Appendices

(Total No. of pages including blank pages = 92)

Note: All appendices are included only on the Project CD.

This page has intentionally been left blank

Appendix 1

Flora Survey Data (extracted from Anne Clements & Associates 2002, 2008)

(Total No. of pages including blank pages = 12)

This page has intentionally been left blank

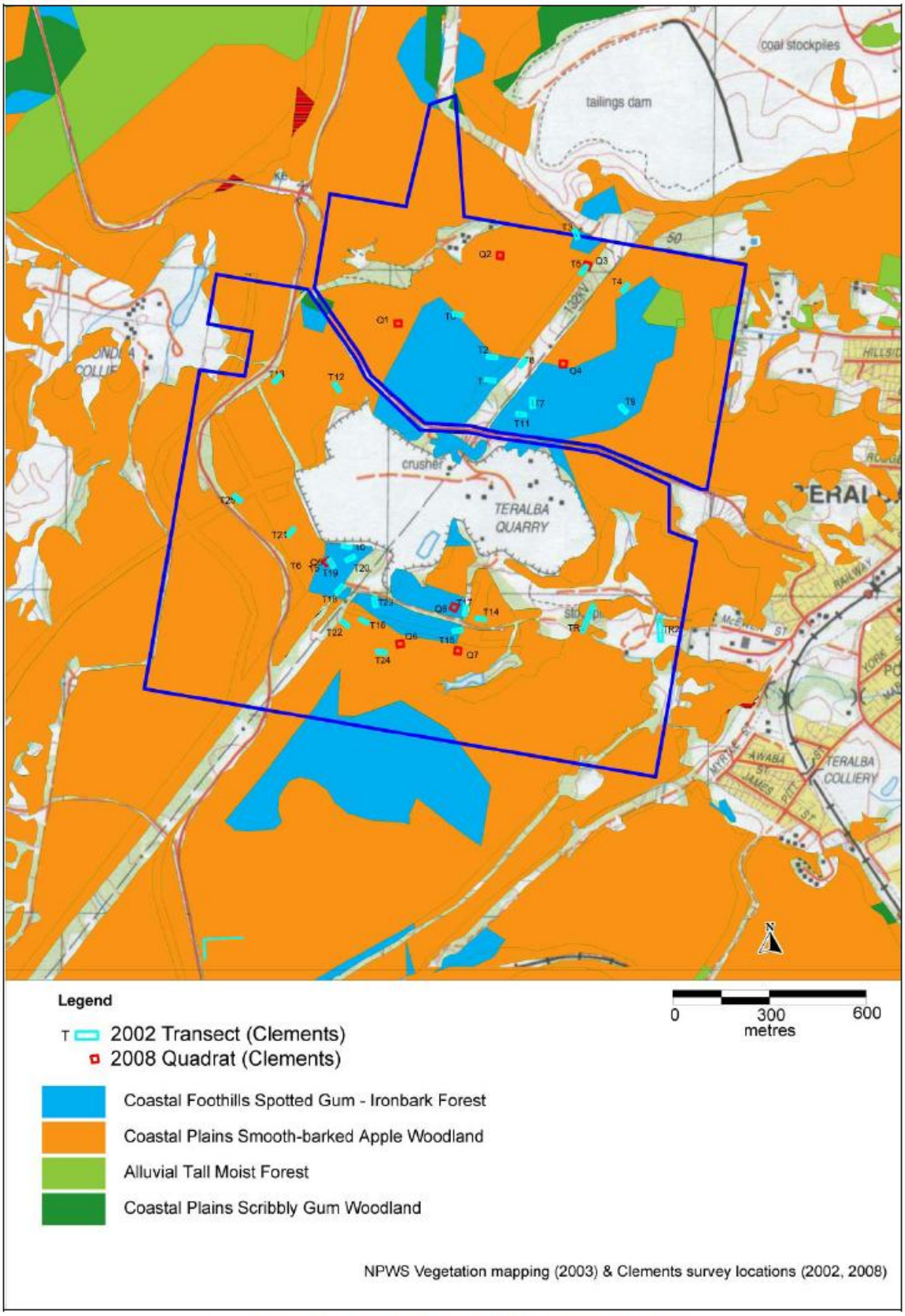


Figure 1 Clements (2002, 2008) survey locations

Table 1 Species recorded at sampling locations in 2002 and 2008 (from Table 2 of Clements 2008)

		2002 Transects																			2008 quadrats							
Class/Family	*Botanical name* **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
1. Pteridophytes																												
Adiantaceae	*Adiantum aethiopicum*							1						1					1						2		1	1
Adiantaceae	*Adiantum hispidulum*		3																							1	1	
Blechnaceae	*Doodia aspera*		2		1							1																
Dennstaedtiaceae	*Pteridium esculentum*																								3			
Dicksoniaceae	*Calochlaena dubia*																		1									
Lindsaeaceae	*Lindsaea microphylla*							1																				1
Pteridaceae	*Pteris tremula*																		1									
Sinopteridaceae	*Cheilanthes sieberi*	2	2	1	1	3	2	3	1	1	1		2	3	1	1	3	3	7	6	1		2	1	3			2
Sinopteridaceae	*Pellaea paradoxa*		3									2														3		
2. Gymnosperms																												
Zamiaceae	*Macrozamia flexuosa*		2		1		1					3			3												2	3
3. Dicotyledons																												
Acanthaceae	*Brunoniella australis*																				4							
Acanthaceae	*Brunoniella pumilio*				3					2																3		
Acanthaceae	*Pseuderanthemum variabile*	2	1	1			1				3	1			1							4	1	2	3	3	3	4
Apiaceae	*Centella asiatica*							1	1									1	1	3								
Apiaceae	*Daucus glochidiatus*		3									3							1							4		
Apiaceae	* *Hydrocotyle bonariensis*																			1								
Apiaceae	*Hydrocotyle peduncularis*		1																3	2								
Apiaceae	*Hydrocotyle tripartita*																								2			
Araliaceae	*Polyscias sambucifolia*		1	3	1	1	1		2				1	1	1	1			5	5		2	3		3	2	1	1
Asclepiadaceae	* *Gomphocarpus sp.*																											
Asteraceae	* *Ageratina adenophora*	1	3					3				1					2		6	3					4	1		
Asteraceae	* *Ambrosia sp.*																			1								
Asteraceae	* *Aster subulatus*																			2								
Asteraceae	* *Bidens pilosa*		1									1				1	1	1	1		2	2		1	1	2	1	
Asteraceae	*Brachyscome multifida*														1							3					2	1
Asteraceae	*Cassinia sp.*			1		1																						
Asteraceae	* *Cirsium vulgare*																			1					1			
Asteraceae	* *Conyza sumatrensis*	1	1					3				1				1		2	6	2	2	1			4			1
Asteraceae	*Coronidium scorpioides*		1																									
Asteraceae	*Euchiton involucratus*	1	1					2								1				1								
Asteraceae	*Euchiton sp.*																					1						

		2002 Transects																			2008 quadrats							
Class/Family	*Botanical name* **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
Asteraceae	** Facelis retusa*																			1								
Asteraceae	** Gamochaeta spicata*																									1		
Asteraceae	*Gnaphalium species*		1																									
Asteraceae	** Hypochaeris radicata*		2					3									3	3	4	6			1		2		1	
Asteraceae	*Lagenophora gracilis*				1						1														2			
Asteraceae	*Ozothamnus diosmifolius*			1		2			1				1					1	6	6		1				2		
Asteraceae	*Senecio hispidulus*		3									1				2								1		3		
Asteraceae	** Senecio madagascariensis*	1	1				1									1	3	3	3	3	2	3			3			
Asteraceae	*Senecio prenanthoides*																				2				3			
Asteraceae	** Senecio pteropherus*																									1		
Asteraceae	*Senecio quadridentatus*											1																
Asteraceae	*Sigesbeckia orientalis*	1	3									1				3			2		3	3			4	3		
Asteraceae	** Sonchus oleraceus*		1														1						1		1	1		
Asteraceae	*Vernonia cinerea*			1					1?					1		1					3	2	4		2	3	2	
Bignoniaceae	*Pandorea pandorana*		2	1	3		3		3	2	2		2	1	3		2					4	4	3		2	4	4
Brassicaceae	*Rorippa laciniata*											1																
Campanulaceae	*Wahlenbergia gracilis*		3															1		1		1						
Caryophyllaceae	** Cerastium glomeratum*		2																									
Caryophyllaceae	** Petrorhagia nanteuilii*																											
Caryophyllaceae	** Polycarpon tetraphyllum*																			1								
Casuarinaceae	*Allocasuarina littoralis*																			3								
Casuarinaceae	*Allocasuarina torulosa*				1				2					1	2	1			3	1							1	2
Celastraceae	*Maytenus silvestris*											2			1			1								4	4	3
Clusiaceae	*Hypericum gramineum*							2																				
Convolvulaceae	*Convolvulus erubescens*																			1								
Convolvulaceae	*Dichondra repens*			1			1			1			1		1				3	3	3	2	2		4	4	3	
Convolvulaceae	*Polymeria calycina*									1															4		3	
Crassulaceae	*Crassula sieberiana*		1																									
Dilleniaceae	*Hibbertia aspera*				2		3	1	2		1				2					1		4			2	2	3	4
Dilleniaceae	*Hibbertia dentata*							1											3	1								
Dilleniaceae	*Hibbertia diffusa*	1						1	2					2		3					4		2					
Dilleniaceae	*Hibbertia pedunculata*								1		1									4			4					
Dilleniaceae	*Hibbertia scandens*																										1	
Ericaceae Styphelioideae	*Acrotriche divaricata*				1		1							2								1	1			1		2
Ericaceae Styphelioideae	*Epacris microphylla*																			1								
Ericaceae Styphelioideae	*Epacris pulchella*																											
Ericaceae Styphelioideae	*Leucopogon lanceolatus*										2				2							1	1		1		2	1
Euphorbiaceae	*Breynia oblongifolia*	1	2	1		1	1					2	2					1	5	2		1		2	3		3	

		2002 Transects																			2008 quadrats							
Class/Family	*Botanical name* **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
Euphorbiaceae	*Glochidion ferdinandi*																		5	3								
Euphorbiaceae	*Phyllanthus gunnii*		2									2														3		
Euphorbiaceae	*Phyllanthus hirtellus*				1				2					2						3			1					
Euphorbiaceae	*Poranthera microphylla*		1															2		1								
Fabaceae Faboideae	*Chorizema parviflorum*	1				1							1															
Fabaceae Faboideae	*Daviesia ulicifolia*	1		2			1									2					2	2						
Fabaceae Faboideae	*Desmodium gunnii*																					2				3	3	2
Fabaceae Faboideae	*Desmodium rhytidophyllum*	2		1	3		2		2	2	3		3	2	1	3				1	3	1	3	4	1		3	1
Fabaceae Faboideae	*Desmodium varians*	3	1			2									1				4	1		2						
Fabaceae Faboideae	*Dillwynia retorta*																											
Fabaceae Faboideae	*Glycine clandestina*	3	2	2		1	3	1	3	2	3	3	2	3	3	3			5	6		4	4	4	2	4	1	4
Fabaceae Faboideae	*Hardenbergia violacea*	2		3	1	1	3		2	3	2	1	2	2	1				4	3	3	3			4		4	4
Fabaceae Faboideae	*Hovea linearis*																											
Fabaceae Faboideae	*Indigofera australis*		1																							1		
Fabaceae Faboideae	*Kennedia rubicunda*		2			1							2						5	3					3		2	1
Fabaceae Faboideae	*Mirbelia rubiifolia*																											
Fabaceae Faboideae	*Podolobium ilicifolium*	2		1	3		3	2	3	3	3		3	3	3		1		6	7	4		4		1		4	2
Fabaceae Faboideae	*Podolobium scandens*	1																										
Fabaceae Faboideae	*Pultenaea euchila*																											3
Fabaceae Faboideae	*Pultenaea retusa*																								3			
Fabaceae Faboideae	*Pultenaea villosa*																											1
Fabaceae Faboideae	* *Trifolium repens*																											
Fabaceae Mimosoideae	*Acacia decurrens*																						1					
Fabaceae Mimosoideae	*Acacia falcata*					3							1				2	2	3	3	1			4	4			
Fabaceae Mimosoideae	*Acacia floribunda*																											2
Fabaceae Mimosoideae	*Acacia implexa*							1		1	1				1						2	1				3		
Fabaceae Mimosoideae	*Acacia irrorata*		2																3	3							4	3
Fabaceae Mimosoideae	*Acacia leiocalyx*			3	1						1		3						3			4		4				
Fabaceae Mimosoideae	*Acacia longifolia*	2						1											2	7	4			4				1
Fabaceae Mimosoideae	*Acacia myrtifolia*																			1								
Fabaceae Mimosoideae	*Acacia ulicifolia*	2	1	3		3	3	2	3	1	3		3	3	2	1	3	1	1	7		4	4	4	4		2	4
Gentianaceae	* *Centaurium sp.*		1																									
Gentianaceae	* *Centaurium tenuiflorum*																								1			
Geraniaceae	*Geranium homeanum*	2	3	1								2								1	1	3			4	3	1	
Geraniaceae	* *Pelargonium sp.*	1																										
Goodeniaceae	*Goodenia hederacea*				2																							
Goodeniaceae	*Goodenia heterophylla*																			2							2	2
Haloragaceae	*Gonocarpus tetragynus*				1				1														2		2			1

		2002 Transects																			2008 quadrats							
Class/Family	Botanical name **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
Lamiaceae	*Plectranthus parviflorus*		3									2														2	1	
Lamiaceae	*Scutellaria humilis*																									2		
Lamiaceae	* *Stachys arvensis*		1																									
Lamiaceae	*Teucrium corymbosum*											1																
Lauraceae	*Cassytha glabella*																						1					
Lauraceae	* *Cinnamomum camphora*																								1			1
Lobeliaceae	*Pratia purpurascens*	2	1	2	2	2	3		3	3	3	1	3	2	1				6	6	1	4	4	1	3	4	2	4
Loganiaceae	*Logania pusilla*																											
Lythraceae	*Lythrum hyssopifolia*																											
Malvaceae	* *Modiola caroliniana*																											
Malvaceae	* *Sida rhombifolia*	1																	1						1			
Menispermaceae	*Stephania japonica*																		6					1	1			
Myrsinaceae	*Myrsine variabilis*		2									2	1													3		1
Myrtaceae	*Acmena smithii*																										1	
Myrtaceae	*Angophora costata*				2				2	3				3						2			2		2			1
Myrtaceae	*Backhousia myrtifolia*											1														4		
Myrtaceae	*Corymbia gummifera*				2				1			2														2		
Myrtaceae	*Corymbia maculata*	3	3	3	1	3	3		1		3	1	3		3	2	3	2	4	4	3	3	4	4	2	2	4	2
Myrtaceae	*Eucalyptus acmenoides*	2	3	2		3	3		3		3	2	3	3	3	3	3	1	8	6	4	4	4	4	4	2	4	4
Myrtaceae	*Eucalyptus fibrosa*									2															1			
Myrtaceae	*Eucalyptus globoidea*				3				2	2				1		3							2					
Myrtaceae	*Eucalyptus paniculata*	3	2		1	1	3				1	2	3	2	1	1	2		1	1	4	4				3	2	1
Myrtaceae	*Eucalyptus piperita*																								2			
Myrtaceae	*Eucalyptus punctata*				3		2		1	2	2		1	3	1					1			2	1	1			2
Myrtaceae	*Eucalyptus resinifera subsp. resinifera*				2																							
Myrtaceae	*Eucalyptus saligna*																		3	3					2			
Myrtaceae	*Eucalyptus sp.*								1								1	1										
Myrtaceae	*Eucalyptus tereticornis*																											
Myrtaceae	*Eucalyptus umbra*			3	3				3	2	2		1	2						2								
Myrtaceae	# *Leptospermum petersonii*																											
Myrtaceae	*Leptospermum polygalifolium*				1																				1			
Myrtaceae	*Leptospermum trinervium*																											
Myrtaceae	*Syncarpia glomulifera*																			2								
Ochnaceae	* *Ochna serrulata*																											1
Oleaceae	* *Ligustrum sinense*																			1								
Oleaceae	*Notelaea longifolia*		3									3								1		1				4	1	
Oxalidaceae	*Oxalis exilis*		1																								1	
Oxalidaceae	*Oxalis perennans*																				2	2				1		

		2002 Transects																			2008 quadrats							
Class/Family	*Botanical name* **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
Oxalidaceae	*Oxalis sp.*									1									4									
Passifloraceae	*Passiflora herbertiana*			1								1				1			1		4	2				2		
Pittosporaceae	*Billardiera scandens*	1		1		2	1	1	1	1			3					1	2	2	2	2	4			2	2	1
Pittosporaceae	*Bursaria spinosa*							1							3							4				3		4
Pittosporaceae	*Pittosporum revolutum*						1					1	1										2		1	1	1	
Pittosporaceae	*Pittosporum undulatum*																		3	1								
Plantaginaceae	*Plantago debilis*		2									2										2				3		
Plantaginaceae	* *Plantago lanceolata*																	2		2								
Primulaceae	* *Anagallis arvensis*	1	1														2	2		2		1				1		
Proteaceae	*Persoonia linearis*				2	1		1	2	1	1				1		1			3		1	3				3	1
Ranunculaceae	*Clematis glycinoides*							1											3	2		1			1	4		
Rosaceae	* *Rubus discolor*																			1								
Rubiaceae	*Canthium coprosmoides*											2																
Rubiaceae	*Galium binifolium*	1	3				2					2								1	1	1	1			2		1
Rubiaceae	*Opercularia diphylla*			2		1	1			1										1	3		3				1	
Rubiaceae	*Opercularia hispida*				1											1												
Rubiaceae	*Pomax umbellata*						1			1					2		1			4	4	2						
Rubiaceae	* *Richardia brasiliensis*					1													1									
Rubiaceae	* *Richardia humistrata*							1									1	1										
Rubiaceae	* *Richardia sp.*																								1			
Rutaceae	*Boronia polygalifolia*			1																			3					
Rutaceae	*Zieria smithii*																									1		
Sapindaceae	* *Cardiospermum grandiflorum*																											
Sapindaceae	*Dodonaea triquetra*	1	3	2													2	2	2	3				4			3	1
Scrophulariaceae	* *Verbascum virgatum*																											
Scrophulariaceae	*Veronica plebeia*		1									2							2			2			2	2		
Solanaceae	*Solanum americanum*											1																
Solanaceae	*Solanum brownii*		1																									
Solanaceae	* *Solanum nigrum*																			1								
Solanaceae	*Solanum prinophyllum*																		1									
Sterculiaceae	*Brachychiton populneus subsp. populneus*																									1		
Thymelaeaceae	*Pimelea linifolia subsp. linifolia*																			1								
Tremandraceae	*Tetratheca juncea*								1														1					
Ulmaceae	*Trema tomentosa var. viridis*																		4									
Verbenaceae	*Clerodendrum tomentosum*		1									1	1							1				3				
Verbenaceae	* *Lantana camara*	1				1			1	1		2	3	1		1				1				3		3	1	
Verbenaceae	* *Verbena brasiliensis*																		2	4								
Verbenaceae	* *Verbena officinalis*							1																				

		2002 Transects																			2008 quadrats							
Class/Family	Botanical name **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
Verbenaceae	* *Verbena rigida*																	1										
Violaceae	*Viola betonicifolia*				1					2																		
Violaceae	*Viola hederacea*																									3		
Vitaceae	*Cayratia clematidea*		2				1					1				1					2					2		
Vitaceae	*Cissus antarctica*																									1		
4. Monocotyledons																												
Anthericaceae	*Arthropodium milleflorum*	1	2	1	1		3			1	1				1						3		1		4	1		
Anthericaceae	*Caesia parviflora*	1																1										
Anthericaceae	*Tricoryne elatior*																						1	1				3
Araceae	*Gymnostachys anceps*		1																									1
Commelinaceae	*Commelina cyanea*		1									1							1									
Cyperaceae	*Carex breviculmis*	1	1								1	1				1				3	3			2	4	1		
Cyperaceae	*Cyperus gracilis*		2																									
Cyperaceae	*Cyperus imbecillis*		3									2																
Cyperaceae	*Gahnia clarkei*																		3									
Cyperaceae	*Lepidosperma laterale*		2	1	2	2	1		1	2	3			3	1					6	3		4		1	2	4	
Cyperaceae	*Ptilothrix deusta*																											
Cyperaceae	*Scleria mackaviensis*															1												
Dioscoreaceae	*Dioscorea transversa*		3									1															4	
Iridaceae	* *Sisyrinchium sp. A sensu*																								1			
Juncaceae	*Juncus continuus*																			1								
Juncaceae	*Juncus usitatus*																		2	3								
Juncaceae	*Luzula sp.*																											
Lomandraceae	*Lomandra confertifolia subsp. rubiginosa*	3				1	2							2				1										
Lomandraceae	*Lomandra cylindrica*																											
Lomandraceae	*Lomandra filiformis subsp. coriacea*							1		1	2	1											3					
Lomandraceae	*Lomandra filiformis subsp. filiformis*	1	1	1	3		2	1	1	2	3	1	2	2	3	2		1	2	2	4	3	3	4	2	1	1	3
Lomandraceae	*Lomandra longifolia*	1					1			1			2		1	1			5	4	2	4	1				1	2
Lomandraceae	*Lomandra multiflora*			2	3				2	1	1		3	2	1	1			4	2	2		2	2				1
Lomandraceae	*Lomandra obliqua*				2																							
Orchidaceae	*Acianthus sp.*						1																					
Orchidaceae	*Caladenia catenata*		1		1		1								1					1								
Orchidaceae	*Calochilus sp.*																						1					
Orchidaceae	*Dipodium sp.*																				3	1						
Orchidaceae	*Microtis parviflora*		1																						1			
Orchidaceae	*Microtis sp.*																					1						
Orchidaceae	*Pterostylis hildae*		3									1																

