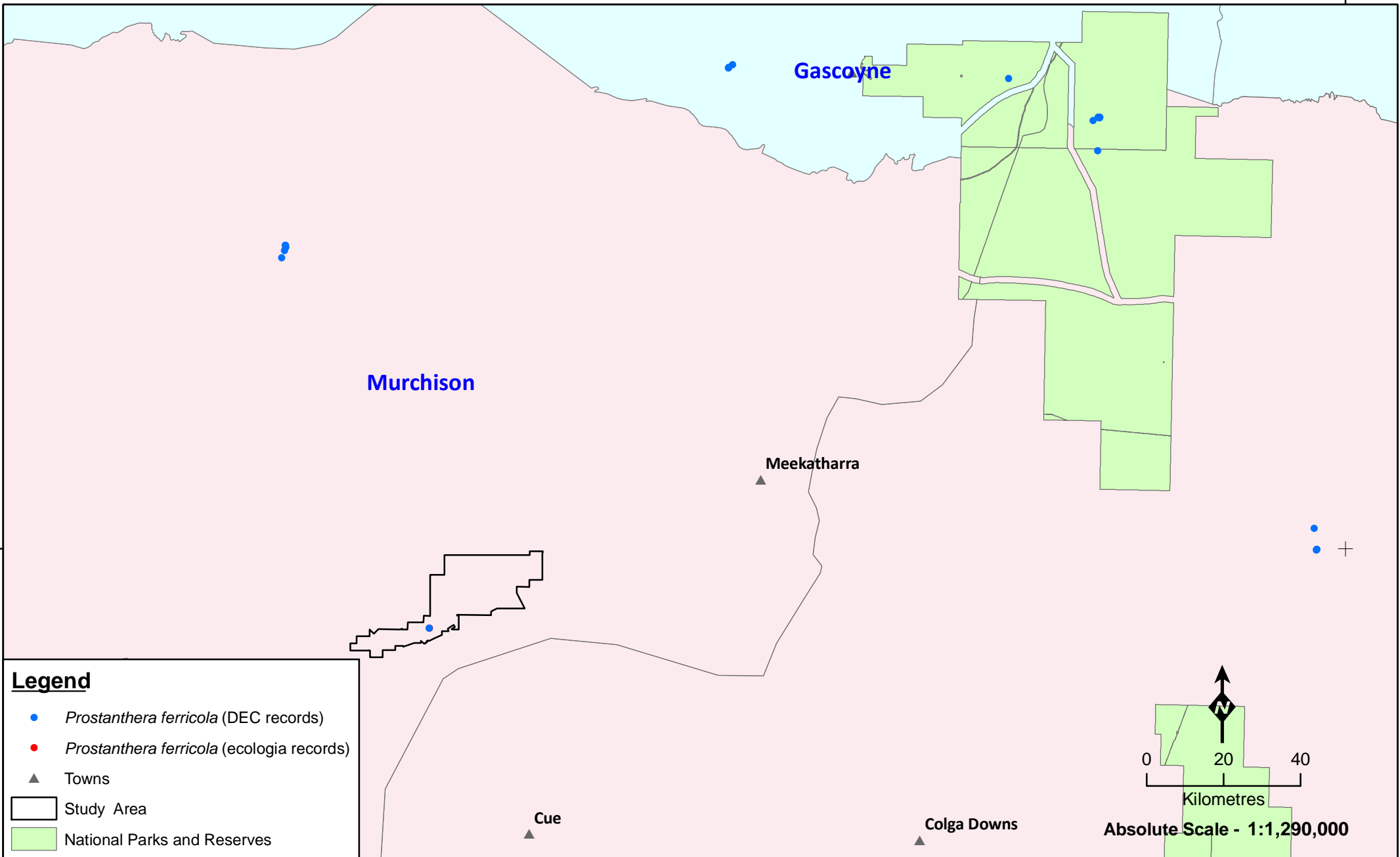
Figure:1.12
Project ID: 722

Drawn: SV
Date: 22/11/10

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

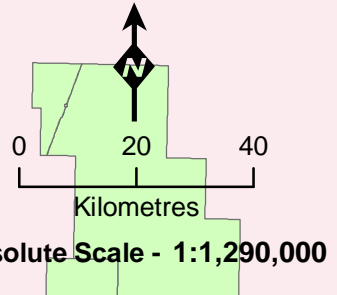
Unique Map ID: SV010





Legend

- *Prostanthera ferricola* (DEC records)
- *Prostanthera ferricola* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves



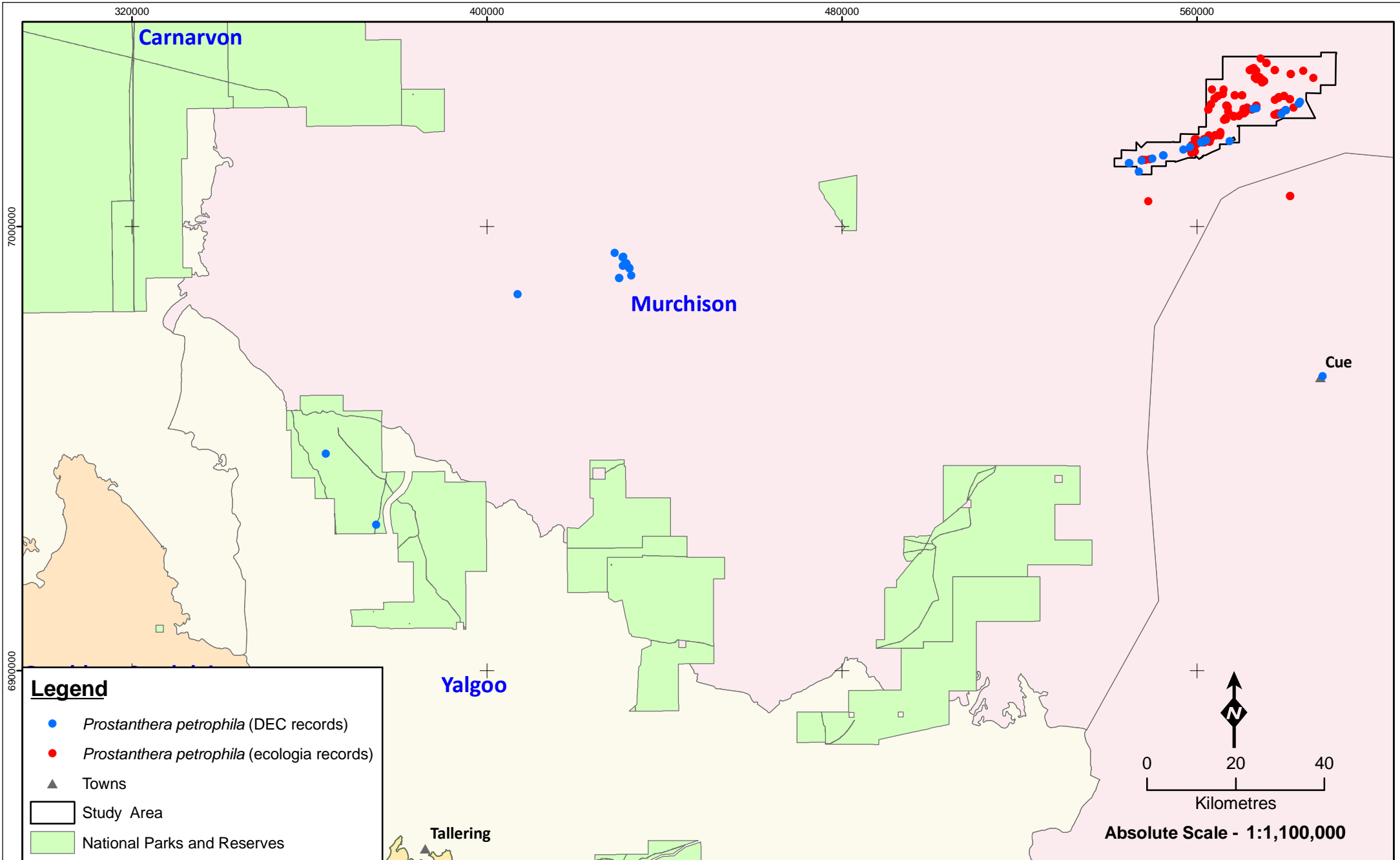
**Regional distribution of
*Prostanthera ferricola***

Figure:1.14
Project ID: 722

Drawn: SV
Date: 02/12/10

Unique Map ID: SV049

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



Legend

- *Prostanthera petrophila* (DEC records)
- *Prostanthera petrophila* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves

Figure:1.15
Project ID: 722

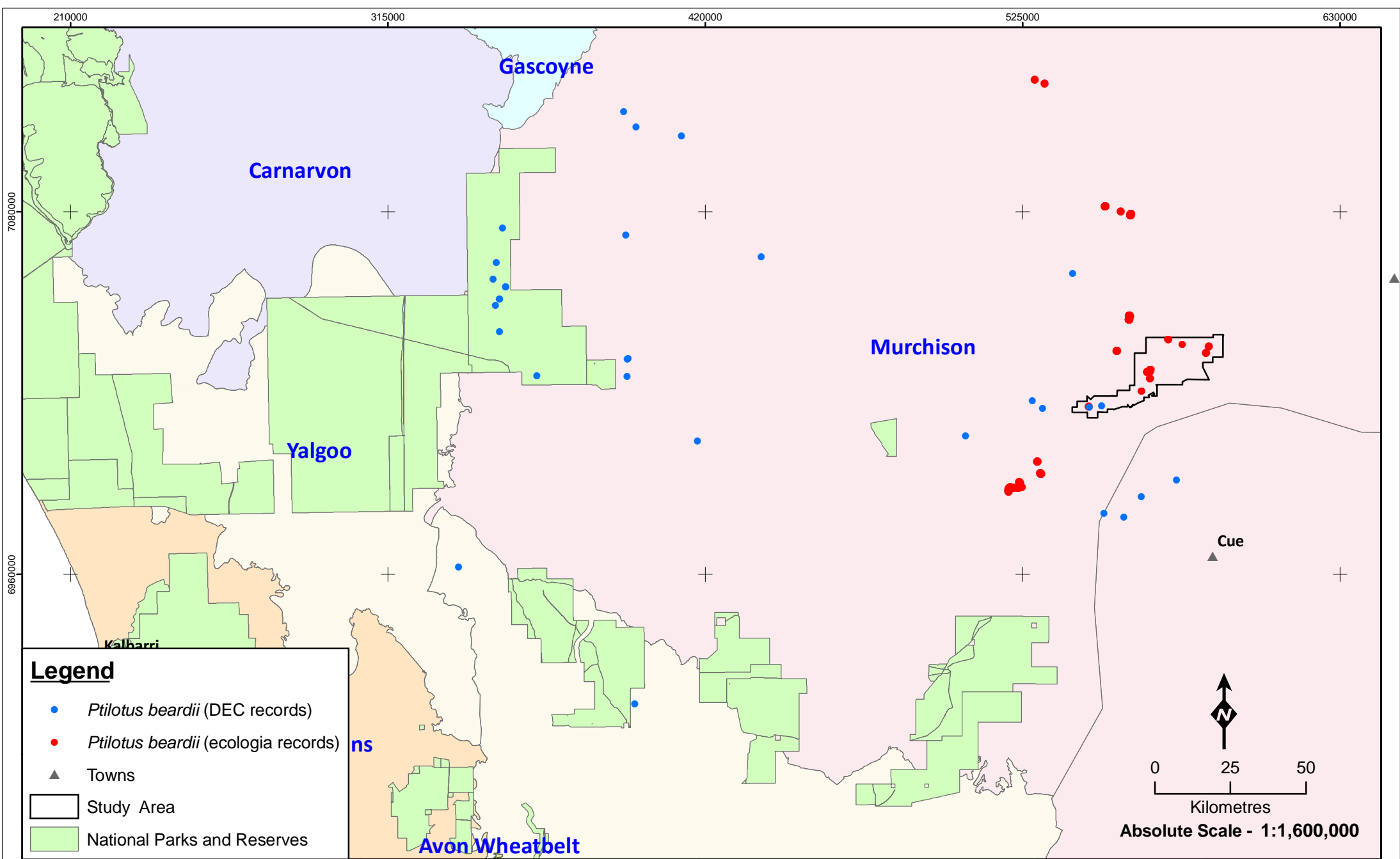
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: SV
Date: 02/12/10

Unique Map ID: SV051



Regional distribution of *Prostanthera petrophila*



Legend

- *Ptilotus beardii* (DEC records)
- *Ptilotus beardii* (ecologia records)

▲ Towns

▭ Study Area

■ National Parks and Reserves

ns



Regional distribution of *Ptilotus beardii*

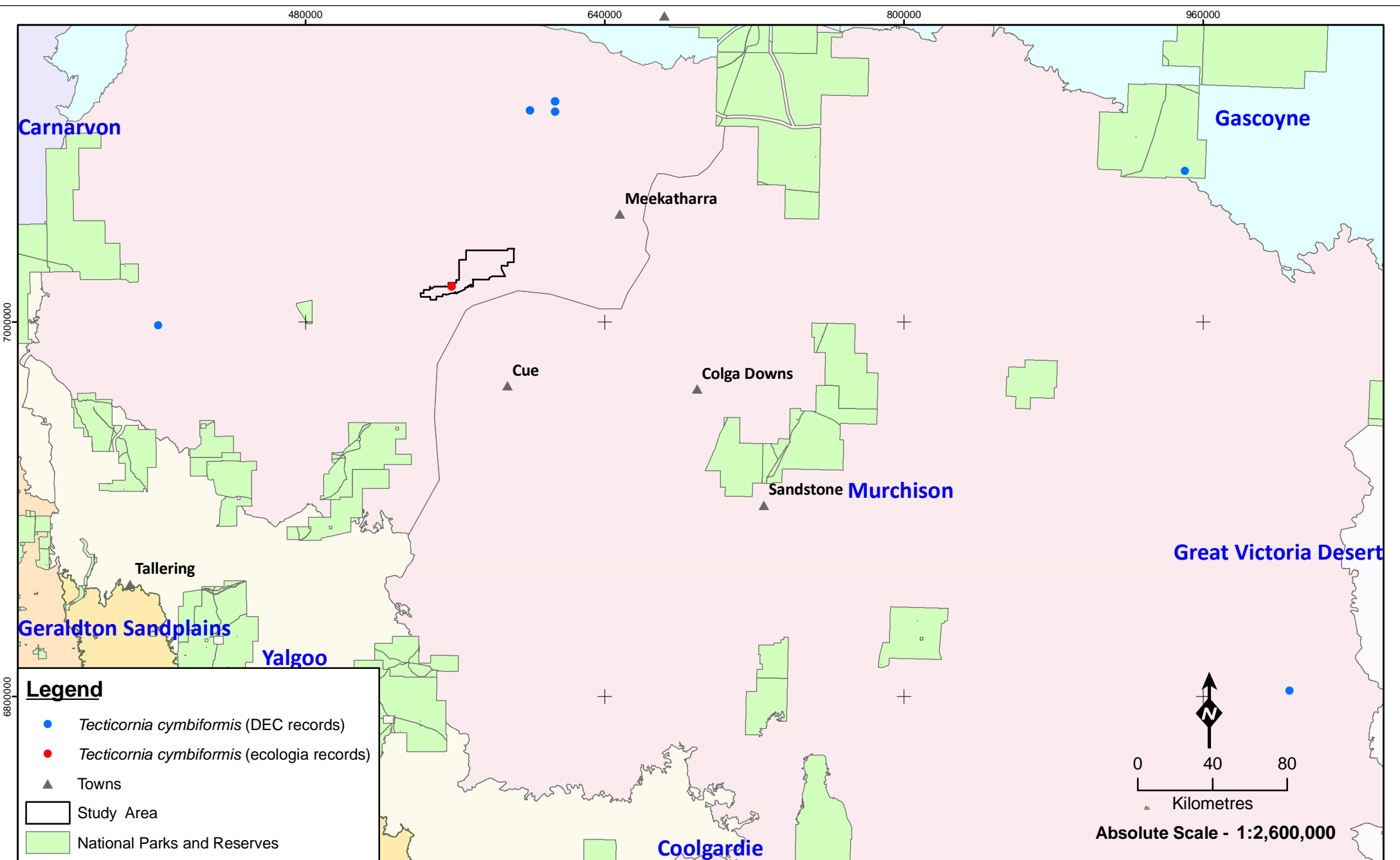
Figure:1.16
Project ID: 722

Coordinate System
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Projection: Transverse Mercator
Datum: GDA 1994

Drawn: SV
Date: 22/11/10

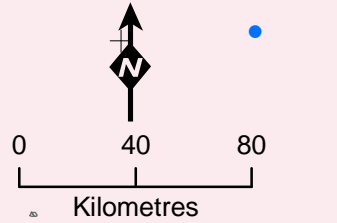
Unique Map ID: SV012

A4



Legend

- *Tecticornia cymbiformis* (DEC records)
- *Tecticornia cymbiformis* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves

