Appendix A

Species of plant recorded within the study area

Appendix A: Species of plant recorded within the study area

Vegetation Patch[1]						1	2	3	4	5				6															
Vegetation Community[2]						RGYB	RGYB	GB/RGYB	RGYB	RGYB	RGYB	RGYB	RGYB	RGYB	RGYB	AB	GB	GB	GB	GB	GB	RRG	RRG	GB	IB	RRG	IB	SB	RRG	DG
Vegetation Survey Site[3]						6	4	2	8	12	14	15	17	20	21	22	3	1	5	7	9	10	11	13	16	18	19	23	24
Class	Scientific	Common	Perennial/Annual	Important *	Native																								
Adiantaceae																													
	Cheilanthes sieberi	Mulga Fern	P		Y	1												x	x						1			
Amaranthaceae																													
	Alternanthera denticulata	Lesser Joyweed	A		Y																								
	Alternanthera sp.		A	I	Y																								
	Amaranthus sp.				N																2	1			2				
Amygdalaceae																													
	Prunus sp.				N						1																		
Anthericaceae																													
	Arthropodium minus	Small Vanilla Lily	P	I	Y													x						1					x
	Dichopogon strictus	Chocolate Lily	P		Y							x						x								2			
	Tricoryne elatior	Yellow Autumn-lily	P	I	Y							1						x		1							2		x
Apiaceae																													
	Daucus glochidiatus	Native Carrot	A	I	Y	1																							
	Eryngium vesiculosum	Prostrate Blue Devil	P	I	Y	1																							
	Hydrocotyle laxiflora	Stinking Pennywort	P		Y																x					2	3		
Asparagaceae																													

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**															
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Asparagus aethiopicus	Asparagus Fern			N																								
Asphodelaceae																													
	Bulbine bulbosa	Bulbine Lily	P	I	Y																								
Asteraceae																													
	Ageratina adenophora	Crofton Weed			N																								
	Arctotheca calendula	Capeweed			N								1									2						2	
	Carthamus lanatus	Saffron Thistle			N																								
	Cassinia arcuata	Sifton Bush	P		Y												x												
	Chrysocephalum apiculatum	Common Everlasting	P	I	Y																								
	Cirsium vulgare	Spear Thistle			N					2		2	1			2		x		1		1					1	2	
	Conyza albida	Tall Fleabane			N																								
	Coreopsis lanceolata	Coreopsis			N		1																						
	Cotula sp.		A		Y							x													1				
	Gnaphalium luteo-album		A		Y																								
	Gnaphalium sphaericum		A		Y																		2						
	Xerochrysum viscosum		A		Y																			1		3			
	Hypochoeris radicata	Catsear			N					3	1	3	2	3		2				2	2			1		2	3		x
	Lactuca serriola	Prickly Lettuce			N				2		1	2			2		1		1										
	Leptorhynchos squamatus	Scaly Buttons	P	I	Y																			1					
	Onopordum acanthium				N																								
	Onopordum illyricum				N																								
	Pseudognaphalium luteo-album	Jersey Cudweed	A		Y																								
	Silybum marianum	Variegated Thistle			N								1	2													1		

Vegetation Patch[1]						1	2	3	4	5				6															
Vegetation Community[2]						RGYB	RGYB	GB/RGYB	RGYB	RGYB	RGYB	RGYB	RGYB	RGYB	RGYB	AB	GB	GB	GB	GB	RRG	RRG	GB	IB	RRG	IB	SB	RRG	DG
Vegetation Survey Site[3]						6	4	2	8	12	14	15	17	20	21	22	3	1	5	7	9	10	11	13	16	18	19	23	24
	Sonchus asper	Prickly Sowthistle			N						1																		
	Sonchus oleraceus	Common Sowthistle			N		1							1															1
	Vittadinia sp.		P		Y																								
	Xanthium sp.				N				1																				
Boraginaceae																													
	Echium plantagineum	Patterson's Curse			N	1				3			4	2	4	3		x			2	3						3	
Brassicaceae																													
	Brassica rapa ssp. sylvestris	Turnip			N		1						1								x	1						1	
	Capsella bursa-pastoris	Shepherd's Purse			N												2												
	Lepidium africanum				N																								
Campanulaceae																													
	Wahlenbergia communis	Tufted Bluebell	P		Y													x											
	Wahlenbergia gracilis	Sprawling or Australian Bluebell	P		Y																			1		2			x
	Wahlenbergia sp.	Bluebell	P		Y					x																	2		
Caryophyllaceae																													
	Stellaria media	Common Chickweed			N																								
Chenopodiaceae																													
	Einadia hastata	Berry Saltbush	P		Y		1										3		2										
	Einadia nutans	Climbing Saltbush	P		Y					1													1				1		
	Einadia polygonoides		P		Y				1	1							1									1			
Clusiaceae																													

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**															
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Hypericum gramineum	Small St John's Wort	P	I	Y												x												x
	Hypericum perforatum	St. Johns Wort			N	1				2	3	3		2		2		x	1	2				1		1	3		
Convolvulaceae																													
	Convolvulus erubescens		P		Y							x															1		
Crassulaceae																													
	Bryophyllum sp.				N																						1		
	Crassula sp.		P		Y																								
Cyperaceae																													
	Carex appressa	Tussock Sedge	P		Y	2			2		x				3						3	2			2			3	x
	Carex inversa	Knob Sedge	P		Y																								x
	Carex sp.		P		Y																								
	Cyperus eragrostis	Umbrella Sedge			N										3							3			2				
	Cyperus sp.		P		Y																x								
	Eleocharis sp.		P		Y										2							2							
	Schoenus apogon	Fluke Bogrush	A		Y																								x
Dilleniaceae																													
	Hibbertia obtusifolia		P	I	Y																						1		
Epacridaceae																													
	Melichrus urceolatus	Urn Heath	P		Y													x								2			
Euphorbiaceae																													
	Chamaesyce drummondii	Caustic Weed	P		Y																								1
Fabaceae (Faboideae)																													
	Daviesia sp?		P	I	Y		x										1												
	Desmodium varians	Slender Tick-trefoil	A	I	Y																								

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**																
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Dillwynia phylicoides		P	I	Y																								
	Glycine tabacina		P	I	Y					1	x	2																	
	Hardenbergia violacea	False Sarsaparilla	P	I	Y																								
	Medicago polymorpha	Burr Medic			N			1		2			1			1		x						2		1	1	2
	Medicago sativa	Lucerne			Y																								
	Melilotus indica				N								1									1							
	Pultenaea sp?		P	I	Y														x	3				1					
	Robinia pseudoacacia	Black Locust			N																								
	Trifolium angustifolium	Narrow-leaved Clover			N					2				1		2								2				2	1
	Trifolium arvense	Haresfoot Clover			N					3			2					1	1								1	2	
	Trifolium campestre	Hop Clover			N																								
	Trifolium repens	White Clover			N					2														1	1			2	
	Vicia sativa				N																								
Fabaceae (Mimosoideae)																													
	Acacia acinacea	Gold-dust Wattle	P		Y												x												
	Acacia baileyana	Cootamundra Wattle	P		Y						1						1												
	Acacia dealbata	Silver Wattle	P		Y						x			3															
	Acacia falcata		P		Y												x		1										
	Acacia genistifolia	Early Wattle	P	I	Y			x			4	3					2	x	3					4			2		
	Acacia paradoxa	Kangaroo Thorn	P		Y	1	1										3	x		3						2			
	Acacia pravissima	Wedge-leaved Wattle	P		Y				1							2	x			3									
	Acacia pycnantha	Golden Wattle	P		Y	3																							
Fumariaceae																													

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**														
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Fumaria capreolata				N																								
	Fumaria muralis				N					1																			
Geraniaceae																													
	Geranium solanderi	Native Geranium	P	I	Y	1					x				1										1		1		x
	Pelargonium australe	Native Storks-bill	P	I	Y							3			1	1													
Goodeniaceae																													
	Brunonia australis	Blue Pincushion	P	I	Y																								
	Goodenia bellidifolia		P		Y																			1					
	Goodenia hederacea ssp. hederacea		P	I	Y													x									1		
Haloragaceae																													
	Gonocarpus tetragynus		P		Y																			1		1			
Iridaceae																													
	Patersonia sp.		P		Y																						2		
	Romulea rosea				N					2			1	2	3	3						1	3				1	2	
Juncaceae																													
	Juncus acutus				N																								
	Juncus bufonius	Toad Rush			N																x				1				
	Juncus filicaulis		P		Y																	2					3		
	Juncus usitatus		P		Y						1							x											x
	Juncus vaginatus		P		Y																								
Lamiaceae																													
	Stachys arvensis	Stagger Weed			N					1																			
Lomandraceae																													
	Lomandra filiformis	Wattle Matt-rush	P		Y					2	3	2		3			x		1	3	1			1		3	2		

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**														
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Lomandra longifolia	Spiny-headed Mat-rush	P		Y						1													1					
	Lomandra multiflora		P		Y							2												1					
Lythraceae																													
	Lythrum hyssopifolia	Hyssop Loosestrife	P		Y		x								2							1							
Malvaceae																													
	Malva sp.		P		Y		1	x	2																				
	Modiola caroliniana	Red-flowered Mallow			N								2		1							2						2	
	Sida corrugata	Vaiable Sida	P	I	Y																								
	Sida sp.		P		Y																								
Myrtaceae																													
	Eucalyptus albens	White Box	P		Y							2																	
	Eucalyptus blakelyi	Blakely's Red Gum	P		Y	4	4			3	x	4	2	3				x			4			4					
	Eucalyptus bridgesiana	Apple Box	P		Y					x						3								1					
	Eucalyptus camaldulensis	River Red Gum	P		Y						4				4		x				2	5		2	2			3	
	Eucalyptus macrorhyncha		P		Y																						4		
	Eucalyptus melliodora	Yellow Box	P		Y		1		3		3		3	4	1	4					1								x
	Eucalyptus microcarpa	Western Grey Box	P		Y		2	5	1								3	3	3	4	2		4						
	Eucalyptus polyanthemos ssp. polyanthemos		P		Y				1		x						1		3								3		
	Eucalyptus rossii	Inland Scribbly Gum	P		Y																			2					
	Eucalyptus sideroxylon	Mugga Ironbark	P		Y												x	x	3							4			

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**															
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Leptospermum polygalifolium		p		Y																	1							
Ochnaceae																													
	Ochna serrulata	Mickey Mouse Plant			N																								
Oleaceae																													
	Ligustrum lucidum	Large-leaved Privet			N																								
	Ligustrum sinense	Small-leaved Privet			N																								
Onagraceae																													
	Epilobium ciliatum				N																								
	Ludwigia peploides		p		Y																								
	Oenothera stricta	Common Evening Primrose			N																								
Oxalidaceae																													
	Oxalis perennans		p		Y					x	1			1												2		1	2
Phormiaceae																													
	Dianella longifolia		p	i	Y																								
	Dianella revoluta		p	I	Y																								
Phytolaccaceae																													
	Phytolacca octandra	Inkweed			N													x											
Pittosporaceae																													
	Cheiranthera cyanea		p		Y																						3		
Plantaginaceae																													
	Plantago debilis		p		Y																						1		
	Plantago lanceolata	Lamb's Tongues			N	2				2		3		4		3	x	x											
Poaceae																													

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**														
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Agrostis aemula	Blowngrass	p		Y																								
	Agrostis capillaris	Browntop Bent			N										2							1							
	Aira sp.				N					2	1						1			1				2		2		1	1
	Amphibromus nervosus		p		Y										2													2	
	Anthoxanthum odoratum	Sweet Vernal Grass			N																								
	Aristida behriana	Bunch Wiregrass	p		Y																								
	Aristida ramosa		p		Y			x				x						x											
	Austrodanthonia auriculata	Lobed Wallaby Grass	p		Y			x			2	x					3	x	1	4			3	1		3			2
	Austrodanthonia eriantha		p		Y	2	1	x	2	3	2	3		3		3	4	x	1	3			3	2		3	3		3
	Austrodanthonia racemosa		p		Y	3	2		2										3	1	2		3			1			2
	Austrodanthonia sp.		p		Y							3						x											
	Austrostipa bigeniculata		p		Y																			1					
	Austrostipa blackii		p		Y		x			2	x	3				1		x	3	3	2			2					
	Austrostipa mollis	Speargrass	p		Y																					2			2
	Austrostipa scabra	Speargrass	p		Y	2	x	1		1						3	3	x	3	4	1		5			4			4
	Avena fatua	Wild Oats			N	3	5		3	4	3	5		5			3	x	1	2	4			2				2	
	Avena sp.				N																								
	Bothriochloa macra	Red Grass	P		Y																								2
	Briza maxima	Quaking Grass			N	3		x		2	4	1				2		x	1	2	2			4		3	3		
	Briza minor	Shivery Grass			N			x		1	1							x							1				
	Bromus catharticus	Prairie Grass			N	x			3				1	2							2	3			2				
	Bromus diandrus	Great Brome			N	3	4		5	2	4	3	4	3		3	3	x			3					1	1	3	
	Bromus hordeaceus				N								2	1	3												3		

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**															
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Bromus molliformis				N					3												2						3	
	Chloris truncata	Windmill Grass	P		Y			2									x	x											3
	Cynodon dactylon	Common Couch	P		Y								2				2	x				3			2				2
	Dactylis glomerata	Cocksfoot			N		2			1						1													
	Dichelachne crinita	Longhair Plumegrass	P	i	Y																								
	Dichelachne sp.		P		Y																	1							
	Echinopogon caespitosus		P		Y							x												3					
	Ehrharta erecta	Panic Veldtgrass			N																								
	Elymus scaber		P		Y		x				2	x		3		4	x				1		2			2	2		
	Eragrostis brownii	Brown's Lovegrass	P		Y			x										x											4
	Eragrostis curvula	African Lovegrass			N		2	x										x	2						2				
	Hemarthria uncinata	Matgrass	P		Y																	2			3				
	Holcus lanatus	Yorkshire Fog			N																				2				
	Hordeum leporinum	Barley Grass			N			4	2	4			5					2				4	3	1	2			4	3
	Lagurus ovatus	Hare's Tail Grass			N								1									1					1		
	Lamarckia aurea	Goldentop			N																								
	Lolium perenne	Perennial Ryegrass			N																								
	Lolium rigidum	Wimmera Ryegrass			N	2	2	2	3	1	2	3	5	2	2		2	2	2	3	3	3		2			4	5	3
	Microlaena stipoides var. stipoides		P		Y						3		2		1												1		
	Panicum decompositum	Native Millet	P		Y				1							2													1

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**															
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Panicum effusum	Poison or Hairy Panic	P		Y					x																			
	Panicum sp.		P		Y												1												
	Paspalidium sp.		P		Y																								
	Paspalum dilatatum	Paspalum			N					x					1														
	Paspalum distichum	Water Couch	P		Y										2										2				
	Pennisetum clandestinum	Kikuyu Grass			N			x										x											
	Pentaschistis airoides	False Hairgrass			N													x											
	Phalaris aquatica	Phalaris			N			x	3	3	3		1	2	5	4		x			3	3			4				
	Phalaris minor	Lesser Canary Grass			N			x																					
	Phragmites australis	Common Reed	P		Y																				2				
	Poa sieberiana		P		Y							x												1					
	Poa anua				N													x				2			2				
	Polypogon monspeliensis	Annual Beardgrass			N																	1							
	Pseudoraphis spinescens	Spiny Mudgrass	P		Y										2														
	Setaria sp.				N													x											
	Sporobolus africanus	Parramatta Grass			N																								
	Sporobolus creber	Slender Rat's Tail Grass	P		Y																								
	Themeda australis	Kangaroo Grass	P	I	Y																								x
	Vulpia bromoides	Squirrel Tail Fesque			N																x								
	Vulpia myuros	Rat's Tail Fescue			N					4	1		1								x	2	1	2		1		1	1