		2002 Transects																			2008 quadrats							
Class/Family	*Botanical name* **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
Orchidaceae	*Pterostylis sp.*																			1								
Orchidaceae	*Thelymitra pauciflora*							1												1								
Philesiaceae	*Eustrephus latifolius*	3	1		3		3	2	2	3	3	1	2	3	3	1						4	3	1	4	1	3	4
Philesiaceae	*Geitonoplesium cymosum*		3					1				1								1	1					4		
Phormiaceae	*Dianella caerulea*	2	2	3	3	1	3	2	2	2	3	3	2	1	2	1			6	7	3	4	4	3	3	3	4	3
Phormiaceae	*Dianella revoluta*	1			1			1	1		3			1	1	1					4			1				
Poaceae	** Andropogon virginicus*				1			3									3	3	4	7								
Poaceae	*Aristida vagans*	2		2	1			2	1	2			1	1	2			3		2	1		2		1			1
Poaceae	*Austrodanthonia tenuior*																			1								1
Poaceae	*Austrostipa rudis*																									1		
Poaceae	** Axonopus affinis*							1																				
Poaceae	** Briza minor*																1											
Poaceae	** Briza subaristata*																	1		2								
Poaceae	** Cortaderia selloana*							2																				
Poaceae	*Cymbopogon refractus*		2	1	1			1	1	2	1			3	2	1		1		2	2	2	2			1		
Poaceae	*Cynodon dactylon*			1				1									1		2	1								
Poaceae	*Dichelachne inaequiglumis*																											
Poaceae	*Dichelachne micrantha*		1		1		1	1			2			1		1	1	1	2	4	2				3			
Poaceae	*Dichelachne sp.*																								2		1	
Poaceae	*Digitaria parviflora*	1	2				2	3	?		1	1		1	3	3				4	2		1					1
Poaceae	*Echinopogon ovatus*		1					1			1	1	1					1	1	1			2		4	3	2	
Poaceae	** Ehrharta erecta*																			1								
Poaceae	*Entolasia marginata*	1	1	1			2												1	1	4	4	1	3	4	1	4	
Poaceae	*Entolasia stricta*			2	3	3	1	1	3	3			2	3	3			2	5	8	3	3	4	4	3	1	2	4
Poaceae	*Eragrostis brownii*					2		2					1	1				1		1								
Poaceae	*Eragrostis leptostachya*		1													1				2	1							
Poaceae	*Imperata cylindrica*	2	3	3	2	3	1	3	3	3		1	3	3	3	2	3	3	2		4	2	4	3	4		4	4
Poaceae	** Melinis repens*																	2		1								
Poaceae	*Microlaena stipoides*	2	3	2	2	3	1	1		3	1	3	2	2	3		2	2	8	6	4	4	2	2	3	2	1	
Poaceae	*Notodanthonia longifolia*											1																
Poaceae	*Oplismenus aemulus*		1																1		1				3			
Poaceae	*Oplismenus imbecillis*	2	3	1			1					3		1	2	1			4		2	2				4	4	1
Poaceae	*Panicum effusum*	1	1					1								3	2	2			1							
Poaceae	*Panicum simile*	3	1	1		2	2	2	3		3		2	3	3					7	3	3	4	3	4		1	3
Poaceae	*Paspalidium distans*						1					1				1				2	3	1	2	1	2		1	1
Poaceae	** Paspalum dilatatum*																1	2		1								
Poaceae	** Pennisetum clandestinum*																		2	3								
Poaceae	*Poa affinis*														2							4				4	4	4

		2002 Transects																			2008 quadrats							
Class/Family	*Botanical name* **Plot/Transect #**	1	2	7	10	11	15	18	19	20	23	5	14	21	24	6	8	17	R1	R2	Q2	Q4	Q5	Q8	Q1	Q3	Q6	Q7
Poaceae	*Poa sieberiana*			1								2														1		
Poaceae	* *Setaria gracilis*																								1			
Poaceae	* *Setaria pumila*							1																				
Poaceae	*Sporobolus creber*					1																						
Poaceae	*Sporobolus diander*			1																								
Poaceae	*Themeda australis*	3	3	1	3	3	3	3	3	3	3		3	3	3	3	3	3	5	8	4	4	4	2	4		4	4
Poaceae	* *Vulpia myuros*																			1								
Smilacaceae	*Smilax australis*																										1	1
Xanthorrhoeaceae	*Xanthorrhoea macronema*					1					2		2		1							3						3
Xanthorrhoeaceae	*Xanthorrhoea media*																						1					

Table 2 Percent projected area cover of vegetation in sampling quadrats (from Table 4 of Clements 2008)

Quadrat	Native canopy trees	Native subcanopy trees	Native Shrubs	Native Monocots	Native Herbs	Exotic plants	Bare ground	Leaf litter
1	25%	7%	10%	80%	5%	< 1%	1%	30%
2	25%	30%	1%	50%	1%	< 1%	1%	60%
3	20%	50%	3%	50%	2%	<1%	0%	50%
4	30%	20%	3%	70%	1%	<1%	0%	30%
5	20%	7%	10%	60%	1%	<1%	0%	40%
6	30%	4%	2%	90%	2%	<1%	0%	15%
7	20%	<1%	20%	80%	1%	<1%	<1%	30%
8	7%	10%	95%	<1%	<1%	<1%	0%	99%

Appendix 2

Flora Survey Data (Elks 2011)

(Total No. of pages including blank pages = 10)

This page has intentionally been left blank

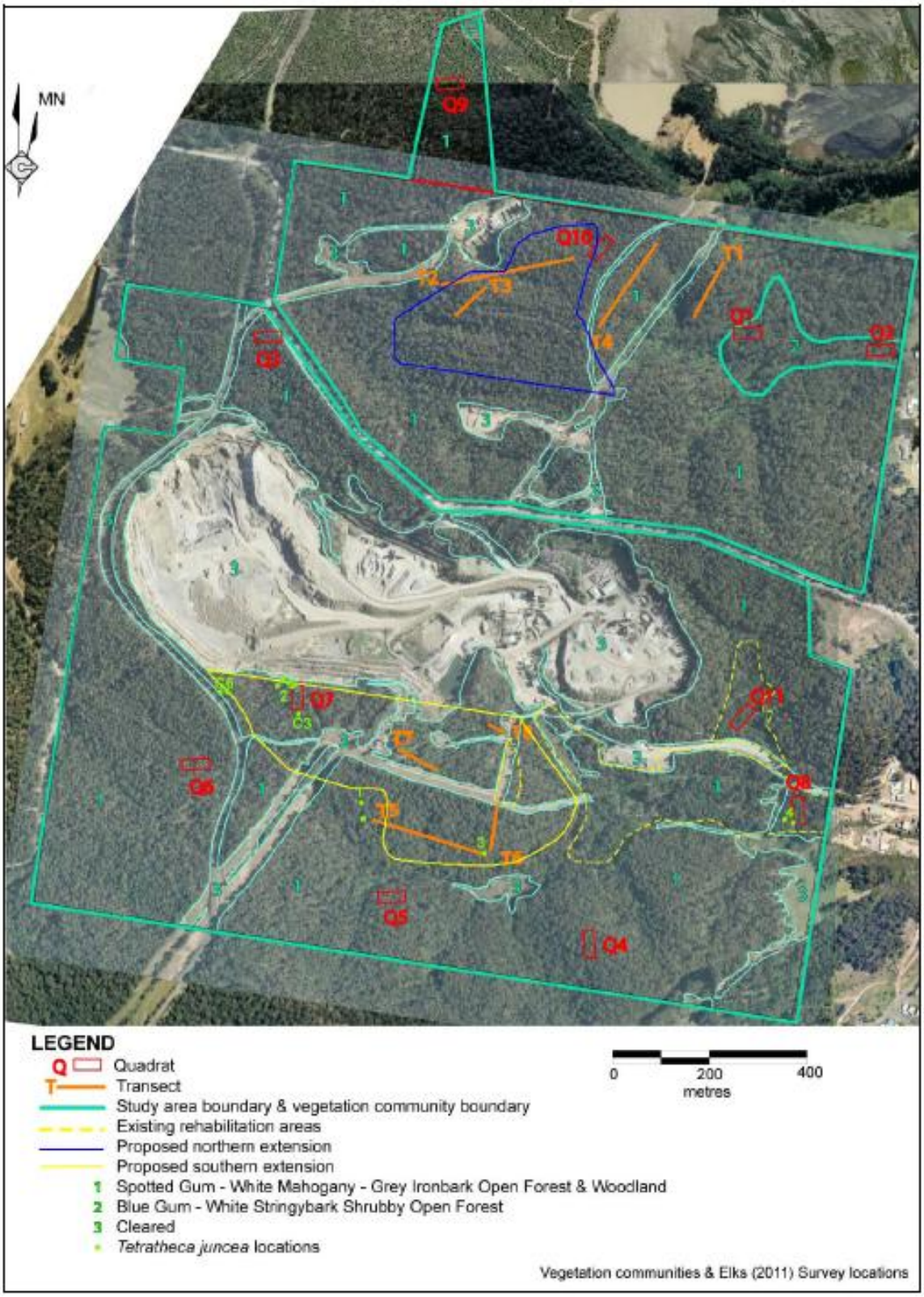


Figure 2 Updated vegetation mapping and survey locations (Elks 2003)

Table 3 Species cover/abundance* by plot (Elks 2011)

				Species Cover-abundance x Plot										
Class/Order	Family	Scientific name Plot	introd	1	2	3	4	5	6	7	8	9	10	11
1. Pteridophytes	Adiantaceae	*Adiantum aethiopicum*							1					
		Adiantum formosanum		1	2									
		Adiantum hispidulum		2										
	Blechnaceae	*Blechnum cartilagineum*		3										
		Doodia aspera		3	2							2		
	Dennstaedtiaceae	*Pteridium esculentum*		2	1							2		
	Dryopteridaceae	*Lastreopsis microsora*		2										
	Lindsaeaceae	*Lindsaea microphylla*								1				
	Pteridaceae	*Pteris tremula*		1	1									
	Sinopteridaceae	*Cheilanthes sieberi*					1	1	2	1		1		
2. Gymnosperms	Zamiaceae	*Macrozamia flexuosa*		2					1					
3. Dicotyledons	Acanthaceae	*Pseuderanthemum variabile*		2			2		1			1		
	Apiaceae	*Centella asiatica*			1									
		Ciclospermum leptophyllum	*											2
	Araliaceae	*Astrotricha latifolius*		2										
		Polyscias sambucifolia			1	2			2	1		1	1	
	Asclepiadaceae	*Marsdenia rostrata*		1										
	Asteraceae	*Ageratina adenophora*	*	3	2							1		1
		Bidens pilosa	*											2
		Conyza sumatrensis	*											2
		Ozothamnus diosmifolius												1
		Senecio madascariensis	*											1
		Sigesbeckia orientalis												1
		Unkn Asteraceae										1		
		Vernonia cinerea							1	1		1		
	Atherospermataceae	*Daphnandra apatala ms*		1										
	Bignoniaceae	*Pandorea pandorana*						1	2	2	1			
	Casuarinaceae	*Allocasuarina littoralis*									2			
		Allocasuarina torulosa						1	1					2
	Celastraceae	*Maytenus silvestris*					2	1	1			1		
	Convolvulaceae	*Dichondra repens*					2					2		1
	Dilleniaceae	*Hibbertia aspera*					1	1	1			2		
		Hibbertia diffusa						1	1	1				
	Elaeocarpaceae	*Elaeocarpus obovatus*		1										
		Elaeocarpus reticulatus		1										
	Epacridaceae	*Acrotriche divaricata*						2		1				
		Astroloma humifusum								1				
		Leucopogon lanceolatus						1		2				1
	Euphorbiaceae	*Breynia oblongifolia*		2	2						2	2		2
		Glochidion ferdinandi									1			
		Phyllanthus gunnii		2										
	Fabaceae Caesalpiniodeae	*Senna septemtrionalis*			3									
	Fabaceae Faboideae	*Chorizema parviflorum*										1		
		Desmodium gunnii		2					1		2			
		Desmodium rhytidophyllum					2					2		
		Dillwynia retorta					1		2					
		Glycine clandestina		3	2	1	2	1	1		1	1	1	1
		Hardenbergia violacea				1	1					1		
		Indigophora australis		2										
		Kennedia rubicunda		1		1								
		Podolobium ilicifolium				2	2	2	2	3	2	1		
		Pultenaea euchila				2			2	1		1		
		Pultenaea paleacea										1		
		Pultenaea retusa										1		
		Pultenaea villosa						2						
	Fabaceae Mimosoideae	*Acacia decurrens*								1				2
		Acacia implexa		1			2			1	1		3	
		Acacia irrorata			2									

				Species Cover-abundance x Plot										
Class/Order	Family	Scientific name Plot	introd	1	2	3	4	5	6	7	8	9	10	11
		Acacia linifolia							1			2	1	
		Acacia myrtifolia							1					
		Acacia ulicifolia				3	1	2	1	2	2	2		
	Geraniaceae	*Geranium sp*		1										
	Goodeniaceae	*Goodenia heterophylla*				2								
	Haloragaceae	*Gonocarpus tetragynus*								1				
	Lauraceae	*Cassytha glabella*								2				
		Cinnamomum camphora	*		2									
		Cryptocarya microneura			1									
		Cryptocarya rigida		1										
	Lobeliaceae	*Pratia purpurascens*									2			
	Malvaceae	*Sida rhombifolia*	*											2
		Sida rhombifolia	*		1									
	Meliaceae	*Melia azedarach*												1
		Synoum glandulosum		3										
	Menispermaceae	*Sarcopetalum harveyanum*		2	1									
		Stephania japonica			2						2			1
	Moraceae	*Maclura cochinchinensis*			2									
	Myrtaceae	*Acmena smithii*			2									
		Angophora costata				3				3		2		
		Callistemon salignus									2			
		Corymbia gummifera				3								
		Corymbia maculata		2	1	2	4	3	4	3	3	3	4	1
		Eucalyptus acmenoides				3	2	2	2	1	3		2	2
		Eucalyptus fibrosa						3						
		Eucalyptus globoidea		2	2									
		Eucalyptus microcorys		1										
		Eucalyptus paniculata					4						2	2
		Eucalyptus piperita										2		
		Eucalyptus punctata					2	2		1	2			2
		Eucalyptus resinifera										2		
		Eucalyptus saligna		3	3						2			2
		Eucalyptus umbra				2						3		
		Eucalyptus umbra					2		3	2				
		Leptospermum polygalifolium										2		
		Rhodamnia rubescens		1										
		Syncarpia glomulifera		1	1			1			2			2
	Oleaceae	*Ligustrum sinense*	*		2						1			
		Notolaea longifolia								1				
	Oxalidaceae	*Oxalis sp*										1		1
	Pittosporaceae	*Billardiera scandens*				2				1		1	1	
		Bursaria spinosa						1		1	2			
		Pittosporum revolutum		1										
		Pittosporum undulatum									1			
	Polygonaceae	*Unkn Polygonaceae*	*											1
	Primulaceae	*Anagallis arvensis*	*	1							1			
	Proteaceae	*Persoonia linearis*						1	1	2				
		Persoonia linifolia										1		
	Ranunculaceae	*Clematis glycinoides*		1										1
	Rhamnaceae	*Alphitonia excelsa*			2									
	Rosaceae	*Rubus moluccanus*		2	1							1		
		Rubus parvifolius										1		2
	Rubiaceae	*Pomax umbellata*						2						
		Richardia brasiliensis	*								2			
	Rutaceae	*Melicope micrococca*		1										
	Sapindaceae	*Dodonea triquetra*						2	1		2			
		Guioa semiglauca		1										
	Solanaceae	*Solanum mauritianum*	*	1	1									
		Solanum prinophyllum		1										

				Species Cover-abundance x Plot										
Class/Order	Family	Scientific name Plot	introd	1	2	3	4	5	6	7	8	9	10	11
	Sterculiaceae	*Seringia arborescens*		1										
	Tremandraceae	*Tetratheca juncea*								2	1			
	Ulmaceae	*Omalanthus populifolius*			1									
		Trema tomentosa									1			
	Verbenaceae	*Clerodendrum tomentosum*		1							1			
		Lantana camara	*	4	5						1		1	2
		Verbena bonariensis	*											1
	Violaceae	*Viola hederacea*			2						2			
	Vitaceae	*Cayratia clematidea*		1	1		2						1	2
		Cissus antarctica		2										
4. Monocotyledons	Amaryllidaceae	*Crinum pedunculatum*			1									
	Commelinaceae	*Commelina cyanea*			2						2			2
	Cyperaceae	*Carex appressa*			2									
		Cyperus sp			1						1			
		Lepidosperma laterale				1	2	2	1	1	1	2	2	
		Unkn Cyperaceae									1			
	Dioscoreaceae	*Dioscorea transversa*		2	2							1		
	Doryanthaceae	*Doryanthes excelsa*							2			1		
	Juncaceae	*Juncus sp*			1									
	Lomandraceae	*Lomandra filiformis*				3	3	3			1	2	2	
		Lomandra longifolia						1		1	1	2		3
		Lomandra multiflora						1			1	1	1	
		Lomandra obliqua				2		1	2	1	2			
		Lomandra sp											1	
	Philesiaceae	*Eustrephus latifolius*		2	2				2	2		2		
		Geitonoplesium cymosum				1								
	Phormiaceae	*Dianella revoluta*			2	2	1	1	1	2	2	2	2	1
	Poaceae	*Andropogon virginicus*	*											1
		Aristida vagans						1	2			1	1	
		Cortaderia selloana	*		1									
		Cymbopogon refractus					1	2	2	2	2	2	1	
		Cynodon dactylon												2
		Digitaria parviflora				1	2		1	1	1		1	
		Echinopogon caespitosus				1								
		Echinopogon ovatus			1									
		Ehrharta erecta	*								2			3
		Entolasia marginata		2	2									
		Entolasia stricta			2	2	2	2	2	2	2	2	1	
		Eragrostis brownii										1		
		Imperata cylindrica				2		2	1	3		3		2
		Microlaena stipoides			2							1	1	2
		Oplismenus aemulus			3						1			2
		Oplismenus imbecillus		2	2				1				1	2
		Panicum maximum	*											2
		Panicum simile				2	2		2				1	
		Paspalum dilatatum	*											1
		Poa affinis						1	1	1				
		Poa sieberiana						1						
		Setaria gracilis	*								1			
		Themeda australis				2	3	2	2	3	1	2	1	
		unknown Poaceae						1						
	Smilacaceae	*Smilax australis*		3	2									
		Smilax glycjphylla		1										
	Xanthorrhoeaceae	*Xanthorrhoea macronema*						2	1	1				
		Xanthorrhoea sp					1				1			
		TOTAL SPECIES NO:		51	46	25	27	36	39	38	45	48	23	41

*Cover abundance scores:

1 = <5% projective foliage cover (pfc), uncommon;

2 = <5% pfc, common;

3 = 5 to <25% pfc;

4 = 25 to <50% pfc, and

5 = 50 to <75% pfc.

Table 4 Biometric plot description data(Elks 2011)

plot no.	easting	northing (mga 56)	date	orientation	photos	hollow trees	fallen logs	pfc native o/storey	pfc native mid	pfc native grasses	pfc native shrubs	pfc native other	pfc exotic	Class
1	368700	6352900	23/03/2011	we	29	2	200	11	<1	5	<1	30	60	Blue Gum MOF
2	368990	6352850	23/03/2011	we	33	1	160	11	9	70	<1	1	25	Blue Gum MOF
3	367740	6352875	23/03/2011	ew	na	2	10	21	19	18	21	17	0	Spotted Gum DOF/W
4	368420	6351630	24/03/2011	ns	34	0	54	20	7	16	16	10	0	Spotted Gum DOF/W
5	368015	6351715	24/03/2011	ew	35	1	72	18	4	15	12	9	0	Spotted Gum DOF/W
6	367640	6352000	24/03/2011	ew	36	2	9	29	13	18	6	9	0	Spotted Gum DOF/W
7	367800	6352140	24/03/2011	ns	39	1	11	16	6	23	15	1	0	Spotted Gum DOF/W
8	368825	6351867	24/03/2011	sn	40	1	69	40	9	16	5	11	1	Rehabilitation
9	368160	6353385	25/03/2011	ew	41	1	38	14	24	17	9	8	0	Spotted Gum DOF/W
10	368420	6353030	25/03/2011	we	42	0	0	23	15	10	0	5	0	Spotted Gum DOF/W
11	368740	6352065	25/03/2011	sw-ne	43	0	46	28	10	18	0	16	8	Rehabilitation

Table 5 Biometric plot disturbance and modification data (Elks 2011)

Plot	1	2	3	4	5	6	7	8	9	10	11
Timber harvesting	3 B O O	2 B O O	1 B O O	3 B O O	2 B O O	2 B O O	2 B O O		2 B O O	3 B O O	
Firewood collection & tidying up											
Grazing & trampling											
Soil disturbance			1 C O NR					3 D OP NR			2 C O NR
Canopy dieback		2 C O R									
Dense post-disturbance regrowth			2 D O NR	1 C O NR				2 D O NR	2 C O NR	3 D O NR	
Weeds	3 D O NR	3 D O NR						1 C O NR		1 B O NR	2 C O NR
Fire damage	3 C O NR	2 C O NR	2 C O NR	3 C O NR	3 C O NR	2 C O NR	2 C O NR		2 C O NR	2 C O NR	
Flood damage											
Storm damage	2C O NR	2 C O NR			2 B O R						
Feral herbivores											
Other - indicate type											3 D O O
Comment		Bellbirds present									Agricultural clearing

Table 6 Locations and numbers of *Tetratheca juncea* populations and individuals detected in the Teralba study area in 2008 and 2011

Sub-Population (Elks)	Population (Clements)	mga 56 Easting	Northing	No of Clumps			Comments (Elks 2011)
				Elks Jan 2011	Clements Dec 2008	Clements Nov 2008	
1a	1	367945	6351900	8	15	8	Several tags without plants
1b	1	367947	6351866	19	22	23	Several untagged plants; fallen branch smothered tagged plant
Total 1				**27**	**37**	**31**	
2a	2	367771	6352145	1	0	0	
2b	2	367782	6352160	1	0	3	Located within currently approved quarry
2c	2	367795	6352150	8	0	4	Several untagged plants
2d	2	367800	6352140	16	0	20	
2e	2	367806	6352150	14	70	14	Several untagged plants; two tags without plants
Total 2				**40**	**70**	**41**	
C3	3	367812	6352085	Not visited	0	2	
Total C3				**0**	**0**	**2**	
3	4	368199	6351795	9	0	7	One tag without plant
-	7	368202	6351798	0	12	0	
Total 3				**9**	**12**	**7**	
4a	8	368825	6351865	1	1	0	
4b	8	368845	6351859	0	1	0	Tag relocated - smothered by fallen tree
Total 4				**1**	**2**	**0**	
C6	6	367652	6352131	Not visited	4	2	
C6	6	367665	6352133	Not visited	2	2	
Total C6					**6**	**4**	
Grand Total				**77**	**127**	**85**	

Table 7 January 2011 survey locations and times

	Transect no. & date		mga56 easting	northing	time	transect length (m)	elapsed time (min)
Transect start	T1		368680	6353004	0858	136	65
Transect finish		11/01/2011	368623	6352880	0923		
Transect start	T2		368113	6352958	0955	270	90
Transect finish		11/01/2011	368379	6353007	1045		
Transect start	T3		368205	6352956	1050	88	55
Transect finish		11/01/2011	368140	6352897	1105		
Transect start	T4		368418	6352864	1120	223	85
Transect finish		11/01/2011	368548	6353045	1205		
Transect start	T5		367960	6351880	1445	253	70
Transect finish		11/01/2011	368200	6351800	1515		
Transect start	T6		368200	6351800	1520	100	10
Transect finish		11/01/2011	368206	6351900	1530		
Transect start	T7		368013	6352008	0852	97	60
Transect finish		12/01/2011	368098	6351962	0912		
Transect start	T8		368234	6352044	0915	136	65
Transect finish		12/01/2011	368212	6352070	0930		
						1304	500

Table 8 March 2011 survey locations and times

plot no.	easting	northing (mga 56)	date	Map Class	Approx start	Approx finish	Approx time
1	368700	6352900	23/03/2011	Blue Gum MOF	830	945	75
2	368990	6352850	23/03/2011	Blue Gum MOF	1015	1130	75
3	367740	6352875	23/03/2011	Spotted Gum DOF/W	1330	1430	60
4	368420	6351630	24/03/2011	Spotted Gum DOF/W	1500	1600	60
5	368015	6351715	24/03/2011	Spotted Gum DOF/W	830	930	60
6	367640	6352000	24/03/2011	Spotted Gum DOF/W	1030	1130	60
7	367800	6352140	24/03/2011	Spotted Gum DOF/W	1200	1300	60
8	368825	6351867	24/03/2011	Rehabilitation	1330	1445	75
9	368160	6353385	25/03/2011	Spotted Gum DOF/W	915	1030	75
10	368420	6353030	25/03/2011	Spotted Gum DOF/W	1100	1215	75
11	368740	6352065	25/03/2011	Rehabilitation	1230	1330	60

This page has intentionally been left blank

Appendix 3

Qualifications and Experience Gregory N. Elks

(Total No. of pages including blank pages = 12)

This page has intentionally been left blank

GREGORY N. ELKS

address 21 Titans Close, Bonville NSW 2441

telephone 02 6653 4190

e-mail gregelks@bigpond.com

QUALIFICATIONS

BSc University of New England 1990 (Botany). Identification and ecology of Australian plants in rainforest, sclerophyll forest and woodland, heathland, grassland and aquatic ecosystems. Plant microbe interactions. Ecology of disturbed communities.