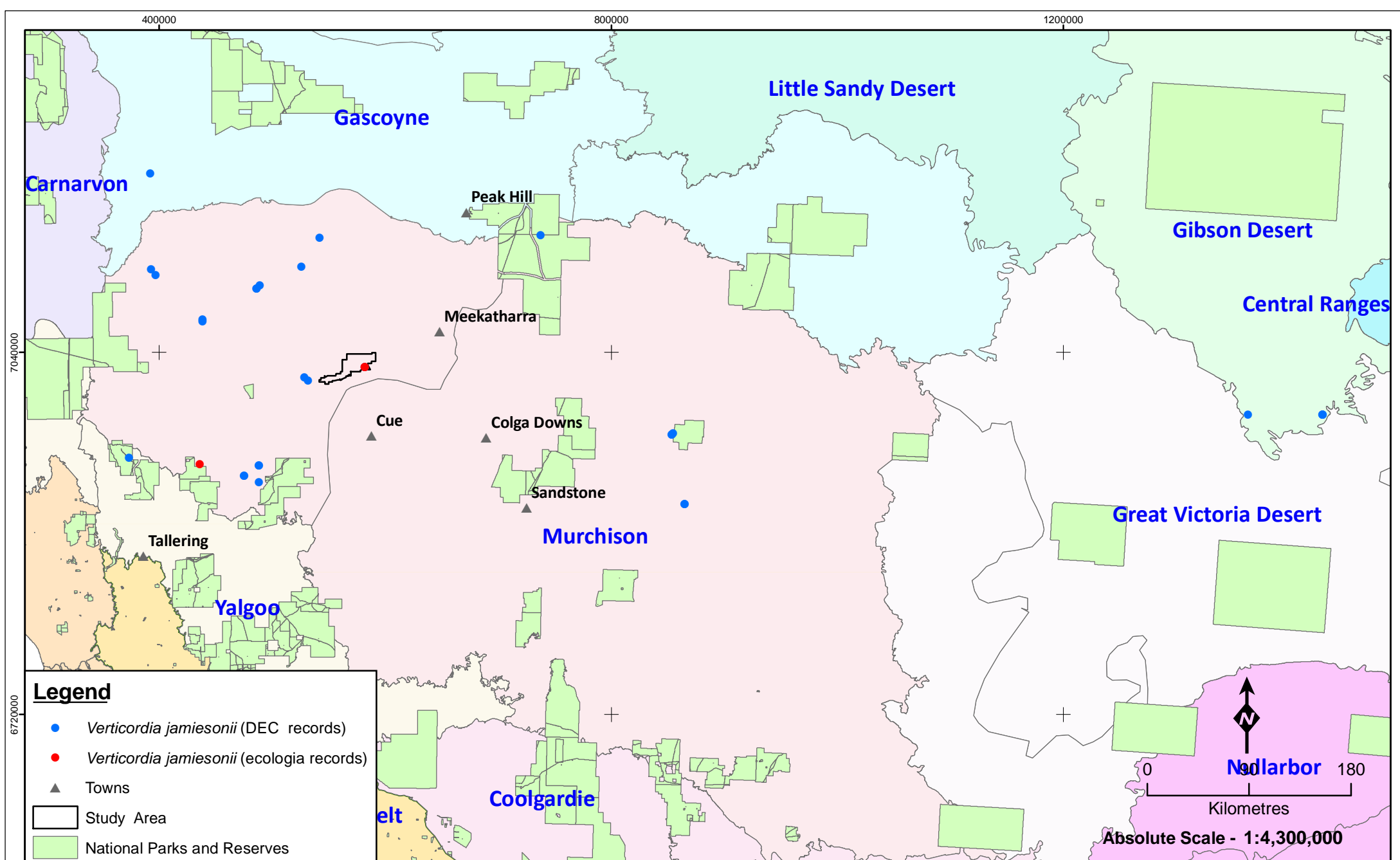


Regional distribution of *Tecticornia cymbiformis*

Figure:1.17
Project ID: 722

Drawn: SV
Date: 02/12/10
Unique Map ID: SV053

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



Legend

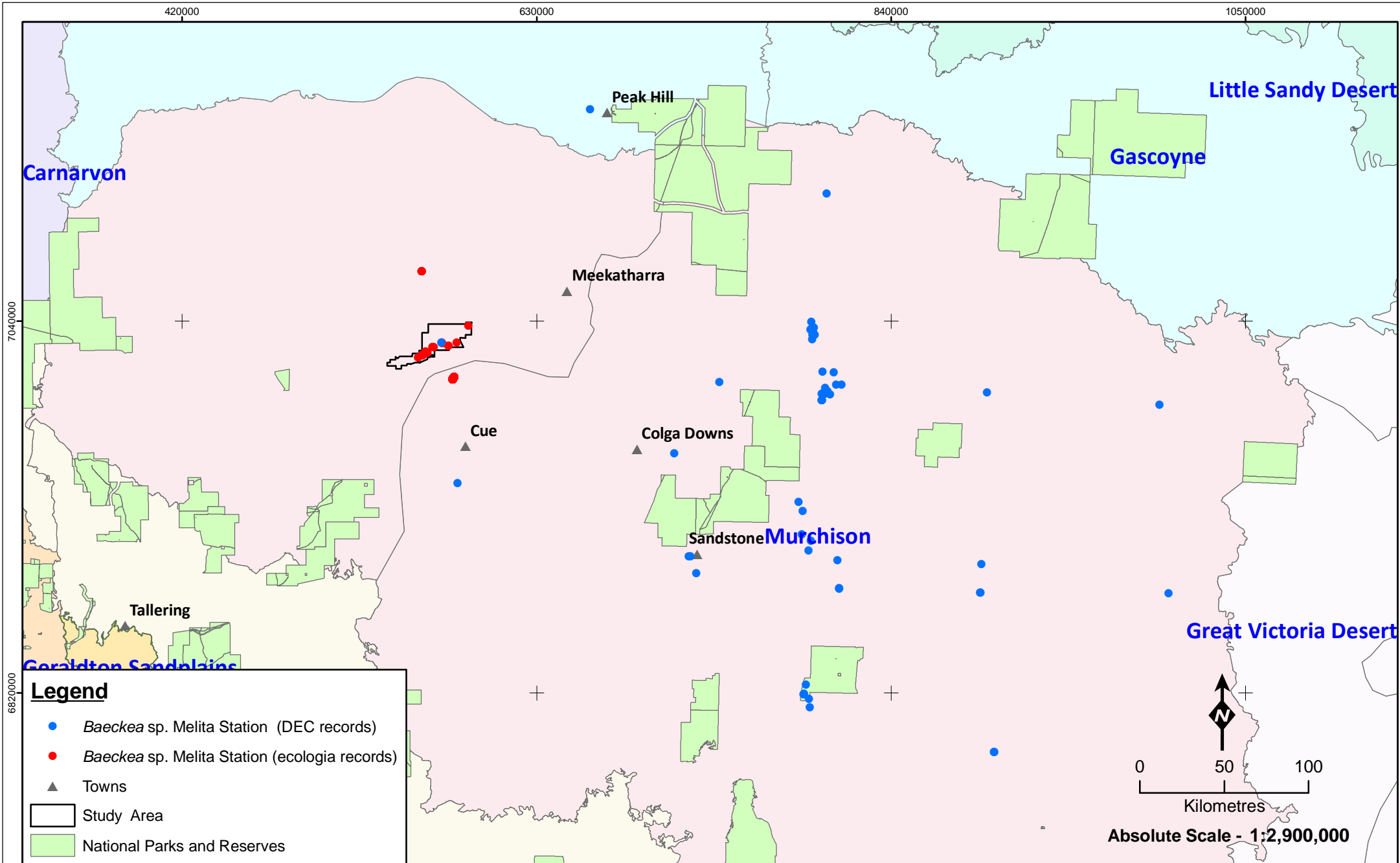
- *Verticordia jamiesonii* (DEC records)
- *Verticordia jamiesonii* (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves

Figure:1.18
 Project ID: 722
 Coordinate System
 Name: GDA 1994 MGA Zone 50
 Projection: Transverse Mercator
 Datum: GDA 1994

Drawn: SV
 Date: 01/12/10
 Unique Map ID: SV035
 A4



**Regional distribution of
*Verticordia jamiesonii***

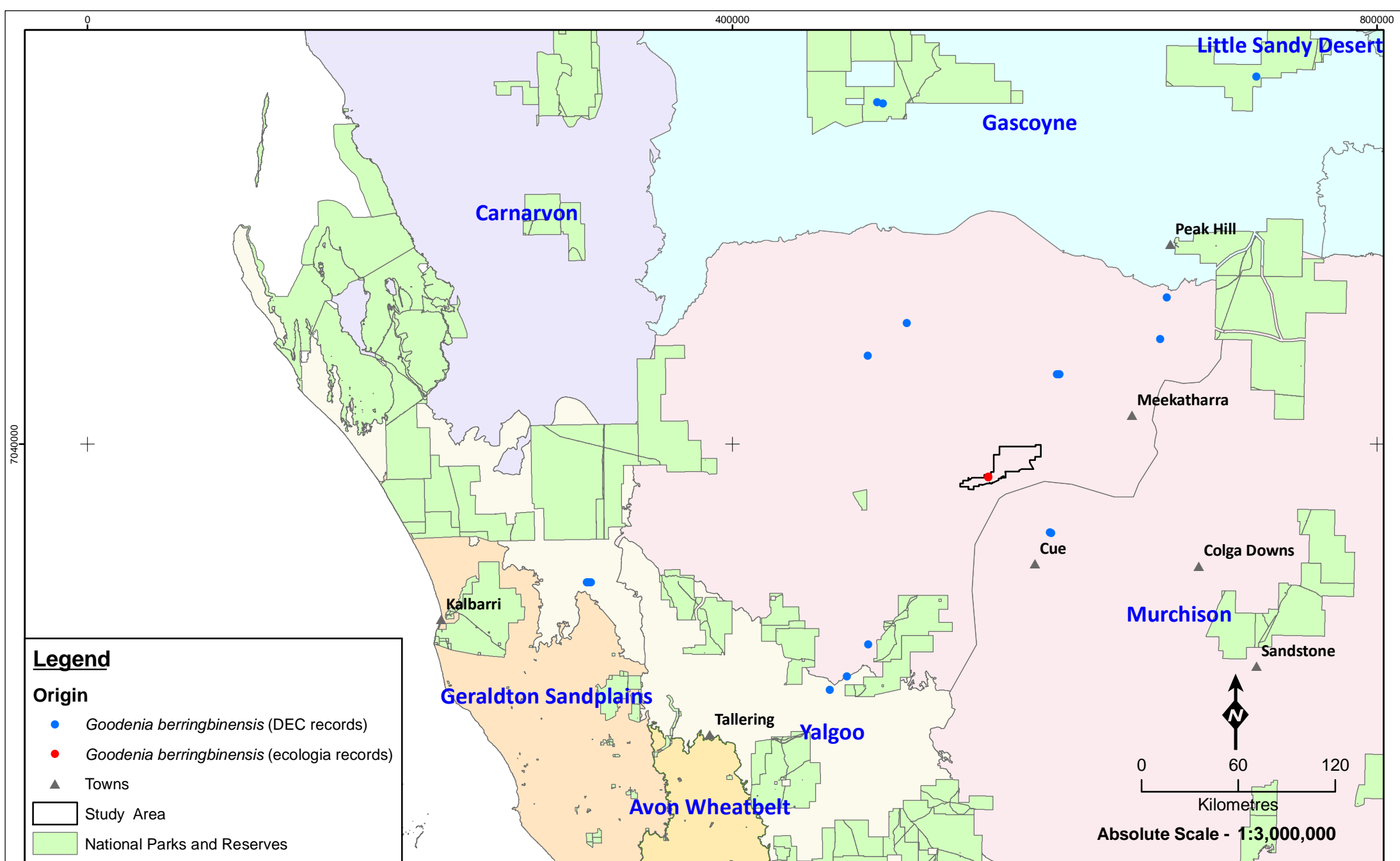


Legend

- *Baeckea* sp. Melita Station (DEC records)
- *Baeckea* sp. Melita Station (ecologia records)
- ▲ Towns
- ▭ Study Area
- National Parks and Reserves

<p>Figure:1.19 Project ID: 722</p>	<p>Drawn: SV Date: 02/12/10</p>
<p>Coordinate System Name: GDA 1994 MGA Zone 50 Projection: Transverse Mercator Datum: GDA 1994</p>	
<p>Unique Map ID: SV055</p>	

Regional distribution of *Baeckea* sp. melita station



Legend

- Origin**
- *Goodenia berringbinensis* (DEC records)
 - *Goodenia berringbinensis* (ecologia records)
 - ▲ Towns
 - ▭ Study Area
 - National Parks and Reserves



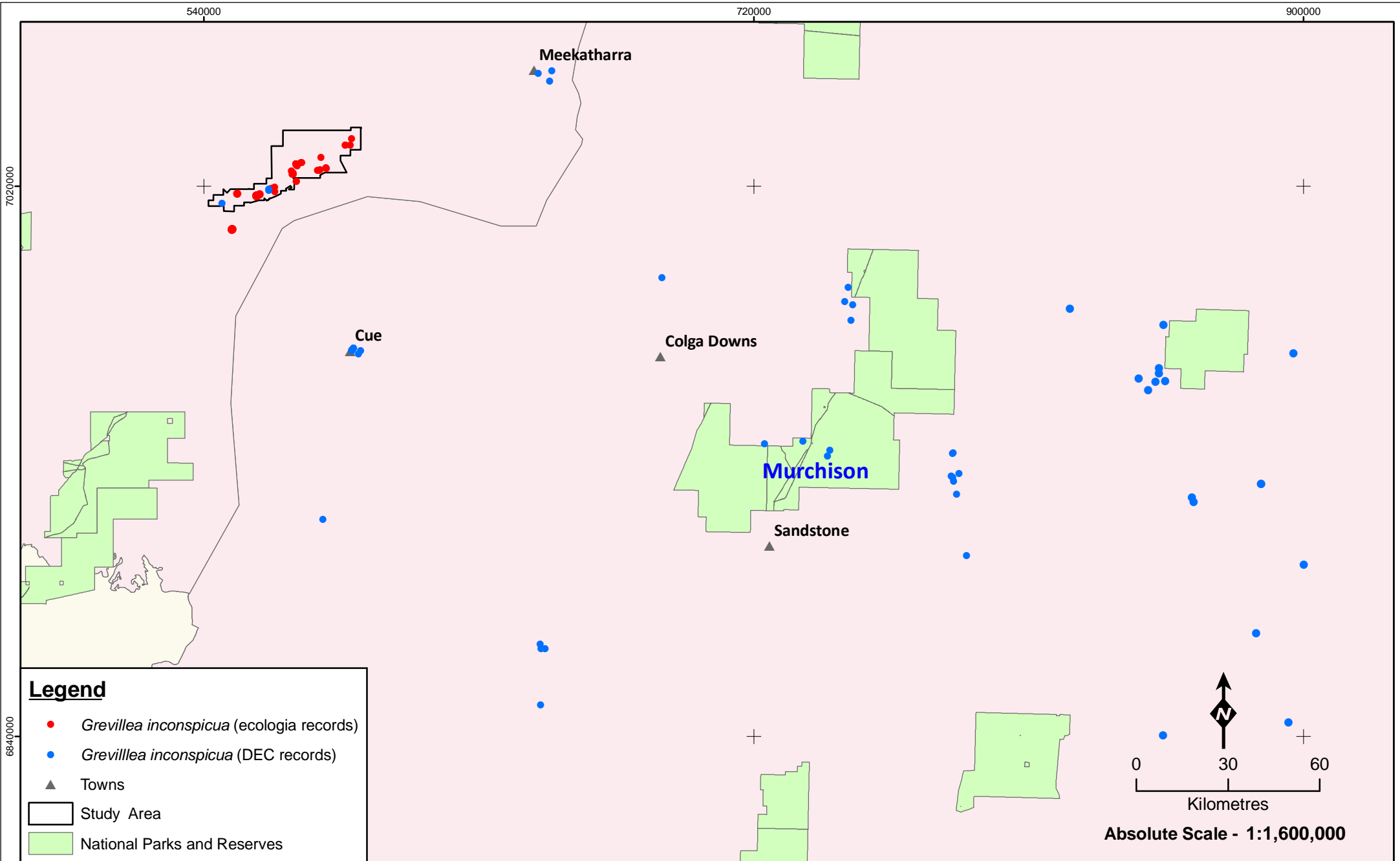
Regional distribution of *Goodenia berringbinensis*

Figure:1.20
Project ID: 722

Drawn: SV
Date: 01/12/10

Unique Map ID: SV037

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



Legend

- *Grevillea inconspicua* (ecologia records)
- *Grevillea inconspicua* (DEC records)
- ▲ Towns
- Study Area
- National Parks and Reserves

Figure:1.21
Project ID: 722

Drawn: SV
Date: 02/12/10



**Regional distribution of
*Grevillea inconspicua***

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

Unique Map ID: SV057

1.3 LOCAL IMPACTS

The degree to which the local viability of a species is threatened by the loss of a subset of plants will vary depending on the degree of habitat specificity, method of pollination, and the location of each cluster of plants relative to all other clusters. To enable a quantitative assessment of viability based on the distribution of populations relative to infrastructure, the local distribution was defined as all loci of plants within 40 km of the proposed infrastructure. The assessment of each species is detailed in Table 1.3. The following taxa were considered to have either a high or moderate risk of reduced local viability:

- *Beyeria lapidicola* (P1);
- *Goodenia lyrata* (P1);
- *Stenanthemum patens* (P1);
- *Acacia burrowsiana* (P3);
- *Calytrix erosipetala* (P3) (High);
- *Eremophila arachnoides* Chinnock subsp. *arachnoides* (P3);
- *Homalocalyx echinulatus* (P3);
- *Prostanthera ferricola* (P3) (High);
- *Tecticornia cymbiformis* (P3) (High); and
- *Goodenia berringbinensis* (P4) (High)

Figures 1.22 to 1.41 illustrate the local distribution of each taxon.

Table 1.3 – Assessment of Local impact to Priority Flora in the SMC Weld Range Study Area

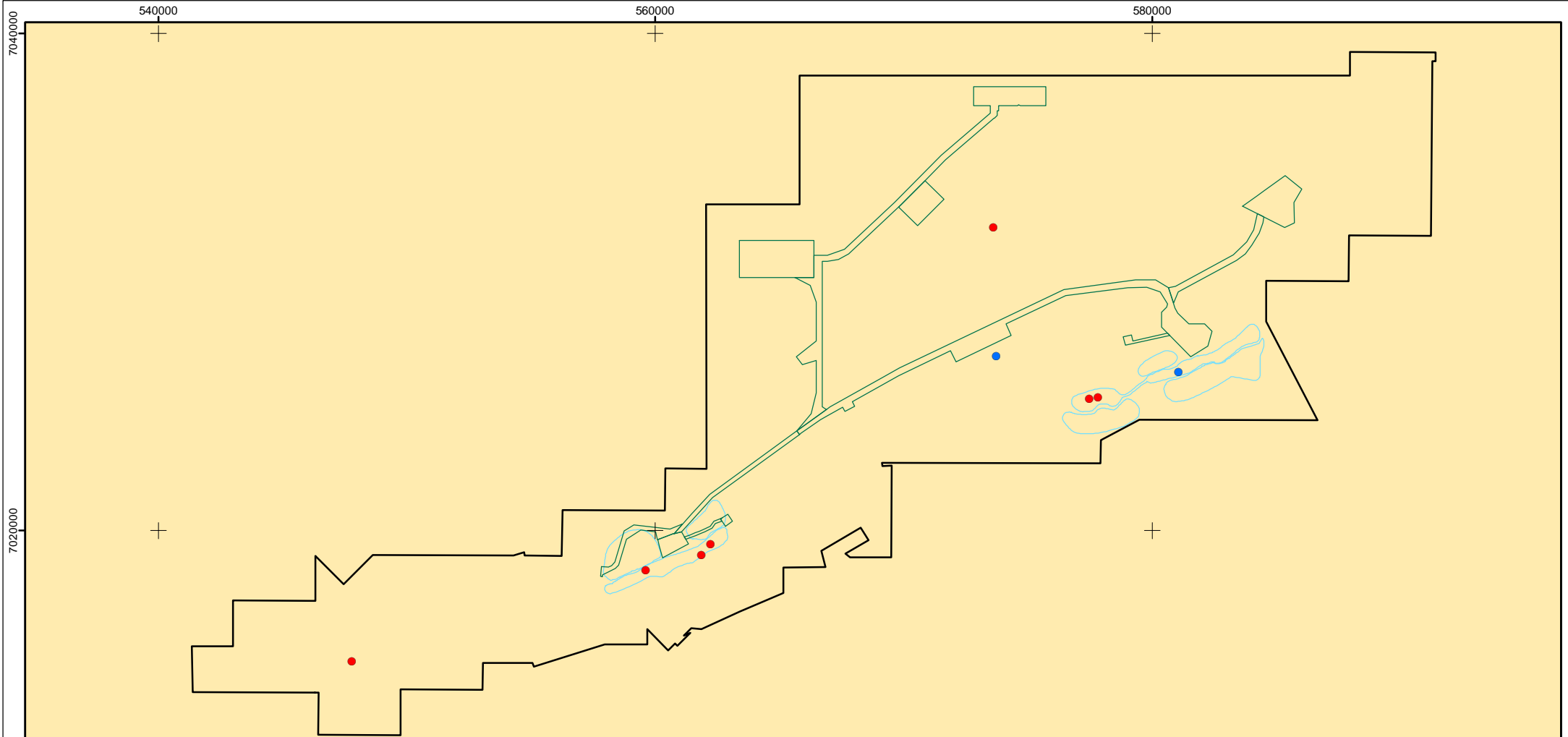
Taxon	No Locations within 40 km of BFS separated by >500 m	Estimated Total No. Plants within 40 km of BFS	Local impact of BFS Option 1				Assessment of impact of footprint to local viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	
<i>Beyeria lapidicola</i> (P1)	8	52	5	62.5	19	36.5	Local viability may be threatened. Two records outside boundaries of infrastructure are in close proximity to footprint, however one record (estimated 10 plants) lies ≈ 10 km to the southwest. (Error! Reference source not found.) .
<i>Eremophila rhegos</i> (P1)	0	0	0	0.0	0	-	Population previously reported at Weld Range in 1995 now appears to be extinct.
<i>Euphorbia sarcostemmoides</i> (P1)	5	9	0	0.0	0	0.0	No impact
<i>Goodenia lyrata</i> (P1)	4	25	2	50.0	15	60.0	Local viability may be threatened. However 2 populations (both estimated at 5 plants) occur ≈ 4-8 km north east and north west respectively from the boundaries of the impact footprint (Figure 1.23).
<i>Sauropus sp. Woolgorong (M. Officer s.n. 10/8/94)</i> (P1)	13	76	1	7.7	1	1.3	Local viability not threatened given minimal impact (Figure 1.24)
<i>Stenanthemum patens</i> (P1)	3	34	1	33.3	20	58.8	Local viability may be threatened. One population (9 plants) recorded outside boundaries of infrastructure lies ≈7 km from the impact footprint (Figure 1.25).
<i>Acacia burrowsiana</i> (P3)	2	19	1	50.0	9	47.4	Local viability may be threatened. Only one record (est. 10 plants) outside impact footprint. However as the impacted population lies within a proposed haul road, there is potential to minimize the impact by altering the design (Figure 1.26).
<i>Acacia speckii</i> (P3)	92	1014	18	19.6	200	19.7	Local viability unlikely to be threatened as records occur to the north east, south and west of the boundary 4-7 km from impact (Figure 1.27).
<i>Calytrix erosipetala</i> (P3)	2	25	1	50.0	20	80.0	Local viability may be significantly threatened . Nearest recorded population ≈28 km distant. Impacted population lies within a borrow target so there may be potential to avoid impact (Figure 1.28).