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**																
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
Polygonaceae																													
	Acetosella vulgaris	Sheep Sorrel			N					1		1	1																
	Persicaria decipiens	Slender Knotweed	P		Y																	1							
	Persicaria prostrata	Creeping Knotweed	P		Y																	3						2	
	Polygonum aviculare	Wireweed			N																								
	Rumex brownii	Swamp Dock	P		Y					1		2	1											1					2
	Rumex conglomeratus	Clustered Dock			N																								
	Rumex crispus	Curled Dock			N						1		1	1	1		1	x				1							
Primulaceae																													
	Anagallis arvensis	Scarlet/Blue Pimpernel			N			x																	2				
Ranunculaceae																													
	Ranunculus sceleratus	Celery Buttercup			N																				2				
Rosaceae																													
	Acaena novae-zelandiae		P		Y													x											
	Acaena ovina		P		Y					x	1	x		1		1											2		
	Rosa canina	Dog Rose			N																								
	Rosa rubiginosa	Sweet Briar			N																								
	Rubus fruiticosus	Blackberry complex			N					1	x	1	2	1	1			x			3				2			3	
Rubiaceae																													
	Asperula scoparia	Prickly Woodruff	P	I	Y																						1		
	Galium aparine	Goosegrass			N	1	2	x	2	1	2	2		2			2				2			2	2			2	
	Opercularia sp.		P		Y																								
Salicaceae																													

Vegetation Patch[1]						**1**	**2**	**3**	**4**	**5**				**6**															
Vegetation Community[2]						**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]						**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
	Populus alba	White Poplar			N																x								
	Salix babylonica	Weeping Willow			N																								
Sterculiaceae																													
	Brachychiton populneus	Kurrajong	Y		Y			x																					
Solanaceae																													
	Solanum nigrum	Black-berry Nightshade			N	1			1																				
Typhaceae																													
	Typha orientalis	Broad-leaved Cumbungi	P		Y																				2				
Thymelaeaceae																													
	Pimelea curviflora		P	I	Y																								
Verbenaceae																													
	Phyla nodiflora	Carpet Weed			N			x																					
	Verbena bonariensis				n																	1							

Summary Species Totals

Vegetation Patch[1]	**1**	**2**	**3**	**4**				**5**			**6**													
Vegetation Community[2]	**RGYB**	**RGYB**	**GB/RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**RGYB**	**AB**	**GB**	**GB**	**GB**	**GB**	**RRG**	**RRG**	**GB**	**IB**	**RRG**	**IB**	**SB**	**RRG**	**DG**
Vegetation Survey Site[3]	**6**	**4**	**2**	**8**	**12**	**14**	**15**	**17**	**20**	**21**	**22**	**3**	**1**	**5**	**7**	**9**	**10**	**11**	**13**	**16**	**18**	**19**	**23**	**24**
Total species (survey quadrat)	22	17	6	20	35	28	24	27	25	23	22	21	4	19	21	21	32	11	33	25	24	33	25	20
Total species (patch)	23	22	22	20				81			53	32	44	21	21	28	32	11	33	25	24	33	25	32
Total natives species	11	13	10	10				39			23	23	23	14	14	12	11	8	22	9	18	20	6	24
Total native species excluding grasses (survey quadrat)	8	6	1	7	6	9	9	3	6	7	5													
Total native species excluding grasses (patch)	8	8	4	7				27			14													
Important species (survey quadrat)	2	0	0	0	1	1	4	0	0	2	1													
Total Important species (patch)	3	1	1	0				5			1													

Notes:

1 Vegetation Patch: As defined by the *EPBC Act Policy Statement* (Department of the Environment and Heritage 2006c) for the Threatened ecological community White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) listed under the *Environment Protection and Biodiversity Conservation Act 1999.*

2 Vegetation Communities: GB = Inland Grey Box Woodland, AB = Apple Box moist gully grass-forb open forest, RGYB = Blakely's Red Gum - Yellow Box grassy woodland, IB = Mugga Ironbark - Scribbly Gum - red gum graminoid open forest, SB = Red Stringybark - Red Box - Long-leaved Box - Scribbly Gum shrub - tussock grass open forest, DG = Derived Native Grassland and RRG = River Red Gum very tall open forest of the NSW South Western Slopes Bioregion.

3 Survey sites are those sites where quadrats where sampled. Cover abundance as a percentage foliage cover of each species recorded within the 400m^2 flora sample quadrats according to the modified 1-6 index scale below;

Class	Cover Abundance
1	Sparse <5%
2	Any Number <5%
3	5% - 25%
4	25% - 50%
5	50% - 75%
6	75% - 100%

x = additional species recorded within the random meander surveys for each flora survey site.

4 Perennial/Annual[i] Annual species are generally those species that annually flower and subsequently die off, while perennial species are present vegetatively year round. Classification follows those identified by the *EPBC Act Policy Statement* (Department of the Environment and Heritage 2006c) for the Threatened ecological community White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) listed under the *Environment Protection and Biodiversity Conservation Act 1999.*

5 Important; Identified Important plant species listed by the *EPBC Act Policy Statement* (Department of the Environment and Heritage 2006c) for the Threatened ecological community White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) listed under the *Environment Protection and Biodiversity Conservation Act 1999.*

Appendix B

Species of animal recorded within the study area

Appendix B: Species of animal recorded in the study area

Common Name	Scientific Name	Box-Gum Woodland[1]	River Red Gum[1]	Opportunistic[1]	TSC Act[2]	EPBC Act[3]
Amphibians						
Peron's Tree Frog	*Litoria peronii*	W	-			
Plains Froglet	*Crinia parinsignifera*	W				
Spotted Grass Frog	*Limnodynastes tasmaniensis*	W				
Reptiles						
Bearded Dragon	*Pogona barbata*	T				
Eastern Long-necked Tortoise	*Chelodina longicollis*			O		
Eastern Brown Snake	*Pseudonaja textilis*	O				
Red-bellied Black Snake	*Pseudechis porphyriacus*	O				
Marbled Gecko	*Christinus marmoratus*	T				
Olive Legless Lizard	*Delma inornata*	T				
Carnaby's Wall Skink	*Cryptoblepharus carnabyi*	T				
Eastern Blue-tongued Lizard	*Tiliqua scincoides*	O				
Grey's Skink	*Menetia greyii*	T				
Southern Rainbow Skink	*Carlia tetradactyla*	T				
Tree Skink	*Egernia striolata*	T				
Native Birds						
Black-shouldered Kite	*Elanus axillaris*	O				
Little Eagle	*Hieraaetus morphnoides*	O				
Wedge-tailed Eagle	*Aquila audax*	O				
Whistling Kite	*Haliastur sphenurus*	O				

Common Name	Scientific Name	Box-Gum Woodland[1]	River Red Gum[1]	Opportunistic[1]	TSC Act[2]	EPBC Act[3]
Azure Kingfisher	*Alcedo azurea*		O			
Australian Wood Duck	*Chenonetta jubata*	O	O			
Grey Teal	*Anas gracilis*	O	O			
Pacific Black Duck	*Anas superciliosa*	O				
Great Egret	*Ardea alba*		O			M
White-faced Heron	*Egretta novaehollandiae*	O				
White-necked Heron	*Ardea pacifica*	O				
Australian Magpie	*Gymnorhina tibicen*	O	O			
Dusky Woodswallow	*Artamus cyanopterus*	O				
White-browed Woodswallow	*Artamus superciliosus*	O				
Galah	*Cacatua roseicapilla*	O	O			
Little Corella	*Cacatua sanguinea*	O				
Sulphur-crested Cockatoo	*Cacatua galerita*	O	O			
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	O	O			
White-bellied Cuckoo-shrike	*Coracina papuensis*	O				
White-winged Triller	*Lalage sueurii*	O				
Black-fronted Dotterel	*Elseyornis melanops*	O				
Masked Lapwing	*Vanellus miles*	O	O			
Brown Treecreeper	*Climacteris picumnus*	O	O		V	
White-throated Treecreeper	*Cormobates leucophaeus*	O				
Crested Pigeon	*Ocyphaps lophotes*	O				
Peaceful Dove	*Geopelia striata*	W				

Common Name	Scientific Name	Box-Gum Woodland[1]	River Red Gum[1]	Opportunistic[1]	TSC Act[2]	EPBC Act[3]
Dollarbird	*Eurystomus orientalis*	O				
White-winged Chough	*Corcorax melanorhamphos*	O				
Australian Raven	*Corvus coronoides*	O	O			
Pallid Cuckoo	*Cuculus pallidus*	O				
Mistletoebird	*Dicaeum hirundinaceum*	O				
Grey Fantail	*Rhipidura fuliginosa*	O				
Magpie-lark	*Grallina cyanoleuca*	O	O			
Willie Wagtail	*Rhipidura leucophrys*	O	O			
Nankeen Kestrel	*Falco cenchroides*	O				
Peregrine Falcon	*Falco peregrinus*	O				
Laughing Kookaburra	*Dacelo novaeguineae*	O	O			
Sacred Kingfisher	*Todiramphus sanctus*	O	O			
Fairy Martin	*Hirundo ariel*	O				
Tree Martin	*Hirundo nigricans*	O				
Welcome Swallow	*Hirundo neoxena*	O				
Superb Fairy-wren	*Malurus cyaneus*	O	O			
Fuscous Honeyeater	*Lichenostomus fuscus*	O				
Little Wattlebird	*Anthochaera chrysoptera*	O				
Red Wattlebird	*Anthochaera carunculata*	O				
Singing Honeyeater	*Lichenostomus virescens*	O				
White-plumed Honeyeater	*Lichenostomus penicillatus*	O	O			
Rainbow Bee-eater	*Merops ornatus*		O			M

Common Name	Scientific Name	Box-Gum Woodland[1]	River Red Gum[1]	Opportunistic[1]	TSC Act[2]	EPBC Act[3]
Brown Songlark	*Cinclorhamphus cruralis*		O			
Clamorous Reed-Warbler	*Acrocephalus stentoreus*		O			
Crested Shrike-tit	*Falcunculus frontatus*	O	O			
Grey Shrike-thrush	*Colluricincla harmonica*	O	O			
Rufous Whistler	*Pachycephala rufiventris*	O				
Brown Thornbill	*Acanthiza pusilla*	O				
Buff-rumped Thornbill	*Acanthiza reguloides*	O				
Speckled Warbler	*Pyrrholaemus sagittatus*	O			V	
Spotted Pardalote	*Pardalotus punctatus*	O				
Striated Pardalote	*Pardalotus striatus*	O				
Striated Thornbill	*Acanthiza lineata*	O				
Western Gerygone	*Gerygone fusca*	O				
White-browed Scrubwren	*Sericornis frontalis*	O	O			
White-throated Gerygone	*Gerygone olivacea*	O				
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	O				
Double-barred Finch	*Taeniopygia bichenovii*	O				
Red-browed Finch	*Neochmia temporalis*	O	O			
Eastern Yellow Robin	*Eopsaltria australis*	O				
Jacky Winter	*Microeca fascinans*	O				
Red-capped Robin	*Petroica goodenovii*	O				
Great Cormorant	*Phalacrocorax carbo*	O				
Pied Cormorant	*Phalacrocorax varius*	O				

Common Name	Scientific Name	Box-Gum Woodland[1]	River Red Gum[1]	Opportunistic[1]	TSC Act[2]	EPBC Act[3]
Tawny Frogmouth	*Podargus strigoides*	O				
Australasian Grebe	*Tachybaptus novaehollandiae*	O	O			
Crimson Rosella	*Platycercus elegans*	O	O			
Eastern Rosella	*Platycercus eximius*	O	O			
Red-rumped Parrot	*Psephotus haematonotus*	O	O			
Eurasian Coot	*Fulica atra*	O				
Barking Owl	*Ninox connivens*	O			V	
Straw-necked Ibis	*Threskiornis spinicollis*	O				
Silvereye	*Zosterops lateralis*	O				
Introduced Birds						
Common Starling	*Sturnus vulgaris*	O			U	
Native Mammals						
Eastern Grey Kangaroo	*Macropus giganteus*	O				
South-eastern Freetail Bat	Mormopterus sp. (big penis)					
Eastern Freetail Bat	Mormopterus sp. (little penis)					
White-striped Freetail bat	*Tadarida australis*	W	W			
rat	*Rattus sp.*		O			
Common Ringtail Possum	*Pseudocheirus peregrinus*		O			
Squirrel Glider	*Petaurus norfolcensis*	T			V/E2	
Sugar Glider	*Petaurus breviceps*	W				
Common Brushtail Possum	*Trichosurus vulpecula*	O	O			
Chocolate Wattled Bat	*Chalinolobus morio*	O	T			

Common Name	Scientific Name	Box-Gum Woodland[1]	River Red Gum[1]	Opportunistic[1]	TSC Act[2]	EPBC Act[3]
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	W			V	
Gould's Wattled Bat	*Chalinolobus gouldii*	O	T			
Large Forest Bat	*Vespadelus darlingtoni*	W				
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	T				
Little Forest Bat	*Vespadelus vulturnus*	T	T			
Southern Forest Bat	*Vespadelus regulus*	O	T			
Introduced Mammals						
Rabbit	*Oryctolagus cuniculus*	O	O		U	
Brown Hare	*Lepus capensis*	O	O		U	
House Mouse	*Mus musculus*			O	U	

Note:

1: O = Observed, W = Heard Call (includes Anabat detection), T= Trapped/ Handheld, K= Dead

2: U = Unprotected, V = Vulnerable, E1 = Endangered, E2 = Endangered Population (*Threatened Species Conservation Act 1995*).

2: V = Vulnerable, E = Endangered, M = Migratory (*Environment Protection and Biodiversity Conservation Act 1999*).

Appendix C

Threatened species of plant in the Proposal locality

Table C-1: Threatened species of plant recorded or predicted to occur within the Proposal locality

Family Name	Scientific Name	Common Name	TSC Act[1]	EPBC Act[2]	ROTAP[3]	Habitat	Likelihood of Occurrence[4] in the study area
Asteraceae	*Ammobium craspedioides*	Yass Daisy	V	V	2V	Found from near Crookwell on the Southern Tablelands to near Wagga Wagga on the South Western Slopes. Most populations are in the Yass region. Found in dry forest, Box-Gum Woodland and secondary grassland derived from clearing of these communities. Grows in association with a large range of eucalypts (*Eucalyptus blakelyi, E. bridgesiana, E. dives, E. goniocalyx, E. macrorhyncha, E. mannifera, E. melliodora, E. polyanthemos, E. rubida*). Apparently unaffected by light grazing, as populations persist in some grazed sites (Department of Environment and Conservation 2005).	**Moderate Likelihood** The study area is located to the south of the known extent of the species, which is generally restricted to an area between Tumut and Crookwell (although there are some other outliers). In addition, the areas of suitable remnant vegetation within the study area were highly modified. Although the species may persist in some grazed sites, this would be likely to be limited to sites with lower levels of disturbance than those occurring in the study area.
Asteraceae	*Brachycome muelleroides*	Claypan Daisy	V	V		Occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray River from Tocumwal to the Ovens River). Grows in damp areas on the margins of claypans in moist grassland with *Pycnosorus globosus*, *Agrostis avenacea* and *Austrodanthonia duttoniana.* Also recorded from the margins of lagoons in mud or water, and in association with *Calotis anthemoides*. Victorian collections have generally come from open positions on the Murray River floodplain, swampy River Red Gum (*Eucalyptus camaldulensis*) Forest and damp depressions (Department of Environment and Climate Change 2008).	**Low Likelihood** Suitable habitat for this species was not recorded within the study area.

