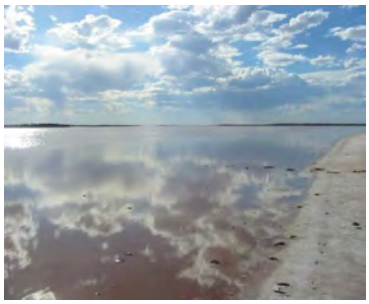

Waddi Wind Farm

Targeted Level 1 Vegetation and Flora Assessment

Waddi

November 2008 and January 2009

RPS

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Targeted Level 1 Flora and Vegetation Assessment:

Waddi Wind Farm

Waddi

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RPS Australia		

Document for Job Number:

Author	Reviewer	Status	Signature	Date of Issue
C. Krens	M. Henson, D. Jasper	Draft	DJ	5/08/2009
R Floyd	R Floyd	Draft	RF	12/01/10
C. Krens, R. Floyd	R Floyd, M. Henson, D. Jasper	Final	RF, DJ	11/03/10

EXECUTIVE SUMMARY

Wind Prospect WA Pty Ltd is planning to develop a wind farm within the Dandaragan Shire. The proposed Waddi Wind Farm, is located approximately 135 kilometres (km) north of Perth, and approximately 5 km east of Cataby, adjacent to the Brand Highway. RPS commissioned Outback Ecology to undertake a flora and vegetation survey of the Waddi Study areas during November 2008 and January 2009. This report details the results of the Waddi Project area (Waddi) survey.

The purpose of the survey was to verify the findings of the desk top study and preliminary field inspection, characterize the flora, and describe and delineate vegetation units present on site. A low-intensity Level 1 survey and targeted searches of conservation significant flora was conducted at a series of sampling points, remnant vegetation patches and access tracks and cable routes selected by RPS within Waddi Project area.

A total of 168 taxa (including subspecies and variants) from 31 families and 73 genera were recorded. The flora was dominated by the family Proteaceae, with 41 taxa recorded. Other dominant families included Myrtaceae (38 taxa) and Papilionaceae (12 taxa).

No Declared Rare Flora (DRF) was recorded. Eight Priority Flora species, *Hypocalymma* sp. Cataby (P1), *Acacia plicata* (P3), *Banksia fraseri* subsp. *crebra* (P3), *Tetratheca angulata* (P3), *Conostephium magnum* (P4), *Eucalyptus macrocarpa* subsp. *elachantha* (P4), *Grevillea saccata* (P4) and *Regelia megacephala* (P4) were recorded. Two weed species, *Cyperus congestus* and *Juncus acutus* subsp. *acutus* were recorded.

A total of 29 sampling points were accessed. Most sampling points were located within pasture, within which the vegetation condition was degraded. Five sampling points were located within remnant vegetation, condition for these sampling points ranged from degraded to excellent.

Vegetation community SH2 Open Shrubland of *Banksia attenuata* over Low Closed Shrubland of *Xanthorrhoea preissii* and mixed *Proteaceae* spp. on gentle slope was identified in the remnant vegetation during survey. This vegetation type is consistent with the TEC identified as "*Banksia attenuata Woodland over species rich dense shrublands*". This community is identified as Endangered under the *Environmental Protection Act (1986)*. It is therefore recommended that impacts upon this conservation significant community be avoided. No other TECs or PECs were identified within the project area.

A total 25 relevés within 18 remnant vegetation patches were surveyed. Three broad vegetation types were identified: Woodland, Shrubland and Heath. Within these vegetation types, 13 communities have been described and mapped. Heath was the dominant vegetation type, occurring in all 18 remnant vegetation patches. Vegetation condition ranged from excellent to

degraded, with most vegetation being in excellent condition. Degradation was mainly due to weed intrusion, grazing and tracks.

A total of 18 relevés were surveyed within three access tracks and underground transmission line routes. Three broad community types were identified: Woodland, Shrubland and Heath, within these, eight communities were described and mapped. Vegetation condition was mainly excellent, however dieback was recorded on an adjacent site on the west side of the Brand Highway.

Recommendations for Waddi include:

- Avoid disturbing remnant vegetation patches in very good or better condition
- Turbines should be placed a minimum of 30 m from remnant vegetation patches
- Avoid placing access tracks and underground transmission line routes within drainage lines to reduce erosion and downstream effects
- Vegetation community SH2 was identified during the survey and is consistent with the TEC identified as *Banksia attenuata* Woodland over species rich dense shrublands. This community is identified as Endangered under the *Environmental Protection Act (1986)*. It is therefore recommended that impacts upon this conservation significant community be avoided
- Avoid cutting into remnant vegetation patches as this will result in edge effect and amplifying disturbance (ie, a 5 m wide track will have around 30-40 m wide disturbance footprint), and
- A follow-up Level 2 survey is recommended prior to construction.

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1 INTRODUCTION

1.1 Project Background and Location

Wind Prospect WA Pty Ltd (Wind Prospect) is proposing to develop a wind farm within the Shire of Dandaragan in Western Australia. The proposed Waddi Wind Farm, is located approximately 130 kilometres (km) north of Perth, and approximately five kilometres east of Cataby, adjacent to the Brand Highway (see Figure 1).

This report details the results of the survey of the Waddi Project area (Waddi). The proposed project consists of the following infrastructure components:

- Wind turbines (sampling points)
- Access tracks;
- Underground transmission line routes;
- Electrical sub-station

The layout of the above infrastructure components are designed to capture the greatest amount of potential wind power, however there are environmental constraints associated with their layout which need consideration, part of which are the potential impacts on the flora and vegetation.

1.2 Scope and Objectives of the Study

RPS Environment (RPS) is conducting an environmental assessment of the proposed Waddi Wind Farm project. RPS commissioned Outback Ecology to undertake the flora and vegetation component of that assessment.

The overall objectives of the flora and vegetation survey were:

i. Undertake a review of conservation significant flora species (Priority and Declared Rare Flora) and Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) known, or likely to occur within the Project area. This incorporated a desktop review of available information;
ii. Develop an inventory of flora species within the Project area, including conservation significant flora;
iii. Define, describe and map vegetation associations across the Project area at selected remnant vegetation patches and access tracks and cable routes;
iv. Provide an initial assessment of the regional and local conservation value of the flora and vegetation; and
v. Identify potential environmental impacts resulting from development and identify alternative routes and development areas where it is possible to reduce impacts on native vegetation.

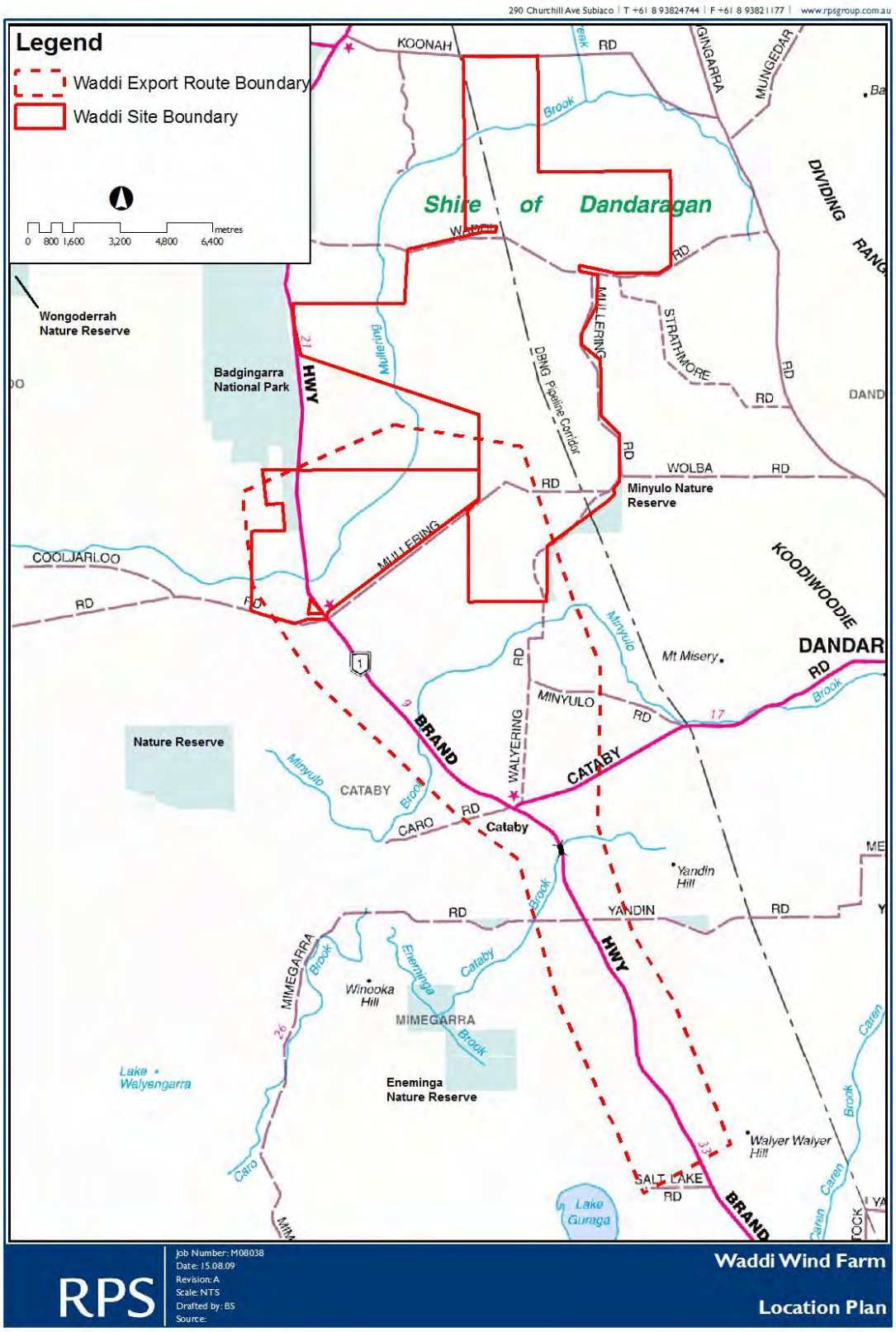

Figure 1 Waddi Wind Farm Site Location Plan

The flora and vegetation assessment involved:

- A background study of:
  - conservation significant flora species and vegetation communities known or potentially present in the Project area (including threatened and priority flora, geographically rare flora, rare species, and threatened and priority ecological communities); and
  - previous flora studies conducted in the Project area and surrounding areas.
- A low-intensity Level 1 flora and vegetation survey of remnant vegetation patches adjacent to proposed infrastructure (e.g. turbines) and potential access tracks and underground transmission line routes, incorporating the identification of:
  - dominant flora species and vegetation communities recorded in specified areas; and
  - conservation significant flora species and vegetation communities.
- Recommendations from sampling points, and the surveys undertaken on the potential access tracks and underground transmission line routes.

The flora and vegetation survey was designed and conducted in accordance with the following Western Australian Environmental Protection Authority (EPA) publications:

- Position Statement No. 3. *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA, 2002)
- Guidance Statement No. 51. *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004).

2 EXISTING ENVIRONMENT

2.1 IBRA Regions – Geraldton Sandplains (GS3 - Lesueur Sandplain)

The Waddi Project area is located in two Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions, Geraldton Sandplain Bioregion to the north and Swan Coastal Plain Bioregion to the south (Kendrick and McKenzie, 2001). Waddi is situated only within the Lesueur Sandplain subregion of the Geraldton Sandplain Bioregion.

The Geraldton Sandplains Bioregion is composed mainly of proteaceous scrub-heaths, rich in endemic species, on the sandy earths of an extensive, undulating, lateritic sandplain, overlaying a Permian to Cretaceous geological sequence. Extensive York Gum and Jam woodlands occur on outwash plains. The Lesueur Sandplain subregion comprises coastal Aeolian sands and limestones, and Jurassic siltstones and sandstones (often heavily lateritised) of the central Perth Basin. Alluvial soils are associated with drainage systems. There are extensive yellow sandplains in south-eastern parts, especially where the subregions overlap the western edge of the Pilbara Craton. Shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains, coastal sands and limestones. Heaths occur on lateritised areas and plains along the north-eastern margins of the subregion. The climate is described as a Mediterranean type climate and the subregional area is 1,358,915 ha (Desmond and Chant 2003).

2.2 Climate

The closest weather monitoring station is located at Badgingarra, 15km north of Waddi. Monthly mean maximum temperature recorded at Badgingarra ranges from a high of 34.4℃ in January to a low of 17.3℃ in July (BOM, 2008) (**Figure 2**). Average annual rainfall is 545 mm, with highest recorded annual rainfall of 785 mm and lowest recorded annual rainfall of 274 mm (BOM 2009).

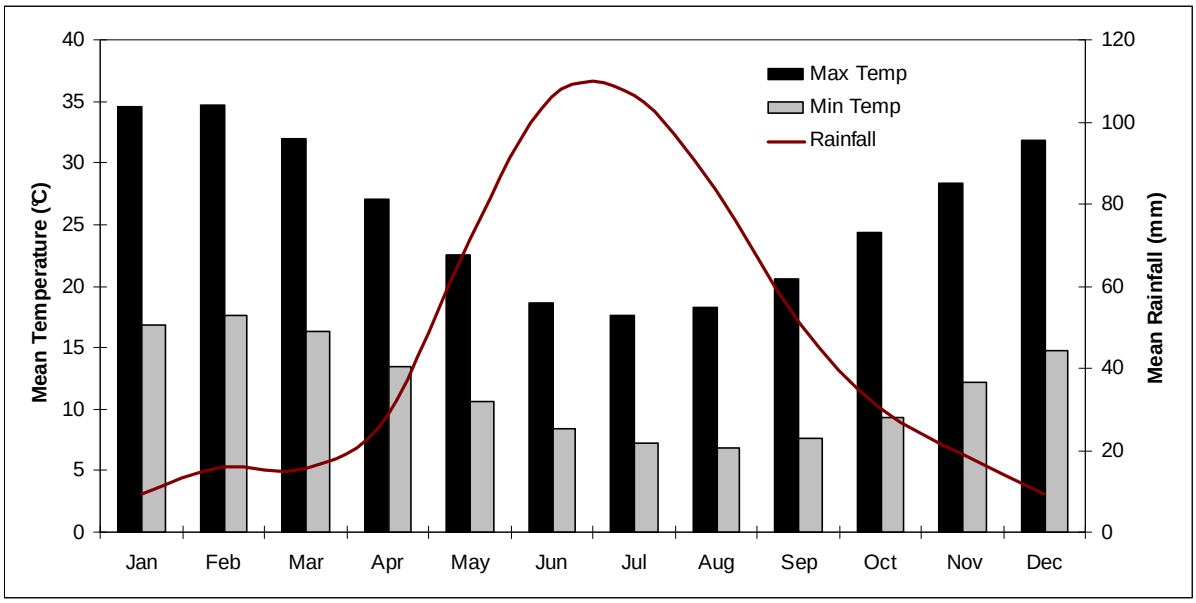

Figure 2 Climate data from Badgingarra Weather Station

3 METHODS

3.1 Environmental Protection Authority Survey Guidelines

The methods adopted for the survey were conducted in accordance with the Environmental Protection Authority (EPA) Position Statement No 3. *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA, 2002), and Guidance Statement No 51. *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004).

The purpose of Position Statement No 3. (EPA 2002) is to provide an overarching guide to the principles employed by the EPA when assessing the potential environmental impacts of an activity. Guidance Statement No 51. (EPA, 2004) outlines the principles for assessment of biodiversity to enable consultants to meet EPA expectations for biological surveys. Within Position Statement No 3, two levels of biological survey are detailed. The requirements of the two levels of survey are summarised below:

Level 1 survey

- Desktop review – incorporating a literature review, database searches and review of maps of proposed area of disturbance; and
- Reconnaissance survey – a site visit by suitably qualified personnel to:
    - Verify the desktop review;
    - Catalogue flora, with a focus on the potential sensitivity of flora to disturbance; and
    - Undertake broad-scale vegetation and vegetation condition mapping based on selected sites.

Level 2 survey

- Desktop review;
- Reconnaissance survey; and
- Comprehensive flora survey of the project area. Key features of the survey:
    - Quadrat-based survey
    - Application of statistical analyses to data
    - Multi-seasonal surveys, with a minimum of one survey conducted in the season following the majority of rainfall for the region.

Guidance Statement No 51 (EPA, 2004) provides proponents with a guide to the instances within which the different levels of survey would be considered appropriate. The relative suitability of the two levels of surveys is a product of the location (bioregion) of the project and the proposed scale and nature of the impact. Where the scale and nature of impact is low, a Level 1 survey is considered adequate (EPA, 2002). Where the scale and nature of the impact is moderate to high, a Level 2 survey is required (EPA, 2002). This report addresses the requirements for a Level 1 survey, with the recommendation that a follow up Level 2 survey will be required prior to construction.

3.2 Background Study

Database search

A review of databases and publicly available information was conducted by RPS and the information was supplied to Outback Ecology prior to the field survey. Flora species of conservation significance known to occur within the Project area is provided in **Appendix A**.

The following databases and public information were reviewed:

- Department of Environment, Water, Heritage and the Arts (DEWHA) *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) Protected Matters database;
- Department of Environment and Conservation (DEC) website;
- DEC data holdings including:
  - Threatened (Declared Rare) flora database
  - WA Herbarium database
  - Declared Rare and Priority Flora Species List
  - Threatened Ecological Communities (TEC) database; and
- Public documents available over the internet e.g. Public Environmental Reviews relating specifically to the site or its immediate surrounds.

Definitions of Threatened (Declared Rare) flora and Priority Flora are provided in **Appendix B**. Definitions of Threatened Ecological Communities are provided in **Appendix C**.

Literature review

No publicly available information from previous studies conducted within the Waddi Project area was reviewed by Outback Ecology.

3.3 Flora and Vegetation Field Survey

3.3.1 Timing of Survey

The survey was undertaken in two parts: the first field visit was conducted between November 12th – 15th, 2008, and the second field visit was conducted between January 28th - 29th, 2009. The rainfall in the months preceding both field visits (October 2008 and December 2008) was slightly higher than the mean long term rainfall average for that month (**Figure 3**).

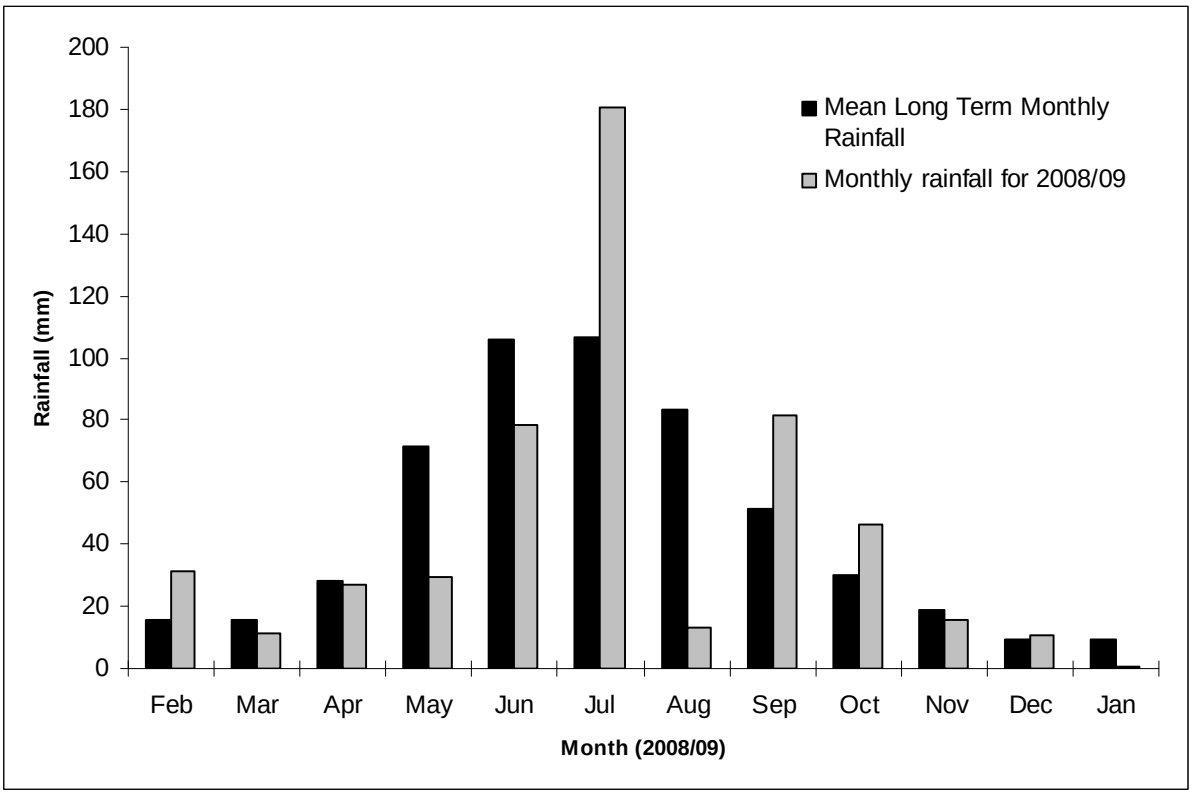

Figure 3 Monthly rainfall recorded at Badgingarra Weather Station (February 2007 – January 2009)

3.3.2 Survey personnel

The flora and vegetation survey of Waddi was conducted by:

Ms. Catherine Krens BSc. (Env. Sc.)