MLitt University of New England 1992 (Ecology). Literature studies of seed and seedling ecology of selected plants, with emphasis on mechanisms whereby plants are able to arrive at and persist on a site. Field experiments and dissertation: an autecological study identified those development stages and processes in the life cycle of Giant Parramatta Grass vulnerable to disruption by environmental influences.

LICENSES

DEC Scientific Investigation License S10421
NSW Heavy Vehicle Drivers Licence 7134RK
Structural Landscaping Contractor Licence 5249C

AFFILIATIONS

Ecological Consultants Association of NSW

CURRENT POSITIONS

1992 – p Nature Conservation Council representative, Coffs Harbour Bushfire Risk Management Committee
1990 – p Principal of Idyll Spaces Environmental Consultants

PREVIOUS POSITIONS

- 2003-4, 2006. Project Ecologist to Ecocivil Pty Ltd for construction of Clarence Valley and Coffs Harbour Regional Water Supply Stage 1B Distribution Pipelines.
- 1997 – 2000. Coffs Harbour Catchment Management Committee.
- 1996-1998. Northern Regional Manager, CRA Multi-attribute Mapping Project, National Parks and Wildlife Service Coffs Harbour/ Department of Urban Affairs and Planning. Responsible for the mapping of vegetation structure and floristics over all forested land between Newcastle and the Queensland border, involving inter-agency and community liaison to develop and apply an appropriate methodology in a project central to the completion of a Regional Forest Agreement in NE NSW.
- 1996. Manager, Forest Conservation Unit, NPWS Northern Zone, Coffs Harbour. Responsible for NPWS submission to Environmental Impact Statements and licensing threatened species impacts of State Forest harvesting activities for five Forestry Districts in northern NSW.
- 1995 – 1996. Manager, Broad Old Growth Mapping Project, NPWS Northern Zone, Coffs Harbour. Responsible for the development and implementation of a methodology for mapping of Old Growth forests in northern NSW.
- 1994 – 1995. Forest Ecologist, Joint Old Growth Forest Project, State Forests & NPWS Grafton. Responsible for management of field survey and interpretation and reporting of scientific survey data in an inter-agency project to study Old Growth Forest.
- Head Teacher, Bush Regeneration Certificate, Coffs Harbour TAFE.
- 1990 – 1992. Teacher, Landscape Trade Skills, Small Area Farming, Coffs Harbour TAFE
- Teacher, Introductory Horticulture, Yarrawarra Aboriginal Corporation.

MANAGEMENT

- Principal of Idyll Spaces Environmental Consultants.
- Manager, CRA Multi-attribute Mapping Project, National Parks and Wildlife Service Coffs Harbour/ Department of Urban Affairs and Planning.
- Manager, Forest Conservation Unit, NPWS Northern Zone, Coffs Harbour.
- Manager, Broad Old Growth Mapping Project, NPWS Northern Zone, Coffs Harbour.
- Principal of Idyll Spaces Landscape Contractors.

EXPERTISE

- Vegetation survey, classification and mapping
- Aerial photo interpretation
- Assessments for Local Environmental Studies, Reviews of Environmental Factors, Development Applications
- Species Impact Assessment
- Targeted survey for threatened flora species
- Weed management
- Vegetation management and restoration
- Threatened species recovery planning.
- Assessment of eucalypt growth stage & forest disturbance history

LAND & ENVIRONMENT COURT EXPERT WITNESS

- Vegetation, soils, drainage and occurrence of EECs, adequacy of offsets. Road & Traffic Authority ats Paul and Sandra Nicholls. Land & Environment Court Proceedings No. 30262 of 2010.
- Aerial photograph interpretation, wetland ecology, remediation. Environment Protection Authority v Geoffrey Allan Robinson and Geoff Robinson Pty Ltd. Land & Environment Court Proceedings No. 10-50029 and 10-50030.
- Vegetation community classification and mapping, assessment of impacts on threatened flora, noxious weeds, vegetation management plan. Champions Quarry Pty Ltd vs Lismore City Council. LEC Class 1 Appeal No. 10/100/69.
- Vegetation community ecology, mapping and classification, Newcastle and Hunter Valley Speleological Society v Upper Hunter Shire Council and Stoneco Pty Ltd, LEC 10497 of 2009.
- Aerial Photographic Interpretation, review of evidence and field investigations Vurlow, Hockey & Southon ats DECC, LEC 50088, 50089 & 50090 of 2008.
- Interpretation of remote imagery and field investigations, Wollongong City Council -V- Ensile Pty Limited, LEC #50019/07 & 50047/07, & Wollongong City Council –V- Robert Martin Hogarth, LEC #50021/07 & 50048/07.
- Occurrence of Endangered Ecological Communities, Gales-Kingscliff Pty Ltd v TSC LEC No. 10775 of 2007.
- Aerial Photographic Interpretation, review of evidence and vegetation mapping. Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74.
- Occurrence of Endangered Ecological Communities, Gales Holding Pty Limited v Tweed Shire Council, NSW Land & Environment Court No Nos 10263 and 10264 of 2005.
- Interpretation of remote imagery and mapping of cleared and remnant vegetation under Native Vegetation conservation Act DNR v Mungyer Pty Ltd 2006.
- Interpretation of satellite imagery and mapping of cleared and remnant vegetation under Native Vegetation conservation Act DNR v Roto Pastoral Co Pty Ltd 2006.
- Aerial Photographic Interpretation and field investigations, review of DNR evidence and field investigations, Hardie Holdings Pty Limited ats DNR 2006.
- Field investigations, interpretation of remote imagery and mapping of cleared and remnant vegetation under Native Vegetation conservation Act DIPNR v Epacris Pty Ltd 2005.
- Interpretation of remote imagery, field investigations and mapping of cleared and remnant vegetation under Native Vegetation conservation Act DIPNR v Wilson 2005.

REPORT WRITING & PUBLICATION

Author or co-author of more than 100 reviews, assessments, & reports.

REFEREED PUBLICATIONS

Elks G 1992. The autecology and control of Giant parramatta Grass *Sporobolus indicus* var *major* (Buse) Baaijens on the North Coast of New South Wales. MLitt thesis, University of New England, Armidale.

MAJOR CONSULTANCY REPORTS

- **Elks G.** and Smith A. (2003) Vegetation on Gales Holdings West Kingscliff. Austeco Armidale.
- Parker P and **Elks G** (2000) Species Impact Statement, Proposed extension to Nambucca Waste Depot. Jelliffe Environmental

- Watson G., **Elks G.**, and Smith A. (1999) Vegetation report for Nymboi-binderay National Park for use in fire and resource Management. Austeco, Armidale.
- Watson G., **Elks G.**, and Smith A. (1999) Vegetation report for Chaelundi National Park for use in fire and resource Management. Austeco, Armidale.
- Watson G., **Elks G.**, and Smith A. (1999) Vegetation report for Bellinger River National Park for use in fire and resource Management. Austeco, Armidale.
- Watson G., **Elks G.**, and Smith A. (1999) Vegetation report for Guy Fawkes River National Park for use in fire and resource Management. Austeco, Armidale.
- **Elks G**, D Brown & N. Cotsell (1999). *Eleocharis tetraquetra* Recovery Plan. NSW NPWS.

OTHER RECENT CONSULTANCIES

- 2011. Vegetation Management Plan for Terrace Reserve Holiday Park. North Coast Accommodation Trust.
- 2011. Part 3A threatened flora assessment: proposed residential subdivision Lot 62 DP 1143405, Pacific Highway Emerald Beach. Bennell & Associates, Mulloway.
- 2010. Environmental Management System for Clarke's Beach Holiday Park. North Coast Holiday Parks.
- 2010. Vegetation & Threatened Species Assessment Report: Terrace Reserve Holiday Park. North Coast Holiday Parks.
- 2010. Review of Environmental reports, Development Application 2010/DA_107. Bellingen Shire Council.
- 2010. Flora assessment: proposed drilling of two exploratory core holes, Dewhurst 20 & 21. Eastern Star Gas, Sydney.
- 2010. The flora and fauna of Valla and Jagun Nature Reserves. NSW NPWS Coffs Harbour.
- 2010. Flora assessment: proposed subdivision of 45 Rutland Street, Bonville. Resource Design & Management Pty Ltd, Coffs Harbour.
- 2010. Flora & fauna habitat assessment: proposed subdivision of 111 Smiths Road Emerald Beach into two rural residential lots. Resource Design & Management Pty Ltd, Coffs Harbour.
- 2010. Ecological Survey, Cedar Creek Bridge – Valla Beach Rd, Pacific Highway, Nambucca. NSW RTA.
- 2010. Review of vegetation classification , Lot 2 DP 840016 Emerald Beach. Bennell & Associates, Mulloway.
- 2010. Review of current and proposed vegetation mapping and classification, 45 Rutland Street Bonville. Bennell & Associates, Mulloway.
- 2010. Ecological Survey, Barries Creek Road to Smiths Creek Bridge, Pacific Highway, Kundabung & Part segment 1820, Cooperabung Range. NSW RTA.
- 2009. Flora survey & assessment - proposed seniors living development Lot 1 DP 1128964 Darkum Road, Mulloway. GHD Coffs Harbour.
- 2009. Aerial photographic interpretation of vegetation and field investigations , 83, 87 and 91 Dulguigan Road, Dulguigan. Stacks Murwillumbah.
- 2009. Flora survey and assessment - proposed boundary adjustments, Lots 20, 53, 54 & 105 in Portion 751368 and Lot 3 DP 816313, Halfway Creek. Petersen Consulting Group Coffs Harbour.
- 2009. Expert review of vegetation classification and EEC mapping, Brigalow Caravan Park Urunga. Bellingen Shire Council.
- 2009. Review of vegetation on historical aerial photographs Lot 6 DP 258637. Adamson Legal & Conveyancing Wauchope.
- 2009. Unidel Pty Ltd – Flora survey, Metgasco Gas Pipeline Casino-Ipswich. Greenloaning Biostudies, Lismore.

- 2009. Tea Garden Farms Pty Ltd - interpretation of historical aerial photographic coverage of Lots 101, 103 and 104 in DP 1049845 and Lot 2 in DP 1076610, Bundabah for the period 1984 – 2003. Stacks Lawyers, Forster
- 2009. Review of aerial photography and reports of Robert Kooyman and David Milledge, Greenfields Mountain Pty Ltd ats Byron Shire Council. Huegill & Associates, Ballina
- 2009. Field survey of proposed optical cable route, Tamworth to Bald Hill. QMIS Pty Ltd, Melbourne
- 2009. Flora survey, proposed Timor Limestone Mine. RW Corkery Pty Ltd Sydney
- 2009. Bushfire Hazard Assessment: Proposed community title subdivision at Lot 1 DP 1067310 Coffs Harbour. Leet, McPherson & Integrity Projex I Pty Ltd
- 2009. Bushfire Hazard Assessment: 4/250 Thunderbolts Cave Road, Armidale. Andrew Macpherson & Judy Ward.
- Bushfire Hazard Assessment: Proposed subdivision of Lot 56 Seaforth Drive, Valla Beach. Integrity Projex I Pty Ltd
- 2008. Flora Assessment - Four Mile Creek Bridge and St Helena Creek Bridge replacement projects, Waterfall Way. RTA Environmental Planning and Assessment, Sydney
- 2008. Vegetation Management Plan, Proposed Community Title subdivision, Lot 2 DP 855572 Froude Street, Inverell. Brian & Terri Boulus, Inverell
- 2008. Bushfire Hazard Assessment: 335A Crossmaglen Rd, Crossmaglen. Ann M Gee Pty Ltd, Sawtell
- 2008. Flora Assessment: Proposed Slope Remediation, Bruxner Highway, Ballina. NGH Environmental, Surry Hills
- 2008. Flora survey, proposed Timor Limestone Mine. RW Corkery Pty Ltd Sydney
- 2008. Report on comparative detrimental impacts and weed management for arbitration, "Albion Park". Eastern Star Gas, Sydney
- 2008. Bushfire Hazard Assessment: Lot 6 Langsford Way, Valla. Blue Ribbon Homes Coffs harbour
- 2008. Condition assessment, opportunities and threats, for lands at Wategos Beach, Byron. NSW Dept of Lands, Urunga
- 2008. Flora Assessment: impacts of proposed rural residential subdivision at 24 Korora Basin Road, Korora. Bennell & Associates Coffs Harbour
- 2007. Flora Assessment: proposed subdivision of industrial land at Isles Drive, Coffs Harbour. Bennell & Associates Coffs Harbour
- 2007. Preliminary Bushfire Hazard Assessment: 335B Crossmaglen Rd, Crossmaglen. Ann M Gee Pty Ltd Sawtell
- 2007. Flora Study: Investigation Areas identified within the Brunswick Heads Foreshore Reserves Strategic Plan. NSW Dept of Lands, Urunga
- 2007. Flora Assessment & EPBC Act Referral, Vegetation of Lot 2 DP 855572 Froude Street, Inverell. Geolink Coffs Harbour
- 2007. Vegetation Management Plan, proposed garage/studio at 1153B Orara Valley Way. DRA Architects, Coffs Harbour
- 2007. Flora assessment, proposed closure of Hawkes Nest – Seal Rocks Road, Myall Lakes National Park. Kendall & Kendall, Kempsey.
- 2007. Flora Assessment: proposed community title subdivision at Opal Cove. Bennell & Associates Coffs Harbour
- 2007. Flora Survey for proposed gas pipeline, PEL 238 Coal Seam Gas project. EasternStar Gas, Sydney
- 2007. Flora Assessment, proposed Sunnyside Realignment, New England Highway, Armidale. RTA Environmental Technology, Parramatta
- 2007. Consideration of impacts of construction on Hoop Pine, Shannon Creek. Envite NSW, Grafton
- 2007. Flora assessment, proposed garage/studio at 1153B Orara Valley Way. DRA Architects, Coffs Harbour

- 2007. Flora Assessment, proposed quarry at South Kempsey. GHD Coffs Harbour
- 2007. Flora Assessment, proposed residential subdivision at Sandy Beach. Tony Ferris, Coffs Harbour
- 2006. Flora Assessment, proposed geotechnical investigations for Sunnyside Realignment, New England Highway, Armidale. RTA Environmental Technology, Parramatta
- 2006. Plot survey and vegetation mapping, Lot 4 DP 828932 Pacific Palms. Cumberland Ecology, Sydney
- 2006. 7 -part test, proposed addition to Baringa Hospital, Coffs Harbour. Bennell & Associates, Coffs Harbour
- 2006 Flora Survey & assessment for proposed evaporation pond, PEL 238 Coal Seam Gas project. Eastern Energy, Sydney
- 2006 Targeted field survey of habitat for the EPBC Act listed Vulnerable species *Bothriochloa biloba* at Kelly's Gully, Warialda Rail, Fossickers Way, & application of Administrative Guidelines to proposed modifications to bridge construction and ancillary works. RTA Northern Environmental Services Grafton
- 2006 Targeted flora survey, Pacific Highway Upgrade, Bonville. RTA Northern Environmental Services Grafton
- 2005 Ecological Flora Assessment of SH9 New England Highway Sunnyside Realignment. RTA Environmental Technology, Parramatta
- 2005 Ecological Flora Assessment of MR76 Waterfall Way St Helena - Four Mile Creeks Upgrade. RTA Environmental Technology, Parramatta
- 2005 PEL 238 Coal Seam Gas Flora Survey and Assessment. Eastern Star Gas Sydney.
- 2005 Flora Study, South Coffs LES. Rick Bennell & Associates.
- 2005 Flora Assessment: Construction of an access road to proposed wastewater treatment plant at West Kingscliff. Jim Glazebrook & Associates Murwillumbah
- 2005 Flora Assessment: Proposed Woolworths Shopping Centre, Kingscliff. Report to Jim Glazebrook & Associates, Murwillumbah
- 2004 Flora Assessment: Proposed Construction of a Sewerage Pumping Station at West Kingscliff. Jim Glazebrook & Associates, Murwillumbah
- 2005 Vegetation of Lot 40 DP 589551 Woolgoolga. Blairlanskey Surveys, Coffs Harbour
- 2005 Vegetation of Lot 16 DP 1050323 Heritage Drive, Emerald Beach. Denis Atkinson Planning, Bellingen
- 2005 Flora & Fauna Assessment: Operation of temporary film set, 527 Promised Land Road Gleniffer. Gum Tree Productions, Fox Studios Australia
- 2005 Flora Assessment: Proposed Electrical Substation at Armidale Road for Clarence Valley and Coffs Harbour Regional Water Supply Project. Department of Commerce Lismore
- 2005 Flora Assessment: Proposed electricity transmission line from substation at Armidale Road to proposed Shannon Creek Storage for Clarence Valley and Coffs Harbour Regional Water Supply Project. Department of Commerce Lismore
- 2004 Proposed Restoration of Mitchell's Snail Habitat, Part Lot 13 DP 871753, Turnock Street, Kingscliff. Jim Glazebrook & Associates, Murwillumbah
- 2004 Preliminary ecological assessment: proposed upgrade of water supply pipeline at Baryulgil. Ecocivil Pty Limited, Sydney.
- 2004 Flora Assessment: Subdivision of 'Springhill', Lot 53 DP 778107 Tilbuster Sandon. Andrew Smith, Armidale
- 2004 Flora Assessment: Proposed clearing for residential development, 113 Sawtell Rd Toormina. Ann M. Gee Pty Ltd, Sawtell
- 2004 Flora Survey & Conservation Assessment: Split Solitary Caravan Park. Besigo Pty Limited Glebe
- 2004 Flora Assessment: Surplus Road Corridor at Macauleys Headland, Coffs Harbour. Beachcourt Pty Limited, Coffs Harbour
- 2004 Flora Assessment: Proposed Construction of a Haul Road & Filling at Turnock Street, Kingscliff. Jim Glazebrook & Associates, Murwillumbah

- 2004 Flora Assessment : Proposed Coffs Coast Resource Recovery Facility, Englands Road, Coffs Harbour. Coffs Harbour City Council
- 2004 Summary Report on Impacts of Pipeline Construction on Flora and Fauna, Clarence Valley and Coffs Harbour Regional Water Supply Stage 1B Distribution Pipelines. Ecocivil Pty Limited, Sydney.
- 2004 Flora Assessment: Proposed Pavement Rehabilitation and Widening, New England Highway 62.69km to 68.04km North of Glen Innes. Report to RTA Operations Environmental Technology
- 2004 Flora Assessment: New England Highway, Ross Rd to Glen Lomond, 67.7km to 68.9km North of Armidale. Report to RTA Operations Environmental Technology
- 2004 Flora Assessment: Proposed Slope Remediation, Bruxner Highway, Ballina. Report to RTA Technical Services, Grafton
- 2004 Flora Report: Proposed rezoning of four sites at Pacific Highway, Lower Nambucca. Report to Gutteridge Haskins and Davey Pty Ltd, Coffs Harbour
- 2003 Ecological Assessment: Proposed Aerial Power Cable, Tindal Road, Eatonsville. Country Energy Coffs Harbour
- 2003 Flora Assessment: proposed Sand Extraction at Lot 2 DP 216705 Crescent St Cudgen. Jim Glazebrook & Associates, Murwillumbah
- 2003 Flora Assessment: Proposed Ridgeview Estate Residential Subdivision, Nambucca. Gutteridge Haskins & Davey Coffs Harbour
- 2003 Flora Assessment – Weetah Proposal, Gwydir Highway 45.1-61.1 West of Warialda. Report to Constructive Solutions, Tamworth
- 2003 Flora Assessment: Lot 11 DP 808007 & Lot 2 DP 261448 Warrell Creek. Report to Smyth Maher & Associates, Coffs Harbour
- 2003 Flora Assessment: proposed Horticultural subdivision at Orara Way Lanitza. Report to Gutteridge Haskins & Davey Coffs Harbour
- 2003 Flora assessment, proposed Goolawah Cooperative. Report to Kendall & Kendall, West Kempsey
- 2003 Flora Assessment, Lot 1 DP 781642 Bayldon. Report to Tony L Ferris, Coffs Harbour
- 2003 8-part test to assess impacts of proposed access road to Shannon Creek Dam on Ancistrachne maidenii. Report to Dept of Commerce, Sydney.
- 2003 Shannon Creek Compensatory Habitat Justification Report – Flora. Jelliffe Environmental
- 2003 Survey and vegetation mapping of Shannon Creek Compensatory Habitat. Jelliffe Environmental
- 2003 Survey and assessment of impacts of designs for Shannon Creek Storage on Angophora robur, Melichrus hirsutus and Phyllanthus microcladus. Report to Dept of Commerce Lismore.
- 2003 Flora Assessment - Proposed Rehabilitation of Gwydir Highway 16.2 to 24.2 km West of Inverell. Report to Connell Wagner, Brisbane.
- 2003 Ecological Assessment – proposed road from Marcia Street to Coffs Harbour Showground. Report to Page Kirkland, Coffs Harbour.
- 2003 Review of proposal to lop trees intruding into Obstacle Limitation Area along eastern side of runway at Coffs Harbour Regional Airport. Report to Coffs Harbour Regional Airport.
- 2002 Assessment of impacts on threatened flora and fauna of proposed route modifications for construction of pipeline from Nymboida to Coutts Crossing. Report to Department of Public Works and Services Coffs Harbour
- 2002 Relative impacts on threatened flora and fauna of alternative routes for construction of an access road to the proposed Shannon Creek Dam. Report to Department of Public Works and Services Coffs Harbour
- 2002 Flora Assessment – Surplus Road Corridor and associated urban land at Macauleys Headland, Coffs Harbour. Report to Purdon Associates Canberra.