Family Name	Scientific Name	Common Name	TSC Act[1]	EPBC Act[2]	ROTAP[3]	Habitat	Likelihood of Occurrence[4] in the study area
Asteraceae	*Brachycome papillosa*		V	V	3V	Occurs chiefly from Mossgiel to Urana, in south-western NSW, with sites in the Jerilderie area, the Hay Plain, Willandra Lakes district and north to Ivanhoe. A north-western outlier is at Byrnedale Station, north of Menindee. The only known site on South-western Slopes is Ganmain Reserve. Recorded primarily in clay soils on Bladder Saltbush (*Atriplex vesicaria*) and *Maireana aphylla* plains, but also in grassland and in Grey Box (*Eucalyptus microcarpa*) - Cypress Pine (*Callitris spp*.) woodland. Recorded as locally occasional to common in populations (Department of Environment and Climate Change 2008).	**Low Likelihood** The study area is located outside of the know extent of the species No suitable habitat for this species was recorded within the study area.
Asteraceae	*Senecio garlandii*	Woolly Ragwort	V	V	3V	This daisy is found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop (and surrounds) and there is a single population in Victoria at Chiltern. Woolly Ragwort occurs on sheltered slopes of rocky outcrops (Department of Environment and Conservation 2006).	**Low Likelihood** No suitable habitat for this species was recorded within the study area.
Fabaceae (Faboideae)	*Cullen parvum*		E1	E	3Ei	The Small Scurf-pea is known in NSW from only two herbarium collections; one from Wagga Wagga in 1884 and the other from Jindera (near Albury) in 1967. Small Scurf-pea is generally associated with alluvial plains, creeks, ephemeral pools and river channels. It has also been reported from artificial drains and other disturbed sites. It grows in grassy woodland or open forest vegetation dominated by species of Eucalyptus, or in grasslands (Department of Environment and Heritage 2005).	**Low Likelihood** This species is considered to be locally extinct and the subject site is east of the current known distribution. Sub-optimal habitat found adjacent to the creek within the study area. Despite a targeted survey for this species no individuals were recorded within the study area.
Fabaceae (Faboideae)	*Pultenaea humilis*		V	V		Dry sclerophyll forest or (wet) heathland or swamps on sand, loam or clay; south from Wagga Wagga district. NSW subdivisions: SWS.	**Low Likelihood** No suitable habitat for this species was recorded within the study area.

Family Name	Scientific Name	Common Name	TSC Act[1]	EPBC Act[2]	ROTAP[3]	Habitat	Likelihood of Occurrence[4] in the study area
Fabaceae (Faboideae)	*Swainsona murrayana*	Slender Darling Pea	V	V	3Vi	Often grows with Maireana species on heavy soils, especially in depression (Royal Botanic Gardens 2005). Found throughout NSW , it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. It grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated. The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. The species may require some disturbance and has been known to occur in paddocks that have been moderately grazed or occasionally cultivated (Department of Environment and Conservation 2005).	**Low Likelihood** No suitable habitat for this species was recorded within the study area.
Fabaceae (Faboideae)	*Swainsona recta*		E1	E	3Ei	Found in grassland and open woodland, often on stony hillsides (Royal Botanic Gardens 2004). Before European settlement it occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida* and Long-leaf Box *E. goniocalyx*. Grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, poa tussocks Poa spp. and spear-grasses *Austrostipa spp*. Plants die back in summer, surviving as a rootstocks until they shoot again in autumn (Department of Environment and Climate Change 2008).	**Low Likelihood** Sub-optimal habitat occurs within the grassland and woodland communities. Despite a targeted survey for this species no individuals were recorded within the study area.

Family Name	Scientific Name	Common Name	TSC Act[1]	EPBC Act[2]	ROTAP[3]	Habitat	Likelihood of Occurrence[4] in the study area
Orchidaceae	*Diuris tricolor*		V	V	3K	Grows in sclerophyll forest among grass, often with Callitris (Royal Botanic Gardens 2005), or in grassy Callitris woodland (Bishop 2000). It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW. Soils include gritty orange-brown loam on granite, shallow red loamy sand on stony porphyry, skeletal lateritic soil and alluvial grey silty loam. Disturbance regimes are not known, although the species is usually recorded from disturbed habitats (NSW Scientific Committee 2007). Within the Upper Hunter it is known to occur in *E. albens/E. crebra/E. blakelyi/Corymbia maculata* woodland complexes and grasslands (Parsons Brinckerhoff 2004).	**Moderate Likelihood** Sub-optimal habitat for this species was recorded within the study area. This species is considered to be cryptic as it requires identification during its specific flowering period. Surveys were completed outside of this species' flowering period.
Poaceae	*Amphibromus fluitans*	River Swamp Wallaby-grass	V	V		Native to the South-western Plains and Slopes where it grows mostly in permanent swamps. Also recorded in the Southern Tablelands (Harden 1993). The species needs wetlands that are at least moderately fertile and that have some bare ground, conditions that are produced by seasonally-fluctuating water levels. Habitats in south-western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with *Potamogeton* and *Chamaeraphis* species (Department of Environment and Climate Change 2008).	**Moderate Likelihood** Suitable habitat found within roadside and drainage channels within the study area. Despite a targeted survey for this species no individuals were recorded within the study area. This species is considered to be cryptic as it may sporadically flower after rain.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	3Vi	Grows in grassland or woodland often in damp sites. It is a semi-parasitic herb and hosts are likely to be *Themeda australis* and *Poa spp*. (Department of Environment and Climate Change 2008; Harden 1992).	**Low Likelihood** Due to the limited occurrence of Themeda within the study area it is considered that the study area does not constitute suitable habitat for this species.

1) V= Vulnerable, E1 = Endangered (*Threatened Species Conservation Act 1995*)

2) V = Vulnerable, E = Endangered (*Environment Protection and Biodiversity Conservation Act 1999*)

3) ROTAP (Rare or Threatened Australian Plants, Briggs and Leigh 1996) is a conservation rating for Australian plants. Codes are:

   1 Species only known from one collection

   2 Species with a geographic range of less than 100km in Australia

3	Species with a geographic range of more than 100km in Australia
X	Species presumed extinct; no new collections for at least 50 years
E	Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate
V	Vulnerable species at risk of long-term disappearance through continued depletion.
R	Rare, but not currently considered to be endangered.
K	Poorly known species that are suspected to be threatened.
C	Known to be represented within a conserved area.
a	At least 1,000 plants are known to occur within a conservation reserve(s).
i	Less than 1,000 plants are known to occur within a conservation reserve(s).
-	The reserved population size is unknown.

4) Likelihood of occurrence is defined as one of three categories below:

Low likelihood

Species considered to have a **low likelihood of occurrence** include species not recorded during the field surveys that fit one or more of the following criteria:

- Have not been recorded previously in the study area and surrounds for which the study area is beyond the current distribution range.
- Use specific habitat types or resources that are not present in the study area.
- Are considered locally extinct.
- Are non-cryptic perennial flora species with limited potential habitat and have been specifically targeted by surveys.

Moderate likelihood

Species considered to have a **moderate likelihood of occurrence** include species not recorded during the field surveys that fit one or more of the following criteria:

- Have infrequently been recorded previously in the study area and surrounds.
- Use habitat types or resources that are present in the study area, although generally in a poor or modified condition.
- Are unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically during variable seasons or migration.
- Are cryptic flowering flora species that were not seasonally targeted by surveys.

High likelihood

Species considered to have a **high likelihood of occurrence** include species recorded during the field surveys or species not recorded that fit one or more of the following criteria:

- Have frequently been recorded previously in the study area and surrounds.
- Use habitat types or resources that are present in the study area that are abundant and/or in good condition within the study area.
- Are known or likely to maintain resident populations surrounding the study area.
- Are known or likely to visit the site during regular seasonal movements or migration.

Appendix C: References

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Appendix D

Threatened species of animal within the study locality

Appendix D: Threatened species of animal within the locality

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Amphibians							
Litoria booroolongensis	Booroolong Frog	E1	E	No records	Confined to mountain streams of the Great Dividing Range (Cogger 2000). Usually found on or under boulders and debris in and beside the rocky beds of mountain streams; breeds in summer (Anstis 2002).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Litoria raniformis	Southern Bell Frog	E1	V	No records	Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Breeding occurs during the warmer months and is triggered by flooding or a significant rise in water levels. The species has been known to breed anytime from early spring through to late summer/early autumn (September to April) following a rise in water levels. During the breeding season animals are found floating amongst aquatic vegetation (especially cumbungi or Common Reeds) within or at the edge of slow-moving streams, marshes, lagoons, lakes, farm dams and rice crops. Tadpoles require standing water for at least four months for development and metamorphosis to occur but can take up to 12 months to develop. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks. Prey includes a variety of invertebrates as well as other small frogs, including young of their own species (Department of Environment and Climate Change 2007).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Native Birds							
Anseranas semipalmata	Magpie Goose	V		No records	Occurs in shallow wetlands such as large swamps and dams, especially with dense growth of rushes or sedges, and with permanent lagoons and grassland nearby. Feeds on seeds, tubers and green grass. Form large nesting colonies during the wet season. During the dry season this species migrates hundreds of kilometres to perennial swamps (Garnett & Crowley 2000; NSW National Parks and Wildlife Service 2002).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Apus pacificus	Fork-tailed Swift		M		Breeds from central Siberia eastwards through Asia, and is migratory, wintering south to Australia. Individuals never settle voluntarily on the ground and spend most of their lives in the air, living on the insects they catch in their beaks (Higgins 1999).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Ardea alba	Great Egret		M		Great Egrets occur throughout most of the world. They are common throughout Australia, with the exception of the most arid areas. Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups. In Australia, the breeding season of the Great Egret is normally October to December in the south and March to May in the north. This species breeds in colonies, and often in association with cormorants, ibises and other egrets (Australian Museum 2003).	**High**. This species was recorded during current surveys.	**No**. Habitat is not considered important as defined under the EPBC Act. Please see Section 4.1.3.

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Ardea ibis	Cattle Egret		M		Subspecies *A. i. coromanda* is found across the Indian subcontinent and Asia as far north as Korea and Japan, and in South-east Asia, Papua New Guinea and Australia (McKilligan 2005).	**Moderate**. Suitable habitats were available for this species.	**No**. Habitat is not considered important as defined under the *Environment Protection and Biodiversity Conservation Act 1999*. Please see Section 4.1.3.
Burhinus grallarius	Bush Stone-curlew	E1		No records	Require sparsely grassed, lightly timbered, open forest of woodland. In southern Australia they often occur where there is a well structured litter layer and fallen timber debris. Feed on a range of invertebrates and small vertebrates, as well as seeds and shoots (NSW National Parks and Wildlife Service 1999a, 2003a).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Callocephalon fimbriatum	Gang-gang Cockatoo	V		No records, but species recorded in Ellerslie Nature Reserve	Occurs in wetter forests and woodland from sea level to an altitude of over 2,000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens (Pizzey & Knight 1997).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		450 records	Occurs in eucalypt woodland and adjoining vegetation. Feeds on ants, beetles and larvae on trees and from fallen timber and leaf litter. Usually nests in hollows (Garnett & Crowley 2000).	**High**. This species was recorded during field surveys.	**Yes**. Known habitat exists within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Gallinago hardwickii	Latham's Snipe		M		Occurs in freshwater or brackish wetlands generally near protective vegetation cover. This species feeds on small invertebrates, seeds and vegetation. It migrates to the northern hemisphere to breed (Garnett & Crowley 2000).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Grantiella picta	Painted Honeyeater	V		No records	Lives in dry forests and woodlands. Primary food is the mistletoes in the genus Amyema, though it will take some nectar and insects. Its breeding distribution is dictated by presence of mistletoes, which are largely restricted to older trees. Less likely to be found in strips of remnant box-ironbark woodlands, such as occur along roadsides and in windbreaks, than in wider blocks (Garnett & Crowley 2000).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Grus rubicunda	Brolga	V		No records	Occurs in well vegetated, shallow freshwater wetlands, small isolated swamps in eucalypt forests, floodplains, grasslands, paddocks, ploughed fields, irrigated pastures, stubbles, crops, desert claypans, bore drains, tidal areas, mangroves, beach wastes. Roosts in shallow, bare swamps and nests on small islands in wetlands or standing in shallow water, eggs are occasionally laid on bare ground (Pizzey & Knight 1997).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Haliaeetus leucogaster	White-bellied Sea-Eagle		M		Occurs in coastal areas including islands, estuaries, inlets, large rivers, inland lakes and reservoirs. Builds a huge nest of sticks in tall trees near water, on the ground on islands or on remote coastal cliffs (Pizzey & Knight 1997).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Hirundapus caudacutus	White-throated Needletail		M		Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds in the northern hemisphere and migrates to Australia in October-April (Pizzey & Knight 1997).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Lathamus discolor	Swift Parrot	E1	E	Eight records	Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Duaringa. Until recently it was believed that in NSW, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering Acacia pycnantha, is indicated. Sites used vary from year to year. (Garnett & Crowley 2000),(Swift Parrot Recovery Team 2001).	**Moderate**. Suitable habitats were available for this species. This species has been regularly recorded from the nearby Mates Gully travelling stock reserve.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979* and *Environment Protection and Biodiversity Conservation Act 1999.*

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Lophoictinia isura	Square-tailed Kite	V		No records	This species hunts primarily over open forest, woodland and mallee communities as well as over adjacent heaths and other low scrubby habitats in wooded towns. It feeds on small birds, their eggs and nestlings as well as insects. Seems to prefer structurally diverse landscapes (Garnett & Crowley 2000).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V		No records	Found in south-eastern Australia, generally east of the Great Dividing Range. Found in eucalypt woodland and mallee and acacia shrubland. This is one of a suite of species that has declined in woodland areas in south-eastern Australia (Garnett & Crowley 2000; Traill & Duncan 2000).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V		Three records	Found in dry eucalypt woodland particularly those containing ironbark and box. Occurs within areas of annual rainfall between 400 and 700 millimetres. Feeds on insects, nectar and lerps (Garnett & Crowley 2000).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Merops ornatus	Rainbow Bee-eater		M		Usually occur in open or lightly timbered areas, often near water. Breed in open areas with friable, often sandy soil, good visibility, convenient perches and often near wetlands. Nests in embankments including creeks, rivers and sand dunes. Insectivorous, most foraging is aerial, in clearings (Higgins 1999).	**High**. This species was recorded during current surveys.	**No**. Habitat is not considered important as defined under the *Environment Protection and Biodiversity Conservation* Act *1999*. Please see Section 4.1.3.
Neophema pulchella	Turquoise Parrot	V		No records	Occurs in the foothills of the Great Dividing Range in eucalypt woodlands and forests with a grassy or sparsely shrubby understorey. Nests in hollows in trees, stumps or even fence posts. It feeds on seeds of both native and introduced grass and herb species (Garnett & Crowley 2000).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Ninox connivens	Barking Owl	V		No records	Occurs in dry sclerophyll woodland. In the south-west it is often associated with riparian vegetation while in the south-east it generally occurs on forest edges. It nests in large hollows in live eucalypts, often near open country. It feeds on insects in the non-breeding season and on birds and mammals in the breeding season (Garnett & Crowley 2000).	**High**. This species was recorded during field surveys.	**Yes**. Known habitat exists within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Oxyura australis	Blue-billed Duck	V		No records	Relatively sparse throughout species range. Regularly found breeding in south-east Queensland, north-east South Australia and throughout NSW. Found on temperate, fresh to saline, terrestrial wetlands, and occupies artificial wetlands. Prefers deep, permanent open water, within or near dense vegetation. Nests in rushes, sedge, Lignum *Muehlenbeckia cunnighamii* and paperbark Melaleuca (Garnett & Crowley 2000).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Pachycephala inornata	Gilbert's Whistler	V		No records	The Gilbert's Whistler occurs in ranges, plains and foothills in arid and semi-arid timbered habitats. In NSW it occurs mostly in mallee shrubland, but also in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including acacias, hakeas, sennas and grevilleas. In woodland habitats, the understorey comprises dense patches of shrubs (Department of Environment and Conservation 2005).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Polytelis swainsonii	Superb Parrot	V	V	One record	Mainly found in the Riverina where they nest in loose colonies in riparian woodland on River Red Gum. On the inland slopes, Superb Parrots both forage and feed within box woodland, mostly nesting in dead trees (Garnett & Crowley 2000).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979* and *Environment Protection and Biodiversity Conservation Act 1999.*