Mr. Chad Hughes BSc. (Env. Sc.) Hons. (Botany)

Specimen identifications:

Mr. Chad Hughes BSc. (Env. Sc.) Hons. (Botany)

Mr. David Leach BSc. Hons. (Botany)

Specialist specimen identification:

Mr. Frank Obbens (Western Australian Herbarium)

3.3.3 Survey Methods

A low-intensity Level 1 survey was conducted within the Waddi Project area consisting of sampling points, remnant vegetation patches and access tracks and underground transmission line routes selected by RPS. Not all patches of remnant vegetation within the Waddi Project area were surveyed, areas selected for survey were located in close proximity to proposed infrastructure and had the greatest potential to be impacted.

The following components were surveyed:

- 29 Sampling points
- 18 Remnant vegetation patches
- Three access tracks and cable routes

Sampling Points

A total of 29 sampling points were assessed within the Waddi Project area. Sampling points represent previous turbine locations selected by RPS, and provided a basis on which to acquire representative information about the vegetation and flora of the study area. Sampling points were assessed for their potential impact on flora and vegetation, with particular attention given to areas of remnant vegetation.

Sampling points were treated separately from remnant vegetation patches that are potentially impacted by underground transmission line routes and access tracks, which are dealt with later.

At each sampling location the following information was recorded:

- GPS Location (recorded in WGS84)
- Photograph of the site showing the general surrounds
- Direction in which the photograph was taken
- Vegetation description, based on Muir (1977)
- Estimated distance to the closest remnant vegetation
- Vegetation condition, based on the Keighery scale (Keighery, 1994)
- Presence of any conservation significant flora

Remnant Vegetation Patches and Access Tracks and Cable Routes

A total of 18 remnant vegetation patches were surveyed within the Waddi Project area. These were located in close proximity to sampling points and access tracks and underground transmission line routes and represent the greatest potential to be impacted.

Three access tracks and and underground transmission line routes were surveyed within the Waddi Project area. Areas of remnant vegetation and drainage lines occurring along access tracks and transmission line routes were surveyed, however some sections, mainly in pasture, were not surveyed, but were noted and mapped. The locations of survey points, vegegation types and vegegation condition are provided in maps presented in **Appendix I and J.**

Remnant vegetation patches, access tracks and underground transmission line routes were traversed on foot with the following information recorded:

- GPS location of each vegetation community;
- Description of topography;
- Description of soil;

- Vegetation condition assessment, using the Keighery scale (Keighery 1994) (**Appendix D**);
- Degrading factors present;
- Description of vegetation (Muir 1977) (**Appendix E**);
- Census of dominant species present;
- Conservation significant flora species present; and
- Photograph showing general surrounds and vegetation structure.

The extent of vegetation communities were determined from aerial photography interpretation and field observations for each remnant vegetation patch and access track and cable route surveyed. Relevés were conducted within each vegetation community. Dominant species were recorded and a search for conservation significant species conducted.

Where species could not be identified in the field, specimens were collected for further identification. Specimens collected were identified with reference to taxonomic guides and Western Australian Herbarium samples. Nomenclature follows Paczkowska and Chapman (2000) except for name changes, which were sourced from the Western Australian Herbarium (2008).

3.4 Vegetation Mapping

Vegetation communities within the remnant vegetation patches and access tracks and cable routes were mapped using aerial photography as a template to delineate the extent of vegetation stands, and modified using field observations and vegetation descriptions. Vegetation community maps were produced using GIS software. Vegetation maps are shown in **Appendix J** to this report.

Vegetation condition was described and mapped using the Keighery Vegetation Condition Scale (Keighery, 1994). A copy of the Keighery Vegetation Condition Scale is provided in **Appendix D**.

3.5 Limitation of Survey

The (EPA 2004) lists a number of possible limitations and constraints that may impinge on the adequacy of flora and vegetation surveys. Limitations and constraints relevant to this survey are provided in **Table 1**.

Table 1 Summary of potential flora and vegetation survey constraints

Aspect	Constraint?	Comment Regarding Current Survey
Competency/experience of consultants	No	Field personnel who conducted the survey have conducted several surveys in the Dandaragan/Cataby area.
Scope	No	The scope was clearly defined and achievable within the designated timeframe.
Proportion of flora identified	Yes	Some of the flora collected during the survey was sterile, limiting the accuracy of their identification. Lack of annual species and grasses was also considered to be a limitation. This can be rectified by conducting additional surveys at differing times of the year. Only specified vegetation patches and sampling points were surveyed, meaning some vegetation was not sampled.
Information sources (e.g. historic or recent)	Limited	A previous Level 1 survey was conducted south of Waddi in 2004
Proportion of task achieved, and further work which might be needed	No	The survey was considered to be sufficient to meet the requirements of a Level 1 survey.
Timing / weather / season / cycle	Limited	The surveys were conducted in early and mid summer after above average rain had been recorded in the region during October and September. Rainfall in the Badgingarra area was just below average for the 12 months prior to the surveys.
Disturbances	Limited	The majority of the sampling points were deemed to be completely degraded (pasture), and some vegetation patches had varying levels of disturbance.
Intensity	No	The field assessment covered all sampling points, remnant vegetation patches and access tracks and cable routes selected by RPS.
Completeness	No	The field portion of the survey was deemed complete following the follow up survey in January 2009.
Resources	No	
Remoteness / access problems	Limited	All areas surveyed during the site visit were readily accessible.
Availability of contextual information	Limited	The area around the Mimegarra road and Brand Highway junction near Cataby was surveyed by Mattiske Consulting in 2004.

4 RESULTS AND DISCUSSION

4.1 Background Study

RPS conducted a search of DEC databases for conservation significant flora and vegetation for the study area and surrounds, the results are outlined below. Outback Ecology conducted the EPBC Protected Matters database search. There was no information available from the DEC Library or other public sources specifically for the area concerned. The following list must therefore be considered incomplete and it is possible that other protected or notable flora or ecological communities may be present.

4.1.1 Environment Protection and Biodiversity Conservation (EPBC) Act 1999 Protected Matters Database Search

No Threatened Ecological Communities are listed as occurring within or nearby the Waddi Project area. However, 27 Threatened Flora species are listed as occurring within the Waddi Project area or surrounding area (**Appendix F**).

Badgingarra National Park extends into a small section of the search area and beyond to the north and west. This National Park is recognized as one of the best wildflower areas in Western Australia and has 'Registered' status on the Register of the National Estate (RNE).

There are several small nature reserves located within the site boundaries as noted during the site inspection (**Figure 1**). However, no further details could be found at this time, and none were supplied by the DEC.

4.1.2 Declared Rare and Priority Flora – DEC Database Search

RPS provided a list of 67 conservation significant species (DRF and Priority Flora), these species were targeted during the conservation significant species search of Waddi. The list of conservation significant species provided is a subset of the DEC database records within the survey area.

The DEC database searches indicate 821 records of conservation significant flora species, of which 36 records occur within the site boundary (**Appendix A)**. Conservation significant flora species appear to be located within discrete pockets of remnant vegetation and along road reserves in the survey area.

4.1.3 Threatened Ecological Communities and Priority Ecological Communities – DEC Database Search

A search was undertaken of the TEC and PEC database supplied by the Department of Environment and Conservation. Only 1 TEC was identified as occurring within 50 km of the Waddi Project area consisting of *Banksia attenuata Woodland over species rich understorey*. This community is considered endangered.

4.1.4 Review of existing reports

No publicly available information from previous studies conducted within the Waddi study area were reviewed by Outback Ecology.

4.2 Field Survey

4.2.1 Flora Summary

A total of 168 taxa (including subspecies and variants) from 31 families and 73 genera were recorded within Waddi, this includes species recorded by RPS and Outback Ecology. A list of the species recorded within Waddi is provided in **Appendix G**.

The flora within Waddi was dominated by the family Proteaceae, with a total of 41 taxa recorded (**Table 2**). Other dominant families included Myrtaceae (38 taxa), Papilionaceae (15 taxa), Cyperaceae (9 taxa), Dilleniaceae (7 taxa) and Mimosaceae (7 taxa).

Table 2 Summary of Families recorded within Waddi

Family	Number of Taxa	Family	Number of Taxa
Proteaceae	41	Stylidiaceae	2
Myrtaceae	38	Zamiaceae	2
Papilionaceae	15	Amaranthaceae	1
Cyperaceae	9	Apiaceae	1
Dilleniaceae	7	Asteraceae	1
Mimosaceae	7	Colchicaceae	1
Goodeniaceae	6	Ecdeiocoleaceae	1
Epacridaceae	5	Haloragaceae	1
Restionaceae	5	Juncaceae	1
Casuarinaceae	3	Lamiaceae	1
Haemodoraceae	3	Loganiaceae	1
Poaceae	3	Loranthaceae	1
Rhamnaceae	3	Phormiaceae	1
Anthericaceae	2	Tremandraceae	1
Chloanthaceae	2	Xanthorrhoeaceae	1
Polygalaceae	2		

The dominant genera within Waddi were *Banksia* and *Hakea* with a total of 12 taxa each (**Table 3**). Other dominant genera were *Eucalyptus* (9 taxa), *Melaleuca* (8 taxa), *Acacia* (7 taxa), *Daviesia* (7 taxa) and *Hibbertia* (7 taxa).

Table 3 Summary of genera recorded within Waddi Wind Farm Area

Genera	Number of Taxa	Genera	Number of Taxa	Genera	Number of Taxa
Banksia	12	*Eremaea*	2	*Hemiandra*	1
Hakea	12	*Isopogon*	2	*Hypocalymma*	1
Eucalyptus	9	*Lechenaultia*	2	*Juncus*	1
Melaleuca	8	*Lepidobolus*	2	*Lambertia*	1
Acacia	7	*Leptospermum*	2	*Logania*	1
Daviesia	7	*Leucopogon*	2	*Mesomelaena*	1
Hibbertia	7	*Macrozamia*	2	*Neurachne*	1
Petrophile	6	*Pityrodia*	2	*Nuytsia*	1
Gastrolobium	4	*Schoenus*	2	*Pithocarpa*	1
Allocasuarina	3	*Stylidium*	2	*Ptilotus*	1
Calothamnus	3	*Actinotus*	1	*Regelia*	1
Grevillea	3	*Adenanthos*	1	*Stenanthemum*	1
Jacksonia	3	*Andersonia*	1	*Stirlingia*	1
Lepidosperma	3	*Anigozanthos*	1	*Synaphea*	1
Verticordia	3	*Burchardia*	1	*Tetraria*	1
Austrostipa	2	*Caustis*	1	*Tetratheca*	1
Baeckea	2	*Chordifex*	1	*Thryptomene*	1
Beaufortia	2	*Corymbia*	1	*Thysanotus*	1
Calytrix	2	*Cryptandra*	1	*Tricoryne*	1
Comesperma	2	*Cyperus*	1	*Trymalium*	1
Conospermum	2	*Darwinia*	1	*Verreauxia*	1
Conostephium	2	*Dianella*	1	*Viminaria*	1
Conostylis	2	*Ecdeiocolea*	1	*Xanthorrhoea*	1
Dampiera	2	*Glischrocaryon*	1		
Desmocladus	2	*Goodenia*	1		

No DRF were recorded within Waddi. Eight Priority Flora were recorded within Waddi:

- *Hypocalymma* sp. Cataby (P1)
- *Acacia plicata* (P3)
- *Banksia fraseri* subsp. *crebra* (P3)
- *Tetratheca angulata* (P3)
- *Conostephium magnum* (P4)
- *Eucalyptus macrocarpa* subsp. *elachantha* (P4)
- *Grevillea saccata* (P4) and
- *Regelia megacephala* (P4)

Two weed species were recorded within Waddi:

- *Cyperus congestus*
- *Juncus acutus* subsp. *acutus*

4.2.2 Vegetation

Sampling Points

A total of 29 sampling points were accessed within Waddi. Most of the sampling points were located in pasture with no remaining remnant vegetation. Condition for these sampling points was degraded and heavily modified and therefore, do not hold any conservation value (**Table 4**). A summary of data recorded at sampling points is provided in **Appendix H**.

Five sampling points (**Table 4**) were located in remnant vegetation, condition for these sampling points ranged from degraded to excellent. Any proposed infrastructure should be kept a minimum of 30 m from the sampling points of vegetation in good to excellent condition.

Table 4 Summary of sample sites accessed within Waddi

Sampling Site	GPS (s)	GPS(n)	Vegetation type	Condition
WSP1	359204	6620621	Pasture	Degraded - Cleared
WSP2	360819	6621017	Pasture	Degraded - Cleared
WSP3	360492	6619114	Pasture	Degraded - Cleared
WSP4	365346	6620544	Pasture	Degraded - Cleared
WSP5	364671	6620084	Pasture	Degraded - Cleared
WSP6	364400	6619043	Pasture	Degraded - Cleared
WSP7	359549	6617471	Pasture	Degraded - Cleared
WSP8	360020	6617320	Pasture	Degraded - Cleared
WSP9	360694	6616933	Pasture	Degraded - Cleared
WSP10	361919	6616780	Pasture	Degraded - Cleared
WSP11	359227	6616547	Heath	Excellent
WSP12	358581	6614353	Pasture	Degraded - Cleared
WSP13	360584	6614661	Heath	Excellent
WSP14	360612	6614198	Heath	Excellent
WSP15	362215	6615868	Pasture	Degraded - Cleared
WSP16	361988	6614609	Pasture	Degraded - Cleared
WSP17	361090	6615002	Pasture/Heath	Cleared / Excellent
WSP18	360971	6613584	Heath - Low Shrubland	Good-Degraded
WSP19	361247	6612789	Pasture	Degraded - Cleared
WSP20	359728	6613057	Pasture	Degraded - Cleared
WSP21	358423	6612775	Pasture	Degraded - Cleared
WSP22	359197	6611908	Pasture	Degraded - Cleared
WSP23	361537	6611821	Pasture	Degraded - Cleared
WSP24	363391	6611055	Pasture	Degraded - Cleared
WSP25	359808	6609531	Pasture	Degraded - Cleared

Sampling Site	GPS (s)	GPS(n)	Vegetation type	Condition
WSP26	358765	6608513	Pasture/Pine plantation	Degraded - Cleared
WSP27	360172	6608625	Pasture	Degraded - Cleared
WSP28	359282	6606120	Pasture	Degraded - Cleared
WSP29	359696	6606646	Pasture	Degraded - Cleared

Remnant Vegetation Patches

A total of 25 relevés were surveyed within the 18 remnant vegetation patches within Waddi. A summary of data recorded at remnant vegetation patches is provided in **Appendix I**. Three broad vegetation types were identified; these were determined according to the dominant vegetation strata, which were:

- Woodland
- Shrubland
- Heath

Within the three broad vegetation types occurring within Waddi, a total of 13 communities have been described (**Table 5**) and delineated (**Appendix J**). Heath was the dominant vegetation type within Waddi, occurring in 17 remnant vegetation patches.

The Heath vegetation type, comprised a mosaic of various heath subtypes dominated by Proteaceae and Myrtaceae species. Due to very high diversity and spatial variability these subtypes have been grouped as one main vegetation community (H1) and a second less dominant community (H2).

Table 5 Vegetation communities identified within Waddi remnant vegetation patches

Vegetation Type	Code	Vegetation Description
Woodland	W1	Woodland of *Corymbia calophylla* over Shrubland of *Proteacae* spp., *Myrtaceae* spp. and *Xanthorrhoea preissii* on mid/lower slope
Woodland	W4	Low Woodland of *Banksia* spp. over Shrubland of *Proteaceae* spp. and *Myrtaceae* spp. on flat
Woodland	W5	Parkland Cleared/Degraded/Planted *Eucalyptus* spp.
Woodland	W7	Closed Woodland of *Eucalyptus* spp. over grassy weeds
Woodland	W9	Woodland of *Corymbia calophylla* and *Eucalyptus* spp. over Shrubland of *Mrytaceae* spp., *Acacia* spp. and mixed herbs
Woodland	W10	Low Woodland of *Banksia* spp. over Heathand of mixed shrubs
Shrubland	SH1	Tall Closed Shrubland of *Adenanthos cygnorum* subsp. *cygnorum* and mixed *Proteaceae* spp. and *Myrtaceae* spp. on flat

Vegetation Type	Code	Vegetation Description
Shrubland	SH2	Open Shrubland of *Banksia attenuata* over Low Closed Shrubland of *Xanthorrhoea preissii* and mixed *Proteaceae* spp. on gentle slope
Shrubland	SH3	Shrubland of *Melaleuca teretifolia* and *Viminaria juncea* on creekline
Shrubland	SH4	Closed Tall Scrub of *Adenanthos cygnorum* subsp. *cygnorum* over mixed *Proteaceae* spp. and *Myrtaceae* spp.
Shrubland	SH5	Tall Closed Scrub of *Letospermum erubescens* and *Adenanthos cygnorum* subsp. *cygnorum* and mixed *Proteaceae* spp. and *Myrtaceae* spp. on midslope
Heath	H1	Heath Mosaic of variable *Proteaceae* spp. and *Myrtaceae* spp. and *Xanthorrhoea preissii* with occasional emergent *Eucalyptus* spp. and *Nuytsia floribunda* on mid to upper slope
Heath	H2	Closed Heath of *Adenanthos cygnorum* subsp. *cygnorum* with scattered patches of *Gastrolobium spinosum*

Vegetation community SH2 Open Shrubland of *Banksia attenuata* over Low Closed Shrubland of *Xanthorrhoea preissii* and mixed *Proteaceae* spp. on gentle slope was identified in the remnant vegetation patches during survey. This vegetation type is consistent with the TEC identified as *Banksia attenuata Woodland over species rich dense shrublands*. This community is identified as Endangered under the *Environmental Protection Act (1986)*. It is therefore recommended that impacts upon this conservation significant community be avoided.

Vegetation Condition

Vegetation condition for all remnant vegetation patches was described (**Appendix K**). Eleven of the 18 remnant vegetation patches within Waddi were in excellent condition (**Table 6**).

Most Heath remnant vegetation patches were in excellent condition and were generally fenced. Where weed intrusion occurred, it extended 5-10 meters into the stand, and was possibly limited due to the low lying, dense nature of the vegetation. Where Heath was not fenced it was generally of poorer condition and between Good to Degraded. These stands showed evidence of animal access and grazing through openings in the vegetation structure, and had heavy weed intrusion. Degraded Heath patches were generally small and found on hilltops within paddocks.

Woodland areas maintained structure, however grassy weeds were common. They were generally located around creeks and seasonally inundated areas.

Remnant vegetation within Waddi was generally in good condition. Waddi was dominated by large remnant vegetation patches of Heath, mainly in excellent condition with lower levels of weeds.