- 2002 Flora Assessment – Tingaroo Proposal, Gwydir Highway 12.0 – 14.4km west of Inverell. Report to Constructive Solutions Pty Ltd Tamworth
- 2002 Review of Ecological Assessment , Macauleys Headland Coffs Harbour (PPK Environment & Infrastructure Pty Ltd, August 2000). Report to Beach Court Pty Ltd
- 2002 Tests for significance of effects on threatened flora species: proposed electricity supply to pump station near Kremnos Close, Glenreagh. Report to Country Energy Coffs Harbour
- 2002 Flora Assessment – Duval Creek Bridge Proposal, New England Highway Report to RTA Sydney
- 2002 Vegetation Study and 8 Part Test: Proposed Mullaway Sportsground. Report to Coffs Harbour City Council
- 2002 Flora Assessment – Slope Stability Rehabilitation Works, Tabulam to Black Swamp, Bruxner Highway. Report to RTA Operations Environmental Services, Sydney.
- 2002 Flora Assessment: Proposed Pipeline from Coffs Harbour Sewerage Treatment Works to Boambee Beach. Report to Coffs Harbour City Council.
- 2001 Roadside Vegetation Study: Gwydir Highway 70-80km west of Grafton. Report to Gutteridge Haskins and Davey, Coffs Harbour.
- 2001 Flora and Fauna Assessment Report, Dolmans Point LES. Prepared for Coffs Harbour City Council.
- 2001 Vegetation Study: Part Lot 19 DP 755560 and Lot 1 DP 823624, Cow Creek Road, Valla. Report to Gutteridge Haskins and Davey, Coffs Harbour.
- 2001 Roadside Vegetation Study: Waterfall Way. Report to Gutteridge Haskins and Davey, Coffs Harbour.
- 2001 Vegetation Study: Reclaimed Water Pipeline Routes, Morgans, Holloways and Condons Roads, Woolgoolga. Report to Jelliffe Environmental.
- 2001 Roadside Vegetation Study: South Arm Road, Urunga. Report to De Groot and Benson, Coffs Harbour.
- 2001 Roadside Vegetation Study, Hakea Slip, Gwydir Highway 83km west of Grafton. Report to RTA Environmental Services, Sydney.
- 2001 Survey of coastal vegetation for determination of fire responses. Report to OSCU Dorrigo Coast Subdistrict and National Fire Response Database, CSIRO Canberra.
- 2001 Report on vegetation survey for borehole access, Bonville deviation. Report to Jeffery and Katauskas Pty Ltd, Gladesville.
- 2001 Vegetation Study and Tests for significance of effects on threatened flora species of proposed pump station near Kremnos Close, Glenreagh, for Clarence Valley and Coffs Harbour Regional Water Supply. Report to Gutteridge Haskins and Davey Pty Ltd, Coffs Harbour
- 2001 Vegetation Study of Lot 11 DP 615229 Chapmans Road for Chapmans Road LES. Report to De Groot and Benson Pty Limited, Coffs Harbour
- 2001 Roadside Vegetation Studies: New England Highway 67 – 73km North of Armidale. Report to RTA Environmental Services, Sydney
- 2001 Roadside Vegetation Studies: New England Highway 49 - 53km North of Glen Innes. Report to RTA Environmental Services, Sydney
- 2001 Roadside Vegetation Studies: New England Highway 63 - 68km North of Glen Innes. Report to RTA Environmental Services, Sydney
- 2001 Vegetation Study: Proposed Seawater Pipeline, Southern Cross University Marine Studies Centre, Pacific Bay. Report to Gutteridge Haskins and Davey, Coffs Harbour.
- 2000 Roadside Vegetation Study: Oxley Highway 5.3km West of Wauchope. Report to RTA Environmental Services, Sydney.
- 2000 Roadside Vegetation Study: Waterfall Way 23.3 – 24.4km west of Dorrigo. Report to RTA Environmental Services, Sydney.
- 2000 Vegetation Study, Tuncurry Local Environmental Study. Report to DeGroot and Benson Pty Ltd Coffs Harbour.

- 2000. Species Impact Statement - Nambucca Shire Landfill Site Flora. Nambucca Shire Council
- 1999 Roadside Survey of Significant Plants of Bindarri and Ulidarra National Parks. NPWS Dorrigo District.
- 1999 Vegetation Study, proposed realignment of Oxley Highway, Wauchope. Report to DeGroot and Benson
- 1999 Vegetation Study, South Forster Local Environmental Study. Report to DeGroot and Benson
- 1999 Eight Part Test, proposed activities at Maclean Rainforest Reserve. Report to Trust Administrator, Department of Land and Water Conservation
- 1999 Vegetation Survey and Eight Part Test, Proposed extension to Nambucca Waste Depot. Report to Jelliffe Environmental
- 1999 Vegetation Survey and Assessment, proposed Bellingen Water Supply Dams. DPWS, Coffs Harbour
- 1999 *Marsdenia longiloba* Draft Recovery Plan, Brochure and Synopsis. Report to NPWS Northern Zone, Coffs Harbour.
- 1998 *Eleocharis tetraquetra* Draft Recovery Plan. Report to NPWS Northern Zone, Coffs Harbour.
- 1998 Report on origins and severity of Giant Parramatta Grass infestation. Telstra Environmental Group, Melbourne.
- 1998 Farm Management Plan for control of Giant Parramatta Grass infestation Telstra Environmental Group, Melbourne.
- 1998 Allocation of responsibility for Giant Parramatta Grass infestation using simple population model. Telstra Environmental Group, Melbourne.
- 1998 Vegetation Survey and Report on Proposed Road in SEPP 14 Wetland 474b. Jelliffe Environmental Coffs Harbour
- 1998 Survey of wilderness values, Carrai Tableland . NPWS Northern Zone, Coffs Harbour.
- 1998 Vegetation Survey and Report on proposed Bluff Track, Bongil Bongil National Park. NPWS District, Dorrigo.
- 1998 Vegetation Survey and report for proposed quarry, Deervale. Report to Bellingen Shire Council.
- 1998 Vegetation Survey and Report on proposed realignment of Waterfall Way, Dorrigo NP. Report to Bellingen Shire Council.
- 1998 Flora Assessment and Regeneration Program for Baryulgil Asbestos Mine Rehabilitation. Christopher M Murray and associates, Yarralumla

This page has intentionally been left blank

Appendix 4

Flora Survey Methodology and Results Compiled by Anne Clements & Associates (2008)

(Total No. of pages including blank pages = 54)

This page has intentionally been left blank

TABLE OF CONTENTS

This page has intentionally been left blank

1. SITE SPECIFIC SURVEYS

1.1 Introduction

On the proposed Northern and Southern Extensions, a total of 232 species (196 native and 36 exotic) were recorded from the 17 transects and five spot locations in 2002 and the eight quadrats in 2008.

On 5 November 2001, Lake Macquarie City Council resolved to adopt the 2001 Flora and Fauna Survey Guidelines (Murray and Bell 2001) as Council Policy. The survey methods used in vegetation surveys of the Teralba quarry extensions are generally in accord with Murray and Bell (2001). A sample size of 400 m² (20 m x 20 m or 10 m x 40 m for linear communities) was recommended in compliance with survey data from the National Herbarium and National Parks and Wildlife Service.

In the 1995 and 2002 surveys on the quarry lease, data were collected from three contiguous 10 m x 10 m quadrats (sample size of 300m²). In the 2008 survey, data were collected from four contiguous 10 m x 10 m quadrats (sample size of 400m²).

Clements and Rodd (1995) surveyed the areas to the south and west of the quarry in January, April and June 1995 for a previous extension. The quarry has expanded into the sampled area to the west. The area surveyed to the south includes part of the currently proposed Southern Extension.

There were 170 species recorded (149 native and 21 exotics and) from 13 transects (Transect 1 to 13) and 14 spot locations (A to N) (Figure D). The transect data were recorded from three contiguous 10 m x 10 m quadrats.

Two communities were identified:

- forest/woodland on ridges and gully sides with canopy species *Angophora costata* (Small-leaved Apple), *Eucalyptus acmenoides* (White Mahogany), *E. globoidea* (White Stringybark), *E. maculata* (Spotted Gum), *E. paniculata* (Grey Ironbark), *E. punctata* (Grey Gum), *E. umbra* subsp. *umbra* (Broad-leaved White Mahogany) with and understorey of *Persoonia pinifolia* (Narrow-leaf Geebung); and
- forest with canopy of *Eucalyptus acmenoides, E. paniculata, E. saligna* (Blue Gum) and *Corymbia gummifera* restricted to the north-western gully floor (sampled in Transect 11).

The plant communities found are widespread within the Newcastle-Lake Macquarie area mapped by Benson (1986). The average density of trees recorded in 10 m x 10 m quadrats for forest/woodland varied from 7.3 individuals (transect 1) to 30.6 individuals (transect 10).

The only species recorded of conservation significance was *Macrozamia pauli-guilielmi* subsp. *flexuosa* (Blackfellows Pineapple, Zamia), as then classified, recorded at spot location G. Further inspection of the lease area revealed a large number of individuals on the south-facing slope of a ridge to the east of the quarry office, outside the area surveyed. This taxon is no longer treated as a subspecies of *M. pauli-guilielmi* (Johnson 1959, Harden 1990) but as a separate species, *M. flexuosa* (Hill 1998).

Two of the exotic species recorded (*Ageratina adenophora* (Crofton Weed) and *Cortaderia selloana* (Pampas Grass)) are listed as noxious for Lake Macquarie Council. Both are classified as W2 weeds (*Noxious Weed Act 1993*).

1.2 2002 Survey

The Metromix Teralba lease area was surveyed on 5 and 6 September 2002 by Tony Rodd and Sian Wilkins and on 9 and 10 September 2002 by Dr AnneMarie Clements, Tony Rodd, Sian Wilkins and Emma Gorrod. A total of 258 species (50 exotic, 208 native) were recorded from 25 transects (T1 to T25) and six spot locations (A to F), and two transects (R1 and R2) and two spot locations (RA and RB) in the rehabilitation areas (Figure D, Table 4) in September 2002. Data recorded from transects T1 to T25 was from three contiguous 10 m x 10 m quadrats.

For the sampling locations within or partially within the proposed Northern and Southern Extension areas, a total of 193 species (166 native and 27 exotic) were recorded from seventeen (17) 30 m x 10 m transects and five 10 m radius spot locations:

Area	2002 sampling locations
Northern Extension	Transects 1, 2, 5, 6, 7, 8, 11, Spot locations A, B
Southern Extension	Transects 10, 14, 15, 17, 18, 19, 20, 21, 23, 24, Spot locations C, D, F

Tetratheca juncea (Black-eyed Susan) was recorded in the south of the sampled area.

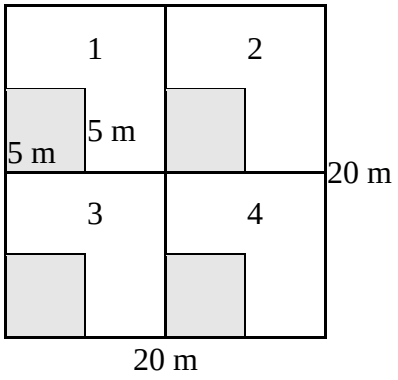
1.3 2008 SURVEY

A total of 162 species (144 native and 18 exotic) were recorded in eight 20 m x 20 m quadrats (Quadrats 1 to 8) (Figure D) on 11 and 12 November 2008 by Tony Rodd and Peter Juniper.

A targeted search for *Tetratheca juncea* was conducted on 15 and 16 November by Tony Rodd and Peter Juniper and on 18 and 19 December 2008 by Anne Clements, Peter Juniper, Jane Rodd, Sue Wright and Anne Jones.

1.4 Methods

In the 2008 survey the vegetation was recorded in eight 0.04 ha quadrats (Quadrats 1 to 8) (Figure B) consisting of four contiguous 10 m x 10 m subquadrats. A 5 m x 5 m subquadrat is nested in each of these 10 m x 10 m quadrats. The layout of the quadrats and subquadrats is as follows:



The relative frequency of plant species in the quadrats was assessed by recording the presence/absence of each species in the four 5 m x 5 m subquadrats (Table 1). The maximum height and number of individuals for each species greater than 2 m high was recorded in each of the 10 m x 10 m subquadrats (Table 2).

The percent projected foliage cover (percent cover) of the following vegetation strata were estimated for each of the quadrats (Table 3):

- Native canopy trees
- Native midstorey trees
- Native shrubs
- Native grasses/graminoids
- Native herbs
- All exotic species

The percentage cover of exposed ground (bare soil and rock) and leaf litter was also recorded (Table 3).

All sampling locations were photographed at the time of survey (Appendix 2).

Nomenclature is consistent with Harden (1990-1993, 2002), Harden and Murray (2000) and subsequent taxonomic changes as published in *Telopea*, the Sydney Royal Botanic Gardens' journal of systematic botany, and in other Australian taxonomic literature. The Royal Botanic Gardens' PlantNet website

Two targeted searches for *Tetratheca juncea* was carried out during the flowering time in November and December 2008 in the Northern and Southern Extensions. Pairs of people walked in straight lines approximately 10 to 15 m apart with each person searching to both the left and right. The search lines used covered the whole of the extension areas as well as areas where *T. juncea* had previously been recorded in September 2002 and on the rehabilitation areas in the east of the Quarry lease.

During the first of the two searches, When each flowering individual of *T. juncea* was located, a thorough search was conducted within an approximately 10 m radius of each flowering individual of *T. juncea*, and all other clumps counted, GPS coordinates (AMG94 Z56) of the locations were noted using a Garmin E-trex hand-held GPS and flagging tape was tied around each plant or adjacent vegetation. A concentrated search was then conducted in an approximately 50 m radius and the same procedure conducted if further clumps were located.

During the second of the two searches, the coloured tags and the GPS coordinates were useful in relocating the recorded individuals. Additional intensive searches in these areas led to additional individuals being recorded.

2. OBSERVATIONS

As identified in Clements and Rodd (1995), the ridges and slopes supported relatively homogenous open forest/woodland.

2.1 Northern Extension

2002 survey

The flora of the Northern Extension was sampled using seven transects (Transects 1, 2, 5, 6, 7, 8 and 11) and two spot locations (Spot locations A and B).

The vegetation in the Northern Extension was an open-forest dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus acmenoides* (White Mahogany) with *E. paniculata* (Grey Ironbark) often co-dominant. *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus umbra* (Bastard White Mahogany) were occasionally present. The open-forest reached a height of approximately 14 to 16 m on the upper slopes and ridgetops and a height of 18 to 22 m in the gullies and lower slopes.

The midstorey varied from sparse (Transects 1 and 6) to scattered tall shrubs (Transects 5, 8 and 11), to dense (Transects 2 and 7). The midstorey in Transect 2 included numerous shrubs of *Dodonaea triquetra* (Hopbush) to 2 m in height as well as scattered individuals of the rainforest species *Clerodendrum tomentosum* (Hairy Clerodendrum), *Notelaea longifolia* (Mock-olive), *Polyscias sambucifolia* (Elderberry Panax) and *Myrsine variabilis* (Muttonwood). The midstorey in Transect 7 was dominated by *Acacia leiocalyx* (Queensland Black Wattle) to 3 m in height, ranging in density from 6 to approximately 100 plants per 10 m x 10 m quadrat.

The most frequently recorded native grass species were *Imperata cylindrica* (Blady Grass), *Microlaena stipoides* (Weeping Grass), *Oplismenus imbecillis* (Narrow-leaved Basket Grass) and *Themeda australis* (Kangaroo Grass).

2008 Survey

The flora of the Northern Extension was surveyed with four quadrats (Quadrats 1, 2, 3, 4) (Figure D); Quadrats 2 and 4 on ridgetop / upper slopes and Quadrats 1 and 3 in gully / lower slope areas.

The most common canopy species in both the ridgetops and the gullies were *Eucalyptus acmenoides* (White Mahogany) and *Corymbia maculata* (Spotted Gum) (Table 1). Other frequently recorded species were *C. gummifera* (Red Bloodwood) and *E. paniculata* (Grey Ironbark). Less commonly recorded species were *Eucalyptus saligna* (Sydney Blue Gum), *Eucalyptus piperita* (Sydney Peppermint), *Eucalyptus fibrosa* and A*ngophora costata* (Smooth-barked Apple). In the deeper gullies and on some adjacent steep, moist slopes there was an increase in canopy height although no clear change in canopy composition. In the Northern Extension the density of canopy trees varied from 20% to 30% and the density of subcanopy trees varied from 7% to 50% (Table 3). No clear correlation was apparent between tree density and topographic location.

A total of 111 species were recorded within the gully / lower slope quadrats (1 and 3) and a total of 81 species were recorded within the ridge top / upper slope quadrats (2 and 4). This difference is due to the higher numbers of native understorey species (primarily herbs and climbers) and exotic species in the gullies and lower slopes. The understorey species were as follows:

Growth form	No. gully / lower slope species (Quadrats 1 and 3)	No. ridge / upper slope species (Quadrats 2 and 4)
Shrub	17	14
Herb and climber	45	35
Graminoid (grass-like)	20	22
Exotic	17	4

Within the shrub layer *Acacia* spp. were the most commonly recorded species, often dominating this vegetation layer (Table 1). However the dominant species varied from quadrat to quadrat. *Acacia falcata* (Sickle Wattle) dominated the shrub layer in Quadrat 1, with over 30 stems recorded within each of two of 4 subquadrats; *Acacia longifolia* (Sydney Golden Wattle) dominated the shrub layer in Quadrat 2, with over 50 stems recorded within each of two of 4 subquadrats; and *Acacia leiocalyx* (Queensland Black Wattle) dominated the shrub layer of Quadrat 4 with very high densities of plants, over 40 stems within each of four subquadrats. Although the number of stems within the shrub layer was high in some quadrats, the overall density of the shrub layer was low; up to 3% in three quadrats within the Northern Extension. The shrub layer density recorded within Quadrat 1 was high however with a recorded density of 10%.

In the groundlayer, little difference was observed in the species composition of the ridgetop / upper slope and gully / lower slope quadrats. Of the groundlayer species the most commonly recorded native herbs and climbers were *Sigesbeckia orientalis* (Indian Weed), *Dichondra repens* (Kidney Weed), *Pratia purpurascens* (White Root) and *Dianella caerulea* (Blue Flax-lily). The most commonly recorded graminoid species were *Lomandra filiformis subsp. filiformis* (Wattle Mat-rush), *Entolasia marginata* (Bordered Panic), *Entolasia stricta* (Wiry panic) and *Themeda australis* (Kangaroo Grass) (Table 1). The density of ground layer vegetation within the quadrats was very high with the density of native monocots and ranging from 50% to 80%. Ground layer herbs were of low density, ranging from 1 to 5% area cover (Table 3).

Fifteen exotic species were recorded in the Northern Extension, although no species were observed in high densities. The most commonly recorded species were *Bidens pilosa* (Cobblers Pegs), *Conyza sumatrensis* (Tall Fleabane) and *Senecio madagascariensis* (Fireweed) (Table 1). Exotic species were found in very low densities of less than 1% (Table 3).

2.2 Southern Extension

2002 Survey

The flora of the Southern Extension was sampled using ten transects (Transects 10, 14, 15, 17, 18, 19, 20, 21, 23 and 24) and three spot locations (Spot locations C, D and F).

The vegetation in the Southern Extension was an open-forest with *Corymbia maculata*, *Eucalyptus acmenoides*, *E. punctata* (Grey Gum), *E. paniculata* and *E. umbra* the most frequently recorded tree species. *Angophora costata* (Sydney Red Gum), *Corymbia gummifera*

(Red Bloodwood) and *Eucalyptus globoidea* (White Stringybark) were occasionally present. The open-forest ranged in height from approximately 14 m to 20 m.

The midstorey was sparse or absent. *Allocasuarina torulosa* was recorded in three transects at up to 12 m in height. *Acacia leiocalyx* (7 individuals in Transect 10) and *Persoonia linearis* (one individual in Transect 10 and one in Transect 24) were the only tall shrub species over 2 m in height recorded. Shrubs recorded at under 2 m in height included *Acacia ulicifolia*, *Macrozamia flexuosa* and *Podolobium ilicifolium.*

The most frequently recorded native grass species were *Entolasia stricta* (Wiry Panic), *Imperata cylindrica*, *Microlaena stipoides*, *Panicum simile* (Two-colour Panic) and *Themeda australis* (Kangaroo Grass).

Transects 17 and 18 sampled cleared tracks and there were no species recorded at over 2 m in height in these locations. The most frequently recorded species in these transects were the native grasses *Aristida vagans*, *Digitaria parviflora*, *Imperata cylindrica*, and *Themeda australis* and the exotic species *Ageratina adenophora*, *Andropogon virginicus*, *Hypochaeris radicata* and *Senecio madagascariensis.*

2008 Survey

The flora of the Southern Extension was surveyed with four quadrats (Figure D) with two quadrats on ridgetop / upper slope areas (Quadrats 8 and 5) and two quadrats on lower slope areas (Quadrats 6 and 7).

The dominant upper canopy species in the Southern Extension area were the same as for the Northern extension area, namely *Eucalyptus acmenoides* and *Corymbia maculata*. Less commonly recorded species were *Eucalyptus punctata*, *Eucalyptus globoidea*, *Corymbia gummifera*, *E. paniculata* and A*ngophora costata* (Table 1) In the Southern Extension the density of canopy trees varied from 20% to 30% within three quadrats (Quadrats 5, 6 and 7), and 7% canopy cover in Quadrat 8; (Table 3). The density of subcanopy trees varied from 10% to less than 1%.

As for the Northern Extension, a greater number of species were recorded in the Southern Extension from the lower slope quadrats than the number of species recorded on the ridge top / upper slope quadrats. A total of 83 species were recorded within the lower slope quadrats (5 and 8) and a total of 67 species were recorded within the ridge top / upper slope quadrats (6 and 7). This difference was due to a greater number of native understorey species (mainly herbs and climbers) and exotic species.

The understorey species were as follows:

Growth form	**No. lower slope species (Quadrats 6 and 7)**	**No. ridge / upper slope species (Quadrats 5 and 8)**
Shrub	18	12
Herb and climber	31	24
Graminoid (grass-like)	21	18
Exotic	6	4

The dominant species in the shrub layer of the Southern Extension included Acacias and three other species; *Podolobium ilicifolium*, *Pultenaea euchila* and *Dodonaea triquetra*. Again the dominant species varied greatly from quadrat to quadrat. *Podolobium ilicifolium* and *Acacia ulicifolia* (Prickly Moses) dominated the shrub layer in Quadrat 5, *Podolobium ilicifolium* and *Acacia irrorata* dominated in Quadrat 6 and *Acacia ulicifolia* dominated Quadrat 7. The shrub layer of Quadrat 8 was very dense with over 1000 stems of *Dodonaea triquetra* recorded in 3 of 4 subquadrats, attaining a cover density of 95%.

Most of the groundlayer species recorded in the Southern Extension were the same as those recorded within the Northern Extension, and little difference was observed in the species composition of the ridgetop / upper slope and gully / lower slope quadrats. Of the groundlayer species the most commonly recorded native herbs and climbers were *Pratia purpurascens* (White Root), *Dianella caerulea* (Blue Flax-lily), *Pandorea pandorana* (Wonga Vine), *Eustrephus latifolius* (Wombat Berry) and *Glycine clandestina* (Twining Glycine). The most commonly recorded graminoid species were *Lomandra filiformis subsp. filiformis* (Wattle Mat-rush), *Entolasia stricta* (Wiry panic), *Imperata cylindrica* (Blady Grass) and *Themeda australis* (Kangaroo Grass). The density of native monocots within three of the four quadrats located in the Southern Extension was high, varying from 60% to 90% cover density. In Quadrat 8, where the shrub cover was very high, the density of native monocots was very low; less than 1%. As for the Northern Extension, the density of herbs in the Southern Extension was low, varying from 2% to less than 1%.