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		No records	Found throughout the Western Slopes and Plains, Southern and Central Tablelands and occurring in Northern Rivers area, Mid-north Coast and the Hunter Valley of NSW. Lives in open forest and woodland, acacia shrubland and adjoining farmland. Large stick dome nest with spout-like entrance (Pizzey & Knight 1997).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Pyrrholaemus sagittatus	Speckled Warbler	V		No records	Occurs in a wide range of eucalypt dominated vegetation with a grassy understorey and is often found on rocky ridges or in gullies. It feeds on seeds and insects and builds domed nests on the ground (Garnett & Crowley 2000).	**High**. This species was recorded during field surveys.	**Yes**. Known habitat exists within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Rostratula benghalensis	Painted Snipe	E1	VM	No records	Inhabits shallow, vegetated, temporary or infrequently filled wetlands, including where there are trees such as *E. camaldulensis* (River Red Gum), *E. populnea* (Poplar Box) or shrubs such as *Muehlenbeckia florulenta* (Lignum) or *Sarcocornia quinqueflora* (Samphire). Feeds at the water's edge and on mudlflats on seeds and invertebrates, including insects, worms, molluscs and crustaceans. Males incubate eggs in a shallow scrape nest (Garnett & Crowley 2000).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Stagonopleura guttata	Diamond Firetail	V		One record	Occurs in a range of eucalypt dominated communities with a grassy understorey including woodland, forest and mallee. Most populations occur on the inland slopes of the Great Dividing Range. Feeds on seeds, mostly of grasses (Garnett & Crowley 2000).	**Moderate**. Suitable habitats were available for this species	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Stictonetta naevosa	Freckled Duck	V		No records	In most years this species appear to be nomadic between ephemeral inland wetlands. In dry years they congregate on permanent wetlands while in wet years they breed prolifically and disperse widely, generally towards the coast. In inland eastern Australia, they generally occur in brackish to hyposaline wetlands that are densely vegetated with Lignum (*Muehlenbeckia cunninghamii*) within which they build their nests (Garnett & Crowley 2000).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Xanthomyza phrygia	Regent Honeyeater	E1	EM	One record	Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding. Important food trees include *E. sideroxylon* (Mugga Ironbark), *E. albens* (White Box), *E. melliodora* (Yellow Box) and *E. leucoxylon* (Yellow Gum) (Garnett & Crowley 2000).	**Moderate**. Suitable habitats were available for this species.	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979* and *Environment Protection and Biodiversity Conservation Act 1999.*

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Native Mammals							
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Two records	Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold (NSW National Parks and Wildlife Service 1999e). Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods (NSW National Parks and Wildlife Service 1999c, 1999e).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		No records	Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high (Churchill 1998).	**High**. This species was recorded during field surveys.	**Yes**. Known habitat exists within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Nyctophilus timoriensis	Greater Long-eared Bat	V	V	No records	Roosts in tree hollows and under loose bark in arid and semi-arid Australia (Strahan 1995) and forages in the understorey of woodlands and open savanna and swamps (Churchill 1998).	**Moderate**. Suitable habitats were available for this species	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979* and *Environment Protection and Biodiversity Conservation Act 1999.*
Petaurus norfolcensis	Squirrel Glider	E2		18 records	Found in dry sclerophyll forest and woodland but not found in dense coastal ranges. Nests in hollows and feeds on gum of acacias, eucalypt sap and invertebrates (NSW National Parks and Wildlife Service 1999d).	**High**. This species was recorded during field surveys.	**Yes**. Known habitat exists within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Phascogale tapoatafa	Brush-tailed Phascogale	V		No records	Largely arboreal, it occurs in a range of habitats that have reliable rainfall (500 to 2,000 millimetres), but has preference for open dry sclerophyll forest on ridges (up to 600 metres altitude) with little/sparse ground cover. It nests in tree hollows and feeds at dusk on arthropods and small vertebrates (Strahan 1995).	**Low**. There is no preferred habitat for this species available within the study area	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Phascolarctos cinereus	Koala	V		Two records	Found in sclerophyll forest. Throughout NSW, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum *E. tereticornis*, Grey Gum *E. punctata*, Monkey Gum *E. cypellocarpa* and Ribbon Gum *E. viminalis*. In coastal areas, Tallowwood *E. microcorys* and Swamp Mahogany *E. robusta* are important food species, while in inland areas White Box *E. albens*, Bimble Box *E. populnea* and River Red Gum *E. camaldulensis* are favoured (NSW National Parks and Wildlife Service 1999b, 2003b).	**Moderate**. Suitable habitats were available for this species	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979.*
Reptiles							
Aprasia parapulchella	Pink-tailed Worm Lizard	V	V	No records	Open areas with predominantly native grass understorey and rock outcrops scattered, partially buried rocks. Burrowing species usually found under rocks on well-drained soil and in ants nests, occasionally with several individuals found under the same rock (Swan *et al.* 2004). Found under weathered granite rocks on a grazed, grassy riverside slopes (Cogger 2000).	**Moderate**. Suitable habitats were available for this species	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979* and *Environment Protection and Biodiversity Conservation Act 1999.*

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Delma impar	Striped Legless Lizard	V	V	One record	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda australis*, spear-grasses *Austrostipa spp*. and poa tussocks *Poa spp*., and occasionally wallaby grasses *Austrodanthonia spp*. (Department of Environment and Conservation 2005).	**Moderate**. Suitable habitats were available for this species	**Yes**. Potential habitat was identified within the study area. Therefore, this species has been assessed under the *Environmental Planning and Assessment Act 1979* and *Environment Protection and Biodiversity Conservation Act 1999.*
Varanus rosenbergi	Heath Monitor	V		No records	Found in coastal heaths, humid woodlands, wet and dry sclerophyll forests. Mostly a terrestrial species it shelters in burrows, hollow logs and rock crevices (Cogger 2000).	**Low**. There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Fish							
Maccullochella peelii peelii	Murray Cod		V	No records	The Murray Cod is found in a wide range of warm water habitats, from clear, rocky streams to slow-flowing turbid rivers and billabongs. Generally, they are found in waters up to 5 m deep and in sheltered areas with cover from rocks, timber or overhanging banks. The species is highly dependant on wood debris for habitat, using it to shelter from fast-flowing water (Department of the Environment Water Heritage and the Arts 2009).	**Low.** There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.

Scientific Name	Common Name	TSC or FM Act[1]	EPBC Act[2]	Recorded in Locality[3]	Habitat[4]	Likelihood of Occurrence[5]	Significance Assessment Required
Macquaria australasica	Macquarie perch	E	E	No records	Macquarie perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries (Department of Primary industries 2009).	**Low.** There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Mogurnda adspersa	Purple Spotted Gudgeon	E		No records	Purple spotted gudgeons are found in slow-moving or still waters of rivers, creeks and billabongs, often amongst weeds, rocks or large woody debris (snags) (Department of Primary industries 2009)	**Low.** There is no preferred habitat for this species available within the study area.	**No**. No preferred habitat is available within the study area. Therefore, this species is unlikely to be affected by the Proposal.
Nannoperca australis	Southern Pygmy Perch	E		Recorded	Southern Pygmy Perch are found in vegetated areas in small streams, lakes, billabongs and other types of wetlands (Department of Primary industries 2009).	**High.** This species was recorded in Tarcutta Creek	**Yes.** An assessment has been completed under the *Environmental Planning and Assessment Act 1979*

Note:

1: V = Vulnerable, E1 = Endangered E2 = Endangered Population (*Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994*).

2: V = Vulnerable, E = Endangered, M = Migratory, C = Conservation Dependent (*Environment Protection and Biodiversity Conservation Act 1999*).

3: Previously recorded refers to records of Threatened species that were identified in the locality (10 kilometres) from the Atlas of NSW Wildlife (Department of Environment and Climate Change 2007)

4: Based on database searches and field surveys.

5: Likelihood of occurrence (refer Section 2.8)

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Appendix E

Significance Assessments

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Significance assessments

For Threatened biodiversity listed under the *Threatened Species Conservation Act 1995*, this section details the heads of consideration for Threatened species assessment as suggested in the Department of Environment and Conservation/ Department of Primary Industries draft *Guidelines for Threatened Species Assessment* (Department of Environment and Conservation 2005a). The guidelines present methods to consider the impacts on biodiversity of Proposals assessed under Part 3A of the *Environmental Planning and Assessment Act 1979,* including presenting heads of consideration for determining the significance of impacts.

For Threatened biodiversity listed under the *Environment Protection and Biodiversity Conservation Act 1999* significance assessment have been completed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999 Significant Impact Guidelines* (Department of the Environment and Heritage 2006a).

Species listed under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999* have been assessed using both assessment guidelines separately.

The following threatened biodiversity have been assessed:

- Box-Gum Woodland.
- Inland Grey Box woodland.
- Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment.
- *Ammobium craspedioides* (Yass Daisy).
- *Diuris tricolor* (Pine Donkey Orchid).
- *Amphibromus fluitans* (River Swamp Wallaby-grass).
- Threatened woodland birds assessed together as a group (Brown Treecreeper, Hooded Robin, Black-chinned Honeyeater, Painted Honeyeater, Grey-crowned Babbler, Speckled Warbler and Diamond Firetail).
- Barking Owl.
- Bush Stone-curlew.
- Regent Honeyeater.
- Superb Parrot.
- Swift Parrot.
- Turquoise Parrot.
- Squirrel Glider.
- Eastern False Pipistrelle.
- Greater Long-eared Bat.
- Koala.
- Pink-tailed Worm Lizard.

- Striped Legless Lizard.
- Southern Pygmy Perch.

E1. White Box Yellow Box Blakely's Red Gum Woodland

White Box Yellow Box Blakely's Red Gum Woodland is an Endangered Ecological Community listed under the *Threatened Species Conservation Act 1995* that occurs in the study area (refer Figure E1) and would be directly affected by the Proposal.

E1.1 Assessment - *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Proposal would result in a reduction of the overall extent of White Box Yellow Box Blakely's Red Gum Woodland within the study area. Approximately seven hectares of this community would be cleared as a result of the Proposal (Figure E1). This represents 25 per cent of the remaining extent of the vegetation community within the study area, but only 0.09 per cent of the community remaining in south-eastern NSW (Thomas *et al.* 2000). A further approximately four hectares within 50 metres of the construction buffer are likely to be subject to new edge effects within the study area's larger remnants.

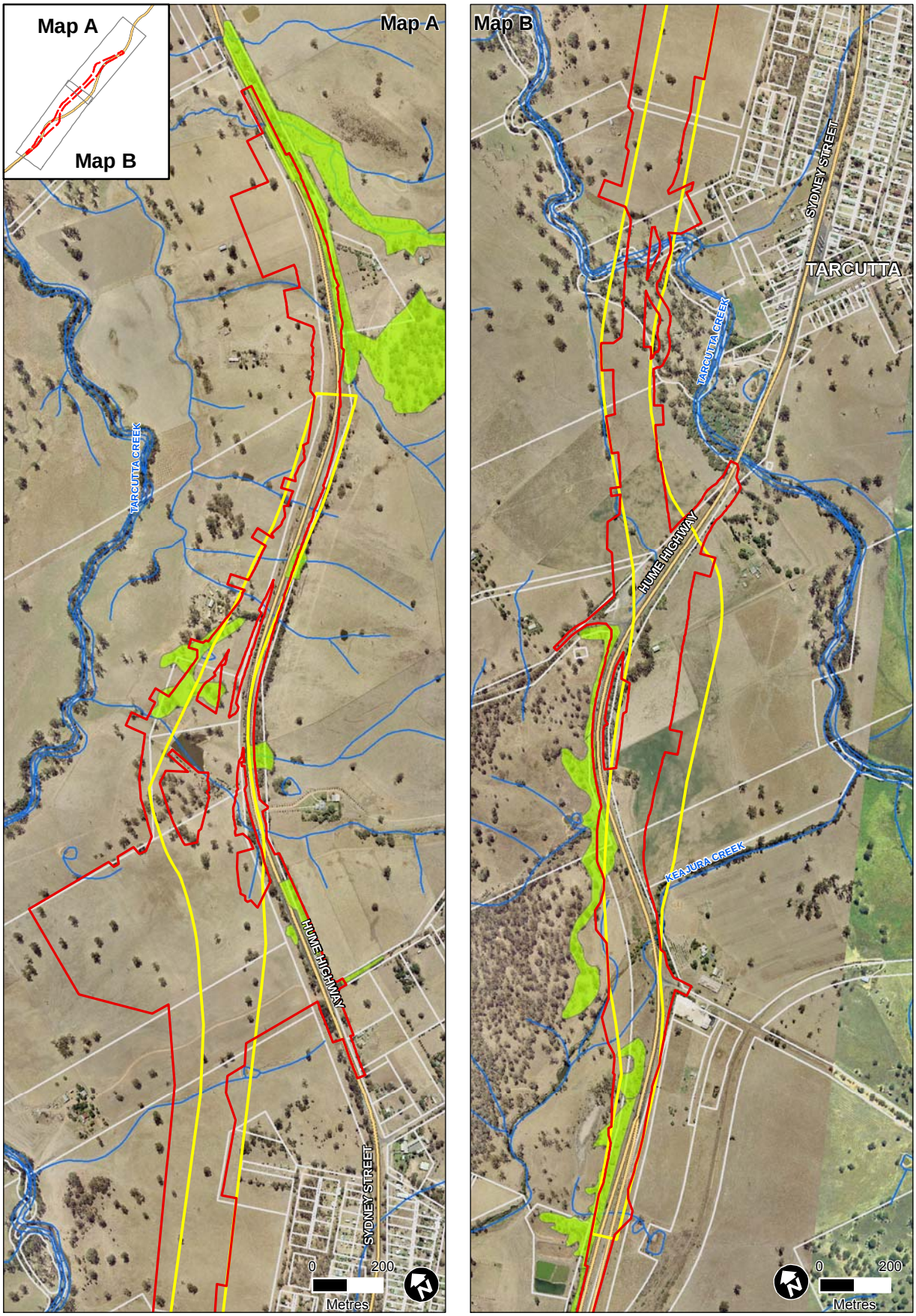
Vegetation in the study area occurs as small remnants within the existing road reserve and much larger remnants within the Southern Travelling Stock Reserve (Figure E1). Together these patches form part of a disjunct local corridor network within a highly modified landscape. Much of this vegetation is of significance because it contains high understorey biodiversity in areas that have not been used for domestic stock grazing or cropping, such as linear reserves including road reserves (Threatened Species Scientific Committee 2006).