Table 6 Summary of remnant vegetation patches surveyed within Waddi

Map	GPS (s)	GPS(n)	Vegetation type	Condition
1	364463	6620270	Heath (H1)	Good
2	359384	6619577	Heath (H2)	Degraded
2	359405	6619603	Woodland (W10)	Degraded
2	359620	6619179	Shrubland (SH4)	Good
3	363360	6618981	Woodland (W1)	Good
4	360593	6618261	Heath (H1)	Excellent
4	361150	6617936	Heath (H1)	Excellent
5	359773	6617357	Heath (H1)	Excellent
5	360141	6617422	Heath (H1)	Excellent
6	363414	6617304	Woodland (W1)	Good
6	363228	6617301	Woodland (W1)	Good
6	363000	6617150	Heath (H1)	Excellent
7	359332	6616553	Heath (H1)	Excellent
8	360182	6616577	Heath (H1)	Very good
8	360330	6616226	Heath (H1)	Good
8	359975	6616238	Heath (H1)	Very good
9	362042	6614860	Heath (H1)	Excellent
10	360884	6614818	Heath (H1)	Excellent
11	358787	6612757	Heath (H1)	Degraded
12	359665	6613029	Heath (H1)	Very good
15	363370	6610895	Heath (H1)	Excellent
16	359142	6606372	Heath (H1)	Excellent – very good
17	359700	6609800	Shrubland (SH2)	Very good
17	360000	6603800	Heath (H1)	Excellent
25	359100	6606000	Heath (H1)	Excellent

Access Tracks and Underground Transmission Line Routes

A total of 18 relevés were surveyed within three access tracks and underground transmission line routes (**Appendix L**). Eleven relevés were surveyed by RPS and 10 relevés (**Table 7**) were surveyed by Outback Ecology. Three broad vegetation types were identified within Waddi access tracks and transmission line routes:

- Woodland
- Shrubland
- Heath

Within the three vegetation types, eight communities were identified (**Table7**). Woodland was the dominant vegetation type, with five communities occurring within access tracks and transmission line routes.

Table 7 Vegetation types and communities identified within Waddi access tracks and transmission line routes

Vegetation Type	Code	Vegetation Description
Woodland	W4	Low Woodland of *Banksia* spp. over Shrubland of *Proteaceae* spp. and *Myrtaceae* spp. on flat
Woodland	W5	Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* over parkland grasses in creekline
Woodland	W7	Closed Woodland of *Eucalyptus* spp. over grassy weeds
Woodland	W9	Woodland of *Corymbia calophylla* and *Eucalyptus* spp. over Shrubland of *Mrytaceae* spp., *Acacia* spp. and mixed herbs
Woodland	W10	Low Woodland of *Banksia* spp. over Heathand of mixed shrubs
Shrubland	SH1	Tall Closed Shrubland of *Adenanthos cygnorum* subsp. *cygnorum* and mixed *Proteaceae* spp. and *Myrtaceae* spp. on flat
Shrubland	SH5	Tall Closed Scrub of *Letospermum erubescens* and *Adenanthos cygnorum* subsp. *cygnorum* and mixed *Proteaceae* spp. and *Myrtaceae* spp. on midslope
Heath	H1	Heath Mosaic of variable *Proteaceae* spp. and *Myrtaceae* spp. and *Xanthorrhoea preissii* with occasional emergent *Eucalyptus* spp. and *Nuytsia floribunda* on mid to upper slope

Vegetation condition of the access tracks and transmission underground line routes within Waddi was mostly excellent (**Table 8**), however some areas were degraded, with dieback occuring in a large section of transmission line Option 2. This area should be avoided to reduce the possibility of spreading dieback to remnant vegetation.

Table 8 Summary of access tracks and underground transmission line routes surveyed within the Waddi Project area

Map	GPS (E)	GPS(N)	Vegetation type	Condition
19	353089	6608922	Woodland (W4)	Excellent
20	352383	6608388	Woodland (W4)	Excellent
20	352332	6607968	Shrubland (SH1)	Very Good
21	352377	6607724	Woodland (W5)	Degraded – rehabilitated
26	353221	6605497	Shrubland (SH1)	Very good
-	361678	6605243	Woodland (W7)	Degraded
-	361907	6605014	Heath (H1)	Excellent
-	362400	6604102	Shrubland (SH5)	Very good

4.2.3 Conservation Significance of Vegetation

Sampling points located within pasture or pine plantations were not considered to hold any conservation value. Sites classified as 'parkland cleared' hold little floral conservation value, but may provide erosion control as well as habitat for wildlife.

Heath patches in very good, or better, condition are considered to be important remnants of pre-existing vegetation, and may potentially hold Rare, Threatened or Priority flora even if not detected by field surveys. These vegetation patches are refuges for native fauna species that cannot survive in pastureland.

Creeklines and seasonally inundated areas are similarly important habitats for native fauna and Priority flora. Vegetation present in these areas provides stabilization from erosion, especially large trees.

Vegetation community SH2 Open Shrubland of *Banksia attenuata* over Low Closed Shrubland of *Xanthorrhoea preissii* and mixed *Proteaceae* spp. on gentle slope was identified in the remnant vegetation during survey. This vegetation type is consistent with the TEC identified as *Banksia attenuata Woodland over species rich dense shrublands*. This community is identified as Endangered under the *Environmental Protection Act (1986)*. It is therefore recommended that impacts upon this

conservation significant community be avoided. No other TECs or PECs were identified within this area. No TEC or PEC communities were identified along the access tracks or the underground transmission line routes.

5 RECOMMENDATIONS

The following recommendations are made for the Waddi Wind Farm Study area for flora and vegetation from the proposed layout of infrastructure components:

- Avoid disturbing remnant vegetation patches in very good or better condition where possible
- Turbines should be placed a minimum of 30 m from remnant vegetation patches
- Avoid placing access tracks and underground transmission line routes within drainage lines to reduce erosion and downstream effects
- Vegetation community SH2 was identified during the survey and is consistent with the TEC identified as *Banksia attenuata Woodland over species rich dense shrublands*. This community is identified as Endangered under the *Environmental Protection Act (1986)*. It is therefore recommended that impacts upon this conservation significant community be avoided
- Avoid cutting into remnant vegetation patches where possible as this will result in edge effect and amplifying disturbance (ie, a 5 m wide track will have around 30-40 m wide disturbance footprint), and
- A follow-up Level 2 survey is recommended prior to construction.

6 REFERENCES

Beard, J.S. (1990) *Plant Life of Western Australia*. Kangaroo Press, Kenthurst, NSW

Brandis, A. (no date) *Report to REMP Committee – CAR Reserve System Establishment in the GMS.*

Bureau of Meteorology (BOM) (2007) *Climate statistics for Australian locations.* [Online]. Available: *http://www.bom.gov.au/lsp/ncc/cdio/cvg/av* [2008, 4th November].

Department of Environment and Conservation (DEC) (2007). Declared Rare and Priority Flora List for Western Australia.

Department of Environment and Heritage. (2003). *Australian Vegetation Attribute Manual, National Vegetation Information System, Version 6.* Available online: http://www.deh.gov.au/erin/nvis/publications/avam/section-2-2.html

Desmond, A. and A. Chant (2003). "Geraldton Sandplains 3 (GS3–Lesueur Sandplain subregion)." May, JE and McKenzie, NL A Biodiversity Audit of Western Australia's **53**.

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

Environment Australia (2000). *Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. – Summary Report*. Department of Environment and Heritage, Canberra.

EPA (2002). Environmental Protection Authority. Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No 3. March 2003.

EPA (2004). Environmental Protection Authority. Guidance for the Assessment of Environmental Factors. Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. No 51. June, 2004.

Government of Western Australia (GoWA) (2000) *Bush Forever V2*: Directory of Bush Forever Sites. Government of Western Australia., p493.

Keighery, B. (1994). Bushland Plant Survey: A guide to plant community survey for the community, Wildflower Society of WA (Inc.).

Keighery, G. J., N. J. Hall, et al. (1994). "Vegetation and flora." Records of the Western Australian Museum Supplement **47**: 24-50.

NLWRA, (2002). National Land and Water Resources Audit (1997 – 2002). A program of the Australian Government Natural Heritage Trust www.nlwra.gov.au (Accessed May 25th, 2007) NLRWA

Paczkowska, G. and Chapman, A.R. (2000). *The Western Australian Flora: A Descriptive Catalogue*. Wildflower Society of Western Australia, Nedlands, Western Australian Herbarium, CALM, (Perth) and Botanic Gardens and Parks Authority, (West Perth).

Shepherd, D.P., Beeston, G.R., and Hopkins, A.J.M. (2002) Native Vegetation in Western Australia. Extent, Type and Status. Department of Agriculture, Western Australia. Resource Management Technical Report 249.

Thackway, R and Cresswell, I.D. (eds) (1995) *An interim biogeographical regionalisation of Australia*. Australian Nature Conservation Agency (now DEH), Canberra.

Western Australian Herbarium (2007). FloraBase — The Western Australian Flora. Department of Conservation and Land Management. http://florabase.calm.wa.gov.au/

Appendix A

Flora species of conservation significance known to occur within the Project area

Species	Conservation Code
Acacia cummingiana	P3
Acacia epacantha	P3
Acacia forrestiana	DRF – Vulnerable
Acacia splendens	DRF
Andersonia gracilis	DRF – Endangered
Anigozanthos viridis subsp. *terraspectans*	DRF – Vulnerable
Anigozanthos humilis subsp. *Badgingarra*	P2
Asterolasia nivea	DRF – Vulnerable
Banksia dallanneyi subsp. *pollosta*	P3
Banksia serratuloides subsp. perissa	DRF – Vulnerable
Banksia serratuloides subsp. serratuloides	DRF – Vulnerable
Calytrix ecalycata subsp. *brevis*	P3
Dampiera tephrea	P2
Darwinia acerosa	DRF – Endangered
Daviesia dielsii	DRF – Vulnerable
Drakaea elastica	DRF – Endangered
Drosera marchantii subsp. *prophylla*	P1
Eleocharis keigheryi	DRF – Vulnerable
Eucalyptus absita	DRF
Eucalyptus balanites	DRF – Endangered
Eucalyptus dolorosa	DRF – Endangered
Eucalyptus suberea	DRF – Vulnerable
Grevillea calliantha	DRF – Endangered
Grevillea curviloba subsp*. incurva*	DRF – Endangered
Grevillea olivacea	P4
Grevillea thyrsoides subsp. *thyrsoides*	P3
Hakea megalosperma	DRF – Vulnerable
Hemiandra rutilans	DRF – Endangered
Hibbertia helianthemoides	P3
Macarthuria keigheryi	DRF – Endangered
Melaleuca clavifolia	P1
Patersonia spirifolia	DRF – Endangered
Ptychosema pusillum	DRF – Vulnerable
Spirogardnera rubescens	DRF – Endangered
Thelymitra stellata	DRF – Endangered
Verticordia insignis subsp. *eomagis*	P3

Appendix B
Definitions of Declared Rare and Priority Flora

Definition of Declared Rare and Priority Flora Species (CALM, 2005)

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

Appendix C
Definitions of Threatened Ecological Communities

Definition of Threatened Ecological Community classifications (English, 2003)

TEC Classification	Description
Presumed Totally Destroyed	Community is unlikely to be able to be rehabilitated.
Critically Endangered	There are immediate threats throughout its range.
Endangered	Threatened throughout most of its range in near future.
Vulnerable	Vulnerable to threatening processes/may move into higher threat category.

Appendix D
Vegetation Condition Scale

Vegetation Condition Scale (Keighery, 1994)

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

Appendix E

Classification of Vegetation Structural Formation and Height Classes

Life Form/ Height Class	**Canopy Cover (percentage)**			
	100% - 70%	**70% - 30%**	**30% - 10%**	**10% - 2%**
Trees 10-30m Trees < 10m	Closed Forest Low Closed Forest	Open Forest Low Open Forest	Woodland Low Woodland	Open Woodland Low Open Woodland
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs > 2m Shrubs 1-2m Shrubs <1m	Closed Tall Scrub Closed Heath Closed Low Heath	Tall Open Scrub Open Heath Open Low Heath	Tall Shrubland Shrubland Low Shrubland	Tall Open Shrubland Open Shrubland Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

Appendix F

Environment Protection and Biodiversity Conservation (EPBC) Act Protected Matters Database Search

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.
You may wish to print this report for reference before moving to other pages or websites.
The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Search Type:	Point
Buffer:	40 km
Coordinates:	-30.68519,115.5602

Report Contents:

Summary
Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	24
Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	2
Commonwealth Heritage Places:	1
Places on the RNE:	5
Listed Marine Species:	5
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	18
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details
Matters of National Environmental Significance

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Bettongia penicillata ogilbyi Woylie	Endangered	Species or species habitat likely to occur within area
Plants		
Acacia splendens Splendid Wattle, Dandaragan Wattle	Endangered	Species or species habitat likely to occur within area
Andersonia gracilis Slender Andersonia	Endangered	Species or species habitat likely to occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw	Vulnerable	Species or species habitat likely to occur within area
Asterolasia nivea Bindoon Starbush	Vulnerable	Species or species habitat likely to occur within area
Banksia serratuloides subsp. perissa Northern Serrate Dryandra	Vulnerable	Species or species habitat likely to occur within area
Banksia serratuloides subsp. serratuloides Southern Serrate Dryandra	Vulnerable	Species or species habitat likely to occur within area
Darwinia acerosa Fine-leaved Darwinia	Endangered	Species or species habitat likely to occur within area
Darwinia sp. Muchea (B.J.Keighery 2458) Muchea Bell	Critically Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leaved Hammer-orchid, Praying Virgin	Endangered	Species or species habitat likely to occur within area
Eleocharis keigheryi Keighery's Eleocharis	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus absita Badgingarra Box	Endangered	Species or species habitat likely to occur within area
Eucalyptus dolorosa Dandaragan Mallee	Endangered	Species or species habitat likely to occur within area
Eucalyptus recta	Endangered	Species or species habitat likely to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea	Endangered	Species or species habitat likely to occur within area
Hakea megalosperma Lesueur Hakea	Vulnerable	Species or species habitat likely to occur within area
Macarthuria keigheryi Keighery's Macarthuria	Endangered	Species or species habitat likely to occur within area
Patersonia spirafolia Spiral-leaved Patersonia	Endangered	Species or species habitat likely to occur within area

Ptychosema pusillum Dwarf Pea	Vulnerable	Species or species habitat likely to occur within area
Spirogardnera rubescens Spiral Bush	Endangered	Species or species habitat likely to occur within area
Thelymitra stellata Star Sun-orchid	Endangered	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl	Migratory	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Commonwealth Lands [Dataset Information]		
Defence		
Unknown		

Commonwealth Heritage Places [Dataset Information]

Lancelin Defence Training Area WA

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Badgingarra National Park and proposed extension WA

Lake Guraga WA

Moore River National Park WA

Nambung National Park and proposed extension WA

Wanagarren and Nilgen Nature Reserves (1976 boundaries) WA

Extra Information

State and Territory Reserves [Dataset Information]

Badgingarra National Park, WA

Bashford Nature Reserve, WA

Bundarra Nature Reserve, WA

Eneminga Nature Reserve, WA

Jam Hill Nature Reserve, WA

Minyulo Nature Reserve, WA

Moore River National Park, WA

Nambung National Park, WA

Namming Nature Reserve, WA

Nilgen Nature Reserve, WA

South Mimegarra Nature Reserve, WA

Twyata Nature Reserve, WA

Un-named (No. 27993) Nature Reserve, WA

Un-named (No. 39571) Nature Reserve, WA

Un-named (No. 40916) Nature Reserve, WA

Un-named (No. 41986) Conservation Park, WA

Wanagarren Nature Reserve, WA

Wongonderrah Nature Reserve, WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Last updated: Thursday, 20-Nov-2008 14:17:56 EST

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Appendix G

Flora Species Recorded within the Waddi Project area

Family	Species	Conservation Significance
Zamiaceae (16A)	*Macrozamia fraseri*	
	Macrozamia riedlei	
Poaceae (31)	*Austrostipa compressa*	
	Austrostipa hemipogon	
	Neurachne alopecuroidea	
Cyperaceae (32)	**Cyperus congestus*	
	Caustis dioica	
	Lepidosperma drummondii	
	Lepidosperma sp.	
	Lepidosperma tenue	
	Mesomelaena pseudostygia	
	Schoenus pedicellatus	
	Schoenus pleiostemoneus	
	Tetraria ? *octandra*	
Restionaceae (39)	*Chordifex sphacelatus*	
	Desmocladus asper	
	Desmocladus flexuosus	
	Lepidobolus preissianus	
	Lepidobolus preissianus subsp. *preissianus*	
Ecdeiocoleaceae (39)	*Ecdeiocolea monostachya*	
Juncaceae (52)	**Juncus acutus* subsp. *acutus*	
Xanthorrhoeaceae (54D)	*Xanthorrhoea preissii*	
Phormiaceae (54E)	*Dianella revoluta*	
Anthericaceae (54F)	*Thysanotus dichotomus*	
	Tricoryne elatior	
Colchicaceae (54J)	*Burchardia multiflora*	
Haemodoraceae (55)	*Anigozanthos humilis* subsp. *humilis*	
	Conostylis angustifolia	
	Conostylis resinosa	
Casuarinaceae (70)	*Allocasuarina campestris*	
	Allocasuarina humilis	
	Allocasuarina microstachya	
Proteaceae (90)	*Adenanthos cygnorum* subsp. *cygnorum*	
	Banksia ? *stenoprion*	
	Banksia aff. *leptophylla* var. *leptophylla*	
	Banksia attenuata	
	Banksia candolleana	
	Banksia carlinoides	
	Banksia fraseri subsp. *crebra*	P3
	Banksia hewardiana	

Family	Species	Conservation Significance
Proteaceae cont. (90)	*Banksia prionotes*	
	Banksia sessilis var. *sessilis*	
	Banksia shuttleworthiana	
	Banksia sp.	
	Banksia tridentata	
	Conospermum crassinervium	
	Conospermum stoechadis subsp. *sclerophyllum*	
	Grevillea eriostachya	
	Grevillea saccata	P4
	Grevillea umbellulata	
	Hakea auriculata	
	Hakea conchifolia	
	Hakea costata	
	Hakea flabellifolia	
	Hakea incrassata	
	Hakea lissocarpha	
	Hakea psilorrhyncha	
	Hakea ruscifolia	
	Hakea spathulata	
	Hakea stenocarpa	
	Hakea trifurcata	
	Hakea undulata	
	Isopogon adenanthoides	
	Isopogon linearis	
	Lambertia multiflora var. *multiflora*	
	Petrophile brevifolia	
	Petrophile macrostachya	
	Petrophile pilostyla subsp. *austrina*	
	Petrophile recurva	
	Petrophile shuttleworthiana	
	Petrophile striata	
	Stirlingia latifolia	
	Synaphea spinulosa	
Loranthaceae (97)	*Nuytsia floribunda*	
Amaranthaceae (106)	*Ptilotus exaltatus*	
Mimosaceae (163)	*Acacia auronitens*	
	Acacia bartleana	
	Acacia plicata	P3
	Acacia pulchella	
	Acacia pulchella var. *pulchella*	

Family	Species	Conservation Significance
Mimosaceae cont. (163)	*Acacia sphacelata* subsp. ? *verticillata*	
	Acacia stenoptera	
Papilionaceae (165)	*Daviesia angulata*	
	Daviesia daphnoides	
	Daviesia decurrens	
	Daviesia divaricata subsp. *divaricata*	
	Daviesia epiphyllum	
	Daviesia nudiflora subsp. *nudiflora*	
	Daviesia podophylla	
	Gastrolobium ilicifolium	
	Gastrolobium oxylobioides	
	Gastrolobium polystachyum	
	Gastrolobium spinosum	
	Jacksonia floribunda	
	Jacksonia nutans	
	Jacksonia restioides	
	Viminaria juncea	
Tremandraceae (182)	*Tetratheca angulata*	P3
Polygalaceae (183)	*Comesperma acerosum*	
	Comesperma calymega	
Rhamnaceae (215)	*Cryptandra intermedia*	
	Stenanthemum humile	
	Trymalium ledifolium var. *ledifolium*	
Dilleniaceae (226)	*Hibbertia* ? *subvaginata*	
	Hibbertia aff. sp. Mt Lesueur	
	Hibbertia huegelii	
	Hibbertia hypericoides	
	Hibbertia mylnei	
	Hibbertia sp.	
	Hibbertia sp. Gnangara (J.R. Wheeler 2329)	
Myrtaceae (273)	*Baeckea camphorosmae*	
	Baeckea grandiflora	
	Beaufortia bracteosa	
	Beaufortia elegans	
	Calothamnus hirsutus	
	Calothamnus quadrifidus	
	Calothamnus torulosus	
	Calytrix angulata	
	Calytrix breviseta subsp. *stipulosa*	
	Corymbia calophylla	