The understorey species in the Southern Extension included *Tetratheca juncea* (Black-eyed Susan), listed as Vulnerable under the Commonwealth EPBC Act and the NSW TSC Act. This species was recorded in Quadrat 5.

Exotic species were found in very low densities of less than 1% (Table 3). The most commonly recorded exotic species was *Lantana camara*, recorded in Quadrat 8 on the northern edge of an old powerline clearing.

3 COMPARISON OF THE RESULTS OF THE 2002 AND 2008 FLORA SURVEYS

There is similar canopy composition recorded in the 2002 and 2008 surveys. Of the total 232 species recorded in the 2002 and 2008 surveys, 122 were recorded in both surveys. Within each of the vegetation strata, many of the more common species were recorded in both 2002 and 2008, as were many of the less common species. There were however some differences in species composition, reflecting the within-community heterogeneity of species composition, differences in post-fire regeneration stage and differences in the number and locations of sampling locations.

	2002 survey	**2008 survey**
Total number of species recorded	193	161
Number of unique species (recorded only in that years survey)	71	39
Number of transects/quadrats	17	8
Area of each transect/quadrat	300 m^2	400 m^2
Total area sampled (m^2)	5,100 m^2	3,200 m^2

	2002 survey	2008 survey
Average number of species recorded per transect/quadrat	44	58
Minimum number of species recorded per transect/quadrat	28	34
Maximum number of species recorded per transect/quadrat	80	70

Northern Extension

The most commonly recorded canopy species were the same for the 2002 and 2008 flora surveys; *Eucalyptus acmenoides, Corymbia maculata, C. gummifera* and *E. paniculata*. Of the uncommonly recorded canopy species, *Eucalyptus umbra* was recorded during the 2002 flora survey but not in the 2008 survey and *Eucalyptus saligna*, *Eucalyptus piperita*, *Eucalyptus fibrosa* and A*ngophora costata* were recorded in the 2008 survey but not in the 2002 survey.

There were 14 shrub species recorded in both 2002 and 2008 and 12 species recorded in either one of the surveys. The shrub species most commonly recorded in 2002 included those commonly recorded in the 2008 survey; *Acacia leiocalyx*, *Acacia falcata* and *Acacia ulicifolia*. During the 2008 survey other species of shrub were also commonly recorded: *Acacia irrorata*, *Acacia leiocalyx*, *Acacia longifolia* and *Dodonaea triquetra*.

Of the ground layer species recorded in the 2002 and 2008 flora surveys, 58 species recorded in both surveys and 45 species were recorded in either one of the surveys. The ground layer species most commonly recorded in both 2002 and 2008 surveys were the native herbs *Pratia purpurascens* (White Root) and *Dianella caerulea* (Blue Flax-lily) and the native graminoids *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush) and *Themeda australis* (Kangaroo Grass).

Of the exotic species, the 2002 and 2008 surveys shared nine species, while another six species were recorded in either one of the surveys. The species most commonly recorded in both 2002 and 2008 were *Bidens pilosa*, *Conyza sumatrensis* and *Senecio madagascariensis*.

One species of conservation significance was recorded in the Northern extension in 2002 (Transects 2 and 5) namely *Macrozamia flexuosa,* listed as regionally significant by City of Lake Macquarie (2008). This species was not recorded in 2008. *Tetratheca juncea* was not recorded within the Northern extension in 2002 or 2008.

Southern Extension

Within the Southern Extension, the most commonly recorded canopy species in the 2002 and 2008 surveys were the same: *Eucalyptus acmenoides* and *Corymbia maculata*. *Eucalyptus paniculata* was also frequently recorded in both surveys. *Angophora costata* was recorded in the north-west of the Southern extension in the 2002 and 2008 surveys. *Eucalyptus umbra* was also frequently recorded in this area in 2002, but was not recorded at all in 2008.

There were 20 shrub species recorded in both 2002 and 2008 flora surveys and four species recorded during either one of the surveys. The shrub species most commonly recorded in 2002 and 2008 were *Acacia ulicifolia*, *Podolobium ilicifolium* and *Persoonia linearis*.

Of the ground layer species, 41 species recorded in the 2002 and 2008 flora surveys and 30 species were recorded during just one of the surveys. The most commonly recorded ground layer species from both surveys were the native herbs *Pratia purpurascens* and *Dianella caerulea* and the native graminoids *Lomandra filiformis subsp. filiformis*, *Entolasia stricta*, *Imperata cylindrica* and *Themeda australis*.

Of the exotic species, four species were recorded in both the 2002 and 2008 flora surveys shared and 14 species recorded during the 2002 survey only. Species recorded as common during the 2002 survey were *Andropogon virginicus* (Whiskey Grass), *Conyza sumatrensis* and *Lantana camara*. *Lantana camara* was the most commonly recorded exotic species in the Southern Extension in 2002. Four species were recorded as common during the 2008 survey; *Bidens pilosa*, *Conyza sumatrensis* and *Senecio madagascariensis* in the Northern Extension and *Lantana camara* in the Southern Extension.

Two species of conservation significance, *Macrozamia flexuosa* and *Tetratheca juncea*, were recorded in both the 2002 and 2008 surveys.

4 COMPARISON OF THE VEGETATION DATA WITH NPWS (2003) MAPPED VEGETATION COMMUNITIES

The Northern and Southern Extension areas of the Site were mapped by NPWS (2003) at 1:25 000 scale (Figure C) as Coastal Plains Smooth-barked Apple Woodland (Map Unit 30) and Coastal Foothill Spotted Gum - Ironbark Forest (Map Unit 15).

The map unit profiles for each vegetation community in NPWS (2003) contain lists of species to assist in distinguishing one map unit from another (Appendix 3). The lists were derived from the analysis of sample site species data and do not include all the species recorded within any given community. In addition to characteristic species the map unit profiles provide indications of the relative probabilities of encountering the listed species using a randomly stratified sampling strategy (NPWS 2003).

Two types of species are used to describe communities:

- Positive species - those that only occur in a single map unit or at an abundance and frequency greater than all other map units and are hence characteristic of that map unit; and
- Uninformative species - given to assist with the description of the map unit; includes all tree species recorded at sites within a map unit, and other species that occur at high frequencies amongst sites at the group.

Although the total number of species listed in the Map Unit profiles for Coastal Foothills Spotted Gum – Ironbark Forest (Map unit 15) and Coastal Plains Smoothbarked Apple Woodland (Map unit 30) is similar, Map Unit 15 has less than half the number of positive species of Map unit 30, but three times as many uninformative species:

Stratum	Coastal Foothills Spotted Gum - Ironbark Forest (Map unit 15)		Coastal Plains Smoothbarked Apple Woodland (Map unit 30)	
	Positive	Uninformative	Positive	Uninformative
Tallest	3	9	4	7
Upper Mid	0	1	10	1
Mid	0	5	0	0
Lowest (<1 m)	9	8	15	0
Vines and Epiphytes	0	1	0	0
Total	**12**	**24**	**29**	**8**

Of the vegetation data recorded in the Northern and Southern Extensions in 2002 and 2008, it was found that the sampling locations generally contained more positive diagnostic species of Coastal Plains Smoothbarked Apple Woodland (Map Unit 30) than Coastal Foothills Spotted Gum - Ironbark Forest (Map Unit 15):

Sampling area	1.1.1.1.	Sampling location	Coastal Foothills Spotted Gum - Ironbark Forest Map Unit 15			Coastal Plains Smoothbarked Apple Woodland Map Unit 30		
			P	U	Total	P	U	Total
Northern Extension	**2002**	T1	6	11	17	7	1	8
		T2	6	7	13	7	1	8
		T5	**5**	8	13	4	1	5
		T6	**3**	12	15	2	1	3
		T7	8	10	18	**10**	1	11
		T8	4	3	7	3	1	4
		T11	6	9	15	6	1	7
	2008	Q1	7	12	19	**12**	3	15
		Q2	6	9	15	**7**	1	8
		Q3	5	9	14	5	1	6
		Q4	**7**	14	21	6	1	7
Southern Extension	**2002**	T10	7	11	18	**13**	3	16
		T14	7	12	19	7	2	9
		T15	7	13	20	7	2	9
		T17	5	4	9	5	1	6
		T18	4	5	9	**5**	0	5
		T19	6	14	20	**12**	2	14
		T20	6	12	18	**8**	1	9
		T21	6	13	19	**10**	1	11
		T23	6	9	15	6	2	8
		T24	7	13	20	8	2	10
	2008	Q5	7	13	20	11	2	13
		Q6	7	15	22	8	1	9
		Q7	6	15	21	10	2	12
		Q8	7	7	14	7	2	9

P = positive, U = uninformative, Bold figures show where the number of positive diagnostic species recorded for a sample location are higher for a particular Map unit.

On average the sampling locations contained 7.4 of the 29 listed positive diagnostic species for Coastal Plains Smoothbarked Apple Woodland (Map Unit 30) and 6.0 of the 12 listed positive diagnostic species for Coastal Foothills Spotted Gum - Ironbark Forest (Map Unit 15).

The most frequently recorded canopy tree species were *Corymbia maculata* (Spotted Gum) and *Eucalyptus acmenoides* (White Mahogany), *E. paniculata* (Grey Ironbark) was also common. Based on the canopy tree species for each map unit, most of the vegetation recorded in both the Northern and Southern Extensions appears to better fit Coastal Foothills Spotted Gum – Ironbark Forest (Map unit 15) than Coastal Plains Smoothbarked Apple Woodland (Map unit 30):

Northern extension

Canopy tree species	2002							2008			
	T1	T2	T5	T6	T7	T8	T11	Q1	Q2	Q3	Q4
Map Unit 15											
Positive species											
Corymbia maculata	3	3	1	2	3	3	3	2	3	2	3
Eucalyptus umbra					3						
Uninformative species											
Angophora costata								2			
Eucalyptus acmenoides	2	3	2	3	2	3	3	4	4	2	4
Eucalyptus punctata								1			
Eucalyptus fibrosa								1			
Eucalyptus globoidea				3							
Eucalyptus paniculata	3	2	2	1		2	1		4	3	4
Map Unit 30											
Positive species											
Angophora costata								2			
Corymbia gummifera			2							2	
Eucalyptus umbra					3						
Uninformative species											
Eucalyptus piperita								2			
Eucalyptus punctata								1			
Corymbia maculata	3	3	1	2	3	3	3	2	3	2	3

Southern extension

Canopy tree species	2002										2008			
	T10	T14	T15	T17	T18	T19	T20	T21	T23	T24	Q5	Q6	Q7	Q8
Map Unit 15														
Positive species														
Corymbia maculata	1	3	3	2		1			3	3	4	4	2	4
Eucalyptus umbra	3	1				3	2	2	2					
Uninformative species														
Angophora costata	2					2	3	3			2		1	
Eucalyptus acmenoides		3	3	1		3		3	3	3	4	4	4	
Eucalyptus punctata	3	1	2			1	2	3	2	1	2		2	1
Eucalyptus fibrosa							2							
Eucalyptus globoidea	3					2	2	1			2			
Eucalyptus paniculata	1	3	3					2	1	1		2	1	
Map Unit 30														
Positive species														
Angophora costata	2					2	3	3			2		1	
Corymbia gummifera	2					1								
Eucalyptus umbra	3	1				3	2	2	2					
Uninformative species														
Eucalyptus punctata	3	1	2			1	2	3	2	1	2		2	1
Eucalyptus resinifera	2													
Corymbia maculata	1	3	3	2		1			3	3	4	4	2	4

5.0 REHABILITATION AREAS

The rehabilitation areas are located in the east of the lease (Figure A). The constructed landform on this highly erodible soil was internally draining with a depression formed in the centre of the rehabilitation area. In the early years post placement, the depression tended to support wetland species and with time as the native vegetation are establishing. The vegetation of the depression is expected to be similar to that on the free draining slopes and gullies of the surrounding bushland. The rehabilitation was achieved by respreading subsoil, topsoil and biomass cleared for the quarry operation. The vegetation cleared was survey by Clements and Rodd (1995).

Transect R1 was located in an area that has been rehabilitated since 1995 and was 90 m in length (data collected from nine 10 m x 10 m quadrats). Transect R2 was located in an area that has been rehabilitated since 1998/99 and was 80 m in length (eight quadrats).

A total of 136 species (100 native and 36 exotic) were recorded from two transects (R1 and R2) and two spot locations (RA and RB) in the rehabilitation areas in September 2002.

There were 67 species recorded in Transect R1, including 10 exotics. Among the most commonly occurring local natives were the main canopy tree species of the open-forest recorded in the Northern and Southern extensions; *Eucalyptus acmenoides* (White Mahogany)

up to 14 m in height and *Corymbia maculata* up to 14 m in height. The maximum tree height per quadrat ranged from 5 m to 14 m, with an average maximum height of 9.3 m. The number of individuals of canopy tree species per 10 m x 10 m quadrat ranged from two to 16, with an average of 7.

The most frequently recorded native grasses were *Microlaena stipoides* and *Entolasia stricta.* As Transect R1 also included part of the constructed wetland native wetland species such as *Gahnia clarkei* and *Juncus usitatus* were recorded.

Of the exotic species, *Ageratina adenophora* (Crofton Weed) was recorded as juveniles and *Andropogon virginicus* (Whisky Grass) was recorded in only 4 of the 9 quadrats, in areas where the canopy is developing.

In Transect R2, 103 species were recorded with 79 natives and 24 exotics. The dominant tree canopy species *Eucalyptus acmenoides* was recorded in 6 of the 8 quadrats. *Corymbia maculata, Eucalyptus saligna, E. umbra, E. punctata* and *E. paniculata* were less frequently recorded. The maximum tree height per quadrat ranged from 6 m to 16 m, with an average maximum height of 7.4 m. The number of individuals of canopy tree species per 10 m x 10 m quadrat ranged from two to 16, with an average of 10.5.

The most frequently occurring native species were the grasses *Themeda australis* and *Entolasia stricta* (recorded in all quadrats). In this early phase of natural regeneration, *Andropogon virginicus* was recorded in 7 of the 8 quadrats.

The survey data of the rehabilitation areas indicates that the species diversity is similar to existing stands of natural vegetation surveyed in the extension areas, and that the structure of the rehabilitated vegetation is approaching that of the undisturbed open forest. Based on observations of ant activities, lack of rabbit burrows, bird movements and wallaby droppings, the rehabilitation areas are providing native fauna habitat and functioning as a natural ecosystem.

The success of the rehabilitation program is related to:

- ongoing weed removal which reduces competition, hence aiding in germination and establishing the native species;
- the transfer of biomass including large logs, branches and fine twigs which provide shade for the emerging seedlings;
- the transfer and placement of topsoil and biomass providing food and habitat for the active soil flora and fauna, resulting in nutrients for the native vegetation, as well as plant seed and other propagules;
- the depth of subsoil providing the natural medium for native plant roots;
- the climatic conditions (see section 2.1), with an average rainfall of about 1000 mm and mild temperature throughout the year.

Re-inspection of the rehabilitation areas in 2008 found that the open-forest is continuing to regenerate. Two clumps of the Vulnerable species *Tetratheca juncea* were found in the 1998 and 1999 rehabilitation area, in the vicinity of Transect R2.

6 CONSERVATION SIGNIFICANCE

The conservation significance of the communities and species recorded on the Site were assessed at a National level against the schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EP&BC Act) and at a State level against the schedules of the *Threatened Species Conservation Act* 1995 (TSC Act).

6.1 Communities

6.1.2 National

A search of the EPBC Act online database using the Protected Matters Search Tool (www.environment.gov.au/epbc accessed on 13 January 2009) found one ecological community possibly occurring within a 5 km radius of the Site:

Community	Habitat	Likely to occur on the Site?
White Box-Yellow Box-Blakely's Gum Grassy Woodland and derived Native Grassland	Occurs in areas where rainfall is between 400 and 1200 mm per annum, on moderate to highly fertile soils at altitudes of 170 to 1200 m on the tablelands and western slopes of NSW	No. The altitude of the lease is less than 100 m. It is not on the tablelands and western slopes of NSW. The record of this community for the Lake Macquarie region is surely an error of the above database.

6.1.3 State

Lake Macquarie City Council (2008) list 13 endangered ecological communities listed under the TSC Act that are known or likely to occur in Lake Macquarie LGA:

Community	Habitat	Likely to occur on the Site?
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Occurs on sand dunes and low-nutrient sandplains along coastal areas in the Sydney Basin bioregion	No
Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, associated with coastal floodplains.	No
Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influence in some wetlands	No
River-Flat Eucalypt Forest on Coastal Floodplains of the	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial	No

Community	Habitat	Likely to occur on the Site?
NSW North Coast, Sydney Basin and South East Corner bioregions	flats, drainage lines and river terraces associated with coastal floodplains.	
Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains	No
Duffys Forest ecological community in the Sydney Basin Bioregion	Occurs on the ridgetops, plateaus, upper slopes and occasionally mid slopes on Hawkesbury sandstone geology, typically in association with laterite soils and soils derived from shale and laminite lenses.	No
Quorrobolong Scribbly Gum Woodland in the Sydney Basin Bioregion	Occurring on a residual sand deposit overlying the Permian clay sediments in the Hunter Valley, in Cessnock.	No
Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions	Found on gentle slopes arising from depressions and drainage flats on Permian sediments of the Hunter Valley floor. Occurring in Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton.	No
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Occurs on both sand dunes and on soils derived from underlying rocks. Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence.	No
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Occurring in the intertidal zone on the shores of estuaries and lagoons	No
Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion	Occurs principally on Permian geology in the central to lower Hunter Valley. Restricted to a range of approximately 65 km by 35 km centred on the Cessnock - Beresfield area in the Central and Lower Hunter Valley	No
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregions	On seacliffs and coastal headlands	No
Lowland rainforest on floodplain in the NSW North Coast Bioregion	Floodplains in the New South Wales North Coast bioregion.	No

In addition to the 13 listed communities, Lower Hunter Valley Dry Rainforest in the Sydney Basin and North Coast Bioregions was gazetted as a Vulnerable ecological community on 4

July 2008. This community typically occurs on Carboniferous sediments of the Barrington footslopes in the Hunter Valley, and is not likely to occur on the Site.

Lake Macquarie City Council (2008) lists the corresponding LHCCREMS community for each endangered ecological community (Appendix 4).

6.2 Species

6.2.1 National

A search of the EPBC Act online database using the Protected Matters Search Tool (www.environment.gov.au/epbc accessed on 13 January 2009) found six plant species of national significance occurring within a 5 km radius of the Site:

Species	Status	Description	Habitat
Angophora inopina	V	Tree to 8 m high, often multistemmed; bark persistent, grey, short fibrous.	In open woodland with a dense shrub understorey on deep white sandy soils over sandstone.
Cryptostylis hunteriana	V	Saprophytic terrestrial herb.	Grows in deep swamp-heath on sandy soils, chiefly in coastal districts.
Grevillea parviflora subsp. parviflora	V	Low open to erect shrub 0.3–1 m tall	Grows in heathy associations or shrubby woodland, in sandy or light clay soils usually over shale substrates.
Rhizanthella slateri	E	Saprophytic herb with fleshy underground stem, with prominent, fleshy, overlapping bracts.	Grows in sclerophyll forest in shallow to deep loams.
Syzygium paniculatum	V	Shrub or small tree with flaky bark.	Grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea.
Tetratheca juncea	V	Prostrate shrub with stems to 1 m long.	Grows in sandy, occasionally swampy heath and in dry sclerophyll forest; chiefly in coastal districts from Bulahdelah to Lake Macquarie.

Note: 'Description' and 'Habitat' details from Harden (1990-1993, 2002) and Harden and Murray (2000). V = Vulnerable, E = Endangered.

One of the listed species, *Tetratheca juncea*, was recorded in the Southern Extension. This species was recorded in Quadrat 5 and during the targeted species search.

6.2.1.1 *Tetratheca juncea*

Tetratheca juncea is a low, sprawling shrub growing in clumps of single or multiple stems; flowers have four petals and range in colour from white through to pink or dark purple. Stems are usually leafless with two to three narrow wings, and 30 to 60 cm long branching from a woody rootstock (NPWS 2005).

In the Species Profile for *T. juncea* (NPWS 2005), it is stated that (Appendix 5):

> *The species is confined to the northern portion of the Sydney basin bioregion and the southern portion of the north coast bioregion. Within these regions the species is known from the local government areas (LGAs) of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. Herbarium records indicate that a disjunct population of* T. juncea *once existed in Sydney's inner western and southern suburbs. There are no historic records of* T. juncea *between Sydney and North Wyong.*

In the Lake Macquarie Conservation Management Plan for *Tetratheca juncea*, Payne (2001) undertook a census of 239 sites of known or predicted *T. juncea* habitat, primarily in the Lake Macquarie and Wyong LGAs, with some detail from the Great Lakes and Cessnock LGAs.

According to Payne (2001), a total of 162 sub-populations occur within the Lake Macquarie LGA, and most of these sub-populations are small with 0-20 clumps of *T. juncea.* Two sub-populations were mapped within the Project Site, numbers 201 and 202 (Figure A7 of Payne 2001). No further details are provided on sub-populations 201 and 202. Payne divided the total distributional range of *T. juncea* into four quadrants. The Project Site is located within the northwest quadrant. Payne states that this quadrant "is the area which mainly requires conservation of the species". At the time of writing, 1.78% of *Tetratheca juncea* clumps in the northwest quadrant were held in conservation reserves; Payne recommended that to achieve conservation objectives, sites held in State Forests and additional sites on Newstan Colliery Land would need to be considered for reservation (Payne 2001).

Tetratheca juncea was first recorded on the Site during the September 2002 flora survey. This species was recorded in Transect T16 near the southern boundary of the Southern Extension, and in T19 and Spot location C in the west of the Southern Extension (Figure D). The following year, in September 2003, a targeted search for *Tetratheca juncea* conducted on the Site. During this search a total of 94 clumps were recorded within and south of the Southern Extension, distributed across five populations (Figure E).

Targeted searches for *Tetratheca juncea* conducted in November and December 2008 recorded a total of 124 clumps within the Southern Extension, distributed across five populations (Figure D). Three of these populations had been previously identified in September 2002 and September 2003 and two were new recorded populations within the Southern Extension. An additional population, consisting of two plants was recorded with the rehabilitation area to the east (Figure D).

Subpopulation No.	Status	No. clumps recorded in 2002	No. clumps recorded in 2008
1	Relocated	49	39
2	Relocated	37	64
3	Relocated	5	2
4	Not relocated	1	0
5	Not relocated	2	0
6	New population	-	4
7	New population	-	15
8	New population in rehabilitation area	-	2
Total		94	126

The GPS locations of the populations of *T. juncea* recorded in the Southern Extension area are presented in Table 5.

During the first targeted search for *Tetratheca juncea* in November 2008 all located clumps (all flowering) were tagged. During the second targeted search for *T. juncea* in December 2008, five weeks later 54, of the tagged clumps (76%) were still flowering, while the remainder (24%) were not. In December 2008 an additional 42 new untagged clumps were recorded, 40 of these clumps were flowering.