Taxon	No Locations within 40 km of BFS separated by >500 m	Estimated Total No. Plants within 40 km of BFS	Local impact of BFS Option 1				Assessment of impact of footprint to local viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	
<i>Dodonaea amplisemina</i>	54	810	12	22.2	183	22.6	Local viability unlikely to be threatened as records occur to the north east, south and west of the boundary ≈ 1-8 km from impact (Figure 1.29).
<i>Eremophila arachnoides</i> <i>Chinnock subsp. arachnoides</i> (P3)	3	50	1	33.3	20	40.0	Local viability may be threatened. Only two other populations outside area of impact: one ≈ 1.6km south of Madoonga Pit (est. 10 plants) and another ≈ 36 km to the west (est. 20 plants) (Figure 1.30).
<i>Grevillea stenostachya</i> (P3)	80	981	6	7.5	205	20.9	Local viability unlikely to be threatened. Records occur ≈ 4 and 2 km to the west and north-east of the infrastructure respectively, and also in the area between haul roads. Numerous records ≈ 15 km to the north. (Figure 1.31).
<i>Hemigenia tysonii</i> (P3)	105	13259	9	8.6	410	3.1	Local viability not threatened given numerous populations to west and north and minimal impact (Figure 1.32)
<i>Homalocalyx echinulatus</i> (P3)	11	845	6	54.5	438	51.8	Local viability may be threatened (Figure 1.33). Plants impacted lie within Madoonga and Beebyn pits so impact cannot be avoided. Most records outside the impact footprint lie within 1 km of the pit haul road so potential indirect impacts such as dust may be significant.
<i>Micromyrtus placoides</i> (P3)	38	2187	20	52.6	532	24.3	Local viability unlikely to be threatened as multiple records occur ≈ 4 and 8-13 km to the north east and south west of the infrastructure respectively (Figure 1.34). Additional records lie to the south of the pit haul road so indirect impacts will need to be managed.
<i>Mirbelia stipitata</i> (P3)	2	6	0	0.0	0	0.0	Not impacted.
<i>Phyllanthus baeckeoides</i> (P3)	1	5	0	0.0	0	0.0	Not impacted.
<i>Prostanthera ferricola</i> (P3)	1	14	1	100.0	14	100.0	Based on current data the only local population will be completely removed (Figure 1.35). As the record lies within the Madoonga Pit the impact cannot be minimized.
<i>Prostanthera petrophila</i> (P3)	87	2133	25	28.7	435	20.4	Local viability unlikely to be threatened. Multiple records lie ≈ 1-14 km to the south west and scattered between infrastructure (Figure 1.36).

Taxon	No Locations within 40 km of BFS separated by >500 m	Estimated Total No. Plants within 40 km of BFS	Local impact of BFS Option 1				Assessment of impact of footprint to local viability
			Total No Loci separated by >500 m	% Total	Estimated Total No. Plants	% Total	
<i>Ptilotus beardii</i> (P3)	24	3679	3	12.5	836	22.7	Local viability unlikely to be threatened. Records lie to ≈ 7-12 to the west, ≈ 1 km to the north east and ≈ 2.5 km to the south east of infrastructure (Figure 1.37). Current records probably significantly underestimate the local distribution of this species which has been recorded at high abundance within the OPR rail corridor.
<i>Ptilotus luteolus</i> (P3)	5	68	0	0.0	0	0.0	Not impacted.
<i>Tecticornia cymbiformis</i> (P3)	1	14	1	100.0	14	100.0	Based on current data the only local population will be completely removed. As the record lies within the Madoonga Pit the impact cannot be minimized (Figure 1.38).
<i>Verticordia jamiesonii</i> (P3)	3	103	1	33.3	1	1.0	Local viability unlikely to be threatened as records occur ≈ 9 and 12 km to the west of the infrastructure, one of which supported ≈ 100 plants. Impact to the population at Weld Range cannot be minimized as it lies within the Beebyn pit (Figure 1.39).
<i>Baeckea</i> sp. Melita Station (P4)	17	827	4	23.5	100	12.1	Local viability unlikely to be threatened as records occur ≈ 10 and 5 km to the west and north-east of the infrastructure respectively with additional records south of the pit haul road 9 (Figure 1.40).
<i>Goodenia berringbinensis</i> (P4)	1	30	1	100	30	100.0	Based on current data the only local population will be completely removed. As the record lies within the Madoonga Pit the impact cannot be minimized (Figure 1.41).
<i>Grevillea inconspicua</i> (P4)	21	308	6	28.6	82	26.6	Local viability unlikely to be threatened as records occur ≈ 1-2 and 12 km to the east and west of the infrastructure respectively with additional records 0.8-4 km south of the pit haul road (Figure 1.42).

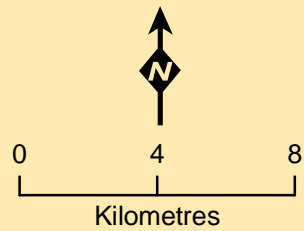
Taxon where local viability is likely to be significantly impacted by the proposed infrastructure

Taxon where there may be some impact to local viability



Legend

- *Beyeria lapidicola* (DEC records)
- *Beyeria lapidicola* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



Absolute Scale - 1:220,000



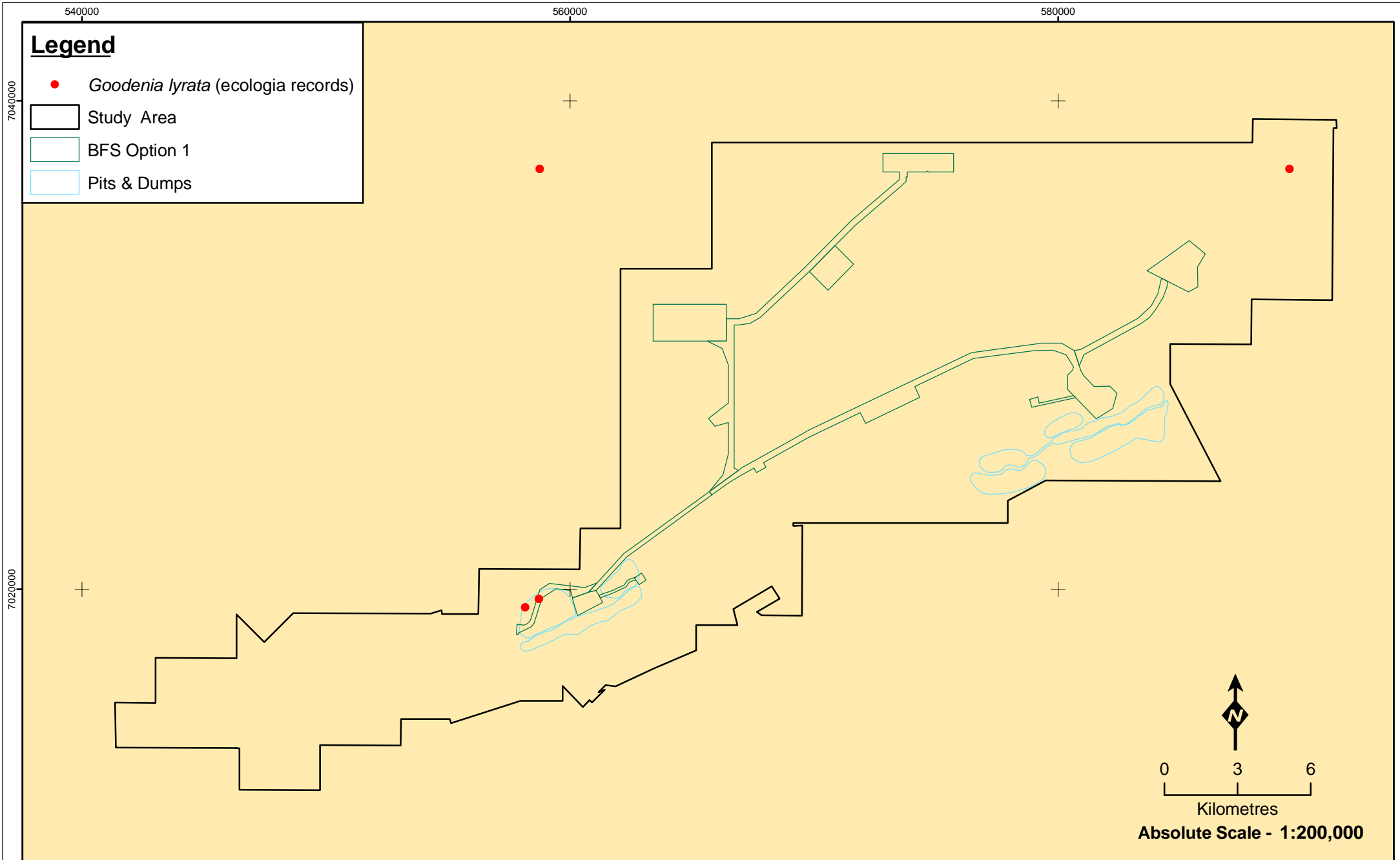
**Distribution of
Beyeria lapidicola
near the study area**

Figure:1.22
Project ID: 722

Coordinate System
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Projection: Transverse Mercator
Datum: GDA 1994

Drawn: SV
Date: 02/12/10

Unique Map ID: SV015



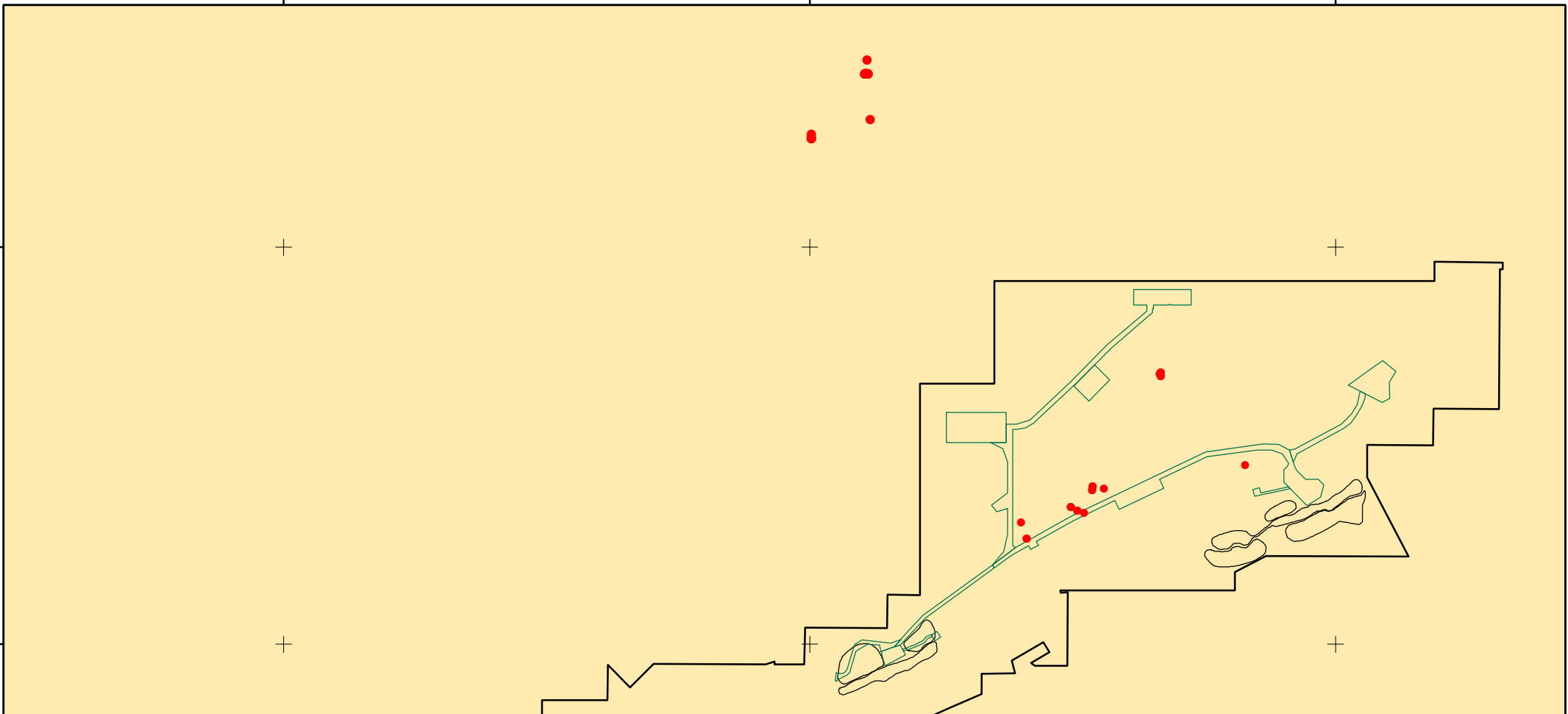
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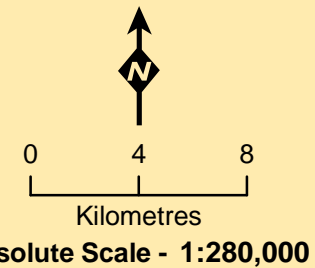
7020000



Legend

- *Sauropus* sp. Woolgorong (DEC records)
- *Sauropus* sp. Woolgorong (ecologia records)

- Study Area
- BFS Option 1
- Pits & Dumps



Distribution of *Sauropus* sp. Woolgorong near the study area

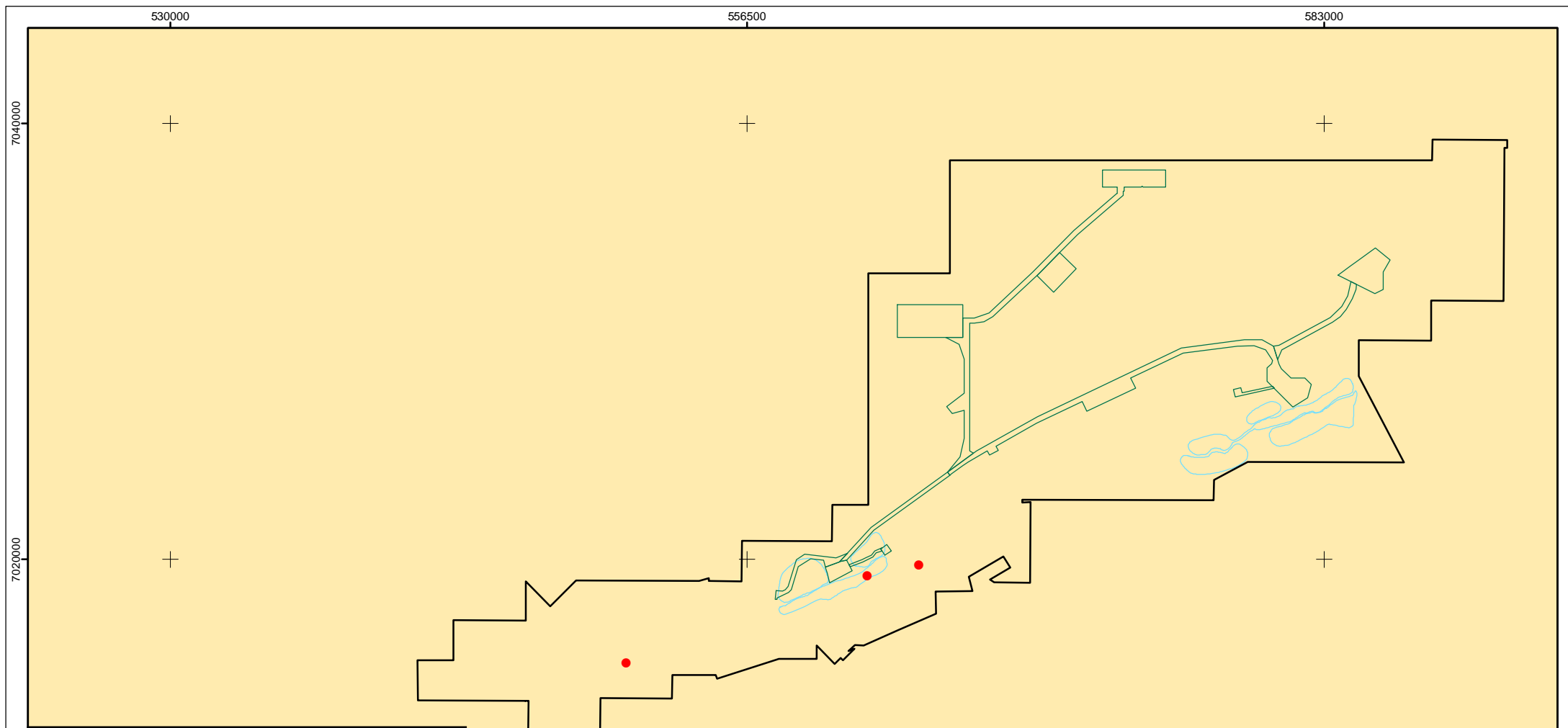
Figure:1.24
Project ID: 722

Coordinate System
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Projection: Transverse Mercator
Datum: GDA 1994

Drawn: SV
Date: 02/12/10

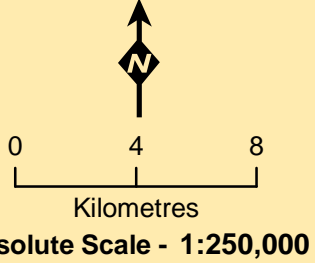
Unique Map ID: SV021

A4



Legend

- *Stenanthemum patens* (DEC records)
- *Stenanthemum patens* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



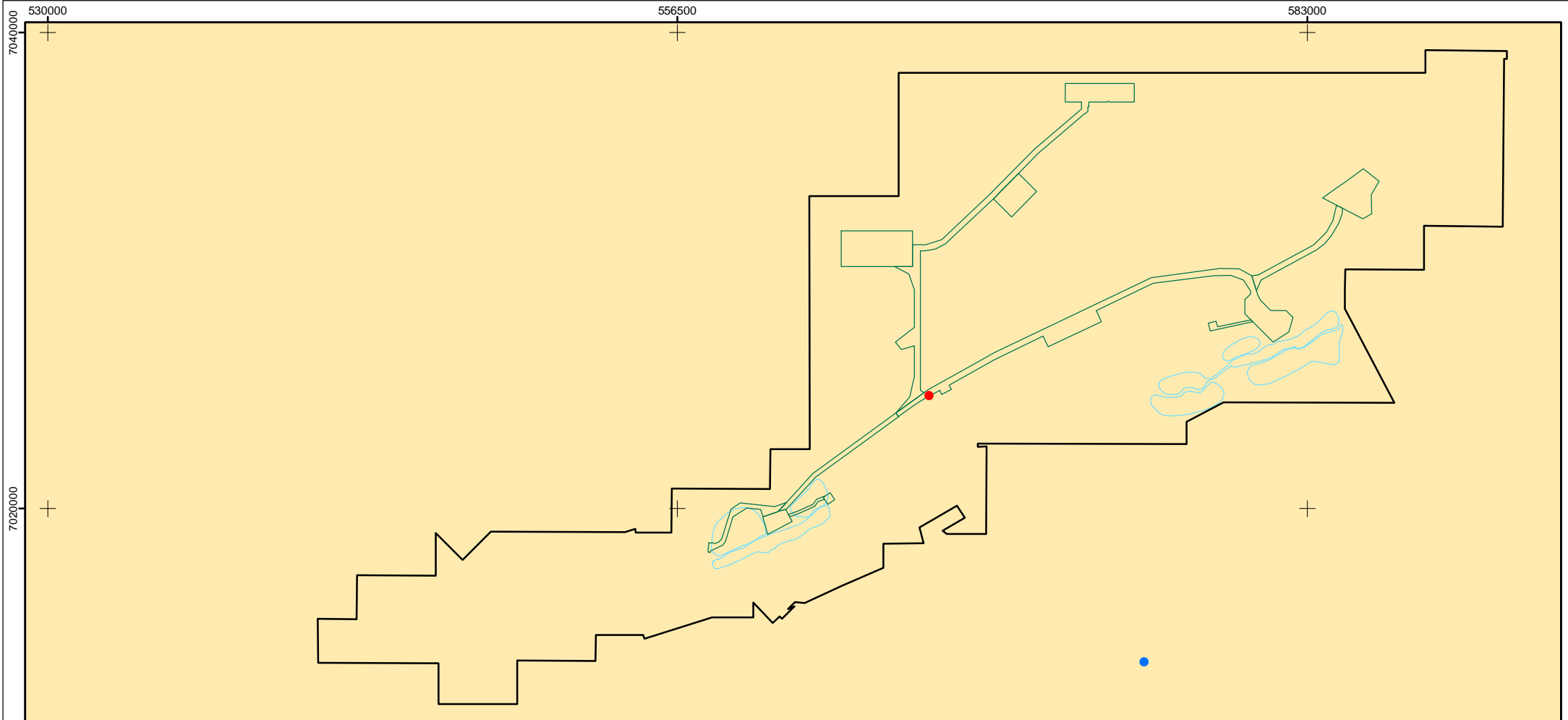
**Distribution of
Stenanthemum patens
near the study area**