Family	Species	Conservation Significance
Myrtaceae cont. (273)	*Darwinia sanguinea*	
	Eremaea asterocarpa subsp*. asterocarpa*	
	Eremaea pauciflora	
	Eucalyptus ? *camaldulensis* var*. obtusa*	
	Eucalyptus drummondii	
	Eucalyptus gittinsii subsp*. illucida*	
	Eucalyptus loxophleba subsp*. supralaevis*	
	Eucalyptus macrocarpa subsp*. elachantha*	P4
	Eucalyptus rudis	
	Eucalyptus sp*.*	
	Eucalyptus todtiana	
	Eucalyptus wandoo	
	Hypocalymma sp. Cataby (G.J. Keighery 5151)	P1
	Leptospermum erubescens	
	Leptospermum spinescens	
	Melaleuca ? *seriata*	
	Melaleuca ciliosa	
	Melaleuca preissiana	
	Melaleuca psammophila	
	Melaleuca rhaphiophylla	
	Melaleuca sp*.*	
	Melaleuca trichophylla	
	Melaleuca viminea subsp*. viminea*	
	Regelia megacephla	P4
	Thryptomene mucronulata	
	Verticordia densiflora var*. densiflora*	
	Verticordia nobilis	
	Verticordia pennigera	
Haloragaceae (276)	*Glischrocaryon aureum* var*. aureum*	
Apiaceae (281)	*Actinotus leucocephalus*	
Epacridaceae (288)	*Andersonia heterophylla*	
	Conostephium magnum	P4
	Conostephium pendulum	
	Leucopogon ? *oxycedrus*	
	Leucopogon oliganthus	
Loganiaceae (302)	*Logania spermacocea*	
Chloanthaceae (311A)	*Pityrodia bartlingii*	
	Pityrodia verbascina	
Lamiaceae (313)	*Hemiandra* ? *linearis*	
Goodeniaceae (341)	*Dampiera linearis*	

Family	Species	Conservation Significance
Goodeniaceae cont. (341)	*Dampiera spicigera*	
	Goodenia coerulea	
	Lechenaultia biloba	
	Lechenaultia expansa	
	Verreauxia reinwardtii	
Stylidiaceae (343)	*Stylidium crossocephalum*	
	Stylidium cygnorum	
Asteraceae (342)	*Pithocarpa pulchella* var. *pulchella*	

* Denotes introduced species

Appendix H

Summary of Data Recorded at Sampling Points within the Waddi Project area

WSP1

Photo Direction	South
GPS	50 359204mE 6620621mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Scattered Trees 400m North-North-West

WSP2

Photo Direction	North-East
GPS	50 360819mE 6621017mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Occasional trees, some planted trees along fenceline (200m North)

WSP3

Photo Direction	South-East
GPS	50 360492mE 6619114mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Scattered clump of trees South-East 400m

WSP4

Photo Direction	North
GPS	50 365346mE 6620544mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Poor condition remnant vegetation patch 140m North

WSP5

Photo Direction	North-West
GPS	50 364671mE 6620084mN
Vegetation	Pasture
Condition	Degraded – cleared
Closest Remnant Vegetation	Clump of trees adjacent to Tower location. Scattered trees 150m South-East of Tower location

WSP6

Photo Direction	North-East
GPS	50 364400mE 6619043mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Tree 70m South-East, Windbreak 120m West

WSP7

Photo Direction	South-West
GPS	50 359549mE 6617471mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Adjacent remnant vegetation patch to the North

WSP8

Photo Direction	South-East
GPS	50 360020mE 6617320mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Adjacent remnant vegetation patch to the North

WSP9

Photo Direction	West
GPS	50 360694mE 6616933mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Scattered trees/shrubs 400m West across fence line

WSP10

Photo Direction	South-East
GPS	50 361919mE 6616780mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Scattered trees 20m South-South-West

WSP11

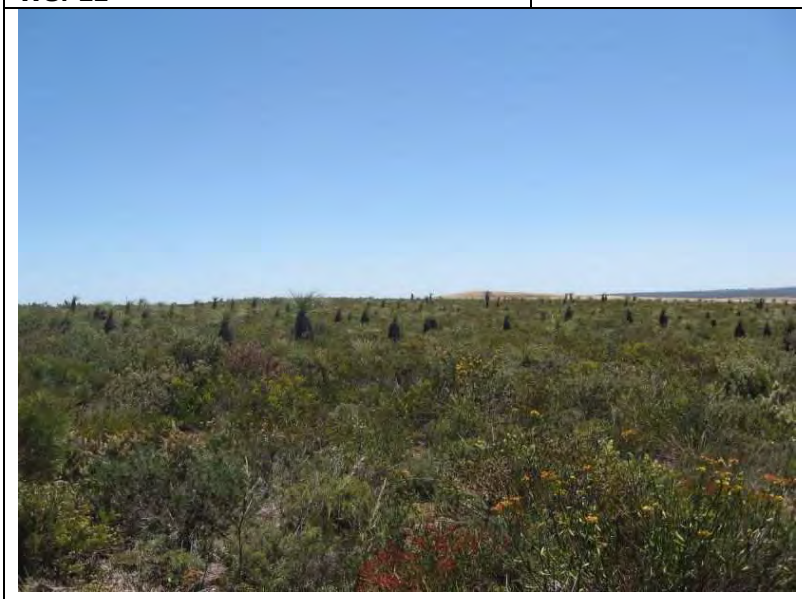

Photo Direction	West
GPS	50 359227mE 6616547mN
Vegetation	Heath
Condition	Excellent
Closest Remnant Vegetation	N/A

WSP12

Photo Direction	South
GPS	50 358581mE 6614353mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Windbreak 100m to South, remnant veg 200m West

WSP13

Photo Direction	West
GPS	50 360584mE 6614661mN
Vegetation	Heath
Condition	Excellent
Closest Remnant Vegetation	N/A

WSP14

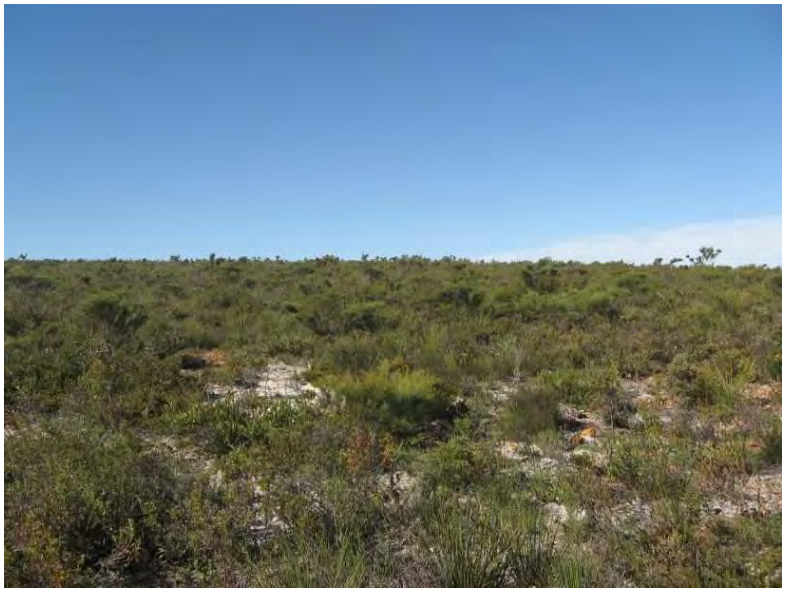

Photo Direction	North-West
GPS	50 360612mE 6614198mN
Vegetation	Heath
Condition	Excellent
Closest Remnant Vegetation	N/A

WSP15

Photo Direction	East
GPS	50 362215mE 6615868mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Tree 150m West

WSP16

Photo Direction	South
GPS	50 361988mE 6614609mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Adjacent to remnant vegetation in excellent condition. Scattered trees South-East

WSP17

Photo Direction	East
GPS	50 361090mE 6615002mN
Vegetation	Pasture/Heath
Condition	Degraded – cleared/Excellent
Closest Remnant Vegetation	Adjacent to remnant vegetation in excellent condition. Scattered trees and shrubs in pasture

WSP18

Photo Direction	East
GPS	50 360971mE 6613584mN
Vegetation	Heath/low shrubland
Condition	Good-degraded
Closest Remnant Vegetation	N/A

WSP19

Photo Direction	North-East
GPS	50 361247mE 6612789mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Tree 300m South-East

WSP20

Photo Direction	East
GPS	50 359728mE 6613057mN
Vegetation	Pasture
Condition	Degraded – cleared
Closest Remnant Vegetation	Surrounded by patches of remnant vegetation (approx 50m)

WSP21

Photo Direction	East
GPS	50 358423mE 6612775mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Degraded remnant hillside vegetation showing evidence of erosion

WSP22

Photo Direction	South-East
GPS	50 359197mE 6611908mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Patches of degraded remnant vegetation

WSP23

Photo Direction	South-East
GPS	50 361537mE 6611821mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Scattered trees (50m spacing)

WSP24

Photo Direction	South-East
GPS	50 363391mE 6611055mN
Vegetation	Pasture
Condition	Degraded – cleared
Closest Remnant Vegetation	Remnant vegetation patch 130m South. Scattered trees/shrubs North to West 30m

WSP25	
No photograph	
GPS	50 359808mE 6609531mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Move sampling site South-West to avoid disturbing remnant vegetation

WSP26	
	
Photo Direction	North
GPS	50 358765mE 6608513mN
Vegetation	Pasture/pine plantation
Condition	Degraded
Closest Remnant Vegetation	On pine plantation, roadside vegetation 400m North, windbreak 300m South-West

WSP27

Photo Direction	South-West
GPS	50 360172mE 6608625mN
Vegetation	Pasture
Condition	Degraded – cleared
Closest Remnant Vegetation	Scattered trees 80m South

WSP28

Photo Direction	South
GPS	50 359282mE 6606120mN
Vegetation	Pasture
Condition	Degraded – cleared
Closest Remnant Vegetation	Adjacent to remnant vegetation on hillock, scattered trees to East and North-West

WSP29

Photo Direction	North-East
GPS	50 359696mE 6606646mN
Vegetation	Pasture
Condition	Degraded - cleared
Closest Remnant Vegetation	Tree 150m South-East, Plantation 400m North

Appendix I

Summary of Data Recorded at Remnant Vegetation Patches within the Waddi Project Area

Map Index of Remnant Vegetation Patches within the Waddi Project Area

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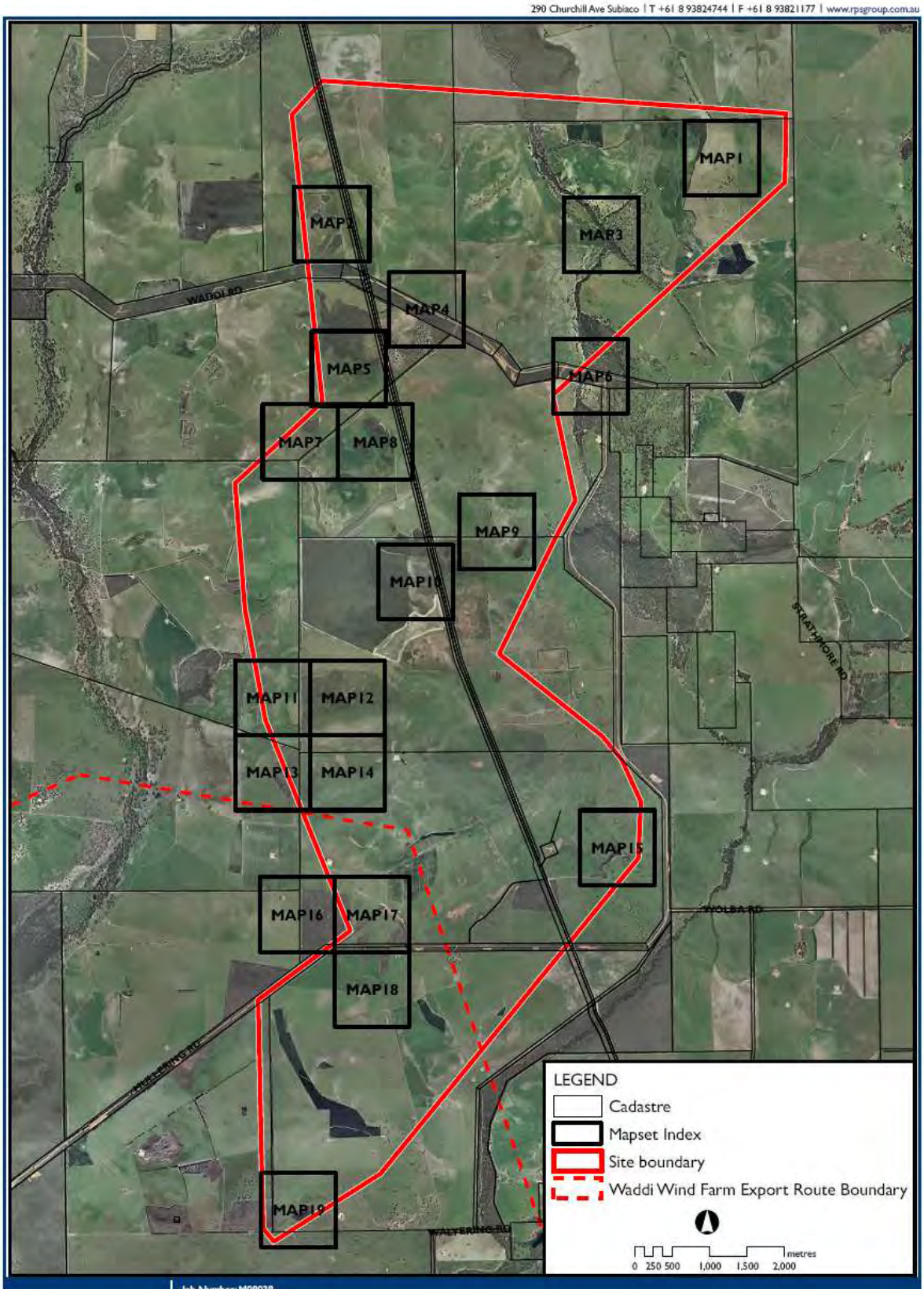


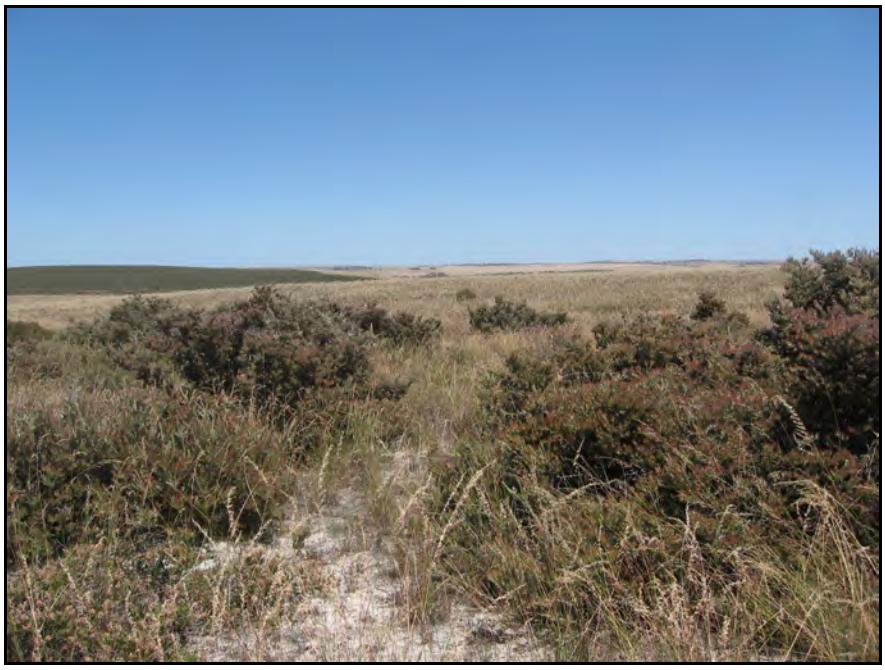
RPS

Job Number: M08038
Date: 30.07.09
Revision: A
Scale: 1:65000 @ A4
Drafted by: SF
Source: Aerial photography - Landgate, 2008

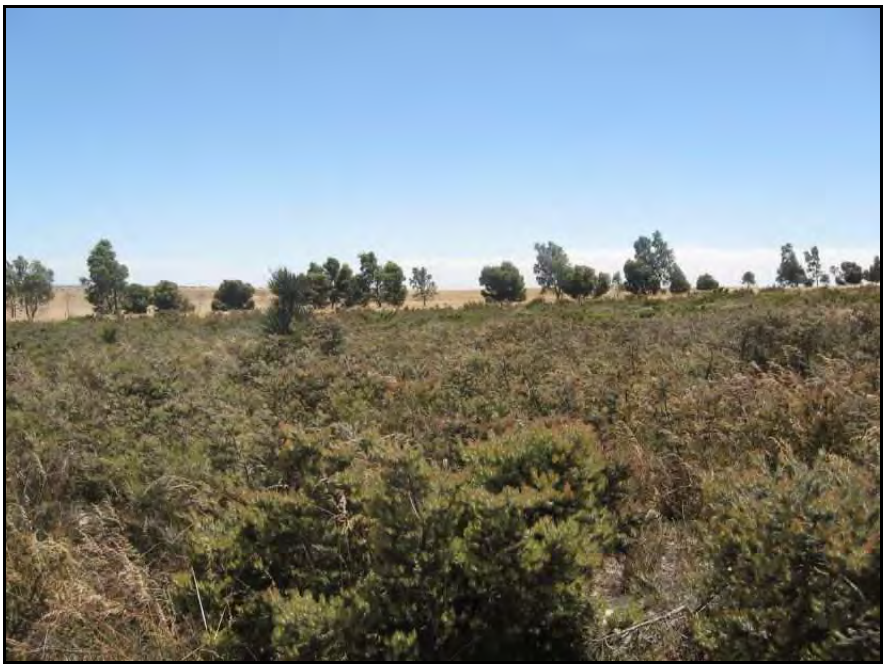
Vegetation Condition Mapset Index - Waddi

Map	1
Date	12/11/08
GPS	50 64463 mE 6620270 mN
Topography	Midslope
Soil	Grey sand
Vegetation condition	Good
Degrading factors	Heavy weed infestation
Vegetation type	Heath
Community	H1
Dominant species	*Calothamnus hirsutus* *Hakea conchifolia* *Petrophile shuttleworthiana* *Xanthorrhoea preissii*
Notes	Eucalyptus wind break infront of heathland

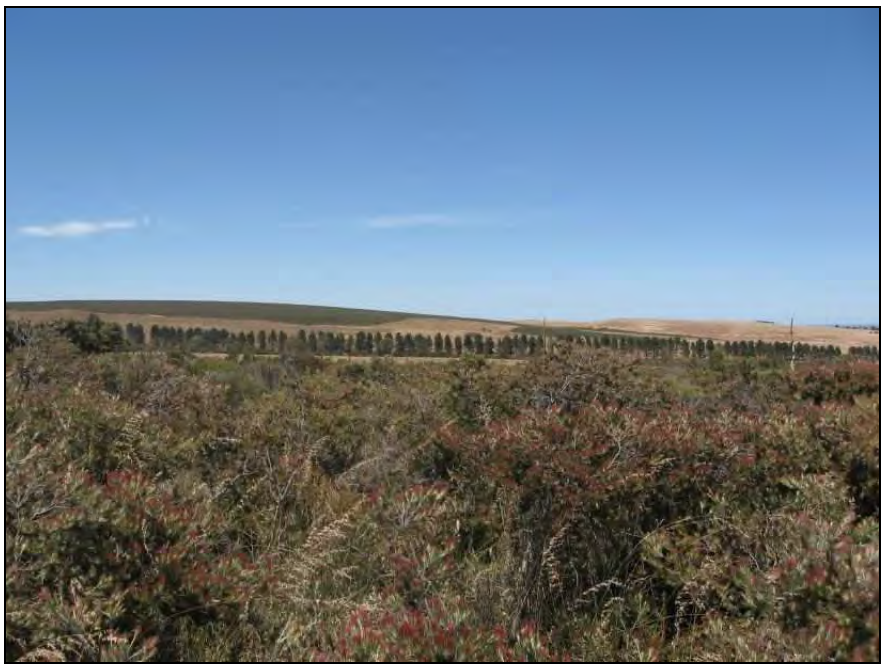
Map	2
Date	12/11/2008
GPS	50 359405 mE 6619603 mN
Topography	Midslope
Soil	White sand
Vegetation condition	Degraded (good in sections)
Degrading factors	Poor diversity compared to surrounding areas, weeds, rabbits
Vegetation type	Heath
Community	H2
Dominant species	*Adenanthos cygnorum* subsp*. cygnorum* *Allocasuarina humilis* *Eremaea pauciflora* *Gastrolobium spinosum*