The Proposal is likely to encroach on the edges of the largest single remnant patch of this community within the study area — the Southern Travelling Stock Reserve — and significantly remove the majority of the large roadside remnant patch in the very south of the study area. However, the condition of these patches was generally poor to moderate, with the better quality remnants located within the unaffected portions of the Southern Travelling Stock Reserve, west of the Proposal alignment.

How is the proposal likely to affect current disturbance regimes?

Remnants of this community within the study area have been highly modified by past land uses and the Proposal is unlikely to significantly alter the microhabitat conditions, except areas that would be subject to new edge effects (four hectares).

The Proposal would not have an impact on the fire regime in the study area. Minor changes to the surface hydrology may occur as result of the Proposal; however, not to an extent that are likely to affect the survival of the ecological community in the area.



Subject site
Tarcutta study corridor
Classified road
Drainage
White Box Yellow Box Blakeley's Red Gum Woodland

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E1 White Box Yellow Box Blakeley's Red Gum Woodland
(Threatened Species Conservation Act 1995)

How is the proposal likely to affect habitat connectivity?

White Box Yellow Box Blakely's Red Gum Woodland is highly fragmented across its former extent, including within the study area. In the region, 54 per cent of the remnant Box-Gum Woodland tree cover occurs as remnants of less than one hectare in size (Gibbons & Boak 2002). The per cent of tree cover in remnants less than one hectare would be lower in the study area given the presence of a number of large remnant patches associated with the Southern Travelling Stock Reserve. These patches are important in maintaining linkages across modified landscapes for fauna movement and genetic exchange for both fauna and flora (Gibbons & Boak 2002).

The vegetation in the study area provides an important corridor on a local scale through the study area and beyond, with remnant trees providing shelter for arboreal mammals and woodland birds moving between larger patches of remnant vegetation. The Proposal would include the clearing of up to four hectares of remnant vegetation; however, this will largely be restricted to the edges and periphery of larger remnants and will not create a significant gap in the local corridor network.

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. While the land within the study area is not listed as critical habitat and it is not considered critical to the survival of Box-Gum Woodland, it is, however, important.

In the region, 54 per cent of the remnant Box-Gum Woodland tree cover occurred as patches of less than one hectare, which provide important linkages across modified landscapes for fauna movement and genetic exchange between larger remnants (Gibbons & Boak 2002). In addition, areas of high understorey biodiversity tend to occur in areas that have not been used for domestic stock grazing or cropping such as travelling stock reserves and road reserves (Threatened Species Scientific Committee 2006). The majority of this community affected by the Proposal is located within roadside remnants.

Conclusion

The Proposal would result in reduction in the extent of the White Box Yellow Box Blakely's Red Gum Woodland. Within the local area and wider region this community has been severely cleared; however, the loss of a further seven hectares is not likely to be significant if suitable offsets are provided.

E2. White Box-Yellow Box-Blakely's Red Gum Grassy woodland and Derived Native Grasslands

White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland is an ecological community listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*, which occurs in the study area and which would be directly affected by the Proposal.

The following impact assessment has been completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment and Heritage 2006a) and is related to those remnants of the ecological community as defined by the *EPBC Act Policy Statement - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Department of the Environment and Heritage 2006b) and the Commonwealth Threatened Species Scientific Committee (Threatened Species Scientific Committee 2006).

The process for identifying the presence of the community is described below considering the various criteria for inclusion of vegetation as the Critically Endangered Ecological Community.

A total of 27 hectares of this community occurs within the study area, of which six hectares are likely to be affected by the Proposal (Figure E2).

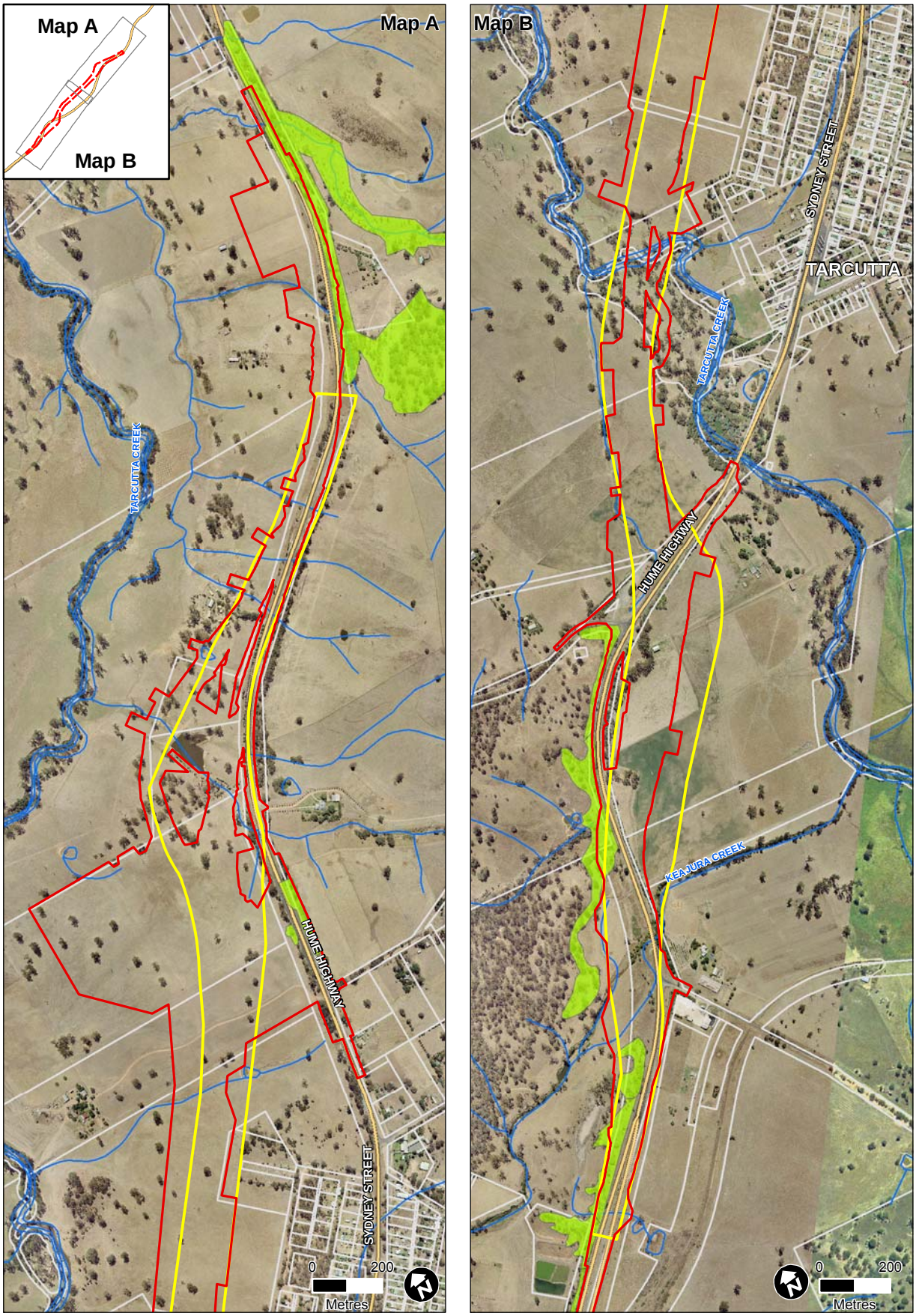
E2.1 Assessment – *Environment Protection and Biodiversity Conservation Act 1999*

An action is likely to have a significant impact on a Critically Endangered Ecological community if there is a real chance or possibility that it will result in one or more of the following:

Reduce the extent of an ecological community

The Proposal would result in a reduction in the extent of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland within the study area.

Approximately six hectares of this community would be cleared in the study area as a result of the Proposal (Figure E-2). This represents 23 per cent of the remaining extent of the vegetation community within the study area, but only 0.08 per cent of the community remaining in south-eastern NSW (Thomas et al. 2000). A further four hectares within 50 metres of the road edge are likely to be subject to new edge effects within the core of the study area's larger remnants.



Subject site
Tarcutta study corridor
Classified road
Drainage
White Box – Yellow Box – Blakely's- Red Gum Grassy Woodland and Derived Native Grassland

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E2 White Box – Yellow Box – Blakely's- Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act)

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland is already highly fragmented in the Proposal locality and in the wider region as a result of past land uses including the construction of the Hume Highway, grazing and other agricultural practices.

Box-Gum Woodland is highly fragmented across its former extent including within the study area. In the Tarcutta area, 54 per cent of the remnant White Box - Yellow Box - Blakely's Red Gum Woodland tree cover occurs as remnants of less than one hectare in size (Gibbons & Boak 2002). The study area, however, also contains a number of large remnant patches associated with the road reserves and Southern Travelling Stock Reserve. These patches are important in maintaining linkages across modified landscapes for fauna movement and genetic exchange for both fauna and flora (Gibbons & Boak 2002).

Much of the vegetation in the study area is of significance because it contains high understorey biodiversity (Threatened Species Scientific Committee 2006).

The Proposal is likely to encroach on the edges of the largest single remnant patch of this community within the study area, the Southern Travelling Stock Reserve, and significantly remove the majority of the large roadside remnant patch in the very south of the study area. However, the condition of these patches were generally poor to moderate, with the better quality remnants located within the unaffected portions of the Southern Travelling Stock Reserve west of the alignment.

Adversely affect habitat critical to the survival of an ecological community

No critical habitat has been listed for the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment and Heritage 2006c).

Habitat critical to the survival of an ecological community may, however, also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The extent of the ecological community that would be cleared as a result of the Proposal does not represent habitat critical to the survival of the ecological community, however, it is important.

In the region, 54 per cent of the remnant Box-Gum Woodland tree-cover occurs as patches less than one hectare in size. These patches provide important linkages across modified landscapes for fauna movement and genetic exchange between larger remnants (Gibbons & Boak 2002). The study area contains not only large patches of this community, but also patches with a high understorey biodiversity.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The Proposal would not modify or adversely affect abiotic factors necessary for the survival of Box-Gum Woodland within the study area. Soil would be disturbed in the subject site; however, the extent of this area is not essential for the survival of the ecological community.

The Proposal would result in some localised modification to surface water hydrology, however, not to an extent that would affect the survival of the ecological community. The changes to the surface water hydrology would not result in significant changes to the groundwater recharge, nor is the ecological community considered a groundwater dependant ecosystem.

Remnants of this community within the study area have been highly modified by past land uses and the Proposal is unlikely to significantly alter the microhabitat conditions, except areas that would be subject to new edge effects.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

The Proposal is not likely to cause a substantial change in the species composition of the patches of this ecological community in the study area. White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland patches within the study area are characterised by a simplified species composition as a result of past land-uses.

The Southern Travelling Stock Reserve and paddocks within the study area have been subject to past land use activities, including vegetation clearing, herbicide application, grazing, cropping and pasture improvement, all of which have reduced species diversity. The patches of the ecological community that remain in Southern Travelling Stock Reserve and paddocks are dominated by those native species that readily regenerate in response to disturbance intermingled with exotic species.

Within the road corridor the long, linear remnants have been subject to earthworks (during construction of the road and clearing of the drains), herbicides from roadside weed control and from within the paddocks, and establishment of pasture improvement species (where cattle are not able to graze), but still maintain a few native species.

The construction and operation of the majority of the Proposal is not likely to amplify the conditions that have resulted in the modification of the ecological community in the study area or cause these impacts to affect any new patches of the ecological community.

The larger remnants within the study area associated with the southern road reserve and Southern Travelling Stock Reserve have the potential to be affected by the encroachment of new edge effects into this community. The changes to habitat resulting from the introduction of edge effects into the previously 'core' areas of these remnants is likely to be approximately four hectares.

A change in the microhabitat conditions within the construction corridor as a result of vegetation clearing and earthworks increases the likelihood of the germination and establishment of exotic plants (weeds). The germination and establishment of weeds is most likely to occur in areas affected by vegetation clearing, in areas of exposed soil/fill (such as topsoil stockpiles, soil cuttings, fill batters and scree slopes) and along edge-affected areas of remnant vegetation.

However, field surveys within these communities already identified significant disturbances associated with edge effects from grazing and adjoining agricultural land practices. It is considered that any marginal increases in these effects caused by the Proposal are unlikely to be significant.

Interfere with the recovery of an ecological community

The removal of four hectares of this Critically Endangered Ecological Community is unlikely to interfere with the recovery of the community given the extent of clearing in relation to the broader extent within the region. However, at the local scale, the roadside vegetation and Southern Travelling Stock Reserve do contain important species, such as those that are grazing sensitive, and may function as an important source of species for the wider area.

Conclusion

The construction and operation of the Proposal, with the removal of six hectares of the Critically Endangered Ecological Community, is not likely to have a significant impact on this community.

E3. Inland Grey Box tall grassy woodland

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Inland Grey Box Woodland) is an Endangered Ecological Community listed under the *Threatened Species Conservation Act 1995* that occurs in the study area (refer Figure E3) and would be directly affected by the Proposal.

E3.1 Assessment - *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Proposal would result in a reduction of the overall extent of Inland Grey Box Woodland within the study area. Approximately five hectares of this community would be cleared as a result of the Proposal (Figure E3). This represents 32 per cent of the remaining extent of the vegetation community within the study area, but only 0.07 per cent of the community remaining in south-eastern NSW (Thomas *et al*. 2000). A further two hectares within 50 metres of the construction buffer are likely to be subject to new edge effects within the study area's larger remnants.

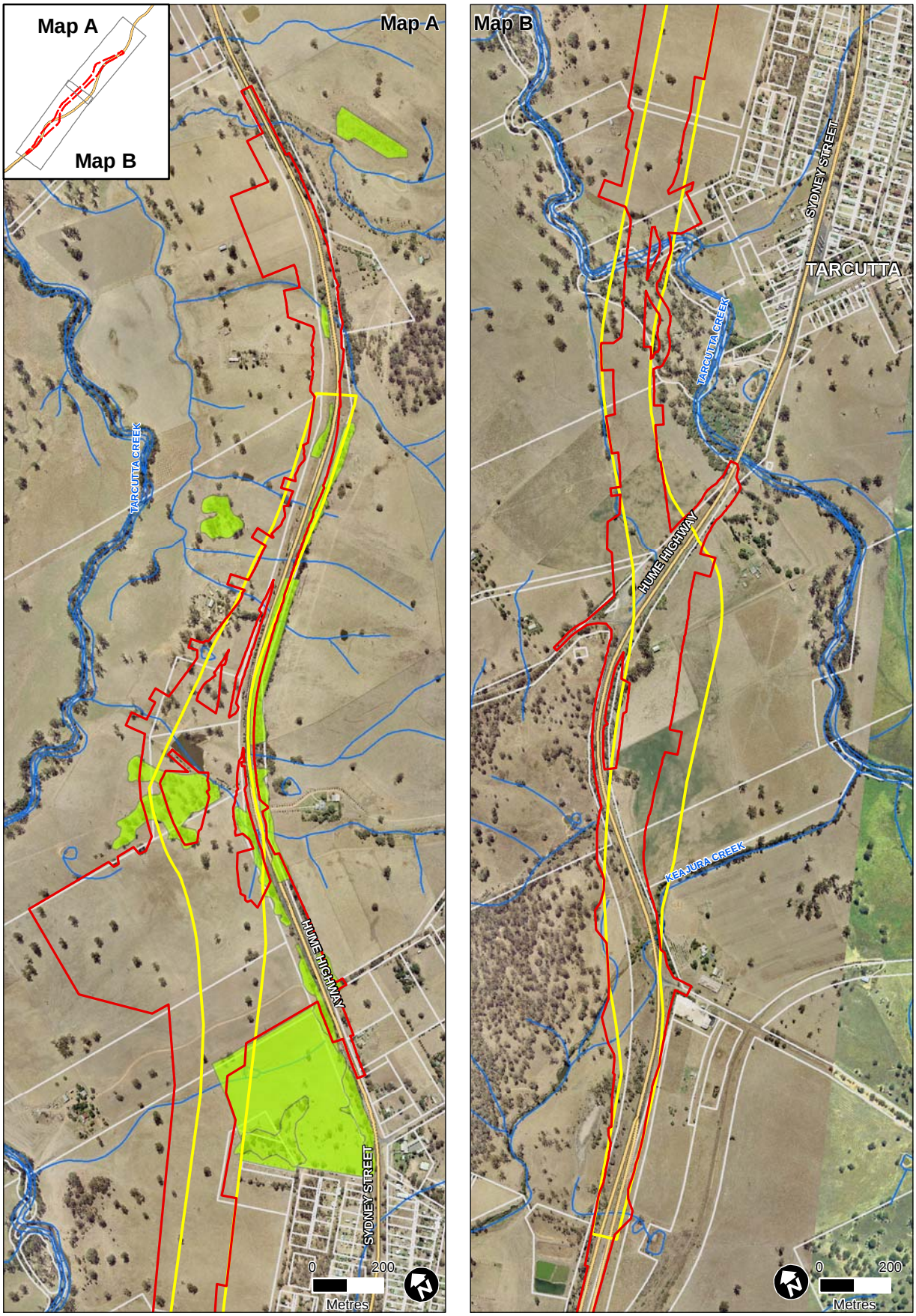
Vegetation in the study area occurs as small remnants within the existing road reserve and much larger remnants within the adjoining paddocks (Figure E3). Together these patches form part of a local corridor network within a highly modified landscape. Much of this vegetation is of significance because it contains high understorey biodiversity in areas that have not been used for domestic stock grazing or cropping, such as linear reserves including road reserves (Threatened Species Scientific Committee 2006).

