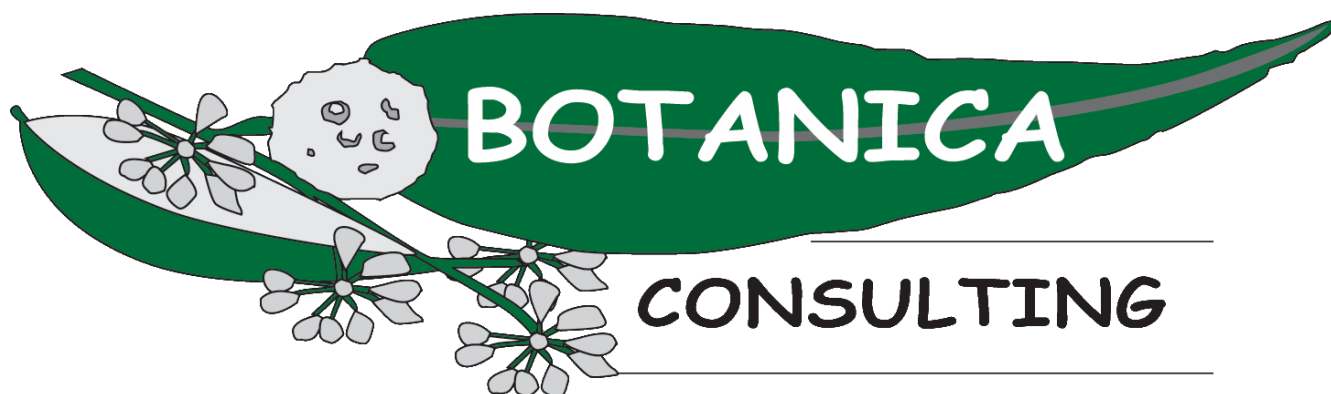




Flora & Vegetation Survey
of the
Greater New Morning/Spotted Quoll Area

Tenements: E77/1568, M77/912, E77/1866, M77/584, M77/583 &
E77/1865

Prepared For



Final Report
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Index	Page #
1 Introduction.....	1
1.1 Project Description.....	1
1.2 Flora and Vegetation within the Greater New Morning/ Spotted Quoll area.....	3
1.3 Previous relevant flora surveys within the surrounding area.....	4
2 Regional Biophysical Environment.....	8
2.1 Regional Environment.....	8
2.2 Conservation Areas.....	9
2.3 Topography & Soils.....	12
2.4 Vegetation.....	12
2.5 Climate.....	13
2.6 Land Use.....	14
2.7 Survey Objectives.....	14
3 Survey Methodology.....	15
3.1 Desktop Assessment.....	15
3.2 Sampling and Analysis Methods.....	16
3.2.1 Personnel involved.....	18
3.2.2 Scientific licences.....	18
3.3 Data Analysis Tools.....	18
3.4 Flora survey limitations and constraints.....	18
4 Results.....	20
4.1 Summary.....	20
4.2 Desktop Assessment.....	21
4.3 Conservation Significant Flora Species.....	24
4.3.1 <i>Eucalyptus steedmanii</i> (T).....	25
4.3.2 <i>Eremophila racemosa</i> (P4).....	26
4.3.3 <i>Microcorys</i> sp. Forrestania (V. English 2004) (P4).....	27
4.3.4 <i>Stylidium sejunctum</i> (P2).....	28
4.4 Conservation Significant Fauna Species.....	29
4.5 Vegetation Communities.....	30
4.6 Low woodland of <i>Eucalyptus flocktoniae</i> / <i>Eucalyptus salubris</i> / <i>Eucalyptus urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	31
4.6.1 Flora.....	31
4.6.2 Vegetation.....	31
4.7 Open shrub mallee of <i>Eucalyptus celastroides</i> / <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	33
4.7.1 Flora.....	33
4.7.2 Vegetation.....	33
4.8 Low woodland of <i>Eucalyptus salmonophloia</i> over low scrub of mixed <i>Melaleuca</i>	35
4.8.1 Flora.....	35
4.8.2 Vegetation.....	35
4.9 Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	37
4.9.1 Flora.....	37
4.9.2 Vegetation.....	37
4.10 Low woodland of <i>Eucalyptus calycogona</i> / <i>Eucalyptus pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop.....	39
4.10.1 Flora.....	39
4.10.2 Vegetation.....	39
4.11 Mallee of <i>Eucalyptus eremophila</i> / <i>Eucalyptus steedmanii</i> (T) over mixed dwarf scrub.....	40
4.11.1 Flora.....	40
4.11.2 Vegetation.....	40
4.12 Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub.....	42
4.12.1 Flora.....	42
4.12.2 Vegetation.....	42
4.13 Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub.....	43
4.13.1 Flora.....	43
4.13.2 Vegetation.....	43
4.14 Open tree mallee of <i>Eucalyptus eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise.....	45
4.14.1 Flora.....	45
4.14.2 Vegetation.....	45
4.15 Burnt open low woodland of <i>Eucalyptus salmonophloia</i> over shrub mallee of <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus pileata</i> and mixed low heath.....	46
4.15.1 Flora.....	46
4.15.2 Vegetation.....	46

4.16	Forest of <i>Eucalyptus urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>	49
4.16.1	Flora	49
4.16.2	Vegetation	49
4.17	Vegetation of Conservation Significance	50
4.18	Vegetation condition.....	52
4.19	Introduced Plant Species	53
4.19.1	<i>Dittrichia graveolens</i> (Stinkwort)	53
5	Relevant Legislation and Compliance with Recognised Standards.....	55
5.1	Commonwealth Legislation	55
5.2	State Legislation.....	55
5.3	EPA Position Statements	57
5.4	Native Vegetation Clearing Principles.....	59
6	Conclusions and Recommendations.....	60
6.1	Conclusions.....	61
6.2	Recommendations	62
7	References	63
8	Appendices.....	65

Tables

Table 1:	Summary of flora and vegetation recorded within the Greater New Morning/Spotted Quoll area	3
Table 2:	Pre-European Beard Vegetation Associations within the survey area (DAFWA, 2011)	13
Table 3:	Definitions of Rare and Priority Flora Species (WAHERB, 2012).	15
Table 4:	Scientific licenses of Botanica staff co-ordinating the survey	18
Table 5:	Limitations and constraints associated with the flora and vegetation survey.	19
Table 6:	Priority Flora with the potential to occur within the Greater New Morning/Spotted Quoll area (DEC, 2011a)	21
Table 7:	Summary of Vegetation Communities and their areas	31
Table 8:	Vegetation assemblage for Low woodland of <i>Eucalyptus flocktoniae</i> / <i>Eucalyptus salubris</i> / <i>Eucalyptus urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i> within the survey area (Muir, 1977)	32
Table 9:	Vegetation assemblage for Open shrub mallee of <i>Eucalyptus celastroides</i> / <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i> within the survey area (Muir, 1977)	34
Table 10:	Vegetation assemblage for Low woodland of <i>Eucalyptus salmonophloia</i> over low scrub of mixed <i>Melaleuca</i> within the survey area (Muir, 1977)	36
Table 11:	Vegetation assemblage for Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i> within the survey area (Muir, 1977)	38
Table 12:	Vegetation assemblage for Low woodland of <i>Eucalyptus calycogona</i> / <i>Eucalyptus pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop within the survey area (Muir, 1977)	39
Table 13:	Vegetation assemblage for Mallee of <i>Eucalyptus eremophila</i> / <i>Eucalyptus steedmanii</i> over mixed dwarf scrub within the survey area (Muir, 1977).....	41
Table 14:	Vegetation assemblage for Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub within the survey area (Muir, 1977)	42
Table 15:	Vegetation assemblage for Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub within the survey area (Muir, 1977).....	44
Table 16:	Vegetation assemblage for Open tree mallee of <i>Eucalyptus eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise within the survey area (Muir, 1977)	45
Table 17:	Vegetation assemblage for Burnt open low woodland of <i>Eucalyptus salmonophloia</i> over shrub mallee of <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus pileata</i> and mixed low heath within the survey area (Muir, 1977).....	47
Table 18:	Vegetation assemblage Forest of <i>Eucalyptus urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i> within the survey area (Muir, 1977)	49

Figures

Figure 1:	Tenements within the Greater New Morning/Spotted Quoll area.....	1
Figure 2:	Regional map of The Greater New Morning/Spotted Quoll area (survey area not to scale).....	2
Figure 3:	IBRA subregions surrounding the Greater New Morning/Spotted Quoll area.....	8
Figure 4:	Map of existing and proposed Conservation Areas (EPA, 2009) in relation to the Greater New Morning/Spotted Quoll area	10
Figure 5:	Location map of the Great Western Woodlands (DEC, 2010a).	11
Figure 6:	Monthly rainfall from January 2009 to August 2012 and mean monthly rainfall (September 1905 to August 2012) for the Lake Carmody weather station (#10670) (BOM, 2012)	13
Figure 7:	GPS tracks traversed throughout the Greater New Morning/Spotted Quoll Area spring 2012	17

Plates

Plate 1: Image of <i>Eucalyptus steedmanii</i>	25
Plate 2: Image of <i>Eremophila racemosa</i> (P4).....	26
Plate 3: Image taken of <i>Microcorys</i> sp. Forrestania (V. English 2004) (P4).....	27
Plate 4: Image of <i>Stylidium sejunctum</i> (P2).....	28
Plate 5: Image of an active malleefowl mound identified within the survey area (BC, 2010).....	29
Plate 5: Image of Low woodland of <i>Eucalyptus flocktoniae</i> / <i>Eucalyptus salubris</i> / <i>Eucalyptus urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	33
Plate 6: Image of Open shrub mallee of <i>Eucalyptus celastroides</i> / <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	35
Plate 7: Image of Low woodland of <i>Eucalyptus salmonophloia</i> over low scrub of mixed <i>Melaleuca</i>	37
Plate 8: Image of Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	38
Plate 9: Image of Low woodland of <i>Eucalyptus calycogona</i> / <i>Eucalyptus pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop	40
Plate 10: Image of Mallee of <i>Eucalyptus eremophila</i> / <i>Eucalyptus steedmanii</i> over mixed dwarf scrub.....	41
Plate 11: Image of Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	43
Plate 12: Image of Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	44
Plate 13: Image of Open tree mallee of <i>Eucalyptus eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	46
Plate 14: Image of Burnt open low woodland of <i>Eucalyptus salmonophloia</i> over shrub mallee of <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus pileata</i> and mixed low heath	48
Plate 15: Heath of <i>Melaleuca hamata</i> sub-community within the Burnt open low woodland of <i>Eucalyptus salmonophloia</i> over shrub mallee of <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus pileata</i> and mixed low heath	48
Plate 16: Image of Forest of <i>Eucalyptus urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>	50
Plate 17: Image taken of <i>Dittrichia graveolens</i> (Stinkwort).....	54

Appendices

Appendix 1: Regional map of the Greater New Morning/Spotted Quoll area including DEC Flora of Conservation Significance locations (survey area not to scale).....	65
Appendix 2: Regional map of the Greater New Morning/Spotted Quoll area including PEC, Lake Cronin ESA & Schedule 1 Area (survey area not to scale).....	66
Appendix 3: Vegetation map of the Greater New Morning/Spotted Quoll area including Flora/Fauna of Conservation Significance	67
Appendix 4: List of species identified within each vegetation community within the Greater New Morning/Spotted Quoll area.....	68
Appendix 5: DEC Threatened Flora Database search results within 10km of Greater New Morning/Spotted Quoll area (DEC, 2011a)	77
Appendix 6: GPS coordinates of Flora/Fauna of Conservation Significance identified within the Greater New Morning/Spotted Quoll area	79
Appendix 7: Muir Life Form/Height Class (Muir, 1977).....	81
Appendix 8: Keighery Health rating scale (1994).	82

Executive Summary

Botanica Consulting was commissioned by Western Areas NL to undertake a Level 1 flora and vegetation survey of the Greater New Morning/Spotted Quoll area, located approximately 75km east of Hyden. The Greater New Morning/Spotted Quoll area covers an area of approximately 991ha of which approximately 812.5ha has been previously surveyed by Botanica Consulting (2008-2011). The remaining 178.5 ha was surveyed on the 28th of August 2012. The results of previous surveys were combined with the results of the current survey to provide a flora and vegetation assessment of the entire Greater New Morning/Spotted Quoll area.

A total of eleven vegetation communities and one sub-community were identified within the Greater New Morning/Spotted Quoll area:

1. Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca*;
2. Open shrub mallee of *Eucalyptus celastroides*/*Eucalyptus cylindrocarpa*/*Eucalyptus eremophila* over low scrub of mixed *Acacia* and *Melaleuca*;
3. Low woodland of *Eucalyptus salmonophloia* over low scrub of mixed *Melaleuca*;
4. Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca*;
5. Low woodland of *Eucalyptus calycogona*/*Eucalyptus pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop;
6. Mallee of *Eucalyptus eremophila*/*Eucalyptus steedmanii* over mixed dwarf scrub;
7. Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub;
8. Low scrub of mixed *Allocasuarina* over mixed dwarf scrub;
9. Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise;
10. Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath (including sub-community Heath of *Melaleuca hamata*); and
11. Forest of *Eucalyptus urna* over low scrub of *Melaleuca pauperiflora* subsp. *pauperiflora*.

These eleven vegetation communities were represented by a total of 29 Families, 74 Genera and 198 Species (including sub-species and variants).

One Threatened Flora species, *Eucalyptus steedmanii*, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* and as listed by the Department of Environment and Conservation, was identified within the Greater New Morning/Spotted Quoll Area. Three Priority Flora species, *Eremophila racemosa* (P4), *Microcorys* sp. *Forrestania* (V. English 2004) and *Stylidium sejunctum* (P2) were identified within the Greater New Morning/Spotted Quoll area. A Department of Environment and Conservation location of *Eutaxia nanophylla* (P3) was searched during the survey however this species could not be located.

Eight of the vegetation communities have National Environmental Significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as they contain Threatened Flora listed under the *Environment Protection and Biodiversity Conservation Act 1999*. One vegetation community also contained an active *Leipoa ocellata* (malleefowl) mound. Malleefowl are listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*. No Threatened Ecological Communities pursuant to Commonwealth legislation or listed by the Department of Environment and Conservation were recorded within the Greater New Morning/Spotted Quoll area. The Greater New Morning/Spotted Quoll area is however located within the North Ironcap and Middle Ironcap Priority Ecological Communities of the *Ironcap Hills Vegetation Complexes* which is listed by the Department of Environment and Conservation as a Priority 3 Ecological Community.

Approximately 215ha of the north-east corner of Greater New Morning/Spotted Quoll area lies within the Lake Cronin Environmental Sensitive Area and is located approximately 5km south-west of the Lake Cronin 'A' Class Nature Reserve. According to the Environmental Protection Authority report (2009) *Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region*, an area of 56,750ha within the mineralised greenstone belt in the Lake Cronin Region (encompassing the entire Greater New Morning/Spotted Quoll area) is proposed to be managed under Section 33(2) of the *Conservation Land Management Act 1984* but not formally reserved. A proposed 'C' Class Nature Reserve is also proposed in the surrounding area to protect the Lake Cronin catchment and areas of extensive sandplain and woodland vegetation located immediately east of the Wheatbelt, which represents vegetation communities and fauna habitats that have been extensively cleared and fragmented in the adjacent Wheatbelt.

The North Ironcap Banded Ironstone Formation located approximately 10km north-west region of the Greater New Morning/Spotted Quoll area is proposed to be reserved in a small 'A' Class Nature Reserve, covering an area of 42.5ha. Approximately 320ha of the northern section of the Greater New Morning/Spotted Quoll Area is also located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Based on Keighery's vegetation health rating scale (1994), nine of the eleven vegetation communities within the Greater New Morning/Spotted Quoll area were rated as being in 'very good' health. The remaining two vegetation communities; Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa/Eucalyptus pileata* and mixed low heath; and Low woodland of *Eucalyptus flocktoniae/Eucalyptus salubris/Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca* were rated as being in 'good' health. One introduced species; *Dittrichia graveolens* (Stinkwort) was identified within the Greater New Morning/Spotted Quoll area. According to the Department of Agriculture and Food Western Australia this species is not listed as a Declared Plant.

1 Introduction

1.1 Project Description

Botanica Consulting (BC) was commissioned by Western Areas NL to undertake a Level 1 flora and vegetation survey of the Greater New Morning/Spotted Quoll area. The flora survey was conducted within tenements E77/1568, M77/912, E77/1866, M77/584, M77/583 and E77/1865 (Figure 1). The aim of the survey was to produce a vegetation map (Appendix 3) and species list (Appendix 4) as well as to document and map locations of any Threatened Ecological Communities (TEC), Threatened or Priority Flora species within the survey area. The entire Greater New Morning/Spotted Quoll area covers an area of 991ha; approximately 178.5ha was surveyed on August 28th 2012 and approximately 812.5ha was previously surveyed by BC between 2008 and 2011. The results of these previous surveys were combined with the results of the current survey to provide a flora and vegetation assessment of the entire Greater New Morning/Spotted Quoll area.

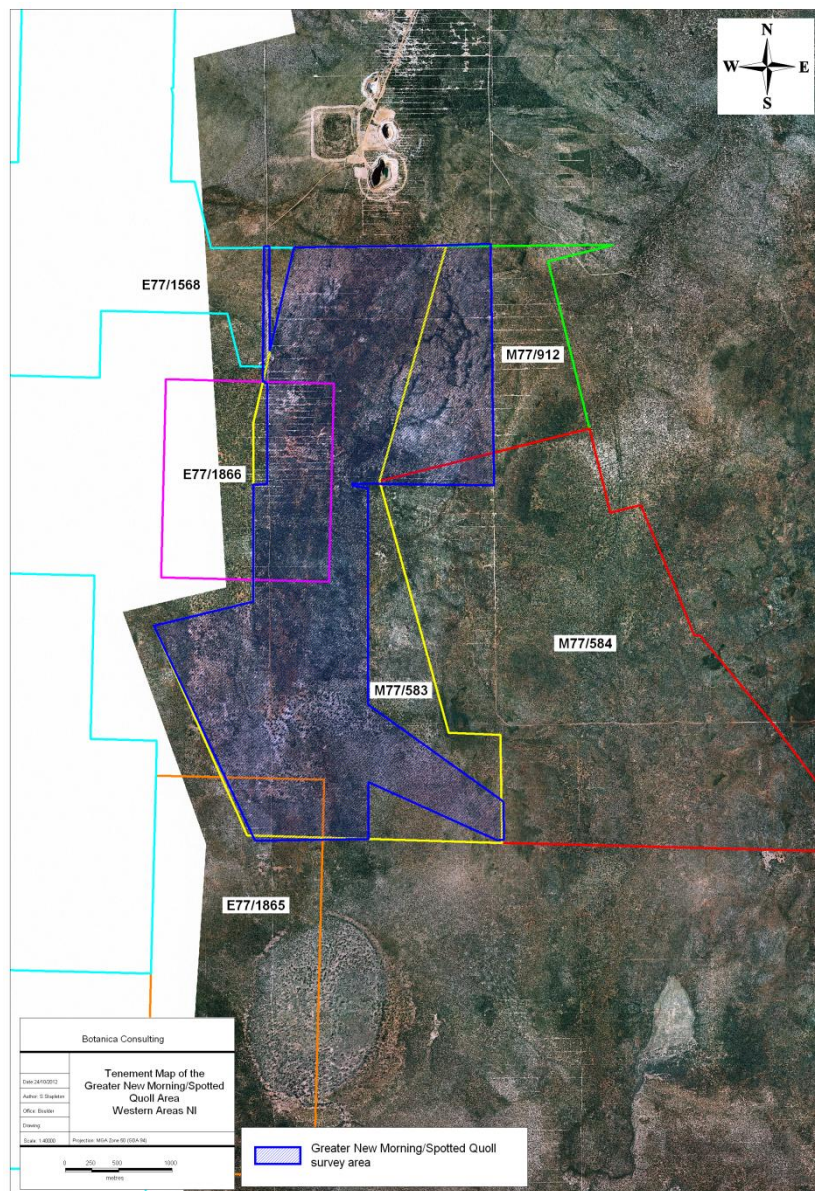


Figure 1: Tenements within the Greater New Morning/Spotted Quoll area

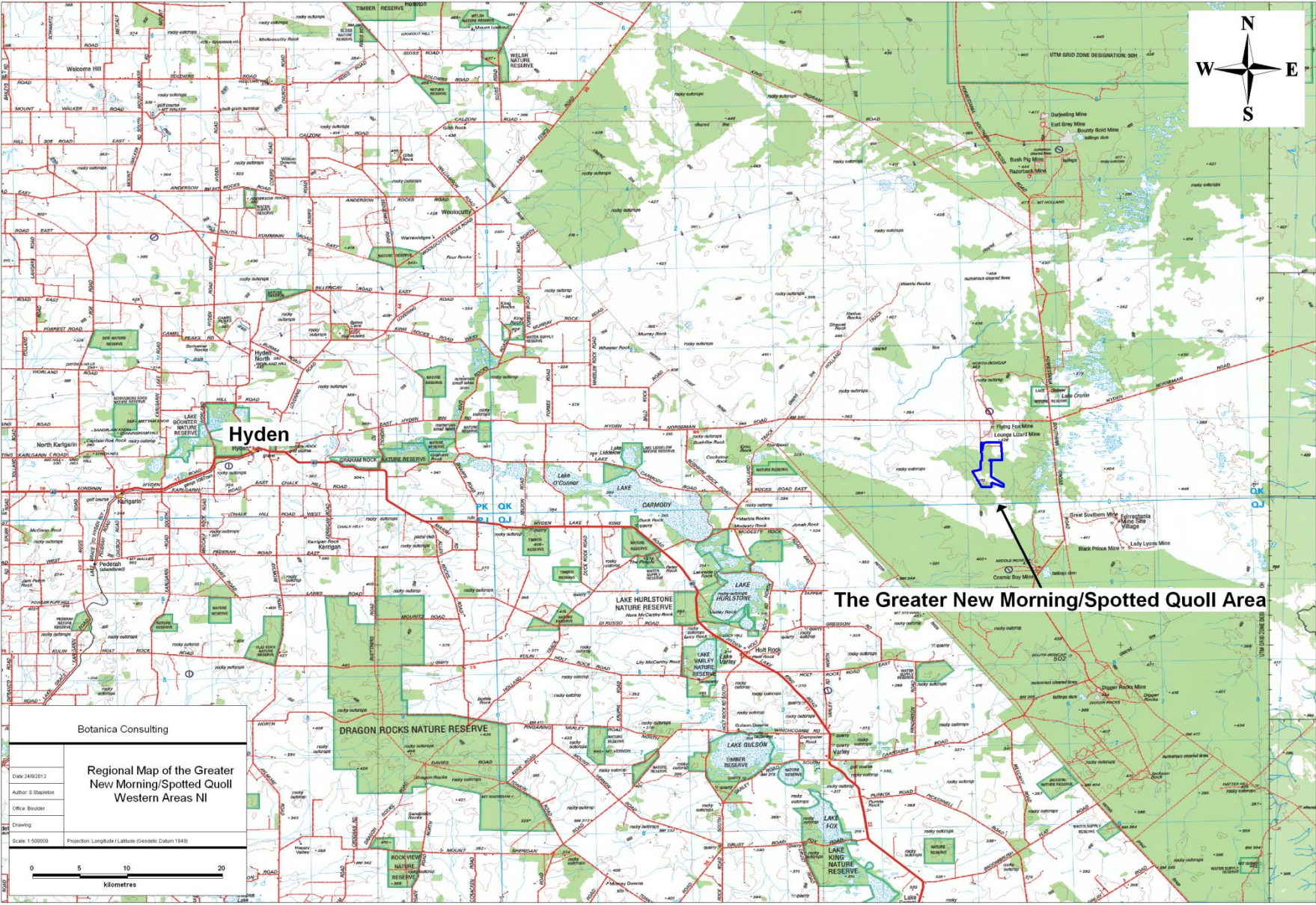


Figure 2: Regional map of The Greater New Morning/Spotted Quoll area (survey area not to scale)

1.2 Flora and Vegetation within the Greater New Morning/ Spotted Quoll area

Table 1 below provides a summary of the vegetation communities and flora/fauna of conservation significance identified within the six flora surveys conducted by BC between 2008 and 2012 within the Greater New Morning/Spotted Quoll area.