Map	2
Date	12/11/2008
GPS	50 359405 mE 6619603 mN
Topography	Midslope
Soil	White sand
Vegetation condition	Degraded
Degrading factors	Weeds, rabbits
Vegetation type	Woodland
Community	W10
Dominant species	*Adenanthos cygnorum* subsp*. cygnorum* *Allocasuarina humilis* *Banksia prionotes* *Eremaea pauciflora*



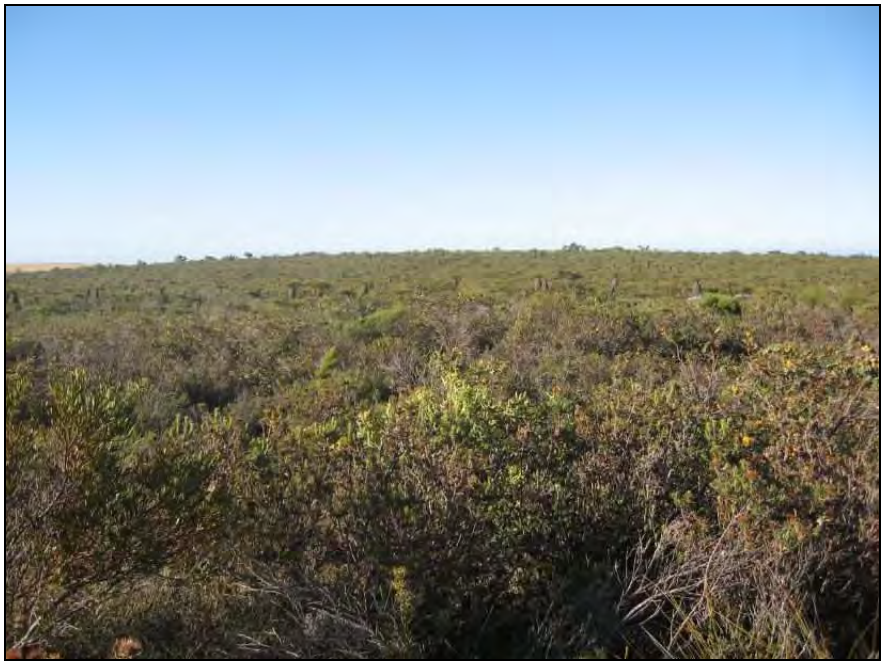
Map	2
Date	12/11/2008
GPS	50 359620 mE 6619179 mN
Topography	Midslope
Soil	White sand
Vegetation condition	Good
Degrading factors	Weeds - edge effect to 5m, rabbits
Vegetation type	Shrubland
Community	SH4
Dominant species	*Adenanthos cygnorum* subsp*. cygnorum* *Allocasuarina humilis* *Calothamnus hirsutus* *Eremaea pauciflora* *Gastrolobium spinosum* *Xanthorrhoea preissii*



Map	3
Date	12/11/2008
GPS	50 363360 mE 6618981 mN
Topography	Creekline
Soil	Brown loam
Vegetation condition	Good
Degrading factors	Heavy weed infestation, structure intact
Vegetation type	Woodland
Community	W1
Dominant species	*Calothamnus quadrifidus* *Caustis dioica* *Corymbia calophylla* *Ecdeiocolea monostachya* *Gastrolobium spinosum* *Melaleuca viminea* subsp*. viminea* *Xanthorrhoea preissii*

No photo available

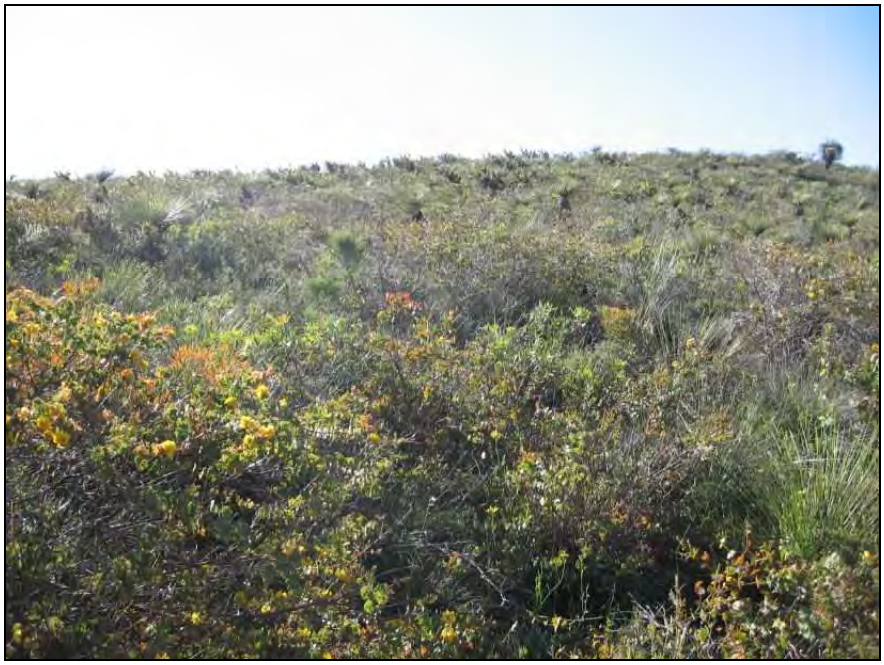
Map	4
Date	12/11/08
GPS	50 360593 **mE** 6618261 **mN**
Topography	Upper slope
Soil	Grey sand
Vegetation condition	Excellent
Degrading factors	Weeds – edge effect to 10m
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Calothamnus hirsutus* *Chordifex sphacelatus* *Daviesia daphnoides* *Gastrolobium spinosum* *Goodenia coerulea* *Hakea flabellifolia* *Lambertia multiflora* var. *multiflora* *Melaleuca trichophylla* *Mesomelaena pseudostygia* *Petrophile shuttleworthiana* *Xanthorrhoea preissii*



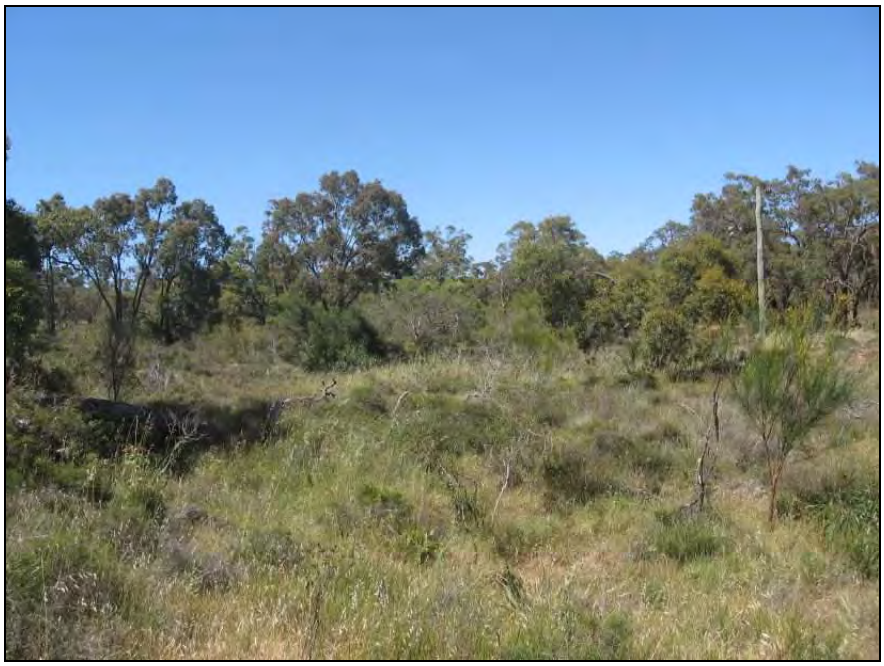
Map	4
Date	12/11/08
GPS	50 361150 mE 6617936 mN
Topography	Mid-upper slope
Soil	Grey sand
Vegetation condition	Excellent
Degrading factors	Weeds, tracks
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Calothamnus hirsutus* *Daviesia daphnoides* *Hakea conchifolia* *Melaleuca trichophylla* *Mesomelaena pseudostygia* *Petrophile shuttleworthiana* *Xanthorrhoea preissii*

Map	5
Date	12/11/2008
GPS	50 359773 mE 6617457 mN
Topography	Upper slope
Soil	Grey sand
Vegetation condition	Excellent
Degrading factors	Weeds
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Calothamnus hirsutus* *Eucalyptus* sp. *Gastrolobium spinosum* *Xanthorrhoea preissii*

Map	5
Date	12/11/2008
GPS	50 360141 mE 6617422 mN
Topography	Upper slope / undulating land
Soil	Grey sand
Vegetation condition	Excellent
Degrading factors	Some weeds, fenced and not grazed
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Calothamnus hirsutus* *Eucalyptus* sp. *Gastrolobium spinosum* *Xanthorrhoea preissii*

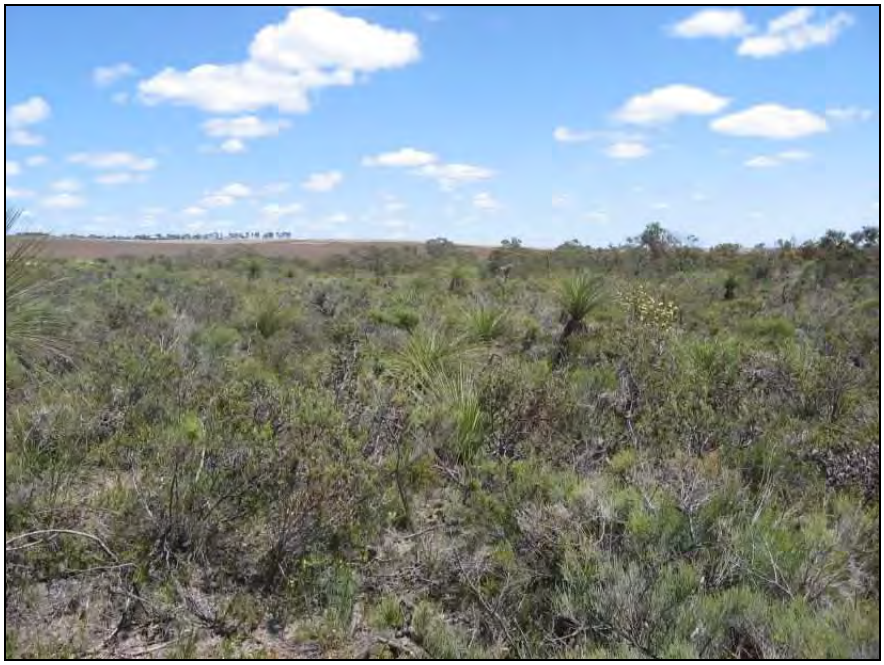


Map	6
Date	12/11/08
GPS	50 363414 mE 6617304 mN
Topography	Creekline
Soil	Brown loam
Vegetation condition	Good
Degrading factors	Weeds
Vegetation type	Woodland
Community	W1
Dominant species	*Acacia bartleana* *Allocasuarina campestris* *Baeckea camphorosmae* *Banksia sessilis* var. *sessilis* *Corymbia calophylla* *Cryptandra intermedia* *Dianella revolute* *Hakea lisocarpha* *Macrozamia fraseri* *Ptilotus exaltatus* *Stirlingia latifolia* *Viminaria juncea* *Xanthorrhoea preissii*



Map	6
Date	12/11/2009
GPS	50 363228 mE 6617301 mN
Topography	Lower slope
Soil	White/grey sand
Vegetation condition	Good
Degrading factors	Weeds - edge effect, some loss of understory structure
Vegetation type	Woodland
Community	W1
Dominant species	*Allocasuarina campestris* *Banksia sessilis* var. *sessilis* *Macrozamia riedlei* *Nuytsia floribunda* *Xanthorrhoea preissii*

Map	6
Date	12/11/2008
GPS	50 363228 mE 6617301 mN
Topography	Hillside
Soil	Grey sand
Vegetation condition	Excellent to very good
Degrading factors	Weeds
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Calothamnus hirsutus* *Chordifex sphacelatus* *Daviesia daphnoides* *Gastrolobium spinosum* *Goodenia coerulea* *Hakea flabellifolia* *Lambertia multiflora* var. *multiflora* *Melaleuca trichophylla* *Mesomelaena pseudostygia* *Petrophile shuttleworthiana* *Xanthorrhoea preissii* *Hakea conchifolia* *Mesomelaena pseudostygia* *Xanthorrhoea preissii*



Map	7
Date	11/12/2008
GPS	50 359332 mE 6616553 mN
Topography	Low rise
Soil	White/grey sand
Vegetation condition	Excellent
Degrading factors	Weeds - edge effect to 5m
Vegetation type	Heath
Community	H1
Dominant species	*Banksia carlinoides* *Calothamnus hirsutus* *Daviesia daphnoides* *Gastrolobium spinosum* *Xanthorrhoea preissii*

Map	8
Date	12/11/2008
GPS	50 360182 mE 6616577 mN
Topography	Slight ridge/hilltop
Soil	Gravelly brown/grey loamy soil
Vegetation condition	Very good
Degrading factors	Weeds - edge effect to 10m
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Daviesia daphnoides* *Gastrolobium spinosum*

Map	8
Date	11/12/2008
GPS	50 360330 mE 6616226 mN
Topography	laterite hillock knob
Soil	Rocky laterite with skeletal white soil
Vegetation condition	Good
Degrading factors	Weeds
Vegetation type	Heath
Community	H1
Dominant species	*Gastrolobium spinosum* *Melaleuca* sp. *Tetraria ? octandra* *Xanthorrhoea preissii*

Map	8
Date	11/12/2008
GPS	50 359975 mE 6616238 mN
Topography	Hillock
Soil	Gravelly sand
Vegetation condition	Very good
Degrading factors	Weeds – some edge effect
Vegetation type	Heath
Community	H1
Dominant species	*Adenanthos cygnorum* subsp*. cygnorum* *Daviesia daphnoides* *Hakea conchifolia* *Lambertia multiflora* var*. multiflora* *Petrophile shuttleworthiana* *Xanthorrhoea preissii*

Map	9
Date	12/11/2008
GPS	50 362042 mE 6614860 mN
Topography	Midslope
Soil	Grey sand, very slighty loamy
Vegetation condition	Excellent
Degrading factors	Weeds
Vegetation type	Heath
Community	H1
Dominant species	*Banksia carlinoides* *Calothamnus hirsutus* *Daviesia daphnoides* *Gastrolobium spinosum* *Xanthorrhoea preissii*

Map	10
Date	12/11/2008
GPS	50 360884 mE 6614818 mN
Topography	Lateitic rise
Soil	Skeletal lateritic
Vegetation condition	Excellent
Degrading factors	Weeds – edge effect to 5m
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Beaufortia bracteosa* *Hakea conchifolia* *Melaleuca ciliosa* *Petrophile shuttleworthiana*

Map	11
Date	28/01/2009
GPS	50 358787 mE 6612757 mN
Topography	Ridge/breakaway
Soil	Gravel over grey sand
Vegetation condition	Degraded
Degrading factors	Grazing, weeds, loss of understorey, farming to edge, erosion
Vegetation type	Heath
Community	H1
Dominant species	*Banksia fraseri* subsp*. crebra* *Hakea lissocarpha* *Xanthorrhoea preissii*

Map	12
Date	28/01/2009
GPS	50 359665 mE 6613029 mN
Topography	Hilltop/ridge
Soil	Gravel over grey sand
Vegetation condition	Very good
Degrading factors	Weeds – edge effect to 15m
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Banksia fraseri* subsp. *crebra* *Banksia shuttleworthiana* *Calothamnus hirsutus* *Caustis dioica* *Gastrolobium spinosum* *Hakea incrassata* *Mesomelaena pseudostygia* *Petrophile shuttleworthiana*

Map	15
Date	28/01/2009
GPS	50 363370 mE 6610895 mN
Topography	Below a ridge
Soil	Skeletal gravel over grey sand
Vegetation condition	Excellent
Degrading factors	Weeds – edge effect to 15m
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Hakea incrassata* *Petrophile shuttleworthiana* *Xanthorrhoea preissii*

Map	17
Date	28/01/09
GPS	50 359700 mE 6609800 mN
Topography	Lower slope
Soil	White/grey sand
Vegetation condition	Excellent
Degrading factors	Weeds, tracks
Vegetation type	Shrubland
Community	SH2
Dominant species	*Allocasuarina humilis* *Banksia attenuata* *Calothamnus hirsutus* *Comesperma acerosum* *Goodenia coerulea* *Hakea flabellifolia* *Hibbertia hypericoides* *Lambertia multiflora* var. *multiflora* *Mesomelaena pseudostygia* *Xanthorrhoea preissii*

Map	17
Date	28/01/09
GPS	50 360000 mE 6609800 mN
Topography	Lower slope
Soil	White/grey sand
Vegetation condition	Excellent
Degrading factors	Some weeds and erosion at edge
Vegetation type	Heath
Community	H1
Dominant species	*Allocasuarina humilis* *Banksia carlinoides* *Petrophile shuttleworthiana* *Xanthorrhoea preissii*

Map	19
Date	28/01/2009
GPS	50 359230 mE 6606135 mN
Topography	Ridge/steep hillock
Soil	Grey sand
Vegetation condition	Excellent
Degrading factors	Weeds – edge effect to 10m
Vegetation type	Heath
Community	H1
Dominant species	*Banksia carlinoides* *Calothamnus hirsutus* *Caustis dioica* *Gastrolobium ilicifolium* *Hibbertia hypericoides* *Lambertia multiflora* var. *multiflora* *Melaleuca* sp. *Xanthorrhoea preissii*

Appendix J
Vegetation and Condition Mapping

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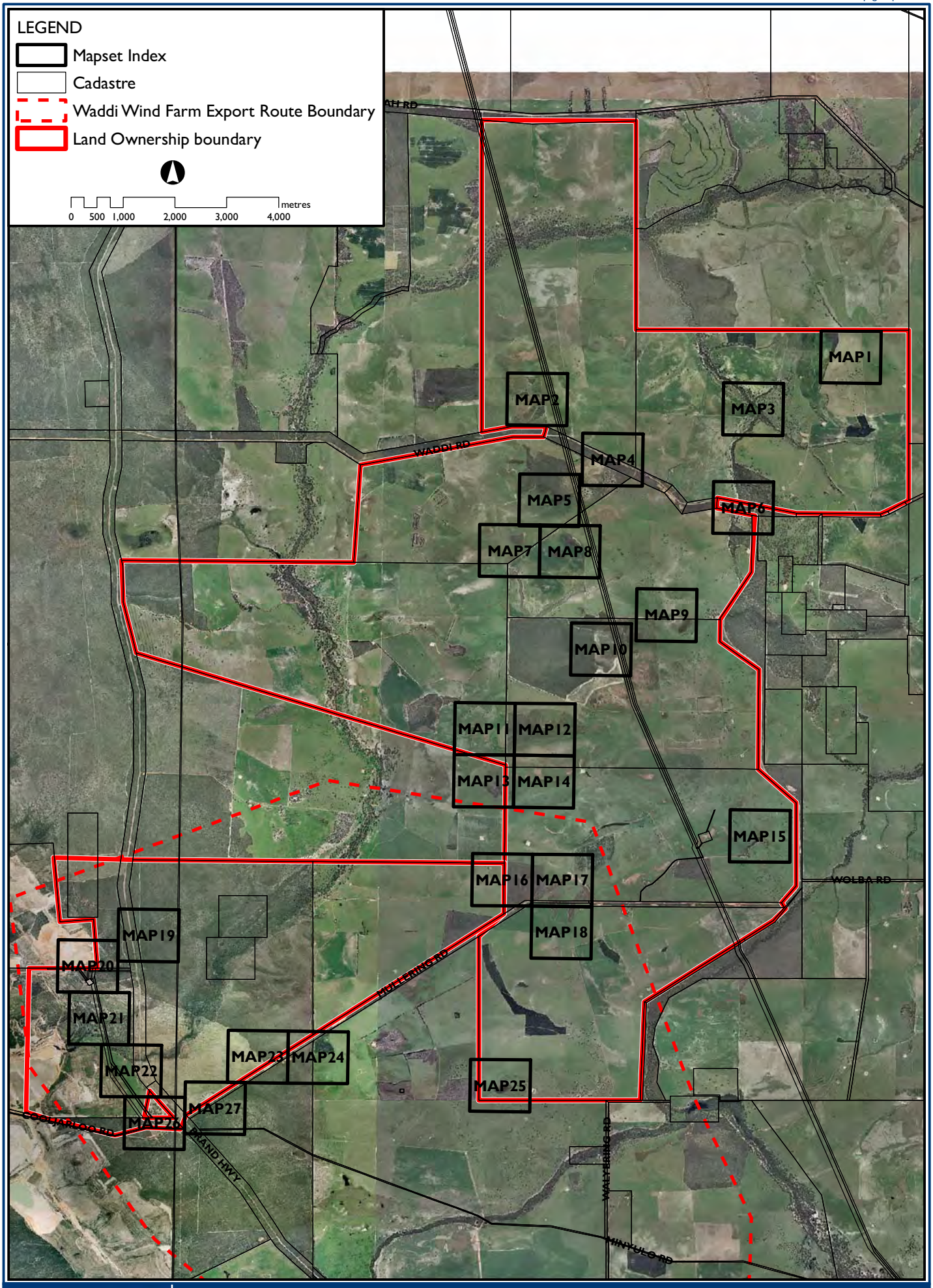