The Proposal is likely to encroach on the edges of the largest single remnant patch of this community within the study area, the native grassland paddock and Tarcutta cemetery, and remove the majority of the large roadside remnant patches in the north of the study area.

How is the proposal likely to affect current disturbance regimes?

Remnants of this community within the study area have been highly modified by past land uses and the Proposal is unlikely to significantly alter the microhabitat conditions, except areas that would be subject to new edge effects (two hectares).

The Proposal would not have an impact on the fire regime in the study area. Minor changes to the surface hydrology may occur as result of the Proposal; however, not to an extent that is likely to affect the survival of the ecological community in the area.



Subject site
Tarcutta study corridor
Classified road
Drainage
Inland Grey Box tall grassy woodland

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E3 Inland Grey Box Tall Grassy Woodland
(TSC Act and preliminary listing under the EPBC Act)

How is the proposal likely to affect habitat connectivity?

Inland Grey Box Woodland is highly fragmented across its former extent, including within the study area. The vegetation in the study area consists of isolated paddock remnants and smaller linear fragments within the local road reserve system that provide a disjunct corridor on a local scale through the study area and beyond, with remnant trees providing shelter for arboreal mammals and woodland birds moving between larger patches of remnant vegetation. The proposal would include the clearing of up to five hectares of remnant vegetation; however, this is unlikely to create a significant gap in the local corridor network.

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. While the land within the study area is not listed as critical habitat and it is not considered critical to the survival of Inland Grey Box Woodland, it is, however, important.

Areas of high understorey biodiversity tend to occur in areas that have not been used for domestic stock grazing or cropping, such as travelling stock reserves and road reserves (Threatened Species Scientific Committee 2006). The majority of this community affected by the Proposal is located within roadside remnants and adjoining paddocks with high understorey biodiversity.

Conclusion

The proposed upgrade would result in reduction in the extent of the Inland Grey Box Woodland. Within the local area and wider region this community has been severely cleared in the past; however, the loss of a further five hectares and likely indirect impacts on two hectares through edge effects is not likely to be significant if suitable mitigation and offsets are implemented.

E3.2 Assessment – *Environment Protection and Biodiversity Conservation Act 1999*

The Scientific Committee has made a preliminary determination to list Inland Grey Box Woodland as a Vulnerable Ecological Community under the *Environment Protection and Biodiversity Conservation Act 1999*.

An action is likely to have a significant impact on an Endangered Ecological community if there is a real chance or possibility that it will result in one or more of the following:

Reduce the extent of an ecological community

The Proposal would result in a reduction in the extent of the Inland Grey Box Woodland within the study area.

Approximately five hectares of this community would be cleared in the study area as a result of the Proposal (Figure E-3). This represents 32 per cent of the remaining extent of the vegetation community within the study area, but only 0.07 per cent of the community remaining in south-eastern NSW (Thomas et al. 2000). A further two hectares within 50 metres of the road edge are likely to be subject to new edge effects within the core of the study area's larger remnants.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

Inland Grey Box Woodland is already highly fragmented in the Proposal locality and in the wider region as a result of past land uses including the construction of the Hume Highway, grazing and other agricultural practices.

Inland Grey Box Woodland is highly fragmented across its former extent, including within the study area. The vegetation in the study area consists of isolated paddock remnants and smaller linear fragments within the local road reserve system that provide a disjunct corridor on a local scale through the study area and beyond, with remnant trees providing shelter for arboreal mammals and woodland birds moving between larger patches of remnant vegetation. The proposal would include the clearing of up to five hectares of remnant vegetation; however, this is unlikely to create a significant gap in the local corridor network

Adversely affect habitat critical to the survival of an ecological community

No critical habitat has been listed for the Inland Grey Box Woodland ecological community under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment and Heritage 2006c).

Habitat critical to the survival of an ecological community may, however, also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The extent of the ecological community that would be cleared as a result of the Proposal does not represent habitat critical to the survival of the ecological community, however, it is important.

The patches of this community within the study area provide important linkages across modified landscapes for fauna movement and genetic exchange between larger remnants (Gibbons & Boak 2002). The study area contains not only large patches of this community, but also patches with a high understorey biodiversity.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The Proposal would not modify or adversely affect abiotic factors necessary for the survival of Inland Grey Box Woodland within the study area. Soil would be disturbed in the subject site; however, the extent of this area is not essential for the survival of the ecological community.

The Proposal would result in some localised modification to surface water hydrology, however, not to an extent that would affect the survival of the ecological community.

The changes to the surface water hydrology would not result in significant changes to the groundwater recharge, nor is the ecological community considered a groundwater dependant ecosystem.

Remnants of this community within the study area have been highly modified by past land uses and the Proposal is unlikely to significantly alter the microhabitat conditions, except areas that would be subject to new edge effects.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

The Proposal is not likely to cause a substantial change in the species composition of the patches of this ecological community in the study area. Inland Grey Box Woodland patches within the study area are characterised by a simplified species composition as a result of past land-uses.

The paddocks within the study area have been subject to past land use activities, including vegetation clearing, herbicide application, grazing, cropping and pasture improvement, all of which have reduced species diversity. The patches of the ecological community that remain in roadside reserves and paddocks are dominated by those native species that readily regenerate in response to disturbance intermingled with exotic species.

Within the road corridor the long, linear remnants have been subject to earthworks (during construction of the road and clearing of the drains), herbicides from roadside weed control and from within the paddocks, and establishment of pasture improvement species (where cattle are not able to graze), but still maintain a few native species.

The construction and operation of the majority of the Proposal is not likely to amplify the conditions that have resulted in the modification of the ecological community in the study area or cause these impacts to affect any new patches of the ecological community.

The larger remnants within the study area associated with the northern road reserve and have the potential to be affected by the encroachment of new edge effects into this community. The changes to habitat resulting from the introduction of edge effects into the previously ‘core’ areas of these remnants is likely to be approximately two hectares.

A change in the microhabitat conditions within the construction corridor as a result of vegetation clearing and earthworks increases the likelihood of the germination and establishment of exotic plants (weeds). The germination and establishment of weeds is most likely to occur in areas affected by vegetation clearing, in areas of exposed soil/fill (such as topsoil stockpiles, soil cuttings, fill batters and scree slopes) and along edge-affected areas of remnant vegetation.

However, field surveys within these communities already identified significant disturbances associated with edge effects from grazing and adjoining agricultural land practices. It is considered that any marginal increases in these effects caused by the Proposal are unlikely to be significant.

Interfere with the recovery of an ecological community

The removal of five hectares of this preliminary listed Vulnerable Ecological Community is unlikely to interfere with the recovery of the community given the extent of clearing in relation to the broader extent within the region. However, at the local scale, the roadside vegetation do contain important species, such as those that are grazing sensitive, and may function as an important source of species for the wider area.

Conclusion

The construction and operation of the Proposal, with the removal of five hectares of the preliminary listed Vulnerable Ecological Community.

E4. Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment

The Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment is listed as an Endangered Ecological Community under the *Fisheries Management Act 1994.*

The lower Murray ecological community includes all native fish and aquatic invertebrates within all natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River below the Hume Weir, the Murrumbidgee River below Burrinjuck Dam, and the Tumut River below Blowering Dam, as well as all their tributaries and branches (NSW Fisheries 2002).

Creeks within the study area all fall within this broad catchment (Figure E4).

E4.1 Assessment – *Environmental Planning and Assessment Act 1979*

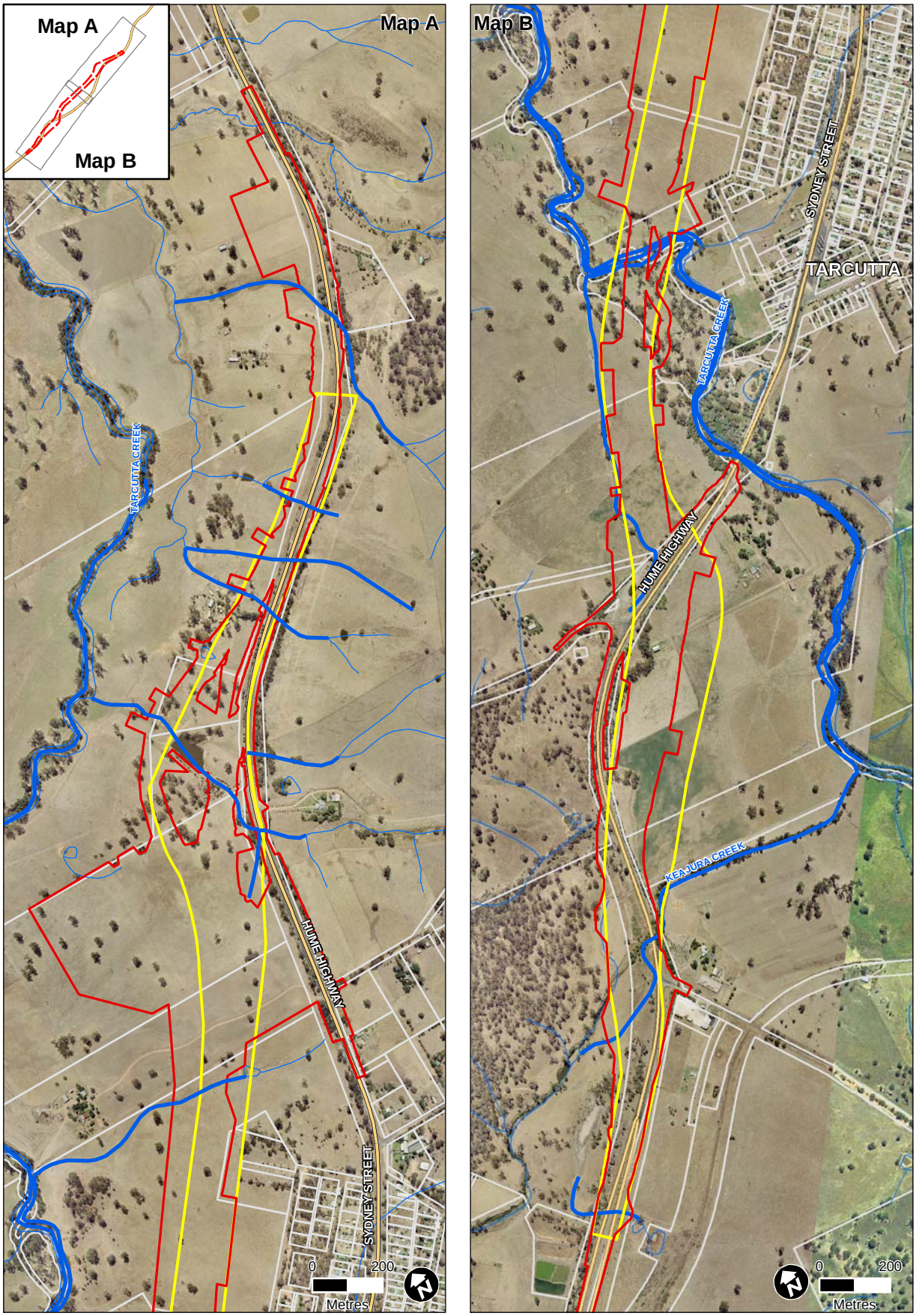
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

All creeks within the study area fall within the broad catchment, and therefore, form part of this ecological community (Figure E4).

Fish and mobile invertebrate assemblages of the water bodies sampled during this study were fairly typical of freshwater habitats within the region. Given that suitable habitat exists up and downstream of the watercourses, no long-term impacts from the proposed waterway crossings are expected on the ecological community, if the crossings comply with NSW Fisheries guidelines (Fairfull & Witheridge 2003) and erosion and sedimentation controls are implemented in accordance with best practice (Department of Environment and Climate Change 2008b).

How is the proposal likely to affect current disturbance regimes?

The Proposal will add new creek crossings, which is likely to add to the overall disturbance regimes in the creeks. However, the waterways within the study area are affected currently by riparian vegetation clearance, erosion and sedimentation, alteration to flows and bank instability due to stock access and vegetation removal. Given that suitable habitat exists up and downstream of the watercourses, no long-term impacts from the proposed waterway crossings are expected on the ecological community within the area, if the crossings comply with NSW Fisheries guidelines (Fairfull & Witheridge 2003) and erosion and sedimentation controls are implemented in accordance with best practice (Department of Environment and Climate Change 2008b).



Subject site
Tarcutta study corridor
Classified road
Drainage
Drainage intersecting preferred option

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E4 Aquatic assemblage

How is the proposal likely to affect habitat connectivity?

The waterways within the study area would not become disconnected as a result of the Proposal. However, the installation of bridges and culverts would have the potential to create barriers to fish passage. Provided the waterways crossings are undertaken in accordance with the NSW Fisheries Guidelines (Fairfull & Witheridge 2003) it is unlikely that the Proposal would result in any barriers to fish passage or habitat connectivity.

How is the proposal likely to affect critical habitat?

The Department of Primary Industries maintains a register of critical habitat. Water bodies within the study area are generally in poor condition, are not listed as a critical habitat and are not considered critical to the survival of the ecological community.

Conclusion

The Proposal would require modification of minor waterways that fall within the range of the Endangered Ecological Community. However, these minor creeks do not contain unique or important assemblages of species and are in poor condition. Tarcutta Creek does contain a Threatened species of fish, but would not be significantly affected by the Proposal. As such, the impacts on this community are not considered to be significant.

E5. *Ammobium craspedioides* (Yass Daisy)

The Yass Daisy is a rosette-forming perennial daisy species found from near Crookwell on the Southern Tablelands to near Wagga Wagga on the South-western Slopes. This species was not observed in the study area during the field assessment; however, it is considered to have potential to occur due to availability of suitable habitat and known previous records in similar habitats in the region (Figure E5).