Figure:1.25
Project ID: 722

Coordinate System
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Projection: Transverse Mercator
Datum: GDA 1994

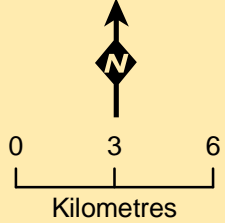
Drawn: SV
Date: 02/12/10

Unique Map ID: SV038



Legend

- *Acacia burrowsiana* (DEC records)
- *Acacia burrowsiana* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



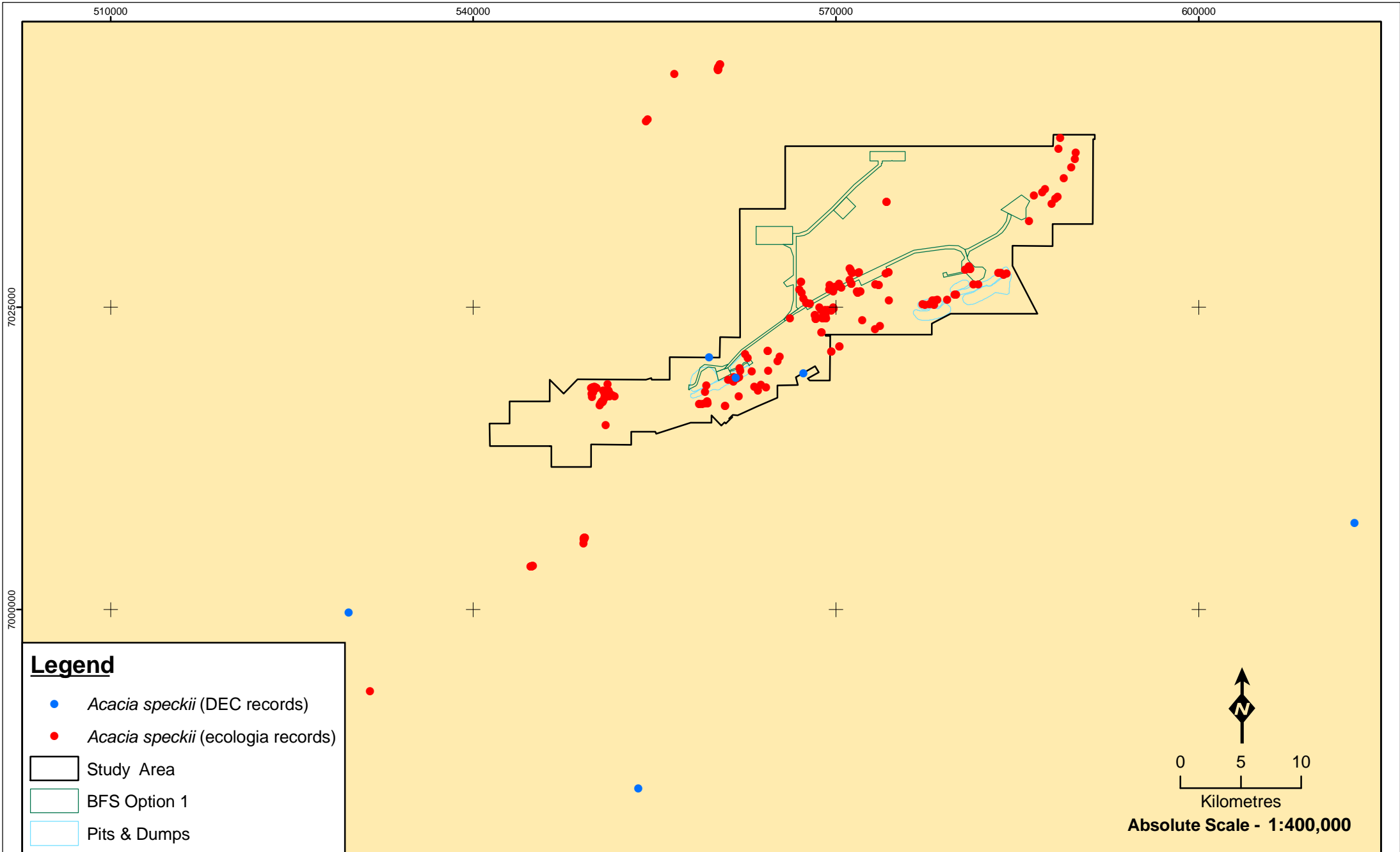
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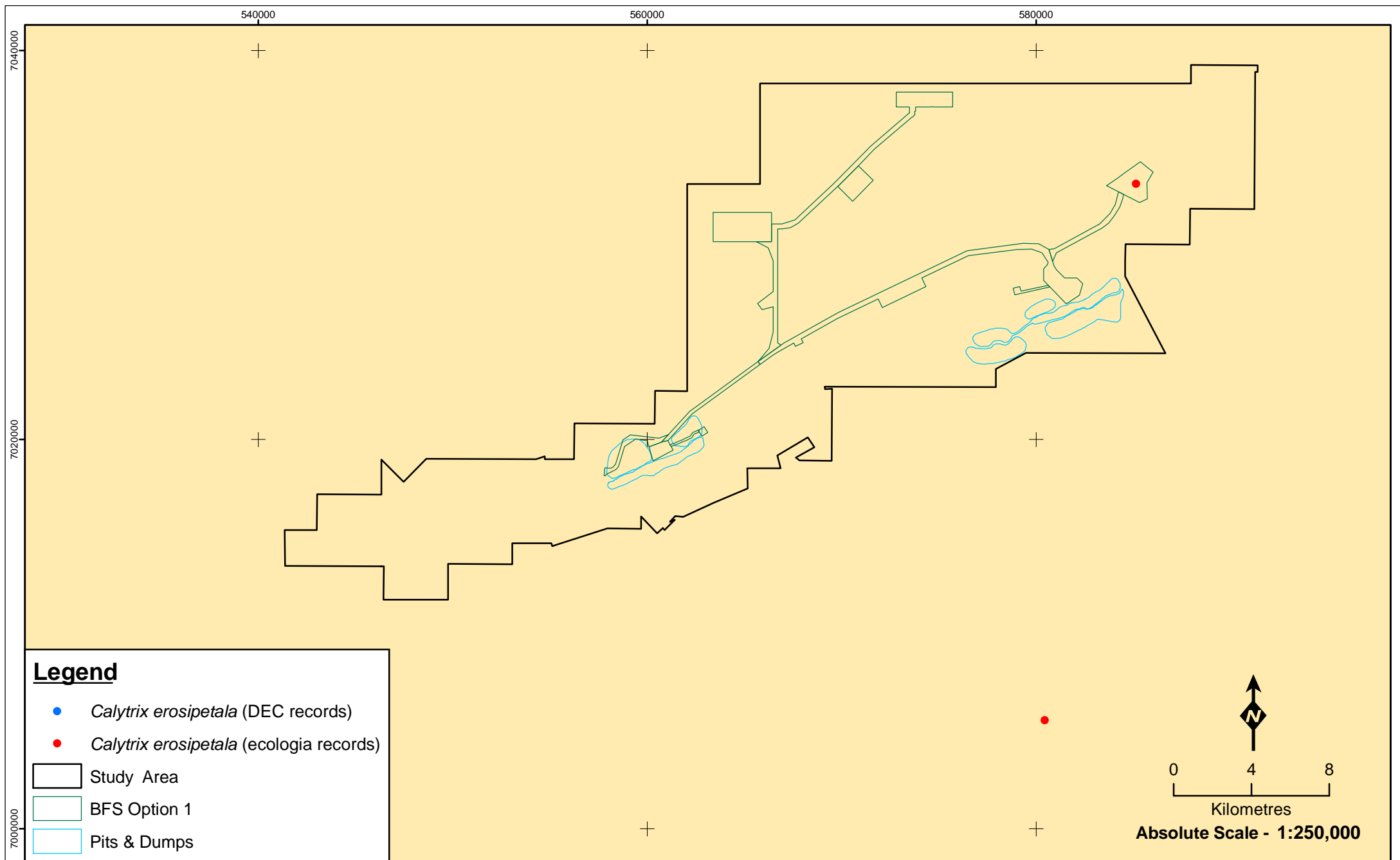


Distribution of *Acacia burrowsiana* near the study area

Figure:1.26
Project ID: 722
Coordinate System
 Name: GDA 1994 MGA Zone 50
 Projection: Transverse Mercator
 Datum: GDA 1994

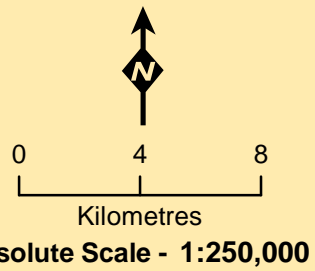
Drawn: SV
Date: 02/12/10
 Unique Map ID: SV040
 A4





Legend

- *Calytrix erosipetala* (DEC records)
- *Calytrix erosipetala* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



**Distribution of
Calytrix erosipetala
near the study area**

Figure:1.28
Project ID: 722

Drawn: SV
Date: 02/12/10

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

Unique Map ID: SV044

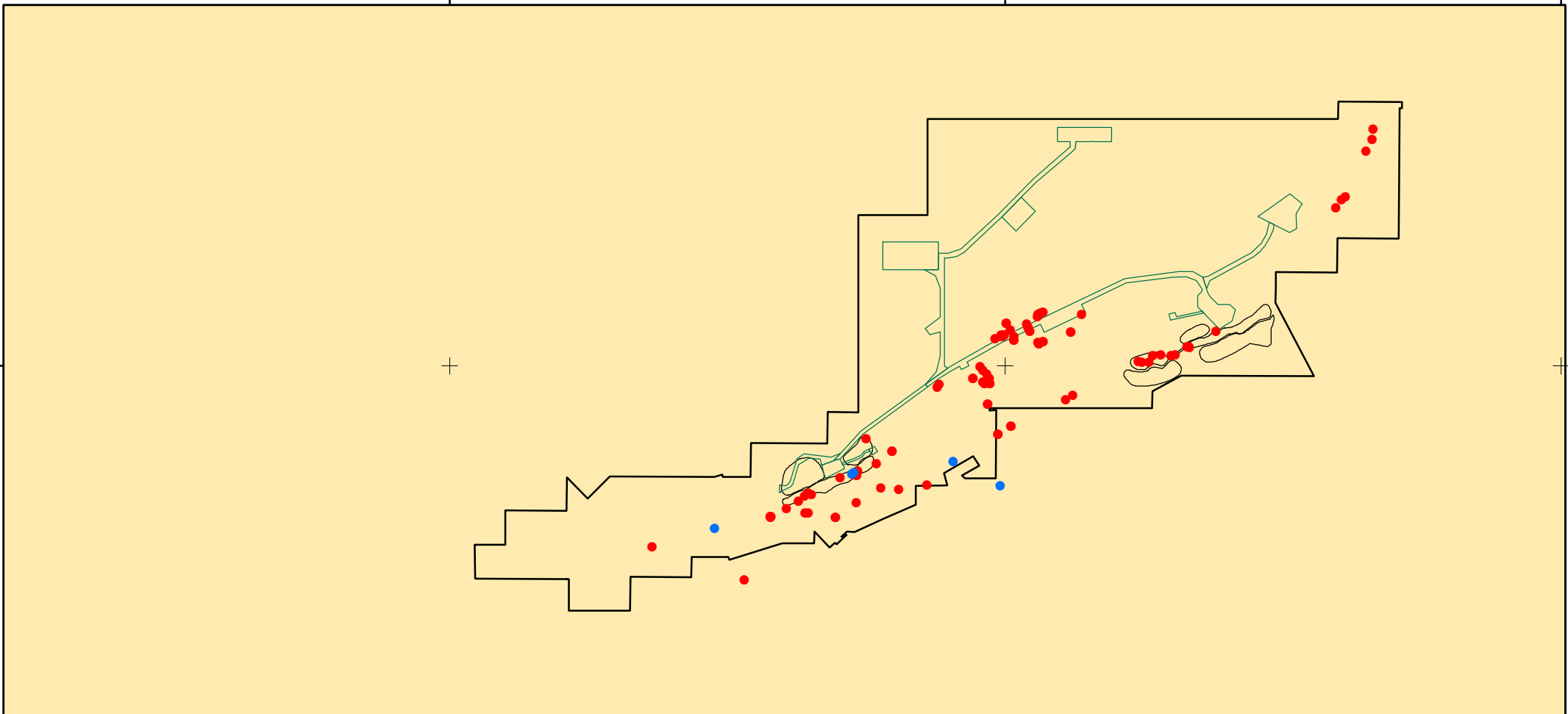
540000

570000

600000

7025000

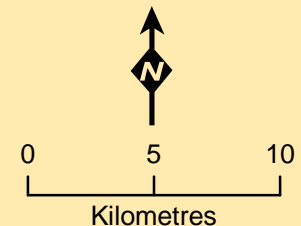
7000000



Legend

- *Dodonaea amplisemina* (DEC records)
- *Dodonaea amplisemina* (ecologia records)

- Study Area
- BFS Option 1
- Pits & Dumps



Absolute Scale - 1:300,000



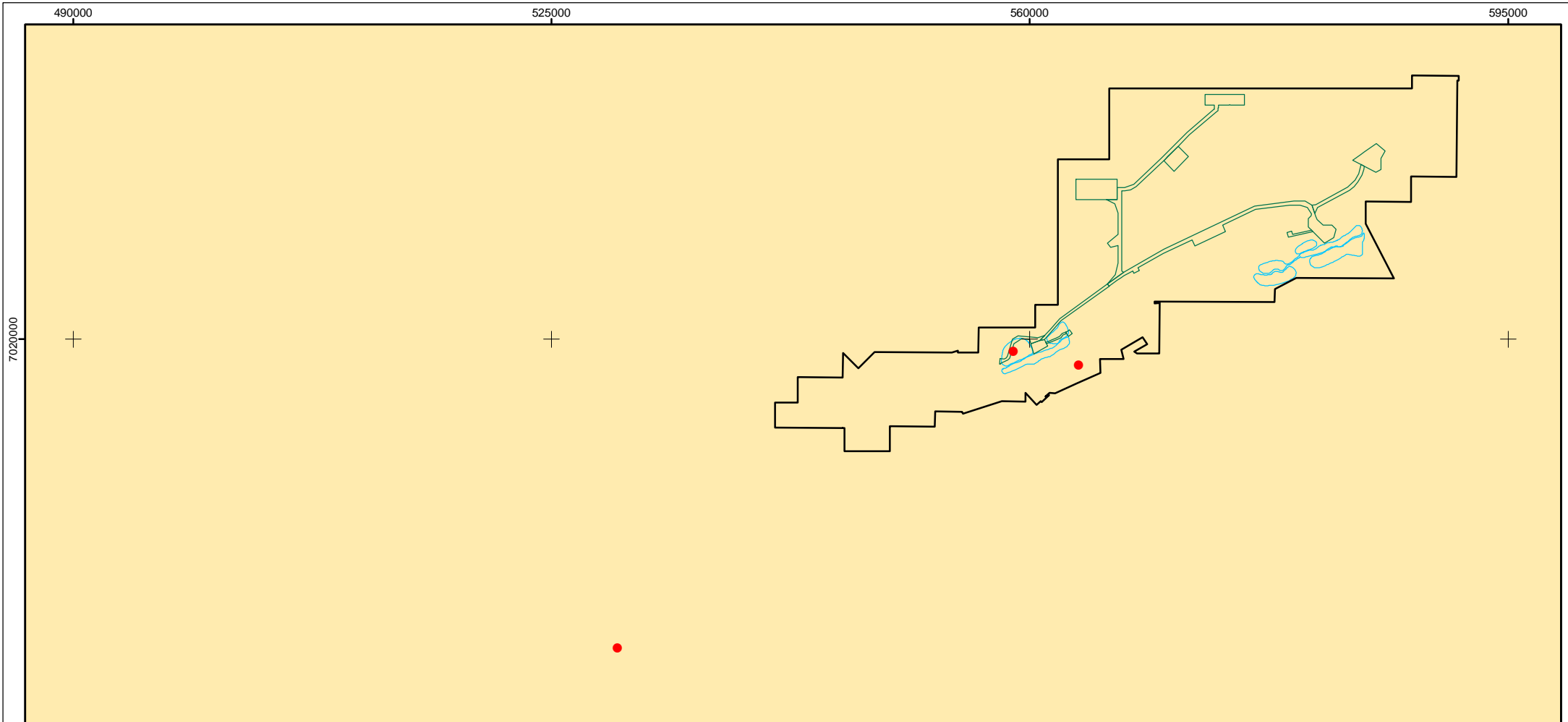
**Distribution of
Dodonaea amplisemina
near the study area**

Figure:1.29
Project ID: 722

Drawn: SV
Date: 0/12/10

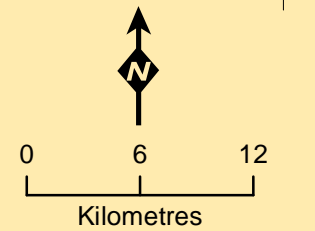
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: SV025



Legend

- *Eremophila arachnoides* subsp. *arachnoides* (DEC records)
- *Eremophila arachnoides* subsp. *arachnoides* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



Absolute Scale - 1:400,000



**Distribution of
Eremophila arachnoides subsp. *arachnoides*
near the study area**

Figure:1.30
Project ID: 722
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Drawn: SV
Date: 02/12/10
Unique Map ID: SV046