RPS

Job Number: M08038
Date: 18.08.09
Revision: A
Scale: 1:95000 @ A4
Drafted by: SF
Source: Aerial photography - Landgate, 2008

Vegetation Type and Condition Mapset Index - Waddi

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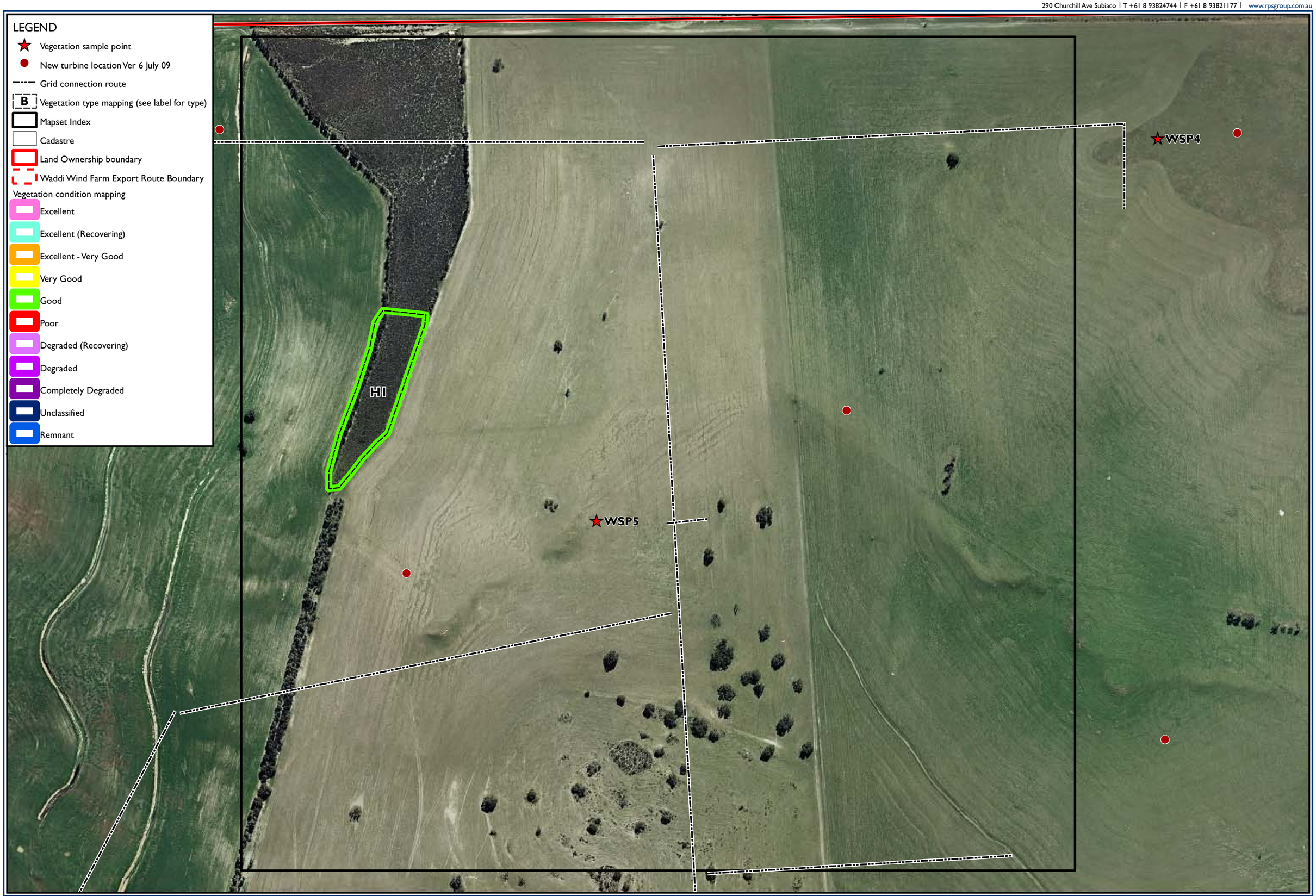
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



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Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 1

Mapset Vegetation Type and Condition - Waddi

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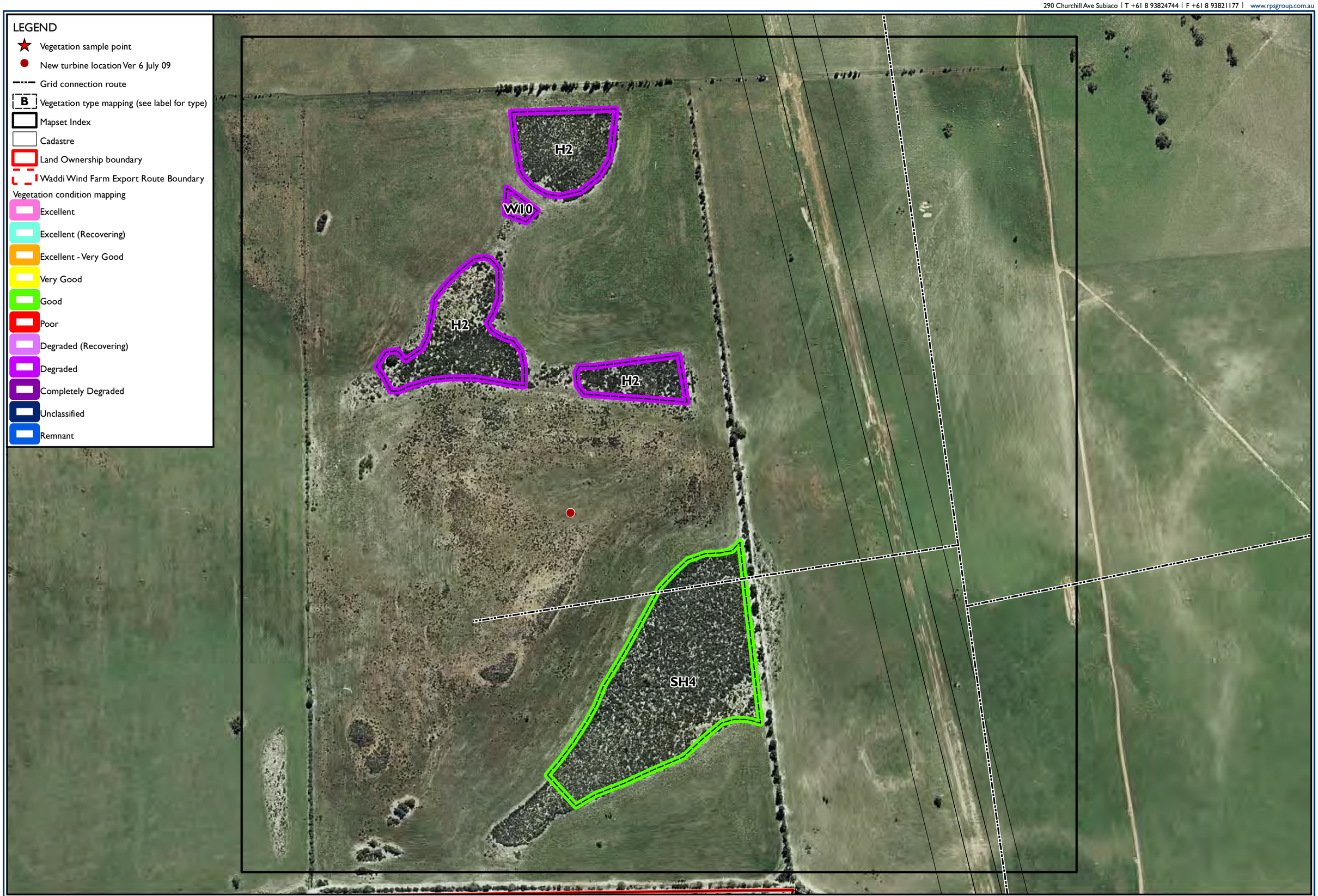
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 2

Mapset Vegetation Type and Condition - Waddi

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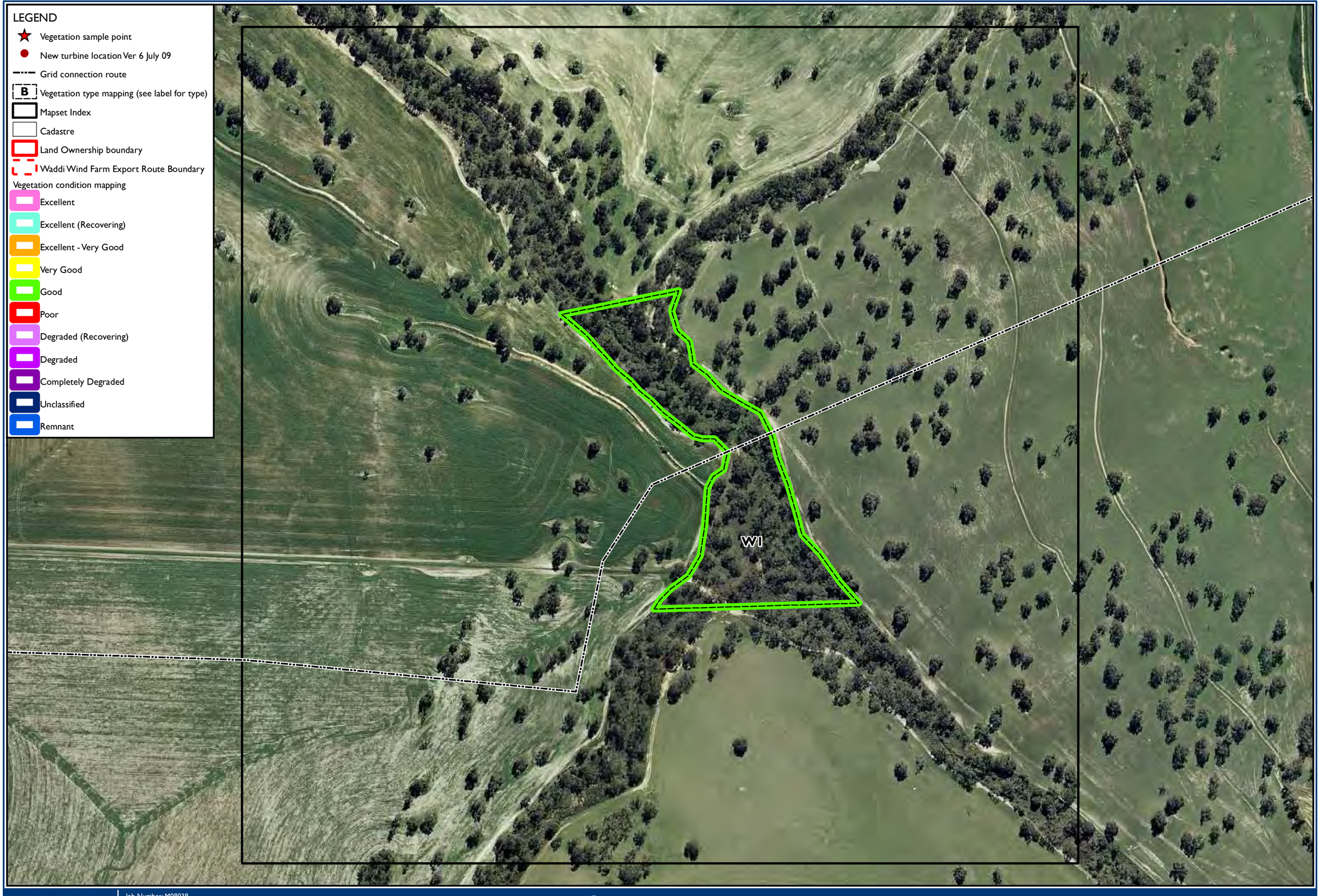
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 3

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 4

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 5

Mapset Vegetation Type and Condition - Waddi

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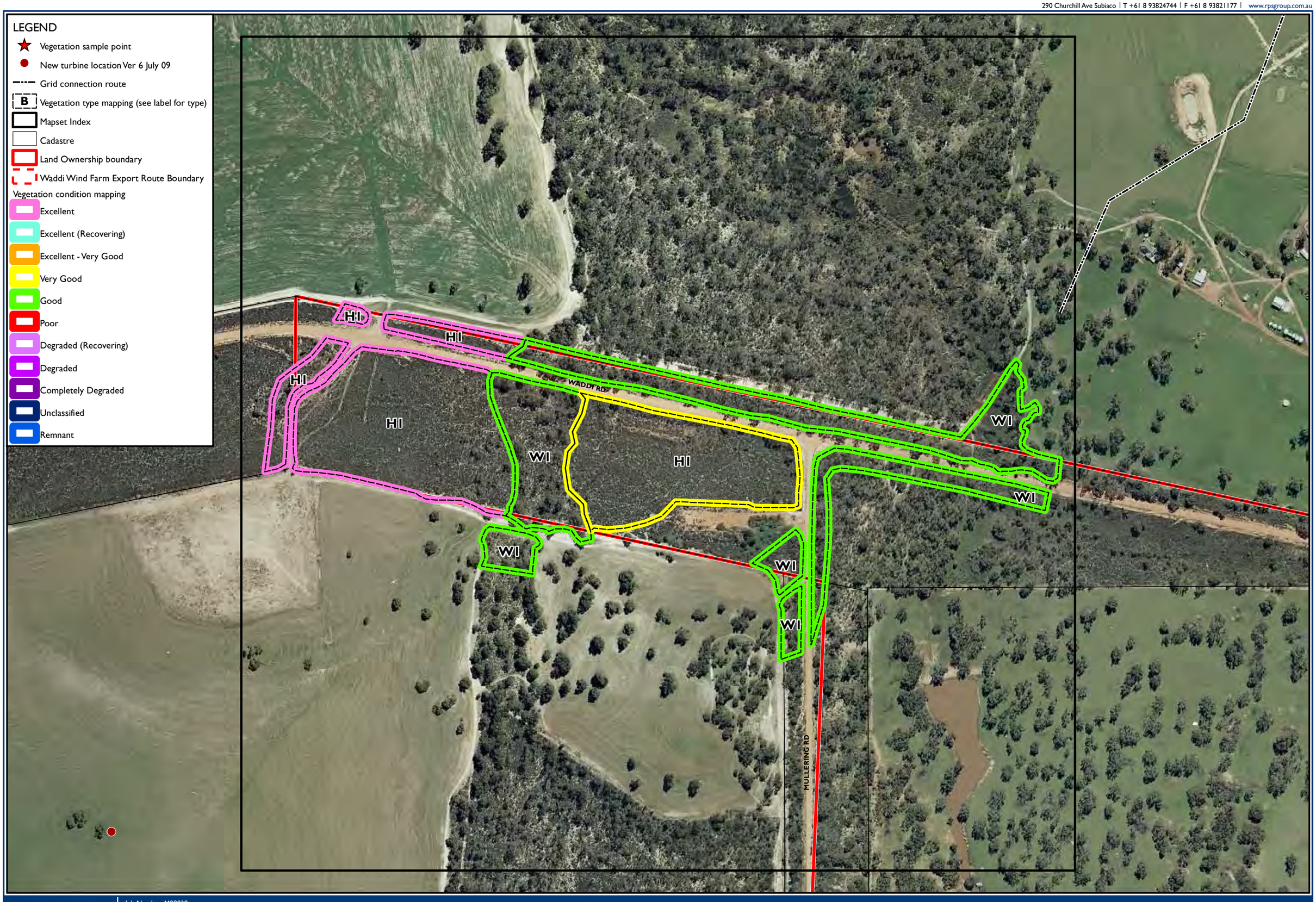
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



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Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 6

Mapset Vegetation Type and Condition - Waddi

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RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 7

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

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RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 8

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

WSP17

H1

WSP16

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 9

Mapset Vegetation Type and Condition - Waddi

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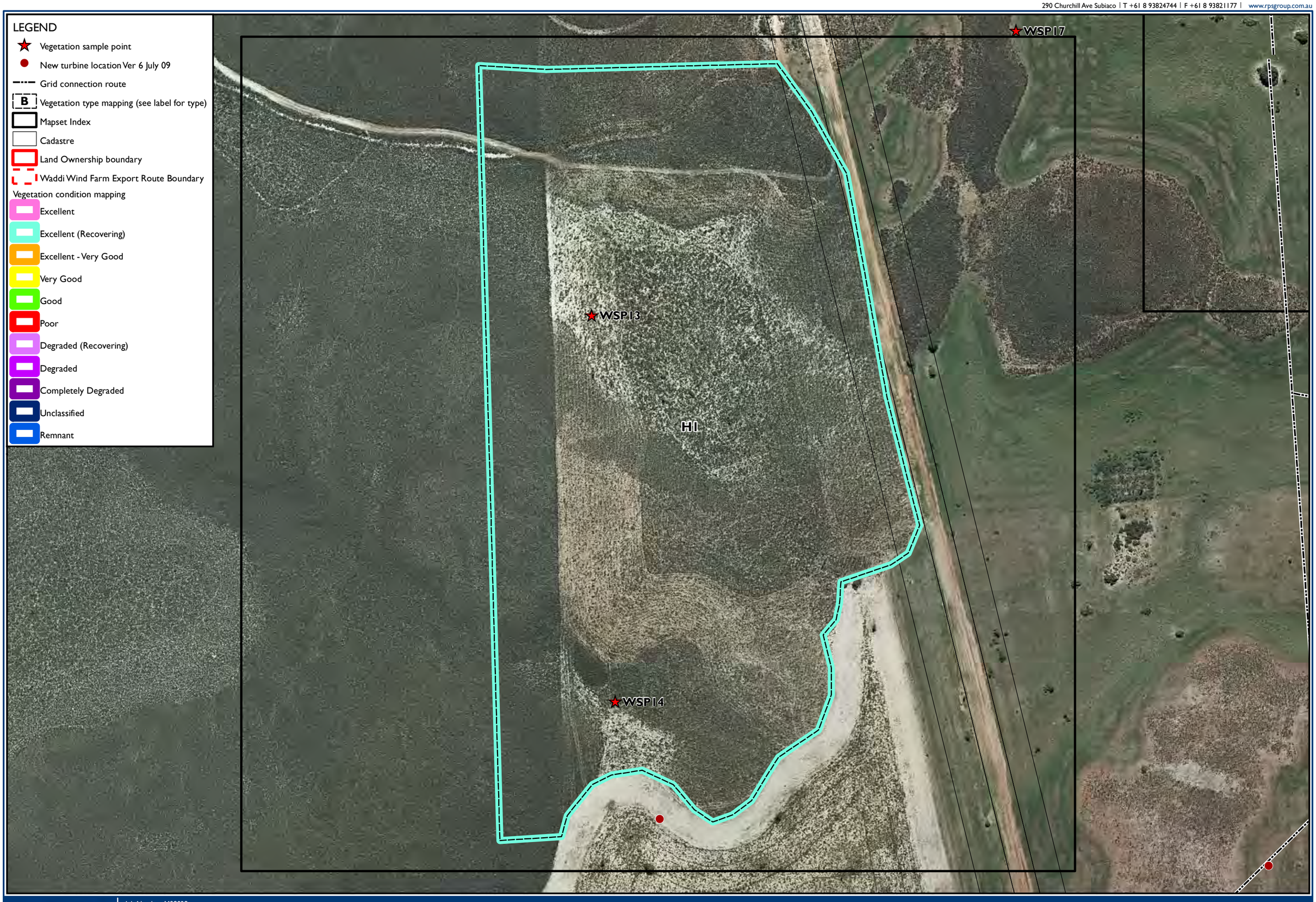
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 10