Table 1: Summary of flora and vegetation recorded within the Greater New Morning/Spotted Quoll area

Date	Survey/Report	Vegetation community	Flora/Fauna of Conservation Significance
June 2008	New Morning-Spotted Quoll	1. <i>Eucalyptus</i> woodland 2. <i>Eucalyptus</i> mallee woodland 3. Salmon gum woodland 4. Sandplain heath 5. <i>Allocasuarina</i> shrubland 6. Rocky Outcrop.	• <i>Eucalyptus steedmanii</i> (T) • <i>Eremophila racemosa</i> (P4) • <i>Microcorys</i> sp. Forrestania (V. English, 2004) (P4)
October 2008	Lounge Lizard/Flying Fox Area Proposed Gravel Pit	1. <i>Eucalyptus</i> mallee woodland 2. Sandplain Heath	• <i>Microcorys</i> sp. Forrestania (V. English, 2004) (P4)
November 2009	New Morning	1. Mallee woodland 2. <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> shrubland <i>Allocasuarina</i> shrubland	• <i>Eucalyptus steedmanii</i> (T)
August 2010	New Morning	1. <i>E. eremophila</i> mallee woodland on stony rise 2. <i>Acacia/Melaleuca</i> shrubland <i>Allocasuarina/Melaleuca</i> shrubland 3. Mallee Woodland over <i>Melaleuca</i>.	• <i>Eucalyptus steedmanii</i> (T) • <i>Microcorys</i> sp. Forrestania (V. English, 2004) (P4) • Active Malleefowl mound
January 2011	Spotted Quoll/Cosmic Boy Haul Road	1. Burnt <i>E. salmonophloia</i> woodland over mixed Mallee shrubland (including sub-community <i>Melaleuca hamata</i> thicket) 2. <i>E. salmonophloia</i> woodland	• <i>Eucalyptus steedmanii</i> (T) • <i>Microcorys</i> sp. Forrestania (V. English, 2004) (P4)
October 2012	New Morning-Spotted Quoll	1. Open shrub mallee of <i>E. celastroides/E. cylindrocarpa/E. eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i> 2. Low woodland of <i>E. salmonophloia</i> over low scrub of mixed <i>Melaleuca</i> 3. Heath of mixed <i>Acacia</i>, <i>Allocasuarina</i> and <i>Melaleuca</i> 4. Low woodland of <i>E. calycogona/E. pileata</i> over low scrub of <i>Acacia hemiteles/Melaleuca hamata</i> on rocky outcrop 5. Mallee of <i>E. eremophila/E. steedmanii</i> over mixed dwarf scrub 6. Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii/Melaleuca hamata</i> over mixed low scrub 7. Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub 8. Open tree mallee of <i>E. eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise 9. Burnt open low woodland of <i>E. salmonophloia</i> over shrub mallee of <i>E. cylindrocarpa/E. pileata</i> and mixed low heath 10. Forest of <i>E. urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>.	• <i>Eucalyptus steedmanii</i> (T) • <i>Eremophila racemosa</i> (P4) • <i>Microcorys</i> sp. Forrestania (V. English, 2004) (P4) • <i>Stylidium sejunctum</i> (P2)

1.3 Previous relevant flora surveys within the surrounding area

Vegetation Survey of the Exploration Drilling Program, Jim's Seeds, Weeds and Trees, February 2006

Jim's Seeds, Weeds and Trees (JSWT) was commissioned by Western Areas to undertake a Level 1 flora and vegetation survey of the North Flying Fox proposed drill lines, located approximately 80km east of Hyden. The survey was conducted on the 1st and 2nd February 2006, covering an area of approximately 17ha.

No Declared Rare Flora (DRF), pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* and listed by the Department of Environment and Conservation (DEC) were located within the survey area. No Priority Flora species were identified during the survey.

Two vegetation communities were identified in the survey area; *Eucalyptus* mallee woodland and sandplain heath. These vegetation communities were represented by a total of 22 Families, 42 Genera and 81 Species (including sub-species and variants).

None of the vegetation communities have National Environmental Significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*. However the area occurs within the Lake Cronin Environmentally Sensitive Area (ESA), which is listed on the Register of the National Estate (RNE).

Based on Keighery's vegetation health rating scale (1994), both of the vegetation communities were given a health rating of 'good'. No introduced species were identified within the survey area.

This survey occurs approximately 2.5km north of the Greater New Morning/Spotted Quoll area.

North Flying Fox Drill Lines Flora Survey, Jim's Seeds, Weeds and Trees, April 2006

JSWT was commissioned by Western Areas to undertake a Level 1 flora and vegetation survey of the North Flying Fox proposed drill lines, located approximately 100km east of Hyden. The survey was conducted on the 12th April 2005, covering an area of approximately 4.2ha.

No DRF, pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* and listed by the DEC were located within the survey area. One Priority Flora species were identified during the survey, *Verticordia mitodes* (P3).

Two vegetation communities were identified in the survey area; *Eucalyptus* mallee woodland and sandplain heath. These vegetation communities were represented by a total of 17 Families, 36 Genera and 69 Species (including sub-species and variants).

None of the vegetation communities have National Environmental Significance as defined by the *EPBC Act 1999*. However the area occurs within the Lake Cronin ESA, which is listed on the RNE.

Based on Keighery's vegetation health rating scale (1994), both of the vegetation communities were given a health rating of 'excellent'. No introduced species were identified within the survey area.

This survey occurs approximately 2.5km north of the Greater New Morning/Spotted Quoll area.

Vegetation Survey of three Proposed Monitoring Bores in the Flying Fox Area, Jim's Seeds, Weeds and Trees, August 2006

JSWT was commissioned by Western Areas to undertake a Level 1 flora and vegetation survey of three proposed monitoring bore sites, located approximately 80km east of Hyden. The survey was conducted on the 10th April 2006, covering an area of approximately 1.24ha.

No DRF, pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* and listed by the DEC were located within the survey area. One Priority Flora species were identified during the survey, *Microcorys* sp. Forresteria (P4).

Two vegetation communities were identified in the survey area; *Eucalyptus salmonophloia* woodland and *Acacia* heath. These vegetation communities were represented by a total of 19 Families, 31 Genera and 53 Species (including sub-species and variants).

None of the vegetation communities have National Environmental Significance as defined by the *EPBC Act 1999*. However the area occurs within the Lake Cronin ESA, which is listed on the RNE

Based on Keighery's vegetation health rating scale (1994), both of the vegetation communities were given a health rating of 'degraded'. One introduced species were identified within the survey area, *Dittrichia graveolens*. According to the Department of Agriculture and Food Western Australia (DAFWA) database, this species is listed as a Declared Plant.

This survey occurs approximately 1.3km east of the Greater New Morning/Spotted Quoll area.

Flora and Vegetation Survey of the Flying Fox North East Exploration Area, Botanica Consulting, November 2006

Botanica Consulting (BC) was commissioned by Western Areas to undertake a Level 1 flora and vegetation survey of the Flying Fox North East Area, located approximately 80km east of Hyden. The survey was conducted from the 29th to the 30th October 2006, covering an area of approximately 329.8ha.

No DRF, pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* and listed by the DEC were located within the survey area. Six Priority Flora species were identified during the survey, *Microcorys* sp. *Forrestania* (P4), *Boronia westringioides* (P2), *Baeckea* sp. North Ironcap (P2), *Dillwynia acerosa* (P1), *Microcorys pimeleoides* (P1) (no longer priority) and *Daviesia elongata* subsp. *implexa* (P3).

Four vegetation communities were identified in the survey area; *Eucalyptus salmonophloia* woodland, *Eucalyptus* mallee woodlands, Sandplain Heath and Kwongan vegetation. These vegetation communities were represented by a total of 26 Families, 54 Genera and 132 Species (including sub-species and variants).

None of the vegetation communities have National Environmental Significance as defined by the *EPBC Act 1999*. However the area occurs within the Lake Cronin ESA, which is listed on the RNE.

Based on Keighery's vegetation health rating scale (1994), all of these vegetation communities were given a health rating of 'excellent'. No introduced species were identified within the survey area.

This survey occurs approximately 2.4km north-east of the Greater New Morning/Spotted Quoll area.

Vegetation Survey of a Proposed Extension to the Current Clearing Permit Number 691/1 at the Flying Fox mine site, Botanica Consulting, June 2007

BC was commissioned by Western Areas to undertake a Level 1 flora and vegetation survey at the Flying Fox mine site, located approximately 80km east of Hyden. The survey was conducted on the 1st June 2007, covering an area of approximately 46ha.

No DRF, pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* and listed by the DEC were located within the survey area. Two Priority Flora species were identified during the survey, *Daviesia elongata* subsp. *implexa* (P3) and *Microcorys lenticularis* (P2).

Two vegetation communities were identified in the survey area; *Eucalyptus* mallee woodland and sandplain heath. These vegetation communities were represented by a total of 20 Families, 24 Genera and 34 Species (including sub-species and variants).

None of the vegetation communities have National Environmental Significance as defined by the *EPBC Act 1999*. However the area occurs within the Lake Cronin ESA, which is listed on the RNE.

Based on Keighery's vegetation health rating scale (1994), both of the vegetation communities were given a health rating of 'excellent'. No introduced species were identified within the survey area.

This survey occurs approximately 1.5km north of the Greater New Morning/Spotted Quoll area.

Flora and Vegetation Survey within the Greater Flying Fox Area, Botanica Consulting, November 2007

BC was commissioned by Western Areas to undertake a Level 1 flora and vegetation survey at the Flying Fox mine site, located approximately 80km east of Hyden. The survey was conducted on the 8th October 2007, covering an area of approximately 247.83ha.

No DRF, pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* and listed by the DEC were located within the survey area. One Priority Flora species were identified during the survey, *Microcorys* sp. Forresteria (V. English, 2004) (P4),

Three vegetation communities were identified in the survey area; *Eucalyptus* mallee woodland, Sandplain Heath and Rehabilitation vegetation. These vegetation communities were represented by a total of 24 Families, 47 Genera and 106 Species (including sub-species and variants).

None of the vegetation communities have National Environmental Significance as defined by the *EPBC Act 1999*. However the area occurs within the Lake Cronin ESA, which is listed on the RNE.

Based on Keighery's vegetation health rating scale (1994), two of the vegetation communities were given a health rating of 'very good'. The remaining vegetation community was given a health rating of 'degraded'. No introduced species were identified within the survey area.

This survey occurs approximately 0.80km north of the Greater New Morning/Spotted Quoll area.

2 Regional Biophysical Environment

2.1 Regional Environment

The Greater New Morning/Spotted Quoll area lies on the border of the Coolgardie and Mallee Regions. The Coolgardie Region forms part Southwestern Interzone of Western Australia in a region known as the Coolgardie Botanical District (Beard, 1990). The area consists of predominantly Eucalypt woodlands, becoming open and with saltbush-bluebush understorey on more calcareous soils (Beard, 1990). The Mallee Region is part of the South-West Province Australia in a region known as the Roe Botanical District. In this area the general cover is mallee with *Eucalyptus eremophila* the most consistent species. Both the Mallee and Coolgardie Regions are further divided into subregions, based on the Interim Biogeographic Regionalisation of Australia (IBRA). The Greater New Morning/ Spotted Quoll area is located on the border between the Western Mallee (MAL2) and Southern Cross (COO2) subregions, see Figure 3 (Cowan, 2001).

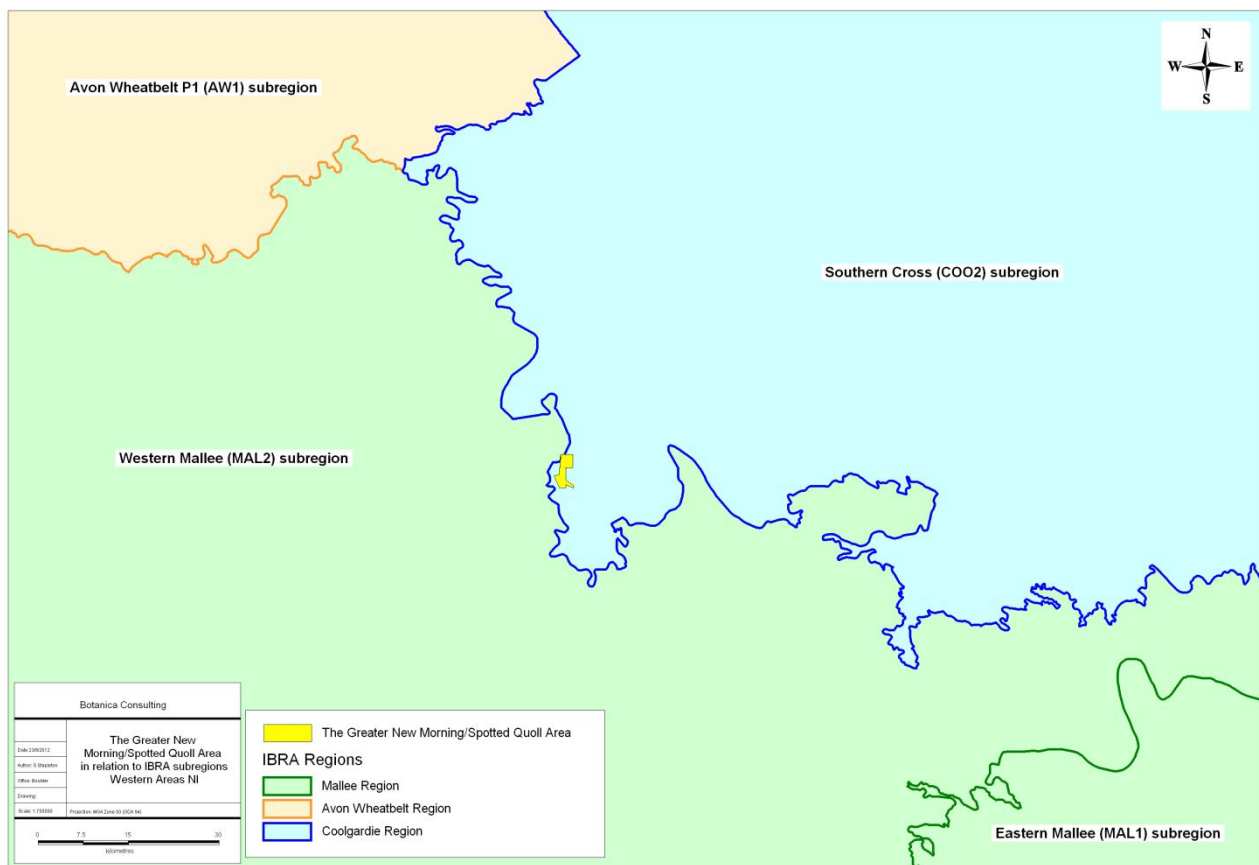


Figure 3: IBRA subregions surrounding the Greater New Morning/Spotted Quoll area

2.2 Conservation Areas

Approximately 215ha of the north-east corner of Greater New Morning/Spotted Quoll area lies within the Lake Cronin Environmental Sensitive Area (ESA) and is located approximately 5km south-west of the Lake Cronin 'A' Class Nature Reserve. According to the Environmental Protection Authority (EPA, 2009) *Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region*, an area of 56,750ha within the mineralised greenstone belt in the Lake Cronin Region (encompassing the entire Greater New Morning/Spotted Quoll area) is proposed to be managed under Section 33(2) of the *Conservation Land Management (CALM) Act 1984* but not formally reserved. A proposed 'C' Class Nature Reserve is also proposed in the surrounding area to protect the Lake Cronin catchment and areas of extensive sandplain and woodland vegetation located immediately east of the Wheatbelt, which represents vegetation communities and fauna habitats that have been extensively cleared and fragmented in the adjacent Wheatbelt.

The North Ironcap Banded Ironstone Formation (BIF) located approximately 10km north-west region of the Greater New Morning/Spotted Quoll area is proposed to be reserved in a small 'A' Class Nature Reserve, covering an area of 42.5ha. Figure 4 provides a map of the existing and proposed conservation areas in relation to the Greater New Morning/Spotted Quoll area.

The Greater New Morning/Spotted Quoll area also lies within the Great Western Woodlands. The Great Western Woodlands is considered by The Wilderness Society of WA to be of global biological and conservation importance as one of the largest and healthiest temperate woodlands on Earth, containing many endemic species. The region covers almost 16 million hectares, 160,000 square kilometres, from the southern edge of the Western Australian Wheatbelt to the pastoral lands of the Mulga country in the north, the inland deserts to the northeast, and the treeless Nullarbor Plain to the east (Figure 4).

The area provides an eastward connection between southwest forests and inland deserts (Gondwana Link) as well as linking the north-west passage to Shark Bay. The majority of the Great Western Woodlands is unallocated crown land (61.1%) with other interests including pastoral leases (20.4%), conservation reserves (15.4%) unallocated crown land ex pastoral managed by the DEC (2%) and private land (approximately 1%) (Watson *et. al.*, 2008).

No specific management strategy applies to the Great Western Woodlands, rather an approach to conservation which occurs across all land tenures and when different stakeholders work together with biodiversity in mind. The central component of this approach is to identify and conserve key large-scale, long term ecological processes that drive connectivity between ecosystems and species. The Great Western Woodlands currently includes towns, highways, roads, railways, private property, Crown Reserves, agricultural activities and mining tenements.