In December 2008 two flowering *Tetratheca junce*a clumps were recorded in the east of the rehabilitation area (Figure D). This population appears to have germinated after the 2002 fire.

6.2.2 State

Lake Macquarie City Council (2008) lists 17 threatened plant species on the TSC Act that are known or likely to occur in Lake Macquarie LGA:

Species	Status	Description	Habitat
Angophora inopina	V	Tree to 8 m high, often multistemmed; bark persistent, grey, short fibrous.	In open woodland with a dense shrub understorey on deep white sandy soils over sandstone.
Callistemon linearifolius	V	Shrub c. 3-4 m high.	Grows in dry sclerophyll forest on the coast and adjacent ranges.
Cryptostylis hunteriana	V	Saprophytic terrestrial herb.	Grows in deep swamp-heath on sandy soils, chiefly in coastal districts.
Diuris praecox	V	Terrestrial herb	Grows in sclerophyll forest of coastal and near-coastal districts; from Ourimbah to Nelson Bay.
Eucalyptus camfieldii	V	Tree or mallee to 10 m high, but often less	Rare and localized, in coastal shrub heath on sandy soils on sandstone, often of restricted drainage; from Gosford to Royal N.P.

Species	Status	Description	Habitat
Genoplesium baueri	V	Terrestrial herb 6–15 cm high	Grows in sparse sclerophyll forest and moss gardens over sandstone; from the Hunter Valley to Nowra district.
Grevillea parviflora subsp. parviflora	V	Low open to erect shrub 0.3–1 m tall	Grows in heathy associations or shrubby woodland, in sandy or light clay soils usually over shale substrates.
Maundia triglochinoides	V	Perennial with rhizomes c. 5 mm thick and emergent tufts of leaves arising along their length.	Grows in swamps or shallow freshwater on heavy clay; north from southern Sydney.
Melaleuca biconvexa	V	Shrub or small tree to 10 m high with papery bark	Grows in damp places, often near streams; coastal districts and adjacent tablelands from Jervis Bay north to the Port Macquarie district.
Prostanthera densa	V	Erect, often compact shrub 0.5–2 m high	Grows in sclerophyll forest and shrubland, on coastal headlands and near-coastal ranges, on sandstone; from Nelson Bay to Beecroft Peninsula.
Pultenaea maritima	V	prostrate shrub, mat forming	North from the Newcastle area, mainly in grasslands along the coast
Rhizanthella slateri	V	Terrestrial saprophytic herb with fleshy underground stem to 15 cm long	Grows in sclerophyll forest in shallow to deep loams. Collections tend to be accidental and it is not possible to determine distribution accurately; recorded for the Blue Mtns, also Bulahdelah south to Dharug N.P.
Rutidosis heterogama	V	Perennial herb, stems decumbent or erect and to 30 cm high from a woody base	Grows mostly in heath, often along disturbed roadsides; chiefly in coastal districts from Maclean to the Hunter Valley, and inland to Torrington, rare.
Syzygium paniculatum	V	Shrub or small tree with flaky bark.	Grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea.
Tetratheca juncea	V	Prostrate shrub with stems to 1 m long.	Grows in sandy , occasionally swampy heath and in dry sclerophyll forest; chiefly in coastal districts from Bulahdelah to Lake Macquarie.
Tetratheca glandulosa	V	Spreading shrub, usually to 20 cm high	Grows in sandy or rocky heath or scrub, from Mangrove Mtn to the Blue Mtns and Sydney.

Species	Status	Description	Habitat
Thesium australe	V	Erect perennial herb to 40 cm high	Grows in grassland or woodland, often in damp sites; widespread but rare and possibly endangered.

Note: 'Description' and 'Habitat' details from Harden (1990-1993, 2002) and Harden and Murray (2000). V = Vulnerable.

One of the listed species, *Tetratheca juncea*, was recorded on the Southern Extension area and in the rehabilitation area.

6.2.3 Regional

Benson (1986) lists 50 plant species from Gosford and Lake Macquarie area, (with a northern limit near Awaba 4 km south of the Site and a southern limit to Macmasters Beach, Gosford). These species are considered as "either rare or threatened, or of significance in terms of geographic distribution, or localized population disjunct from other occurrences." (Benson 1986). *Tetratheca juncea* was the only species recorded on the Site in 2008 included on this list.

NPWS (2003) lists 28 plant species as rare, vulnerable or "poorly known but suspected as any of the above [rare, endangered or vulnerable]" in the LHCCREMS study area. Of these species, *Macrozamia flexuosa* and *Tetratheca juncea* were recorded in the current flora survey.

Macrozamia flexuosa was recorded from Quadrats 6 and 7 on the south facing slope of the Southern Extension.

Lake Macquarie City Council (2008) lists five ROTAP (Rare or Threatened Plant Species) known to occur in the Lake Macquarie LGA:

Species	ROTAP code	Description	Habitat
Callistemon shiressii	3RC-	Shrub or small tree, 1.5–12 m high	Grows on shale ridges, in moist eucalypt forest and rainforest gullies, occasionally along riverbanks; chiefly from Colo R. to Gosford district, also Howes Valley to Bulga district.
Eucalyptus fergusonii subsp. *fergusonii*	3KC-	Tree to 25 m high	Scattered and sporadic, in wet sclerophyll forest or woodland on sandy soils; Bulahdelah to Morisset.
Gonocarpus salsoloides	3RCa	Erect or ascending, much-branched perennial herb to 40 cm high	In swampy areas on sand, uncommon; coastal districts from Port Macquarie to Royal N.P.
Typhonium eliosurum	3RC-	Perennial herb, deciduous	Rare, chiefly from Wyong to Nowra district, also recorded for Bulahdelah. Grows on rainforest margins and along creek banks.

Macrozamia pauli-guilielmi subsp. *flexuosa* (now *M. flexuosa*)	2K		Scattered in sclerophyll forests on siliceous soils from Bulahdelah to Lake Macquarie.

It is stated in City of Lake Macquarie (2008) that *Macrozamia pauli-guilielmi* subsp. *flexuosa* is listed as endangered under the EPBC Act. This is not the case. *Macrozamia flexuosa* was originally described as a species by Moore (1884), but was subsequently reduced to the status of subspecies, as *Macrozamia pauli-guilielmi* subsp. *flexuosa*, by Johnson (1959). *Macrozamia flexuosa* was again recognised as a separate species by Hill (1998).

Macrozamia pauli-guilielmi, sensu stricto, is listed as endangered under the EPBC Act. This species is restricted to Southern Queensland, in the Burnett, Darling Downs and western Moreton districts (plantnet.rbgsyd.nsw.gov.au/PlantNet/cycad). But the New South Wales species *M. flexuosa* is not listed either under the EPBC Act or the NSW TSC Act.

Macrozamia flexuosa was recorded in the Southern Extension in Transects 10, 15, 16 and 24 in the 2002 survey and in Quadrats 6 and 7 in the 2008 survey and in the Northern Extension in Transects 2 and 5 in the 2002 survey.

7 NOXIOUS WEEDS

The NSW Department of Primary Industries list of Noxious weed declarations (www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed accessed 6 February 2009) identifies 92 noxious weeds for Lake Macquarie City Council (Appendix 6). Three of the 36 exotic species recorded in the Northern and Southern extension areas in 2002 and 2008 are declared noxious weeds in the Lake Macquarie LGA, namely:

Botanical name	Common name	Class	Sampling locations	
			2002	2008
Ageratina adenophora	Crofton Weed	4	Transects 1, 2, 5, 8, 18	Quadrats 1, 3
Cortaderia selloana	Pampas Grass	4	Transect 18	
Lantana camara	Lantana	5	Transects 1, 5, 6, 11, 14, 19, 20, 21	Quadrats 3, 6, 8

The legal requirements for Control Class 4 weeds are:

> *The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.*

The legal requirements for Control Class 5 weeds are:

> *The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.*

8 REFERENCES

Benson (1986)
The vegetation of the Gosford and Lake Macquarie 1:100 000 vegetation map sheet. *Cunninghamia.* Volume 1(4), 467-489.

Lake Macquarie City Council (2008)
2008 State of the Environment Report, dated December 2008.

Clements A. and Rodd T. (1995)
Flora Report: Teralba Quarry Extension.
Prepared for Metromix Pty Ltd, dated 4 June 1995.

Harden G.J. (1990-93, 2002)
Flora of New South Wales. Volumes 1 to 4. University of New South Wales Press, Kensington.

Harden G.J. and Murray L.J. (2000)
Supplement to Flora of New South Wales. Volume 1. University of New South Wales Press, Kensington.

Hill (1998)
Cycadophyta, in McCarthy, P.M. (ed.) *Flora of Australia,* vol. 48: 597–661. CSIRO, Canberra.

Johnson, L.A.S. (1959)
The families of cycads and the Zamiaceae of Australia. *Proc. Linn. Soc. New South Wales* 84: 64–117.

Matthei L.E. (1995)
Soil landscapes of the Newcastle 1:100 000 Sheet. Department of Land and Water Conservation, Sydney.

Moore, C. (1884)
J. & Proc. Roy. Soc. New South Wales 17: 121 (description of *Macrozamia flexuosa*).

Murray M. and Bell S. (2001)
Flora and fauna survey guidelines. Version 2.0. Prepared for Lake Macquarie City Council. Dated July 2001.

NPWS (2003)
Vegetation Survey, Classification and Mapping: Lower Hunter and Central Coast Region. Version 1.2. Prepared for The Lower Hunter and Central Coast Regional Environment Management Strategy. CRA Unit, Sydney Zone, National Parks and Wildlife Service, dated May 2003.

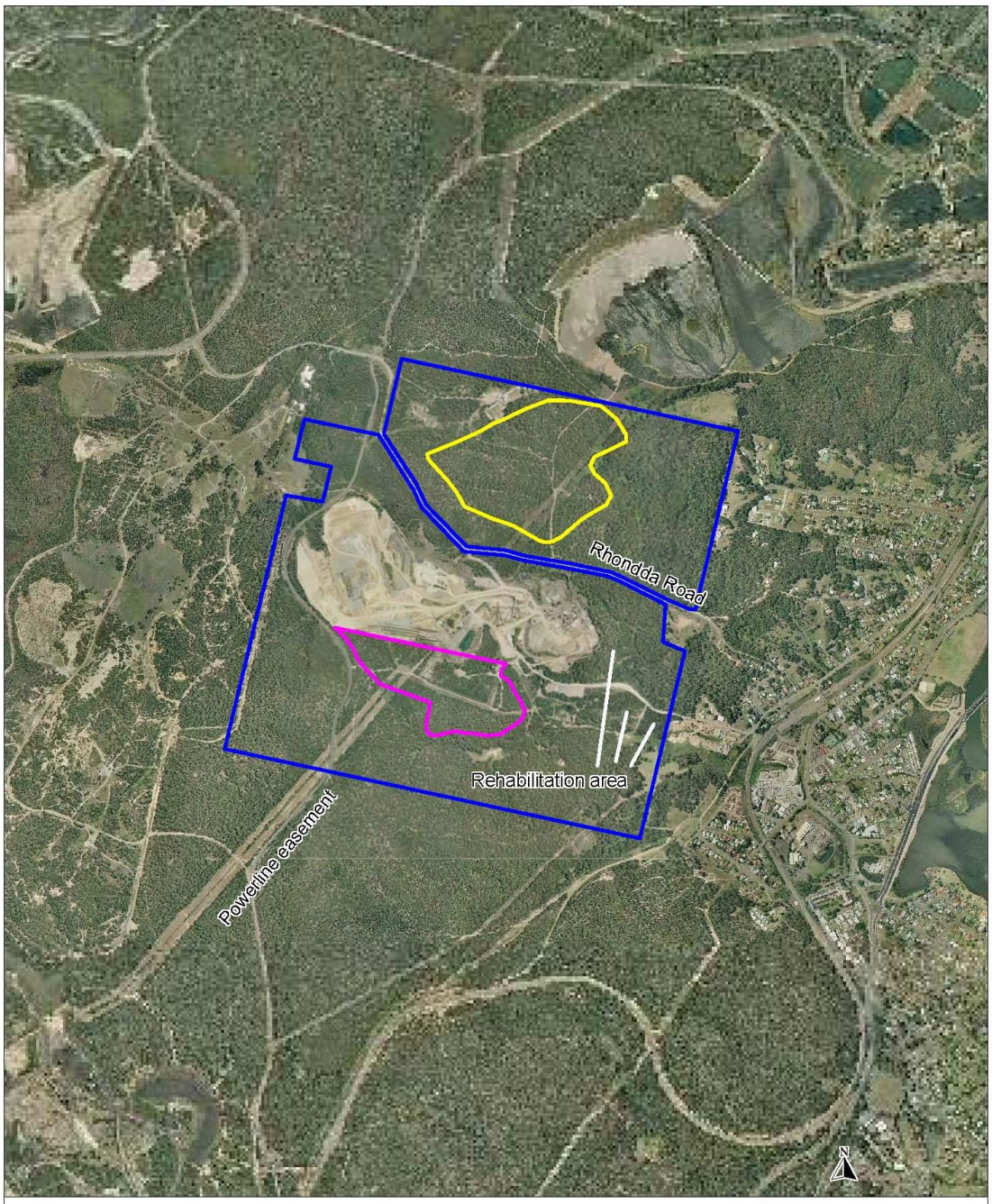
NPWS (2005)
Species profile sheet for Tetratheca juncea.
Threatened Species Information & Environmental Assessment Guidelines - Central Directorate NSW NPWS, Hurstville. Dated May 2000.

NSW Department of Primary Industry (2005)
Noxious Weed Declarations
http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed
Accessed on 15 January 2008

NSW Scientific Committee (2005)
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin Bioregion - Endangered ecological community determination - final. DEC (NSW), Sydney

Payne R. (2001)
Lake Macquarie Tetratheca juncea *Conservation Management Plan*.
Prepared for Lake Macquarie City Council, NSW National Parks and Wildlife Service and Broken Hill Proprietary. Dated November 2000, including Addendum July 2001.

Rose G., Jones W.H. and Kennedy D.R. (1966)
Newcastle 1:250 000 Geological Sheet SI/56-02. 1st edition. Department of Mines NSW, Sydney.



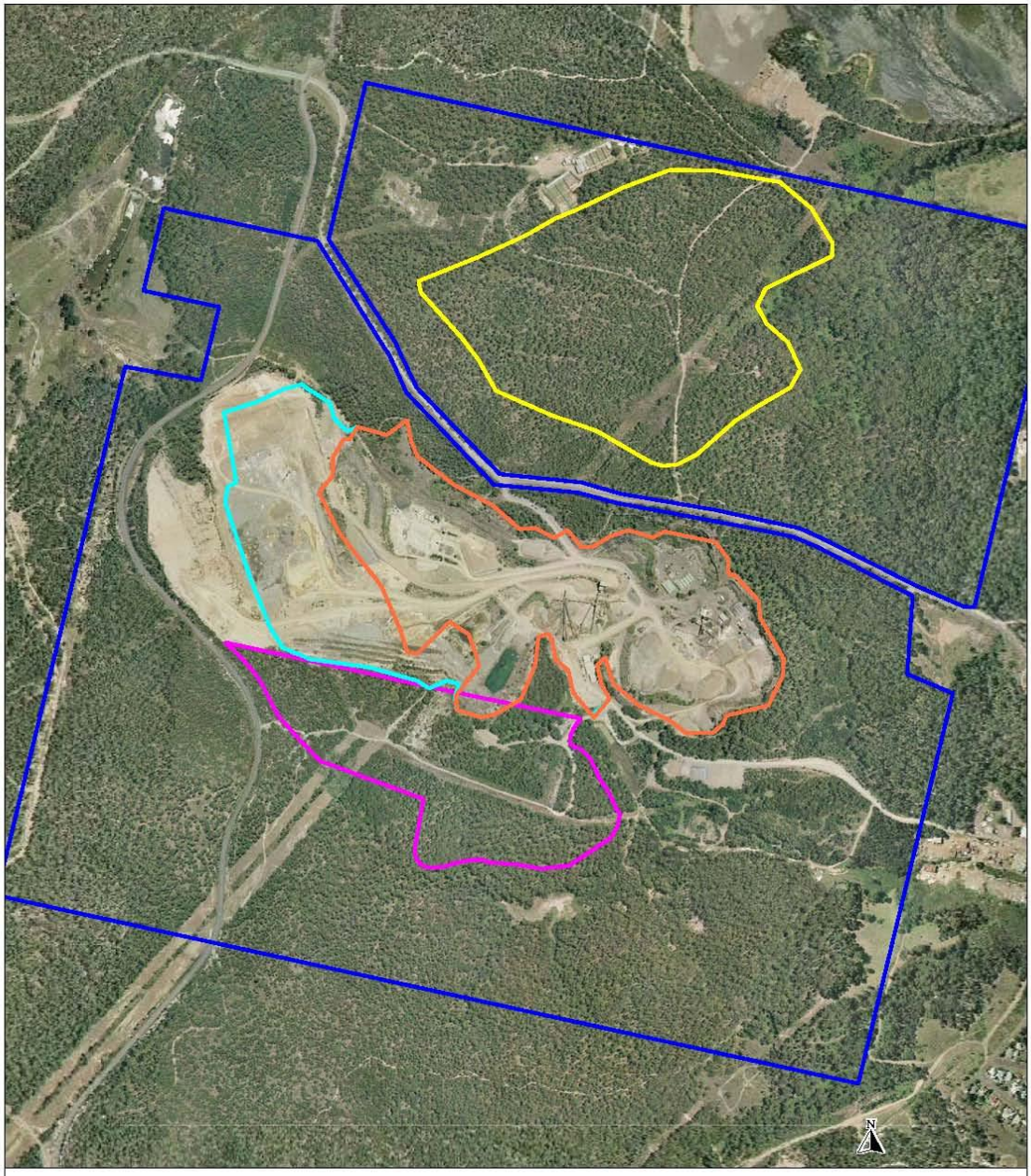
Legend

- Quarry lease boundary
- Northern Extension boundary
- Southern Extension boundary

0 400 800
metres

Figure A

Location of proposed Northern and Southern Extensions overlaid on the 2008 SIX Viewer aerial photograph.



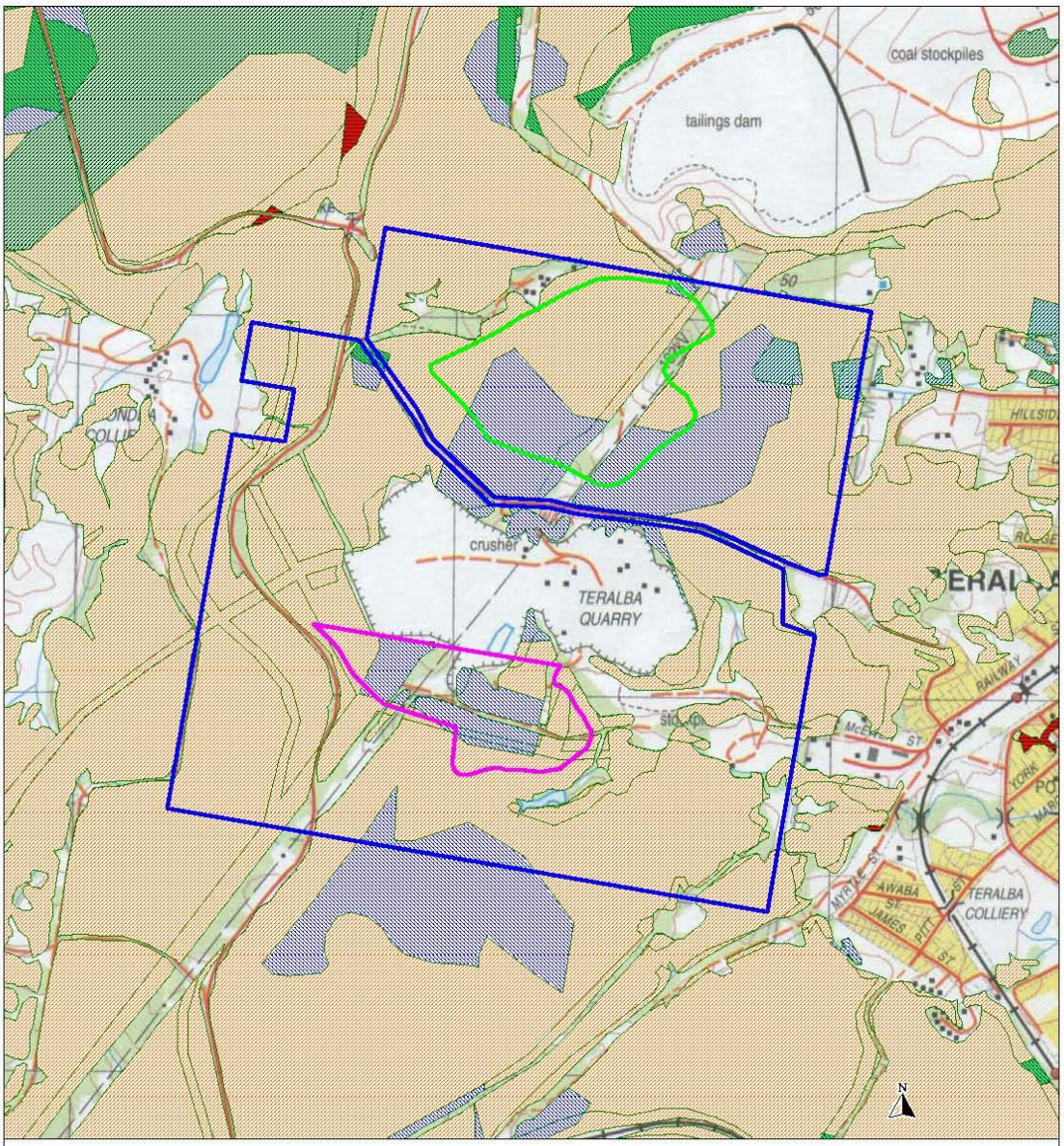
Legend

- Quarry lease boundary
- Northern Extension boundary
- Southern Extension boundary
- Quarry boundary 1993
- Quarry boundary 2002

0 200 400
metres

Figure B

Previous extent of the quarry overlaid on the SIX Viewer 2008 aerial photograph.