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 11

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 12

Mapset Vegetation Type and Condition - Waddi

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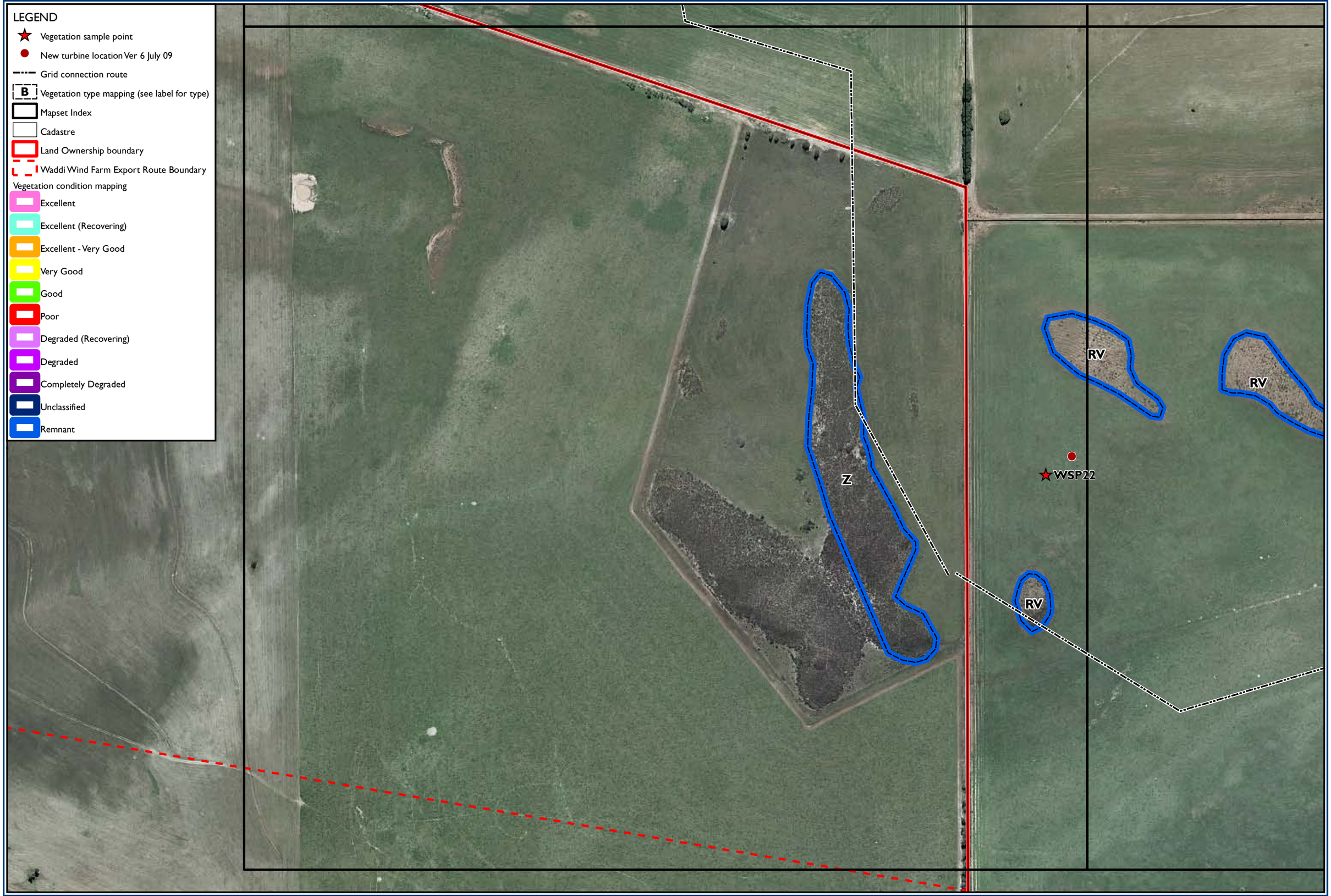
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



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Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 13

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RV RV RV RV RV RV RV RV Z WSP22

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 14

Mapset Vegetation Type and Condition - Waddi

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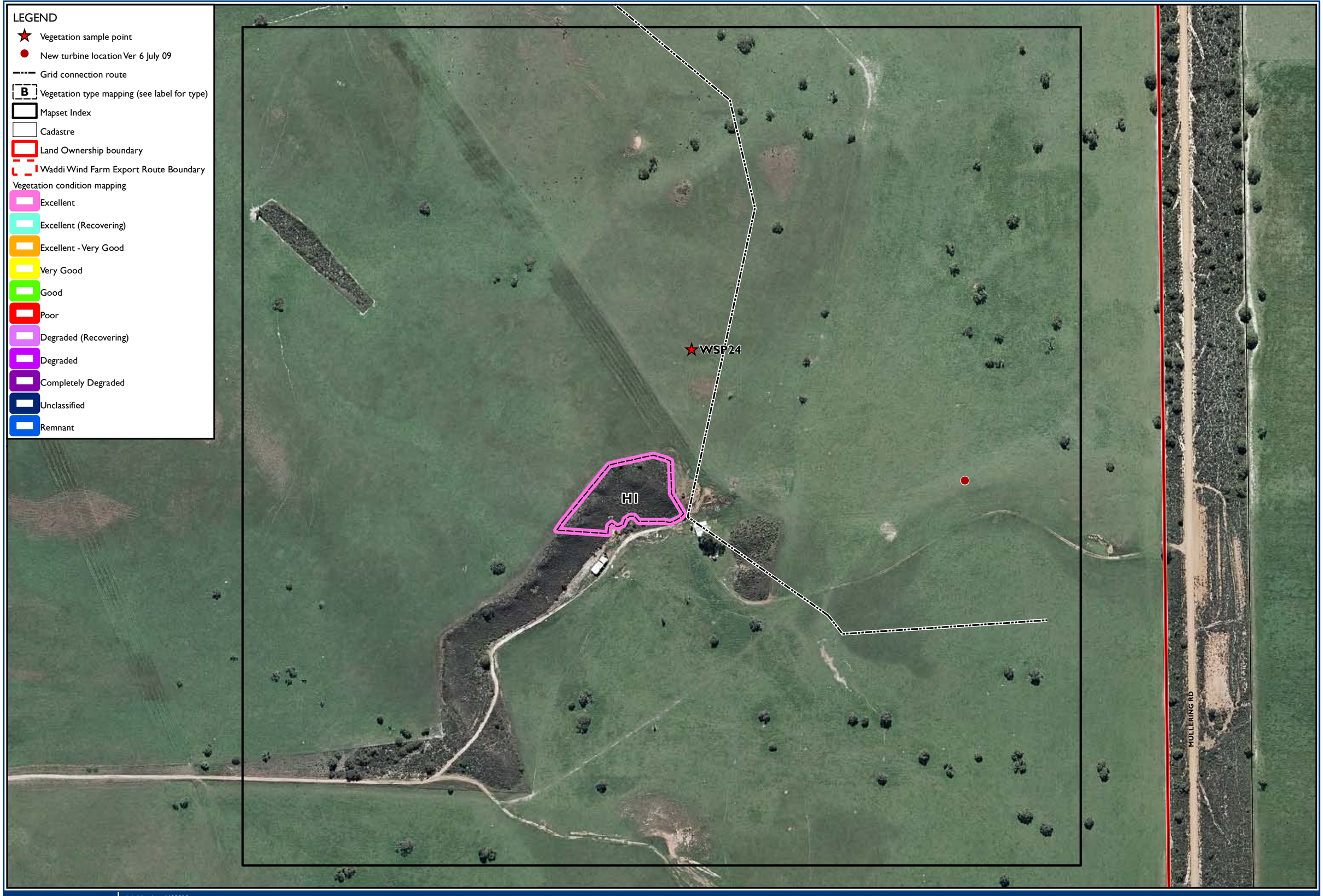
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 15

Mapset Vegetation Type and Condition - Waddi

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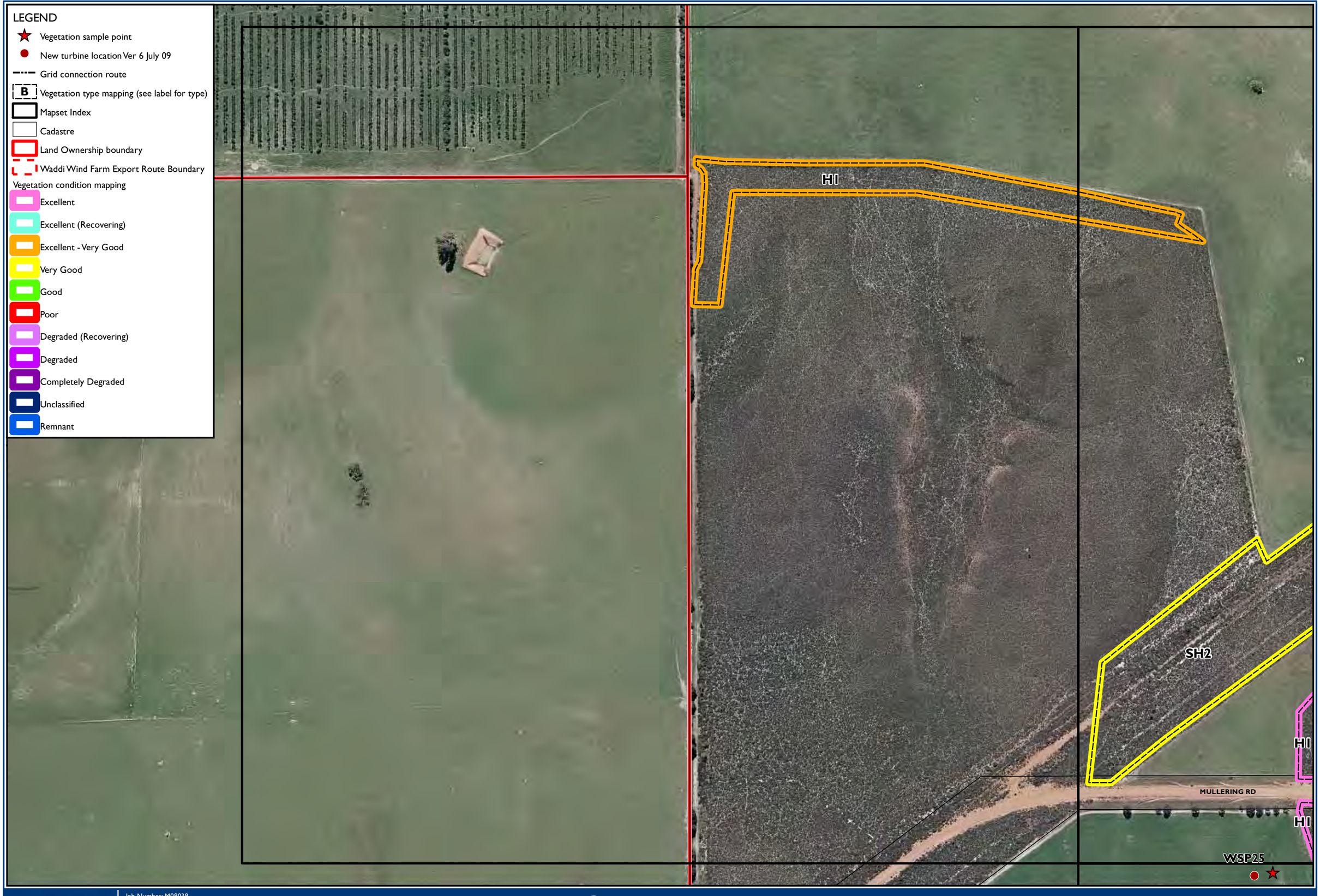
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



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Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 16

Mapset Vegetation Type and Condition - Waddi

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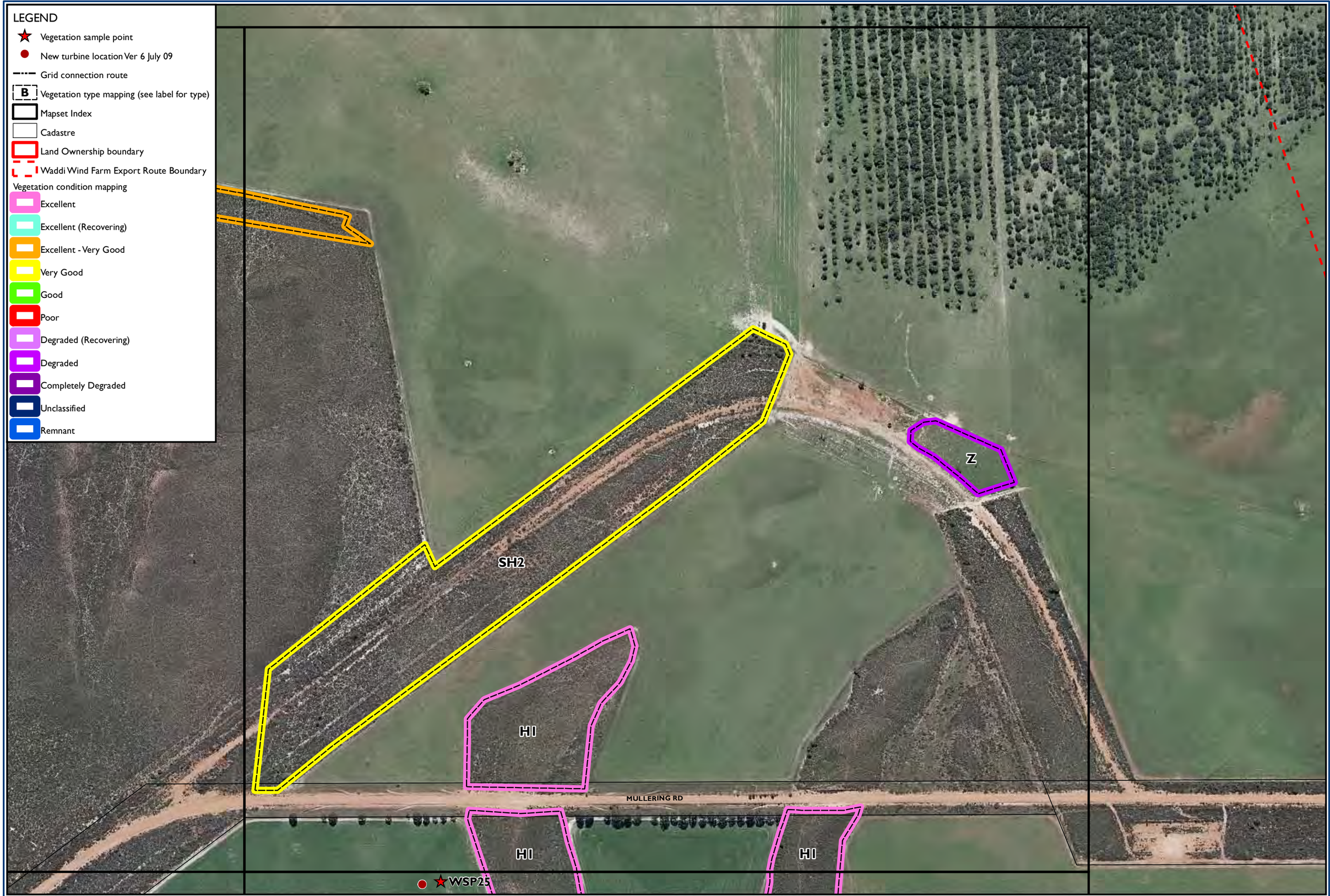
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 17

Mapset Vegetation Type and Condition - Waddi

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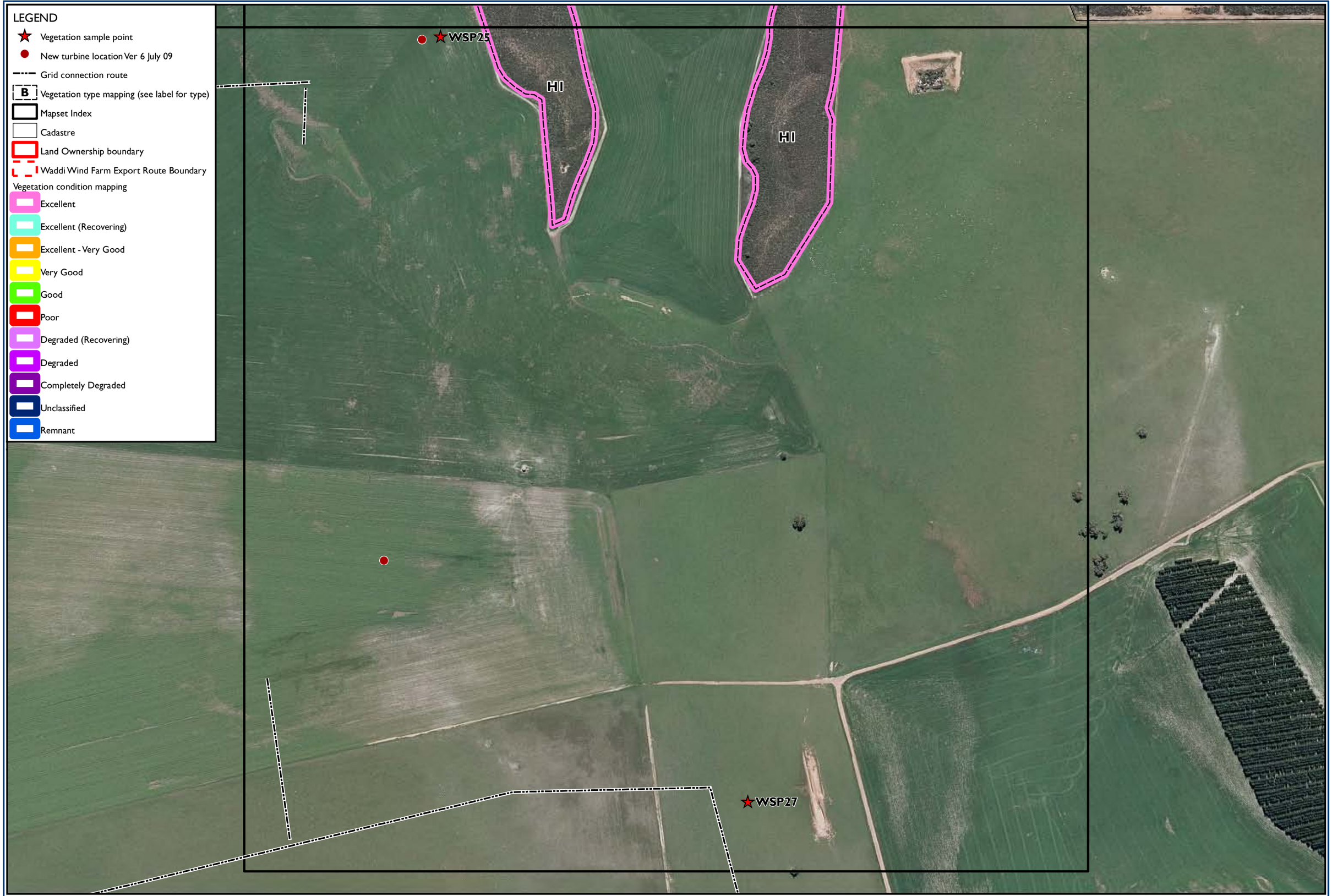
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 18