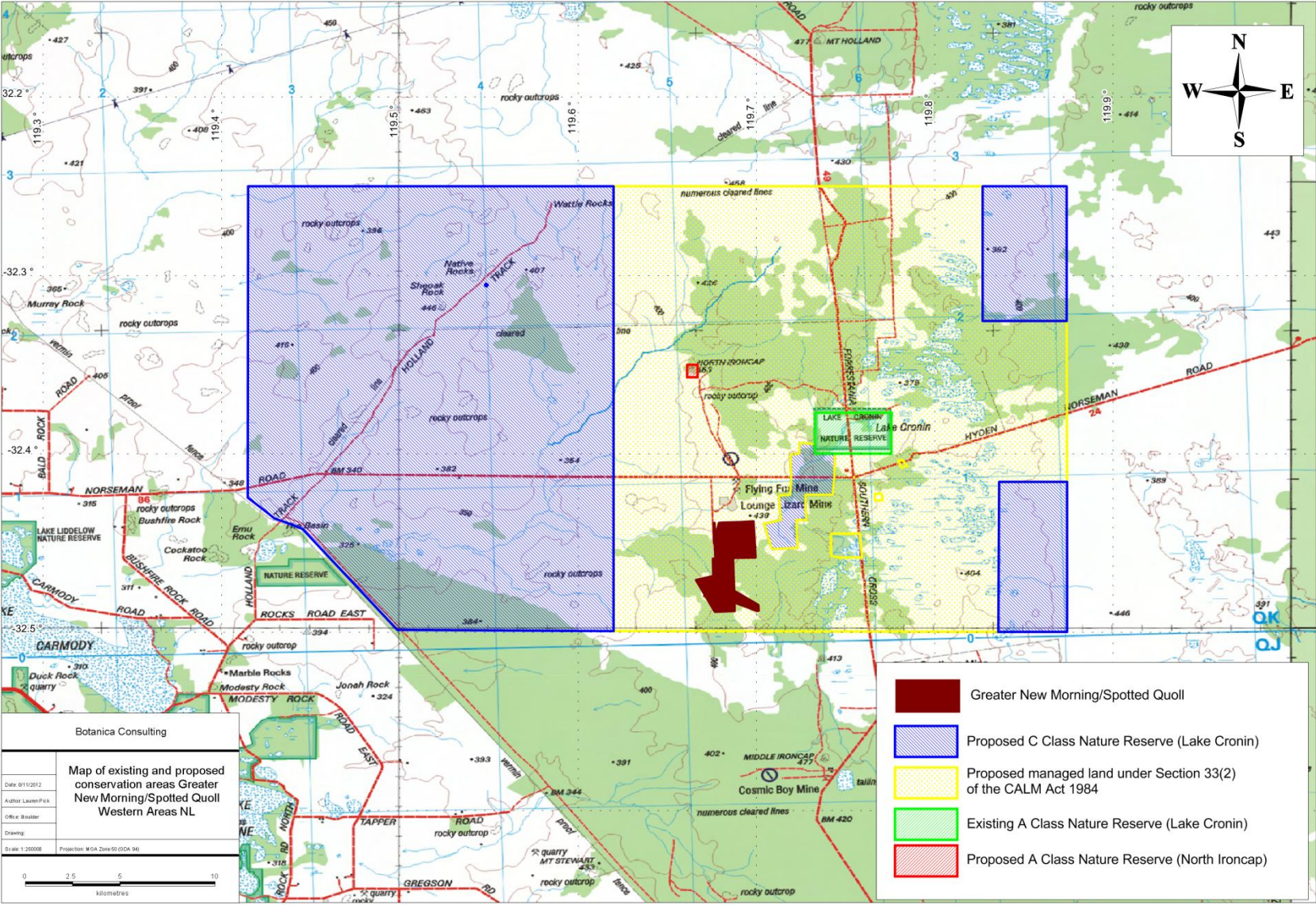


Figure 4: Map of existing and proposed Conservation Areas (EPA, 2009) in relation to the Greater New Morning/Spotted Quoll area

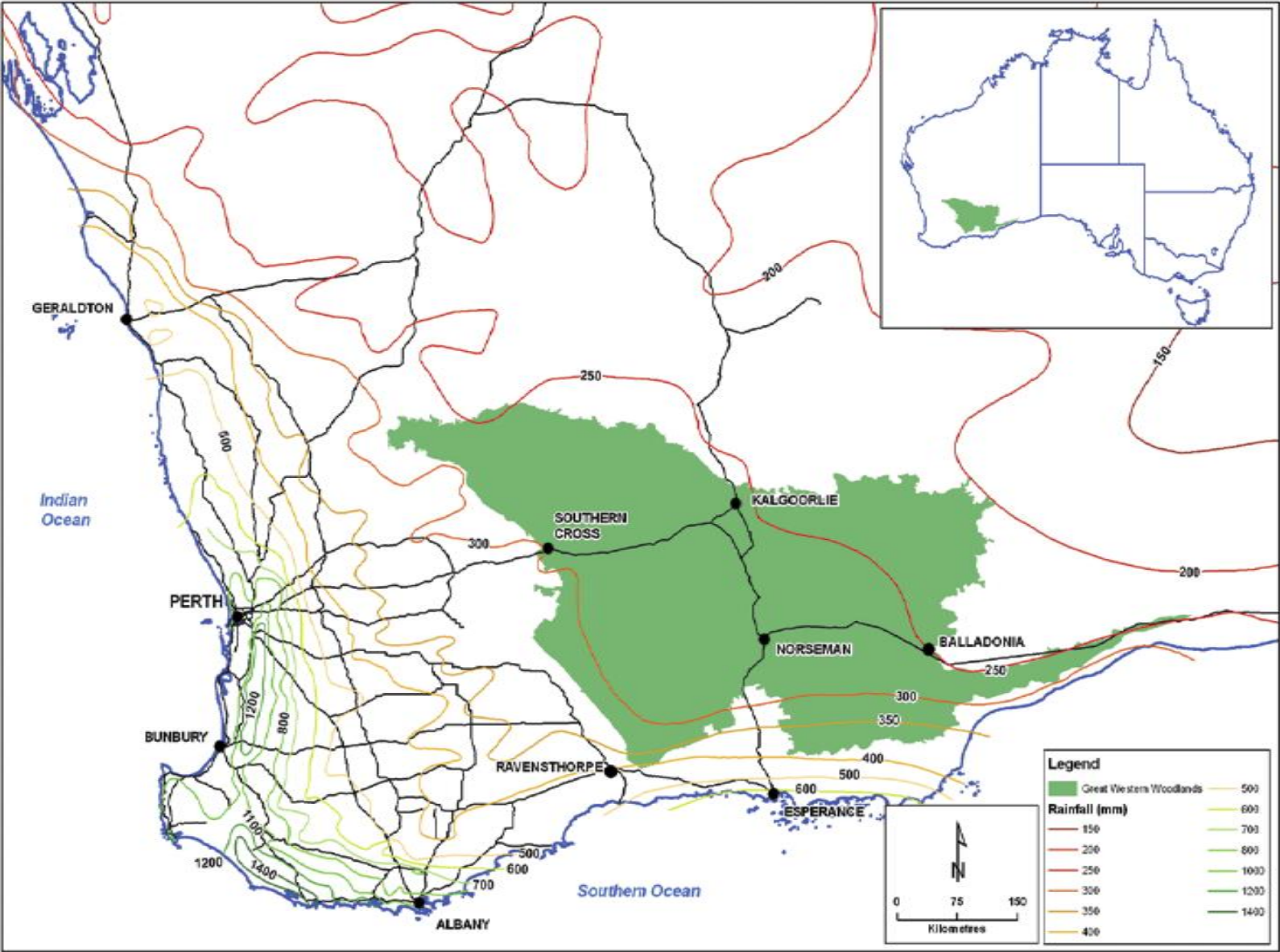


Figure 5: Location map of the Great Western Woodlands (DEC, 2010a).

2.3 Topography & Soils

The Southern Cross subregion (COO2) lies on the Yilgarn Craton's 'Southern Cross Terrains'. The relief is subdued and comprises of gently undulating uplands dissected by broad valleys with bands of low greenstone hills. The underlying geology is of granite strata interrupted by parallel intrusions of Archaean Greenstone. Calcareous earths are the dominant soil community and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line (Cowan, 2001). The Western Mallee (MAL2) subregion lies on the south-eastern part of the Yilgarn Craton. It is a gently undulating country of low relief with duplex mallee soil (Beecham & Danks, 2001).

2.4 Vegetation

Vegetation of the Southern Cross subregion in the Coolgardie Botanical District is predominantly Eucalypt woodlands, Mallees, Acacia thickets and scrub-heaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on the low greenstone hills, valley alluvials and broad plains of calcareous earths. Salt lakes support dwarf shrublands of samphire. The area is rich in endemic *Acacias* (Cowan, 2001). The Western Mallee subregion vegetation commonly includes Mallee over myrtaceous-proteaceous heaths, *Melaleuca* shrublands, Samphire low shrublands on saline depressions and mixed Eucalypt woodlands. Mallee communities of the Western Mallee subregion occur on a variety of surfaces; *Eucalyptus* woodlands occur mainly on finetextured soils, with scrub-heath on sands and laterite (Beecham & Danks, 2001).

During a biological survey of the 20,300km² within the Lake Johnston-Hyden area (How, Newbey, Dell, Muir & Hnatiuk, 1988) Newbey and Milewski identified seven land units: Breakaway, Granite Exposure, Hill (Banded Ironstone Formation), Salt Lake Features (Saline flats, well-drained flats), Sandplains, Undulating Plain and Broad Valley. According to Newbey and Hnatiuk (1988) these seven land units comprised of 51 vegetation types, including four vegetation complexes; Breakaway complex, Banded Ironstone Formation (BIF) complex, Granite complex and Greenstone complex. Seven of these vegetation types were considered unique to the area; breakaway complex, BIF complex, greenstone complex, *Acacia jennerae* tall shrubland, *Eucalyptus georgei* low woodland, *Eucalyptus* sp. HRN 5603) low woodland and *E. scyphocalyx* Mallee.

The DAFWA GIS file (2011) indicates that the Greater New Morning/Spotted Quoll area is located within Pre-European Beard vegetation associations Forrestania 511 (COO2), Forrestania 2048 (COO2) and Forrestania 2048 (MAL2). The extent of these vegetation associations as described by the DAFWA is shown in Table 2.

Table 2: Pre-European Beard Vegetation Associations within the survey area (DAFWA, 2011)

IBRA Subregion	Veg association	Pre-European Extent (ha)	Current Extent (ha)	Pre-European extent remaining (%)	% of Current extent within DEC managed lands	Vegetation Description (Beard, 1990)
COO2	Forrestania 511	153 641.65	153 336.64	99.80	9.70	Medium woodland; salmon gum & morrel

COO2	Forrestania 2048	2 093.32	2085.32	99.60	2.40	Shrublands; scrub-heath in the Mallee Region
MAL2	Forrestania 2048	5 735.92	5651.19	98.52	0	Shrublands; scrub-heath in the Mallee Region

Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered “endangered”.

2.5 Climate

The climate of the Southern Cross subregion is characterised as arid to semi-arid Mediterranean with an annual rainfall of 200-300mm (Beard, 1990; Cowan, 2001). The climate of the Western Mallee subregion is characterised as dry warm Mediterranean with an annual rainfall of 300-500mm (Beard, 1990; Beecham & Danks, 2001). Rainfall data for the Lake Carmody weather station (#10565) located approximately 30km south of the Greater New Morning/Spotted Quoll is shown in Figure 6 (Bureau of Meteorology, BOM, 2012).

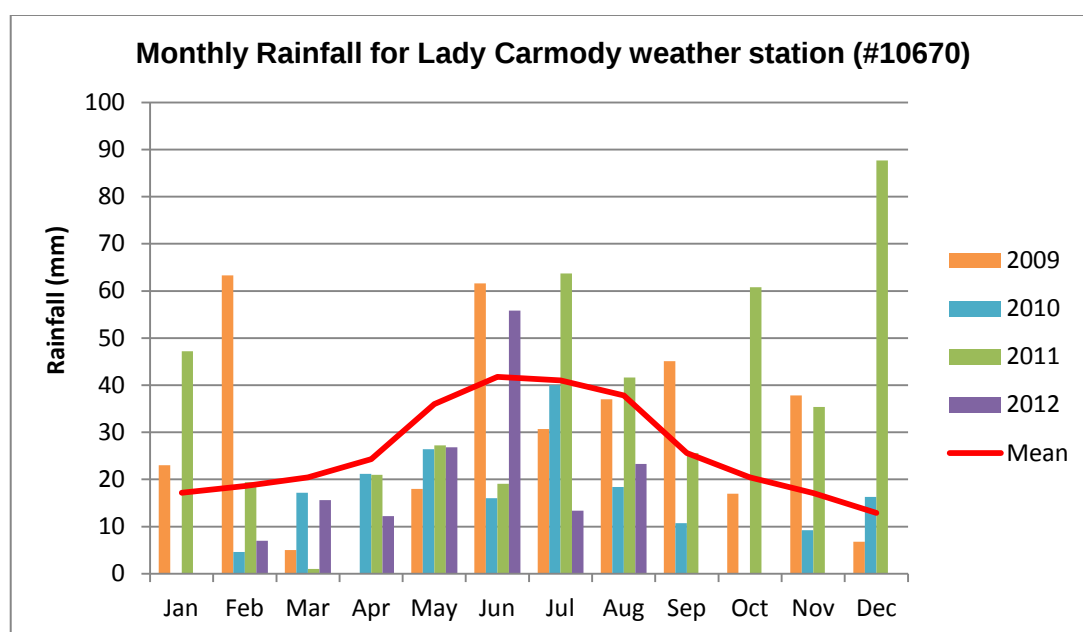


Figure 6: Monthly rainfall from January 2009 to August 2012 and mean monthly rainfall (September 1905 to August 2012) for the Lake Carmody weather station (#10670) (BOM, 2012)

2.6 Land Use

Based on the findings from its 2001 biodiversity audit, CALM identified the dominant land uses of the COO2 IBRA subregion as native pastures (17%), Conservation Reserves (11.53%), UCL & Crown Reserves (66.74%) and Cultivation – Dry Land agriculture (2.27%) (Cowan, 2001). The dominant land uses of the MAL2 IBRA subregion are Dry Land agriculture, UCL & Crown Reserves, roads and other easements.

2.7 Survey Objectives

The objectives of the survey undertaken were to:

- Compile a broad scale vegetation community flora map and species list of the Greater New Morning/Spotted Quoll area (

- Appendix 4);
- Document and map locations of any Threatened or Priority listed flora species located; (

- Appendix 4);
- Assess the regional and local conservation status of plant species and ecological communities within the Greater New Morning/ Spotted Quoll area (Appendix 1 and Appendix 2); and
- Identify and map occurrences of any “Declared and Environmental” weeds within the Greater New Morning/ Spotted Quoll area.

3 Survey Methodology

3.1 Desktop Assessment

Prior to the field survey, the results of the combined search of the DEC Flora of Conservation Significance databases (DEC, 2012a), were obtained by BC. These significant flora species were examined on the Western Australian Herbarium's web page (WAHERB, 2012) prior to the survey to familiarise staff with their appearance. Locations of Threatened Flora and Priority Flora species revealed in the databases search were overlaid on aerial photography of the area. Vegetation descriptions of locations and available pictures of the Priority Flora were obtained from Florabase.

Priority Flora and their respective vegetation types were targeted in the survey area and all areas of occurrence were traversed on foot specifically looking for the Threatened flora associated with that vegetation description. Table 3 lists the definitions of Threatened and Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from Florabase (WAHERB, 2012).

Table 3: Definitions of Rare and Priority Flora Species (WAHERB, 2012).

T: Schedule 1 Threatened Flora (Declared Rare Flora)-extant under the <i>Wildlife Conservation Act 1950</i>
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.
X: Schedule 2 Declared Rare flora – Presumed Extinct Taxa under the <i>Wildlife Conservation Act 1950</i>
Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
1: Priority One – Poorly known Species
Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2: Priority Two – Poorly Known Species
Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3: Priority Three – Poorly known Species
Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4: Priority Four – Rare, Near Threatened and other species in need of monitoring

1. Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
2. Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
3. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5: Priority 5 – Conservation Dependent Species

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

3.2 Sampling and Analysis Methods

BC was commissioned by Western Areas in spring 2012 to conduct a Level 1 flora and vegetation survey of 178.5ha within the 991ha Greater New Morning/Spotted Quoll area. 812.5ha of the Greater New Morning/Spotted Quoll area has been previously surveyed by BC from 2008 to 2011. The fieldwork was completed on the 28th August 2012. The objective of the survey was to document all observed “Threatened/Declared Rare and Priority Flora” species encountered and the occurrences of any “Environmental or Declared Weeds” observed within or adjacent to the Greater New Morning/Spotted Quoll area. The Greater New Morning/ Spotted Quoll area was traversed by two people via all-terrain vehicle and on foot. Figure 7 provides a map of the areas traversed throughout the survey.

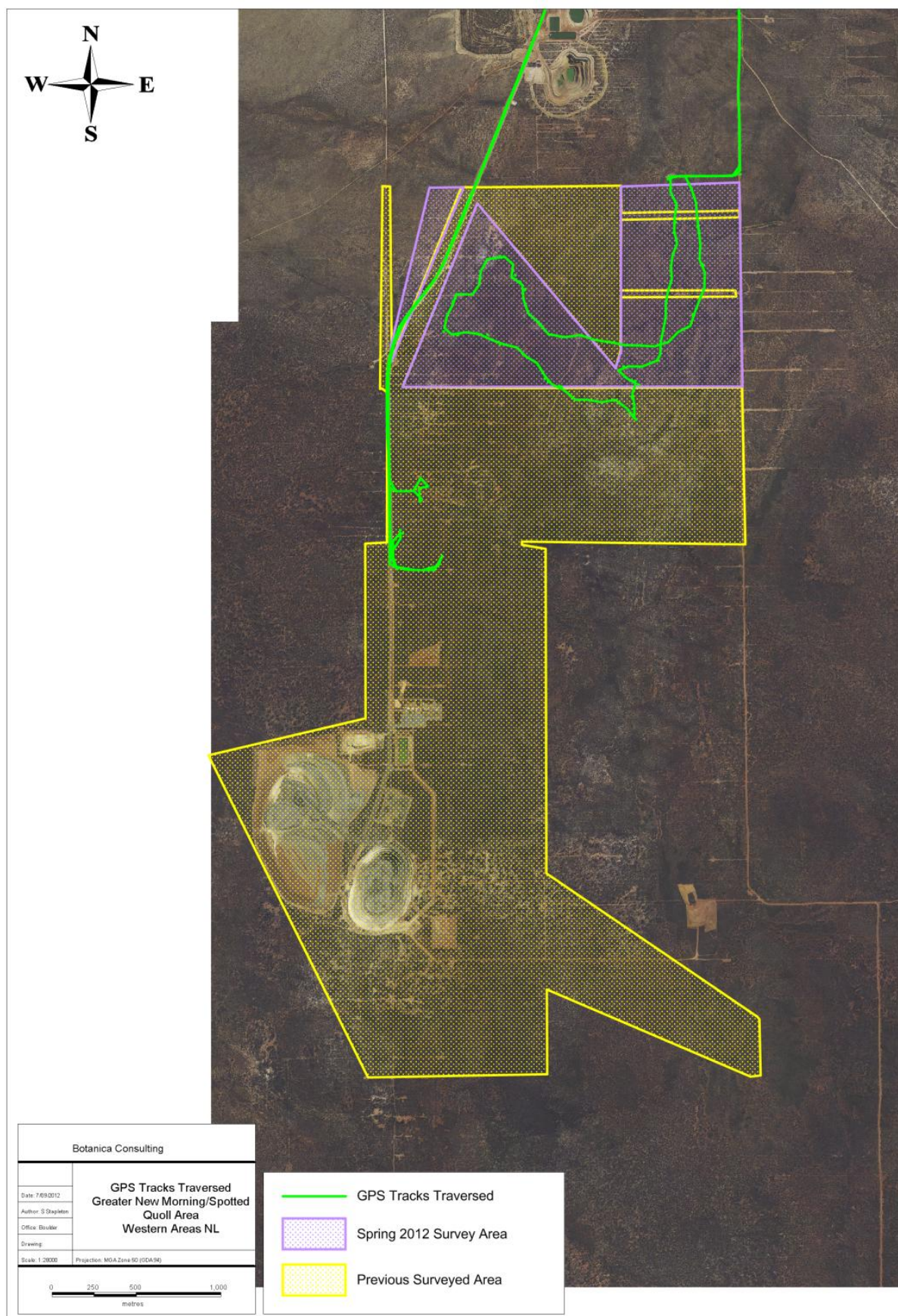


Figure 7: GPS tracks traversed throughout the Greater New Morning/Spotted Quoll Area spring 2012

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the co-ordinates of the boundaries between existing vegetation communities.

At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant species;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of Threatened Flora if encountered.

Unknown specimens collected during the survey were identified with the aid of samples housed at the BC Herbarium and the Western Australian Herbarium. Presence/absence data of species from sample sites of similar vegetation was then compiled forming the best representative vegetation communities. Similar vegetation communities were recognised visually in the field.

3.2.1 Personnel involved

Jim Williams - Environmental Consultant/Botanist (Diploma of Horticulture)
Lauren Pick - Environmental Consultant/Botanist (BSc Conservation Biology)

3.2.2 Scientific licences

Table 4: Scientific licenses of Botanica staff co-ordinating the survey

Licensed staff	Permit Number	Valid Until
Jim Williams	SL009978	25-04-2013
Lauren Pick	SL009979	25-04-2013

3.3 Data Analysis Tools

Once the survey was completed the data obtained was analysed to generate a vegetation map (Appendix 3).

3.4 Flora survey limitations and constraints

It is important to note that there are limitations involved with conducting flora surveys, despite the careful planning that is put into their design. Such limitations that can occur are listed in Table 5 below.

Table 5: Limitations and constraints associated with the flora and vegetation survey spring 2012.

Variable	Impact on Survey outcomes
Access problems	The vegetation within the survey area was dense and therefore ATV/4WD vehicle access was not possible. The area was surveyed on foot.
Experience levels	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. Coordinating Botanist: Jim Williams Field Staff: Jim Williams & Lauren Pick Data Interpretation: Jim Williams & Lauren Pick
Timing of survey, weather & season	Fieldwork was completed during the Environmental Protection Authority's (EPA) recommended time period (i.e., Spring) for detecting most ephemeral flora and when the majority of species are in flower (Figure 5) (BOM, 2012).
Sources of information	BC have conducted a number of surveys within the Forrestania region and were also able to obtain information about the area from previous research conducted within the Western Areas tenements and the surrounding region.
Mapping reliability	BC obtained a high resolution ortho aerial image to assist with vegetation mapping.
Area disturbance	The majority of the survey area is in very good condition and comprised of native vegetation. Disturbance in the area was a result of exploration and access tracks.
Survey Intensity	Survey intensity was appropriate for the size/significance of the area with a Level 1 reconnaissance survey completed in Spring to identify vegetation communities and any Priority Flora. A targeted search to identify all Priority Flora populations was not conducted. Prior to any disturbance a targeted search in those vegetation communities identified as containing Priority Flora should be conducted along any proposed clearing.
Resources	The DEC provided several resources including threatened flora information which were used to complete the survey. Other information was utilised from previous BC surveys in the area.
Completeness	In the opinion of BC the survey area was covered sufficiently in order to identify vegetation assemblages. Many of the plants were in flower due to the time of year and above average rainfall in June; as a result many of the flora species could be fully identified. It is estimated that approximately 90% of the flora within the area were able to be fully identified. The vegetation communities for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities outside the study area is not known, however vegetation communities identified were categorized via comparison to vegetation distributions throughout WA given on Australian Natural Resources Atlas (ANRA, 2012).

4 **Results**

4.1 **Summary**

A total of eleven vegetation communities and one sub-community were identified within the Greater New Morning/Spotted Quoll area. These eleven vegetation communities were represented by a total of 29 Families, 74 Genera and 198 Species (including sub-species and variants).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012), was identified within the Greater New Morning/Spotted Quoll area. Three Priority Flora species, *Eremophila racemosa* (P4), *Microcorys* sp. Forresteria (V. English 2004) and *Stylidium sejunctum* (P2), as listed by the DEC were identified within the Greater New Morning/Spotted Quoll area. A DEC location of *Eutaxia nanophylla* (P3) was searched for during the survey however this species could not be located.