520000

540000

560000

580000

7040000

7020000

Legend

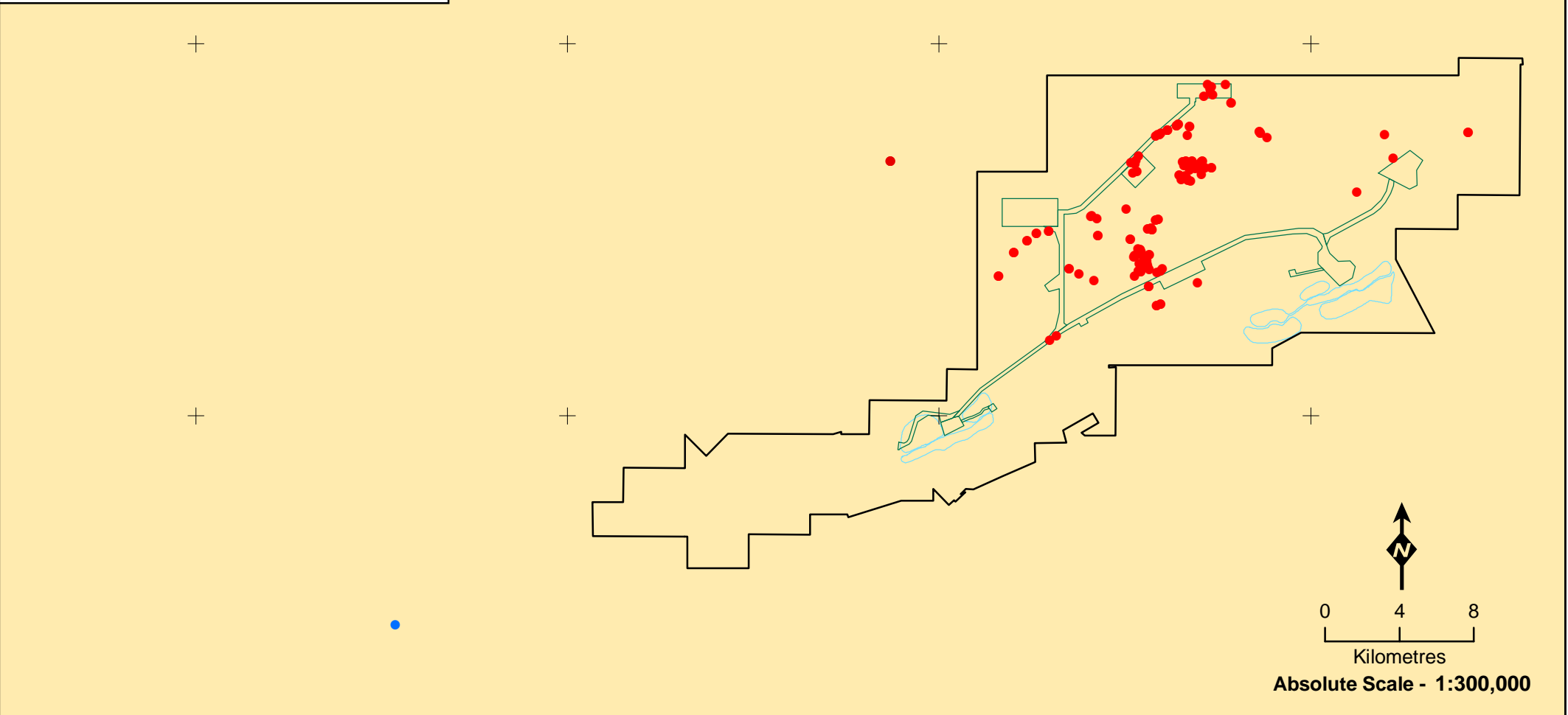
● *Grevillea stenostachya* (DEC records)

● *Grevillea stenostachya* (ecologia records)

□ Study Area

□ BFS Option 1

□ Pits & Dumps



Distribution of *Grevillea stenostachya* near the study area

Figure:1.31
Project ID: 722

Drawn: SV
Date: 02/12/10

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

Unique Map ID: SV009

510000

540000

570000

600000

Legend

- *Hemigenia tysonii* (DEC records)
- *Hemigenia tysonii* (ecologia records)

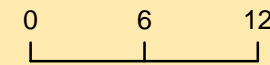
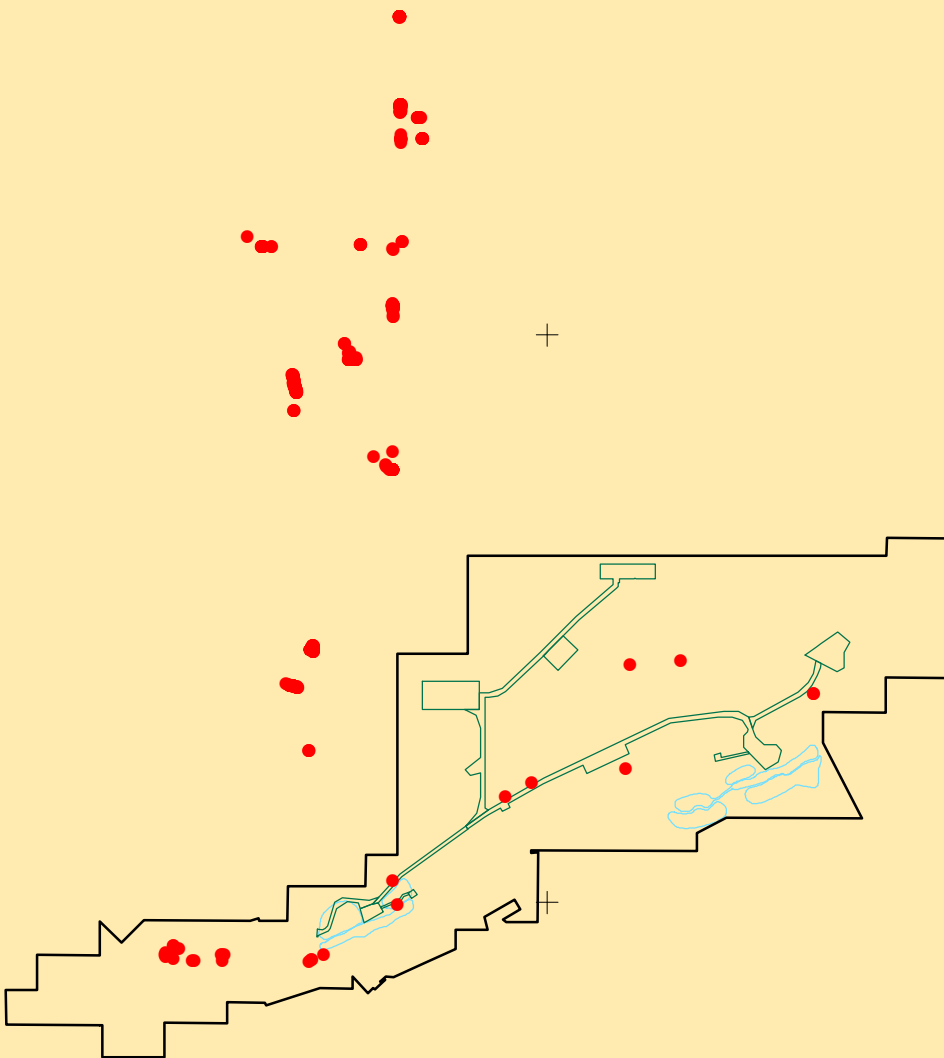
- Study Area
- BFS Option 1
- Pits & Dumps

7050000

7020000

+ + + +

+ + + +



Absolute Scale - 1:400,000



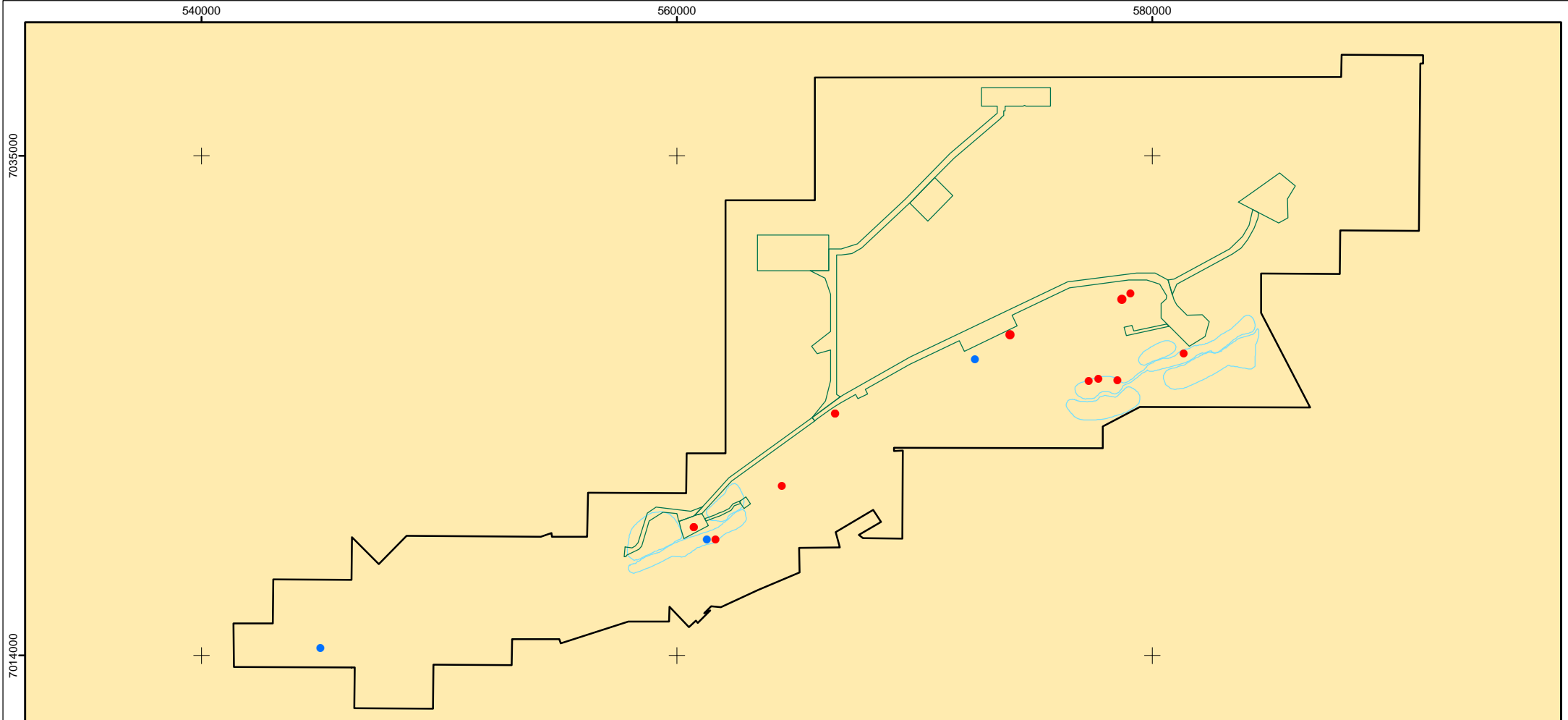
Distribution of *Hemigenia tysonii* near the study area

Figure:1.32
Project ID: 722

Drawn: SV
Date: 02/12/10

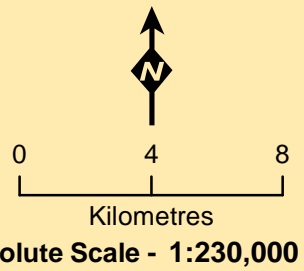
Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: SV023



Legend

- *Homalocalyx echinulatus* (DEC records)
- *Homalocalyx echinulatus* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



**Distribution of
Homalocalyx echinulatus
near the study area**

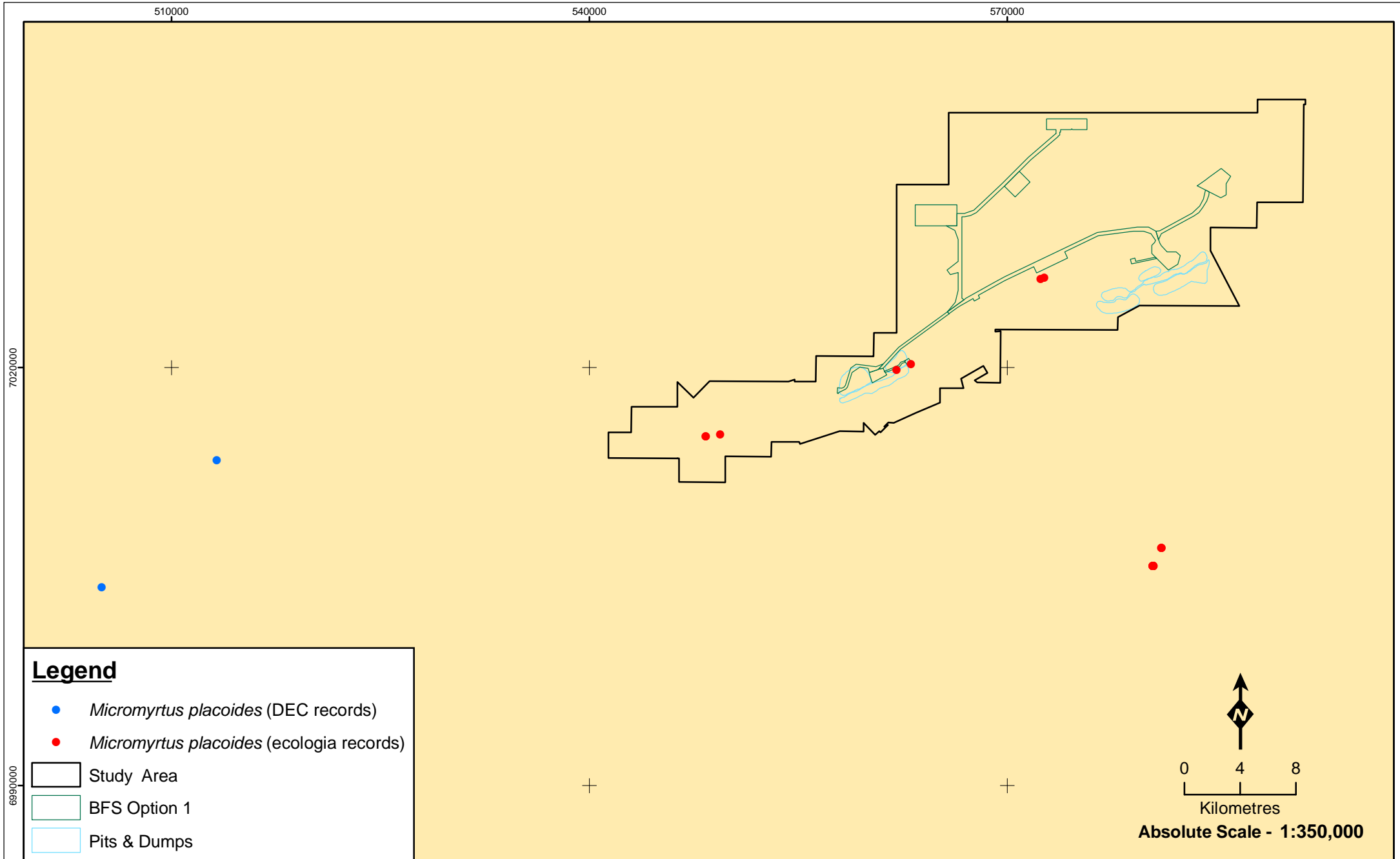
Figure:1.33
Project ID: 722

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

Drawn: SV
Date: 02/12/10

Unique Map ID: SV011

A4



**Distribution of
Micromyrtus placoides
 near the study area**

Figure:1.34
Project ID: 722

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

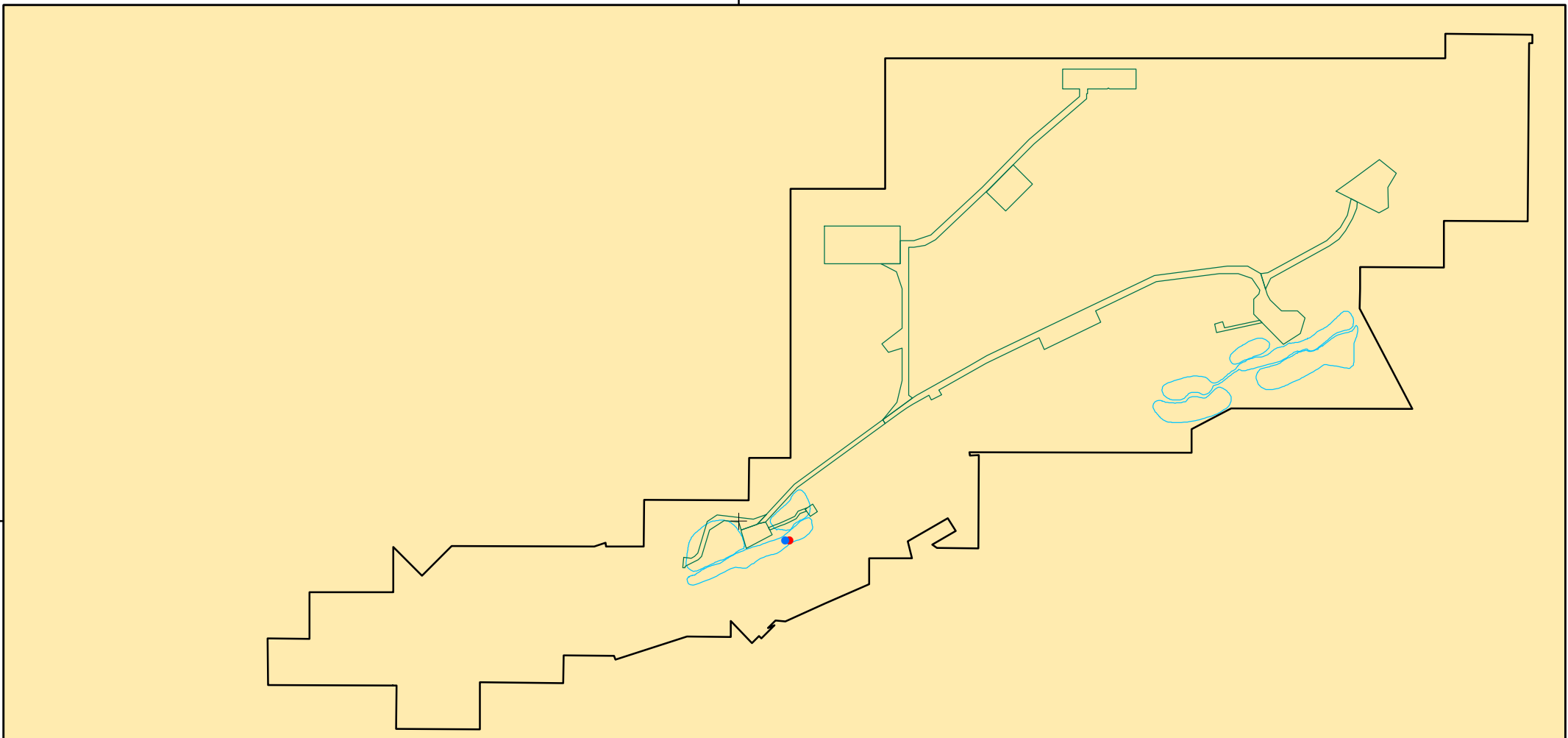
Drawn: SV
Date: 02/12/10

Unique Map ID: SV027

A4

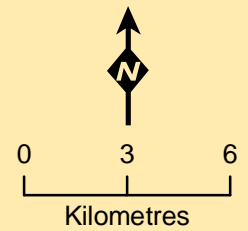
560000

7020000



Legend

- *Prostanthera ferricola* (DEC records)
- *Prostanthera ferricola* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