The Yass Daisy grows in dry forest, Box-Gum Woodland and secondary grassland derived from clearing of these communities. It generally flowers in spring.

The Yass Daisy is listed as Vulnerable under both the *Threatened Species Conservation Act 1995 and the Environment Protection and Biodiversity Conservation Act 1999*.

E5.1 Assessment – *Environment Protection and Biodiversity Conservation Act 1999*

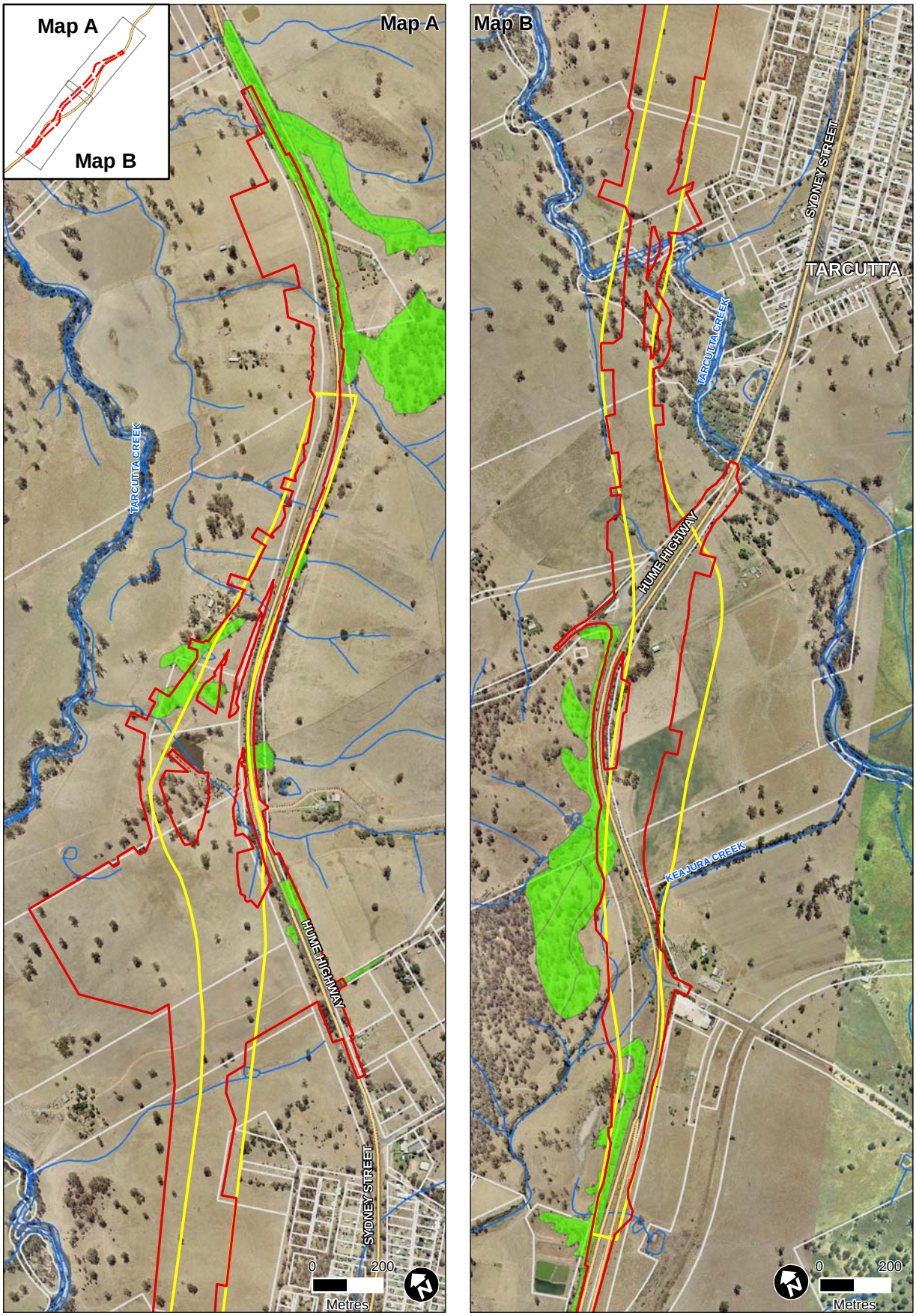
Under the *Environment Protection and Biodiversity Conservation Act 1999,* important populations are:

- Likely to be key source populations either for breeding or dispersal.
- Likely to be necessary for maintaining genetic diversity.
- At or near the limit of the species range.

If present, the population of *Ammobium craspedioides* (Yass Daisy) in the study area would not be considered an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

No populations of *Ammobium craspedioides* (Yass Daisy) have been identified within the study area, and if present it would unlikely to be an important population. In the event that the *Ammobium craspedioides* (Yass Daisy) may be present in the study area, development of the Proposal, and removal of approximately eleven hectares of potential habitat, would not represent a significant decrease in the size of the known population in the region.



Subject site
Tarcutta study corridor
Classified road
Drainage
Ammobium craspedioides (Yass Daisy) potential habitat

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E5 Potential habitat of
Ammobium Craspedioides (Yass Daisy)

Will the action reduce the area of occupancy of an important population?

Ammobium craspedioides (Yass Daisy) within the study area has not been identified as an important population. *Ammobium craspedioides* (Yass Daisy) that may be affected in the study area, if present, would not represent a significant area within the known range of this species.

Will the action fragment an existing important population into two or more populations?

Habitat connectivity for *Ammobium craspedioides* (Yass Daisy) in the study area would not be significantly affected. Connectivity within a plant population relates to the ability of individuals to disperse and cross pollinate. *Ammobium craspedioides (*Yass Daisy) reproduces via seed dispersal. Despite targeted surveys for this species no individuals of this species were recorded. While the habitat for this threatened species will be further fragmented, no currently known populations are likely to be fragmented into two or more populations.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for the *Ammobium craspedioides* (Yass Daisy) under the *Environment Protection and Biodiversity Conservation Act 1999.*

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The vegetation that would be affected as a result of the Proposal does not represent habitat critical to the survival of *Ammobium craspedioides (*Yass Daisy).

Will the action disrupt the breeding cycle of an important population?

No individuals of *Ammobium craspedioides* (Yass Daisy) have been recorded within the study area or as an important population. Asteraceae are usually pollinated by insect pollinators drawn to the flowers by scent mimicking pheromones. Once in sight of the flower, the insects attempts to remove pollen, effecting pollination. The pollinator or pollinators for this species are unknown. The Proposal is unlikely to affect these processes.

Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

No *Ammobium craspedioides* (Yass Daisy) individuals were recorded during the targeted surveys despite targeted surveys being conducted during the flowering period for this is species (September to November).

The action will impact approximately eleven hectares of potential habitat. This is unlikely to result in the decline of the species given that no individuals were recorded.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The Proposal is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat. The Proposal is unlikely to result in introduction of new weeds into the study area, or change the microhabitats within the study area in a way that would assist the proliferation of existing weeds.

Will the action introduce disease that may cause the species to decline?

No, there are no known diseases associated with *Ammobium craspedioides* (Yass Daisy).

Will the action interfere substantially with the recovery of the species?

No recovery plans have been prepared for *Ammobium craspedioides* (Yass Daisy) and the study area has not been identified as important habitat for the recovery of the species.

Conclusion

The potential population of *Ammobium craspedioides* (Yass Daisy) in the study area is not considered an important population. Based on the above assessment, *Ammobium craspedioides* (Yass Daisy) is unlikely to be significantly affected by the Proposal.

E5.2 Assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The lifecycle of *Ammobium craspedioides* (Yass Daisy) within the study area is unlikely to be to be affected by the Proposal. *Ammobium craspedioides (*Yass Daisy) produces solitary flowerheads borne on unbranched stems to 60 centimetres tall; the stems are sparsely leafed, and edged with narrow 'wings'. Rosettes die off after fruiting.

Currently little is known on the specific pollination and seed dispersal of this species; however, it can be assumed that insects and wind are the primary pollination and seed dispersal mechanism. The Proposal is unlikely to affect these processes.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Proposal may modify some of the habitats that have potential for this species to occur (eleven hectares). However, this is not a significant proportion of the habitat available within the region, and as such is unlikely to result in a decline in habitat availability.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Ammobium craspedioides's (Yass Daisy) current known habitat distribution is from localities in NSW near Crookwell, on the Southern Tablelands to near Wagga Wagga, on the South-western Slopes. Most populations occur in the Yass District, at Lake Burrinjuck, Bookham, Rye Park and Dalton. A small population exists in Livingstone National Park, about 30 kilometres south of Wagga Wagga. The species has been noted as growing in large colonies.

If present within the study area, it would not be at the limit of its distribution.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire (intensity and frequency), flooding or other disturbance regimes. The Proposal occurs primarily within areas of habitat that are already disturbed from past clearing, grazing and the establishment of exotic weed species within the ground layers. The Proposal is unlikely to alter the current disturbance regimes that are already in place.

How is the proposal likely to affect habitat connectivity?

Habitat connectivity for *Ammobium craspedioides* (Yass Daisy) will be further fragmented as a result of the Proposal; however, connectivity within the study area would not be significantly affected. Connectivity within a plant population relates to the ability of individuals to disperse and cross pollinate. This species cross pollinates via insect pollinators, which are capable of flying between populations.

How is the proposal likely to affect critical habitat?

No critical habitat has been listed for *Ammobium craspedioides* (Yass Daisy) under the *Threatened Species Conservation Act 1995.*

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The habitat that would be affected as a result of the Proposal does not represent habitat critical to the survival of the *Ammobium craspedioides* (Yass Daisy).

Conclusion

Based on the above assessment, *Ammobium craspedioides* (Yass Daisy) is unlikely to be significantly affected by the Proposal.

E6. *Diuris tricolor* (Pine Donkey Orchid)

The Pine Donkey Orchid (*Diurus tricolor* — formerly known as *Diuris sheaffiana*) is a terrestrial species (it grows from the ground rather than from rocks or vegetation). This species is particular cryptic to detect and requires surveys to be completed during its limited flowering period between late August and mid October, The surveys completed for this study were undertaken in November and were unlikely to detect this species; however, it has the potential to occur due to availability of suitable habitat (Figure E6) and known previous records in similar habitats in the region.

The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (*Callitris* spp.). It is found in sandy soils, either on flats or small rises. Disturbance regimes are not known, although the species is usually recorded from disturbed habitat. Associated species include *Callitris glaucophylla*, *Eucalyptus populnea*, E. *intertexta*, Ironbark and Acacia shrubland. The understorey is often grassy with herbaceous plants such as Bulbine species. It flowers from September to November or generally spring.

The *Diuris tricolor* (Pine Donkey Orchid) is listed as Vulnerable under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999.*

E6.1 Assessment – *Environment Protection and Biodiversity Conservation Act 1999*

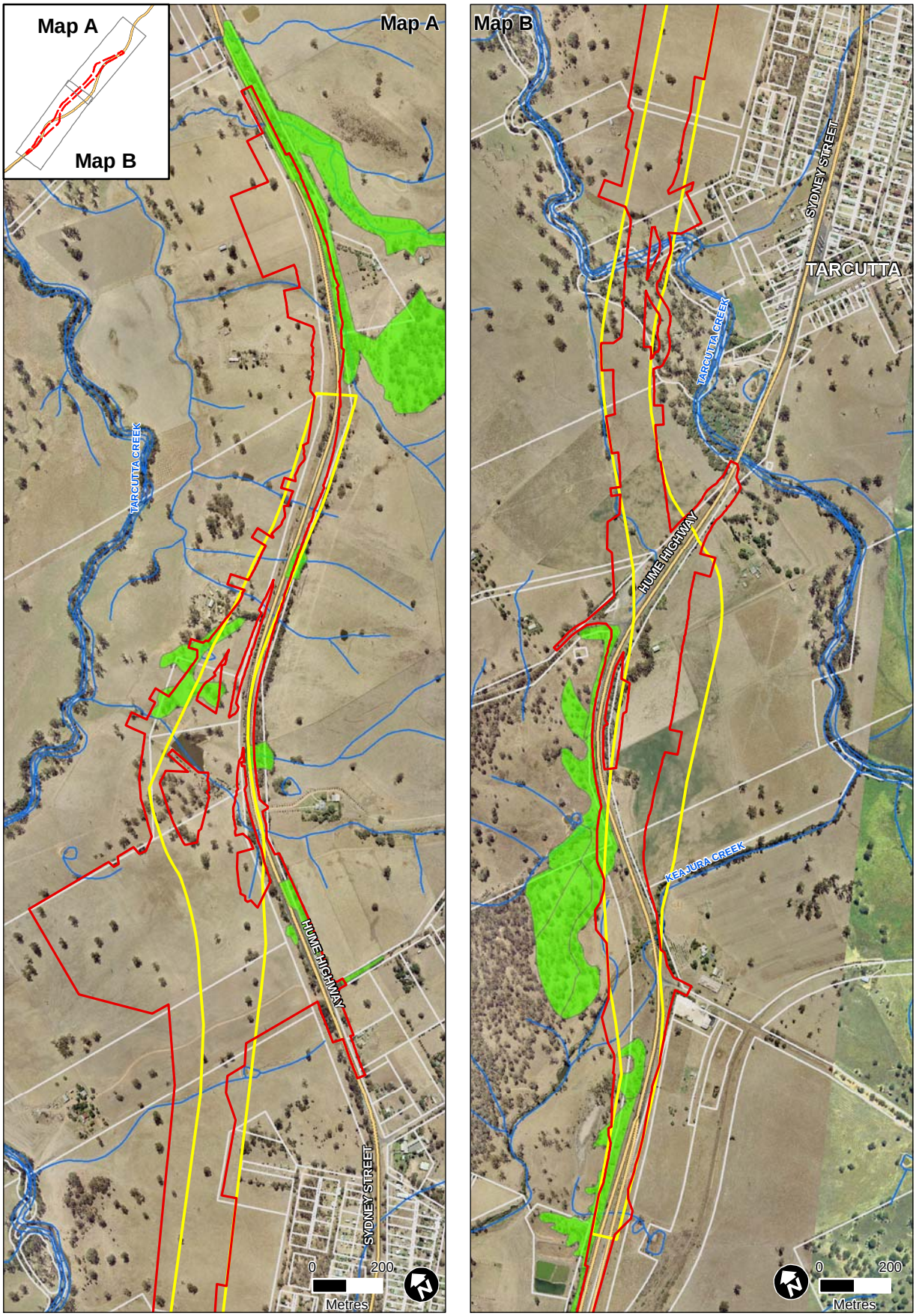
Under the *Environment Protection and Biodiversity Conservation Act 1999*, important populations are:

- Likely to be key source populations either for breeding or dispersal.
- Likely to be necessary for maintaining genetic diversity.
- At or near the limit of the species range.

If present, the population of *Diuris tricolor* (Pine Donkey Orchid) in the study area would not be considered an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

No population of *Diuris tricolor* has been identified within the study area, and if present it would unlikely to be an important population. In the event that the *Diuris tricolor* may be present in the study area, development of the Proposal, and removal of approximately eleven hectares of potential habitat, would not represent a significant decrease in the size of the known population in the region.



Subject site
Tarcutta study corridor
Classified road
Drainage
Diuris tricolor (Pine Donkey Orchid) potential habitat

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E6 Potential habitat of
Diuris tricolor (Pine Donkey Orchid)

Will the action reduce the area of occupancy of an important population?

Diuris tricolor within the study area has not been identified as an important population. *Diuris tricolor* that may be affected in the study area, if present, would not represent a significant area of the known range of this species.

Will the action fragment an existing important population into two or more populations?