Eight of the vegetation communities have National Environmental Significance as defined by the *EPBC Act 1999* as they contain Threatened Flora under the *EPBC Act 1999*. One vegetation community, Open tree mallee of *E. eremophila* over scrub of *Melaleuca hamata* on stony rise also contained an active malleefowl mound which was identified by BC in 2010. Malleefowl are listed as vulnerable under the *EPBC Act 1999*. No TEC pursuant to Commonwealth legislation or as listed by the DEC were recorded within the Greater New Morning/Spotted Quoll area (DEC, 2011a; DSEWPaC, 2012). The Greater New Morning/Spotted Quoll area however is located within the North Ironcap and Middle Ironcap Priority Ecological Communities of the *Ironcap Hills Vegetation Complexes*. This is listed by the DEC as a Priority 3 Ecological Community.

Approximately 215ha of the north-east corner of Greater New Morning/Spotted Quoll area lies within the Lake Cronin ESA and is located approximately 5km south-west of the Lake Cronin 'A' Class Nature Reserve. According to the EPA (2009) *Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region*, an area of 56,750ha within the mineralised greenstone belt in the Lake Cronin Region (encompassing the entire Greater New Morning/Spotted Quoll area) is proposed to be managed under Section 33(2) of the *CALM Act 1984* but not formally reserved. A proposed 'C' Class Nature Reserve is also proposed in the surrounding area to protect the Lake Cronin catchment and areas of extensive sandplain and woodland vegetation located immediately east of the Wheatbelt, which represents vegetation communities and fauna habitats that have been extensively cleared and fragmented in the adjacent Wheatbelt.

The North Ironcap BIF located approximately 10km north-west region of the Greater New Morning/Spotted Quoll area is proposed to be reserved in a small 'A' Class Nature Reserve, covering an area of 42.5ha. Approximately 320ha of the northern section of the Greater New Morning/Spotted

Quoll area is also located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Based on Keighery's vegetation health rating scale (1994), nine of the eleven vegetation communities within the Greater New Morning/Spotted Quoll area were rated as being in 'very good' health. The remaining two vegetation communities; Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath; and Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca* were rated as being in 'good' health. One introduced species; *Dittrichia graveolens* (Stinkwort) was identified within the Greater New Morning/Spotted Quoll area. According to the DAFWA (2012) this species is not listed as a Declared Plant.

4.2 Desktop Assessment

The results of the combined search of the DEC's Flora of Conservation Significance databases (DEC, 2011a) revealed two DEC listings of Priority Flora; *Eutaxia nanophylla* (P3) and *Stylidium sejunctum* (P2), and one Threatened Flora; *Eucalyptus steedmanii* (T), within the Greater New Morning/Spotted Quoll area. BC were unable to locate the *Eutaxia nanophylla* (P3) DEC location. A total of three Threatened Flora and 47 Priority Flora species were listed within a 10km radius of the Greater New Morning/Spotted Quoll area. All except one of these Priority Flora species within a 10km radius have the potential to occur within the Greater New Morning/Spotted Quoll area, as they occur in similar habitats and vegetation communities to those identified within the Greater New Morning/Spotted Quoll area. Table 6 identifies the DEC listed Threatened/Priority Flora species potentially occurring within the Greater New Morning/Spotted Quoll area.

Table 6: Priority Flora with the potential to occur within the Greater New Morning/Spotted Quoll area (DEC, 2011a)

Species	Conservation Code	Description (WAHERB, 2012)
<i>Banksia sphaerocarpa</i> var. <i>dolichostyla</i>	T	Lignotuberous shrub, 1-3 m high. Fl. yellow-orange, Mar to May. Lateritic gravel, grey sand.
<i>Eucalyptus steedmanii</i>	T	Tree, 2-8(-12) m high, bark smooth. Fl. white, Jan to Mar. Gravelly loam over ironstone, sand. Low hills, undulating plains.
<i>Paragoodia crenulata</i>	T	No description available
<i>Acacia asepala</i>	2	Diffuse, much-branched shrub, 0.5-1.5 m high. Fl. yellow, Aug. Red-brown sandy loam. Undulating plains, along drainage lines.
<i>Acacia kerryana</i>	2	Low, spreading, domed shrub, 0.3-1 m high. Fl. yellow, Oct to Dec or Jan to Feb. Granitic loamy sand, stony clayey loam or clayey sand. Low stony ridges, undulating plains.

Species	Conservation Code	Description (WAHERB, 2012)
<i>Baeckea</i> sp. Crossroads (B.L. Rye & M.E. Trudgen 241186)	1	No description available
<i>Baeckea</i> sp. Lake Cronin (K.R. Newbey 9191)	1	Upright, spreading, moderately open shrub. Fl. white/pink, Oct. Well-drained gravelly sands. Moderately exposed, gently undulating plain.
<i>Baeckea</i> sp. North Ironcap (R.J. Cranfield 10580)	2	Erect, open shrub, to 0.4 m high. Fl. white/pink, Oct. Red clay. Gently undulating sandplains.
<i>Baeckea</i> sp. Parker Range (M. Hislop & F. Hort MH 2968)	3	Straggly, erect shrub, to 1.5 m high. Fl. pink, Jun. Yellow to orange sandy loam with laterite gravel. Gently undulating sandplains, low ridges, road verges.
<i>Boronia westringioides</i>	2	Erect shrub, 0.2-0.75 m high. Fl. pink, Jul to Sep. Loamy sand. Plains.
<i>Brachyloma nguba</i>	1	Erect, compact to spreading, mid-dense shrub, to 0.8 m high, leaves discolorous, usually 2-3 mm long; style 0.2-0.25 mm long; disc truncate. Fl. red, Apr to May. White to brown sandy clay, shallow sandy loam. Open mallee woodland, mallee scrub, flat plains.
<i>Calamphoreus inflatus</i>	4	Erect, spreading shrub, 0.4-1.6 m high, to 2 m wide. Fl. blue-purple/green, Oct to Dec or Feb to Mar. Clay loam with ironstone gravel. Flats, disturbed sites.
<i>Comesperma calcicola</i>	3	Soft perennial, herb, to 0.3 m high. Fl. pink, Oct to Dec or Jan. Calcareous or semi-saline clay loams, limestone. Areas around saline water.
<i>Conospermum sigmoideum</i>	2	Erect shrub, 0.2-0.5 m high. Fl. blue, Aug to Sep. Yellow sand.
<i>Cryptandra polyclada</i> subsp. <i>polyclada</i>	3	Mat-forming or upright shrub, 0.1-0.7 m high. Fl. white/cream, Jan to May or Aug or Oct. Sand. Sandplains.
<i>Dampiera scaevolina</i>	1	Erect to ascending perennial, herb or shrub, 0.2-0.5 m high. Fl. blue/white, Sep to Nov. Sandy & gravelly soils.
<i>Daviesia elongata</i> subsp. <i>implexa</i>	3	Spreading or sprawling shrub, 0.4-1 m high. Fl. yellow/orange & red, Sep. Sand & laterite.
<i>Elatine macrocalyx</i>	3	Prostrate, glabrous, mat-forming annual, herb, sepals 2-3mm long, fruit indehiscent. Fl. white, May to Oct (probably opportunistic). Shallow sands over clay. Margins of playa lakes and clay pans.
<i>Eremophila biserrata</i>	4	Prostrate shrub, to 3 m wide. Fl. green/yellow-green, Sep to Nov or Mar. Sandy or sandy clay soils. Alluvial flats, salt flats & lakes.
<i>Eremophila racemosa</i>	4	Erect shrub, 0.5-1.7 m high. Fl. purple-pink-red/white, Mar or Aug to Dec. Sandy or stony loam, clay loam. Undulating plains, roadsides.
<i>Eucalyptus exigua</i>	3	Mallee, 2-5 m high, bark smooth. Fl. white-cream, Mar. Sandy loam, white sand. Sandplains.
<i>Eucalyptus georgei</i> subsp. <i>fulgida</i>	4	Tree, 4-20 m high, bark smooth, often hanging in ribbons. Fl. cream-white. Sandy loam, clayey

Species	Conservation Code	Description (WAHERB, 2012)
		sand. Slight depressions.
<i>Eucalyptus myriadena</i> subsp. <i>parviflora</i>	1	Mallee or tree, 3-10 m high, bark rough, coarse & flaky on trunk, smooth above. Loam. Swamps, plains.
<i>Eutaxia acanthoclada</i>	3	Compact, mat-forming, prostrate shrub, to 0.3 m high. Fl. yellow/orange/red, Oct to Nov. Light brown sandy clay, shallow sandy loam, red clay over banded ironstone, gravel. Gently undulating plains.
<i>Eutaxia nanophylla</i>	3	Straggly, rounded shrub, to 0.35 m high. Fl. Yellow & orange & red, Oct to Nov. Clayey sand, red clay, stoney clayey loam. Low-lying areas, damp flats, slopes, undulating plains, low stony ridges.
<i>Eutaxia rubricarina</i>	3	Straggling shrub, to 0.5 m high. Fl. Orange & yellow & brown, Aug or Oct. Gravelly sand, grey to pinkish-white sandy clay, red loam. Flats, slopes, valley floors, road verges.
<i>Frankenia drummondii</i>	3	Prostrate shrub. Fl. white. Sand. Lake edges.
<i>Gnephosis intonsa</i>	1	Prostrate to ascending annual, herb, 0.01-0.04 m high. Fl. yellow-brown, Sep to Oct. Red/brown clay, stony saline loam.
<i>Grevillea insignis</i> subsp. <i>elliottii</i>	3	Erect, bushy, non-lignotuberous shrub, 1-2 m high. Fl. red/pink & cream & white, Oct. Gravelly sand or loam over ironstone. Hilltops or rises.
<i>Grevillea prostrata</i>	4	Loose, prostrate shrub, 0.04-0.1 m high, 0.8-1.2 m wide. Fl. cream-white/pink-red, Aug to Dec or Jan. White, grey or yellow sand, gravel. Sandplains.
<i>Guichenotia asteriskos</i>	2	Erect, compact shrub, ca 0.35 m high. Fl. white, Sep to Oct. Sandy clay or loam with gravel.
<i>Haegiela tatei</i>	4	Ascending to erect annual, herb, 0.02-0.08(-0.2) m high. Fl. white-yellow, Aug to Nov. Clay, sandy loam, gypsum. Saline habitats.
<i>Hibbertia pachyphylla</i>	3	Shrub, to 0.5 m high. Fl. yellow, Sep to Nov. White to yellow sand, brown sandy gravel, gravelly loam, laterite, granite, quartz. Undulating plains, low rises, valley floors.
<i>Isolepis australiensis</i>	3	Annual, grass-like or herb (sedge), 0.03-0.055 m high, glumes 0.8-1.2 mm long; stamens 1(-2); style branches 3; nut with abaxial angle acute. Fl. Jun or Sep. Silty sand, sandy clay. Lake margins, pools.
<i>Keraudrenia adenogyna</i>	3	Erect shrub, ca 0.4 m high. Fl. purple-blue, Sep. Heavy loamy clay, loamy gravelly soils. Low-lying area.
<i>Melaleuca macrorychia</i> subsp. <i>trygonoides</i>	3	Multi-stemmed, spreading shrub, 1-4 m high, leaves broadly elliptic. Fl. red, Feb or Jul to Aug or Oct. Sandy soils. Granite outcrops.
<i>Microcorys</i> sp. <i>Forrestania</i> (V. English 2004)	4	Prostrate or erect shrub, 0.35-0.4 m high. Fl. white/purple, Jan or Apr. Yellow sandy clay or red-brown clay. Open woodland or cleared areas.

Species	Conservation Code	Description (WAHERB, 2012)
<i>Olearia laciniifolia</i>	2	Erect, few-stemmed shrub, 0.6-1.2 m high. Fl. blue/purple & white/yellow, May to Sep. White sand. Around playa lakes.
<i>Pityrodia</i> sp. Yilgarn (A.P. Brown 2679)	3	No description available
<i>Pultenaea daena</i>	3	Dense, prostrate, domed shrub, to 0.07 m high. Fl. yellow, Mar. White to yellow sand or sandy loam, sandy or loamy clay, gravel, limestone, dolomite, laterite. Gently undulating plains, adjacent to salt lakes, in disturbed areas.
<i>Scaevola tortuosa</i>	1	Ascending perennial, herb, 0.1-0.2 m high. Fl. blue-purple/pink, Oct. Sandy clay. Margins of salt lakes.
<i>Stenanthemum liberum</i>	1	Dwarf shrub, ca 0.5 m high. Yellow sandy loam over laterite.
<i>Stylidium sejunctum</i>	2	Caespitose perennial, herb, 0.25-0.45 m high, Leaves tufted, linear to narrowly oblanceolate, 10-30 cm long, 0.8-4 mm wide, apex acute to mucronate, margin involute, glabrous to scabrous. Membraneous scale leaves present at base of mature leaves. Scape glandular throughout. Inflorescence paniculate. Fl. white/pink-purple, Sep to Nov. Clayey sand or loam, laterite. Outcrops, upper slopes, breakaways. Mallee and Allocasuarina shrubland.
<i>Verticordia gracilis</i>	3	Low, slender shrub, 0.15-0.6 m high. Fl. pink, Oct to Nov. Yellow sand, gravelly sand, sandy loam.
<i>Verticordia multiflora</i> subsp. <i>solox</i>	2	Erect to spreading shrub, 0.2-0.6 m high. Fl. yellow, Oct to Dec or Jan. Yellow sand over gravel, sand over granite.

4.3 Conservation Significant Flora Species

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012), was identified within the Greater New Morning/Spotted Quoll area. Three Priority Flora species, *Eremophila racemosa* (P4), *Microcorys* sp. Forresteria (V. English 2004) and *Stylidium sejunctum* (P2) were also identified within the Greater New Morning/Spotted Quoll area. A DEC location of *Eutaxia nanophylla* (P3) within the Greater New Morning/Spotted Quoll area was searched for however this species could not be located.

4.3.1 *Eucalyptus steedmanii* (T)

Eucalyptus steedmanii is listed as a Threatened Flora species pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act* (1950), section 179 of the *EPBC Act* 1999 and as listed by the DEC (Atkins, 2012). This species is described as a tree that grows to 2-8m high. It has smooth bark, and produces white flowers from January to March (WAHERB, 2012). It grows in gravelly loam over ironstone and sand, and it can be found on low hills and undulating plains. The populations identified during the survey are previously recorded populations/DEC known locations referred to as Population 1, 3, 7 and 8. This species was recorded in eight vegetation communities: Low woodland of *E. flocktoniae*/*E. salubris*/*E. urna* over low scrub of mixed *Acacia* and *Melaleuca*; Open shrub mallee of *E. celastroides*/*E. cylindrocarpa*/*E. eremophila* over low scrub of mixed *Acacia* and *Melaleuca*; Mallee of *E. eremophila*/*E. steedmanii* over mixed dwarf scrub; Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub; Open tree mallee of *E. eremophila* over scrub of *Melaleuca hamata* on stony rise; Burnt open low woodland of *E. salmonophloia* over shrub mallee of *E. cylindrocarpa*/*E. pileata* and mixed low heath; Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca*; and Low woodland of *E. salmonophloia* over low scrub of mixed *Melaleuca*.



Plate 1: Image of *Eucalyptus steedmanii*

4.3.2 *Eremophila racemosa* (P4)

This species is described as an erect shrub that grows up to 0.5-1.7m high. It produces purple-pink-red/white flowers in March or August to December. It grows in sandy or stony loam, clay loam, and can be found on undulating plains and roadsides (WAHERB, 2012). This species was recorded in three vegetation communities: Low woodland of *E. flocktoniae*/*E. salubris*/*E. urna* over low scrub of mixed *Acacia* and *Melaleuca*; Open shrub mallee of *E. celastroides*/*E. cylindrocarpa*/*E. eremophila* over low scrub of mixed *Acacia* and *Melaleuca*; and Low woodland of *E. salmonophloia* over low scrub of mixed *Melaleuca*. There were no DEC known locations of this species within the Greater New Morning/Spotted Quoll area. GPS locations of this species are provided in Appendix 6.



Plate 2: Image of *Eremophila racemosa* (P4)

4.3.3 *Microcorys* sp. *Forrestania* (V. English 2004) (P4)

This species is described as a prostrate or erect shrub that grows up to 0.35-0.4m high. It produces white/purple flowers in January or April. It grows in yellow sandy clay or red-brown clay, and it can be found in open woodland or cleared areas (WAHERB, 2012). This species was recorded in six vegetation communities: Low woodland of *E. flocktoniae*/*E. salubris*/*E. urna* over low scrub of mixed *Acacia* and *Melaleuca*; Open shrub mallee of *E. celastroides*/*E. cylindrocarpa*/*E. eremophila* over low scrub of mixed *Acacia* and *Melaleuca*; Low woodland of *E. salmonophloia* over low scrub of mixed *Melaleuca*; Mallee of *E. eremophila*/*E. steedmanii* over mixed dwarf scrub; Open tree mallee of *E. eremophila* over scrub of *Melaleuca hamata* on stony rise; and Burnt open low woodland of *E. salmonophloia* over shrub mallee of *E. cylindrocarpa*/*E. pileata* and mixed low heath. There were no DEC known locations of this species within the Greater New Morning/ Spotted Quoll area. GPS locations of this species are provided in Appendix 6.



Plate 3: Image taken of *Microcorys* sp. *Forrestania* (V. English 2004) (P4)

4.3.4 *Stylidium sejunctum* (P2)

This species is described as a caespitose perennial herb that reaches heights of 0.25–0.45 metres. The 10–30 mm long and 0.8–4 mm wide leaves are tufted, linear to narrowly oblanceolate, apex acute to mucronate, margin involute and glabrous to scabrous. This species has membranous scale leaves present at base of the mature leaves. The flowers are white, pink and purple and bloom from September through November. It inhabits sites with clayey sand, loam or laterite on outcrops, upper slopes and breakaways (WAHERB, 2012). This species was recorded in four vegetation communities: Open shrub mallee of *E. celastroides*/*E. cylindrocarpa*/*E. eremophila* over low scrub of mixed *Acacia* and *Melaleuca*; Low woodland of *E. salmonophloia* over low scrub of mixed *Melaleuca*; Low woodland of *E. calycogona*/*E. pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop; and Low woodland of *E. flocktoniae*/*E. salubris*/*E. urna* over low scrub of mixed *Acacia* and *Melaleuca*. There were two DEC known locations of this species within the Greater New Morning/ Spotted Quoll area both of which were confirmed by BC. BC also identified and additional two locations of this species. GPS locations of this species are provided in Appendix 6.



Plate 4: Image of *Stylidium sejunctum* (P2)

4.4 Conservation Significant Fauna Species

An active malleefowl mound was identified within the Greater New Morning/ Spotted Quoll area which was first identified by BC in 2010 (BC, 2010). Malleefowl are listed as vulnerable under the *EPBC Act 1999*. This malleefowl mound was identified within the Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise vegetation community (Plate 5).



Plate 5: Image of an active malleefowl mound identified within the survey area (BC, 2010)

4.5 Vegetation Communities

A total of eleven broad vegetation communities and one sub-community were identified within the Greater New Morning/Spotted Quoll area. These included:

1. Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca*;
2. Open shrub mallee of *Eucalyptus celastroides*/*Eucalyptus cylindrocarpa*/*Eucalyptus eremophila* over low scrub of mixed *Acacia* and *Melaleuca*;
3. Low woodland of *Eucalyptus salmonophloia* over low scrub of mixed *Melaleuca*;
4. Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca*;
5. Low woodland of *Eucalyptus calycogona*/*Eucalyptus pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop;
6. Mallee of *Eucalyptus eremophila*/*Eucalyptus steedmanii* over mixed dwarf scrub;
7. Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub;
8. Low scrub of mixed *Allocasuarina* over mixed dwarf scrub;
9. Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise;
10. Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath (including sub-community Heath of *Melaleuca hamata*); and
11. Forest of *Eucalyptus urna* over low scrub of *Melaleuca pauperiflora* subsp. *pauperiflora*.

These vegetation communities were represented by a total of 29 Families, 74 Genera and 198 Species (including subspecies and variants). A map showing the vegetation communities present in the survey area is located in Appendix 3.

Table 7: Summary of Vegetation Communities and their areas

Vegetation Community	Area (ha)
Low woodland of <i>Eucalyptus flocktoniae</i> / <i>Eucalyptus salubris</i> / <i>Eucalyptus urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	372
Open shrub mallee of <i>Eucalyptus celastroides</i> / <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	101
Low woodland of <i>Eucalyptus salmonophloia</i> over low scrub of mixed <i>Melaleuca</i>	147
Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	60
Low woodland of <i>Eucalyptus calycogona</i> / <i>Eucalyptus pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop	1
Mallee of <i>Eucalyptus eremophila</i> / <i>Eucalyptus steedmanii</i> over mixed dwarf scrub	167
Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	18
Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	5.5
Open tree mallee of <i>Eucalyptus eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	49
Burnt open low woodland of <i>Eucalyptus salmonophloia</i> over shrub mallee of <i>Eucalyptus cylindrocarpa</i> / <i>Eucalyptus pileata</i> and mixed low heath	67
Forest of <i>Eucalyptus urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>	0.5
sub-community Heath of <i>Melaleuca hamata</i>	3
Total	991

4.6 Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca*

4.6.1 Flora

Flora recorded in this vegetation community was represented by 18 Families, 32 Genera and 83 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) was identified within this vegetation community. Three Priority Flora species, *Eremophila racemosa* (P4), *Microcorys* sp. Forresteria (V. English 2004) (P4) and *Stylidium sejunctum* (P2) were identified within this vegetation community. No introduced species were identified within this vegetation community.