Absolute Scale - 1:220,000



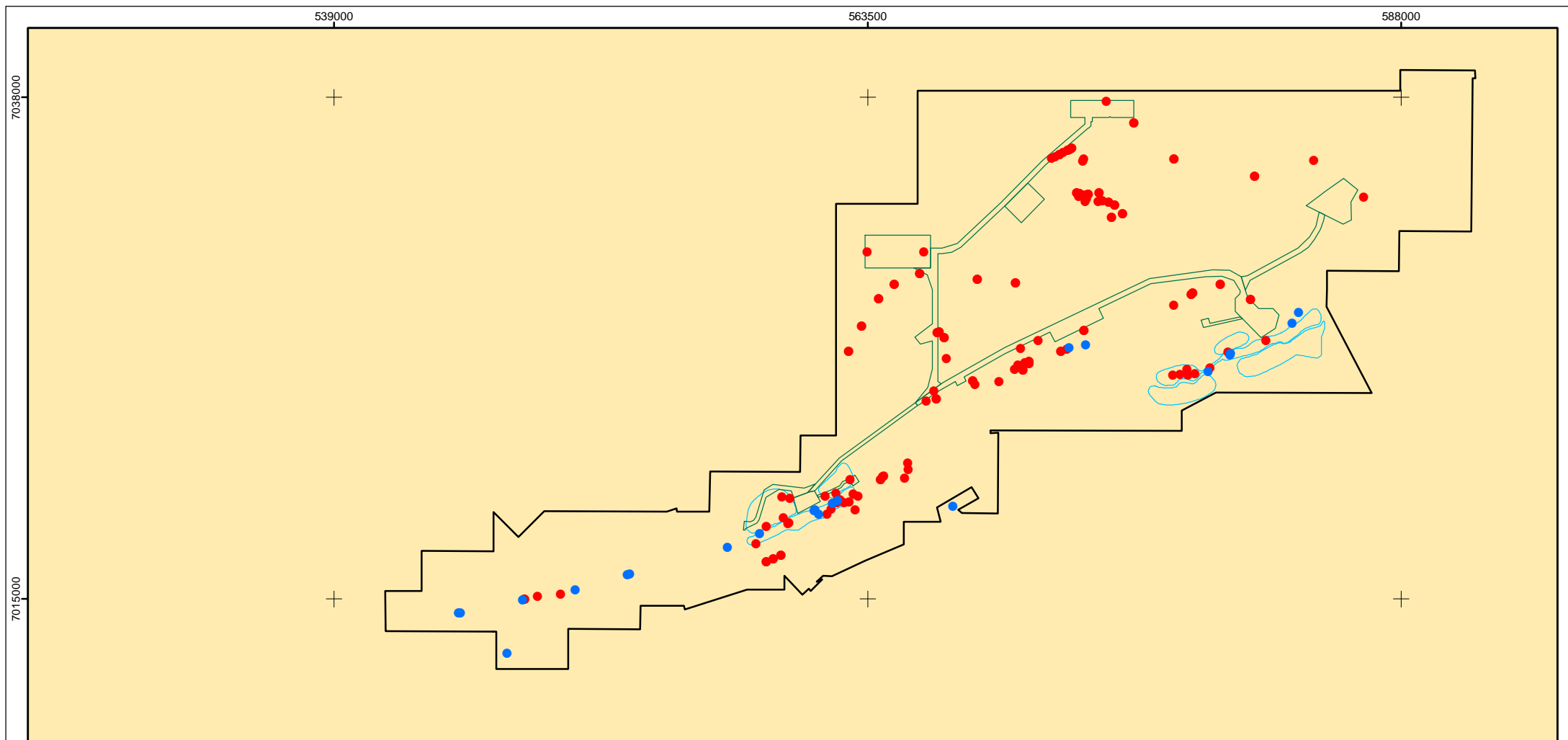
**Distribution of
Prostanthera ferricola
near the study area**

Figure:1.35
Project ID: 722

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

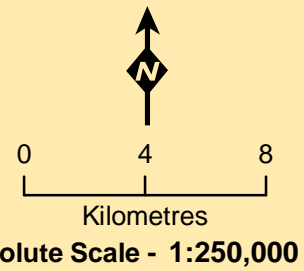
Drawn: SV
Date: 02/12/10

Unique Map ID: SV048



Legend

- *Prostanthera petrophila* (DEC records)
- *Prostanthera petrophila* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



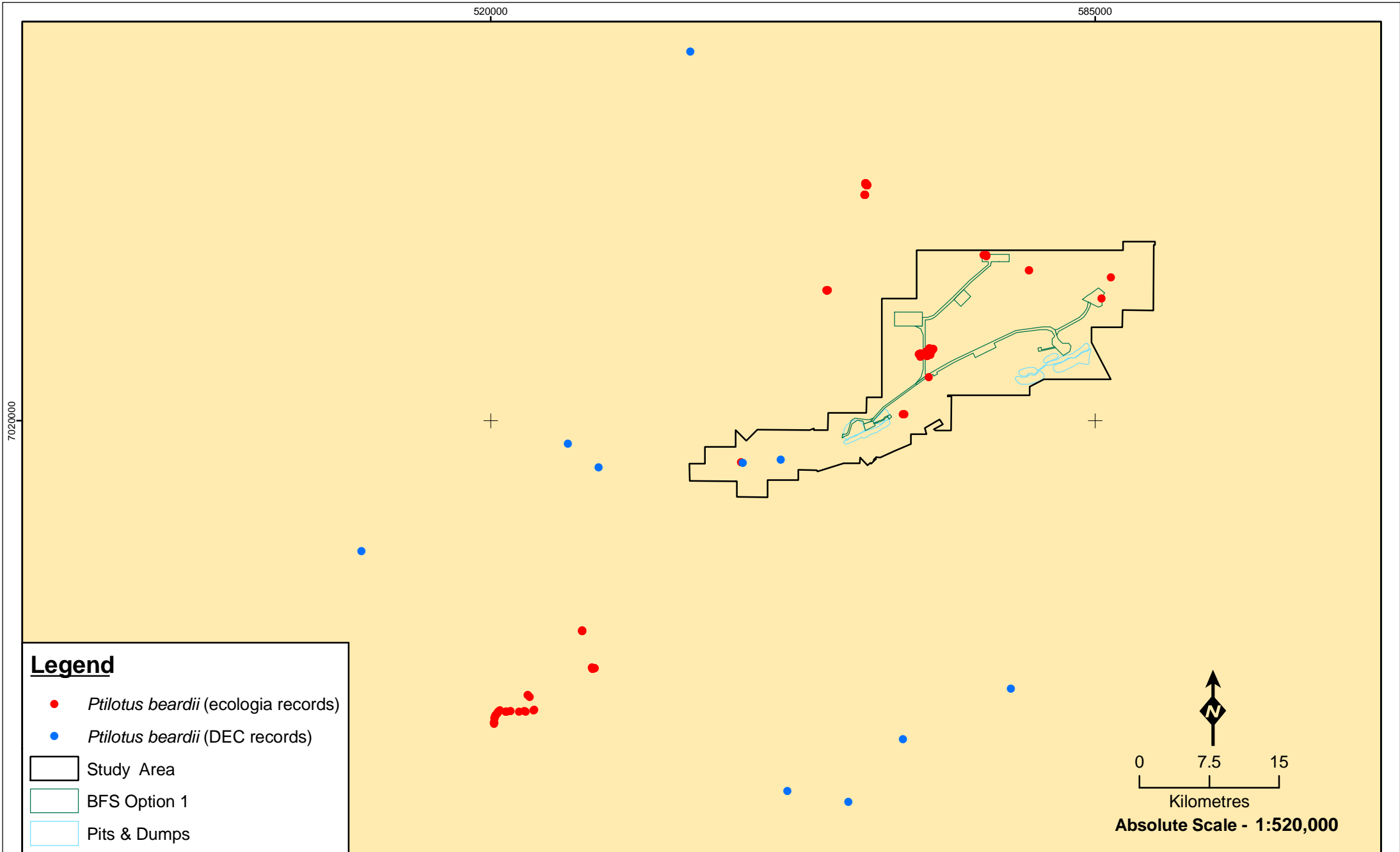
**Distribution of
Prostanthera petrophila
near the study area**

Figure:1.36
Project ID: 722

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

Drawn: SV
Date: 02/12/10

Unique Map ID: SV050



Legend

- *Ptilotus beardii* (ecologia records)
- *Ptilotus beardii* (DEC records)
- ▭ Study Area
- ▭ BFS Option 1
- ▭ Pits & Dumps

0 7.5 15
 Kilometres
Absolute Scale - 1:520,000



Distribution of *Ptilotus beardii* near the study area

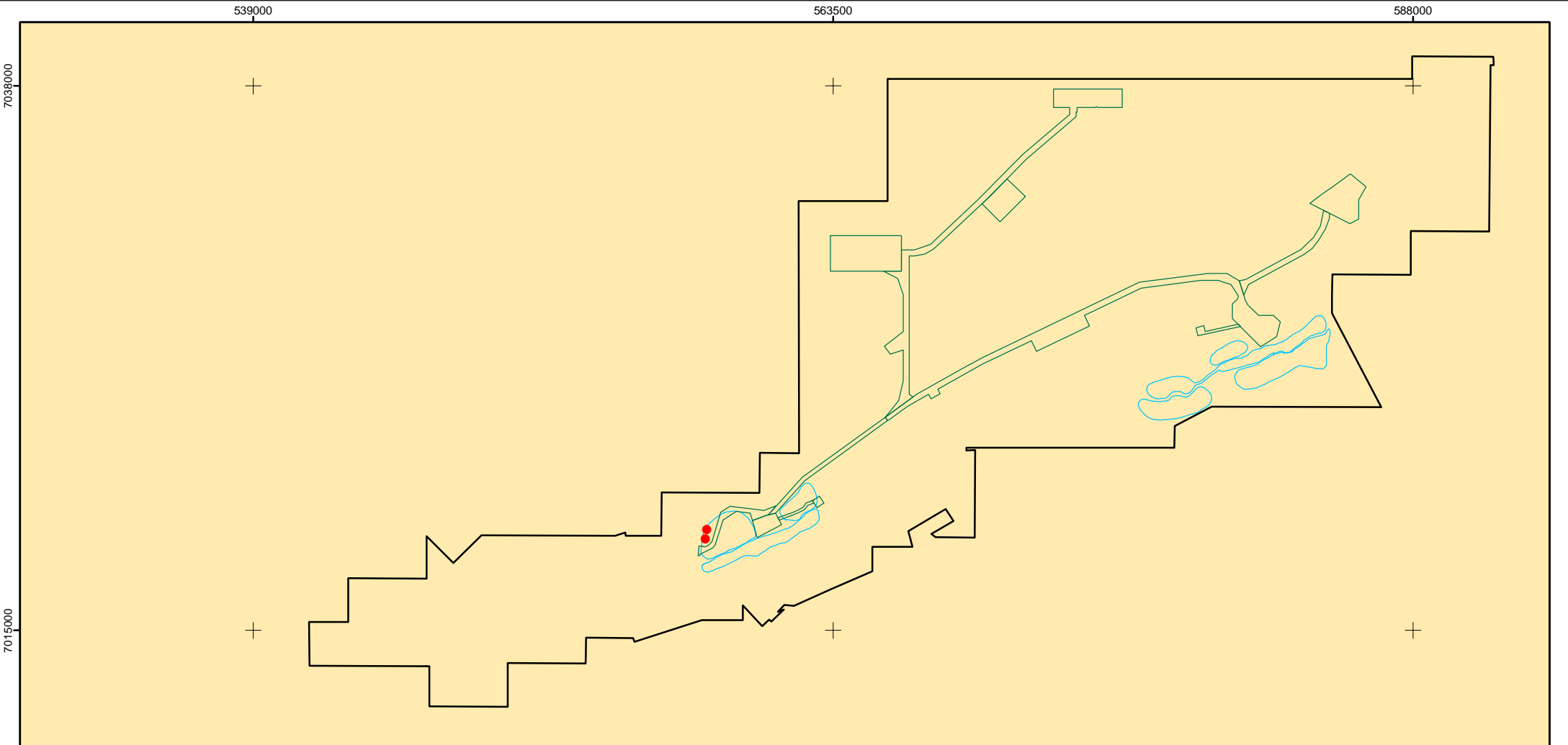
Figure:1.37
Project ID: 722

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

Drawn: SV
Date: 02/12/10

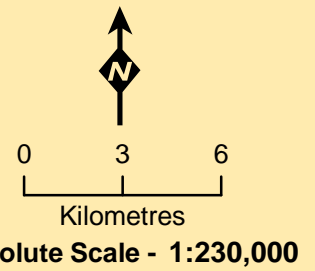
Unique Map ID: SV013

A4



Legend

- *Tecticornia cymbiformis* (DEC records)
- *Tecticornia cymbiformis* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



**Distribution of
Tecticornia cymbiformis
near the study area**

Figure:1.38
Project ID: 722

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

Drawn: SV
Date: 02/12/10

Unique Map ID: SV052

532000

560000

588000

7032000

7008000

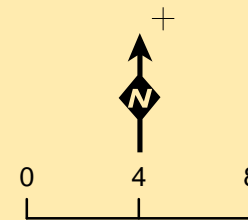
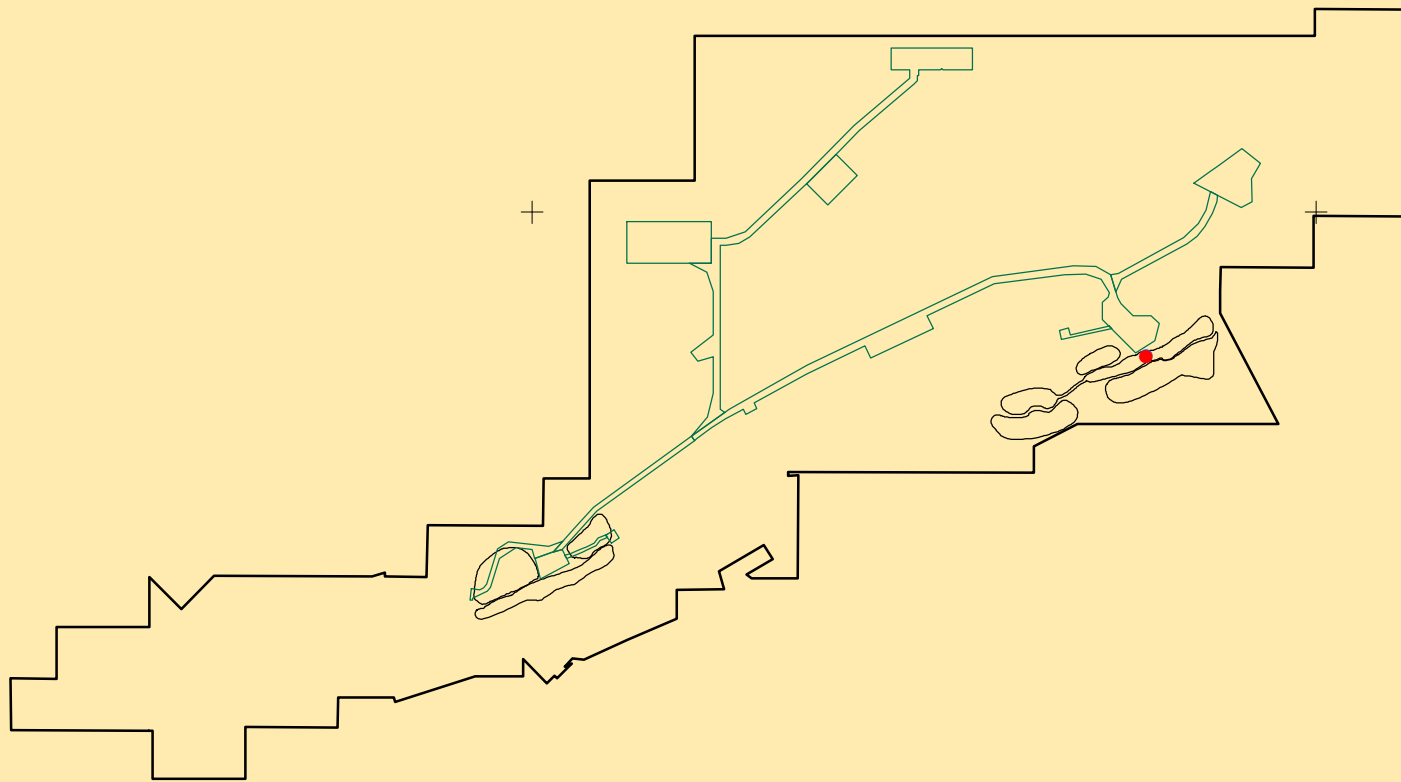
Legend

- *Verticordia jamiesonii* (DEC records)
- *Verticordia jamiesonii* (ecologia records)

Study Area

BFS Option 1

Pits & Dumps



Absolute Scale - 1:270,000



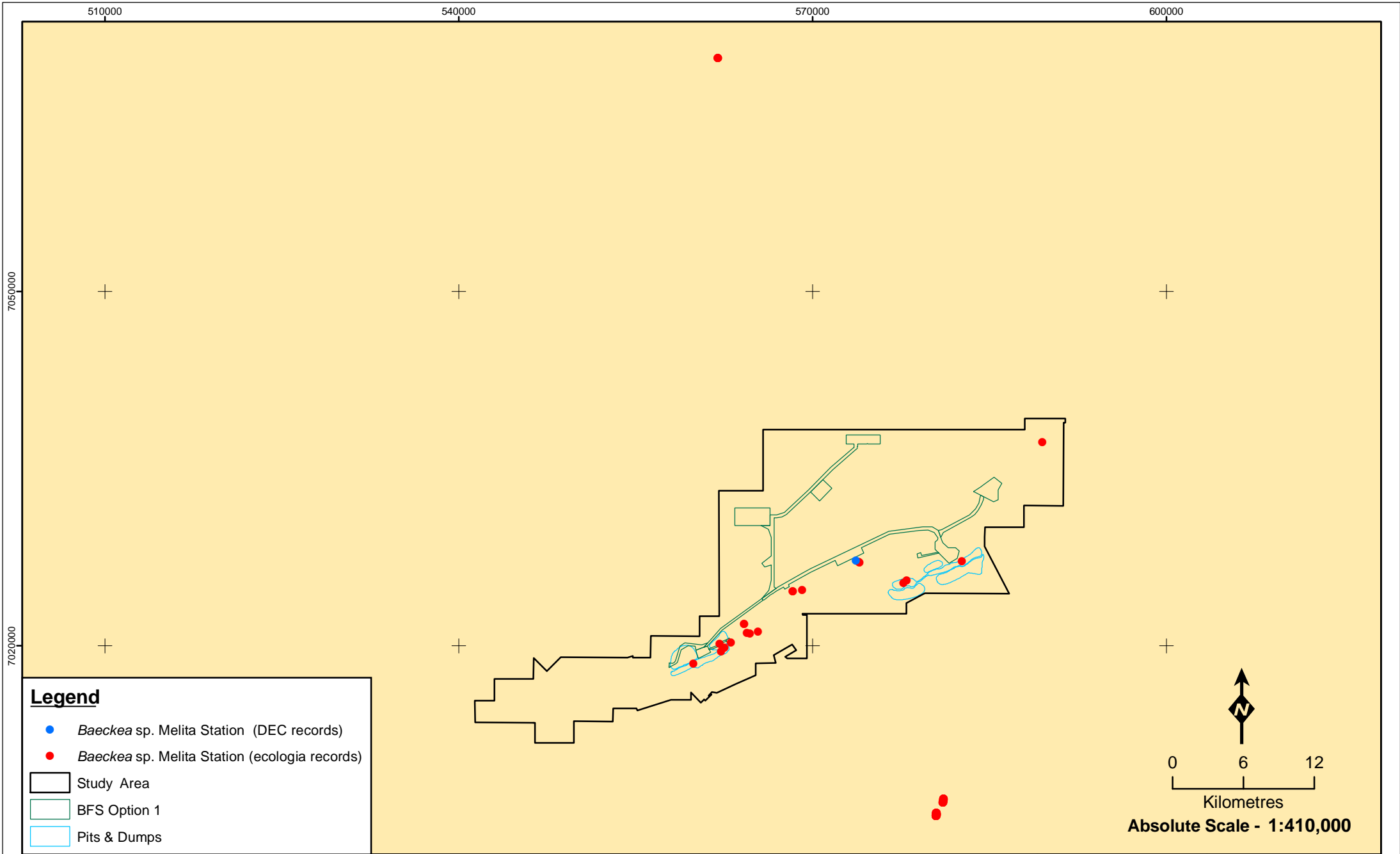
Distribution of *Verticordia jamiesonii* near the study area

Figure:1.39
Project ID: 722

Drawn: SV
Date: 02/12/10

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

Unique Map ID: SV034



Legend

- *Baeckea* sp. Melita Station (DEC records)
- *Baeckea* sp. Melita Station (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps

0 6 12
 Kilometres
Absolute Scale - 1:410,000



**Distribution of
Baeckea sp. Melita station
near the study area**

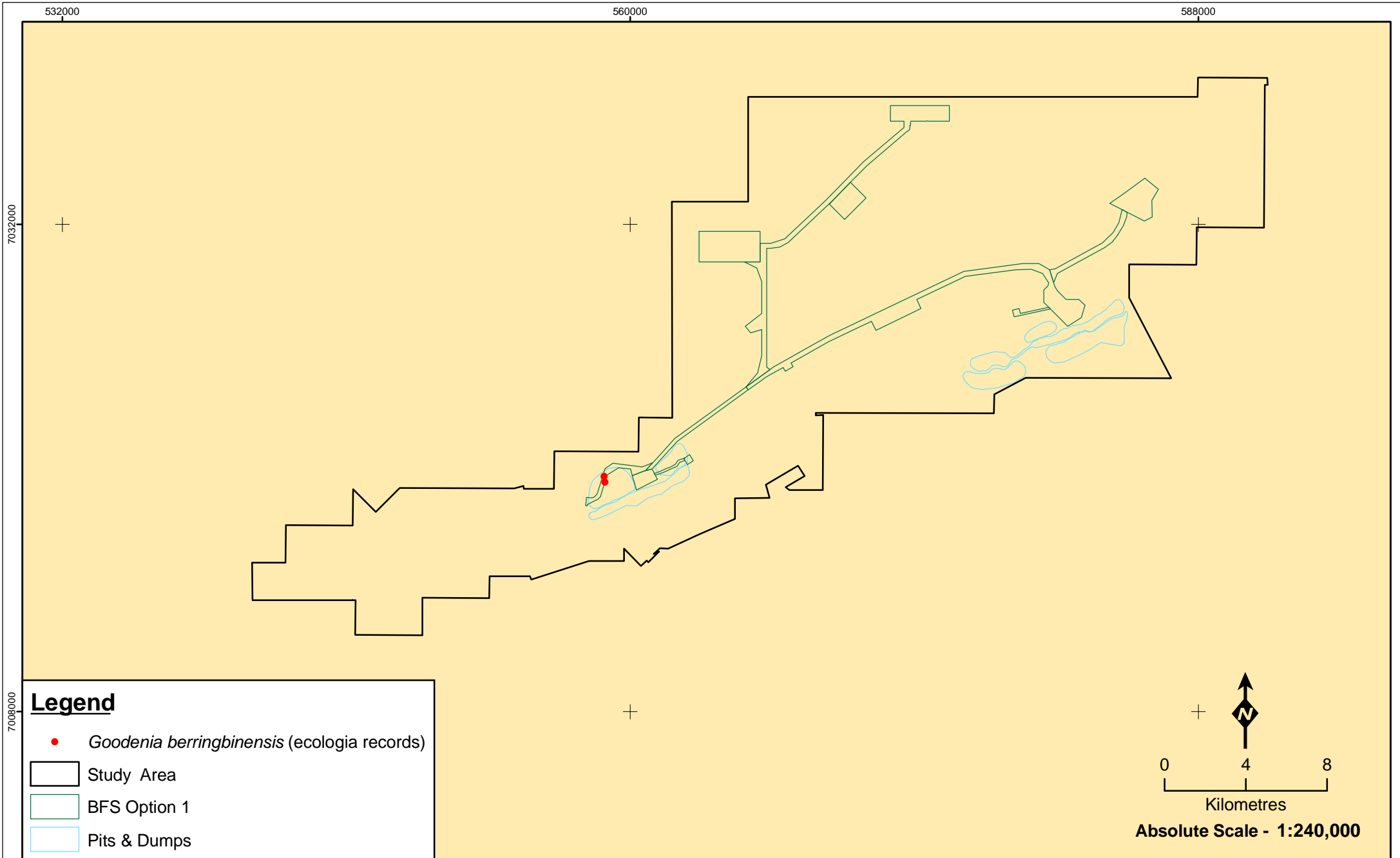
Figure:1.40
Project ID:722

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

Drawn: SV
Date: 02/12/10


Unique Map ID: SV054

A4



Legend

- *Goodenia berringbinensis* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps


 0 4 8
 Kilometres
Absolute Scale - 1:240,000



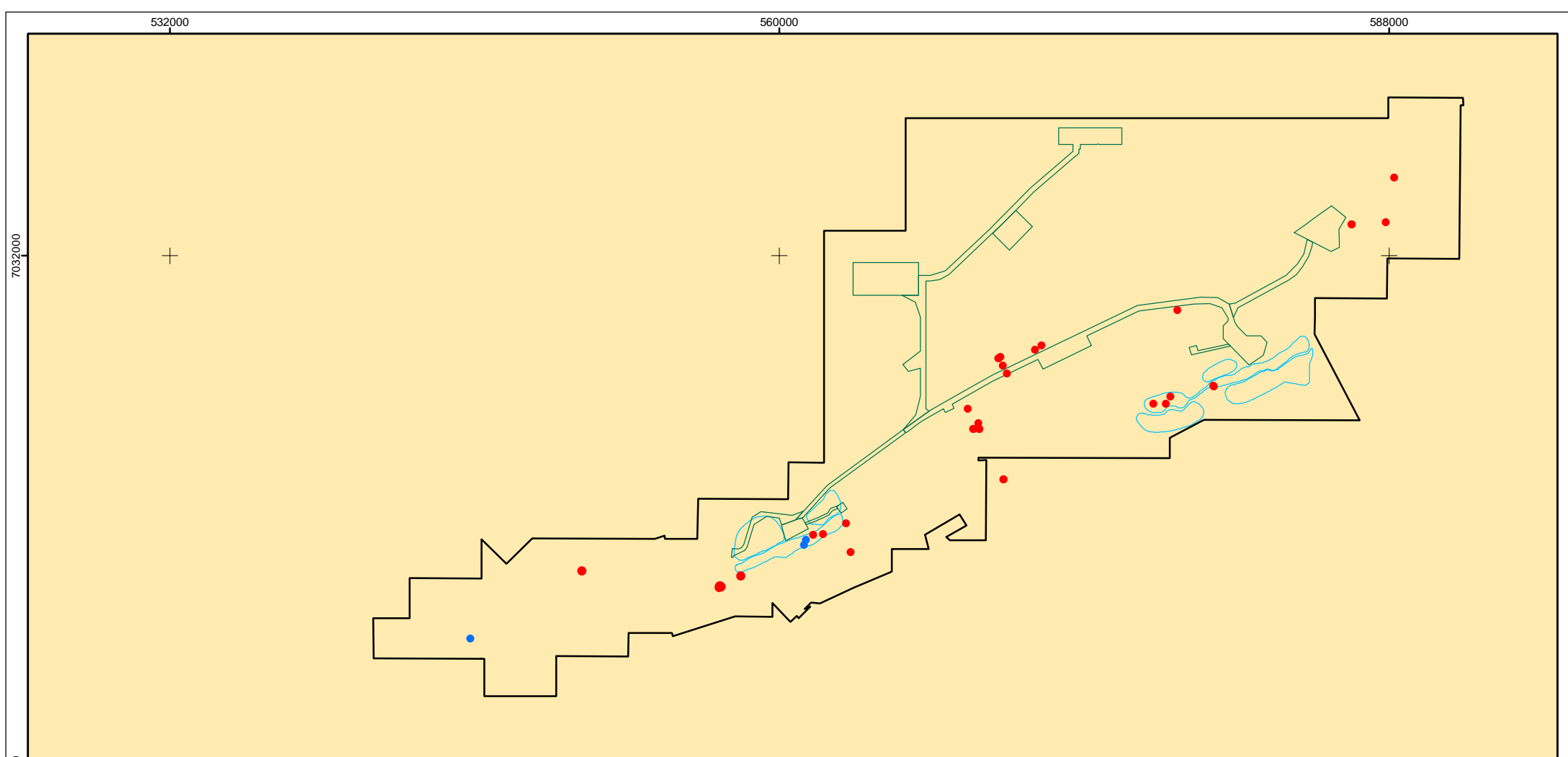
**Distribution of
Goodenia berringbinensis
near the study area**

Figure:1.41
Project ID: 722

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

Drawn: SV
Date: 02/12/10

Unique Map ID: SV036



Legend

- *Grevillea inconspicua* (ecologia records)
- *Grevillea inconspicua* (DEC records)
- Study Area
- BFS Option 1
- Pits & Dumps

Absolute Scale - 1:250,000

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SINO STEEL MIDWEST CORPORATION LIMITED

Distribution of *Grevillea inconspicua* near the study area

Figure:1.42
Project ID:722

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

Drawn: SV
Date: 02/12/10

Unique Map ID: SV056

2 IMPACTS TO UNDESCRIBED TAXA

Recommendation 4: That the proponent resolve the taxonomic status of *Hemigenia* sp. nov (aff. *kochii*) and *Acacia* sp. nov (aff. *exilis*). Note: Should be *Hemigenia* sp. nov (aff. *exilis*) and *Acacia* sp. nov. (aff. *kochii*). Note that *Acacia* sp. nov. (aff. *kochii*) has now been given a preliminary phrase name of sp. Wilgie Mia (Coultas & Woodman AW 03-Opp 1

Recommendation 5: That should *Hemigenia* sp. nov (aff. *kochii*) and *Acacia* sp. nov (aff. *exilis*) be identified as new species endemic to Weld Range (i.e. conservation significant), the proponent determines the significance or otherwise, of potential impacts from the proposal on these species.

Discussion

Based on the information presented in the PER and Appendix 12, it is not possible to assess the significance of potential impacts on the undescribed species (i.e. *Hemigenia* sp. nov (aff. *kochii*) and *Acacia* sp. nov (aff. *exilis*)). To date populations of these species have only been recorded from Weld Range, indicating that these species are potentially endemic and restricted. No information has been provided in the PER on the number of populations, number of individuals in each population and quantified impacts to these populations.

From the maps provided in Appendix 12, it is clear that at least two of the three known locations of *Acacia* sp. nov (aff. *kochii*) will be impacted by the Beebyn mine pits. It is unclear whether the remaining known population/location will be subject to indirect impacts.

While the three known locations of *Hemigenia* sp. nov (aff. *exilis*) do not appear to be directly impacted, it is not clear whether these locations will be subject to indirect impacts.

2.1 *Acacia* sp. Wilgie Mia (Coultas & Woodman Aw 03-OPP 1) (FORMERLY *Acacia* sp. nov. (aff. *kochii*))

The taxon *Acacia* sp. nov. (aff. *kochii*) is now referred to by the phrase name *Acacia* sp. Wilgie Mia (Coultas & Woodman AW 03-Opp 1). Although it is yet to be subject to a rigorous taxonomic evaluation and has not been formally described, it is considered as “taxonomically distinct” (Bruce Maslin, personal communication). This taxon has only been collected from five locations at Weld Range, two of which are within the area of impact (Figure 2.1). Although not currently nominated for listing as a Priority species, it meets the criteria of a Priority 1 taxon based on current data. There has been insufficient searching for this species to accurately assess its distribution and abundance in the vicinity of Weld Range. The location at which the largest number of plants (22) was recorded lies within the proposed Beebyn pit and will be removed. The record to the immediate south of the pit haul road may be vulnerable to indirect effects from dust. Until further data is available regarding the abundance of the populations further from the infrastructure, the viability should be regarded as threatened.

2.2 *Hemigenia* sp. nov (aff. *exilis*)

The taxonomic status of this taxon has yet to be clarified as until recently no flowering material had been obtained. A recent survey obtained sufficient reproductive material to enable further resolution of the status of this taxon and it has been now been referred to a specialist taxonomist. There are three records of this taxon, all of which are located to the south of the infrastructure (Figure 2.2). The proposed infrastructure should not directly impact the viability of this taxon, however, given the proximity of the western and eastern records to the proposed Madoonga pit and haul road respectively, the taxon may be vulnerable to indirect impacts from dust.

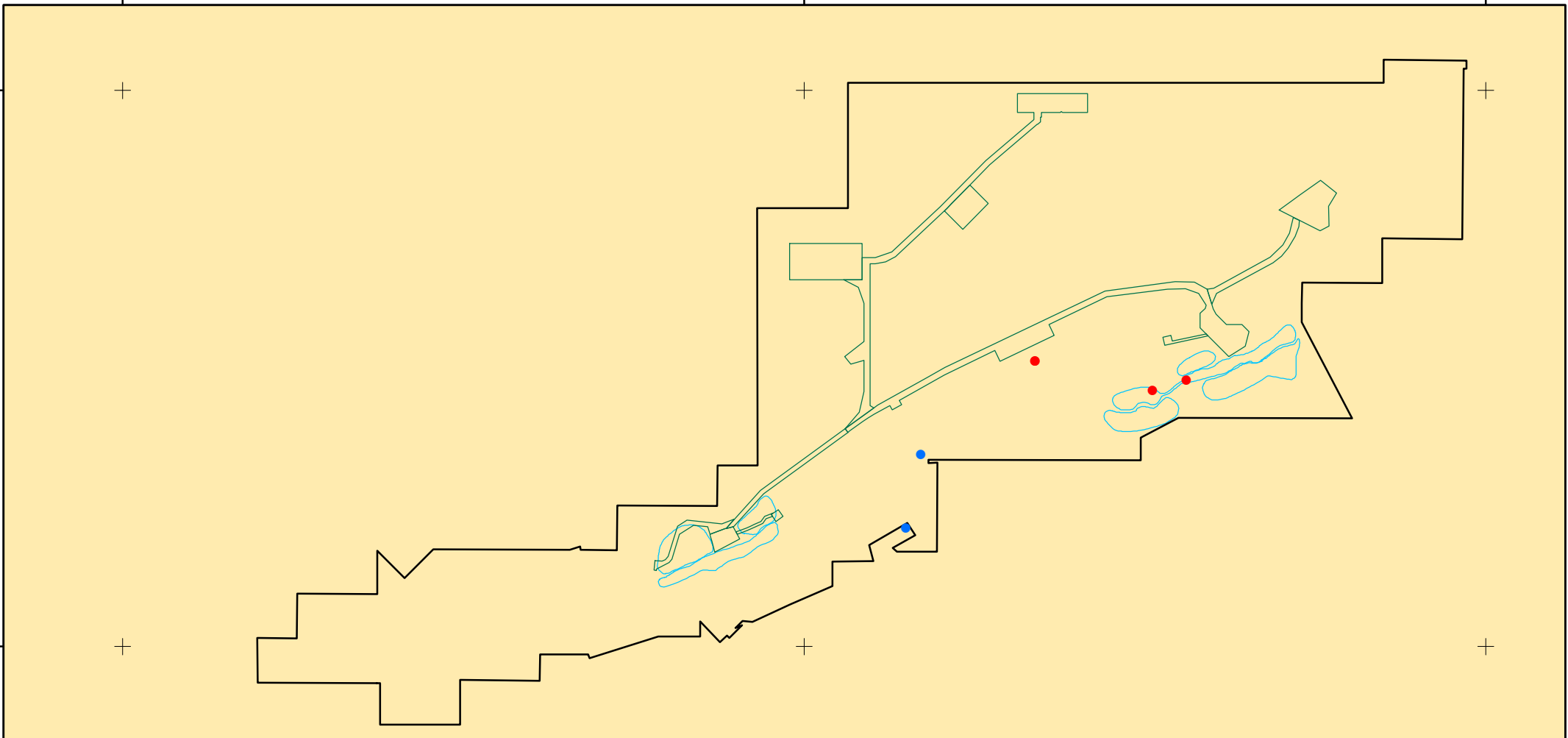
535800

564000

592200

7038000

7015000



Legend

- *Acacia* sp. Wilgie Mia (DEC records)
- *Acacia* sp. Wilgie Mia (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps

Absolute Scale - 1:230,000

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**Distribution of
Acacia sp. Wilgie Mia
near the study area**

Figure:2.1
Project ID: 722

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

Drawn: SV
Date: 02/12/10

Unique Map ID: SV059

A4

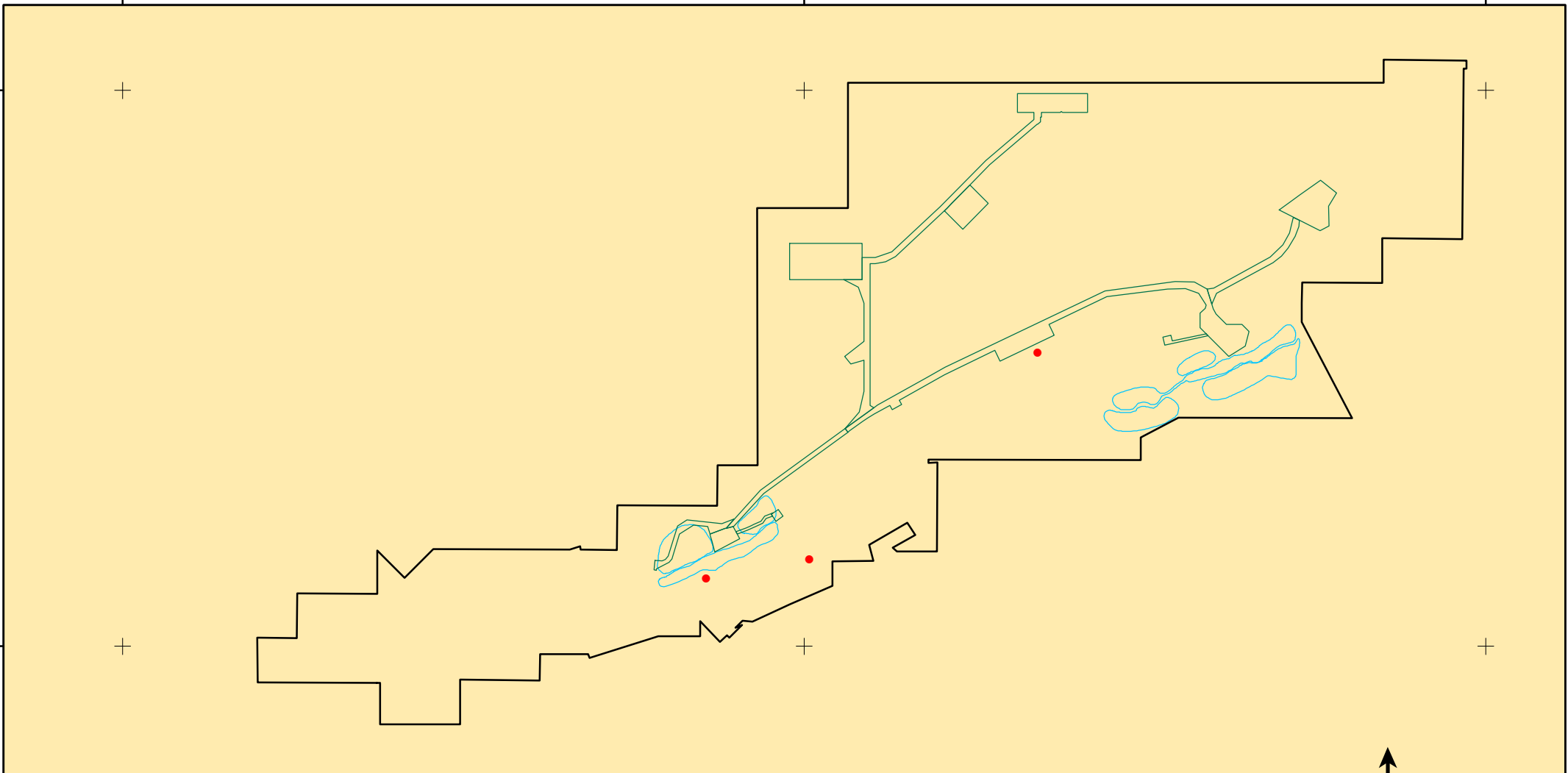
535800

564000

592200

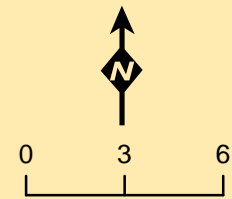
7038000

7015000



Legend

- *Hemigenia sp. nov. (aff. exilis)* (ecologia records)
- Study Area
- BFS Option 1
- Pits & Dumps



Absolute Scale - 1:230,000



**Distribution of
Hemigenia sp. nov. (aff. exilis)
near the study area**

Figure:2.2
Project ID: 722

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

Drawn: SV
Date: 02/12/10

Unique Map ID: SV058

3 COMMUNITY 5B

Issue: The proposal will result in a 76.66 per cent direct loss of the 5b vegetation community.

Recommendation 10: That the conservation value of vegetation community 5b be clarified.

Discussion

It is unclear, from the information provided in the PER, if the 5b vegetation community provides habitat for significant biodiversity conservation values. Currently, it is only known from 56 hectares and the proposal will impact on 76.66 per cent of this community.

Response:

Community 5b is described as ± *Grevillea striata* low isolated trees over *Acacia craspedocarpa* and *A. aneura* tall open shrubland over *Scaevola spinescens* sparse mid shrubland over *Austrostipa elegantissima* and *Eriachne flaccida*. It occurs on a clay-rich plain to the east of the seasonally inundated wetlands mapped as 7a/7b.