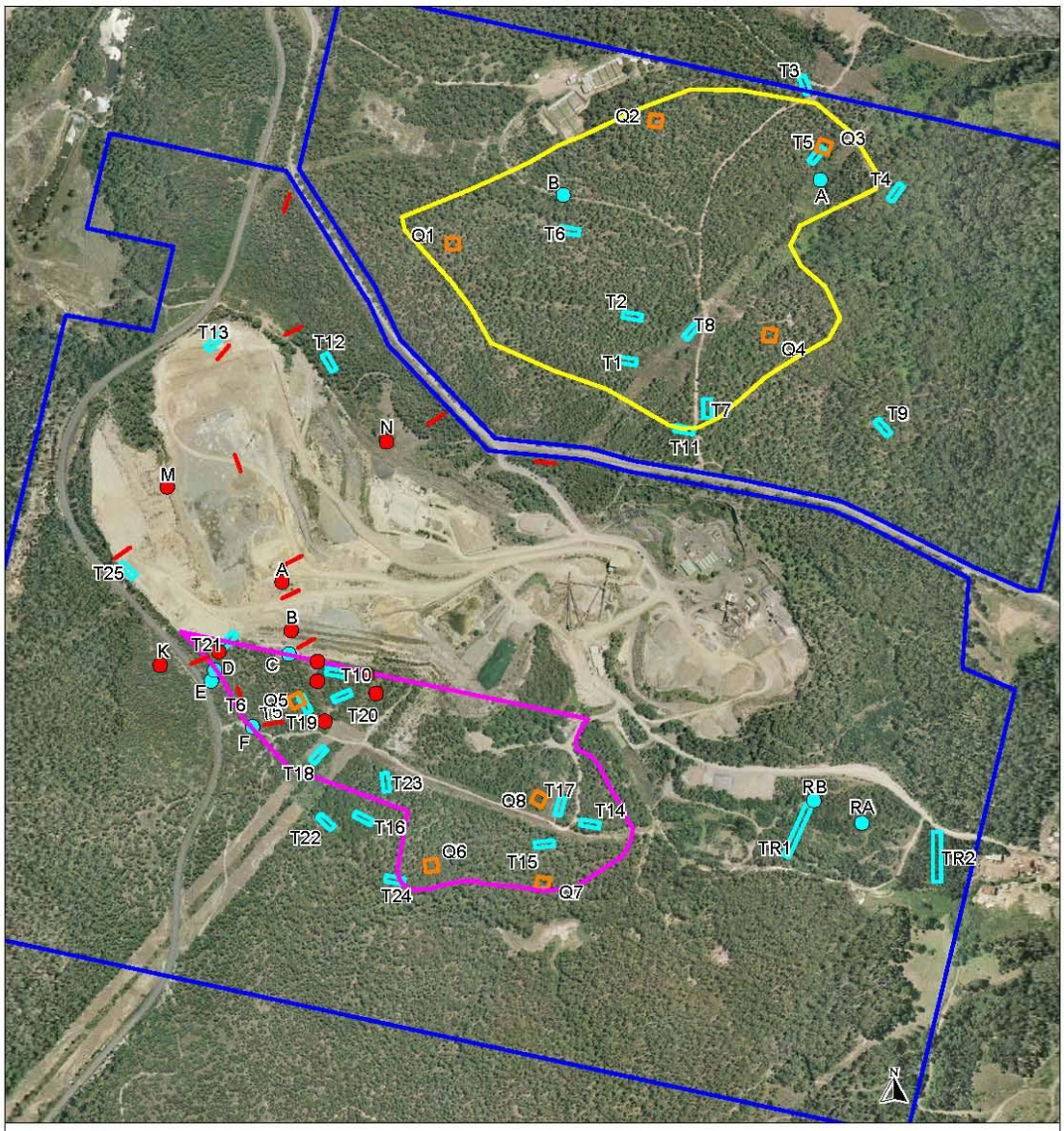
Legend

- Quarry lease boundary
- Northern Extension boundary
- Southern Extension boundary
- Coastal Foothills Spotted Gum - Ironbark Forest
- Coastal Plains Smooth-barked Apple Woodland
- Alluvial Tall Moist Forest
- Coastal Plains Scribbly Gum Woodland

0 300 600
metres

Figure C

Vegetation mapping of the Site (NPWS 2003) overlaid on the 1:25 000 topographic map.



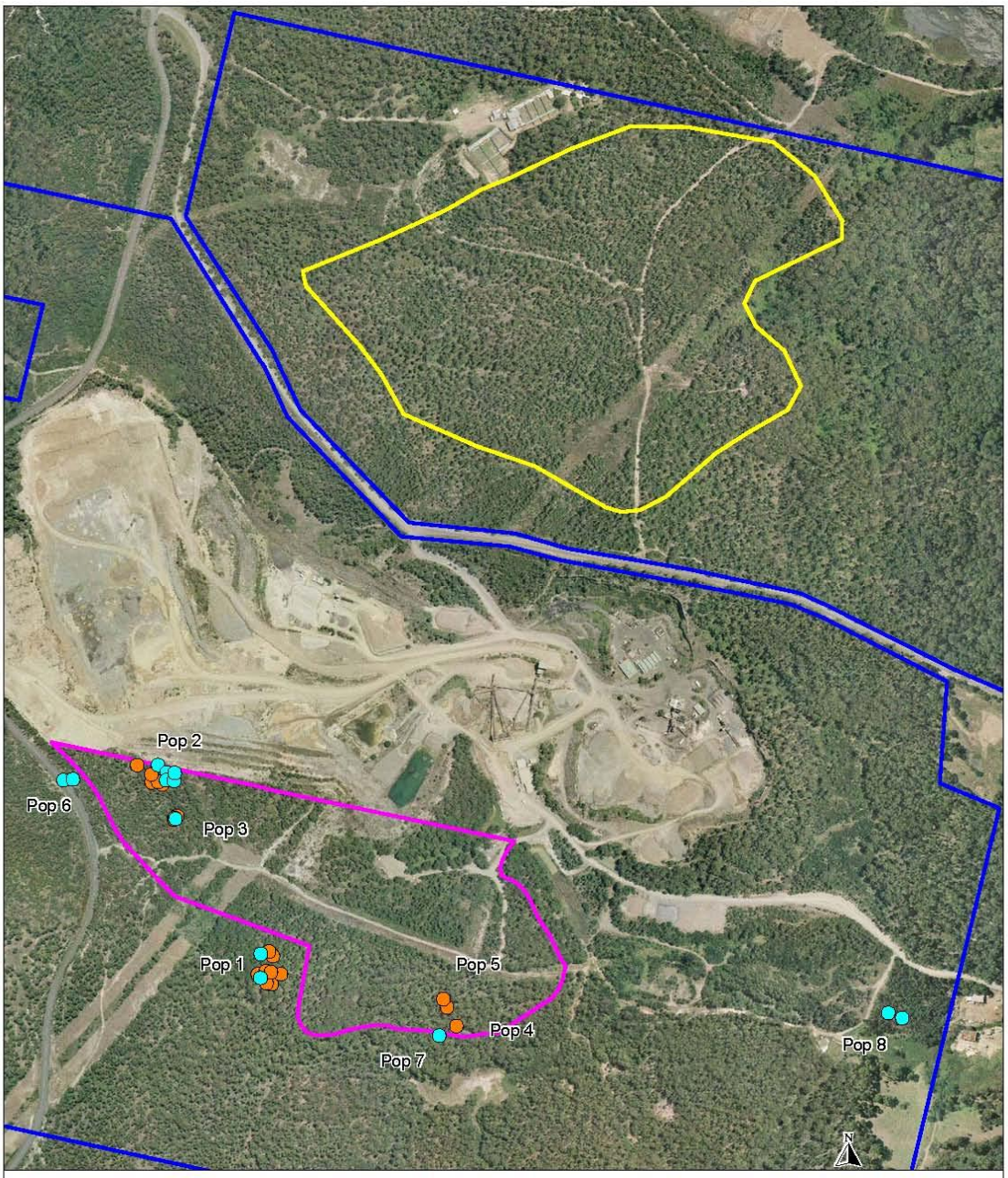
Legend

- Quarry lease boundary
- Northern Extension boundary
- Southern Extension boundary
- 1995 Spot location
- 1995 Transect
- 2002 Spot location
- 2002 Transect
- 2008 Quadrat

0 180 360
metres

Figure D

Sample locations for 1995 (Clements and Rodd 1995), 2002 and 2008 flora surveys overlaid on the SIX Viewer 2008 aerial photograph.



Legend

- Quarry lease boundary
- Northern Extension boundary
- Southern Extension boundary
- Tetratheca juncea Sept 2002
- Tetratheca juncea Nov and Dec 2008

Figure E

Figure 9.
Location of Tetratheca juncea recorded in September 2002, November and December 2008 overlaid on the SIX Viewer aerial photograph.

Table 1. Species recorded on the Site in 2002 and 2008

Note: * preceding Botanical name signifies exotic species;
 # signifies non-local native (presumed planted)

Botanical name	Common name
1. Pteridophytes	
Adiantaceae	
Adiantum aethiopicum	Common Maidenhair Fern
Adiantum hispidulum	Rough Maidenhair Fern
Blechnaceae	
Doodia aspera	Prickly Rasp Fern
Dennstaedtiaceae	
Pteridium esculentum	Bracken
Dicksoniaceae	
Calochlaena dubia	Rainbow Fern, False Bracken
Lindsaeaceae	
Lindsaea microphylla	Lacy Wedge-fern
Pteridaceae	
Pteris tremula	Tender Brake
Sinopteridaceae	
Cheilanthes sieberi	Rock Fern
Pellaea paradoxa	
2. Gymnosperms	
Zamiaceae	
Macrozamia flexuosa	Blackfellows Pineapple, Zamia
3. Dicotyledons	
Acanthaceae	
Brunoniella australis	Blue Trumpet, Blue Yam
Brunoniella pumilio	Dwarf Blue Trumpet
Pseuderanthemum variabile	
Apiaceae	
Centella asiatica	Indian Pennywort
Daucus glochidiatus	Native Carrot
* Hydrocotyle bonariensis	Beach Pennywort
Hydrocotyle peduncularis	
Hydrocotyle tripartita	Pennywort
Araliaceae	
Polyscias sambucifolia	Elderberry Panax
Asclepiadaceae	
* Gomphocarpus sp.	
Asteraceae	
* Ageratina adenophora	Crofton Weed
* Ambrosia sp.	
* Aster subulatus	Wild Aster
* Bidens pilosa	Cobblers Pegs
Brachyscome multifida	Cut-leaf Daisy
Cassinia sp.	
* Cirsium vulgare	Black Thistle, Spear Thistle
* Conyza sumatrensis	Tall Fleabane
Coronidium scorpioides	Button Everlasting

Page 1

Botanical name	Common name
Euchiton involucratus	Star Cudweed
Euchiton sp.	
* Facelis retusa	
* Gamochaeta spicata	Spike Cudweed
Gnaphalium species	Cudweed
* Hypochaeris radicata	Catsear, False Dandelion
Lagenophora gracilis	Slender Bottle-daisy
Ozothamnus diosmifolius	White Dogwood
Senecio hispidulus	Hill Fireweed, Rough Fireweed
* Senecio madagascariensis	Fireweed, Madagascar Ragwort
Senecio prenanthoides	
* Senecio pterophorus	African Daisy
Senecio quadridentatus	Cotton Fireweed
Sigesbeckia orientalis	Indian Weed
* Sonchus oleraceus	Common Sow-thistle, Milk-thistle
Vernonia cinerea	
Bignoniaceae	
Pandorea pandorana	Wonga Vine
Brassicaceae	
Rorippa laciniata	Perennial Marsh-cress
Campanulaceae	
Wahlenbergia gracilis	Sprawling Bluebell
Caryophyllaceae	
* Cerastium glomeratum	Mouse-ear Chickweed
* Petrorhagia nanteuilii	Proliferous Pink
* Polycarpon tetraphyllum	Four-leaf Allseed
Casuarinaceae	
Allocasuarina littoralis	Black She-Oak
Allocasuarina torulosa	Forest She-oak
Celastraceae	
Maytenus silvestris	
Clusiaceae	
Hypericum gramineum	Small St Johns-wort
Convolvulaceae	
Convolvulus erubescens	Native Bindweed, Blushing Bindweed
Dichondra repens	Kidney-weed, Mercury Bay Weed
Polymeria calycina	Polymeria
Crassulaceae	
Crassula sieberiana	Australian Stonecrop
Dilleniaceae	
Hibbertia aspera	Rough Guinea-flower
Hibbertia dentata	Guinea-flower
Hibbertia diffusa	Guinea-flower
Hibbertia pedunculata	
Hibbertia scandens	Twining Guinea-flower
Ericaceae Styphelioideae	
Acrotriche divaricata	
Epacris microphylla	Coral Heath
Epacris pulchella	Wallum Heath
Leucopogon lanceolatus	Lance-leaf Beard-heath

Botanical name	Common name
Euphorbiaceae	
Breynia oblongifolia	Coffee Bush
Glochidion ferdinandi	Cheese Tree
Phyllanthus gunnii	
Phyllanthus hirtellus	Thyme Spurge
Poranthera microphylla	Small Poranthera
Fabaceae Faboideae	
Chorizema parviflorum	Eastern Flame Pea
Daviesia ulicifolia	Gorse Bitter-pea
Desmodium gunnii	Slender Tick-trefoil
Desmodium rhytidophyllum	Tick-trefoil
Desmodium varians	Slender Tick-trefoil
Dillwynia retorta	Eggs-and-bacon Pea, Parrot Pea
Glycine clandestina	Twining Glycine
Hardenbergia violacea	False Sarsaparilla
Hovea linearis	Narrow-leaf Hovea
Indigofera australis	Native Indigo
Kennedia rubicunda	Dusky Coral-pea
Mirbelia rubiifolia	Heathy Mirbelia
Podolobium ilicifolium	Native Holly, Prickly Shaggy-pea
Podolobium scandens	Netted Shaggy Pea
Pultenaea euchila	
Pultenaea retusa	
Pultenaea villosa	
* Trifolium repens	White Clover
Fabaceae Mimosoideae	
Acacia decurrens	Black Wattle
Acacia falcata	Sickle Wattle
Acacia floribunda	White Sally
Acacia implexa	Hickory Wattle
Acacia irrorata	Green Wattle
Acacia leiocalyx	Queensland Black Wattle
Acacia longifolia	Sydney Golden Wattle
Acacia myrtifolia	Red-stemmed Wattle
Acacia ulicifolia	Prickly Moses, Prickly Wattle
Gentianaceae	
* Centaurium sp.	Centaury
* Centaurium tenuiflorum	Centaury
Geraniaceae	
Geranium homeanum	Rainforest Cranesbill
* Pelargonium sp.	
Goodeniaceae	
Goodenia hederacea	Ivy Goodenia
Goodenia heterophylla	Variable Goodenia
Haloragaceae	
Gonocarpus tetragynus	Common Raspwort
Lamiaceae	
Plectranthus parviflorus	
Scutellaria humilis	Dwarf Skullcap
* Stachys arvensis	Stagger Weed
Teucrium corymbosum	Forest Germander

Botanical name	Common name
Lauraceae	
Cassytha glabella	
* Cinnamomum camphora	Camphor-laurel
Lobeliaceae	
Pratia purpurascens	Whiteroot
Loganiaceae	
Logania pusilla	Tiny Logania
Lythraceae	
Lythrum hyssopifolia	Hyssop Loosestrife
Malvaceae	
* Modiola caroliniana	Red-flower Mallow
* Sida rhombifolia	Paddy's Lucerne
Menispermaceae	
Stephania japonica	Snake Vine
Myrsinaceae	
Myrsine variabilis	Muttonwood
Myrtaceae	
Acmena smithii	Lilly-pilly
Angophora costata	Sydney Red Gum
Backhousia myrtifolia	Grey Myrtle, Ironwood
Corymbia gummifera	Red Bloodwood
Corymbia maculata	Spotted Gum
Eucalyptus acmenoides	White Mahogany
Eucalyptus fibrosa	Red Ironbark
Eucalyptus globoidea	White Stringybark
Eucalyptus paniculata	Grey Ironbark
Eucalyptus piperita	Sydney Peppermint
Eucalyptus punctata	Grey Gum
Eucalyptus resinifera subsp. resinifera	Red Mahogany
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus sp.	
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus umbra	Bastard White Mahogany
# Leptospermum petersonii	Lemon-scented Tea-tree
Leptospermum polygalifolium	Yellow Tea-tree, Tantoon Tea-Tree
Leptospermum trinervium	Slender Tea-tree
Syncarpia glomulifera	Turpentine
Ochnaceae	
* Ochna serrulata	Mickey Mouse Plant
Oleaceae	
* Ligustrum sinense	Small-Leaved Privet, Chinese Privet
Notelaea longifolia	Mock-olive
Oxalidaceae	
Oxalis exilis	Creeping Oxalis
Oxalis perennans	
Oxalis sp.	
Passifloraceae	
Passiflora herbertiana	Native Passionfruit
Pittosporaceae	
Billardiera scandens	Hairy Apple Berry

Botanical name	Common name
Bursaria spinosa	Australian Boxthorn
Pittosporum revolutum	Yellow Pittosporum
Pittosporum undulatum	Pittosporum
Plantaginaceae	
Plantago debilis	
* Plantago lanceolata	Plantain, Ribwort
Veronica plebeia	Creeping Speedwell
Primulaceae	
* Anagallis arvensis	Pimpernel
Proteaceae	
Persoonia linearis	Narrow-leaf Geebung
Ranunculaceae	
Clematis glycinoides	Headache Vine, Traveller's Joy, Old Man's Beard
Rosaceae	
* Rubus discolor	Blackberry
Rubiaceae	
Canthium coprosmoides	Coast canthium
Galium binifolium	
Opercularia diphylla	Stinkweed
Opercularia hispida	Hairy Stinkweed
Pomax umbellata	Pomax
* Richardia brasiliensis	
* Richardia humistrata	
* Richardia sp.	
Rutaceae	
Boronia polygalifolia	
Zieria smithii	Sandfly Zieria, Stinkwood
Sapindaceae	
* Cardiospermum grandiflorum	Balloon Vine
Dodonaea triquetra	Hopbush
Scrophulariaceae	
* Verbascum virgatum	Twiggy Mullein
Solanaceae	
Solanum americanum	Blackberry Nightshade, Glossy Nightshade
Solanum brownii	Violet Nightshade
* Solanum nigrum	Blackberry Nightshade
Solanum prinophyllum	Forest Nightshade
Sterculiaceae	
Brachychiton populneus subsp. populneus	Kurrajong
Thymelaeaceae	
Pimelea linifolia subsp. linifolia	Slender Rice-flower
Tremandraceae	
Tetratheca juncea	Black-eyed Susan
Ulmaceae	
Trema tomentosa var. viridis	Poison Peach, Peach-leaf Poison Bush
Verbenaceae	
Clerodendrum tomentosum	Hairy Clerodendrum
* Lantana camara	Lantana
* Verbena brasiliensis	
* Verbena officinalis	European Vervain

Botanical name	Common name
* Verbena rigida	Purple Verbena
Violaceae	
Viola betonicifolia	Showy Violet
Viola hederacea	Native Violet, Ivy-leaved Violet
Vitaceae	
Cayratia clematidea	Slender Grape
Cissus antarctica	Kangaroo Vine
4. Monocotyledons	
Anthericaceae	
Arthropodium milleflorum	Pale Vanilla Lily
Caesia parviflora	Pale Grass Lily
Tricoryne elatior	Yellow Rush Lily
Araceae	
Gymnostachys anceps	Settlers' Flax, Settlers' Twine
Commelinaceae	
Commelina cyanea	Blue Spiderwort
Cyperaceae	
Carex breviculmis	
Cyperus gracilis	Slender Sedge
Cyperus imbecillis	
Gahnia clarkei	Tall Saw-sedge
Lepidosperma laterale	Variable Sword-sedge
Ptilothrix deusta	
Scleria mackaviensis	
Dioscoreaceae	
Dioscorea transversa	Native Yam
Iridaceae	
* Sisyrinchium sp. A sensu	Scourweed
Juncaceae	
Juncus continuus	
Juncus usitatus	
Luzula sp.	Wood-rush
Lomandraceae	
Lomandra confertifolia subsp. rubiginosa	
Lomandra cylindrica	Needle Mat-rush
Lomandra filiformis subsp. coriacea	Wattle Mat-rush
Lomandra filiformis subsp. filiformis	Wattle Mat-rush
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra multiflora	Many-flowered Mat-rush
Lomandra obliqua	
Orchidaceae	
Acianthus sp.	Gnat Orchid
Caladenia catenata	White Caladenia
Calochilus sp.	
Dipodium sp.	Hyacinth Orchid
Microtis parviflora	Slender Onion Orchid
Microtis sp.	Onion Orchid
Pterostylis hildae	Rainforest Greenhood
Pterostylis sp.	Greenhood
Thelymitra pauciflora	Slender Sun Orchid

Botanical name	Common name
Philesiaceae	
Eustrephus latifolius	Wombat Berry
Geitonoplesium cymosum	Scrambling Lily
Phormiaceae	
Dianella caerulea	Blue Flax-lily
Dianella revoluta	Blue Flax-lily, Spreading Flax-lily
Poaceae	
* Andropogon virginicus	Whisky Grass
Aristida vagans	Threeawn Speargrass
Austrodanthonia tenuior	Wallaby Grass
Austrostipa rudis	
* Axonopus affinis	Narrow-leaved Carpet Grass
* Briza minor	Shivery Grass
* Briza subaristata	
* Cortaderia selloana	Pampas Grass
Cymbopogon refractus	Barbed Wire Grass
Cynodon dactylon	Couch, Bermuda Grass
Dichelachne inaequiglumis	
Dichelachne micrantha	Shorthair Plumegrass
Dichelachne sp.	Plume Grass
Digitaria parviflora	Smallflower Finger Grass
Echinopogon ovatus	Forest Hedgehog Grass
* Ehrharta erecta	Panic Veld-grass
Entolasia marginata	Bordered Panic
Entolasia stricta	Wiry Panic
Eragrostis brownii	Brown's Lovegrass
Eragrostis leptostachya	Paddock Lovegrass
Imperata cylindrica	Blady Grass
* Melinis repens	Red Natal Grass
Microlaena stipoides	Weeping Grass, Meadow Rice-grass
Notodanthonia longifolia	Long-leaved Wallaby Grass
Oplismenus aemulus	Broad-leaved Basket Grass
Oplismenus imbecillis	Narrow-leaved Basket Grass
Panicum effusum	Hairy Panic
Panicum simile	Two-colour Panic
Paspalidium distans	
* Paspalum dilatatum	Paspalum
* Pennisetum clandestinum	Kikuyu Grass
Poa affinis	
Poa sieberiana	Snow Grass, Fine-leaf Tussock Grass
* Setaria gracilis	Slender Pigeon Grass
* Setaria pumila	Pale Pigeon Grass
Sporobolus creber	Slender Rat's-tail Grass
Sporobolus diander	
Themeda australis	Kangaroo Grass
* Vulpia myuros	Rats-tail Fescue
Smilacaceae	
Smilax australis	Lawyer Vine, Native Sarsaparilla
Xanthorrhoeaceae	
Xanthorrhoea macronema	
Xanthorrhoea media	Grass Tree

Table 2. Species recorded at sampling locations in 2002 and 2008

Notes: **1. * before botanical name signifies exotic species; # signifies non-local native (presumed planted)**

2. for common names see Table 1

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1. Pteridophytes																																		
Adiantaceae																																		
Adiantum aethiopicum												1			1								1				2					1	1	
Adiantum hispidulum		3																											1			1		
Blechnaceae																																		
Doodia aspera		2	1				1											X																
Dennstaedtiaceae																																		
Pteridium esculentum																											3							
Dicksoniaceae																																		
Calochlaena dubia																							1											
Lindsaeaceae																																		
Lindsaea microphylla												1																					1	
Pteridaceae																																		
Pteris tremula																							1											
Sinopteridaceae																																		
Cheilanthes sieberi	2	2		1	1	3	1	3	2	2	3	3	1	1	3	1	1		X				7	6			3	1			2		2	1
Pellaea paradoxa		3	2																										3					
2. Gymnosperms																																		
Zamiaceae																																		
Macrozamia flexuosa		2	3				1			1							3															2	3	
3. Dicotyledons																																		
Acanthaceae																																		
Brunoniella australis																												4						
Brunoniella pumilio							3							2						X									3					
Pseuderanthemum variabile	2	1	1		1					1						3	1		X			X					3		3	4	1	3	4	2