4.6.2 Vegetation

The flora recorded in this vegetation community was representative of Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca* (Plate 5). The upper story species included *Eucalyptus cylindrocarpa*, *Eucalyptus calycogona*, *Eucalyptus eremophila* subsp. *eremophila*, *Eucalyptus flocktoniae*, *Eucalyptus gracilis*, *Eucalyptus kondininensis*,

Eucalyptus melanoxydon, *Eucalyptus polita*, *Eucalyptus salmonophloia* and *Eucalyptus urna*. The mid-storey species included *Allocasuarina campestris*, *Callitris preissii*, *Acacia hemiteles*, *Daviesia benthamii*, *Senna artemisioides* subsp. *filifolia*, *Melaleuca adnata*, *Melaleuca pauperiflora* subsp. *fastigiata*, *Grevillea acuaria*, *Hakea commutata* and *Dodonaea stenozyga*. The understorey species included *Bulbine semibarbata*, *Angianthus tomentosus*, *Calotis hispidula*, *Olearia pimeleoides*, *Atriplex stipitata*, *Maireana oppositifolia*, *Sclerolaena diacantha*, *Wilsonia humilis*, *Acacia deficiens* and *Gompholobium gompholobioides*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 8. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 8: Vegetation assemblage for Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Trees 5-15m	10-30%	<i>Eucalyptus flocktoniae</i> <i>Eucalyptus urna</i> <i>Eucalyptus salubris</i>
Shrub 1.5-2m	10-30%	<i>Melaleuca adnata</i> <i>Grevillea obliquistigma</i>
Shrub 0.5-1m	10-30%	<i>Acacia eremophila</i> <i>Eremophila densiflora</i> <i>Melaleuca cardiophylla</i>
Shrub < 0.5m	10-30%	<i>Microcybe multiflora</i> <i>Dodonaea stenozyga</i> <i>Wilsonia humilis</i> <i>Acacia intricata</i>
Sedges >0.5m	2-10%	<i>Lepidosperma</i> sp. A2 Inland Flat (G. J. Keighery 7000)

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the *Eucalyptus* woodlands vegetation community which, according to the ANRA, covers 3.5% of WA (ANRA, 2012).



Plate 6: Image of Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca*

4.7 Open shrub mallee of *Eucalyptus celastroides*/*Eucalyptus cylindrocarpa*/*Eucalyptus eremophila* over low scrub of mixed *Acacia* and *Melaleuca*

4.7.1 Flora

Flora recorded in this vegetation community was represented by 21 Families, 39 Genera and 98 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) was identified within this vegetation community. Three Priority Flora species, *Eremophila racemosa* (P4), *Microcorys* sp. Forresteria (V. English 2004) (P4) and *Stylidium sejunctum* (P2) were identified within this vegetation community. No introduced species were identified within this vegetation community.

4.7.2 Vegetation

The flora recorded in this vegetation community was representative of Open shrub mallee of *Eucalyptus celastroides*/*Eucalyptus cylindrocarpa*/*Eucalyptus eremophila* over low scrub of mixed *Acacia* and *Melaleuca* (Plate 7). The upper story species included *Eucalyptus cylindrocarpa*, *Eucalyptus eremophila* subsp. *eremophila*, *Eucalyptus kondininensis*, *Eucalyptus horistes*, *Eucalyptus pileata*, *Eucalyptus salmonophloia* and *Eucalyptus urna*. The mid-storey species included *Allocasuarina acutivalvis*, *Allocasuarina corniculata*, *Callitris preissii*, *Leucopogon cuneifolius*, *Acacia coolgardiensis*,

Acacia steedmanii, *Daviesia nematophylla*, *Gastrolobium spinosum*, *Baeckea crispiflora*, *Melaleuca adnata* and *Melaleuca eleuterostachya*. The understorey species included *Westringia cephalantha* var. *caterva*, *Grevillea huegelii*, *Boronia inornata* subsp. *leptophylla*, *Phebalium ambiguum*, *Olearia muelleri*, *Sclerolaena uniflora*, *Wilsonia humilis*, *Lepidosperma* sp. A2 Inland Flat (G.J. Keighery 7000), *Acacia erinacea* and *Phebalium ambiguum*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 9. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 9: Vegetation assemblage for Open shrub mallee of *Eucalyptus celastroides*/*Eucalyptus cylindrocarpa*/*Eucalyptus eremophila* over low scrub of mixed *Acacia* and *Melaleuca* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Mallee Tree Form	10-30%	<i>Eucalyptus eremophila</i> subsp. <i>eremophila</i> <i>Eucalyptus celastroides</i> <i>Eucalyptus cylindrocarpa</i>
Shrubs 1.5-2m	10-30%	<i>Acacia coolgardiensis</i> <i>Melaleuca hamata</i> <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Shrub 0.5-1m	10-30%	<i>Melaleuca lateriflora</i> <i>Acacia hemiteles</i> <i>Melaleuca cordata</i> <i>Melaleuca cucullata</i>
Shrub 0-0.5m	10-30%	<i>Dodonaea bursariifolia</i> , <i>Phebalium tuberosum</i> <i>Grevillea acuaria</i> <i>Westringia cephalantha</i> var. <i>caterva</i> <i>Baeckea crispiflora</i>
Sedges >0.5m	2-10%	<i>Lepidosperma</i> sp. A2 Inland Flat (G. J. Keighery 7000)

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the Mallee woodlands and shrublands vegetation community which, according to the ANRA, covers 2% of WA (ANRA, 2012).



Plate 7: Image of Open shrub mallee of *Eucalyptus celastroides*/*Eucalyptus cylindrocarpa*/*Eucalyptus eremophila* over low scrub of mixed *Acacia* and *Melaleuca*

4.8 Low woodland of *Eucalyptus salmonophloia* over low scrub of mixed *Melaleuca*

4.8.1 Flora

Flora recorded in this vegetation community was represented by 19 Families, 30 Genera and 58 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) was identified within this vegetation community. Three Priority Flora species, *Eremophila racemosa* (P4), *Microcorys* sp. Forrestania (V. English 2004) (P4) and *Stylidium sejunctum* (P2) were identified within this vegetation community. No introduced species were identified within this vegetation community.

4.8.2 Vegetation

The flora recorded in this vegetation community was representative of Low woodland of *Eucalyptus salmonophloia* over low scrub of mixed *Melaleuca* (Plate 7). The upper storey species included *Eucalyptus protensa*, *Eucalyptus flocktoniae*, *Eucalyptus salmonophloia* and *Eucalyptus salubris*. The mid-storey species included *Acacia merrallii*, *Daviesia benthamii*, *Melaleuca adnata*, *Melaleuca teuthidoides*, *Grevillea acuaria*, *Phebalium tuberculosum*, *Santalum acuminatum*, *Dodonaea stenozyga* and *Eremophila densifolia*. The understorey species included *Gompholobium gompholobioides*, *Acacia intricata*, *Acacia deficiens*, *Lepidosperma* sp. A2 Inland Flat (G. J. Keighery 7000), *Sclerolaena uniflora*, *Dianella revoluta* and *Westringia rigida*. Dominant species from the vegetation assemblage, according

to Muir (1977), are shown in Table 10. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 10: Vegetation assemblage for Low woodland of *Eucalyptus salmonophloia* over low scrub of mixed *Melaleuca* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5m-15m	10-30%	<i>Eucalyptus salubris</i> <i>Eucalyptus salmonophloia</i>
Shrub 1.5-2m	10-30%	<i>Exocarpos aphyllus</i> <i>Melaleuca adnata</i> <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Shrub 0.5-1m	10-30%	<i>Acacia merrallii</i> <i>Acacia sphacelata</i> subsp. <i>sphacelata</i> <i>Daviesia benthamii</i> <i>Eremophila decipiens</i> subsp. <i>decipiens</i> <i>Grevillea acuaria</i>
Shrub 0-0.5m	10-30%	<i>Acacia deficiens</i> <i>Acacia intricata</i> <i>Cooperhooikia strophilata</i> <i>Dodonaea stenozyga</i> <i>Phebalium tuberculatum</i> <i>Wilsonia humilis</i>
Sedges >0.5m	2-10%	<i>Lepidosperma</i> sp. A2 Inland Flat (G. J. Keighery 7000)

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the Eucalyptus woodlands vegetation community which, according to the ANRA, covers 3.5% of WA (ANRA, 2012).



Plate 8: Image of Low woodland of *Eucalyptus salmonophloia* over low scrub of mixed *Melaleuca*

4.9 Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca*

4.9.1 Flora

Flora recorded in this vegetation community was represented by 18 Families, 43 Genera and 96 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) was identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were identified within this vegetation community.

4.9.2 Vegetation

The flora recorded in this vegetation community was representative of Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca* (Plate 9). The species in the upper storey included *Eucalyptus eremophila* subsp. *eremophila*, *Allocasuarina acutivalvis*, *Allocasuarina corniculata*, *Callitris preissii*, *Acacia coolgardiensis*, *Acacia enervia*, *Acacia hemiteles*, *Gastrolobium spinosum*, *Scaevola spinescens*, *Melaleuca cordata* and *Melaleuca thyoides*. The understorey species included *Acacia deficiens*, *Dianella revoluta*, *Westringia cephalantha* var. *caterva*, *Verticordia plumosa*, *Phebalium ambiguum* and *Pimelea aeruginosa*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 11. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 11: Vegetation assemblage for Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Shrub >2m	30-70%	<i>Allocasuarina acutivalvis</i>
Shrubs 1.5-2m	30-70%	<i>Allocasuarina corniculata</i> <i>Acacia fragilis</i> <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> <i>Melaleuca hamata</i> <i>Leptospermum erubescens</i>
Shrub 0.5-1m	30-70%	<i>Melaleuca uncinata</i> <i>Thryptomene kochii</i> <i>Banksia cirsioides</i>
Shrub 0-0.5m	30-70% 10-30%	<i>Acacia sphacelata</i> subsp. <i>sphacelata</i> <i>Leptosema daviesioides</i> <i>Verticordia chrysanthella</i> <i>Darwinia inconspicua</i> <i>Westringia cephalantha</i> var. <i>caterva</i> <i>Hibbertia gracilipes</i>
Sedges >0.5m	10-30%	<i>Lepidosperma</i> sp. A2 Inland Flat (G. J. Keighery 7000) <i>Lepidosperma drummondii</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the Heath vegetation community which, according to the ANRA, covers 0.7% of WA (ANRA, 2012).



Plate 9: Image of Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca*

4.10 Low woodland of *Eucalyptus calycogona*/*Eucalyptus pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop

4.10.1 Flora

Flora recorded in this vegetation community was represented by 12 Families, 14 Genera and 18 Species (Appendix 4).

No Threatened Flora species pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act* (1950), section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) were identified within this vegetation community. One Priority Flora species, *Stylidium sejunctum* (P2) was identified within this vegetation community. No introduced species were identified within this vegetation community.

4.10.2 Vegetation

The flora recorded in this vegetation community was representative of Low woodland of *Eucalyptus calycogona*/*Eucalyptus pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop (Plate 10). The upper storey was comprised of *Eucalyptus calycogona* and *Eucalyptus pileata*. The mid-storey species included *Allocasuarina campestris*, *Hibbertia pungens*, *Acacia hemiteles*, *Acacia steedmanii*, *Senna artemisioides* subsp. *filifolia*, *Melaleuca hamata*, *Hakea subsulcata* and *Hybanthus floribundus* subsp. *curvifolius*.

The understorey species included *Atriplex stipitata*, *Gahnia ancistrophylla*, *Acacia intricata* and *Dampiera angulata*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 12. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 12: Vegetation assemblage for Low woodland of *Eucalyptus calycogona*/*Eucalyptus pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Trees 5-15m	10-30%	<i>Eucalyptus calycogona</i> <i>Eucalyptus pileata</i>
Shrubs 1-1.5m	10-30%	<i>Melaleuca hamata</i> <i>Hakea subsulcata</i> <i>Acacia hemiteles</i>
Shrub 0-0.5m	10-30%	<i>Atriplex stipitata</i> <i>Hibbertia pungens</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the *Eucalyptus* woodlands vegetation community which, according to the ANRA, covers 3.5% of WA (ANRA, 2012).



Plate 10: Image of Low woodland of *Eucalyptus calycogona*/*Eucalyptus pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop

4.11 Mallee of *Eucalyptus eremophila*/*Eucalyptus steedmanii* (T) over mixed dwarf scrub

4.11.1 Flora

Flora recorded in this vegetation community was represented by 15 Families, 25 Genera and 49 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) was identified within this vegetation community. One Priority Flora species, *Microcorys* sp. Forresteria (V. English 2004) (P4), was identified within this vegetation community. No introduced species were identified within this vegetation community.

4.11.2 Vegetation

The flora recorded in this vegetation community was representative of Mallee of *Eucalyptus eremophila*/*Eucalyptus steedmanii* (T) over mixed dwarf scrub (Plate 11). The upper storey species was comprised included *Eucalyptus polita*, *Eucalyptus steedmanii* (T), *Eucalyptus salmonophloia*, *Eucalyptus salubris*, *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus eremophila* subsp. *eremophila*. The mid-storey species included *Allocasuarina corniculata*, *Hibbertia pungens*, *Eremophila drummondii*, *Dodonaea stenozyga*, *Santalum acuminatum*, *Phebalium filifolium*, *Hakea multilineata*, *Grevillea acuaria*, *Melaleuca eleuterostachya* and *Melaleuca urceolaris*. The understorey species

included *Olearia muelleri*, *Wilsonia humilis*, *Lepidosperma drummondii*, *Acacia deficiens*, *Acacia poliochroa*, *Gompholobium gompholobioides* and *Boronia inornata* subsp. *inornata*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 13. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 13: Vegetation assemblage for Mallee of *Eucalyptus eremophila*/*Eucalyptus steedmanii* over mixed dwarf scrub within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Mallee Tree Form	30-70%	<i>Eucalyptus eremophila</i> subsp. <i>eremophila</i> <i>Eucalyptus steedmanii</i> (T)
Shrubs 0.5-1.0 m	10-30%	<i>Melaleuca eleuterostachya</i> <i>Eremophila drummondii</i> <i>Dodonaea stenozyga</i>
Shrubs 0.5-1.0 m	2-10%	<i>Exocarpos aphyllus</i> <i>Olearia muelleri</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the Mallee woodlands and shrublands vegetation community which, according to the ANRA, covers 2% of WA (ANRA, 2012).



Plate 11: Image of Mallee of *Eucalyptus eremophila*/*Eucalyptus steedmanii* over mixed dwarf scrub

4.12 Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub

4.12.1 Flora

Flora recorded in this vegetation community was represented by 12 Families, 18 Genera and 26 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act* (1950), section 179 of the *EPBC Act* 1999 and as listed by the DEC (Atkins, 2012) was identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were identified within this vegetation community.

4.12.2 Vegetation

The flora recorded in this vegetation community was representative of Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub (Plate 12). The upper storey species included *Allocasuarina campestris*, *Acacia steedmanii* subsp. *steedmanii*, *Allocasuarina corniculata*, *Callitris preissii*, *Melaleuca hamata*, *Leucopogon cuneifolius*, *Acacia coolgardiensis*, *Baeckea crispiflora*, *Melaleuca eleuterostachya*, *Melaleuca laxiflora*, *Grevillea decipiens* and *Hakea multilineata*. The understorey species included *Drosera andersoniana*, *Isopogon axillaris*, *Cryptandra minutifolia* subsp. *minutifolia* and *Persoonia coriacea*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 14. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 14: Vegetation assemblage for Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Shrubs 1.5- 2m	30-70%	<i>Acacia steedmanii</i> subsp. <i>steedmanii</i> <i>Melaleuca hamata</i>
Shrubs 0.5-1.5	10-30%	<i>Baeckea crispiflora</i> <i>Isopogon axillaris</i> <i>Melaleuca uncinata</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the Heath vegetation community which, according to the ANRA, covers 0.7% of WA (ANRA, 2012).



Plate 12: Image of Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub

4.13 Low scrub of mixed *Allocasuarina* over mixed dwarf scrub

4.13.1 Flora

Flora recorded in this vegetation community was represented by 9 Families, 20 Genera and 32 Species (Appendix 4).

No Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act* (1950), section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were identified within this vegetation community.

4.13.2 Vegetation

The flora recorded in this vegetation community was representative of Low scrub of mixed *Allocasuarina* over mixed dwarf scrub (Plate 13). The upper storey was comprised of *Eucalyptus eremophila* subsp. *eremophila* and *Eucalyptus horistes*. The mid-storey species included *Allocasuarina acutivalvis*, *Allocasuarina campestris*, *Callitris preissii*, *Grevillea eriostachya*, *Acacia fragilis*, *Acacia steedmanii*, *Gastrolobium spinosum*, *Melaleuca cordata*, *Persoonia coriacea* and *Santalum acuminatum*. The understorey species included *Lepidosperma drummondii*, *Melaleuca laxiflora*, *Conospermum brownii*, *Grevillea huegelii* and *Boronia inornata* subsp. *inornata*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 15. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 15: Vegetation assemblage for Low scrub of mixed *Allocasuarina* over mixed dwarf scrub within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Shrubs 1.5-2m	30-70%	<i>Allocasuarina campestris</i> <i>Allocasuarina corniculata</i>
Shrubs 0.5-1m	30-70% 10-30%	<i>Acacia fragilis</i> <i>Thryptomene kochii</i> <i>Baeckea crispiflora</i> <i>Acacia steedmanii</i>
Shrubs 0-0.5m	10-30%	<i>Melaleuca laxiflora</i> <i>Conospermum brownii</i>
Sedges >0.5m	2-10%	<i>Lepidosperma drummondii</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the Other Shrublands vegetation community which, according to the ANRA, covers 1.7% of WA (ANRA, 2012).



Plate 13: Image of Low scrub of mixed *Allocasuarina* over mixed dwarf scrub

4.14 Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise

4.14.1 Flora

Flora recorded in this vegetation community was represented by 13 Families, 23 Genera and 39 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii*, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) were identified within this vegetation community. This vegetation community also contained an active malleefowl mound which was first identified by BC in 2010 (BC, 2010). Malleefowl are listed as vulnerable under the *EPBC Act 1999*. One Priority Flora species, *Microcorys* sp. Forresteria (V. English 2004) (P4) was identified within this vegetation community. One introduced species, *Dittrichia graveolens*, was identified within this vegetation community. According to the DAFWA (2012) this species is not listed as a Declared Plant.

4.14.2 Vegetation

The flora recorded in this vegetation community was representative of Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise (Plate 14). The upper storey species included *Eucalyptus celastroides*, *Eucalyptus pluricaulis* subsp. *pluricaulis* and *Eucalyptus eremophila* subsp. *eremophila*. The mid-storey species included *Melaleuca hamata*, *Exocarpos aphyllus*, *Dodonaea bursariifolia*, *Melaleuca adnata*, *Hakea scoparia*, *Allocasuarina corniculata*, *Santalum acuminatum* and *Melaleuca pauperiflora* subsp. *pauperiflora*. The understorey species included *Olearia muelleri*, *Grevillea acuaria*, *Westringia cephalantha* var. *caterva*, *Daviesia benthamii* subsp. *acanthoclada*, *Acacia intricata*, *Phebalium filifolium*, *Beyeria brevifolia* and *Acacia deficiens*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 16. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 16: Vegetation assemblage for Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Mallee Tree Form	10-30%	<i>Eucalyptus eremophila</i> subsp. <i>eremophila</i>
Shrubs >2 m	2-10%	<i>Melaleuca hamata</i>
Shrubs 1.0 – 1.5 m	2-10%	<i>Dodonaea bursariifolia</i> <i>Acacia deficiens</i> <i>Westringia cephalantha</i> var. <i>caterva</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the Mallee woodlands and shrublands vegetation community which, according to the ANRA, covers 2% of WA (ANRA, 2012).



Plate 14: Image of Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise

4.15 Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath

4.15.1 Flora

Flora recorded in this vegetation community was represented by 12 Families, 15 Genera and 42 Species (Appendix 4).

One Threatened Flora species, *Eucalyptus steedmanii*, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) were identified within this vegetation community. One Priority Flora species, *Microcorys* sp. Forresteria (V. English 2004) (P4) was identified within this vegetation community. No introduced species were identified within this vegetation community.

4.15.2 Vegetation

The flora recorded in this vegetation community was representative of Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath (Plate 15). The upper storey comprised of *Eucalyptus salmonophloia* in low densities which have been disturbed by fire. The mid-storey included a variety of Mallees including *Eucalyptus polita*, *Eucalyptus cylindrocarpa*, *Eucalyptus transcontinentalis*, *Eucalyptus urna* and *Eucalyptus goniocarpa*.

The understorey included *Eremophila drummondii*, *Templetonia sulcata*, *Dodonaea stenozyga*, *Acacia hemiteles*, *Melaleuca pauperiflora* subsp. *pauperiflora*, *Acacia deficiens*, *Acacia erinacea*, *Lepidosperma* sp. A2 Inland Flat (G. J. Keighery 7000), *Acacia intricata*, *Westringia cephalantha* var. *caterva*, *Acacia merrallii*, *Grevillea acuaria*, *Wilsonia humilis* and *Olearia muelleri*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 17. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 17: Vegetation assemblage for Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	2-10%	<i>Eucalyptus salmonophloia</i>
Mallee Shrub Form	30-70%	<i>Eucalyptus polita</i> <i>Eucalyptus cylindrocarpa</i>
Shrub 1.5-2m	10-30%	<i>Eremophila drummondii</i> <i>Templetonia sulcata</i> <i>Dodonaea stenozyga</i> <i>Acacia hemiteles</i> <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Shrub 0-0.5m	30-70%	<i>Acacia deficiens</i> <i>Acacia erinacea</i> <i>Acacia intricata</i> <i>Acacia merrallii</i> <i>Grevillea acuaria</i> <i>Wilsonia humilis</i> <i>Olearia muelleri</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the *Eucalyptus* woodlands vegetation community which, according to the ANRA, covers 3.5% of WA (ANRA, 2012).



Plate 15: Image of Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath

This vegetation community also contained a sub-community; heath of *Melaleuca hamata* comprised entire of *Melaleuca hamata* (Plate 16).



Plate 16: Heath of *Melaleuca hamata* sub-community within the Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath

4.16 Forest of *Eucalyptus urna* over low scrub of *Melaleuca pauperiflora* subsp. *pauperiflora*

4.16.1 Flora

Flora recorded in this vegetation community was represented by 3 Families, 5 Genera and 6 Species (Appendix 4).

No Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were identified within this vegetation community.

4.16.2 Vegetation

The flora recorded in this vegetation community was representative of Forest of *Eucalyptus urna* over low scrub of *Melaleuca pauperiflora* subsp. *pauperiflora* (Plate 17). The upper story species was comprised of *Eucalyptus urna*. The mid-storey species included *Melaleuca pauperiflora* subsp. *pauperiflora*, *Melaleuca pauperiflora* subsp. *fastigiata*, *Exocarpos aphyllus* and *Santalum acuminatum*. The understorey species comprised of *Acacia deficiens*. Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 18. The Muir Life Form and Height Class sheet is located in Appendix 7.