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 19

Mapset Vegetation Type and Condition - Waddi

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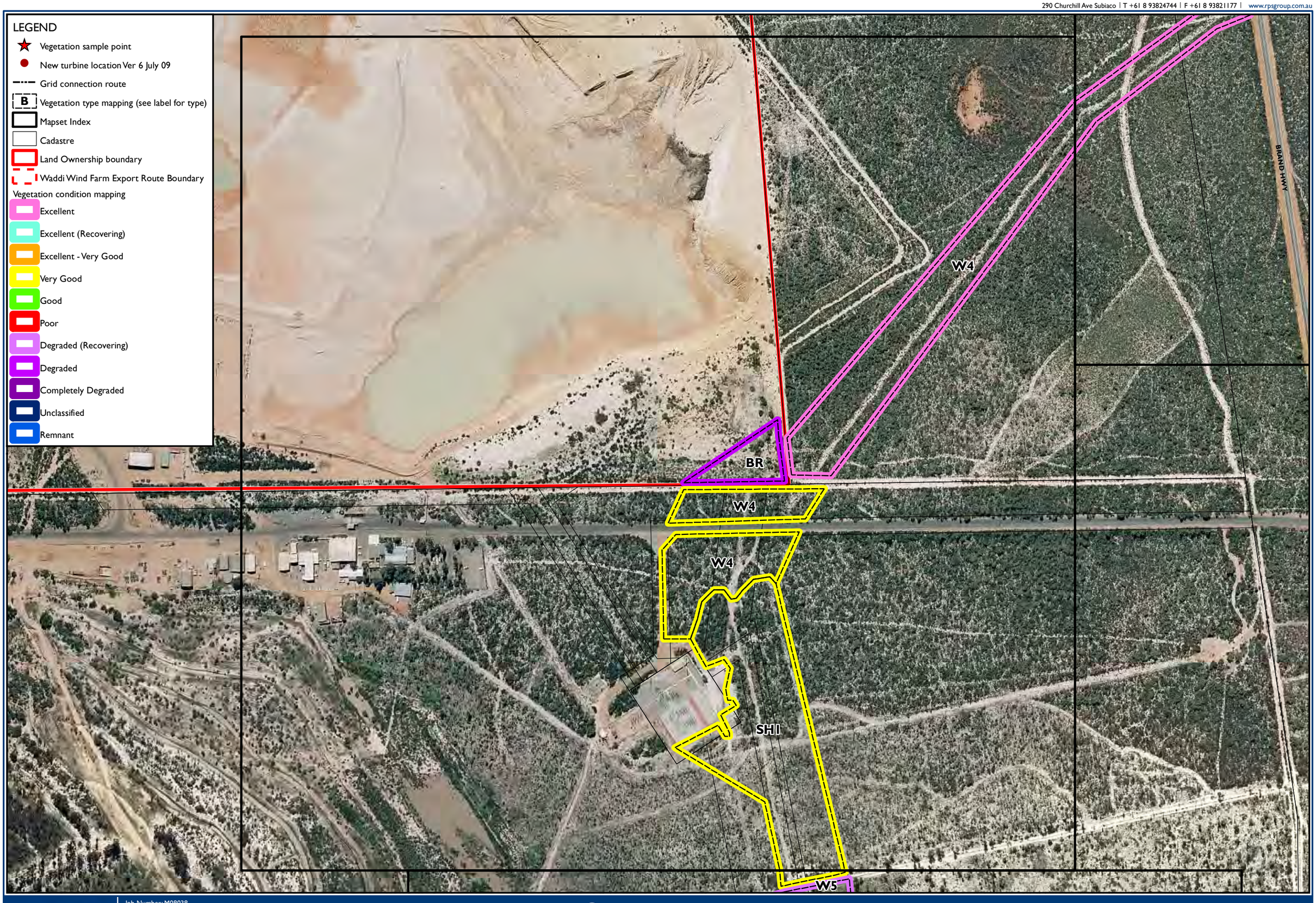
LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant



RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 20

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

SH1

W5

HE

BRAND HWY

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 21

Mapset Vegetation Type and Condition - Waddi

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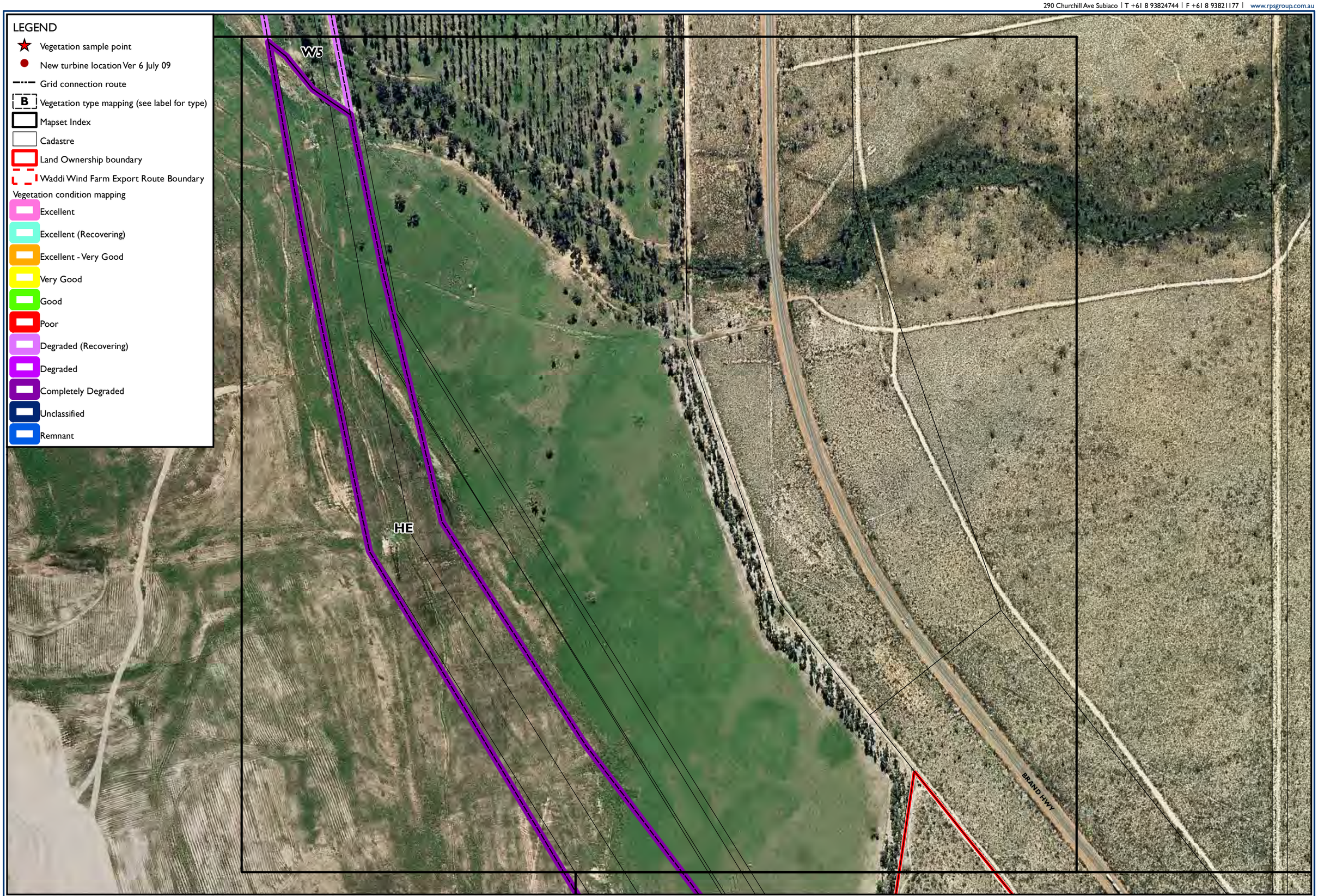

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 22

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 23

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 24

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 25

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

HE

RV

SHI

SHI

Z

BRAND HWY

MULLERING RD

COOLJARLOO RD

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 26

Mapset Vegetation Type and Condition - Waddi

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LEGEND

- Vegetation sample point
- New turbine location Ver 6 July 09
- Grid connection route
- B — Vegetation type mapping (see label for type)
- Mapset Index
- Cadastre
- Land Ownership boundary
- Waddi Wind Farm Export Route Boundary

Vegetation condition mapping

- Excellent
- Excellent (Recovering)
- Excellent - Very Good
- Very Good
- Good
- Poor
- Degraded (Recovering)
- Degraded
- Completely Degraded
- Unclassified
- Remnant

RPS

Job Number: M08038
Date: 17.08.09
Revision: A
Scale: 1:4000 @ A3
Drafted by: SF
Source: Aerial photograph - Landgate, 2008

0 25 50 100 150 200 metres

Map 27

Mapset Vegetation Type and Condition - Waddi

Appendix L

Summary of Data Recorded within Access Tracks and Cable Routes within the Waddi Project Area

RPS Data

Date	31/10/2008
GPS	50 355902 mE 6606967 mN
Topography	
Soil	
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Adenanthos cygnorum* *Allocasuarina humilis* *Baeckea grandiflora* *Banksia attenuata* *Banksia shuttleworthiana* *Conostephium magnum* *Conostylis angustifolia* *Eucalyptus todtiana* *Hibbertia huegelii* *Hibbertia hypericoi*des *Mesomelaena pseudostygia* *Petrophile serruriae* *Petrophile striata* *Stirlingia latifolia*

Date	31/10/2008
GPS	50 355100 mE 6610330 mN
Topography	
Soil	Beige sandy loamy gravel, some laterite
Vegetation condition	
Degrading factors	
Vegetation type	
Community	
Dominant species	*Allocasuarina humilis* *Banksia shuttleworthiana* *Conostylis angustifolia* *Hakea petiolaris* *Hibbertia hypericoides* *Jacksonia floribunda* *Nuytsia floribunda*

Date	31/10/2008
GPS	50 353741 mE 6609427 mN
Topography	
Soil	Yellow and light grey sandy loam
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Baeckea grandiflora* *Banksia attenuata* *Banksia menziesii* *Banksia prionotes* *Banksia shuttleworthiana* *Calothamnus hirsutus* *Calytrix angulata* *Calytrix breviseta* subsp. *stipulosa* *Comesperma acerosum* *Conostephium magnum* *Conostylis angustifolia* *Daviesia angulata* *Daviesia podophylla* *Eremaea asterocarpa* subsp. *asterocarpa* *Eucalyptus todtiana* *Gastrolobium oxylobioides* *Hakea costata* *Hakea psilorrhyncha* *Hakea trifurcata* *Hibbertia huegelii* *Hibbertia vaginata* *Jacksonia floribunda* *Leptospermum erubescens* *Leptospermum spinescens* *Melaleuca ? seriata* *Mesomelaena pseudostygia* *Nuytsia floribunda* *Petrophile brevifolia* *Petrophile linearis* *Schoenus pedicellatus* *Stirlingia latifolia* *Verticordia nobilis*
Notes	Along telegraph line

Date	30/10/2008
GPS	50 355050 mE 6606276 mN
Topography	Flat
Soil	Sandy loam
Vegetation condition	
Degrading factors	
Vegetation type	
Community	
Dominant species	*Acacia auronitens* *Adenanthos cygnorum* *Baeckea grandiflora* *Banksia shuttleworthiana* *Calothamnus quadrifidus* *Comesperma acerosum* *Conospermum stoechadis* subsp. *sclerophyllum* *Conostylis resinosa* *Dampiera spicigera* *Eucalyptus macrocarpa* subsp*. elachantha* *Eucalyptus megacarpa* *Gastrolobium oxylobioides* *Isopogon linearis* *Jacksonia floribunda* *Logania spermacocea* *Mesomelaena pseudostygia* *Pityrodia bartlingii* *Stylidium crossocephalum* *Synaphea spinulosa* *Verreauxia reinwardtii* *Verticordia pennigera*

Date	30/10/2008
GPS	50 354839 mE 6606114 mN
Topography	Flat
Soil	Orange grey sandy loam
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Adenanthos cygnorum* *Alexgeorgea nitens* *Baeckea grandiflora* *Banksia attenuata* *Banksia menziesii* *Banksia shuttleworthiana* *Conospermum stoechadis* subsp. *sclerophyllum* *Dampiera spicigera* *Daviesia divaricata* subsp*. divaricata* *Daviesia podophylla* *Grevillea saccata* *Hakea ruscifolia* *Hibbertia huegelii* *Jacksonia floribunda* *Lepidobolus preissianus* subsp. *preissianus* *Leptospermum erubescens* *Mesomelaena pseudostygia* *Patersonia occidentalis* *Petrophile linearis* *Petrophile pilostyla* *Schoenus pedicellatus* *Verticordia grandis* *Verticordia pennigera*

Date	31/10/2008
GPS	50 355112 mE 6606317 mN
Topography	
Soil	Orange sandy loamy gravel
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Acacia pulchella* var. *glaberrima* *Acacia stenoptera* *Alexgeorgea nitens* *Allocasuarina microstachya* *Austrostipa compressa* *Austrostipa hemipogon* *Banksia carlinoides* *Beaufortia bracteosa* *Beaufortia elegans* *Calothamnus hirsutus* *Comesperma acerosum* *Conostylis resinosa* *Dampiera spicigera* *Daviesia angulata* *Daviesia nudiflora* subsp. *nudiflora* *Eucalyptus drummondii* *Eucalyptus gittinsii* subsp. *illucida* *Gastrolobium oxylobioides* *Gastrolobium polystachyum* *Hibbertia huegelii* *Isopogon adenanthoides* *Jacksonia floribunda* *Jacksonia restioides* *Lechenaultia biloba* *Leucopogon oliganthus* *Melaleuca trichophylla* *Mesomelaena pseudostygia* *Neurachne alopecuroidea* *Petrophile shuttleworthiana* *Schoenus pedicellatus* *Tetraria octandra* *Tricoryne elatior* *Verticordia pennigera*

Date	30/10/2008
GPS	50 353866 mE 6605436 mN
Topography	
Soil	Grey sand
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Adenanthos cygnorum* *Alexgeorgea nitens* *Banksia attenuata* *Banksia menziesii* *Bossiaea eriocarpa* *Codonocarpus cotinifolius* *Conostephium magnum* *Conostylis resinosa* *Hibbertia hypericoides* *Jacksonia floribunda* *Mesomelaena pseudostygia* *Petrophile linearis* *Schoenus curvifolius* *Stirlingia latifolia* *Verticordia sp.*
Notes	Fire < 3 years

Date	30/10/2008
GPS	50 354758 mE 6606056 mN
Topography	
Soil	Beige soil
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Adenanthos cygnorum* *Baeckea grandiflora* *Banksia ashbyi* *Banksia attenuata* *Banksia menziesii* *Daviesia divaricata* subsp. *divaricata* *Hakea prostrata* *Hibbertia hypericoides* *Jacksonia floribunda* *Lepidobolus preissianus* subsp. *preissianus* *Leptospermum erubescens* *Mesomelaena pseudostygia* *Pityrodia bartlingii* *Schoenus pedicellatus* *Verticordia pennigera*

Date	31/10/2008
GPS	
Topography	
Soil	Beige Sandy loamy gravel
Vegetation condition	Excellent
Degrading factors	Tracks
Vegetation type	
Community	
Dominant species	*Banksia shuttleworthiana* *Beaufortia bracteosa* *Daviesia epiphyllum* *Eucalyptus macrocarpa* subsp. *elachantha* *Hakea flabellifolia* *Hakea incrassata* *Hibbertia mylnei* *Jacksonia floribunda* *Leucopogon oliganthus* *Melaleuca* sp. *Petrophile shuttleworthiana*

Date	30/10/2008
GPS	
Topography	
Soil	Grey Sand
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Adenanthos cygnorum* *Alexgeorgea nitens* *Banksia attenuata* *Banksia menziesii* *Bossiaea eriocarpa* *Codonocarpus cotinifolius* *Conospermum teretifolium* *Conostephium magnum* *Conostylis resinosa* *Hibbertia hypericoides* *Jacksonia floribunda* *Mesomelaena pseudostygia* *Petrophile linearis* *Schoenus curvifolius* *Stirlingia latifolia* *Verticordia nitens*
Notes	Fire > 3 years

Date	31/10/2008
GPS	50 354270 mE 6609824 mN
Topography	
Soil	Orange/grey sandy loamy gravel
Vegetation condition	Excellent
Degrading factors	
Vegetation type	
Community	
Dominant species	*Baeckea grandiflora* *Banksia carlinoides* *Calothamnus hirsutus* *Conospermum stoechadis* subsp. *sclerophyllum* *Dampiera spicigera* *Daviesia angulata* *Eremaea asterocarpa* subsp*. asterocarpa* *Gastrolobium oxylobioides* *Hibbertia huegelii* *Isopogon adenanthoides* *Jacksonia floribunda* *Mesomelaena pseudostygia*
Notes	Along telegraph line

Outback Ecology Data

Map	19
Date	12/11/2008
GPS	50 353089 mE 6608922 mN
Topography	Lower slope
Soil	Grey sand
Vegetation condition	Excellent
Degrading factors	Disturbance and weeds edge effect caused by telegraph line
Vegetation type	Woodland
Community	W4
Dominant species	*Adenanthos cygnorum* subsp.*cygnorum* *Banksia attenuata* *Banksia prionotes* *Conospermum stoechadis* subsp*. sclerophyllum* *Eremaea pauciflora* *Mesomelaena pseudostygia* *Petrophile macrostachya*

Map	20
Date	12/11/2008
GPS	50 352383 mE 6608388 mN
Topography	Lower slope
Soil	White/yellow/grey sand
Vegetation condition	Excellent
Degrading factors	Weeds – edge effect to 10m
Vegetation type	Woodland
Community	W4
Dominant species	*Adenanthos cygnorum* subsp.*cygnorum* *Banksia attenuata* *Banksia prionotes* *Conospermum stoechadis* subsp*. sclerophyllum* *Eremaea pauciflora* *Mesomelaena pseudostygia* *Petrophile macrostachya*

Map	20
Date	12/11/2008
GPS	50 352332 mE 6607968 mN
Topography	Lower slope
Soil	Grey/white soil
Vegetation condition	Very good
Degrading factors	Weeds – edge effect to 10m, tracks, dieback in this area
Vegetation type	Shrubland
Community	SH1
Dominant species	*Adenanthos cygnorum* subsp*. cygnorum* *Banksia attenuata* *Banksia prionotes* *Beaufortia elegans* *Stirlingia latifolia* *Xanthorrhoea preissii*

Map	21
Date	12/11/2008
GPS	50 352377 mE 6607724 mN
Topography	Lower slope
Soil	Yellow/grey sand
Vegetation condition	Degraded – rehabilitated
Degrading factors	Dieback, weeds
Vegetation type	Woodland
Community	W5
Dominant species	*Banksia* sp. *Eucalyptus todtiana* *Xanthorrhoea preissii*

Map	26
Date	12/11/2008
GPS	50 353221 mE 6605497 mN
Topography	Lower slope
Soil	White/grey sand
Vegetation condition	Very good
Degrading factors	Weeds – edge effect 10m
Vegetation type	Shrubland
Community	SH1
Dominant species	*Adenanthos cygnorum* subsp*. cygnorum* *Chordifex sphacelatus* *Conostylis resinosa* *Eremaea pauciflora* *Hibbertia* sp. Gnangara

Map	-
Date	12/11/2008
GPS	50 361678 mE 6605243 mN
Topography	Creekline
Soil	Brown loam
Vegetation condition	Degraded
Degrading factors	Cleared, weeds
Vegetation type	Woodland
Community	W7
Dominant species	*Eucalyptus* sp. *Eucalyptus wandoo* *Melaleuca rhaphiophylla*

Map	-
Date	12/11/2008
GPS	50 361907 mE 6605014 mN
Topography	Laterite rise/ridge
Soil	Skeletal grey sand with high gravel content
Vegetation condition	Excellent
Degrading factors	Weeds – edge effect to 10m
Vegetation type	Heath
Community	H1
Dominant species	*Acacia pulchella* *Calothamnus hirsutus* *Gastrolobium spinosum* *Hibbertia hypericoides* *Xanthorrhoea preissii*

Map	-
Date	28/01/2009
GPS	50 362400 mE 6604102 mN
Topography	Midslope
Soil	Grey sand
Vegetation condition	Very Good
Degrading factors	Weeds
Vegetation type	Shrubland
Community	SH5
Dominant species	*Adenanthos cygnorum* subsp. *cygnorum* *Daviesia podophylla* *Hakea ruscifolia* *Hibbertia* aff. sp. Mt Lesueur *Leptospermum erubescens* *Melaleuca trichophylla* *Petrophile recurva*