Habitat connectivity for *Diuris tricolor* in the study area would not be significantly affected. Connectivity within a plant population relates to the ability of individuals to disperse and cross pollinate. *Diuris tricolor* reproduces via seed dispersal. Despite targeted surveys for this species no individuals of this species were recorded. While the habitat for this threatened species will be further fragmented, no currently known populations are likely to be fragmented into two or more populations.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for the *Diuris tricolor* (Pine Donkey Orchid) under the *Environment Protection and Biodiversity Conservation Act 1999*.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The vegetation that would be affected as a result of the Proposal does not represent habitat critical to the survival of Diuris *tricolor*.

Will the action disrupt the breeding cycle of an important population?

No individuals of *Diuris tricolor* have been recorded within the study area or as an important population. *Diuris* sp are usually pollinated by insect pollinators drawn to the flowers by scent mimicking pheromones. Once in sight of the flower, the insects attempts to remove pollen, effecting pollination. The Proposal is unlikely to affect these processes.

Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

No *Diuris tricolor* individuals were recorded during the targeted surveys despite targeted surveys being conducted during the flowering period for this species (September to November).

The action will impact approximately eleven hectares of potential habitat. This is unlikely to result in the decline of the species given that no individuals were recorded.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The Proposal is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat. The Proposal is unlikely to result in introduction of new weeds into the study area, or change the microhabitats within the study area in a way that would assist the proliferation of existing weeds.

Will the action introduce disease that may cause the species to decline?

No, there are no known diseases associated with *Diuris tricolor.*

Will the action interfere substantially with the recovery of the species?

No recovery plans have been prepared for *Diuris tricolor* (Pine Donkey Orchid) and the study area has not been identified as important habitat for the recovery of the species.

Conclusion

The potential population of *Diuris tricolor* (Pine Donkey Orchid) in the study area is not considered an important population. Based on the above assessment, *Diuris tricolor* (Pine Donkey Orchid) is unlikely to be significantly affected by the Proposal.

E6.2 Assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The lifecycle of *Diuris tricolor* (Pine Donkey Orchid) within the study area is unlikely to be to be affected by the Proposal. Emerging annually from a subterranean tuber, *Diuris tricolor* is likely to be pollinated through a process called pseudocopulation (Jones et al. 2006). The glands on the perianth segments are a source of the sexual attractants for the pollinators, usually male thynnine wasps drawn to the flowers by scent mimicking the female thynnine wasp pheromone. Once in sight of the flower, the male attempts to copulate with the labellum of the flower, mistaking it for a female wasp, and effects pollination. Once pollinated, *Diuris tricolor* reproduces via seed dispersal, probably assisted by wind. Given this species was not recorded within the subject site and the availability of potential habitat being retained within the locality. The Proposal is unlikely to affect these processes.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Diuris tricolor is a terrestrial deciduous herb, emerging annually from a subterranean tuber that occurs in sclerophyll forest among grass, often with native Cypress Pine (*Callitris* spp.). It is found in sandy soils, either on flats or small rises.

The Proposal may modify some of the habitats that have potential for this species to occur (eleven hectares). However, this is not a significant proportion of the habitat available within the region, and as such, is unlikely to result in a decline in habitat availability.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Diuris tricolor's current known habitat distribution is widespread throughout NSW occurring within the following catchment management areas: Central West, Hawkesbury/Nepean, Hunter/Central Rivers, Lachlan, Murrumbidgee, Namoi and Western CMAs, usually recorded as common and locally frequent in populations. The species has been noted as growing in large colonies.

If present within the study area, it would not be at the limit of its distribution.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire (intensity and frequency), flooding or other disturbance regimes. The Proposal occurs primarily within areas of habitat that are already disturbed from past clearing, grazing and the establishment of exotic weed species within the ground layers. The Proposal is unlikely to alter the current disturbance regimes that are already in place.

How is the proposal likely to affect habitat connectivity?

Habitat connectivity for *Diuris tricolor* would be further fragmented as a result of the Proposal; however, connectivity within the study area would not be significantly affected. Connectivity within a plant population relates to the ability of individuals to disperse and cross pollinate. This species cross pollinates via insect pollinators (wasps and bees), which are capable of flying between populations. *Diuris tricolor* reproduces via seed dispersal. Despite targeted surveys for this species, no individuals of this species were recorded. While the habitat for this threatened species will be further fragmented, no currently known populations are likely to be affected.

How is the proposal likely to affect critical habitat?

No critical habitat has been listed for *Diuris tricolor* under the *Threatened Species Conservation Act 1995*.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The habitat that would be affected as a result of the Proposal does not represent habitat critical to the survival of the *Diuris tricolor* (Pine Donkey Orchid).

Conclusion

Based on the above assessment, *Diuris tricolor* (Pine Donkey Orchid) is unlikely to be significantly affected by the Proposal.

E7. *Amphibromus fluitans* (River Swamp Wallaby-grass)

Amphibromus fluitans (River Swamp Wallaby-grass) was not observed in the study area during the field assessment; however, it has the potential to occur due to availability of suitable habitat (Figure E7) and known previous records in similar habitats in the region.

Amphibromus fluitans is a semi-aquatic species that occurs in areas with permanent or seasonal inundation including natural floodplain wetlands (such as oxbow swamps), along small perennial streams and in farm dams (Carr 2006; Department of Environment and Conservation 2006a) and is known to occur in numerous natural water bodies and farm dams throughout the region (Carr 2006; Connell Wagner Pty Ltd 2000). The species is tolerant of high nutrient levels, however, intolerant of turbid water (Carr 2006).

Amphibromus fluitans is listed as Vulnerable under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.

E7.1 Significance assessment – *Environment Protection and Biodiversity Conservation Act 1999*

Under the *Environment Protection and Biodiversity Conservation Act 1999*, important populations are:

- Likely to be key source populations either for breeding or dispersal.
- Likely to be necessary for maintaining genetic diversity.
- At or near the limit of the species range.

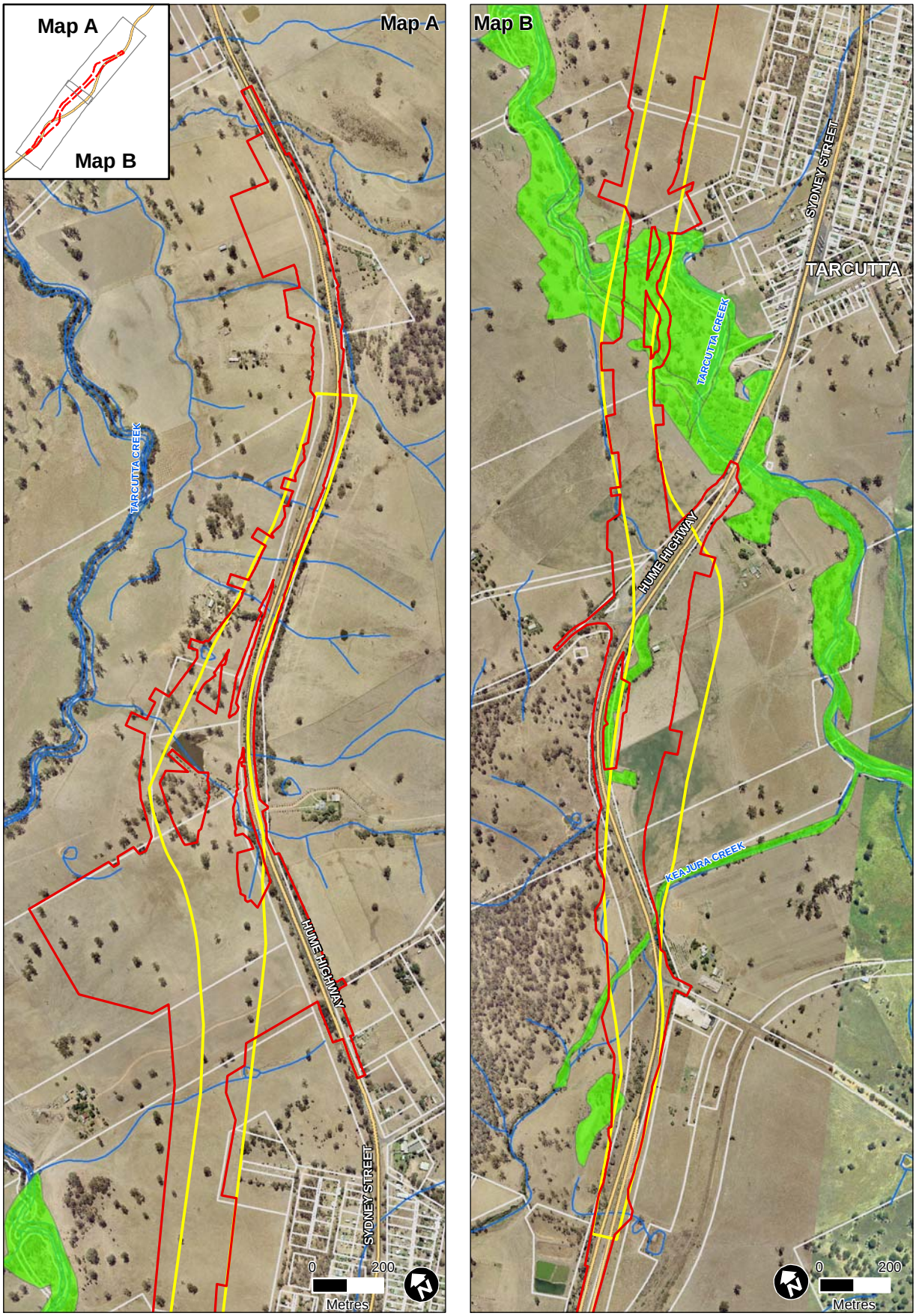
If present, the population of *Amphibromus fluitans* in the study area would not be considered an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Amphibromus fluitans within the study area has not been identified as an important population. *Amphibromus fluitans* that may be affected in the study area, if present, would not represent a significant or long-term decrease in the size of the known population in the region.

Will the action reduce the area of occupancy of an important population?

Amphibromus fluitans within the study area has not been identified as an important population. Approximately three hectares of aquatic habitats associated with the River Red Gum very tall open forest, minor drainage lines and wet soaks surrounding artificial farm dams provides potential habitat for *Amphibromus fluitans* in the study area. However, this is not a significant proportion of the habitat available within the region, and as such, is unlikely to represent a significant reduction in the area of the known range of this species.



Subject site
Tarcutta study corridor
Classified road
Drainage
Amphibromus fluitans potential habitat

J:\A243-ENV\PROJ\2116784A_EIA_PM_Hume_Hi\10_GIS\Projects\Tarcutta_2116784B\2116784B_Tarcutta_2039_Ecology_Vegetation_Amphibromus_Fluitans.mxd - ei - 25.05.09

E7 Potenital habitat of Amphibromus fluitans

Will the action fragment an existing important population into two or more populations?

Habitat connectivity for *Amphibromus fluitans* in the study area would not be significantly affected. Connectivity within a plant population relates to the ability of individuals to disperse and cross pollinate. Dispersal of *Amphibromus fluitans*, like many other water plants, is likely to be linked to physical transportation of seeds and vegetative material by water and/or dispersal of seeds attached to fauna moving between water bodies (such as water birds).

Transportation of seeds and vegetative material by water is most likely to be important to the plants occurring within drainage lines. Although the Proposal will directly affect the creeks and associated drainage lines, connectivity will still be maintained. The connectivity of *Amphibromus fluitans* occurring within the creek is, therefore, not likely to be adversely affected by the Proposal.

Amphibromus fluitans occurring in farm dams are likely to be more reliant on dispersal of seeds attached to fauna moving between water bodies. This process would not be adversely affected by the Proposal.

The Proposal is not likely to fragment an existing population into two or more populations.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for *Amphibromus fluitans* under the *Environment Protection and Biodiversity Conservation Act 1999.*

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The water bodies that would be affected as a result of the Proposal do not represent habitat critical to the survival of the *Amphibromus fluitans*.

Will the action disrupt the breeding cycle of an important population?

The potential *Amphibromus fluitans* within the study area has not been identified as an important population. While the pollination mechanisms of *Amphibromus fluitans* have not been identified, like other stoloniferous or rhizomatous grasses and aquatic plants, it is likely to be reliant on both pollination and development of seeds and asexual (vegetative) reproduction. The Proposal is unlikely to affect these processes.

Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The Proposal may modify some aquatic habitats that have potential for this species to occur. However, this is not a significant proportion of the habitat available within the region, and as such is unlikely to result in a decline in the species.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The Proposal is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. The Proposal is unlikely to result in introduction of new weeds into the study area, or change the microhabitats within the study area in a way that would assist the proliferation of existing weeds.

Will the action introduce disease that may cause the species to decline?

No, there are no known diseases associated with *Amphibromus fluitans.*

Will the action interfere substantially with the recovery of the species?

A recovery plan has not been prepared for *Amphibromus fluitans* and the potential habitat is not considered to be important for the recovery of the species.

Conclusion

The potential population of *Amphibromus fluitans* in the study area is not considered an important population. Based on the above assessment, *Amphibromus fluitans* is unlikely to be significantly affected by the Proposal.

E7.2 Assessment – *Environmental Planning and Assessment Act 1979*

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The lifecycle of *Amphibromus fluitans* within the study area is unlikely to be to be affected by the Proposal.

While the pollination mechanisms of *Amphibromus fluitans* have not been identified, like other stoloniferous or rhizomatous grasses and aquatic plants, it is likely to be reliant on both pollination and development of seeds and asexual (vegetative) reproduction. The Proposal is unlikely to affect these processes.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Amphibromus fluitans is a semi-aquatic species that occurs in areas with permanent or seasonal inundation, including natural floodplain wetlands (such as oxbow swamps), along small perennial streams and in farm dams (Carr 2006; Department of Environment and Conservation 2006a) and is known to occur in numerous natural water bodies and farm dams throughout the region (Carr 2006; Connell Wagner Pty Ltd 2000).

The Proposal may modify approximately three hectares of aquatic habitats associated with the River Red Gum very tall open forest that have potential for this species to occur.

However, this is not a significant proportion of the habitat available within the region, and as such is unlikely to result in a decline in habitat availability.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Amphibromus fluitans is naturally distributed throughout the greater Albury region of NSW (Department of Environment and Conservation 2006b). The study area is located in the mid to upper region of the natural distribution of this species.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire (intensity and frequency), flooding or other disturbance regimes. The Proposal occurs primarily within areas of habitat that are not suitable for this species to persist within; however, small areas of sub-optimal habitat persist along Tarcutta and Keajura Creeks. This area of habitat is already highly disturbed from past vegetation clearing, establishment of exotic species and erosion; as such, it is considered that the Proposal is unlikely to alter the current disturbance regimes that are already in place.

Therefore, it is unlikely the Proposal will affect current disturbance regimes.

How is the proposal likely to affect habitat connectivity?

Habitat connectivity for *Amphibromus fluitans* in the study area would not be significantly affected. Connectivity within a plant population relates to the ability of individuals to disperse and cross pollinate. Dispersal of *Amphibromus fluitans*, like many other water plants, is likely to be linked to physical transportation of seeds and vegetative material by water and/or dispersal of seeds attached to fauna moving between water bodies (such as water birds). These means of transportation, and hence connectivity, will not be affected by the Proposal.

How is the proposal likely to affect critical habitat?

No critical habitat has been listed for the *Amphibromus fluitans* under the *Threatened Species Conservation Act 1995.*

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The water bodies that would be affected as a result of the Proposal do not represent habitat critical to the survival of the *Amphibromus fluitans.*

Conclusion

Based on the above assessment, *Amphibromus fluitans* is unlikely to be significantly affected by the Proposal.