Table 18: Vegetation assemblage Forest of *Eucalyptus urna* over low scrub of *Melaleuca pauperiflora* subsp. *pauperiflora* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	30-70%	<i>Eucalyptus urna</i>
Shrub 1-1.5m	30-70%	<i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Shrub 0-0.5m	2-10%	<i>Acacia deficiens</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area.

This vegetation community is best represented by the *Eucalyptus* open forests vegetation community which, according to the ANRA, covers 0.8% of WA (ANRA, 2012).



Plate 17: Image of Forest of *Eucalyptus urna* over low scrub of *Melaleuca pauperiflora* subsp. *pauperiflora*

4.17 Vegetation of Conservation Significance

Approximately 215ha of the north-east corner of Greater New Morning/Spotted Quoll area lies within the Lake Cronin ESA and is located approximately 5km south-west of the Lake Cronin 'A' Class Nature Reserve. A description of the Lake Cronin Region according to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) and the EPA is provided below;

Lake Cronin is a semi-permanent freshwater lake located in the south western region of the Eastern Goldfields and is the largest freshwater lake in the region. The Lake Cronin area is one of a number of areas in the Wheatbelt region that are significant for rare species, due to widespread clearing in the surrounding landscape, and to the high diversity and level of local endemism. The Lake Cronin area supports extensive shrubland, sandplain and woodland environments, including excellent representation of a range of vegetation types that are now extensively cleared in the Wheatbelt and supports a high number of species that are disjunct. Disjunct populations are those that have become physically separated, resulting in minimal or no gene flow between them, and they are an important precursor to the development of new species. A number of species in Australia have separate eastern and western populations, and some have formed sub-species, reflecting important broader long-term processes such as sea level changes and climatic fluctuations. It also supports a number of species reaching the limit of their distribution range. The number of species at the edge of their range reflects the convergence in the area of the Avon, Mallee and Coolgardie Biogeographic regions.

According to the EPA (2009) *Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region*, an area of 56,750ha within the mineralised greenstone belt in the Lake Cronin Region (encompassing the entire Greater New Morning/Spotted Quoll area) is proposed to be managed under Section 33(2) of the *CALM Act 1984* but not formally reserved. A proposed 'C' Class Nature Reserve is also proposed in the surrounding area to protect the Lake Cronin catchment and areas of extensive sandplain and woodland vegetation located immediately east of the Wheatbelt, which represents vegetation communities and fauna habitats that have been extensively cleared and fragmented in the adjacent Wheatbelt. Lake Cronin is not formally protected under the Commonwealth *EPBC Act 1999*.

The Greater New Morning/Spotted Quoll area lies within the Great Western Woodlands, an area recognised as the largest remaining area of intact Mediterranean-climate on Earth, and for its natural and cultural values and its natural resource-related productivity (DEC, 2010a). It is also located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Eight of the eleven vegetation communities identified within the Greater New Morning/Spotted Quoll area have National Environmental Significance as defined by the *EPBC Act 1999* as they contain the Threatened Flora species *Eucalyptus steedmanii*, which is listed as vulnerable under Section 179 of the *EPBC Act 1999*. These eight vegetation communities are:

1. Low woodland of *E. flocktoniae*/*E. salubris*/*E. urna* over low scrub of mixed *Acacia* and *Melaleuca*;
2. Open shrub mallee of *E. celastroides*/*E. cylindrocarpa*/*E. eremophila* over low scrub of mixed *Acacia* and *Melaleuca*;
3. Mallee of *E. eremophila*/*E. steedmanii* over mixed dwarf scrub;
4. Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub;
5. Open tree mallee of *E. eremophila* over scrub of *Melaleuca hamata* on stony rise;
6. Burnt open low woodland of *E. salmonophloia* over shrub mallee of *E. cylindrocarpa*/*E. pileata* and mixed low heath;
7. Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca*; and
8. Low woodland of *E. salmonophloia* over low scrub of mixed *Melaleuca*.

Within a 50m radius of each Threatened Flora plant is protected as an ESA under Regulation 6 of the *Environmental Protection (Clearing of Native Vegetation) Regulations WA 2004*. One vegetation community; Open tree mallee of *E. eremophila* over scrub of *Melaleuca hamata* on stony rise, also contained an active malleefowl mound. Malleefowl are listed as vulnerable under the *EPBC Act 1999*. The GPS coordinates of this mound are provided in Appendix 6.

There were no TECs listed under Commonwealth legislation or as defined by the DEC located within the Greater New Morning/Spotted Quoll area (DEC 2011b; DSEWPaC, 2012). However, the entire Greater New Morning/Spotted Quoll area is located within both the North Ironcap and Middle Ironcap region of the *Ironcap Hills Vegetation complexes* which is a Priority 3 Ecological Community (DEC, 2011b). The North Ironcap BIF located approximately 10km north-west region of the Greater New Morning/Spotted Quoll area is proposed to be reserved in a small 'A' Class Nature Reserve, covering an area of 42.5ha. Results of a flora and vegetation survey conducted by BC within the Greater Northern Ironcap area (BC, 2012a) identified six vegetation communities within the proposed 'A' Class Nature Reserve:

1. Shrub mallee of *Eucalyptus eremophila* and *E. urna* over heath of *Daviesia nematophylla* & *Melaleuca adnata*;
2. Heath of *Allocasuarina campestris*/*Melaleuca hamata*/*Acacia eremophila* over dwarf scrub of *Borya constricta*;
3. Scrub of *Allocasuarina huegeliana* over heath of *Acacia multispicata*/*Acacia lasiocalyx* and dwarf scrub of *Borya constricta*/*Leptospermum erubescens*;
4. Low woodland of *E. salmonophloia* over open tree mallee of *E. cylindrocarpa*/*E. cylindriflora*/*E. pileata*;
5. Open tree mallee of *Eucalyptus livida* over heath of *Acacia steedmanii*/*Allocasuarina campestris* and low heath of *Phebalium ambiguum*/*Acacia sulcata* on rock outcrop; and
6. Open tree mallee of *E. polita*/*E. salubris* over scrub of *Melaleuca pauperiflora* subsp. *pauperiflora* and heath of *Melaleuca adnata*/*Melaleuca lateriflora*.

The majority of the proposed 'A' Class Nature Reserve (approximately 60%) comprised of the Open tree mallee of *Eucalyptus livida* over heath of *Acacia steedmanii*/*Allocasuarina campestris* and low heath of *Phebalium ambiguum*/*Acacia sulcata* on rock outcrop vegetation community. None of the vegetation communities identified within the North Ironcap proposed 'A' Class Nature Reserve were identified within the Greater New Morning/Spotted Quoll area.

None of the seven vegetation communities described by Newbey and Hnatiuk (1988) as unique to the Lake Johnston-Hyden area (breakaway complex, BIF complex, greenstone complex, *Acacia jennerae* tall shrubland, *Eucalyptus georgei* low woodland, *Eucalyptus* sp. HRN 5603 low woodland and *E. scypocalyx* Mallee) were identified within the Greater Flying Fox area.

4.18 Vegetation condition

Based on Keighery's vegetation health rating scale (1994), nine of the eleven vegetation communities within the Greater New Morning/Spotted Quoll area were rated as being in 'very good' health.

1. Open shrub mallee of *Eucalyptus celastroides*/*Eucalyptus cylindrocarpa*/*Eucalyptus eremophila* over low scrub of mixed *Acacia* and *Melaleuca*;

2. Low woodland of *Eucalyptus salmonophloia* over low scrub of mixed *Melaleuca*;
3. Heath of mixed *Acacia*, *Allocasuarina* and *Melaleuca*;
4. Low woodland of *Eucalyptus calycogona*/*Eucalyptus pileata* over low scrub of *Acacia hemiteles*/*Melaleuca hamata* on rocky outcrop;
5. Mallee of *Eucalyptus eremophila*/*Eucalyptus steedmanii* over mixed dwarf scrub;
6. Heath of *Acacia steedmanii* subsp. *steedmanii*/*Melaleuca hamata* over mixed low scrub;
7. Low scrub of mixed *Allocasuarina* over mixed dwarf scrub;
8. Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise; and
9. Forest of *Eucalyptus urna* over low scrub of *Melaleuca pauperiflora* subsp. *pauperiflora*.

A 'very good' health rating indicates that vegetation is altered due to obvious signs of disturbance, in this instance as a result of exploration activities (access tracks/gridlines etc.).

The remaining two vegetation communities were rated as being in 'good health';

1. Burnt open low woodland of *Eucalyptus salmonophloia* over shrub mallee of *Eucalyptus cylindrocarpa*/*Eucalyptus pileata* and mixed low heath; and
2. Low woodland of *Eucalyptus flocktoniae*/*Eucalyptus salubris*/*Eucalyptus urna* over low scrub of mixed *Acacia* and *Melaleuca*.

A 'good' health rating depicts that although the vegetation structure has been affected by multiple disturbances, in this instance as a result of exploration activities (access tracks/gridlines etc.) and fire, it retains its basic structure and has ability to regenerate.

4.19 Introduced Plant Species

4.19.1 *Dittrichia graveolens* (Stinkwort)

This species is described as an erect, bushy, viscid, annual herb that grows up to 0.1-0.5m high. It has yellow/yellow-white flowers from January to November, and grows in a variety of soils. It is a weed of waste grounds, along rivers and roadsides (WAHERB, 2012). According to the DAFWA (2012) this species is not listed as a Declared Plant. *Dittrichia graveolens* was located in only one vegetation community, Open tree mallee of *Eucalyptus eremophila* over scrub of *Melaleuca hamata* on stony rise.



Plate 18: Image taken of *Dittrichia graveolens* (Stinkwort)

5 Relevant Legislation and Compliance with Recognised Standards

5.1 Commonwealth Legislation

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

The aim of this Act is to protect matters of national environmental significance, and is used by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) to list threatened species and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance.

The Greater New Morning/Spotted Quoll area has national environmental significance under the *EPBC Act 1999* as it contains Threatened Flora and Fauna listed as vulnerable under the *EPBC Act 1999*.

5.2 State Legislation

Clearing of Native Vegetation

The *Environmental Protection (Clearing of Native Vegetation) Regulations WA 2004* establish that any clearing of native vegetation in Western Australia requires a permit from the DEC. Under Section 51A of the *WA Environmental Protection Act, 1986 (EP Act)* native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent. Section 51A of the EP Act defines clearing as “...*the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above*”.

Regulation 6 of the 2004 Regulations defines ESA as “...*the area covered by vegetation within 50 m of Rare Flora, to the extent to which the vegetation is continuous with the vegetation in which the Rare Flora is located*”.

A clearing permit must be granted prior to any clearing within a minimum of 50 m surrounding all populations of Threatened/DRF. The area covered by a TEC is also considered an ESA wherein clearing cannot occur unless a clearing permit is granted. Exploration activities are exempt from the requirement for clearing permits if undertaken pursuant to a Mining Act approval, for example through a “Programme of Work” provided the area involved does not occur in an ESA.

Approximately 215ha of the north-east corner of Greater New Morning/Spotted Quoll area lies within the Lake Cronin ESA. The Greater New Morning/Spotted Quoll area contains Threatened Flora. Approximately 320ha of the northern section of the Greater New Morning/Spotted Quoll area is also located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Conservation and Land Management Act WA 1984

Under Section 33(2) of the *CALM Act 1984* land that is not formally reserved under the *CALM Act 1984* can be managed under the *CALM Act 1984* if it is not the subject of a management plan; or it is the subject of a management plan that, due to an exemption given under section 57A(2), was not prepared in accordance with section 56(2). The management of the land and its associated forest produce, fauna and flora shall be carried out in a manner that protects and conserves the value of the land to the culture and heritage of Aboriginal persons, in particular from any material adverse effect caused by entry on or the use of the land by other persons, the taking or removal of the land's fauna, flora or forest produce or adverse effect on the protection or conservation of the land's fauna and flora.

According to the EPA (2009) *Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region*, an area of 56,750ha within the mineralised greenstone belt in the Lake Cronin Region (encompassing the entire Greater Flying Fox area) is proposed to be managed under Section 33(2) of the *CALM Act 1984* but not formally reserved.

Environmental Protection Act WA 1986

The *EP Act 1986* includes requirements relating to the protection of Threatened/DRF and TEC, and to the assessment of applications for clearing permits. TEC are protected even where exemptions for a clearing permit may apply. The *EP Act 1986* enforces both financial and/or imprisonment penalties on those who unlawfully damage a TEC.

The Greater New Morning/Spotted Quoll area does not contain any TEC however it does contain Threatened Flora as listed under the *EPBC Act 1999* and by the DEC (Atkins, 2012).

Wildlife Conservation Act WA 1950

The DEC uses the provisions of this Act to list flora taxa as protected and the level of protection assigned to such flora. Flora species are classified as Threatened/DRF when their populations are geographically restricted or are threatened by local processes. Under this Act, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) are protected throughout the State. Financial penalties pursuant to the Act can be imposed if threatened plant species are collected without an appropriate licence.

DEC Priority lists

The DEC lists 'Priority' flora species which are under consideration for declaration as Rare Flora. Species classed as Priority 1-3 are in urgent need of further survey, whereas Priority 4 species are considered to have been adequately surveyed but may become vulnerable or rare in future years. Priority 4 species are also species that have been removed from the threatened species list in the past 5 years. Priority 5 species are those species which are not currently threatened but are likely to become threatened within 5 years due to a specific conservation program.

The DEC also lists PEC as a mechanism for identifying communities that may need monitoring before possible nomination for TEC status. These priority species and communities have no formal legal protection until they are endorsed by the Minister as being Threatened/Declared Rare Flora and TEC respectively.

Results from the DEC database search (2011a) revealed two DEC listings of Priority Flora; *Eutaxia nanophylla* (P3) and *Stylidium sejunctum* (P2), and one Threatened Flora; *Eucalyptus steedmanii* (T), within the Greater New Morning/Spotted Quoll area. BC was unable to locate the *Eutaxia nanophylla* (P3) DEC location. A total of three Threatened Flora and 47 Priority Flora species were listed within a 10km radius of the survey area. One Threatened Flora and three Priority Flora species were identified during the survey. The Greater New Morning/Spotted Quoll area is located within the North Ironcap and Middle Ironcap Priority Ecological Communities of the *Ironcap Hills Vegetation Complexes*. This is listed by the DEC as a Priority 3 Ecological Community.

5.3 EPA Position Statements

The EPA develops Position Statements to inform the public about environmental issues facing Western Australia and the plans for the future to ensure protection and ecological sustainability of environmentally important ecosystems. It provides a set of principles to assist the public and decision-makers on their responsibilities for managing land with care. These principles also provide the basis for the Environmental Protection Authority to evaluate and report upon achieving environmental and ecological sustainability and the protection of natural resources.

Position Statement No. 2 *Environmental Protection of Native Vegetation in Western Australia* (EPA 2000) outlines EPA policy on the protection of native vegetation in Western Australia, particularly in the agricultural area. It identifies basic elements that the EPA should consider when assessing proposals that impact on biological diversity. These include comparison of all proposal options; avoidance of species and community extinctions; an expectation that implementing the proposal will not take a vegetation type below the "threshold level" of 30%; and that proponents should demonstrate that on- and off-site impacts can be managed.

According to DAFWA (2011), the Greater New Morning/Spotted Quoll area occurs in pre-European Beard vegetation association Forrestania 511 and 2048 within the Southern Cross (COO2) subregion, of which 99.80% and 99.60% of the original vegetation extent remains respectively. It also occurs in vegetation association Forrestania 2048 within the Western Mallee (MAL2) subregion, of which 98.52% of the original vegetation extent remains.

Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* establishes that the EPA has adopted the definition and principles of biological diversity as defined in the *National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia, 1996), and has stipulated the following requirements:

- the quality of information and scope of field surveys should meet standards, requirements and protocols as determined and published by the EPA; and
- the IBRA regionalisations should be used as the largest unit for environmental impact assessment (EIA) decision-making in relation to the conservation of biodiversity.

Pursuant to the IBRA regionalisations, 26 bioregions in WA, which are affected by a range of different threatening processes and have varying levels of sensitivity to impact, have been identified. Terrestrial biological surveys should provide sufficient information to address both biodiversity conservation and ecological functional values within the context of proposals and the results of surveys should be publicly available.

The flora survey of the Greater New Morning/ Spotted Quoll area was planned and implemented as far as practicable according to the EPA Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004). Also, the IBRA regionalisations have been used in preparing the report to identify the conservation status of the area and identify the main threats to the biodiversity of plant species in the region.

5.4 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, as presented in this report, BC provides the following comments regarding the native vegetation clearing principles:

a. Native vegetation should not be cleared if it comprises a high level of biological diversity.

The woodlands of the Southern Cross subregion have a very high diversity of Eucalypts with as many as 170 species occurring within the subregion. The subregion also has a high diversity of Acacia species however most species (excluding Threatened and Priority Flora species) are wide ranging and usually occur in at least one, and often several, adjoining subregions (Cowan, 2001). With the exception of granite outcrops vegetation of the Western Mallee subregion is not considered to comprise of a high level of biodiversity however it does contain a high number of endemic species (Beecham & Danks, 2001).

b. Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

One Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012), was identified within eight of the eleven vegetation communities within the Greater New Morning/Spotted Quoll area.

c. Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community (TEC).

No TEC listed under the *EPBC Act 1999* (DSEWPaC, 2012) or by the DEC (2011b) occur within the survey area.

d. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

According to DAFWA (2011), the Greater New Morning/Spotted Quoll area occurs in pre-European Beard vegetation association Forrestania 511 and 2048 within the Southern Cross (COO2) subregion, of which 99.80% and 99.60% of the original vegetation extent remains respectively. It also occurs in vegetation association Forrestania 2048 within the Western Mallee (MAL2) subregion, of which 98.52% of the original vegetation extent remains.

e. Native vegetation should not be cleared if it is growing, in, or in association with, an environment associated with a watercourse or wetland

No vegetation communities identified within the Greater New Morning/Spotted Quoll area were found to be growing in, or in association with, an environment associated with a watercourse or wetland.

- f. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**

Approximately 215ha of the north-east corner of Greater New Morning/Spotted Quoll area lies within the Lake Cronin ESA and is located approximately 5km south-west of the Lake Cronin 'A' Class Nature Reserve. An area of 56,750ha within the mineralised greenstone belt in the Lake Cronin Region (encompassing the entire Greater New Morning/Spotted Quoll area) is proposed to be managed under Section 33(2) of the *CALM Act 1984* but not formally reserved.

A proposed 'C' Class Nature Reserve is also proposed in the surrounding area to protect the Lake Cronin catchment and areas of extensive sandplain and woodland vegetation located immediately east of the Wheatbelt, which represents vegetation communities and fauna habitats that have been extensively cleared and fragmented in the adjacent Wheatbelt.

The North Ironcap BIF located approximately 10km north-west region of the Greater New Morning/Spotted Quoll area is proposed to be reserved in a small 'A' Class Nature Reserve, covering an area of 42.5ha. Exploration activities within the Greater New Morning/Spotted Quoll area are not likely to impact on the conservation values of any existing or proposed Nature Reserves within the Lake Cronin/ North Ironcap Region.

6 Conclusions and Recommendations

6.1 Conclusions

Eleven vegetation communities and one sub-community were identified within the Greater New Morning/Spotted Quoll area. These eleven vegetation communities were represented by a total of 29 Families, 74 Genera and 198 Species (including sub-species and variants).

One Threatened Flora species, *Eucalyptus steedmanii* (T), pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, section 179 of the *EPBC Act 1999* and as listed by the DEC (Atkins, 2012), was identified within the Greater New Morning/Spotted Quoll area. Three Priority Flora species, *Eremophila racemosa* (P4), *Microcorys* sp. Forrestania (V. English 2004) (P4) and *Stylidium sejunctum* (P2) were identified within the Greater New Morning/Spotted Quoll area. A DEC location of *Eutaxia nanophylla* (P3) was searched during the survey however this species could not be located.

Eight of the vegetation communities have National Environmental Significance as defined by the *EPBC Act 1999* as they contain Threatened Flora under Section 179 of the *EPBC Act 1999*. One vegetation community, Open tree mallee of *E. eremophila* over scrub of *Melaleuca hamata* on stony rise also contained an active malleefowl mound. Malleefowl are listed as vulnerable under the *EPBC Act 1999*. No TEC pursuant to Commonwealth legislation or as listed by the DEC were recorded within the Greater New Morning/Spotted Quoll area (DEC, 2011a; DSEWPaC, 2012). The Greater New Morning/Spotted Quoll area however is located within the North Ironcap and Middle Ironcap Priority Ecological Communities of the *Ironcap Hills Vegetation Complexes*. This is listed by the DEC as a Priority 3 Ecological Community.

Approximately 215ha of the north-east corner of Greater New Morning/Spotted Quoll area lies within the Lake Cronin ESA and is located approximately 5km south-west of the Lake Cronin 'A' Class Nature Reserve. An area of 56,750ha within the mineralised greenstone belt in the Lake Cronin Region (encompassing the entire Greater New Morning/Spotted Quoll area) is proposed to be managed under Section 33(2) of the *CALM Act 1984* but not formally reserved. A proposed 'C' Class Nature Reserve is also proposed in the surrounding area. The North Ironcap BIF located approximately 10km north-west region of the Greater New Morning/Spotted Quoll area is proposed to be reserved in a small 'A' Class Nature Reserve, covering an area of 42.5ha. Approximately 320ha of the northern section of the Greater New Morning/Spotted Quoll area is also located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Based on Keighery's vegetation health rating scale (1994), nine of the eleven vegetation communities within the Greater New Morning/Spotted Quoll area were rated as being in 'very good' health. The remaining two vegetation communities were rated as being in 'good' health. One introduced species; *Dittrichia graveolens* (Stinkwort) was identified within the survey area. According to the DAFWA (2012) this species is not listed as a Declared Plant.