Although sufficiently distinctive to be distinguished in aerial photography, it was segregated by multivariate analysis at a relatively high level of resolution (i.e. a fine-scale mapping unit) and resembles both 5a (in the composition of its upper stratum) and 6c (in the composition of the ground cover of grasses). The dominant species within the shrub strata of this group are well represented elsewhere in the study area and region. Relatively few species were restricted to this community type: *Centipeda thespidioides*, *Goodenia berringbinensis* (P4), *Marsilea drummondii*, *Senna glutinosa* subsp. *chatelainiana* and *Peplidium* sp. C Evol. Fl. Fauna Arid Aust. (N.T. Burbidge & A. Kanis 8), all of which are widespread regionally. It supported two Priority taxa, *Goodenia lyrata* (P1), and *G. berringbinensis* (P4). *Goodenia lyrata*, as discussed in Section 2, has a sparse but broad distribution in the Pilbara and Murchison and was not unique to this community type within the Study Area. *Goodenia berringbinensis* was unique to this community within the Study Area but has been recorded elsewhere in the bioregion in claypans and creek beds supporting a variety of vegetation types, hence is not considered to be unique to this community type.

Species richness within quadrats surveyed within the community was relatively close to the average for the study area ($16 \pm \text{st.dev. } 2.1, n=3$, compared to $15.2 \pm \text{st. dev. } 0.3, n=238$).

There is no data mapping vegetation at this scale regionally to allow the broader distribution of this community to be quantified but, given its occurrence near the edge of a seasonally inundated clay pan, it is likely to occur sporadically over relatively small areas and hence constitute a small proportion of the total area of vegetation regionally. Locally it is likely to occur sporadically around the circumference of the series of saline clay pans which extend further north of the Study Area boundary.

On the basis of the above information it is considered to have moderate biodiversity value.

4 DEWATERING IMPACTS

Issue: The impacts associated with de-watering are not clearly defined in the PER and therefore cannot be adequately assessed.

Recommendation 21: That the proponent quantifies potential long-term impacts on ecohydrological water requirements associated with drawdown cones to the three metre groundwater contour of 9,000 metres (north) and 7,500 metres (south) from the Madoonga pit and 4,500 metres (north) and 5,000 metres (south) from the Beebyn pit for review by the OEPA, on advice from DEC, particularly in relation to the following conservation values that have been identified as having the potential to be impacted:

- locally significant groundwater dependent ecosystem vegetation community unit 7b (estimated direct impact of 38.82 per cent);
- habitat value of community 7b for fauna species of conservation significance;
- the cumulative impact to community 7b from both the proposed Madoonga waste dump (direct) and groundwater drawdown (indirect) impacts; and
- the extent to which community 7b is dependent on groundwater sources for survival during periods of peak environmental (groundwater) demand.

Discussion

The impacts associated with nine years of de-watering at a rate of approximately 11.95 gigalitres per annum from both the Madoonga and Beebyn pits are not clearly defined.

The groundwater drawdown (depression) cones as predicted by the current model are extensive, and risk a potentially significant and permanent alteration to the groundwater hydrology within the vicinity of the Madoonga and Beebyn pits.

Uncertainty in the assessment exists in the:

- “limited monitoring data...collected in the area” (p. 139);
- whether recharge rates in the region will be sufficient to allow the recovery of the aquifers to their former levels; and
- unrealistic expectations that “During periods of peak environmental demand, SMC will restrict lowering of the groundwater table to allow for the maximum rate of downward growth of the roots of plants dependent on groundwater” (p. 146).

4.1 LOCALLY SIGNIFICANT GROUNDWATER DEPENDENT ECOSYSTEMS

As discussed in the Flora and Vegetation Assessment (ecologia, 2010), both Communities s 7a and 7b have been identified as potentially groundwater dependent.

Unit 7a, which contains *Melaleuca stereophloia* as a dominant species within the shrub stratum, encompasses a larger proportion of the area affected by groundwater drawdown. *Melaleuca* species are frequently obligate phreatophytes. *M. argentea* has been shown to have less resilience to changes in water availability (Graham, 2001). Other shrub species dominant within the shrub stratum, such as *Tecticornia* species and *Frankenia laxiflora* are typically associated with saline, seasonally inundated clay pans and are probably reliant on a high water table. Unit 7a is considered highly likely to be affected by changes to the water table.

Unit 7b occurs as narrow belts of vegetation within the area mapped as 7a and is characterised by woodland of *Eucalyptus carnei* and *E. trivalvis* over sparse shrubs of *Cratystylis subspinescens* and *Muehlenbeckia florulenta* over tussock grasses. Neither *E. carnie* nor *E. trivalvis* are obligate phreatophytes and are recorded regionally in habitats where a lower water table would be present. However they may be reliant on the higher water table at the location near the Madoonga pit and therefore be vulnerable to changes in availability, unless their roots are capable of adapting to the declining water table. The ability of these species to adapt at the proposed rate of change to the watertable is unknown.

Figure 4.1 illustrates the projected pattern of the 3 metre drawdown cone at Madoonga over the period from 3 to 12 years. The areas of both communities 7a and 7b occurring within the 3 m drawdown zones are detailed in Table 4.1.

Table 4.1 –Areas of Communities 7a and 7b within 3 m Drawdown Cone adjacent to Proposed Madoonga Pit

Community type	3 years		6 years		9 years		12 years	
	Area (ha)	% Total Mapped	Area (ha)	% Total Mapped	Area (ha)	% Total Mapped	Area (ha)	% Total Mapped
7a	45.2	7.1	131.4	20.7	188.8	29.7	231.4	36.4
7b	4.2	30.0	7.6	54.3	7.6	54.3	7.6	54.3

These vegetation communities extend further north beyond the boundaries of the area mapped (Figure 4.2), for a considerable distance. It is estimated approximately 315 additional hectares of Community 7a are present. The area of 7b is more difficult to estimate without inspection, as it occurs intermittently at the boundary of the area of seasonal inundation and cannot be reliably discriminated without field verification using the current aerial photography

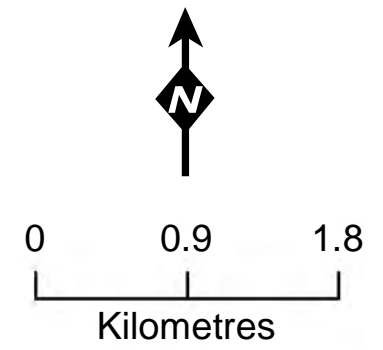
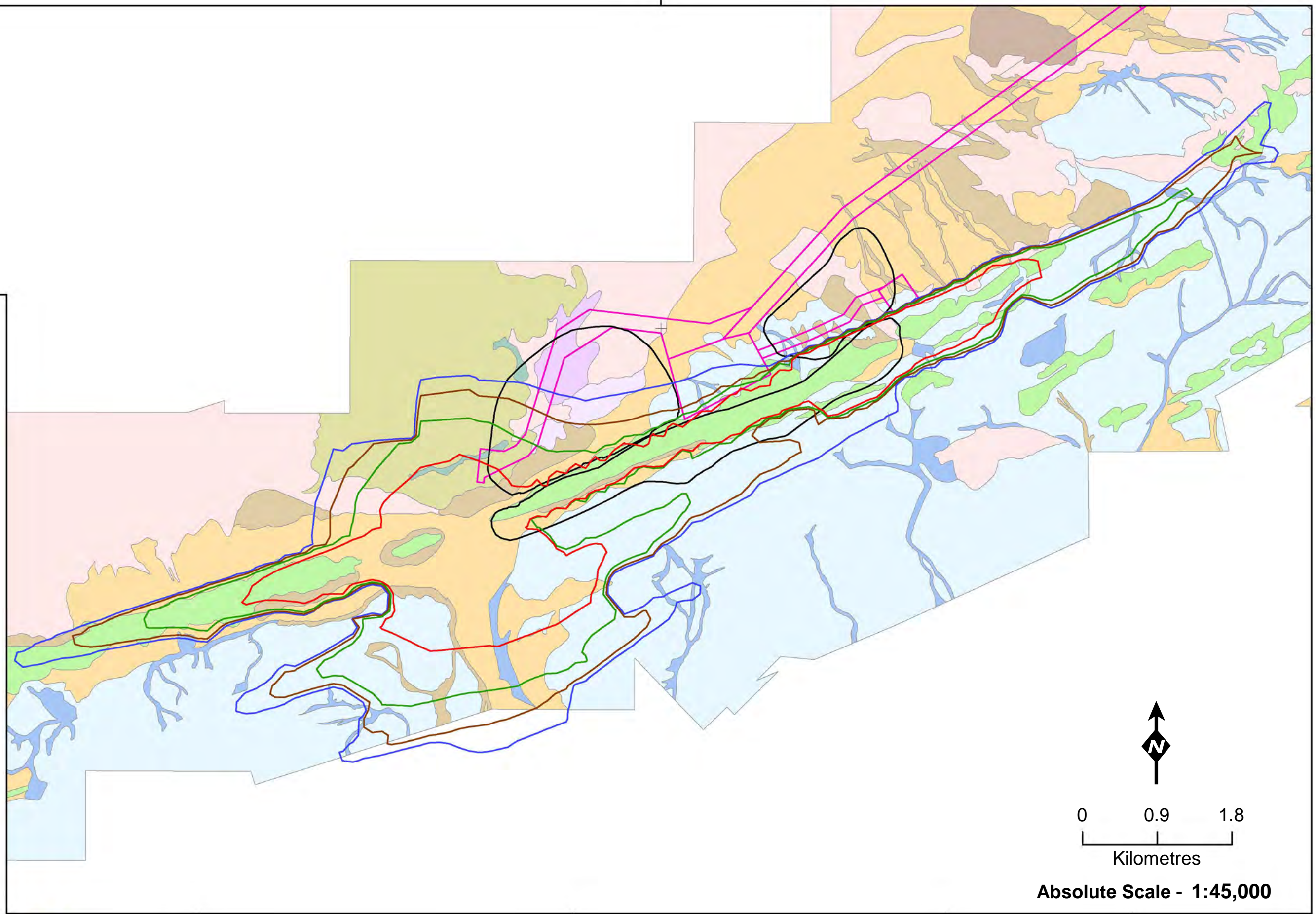
Communities 7a and 7b do not occur within the projected drawdown cones at Beebyn (Figure 4.3). No species known to be phreatophytic have been recorded in the communities present.

560000

7020000

Legend

- 3m drawdown (3years)
- 3m drawdown (6years)
- 3m drawdown (9years)
- 3m drawdown (12years)
- 1a
- 3a
- 3b
- 3c
- 3d
- 4a
- 4b
- 5
- 6a
- 6b
- 6c
- 6d
- 7a
- 7b



Absolute Scale - 1:45,000



3m draw down cone at Madoonga

Figure:4.1
Project ID: 722

Drawn: SV
Date: 02/12/10

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

Unique Map ID: SV60

560000

7020000

Legend

- 3m drawdown (3years)
- 3m drawdown (6years)
- 3m drawdown (9years)
- 3m drawdown (12years)
- 1a
- 3a
- 3b
- 3c
- 3d
- 4a
- 4b
- 5
- 6a
- 6b
- 6c
- 6d
- 7a
- 7b

**Riparian
Vegetation**



0 0.6 1.2
Kilometres

Absolute Scale - 1:30,000



**Extent of riparian vegetation
relative to the drawdown
near the Madoonga pit**

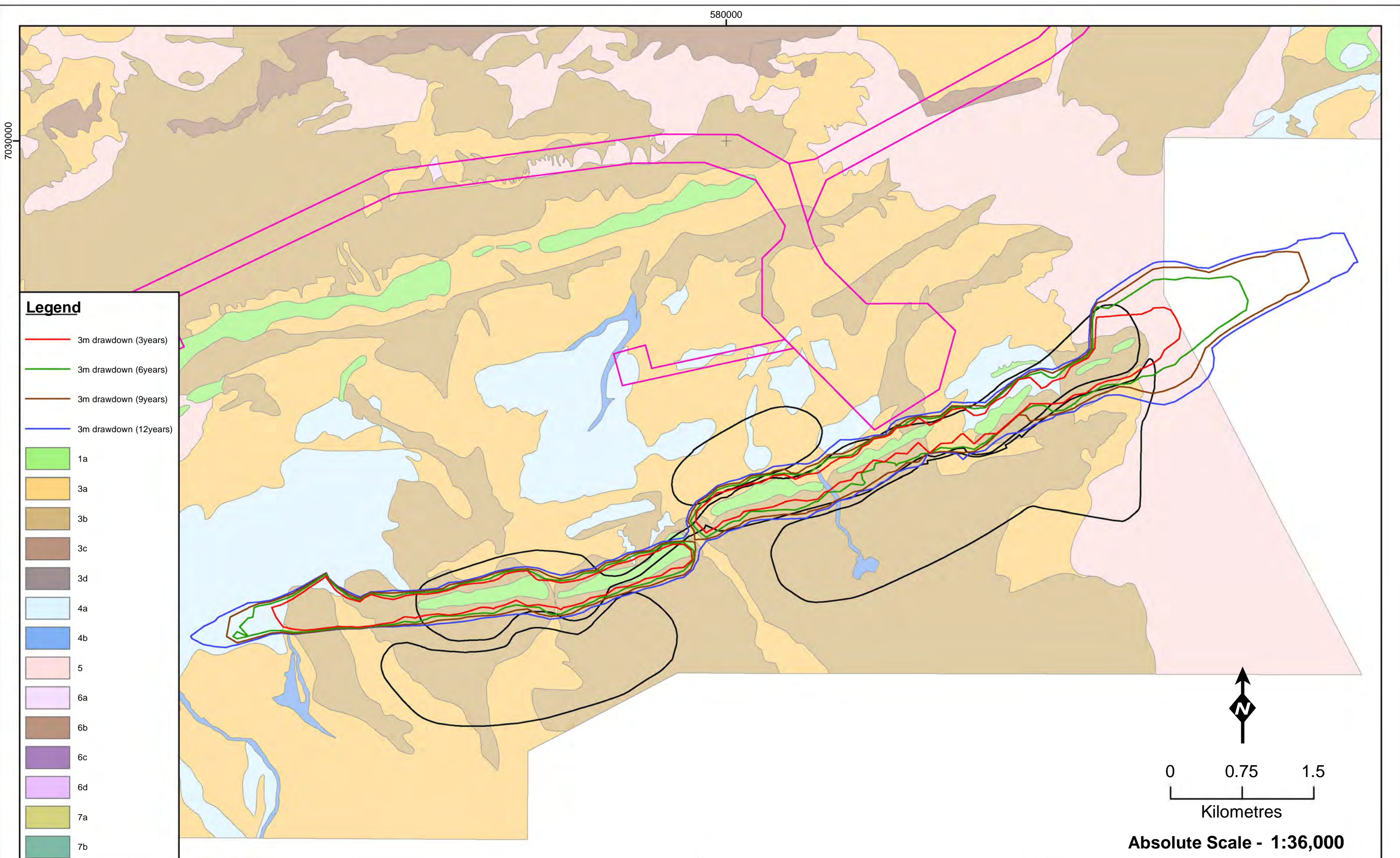
**Figure:4.2
Project ID: 722**

**Drawn: SV
Date: 02/12/10**

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

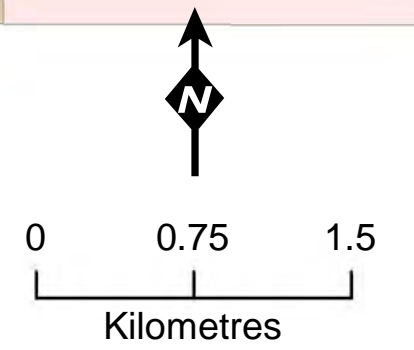
Unique Map ID: SV62

A3



Legend

- 3m drawdown (3years)
- 3m drawdown (6years)
- 3m drawdown (9years)
- 3m drawdown (12years)
- 1a
- 3a
- 3b
- 3c
- 3d
- 4a
- 4b
- 5
- 6a
- 6b
- 6c
- 6d
- 7a
- 7b



Absolute Scale - 1:36,000



3m draw down cone at Beebyn

Figure:4.3
Project ID: 722

Drawn: SV
Date: 02/12/10

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

Unique Map ID: SV61

4.2 CUMALATIVE EFFECT OF GROUNDWATER DRAWDOWN (INDIRECT) AND MADOONGA WASTE DUMP (DIRECT)

The additional areas impacted directly are provided in

Table 4.2 – Cumaltive impact on Communities 7a and 7b of indrect (3 metre drawdown) and direct (infrastructure)

Com. type	3 years			6 years			9 years			12 years		
	Draw - down	Add. Direct	% total	Draw - down	Add. Direct	% total	Draw-down	Add. Direct	% total	Draw-down	Add. Direct	% total
7a	45.2	40.6	13.5	131	13.0	22.7	189	7.78	31.0	231	0.68	36.5
7b	4.2	5.2	67.1	7.6	2.6	72.9	7.6	2.6	72.9	7.6	2.6	72.9

4.3 IMPACT OF PROJECTED DRAWDOWN ON VERTEBRATE FAUNA

The Slender-billed Thornbill (EPBC Vulnerable) is restricted to habitat found in Vegetation 7a therefore any reduction to this vegetation as a result of drawdown will reduce the area of habitat available.

It is not expected to utilise vegetation 7b as the woodland vegetation structure is not associated with its preferred habitat. Vegetation unit 7b is not expected to provide significant habitat to any other conservation significant species and its importance to the general vertebrate fauna assemblages found in the region is expected to be low due to the small size and narrowness of the area it encompasses.

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5 INDIRECT IMPACTS

Issue: The proponent has not attempted, or clearly delineated areas that will be subject to indirect impacts (dust emissions and altered hydrology (i.e. surface drainage and groundwater drawdown or mounding)) or developed a monitoring and management program for these areas.

Recommendation 22: That a condition be applied that ensures impacts on flora of conservation significance, vegetation communities and fauna habitat are limited to an agreed direct and indirect disturbance footprint.

Recommendation 23: That within the zone of indirect impact (adjacent to the area of direct impacts,) the condition and health of conservation significant flora, vegetation and fauna habitat, may decline to agreed limits.

Recommendation 24: That the proponent develops a vegetation health and condition monitoring program, for flora of conservation significance, vegetation and fauna habitat, to achieve the outcomes in Recommendation 23. The monitoring program to include baseline measurements at suitable reference sites that will provide comparative data for measuring change in relation to trigger levels referred to in Recommendation 25, and be developed on the advice of DEC.

Recommendation 25: That trigger levels be developed and applied to the management of the project in key areas, specifying:

1. the levels of acceptable decline in the health of flora of conservation significance and vegetation condition within the defined indirect impact zone areas; and
2. the levels of flora health and vegetation condition change at which contingency measures are to be applied to avert further condition and health decline.

Recommendation 26: That the proponent reports annually to the OEPA and DEC on the results of monitoring and any contingency action implemented in response to trigger exceedance.

Discussion

The extent of indirect impacts of the project on flora of conservation significance and vegetation communities, and fauna habitat, is not clearly documented in the PER, and it is unclear if the quantitative descriptions of vegetation and flora impacts (i.e. Table 7.11, 7.13 and 7.15) include indirect impacts. It is important that the impacts proposed by the development are made clear and confined to the identified total disturbance footprint.

The quantitative descriptions of vegetation and flora impacts within the PER do not include indirect impacts as the extent to which these impacts occur are difficult to quantify at present. SMC intends to use saline water for dust suppression, and to contain runoff of hyper saline water to surrounding vegetation using containment sinks. The design of saline containment will need to consider in detail the distribution of Priority Flora in the vicinity of infrastructure. SMC has committed to further surveys of flora of conservation significance along the proposed haul roads and at the perimeter of waste dumps and pits.

Once the alignment of haul roads has been finalised, baseline monitoring of adjacent vegetation will be commenced to allow monitoring of vegetation for the life of mine.

6 REFERENCES

ecologia, 2010 *Weld Range Flora and Vegetation Assessment*, Technical Appendix to Weld Range PER, Sinosteel Midwest Corporation 2010.

FloraBase, 2010 <http://florabase.calm.wa.gov.au/>

Graham, J 2001, *The root hydraulic architecture of Melaleuca argentea*, University of Western Australia.