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Apiaceae																																		
Centella asiatica											1	1	1										1	3										
Daucus glochidiatus		3	3																				1			X			4					
* Hydrocotyle bonariensis																								1										
Hydrocotyle peduncularis		1																					3	2										
Hydrocotyle tripartita																											2							
Araliaceae																																		
Polyscias sambucifolia		1		1	3		1	1	1	1			2		1		1			X	X	X	5	5			3		2	2	3	1	1	
Asclepiadaceae																																		
* Gomphocarpus sp.																									X									
Asteraceae																																		
* Ageratina adenophora	1	3	1			2						3											6	3		X	4		1					
* Ambrosia sp.																								1										
* Aster subulatus																								2										
* Bidens pilosa		1	1	1		1					1												1				1	2	2	2		1		1
Brachyscome multifida																	1													3		2	1	
Cassinia sp.					1			1																										
* Cirsium vulgare																								1			1							
* Conyza sumatrensis	1	1	1	1							2	3											6	2	X	X	4	2		1			1	
Coronidium scorpioides		1																																
Euchiton involucratus	1	1		1								2												1										
Euchiton sp.																														1				
* Facelis retusa																								1										
* Gamochaeta spicata																													1					
Gnaphalium species		1																																
* Hypochaeris radicata		2				3					3	3											4	6			2				1	1		
Lagenophora gracilis							1									1											2							
Ozothamnus diosmifolius					1			2	1		1		1									X	6	6					2	1				
Senecio hispidulus		3	1	2															X										3					1
* Senecio madagascariensis	1	1		1		3				1	3												3	3	X		3	2		3				
Senecio prenanthoides																											3	2						
* Senecio pterophorus																													1					
Senecio quadridentatus			1																															
Sigesbeckia orientalis	1	3	1	3																			2				4	3	3	3				
* Sonchus oleraceus		1				1																					1		1		1			
Vernonia cinerea				1	1								1?		1												2	3	3	2	4	2		

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Bignoniaceae																																		
Pandorea pandorana		2			1	2	3		2	3			3	2	1	2	3			X									2	4	4	4	4	3
Brassicaceae																																		
Rorippa laciniata			1																															
Campanulaceae																																		
Wahlenbergia gracilis		3									1													1						1				
Caryophyllaceae																																		
* Cerastium glomeratum		2																							X									
* Petrorhagia nanteuilii																									X									
* Polycarpon tetraphyllum																								1										
Casuarinaceae																																		
Allocasuarina littoralis																								3										
Allocasuarina torulosa				1			1						2		1		2			X			3	1								1	2	
Celastraceae																																		
Maytenus silvestris			2								1						1	X											4			4	3	
Clusiaceae																																		
Hypericum gramineum												2								X														
Convolvulaceae																																		
Convolvulus erubescens																								1										
Dichondra repens					1				1	1				1			1						3	3			4	3	4	2	2	3		
Polymeria calycina														1													4					3		
Crassulaceae																																		
Crassula sieberiana		1																																
Dilleniaceae																																		
Hibbertia aspera							2			3		1	2			1	2		X					1			2		2	4		3	4	
Hibbertia dentata												1											3	1										
Hibbertia diffusa	1			3								1	2		2													4			2			
Hibbertia pedunculata													1			1				X				4							4			
Hibbertia scandens																																1		
Ericaceae Styphelioideae																																		
Acrotriche divaricata							1			1					2														1	1	1		2	
Epacris microphylla																								1										
Epacris pulchella																					X	X												
Leucopogon lanceolatus																2	2									X	1			1	1	2	1	

Botanical name	2002																											2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Euphorbiaceae																																			
Breynia oblongifolia	1	2	2		1			1	2	1	1							X					5	2			3			1		3		2
Glochidion ferdinandi																							5	3										
Phyllanthus gunnii		2	2															X											3					
Phyllanthus hirtellus							1						2		2					X		X		3							1			
Poranthera microphylla		1									2													1										
Fabaceae Faboideae																																			
Chorizema parviflorum	1							1	1																										
Daviesia ulicifolia	1			2	2					1																		2		2				
Desmodium gunnii																													3	2		3	2	
Desmodium rhytidophyllum	2			3	1		3		3	2			2	2	2	3	1				X	X		1			1	3		1	3	3	1	4
Desmodium varians	3	1						2									1						4	1						2				
Dillwynia retorta																					X	X												
Glycine clandestina	3	2	3	3	2			1	2	3		1	3	2	3	3	3				X	X	5	6			2		4	4	4	1	4	4
Hardenbergia violacea	2		1		3		1	1	2	3			2	3	2	2	1		X		X	X	4	3		X	4	3		3		4	4	
Hovea linearis																					X													
Indigofera australis		1																											1					
Kennedia rubicunda		2						1	2														5	3	X	X	3					2	1	
Mirbelia rubiifolia																						X												
Podolobium ilicifolium	2				1	1	3		3	3		2	3	3	3	3	3		X	X	X		6	7			1	4			4	4	2	
Podolobium scandens	1																																	
Pultenaea euchila																																	3	
Pultenaea retusa																											3							
Pultenaea villosa																					X	X											1	
* Trifolium repens																										X								
Fabaceae Mimosoideae																																		
Acacia decurrens																															1			
Acacia falcata						2		3	1		2								X				3	3			4	1						4
Acacia floribunda																																	2	
Acacia implexa												1		1		1	1	X			X							2	3	1				
Acacia irrorata		2																X					3	3		X						4	3	
Acacia leiocalyx					3		1		3							1							3							4				4
Acacia longifolia	2											1								X	X		2	7		X		4					1	4
Acacia myrtifolia																				X	X			1										
Acacia ulicifolia	2	1		1	3	3		3	3	3	1	2	3	1	3	3	2			X	X		1	7			4			4	4	2	4	4
Gentianaceae																																		
* Centaurium sp.		1																																

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
* Centaurium tenuiflorum																											1							
Geraniaceae																																		
Geranium homeanum	2	3	2		1																			1	X		4	1	3	3		1		
* Pelargonium sp.	1																																	
Goodeniaceae																																		
Goodenia hederacea							2																											
Goodenia heterophylla																			X		X			2								2	2	
Haloragaceae																																		
Gonocarpus tetragynus							1						1									X					2				2		1	
Lamiaceae																																		
Plectranthus parviflorus		3	2																										2			1		
Scutellaria humilis																													2					
* Stachys arvensis		1																																
Teucrium corymbosum			1																															
Lauraceae																																		
Cassytha glabella																				X											1			
* Cinnamomum camphora																											1						1	
Lobeliaceae																																		
Pratia purpurascens	2	1	1		2		2	2	3	3			3	3	2	3	1			X	X	X	6	6			3	1	4	4	4	2	4	1
Loganiaceae																																		
Logania pusilla																				X														
Lythraceae																																		
Lythrum hyssopifolia																									X									
Malvaceae																																		
* Modiola caroliniana																									X									
* Sida rhombifolia	1																						1		X		1							
Menispermaceae																																		
Stephania japonica																							6				1							1
Myrsinaceae																																		
Myrsine variabilis		2	2						1									X											3				1	
Myrtaceae																																		
Acmena smithii																																1		
Angophora costata							2						2	3	3					X	X	X		2			2				2		1	

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Backhousia myrtifolia			1															X											4					
Corymbia gummifera			2				2						1						X		X								2					
Corymbia maculata	3	3	1	2	3	3	1	3	3	3	2		1			3	3		X		X	X	4	4			2	3	2	3	4	4	2	4
Eucalyptus acmenoides	2	3	2	3	2	3		3	3	3	1		3		3	3	3	X	X		X	X	8	6		X	4	4	2	4	4	4	4	4
Eucalyptus fibrosa														2													1							
Eucalyptus globoidea				3			3						2	2	1						X										2			
Eucalyptus paniculata	3	2	2	1		2	1	1	3	3					2	1	1	X					1	1				4	3	4		2	1	
Eucalyptus piperita																											2							
Eucalyptus punctata							3		1	2			1	2	3	2	1					X		1	X		1				2		2	1
Eucalyptus resinifera subsp. resinifera							2																											
Eucalyptus saligna																							3	3	X	X	2							
Eucalyptus sp.						1					1		1																					
Eucalyptus tereticornis																				?														
Eucalyptus umbra					3		3		1				3	2	2	2				X	X			2										
# Leptospermum petersonii																									X									
Leptospermum polygalifolium							1																				1							
Leptospermum trinervium																									X									
Syncarpia glomulifera																								2										
Ochnaceae																																		
* Ochna serrulata																																	1	
Oleaceae																																		
* Ligustrum sinense																								1										
Notelaea longifolia		3	3																					1					4	1		1		
Oxalidaceae																																		
Oxalis exilis		1																														1		
Oxalis perennans																												2	1	2				
Oxalis sp.														1									4											
Passifloraceae																																		
Passiflora herbertiana			1	1	1																		1					4	2	2				
Pittosporaceae																																		
Billardiera scandens	1				1			2	3	1	1	1	1	1							X		2	2				2	2	2	4	2	1	
Bursaria spinosa												1					3	X											3	4			4	
Pittosporum revolutum			1						1	1																	1		1		2	1		
Pittosporum undulatum																							3	1	X									
Plantaginaceae																																		
Plantago debilis		2	2																										3	2				

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
* Plantago lanceolata											2													2	X									
Veronica plebeia		1	2																				2				2		2	2				
Primulaceae																																		
* Anagallis arvensis	1	1				2					2													2					1	1				
Proteaceae																																		
Persoonia linearis						1	2	1				1	2	1		1	1		X		X			3						1	3	3	1	
Ranunculaceae																																		
Clematis glycinoides												1											3	2			1		4	1				
Rosaceae																																		
* Rubus discolor																								1										
Rubiaceae																																		
Canthium coprosmoides			2																															
Galium binifolium	1	3	2							2														1				1	2	1	1		1	
Opercularia diphylla					2			1		1				1								X		1				3			3	1		
Opercularia hispida				1			1																											
Pomax umbellata						1				1				1			2							4				4		2				
* Richardia brasiliensis								1															1											
* Richardia humistrata						1					1	1																						
* Richardia sp.																											1							
Rutaceae																																		
Boronia polygalifolia					1															X											3			
Zieria smithii																													1					
Sapindaceae																																		
* Cardiospermum grandiflorum																									X									
Dodonaea triquetra	1	3			2	2					2												2	3								3	1	4
Scrophulariaceae																																		
* Verbascum virgatum																									X									
Solanaceae																																		
Solanum americanum			1																															
Solanum brownii		1																																
* Solanum nigrum																								1										
Solanum prinophyllum																							1											
Sterculiaceae																																		
Brachychiton populneus subsp. populneus																													1					

Botanical name	2002																											2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Thymelaeaceae																																		
Pimelea linifolia subsp. linifolia																					X	X		1										
Tremandraceae																																		
Tetratheca juncea													1							X											1			
Ulmaceae																																		
Trema tomentosa var. viridis																							4		X									
Verbenaceae																																		
Clerodendrum tomentosum		1	1						1															1										3
* Lantana camara	1		2	1				1	3				1	1	1									1		X			3			1		3
* Verbena brasiliensis																					X		2	4										
* Verbena officinalis												1																						
* Verbena rigida											1																							
Violaceae																																		
Viola betonicifolia							1							2																				
Viola hederacea																													3					
Vitaceae																																		
Cayratia clematidea		2	1	1						1																		2	2					
Cissus antarctica																													1					
4. Monocotyledons																																		
Anthericaceae																																		
Arthropodium milleflorum	1	2			1		1			3				1		1	1										4	3	1		1			
Caesia parviflora	1										1																							
Tricoryne elatior																															1		3	1
Araceae																																		
Gymnostachys anceps		1																															1	
Commelinaceae																																		
Commelina cyanea		1	1																				1											
Cyperaceae																																		
Carex breviculmis	1	1	1	1												1								3			4	3	1					2
Cyperus gracilis		2																																
Cyperus imbecillis		3	2																															
Gahnia clarkei																							3											
Lepidosperma laterale		2			1		2	2		1			1	2	3	3	1	X		X		X		6			1	3	2		4	4		

Botanical name	2002																											2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Ptilothrix deusta																						X												
Scleria mackaviensis				1																														
Dioscoreaceae																																		
Dioscorea transversa		3	1															X														4		
Iridaceae																																		
* Sisyrinchium sp. A sensu																											1							
Juncaceae																																		
Juncus continuus																								1										
Juncus usitatus																							2	3										
Luzula sp.																										X								
Lomandraceae																																		
Lomandra confertifolia subsp. rubiginosa	3							1		2	1				2					X														
Lomandra cylindrica																						X												
Lomandra filiformis subsp. coriacea			1									1		1		2															3			
Lomandra filiformis subsp. filiformis	1	1	1	2	1		3		2	2	1	1	1	2	2	3	3	X	X	X	X		2	2			2	4	1	3	3	1	3	4
Lomandra longifolia	1			1					2	1				1			1	X		X			5	4	X			2		4	1	1	2	
Lomandra multiflora				1	2		3		3				2	1	2	1	1				X	X	4	2				2			2		1	2
Lomandra obliqua							2													X	X	X												
Orchidaceae																																		
Acianthus sp.										1																								
Caladenia catenata		1					1			1							1					X		1										
Calochilus sp.																															1			
Dipodium sp.																												3		1				
Microtis parviflora		1																									1							
Microtis sp.																														1				
Pterostylis hildae		3	1																															
Pterostylis sp.																								1										
Thelymitra pauciflora												1												1										
Philesiaceae																																		
Eustrephus latifolius	3	1	1	1			3		2	3		2	2	3	3	3	3		X	X	X	X					4		1	4	3	3	4	1
Geitonoplesium cymosum		3	1									1												1				1	4					
Phormiaceae																																		
Dianella caerulea	2	2	3	1	3		3	1	2	3		2	2	2	1	3	2	X	X	X		X	6	7		X	3	3	3	4	4	4	3	3
Dianella revoluta	1			1			1					1	1		1	3	1											4						1

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Poaceae																																		
* Andropogon virginicus						3	1				3	3								X	X	X	4	7	X									
Aristida vagans	2				2		1		1		3	2	1	2	1		2			X		X		2			1	1			2		1	
Austrodanthonia tenuior																								1									1	
Austrostipa rudis																													1					
* Axonopus affinis												1													X									
* Briza minor						1																												
* Briza subaristata											1													2										
* Cortaderia selloana												2																						
Cymbopogon refractus		2		1	1		1				1	1	1	2	3	1	2							2				2	1	2	2			
Cynodon dactylon					1	1						1											2	1	X									
Dichelachne inaequiglumis																					X	X												
Dichelachne micrantha		1		1		1	1			1	1	1			1	2							2	4			3	2						
Dichelachne sp.																											2					1		
Digitaria parviflora	1	2	1	3						2		3	?		1	1	3							4				2			1		1	
Echinopogon ovatus		1	1						1		1	1				1							1	1			4		3		2	2		
* Ehrharta erecta																								1										
Entolasia marginata	1	1			1					2													1	1			4	4	1	4	1	4		3
Entolasia stricta					2		3	3	2	1	2	1	3	3	3		3		X	X	X	X	5	8			3	3	1	3	4	2	4	4
Eragrostis brownii								2	1		1	2			1									1										
Eragrostis leptostachya		1		1																				2				1						
Imperata cylindrica	2	3	1	2	3	3	2	3	3	1	3	3	3	3	3		3				X	X	2			X	4	4		2	4	4	4	3
* Melinis repens											2													1										
Microlaena stipoides	2	3	3		2	2	2	3	2	1	2	1		3	2	1	3	X				X	8	6			3	4	2	4	2	1		2
Notodanthonia longifolia			1																															
Oplismenus aemulus		1																X					1				3	1						
Oplismenus imbecillis	2	3	3	1	1					1					1		2						4					2	4	2		4	1	
Panicum effusum	1	1		3		2					2	1																1						
Panicum simile	3	1			1			2	2	2		2	3		3	3	3		X	X	X	X		7			4	3		3	4	1	3	3
Paspalidium distans			1	1						1														2			2	3		1	2	1	1	1
* Paspalum dilatatum						1					2													1										
* Pennisetum clandestinum																							2	3	X	X								
Poa affinis																	2		X										4	4		4	4	
Poa sieberiana			2		1																								1					
* Setaria gracilis																											1							
* Setaria pumila												1																						
Sporobolus creber								1																										
Sporobolus diander					1																													

Botanical name	2002																										2008							
	1	2	5	6	7	8	10	11	14	15	17	18	19	20	21	23	24	A	B	C	D	F	R1	R2	RA	RB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Themeda australis	3	3		3	1	3	3	3	3	3	3	3	3	3	3	3	3	X	X	X	X	X	5	8			4	4		4	4	4	4	2
* Vulpia myuros																								1										
Smilacaceae																																		
Smilax australis																																1	1	
Xanthorrhoeaceae																																		
Xanthorrhoea macronema								1	2							2	1				X	X								3			3	
Xanthorrhoea media																															1			

Table 3. Maximum height and number of individuals per 10m x 10m subquadrat for species > 2 m in height for the quadrats

Botanical name	SQ1		SQ2		SQ3		SQ4	
	number	height	number	height	number	height	number	height
Quadrat 1								
Acacia falcata	30	3 m	3	3 m	40	3 m	3	2 m
Podolobium ulicifolia					1	2 m		
Acacia ulicifolia							1	2 m
Corymbia maculata	2	6 m			2	16 m		
Angophora costata	1	10 m					3	15 m
Eucalyptus fibrosa			1	17 m				
Eucalyptus piperita	2	4 m					1	18 m
Eucalyptus acmenoides	6	7 m	3	13 m	1	19 m	2	13 m
Eucalyptus punctata	1	4 m						
Eucalyptus saligna			1	9 m	1	18 m		
Quadrat 2								
Acacia falcata	12	3 m						
Podolobium ulicifolia	3	3 m						
Acacia implexa					1	2 m		
Acacia longifolia	3	4 m	90	5 m	17	6 m	50	5 m
Corymbia maculata	2	12 m	3	16 m	5	12 m		
Eucalyptus paniculata	3	7 m	3	12 m	2	9 m	4	8 m
Eucalyptus acmenoides	7	7 m	1	8 m	10	14 m	7	13 m
Quadrat 3								
Notelea longifolia	2	2 m						
Acacia implexa							1	2 m
Corymbia maculata			2	14 m				
Eucalyptus acmenoides	4	10 m			4	9 m		
Corymbia gummifera	7	16 m			2	16 m		
Eucalyptus paniculata	5	15 m	3	16 m			6	16 m
Backhousia myrtifolia	3	4 m	11	3 m	18	4 m	12	4 m
Brachychiton populneus					1	4 m		
Quadrat 4								
Podolobium ulicifolia							2	2 m
Acacia leiocalyx	65	5 m	55	4 m	40	4 m	75	4 m
Corymbia maculata	5	15 m	2	14 m			2	17 m
Eucalyptus paniculata	2	8 m	5	7 m	1	14 m	3	11 m
Eucalyptus acmenoides	7	13 m	6	12 m	11	14 m	8	12 m
Quadrat 5								
Persoonia linifolia			1	2 m				
Podolobium ulicifolia							4	2 m
Acacia ulicifolia					5	2 m	4	2 m

Acacia decurrens			1	3 m				
Corymbia maculata	8	16 m	6	20 m	4	17 m	4	17 m
Eucalyptus punctata	3	13 m			2	13 m		
Eucalyptus acmenoides	6	10 m	7	13 m	5	14 m	4	5 m
Eucalyptus globoidea			3	6 m			1	7 m
Corymbia gummifera			1	5 m				
Angophora costata					1	14 m	2	14 m

Quadrat 6

Acacia irrorata			3	3 m	1	4 m	16	5 m
Persoonia linifolia							1	3 m
Dodonea triquetra							2	2 m
Eucalyptus paniculata	1	4 m					2	3 m
Corymbia maculata	1	17 m	2	18 m	2	22 m	1	10 m
Eucalyptus acmenoides	4	16 m	5	18 m	8	18 m	1	6 m
Allocasaurina torulosa					1	10 m		

Quadrat 7

Bursaria spinosa	1	2 m			1	3 m		
Acacia ulicifolia							1	2 m
Acacia irrorata	3	3 m	1	2 m				
Pultanea euchila					7	3 m		
Eucalyptus acmenoides	7	16 m	1	15 m	4	18 m	1	18 m
Corymbia maculata	1	15 m	2	16 m				
Eucalyptus paniculata	1	2 m						
Eucalyptus punctata			1	4 m	1	5 m		
Allocasaurina torulosa					1	9 m	1	5 m
Angophora costata							1	17 m

Quadrat 8

Dodonea triquetra	>1000	4 m	>1000	4 m	>500	3 m	>1000	3 m
Clerodendron tomentosum	1	2 m						
Acacia ulicifolia	3	2 m			2	2 m		
Acacia longifolia	1	3 m	1	5 m	2	3 m	1	4 m
Acacia leiocalyx	4	5 m	2	3 m	2	4 m	1	4 m
Acacia falcata			3	4 m	2	4 m	3	3 m
Corymbia maculata	4	13 m	2	12 m	2	17 m	1	11 m
Eucalyptus acmenoides	3	8 m	7	10 m	6	10 m	7	10 m
Eucalyptus punctata					1	16 m		

Table 4. Area cover of vegetation in sampling quadrats (percent projected area cover)

Quadrat	Native canopy trees	Native subcanopy trees	Native Shrubs	Native Monocots	Native Herbs	Exotic plants	Bare ground	Leaf litter
1	25%	7%	10%	80%	5%	< 1%	1%	30%
2	25%	30%	1%	50%	1%	< 1%	1%	60%
3	20%	50%	3%	50%	2%	<1%	0%	50%
4	30%	20%	3%	70%	1%	<1%	0%	30%
5	20%	7%	10%	60%	1%	<1%	0%	40%
6	30%	4%	2%	90%	2%	<1%	0%	15%
7	20%	<1%	20%	80%	1%	<1%	<1%	30%
8	7%	10%	95%	<1%	<1%	<1%	0%	99%

Table 5. GPS locations of *Tetratheca juncea* recorded in 2002 and 2008

	GPS location		Number of clumps recorded		
Population No.	Easting	Northing	Nov 2002	Nov 2008	Dec 2008
1	367958	6351881	49		
1	367945	6351900		8	15
1	367947	6351866		22	23
2	367771	6352145	37		
2	367782	6352160		3	
2	367795	6352150		4	
2	367806	6352139		9	
2	367795	6352139		11	
2	367806	6352150		14	70
3	367811	6352086	5		
3	367812	6352085		2	
4	368225	6351813	1		
4	368199	6351795		7	
5	368210	6351839	1		
5	368204	6351850	1		
6	367652	6352131		2	4
6	367665	6352133		2	2
7	368202	6351798			12
8	368825	6351865			1
8	368845	6351859			1