6.2 Recommendations

- No clearing within the Greater New Morning/Spotted Quoll area is permitted until a clearing permit has been granted as the Greater New Morning/Spotted Quoll area is located within a proposed managed land under Section 33(2) of the *CALM Act 1984*; Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*; ESA and contains Threatened Flora/Fauna.
- Consultation with the DEC is recommended prior to any clearing within the Greater New Morning/Spotted Quoll area as it occurs within the boundary of a PEC. Although PEC's are not formally protected they are of conservation significance and are being considered to be formally protected under the *EPBC Act 1999* as TEC's.
- As Threatened Flora/Fauna and Priority Flora have been identified within the Greater New Morning/Spotted Quoll area, targeted searches of all proposed areas to be cleared should be conducted prior to any clearing.
- No disturbance within a 250m radius of the active malleefowl is permitted. Should disturbance within this radius be unavoidable consultation with the DEC is recommended.
- No disturbance to any Threatened Flora is permitted. Should disturbance to Threatened Flora be unavoidable an application to impact Threatened Flora must be submitted to the DEC in conjunction with the clearing permit application.
- Disturbance to Priority Flora identified within survey should be avoided. If disturbance is unavoidable an application to impact Priority Flora must be submitted to the DEC.

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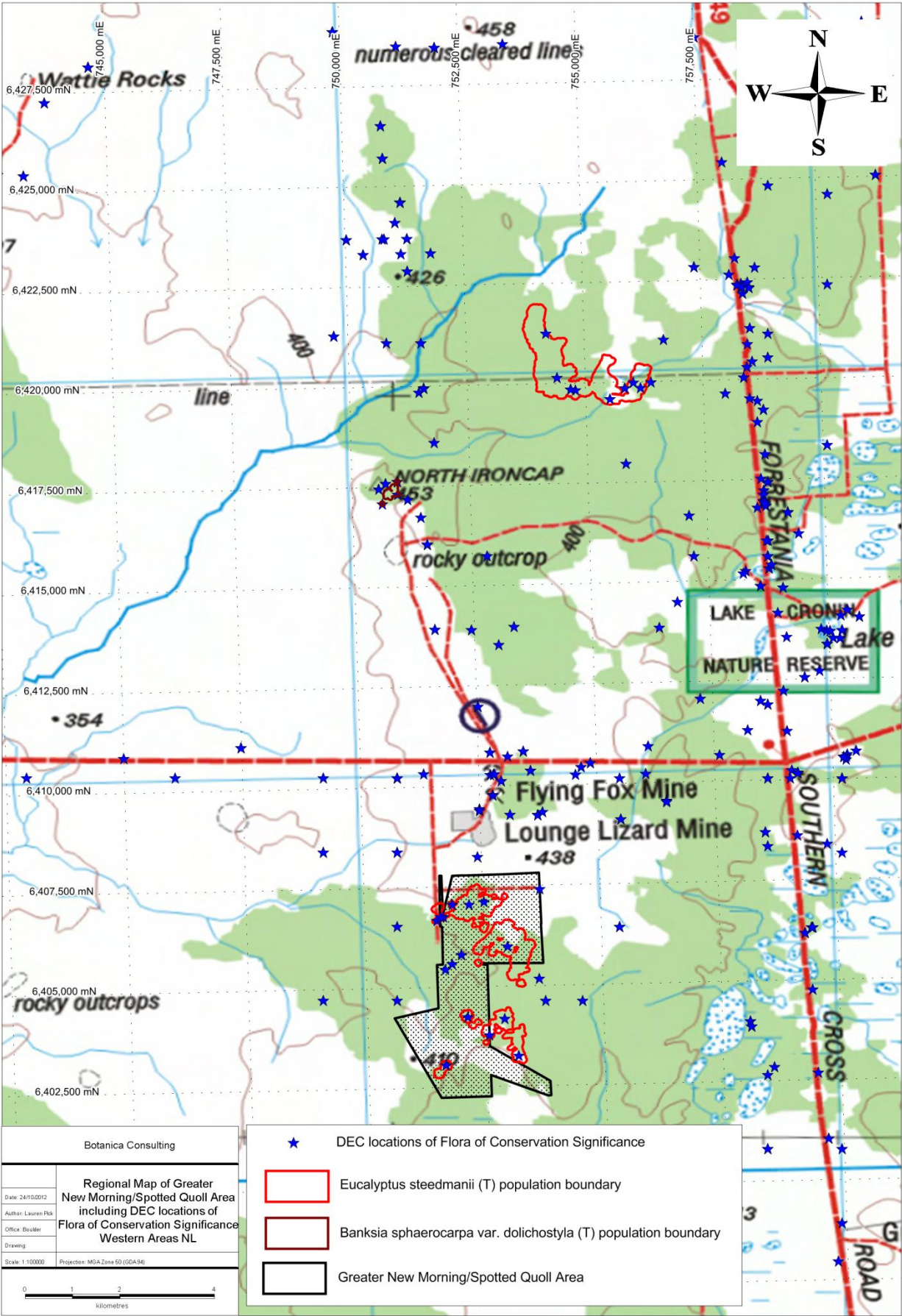
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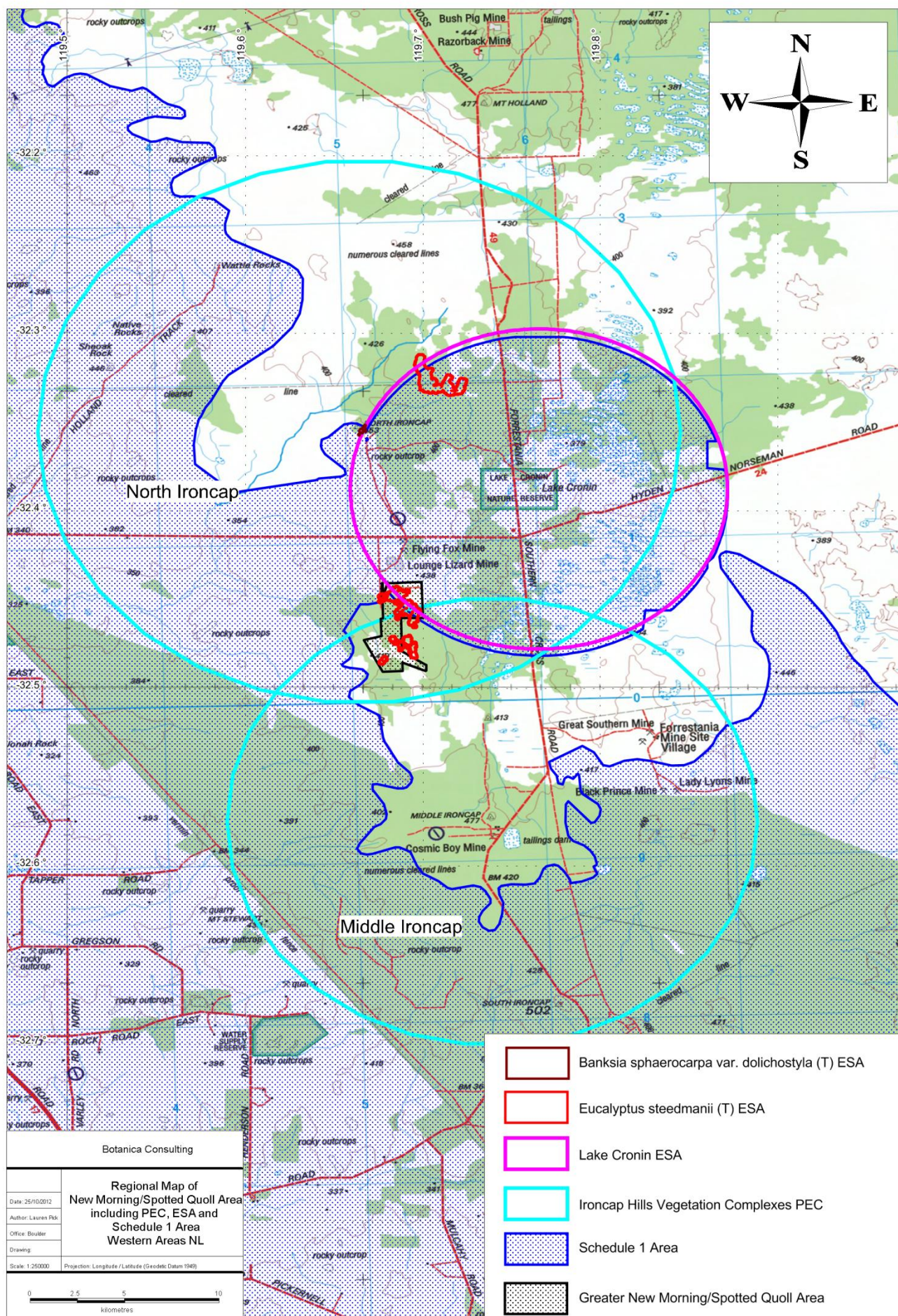
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8 Appendices

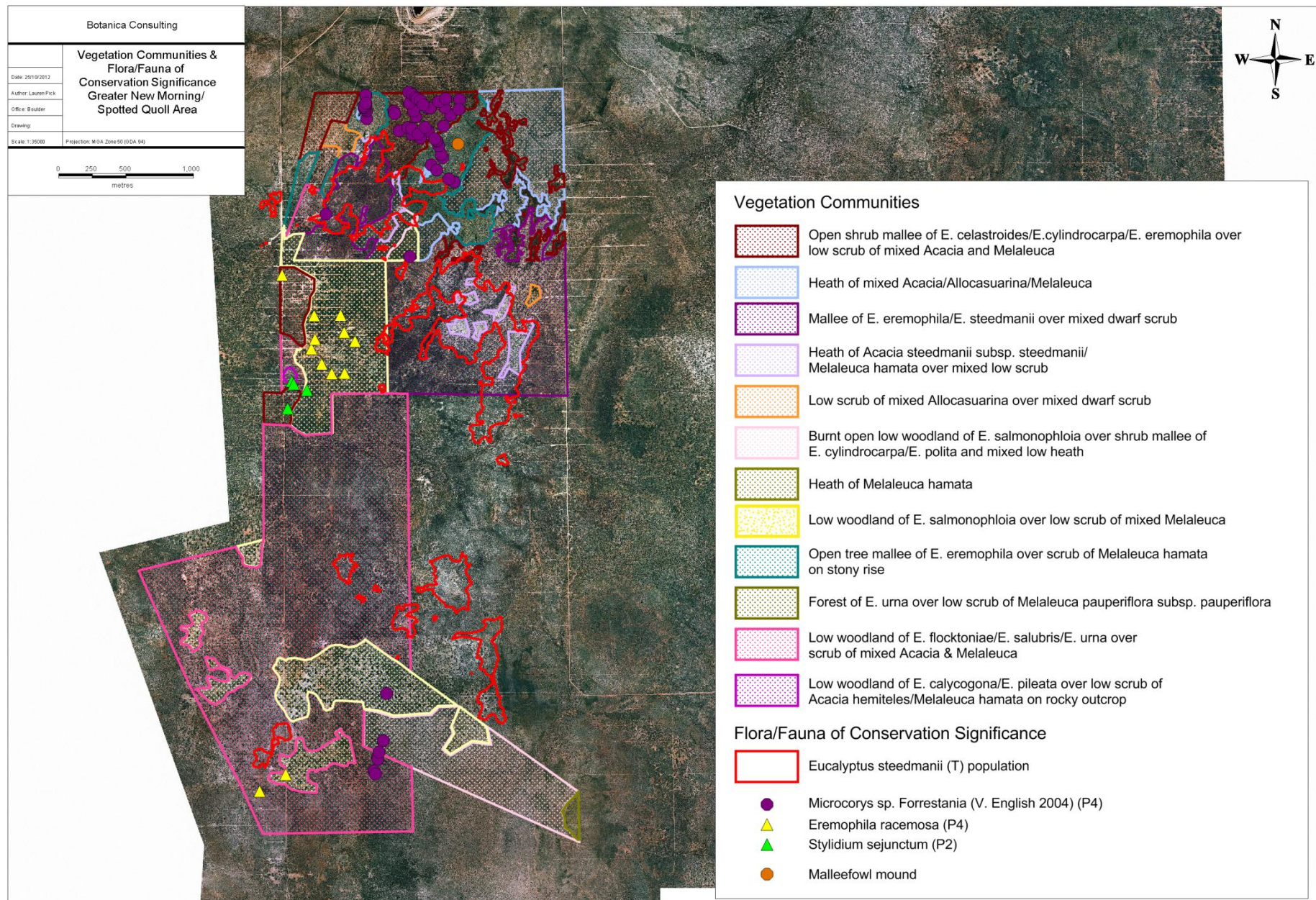
Appendix 1: Regional map of the Greater New Morning/Spotted Quoll area including DEC Flora of Conservation Significance locations (survey area not to scale).



Appendix 2: Regional map of the Greater New Morning/Spotted Quoll area including PEC, Lake Cronin ESA & Schedule 1 Area (survey area not to scale).



Appendix 3: Vegetation map of the Greater New Morning/Spotted Quoll area including Flora/Fauna of Conservation Significance



Appendix 4: List of species identified within each vegetation community within the Greater New Morning/Spotted Quoll area

Red Text (P) denotes Priority Flora species (WAHERB, 2012); **Red Text (T)** denotes Threatened Flora species (Atkins, 2012); **Green Text (W)** denotes introduced species (WAHERB, 2012). *previously named *Melaleuca pentagona*

Family	Genus	Species	Low woodland of <i>E. flocktoniae</i> / <i>E. salubris</i> / <i>E. urna</i> over low scrub of mixed Acacia and <i>Melaleuca</i>	Open shrub mallee of <i>E. celastroides</i> / <i>E.</i> <i>cylindrocarpa</i> / <i>E. eremophila</i> over low scrub of mixed Acacia and <i>Melaleuca</i>	Low woodland of <i>E. salmonophloia</i> over low scrub of mixed <i>Melaleuca</i>	Heath of mixed Acacia, <i>Allocasuarina</i> and <i>Melaleuca</i>	Low woodland of <i>E. calycogona</i> / <i>E. pileata</i> over low scrub of Acacia hemiteles/ <i>Melaleuca</i> <i>hamata</i> on rocky outcrop	Mallee of <i>E. eremophila</i> / <i>E. steedmanii</i> over mixed dwarf scrub	Heath of Acacia <i>steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	Open tree mallee of <i>E. eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	Burnt open low woodland of <i>E. salmonophloia</i> over shrub mallee of <i>E. cylindrocarpa</i> / <i>E. pileata</i> and mixed low heath	Forest of <i>E. urna</i> over low scrub of <i>Melaleuca</i> <i>pauperiflora</i> subsp. <i>pauperiflora</i>
Aizoaceae	<i>Disphyma</i>	<i>crassifolium</i> subsp. <i>clavellatum</i>			*								
Asparagaceae	<i>Thysanotus</i>	<i>sparteus</i>			*	*							
Asphodelaceae	<i>Bulbine</i>	<i>semibarbata</i>	*										
Asteraceae	<i>Angianthus</i>	<i>tomentosus</i> (A)	*				*						
Asteraceae	<i>Calotis</i>	<i>hispidula</i> (A)	*										
Asteraceae	<i>Dittrichia</i>	<i>graveolens</i> (W)									*		
Asteraceae	<i>Erymophyllum</i>	<i>ramosum</i> subsp. <i>ramosum</i> (A)			*								
Asteraceae	<i>Gnephosis</i>	<i>tenuissima</i> (A)	*										
Asteraceae	<i>Olearia</i>	<i>muelleri</i>	*	*	*			*			*	*	
Asteraceae	<i>Olearia</i>	<i>pimeleoides</i>	*										
Casuarinaceae	<i>Allocasuarina</i>	<i>acutivalvis</i>		*		*				*	*		
Casuarinaceae	<i>Allocasuarina</i>	<i>campestris</i>	*				*		*	*			
Casuarinaceae	<i>Allocasuarina</i>	<i>corniculata</i>		*		*		*	*	*	*		
Casuarinaceae	<i>Allocasuarina</i>	<i>helmsii</i>	*	*									
Chenopodiaceae	<i>Atriplex</i>	<i>stipitata</i>	*				*						
Chenopodiaceae	<i>Maireana</i>	<i>georgei</i>	*		*								
Chenopodiaceae	<i>Maireana</i>	<i>oppositifolia</i>	*										
Chenopodiaceae	<i>Sclerolaena</i>	<i>diacantha</i>	*		*								

Family	Genus	Species	Low woodland of <i>E. flocktoniae</i> / <i>E. salubris</i> / <i>E. urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Open shrub mallee of <i>E. celastroides</i> / <i>E. cylindrocarpa</i> / <i>E. eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Low woodland of <i>E. salomonophloia</i> over low scrub of mixed <i>Melaleuca</i>	Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	Low woodland of <i>E. calycogona</i> / <i>E. pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop	Mallee of <i>E. eremophila</i> / <i>E. steedmanii</i> over mixed dwarf scrub	Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	Open tree mallee of <i>E. eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	Burnt open low woodland of <i>E. salomonophloia</i> over shrub mallee of <i>E. cylindrocarpa</i> / <i>E. pileata</i> and mixed low heath	Forest of <i>E. urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Chenopodiaceae	<i>Sclerolaena</i>	<i>uniflora</i>	*	*	*								
Convolvulaceae	<i>Wilsonia</i>	<i>humilis</i>	*	*	*			*				*	
Cupressaceae	<i>Callitris</i>	<i>preissii</i>	*	*		*			*	*	*		
Cyperaceae	<i>Gahnia</i>	<i>ancistrophylla</i>					*						
Cyperaceae	<i>Lepidosperma</i>	sp. A2 Inland Flat (G.J. Keighery 7000)		*								*	*
Cyperaceae	<i>Lepidosperma</i>	aff. sp. Maggie Hills (R. Barrett)				*							
Cyperaceae	<i>Lepidosperma</i>	<i>drummondii</i>		*		*		*		*			
Dilleniaceae	<i>Hibbertia</i>	<i>gracilipes</i>		*		*					*		
Dilleniaceae	<i>Hibbertia</i>	<i>pungens</i>		*		*	*	*					
Droseraceae	<i>Drosera</i>	<i>andersoniana</i>							*				
Ericaceae	<i>Astroloma</i>	<i>serratifolium</i>		*		*							
Ericaceae	<i>Leucopogon</i>	<i>cuneifolius</i>		*		*			*				
Ericaceae	<i>Leucopogon</i>	sp. outer Wheatbelt (M. Hislop 30)				*							
Ericaceae	<i>Lysinema</i>	<i>ciliatum</i>				*							
Euphorbiaceae	<i>Beyeria</i>	<i>brevifolia</i>									*		
Fabaceae	<i>Acacia</i>	<i>acanthoclada</i> subsp. <i>acanthoclada</i>				*		*			*		
Fabaceae	<i>Acacia</i>	<i>acuaria</i>			*								
Fabaceae	<i>Acacia</i>	<i>acuminata</i>	*	*									
Fabaceae	<i>Acacia</i>	<i>assimilis</i>				*							
Fabaceae	<i>Acacia</i>	<i>brachyclada</i>				*							
Fabaceae	<i>Acacia</i>	<i>camptoclada</i>	*	*		*					*		
Fabaceae	<i>Acacia</i>	<i>coolgardiensis</i>		*		*			*	*			
Fabaceae	<i>Acacia</i>	<i>deficiens</i>	*	*	*	*		*			*	*	*

Family	Genus	Species	Low woodland of <i>E. flocktoniae</i> / <i>E. salubris</i> / <i>E. urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Open shrub mallee of <i>E. celastroides</i> / <i>E. cylindrocarpa</i> / <i>E. eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Low woodland of <i>E. salomonophloia</i> over low scrub of mixed <i>Melaleuca</i>	Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	Low woodland of <i>E. calycogona</i> / <i>E. pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop	Mallee of <i>E. eremophila</i> / <i>E. steedmanii</i> over mixed dwarf scrub	Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	Open tree mallee of <i>E. eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	Burnt open low woodland of <i>E. salomonophloia</i> over shrub mallee of <i>E. cylindrocarpa</i> / <i>E. pileata</i> and mixed low heath	Forest of <i>E. urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Fabaceae	<i>Acacia</i>	<i>densiflora</i>	*										
Fabaceae	<i>Acacia</i>	<i>enervia</i> subsp. <i>enervia</i>	*			*							
Fabaceae	<i>Acacia</i>	<i>eremophila</i>	*			*							
Fabaceae	<i>Acacia</i>	<i>erinacea</i>	*	*	*	*		*			*	*	
Fabaceae	<i>Acacia</i>	<i>fragilis</i>		*		*				*			
Fabaceae	<i>Acacia</i>	<i>hemiteles</i>	*	*	*	*	*	*	*		*	*	
Fabaceae	<i>Acacia</i>	<i>intricata</i>	*	*	*		*	*				*	
Fabaceae	<i>Acacia</i>	<i>longispinea</i>		*									
Fabaceae	<i>Acacia</i>	<i>merrallii</i>	*	*	*							*	
Fabaceae	<i>Acacia</i>	<i>neurophylla</i> subsp. <i>neurophylla</i>								*			
Fabaceae	<i>Acacia</i>	<i>poliochroa</i>	*	*				*				*	
Fabaceae	<i>Acacia</i>	<i>rendlei</i>				*							
Fabaceae	<i>Acacia</i>	<i>sphacelata</i> subsp. <i>sphacelata</i>	*	*	*	*	*						
Fabaceae	<i>Acacia</i>	<i>steedmanii</i> subsp. <i>steedmanii</i>	*	*		*	*	*		*			
Fabaceae	<i>Acacia</i>	<i>uncinella</i>	*					*					
Fabaceae	<i>Acacia</i>	<i>viscifolia</i>		*									
Fabaceae	<i>Acacia</i>	<i>yorkrakinensis</i>		*		*							
Fabaceae	<i>Daviesia</i>	<i>benthamii</i>	*	*	*	*							
Fabaceae	<i>Daviesia</i>	<i>benthamii</i> subsp. <i>acanthoclona</i>		*	*			*				*	
Fabaceae	<i>Daviesia</i>	<i>lancifolia</i>		*		*							
Fabaceae	<i>Daviesia</i>	<i>nematophylla</i>	*	*	*							*	
Fabaceae	<i>Eutaxia</i>	<i>neurocalyx</i>							*				
Fabaceae	<i>Gastrolobium</i>	<i>spinosum</i>		*		*				*			

Family	Genus	Species	Low woodland of <i>E. flocktoniae</i> / <i>E. salubris</i> / <i>E. urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Open shrub mallee of <i>E. celastroides</i> / <i>E. cylindrocarpa</i> / <i>E. eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Low woodland of <i>E. salomonophloia</i> over low scrub of mixed <i>Melaleuca</i>	Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	Low woodland of <i>E. calycogona</i> / <i>E. pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop	Mallee of <i>E. eremophila</i> / <i>E. steedmanii</i> over mixed dwarf scrub	Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	Open tree mallee of <i>E. eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	Burnt open low woodland of <i>E. salomonophloia</i> over shrub mallee of <i>E. cylindrocarpa</i> / <i>E. pileata</i> and mixed low heath	Forest of <i>E. urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Fabaceae	<i>Gastrolobium</i>	<i>tetragonophyllum</i>									*		
Fabaceae	<i>Gompholobium</i>	<i>gompholobioides</i>	*		*			*			*		
Fabaceae	<i>Leptosema</i>	<i>daviesioides</i>				*							
Fabaceae	<i>Pultenaea</i>	<i>arida</i>		*									
Fabaceae	<i>Senna</i>	<i>artemisioides</i> subsp. <i>filifolia</i>	*				*						
Fabaceae	<i>Templetonia</i>	<i>egena</i>		*									
Fabaceae	<i>Templetonia</i>	<i>sulcata</i>			*			*			*	*	
Goodeniaceae	<i>Coopernookia</i>	<i>strophiolata</i>		*	*	*		*					
Goodeniaceae	<i>Dampiera</i>	<i>angulata</i>		*			*			*			
Goodeniaceae	<i>Goodenia</i>	<i>pinifolia</i>		*	*	*				*	*	*	
Goodeniaceae	<i>Goodenia</i>	<i>viscida</i>	*	*				*					
Goodeniaceae	<i>Scaevola</i>	<i>spinescens</i>			*	*					*		
Haloragaceae	<i>Glischrocaryon</i>	<i>roei</i>		*									
Hemerocallidaceae	<i>Dianella</i>	<i>revoluta</i>	*		*	*							
Lamiaceae	<i>Microcorys</i>	sp. <i>Forrestania</i> (V. English 2004) (P4)	*	*	*			*			*	*	
Lamiaceae	<i>Pityrodia</i>	<i>exserta</i> var. <i>lanata</i>											
Lamiaceae	<i>Westringia</i>	<i>cephalantha</i> var. <i>caterva</i>	*	*	*	*		*			*	*	
Lamiaceae	<i>Westringia</i>	<i>rigida</i>	*		*	*						*	
Lauraceae	<i>Cassytha</i>	<i>melantha</i>	*	*	*			*	*		*		
Myrtaceae	<i>Astartea</i>	<i>heteranthera</i>				*							
Myrtaceae	<i>Baeckea</i>	<i>crispiflora</i>		*		*			*	*	*		
Myrtaceae	<i>Beaufortia</i>	<i>schaueri</i>				*							
Myrtaceae	<i>Calytrix</i>	<i>brevisetia</i> subsp. <i>stipulosa</i>		*		*							

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Myrtaceae	<i>Cyathostemon</i>	<i>tenuifolius</i>						*					
Myrtaceae	<i>Darwinia</i>	sp. Lake Cobham (K. Newbey 3262)		*		*							
Myrtaceae	<i>Eucalyptus</i>	<i>aff. yilgarnensis</i>											
Myrtaceae	<i>Eucalyptus</i>	<i>protensa</i>			*			*					
Myrtaceae	<i>Eucalyptus</i>	<i>astringens</i>										*	
Myrtaceae	<i>Eucalyptus</i>	<i>calycogona</i> subsp. <i>calycogona</i>	*				*						
Myrtaceae	<i>Eucalyptus</i>	<i>celastroides</i>									*		
Myrtaceae	<i>Eucalyptus</i>	<i>cylindrocarpa</i>	*	*	*							*	
Myrtaceae	<i>Eucalyptus</i>	<i>eremophila</i> subsp. <i>eremophila</i>	*	*		*		*		*	*	*	
Myrtaceae	<i>Eucalyptus</i>	<i>flocktoniae</i> subsp. <i>flocktoniae</i>	*		*			*					
Myrtaceae	<i>Eucalyptus</i>	<i>goniocarpa</i>										*	
Myrtaceae	<i>Eucalyptus</i>	<i>gracilis</i>	*									*	
Myrtaceae	<i>Eucalyptus</i>	<i>horistes</i>		*						*			
Myrtaceae	<i>Eucalyptus</i>	<i>kondininensis</i>	*	*									
Myrtaceae	<i>Eucalyptus</i>	<i>melanoxydon</i>	*										
Myrtaceae	<i>Eucalyptus</i>	<i>pileata</i>		*			*					*	
Myrtaceae	<i>Eucalyptus</i>	<i>pluricaulis</i> subsp. <i>pluricaulis</i>									*		
Myrtaceae	<i>Eucalyptus</i>	<i>polita</i>	*	*				*				*	
Myrtaceae	<i>Eucalyptus</i>	<i>salmonophloia</i>	*	*	*			*				*	
Myrtaceae	<i>Eucalyptus</i>	<i>salubris</i>	*	*	*			*				*	
Myrtaceae	<i>Eucalyptus</i>	sp. (sterile)			*								
Myrtaceae	<i>Eucalyptus</i>	<i>sporadica</i>	*										
Myrtaceae	<i>Eucalyptus</i>	<i>steedmanii</i> (T)	*	*	*	*		*	*		*	*	

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Myrtaceae	<i>Eucalyptus</i>	<i>transcontinentalis</i>										*	
Myrtaceae	<i>Eucalyptus</i>	<i>urna</i>	*	*	*								*
Myrtaceae	<i>Leptospermum</i>	<i>erubescens</i>		*		*							
Myrtaceae	<i>Melaleuca</i>	<i>adnata</i>	*	*	*	*		*	*		*	*	
Myrtaceae	<i>Melaleuca</i>	<i>calyptroides</i> *	*	*		*				*			
Myrtaceae	<i>Melaleuca</i>	<i>cardiophylla</i>	*	*	*								
Myrtaceae	<i>Melaleuca</i>	<i>cordata</i>		*		*				*			
Myrtaceae	<i>Melaleuca</i>	<i>cucullata</i>		*				*				*	
Myrtaceae	<i>Melaleuca</i>	<i>eleuterostachya</i>	*	*		*		*	*		*	*	
Myrtaceae	<i>Melaleuca</i>	<i>elliptica</i>	*	*									
Myrtaceae	<i>Melaleuca</i>	<i>hamata</i>		*	*	*	*				*	*	
Myrtaceae	<i>Melaleuca</i>	<i>lanceolata</i>										*	
Myrtaceae	<i>Melaleuca</i>	<i>lateriflora</i> subsp. <i>lateriflora</i>			*	*		*					
Myrtaceae	<i>Melaleuca</i>	<i>laxiflora</i>		*					*	*			
Myrtaceae	<i>Melaleuca</i>	<i>pauperiflora</i> subsp. <i>fastigiata</i>	*		*	*		*			*	*	*
Myrtaceae	<i>Melaleuca</i>	<i>pauperiflora</i> subsp. <i>pauperiflora</i>	*	*		*		*			*		*
Myrtaceae	<i>Melaleuca</i>	<i>pungens</i> var. <i>pungens</i>		*					*	*			
Myrtaceae	<i>Melaleuca</i>	<i>sapientes</i>		*		*							
Myrtaceae	<i>Melaleuca</i>	<i>sparsiflora</i>	*										
Myrtaceae	<i>Melaleuca</i>	<i>spicigera</i>				*							
Myrtaceae	<i>Melaleuca</i>	<i>teuthidoides</i>	*		*	*							
Myrtaceae	<i>Melaleuca</i>	<i>thyoides</i>	*	*		*					*		
Myrtaceae	<i>Melaleuca</i>	<i>uncinata</i>	*	*		*		*	*				

Family	Genus	Species	Low woodland of <i>E. flocktoniae</i> / <i>E. salubris</i> / <i>E. urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Open shrub mallee of <i>E. celastroides</i> / <i>E. cylindrocarpa</i> / <i>E. eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Low woodland of <i>E. salomonophloia</i> over low scrub of mixed <i>Melaleuca</i>	Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	Low woodland of <i>E. calycogona</i> / <i>E. pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop	Mallee of <i>E. eremophila</i> / <i>E. steedmanii</i> over mixed dwarf scrub	Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	Open tree mallee of <i>E. eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	Burnt open low woodland of <i>E. salomonophloia</i> over shrub mallee of <i>E. cylindrocarpa</i> / <i>E. pileata</i> and mixed low heath	Forest of <i>E. urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Myrtaceae	<i>Melaleuca</i>	<i>urceolaris</i>			*			*					
Myrtaceae	<i>Microcorys</i>	<i>obovata</i>		*									
Myrtaceae	<i>Thryptomene</i>	<i>kochii</i>		*		*				*			
Myrtaceae	<i>Verticordia</i>	<i>chrysanthella</i>				*							
Myrtaceae	<i>Verticordia</i>	<i>plumosa</i>				*							
Myrtaceae	<i>Verticordia</i>	<i>roei</i>				*							
Proteaceae	<i>Banksia</i>	<i>cirsioides</i>				*							
Proteaceae	<i>Banksia</i>	<i>elderiana</i>				*							
Proteaceae	<i>Banksia</i>	<i>erythrocephala</i>				*							
Proteaceae	<i>Banksia</i>	<i>laevigata</i> subsp. <i>fuscolutea</i>				*				*			
Proteaceae	<i>Conospermum</i>	<i>brownii</i>								*			
Proteaceae	<i>Grevillea</i>	<i>acuaria</i>	*	*	*	*		*	*	*	*	*	
Proteaceae	<i>Grevillea</i>	<i>cagiana</i>	*			*							
Proteaceae	<i>Grevillea</i>	<i>decipiens</i>							*				
Proteaceae	<i>Grevillea</i>	<i>eristachya</i>		*		*				*			
Proteaceae	<i>Grevillea</i>	<i>huegelii</i>	*	*	*							*	
Proteaceae	<i>Grevillea</i>	<i>obliquistigma</i>	*			*							
Proteaceae	<i>Grevillea</i>	<i>oligantha</i>	*										
Proteaceae	<i>Grevillea</i>	<i>oncogyne</i>		*	*	*							
Proteaceae	<i>Grevillea</i>	<i>pterosperma</i>		*		*							
Proteaceae	<i>Hakea</i>	<i>commutata</i>	*	*									
Proteaceae	<i>Hakea</i>	<i>corymbosa</i>				*					*		
Proteaceae	<i>Hakea</i>	<i>erecta</i>				*							

Family	Genus	Species	Low woodland of <i>E. flocktoniae</i> / <i>E. salubris</i> / <i>E. urna</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Open shrub mallee of <i>E. celastroides</i> / <i>E. cylindrocarpa</i> / <i>E. eremophila</i> over low scrub of mixed <i>Acacia</i> and <i>Melaleuca</i>	Low woodland of <i>E. salomonophloia</i> over low scrub of mixed <i>Melaleuca</i>	Heath of mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i>	Low woodland of <i>E. calycogona</i> / <i>E. pileata</i> over low scrub of <i>Acacia hemiteles</i> / <i>Melaleuca hamata</i> on rocky outcrop	Mallee of <i>E. eremophila</i> / <i>E. steedmanii</i> over mixed dwarf scrub	Heath of <i>Acacia steedmanii</i> subsp. <i>steedmanii</i> / <i>Melaleuca hamata</i> over mixed low scrub	Low scrub of mixed <i>Allocasuarina</i> over mixed dwarf scrub	Open tree mallee of <i>E. eremophila</i> over scrub of <i>Melaleuca hamata</i> on stony rise	Burnt open low woodland of <i>E. salomonophloia</i> over shrub mallee of <i>E. cylindrocarpa</i> / <i>E. pileata</i> and mixed low heath	Forest of <i>E. urna</i> over low scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>
Rutaceae	<i>Phebalium</i>	<i>ambiguum</i>		*		*							
Rutaceae	<i>Phebalium</i>	<i>filifolium</i>				*		*		*			
Rutaceae	<i>Phebalium</i>	<i>megaphyllum</i>							*				
Rutaceae	<i>Phebalium</i>	<i>tuberculosum</i>	*	*	*	*		*					
Rutaceae	<i>Philotheca</i>	<i>rhomboidea</i>	*										
Santalaceae	<i>Exocarpos</i>	<i>aphyllus</i>	*	*	*	*		*	*		*	*	*
Santalaceae	<i>Exocarpos</i>	<i>sparteus</i>		*							*		
Santalaceae	<i>Santalum</i>	<i>acuminatum</i>	*	*	*	*		*		*	*		*
Sapindaceae	<i>Dodonaea</i>	<i>bursariifolia</i>		*	*	*		*			*	*	
Sapindaceae	<i>Dodonaea</i>	<i>microzyga</i>	*	*									
Sapindaceae	<i>Dodonaea</i>	<i>microzyga</i> var. <i>acrolobata</i>							*				
Sapindaceae	<i>Dodonaea</i>	<i>stenozyga</i>	*	*	*			*			*	*	
Sapindaceae	<i>Dodonaea</i>	<i>viscosa</i>	*										
Scrophulariaceae	<i>Eremophila</i>	<i>decipiens</i> subsp. <i>decipiens</i>	*		*			*				*	
Scrophulariaceae	<i>Eremophila</i>	<i>densifolia</i>	*	*	*								
Scrophulariaceae	<i>Eremophila</i>	<i>densifolia</i> subsp. <i>capitata</i>						*				*	
Scrophulariaceae	<i>Eremophila</i>	<i>dichroantha</i>											
Scrophulariaceae	<i>Eremophila</i>	<i>drummondii</i>	*	*		*		*				*	
Scrophulariaceae	<i>Eremophila</i>	<i>maculata</i>	*										
Scrophulariaceae	<i>Eremophila</i>	<i>racemosa</i> (P4)	*	*	*		*						
Stylidiaceae	<i>Stylidium</i>	<i>sejunctum</i> (P2)		*	*		*						
Thymelaeaceae	<i>Pimelea</i>	<i>aeruginosa</i>		*		*							
Violaceae	<i>Hybanthus</i>	<i>floribundus</i> subsp. <i>curvifolius</i>					*						

**Appendix 5: DEC Threatened Flora Database search results within 10km of Greater New Morning/Spotted Quoll area
(DEC, 2011a)**

Species	Conservation Code
<i>Banksia sphaerocarpa</i> var. <i>dolichostyla</i>	T
<i>Eucalyptus steedmanii</i>	T
<i>Paragoodia crenulata</i>	T
<i>Acacia asepala</i>	2
<i>Acacia kerryana</i>	2
<i>Baeckea</i> sp. Crossroads (B.L. Rye & M.E. Trudgen 241186)	1
<i>Baeckea</i> sp. Lake Cronin (K.R. Newbey 9191)	1
<i>Baeckea</i> sp. North Ironcap (R.J. Cranfield 10580)	2
<i>Baeckea</i> sp. Parker Range (M. Hislop & F. Hort MH 2968)	3
<i>Boronia westringioides</i>	2
<i>Brachyloma nguba</i>	1
<i>Calamphoreus inflatus</i>	4
<i>Comesperma calcicola</i>	3
<i>Conospermum sigmoideum</i>	2
<i>Cryptandra polyclada</i> subsp. <i>polyclada</i>	3
<i>Dampiera scaevolina</i>	1
<i>Daviesia elongata</i> subsp. <i>impressa</i>	3
<i>Dillwynia acerosa</i>	3
<i>Dillwynia</i> sp. Capel (P.A. Jurjevich 1771)	1
<i>Elatine macrocalyx</i>	3
<i>Eremophila biserrata</i>	4
<i>Eremophila racemosa</i>	4
<i>Eucalyptus exigua</i>	3
<i>Eucalyptus georgei</i> subsp. <i>fulgida</i>	4
<i>Eucalyptus myriadena</i> subsp. <i>parviflora</i>	1
<i>Eutaxia acanthoclada</i>	3
<i>Eutaxia nanophylla</i>	3
<i>Eutaxia rubricarina</i>	3
<i>Frankenia drummondii</i>	3
<i>Gnephosis intonsa</i>	1
<i>Grevillea insignis</i> subsp. <i>elliottii</i>	3
<i>Grevillea prostrata</i>	4
<i>Guichenotia asteriskos</i>	2
<i>Haegiela tatei</i>	4

Species	Conservation Code
<i>Hibbertia pachyphylla</i>	3
<i>Isolepis australiensis</i>	3
<i>Keraudrenia adenogyna</i>	3
<i>Melaleuca macronychia</i> subsp. <i>trygonoides</i>	3
<i>Microcorys</i> sp. Forrestania (V. English 2004)	4
<i>Olearia laciniifolia</i>	2
<i>Pityrodia</i> sp. Yilgarn (A.P. Brown 2679)	3
<i>Pultenaea daena</i>	3
<i>Scaevola tortuosa</i>	1
<i>Stenanthemum liberum</i>	1
<i>Stylidium sejunctum</i>	2
<i>Verticordia gracilis</i>	3
<i>Verticordia multiflora</i> subsp. <i>solox</i>	2

Appendix 6: GPS coordinates of Flora/Fauna of Conservation Significance identified within the Greater New Morning/Spotted Quoll area

Species	DEC known location	No. plants	Zone (GDA94)	Easting	Northing
<i>Eremophila racemosa</i> (P4)	N	>100	50 H	751633	6406437
<i>Eremophila racemosa</i> (P4)	N	100	50 H	752001	6405707
<i>Eremophila racemosa</i> (P4)	N	25	50 H	752095	6405710
<i>Eremophila racemosa</i> (P4)	N	25	50 H	751926	6405779
<i>Eremophila racemosa</i> (P4)	N	25	50 H	751849	6405891
<i>Eremophila racemosa</i> (P4)	N	2	50 H	752172	6405948
<i>Eremophila racemosa</i> (P4)	N	50	50 H	751874	6405960
<i>Eremophila racemosa</i> (P4)	N	100	50 H	751870	6406136
<i>Eremophila racemosa</i> (P4)	N	4	50 H	752064	6406139
<i>Eremophila racemosa</i> (P4)	N	55	50 H	752093	6406012
<i>Eremophila racemosa</i> (P4)	N	10	50 H	751658	6402742
<i>Eremophila racemosa</i> (P4)	N	25	50 H	751465	6402618
<i>Eucalyptus steedmanii</i> (T)	Y	N/A	Population 1		
<i>Eucalyptus steedmanii</i> (T)	Y	N/A	Population 3		
<i>Eucalyptus steedmanii</i> (T)	Y	N/A	Population 7		
<i>Eucalyptus steedmanii</i> (T)	Y	N/A	Population 8		
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752259	6407592
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752257	6407652
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752246	6407660
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752240	6407672
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752238	6407679
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752237	6407691
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752253	6407768
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	15	50 H	752460	6407650
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752498	6407503
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	15	50 H	752594	6407476
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752735	6407252
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752778	6407214
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	25	50 H	752907	6407123
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	15	50 H	752251	6407707
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	25	50 H	752464	6407632
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	5	50 H	752562	6407528
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	30	50 H	752594	6407519
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	752639	6407480
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752656	6407451
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	2	50 H	752865	6407147
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	5	50 H	752820	6407304
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752808	6407329
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	752792	6407395
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752779	6407427

Species	DEC known location	No. plants	Zone (GDA94)	Easting	Northing
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	30	50 H	752773	6407432
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752761	6407443
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752715	6407498
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752692	6407529
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	5	50 H	752622	6407606
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	2	50 H	752606	6407652
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	3	50 H	752576	6407708
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752569	6407788
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752596	6407774
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752620	6407753
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752632	6407742
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752656	6407728
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50 H	752677	6407697
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	120	50 H	752710	6407673
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752728	6407672
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	5	50 H	752828	6407540
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	15	50 H	752879	6407618
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	752835	6407676
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	752793	6407721
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752841	6407742
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	100	50 H	752947	6407735
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	50	50 H	752939	6407663
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752577	6406573
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	751959	6406886
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	10	50 H	752381	6402991
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	752349	6402908
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	36	50 H	752339	6402870
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	150	50 H	752341	6402853
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	752310	6402768
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	20	50 H	752323	6402745
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50H	752349	6402908
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50H	752381	6402991
<i>Microcorys</i> sp. Forrestania (V. English 2004) (P4)	N	1	50H	752406	6403339
<i>Stylidium sejunctum</i> (P2)	N	10	50 H	751703	6405651
<i>Stylidium sejunctum</i> (P2)	N	5	50 H	751718	6405629
<i>Stylidium sejunctum</i> (P2)	Y	1	50 H	751815	6405584
<i>Stylidium sejunctum</i> (P2)	Y	1	50 H	751673	6405448
Active malleefowl mound	N/A	N/A	50 H	752671	6407159

Appendix 7: Muir Life Form/Height Class (Muir, 1977).

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70% -100%	MID DENSE 30% -70%	SPARSE 10% -30%	VERY SPARSE 2% -10%
Trees > 30m Trees 15 – 30m Trees 5 – 15m Trees < 5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee Tree Form Mallee Shrub Form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs > 2m Shrubs 1.5 – 2m Shrubs 1 – 1.5m Shrubs 0.5 – 1m Shrubs 0 – 0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat Plants Hummock Grass Bunch grass >0.5m Bunch grass < 0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-dense Hummock Grass Tall Grass Low Gras Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges > 0.5m Sedges < 0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverworts	Dense ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Appendix 8: Keighery Health rating scale (1994).

Health Rating	Health Description	Definition
6	Pristine	No obvious signs of disturbance
5	Excellent	Vegetation intact despite disturbance affect, weeds are non-aggressive individual species
4	Very Good	Vegetation altered due to obvious signs of disturbance
3	Good	Structure affected multiple disturbances. Retains basic structure, has ability to regenerate
2	Degraded	Structure severely disturbed. Can regeneration to good condition, but requires intensive management
1	Completely Degraded	Completely bare no native species